

Approved: Carl D. Holmes  
Date 4/29/94

MINUTES OF THE HOUSE COMMITTEE ON ENERGY AND NATURAL RESOURCES.

The meeting was called to order by Chairperson Carl Holmes at 3:30 p.m. on March 21, 1994 in Room 526-S of the Capitol.

All members were present except: Representative Powers - Excused

Committee staff present: Raney Gilliland, Legislative Research Department  
Dennis Hodgins, Legislative Research Department  
Mary Torrence, Revisor of Statutes  
Shirley Wilds, Committee Secretary

Conferees appearing before the committee: Susan Fox, Southwestern Bell Telephone Company  
Frank Caro, Polsinelli, White, Vardeman and Shalton  
Richard Robl, KS State Board of Education (former member)  
Joe Ryan, Southwestern Bell Telephone Company  
Debbie Snow, Communication Workers of America  
Bill Peterson, City Councilman - Abilene  
Peggy Blackman, Marion KS Community Coordinator  
Jerry Fear, City Administer - Oberlin  
Dr. Jack Reed, Northwest Kansas Educational Service Center  
Jack Maxwell, Ottawa University  
Bill Norris, Superintendent of Schools - Yates Center  
J H Seitz, Clay Center Hospital  
Dr. Edward Hammond, Ft Hays State University  
James M. Caplinger, State Independent Telephone Assn of KS

Others attending: See attached list

**Hearing on SB 591 and SCR 1627: (Proponents)**

**Sue Fox.** Ms. Fox reported her Company is willing to support this Bill and Resolution, because their customers will benefit from the high-risk capital dollars Southwestern Bell will spend in Kansas, and the bill does not guarantee they will be forced backwards into an archaic mode of rate-base regulation. (Attachment #1)

She emphasized that the Kansas Corporation Commission will continue to regulate her Company in the same manner as it has since 1990. That form of regulation, she reported, is what their customers tell the Company is their greatest concern - that the rate they pay for service is reasonable.

Citing several benefits implemented under TeleKansas I (and would be continued with **SB 591**), Ms. Fox said the Company's pledge is to continue modernization in Kansas, investing in the range of \$56 million to \$64 million over two years. She said these dollars are over and above their normal construction expenditures in the state, which have averaged around \$100 million per year for the last five years. By agreement with the KCC, she said they will spend that extra investment to enhance educational opportunities for Kansas schools, especially in rural Kansas (a concept called "Distance Learning"). Ms. Fox reported that the \$56-64 million she mentioned represents a very high risk for the Company and they will not earn off that investment in the near future. She alleged the Company's competitors are aware of this and that is why they are working to provide comparable levels of investment for rural Kansas customers.

She explained the reason the Company is willing to take the risk in rural Kansas is that the infrastructure improvement will give the rural parts of the state a chance to reverse a population decline. Over time, if rural Kansas can grow, the Company can grow with it and their shareowners who invest today can earn off their investment at some point in the future. Although **SB 591** does not guarantee that at the end of the two-year extension Southwestern Bell will not be forced to return to rate base regulation, they are willing to take the risk, because it is their belief that two more years of TeleKansas-like regulation will prove that incentives to invest private capital in Kansas works for everyone.

Referencing **SCR 1627**, Ms. Fox reported Southwestern Bell recognizes everyone has a stake in this issue and they are hopeful a formal, two-year study will culminate in a solid growth plan for Kansas.

Reporting that some parties have claimed that over the period of TeleKansas I the Company's expenses have gone down with excessive net income, those allegations are wrong and she offered to explain in more detail if the Committee so desired.

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Additionally, she said some of their long distance competitors have claimed that access charges should be reduced or eliminated, and it is important to understand that access charges are a government-created subsidy that help offset the cost of basic local service. She said the rural Kansas local exchange customer who does not make many long distance calls would have a hard time seeing the benefit of access charge reductions. She said access charges would continue to be treated separately under the extension called for in **SB 591**.

Ms. Fox concluded by reporting positive customer responses from a research they conducted and said **SB 591** and **SCR 1627** are a step in the right direction, delivering to Kansans what their customers say they want and need. She urged a favorable vote on the legislative package.

**Frank Caro.** (See Attachment #2) As a consultant and advisor to Southwestern Bell Mr. Caro said **SCR 1627** recognizes that telecommunications are a vital link to the economic development and growth of rural Kansas and directs the development of a statewide strategic plan during the next two years. Also, **SB 591** continues Southwestern Bell's additional infrastructure investment during the development of the statewide strategic plan.

Mr. Caro gave a detailed background of the regulation of the telecommunications industry in Kansas, subsequently submitting that **SCR 1627** sets forth the parameters for a study task force (under the auspices of Kansas Inc) to develop a statewide strategic plan for telecommunications. The Resolution focuses on three main areas:

- Emerging competition in the telecommunications industry
- The need for additional infrastructure investment
- The form of regulation in the future

While Kansas Inc is developing a statewide strategic plan for telecommunications, Mr. Caro said **SB 591** extends the terms of TeleKansas I for two years and will provide a continuation of:

- A cap on basic local service rates.
- The form of regulation that Southwestern Bell has operated in Kansas since 1990
- Incremental investment of \$56-64 million on the part of SWB to improve network infrastructure by providing "distance learning" capability for schools throughout its service territory.

**Richard Robl.** (See Attachment #3) Mr. Robl reported that Southwestern Bell is the only company presently in his area with an offer to invest in the education of all Kansas students. He said the benefits and uses of fiber optic cable are well known. With two-way interactive technology all learners receive the benefits to be gained when the link is to the so-called information super highway. Also, another level of benefits with fiber optic cable access allows individualized student learning. Mr. Robl added that fiber optics will encourage the use of technology in our schools.

Mr. Robl concluded by reporting that the parents and students in their Catholic Schools consider Southwestern Bell to be a caring corporate citizen in their community and a corporation that keeps its work. He urged the Committee to find a way that all schools and all students have equal access to fiber optics (regardless of the outcome of **SB 591**).

**Joe Ryan.** Supporting several of the comments as was stated by Mr. Robl, Mr. Ryan promoted the attributes of fiber optics as is related to engineering design and its application to education (via video). Also, he said fiber optics encourages economic development, training in medicines, as well as other promotional outlets within a community. Mr. Ryan said particularly essential is supplying fiber optics in rural areas with hook-ups that can be provided throughout the state. He supports both measures.

**Debbie Snow.** (See Attachment #4) Reporting that the Communications Workers of America is the work force that built, maintained and improved the best communication network in the world, Ms. Snow said that **SB 591** is a way to ensure that the network will continue its services. It will also keep rural Kansas in pace with changing technology. She said that the CWA wants to remain a vital link in the information super highway with the progression of time. Ms. Snow remarked in closing that the CWA has always held high commitment to customer service in Kansas and, as Kansans, have a stake in the state's future. She asked the Committee to aid them in their continuance of providing the communication network.

**Bill Peterson.** (See Attachment #5) Appearing as a Silver-Haired Legislator and an advocate for fellow senior citizens, Mr. Peterson said **SB 591** is a good deal for seniors. He said in spite of inflation and rising costs, SWB has worked to keep rates for basic, local service lower than the national average, an important factor for senior citizens,

As a civic leader in rural Kansas, he said the economic welfare of the state and community is of great important to him personally. If Southwestern Bell is not encouraged to bring technologies to rural Kansas (such as fiber optics) it will never materialize.

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Granting that this legislation will only bring investments for education, he maintained it will make the state more attractive to business. He asked for passage of this measure.

**Peggy Blackman.** (See Attachment #6) Living in rural Marion, Ms. Blackman said the rural areas need to have willing partners working alongside in their endeavors to provide growth to their economy, and Southwestern Bell is one of their partners. She asked the Committee to give the rural communities the same opportunity (as the urban areas) to compete in today's global economy. She added the rural areas need help to attract new business, to allow existing business to prosper, create jobs, continue health care, and allow a good quality of life to remain a reality. Ms. Blackman asked the Committee to extend TeleKansas I and look to the future with TeleKansas II.

**Jerry Fear.** (See Attachment #7) Mr. Fear provided the Committee with an article from the March issue of BYTE Magazine, summarizing developments and issues related to all interrelated aspects of information exchange. Also included in his testimony are a sampling of news stories on current events relative to the industry.

He said there are two parts of **SB 591** that he strongly supports: 1) Southwestern Bell will be allowed to construct a broadband analog video network, and 2) it mandates a continuation of a scheme of incentive regulations which enabled TeleKansas I to happen. His major concern in delaying full implementation of TeleKansas II is that the economic climate may change through market competition, and the conditions which have allowed SWBT to propose capital investments may cease to exist. (Particularly worrisome to the rural areas.) With regard to **SCR 1627** he is less sanguine about its ability to develop a strategic telecommunications plan for the state. Having participated over the last three years in various planning forums, it was determined to be too complex. He explained that a strategic plan must not give advantages or disadvantages to any particular technology - yet provide access to the market place. At the same time, it must provide that every Kansan have convenient, affordable and reasonably equal access to the network. Finally, Mr. Fear said it is important to take advantage of every opportunity to improve access terminals to as many Kansans as possible and **SB 592** will help and urges its passage.

**Jack L. Reed.** (See Attachment #8) As a representative for the Northwest Kansas Educational Service Center (encompassing 21 schools), Mr. Reed supports this measure. He said it is critical to the schools and communities in Northwest Kansas to have access to fiber optic telecommunications, affording them the opportunity to grow and maintain a high educational quality. Recognizing that not all communities have the advantage of fiber optics as yet, he said passage of this bill would expand the opportunities for school districts offering fiber optics within a reasonable cost. His Center presently has eight districts (of the 21) connected through fiber optics; an additional eight districts within their consortium would have access. (Mr. Reed provided charts and related information where their network is used.)

Citing benefits and opportunities for other communities, and interactions to be available throughout various areas of Kansas, Mr. Reed said it will help unify the state and improve the concept of the State of Kansas as a single unit, instead of the state having separate sectioned areas.

**Jack Maxwell.** (See Attachment #9) Dr. Maxwell is the director of Information Systems at Ottawa University and serves on the Ottawa USD School Board and discussed the benefits of **SB 591** and **SCR 1627**. Recalling the Legislature's recent successful efforts in providing equal funding for education, he correlates that success with the present opportunity to ensure that educational facilities have equal access funding to technology. He is of the opinion that the infrastructure investment offered in these two pieces of legislation is small in comparison to the original Southwestern Bell proposal. However, it will make a big difference in the lives of Kansas students, regardless of a student's grade or age level. Dr. Maxwell urged passage of both measures, saying that the fiber optics super highway is a way to reach an improved educational plateau.

**Bill Norris.** (See Attachment #10) Mr. Norris furnished a map illustrating where fiber optics networks are in Southeast Kansas at the present time and said he is aware of other areas where Southwestern Bell is currently installing cable. Although the cable is very close to them, Mr. Norris reported they cannot hook on as there is no networking in place. He urged support for the extension of telecommunications for another two years and reported he knows of Southwestern Bell's plans to provide fiber optics to the rural areas of Southeast Kansas.

**J. H. Seitz.** (See Attachment #11) Mr. Seitz reported to the Committee that he is not sure other major telecommunications companies are as committed, both fiscally and morally, to provide the service to rural Kansas as is Southwestern Bell. He is concerned that the recent actions from the KCC and Legislative bodies hampers efforts for affordable telecommunication capabilities in the rural areas. He is confident that the proposed two-year study will produce the same vision that Southwestern Bell has already identified. Mr. Seitz's interests are focused on health care issues in the State of Kansas (he is vice president of Saint Mary's Hospital in Manhattan KS). He feels the State of Kansas must take the first step, so that at the end of the two-year study they can go forward with technologies enabling them to provide improved health care services for Kansas citizens.

**Ron Rykert.** A teacher from Liberal High School and escort for students from his area representing Close-Up, Mr. Rykert introduced two students to the Committee to speak on behalf of **SB 591** and **SCR 1627**.

**Rebecca Woodruff.** Ms. Woodruff reported to the Committee that she is a senior at Meade High School. She addressed the impact to rural students who do not have the advantages of interactives as opposed to those students who do upon entering college.

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At the conclusion of this school year she will have completed four years of interactive video classes. An advantage to interact with students in other schools is to broaden their intellect and share ideas and educational experiences. Personal advantages for Ms. Woodruff have been the opportunity to learn Spanish and to belong to a French Club. Additionally, she can take college classes in the evening, preparing her now for the eventual journey into the adult world, finding a job and succeeding. In citing these attributes for interactive video classes, she said without this experience all the students presently involved would be falling behind.

**Kevin R. Pennington.** Mr. Pennington is also a senior at Meade High School and is presently in his third year of interactive video. He reported he has had the opportunity to meet many people from other schools through this medium that would otherwise be lost to him. He said this is a good thing offered in his educational experience and one of the benefits to him personally was the opportunity to become a better artist. He said his teacher has had a chance to teach students at (at least) six other schools the same basic skills she has taught him. He believes that interactive video has offered him and his fellow students an extra "edge" and provided them a chance to succeed.

Mr. Pennington told the Committee that they need **SB 591** which will improve their fiber optics interactive video system, giving students a chance to be competitive and successful.

Chairperson Holmes adjusted the original Committee schedule today to accommodate James M. Caplinger, an opponent to this legislation, explaining that Mr. Caplinger would be in Washington D.C. for the duration of the week.

**James M. Caplinger.** (See Attachment #12) Should the Legislature decide to favor Southwestern Bell with a respite from KCC regulation on their earnings, Mr. Caplinger asked that all other telecommunications public utilities (who have been modernizing and keeping up with technology without over-earnings) be treated in the same manner. Also, he asked for the same time period for all telecommunications on the stipulation that would expire this year.

He said all the rural telecommunications have constantly upgraded their exchanges without the benefit of a TeleKansas over-earnings. He reported they have been burying all one-party services, with digital switching, for many years. He added the first and most interactive educational television for schools is provided by rural telcos and some are providing telemedicine to their hospitals.

To support Mr. Caplinger's reasoning, he urged the Committee to consider an amendment to **SB 591** to read as follows:

"The Kansas Corporation Commission, for a period extending through March 1, 1997, shall continue to regulate all telecommunications public utilities' access charges in accordance with the terms and conditions set forth in the Stipulation, as approved by the corporation commission on November 19, 1990, in Docket No. 127, 140-U,"

Also, he requested some minor changes in **SCR 1627**:

- On Page 3, line 43, strike "all," and insert "where feasible" after the word "services."
- On Page 4, line 10, strike "and" and insert a comma.
- On Page 4, line 11 strike "in every region," and insert "and establish appropriate policies to maintain universal service in high cost areas."

Upon completion of its business, the meeting adjourned at 6:30 p.m.

The next meeting is scheduled for March 22, 1994.



## GUEST LIST

Committee: Energy and Natural Resources

3:30

Date: 3/21/94

NAME: (Please print)	Address:	Company/Organization:
DAVID ARMSTRONG	522 W PRESCOTT	CWA LOCAL 6411
A.J. VILLEGAS	1728 HANS DR. KCK.	CWA Local 6327
Rene Riquelme	3200 S. Reno <sup>Wichita 67215</sup>	CWA Local 5702
Debra J. Brown	1801 S. E. 37	CWA Local 6401
Mike Pugh	2608 Highland, SALINA	CWA LOCAL 6411
Nelson Krueger	4308 Wimbledon <sup>Lawrence KS</sup>	KINNET
Mike Ensued	6950 W. 5 <sup>th</sup> <sup>Overland Park, KS</sup>	CSH/Computer Services
BRIAN, LIPPOD	WICHITA	MULTIMEDIA HUBBARD TELECOMMUNICATIONS
Ken Baker	TOPEKA	CGI/Control of Ks.
J.H. SEITZ	1823 College Ave, Manhattan, Ks.	ST. MARY HOSPITAL
Jay Scott Timber	Salina	KINET L.C.
PRECEDENT ROBL	5003 N. Maybuckes, Hurdleboro KS 67501	Hurdleboro Catholic School
Billy M. Hines	4511 W 361 Bay Ks	grtong Church Ks 67107
Jack Rold	1625 Elm <sup>Overland Park, KS</sup>	NK ESC
Jerry Dean	305 W. Maple <sup>Overland Park, KS</sup>	City of Overland
Joe Ryan	220 E 6 Topeka Ks	SWBT
Larry Dismitt	220 E 6 Topeka	"
Steve Cox	220 E 6 Topeka	"
Tommy Cox	220 E 6 Topeka	"
Rene Ryckman	Box 192 Mead	USO #2211 Airtwork
Kenny Hines	Box 641 Mead	USO #2216 Chas. Hines
Frank CARD, Jr.	Topeka	SWBT
P. WOODBURY	EUROPA	INTERCOM
Ann Riggs	Topeka	HCC



## GUEST LIST

**Committee: Energy and Natural Resources**

**Date:**

NAME: (Please print)	Address:	Company/Organization:
Karen Matson Flaming	Topeka	KCC
BILL PETERSON	Abilene	
Don Telle	Maale	Close-Up Kansas
Samya Roberts	Meade	close-up Kansas
Rebecca Woodruff	Meade	Close-Up Kansas
Phyllis Peterson	Abilene	observer -
Roger Bales	Topeka	KCPR
Dana Brackbury	Topeka	KCC
Jim Robinson	Topeka	KCC
Eric Alexander	Topeka	KCC
RODOLPH LIPMAN	TOPEKA	KCC
Virginia Stan	Topeka	ATET
Rob Hodges	Topeka	Ks Telecom Assn.
Eva Powers	"	MCT
SKIPP	Topeka	11 CATV
JANET STUBBS	TOPEKA	Stubbs & Assoc.
TOM DAY	TOPEKA	KCC
Eric Milstead	CURB / Topeka	C.U.R.B.
Mike Warner	" "	
Brian Wolan	TOPEKA	KCC
Jan Ludwig	Topeka	Western Resources
STUE KEAGNEY	TOPEKA	KINWET

SUSAN B. FOX  
TESTIMONY-HOUSE ENERGY & NATURAL RESOURCES COMMITTEE  
S.B. 591, SCR 1627  
MARCH 21, 1994

GOOD AFTERNOON, MR. CHAIRMAN . . . MEMBERS OF THE COMMITTEE. MY NAME IS SUSAN FOX AND I'M EMPLOYED BY SOUTHWESTERN BELL TELEPHONE HERE IN KANSAS. I'M HERE TODAY TO SPEAK IN SUPPORT OF SUBSTITUTE SENATE BILL 591 AND SENATE CONCURRENT RESOLUTION 1627.

I SHOULD BEGIN BY SAYING SUBSTITUTE S.B. 591 IN NO WAY RESEMBLES THE BILL THAT WAS ORIGINALLY INTRODUCED. YOUR COLLEAGUES IN THE SENATE REJECTED THE ORIGINAL 591 AFTER HEARING PLENTY OF OPPOSING TESTIMONY FROM A SMALL ARMY OF OUR COMPETITORS. IF NOTHING ELSE, AT LEAST THE EARLIER HEARINGS PROVED ONCE AND FOR ALL THAT SOUTHWESTERN BELL FACES FORMIDABLE COMPETITION.

THE SUBSTITUTE BILL DOES NOT GO AS FAR AS SOUTHWESTERN BELL WANTED TO GO OR WAS PREPARED TO GO IN PARTNERSHIP WITH THE STATE OF KANSAS TO FOSTER ADVANCES IN EDUCATION, MEDICINE AND ECONOMIC DEVELOPMENT. OUR ORIGINAL PROPOSAL, NOW REJECTED, INCLUDED A PLAN FOR ADVANCING ABOVE NORMAL CONSTRUCTION SPENDING THROUGHOUT KANSAS AND ESSENTIALLY ATTEMPTED TO CODIFY THE PLAN KNOWN AS TELEKANSAS II THAT WE FILED WITH THE KANSAS CORPORATION COMMISSION ON JANUARY 3 OF THIS YEAR.

*Energy & Natural Resources  
Attachment #1  
3/21/94*

BUT IT BECAME CLEAR THAT, ALTHOUGH WE WERE READY TO IMPLEMENT A WIN-WIN PLAN, WE COULD NOT BUILD CONSENSUS IN THE SHORT TIME THAT WAS AVAILABLE.

SO, THE COMPROMISE PACKAGE ESSENTIALLY SAYS "KEEP DOING WHAT YOU'VE BEEN DOING. LET'S NOT TAKE THE NEXT STEP YET. INSTEAD, LET'S EXTEND THE OLD TELEKANSAS PLAN FOR TWO MORE YEARS WHILE THE PEOPLE AND BUSINESSES OF KANSAS PARTICIPATE IN A PUBLIC DISCUSSION."

EVEN THOUGH THE LEGISLATIVE PACKAGE THAT INCLUDES SUBSTITUTE 591 AND THE CONCURRENT RESOLUTION IS NOT WHAT MY COMPANY SOUGHT, WE ARE WILLING TO SUPPORT IT FOR TWO REASONS. FIRST, BECAUSE OUR CUSTOMERS WILL BENEFIT FROM THE HIGH-RISK CAPITAL DOLLARS THAT THE BILL INCENTS SOUTHWESTERN BELL TO SPEND IN KANSAS. AND SECONDLY, BECAUSE AT LEAST THE BILL DOES NOT GUARANTEE THAT WE WILL BE FORCED TO TAKE A BIG STEP BACKWARDS INTO THE ARCHAIC MODE OF RATE-BASE REGULATION.

LET ME MAKE IT CLEAR UP FRONT: SUBSTITUTE 591 IS NOT DEREGULATION. THE KANSAS CORPORATION COMMISSION WILL CONTINUE TO REGULATE SOUTHWESTERN BELL IN THE SAME MANNER AS IT HAS SINCE 1990.

THIS FORM OF REGULATION FOCUSES ON THE PRICES TELEPHONE CUSTOMERS PAY FOR SERVICE AND THE QUALITY OF THAT SERVICE. THOSE ARE THE SAME MEASUREMENTS USED BY THE FREE MARKET AND THE UNREGULATED COMPANIES WITH WHOM WE COMPETE. IT ALSO IS A FORM OF REGULATION THAT OUR CUSTOMERS TELL US ADDRESSES THEIR GREATEST CONCERN -- THAT THE RATE THEY PAY FOR SERVICE IS REASONABLE.

TELEKANSAS I WAS A SUCCESS. IT ACCOMPLISHED EXACTLY WHAT IT SET OUT TO DO. BRIEFLY, HERE ARE THE BENEFITS THAT WERE IMPLEMENTED UNDER TELEKANSAS I AND WOULD BE CONTINUED WITH SUBSTITUTE S.B. 591:

- TELEKANSAS I CAPPED BASIC LOCAL SERVICE RATES FOR RESIDENTIAL AND BUSINESS CUSTOMERS. THOSE RATES NOW HAVE BEEN FROZEN FOR 10 YEARS, DURING WHICH TIME THE INFLATION RATE INCREASED OVER 41%. THIS TRANSLATES TO A 29 PERCENT DECREASE IN REAL DOLLARS.
- TELEKANSAS I INCENTED SOUTHWESTERN BELL TO INVEST \$140 MILLION OF HIGH-RISK, SHAREOWNER CAPITAL IN ITS KANSAS NETWORK OVER AND ABOVE ITS NORMAL CONSTRUCTION SPENDING -- 85 PERCENT OF WHICH WAS FOCUSED IN THE RURAL AREAS OF KANSAS.

- DURING THE PERIOD OF TELEKANSAS, SOUTHWESTERN BELL SPENT \$680 MILLION IN TOTAL CAPITAL SPENDING IN KANSAS, TRANSLATING TO \$760 INVESTMENT PER CUSTOMER.
- 131 OLDER CENTRAL OFFICE SWITCHES WERE REPLACED WITH STATE OF THE ART DIGITAL SWITCHING.
- ALL PARTY LINES IN THE STATE HAVE BEEN UPGRADED TO SINGLE LINE SERVICE.
- FIBER OPTICS WERE AGGRESSIVELY DEPLOYED THROUGHOUT THE STATE TO ACCOMMODATE ADVANCED NEW SERVICES LIKE INTERACTIVE VIDEO AND HIGH-SPEED DATA TRANSMISSION.
- TO DATE, TELEKANSAS-RELATED INVESTMENT RESULTED IN THE CREATION OF ABOUT 400 NEW JOBS FOR KANSANS IN EACH YEAR SINCE 1990. A UNIVERSITY OF KANSAS STUDY ON THE EFFECTS OF TELEKANSAS I FURTHER REVEALED THAT CONTINUED ACCELERATED INVESTMENT WILL CREATE EVEN MORE JOBS. MOREOVER, THE UNIVERSITY OF KANSAS STUDY CONFIRMED OUR BELIEF THAT A STATE-OF-THE-ART TELECOMMUNICATIONS INFRASTRUCTURE IS A NECESSARY, ALBEIT INSUFFICIENT CONDITION FOR ECONOMIC DEVELOPMENT IN RURAL KANSAS.

- MOST RECENTLY, KU ECONOMISTS' PRELIMINARY RESULTS SUGGEST THAT EVEN THE MODIFIED, TWO-YEAR EXTENSION OF TELEKANSAS I FOCUSING ON DISTANCE LEARNING WILL ALLOW RURAL HIGH SCHOOLS SERVED BY SOUTHWESTERN BELL TO PROVIDE URBAN-QUALITY COURSE OFFERINGS AT A NET SAVINGS OF \$40 MILLION PER YEAR TO THE STATE OF KANSAS RATHER THAN ADDING ENOUGH TEACHERS TO DO THE SAME.

WITH SUBSTITUTE 591, SOUTHWESTERN BELL PLEDGES TO CONTINUE THIS MODERNIZATION IN KANSAS, INVESTING IN THE RANGE OF \$56 TO \$64 MILLION DOLLARS OVER TWO YEARS. THOSE DOLLARS ARE AGAIN OVER AND ABOVE OUR NORMAL CONSTRUCTION EXPENDITURES IN THIS STATE, WHICH HAVE AVERAGED AROUND \$100 MILLION A YEAR FOR THE LAST FIVE YEARS.

BY AGREEMENT WITH THE STAFF OF THE KANSAS CORPORATION COMMISSION, WE WILL SPEND THAT EXTRA INVESTMENT TO ENHANCE EDUCATIONAL OPPORTUNITIES FOR KANSAS SCHOOLS, ESPECIALLY IN RURAL KANSAS.

THE CONCEPT IS CALLED "DISTANCE LEARNING". OTHERS HERE TODAY WILL DESCRIBE WHAT WE HAVE DONE SO FAR IN THE AREA OF DISTANCE LEARNING AND WHAT WE PLEDGE TO DO IN THAT AREA OVER THE NEXT TWO YEARS.

I HAVE SEEN SOME MEDIA REPORTS -- MOSTLY FROM THE KANSAS CITY METRO AREA -- THAT CLAIM SOUTHWESTERN BELL WOULD BE SPENDING THIS OVER-AND-ABOVE CAPITAL ANYWAY. THEY CLAIM THAT THIS IS MONEY WE WANT TO SPEND REGARDLESS OF THE PASSAGE OF SUBSTITUTE SB 591 TO MEET AND BEAT THE COMPETITION IN RURAL KANSAS.

THEY ARE WRONG.

THE \$56 TO \$64 MILLION SPENDING CALLED FOR IN SUBSTITUTE SB 591 REPRESENTS A VERY HIGH RISK FOR US. VIRTUALLY ALL OF THIS INVESTMENT IS DESTINED FOR RURAL KANSAS EDUCATION. WE KNOW THAT WE WILL NOT EARN OFF THAT INVESTMENT ANY TIME IN THE NEAR TERM. OUR COMPETITORS KNOW THAT, TOO, AND THAT'S WHY THEY ARE NOT BEATING DOWN THE DOOR TO PROVIDE COMPARABLE LEVELS OF INVESTMENT FOR RURAL KANSAS CUSTOMERS.

THE REASON WE ARE WILLING TO TAKE THE RISK ON RURAL KANSAS IS THAT WE BELIEVE THE INFRASTRUCTURE IMPROVEMENT WILL GIVE THE RURAL PARTS OF OUR STATE A CHANCE TO REVERSE A POPULATION DECLINE THAT HAS CHARACTERIZED WESTERN KANSAS COUNTIES SINCE THE 1930'S. THE INFRASTRUCTURE WE OFFER IS NOT A SUFFICIENT CONDITION TO REVERSE THE DECLINE AND CREATE ECONOMIC GROWTH IN RURAL KANSAS. BUT IT IS A NECESSARY CONDITION. OVER TIME, IF RURAL KANSAS CAN GROW, SOUTHWESTERN BELL CAN GROW WITH IT AND OUR SHAREOWNERS WHO INVEST IN KANSAS TODAY CAN EARN OFF THEIR INVESTMENT AT SOME POINT IN THE FUTURE.

SUBSTITUTE SB 591 DOES NOT GUARANTEE THAT -- AT THE END OF THE TWO-YEAR EXTENSION -- SOUTHWESTERN BELL WILL NOT BE FORCED TO RETURN TO RATE BASE REGULATION. THEREFORE, IT REPRESENTS A HUGE RISK TO US AND OUR SHAREOWNERS. FRANKLY, IT IS A RISK WE ARE WILLING TO TAKE BECAUSE WE BELIEVE THAT TWO MORE YEARS OF TELEKANSAS-LIKE REGULATION WILL PROVE THAT INCENTIVES TO INVEST PRIVATE CAPITAL IN KANSAS WORKS FOR EVERYONE.

SCR 1627 DIRECTS THE KCC AND KANSAS INC. TO TAKE THE LEAD IN STUDYING BOTH THE COURSE AND PACE OF COMPETITION AND EMERGING TECHNOLOGIES IN KANSAS. WE RECOGNIZE EVERYONE HAS A STAKE IN THIS ISSUE AND WE ARE HOPEFUL A FORMAL, TWO-YEAR STUDY WILL CULMINATE IN A SOLID GROWTH PLAN FOR KANSAS -- A PLAN THAT MOVES TOWARD A MORE COMPETITIVE, LESS REGULATED GROWTH MODEL.

BEFORE I CONCLUDE MY TESTIMONY BEFORE YOU TODAY, THERE ARE A COUPLE OF LINGERING MISCONCEPTIONS THAT NEED TO BE ADDRESSED.

SOME PARTIES HAVE CLAIMED THAT, OVER THE PERIOD OF TELEKANSAS I, OUR EXPENSES HAVE GONE DOWN AND THEREFORE OUR NET INCOME IS EXCESSIVE. IN FACT, SOUTHWESTERN BELL'S ACTUAL EXPENSES SINCE 1990 -- EXCLUDING TAXES WHICH GREW SIGNIFICANTLY AS A RESULT OF RECLASSIFICATION -- INCREASED OVER 16 PERCENT.

MEANWHILE, MY COMPANY'S EARNINGS IN KANSAS HAVE CONSISTENTLY BEEN LOWER THAN THEY WERE BEFORE TELEKANSAS WAS IMPLEMENTED IN 1990. IN 1990 ALONE, OUR NET INCOME DECREASED 26 PERCENT. WE HAVE IMPROVED OUR EARNINGS PICTURE SINCE 1990, BUT WE HAVE NOT YET RISEN BACK TO OUR 1989 NET INCOME LEVEL.

ANY ALLEGATIONS OF OVEREARNING ARE WRONG AND I WOULD WELCOME THE OPPORTUNITY TO EXPLAIN WHY IN GREATER DETAIL WITH YOU IF YOU WISH.

SOME PARTIES, PARTICULARLY SOME OF OUR LONG DISTANCE COMPETITORS, ALSO HAVE CLAIMED THAT ACCESS CHARGES SHOULD BE REDUCED OR EVEN ELIMINATED. WITHOUT GETTING INTO TOO MUCH TECHNICAL DETAIL, IT IS IMPORTANT THAT YOU UNDERSTAND THAT ACCESS CHARGES ARE A GOVERNMENT-CREATED SUBSIDY THAT HELP OFFSET THE COST OF BASIC LOCAL SERVICE.

IF ACCESS CHARGES GO AWAY, THE BENEFIT GOES TO THE LONG DISTANCE PROVIDERS, WHO MAY OR MAY NOT PASS ALONG THEIR SAVINGS TO THEIR CUSTOMERS. IN ANY CASE, THE RURAL KANSAS LOCAL EXCHANGE CUSTOMER WHO DOES NOT MAKE MANY LONG DISTANCE CALLS WOULD HAVE A HARD TIME SEEING THE BENEFIT OF ACCESS CHARGE REDUCTIONS.

WE COULD DEBATE THE ISSUE OF ACCESS CHARGES FURTHER, BUT THE MAIN POINT TO BE MADE AT THIS TIME IS THAT ACCESS CHARGES WERE NEGOTIATED SEPARATELY FROM TELEKANSAS I AND WOULD CONTINUE TO BE TREATED SEPARATELY UNDER THE EXTENSION CALLED FOR IN SUBSTITUTE SB 591.

IN CLOSING, I'D LIKE TO LEAVE YOU WITH SOME FEEDBACK FROM OUR CUSTOMERS. MANY PEOPLE CLAIM TO SPEAK FOR OUR CUSTOMERS. WE ACTUALLY ASKED THEM TO SPEAK FOR THEMSELVES. RESEARCH CONDUCTED LATE LAST YEAR AND AGAIN EARLIER THIS MONTH BY CENTRAL RESEARCH CORPORATION OF TOPEKA PROVIDED US WITH THE FOLLOWING INFORMATION FROM OUR RESIDENTIAL CUSTOMERS ALL OVER KANSAS:

- 90 PERCENT -- 9 OUT OF 10 -- SAID A MODERN TELECOMMUNICATIONS INFRASTRUCTURE IS ESSENTIAL TO ECONOMIC GROWTH IN KANSAS.
- 89 PERCENT SAY THAT THEY BENEFIT WHEN THE TELEPHONE COMPANY SPENDS MONEY TO UPGRADE AND MODERNIZE ITS NETWORK.
- 89 PERCENT SAY THAT HAVING SERVICES THEY WANT AVAILABLE AND AT PRICES THEY CONSIDER REASONABLE ARE MORE IMPORTANT TO THEM THAN WHATEVER THE PROFIT LEVEL IS OF THE COMPANY PROVIDING THE SERVICE.

- 86 PERCENT SAY THE RATE THEY PAY FOR BASIC TELEPHONE SERVICE IS REASONABLE.
- 85 PERCENT OF OUR CUSTOMERS SAY SOUTHWESTERN BELL PROVIDES A GOOD VALUE TO THEM.
- AND 75 PERCENT RATE SOUTHWESTERN BELL'S OVERALL SERVICE AS VERY GOOD.

SUBSTITUTE SENATE BILL 591 AND SENATE CONCURRENT RESOLUTION 1627 ARE A STEP IN THE RIGHT DIRECTION OF DELIVERING TO KANSAS WHAT OUR CUSTOMERS SAY THEY WANT AND NEED. IN THE MEANTIME, SOUTHWESTERN BELL WILL PARTICIPATE IN THE DISCUSSIONS THROUGHOUT KANSAS TO DEVELOP A STRATEGIC PLAN FOR KANSAS' TELECOMMUNICATIONS FUTURE. SOUTHWESTERN BELL STANDS READY TO TAKE THE RISK BECAUSE WE BELIEVE IN THE POSSIBILITY OF LONG-TERM GROWTH IN KANSAS.

I URGE YOU TO VOTE FAVORABLY ON THIS PACKAGE.

# # #

Kansas House Energy & Natural Resources Committee  
Kansas State Capitol  
Topeka, Kansas

March 21, 1994

Re: Supporting the Adoption of Senate Concurrent Resolution No. 1627 and the Passage of Sub. S.B. 591

Good Afternoon Chairman Holmes and Committee Members:

My name is Frank A. Caro, Jr. I served as the General Counsel for the Kansas Corporation Commission ("Commission") from 1987-1991. Currently, I am a partner in the law firm of Polsinelli, White, Vardeman & Shalton and the bulk of my practice involves public utility regulation.

I am testifying before you this afternoon urging your support for the adoption of Senate Concurrent Resolution No. 1627 and the Substitute for Senate Bill No. 591. SCR 1627 recognizes that telecommunications are a vital link to the economic development and growth of rural Kansas and directs the development of a statewide strategic plan during the next two years. The Sub. S.B. 591 continues Southwestern Bell's additional infrastructure investment during the development of the statewide strategic plan.

I am working as a consultant to advise Southwestern Bell regarding its efforts to develop plans for telephone service in the future in the State of Kansas. I have intimate knowledge of the regulation of telecommunications companies and in particular Southwestern Bell's regulatory matters as I was the General Counsel of the Commission when Southwestern Bell's first alternative regulatory plan ("TeleKansas I") was adopted

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by the Commission in 1990. Before I discuss the need for Senate Concurrent Resolution No. 1627 and Sub. S.B. 591, it is important to understand the background of the regulation of the telecommunications industry in the State of Kansas and the need for a strategic plan for the future.

#### **I. Background.**

In 1989, Southwestern Bell filed a petition with the Kansas Corporation Commission which generally provided for an accelerated network modernization of \$160 million, freezing local rates, and a flexible pricing system for competitive/discretionary services. In addition, the TeleKansas plan proposed a movement away from the restraints of traditional regulation of Southwestern Bell's earnings and toward regulation of the company's prices instead. As Susan Fox testified, customers are more concerned that prices are reasonable than they are about how much the company earns. When we as consumers buy a product or service, we are concerned about the price for that service and not how much the manufacturer or store is earning. In fact, if consumers are satisfied with the price for the service and the company or store's earnings increase, the store will have incentive to increase its investment in that area and offer new services. This is the same theory of TeleKansas.

After a review of Southwestern Bell's plan, the Commission staff entered into a stipulation with Southwestern Bell, which

provided Southwestern Bell incentives to make additional investments in the telecommunications network.

The stipulation provided for:

- Additional investment of approximately \$160 million (Actual investment was \$140 million due to cost savings) by Southwestern Bell for accelerated network modernization, which included the elimination of all two-party and four-party line services and upgrading of central offices with electronic switches;
- A freeze on basic local residential and business rates for five (5) years;
- Established a mechanism to flexibly price certain non-basic, discretionary, competitive services;
- A reduction of certain rates and charges, primarily toll and access; and
- Regulation on the basis of price, not earnings.

#### TeleKansas Summary of Results.

As Susan Fox testified, TeleKansas I is a success! The results of TeleKansas are as follows:

- The TeleKansas network modernization program is ahead of schedule. All of the 131 mechanical central office switches have been replaced with new electronic switches;
- Nearly all multi-party service has been eliminated in the State of Kansas;

- Basic rate levels have not been raised at all during the TeleKansas plan; and
- Southwestern Bell has been able to quickly introduce various new services under the "flexible pricing procedure" for competitive or discretionary services.

## II. Senate Concurrent Resolution No. 1627.

Senate Concurrent Resolution No. 1627 ("Resolution") sets forth the parameters for a study task force, under the auspices of Kansas Inc., to develop a statewide strategic plan for telecommunications. This Task Force will assess the landscape of telecommunications providers and determine the needs of telephone users. This Task Force will also suggest a strategic plan for infrastructure development in the State of Kansas. The Task Force will be composed of legislators, industry representatives, regulators and other key stakeholders.

During this same time period, the Kansas Corporation Commission shall open a generic docket to investigate the level and effect of competition for regulated telecommunications services.

SCR 1627 focuses on these main areas:

- Emerging competition in the telecommunications industry;
- The need for additional infrastructure investment; and
- The form of regulation in the future.

**A. Competition.**

During the course of the debates in the Senate Commerce Committee, it became apparent that the telecommunications industry has changed drastically over the past ten years, since the break-up of AT&T. During this ten year period, we have seen the entry of numerous telecommunications companies to serve customer's needs. In the past, these needs were traditionally served by one carrier. Now, Kansans have a choice of long distance telephone companies to provide their long distance service. We have all seen and heard the advertisements by AT&T, Sprint and MCI.

As technology advances, more and more competition emerges in the telecommunications industry. Competition is present and rapidly emerging in many areas:

Long distance, WATS, 800, private line, long distance resale, competitive access (application filed), bypass of local facilities by long distance providers and private communications systems, PBXs (competitive with Southwestern Bell's local business services), coin telephone service, inside telephone wiring, operator services, shared tenant services, directory assistance service, etc.

As the largest telecommunications public utility in Kansas, Southwestern Bell welcomes and embraces competition so long as it is fair and serves the public well. In many cases competition can bring new services, promote efficiency incentives and reduce prices.

But, unfortunately competitive forces are sometimes only available to urban and industrial areas causing further isolation of rural communities and areas of less profitability.

We have seen the adverse effects of deregulation and competition on rural America with the airline, trucking and bus industries. Services which were once plentiful are now scarce, further isolating our rural communities. Southwestern Bell's TeleKansas plans were designed to link rural Kansas communities to urban areas and the rest of the world.

In Senate Concurrent Resolution 1627, both Kansas Inc. and the KCC will be exploring the effects of competition on the telecommunications industry and competition's effect on a telecommunication public utility's obligation to provide universal service to all Kansans, rural and urban. Universal service is the social contract between the telecommunications public utility and the state to provide service to all who seek service. In developing a statewide strategic plan, Kansas Inc. and the KCC will study the effects of competition in the development of a state-of-the-art telecommunications network to linkup Kansas.

**B. Infrastructure Investment.**

In order to ensure that all Kansans have access to state-of-the-art telecommunication systems, Southwestern Bell, during the past four years, has invested nearly \$140,000,000 in additional capital expenditures to provide Kansas a state-of-the-art telecommunications network and to provide them access to the "information superhighway" of tomorrow. Southwestern Bell's infrastructure investment was above and beyond its legal obligation as a telecommunications public utility to provide

adequate and sufficient service for its customers. In the four years of TeleKansas (1990-1993), Southwestern Bell invested a total of \$680,000,000 in Kansas, including the \$140 million invested under TeleKansas, which equates to a \$760 investment per customer. In fact, the network infrastructure in Kansas is better than in any neighboring state. Kansas has an all-electronic network, more fiber optic miles per customer than any other Southwestern Bell state and soon will have no remaining party lines. But, additional infrastructure investment is necessary in Kansas to draw rural Kansas communities into the information superhighway, to promote economic development in rural communities and to provide educational and health care opportunities to those communities that urban areas have available to them.

Under SCR 1627 Kansas Inc. will inventory the State's telecommunications infrastructure and assess the telecommunications needs for all end users. The Kansas Inc. committee will also develop a plan to promote the availability of new telecommunication services to promote business development, improve health care, increase educational opportunities and improve the effectiveness of local government.

#### C. Review of Regulation.

SCR 1627 also directs a review of the current regulatory scheme under which telecommunications companies operate. The evolution of the telecommunications industry with the advent of competition, technological advancements and investment incen-

tives, has led to a change in the form of regulation of telecommunications public utilities throughout the United States. Numerous states have commissioned studies to analyze whether traditional rate base/rate of return regulation fosters and promotes competition, investment incentives and economic efficiencies. Unfortunately, regulatory bodies throughout the United States are torn between traditional rate base rate of return regulation and its disincentives and inefficiencies versus incentive regulation over a company's services and prices. Approximately forty (40) states now have pending or approved some form of incentive regulation for telecommunication companies.

Fortunately, we in Kansas have a quasi-governmental body, Kansas Inc., that was formed by the legislature to study, develop and formulate strategic planning, economic development policy and a vision for the state's telecommunication infrastructure. With technical assistance from the KCC's study of competition in various telecommunication services, Kansas Inc., under SCR 1627, will forge a statewide strategic plan for telecommunications.

The Resolution directs the Commission and the Task Force to submit reports to both the 1995 and 1996 Legislatures. The Commission is charged with formulating a successor alternative regulation plan, based on the investigations of the generic docket and the findings of the Task Force, to take effect after March 1, 1997.

### III. Substitute for Senate Bill No. 591.

While Kansas Inc. is developing a statewide strategic plan for telecommunications, Sub. S.B. 591 extends for two years the terms of TeleKansas I, which is set to expire in March 1995. The extension will provide a continuation of the following:

- A cap on basic local service rates. In fact, basic local service rates have not increased for ten years and will be capped at least until March 1997;
- Continue the form of regulation that Southwestern Bell has operated in Kansas since 1990; and
- Continue incremental investment of \$56 to \$64 million on the part of Southwestern Bell to improve its network infrastructure by providing "distance learning" capability for schools throughout its service territory.

### IV. Conclusion.

Senate Concurrent Resolution No. 1627 and Sub. S.B. 591 represent a movement toward enhanced telecommunications services by means of a logical system based on accurate information, public analysis and debate, and will provide a good balance in meeting the needs all of Kansas citizens, and the telecommunications industry. For these reasons, I urge you to support SCR 1627 and Sub. S.B. 591.

I will be happy to answer any questions, and thank you for the opportunity to appear before you this afternoon.

Sincerely yours,

Frank A. Caro, Jr.

TESTIMONY TO THE KANSAS HOUSE COMMITTEE  
ON ENERGY AND NATURAL RESOURCES  
MARCH 21, 1994

Thank you for allowing me to share with you some brief thoughts about fiber optic cable, technology, and our schools. I realize that the legislation (Senate Bill #591) being considered has implications for public policies and fiscal issues beyond education. Yet, I appreciate you allowing educators to be involved in making decisions that affect the ability of schools to accomplish their missions. You are to be complimented for your vision in bringing the issue of fiber optics to a public form.

The benefits and uses of fiber optic cable are well known. In March of 1989 while I was a member of the Kansas State Board of Education we released an outline of the potential uses of fiber optic cable. Two-way interactive technology allows schools to share teachers to bring special courses to more students, to train teachers in their schools, and to provide lifelong learning for members of a community. All learners receive the benefits to be gained when you are linked to the information super highway. As we meet today, educational organizations and businesses are gearing up to offer services to our schools through the use of distance learning technology.

A second level of benefits of having access to fiber optic cable focuses on restructuring schools. The high level skills required of workers and the diversity of students require a paradigm shift. The teacher is no longer the only source of information, and the self-contained classroom limits the learning experiences of students. Every student must learn how to use technology to access and process information. Technology allows schools to individualize student learning. Fiber optics will encourage the use of technology in our schools.

Information and who controls information equals power. Every citizen should have this power to use information to improve his or her quality of life. Some Kansas Schools and some students today have access to fiber optics and the related benefits. Schools in our metropolitan areas will probably have access to fiber optic cable regardless of the outcome of Senate Bill #591. I ask you to seek and to find a way that all schools and all students have equal access.

Through the enlightened use of private and public resources all Kansas citizens can have equitable opportunities for learning. At this time, Southwestern Bell is the only company that is knocking on my door with an offer to invest in the education of all Kansas students. The parents and students in our Hutchinson, Catholic Schools have seen Southwestern Bell to be a caring corporate citizen in our community and a corporation that keeps its word. I urge you to support Senate Bill #591.

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Some day in the near future through the use of technology students will experience "virtual reality" in our schools. Imagine the impact on student learning if they can interact with Abraham Lincoln or experience living in another culture through the use of "virtual reality." Imagine too that your policy decisions will determine how schools will change. I am confident that you will make the wise decisions. Thank you.

Presented By:

Dr. Richard Robl, Director  
Hutchinson Catholic Schools  
1400 East 17th  
Hutchinson, Kansas 67501

Debbie Snow  
Communications Workers of America  
Kansas House Energy and Natural Resources Committee  
March 21, 1994

1 Mr. Chairman, Members of the Committee, good afternoon. My name  
2 is Debbie Snow and I'm here representing the Communications  
3 Workers of America, a labor union that in the State of Kansas  
4 has a membership 4,000 strong. Of that number, nearly 2,800 of  
5 those working men and women find employment with Southwestern  
6 Bell. Our fifteen locals span the state, from Wichita to Hays,  
7 Topeka to Garden City, Salina, Hutchinson, Parsons, metropolitan  
8 Kansas City and points in between. As a labor union, we are  
9 charged with the responsibility to press for issues that benefit  
10 our membership. In that regard, we sometimes find ourselves at  
11 odds with our employer, but not on this issue: we need a level  
12 playing field in our industry. This may come from either  
13 universal, identical regulation, or universal and equal  
14 deregulation.

15  
16 It's now obvious that we will not return to the days of full  
17 regulation in the telephone industry. The Bell System was  
18 divided in 1984, never to be reunited, and now we must address  
19 what to do with the remaining parts.

20

21 We are the work force who built, maintained and improved the  
22 best communications network in the world. Substitute Bill 591  
23 is a way to ensure that network will survive and keep rural  
24 Kansas in pace with this rapidly changing technology. This

*Energy: Natural Resources  
Attachment #4*

*3/24/94*

25 improved network will help nourish the roots of all Kansas  
26 communities, to help all of us enter the new century on equal  
27 footing. We want rural Kansas to succeed - our people live  
28 and work there. We sit on your school boards, work in your  
29 community organizations, contribute to your churches and  
30 charities, enhance your tax bases, and put vital commerce into  
31 your local economies. The wages and benefits won by CWA benefit  
32 all Kansans through the ripple effect. Those who would come in  
33 to compete in the local loop do not provide for their employees  
34 in a like manner. We want to live here in Kansas. We want our  
35 children to have the opportunity to live here, too. We want our  
36 kids to have an equal-access share to the finest educational  
37 opportunities through advanced fiber optics. We want to be a  
38 vital link in the information highway, not just a country road  
39 detour from it.

40  
41 After a severe storm or other disaster, phone people  
42 traditionally come into work early to get a jump start restoring  
43 service. Our operators, so committed to service, have stayed  
44 on their posts even during tornado warnings. They hold high  
45 their charge as "weavers of speech". For this reason, we also  
46 support HR 3078, a bill to ensure live operators. We hope these  
47 two pieces of legislation will consolidate to guarantee quality  
48 phone service for all Kansans, not just the most profitable  
49 ones. We pride ourselves in providing and maintaining the best  
50 communication service on earth.

51 In my twenty-one years of service to Southwestern Bell, I have  
52 watched my employer undergo a forced evolution from playing a  
53 part in a highly regulated Bell System to standing alone as a  
54 player in a rapidly changing marketplace. Ironically, the think  
55 tank atmosphere of that original company fostered the  
56 discoveries that ushered in this new technological age. That  
57 enabled competition to crack the Bell through court action and  
58 now threatens to decimate its roots by holding one part of the  
59 old regulation on one hand, yet taking its traditional market  
60 and handing it to the competition with the other.

61  
62 In closing, we have always held high commitment to customer  
63 service in Kansas. We are loyal Kansans with a stake in the  
64 future of our state. We helped bring you this far, please help  
65 us continue to provide the communication network Kansans  
66 deserve.

Testimony of  
Bill Peterson  
to the  
House Energy and Natural Resources Committee  
Monday, March 21, 1994

Thank you for permitting me to speak to you to day.

My name is Bill Peterson. I come before you, today, to offer two different perspectives to this issue of continuing TeleKansas.

As a Silver-Haired Legislator, I am an advocate for fellow senior citizens and I make sure our voices are heard during debates such as these. One issue that is of great concern to the aging community is the price they must pay for services that are vital to their well-being.

Substitute for Senate Bill 591 and Senate Concurrent Resolution 1627 is a good deal for seniors. I doubt there are many companies besides Southwestern Bell that have not raised rates for a service in 10 years. In spite of inflation and rising costs, Southwestern Bell has worked to keep rates for basic, local service low—lower than the national average—in spite of inflation and rising costs. That is so important to senior citizens, many of whom must live off of Social Security.

But I also see this issue from another angle, and that is as a civic leader in rural Kansas. I serve on the Abilene City Council, as well as a former mayor of Abilene.

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Consequently, the economic welfare of our state and my community is of great importance to me. I am proud to say that Russell Stover Candies is building a facility in Abilene. But, the only way companies such as this will consider locating and expanding in Kansas, is if we, ourselves, continue to invest in our state to make it more attractive.

If we do not encourage Southwestern Bell to bring technologies like fiber-optics to rural Kansas communities like Abilene, we will never get it.

Granted, this legislation will only bring investments for education. But an improved education system *will* make our state more attractive to business. And I can only hope that we will continue to work—during the proposed two-year study—to make sure technologies for health care and economic development are soon to follow.

Thank you for allowing me to share my views on this issue with you, and I hope you will vote to pass these measures.

STATEMENT IN SUPPORT OF SUBSTITUTE FOR SENATE BILL No. 591  
ALLOWING TELEKANSAS I to CONTINUE

SPEAKER: Peggy Blackman, Community Coordinator for the City of Marion

CREDENTIALS: Community Coordinator, Feb. '91 - Current

Chairman of Community Development Block Grant Task Force for State of Kansas

Secretary/Treasurer Marion County Economic Development Council

Board of Directors of Resource, Development and Conservation Flint Hills Region

Board of Directors of St. Luke Hospital, Marion

Mayor of Marion, April 77 to April 86

Board Member and President of the Kansas League of Municipalities

Ladies and Gentlemen:

I am here today to speak on behalf of Southwestern Bell and the extension of TeleKansas I, for two years, and how I see it will effect Rural Kansas and in particular my city and county.

We that live in Rural Kansas have seen continuous mandates from the federal and state governments coming down to the local governments without giving us additional funding or resources to raise those funds and tying our hands with tax lids. Our only hope of survival is our own initiative to increase economic growth within our boundaries by increasing our tax base, which in turn should also help the State.

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The future is hear, now!!! We need to have willing partners working with us in our endeavors to provide growth to our economy. Southwestern bell is one of our partners. We see the availability of telecommunication in each community as an essential part of our success. We see the need to create an equal playing field for all participants in providing this communications network. How can this be done if we continue to restrict the growth of one of the major players in the industry while their competitors are having restrictions removed which allow them greater share of the existing market? We realize Rural Kansas is not going to attract that many interested "partners" when it's easier to serve the population centers with telecommunication service for less investment.

Do we not have any economic value in the future growth of our state or does the state only see it happening in the "urban areas"? Give us the same opportunity to compete in this global economy today. What good does it do to have the telecommunication highway if we do not have a connecting link as an inroad for each community. We need help to attract new business, to allow existing business to prosper, to create jobs, to continue health care, and allow that great quality of life, that exists in Rural Kansas, to remain a reality. Rural Kansas needs to be part of the telecommunication highway. Rural Kansas needs "Strategic and Action Plans" in place to develop this communications highway. Rural Kansas needs TeleKansas I to continue. (It would be better if it could have been

TeleKansas II) Don't close the door on us and our partners. Allow the investment for the future in Kansas, in particular Rural Kansas, to continue. Extend TeleKansas I and look to the future with TeleKansas II.

Testimony

on behalf of Substitute Senate Bill 591 and Senate Concurrent Resolution 1627

Jerry J. Fear, City Administrator

City of Oberlin, Kansas

My name is Jerry Fear, I am the City Administrator of Oberlin, Kansas, a city that benefited greatly from TeleKansas I. We have a digital switch and fiber to our central office. I am here today to testify in favor of Substitute Senate Bill 591 and Concurrent Resolution 1627.

You are going to make decisions regarding an exceedingly complex issue. And those decisions will not be made in a Kansas vacuum but will be made against a backdrop of national and global technological and organizational activities that are changing the ways we transfer information from one to another. It is critical that these decisions be informed and in the best interest of the state.

For that reason, I have provided you an article from the March issue of BYTE Magazine which has the most comprehensive summary I have seen of the developments and issues related to all of the interrelated aspects of information exchange. It will take at least an hour of your very precious time, but I beg you to read it before acting on this bill. I have also included a sampling of news stories of current relevant events which you may find interesting and enlightening.

You will find that the issues are not only, or even primarily, about basic telephone service. TeleKansas I pretty much took care of that. Southwestern Bell proposed under TeleKansas II, to build a broadband fiber infrastructure within reach of every county seat, school, hospital and major town in their service area.

That backbone is of inestimable value to the state of Kansas, and particularly the rural areas of the state. It means that we will have on on-ramp to the information superhighway. The only hope for long term economic stability and growth in rural Kansas is the ability and access to participate in the global economy.

The substitute bill before you deals only with the capital investment to be made by SWBT during the next two years, and focuses the effort on distance learning and education.

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Frankly, I would have preferred the original version of the Senate Bill. I believe that it would have provided greater benefits, and at a more critical time frame.

Nevertheless, there are two parts of the substitute version that I strongly support. First, Southwestern Bell will be allowed to construct a broadband analog video network which will help our schools expand their educational opportunities and share resources.

Second, it mandates a continuation of a scheme of incentive regulation which enabled TeleKansas I to happen. I feel very strongly that a return to rate-of-return regulation would be counterproductive and inappropriate, given the experiences of other states and the federal government. In that regard I have provided written testimony on that issue which is in your packet.

My major concern about the delay in full implementation of TeleKansas II is that the economic climate may well change so drastically through competition in the market place that the conditions which have allowed Southwestern Bell to propose these capital investments may cease to exist. This is particularly worrisome for rural areas where any fragmentation of the market makes them less desirable (See article about US West.)

In terms of the concurrent resolution, I am less sanguine about our ability to develop a strategic telecommunications plan for the state. For over three years I have been participating in various forums trying to do just that. The results have been characterized as too complex (The Board of Regents study) because the issue is complex, or minimalist (the Kansas, Inc. report) because agreement between conflicting interests could only be achieved at the lowest common denominator.

The facts are that it is an extremely complex issue with genuine differences of opinion and conflicting technologies (old, new, and unforeseen) and organizations that could be helped or harmed by elements of a strategic plan.

A strategic plan must not give advantages or disadvantages to any particular technology, yet must provide access to the market place. It must insure that whatever technology is chosen by the end user will provide that user with access to the national and international infrastructure. And it must provide that every Kansan, who chooses, has convenient, affordable and reasonably equal access to the network.

Glen Jones, creator of Mind Extension University said, "We must remember that the final terminal on the information highway, is a 3 1/2 pound electro-chemical device called the human brain."

It is important that we take advantage of every opportunity to improve access to as many Kansas terminals as possible. Substitute Senate Bill 591 will help, and I urge its passage.

Testimony

on behalf of Substitute Senate Bill 591 and Senate Concurrent Resolution 1627

Jerry J. Fear, City Administrator

City of Oberlin, Kansas

I am here today to testify in favor of Substitute Senate Bill 591 and SCR 1627. I am testifying on behalf of residents of my community and other communities in the Southwestern Bell service area who will benefit from new infrastructure and services proposed in Telekansas II. And I speak as someone who's community has benefited by Telekansas I.

As some of you may know, Oberlin has invested a great deal of time, effort, and money in insuring that we have the most advanced communications capabilities as any urban area in the U.S. Our economic development effort has been geared to marketing that communication system to firms and individuals who can use that technology to locate away from urban areas. We have fiber to our community and a digital switch. Single party lines are available to any subscriber who wants one---all as a result of Telekansas I.

I have personally spent four years studying telecommunications issues and technologies so that I could understand what we needed to do to make this work. I have read every book that I have been able to find on telecommunications and economic development. I have a stack of magazine and newspaper articles over a foot high on the subject. I have been to dozens of meetings, conferences and trade shows throughout the United States as either a presenter or participant where telecommunications issues were discussed.

I have appeared before this legislature on technology issues. I am on the Kansas, Inc. Telecommunications Task Force, participated as a Stakeholder in the Regents Telecommunications Task Force, and was nominated by Governor Finney for consideration as a member of the National Information Infrastructure Advisory Committee.

I have cited all this to say, that in all those activities, I have never, never heard anyone seriously suggest that rate-of-return regulation was an effective method for regulating the telecommunications industry after divestiture. In fact, the evidence is that the Federal Commerce Commission and most states are moving away from this type of regulation. I cannot set by and see the State of Kansas take a step backward when we are poised on the edge of opportunity to become the leader in telecommunications of all fifty

states. The future of Kansas as a world player, and the hopes of rural Kansas will be determined, in large part, by the decisions we make about telecommunications policy.

The Aspen Institute financed a study of the impact and potential of telecommunications on rural economic development. The resulting book, published in 1988, called "Rural America in the Information Age," is the seminal work which began the creation of awareness of telecommunications policy issues. Focusing, as it did on the Federal role, it became the basic blueprint of what has become the National Information Infrastructure Initiative of the Clinton administration.

Subsequently, the Aspen Institute, commissioned another study, which focused on state, local and private issues. Published in 1992, it is called "Electronic Byways-State Policies for Rural Development Through Telecommunications." This book directly addresses the issues before you today. I realize you don't have the time or access to this study, so I am going to quote directly from it in my written testimony so that you can read it at your leisure. It says what I want to say and lends expert authenticity. All the quotes are in bold type.

**A recurring criticism of rate-of-return regulation is that it is a form of cost-plus contracting in which the telephone carrier recovers from telephone ratepayers all of its costs, plus a percentage profit. In such regulation, there is little incentive (and sometimes a disincentive) to reduce or control costs, because companies using lower cost technology would have a lower base on which to calculate their percentage profit. Some critics have argued that this approach has led to too much "gold plating," or unnecessary investment, in telephone networks. Price caps and other incentive regulation schemes are intended to solve this problem by giving telephone carriers an incentive to lower costs--namely allowing them a higher percentage profit when costs are lower. (page 208)**

**Market conditions and technological advances have already wrought such sweeping changes in telecommunications that a return to the prior system (Monopoly) is unthinkable. In grappling with the quandaries raised by competition, the FCC has abandoned traditional rate-of-return regulation of large telephone carriers in favor of a new system of "price-cap" regulation that directly limits prices.**

**Regulators in many states have established or experimented with various "incentive regulation" programs in which they give carriers more pricing flexibility. (page 45).**

The State of Kansas was among those progressive states, when the Kansas Corporation Commission and Southwestern Bell agreed to the original TeleKansas plan.

**Some state incentive regulation proposals require that carriers spend a specified dollar amount on upgrading rural telephone switches or other network facilities (for example, "the Michigan plan" for Michigan Bell. (page 208)**

Through TeleKansas the Southwestern service area has become digital, multi-party lines eliminated, and fiber trunks have been installed to many communities. Are we to turn backward in Kansas? I certainly hope not.

**In metropolitan areas, vigorous competition, including the proliferation of dedicated private networks, is the engine for major service improvements. (page 45)**

**A fruitful new dialog between rural development advocates, the telephone industry, and telephone regulators is already under way. Unlike many political debates in which the gains of one group come at the expense of another, this dialog can lead to cooperative strategies that yield benefits to all parties. (page 46)**

This dialog has been going on in Kansas. Much has been accomplished, but more remains to be done. The question for the state is whether we go forward or backward. Rate-of-return is not forward.

**Just as the new services made possible by computer technology have contributed to a global competitive advantage for the U.S. economy, so the new telecommunications services can contribute to future economic advancement of both rural and urban regions of the country.**

**The regulatory questions: How can the initial investments in newer, lower-cost communications technology---which can do much to fuel economic development---be paid for? The initial capital is available from private investors and the profits generated by prior telephone company investments. This issue becomes one of devising regulatory incentives that can leverage private investment to achieve public economic development goals.**

**One obvious option for the regulators is simply to lower prices for existing telephone services. This reduction would divert telephone company profits to consumers and thereby reduce the funds available to invest in new telecommunications facilities, especially in rural areas. Alternately, regulators could provide incentives for investment in newer facilities that could stimulate both rural and urban economic development. This is a unique and unusual choice. Unlike the development of the transportation infrastructure, which requires a substantial investment of taxpayer dollars, major upgrades of the telecommunications infrastructure can be made *without* taxpayer dollars or raising telephone rates! The resulting productivity gains for industry and (given appropriate regulatory incentives) economic development gains for rural communities make this a rare "win-win" opportunity that development advocates should not miss. (page 47)**

This is such an opportunity. Southwestern Bell has proposed investing \$138,000,000 in Kansas in the next five years. They have proposed capping basic residential and commercial telephone at today's (1984) rates. And the \$138,000,000 will be spent in Kansas for the benefit of Kansans, not some cable system in England.

**Executives of publicly traded telephone companies, who have a duty to their shareholders as well as subscribers, may not approve the capital budgets for rural equipment modernization. They may conclude that modernization of equipment in rural communities will generate less return on investment (profit) than other investments, such as the purchase of foreign telephone companies or cable television systems. (page 211)**

**Under rate-of-return regulation, carriers passed on maintenance costs to telephone subscribers. Shareholders could be penalized when equipment was taken out of service before being fully depreciated. Therefore to achieve significant quality improvements, regulators should reassess the modernization incentives (or disincentives) implicit in current modes of regulation. (page 211)**

**Regulators can do much to dispel the perception (fostered by rate-of-return regulation) that regulation is a "zero-sum game," in which any gains by subscribers necessarily come at the expense of the telephone companies, and vice versa. Incentive regulation can help convert the situation into a "win-win" situation in which telephone companies can serve both their shareholders and their subscribers by offering better service at a reasonable price---the normal scenario in non-monopoly, competitive markets. (page 211)**

This bill is not a deregulation bill. It is an incentive regulation bill. It affects only Southwestern Bell. The other phone companies should be here today supporting this concept and developing their own approach to incentive regulation that will provide needed capital for their own modernization. And we should be encouraging them to do so, thus benefiting all parts of the state and the state as a whole.

One final quote from the Aspen study, is the specific recommendation on this issue:

**Recommendation 4:**

*State legislatures should authorize their regulatory commissions to use incentive regulations as an alternative to traditional rate-of-return regulations.*

**Since most of the telecommunications infrastructure for economic development will be built by regulated telecommunications carriers, appropriate regulatory incentives will be needed. Unfortunately, traditional rate-of-return regulation, designed to prevent monopoly abuses, is not likely to spur necessary investments and innovation. As explained in Chapter 2, incentive regulation holds**

**much greater promise for eliciting new investment in advanced telecommunications.**  
(page 189)

In concluding my remarks, I have attached a copy of all of the recommendations to state governments which are contained in the Aspen study. For those of you who are familiar with the Regents Telecommunications Task Force report on telecommunications, or who have read it in its entirety, will find that all of these recommendations are included in the recommendations in that report. Thank you very much for your time and interest.

## CHAPTER 7

### BUILDING ELECTRONIC BYWAYS: GOALS AND RECOMMENDATIONS

How can we ensure that the electronic byways are built, and that their full developmental benefits for rural America are realized? Chapter 7 discusses detailed sets of policy goals and recommendations for four different audiences: governors and legislators, state and local development agencies, state regulatory commissions, and the telecommunications industry. These goals and recommendations are listed below.

The infrastructure recommendations are cast in terms of services that should be available to users, not particular technologies. It is not necessary for regulators to micro-manage the carriers' technology choices to achieve service and quality goals. Rather, it is preferable to give carriers economic incentives to provide the needed variety and quality of services in the most efficient manner.

Many experts have compared the telecommunications infrastructure to an "electronic highway," an analogy that may lead some people to conclude that it will be too costly to provide access to modern electronic superhighways from every community. This assumption is incorrect. It is economically feasible to provide broadband service connecting every telephone exchange in the country, including those in small rural communities, and high quality narrowband access (for voice and data) for every household in the country. Broadband links for video and high-speed data can be provided wherever the business, educational or other applications require them.

Universal access to high quality telecommunications networks is not only affordable; it can be provided without tax dollars. Although large investments will be required, the anticipated profits should be sufficient to raise the necessary capital. Telephone subscribers, on the average, are unlikely to have higher telephone bills, except for increased usage. As the new investments lead to lower costs and increased usage, subscriber revenues will repay, over time, the costs of the new investments.

In order to harvest the many benefits of telecommunications technologies, the challenge is to craft incentives that will extend electronic highways and byways throughout rural America. Telecommunications providers and rural development advocates should both remember, however, that telecommunications alone is not enough. Putting a modern infrastructure in place is a necessary starting point. The continuing challenge is to develop the uses and applications of modern electronic byways that will contribute to economic development and improved quality of life for all rural Americans.

## GOALS AND RECOMMENDATIONS

### RECOMMENDATIONS FOR STATE GOVERNORS AND LEGISLATORS

1. State governors and legislatures should develop a comprehensive telecommunications plan with specific goals appropriate to the conditions of their states.
2. Each state should establish a full set of performance measures to monitor progress toward meeting state goals for its telecommunications infrastructure.
3. State legislatures should authorize their regulatory commissions to consider economic development potential as they regulate telecommunications.
4. State legislatures should authorize their regulatory commissions to use incentive regulation as an alternative to traditional rate-of-return regulation.
5. State economic development agencies should be authorized to become advocates for telecommunications policies that serve economic development goals.
6. State governments should establish a high level, centralized telecommunications authority within the state government. This body would coordinate, evaluate and set priorities for the state's own telecommunications and information technology efforts, including voice, data and image processing and transmission.
7. Planners of state government telecommunications services should design them to increase citizens' access to public information and services without regard to geographic location or income.

8. The state government process for procurement of telecommunications should be used to help develop a modernized public switched network throughout the state.
9. State governments should support pilot projects involving telecommunications applications that could benefit rural development.

### GOALS AND RECOMMENDATIONS FOR DEVELOPMENT AGENCIES

1. *Increased Statewide Awareness of the Linkages Between Telecommunications and Development*
  - 1.1 Development agencies should sponsor regional workshops to share information about innovative uses of telecommunications and identify rural telecommunications needs.
  - 1.2 Development agencies should convene task forces to set goals for modernization of the state's telecommunications infrastructure and plans for its use to stimulate development.
2. *More Sophisticated Advocacy for Telecommunications Policies that Serve Development Goals*
  - 2.1 State development agencies should become credible advocates for rural development interests at the state regulatory commission.
3. *Better Understanding among Small Businesses and Rural Communities of the Many Valuable Uses of Telecommunications Services*
  - 3.1 State development agencies should build a telecommunications component into small business assistance and rural community development programs.
  - 3.2 Development agencies should sponsor training courses on telecommunications for community and economic development professionals.
4. *A Rural Workforce Trained to Meet the Telecommunications Needs of Rural Business*
  - 4.1 Development agencies should work with community colleges to establish telecommunications training courses.

- 4.2 State development agencies should encourage the establishment and expansion of distance learning programs for both student and adult education.
5. *Aggregation of Rural and Small Business Demand for Modern Telecommunications Services*
  - 5.1 Development agencies should work with rural communities and small businesses to help them to obtain collectively the telecommunications services they might not be able to obtain individually.

### GOALS AND RECOMMENDATIONS FOR STATE REGULATORY COMMISSIONS

1. *Universal Single-party Touchtone Service*
  - 1.1 All state regulatory commissions should participate to the maximum extent allowed in the FCC's "lifeline" program, which reduces the monthly basic telephone service fee for eligible households by as much as \$7.00 below the normal charges.
  - 1.2 All state regulatory commissions should participate in the FCC's "Link-up America" program, which reduces the installation and deposit charges for telephone service for eligible poor households by \$30.00.
  - 1.3 State regulatory commissions should encourage "local service only" options for subscribers who would otherwise be denied access to both local and long-distance service.
  - 1.4 All state regulatory commissions should establish "relay services" that enable persons using teletype or other terminals for the speech- or hearing-impaired (or those with other disabilities) to communicate through the telephone network with people using ordinary telephones.
  - 1.5 State regulatory commissions should encourage competition for service to all locations where telephone carriers charge extraordinary installation fees.
  - 1.6 State regulatory commissions should solicit competitive bids for telephone service to locations outside telephone franchise boundaries. The commissions should then grant franchise authority (and corresponding service obligations) to qualified low bidders.

- 1.7 All state regulatory commissions should eliminate "suburban mileage charges" from basic single-party telephone service rates.
- 1.8 State regulatory commissions should redefine basic telephone service to include touchtone service.
- 1.9 State regulatory commissions adopting incentive regulation plans should include an incentive to encourage universal access to single-party touchtone service.

## 2. *Service Quality Sufficient for Voice, Fax and Data*

- 2.1 State regulatory commissions should establish mandatory, audited telephone service quality standards and should include a service quality component in any incentive regulation program they adopt.
- 2.2 State regulatory commissions should change regulatory policies that inhibit network modernization, including depreciation schedules and rules for amortization of costs of older equipment taken out of service.

## 3. *Extended Area Service (EAS) and Reduced Intrastate Long-distance Rates*

- 3.1 State regulatory commissions should establish Extended Area Service policies that enable residents to reach their major communities of interest with "local" calls.
- 3.2 State regulatory commissions should maintain geographic rate averaging for intrastate long-distance calls.
- 3.3 State regulatory commissions should allow intrastate long-distance competition within each LATA established by the Modified Final Judgment of the AT&T Consent Decree.
- 3.4 State regulatory commissions should encourage lower intrastate long distance rates.

## 4. *Universal Enhanced 911 (E911) Service*

- 4.1 State regulatory commissions should work with local government agencies to make E911 services available from all telephones throughout the state.

## 5. *Widespread Access to Optional Information Services*

- 5.1 State regulatory commissions should encourage statewide local access to information services that are generally available in urban areas.

## 6. *Public Network Utilization for Distance Education*

- 6.1 State regulatory commissions should encourage flexible tariff structures for distance learning networks.

## RECOMMENDATIONS FOR TELECOMMUNICATIONS PROVIDERS

- 1. Telephone carriers should upgrade their facilities to provide universal single-party touchtone service with quality levels suitable for reliable data and facsimile transmission. They also should upgrade facilities to meet demands for access to distance learning, other video and data applications, and a variety of enhanced services as they become available.
- 2. Telecommunications equipment and service providers should design and promote equipment and services to meet the needs of rural users.
- 3. Telecommunications providers should market their products and services effectively.
- 4. The telecommunications industry should offer telecommunications training for the present and future workforce.
- 5. Telephone carriers should provide local leadership for economic development programs in the communities they serve.
- 6. Telephone carriers should contribute trained staff to economic development programs in their service areas.
- 7. Telephone carriers should help local entrepreneurs and economic development projects obtain financing.
- 8. Telephone carriers should make direct investments in rural economic development.

# BUSINESS

SECTION D

THE DENVER POST

## U S West deal a tangled web

### Sale involves 45 rural exchanges

By Dinah Zeiger  
Denver Post Business Writer

Final deliberations begin next week on what started out as a straightforward sale by U S West Communications Inc. of 45 rural Colorado telephone exchanges, which now has turned into a tangle of conflicting agendas.

The Public Utilities Commission's three commissioners will begin the difficult process of making their decision in public at hearings next Friday, starting at 1:30 p.m.

What they have to decide is whether to accept a deal worked out between U S West, Pacific Telecom Inc., the proposed buyer, the PUC staff and the state's Office of Consumer Counsel, which represents consumer interests, to allow the sale in exchange for U S West dropping a proposed \$28 million rate hike.

The commissioners don't have to accept the deal as part of the sale, nor do they have to approve the proposed sale itself. They can modify either or both agreements if they choose.

But then, PTI and U S West don't have to accept modified terms, either.

In other words, after months of nego-

### COMMUNICATIONS

tiation, testimony and debate, the whole deal could collapse, leaving things just the way they are now.

Observers generally agree that the commission will reach its decision by the end of the month, when PUC Chairman Robert Temmer steps down.

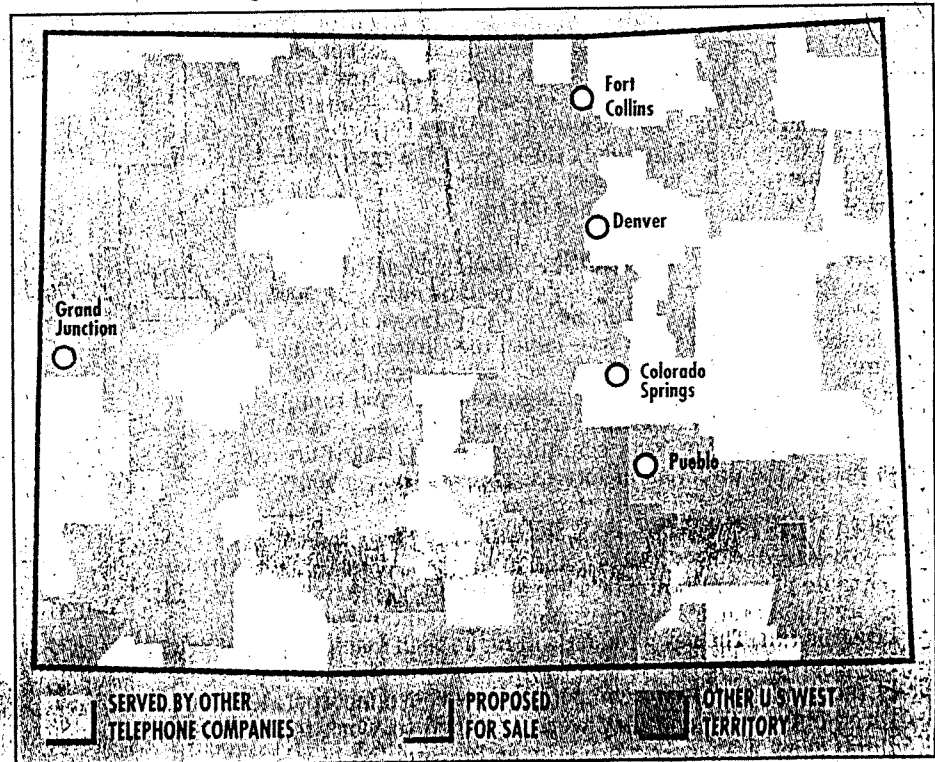
Whether there is a consensus among the commissioners is unknown. Some observers worry that they may accept the sale, but without the carefully crafted deal that gives Colorado consumers some relief from a rate hike. If the deal is scuttled, some say that will leave consumers vulnerable to a rate increase that could otherwise be avoided.

What set the decision making in motion was U S West's agreement last July to sell 45 rural Colorado telephone exchanges to Vancouver, Wash.-based Pacific Telecom for \$207 million. The sale would affect about 48,000 customers, or 2.8 percent of U S West's Colorado customers.

The Colorado company stands to realize \$31 million in after-tax profits from

### U S WEST TELEPHONE SALE

U S West has proposed the sale of these 45 telephone exchanges to Pacific Telecom Inc. and agreed to postpone a rate increase to see the sale go through.



Please see **RURAL** on 7D

# Hearings to begin on phone exchange sale

RURAL from Page 1D

the sale. It was a condition of the sale that U S West be permitted to return the \$31 million to its shareholders, not to ratepayers.

The PUC staff and the Office of Consumer Counsel both support the sale, but they wanted to get something out of it for consumers.

## Trade-off

That's when they came up with a trade-off. They would support U S West's demand that the \$31 million be returned to shareholders, if U S West would withdraw a requested \$28 million residential rate hike that the phone company said it needed to recoup expenses required under new accounting rules for retirement health benefits.

In addition, U S West would agree not to seek a rate increase for those costs for two years. If it did, the costs would be amortized over 40 years rather than 17.5 years, thus reducing the revenue required to \$14 million from \$28 million.

"We believe U S West customers would benefit by not having to pay the rate increase, and they would get rid of the high-cost rural areas," said Jim Richards, the PUC's chief of utilities who headed the negotiations for the PUC staff.

Ron Binz, the state's Consumer

Counsel, said it was a "very significant concession" by U S West.

Most of the interested parties think it's a good idea. But four of the exchanges included in the sale don't like it, nor does long-distance carrier American Telephone & Telegraph Co.

Tom Farley, a lawyer representing the Southeast Colorado Power Association, which was an unsuccessful bidder for some of the 45 exchanges, said the deal "does nothing for the people (in the exchanges) being sold."

It wants U S West to plow back the profit it would make on the sale into new lines and switches for the exchanges on the block, not give it to shareholders. In addition, Farley said Pacific Telecom has made "very aggressive assumptions" about how much federal subsidy money it might be eligible for.

"We are worried that consumers will end up paying" for a massive rebuilding of the phone system, he said.

Washington and Yuma counties have had a running battle over service with U S West for years. Now, they want to form their own phone cooperative and run the exchanges locally.

Charles Holum, a Denver attorney representing the counties, said that although Pacific Telecom appeared to be more responsive to

community concerns than U S West, "we still view them as another big out-of-state company."

"We would like to see the whole deal collapse so we can make our own bid," Holum said.

Brian Johnson, director of regulatory affairs in Colorado for U S West, said Washington and Yuma counties were not bidders when the sale was announced, and they have "no cash, no funding and no company" now. "They could have gotten a company together by now, and they haven't." Nor will U S West sell the exchanges in Washington and Yuma counties separately from the Pacific Telecom package, Johnson said.

## Complaints on service

Holum said he thought that was posturing on the part of U S West. "They've made it company policy to get out of the rural business," he said.

Rural customers have complained long and loud about inadequate service from U S West, and a sale could open up a stream of federal money that currently can't be tapped to help upgrade rural phone systems.

Unlike most states, where the Baby Bells serve high-density urban areas and small independent phone companies serve rural communities, U S West owns 98 percent of the phone lines in Colorado.

One result is that U S West, because of its size, cannot tap the federal universal service fund, which provides monies to build and upgrade phone systems in high-cost areas. According to testimony, Colorado only gets about 3 percent of such funds, compared with a national average of 20 percent.

An independent phone company, though, can draw from the fund. It is believed that Pacific Telecom may be able to draw an additional \$18 million from the fund to upgrade services in the 45 rural communities.

AT&T objected to the sale because of that: It will open a large new drain on the federal money, which is financed by mandatory contributions from long-distance companies.

Observers say AT&T would like to see the deal derailed because it would relieve pressure on the high-cost fund, and they wouldn't be affected either way by the proposed rate hike.

If the rate deal is killed, Johnson said U S West "would be happy to go ahead with the sale, and we'd be glad to pursue the (rate) increase."

"We feel we put together a beneficial package," he said. "If the PUC says no, I can't conceive how we could put together a better one."

# Business Sunday

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## *Mammoth unlikely to stay single for long*

Cable giant, Baby Bells must share info highway, but corporate cultures poles apart, experts say

By Joe Estrella

Rocky Mountain News Staff Writer

**T**ele-Communications Inc.'s decision to shelve a merger with Bell Atlantic Corp. won't leave the world's largest cable operator traveling the information super-highway alone.

Analysts say TCI chief John Malone will forge some kind of corporate marriage with one of the Baby Bells still panting to pour billions into the next generation of integrated television.

TCI's immediate need is to attract a partner with the deep pockets necessary to simply maintain its existing cable network, let alone finance any future expansion, observers say.

"Malone still needs to support his cable business," said Elaine Altman, half of a husband-and-wife telecommunications analyst team with Furman Selz in New York. "Right now, TCI's in-ground assets are dead assets. If they don't do something with them, they're going to deteriorate. That means the network will not

be state-of-the-art."

Privately, TCI insiders confide that "there's no shortage of interested buyers" for the nation's largest cable company and its estimated 10 million U.S. subscribers.

Apparently the most logical candidate is Georgia-based BellSouth Corp., the largest of the Baby Bells.

BellSouth came up a loser in its recent attempt to become a player in the cable industry by backing QVC Network's failed \$10 billion hostile takeover bid for the Paramount Communications entertainment and publishing empire.

"If I was (Bell South chairman) John Clendenin, the first thing I'd do would be to call John Malone," said John Bain, telecommunications analyst with Raymond James & Associates.

BellSouth spokesman Tim Klein declined to comment on "potential or rumored activity," but conceded that the collapse of the TCI-Bell Atlantic deal indicates the telephone industry must "recalibrate" its financial models to reflect the "new environment."

The financials of the TCI-Bell Atlantic merger began to change almost immediately.

After climbing to \$63 a share, Bell Atlantic's stock had succumbed to higher interest rates in recent weeks,

# TCI

falling to \$53 a share the day the merger was scuttled.

"John Malone saw that the stock being offered was not as valuable to the market," Bain said. "And Bell Atlantic was looking at too much of a dilution (of earnings). People were wondering if they would be able to maintain their dividend."

But it was the new regulatory environment that ultimately doomed the TCI-Bell Atlantic merger.

The \$33 billion deal, the largest corporate merger in U.S. history, fell

apart when Bell Atlantic asked for a last-minute cut in TCI's asking price after the Federal Communication Commission said it would impose a 7% reduction in basic cable rates.

It was a fatal blow to the proposed merger, which was based on Bell Atlantic paying 11.75 times TCI's cash flow. The FCC's action translated into a \$144 million shortfall for TCI, which estimates its cash flow was trimmed by another \$150 million by a 10% FCC-mandated rate cut last September.

However, industry observers believe that both parties had already discovered they were making a mistake.

See TCI on 88A



Thomas Kelsey/Rocky Mountain News

Tele-Communications Inc. chief executive officer John Malone has conceded that TCI is still seeking a telephone alliance.

# U S West the model for cable

**TCI** from 87A

What neither TCI nor Bell Atlantic addressed in terminating the merger were the wildly divergent corporate cultures that have been eating away at the deal, said Dan Callahan, director of University of Denver's telecommunications program.

"In the cable industry you're looking at entrepreneurial people," said Callahan, who spent a combined 31 years with AT&T and Southern New England Telephone Co. "On the telephone side, you're looking at very conservative people. Both sides use different decision support systems, different financial management systems."

Callahan said the U S West-Time Warner partnership is the model that the telephone and cable industries should follow in trying to forge any future alliances.

"Do either have the resources to make the information super-highway work? I don't think so," Callahan said. "It's going to require a joining of the two industries. And the partnership combination would work the best."

Bain said scuttling the Bell Atlantic merger does not mean that TCI has fallen behind the pack in racing to build the information highway.

"The whole thing is just a myth," he said. "The term digital network was coined back in the 1970s, and they're only now rolling it out to a limited number of people."

Malone has publicly dismissed any possible future merger talks, but conceded that TCI is "actively seeking" another alliance with a telephone company.

He did not preclude reapproaching Bell Atlantic from "a different perspective."

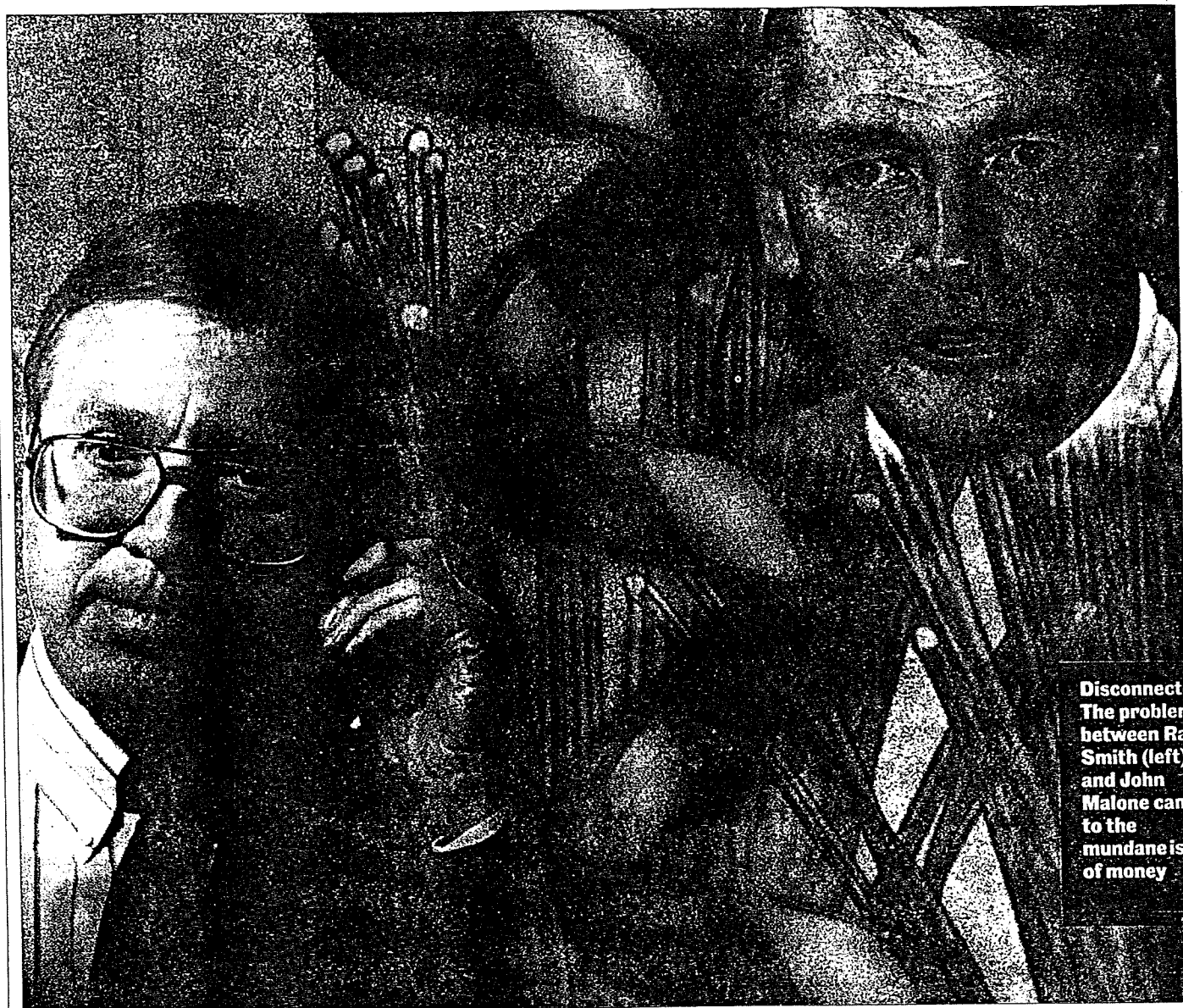
"I don't think any of the other Bells will move on TCI right now," Altman said. "The economics don't make sense."

Instead, Altman predicted that the Baby Bells will follow the lead of Englewood-based U S West Inc., which is spending \$500 million a year to build its own cable system within its 14 state territory.

Like U S West, the telcos could offer their systems as a conduit for delivering cable programming of their fiber optic network.

They can operate these systems until Congress lifts the restrictions prohibiting them from owning cable systems within their territory.

"They'll be all set," Altman said. "It makes sense to go to fiber. But they're still going to need the cable companies, because they are the one's who have the programming."



**Disconnected:** The problem between Ray Smith (left) and John Malone came to the mundane issue of money

# Full Speed Ahead—Maybe

**Mergers:** The collapse of the deal between Bell Atlantic and TCI won't bring construction of the Information Superhighway to a halt. Even the FCC's new cable price controls will only slow it down. Now the race to find the detours begins.

BY NANCY HASS

IT WAS BILLED AS THE DEAL THAT would jump-start the 21st century. The merger of the nation's largest cable operator and one of its mightiest telephone companies was supposed to catapult us into the golden age of interactivity, of video on demand, home shopping, videoconferencing. But last week the deal between Tele-Communications Inc. and Bell Atlantic collapsed, torn apart by the same earthbound issue that ruins most marriages: money. Bell Atlantic's Ray Smith and TCI's John Malone couldn't agree on a final price. Could such a mundane argument mean the end of the road for the Information Superhighway?

Don't believe it. The wreckage of the \$22 billion merger may clog traffic for a while, but it won't detour the communica-

tions revolution. Even the Federal Trade Commission's decision last week to roll back cable rates by 7 percent can't stop the wheels, although critics called it the straw that broke the back of the Bell Atlantic-TCI deal and say it will disable the cable industry. "This revolution is happening, merger or no merger," says Smith, "cable re-regulation or not." For his part, Malone may have headed home to TCI's Colorado headquarters muttering that the new cable price controls have ruined everything, but he'll be back. The public's appetite for advanced communications—from video-on-demand to global data networking—has been whetted. Price regulations may make it harder—as the telephone companies have argued for years—but they will not stop the true believers. Says Comcast president Brian Roberts: "The drive to bring cable and telephone technologies together is simply too strong to be ignored."

Still, you wouldn't know that if you heard the screams coming from the cable industry last week—some of them clearly valid. The FCC's rate rollback, which came on top of a 10 percent reduction last year, is expected to cost cable companies \$3 billion in income next year. They say that means they won't be able to spend money right away upgrading their systems to bring more video-on-demand and other interactive services into the home. And dreams of improving their network to carry voice may be even more distant now. As if to emphasize that point, after the merger was abandoned, Malone said he would cut TCI's investment in new technology by 50 percent (sending down the stock of cable-equipment suppliers). Time Warner CEO Gerald Levin, who called the rules "arbitrary, unfair and unacceptable," is expected to follow suit.

**Consumer advocate:** FCC chairman Reed Hundt defended the price controls on basic service as a way to protect consumers from monopolistic cable rates. Besides, he thinks cable companies are bluffing. After the overheated rhetoric calms down, he predicts, the cable industry will focus on programming that doesn't fall in the basic tier of regulated services. And it will aggressively push costly premium channels and pay-per-view. Those offerings will, within a couple of years, make the industry enough money to finance technological improvements. "The cable companies will go from strength to strength," he says.

In either case, what temporarily handicaps cable gives competing technologies room to zoom. For the Baby Bells, cable re-regulation is a windfall. Nipped at on all sides by new competitors such as satellite and wireless, they now can play catch-up with the cable companies. Companies like Ameritech and Pacific Telesis look smart now. They avoided cable alliances and instead are spending billions to add video

## This revolution is happening, merger or no merger, cable reregulation or not

RAYMOND SMITH  
Bell Atlantic

capability to their phone systems. "The FCC's decision buys the telephone companies at least another year to develop video capability," says analyst Fred Moran of Salomon Bros. "That's a lot."

The telephone companies could benefit another way from the collapse of the deal and the new rate controls. While big diversified cable providers like Time Warner and TCI will survive the rate rollbacks, many smaller, local cable franchises are so deep in debt that they may have to sell out. And guess who's buying? "No one else has enough money to bail them out but the Baby Bells," says consultant Berge Ayvazian of the Yankee Group.

And despite the regulatory uncertainty, it will be a buyer's market as prices fall; cable companies desperately need big money to upgrade their systems. This is a remarkable turnaround from just a few weeks ago, when cable companies were holding out for top dollar. Says Ayvazian: "This a fire sale." The president and founder of a 35,000-subscriber cable company in the Midwest knows this all too well. He says he was approached last week after the merger news by a Baby Bell representative who "talked about an offer so inadequate it's embarrassing." Two years ago he turned down a 50 percent higher offer from another suitor. "I guess now the Bells will eat systems like mine for lunch," he says.

This means that some of the deep-pocket Baby Bells and a few of the stronger cable companies will find a cheap way to get bigger. One weak cable player has already been singled out from the herd: heavily

indebted Cablevision Systems. USWest will take a particular interest; some months ago the Baby Bell and its strategic partner Time Warner talked with founder Charles Dolan about selling his company. Now they may get it cheap. That might help finance plans to build a grand network to bring voice, video and data to subscribers' living rooms.

Such distress-sale purchases represent the simple, safe way to form the alliances that are needed to build the superhighway. After last week's merger collapse, there probably won't be another joining of two behemoths any time soon—at least not in that sweeping style. The failed merger, like most large ones, was a stock swap between the two companies. That's where the problems started. During the months it took to finalize the deal, the stock of both firms fell sharply. Investors drove down the shares because they were nervous about new cable price regulations and an uncertain future. The deal fell apart because Malone wanted more shares of Bell Atlantic as compensation for the falling stock price; Smith wanted to pay less for TCI's cable properties because the new FCC rules meant they wouldn't bring in as much cash. The two men, tough guys accustomed to getting their way, grew farther and farther apart until the deal exploded.

**New deals:** In the future, companies in search of the fast lane will probably avoid outright mergers or acquisitions. Instead of stock swaps, they may offer up cash for a piece of the action. That's what USWest did when it struck its strategic partnership with Time Warner in May 1993. The Baby Bell paid \$2.5 billion for 25 percent of the nation's second largest cable franchise and properties like HBO and Warner Bros. "It's hard not to sing that deal's praises now, considering how the TCI thing turned out," says Smith Barney analyst John Reidy.

Count Ray Smith in the chorus. Sobered by the events of last week, he is nevertheless scouting for new deals. He may scoop up a few smaller cable properties or drive some strategic partnerships with other big players. He and John Malone have even chatted about an alliance, though clearly in some smaller fashion.

Even cable companies are expected to feel flush again eventually and will be back to spend billions on the interactive trail. Rumors are already flying that Malone will pair up with QVC chief and former Paramount suitor Barry Diller to seek out new deals. "I've got my uniform on," says Malone. "Put me back in, Coach." Considering what setbacks they've both seen lately, expect them to play a smarter game next round. The golden age of interactivity may not come in a blinding flash as promised, but it will come no matter what.

With SHERRY KEENE-OSBORN in Denver

## I've got my uniform back on, and I'm ready to play. Put me back in, Coach.

JOHN MALONE  
Tele-Communications Inc.

## MCI moves up mobile communications

By The Associated Press

WASHINGTON — The day when you will be able to send faxes and electronic mail — all from a mobile telephone whose number goes where you go — moved a crucial step forward on Monday.

MCI Communications Corp. announced it is going into the wireless communications business.

The nation's No. 2 long-distance company said it will invest \$1.3 billion, buying a 17 percent stake, in little-known Nextel Communications. The alliance will mean consumers will be able to use the same mobile phone and phone number anywhere in the country.

Today, with cellular phone service, many consumers must look up and punch in "roaming codes" when they travel from city to city. But already some cellular providers have linked their operations regionally, eliminating the need for roaming codes and allowing the phone number to travel through the region with the phone.

Nextel Chairman Morgan O'Brien said that within two years 95 percent of the country's population will have access to the new service, delivered over radio frequencies.

MCI said the alliance gives it a leg up into the next generation of mobile communications services, but com-

**MCI is moving toward a day when a mobile telephone number will be wherever you are.**

petitors disputed that. They said they are closing in on that goal.

Like the MCI-Nextel alliance, other firms are in the process of:

- Converting analog-based networks into digital.

- Linking individual cellular companies together nationally.

- Developing mobile services, such as fax and data transmissions to laptop computers, enabling a customer to use a phone like a personal computer.

Still, MCI, Nextel and their partner Comcast Corp. — a big cable TV company that also holds a 17 percent stake in Nextel — predict they will get to market faster than their competitors.

The alliance is "bringing together partnerships that can make things happen quickly," MCI Chairman Bert Roberts told a news conference.

"We're already digital; other cellular providers will still have to be converted," Roberts said.

MCI's biggest rival is AT&T, which

has plans to acquire the nation's largest cellular company, McCaw Cellular Communications.

AT&T disputed MCI's contention that Monday's development put it ahead of the pack. AT&T expects the Justice Department to approve the McCaw merger by late summer, clearing the way for the company to plunge into the wireless communications market, said AT&T spokesman Herb Linnen. He said AT&T then would move aggressively.

Sprint, the nation's third largest long-distance provider, which is already in the wireless business, played down the impact of the MCI alliance.

"Sprint is pleased with its position in the wireless telecommunications industry and its prospects for growth in the future," the company said.

The wireless communications market, chiefly mobile phone service, is expected to grow from its current 15 million customers to as

many as 90 million customers in 10 years, fueled by paging, messaging and other data transmission services, Roberts said.

Nextel's licenses cover 45 of the top 50 markets, O'Brien said. Nextel's operation in Los Angeles is already up and running. Service to the rest of California, New York, Chicago, Dallas and Houston should be in operation by mid-1995, O'Brien said.

Customers of the MCI-Nextel service will be able to use their mobile phones for paging, faxing and other services without needing additional equipment. But they will have to buy a sophisticated Motorola telephone expected to cost \$100 and up, said MCI spokesman Kevin Inda.

Inda said he expected charges for mobile phone services to be in line with those from cellular providers, from \$30 to \$60 a month.

MCI will market the new service nationally. In local markets, it will be marketed by Comcast.

Unlike its competitors, the new venture will not have to depend on getting radio frequencies from the FCC because Nextel already has them. The FCC is scheduled to begin auctioning radio frequencies for personal communications service in May but the process may be delayed.

# Superhighway hits FCC detour

The much ballyhooed merger between Bell Atlantic and cable TV giant Tele-Communications Inc. was aborted last week. Primary reason: a decision by the Federal Communications Commission to roll back rates for basic services (a new 7% reduction on top of last year's 10% cut) and to impose new regulations on the cable industry. These new uncertainties — about cable earnings and the ability of the industry to chart its own course without excessive interference by government — made pricing the deal impossible.



**Philip  
Burgess**

Result: delays in building America's information superhighway; an increasing role of government as bureaucrats and lawyers are substituted for entrepreneurs, engineers and consumers in designing the information superhighway; the migration of innovation in communications from cable and telephony (e.g., fiber optics, coaxial cable) to wireless (e.g., satellite, cellular) and computer devices (e.g., CD-ROM).

Reason: Many of the products and services that can be delivered by interactive, multimedia technologies that favor cable's "big pipelines" (called "broadband"), and the interactive (or two-way) capacity of the phone companies can also be delivered by radio waves and hard disks. Examples: Home shopping, encyclopedias, home medical guides, games, movies and other entertainment. The substitution is not perfect, but it is substantial.

It is unfortunate — some would say irresponsible — that the cable and telephone industry leaders are not forcing a public vetting of the federal government's decision to detour the information highway. After all, there is a substantial national interest here: to expand choices and convenience for U.S. consumers and give U.S. businesses the competitive benefits of the information superhighway at the lowest cost at the earliest possible date.

Instead, telephone and cable company spokesmen mumble about "bumps in the road" and move on to the next deal as they accommodate rather than challenge the prevailing views of Washington lawyers and bureaucrats who believe you can "guide" the diffusion of new technology and "neaten up" the process of innovation so it isn't so messy. These are the views of European social democrats which have been discredited everywhere (except Washington, D.C.).

It is instructive that the same issue of *The Wall Street Journal* that carried the TCI-Bell Atlantic break-up story also carried the following headline: "France Steers Toward 'Superhighway' with TV-Industry Mergers, a New Law." Punchline: The French government knows Europe is trailing the U.S. in building advanced telecommunications. Playing catch-up, the French are increasing investment in cable and forcing new combinations among telephone, cable, publishing and television to motivate more sophisticated pan-European interactive networks — much like TCI-Bell Atlantic plan.

Conclusion: We need a public debate in the U.S. before we let the government derail two of our most successful industries by punitive industrial policies.

Industries can be run into the ground by misguided government regulation. Consider the fate of U.S. railroads in the years following World War II, when they were marginalized by public policy that favored highway and air transportation. Unless cable and the telephone industries get their act together and begin talking to the public in terms the public can understand, they will suffer the same fate as the railroads.

Philip M. Burgess is president of the Center for the New West in Denver.

# Microsoft, TCI to team on home PC cable channel

By Joe Estrella

Rocky Mountain News Staff Writer

Tele-Communications Inc. and Microsoft Corp. Monday announced a joint venture Monday that will create a new cable television channel that will target the burgeoning home computer market.

The news came just days after TCI, the nation's largest cable company, and Microsoft, the world leader in computer software, said they would be the first to deploy interactive television technology with a marketing test next year in Denver and Seattle.

"With Microsoft's strength in PC software and TCI's ability to deliver special-interest programming, we think this new programming network of PC information will be appealing to the growing number of cable and PC customers," TCI president John Malone said in a statement.

The companies will be equal partners in the venture, which will give consumers access to personal computer information, goods and services through magazine format shows and home shopping.

It also will provide a range of interactive services to home personal computer using cable-modem technology that will allow consumers to access personal computer information directly from the cable system.

"The reason for doing this is that the home market for PCs is just exploding," said Microsoft spokeswoman Lisa MacKenzie, referring to the more than 30 million households that own personal computers. "There is an incredible need for programming that addresses the needs of the home computer user."

MacKenzie said the network is expected to be ready in 12 to 18 months.

Other cable companies will have the option of carrying the network over their systems.

"The goal is to have the channel on all cable systems, not just TCI," MacKenzie said.

## U S West creates video subsidiary

By Joe Estrella

Rocky Mountain News Staff Writer

U S West said Monday that it has formed a new subsidiary that will design, develop, distribute and promote interactive television services.

Interactive Video Enterprises Inc., a subsidiary of U S West Marketing Resources, will develop and implement interactive advertising, promotion and merchandising services for retailers, manufacturers, catalog companies, local merchants, and professional and skilled services companies.

"For the last year, U S West has been involved in the distribution side of the information superhigh-

way," said U S West spokeswoman Robin Baca. "This is a commitment to offer some of the content that will go over that highway."

The Englewood-based telecommunications giant is currently testing an interactive cable television network in Omaha that it hopes to deploy in Colorado, Oregon and Minneapolis-St. Paul by 1996.

"U S West, with the formation of IVE, is not only building broadband networks, but is also developing the interactive multimedia services that will be delivered over those networks to consumers and businesses," said Sol Trujillo, president of U S West Marketing Resources and chairman of IVE.

## TCI is rebuilding system with new fiber optic cable

By Joe Estrella

Rocky Mountain News Staff Writer

TCI of Colorado said Friday it has begun a \$34 million rebuild of its cable system that will install fiber optic cable in Aurora and Lakewood by year's end.

Construction manager Matt Rowzee said the project involves installation of 300 miles of aerial cable and 183 miles of underground cable in Lakewood, along with 227 miles of aerial cable and 135 miles of underground cable in Aurora.

TCI estimates the cost at about \$2,000 per subscriber.

The project began in 1993 with the construction of 120-mile fiber optic ring around the metro area.

Ronda Dorchester, director of metro marketing, said the company will begin a public information program that will involve direct mailings up to 14 days before a TCI crew is to begin work in each neighborhood.

It will also staff 24-hour-a-day hotlines for consumers with questions.

The Denver system is scheduled to be rebuilt in 1996.

When completed, TCI's 350,000 subscribers in the metro area will be able to receive the interactive cable network the company is building nationwide.

## Motorola launches new personal communicator

Associated Press

**SAN JOSE, Calif.** — Motorola Inc., raising the level of palm-top computing and wireless communications, is introducing a device that combines the two emerging services.

The Envoy personal communicator, unveiled Monday, lets users

send and receive information through Ardis, the nation's largest wireless network.

The device also can be linked by wire to telephones, computers and peripherals. This lets users tap into on-line information services, exchange files with personal computers, or use a printer or keyboard.

Envoys also can talk. They can jot down a note and transmit it as written, but Envoy — unlike Apple's Newton — does not recognize handwriting.

That's because handwriting recognition hasn't come far enough to use easily, said Curtis Sasaki, manager of product marketing for General Magic.

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MARCH 1994

# BYTE

THE WORLDWIDE COMPUTING AUTHORITY

PowerPC Benchmarks PAGE 23

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## The Data Highway



**UNDER  
CONSTRUCTION**

Technology, corporate investment,  
and government policy will  
shape the data highway.  
Here's the way it should be built.

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# BUILDING THE DATA HIGHWAY

Many of the technologies and players needed to construct the information infrastructure are already in place. But the precise definition of the data highway is in the eye of the beholder. Who builds it could dramatically affect how it works—and how it's used.

ANDY REINHARDT

**O**ne fact must be made clear about the national information infrastructure: The government is not planning to dig a trench from New York to San Francisco, fill it with fiber-optic cables, and call it a data highway. Rather, the information highway will be privately built, owned, and operated; the Feds will encourage its development only through research funding, standards efforts, and changes in regulations.

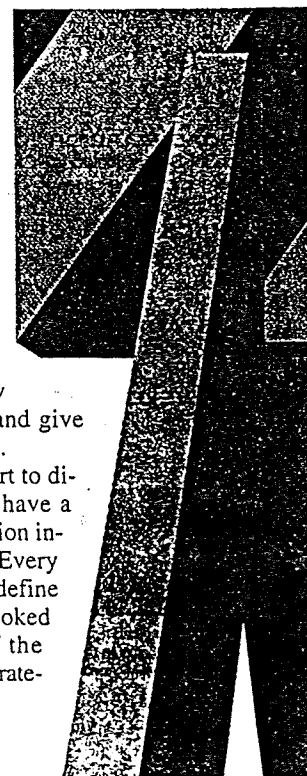
In fact, much of the data highway *already exists* in the vast web of fiber-optic strands, coaxial cables, radio waves, satellites, and lowly copper wires now spanning the globe. What's needed now are better on- and off-ramps—that is, better and faster links from businesses, schools, and homes to the communications backbone—as well as new vehicles, more destinations, and better guidebooks on how to get there. Hundreds of billions of private and public dollars will be required over the next decade to weave together the world's communications systems and create these new software and hardware navigation tools.

What will be the benefit of all this investment? For business users, the data highway represents the holy grail of connectivity: a ubiquitous internetwork that allows them easily and inexpensively to connect with customers and suppliers, improve communications among employees, and gather competitive data. Applications facilitated by the highway, such as videoconferencing, document sharing, and multimedia E-mail, could reduce travel spending and encourage telecommuting. Businesses might also save big on reduced health-care costs if the data highway improves distribution of medical records and enables new techniques such as remote

diagnostics. "We're very excited about it," says Ward Keever, the coauthor of a report on the data highway from SIM (Society for Information Management) and senior vice president for information services at the Medical Center of Delaware in Wilmington.

There's little disagreement over the grand vision of the data highway. It will be, as U.S. vice president Al Gore calls it, "a network of networks," a massive client/server and peer-to-peer mesh capable of carrying gigabits, and eventually terabits, of data per second on its trunk lines. The back-end servers, networking technologies, client devices, and software applications will be utterly heterogeneous—the most secular network ever constructed. And if it succeeds as envisioned, the data highway could help businesses find information more easily, open up new modes of research and education, and give consumers a wide choice of services.

It's in the details that opinions start to diverge, and these differences could have a profound effect on how the information infrastructure is designed and used. "Every technology company out there can define the information highway for you," joked James Abrahamson, chairman of the board at Oracle, recently. "[It's] the strate-



gic vision for whatever the company happens to sell."

The parties vying to create the data highway—telephone companies, cable distributors, computer makers, content providers (e.g., publishers, studios, and on-line services), and the worldwide Internet community—bring to the table different technologies and points of view. Forecasting the ultimate form and function of the data highway requires examining these conflicting technical perspectives. For instance, cable companies tend to see the data highway as a distribution vehicle for video and audio; were they solely responsible for linking users to the backbone, their data highway might favor information delivery over two-way communication.

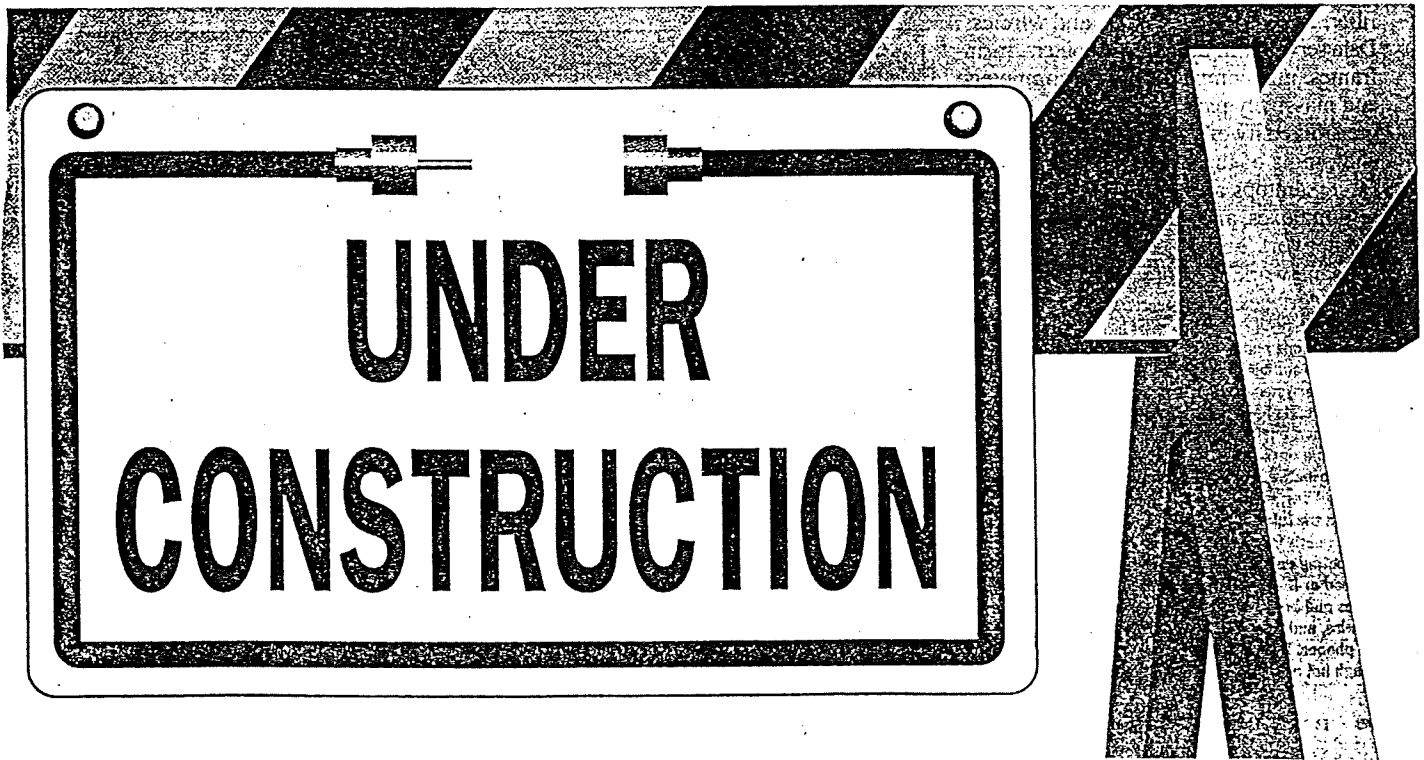
Others, including Mitch Kapor, founder of Lotus and now chairman of the Washington, D.C.-based Electronic Frontier Foundation, see the creation of the data highway as an oppor-

tunity to give citizens access to a vast wealth of information. Kapor's data highway might be less commercial- or entertainment-oriented, and its architecture would encourage individuals to become information creators, not just consumers.

In interviews with nearly 100 industry executives, engineers, analysts, users, and policymakers, BYTE has explored how the national and international information infrastructure is likely to be built. Below is a summary of those competing views, along with our own opinions of the optimal direction for the data highway of the future.

#### What Is It?

Oracle's Abrahamson contends that the highway is simply the logical conclusion of today's convergence of hardware, software, and networking technologies. The driving force for



## Data Highway Report Card

	Telephone	Cable	Internet
Availability	A+	B+	B
Affordable	A	B-	C+
Ease of use	A+	A+	C-
Security	B-	F	C-
Billing	A+	B	D+
Information content	D	C-	A+
Openness	B-	D	A
Bandwidth	D	A-	D

Today's telephone system comes closest to meeting the criteria for a data superhighway, but its copper wiring can't currently support multiple channels of video or other high-bandwidth data. The Internet is hard to use, doesn't support billing or widespread distribution of real-time data, and can be both expensive and difficult to access. This is changing, however, with the rise of commercial Internet providers and new tools. The cable system falls in the middle, but two-way capabilities are only now being added.

content), and a new generation of smart middleware (e.g., General Magic's agent-based Telescript) that will help users navigate the network.

Unresolved technical arguments about the data highway's architecture boil down to two main categories: protocols and bandwidth. The protocol problem concerns the ultimate role of TCP/IP, the lingua franca of the Internet and Unix-based LANs. Buttressed by the engineering resources of the IETF (Internet Engineering Task Force), TCP/IP has continuously evolved. But it suffers drawbacks for real-time use that could threaten its position as an internetworking standard when multimedia traffic plays a greater role on the data highway. An emerging alternative is ATM (Asynchronous Transfer Mode), a hybrid circuit-switched and packet-switched networking scheme that performs well in real-time applications but lacks TCP/IP's software base. One potential solution is to run TCP/IP over ATM.

Bandwidth equals data transmission capacity. Conventional telephones need very

little, while HDTV needs large amounts—20 Mbps or more per channel. How much bandwidth is necessary to connect businesses, homes, schools, and governmental bodies to the data superhighway will depend on the applications they end up using: on-ramps will need a lot more bandwidth if users demand interactive digital video than if they use the highway to send E-mail. A yet more subtle problem is how to allocate bandwidth into and out of customer sites: A system biased to data delivery—i.e., with a high ratio of downstream to upstream bandwidth—implies information *consumption*, whereas one with symmetrical or dynamically assigned capacity implies *communication*.

### The Players

To meet the needs of society, the data highway has to be ubiquitous, affordable, easy to use, secure, multipurpose, information rich, and open. If it's to be economically viable, service providers have to be able to bill customers for the time they spend on the network or for the data they use. Each of the precursors of the data highway meets these criteria with varying success. The different heritages of the players are reflected in how they define the information infrastructure.

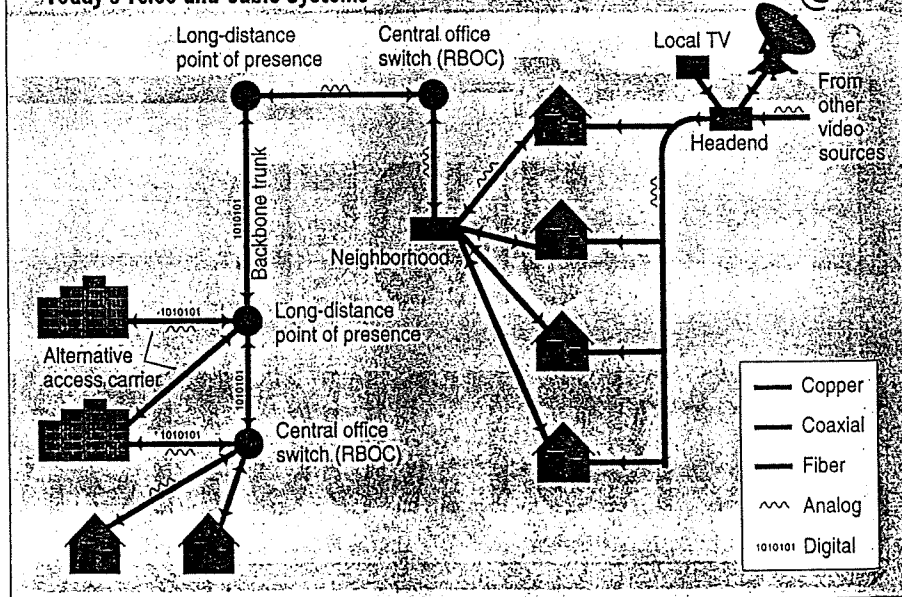
**Cable companies.** Steeped in broadcasting analog video through a wire, cable companies see the data highway largely as synonymous with enhanced entertainment services. They want to layer onto the video stream new consumer offerings such as interactive TV (e.g., video-on-demand, home shopping, viewer polling, and in-

this convergence is the increasing digitization of data; as Nicholas Negroponte, the head of MIT's Media Laboratory, says, "Bits are bits." Service providers are fighting over how to build the data highway. However, once video or speech or geological data becomes strings of 1s and 0s, users won't care what pipe they traverse to get from one computer to another.

The data highway's backbone will use every wide-area communication technology now known, including fiber, satellites, and microwaves, and the on- and off-ramps connecting users to the backbone will be fiber, coaxial cable, copper, and wireless. Data servers will be supercomputers, mainframes, minicomputers, microcomputers, and massively parallel machines, while a great diversity of clients will populate the end points of the network: conventional PCs, palmtops and PDAs, smart phones, set-top boxes, and TVs. Software used on the network will include operating systems, networking protocols and services, user interfaces, databases, data sources (or

Today's phone and cable companies use different topologies and technologies to deliver their services. The phone system is switched, symmetrical, and interactive. Its backbone or "trunk" lines are typically digital fiber; analog copper wires deliver service into homes and businesses. The cable system is unswitched and distributive, built on a backbone of analog fiber and satellites, with analog coaxial cables into customer sites. In the future (far right), their local architectures will be nearly identical: Interconnected signal collection and routing points feed services via fiber to the neighborhood or the curb. From these nodes, data enters homes and businesses on a mix of coaxial cable, copper wire, and fiber to reach set-top boxes, computers, and phones. Both systems are switched and two-way, though not necessarily symmetrical or entirely digital.

### Today's Telco and Cable Systems



formation-on-demand). But the cable companies want to provide important business services, too, such as voice telephony, data communications, and access to on-line services. Most of all, they see the data highway as a chance to exploit their primary asset: broadband coaxial cables stretching into an estimated 60 million U.S. homes and millions more around the world.

A major challenge for cable companies is that their systems tend to be proprietary and not interconnected. Constructing a nationwide network will require adopting common standards, installing giant gateways, and leasing backbone capacity from long-distance carriers (or spending big money to lay their own digital fiber trunk lines).

**Telephone companies.** Where the cable companies are weak, phone companies—both local and long-distance—are strong. Cable has traditionally used a one-to-many, trunk-and-branch topology with little or no provision for “upstream,” or return, communications. The phone system was designed for point-to-point communications and has evolved into the world’s largest switched, distributed network, capable of handling millions of phone calls simultaneously, tracking each one, and billing customers precisely for their usage. The phone system’s legacy as a public utility has given it a degree of reliability and openness unmatched in the cable world.

The phone companies want to send data, especially video, over their vast networks. But the phone system suffers a bandwidth shortage: Although the trunk lines crisscrossing the country are of high-capacity fiber, the local loops into businesses and

## TOPOLOGIES AND PROTOCOLS

Telephone and cable systems use dramatically different communications architectures and standards. If the RBOCs, interexchange carriers, and cable companies merge into the data highway, their systems will evolve to encompass each other’s advantages.

	TELCOs (VOICE/DATA)	INTERNET (VIA TELCOs)	CABLE (TODAY)	CABLE/TELCO (FUTURE)
Key users	Everybody	Government, academia, business	60 percent of U.S. homes	Everybody
Media/backbone	97 percent digital fiber optic	NSFnet (T3), other telcos	Satellite, analog fiber optic	Analog/digital fiber optic, satellite
Media/local	Copper wire, wireless	Copper wire, Switched-56, T1/FT1	Coaxial cable	Coaxial cable, fiber optic, copper wire, two-way radio
Topology	Circuit-switched, star	Packet-switched, routed	Unswitched, trunk and branch	Switched/unswitched, star
Protocols	POTS, ISDN, ATM	TCP/IP	Proprietary analog	Analog, ADSL, ATM

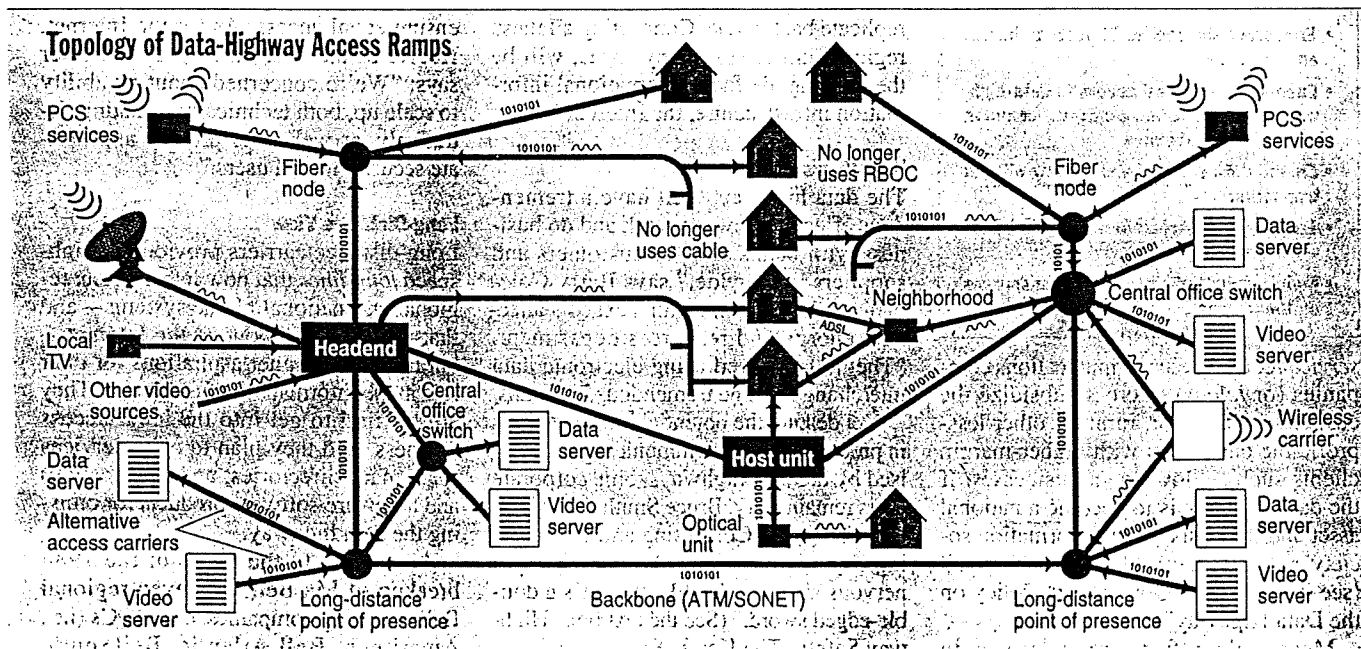
homes are typically two- or four-wire unshielded copper with limited bandwidth.

**The Internet.** Riding on the shoulders of the phone system is a remarkable worldwide computer cooperative, the Internet, a government-subsidized experiment in distributed computing, electronic community, and controlled chaos. The Internet doesn’t own the pipes it passes through, and nobody owns the Internet, but it is growing by as many as 150,000 new users per month. If the wires and cables of the communications industry are the data highway’s foundation, the Internet may provide its language, culture, and customs.

A unification of phone and cable systems could bypass the Internet and threaten its relevance, but given the Internet’s

rich human and informational capital, the more likely scenario is that its technology will be harnessed for the highway. A number of companies are working to make the resources of the Internet, which has a notoriously arcane interface and command structure, more accessible to businesses and individuals.

**Policymakers.** Washington is working to resolve policy issues concerning the data highway. Proposed legislation to ease regulations on cable and phone companies has the support of the Clinton administration. The most significant remaining challenge is how to ensure universal access to the information infrastructure. A principle enshrined in phone regulation since the 1934 Communications Act, *universal*



# BYTE's Recommendations for the Data Highway

## SHORT TERM (1994-1996)

### INFRASTRUCTURE

- Backbone: existing standards (T1/T3, X.25, basic-rate ISDN); increased use of frame relay, SMDS, and SONET; limited penetration of ATM; TCP/IP for internetworking
- Local loop: separate phone (POTS, ISDN, cellular) and cable (analog, pay-per-view) delivery systems; emergence of packet radio and PCS wireless
- Trials of radio- and cable-based interactive analog TV
- Trials of ADSL video-over-copper
- Trials of switched digital video
- Increasing insensitivity of "smart" backbone to end-point devices
- Increasing commercialization of the Internet
- Continued growth of commercial and business on-line services and entry of new parties
- Proliferation of easy-to-use retrieval tools and information agents

### POLICY

- Lift restrictions on RBOC delivery of video content in and out of region, but retain restrictions against in-region ownership of cable companies by RBOCs.
- See more competition at local loop from interexchange carriers and alternative access carriers; maintain restrictions on RBOCs' providing long-distance service.
- Encourage two wires into each home—coaxial cable and copper—and multiple services to business locations.
- Encourage greater penetration and tariffing of ISDN to business and residential users.
- Encourage interactive TV tests to homes and businesses.
- Encourage universal access to data-highway on-ramps: open platform, common carrier, user subsidies.
- Ensure data security and privacy without trapdoors.
- Encourage upstream/downstream bandwidth symmetry.
- Maintain multiplicity of free data sources on the Internet.

service requires telecommunications companies (or *telcos*) to cross-subsidize the cost of serving poor, rural, or other less-profitable customers with higher-margin clients such as downtown businesses. If the data highway is to become a national asset and the basis for an information society, access to it must be affordable to all (see the text box "Government Policy on the Data Highway").

Meanwhile, efforts are under way in

## MEDIUM TERM (1996-1998)

### INFRASTRUCTURE

- Backbone: primary-rate ISDN, frame relay, SMDS, SONET, and ATM; TCP/IP.
- Local loop: fiber-to-the-node, dual services (phone and cable on copper and coaxial cable) or single-provider services (via coaxial). Mix of POTS and ISDN, analog and digital cable. Some fiber to the home. Widely installed wireless.
- Bandwidth allocation remains skewed to downstream delivery.
- Greater use of analog interactive TV.
- Serious investment in switched digital video, ATM to the node.
- Early use of HDTV.
- Widespread use of personal communicators.

### POLICY

- Lift restrictions on in-region cross-ownership between cable and telcos.
- Lift restrictions on RBOCs providing long-distance service.
- Increase investment in fiber to the home and desktop.
- Maintain antitrust vigilance toward infrastructure and content providers.

countries outside the U.S. to build similar national networks. Canada, Germany, and Japan have major projects (see the text boxes "Data Highway Lags in Japan" and "Europe's Many Data Highways"). Many U.S. firms are rushing into foreign markets to gobble up newly privatized telecommunications franchises or to conduct technical trials of systems they hope to replicate back home. Connecting all these regional initiatives, many argue, will be the existing, *de facto* international information infrastructure, the Internet.

### User Views

The data highway "will have a tremendous effect on how we work and do business with banks and our customers and suppliers worldwide," says Barry Coleman, senior economist for Texaco's alternate energy and resources department. "The dollars saved using electronic data interchange will be tremendous," he adds.

Yet despite the potential improvements in productivity and communications promised by the data highway, some corporate users remain wary. Bruce Smith, MIS manager for ENSR Consulting and Engineering, says he is worried about security. "I'm nervous about things like that; it's a double-edged sword." (See the text box "Highway Safety: The Key Is Encryption.")

## LONG TERM (1998-2001)

### INFRASTRUCTURE

- Backbone: ATM over SONET, Broadband ISDN, SMDS over ATM, IPng
- Local loop: single coaxial cable or fiber to the home, running end-to-end ATM
- Ubiquitous bandwidth symmetry
- Switched digital video infrastructure in place
- Wide adoption of HDTV and early use of 3-D/virtual reality services

For some users, security is of such paramount concern that they don't even outsource their communications needs today to private network providers, much less anticipate using a public backbone to exchange sensitive information. "A public information highway doesn't mean a thing to me," says Ben Fishman, LAN manager for the Wells Fargo Bank in San Francisco, California. But Fishman acknowledges that on the customer side of the bank's business, on-line banking services over the data highway could be an attractive time- and money-saver.

A SIM report examines nine areas of concern for business users of the data highway: standards for connectivity and interoperability, competitive versus regulatory forces, access, protection of rights, pace of development, funding of research, transport media, speed of data transfer, and the role of the Internet. As a rule, SIM advocates openness and competition wherever possible, but with adequate legal protections to guard against monopolies and ensure equal access. As for the Internet, Keever of the Delaware Medical Center says: "We're concerned about its ability to scale up, both technically and administratively, as well as to provide appropriate security to end users."

### Long-Distance View

Long-distance carriers provide the high-speed *long lines* that now interconnect regional and national phone systems—and that form the backbone of the Internet—but they have higher aspirations for their role in the information infrastructure: They are starting to get into the local-access business, and they plan to offer services (e.g., mail, directories, and information) and hardware/software products for cruising the data highway.

According to the terms of the 1984 breakup of Ma Bell, the seven regional Bell operating companies, or RBOCs (i.e., Ameritech, Bell Atlantic, BellSouth,

# Government Policy on the Data Highway

## JUDICIARY

### • MODIFIED FINAL JUDGMENT, JANUARY 1984

Judge Harold Greene's decision broke up the AT&T Bell System and created the seven RBOCs. It forbade local telcos from manufacturing equipment, providing long-distance service, delivering video, or owning content.

### • INFORMATION SERVICES RESTRICTIONS EASED, OCTOBER 1991

Responding to an appeals court order, Judge Greene lifted restrictions against RBOCs' providing information services, allowing them to own news, sports, weather, and other data services distributed over their phone lines.

### • BELL ATLANTIC V. U.S., AUGUST 1993

U.S. District Court Judge T. S. Ellis ruled unconstitutional the provision of the 1984 Cable Act preventing local phone companies from providing TV programming in their service territories. Now on appeal. Ruling applies only to Bell Atlantic.

Nynex, Pacific Telesis, Southwestern Bell, and US West), provide regulated local service and are concerned with the local loop—how data, voice, and video services get in and out of customer sites. Long-distance (or *interexchange*) carriers, such as AT&T, MCI, and Sprint, focus on the backbone and on value-added services. These roles, however, are starting to blur.

One job now performed by long-distance firms will remain the same in the data-highway era: They will provide the trunks, or *long lines*, that carry telephone traffic across the boundaries separating local service areas in the U.S. and into other countries. These lines are almost entirely fiber now, and most use SONET (Synchronous Optical Network), a CCITT/ITU standard that defines various levels of digital telephony service over fiber.

Trunk lines range in capacity from T1 rates (1.544 Mbps) up to OC-48 (2.4 Gbps) and beyond. Today's Internet backbone, for instance, is built on T3 (45 Mbps) lines operated by MCI. Local access from users to hosts and hosts to the backbone occurs at rates ranging from 2400 bps to 19.2 Kbps for dial-up, or via leased lines at multiples of 56 Kbps or 64 Kbps up to the T1 rate of 1.544 Mbps.

The complex telco regulatory structure permits other roles for long-distance carriers as well. They can manufacture equipment, which RBOCs cannot do. Long-distance companies also offer value-added

## LEGISLATIVE

### • HIGH PERFORMANCE COMPUTING ACT OF 1991

Sen. Gore's bill authorized creation of the NREN (National Research and Education Network) and funded research on high-speed networking hardware and software.

### • H.R. 1757, NATIONAL INFORMATION INFRASTRUCTURE ACT OF 1993

Author: Boucher (D-VA). Status: Passed House of Representatives September 1993; no Senate equivalent, but portions are found in S.4, which is pending. Would expand on the High Performance Computing Act of 1991, providing coordinated federal program to develop and disseminate applications for high-performance networking and high-speed networking in education, libraries, health care, and provision of government information.

### • H.R. 3636, NATIONAL COMMUNICATIONS COMPETITION AND INFORMATION INFRASTRUCTURE ACT OF 1993

Sponsors: Markey (D-MA), Fields (R-TX), Boucher (D-VA), and Oxley (R-OH). Status: Introduced Nov. 22, 1993. Major restructuring of 1934 Communications Act; would permit telcos to deliver video, open local telco market to competition, provide for open platform, ensure universal service.

### • H.R. 3626, ANTITRUST REFORM ACT OF 1993

Sponsors: Brooks (D-TX) and Dingell (D-MI). Status: Introduced Nov. 23, 1993. Would phase out limitations placed on RBOCs by Modified Final Judgment to 1982 consent decree breaking up AT&T. Would let U.S. Attorney General and FCC grant RBOCs the right to offer interstate and interexchange services, manufacture equipment, offer burglar alarm services, and own a partial interest (up to 50 percent or 80 percent, depending on conditions) in electronic publishing ventures.

services, such as formatted data handling; both AT&T and Sprint, for instance, have begun to sell ATM backbone service directly to customers who install private lines from their facilities to nearby long-distance points of presence, or POPs.

Most important, long-distance companies are not enjoined from offering local phone service in competition with the RBOCs. The biggest news in this context is AT&T's pending \$12.6 billion acquisition of McCaw Cellular Communications; wireless technology provides a means to bypass the RBOCs and connect customers directly to long-distance POPs. To the extent that wireless communications become

## EXECUTIVE

### • THE NATIONAL INFORMATION INFRASTRUCTURE: AGENDA FOR ACTION, SEPTEMBER 15, 1993

The Clinton administration proposed forming IITF (Information Infrastructure Task Force), composed of federal officials, and "U.S. Advisory Council on the NII," composed of 25 public- and private-sector appointees. Among its goals: to promote private-sector investment; reform communications regulation; ensure universal service; promote applications in education, health care, manufacturing, and government information; promote standards for seamless networking; ensure security and reliability; protect intellectual property rights; and improve management of the frequency spectrum.

### • VICE PRESIDENT GORE'S ADDRESS, JANUARY 11, 1994

The administration voiced support for the Brooks/Dingell bill (H.R. 3626), which would allow competition between local and long-distance phone companies and proposes creation of a new, optional class of regulation for broadband interactive services, called Title VII. Three principles are paramount: private investment, fair competition, and open access. Legislation proposed by Clinton will aim to ensure universal service and open access. The administration will also support other NII measures, including networking research, applications development, and electronic delivery of government services.

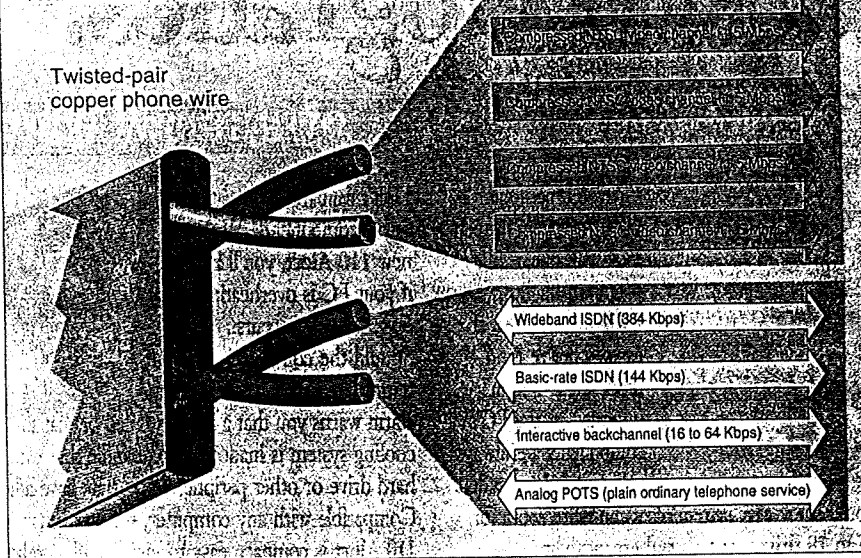
a key on-ramp to the data highway, the long-distance carriers—as well as wireless providers such as RAM Mobile Data and the IBM/Motorola Ardis joint venture—want a piece of the action.

AT&T has yet more irons in the fire. It now owns the Eo and Go technologies for pen-based computing, signifying its intention to compete in the market for mobile end-user devices. And it has obtained agent-based communications software from General Magic, which forms the basis for an advanced messaging service called PersonalLink that AT&T unveiled in early January.

The current regulatory environment works to the advantage of interexchange carriers, because they are freer than the RBOCs to move into new services. But with pending policy changes in Washington, telecommunications competition could turn into a free-for-all. The result for customers could be fierce price competition and an explosion of service options.

*continued*

## What ADSL and DMT Provide



ADSL attempts to use existing copper phone wire for broadband interactive video and other high-speed digital services. An experimental variation on ADSL, known as DMT (Discrete Multi-Tone), squeezes four one-way video channels onto ordinary twisted-pair wiring, along with a two-way interactive backchannel and two ISDN channels—still leaving room for regular analog telephone service.

### RBOC Realignment

The local phone companies are the vanguard of data-highway construction; their lines into homes and businesses are the access ramps to the backbone. Yet their perspective is different from that of the interexchange carriers because RBOCs have, in effect, been treated as utilities for the last decade.

Two critical restrictions imposed on the RBOCs by the 1984 breakup of the Bell system were that they could not own information services and could not deliver video content within their designated service areas. The judicial, executive, and legislative branches of the federal government are now racing to see who can lift these provisions fastest: Last August, a federal court decision on behalf of Bell Atlantic wiped out the video restriction, pending appeal; and both White House initiatives and Congressional legislation have been introduced to ease regulation.

Until new regulatory structures are in place, the RBOCs are growing by buying cable properties outside their regions; the best-known deal is the pending \$25 billion merger of Bell Atlantic and Tele-Communications, Inc., or TCI, the nation's largest cable provider. At the same time, to protect themselves from expected competition from other RBOC/cable partnerships, they are retrofitting their local systems to support video.

Several approaches are being used. Bell Atlantic has conducted trials in northern Virginia and central New Jersey. The Vir-

ginia test harnesses ADSL (Asymmetrical Digital Subscriber Line), a new technology that lets conventional copper wires carry up to 1.54 Mbps of data—enough to deliver one channel of precompressed movies to a single user. The data is sent through the switched phone network to a set-top box that decompresses it and converts it back to NTSC analog video for delivery to the TV. The Virginia trial, which began with a few Bell Atlantic employees, is evolving into a market test of some 2000 consumers in northern Virginia.

ADSL is a quick-and-dirty way to pump digital video over the existing copper plant. It's no match for 50 channels of cable, but with a pair of set-top boxes and an A-B switch, customers could receive video feeds from both their cable company and their phone company. By late 1994, says Bell Atlantic vice president of technology John Seazholtz, ADSL is expected to support up to 6 Mbps of video plus ancillary services, as well as multiple users per premises and, when real-time compression arrives in 1995, live TV.

ADSL can also play a role in nonvideo applications. For instance, Bell Atlantic is considering bundling together Internet access software, ADSL compression, and ISDN service, to give customers easy, high-speed access to the Internet. The 1.54-Mbps downstream data rate would make downloading image files hundreds of times faster than over a modem, while upstream data transfers, at ISDN speeds, would be upwards of 25 times faster. This raises the

interesting possibility of CompuServe or Internet ftp sites becoming multimedia service providers.

Bell Atlantic's New Jersey trial uses a much more ambitious and expensive approach, based on technology from Broad-Band Technologies (BBT) of Durham, North Carolina. BBT's system consists of several pieces. A *host digital terminal* combines telephony feeds from central phone offices and digital video feeds from cable headends and sends them over a single paired-fiber cable (for two-way transmission) to an *optical network unit*. (A *cable headend* is the central point at which TV signals downlinked from satellites and supplied by local stations are modulated onto the cable. A BBT device converts this analog video to digital.) The optical network unit, located at or near the customer site, then splits the signal back into digital video and analog telephony components and sends them, respectively, via coaxial cable to a digital set-top box and via copper wire to a standard phone. Returning signals follow the reverse path. BBT's set-top box is being developed with Philips Consumer Electronics and Compression Laboratories.

Although BBT's architecture requires installing fiber nearly to the customer site, most telecommunications and cable companies were already doing this anyway. BBT's advantage is that it uses only a single fiber for voice and video data. Furthermore, it adds star-topology switching to the video distribution system, providing customers with guaranteed but asymmetrical downstream and upstream bandwidth.

Bell Atlantic's BBT trial builds on a basic premise: that there will be two wires reaching into the home—the copper and coaxial cable already found in over 60 percent of U.S. households. Coaxial cable has ample bandwidth to support the applications envisioned so far for the data highway, especially if the backchannel is provided through the switched phone system.

Others foresee only one wire: a coaxial cable or a single fiber. Cable companies like TCI hope to provide both video and voice/data service over a single coaxial cable. Pulling fiber everywhere is too expensive to justify (estimates range as high as \$400 billion to do every business, home, and school in the U.S.) until demand for broadband services is better understood and content offerings have matured.

Besides, as Seazholtz points out, all-fiber connections pose a tricky technical problem: how to keep phone service alive during a power failure. The lasers used to drive fiber optics in the office or home would have to draw AC current and thus

# Data Highway Lags in Japan

Asao Ishizuka

The data highway hasn't yet come to Japan. NTT (Nippon Telephone & Telegraph), Japan's largest common carrier, has a backbone that is already 65 percent fiber, and corporations are using this fiber for intra- and intercity communications. ISDN is also available—there are more than 230,000 basic-rate ISDN circuits (64 Kbps) and 3100 primary-rate circuits (1.5 Mbps).

Implementing fiber to the home, or even fiber to the curb (also known as the Next Generation Communications Infrastructure) will be a long, tough road. NTT estimates that the cost to develop the new infrastructure will be \$410 billion; if \$18 billion is allocated annually for this, the new infrastructure will be built by 2015.

Japan has also experienced a very slowly developing cable business. This is due in part to widespread coverage by broadcast TV, a large number of video rental shops, and the availability of alternative entertainment sources, such as Direct Broadcast Satellite, which now dishes out NTSC and HDTV signals to nearly 6.3 million subscribers.

However, some Japanese multimedia network researchers think that the real use of the information highway will be for professional and business applications, not for the home, because of its cost. The Ministry of Posts and Telecommunications decided in December 1993 to deregulate CATV and boost the integration of broadcasting and communications by repositioning cable as a core medium. Under the new rules, cable businesses will be able to provide communications services in addition to broadcasting, and foreign carriers will be able to enter the Japanese cable business. Nynex is already getting ready for experimental CATV service in Yokohama with Japanese partners, starting in the spring of 1994. And TCI is starting an advanced CATV service in Tokyo with Sugunami CATV, beginning in October 1994.

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would fail during an outage. BBT's hybrid architecture, in which active optics stay at the curb while buildings remain domains of passive electronics, appears to be a safer solution for customers.

On the opposite coast of the U.S., Pacific Bell has announced an ambitious multibillion-dollar plan to go it alone, without a cable partner, and rewire California with fiber and coaxial cable. It aims to provide not just a "video dial tone" (its right to do so relying on the Bell Atlantic precedent or new FCC regulations), but video telephony and data access as well. Says Keith Cambron, Pac Bell's director of systems engineering for consumer broadband: "Video telephony, because it's symmetrical and point-to-point, requires more of a telephony model than a CATV model."

Pac Bell's design presumes, as a starting point, a heterogeneous mix of end-user devices. Cambron identifies a minimum of eight: standard analog phones; standard cellular phones; home computers linked to the network by analog modems or digital ISDN ports; RF modems that attach CATV to an individual PC (via an add-in card) or a network of PCs (via an RF-to-Ethernet converter); conventional analog

set-top boxes; advanced digital set-top boxes; and plain old cable-ready TVs and VCRs. In other words, the network envisioned by Pac Bell doesn't make existing equipment obsolete, and it adds new digital services incrementally.

The architecture is similar to that of other switched systems. Central office switches communicate by digital fiber to neighborhood nodes that serve roughly 500 customers. From the fiber nodes to the customer site is shared coaxial cable, which terminates at an NIU (network interface unit) attached to the side of the building. From there, separate signals are fed by coaxial cable and copper to video and telephone devices. Cambron contends that there is enough upstream bandwidth in this design to permit video telephony.

At the back end is where Pac Bell's legacy as a common carrier becomes most evident. The central switch communicates with a video gateway, which according to Cambron still needs development. This gateway provides the user's first-level menu selections; the second-level menus are for each particular service provider. All these interfaces are open and work cooperatively. "We want to encourage as

many suppliers as possible to get onto our network with gateways to their video services," Cambron says.

## From Trunks to Stars

Cable companies already have the most bandwidth into American homes, but they haven't wired up many schools or businesses. They also have the most to gain from retrofitting their networks to become data-highway access roads: While holding onto their video delivery business, they could unseat the RBOCs by providing local access to long-distance carriers. The key technical need is to push fiber closer to the final delivery point. TCI and others are doing that, following models similar to the Bell Atlantic/BBT and Pac Bell projects. Time Warner is trying a more radical approach that employs ATM.

Cable systems are moving in roughly the same direction as RBOCs, which is why their partnerships seem so logical. TCI, for instance, announced in 1993 that it would spend \$2 billion over the next few years to upgrade its system with fiber nodes and support for video compression. The upgrade was widely misreported to mean that TCI would supply 500 channels of cable; the truth, according to vice president of TCI Technology (TCI's technology subsidiary) Bruce Ravenel, is that TCI will have enough capacity for 500 channels for a variety of business and consumer services, including traditional broadcasts, pay-per-view or video-on-demand, videoconferencing, voice telephony, and on-line access.

Traditional cable systems use a distributive architecture antithetical to two-way communications. Area headends, or cable programming distribution points that serve thousands of subscribers, receive programming via satellite or feeds from local broadcasters and shunt them onto coaxial cables that run into neighborhoods, with cable drops to individual homes. Channels are broadcast in 6-MHz bands between the frequencies of 50 MHz and 450 MHz, although newer systems can go up to 750 MHz or higher.

The two biggest changes since cable emerged 40 years ago were the development of addressable channel selectors (i.e., set-top boxes with individual IDs that can accept messages broadcast through the cable system) and the discovery of a way to modulate analog video over fiber media. Cable systems have dramatically improved picture quality by shipping source programming around on interference-free fiber instead of coaxial cable. Their potential for two-way communications, however, is still constrained by an analog trunk-and-

# Europe's Many Data Highways

BERND STEINBRINK

**H**aving built a uniform standard for Euro-ISDN that was accepted by 26 network companies in 20 countries, France Telecom and Deutsche Telekom are now trying to establish a European standard for the next generation of high-speed networks. In cooperation with British Telecom, Spanish Telefonica, Italian STET/ASST, and Swedish Telia, the companies will build a Europe-wide, high-speed digital fiber network called the Global European Network, or GEN, that should be the precursor of a future ATM (Asynchronous Transfer Mode) network. In the mid-1990s, GEN is expected to be absorbed into the METRAN or Managed European Transmission Network, which will support data transmission at rates of up to 155 Mbps across Europe.

AT&T now cooperates with most of these state companies on national ATM projects, as well as on PEAN (Pan European ATM Network), a pilot project set up by 18 European operators to test a broad palette of communication services. By mid-1994, PEAN will have nodes in Austria, Belgium, Denmark, Finland, France, Germany, the Netherlands, Norway, Spain, Sweden, and perhaps other countries; interoperability tests scheduled for then will allow transmission of video and image data across the high-speed network. PEAN members have agreed to purchase and install ATM cross-connections that meet standards and recommendations from CCITT/ITU and ETSI (the European Telecommunication Standard Institute), as well as specifications from Heidelberg-based Eurescom.

France Telecom has started yet another project with Telecom PTT Switzerland called Betel (Broadband Exchange over Trans-European Links), which began trials in September 1993 with the interconnection of several research facilities in France and Switzerland. Applications running on the Betel network include distance learning via videoconferencing and sharing supercomputers for scientific computing

tasks. The platform consists of 34-Mbps fiber-optic circuits, and the different sites are equipped with FDDI (Fiber Distributed Data Interface) LANs linked to the ATM platform. Starting this year, cost-effective LAN interconnections at very high speeds via ATM networks will be offered.

Another France Telecom ATM project is Brehat, a complete communication system for videoconferencing, video transmission, LAN interconnection, and circuit emulation. The first segments of this network will be deployed in the cities of Lannion and Rennes and at several sites in the Paris region this year. Full-scale commercial launch is planned for 1995. By then, about 17,000 kilometers of fiber-optic lines will be installed in France.

Britain is a special case because it liberalized its telecommunications in 1991, allowing TV and telephone on the same network and making investment in fiber optics profitable for private companies. One of the most unusual projects involves a company called Energis, which is owned by the 12 regional electric companies in England and Wales. Energis is planning a nationwide fiber-optic network that piggybacks on the power grid. The company was granted a full telecommunications operating license last May and since then has installed 1200 km of fiber by wrapping it around the wires of overhead electrical lines. By the spring of this year, Energis's services—voice, data, image, and multimedia—will link 20 of the country's largest cities and be available to businesses and residential customers. By January 1995, Energis will extend the network to all major towns in the country.

Germany already has one of the most extensive fiber-optic networks in the world. Deutsche Telekom has installed fiber in about 80 large cities and connected them to each other via fiber. This is the basis for a network called VBN (Vermittelndes Breitbandnetz), which was first launched in February 1989. VBN allows data transfers at up to 140 Mbps for videoconferencing and is connected via satellite to international videoconferencing networks.

VBN will be the foundation for a fiber-optic network leading into customer homes. One pilot project, BERKOM (Berlin Kommunikation), has already been installed in Berlin for applications such as telepublishing, telemedicine, and city information systems.

In western Germany, the fiber-optic network will be built up through introduction of broadband communications services. A pilot ATM project called Broadband ISDN is scheduled for early this year, starting in Berlin, Hamburg, and the Bonn/Koln (Cologne) region. By 1996, the network will be made available for general use.

## Group Effort

The three best-known Pan-European initiatives are RACE, ESPRIT, and IMPACT, all started by the EC (European Community) in the 1980s. RACE (Research and Development in Advanced Communication in Europe) is focused on integrated broadband communications and image/data communications. ESPRIT (European Strategic Program for Research in Information Technology) began in 1984 and is now in its third phase. Its focus is information technology, and it includes an Office and Business Systems subprogram, slated to run from 1991 to 1994, that deals with image compression techniques for interactive media.

IMPACT 1 (Information Market Policy Actions) ran from 1988 to 1990; in December 1991 the EC adopted its successor, IMPACT 2, to establish an information services market in two key areas: interactive multimedia and geographical information. At the end of 1993, another effort, Info Euro Access, was established to develop the European market for information services, especially those using broadband communications and Euro-ISDN.

Most European ATM networks will remain pilot projects until the middle of the 1990s and will likely be used for business communication afterward.

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# Highway Safety: The Key Is Encryption

PAULINA BORSOOK

**H**ow will information sent over the data superhighway be kept safe and secure, ensuring privacy for individuals and commercial operators? This question is far from resolved, and it has provoked heated controversy about encryption regulations.

Data encryption is vital because it's the only way to ensure that data is kept strictly private—especially as communication shifts more and more to wireless pathways. Other security measures, such as requiring passwords or physically restricting access to a network, are less reliable. According to Stephen Crocker, vice president at Trusted Information Systems (Glenwood, MD) and Internet area director for security, encryption implemented in hardware will be able to keep up perfectly well with gigabit speeds, but hardware implementations may prove too costly in component prices, space, or power consumption for inexpensive con-

sumer devices such as set-top boxes or cellular phones. On the other hand, software encryption may not be able to keep up with very high-speed applications.

At the level of technology, how to use encryption routinely has not been worked out. Yet it's essential: To feel comfortable using the data highway, consumers must be sure that information about their tastes and habits is kept private unless they authorize its release. Crocker points out that while DES, the most common U.S. encryption technology, has been recertified by NIST (National Institute of Standards and Technology) for another five years, increasingly powerful computers may soon "have enough brute force to break yesterday's code," meaning the years-old DES technology.

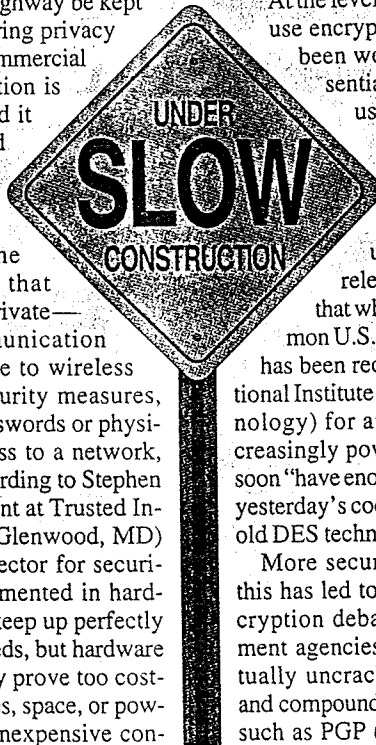
More secure schemes exist, and this has led to a new kink to the encryption debate: how law enforcement agencies should deal with virtually uncrackable new public-key and compound encryption techniques, such as PGP (Pretty Good Privacy).

These schemes can protect people from malicious industrial competitors—or stymie law-enforcement agencies on the trail of a criminal money-laundering scheme.

The Clipper chip proposed by the U.S. government largely for telephone-based communications uses an encryption technology that provides a "back door" accessible to government agencies authorized for a wiretap. The proposal has been met with a storm of legal and technological controversy, although the government has said it is considering alternatives.

Despite Clipper, "it's not a big trick for criminals to encrypt conversations," says Crocker; they can, for instance, obtain foreign DES products. So unless the U.S. government makes Clipper mandatory on all telecommunications gear and, in Crocker's words, "outlaws stray cryptography"—two actions it has repeatedly said it will not take—there is no reason society's bad elements would use products that give law enforcement a means to entrap them.

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branch topology in which the source signal passes through 30 to 50 cascaded amplifiers before reaching each destination.

Unlike with the switched phone system, all the nodes in a given area share a common cable, as on a "shared media access" LAN such as Ethernet. In theory, with a contention access scheme like Ethernet's CSMA/CD, customers ought to be able to vie for upstream bandwidth and send messages to each other or to a server; unfortunately, each drop on the cable produces electrical noise (i.e., *noise ingress*), which is progressively magnified on its way back up the cascade to the point where it overwhelms the signal. Even without the noise problem, the thousands of customers on each cable segment would rapidly deplete the available upstream bandwidth.

According to Mario Vecchi, vice president of network design and architecture for Cable Television Laboratories (CableLabs)—the cable industry's equivalent to Bellcore, the joint research facility of the

RBOCs—the solution to this problem, now being implemented by cable providers, is to reduce the number of amplifiers in the cascade and the number of drops on each segment. By pushing fiber further into a given area, each segment can serve up to 500 customers, and only 3 or 4 amplifiers come between the fiber node and the user. At the same time, new super headends connected by SONET rings will serve 100,000 or more customers. This standards-based architecture will let cable systems interconnect more easily with telcos and data services. "Point-to-point links just to serve our own needs are no longer possible," says CableLabs' Vecchi.

Existing frequencies between 50 MHz and 750 MHz will be used for downstream broadcast, while the *subsplit* frequencies from 5 MHz to 42 MHz are available for upstream data. At 6 MHz per channel, this translates into six channels of full upstream video, or many more subchannels of text or other data. The local loop will still share

media, and the contention access protocol hasn't been determined, although one likely contender is DQDB, which is an IEEE standard used in MANs (metropolitan-area networks).

TCI Technology's Ravenel says TCI is implementing a scheme like Vecchi describes, with an added twist: The company will actually install two coaxial cables to each feeder, one of which will be "dark" until sometime in the future. The primary wire will be configured with asymmetrical bandwidth: downstream from 50 MHz to 750 MHz or higher, and upstream in the subsplit frequencies. Ravenel asserts—and many agree—that in the near term, information and consumer services will be heavily biased in favor of data delivery. The upstream bandwidth available on the first cable will be enough to support voice phones, two-way data, PCS (personal communications services, the new wireless spectra that will be auctioned off by the FCC this year), and video telephony,

# The Tools for New TV

TOM R. HALFHILL

**T**hink of it as the world's largest WAN (wide-area network) with the world's largest database servers at one end and the world's largest number of clients at the other: That's the vision for broadband ITV (interactive TV).

The clients, of course, are ordinary TV sets, augmented by a new generation of digital set-top boxes that will rival the processing power of today's PCs and workstations. The servers are likewise a new breed of computers that not only have enough storage for vast libraries of movies, TV shows, and multimedia applications, but also are capable of feeding that data downstream to millions of users—in real time, on demand. In between, tying everything together, is the nationwide broadband network that flawlessly switches all this traffic while ensuring that every transaction is billed to the appropriate user.

The whole system is far larger and more complex than anything that exists today. Its nearest relative is the public telephone system—a low-bandwidth

network that terminates into relatively simple analog devices and is designed to deliver communications instead of content. ITV is so new that critical pieces of the hardware and software technologies are still being invented. It won't come cheap, it won't come easy, and it probably won't come as quickly as some people are predicting.

Will it come at all? No question. ITV definitely isn't a technology in search of a solution. In fact, it's the technology that's the problem.

Consider, for example, the servers that will form the hub of this great network. Most of today's databases store relatively simple data (e.g., names and addresses), and their I/O model is transactional, so minor delays are common when accessing records. But headend servers on the ITV network must store full-motion video, stereo sound, and other rich data types. These "video servers" must also achieve real-time or near real-time throughput, because even brief delays will cause visible glitches on home TV screens.

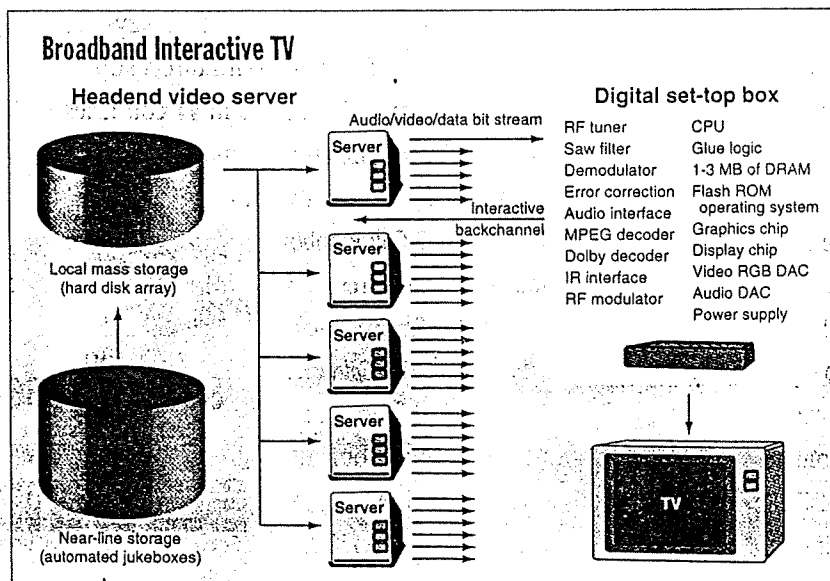
Oracle (Redwood Shores, CA), which hopes to become a key player in this field, says that most of its current data-

base customers manage 100 to 150 GB of data. Oracle's biggest customer, a credit-history company, has a database approaching 1 TB (1024 GB). But the ITV network of the future will store the world's entire movie library, estimated at 65,000 films. Each film requires 1.5 GB or more of storage when compressed in MPEG-2 format. That adds up to about 95 TB. Now add all the historical news footage and popular TV shows that will eventually be stored, too. And don't forget the other content, such as electronic catalogs and interactive encyclopedias, and things yet to be imagined.

The bulk of this material will be archived in near-line storage: banks of automated jukeboxes that can mount tape cartridges or optical disks on the video server within seconds of a user's request. The server will copy the video onto its local mass storage, probably striping the data across arrays of hard disks for redundancy and faster access. Then it will buffer the data in RAM while pumping it downstream to the user's set-top box. Frequently accessed material, such as the most popular movies and games, may be permanently maintained on local storage. Special software will track viewing habits, automatically loading *It's a Wonderful Life* in December.

Consumers will expect the same reliability from the ITV network that they do from the public phone system, so video servers will need careful maintenance. An array of 1000 hard disks will lose an average of one drive per day, according to MTBF (mean time between failure) statistics. Technicians will patrol rooms of servers and jukeboxes, hot-swapping failed drives on the spot, just as they used to keep ENIAC running by constantly replacing blown vacuum tubes.

If the storage requirements of video servers seem daunting, the I/O is nightmarish. During peak hours in major cities, thousands of people may be requesting videos. Today's broadcast model is synchronous: One "copy" of a movie is sent over cable or the airwaves to a mass audience, and everyone watches it at once. Pure video-on-demand is asynchronous: If 5000 people on Saturday night want to watch the latest hit film, only a few will punch in their orders at



To provide video-on-demand, multimedia encyclopedias, and other new services, ITV networks will need high-speed servers with vast amounts of mass storage. Material will be stored on digital tapes or optical disks in automated jukeboxes. When the network receives a user's request via the upstream backchannel, the server will retrieve the appropriate file from the jukebox and copy it to a hard disk array, from which the compressed video will be spooled downstream to the user's digital set-top box. The box will decode and decompress the video and then modulate an analog signal for the TV.

the same moment. Thus, the server must stream the same video to thousands of destinations according to different time bases, some only seconds apart.

To complicate matters still further, the video server will provide virtual VCR functions, such as pause, rewind, fast-forward, slow motion, and frame advance. So it has to update thousands of file pointers to keep pace with frequently shifting viewing patterns.

What kind of computer can do all this? "I think 'computer' may be the wrong word," says Greg Hoberg, marketing manager of the video communications division at Hewlett-Packard (Santa Clara, CA); "it's really an I/O machine." Hoberg says the problem is not computational and therefore requires an entirely new approach to hardware design. "We're trying to come up with the architecture that is appropriate to this problem. It's a problem of I/O and mass storage, not a problem of MIPS."

HP's video server, dubbed the Video Engine, is expected to be ready in about a year. Hoberg says it will be a highly scalable machine that fits into HP's vision of numerous servers distributed across a hierarchical network. Local servers will supply the most popular videos, while remote machines that serve many localities will store less-popular content. This topology could minimize headend costs without compromising access.

HP isn't alone in the scramble to gain a foothold in the high-stakes video-server market. IBM and DEC see video servers as a potential use—even a savior—for large minicomputers and mainframes. Microsoft, Intel, AT&T, Silicon Graphics, Motorola, nCube, and Oracle are a few of the other companies working on hardware and software. As with anything new, different approaches are emerging.

Unlike HP, Oracle and nCube (Foster City, CA) think video servers *do* need great computational power. They're designing servers using nCube's massively parallel computers and Hypercube architecture. In their view, symmetric multiprocessor systems have too much hardware overhead and will quickly fall victim to bus saturation if applied to large-scale video-on-demand.

To boost the server's I/O bandwidth, nCube interconnects large numbers of proprietary microprocessors comparable to a 386 but optimized for throughput. Oracle, which is writing the software,

says an nCube-based video server with 1024 processors could supply video to 7000 homes. A larger nCube-2 computer supports up to 4096 processors and could serve 30,000 homes.

"No one knows for sure how these machines will be used," says Benjamin Linder, director of technical marketing for Oracle's Media Server project. "So Oracle is designing a system that's as general as possible. We're trying to create servers to act as living libraries on the data superhighway."

Linder says that the massively parallel approach is overkill for video I/O, even on this scale, but nevertheless makes sense because the server could handle tasks that otherwise would be shunted downstream to the user's set-top box.

This is a key point. New computers are needed for *both* ends of the ITV network—clients as well as servers. Digital set-top boxes are much more than simple tuners or descramblers, yet their cost must be driven down to about \$300 before broadband ITV is economical.

Consider what a typical box might contain. Start with a powerful CPU, such as a 486, PowerPC, or Mips R4000. Add 1 to 3 MB of RAM; a high-speed graphics chip for screen overlays and video games; a display chip; a 1-GHz RF tuner; a demodulator; an error-correction chip; an MPEG-II decoder; logic to strip the audio soundtrack from the incoming video; a Dolby decoder; two 16-bit audio D/A converters; a video RGB converter; an RF modulator; an infrared interface for remote control; flash ROM for the operating system; a security chip to prevent theft of service; and a switching power supply.

"People have this interactive TV vision, but if the set-top box costs \$1000, it's not going to be worth it," notes Roger Kozlowski, vice president and technical director for the consumer segment of Motorola (Phoenix, AZ). That's why Oracle and nCube are designing video servers that can shoulder part of the computational burden. They seem to be in the minority, however. Other companies are betting the set-top technology will be affordable by 1995 or 1996—and it'll be at least that long before the network infrastructure is ready to support it.

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which needs 384 Kbps to 1.54 Mbps of bandwidth, Ravenel says.

TCI's second cable will be *midsplit*, with the "free" portions of 500 MHz of bandwidth allocated in each direction (the second, digital-only, unamplified cable is subject to RF ingress). When activated, this cable would allow TCI to provide more than just telephony: It would empower subscribers to become originators, not just consumers, of content—in effect, to become broadcasters in their own right. "You're more likely to be enfranchised as a user if your cable service allows you to communicate with other users," says Allison Mankin, a researcher at the U.S. Naval Research Laboratory and a cochair of the IETF's "IP:next generation" project.

Cable companies are serious about using upstream bandwidth to compete with the RBOCs in local phone access. The top five cable firms—TCI, Time Warner Cable, Continental Cablevision, Cox Cable Communications, and Comcast—jointly own TCG (Teleport Communications Group), the leading alternative access provider, which connects local users to interexchange-carrier POPs. Large corporate customers are already contracting with TCG for primary or backup access from their phone systems directly to long-distance carriers. Now cable companies want to offer the same option to smaller businesses and individuals. Access to the long-distance network through the cable system could lower costs for customers and give RBOCs a run for their money.

### Future Networks

A technology that may bring cable and phone companies even closer together is ATM, which spans the gap between packet-switched and circuit-switched technologies by using elements of each. ATM splits data into small chunks, like a packet service, but the cells are all of equal size. Then, instead of routing each cell individually, ATM sets up a virtual circuit and streams them across the network. Aside from its scalability and ultrafast switching performance (622-Mbps ATM products are available now), what makes ATM so attractive for video applications is its ability to allocate bandwidth on demand and assign priority levels to cell streams. This means ATM can guarantee nearly real-time delivery of digital video data. "ATM is the right kind of switching technology for interactive video," says TCI's Ravenel.

To test this hypothesis and to push ATM technology to its limit, Time Warner Cable is conducting an interactive TV and video-on-demand trial in Orlando, Florida, together with AT&T, Silicon Graphics, and

others (see the text box "The Tools for New TV"). This trial uses ATM end-to-end, from the massive video servers at the back end to the set-top boxes in subscriber homes. It's a costlier solution than TCI or Pac Bell is trying, but it may be more forward-looking. Ravenel says he's not sure ATM to the home is necessary but he's grateful to Time Warner for trying it out.

Some are even less certain about ATM, cautioning that it has been overhyped. This view is particularly found in the Internet community, which tends to be skeptical about one-solution-fits-all technologies. "We don't have to have a single, universal architecture," says Tony Rutkowski, an Internet pioneer and director of technology assessment at Sprint. "It's nonsense to think that everything will run over ATM."

Craig Partridge, a senior scientist at Bolt Beranek and Newman (BBN) and author of *Gigabit Networking* (Addison-Wesley, 1994), says that although enterprise ATM switches from Fore Systems and Lightstream (a joint venture of Ungermann-Bass and BBN) can deliver their rated 155-Mbps speeds, some high-end 622-Mbps switches have failed from a lack of adequate flow control. "ATM switches are really designed for steady, not bursty, traffic. But data communications is bursty, so they drop bits all over the floor," he says.

ATM also doesn't now support multicasting, which means that all transactions are point-to-point. This could prove very inefficient for broadcast video content, such as live news or sports events, when millions of users are watching the same source and don't need to be individually addressed. Still, cable and telco executives almost unanimously conclude that ATM will be a vital backbone technology for the data highway, weaving together the cable, telco, and data service providers.

## Linking with Content

Another problem that both cable companies and telcos confront in promoting their visions of the data highway is that neither owns meaningful data content. The cable companies bring to the party lots of entertainment properties and Hollywood relationships, but these are a far cry from business-oriented information sources such as demographic databases or parts catalogs.

To gain access to this information, cable and phone companies are forging links with on-line services. In late 1993, Com-

cast and Viacom announced they would test delivery of Prodigy and America On-Line over cable systems in Castro Valley, California, and elsewhere. Continental Cablevision began a trial last December in Exeter, New Hampshire, that lets some home and business cable customers connect directly to CompuServe; and in early 1994, Continental will offer cable subscribers in Cambridge, Massachusetts, a direct link to Performance Systems International, or PSI (Herndon, VA), a leading commercial Internet provider.

For all these arrangements, customers hook up an RF modem to their cable and from there connect to a PC, Mac, workstation, or network. The result of using broadband coaxial cable instead of twisted-pair copper for data delivery is a thousand-fold increase in speed. Says Daniel F. Akerson, chairman and CEO of set-top box maker General Instrument, "A high-resolution image that now takes 15 minutes to download over a conventional modem will be accessible within a few seconds."

Zenith Electronics (Glenview, IL) makes one such interface, called HomeWorks, that sells for \$495 and consists of an external cable modem (with Ethernet output) and a PC bus card. HomeWorks is being used for the Continental/CompuServe trial in Exeter, and Zenith is also partnering with Spry (Seattle, WA) to promote cable-based Internet access via Spry's Air Navigator, a \$149 Windows-based software package.

DEC is getting into the act with ChannelWorks, a bridge that permits interconnection of Ethernet LANs over CATV systems, supporting 10-Mbps speeds at distances of up to 70 miles. According to a Datapro Information Services report, "Data over CATV," DEC has partnered with TCI, Continental Cablevision, Times Mirror Cable, and others, and is targeting ChannelWorks at businesses, hospitals, state and local governments, and educational institutions. Both the DEC and Zenith modems require two-way cable systems and support symmetrical data rates.

Start-up Hybrid Networks (Mountain View, CA) is taking a different approach with an asymmetrical architecture that uses both cable and phone lines. Its product uses RF modem technology for 10-Mbps downstream data over subsplit frequencies and sends return data over conventional phone lines at 9600 bps to 19.2 Kbps.

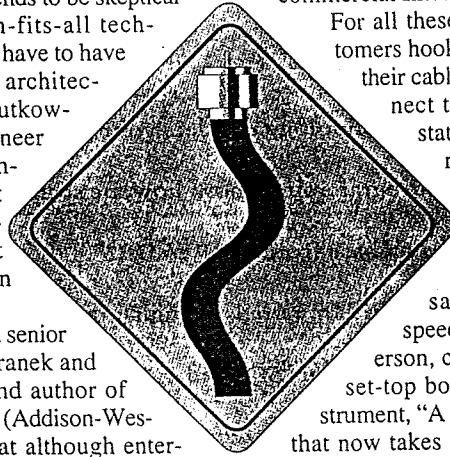
Hybrid has also demonstrated upstream communications over ISDN, using 2B channels, or 128 Kbps. President Howard Strachman notes that only 15 percent of U.S. cable systems are now two-way, and of those, most suffer noise ingress that makes provision of even a single 6-MHz upstream channel nearly impossible. Hybrid's product will thus serve the millions of users lacking advanced cable service.

But looking forward to the time when fiber nodes move closer to end users, Hybrid is also working with Intel and General Instrument on a device that communicates in both directions over cable. This two-way RF modem, slated to be used for the Viacom and Comcast trials this year, will be implemented on a PC add-in card, not in an external unit like HomeWorks. Strachman says the specifications for the final card aren't set but could include NTSC-to-VGA conversion; if so, he says, a single board would "cable-enable" a PC for both video reception and data I/O. Although the initial product is for the ISA bus, future versions could support other I/O buses or PCI (Peripheral Component Interconnect) or could be built directly into a set-top box.

Services such as CompuServe and Prodigy were designed around the presumption of scarce bandwidth, but with connection rates orders of magnitude higher, they will be able to offer richly detailed multimedia user interfaces and new capabilities such as interactive imaging, store-and-forward audio and video communication, and "rentals" of massive data sets. "Some believe that a good part of the required transport infrastructure [for the data highway] already exists in the cable plant," says Datapro analyst Lance Lindstrom. By adding support for data communications, he says, cable companies can leverage their bandwidth advantage over the telcos and assume the role they see for themselves as "important contributors" in building the information highway.

## The Data Web

People often confuse the Internet's physical structure—its web of T3 trunks linking IBM RS/6000-based routers and its various dial-up and dedicated access lines and services—with its true identity: a set of software protocols and tools, thousands of open data servers, a community of more than 20 million users, and a process for engineering upgrades. But in theory, this identity could be divorced from today's Internet hardware and the "Net" would still exist; indeed, if the data highway turns into a melding of cable and telco infrastructures, the Internet could live on as a



# Federally Funded Pilot Projects

## VISTANET

- Participants** University of North Carolina at Chapel Hill, North Carolina State University, Bell South, GTE MCNC
- Technical details** Uses data-intensive files such as CAT scans and MRIs to drive tests of protocols and network performance analysis using HIPPI (High Performance Parallel Interface), ATM (Asynchronous Transfer Mode), SONET (Synchronous Optical Network), and broadband circuit switching
- Goals** To examine medical uses for gigabit networking, concentrating on medical imaging

## AURORA

- Participants** IBM, Bellcore, MIT, University of Pennsylvania, MCI, Nynex, Bell Atlantic, University of Arizona.
- Technical details** Uses 2.4-Gbps channels from MCI to link the computer labs of the other participants. The switches are configured for both standard ATM and an alternative known as PTM (Packet Transfer Mode).
- Goals** To test the differences between the switching schemes and to explore the implications of hooking up a data firehose to a desktop workstation.
- Comments** To handle these blistering interface speeds, future desktop computers will need specialized I/O controllers with DMA and direct access to video, as well as operating-system improvements to greatly reduce context-switching time.

## NECTAR

- Participants** Carnegie Mellon University, Bellcore, Bell Atlantic, and the Pittsburgh Supercomputing Center.
- Technical details** Uses ATM as an intermediate layer between SONET backbone links and HIPPI interfaces on the computers.
- Goals** Scalability; to link gigabit LANs and WANs to one another and to supercomputers. To overcome current I/O bottlenecks and to develop a dedicated network coprocessor to off-load protocol handling from system bus.
- Comments** Adding a new computer to the network only requires connecting it to the ATM switch, whereas the Casa network needs a direct SONET line between every pair of communicating computers. Nectar's approach is much closer to the architecture that will be used to link homes and businesses to the data superhighway. Since most people will want to make connections with many different computers in a day, they'll require the flexibility of a switched network. But point-to-point, switchless approaches like Casa's could be used to establish permanent links between a small number of sites, such as when a company connects computers in neighboring plants.

## MAGIC

- Participants** Earth Resources Observation System Data Center, Lawrence Berkeley Laboratory, Minnesota Supercomputer Center, SRI International, University of Kansas, MITRE, Army High-Performance Computing Research Center, Army Battle Command Battle Laboratory, DEC, Northern Telecom, Southwestern Bell, Splitrock Telecom, Sprint, U.S. West
- Technical details** Will use SONET links and ATM to create a gigabit WAN interconnecting three high-speed ATM LANs and one HIPPI LAN, providing trunk speeds of 2.4 Gbps and access speeds of 622 Mbps
- Goals** Will use a military-terrain visualization application to study real-time interactive data exchange among diverse, geographically distributed computing and networking devices

## CASA

- Participants** Caltech, The San Diego Supercomputing Center, The Jet Propulsion Laboratory, MCI, Pacific Bell, UCLA, US West, and Los Alamos National Laboratory.
- Technical details** Uses SONET fiber-optic lines running at 622 Mbps to link the different sites, but doesn't use ATM because ATM's 53-byte cell size proved inefficient for moving supercomputer-size blocks of data that routinely grow to 64 KB or greater.
- Goals** To explore methods for synchronizing massive distributed simulations running on supercomputers hundreds of miles apart.
- Comments** Even at gigabit speeds, the propagation delay introduced by networking throws off these applications, which concern problems such as modeling the global climate system.

## BLANCA

- Participants** Lawrence Berkeley Lab, NCSA, University of California-Berkeley, University of Illinois, University of Wisconsin, AT&T, Ameritech, Astronautics, Bell Atlantic, and Pacific Bell.
- Technical details** The test-bed links local FDDI (Fiber Distributed Data Interface) LANs with SONET-based ATM switches.
- Goals** To study how voice, data, and video flow in networks.
- Comments** Voice is at once more forgiving and more demanding than regular data. People using a phone won't even notice if one packet containing a microsecond of conversation is lost; the ear and brain fill in the gap. However, a long pause is unacceptable. Data connections, on the other hand, are time-insensitive but cannot tolerate even a single lost packet. From a user standpoint, delayed data means sluggish performance, but not gibberish. Put another way, voice traffic is predictable and steady, whereas data communications occur in unpredictable bursts that can overflow switch buffers designed for voice traffic.

set of services and standards.

Whether you connect to the data highway by copper, coaxial cable, fiber, or radio, the key unanswered questions are *how* you will interact with the giant network and *what* you will find there. Being linked to everybody and everything in the world won't do much good if you can't use the system or locate services you need—or if there's no data on-line that you care about.

This is where the Internet comes in. Unlike experimental networks such as Time Warner's ATM trial in Orlando, the Internet is in place today, running the battle-tested TCP/IP protocol, offering global remote log-in and file transfer (telnet and ftp, respectively) to and from thousands

of data servers, and supporting public domain networking standards such as SNMP, SMTP, and SLIP. To help users navigate this vast, interconnected mesh, the Internet community has created innovative searching and indexing schemes, such as Gopher, Archie, WAIS, and the hypertextual World Wide Web.

The physical Internet is quickly evolving: According to Steven Wolff, director of the networking division of the NSF (National Science Foundation), which oversees the Internet's core, "the NSFnet backbone is going away" in the next few years, to be replaced by a combination of linked commercial subnetworks and a restricted-access research backbone. One immedi-

ate effect of this is that the Acceptable Use Policy, which prohibited commercial data traffic across the NSFnet, will become even more moot than it already is.

Instead of providing universities and public institutions with free access to a government-sponsored network, Wolff says, the government will get out of the network business and offer these users vouchers or grants to buy access to commercial Internet providers. There are now nearly 50 of these regional mid-level network providers in North America (including PSInet, BARRnet, CERFnet, NEARnet, and NYSERnet), most linked under an umbrella called CIX, or the Commercial Internet Exchange. Many may merge or

# Commercially Funded Pilot Projects

## NIIT

(The National Information Infrastructure Testbed)

**Participants** AT&T, Department of Energy, DEC, Ellery Systems, Essential Communications, Hewlett-Packard, Network Systems, Novell, Ohio State University, Oregon State University, Pacific Bell, Sandia Labs, Smithsonian, Sprint, Sun Microsystems, SynOptics, UC-Berkeley, University of New Hampshire.

**Technical details** Prototyping data-highway concepts using the Internet, FDDI, frame relay, and ATM.

**Goals** To create real-world demonstration projects using currently available products.

**Comments** The first test, called Earth Data Sciences, distributed environmental data over disparate systems in a collaborative multimedia framework. The second test will be on medical imaging.

## SMART VALLEY

**Participants** 3Com; Hewlett-Packard; Pacific Bell; Silicon Graphics; Network General; Stanford University; Regis McKenna; Mohr, Davidow Ventures; and others.

**Goals** To promote the development of the data superhighway through brokering public and private partnerships and by supporting applications development.

## XIWT

(The Cross-Industry Working Team)

**Participants** Apple Computer, AT&T, Bellcore, Bell South, CableLabs, Citicorp, DEC, GTE, Hewlett-Packard, IBM, Intel, MCI, McCaw Cellular, Motorola, Nynex, Pacific Bell, Silicon Graphics, Southwestern Bell, Sun Microsystems, and others.

**Goals** To hammer out technical issues involved in bringing gigabit technology to homes and business desktops. XIWT has four working groups—architecture, services, portability, and applications—and has assigned each to examine pertinent issues and produce white papers. XIWT's overall goals for the data highway are that it be ubiquitous, affordable, flexible, and easy to use.

## COLLABORATORY ON:

## INFORMATION INFRASTRUCTURE

**Participants** Bellcore, all the regional Bell operating companies, Capital Cities/ABC, DEC, Hewlett-Packard, JCPenney, Los Alamos National Laboratory, MIT Media Lab, Microware Systems, Northern Telecom, WiTel.

**Goals** To find solutions to practical problems such as user interface and network navigation.

be acquired by telcos, cable companies, or on-line service providers. "We won't be buying our bandwidth from people like CERFnet and PSI 20 years from now," predicts Noel Chiappa, a member of the IETF and an independent networking researcher based in Vermont.

To carry forward the Internet's original mandate as a research tool, the government will create a new backbone under the auspices of the 1991 NREN (National Research and Education Network) Act, which was sponsored in Congress by then-Senator Al Gore. This new backbone will operate at speeds of 155 Mbps (OC-3) and will not carry routine mail or file-transfer traffic; it will exist, says Wolff, to support research on protocols, RPCs (remote procedure calls), large file transfers, and other advanced applications. NSF is also co-funding research on even higher-speed networking via so-called Gigabit Testbeds.

As the Internet's backbone is changing, so are its on-ramps. Programs such as Continental Cablevision's link to PSI are opening up the Internet to a new class of users and bringing it into the same devices people will use to view videos or make phone calls. Thus, distinctions among these services will blur. The thousands of Internet data servers and news groups, offering virtual community and free information ranging from government statistics to satellite images to crop studies, will be available from your office or living room through the same user interface you use to conduct a videoconference or order a pizza.

One major problem that could hold back

growth of the Internet as a commercial venue is that no provisions exist today for usage-based billing. If you log into a server with anonymous ftp, nobody charges you (by access time, packets downloaded, records passed, or some other scheme) for the data that you obtain. By comparison, proprietary on-line services such as CompuServe were designed from the beginning to track usage.

"The thought of billing is a nightmare to 90 percent of the providers on the Internet," says Susan Estrada, former managing director of CERFnet and now president of start-up Aldea (Carlsbad, CA). Unlike commercial services, she adds, many Internet nodes, such as government servers, are required to publish their data at no charge.

Some people also bemoan the inevitable change that expansion of the Internet will wreak on its unique subculture. Says Dave Farber, an Internet founder and professor at the University of Pennsylvania (Philadelphia): "Internet people believe in free goods to everybody; Give each user a straw and let him sip on the pool of wisdom." If Internet access is no longer free and users have to pay to download data sources, the Internet will lose its communal spirit.

## Protocol Quandary

Aside from its highly evolved tools and wealth of data sources, the Internet's greatest contribution to the data highway may be the TCP/IP protocol. But this is debatable, because TCP/IP wasn't originally designed for real-time data delivery, which is necessary to support any meaningful

volume of audio or video traffic. "Its optimal use is to hang together a great many apps, nets, and operating systems around the world," says Sprint's Rutkowski.

TCP/IP is a routed, connectionless, datagram (or packet) protocol, which means it divides network traffic into unequally sized, individually addressed chunks that are routed through the network over a dynamically assigned path. (The Internet uses several algorithms to determine the best route at any given time.) This is analogous to sending a friend a postcard every day for a month: The cards may arrive out of order or take different routes to get there, but the friend can sort them out at the other end. By contrast, connection-oriented schemes, such as voice telephony or ATM, establish a circuit between the source and destination and send all signals or packets in sequence along the same path. Each approach has its strengths and weaknesses.

TCP/IP's greatest competitor—if, indeed, they must be at odds rather than complementary—is ATM. But ATM spans different levels of the network stack, including link-layer specifications that are out of TCP/IP's purview, and not including TCP/IP's "reliable" layer, which ensures end-to-end error checking. An IETF group is working to implement IP over ATM (this requires splitting IP's variable-length packets over ATM's fixed-length cells and then reassembling them on the other side), on the premise that IP can and should remain an internetworking standard even if the underlying transport changes from a connectionless datagram to cell switching.

continued

But if ATM does so well with video and other real-time data, why muck around with TCP/IP at all for the data highway? The answer is heterogeneity, says Scott Bradner of the Harvard University Office of Information Technology, and cochair of the IETF's IPng committee. "Just because a large chunk of the network of the future will be running over ATM doesn't mean it will all be," he says.

TCP/IP is widely supported in applications and routers and is unmatched in universality and reliability—significant advantages in building the information infrastructure. It has also been upgraded in recent years, through the efforts of the IETF, to support *multicasting*, or one-to-many packet broadcasting, which ATM does not support. Multicasting reduces the burden on routers by mapping packets into predefined distribution groups.

Among other things, multicasting is now used to distribute live digital video of IETF meetings across the Internet through a program called the Multimedia Backbone, or M-Bone. The program demonstrates a potential use for the Internet, but it's a far cry from the architecture required for widespread video-on-demand or video telephony. "The way they do M-Bone now is to shoot the packets through the net and pray for the best," says CableLabs' Vecchi.

Despite its shortcomings, M-Bone's real significance is symbolic: The Internet's ability to grow and adapt to changing requirements should never be underestimated. A case in point is the current effort to expand the IP address space. Concern that the explosive growth in Internet use would exhaust the remaining IP addresses has prompted a creative two-pronged effort to plan for the future. If the efforts of the IPng task force are successful, there will be enough IP addresses to give one to every computer, telephone, fax machine, and set-top box in the world, with billions more to spare.

The IP address field is now specified at 32 bits, which theoretically ought to permit 4 billion addresses. But when the Internet was set up, addresses were divided into three classes based on the size of the attached network, and now there is a shortage of the most popular (Class B) type. The first step to combat the address crunch is to eliminate classes with new technology called CIDR (Classless Inter-Domain Routing). Coupled with more aggressive

efforts to reclaim unused blocks of addresses, this may buy the Internet as many as five to 10 years of breathing room, depending on growth rates, says network researcher Chiappa.

For the longer term, the IPng will consider proposals to modify IP to support at least 1 billion networks and 1 trillion nodes. Three proposals have been formulated so far, but contenders could still emerge or drop out; all three proposals include 64-bit address fields (allowing essentially unlimited addresses) and tackle the problem of auto-configuration, or how to support mobile devices that join and leave the network at will. The IPng may also examine schemes for adding resource allocation and pseudo-guaranteed packet delivery (a "good enough" solution) to better support video over TCP/IP.

The purpose of all these efforts is to ensure TCP/IP's position as the universal internet-working protocol of the data highway. This doesn't mean it will be adopted tomorrow by makers of set-top boxes and cellular phones; most of these devices will remain analog for some time, and those that are digital could use proprietary protocols on top of ISDN or ATM. But TCP/IP protocol stacks may show up in some unusual places, such as plug-and-play "cable-enabled" PCs.

IP could also face competition from experimental "lightweight" protocols, such as XTP or HighSpeed Transport Protocol, that are designed to reduce switching overhead on the backbone. TCP/IP was written to cope with an older, more unreliable network infrastructure, and it places heavy emphasis on error control and retransmission, says William Stallings of CompComm Consulting (Brewster, MA). In the context of a fiber infrastructure running fast transports like ATM, IP may be too "muscle-bound to cope," he says.

According to Stallings, XTP establishes connections more efficiently than TCP/IP, supports different priority levels and multicasting, offers greater flexibility in checksums, and is the only protocol that permits selective retransmission of missing packets. By combining functions of TCP and IP into a single, streamlined protocol, XTP manages to be both reliable and fast, he says.

## A Window Seat

What will be your view onto the data highway? This is the ultimate client-side bat-

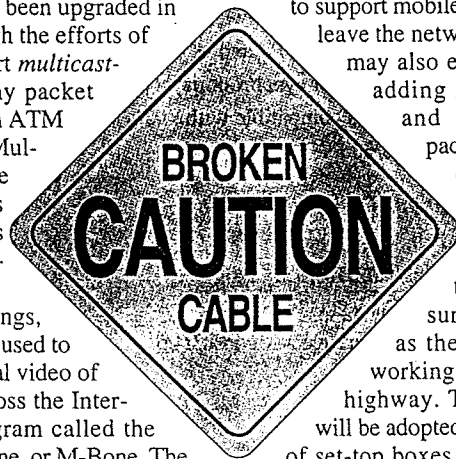
tleground, pitting against one another companies that pride themselves on their user-interface design skills, such as Apple, Microsoft, and General Magic, as well as makers of devices ranging from palmtops to smart TVs. In all likelihood, no single user interface will prevail, but standards have to be developed so that set-top boxes are interchangeable among different delivery systems and software applications run the same around the country.

Microsoft aims to be a major player in defining the user interface for interactive services, whether delivered over cable or wireless, onto desktop PCs or TVs. Its first-generation product, Modular Windows, derived from the same API as Win-16 (and was promoted to developers as an easy way to leverage multimedia PC development onto TV-like devices), but it fizzled after being adopted only by Tandy for its VIS player. Microsoft is trying again with new non-Windows technologies, due to appear in pilots and trials this year, says Craig Mundie, vice president of advanced consumer technologies at Microsoft.

These consumer technologies—a separate initiative from the Microsoft At Work environment for office equipment slated to be rolled out this year—will cover the gamut from back-end servers through broadband networking to end-user products, Mundie says. "Our public position now is that we don't intend to use the Windows user interface for consumer devices."

Windows will play a key role as a portal to the data highway. For example, the new Internet-In-A-Box from O'Reilly & Associates (Sebastopol, CA) runs under Windows, providing a TCP/IP stack, automatic network registration, Internet services, and navigation tools. This product and other Windows-based interfaces to on-line services (i.e., CompuServe Navigator or the America On-Line front end) will operate in conventional set-ups such as a desktop or notebook PC connected via the phone system, or in emerging schemes such as PCs connected via RF modems through the cable system.

For radically different devices, such as PDAs or set-top boxes, different interfaces will be created. Apple has already invested heavily in the Newton, which, with the addition of needed communications capabilities, could become a hand-held data highway navigator. General Magic's Magic Cap interface, slated for use in devices from Motorola, Sony, Philips, and Matsushita, may also show up under the name MagicTV in set-top boxes. Silicon Graphics is carrying its Indigo Magic media interface from the Indy desktop into the set-top boxes that it is designing for the Time



## Cover Story

Warner Orlando trial. And Eon (Reston, VA), formerly TV Answer, has spent more than five years developing and testing a user interface for its interactive TV system, which will be designed into a set-top box from Hewlett-Packard.

To make these environments truly useful to users, software tools have to run deeper than just the surface of the screen. For instance, support for General Magic's Telescript communications language is built into Magic Cap, which means that when the user selects services by pointing at screen icons, smart agents are automatically dispatched across the network to obtain those services. Similar capabilities can be imagined for any of the set-top box interfaces, which will offer home and business users a kick-off point for cruising the data highway.

One of the finest examples of data highway middleware is Mosaic, developed at the National Center for Supercomputing Applications in Illinois. Mosaic runs under Windows, the X Window System, and the Mac, acting as a client-side browser for World Wide Web servers on the Internet. The software makes visible and easily navigable the hypertext links implicit in the World Wide Web. Thus, you could click on an icon to learn about northwestern conifers and get connected to a server in Vancouver, and then hop a link in pursuit of details on pinecones and be transparently logged into a server in Oslo. "Mosaic is the most intuitive, user-friendly, attractive user interface I've ever seen," says Sprint's Rutkowski. "It's the Internet's killer app."

Learning to best exploit these tools will be a major challenge facing businesses in the era of the data highway. "Information access is going to be a commodity," says Joe Correia, vice president of applied technology for The Travelers insurance company (Hartford, CT). "Everyone will have access to the information, [but] those with the experience will profit from the information."

### Haves and Have-Nots

All these snazzy devices and rich tools will be meaningless to average citizens if accessing the data highway is too expensive or difficult. If proper precautions are not taken, the highway could become the

province of the educated and economically privileged, dragging the U.S. even farther toward being a land of information haves and have-nots.

Lowering regulatory barriers between telcos and cable companies, and the rise of yet more gigantic media empires to fill the wires with content-for-hire, could lead to fierce competition over services and prices—or to new monopolies. Will all citizens be guaranteed access to the national information infrastructure? San Francisco consultant Evelyn Pine, former managing director of Computer Professionals for Social Responsibility, says that "people take phone service for granted," where "universal service has brought about great economic and political advantages." But, she says, "it's hard to visualize universal [computer] access that's not a high-priced solution." Paying \$17 per month for service (an amount more in line with the cost of discretionary cable than with basic lifeline phone service) may seem like peanuts to people in the computer business, but it could be a burden for those with lower incomes, she notes.

Pine also poses the question whether cash-starved libraries and community col-

leges should be charged with providing universal access to the data highway (i.e., through public centers offering subsidized accounts), or whether new public institutions should be established for granting access. While the latter approach would spare colleges and libraries a burden, it could also "siphon money away [from them]," she adds.

The cable and telco businesses are racing so far ahead of regulators, judges, and legislators that their wish to invade each other's territories may be granted before proper protections are in place for the public. But if the information highway is to fulfill the grand civic vision outlined for it by President Clinton, the government must set in stone rules that carry forth the spirit, if not the substance, of the 1934 Communications Act that bound Ma Bell to be a common carrier and provide universal service. RBOCs can't be left to carry that burden alone while the cable companies and alternative carriers skim off the best customers. Perhaps the best solution is one currently floating around Washington: to create a public trust fund into which all providers pay

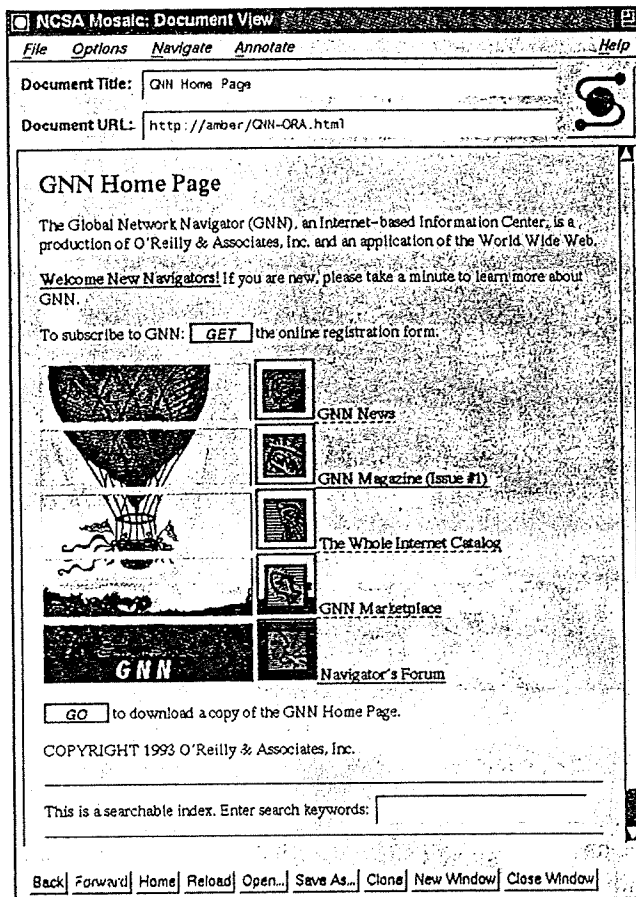
and from which subsidies are drawn.

Like the transcontinental railroads and interstate freeways, the data highway will profoundly alter society—perhaps in ways we can't even anticipate today. No matter who controls the wires or airwaves that reach into homes and businesses in the U.S. and around the world, major technical, legal, and economic challenges remain before the data highway is as unremarkable as telephones and TVs. But when these hurdles are surmounted, enormous opportunities will be unleashed for all providers and consumers of information. Vice President Gore put it most succinctly: "Better communication has almost always led to greater freedom and greater economic growth." ■

### CONTRIBUTORS

Senior news editor Tom Halphill, news editor Ed Perratore, news editor Dave Andrews, consulting editor Peter Wayner, and freelancer Frank Hayes provided additional reporting for this story.

Andy Reinhardt is BYTE's West Coast bureau chief. He can be reached on MCI Mail at 536-9124 or on the Internet or BIX at areinhardt@bix.com.



O'Reilly & Associates' Internet-In-A-Box makes use of the Mosaic data browser, developed at the National Center for Supercomputing Applications.



Northwest Kansas Educational Service Center

703 W. 2nd Ave

Oakley, KS 67748

(913) 672-3125

(913) 672-3175 (fax)

March 18, 1994

Mr. Carl D. Holmes, Chairperson  
Energy and Natural Resources Committee  
House of Representatives  
State Capitol  
Topeka, KS 66612

Dear Mr. Holmes:

On behalf of the Northwest Kansas Educational Service Center and the twenty-one schools we represent, I ask you to support Substitute Senate Bill No. 591.

It is critical to the schools and communities of Northwest Kansas that fiber optic telecommunications capabilities be available in order for them to continue to grow while still maintaining the high quality of education and lifestyle currently available.

Northwest Kansas has been a leader in developing interactive television and distance learning technologies in order to provide expanded educational opportunities to its citizens. However, not all communities have been able to take advantage of these technologies due to the unavailability and high cost of fiber optics in their towns. Passage of this bill would expand the number of school districts that would have fiber optics available to them at an affordable cost. This would allow for wide-spread educational opportunities in virtually all communities in our area.

Presently, we have eight of the twenty-one districts connected through fiber optics. Passage of this bill would make fiber optics available to an additional eight school districts within our consortium. This would allow the people in those additional eight

*Energy & Natural Resources  
Attachment #8  
3/21/94*

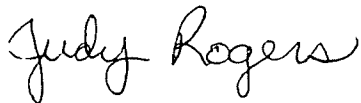
communities to access and share interactively high school courses as well as to receive college courses, both undergraduate and graduate level, in their home communities. This will become increasingly more important to schools as they struggle to meet expanding curriculum needs with reduced budgets.

In addition to educational advantages, the community would benefit from the fiber optic network by being able to interact with other communities for increased educational opportunities for their community fire and rescue teams, training for their business members as well as providing communities opportunities for additional economic development strategies in areas that require high quality telecommunications for day-to-day business activities.

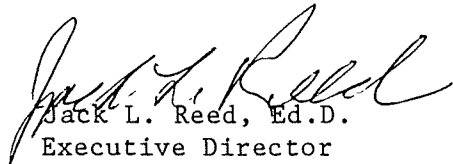
Telecommunications capabilities will also allow communities in Northwest Kansas the ability to interact with specialists in different fields in other areas of the state thereby giving all residents equal access and opportunities. This will help to unify the state and improve the concept of the State of Kansas as a single unit instead of the state being sectioned off into separate areas.

Please consider carefully the benefits to the citizens of Northwest Kansas along with the rest of the state when voting on Substitute Senate Bill No. 591.

Cordially,



Mrs. Judy Rogers  
ITV Coordinator



Jack L. Reed, Ed.D.  
Executive Director

	A	B	C	D	E	F	G	H	I
1	<b>NORTHWEST KANSAS ITV NETWORK</b>								
2	<b>ITV CLASS SCHEDULE</b>								
3	<b>AS OF 3-17-94</b>								
4									
5									
6		<b>"0" Period</b>	<b>1st Period</b>	<b>2nd Period</b>	<b>3rd Period</b>	<b>4th Period</b>	<b>5th Period</b>	<b>6th Period</b>	<b>7th Period</b>
7									
8	<b>Class Title</b>	<b>Clg. Comp</b>	<b>Econ/B. Law</b>	<b>Physics</b>	<b>Spanish I</b>	<b>Clg. Algebra</b>	<b>Spanish II</b>	<b>Art (sngl.)</b>	<b>German I</b>
9	<b>Instructor</b>		Lynda McKee	Gary Feldcamp	Gary Gladin	Jeanie Johnson	Gary Gladin	Ronna Schultz	Dee Depe
10	<b>Sending Site</b>	OCC	Brewster	Quinter	Oakley	Brewster	Oakley	Wheatland	Brewster
11	<b>Receiving Site</b>	Tri-Plains	Tri-Plains	Brewster	Healy	Tri-Plains	Grinnell	Grinnell	Healy
12	<b>Receiving Site</b>	Brewster		Tri-Plains	Brewster		Golden Plains	Brewster	Wheatland
13	<b>Receiving Site</b>	Healy		Grinnell	Grinnell		Quinter	Healy	
14									
15									
16	<b>Class Title</b>		<b>Crim.Justic</b>	<b>Physics</b>		<b>French I</b>			<b>Spanish I</b>
17	<b>Instructor</b>		Bill Leggett	Mark Larkin		Gary Gladin			Gary Gladin
18	<b>Sending Site</b>		Golden Plains	Healy		Oakley			Oakley
19	<b>Receiving Site</b>		Healy	Golden Plains		Healy			Golden Plains
20	<b>Receiving Site</b>		Oakley			Golden Plains			Tri-Plains
21	<b>Receiving Site</b>					Quinter			
22									
23			<b>Comp I/Comp II*</b>						
24	<b>Class Title</b>		<b>Speech/Psych.</b>						<b>Drafting</b>
25	<b>Instructor</b>								
26	<b>Sending Site</b>		OCC						Grinnell
27	<b>Receiving Site</b>		Wheatland						Quinter
28	<b>Receiving Site</b>		Grinnell						
29	<b>Receiving Site</b>		Quinter						
30									
31									
32									

**Northwest Kansas ITV Network  
Fort Hays State University  
Colby Community College  
Spring 1994  
Course Offerings**

<u>Time</u>	<u>Cr</u>	<u>CourseID</u>	<u>Course Title</u>	<u>Send</u>	<u>Receive</u>
<b>Monday</b>					
4:00-5:50 p.m.	3	NURS 820	Dev Potential of Adult	FHSU	NKESC
6:00-7:50 p.m.	3	MACS571/771	Theory of Numbers	FHSU	NKESC
8:00-9:50 p.m.	3	COMM578/778	Nonverbal Codes	FHSU	NKESC
7:00-10:00 p.m.	3	PO101	American Govt.	CCC	Grainfield Oakley Rexford
<b>Tuesday</b>					
4:00-6:20 p.m.	3	SPED704	Behavior Mgmt in Schools	FHSU	NKESC
4:00-7:00 p.m.	3	PS101	General Psychology	CCC	Brewster Grinnell Winona
<b>Wednesday</b>					
8:00-9:50 p.m.	3	ACES810	Community College	FHSU	NKESC
4:00-7:00 p.m.	3	GE101	World Reg Geography	CCC	Grinnell Quinter Winona
7:00-10:00 p.m.	3	PS104	Human Growth & Dev	CCC	Winona Oakley Brewster
<b>Thursday</b>					
4:00-5:50 p.m.	3	POLS300	Current Pol Issues	FHSU	NKESC
6:00-7:50 p.m.	3	NURS862	Admin Mgmt for Nurses	FHSU	NKESC
8:00-9:50 p.m.	3	CUIN860	Adv Lit for Children	FHSU	NKESC
7:00-10:00 p.m.	3	ED225	Children's Lit	CCC	Grainfield Oakley Brewster
<b>Saturday</b>					
10:00-11:50 a.m.	3	ACES875	Sex, Aids, & Death	FHSU	NKESC
(Course is three separate courses, 1 credit each)					

## Friday/Saturday Workshops

### February 18-19, 1993

F--6:00-11:00 p.m. 1  
S--8:00 a.m.-5:00 p.m.

PS162

Topics Applied Psych CCC  
Deal w/ Difficult People

Grinnell  
Winona  
Oakley

### March 4-5, 1993

F--6:00-11:00 p.m. 1  
S--8:00 a.m.-5:00 p.m.

PS162

Topics Applied Psych CCC  
Dream--Search for Meaning

Grainfield  
Brewster  
Rexford

### March 11-12, 1993

F--6:00-11:00 p.m. 1  
S--8:00 a.m.-5:00 p.m.

PS162

Topics Applied Psych CCC  
Making Friends w/  
Yourself

Oakley  
Quinter  
Winona

### March 18-19, 1994

F--6:00-11:00 p.m. 1  
S--8:00 a.m.-5:00 p.m.

PS162

Topics Applied Psych CCC  
Grief Recovery

Grinnell  
Winona  
Quinter

### April 8-9, 1993

F--6:00-11:00 p.m. 1  
S--8:00 a.m.-5:00 p.m.

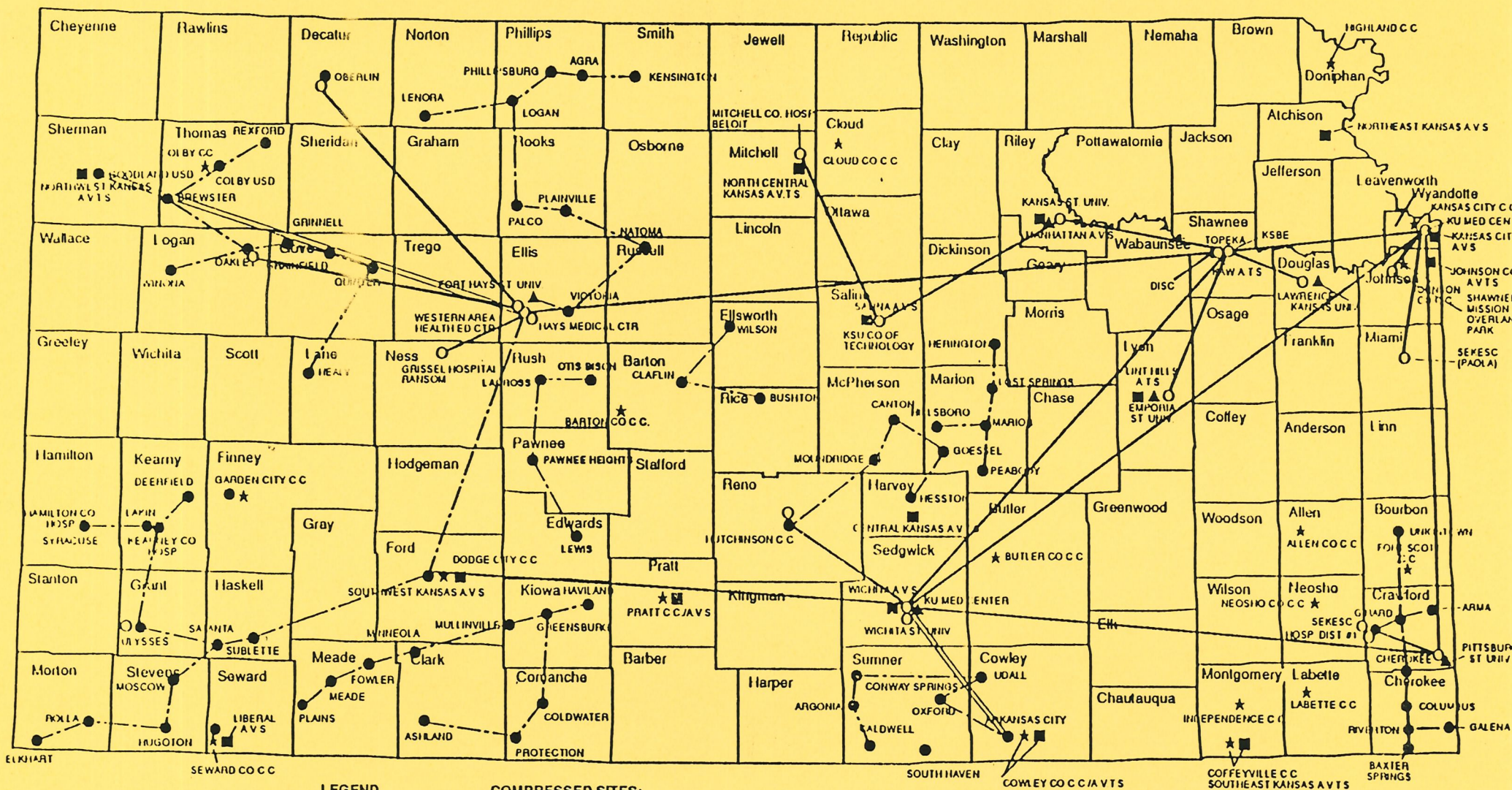
PS162

Topics Applied Psych CCC  
Recognize & Cope  
w/ Guilt

Rexford  
Grainfield  
Brewster

# Full-Motion and Compressed Two-Way Interactive Video Networks

8-6



September 1993

Shawnee Mission Center of International Studies, Overland Park  
Southeast Kansas Education Service Center, Greenbush  
Southeast Kansas Education Service Center, Paola  
The Wichita State University, Wichita (2 sites)

**FUTURE COMPRESSED VIDEO SITES:**  
Cowley County Community College, Arkansas City  
KU Med Center, Kansas City (Site #2)  
State Office Building, Wichita



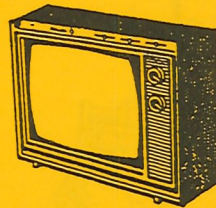
## The Future Is Now

The future belongs to those who have skills, those who know how to acquire new skills, and those who can quickly adapt to rapid social, economic, and technical change. The future of schools includes Two-Way Interactive Television. In rural

areas the use of interactive television (ITV) allows schools located in different communities to expand and enhance curriculum by offering a wider range of elective courses, thus permitting students access to subject matter which would otherwise have been difficult for their school to offer.

## The Northwest Kansas Network

The Northwest Kansas ITV Network, located in Northwest Kansas and serviced by the Northwest Kansas Educational Service Center enables eight area high schools and the local junior college to share resources for the mutual benefit of the students enrolled in those districts. ITV rooms are located in the high schools of Brewster, Golden Plains, Grinnell, Healy, Oakley, Quinter, Tri-Plains, and Wheatland. There are also ITV rooms at Colby Community College and the Northwest Kansas Educational Service Center in Oakley. There are plans to expand the network to additional high schools in the Northwest Kansas area.



## Technology In Use

Fiber-optic cable connects all of the participating sites.

Video cameras, video recorders, and micro-processor driven sound systems are at the heart of the system. Facsimile machines are used for instantaneous transfer of hard-copy materials.

## Network Courses and Uses

The ITV network is designed to provide instruction in what are considered "low-incidence" classes in area high schools--classes that may not be offered due to low enrollment or lack of a qualified instructor. These include classes in advanced sciences or mathematics, foreign languages, the arts, and other specialized studies. In addition, the Northwest Kansas Network can be used for continuing, adult, and community education courses for the benefit of school district patrons. The network strives to build a cooperative relationship among students, teachers, administrators, school board members, parents, and others in the communities involved with the network.

## Engaging In Lifelong Learning

Many citizens in our communities need to enhance their skills to keep up with changing job requirements. The Northwest Kansas Network will provide college courses from Colby Community College and eventually from Fort Hays State University. The network is also available for training sessions for community groups, hospital workers, judicial officials, city employees, law enforcement officials, SRS officials and other organizations. By training through the ITV network, workers can update their skills with valuable savings in time and travel.

## The Kans-a-n Network

The Northwest Kansas Educational Service Center is connected to the Kansas Access Network (KANS-A-N) which allows them access to a variety of locations

across the state including many higher-level colleges and universities, three large medical centers and the Kansas State Board of Education in Topeka. This enables face-to-face communication with virtually anyone in the state.



## Advantages of ITV Instruction



ITV instruction enables students to better meet their educational needs by making it possible for them to take specialized courses. The fiber optic technology has provided an array of learning and teaching

tools, an expansive classroom, and a host of capable, talented instructors from varied sources. Students who participate in ITV classes have access to a greater variety of teaching modalities and resources and are introduced to a host of different communities, colleges, and eventually, neighboring states and countries. The instructors put the technology to work in a uniquely warm and personal way to enhance the educational classroom.



## Effectiveness of ITV

Classroom interaction—The mode of teaching and learning is instantaneous. Teachers and students in up to four classrooms can see and hear each other with no loss of access or time delays. Students, teachers, and staff in participating schools learn to know each other, share their "academic chemistry," and provide a larger peer group for intellectual response, planning, and growth.

Cost-effectiveness—There is agreement that interactive long-distance fiber-optic instruction is very cost effective.

Transportation of students and/or staff to remote sites is eliminated. Duplication of staffing and instruction in neighboring schools for low-incidence classes is reduced. Additionally, the equipment is expected to have a long life capable of continuous upgrade and expansion.



## 80

Dr. Mikel V. Ary, President  
Mr. D. J. Mildrexler, Dean of  
Community Service  
(913) 462-3984

Colby C. C. ★

Brewster

Grinnell

Grainfield

Quinter

Healy

Winona

Oakley

Rexford

For More Information,  
please contact:  
**Northwest Kansas  
Educational Service Center**  
Dr. Jack Reed, Executive Director  
Mrs. Judy Rogers, ITV Coordinator  
Mr. Mark Hallinger, Technician  
703 W. Second  
Oakley, KS 67748  
(913) 672-3125

Brewster --Colby College --  
Golden Plains--Grinnell--Healy-  
-NKESC -- Oakley -- Quinter --  
Tri-Plains -- Wheatland --  
Brewster -- Colby College --  
Golden Plains--Grinnell--Healy-  
-NKESC--Oakley--Quinter-- Tri  
Plains--Wheatland-- Brewster--  
Colby College--Golden Plains--  
Grinnell -- Healy -- NKESC--  
Oakley -- Quinter -- Tri-Plains--  
-Wheatland -- Brewster -- Colby  
College--Golden Plains--Grinnell  
-- Healy -- NKESC -- Oakley--  
Quinter-- Tri-Plains--Wheatland  
-- Brewster --Colby College--  
Golden Plains--Grinnell -- Healy  
-- NKESC --Oakley -- Quinter--  
Tri-Plains -- Wheatland --  
Brewster -- Colby College --  
Golden Plains -- Grinnell-- Healy  
-- NKESC -- Oakley -- Quinter --  
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--  
Tri --  
Brew age--  
Golden - Healy  
-- NKESC Quinter --  
Tri-Plains -- Wheatland -- Brew

The logo consists of a central illustration of a wooden windmill with four blades, standing on a small patch of ground. Above the windmill, the letters 'N', 'K', 'E', 'S', and 'U' are arranged in a semi-circle, each enclosed in its own circle. Below the windmill, the words 'THE' and 'NETWORK' are written in a stylized, bold font, with 'THE' on the left and 'NETWORK' on the right, connected by a banner-like shape.

Dr. Jack Maxwell

Testimony to the

Kansas House Energy and Commerce Committee

March 21, 1994

My name is Dr. Jack Maxwell. I am director of Information Systems at Ottawa University, and I also serve on the school board of the Ottawa Unified School District.

It is an honor to be here, today, to discuss the benefits that Substitute Senate Bill 591 and Senate Concurrent Resolution 1627 will bring to education in Kansas.

About a year ago, the Kansas Legislature passed a comprehensive school finance plan. Many other states are still struggling with the question of how to provide equal access to education for their children. It is a complex problem. But, Kansas led the way by passing a measure that would help ensure that the same educational opportunities would be offered to all Kansas children—rich or poor, urban or rural.

Now, you have an opportunity to ensure that schools will not only have equal access to funding—but also to technology. Passing this legislation before you, right now, will ensure that distance learning technology is available not just in Kansas City and Wichita, but also in Ottawa, Colby, and Manhattan. You see, it will be much less expensive for a company to provide these advanced telecommunications networks in urban areas, where schools are close together.

But Southwestern Bell is the only telecommunications company offering to bring the future to rural Kansas students—now.

As a school board member, I can tell you that there exists an increasing pressure to provide a more challenging and diverse educational experience for the same or less money. Businesses, today, are constantly urging us, as educators, to better prepare our students for a more demanding workplace. In order to keep up with the demands of the business community to provide a more highly-trained workforce, we also must keep pace with the technological advances in education. We must be able to offer our students the broadest course selection possible, understanding that we have limited dollars from taxpayers who, themselves, are working harder for less money.

*Energy! Natural Resources  
Attachment #9  
3/21/94*

The technology that will be made available through this legislation will give taxpayers the biggest educational “bang for their buck.”

Granted, at the university, we have more funds available to us than do public school districts. Investing in costly, high-tech equipment, however, is useless without the necessary infrastructure to tie it in to. We can do all we can do from a university standpoint, but we have to have the missing piece of the puzzle—the infrastructure.

Distance learning applications also will allow us to reach more students. This technology will create opportunities for satellite campuses, enabling us to reach a broader audience and making higher and continuing education more accessible to Kansans. It will be especially beneficial to our nontraditional students—the working mother, the small business owner who would like to get a second degree, or the plant worker who would merely like to improve and enhance his skills.

The infrastructure investment offered in Substitute Senate Bill 591 and Senate Concurrent Resolution 1627 is small in comparison to the original Southwestern Bell proposal. But it will make a big difference in the lives of Kansas students, be they young or old. And the two-year study offers us the opportunity to do even more for Kansans.

I urge you to pass these measures.

*Norris*

I want to thank you for the opportunity to visit with you in regards to telecommunication legislation.

Despite living in the era of computers and soon we will have "virtual reality" through computers the most basic equipment of technology is the telephone. A cellular phone is a must in today's society. Our students in the fourth grade through the use of computer and telephone modem are connected with eight other schools across America for a National Geographic project studying weather, acid rain and environment. The kids are able to electronically send letters to each other and work towards solving problems that they may have chosen to study.

Our high school students in sociology work with schools around the world and discuss various social problems and possible solutions. They communicate via the telephone modem. We utilize distance learning by satellite from both Kansas State University and Oklahoma State University. The students view the program on television and have interaction with their instructor by telephone.

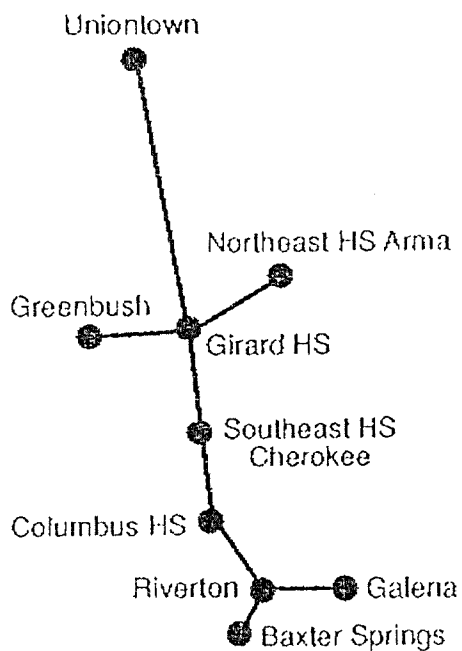
Through the use of telephone and computers we are able to connect into all of the Regent's university libraries and check on the various books they have. We soon will get on the Kansas Library system via telephone modem and computer and actually be able to check books out from the various libraries through the use of the technology.

We and most of you know how fiber optics are being used in schools. I have an illustration of where fiber optics networks are in Southeast Kansas at the present time and I know where Southwestern Bell is at the present time installing the cable. I have indicated by dots where Southwestern Bell is laying or planning on laying cable. At the present time it runs through our front yard and yet we cannot hook on as there is no networking in place.

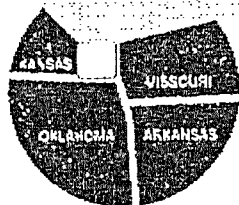
Fiber optics will be the salvation of the rural schools as we get into the next century. It can be used in almost every area of our life even to the point of a doctor a great distance away advising another doctor on medical problems.

I would urge you to support the extension of telecommunications for another two years as I know Southwestern Bell has plans for providing the fiber optics for rural areas of Southeast Kansas.

*Energy: Natural Resources  
Attachment #10  
3/21/94*



SOUTHEAST KANSAS  
INTERACTIVE TELEVISION  
NETWORK  
**EXPANSION**

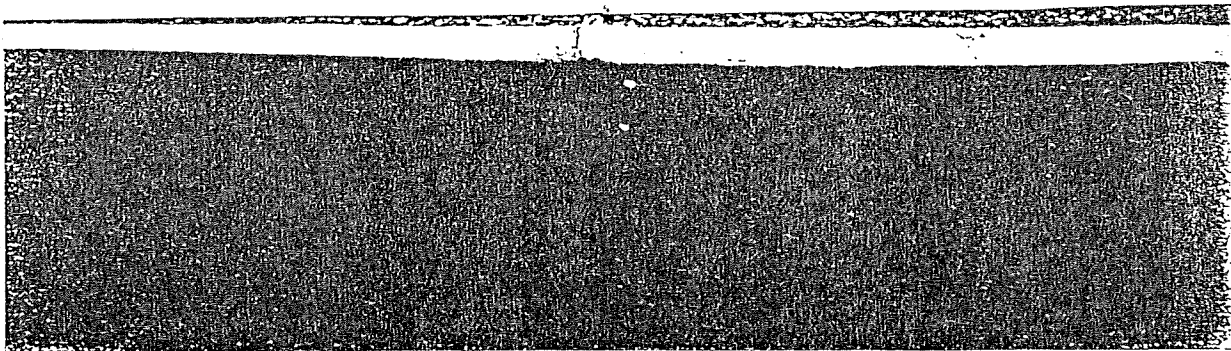
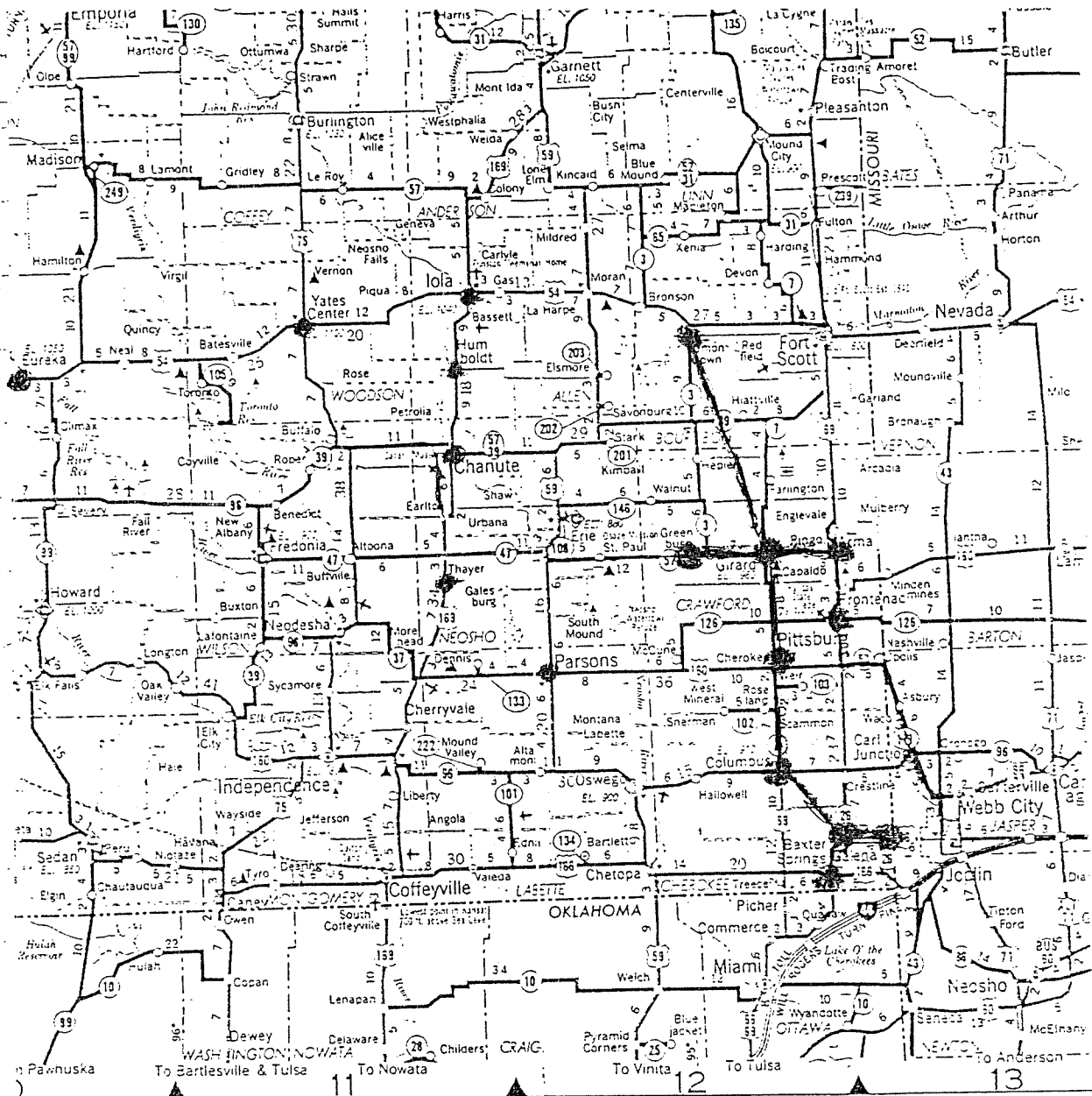


## Expanding the Light...

In 1992 four more school districts, USD 235 Uniontown, USD 404 Riverton, USD 499 Galena, and USD 508 Baxter Springs expressed an interest in joining the Interactive Distance Learning Network. Adding these districts proved to be a rewarding challenge. Craw-Kan Telephone released twenty-two miles of fiber optics which enabled Uniontown to join the Network. Baxter Springs, Galena, and Riverton faced the difficulty of having to purchase and install their own fiber optic cable. With the aid of a state grant, these districts purchased sixteen miles of fiber optics. One of the advantages of ownership, however, is they can have their own telephone and computer networks as well as IDL. All schools benefitted from adding the second four districts. Enriched academic offerings continued to expand, pooling additional talented teachers and students.

Interactive Distance Learning illuminates the educational pathway for hundreds of Southeast Kansas students by providing unique and rare educational experiences through several special projects.

When the JASON robot explored the hydrothermal vents 6,000 feet below the ocean surface in March 1993, Southeast Kansas students were there. They saw in their



Dear Committee Members:

Good afternoon. I am J.H. Seitz and I am the Vice President of the Saint Mary Hospital in Manhattan, Kansas. It is indeed a honor and privilege for me to be here today and I want to thank the committee members for allowing me this opportunity to voice my support for Senate Bill 591 and Senate Concurrent Resolution 1627.

My comments today, are directed toward the impact this bill has to the economic growth and development in the healthcare delivery system with particular emphasis on the rural areas of Kansas. I am concerned, that with the recent actions from the KCC and Legislative Bodies, that there is a strong possibility for exclusion of affordable telecommunication capabilities for those who live in rural Kansas. In addition, there seems to be a certain undercurrent to impose, what seems to an outsider, recommendations on Southwestern Bell to continue their efforts to support rural Kansas. From the perspective of this rural Kansas individual, Southwestern Bell is a friend to those who live in Rural Kansas. The recommendations that are coming out of the regulators as well as the Legislators seem to be unfair to a company with strong Kansas ties in the rural sector and has a tremendous possibility to be detrimental to the economic growth and development to the folks and businesses in Rural Kansas.

I honestly believe that for those who live in Rural Kansas, Southwestern bell is one of the last true friends that they have and can rely on for good, honest service and that really has the will and desire to see rural Kansas grow and survive. I am not sure that the other major telecommunications companies are that committed both fiscally and morally to do or say that.

Prior to my moving to Manhattan in the summer of 1993, I spent fourteen years in healthcare administration in Northwest and Western Kansas. In 1991, I personally experienced what telecommunications can do for the delivery of healthcare services in rural Kansas. While I was the Vice-President for Hays Medical Center, I was successful in receiving a large federal grant to develop a two-way interactive televideo system linking a small rural hospital, Grisell Memorial Hospital in Ransom, Kansas to Hays Medical Center in Hays and on to KU Medical Center in Kansas City. This system is a boon to rural Kansas, where the number of physicians is declining and the number of older residents is increasing. Twelve counties in Kansas lost two or more physicians between 1988 and 1991 and as most of you know 61 counties in Kansas are considered medically underserved.

This system increases the accessibility of subspecialists seeing rural patients without the patient having to travel great distances to the urban community, moreover, this increased accessibility will lead to a greater understanding between rural and urban

*Energy & Natural Resources  
Attachment # 11*

*3/21/94*

communities, will increase rural physician recruitment and will encourage rural physicians to stay put in the rural community where they are practicing.

This capability, which Southwestern Bell is committed to very strongly, enables rural hospitals and providers to continue to be viable economic leaders in their community and creates a beautiful healthcare delivery system in Rural Kansas.

Southwestern Bell proposed in the original S.B. 591 and in its TeleKansas II proposal to make a major investment in telecommunications infrastructure for this telemedicine technology.

Unfortunately, the Substitute for S.B. 591 and Senate Concurrent Resolution 1627 reflects a scaling back of Southwestern Bell's original proposal, to the point that investment for telemedicine is not possible. I am confident, however, that the proposed two-year study will produce the same vision that Southwestern Bell has already identified. The State of Kansas must take this first step, so that at the end of the two-year study we can move forward with technologies that will enable us to provide improved health care services to our citizens.

Southwestern Bell is truly a friend of the citizens of rural Kansas and they have proven that over the years, particularly the past few years with their upgrading of their equipment and their pledge to become actively involved in the rural communities, creating barriers for their growth is in essence creating barriers for rural communities to succeed and survive and that is not what the great State of Kansas is all about.

Thank you very much for your time today.

TESTIMONY OF JAMES M. CAPLINGER  
STATE INDEPENDENT TELEPHONE ASSOCIATION OF KANSAS

SUBSTITUTE FOR SENATE BILL 591  
March 21, 1994

Mr. Chairman and members of the Committee, my name is James M. Caplinger. I am the executive manager of the State Independent Telephone Association of Kansas (SITA).

There are 37 telecommunication public utilities operating in Kansas. 26 of those are members of SITA.

Our membership is of the same opinion Southwestern Bell had during your 1992 Session, when there was proposed legislation to take over a function of the Kansas Corporation Commission. We would ask you to look at the testimony a Southwestern Bell witness gave before your committee in House Bill No. 3022. He said:

"This legislation, then would inject itself into this process and seem to usurp the established jurisdiction of the Corporation Commission."

He went on to say:

"In my opinion, all the many ramifications of capital investment and revenue recovery...is primarily a function of ratemaking which is best determined within the expertise and resources of the Commission."

He also said:

"Whether or not this is a wise course of action is a decision to be made by this Committee and the legislature."

*Energy: Natural Resources  
Attachment #12*

*3/21/94*

We totally agree with that Bell witness. The legislature created the KCC in the early 1900's to regulate all public utilities. The Commission and its staff spend every working day, year around, trying to carry out this task.

Should you decide to favor Southwestern Bell with a respite from KCC regulation on their earnings, we would ask that you treat all other telecommunications public utilities in the same manner.

All the rural telcos have constantly upgraded their exchanges without the benefit of a TeleKansas overearnings. We have for many years had all buried one-party service, with digital switching. The first and most interactive educational television for schools is provided by rural telcos. Some of the rural telcos are providing telemedicine to their hospitals.

If Senate Bill No.591 is to be passed, we ask that you also provide for a same time period for all telcos on the Stipulation that would expire this year.

The KCC ordered the Stipulation covering access charges on November 19, 1990, in Docket No. 127,140-U, for a four-year period. The Stipulation was signed by all telcos including the interexchange carriers.

If Southwestern Bell's earnings are to go unchallenged until March 1, 1997, then the reasonable thing to do is to allow the same benefit to all the telcos who have been modernizing and keeping up with technology without

overearnings.

We would urge an amendment to Substitute Senate Bill No.591 as a new Section 2. It would read:

"The Kansas Corporation Commission, for a period extending through March 1, 1997, shall continue to regulate all telecommunications public utilities' access charges in accordance with the terms and conditions set forth in the Stipulation as approved by the Corporation Commission on November 19, 1990, in Docket No. 127,140-U."

We would also request a couple of minor changes in Senate Concurrent Resolution No.1627.

On page 3, line 43, we would suggest that the word "all" be deleted and the words "where feasible" be inserted after the word "services."

On page 4, line 10, we would ask that the word "and" be deleted and a comma inserted, and on line 11, the words "in every region" be deleted and the phrase "and establish appropriate policies to maintain universal service in high costs areas" be inserted.

Thank you for this opportunity to appear before your Committee.

TESTIMONY OF MARVIN H. SCHULTEIS  
SOUTHWESTERN BELL TELEPHONE COMPANY  
KANSAS HOUSE BILL No. 3022

My name is Marvin H. Schulteis; and, I am here this afternoon representing Southwestern Bell Telephone Company. I have been with Southwestern Bell for nearly twenty-six years in many areas of the business. In my earlier years I worked in what is now our Customer Services Department; but, I have spent most of my career in the rate and regulatory end of the business. I have held various rate and regulatory positions including jobs with AT&T in New York, Pennsylvania, Illinois, and at Southwestern Bell's general headquarters in St. Louis, and now, since 1982, on my present position as Division Manager-Industry Relations and Rate Administration in Kansas. As part of my job, I am responsible for all rate and tariff matters affecting the Company and its customers in Kansas including the matters which are here before you today in this legislation. I am responsible for the design and administration of all of Southwestern Bell's rate and tariff structure; and, I am the Company's spokesman on these matters in hearings before the Kansas Corporation Commission.

The issue involved in this legislation is EAS--Extended Area Service--and how to pay for the expansion of EAS routes in Kansas. EAS, as commonly understood by our customers, is the extension of the local calling scope of a defined group of customers. That is, calls made from these customers to persons in other exchanges which were long distance calls, become local calls in an EAS arrangement which expands the local calling scope.

3/3/92  
H. Schulteis  
Atty. General II

Please permit an early observation by someone who has been acquainted with this issue for most of his career--an observation which is helpful to keep in mind. The central issue before you today--i.e., the size of the local calling scope--has always been present with the telephone industry and its customers and always will be. You can't legislate or regulate this issue away. Anytime a demarcation line is drawn and certain conditions or criteria are developed which allow certain ratepayers to enjoy local

calling--usually on a flat-rate, inexpensive basis--while other ratepayers must pay usage-based long distance charges, there is created an economic incentive to move the demarcation line and/or change the rules to benefit those customers who wish to be included in the local calling scope.

So, over time, the line between local and long distance inevitably gets moved, the criteria for inclusion into the local calling scope are changed, and the group of customers which sought to make the changes is now placated. But, just as soon as this happens, there is now created a new group of non-included long distance ratepayers who see the new demarcation line only a short distance from them and seek to move the line yet again so that they may be included in the local calling scope. This process is continual; it has been an economic fact of life in our industry since the Bell Companies first began to offer long distance service a century ago and a line was drawn between what was a local call and what was a long distance call.

I am sure the members of this Committee know and understand that the rate structures for local and long distance calling which are in place today reflect a long evolutionary process through years of regulatory interaction between the Kansas Corporation Commission and the thirty-eight (38)

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telephone companies in Kansas. The parameters and rules defining who pays local rates and who pays long distance rates didn't just happen by accident. These lines of demarcation and definition are rooted in the growth of the telecommunications industry in Kansas, the development of telephone company networks and attendant technology, the growth of the various communities in the state, and, of course, regulatory decisions made by the Kansas Corporation Commission (KCC) over many years.

The Kansas Commission has addressed these matters in some considerable detail during the last several years. Beginning in 1986, the Commission created an Industry Task Force representing all telephone companies in the state, conducted public and technical hearings across the state to gather evidence from consumers, and along with the companies, devoted two years of research and hard work to develop Optional Community Calling Service (OCCS). The Commission approved OCCS in 1988; it has been well received by Kansas communities because it strikes a reasonable balance between the interests of Kansas telephone consumers and the telephone companies. OCCS is currently providing savings of fifty to eighty percent (50 to 80%) over regular long distance rates for those communities which have demonstrated a local community of interest. Since its inception, thirty-two (32) communities across the state have qualified for OCCS and there are currently about 12,000 customers subscribing to the plan.

This legislation, then, would inject itself into this process and seem to usurp the established jurisdiction of the Corporation Commission. Whether or not this is a wise course of action is a decision to be made by this Committee and the legislature. In my opinion, all the many ramifications of capital investment and revenue recovery surrounding the

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creation of new EAS routes is primarily a function of ratemaking which is best determined within the expertise and resources of the Commission.

I am appearing today as an opponent of House Bill 3022 for the following reasons. In the first place, the legislation does not address a major problem which Southwestern Bell would have with Sections 9. and 13. because of its commitments under TeleKansas. TeleKansas is the regulatory plan which forms the basis for Southwestern Bell's current operating and ratemaking environment in Kansas. It is the result of the Corporation Commission's Order of February 2, 1990, which embodies many ratemaking and regulatory agreements between Southwestern Bell and the KCC. Under TeleKansas, Southwestern Bell has agreed to freeze its local service rates at their current levels until the end of the TeleKansas period, i.e., March 1, 1995. For Southwestern Bell to be able to utilize the surcharges envisioned by Section 9. and the rate increases contemplated by Section 13., this legislation would need to specifically exempt Southwestern Bell from the constraints of TeleKansas for purposes of the rate changes embodied in this bill.

Secondly, the bill as currently constructed would lead to economic inefficiency and the use of arbitrary formulas and rules to create EAS arrangements of little or no interest to consumers. It also would impose many network costs which could not be recovered by the telephone companies and would lead to disparate and unfair rate treatment as between customer groups. I have detailed these problems and shortcomings in the Attachment to this testimony.

