Approved: 1-25-96
Date

MINUTES OF THE HOUSE SELECT COMMITTEE ON TELECOMMUNICATIONS.

The meeting was called to order by Chairperson Doug Lawrence at 1:35 p.m. on January 17, 1996 in Room 313-S of the Capitol.

All members were present except:

Committee staff present: Lynne Holt, Legislative Research Department
Mary Ann Graham, Committee Secretary

Conferees appearing before the committee:

Others attending: See attached list

The meeting was called to order at 1:35 p.m. by Chairman Doug Lawrence.

The Chairman announced that tomorrow January 18 the committee will be briefed on Minority reports of the Telecommunications Strategic Planning Committee report. Also he briefly reviewed the agenda for the week of January 22, 1996, reminding the committee and guests that on Monday, January 22 anyone that wishes to address the committee may do so by giving their name to the committee secretary and providing 20 copies of testimony.

Chairman Lawrence turned the meeting over to Lynne Holt, of the Legislative Research Department to continue briefing the committee on the Telecommunications Strategic Planning Committee Report. Ms. Holt distributed three reports that had been prepared for that Committee. The first, Evolving Services and Technologies (See Attachment 1), second, Telecommunications Policy Issues (See Attachment 2), and third, Theory and Practice of Price Caps. (See Attachment 3) She also presented the committee with a map of Kansas showing Local Exchange Carriers in each county. (See Attachment 4)

After the completion of the briefing Ms. Holt gave the committee members a memorandum from the Kansas Legislative Research Department containing Policy Questions on Telecommunications Competition and Universal Service. (See Attachment 5) Approximately fifteen minutes was utilized by the committee for questioning concerning the report.

The Chairman adjourned the meeting at 3:10

The next meeting is scheduled for January 18, 1996

Unless specifically noted, the individual remarks recorded herein have not been transcribed verbatim. Individual remarks as reported herein have not been submitted to the individuals appearing before the committee for editing or corrections.

SELECT COMM. ON TELECOMMUNICATIONS
COMMITTEE GUEST LIST

DATE: 1-17-96

NAME	REPRESENTING
Rob Hodges	KTA
CARL KREHBIEL	MOUNDRIDGE TELEPHONE CO.
JEFF RUSSELL	SPRINT
Tom Bruno	Allen & Assoc.
Heinemann	KCC
David Brenty	KCC
Glenda Cafer	KCC
Jim Green	KDHE
Harriet Lange	Ks Assn of Broadcasters
MICHAEL HENRY	COMMUNITY ACCESS OF SALINA
George Barbee	RTMC
KENDALL MIKESELL	SOUTHERN KANSAS TELEPHONE
Roger B Balin	Ks. Consolidated Professional Resources
STEVE KEARNEY	KINI L.C.
John D. Pinegar	State Independent Telephone Assn.
Tom Young	AARP
Kathy Peterson	AT&T
Charles Young	Via Christi Reg. Med. Center
Ken Bahr	Comptel

SELECT COMM. ON TELECOMMUNICATIONS
COMMITTEE GUEST LIST

DATE: 1-17-96

NAME	REPRESENTING
Denny S. Koch	SW Bell Tel
Craig Grant	KNEA

Evolving Services and Technologies

Report Prepared for the Kansas Telecommunications Strategic Planning Committee

J.H. Weber
T.E.L.A. Group/DCI
April 1, 1995

House Sel/Comm on Telecomm.
1-17-1996
Attachment 1

Table of Contents

Evolving Services and Technologies

J.H. Weber - T.E.L.A. Group

1. Introduction

This report to the Telecommunications Strategic Planning Committee is intended to provide factual support for the recommendations to be made by the Committee in its report to the Legislature. It has, of course, been foreshadowed by the presentation that was made to the Committee on February 10, 1995. This report uses the charts contained in that presentation, with some modifications as a result of information gathered since the meeting. In addition, it includes narrative so that the charts can be readily understood even by those who did not attend the February 10 meeting, as well as extensive discussions of particular issues. The objectives and subjects discussed are listed in Chart I.

2. General Background

Before we begin to discuss the particular approach and issues which form the heart of this report, it might be useful to insert a short narrative about (1) the nature of the technologies which are evolving - the fundamental building blocks, the "atoms" as it were - of telecommunications systems; and (2) a short discussion of what "digital" really means, and why it is so important.

Basic Telecommunications Components

All current and anticipated advances in telecommunications are driven by two basic technologies.

One of these is fiber optic cables for transmission. The basic medium, consisting of hair-thin strands of glass encased in cables, is relatively inexpensive and virtually limitless in capacity, which is constrained only by the electronics at the ends which convert electrical signals to light waves and vice versa. If operated digitally (the usual mode) it provides very high quality service. It is impervious to electrical interference, its principal vulnerability being to physical disruption.

The other is digital microelectronics. This technology consists of high density integrated circuits, in which thousands of elements, such as transistors, are incorporated into a tiny silicon chip. These "building blocks" form the basis for everything in telecommunications except the basic transmission medium described above. Switching systems, terminal equipment, terminations for fiber systems, and wireless systems are all based on these components, whose cost is halving every year as the number of elements which can be placed on a single chip increase. (The systems in which these components are embedded decline in cost less rapidly, because of the other things they are made of and contain, such as boxes, frames, power supplies, wires and the like.)

The Significance of "Digitization"

Analog transmission is so named because an electrical wave analogous to the sound wave or other stimulus is transmitted over a communications line. This was the basis of the telephone. Pressure waves in the air fell on a diaphragm which in turn generated an electrical signal that followed the form of the original. At the receiving end, the process was reversed. This simple system worked well, but one of the problems was that over long distances, the signal would weaken and need to be regenerated, which would add noise. Hence the relatively noisy long distance calls we all remember.

Some time ago, it was discovered that these analog waveforms could, by appropriate means, be transformed into numbers representing the amplitude of the wave and discrete points in time, which, when received and interpreted, could exactly reproduce the original waveform. Furthermore, as is done in computers, these numbers could be represented by binary digits, or strings of ones and zeros. Although there were some complications and costs to do this, it would now be possible to transmit a signal with virtually no impairment, since, in order to regenerate the signal, it was necessary only to know whether it was a "one" or a "zero, a decision that could almost always be made correctly unless there was severe impairment on the line (in which case the transmission would be virtually unintelligible in any event.) Furthermore, with the signal in this form, it could be "processed" by computers to do many things, such as reduce the number of bits required for a given application (compression) or make it immune to eavesdropping (encryption). Finally, the implementation of such systems played very well with the ongoing development of digital microelectronics, which was in turn stimulated by the computer industry, where everything always has been digital.

Digital systems now have hit a happy confluence. By using them, we can enjoy a wide variety of high quality, flexible services with rapidly falling prices. Therefore, that's where everything is going in this business.

3. Services and Service Classes

Since discussions of technology can be endless in their details, this report is organized around a certain finite class of service capabilities, characterized by the basic underlying technologies they require, and the services they support. This definitional structure allows the discussion to proceed in a way which relates the technologies to what people other than the service providers are really interested in - the services provided. It also provides a natural structuring of the technologies themselves, without getting bogged down in a welter of detail which is of interest only to those developing telecommunications equipment.

Charts II and III describe these services and service classes. Chart VI outlines the technologies required in each part of the plant, but in a nutshell the categories as listed in Chart II are best understood as follows:

Voicegrade Fixed Point-to-Point

This encompasses the transmission services supported by all current telephone networks. Thus it basically requires only the technologies that have existed for decades - wire pairs and any kind of switching. All more advanced technologies can also carry these services, of course. Chart III defines the maximum data rate supported by these networks as 28.8 kb. However, advances in signal processing technology may increase that rate in the future, making it more competitive with basic rate ISDN, which is described below.

Voicegrade Mobile

This encompasses much the same set of services as voicegrade fixed, except that there is a wireless element in at least one end of the connection which allows the user to move around while making a call. Ordinary cordless phones could be considered part of this class, but they are normally thought of as terminal equipment. However, cellular mobile certainly meets the definition, as do the variety of services envisioned under the Personal Communications System, or PCS rubric.

Digital Data

This encompasses a set of point-to-point services which can use modern existing facilities, such as digital switching systems and twisted pairs, but modified to support digital transmission in the 56 kilobit to 1.5 megabit range.

A set of services in this class which is of particular interest is called Integrated Services Digital Network, or ISDN. It has several variants, with different data rates and capabilities. The most limited, and potentially the most ubiquitous is called Basic Rate. It consists of two 64 (or 56) kb data channels, and one 16 kb signaling channel. It can be carried on twisted pairs without modification and has the potential for widespread use in residential and business applications such as high speed fax, encrypted voice, information service access, and video teleconferencing. (A video teleconferencing network in Kansas City described in the Kansas City Star on March 14, 1995 is based on this service.)

The other ISDN service currently available is called Primary Rate. It consists of twenty three 64 (or 56) kb data channels and a 64 (or 56) kb signaling channel. These can be channelized in various ways, including a single 1.5 mb service which can support VCR quality video. This is a more complex, capable and expensive service than Basic Rate, requiring extensive conditioning of the line to the customer's premises. It is currently being made available by SBC everywhere in Kansas using an overlay network with switches located in Wichita, Topeka and Kansas City.

Broadcast Video

This includes video as we now know it, whether over the air, via cable, or via direct broadcast satellite. It involves broadband media, but no switching. It is characterized by a single set of signals emanating from a central point (Head

End) to all users, with little or no capability of information transmission the other way. A potential added service in this category would be High Definition Television, or HDTV.

Interactive TV

This is the class that requires the most sophisticated, complex and expensive underlying network. It requires broadband transmission and switching facilities throughout the network, capable of carrying video signals everywhere, including two way, point-to-point services. It includes existing services such as video teleconferencing, as well as future services such as video on demand, interactive games and video telephony. Data services at 45 mb and above are also included as part of this category, since they rely on the same kinds of network facilities.

Call Management Services

These services have a somewhat different dimensionality than the other classifications. They are defined not in terms of transmission capacity (voicegrade will do) but in terms of network intelligence. This class principally includes the evolving set of services starting with CLASS or Caller ID, and moving through data base access services, number portability, and other applications growing out of so-called Intelligent Networks. The network architectures to support these services involve additional equipment, such as Signal Control Points (SCPs) which contain routing and other information.

4. Fundamental Telecommunications Architectures

The discussions that follow are oriented around three functional areas, which form the basis for all telecommunications systems. The first is local distribution, which connects the customer's premises to the local switch or other concentration point. This is the "last mile" of telecommunications. Because it is dispersed, it has been resistant to significant technological improvement until quite recently, and is quite costly. It represents about one third of the total telecommunications investment. The second is the switching function currently located at the central office, or wire center. This equipment contains the intelligence in the network. It concentrates, routes and distributes traffic, as well as keeping records for billing and other purposes. Improvements in this area have been rapid and continuous, both in terms of new features and services, and in cost reduction. Finally, the interoffice trunking interconnects the central offices or other points of concentration. It also has benefited greatly from technological change, and no longer represents the significant proportion of telecommunications investment that it once did.

These functions are described and summarized in Chart IV.

5. Basic Technologies in Use in Telecommunications Systems

Chart V lists the basic technologies in use in various parts of telecommunications networks. The discussion that follows contains a brief description of each item in that list.

Twisted Pair

This is the oldest technology currently in use in telephone networks. It is made up of pairs of wires collected in cables, with a single pair dedicated to each use. It historically has been used for short distance interoffice transport and for distribution plant connecting a point of concentration with the customer's premises. It is currently used largely for the latter, as well as for so-called "feeder" facilities interconnecting remote concentration points to wire centers.

Digital Carrier

This technology allows a number of connections to share the same physical facility, or pair of wires. Digital carrier on copper pairs has been evolving for a number of years, and is now principally used in the so-called "feeder" portion of the network, connecting a remote point of concentration to a wire center. Some interoffice trunking using digital carrier remains, but it is gradually being replaced by fiber.

Coaxial Cable

This technology consists of a central metallic conductor surrounded by a metallic outer sheath (hence "coaxial"). It was originally designed for transmission of analog signals, although it can accommodate digital transmission. It is currently not in use in the telephone network, except in a very few cases for interoffice transmission. It is, of course, widely used for cable TV distribution, which is likely to continue, or expand in the future.

Optical Fiber

Fiber is the newest and most robust of all transmission media. It is virtually unlimited in its carrying capacity, which is constrained only by the electronic equipment at the terminals. It is used for interoffice connections by all carriers, by LECs in the "feeder" sections of the loop plant, by Competitive Access Providers to reach their customers, in rings around large cities by telephone companies and others to support advanced services, and by cable TV companies in their backbone routes.

Terrestrial Radio

This is the technology that supports cellular telephony and PCS. As mentioned above, it also supports cordless phones, but these are considered to be terminal equipment. There also are a number of potential services at very high frequencies (such as 28 ghz) which may support point-to-point video distribution, but these remain in the experimental or trial stage.

Synchronous Satellite

These are the high altitude (23,000 mile high) satellites that are stationed at apparently fixed points over the equator. (Their orbital speed is the same as the earth's rotation). They are in wide use for TV distribution - from remote sites to network head ends, from program distributors to cable company head ends and local TV stations, and directly to end users. They also are used for telephone service to hard-to-reach places. They are considered undesirable for this application, however, because the round trip delay (at the speed of light) amounts to almost half a second, which many people find unsatisfactory.

Low Earth Orbit (LEO) Satellite

These services involve satellites only a few hundred to a few thousand miles high. They move very rapidly relative to the earth, and the earth stations must be able to track them and switch from one to the other as they appear and disappear over the horizon. However, they do not have the delay problems that characterize synchronous satellites. Several systems have been proposed, one for a global mobile service (called Iridium, and being constructed by Motorola), and the other a personal communications system, which is further off.

Analog Switching

As discussed above, this involves switching equipment in which a call is established using a solid metallic connection through the switch, so the switch looks to the call just like another piece of wire. Aside from the electromechanical equipment still in use by a few small telephone companies, the only examples of this type of technology still in use are the 1AESS, 1ESS and 2BESS switches operated by the Bell companies. These are electronically controlled analog switches and have many modern features. The 1AESS in particular, which accounts for the bulk of the equipment still in service, is a full function switch which supports virtually all voicegrade and call management features currently available anywhere.

Digital Switching

All new switching equipment being manufactured and installed today is digital. These switches use the properties of digital technology as described above to share the switching fabric among a number of different users. They are software-controlled, as are the ESS switches, and are often capable of supporting all voicegrade and switched video services. Digital switches are well suited to support a so-called "host-remote" architecture, in which much of the intelligence is contained in a "host" switch, with simpler and less expensive "remotes" able to provide a full panoply of services to smaller communities in the region. This architecture is an important reason why digital switches have become the first economical substitutes for small electromechanical switches, and why smaller companies and rural areas have already reached, or are rapidly approaching, 100% digital switch deployment. Except for a few electromechanical switches owned by some small companies, and the analog ESS switches operated by the Bells, digital switches account for all of the switching capacity in place in the US today.

Packet Switching

This is a form of digital switching optimized for data traffic, which is "bursty" in nature - that is, information comes in short bursts, unlike voice or video, which tends to be more or less continuous. The bit stream representing the original set of data is broken up into "packets" which are independently routed through the network and reassembled at the other ends. X.25, Frame relay and Switched Multimegabit Data Service (SMDS) are examples of services supported by packet switches. Asynchronous Transfer Mode, or ATM is a method of packet switching which may turn out to be useful for all services, including video and voice. If that were to be economical, then a single switch could be used for all service classes.

Broadband Switching

This describes special digital switches that have been optimized to switch video signals. They can be ordinary time division digital switches, or ATM switches, depending upon the application and usage levels.

Out-of-Band Signaling

This technology describes the high speed signaling system, known as SS7 which carries information about calls across the telecommunications network using a dedicated, high speed digital network which is functionally separate from the network carrying the calls.. Although designed to provide simple information like call destination, it can be used for a number of different purposes, and forms the basis for intelligent network services. The earlier "in-band" signaling which it replaces utilizes the same transmission path as the voice signal, and is extremely limited in capacity and functionality.

Point-to-Point Radio

This is the familiar "microwave" technology which dominated long haul transmission from the 1940's until just a few years ago. It is rapidly being replaced by optical fiber systems.

6. Relationships among Technologies, Service Capabilities, Service Providers and Network Architectures.

Charts VI to XI comprise a series of matrices describing how, and by whom, various technologies are currently deployed, and expected to be deployed, in Kansas and elsewhere.

Chart VI is a matrix which shows which of the above technologies is in use for each of the service classes in each portion of the network. For example, it shows that everything from twisted pair to fiber, including coaxial cable, terrestrial radio and low earth orbit satellites can be used as a local distribution medium to support voice grade fixed point-to-point services, and that fiber is sufficient, but not necessary, for internodal transport in all categories. (Digital carrier on copper is actually sufficient for digital data, but the capacity would be exhausted if very many services were provided. It has therefore been excluded it as a practical medium for this application.)

It is clear from Chart VI that, as the industry moves towards ubiquitous deployments of digital switching and fiber for internodal transport, most of the service classes can be readily supported in these portions of the network. The difficulty is in the local distribution. As has been mentioned earlier, this technology is expensive and widely distributed, and there are a number of strategies being pursued to upgrade it to meet new service demands.

The current local distribution plant of the LECs consists almost entirely of twisted pairs; the cellular carriers and potential PCS providers use radio, while the cable TV companies use coaxial cable. If the LECs wish to offer services at any higher data rate than basic rate ISDN, they must modify their local distribution plant.

One alternative is called ADSL, or Asymmetric Digital Subscriber Line, which allows a one way signal of 1.5 to 6 mb to be carried on a twisted pair, depending upon its length. (The longer the length of the wire pair, the lower the bit rate that can be supported. The system will not work at all for loops longer than 12,000 feet.) This equipment is currently rather expensive, but will come down in cost if it is extensively used and can be produced in volume. It can be installed on an "as needed" basis and can support VCR quality video service.

Another multiplexing scheme, called HDSL, or High Speed Digital Subscriber Line, provides two way service over two pairs, but is substantially more expensive than ADSL. Once again, however, if there were more demand and higher volume production, costs could be reduced.

Finally, some LECs are planning to install fiber and/or coaxial cable either in place of or in addition to their twisted pairs to provide video services, as discussed later.

Chart VII is another matrix, showing which type of company - LEC, IXC, etc., currently (Now) or in the future (Later) plans to support each of the identified service classes.

Chart VIII expands upon Chart VII, but focuses on some of the specific services. Generally, an "L" in Chart VII or VIII implies functional capability and general intent. It does not connote firm plans or a particular time period. This is subject to change, of course. IXCs could attempt to integrate backward into local telephone service, but there seem to be few concrete plans to do so at the moment. MCI has made some announcements along these lines, but they appear to intend to keep the local service provider separate.

The evident message in Charts VII and VIII is that there is a potential convergence in service provision as well as technology. There appear to be many potential providers for virtually every kind of service. In such a situation, it is likely that, if authorized, competition will develop for many services which are presently provided by a single authorized carrier. However, this should not be taken to mean that all these companies will actively participate in all markets everywhere. Entry will undoubtedly occur only where there is a perception of market opportunity.

Chart IX is a summary of some of the key issues concerning new technologies and services. The first three points describe the potential competitors to the LECs for the provision of local exchange service. The cable companies, if they have fiber in their backbone routes, may be able to add telephone service capability to their networks for under $500 per line. The CAPs have already demonstrated their willingness and interest in providing local exchange service, and the incremental cost of providing such services on wireless networks is quite low. Although it is unclear how rapidly or exactly where competition will develop, the convergence of technologies makes it virtually certain that competitors will try to penetrate those markets where the revenues are highest and the costs are lowest - business, high volume residence, and metro areas.

The fourth paragraph in Chart IX deals with LEC plans to provide broadband services. The architectures they propose span the gamut from full fiber to the curb, such as Bell Atlantic's New Jersey systems, to a straight fiber/coax overlay system such as is being planned by Ameritech, which envisions a functionally separate network for video services. The costs are highly variable, ranging from less that $400 per line for overlay systems in metro areas, to over $1000 for fiber to the curb in some areas. However, the ultimate capabilities also vary enormously. Most of these systems are being established under the FCC's "Video dial Tone" rules, and the rate of approval of these systems by the FCC has been increasing in recent months.

Chart X summarizes the current and planned future technology deployments in Kansas. The "current" column was largely derived from the KCC database compiled in the course of the infrastructure docket, with some updates added as more information became available.

The "Future" columns in this display are only intended to represent current plans covering at most the next five years. It is well recognized, for example, that all LECs are examining the use of fiber in their loop plant, which will be required if they are to ultimately provide broadband services. However, none have any firm plans to install such, hence the "twisted pair" entry for both current and future technology. It should also be recognized that the portion of the loop plant normally designated "feeder" is included in the "internodal transport" rather than the "local distribution" category. Potential deployments beyond five years will be addressed in the discussions relating to telecommunications policy and its effect on infrastructure development.

There was some concern that the KCC data survey on such things as fiber connectivity and SS7 were somewhat out of date. There does appear to be reasonable progress on those two fronts. A survey of eight independent telephone companies serving 45, 000 lines conducted by Kendall Mikesell of Southern Kansas Telephone Company indicates a reasonably rapid expansion of both SS7 and fiber trunking. This sample of independent companies reported that about half their offices currently had both SS7 and fiber connectivity, increasing to 95% within five years.

Chart XI shows existing and planned services in Kansas. Once again, "Future Availability" is focused on the near term. This column does not deal with theoretical capability, but with actual plans.

7. Comparisons with Other Jurisdictions

Charts XII and XIII are comparisons of infrastructure deployments in various jurisdictions.

Chart XII is a summary of data collected by the FCC on several parameters of technology deployment. It only covers the Bell companies, and is as of the end of 1993. It is interesting to note that, although SBC in Kansas is shown as only having 63% of its lines accessible to SS7 in 1993, by the end of 1995 it will have SS7 in every office but one, a 2BESS which is not capable of connecting to SS7. Although the data is available from the FCC for all Regional Bell companies, and for all states, Chart XII just shows the Regional Bells, the states in SBC, and New Jersey, Pennsylvania, New York and Tennessee, which are discussed in Chart XIII.

The fact that SBC had a significantly lower penetration of ISDN probably has had little impact to date, since ISDN has been moving slowly through the tariff process and into the marketplace throughout the country. It is only now beginning to show promise of significant use, and SBC's overlay strategy, if appropriately priced, may allow it to move quickly to meet market demand. (An overlay strategy means that only a few switches are equipped for ISDN, and users may be connected by long access lines. This is an economical strategy for low usage services, but prices must be kept at affordable levels. If the access lines are priced in a traditional manner, it is likely to cause the service to be too expensive except in metro areas. As the traffic volume expands, it becomes economical to add switches, leading ultimately to a ubiquitous network of ISDN capable switches.)

Chart XIII describes infrastructure related activities in several states.

The first three examples rely on a planned network infrastructure upgrade. Tennessee was the first, developing a network plan which is generally considered a success by all involved, although there have been subsequent struggles over the regulatory plan.

In New Jersey and Pennsylvania the Bell companies were very proactive in seeking legislation and developing aggressive network deployment plans in return for favorable regulatory treatment. (Not rates - many rates were frozen, but freedom from rate of return regulation was granted.)

The next two rely on competition as the principal motivator, leaving infrastructure improvements in less desirable areas to be monitored and reviewed at a later time. New York and California have very many powerful and sophisticated interest groups, as well as large and proactive commissions. They have opted for a competitive model, but it remains to be seen how this will affect service deployment in different demographic areas.

It is likely that neither of these approaches will, by itself, be workable in Kansas at this time. Kansas, with its large rural areas, probably needs to provide some extra stimulus if advanced services are to be provided throughout the state. At the same time, those who live and work in metro areas should get the advantages of competitive markets. Possible approaches to reaching these disparate and somewhat conflicting goals will be the focus of the policy discussions which will follow the completion of this report.

8. Summary and Conclusions

Chart XIV sums up the principal conclusions of this report. It discusses the proliferation of services and potential service providers which are appearing as a result of the rapid development of a wide variety of technologies. It also summarizes the situation in Kansas and describes the relationship among technology, policy and economics.

Chart I. Introduction

Objectives:

To provide the Committee with information to assist them in developing a telecommunications strategy for Kansas.

Specifically, to describe the wide variety of markets, services and technologies being explored, and their associated uncertainties.

Subjects Discussed:

Current and future service scenarios in Kansas and elsewhere

Description of underlying technologies and deployment plans in Kansas

Anticipated roles of various industry participants

Comparison of Kansas infrastructure with that of other states

Telecommunications strategies adopted in some other states

Chart II. Service Classes or Capabilities to be Considered

Voice grade fixed point-to-point

Voice grade mobile

Digital data

Broadcast video

Interactive video

Call management

Each service class requires some fundamentally distinct underlying technology, as is shown on Chart VI.

Chart III. Examples of Services in Each Class

Voice grade fixed
- Local telephone
- IntraLATA toll
- InterLATA toll
- Exchange access
- Facsimile
- Data transmission up to 28.8 kb (currently)
- On-line access
- Electronic mail

Voice grade mobile
- Cellular mobile, used as above
- PCS
- Special Mobile (dispatching, etc.)

Digital Data
- ISDN at various rates
- High speed fax
- Encrypted voice
- Low and medium resolution video
- Packet services (SMDS, Frame Relay, etc.)

Broadcast Video
- CATV
- Broadcast TV
- Direct Broadcast Satellite
- HDTV

Interactive Video
- Video on demand
- Video Teleconferencing
- Telemedicine (some applications)
- Distance learning
- Home shopping
- Interactive games

Call Management
- CLASS services
- Data base access
- Single number calling
- Number portability
- Voice Mail
- E911

Chart IV. Basic Serving Arrangements

Three functions

Local Distribution
Transport between the customer and a point of concentration. A point of concentration may be a switch, a wire center, a radio transmitter site, a cable head end, or a remote terminal where "neighborhood" facilities join "backbone" or "feeder" facilities.

Switching
Concentration, distribution and routing of traffic - location of "intelligence"

Internodal transport
Transport between points of concentration

Chart V. Basic Technologies

Local Distribution

- Twisted pair
- Digital Carrier
- Coaxial Cable
- Optical fiber
- Terrestrial Radio
- Synchronous Satellite (DBS)
- Low Earth Orbit Satellite

Switching

- Analog
- Digital
- Packet
  - X.25. Frame Relay, SMDS, ATM
- Broadband
- Out of band signaling

Internodal Transport

- Digital carrier
- Fiber
- Synchronous satellite
- Low Earth Orbit (LEO) Satellite
- Point-to-Point Radio

Chart VI. Technologies Required for Various Service Capabilities

Service Capability	Local Distrib Technology	Switch Technology	Internodal Technology
VG Fixed Pt-Pt	Twisted Pair Coaxial Fiber Ter Radio LEO Sat	Analog Digital	Dig Carrier on cpr Fiber LEO Sat Pt-Pt Radio
VG Mobile	Ter Radio LEO Sat	Analog Digital	Dig Carrier Fiber Pt-Pt Radio
Digital Data (64 Kb up)	Twisted Pair* Coaxial Fiber	Digital Packet	Fiber
Broadcast Video	Coaxial Cable Fiber Synch Sat Brdcst TV	None	Synch Sat Pt-Pt Radio Fiber
Interactive Video	Coaxial Cable Fiber 18, 28 ghz Radio	ATM Broadband	Fiber
Call Management	All	Digital Hi Speed Sig	Dig carrier Fiber LEO Sat Pt-Pt Radio

* Requires ISDN, ADSL or HDSL digital multiplexing equipment

Chart VII. Current and Potential Future Providers of Service Capabilities

Service Capability	LEC	IXC	CTV	CAP	DBS	PCS	CLL	SCC
VG PT-PT	N	N	L	N	L	L	L	
VG Mobile					L	L	N	
Digital Data	N	N	L	N	L	L	L	N
Broadcast Video	L		N		N			
Interactive Video	N	N	L					
Call Management	N	N	L					

LEC = Local Exchange Carrier
IXC = Interexchange Carrier
CTV = Cable TV Carrier
CAP = Competitive Access Provider
DBS = Direct Broadcast Satellite
PCS = Personal Communication System
CLL = Cellular Carrier
SCC = Specialized Common Carrier
N = Now
L = Later

Note: Electric power companies may enter some telecommunications markets, but not clear which, when or where.

Chart VIII. Current and Future Providers of Specific Services

Service	LEC	IXC	CTV	CAP	DBS	PCS	CLL	SCC
Local Telephone	N		L	L	L	L	L	
IntraLATA Toll	N	N	L	N	L			
InterLATA Toll	L	N	L	N	L			
Exchange Access	N	N	L	N		L		
Mobile Telephone					L	L	N	
ISDN	N	N	L	L	L	L	L	
Packet Services	N	N		N		L	L	N
Cable TV	L		N		N			
Interactive Video	N	N	L					
Call Management	N	N	L	L		L	L	

LEC = Local Exchange Carrier
IXC = Interexchange Carrier
CTV = Cable TV Carrier
CAP = Competitive Access Provider
DBS = Direct Broadcast Satellite
PCS = Personal Communication System
CLL = Cellular Carrier
SCC = Specialized Common Carrier
N = Now
L = Later

Chart IX. Issues Concerning New Services and Technologies

Cable companies expect to provide telephone service. They can feasibly do it if they have fiber in their backbone routes. Costs and operational (e.g. powering) questions remain open.

CAPS have just begun to get authorization to provide local telephone service in metro areas.

PCS licenses may be used to (1) Add a new kind of service (2) Compete with cellular or (3) Compete with wireline.

LECs want to provide cable TV service as well as broadband interactive services. Several different local distribution architectures are being tried. Costs and operational considerations remain uncertain, but capital costs may be largely offset by operational savings in the long run.

Markets for broadband interactive services are highly uncertain. Some companies (Bell Atlantic, Pacific Telesis) are moving aggressively, while others (SBC) are more cautious.

Low Earth Orbit (LEO) satellites may be used for either mobile or fixed point telephony, or both.

High frequency (28ghz) radio may be used for local distribution of both narrowband and wideband services.

Chart X. Technology Deployments in Kansas

Local Distribution

Carrier Type	Current Technology	Future Technology
LEC	Twisted Pair	Twisted Pair
CATV	Coaxial Cable	Coaxial Cable
CAP	Fiber	Fiber
Cellular	Analog Radio	Analog, Digital Radio
PCS Operator	N/A	Radio
DBS (synchronous)	Radio	Radio
DBS (LEO)		Radio

Switching

Carrier	Current Technology	Future Technology
SBC	43% metro lns 1AESS Remainder digital 100% SS7	No plans for significant change
United	36% of lines served by E/M. Rest digital. No SS7.	All digital. SS7 in tandems only
Other LECs	Almost all digital. About half of all switches utilize SS7	All digital. Continuing expansion of SS7 capability
IXCs	AT&T 4ESS in Wichita. No others.	Same
CAPs	Kinnet access tdm in Moundridge*. No others.	No specific plans
Cellular	Liberty, SWBM - digital	
Others (PCS, DBS, etc.)	None	No specific plans

* Kinnet provides a number of services, some of which would cause it to be designated an IXC.

Chart X. Technology Deployments in Kansas (Continued)

Internodal Transport

Carrier	Current Technology	Future Technology
SBC	67% of offices with fiber access. Rest digital carrier	Over 95% of offices with fiber access
United	25% of offices with fiber access. Rest mostly digital carrier	43% of offices with fiber access
Other LECs	Mixture of fiber, digital and baseband	Most offices with fiber access
IXCs	Almost all fiber. Some pt-pt radio	Probably all fiber
CATV	Coaxial Cable	Fiber
CAPs	Fiber	Fiber

Chart XI. Services Available in Kansas

Service	Present Availability	Future Availability
Local Service	LECs	Same. Others may enter. No firm plans
IntraLATA toll	LECs. IXCs using 10XXX	Same. IXCs using 1+ if allowed.
InterLATA toll	IXCs	Same. LECS if allowed
Exchange Access	LECs, CAPs in Wichita, KC.	Same.
Voice Grade Mobile	Cellular almost everywhere	Same. Perhaps PCS
Primary Rate ISDN	Offered statewide by SBC on 5 year contract using overlay network. Less expensive in metro. IXCs also can provide.	Same.
Basic Rate ISDN	Not available	Possibly in metros by SBC
Packet Services	SBC - Frame Relay in KC, Top, Wich.	Perhaps SMDS
Broadcast Video	CATV everywhere. Most can receive over-the-air. DBS services starting up.	Same. No specific plans. LECs may enter.
Interactive Video	12 LECs report some service.	Telekansas II will provide to some schools. Metromedia to schools in Great Bend. No other specific plans identified.
Call Management	Available in metro and in some other areas.	Available statewide by Bell by YE 1995. Expansion planned by small independents. No current plans by United.

Chart XII. Comparison with Other States

12/93 Status of Certain Technologies in Bell Companies
(Source FCC ARMIS Infrastructure Reports)

Compny /State	% Dig Lines	% SS7 Lines	% ISDN Lines	% Fiber IOF Tks	Cap $ /A.L./Yr	A.L. Grth/Yr
Amertech	67	80	46	84	$98	3.5%
Bell Atl	70	98	53	73	$104	2.5%
NJ	65	99	56	57	$113	2.7%
PA	64	99	46	72	$111	2.0%
BellSou	69	94	40	89	$156	3.5%
TN	71	100	54	74	$157	3.7%
NYNEX	74	70	22	88	$134	2.8%
NY	77	72	16	84	$130	2.4%
PacTel	53	83	36	63	$116	2.0%
USWest	53	72	29	76	$161	3.2%
SBC	46	64	11	76	$131	3.3%
ARK	53	61	13	76	$149	3.7%
MO	49	72	12	87	$155	3.3%
OK	65	82	18	83	$106	2.1%
TX	38	60	9	74	$126	3.6%
KS	59	63	13	72	$127	2.5%

Conclusions:

Kansas has a lower percentage of digital lines than most of the Bells, but the differences are small.

SBC and Kansas had the lowest penetration of SS7 among the Bells in 1993. However, recent deployments have brought Kansas to virtually 100%

SBC and Kansas have by far the smallest number of lines with ISDN access. However, this is may be somewhat misleading, since SBC has adopted an overlay strategy, at least for primary rate.

SBC in Kansas is close to the median for fiber interoffice trunks and capital spending per access line, though it is slightly on the low side in access line growth.

Chart XIII. Infrastructure Related Actions in Selected States

States with Specific Infrastructure Plans

Tennessee

Telecommunications Master Plan, entitled FYI Tennessee, adopted in 1990.

- -Telephone companies only
- -Bell and all 26 Independents and Cooperatives participated
- -Accelerated SS7, ISDN, and Broadband loop installations over a ten year period.
- -Objectives varied according to demographics. Stratified by Urban, Suburban and Rural.
- -Accompanied by relaxed regulation - allowable range of returns
- -Supported by telephone industry
- -Opposed by cable industry, others
- -Adopted by Commission
- -Still being implemented - ahead of schedule

New Jersey

Adopted legislation deregulating competitive services and providing for price cap regulation

New Jersey Bell filed infrastructure plan, called Opportunity New Jersey, in 1992.

- -New Jersey Bell only (serves almost all of New Jersey).
- -Accelerated ISDN deployments (SS7 was already complete) and committed to 100% broadband loops by 2010.
- -Regulatory plan included price caps and some freezes.
- -Opposed by cable companies
- -Adopted by Commission in 1993

Pennsylvania

Similar scenario to New Jersey, except that Pennsylvania has a large number of independent companies, and New Jersey has very few. Legislation adopted early in 1994 requires all companies to file a plan for infrastructure upgrade and regulatory reform within five years. Bell of Pennsylvania filed almost as soon as the legislation was adopted, and their plans have been approved. Other companies are less eager to file quickly.

Chart XIII. Infrastructure Related Actions in Selected States (cont.)

States Relying Principally on Competition

New York

-No specific Infrastructure Plan
-Relying on competition to stimulate new service development. Idea of "Network of Networks."
-Convened "New York Exchange" to develop principles
-Service and technology "benchmarks" to be developed and monitored.
-Local competition beginning in Rochester and New York City.

California

-Open as many markets to competition as possible
-Streamline regulation
-Monitor deployments to detect inequities
-Details still being developed

Chart XIV. Summary and Conclusions

There is a wide variety of telecommunications services currently available and more to come.

Many existing and evolving technologies may be suitable for providing these services. However, numerous cost and operational uncertainties remain.

Many industry participants are interested in and may be capable of deploying the necessary technologies to provide these services.

Kansas has a modern network, but technology deployment is spotty. Advanced services are being deployed throughout the sate, but most rapidly in metro areas. Both Bell and many independents are planning to upgrade within the next five years.

Different policy approaches have been adopted in different jurisdictions. Except for Tennessee, it is too soon to evaluate their effect on service availability and infrastructure deployment.

Relationship to Other Issues

The future availability of new technology and advanced services in Kansas depends as much on

- Economic incentives to invest in infrastructure development
- Demands for advanced services and the ability to meet them
- Regulatory policy

as it does on the opportunities afforded by technological change.

This review has explored the foundation - the technology.

It is important that this be combined with the rest of the story to develop a telecommunications strategy which will meet the diverse needs of the citizens of Kansas.

Telecommunications Policy Issues

Competition

Interconnection

Pricing

Universal Service

Infrastructure Deployment

Presentation Prepared for the Kansas Telecommunications Strategic Planning Committee

T.E.L.A. Group/DCI
April 19, 1995

T.E.L.A. group

House Sel/Comm. Telecomm.
1-17-1996
Attachment 2

Table of Contents

Goals of Telecommunications Policy

- Provide Advanced Services at Reasonable Rates
- Maintain Universal Service

Proposed Strategy

- Encourage Competition where Appropriate
- Adopt Regulatory Policy to Promote Infrastructure Development

Section One

Competition

I. Competition in Telecommunications

Advantages of Competition

- Promotes Efficient Supply
- Allows Diversity of Choice
- Stimulates a Variety of New Products and Services

Drawbacks and Problems

- Difficult Transition from Monopoly Environment
    - Pricing Distortions
        - "Cream Skimming"
    - Universal Service
    - Potential "Stranded Investment"
    - Service Continuity
    - Definition of "Level Playing Field"

II. Current Status of Competition in Kansas

Local Competition Prohibited

- Tentative Objective of KCC to open some Markets by 2/1/97

Toll Bypass Allowed

- Currently in Operation in KC and Wichita

InterLATA Toll Competitive only among IXCs

- SBC Excluded
- ILECs not Providing

IntraLATA Toll Competitive

- IXCs must use "10xxx" Access Codes
- "1+" Competition under Study

III. Probable Future Status of Competition in Kansas

Local Competition Allowed

- Federal Legislation may Force the Issue
- Generally Regarded as Desirable
- Many Potential Competitors
  - Cable Companies
  - Wireless Companies
  - CAPS

InterLATA Toll Competition Increased

- Likely Loosening of MFJ Restrictions on SBC

IntraLATA Toll Competition Increased

- "1+" Competition Authorized
  - Concurrently with MFJ Relaxation?
  - Before MFJ relaxation?

IV. Local Exchange Competition

Terms and Conditions

- Interconnection Arrangements
- Definition of "Competitive" Services
- How to Regulate the LEC
    - Pricing
    - Other Obligations and Restrictions

Extent of Authorization

- Urban areas only?
- SBC areas only?
- Everywhere?

Timing

- As Soon as Possible?
- Concurrently with Relaxed Regulation for LEC?
- Concurrently with Price Changes?

V. Implications of Local Exchange Competition

Impact on Prices

- Reduce Differential between Business and Residential Rates
- Reduce or Reverse Differential between Urban and Rural rates

Impact on Service

- Need to Find a way to Maintain Service
  - "Carrier of Last Resort" Obligations
    - Designate and Fund
    - Auction Rights and Obligations
    - Maintain as part of LEC Franchise

VI. Toll Competition

InterLATA - Under Federal Jurisdiction

- If MFJ is Lifted
    - Federal Government may Preempt Intrastate
    - State may Free SBC for Intrastate

IntraLATA "1+"

- Prior to MFJ Relaxation?
    - Provides Consumers with Benefits of Competition
    - Accelerates Need for Rate Rebalancing
    - May Permanently Damage SBC's Market Position with some Users
    - Requires Installation of "2-PIC" Software
- Concurrently with MFJ Relaxation?
    - Consumers must Wait
    - SBC and IXCs can Concurrently offer "Full Solutions."

VI. Policy Issues Associated with Transition

Should LEC Regulation be Relaxed for Competitive Services?

- How are Competitive Services Defined
  - Authorized
  - One competitor
  - Several Competitors
  - Specified Market Share

Should There be any Constraints on LEC Provision of competitive Services?

- Price Ceilings - Competition should make these unnecessary
- Price floors - Perhaps an antitrust standard

Should unlimited resale be Allowed?

- Some Services are Priced Below Cost - Unfair Competition for LEC?
- Lowers Barriers to Entry for Competitors

Section Two

Interconnection

2-12

I. Interconnection

Essential for Local Exchange Competition

Comprises Many Elements

- Points of Interconnection
- Degree of Unbundling
- Functions and Features to be Shared
- Pricing

Several Possible Processes

- Rulemaking
- Negotiation
- A Combination of the Above

Dealt with in Many Jurisdictions

- FCC (ONA, Colocation)
- New York
- California
- Illinois
- Kansas (KCC Interconnection Docket)
- Many others

II. Elements of Interconnection

A. Points of Interconnection

What Interfaces must be Opened by LECs

- At Local Switch
- At Cross-Connect Point in Outside Plant
- At Cross-Connect Point in Wire Center

Where

- At LEC Building
- At Competitor's Building
- Elsewhere

B. Degree of Unbundling

Minimal
  Loop, Switch Port, Trunk
Extensive
  Network Subelements

C. Functions and Features to be Shared

- Telephone Numbers
- Directory listings
- Signaling System (SS7) Access
- Directory Assistance
- Emergency Services
- Other

D. Pricing

- "Cost Based"
- Negotiated
- By Feature and Function
- By Access Port
- By Traffic Volume
- Reciprocal

III. Processes for Ensuring Necessary Interconnection

A. Rulemaking

- Cumbersome and Time Consuming
- Contentious
- May lead to Results not Geared to Market
- Available to All

B. Negotiation

- Focused on Needs of Parties
- Requires Arbitrator (KCC)
- Available only to Parties

C. Combination

- Start with Negotiation
- Require Filing of Agreement
- Agreed Terms Available to All, but not Mandated
- May Inhibit Negotiation

Section Three

Pricing and Universal Service

2-16

I. Pricing History

Monopoly providers, largely Bell

- "Separations" began in the 1950s to keep local rates low
  - Long distance "costs" fell faster than local service "costs"
- Competition began in long distance services in the 1970s
  - Led to cost studies of specific services

Cost studies mired in controversy

- Problem: joint costs
- No Good solution - no "correct" theory

Rate of return regulation designed for monopolies

- Only aggregate costs were needed
- Application to specific services awkward and ill defined
  - Should policy avoid it?

II. Pricing policy issues

Goals:

- Universal service at reasonable rates
- Efficency
  - Competition; no barriers to entry; level playing fields
- Equity for "stranded capital"

Problems

- Current Prices not Related to Costs
  - Competition enters selectively
  - LEC costs largely fixed

How to

- Allow transition to competition
- Treat "stranded capital" equitably

Should entry be limited in some way?

- For small markets?
- Over Time?
- Until LECs are free to compete?

III. Pricing Policy Alternatives

Price regulation - Price caps

- Advantages:
  - "Incentive regulation" - encourages efficiency, innovation
  - Does not rely on costs of specific services
- Disadvantages
  - Consumers do not get the full benefit of cost reductions
  - No guaranteed return - investment may decline

Cost regulation - Rate of return

- Advantages
  - Guaranteed return - stimulates investment
  - Ensures consumers do not fund "excess profits"
  - Closer KCC control of SBC
- Disadvantages
  - Distortion of LEC incentives - may overinvest
  - Problems of mixed regulation and competition
  - Higher costs of regulation

IV. Pricing Policy in Transition to Competition

Goal - to bring prices close to "costs"

- LECs lose revenue when competition occurs
  - "Overpriced" toll rates fall
  - Customers move to competitors

Possible LEC strategies

- Improve efficiency, i.e., reduce work force
- Rebalance rates
  - Increase local "monopoly" rates
  - Lower toll "Competitive" rates

Efficiency improvements may be insufficient

Rapid rate rebalancing is difficult

- Disorientation of consumers
- Political opposition

Slow rate rebalancing may be good, even inevitable

- Moves prices closer to costs - economically efficient

V. Possible Form of Price Caps

Cap for residential and basic business services

- % price change = CPI - X + Y

  Where

  CPI = % Change in Consumer Price Index

  X = Expected Productivity Increase

  Y = Rate rebalancing Factor

Proposed Procedure for setting X and Y

- KCC determines values of X and Y
  - X based on
    - Productivity Improvement Estimates
    - Comparison with other states
  - Y based on
    - Reductions in toll revenues due to price reductions
    - LEC losses from competition
      - Only partial offset - to keep appropriate incentives
    - Limits on rate of local price increases

VI. Universal Service

Several Aspects

- High Cost Areas
- Low Income Customers
- Residential Service Prices
- Universal service fund

Current Funding

- Interstate Toll Access Charges
- Intrastate toll Service
- Intrastate toll access charges
- FCC/NECA funds
- High revenue users (business)

Problems as Competition Appears

- Access charge revenues decline (due to bypass)
- Intrastate toll revenues decline (due to competition)
- How to deal with "Carrier of Last Resort" issues?
- Large users targeted by competitors

Possible Solutions

- Accept Federal actions on Interstate portion
    - Interstate Access Charges
    - FCC/NECA Funds
    - Other actions

- Within the Intrastate jurisdiction
    - Rebalance Rates
    - Set up State Universal Service Fund
        - How big?
        - Who pays?
        - Who gets?

VII. Pricing for Optional local services

Long-run goal: let the market determine prices

- Demand for optional services is elastic
- Even monopoly prices are limited by demand

Can LECs find the optimum monopoly price?

- How to determine?
- Should policy help if they cannot?

Possible timing

- When price caps are revised and made permanent
- When competition is allowed

VIII. Intrastate access charges

Long-run goal

Intrastate access charge equals interstate access charge

- Closer to costs
- Interstate access charges trending down
- Easy to administer
    - Current intrastate access charges:

SBC	$.041 per minute
United	$.11 per minute
ILECs	$.09 per minute average (range: $.05-$.20)

    - Current Interstate access charges:

SBC	$.028 per minute

Possible timing

- In concert with rate rebalancing
    - Rapidity helps economic activity
    - Slowness encourages uneconomic by-pass
- Potential problem
    - How to replace lost revenue

IX. Alternative Starting Points for Price Cap Plan

A. Start with Current Prices

B. Undertake a Rate Case to Determine Proper Prices to Start

- Issue - Parties do not agree about the appropriateness of current prices and earnings levels
- Reasons for a Rate Case
  - Do not perpetuate excessive earnings
- Reasons against a rate case
  - Will get mired in controversy
  - May lead to local rate reductions - wrong direction
  - Local rates already below national average
  - May reduce funds available for infrastructure
  - May be unnecessary in any event
    - Competition will bring prices down
    - Only partial offset allowed in price cap plan

Section Four

Infrastructure Deployment

I. Definition of Infrastructure

A.. General Definition

in-fra-struc-ture: 1. An underlying base or supporting structure. 2. The basic facilities, equipment, services and installations needed for the growth and functioning of a country, community or organization. *The American Heritage Dictionary.*

B. Proposed Definition for Telecommunications in Kansas

All equipment and facilities in place within the State of Kansas used for, or capable of being used for, the instantaneous transmission of information among two or more points not located on the same physical premises.

Includes:

- Radio and TV Broadcast
- Telephone networks
- Cable TV Networks
- Private Networks
- Cellular systems
- Private lines

Excludes:

- Terminal equipment

II. Elements of Infrastructure

Service Capabilities and Kansas Deployments as per Technology Report

• Voice grade fixed point-to-point	- Fully deployed
• Voice grade mobile	- Fully deployed
• Broadcast video	- Fully deployed
• Call management	- Extensively deployed
• Digital data	- Limited deployment
• Interactive video	- Sparsely deployed

III. General Approach

A. Basic premises underlying infrastructure deployment plan

1. People find it very difficult to envision how they will use services unlike those with which they are familiar. User needs studies more useful for familiar services.

2. Telecommunications services are more valuable as more people have access to them. Hence difficult to start services which no one has, like video telephony.

B. How to get Started

1. Widely deploy common underlying facilities

2. Deploy for specific customer applications by:

- Waiting for market demand, or
- Establishing regulatory policy
  - Set priorities for deployment
  - Set targets for pricing
  - Determine how it is to be financed

IV. Possible Deployment Strategy for Kansas

A. Focus on Service Capabilities not Fully Deployed

- Call management
- Digital data
- Interactive video

B. Accelerate deployment of common use equipment to support the above service capabilities as follows:

1. Call Management

   Complete deployment of SS7 in all switches

   - Modify digital switches
   - Replace 2BESS and electromechanical switches

2. Digital Data

   Provide Basic Rate ISDN accessibility everywhere, priced to stimulate widespread acceptability

   - Modify switches and/or build an overlay network
   - Price is part of committed deployment plan

3. Interactive Video

   Provide fiber interoffice connectivity to every central office

V. Effects of Suggested Deployment Strategy

1. CLASS and database access services ubiquitously available
2. Digital data service (Basic Rate ISDN) accessible everywhere
    - Can be used by residential and small businesses for
        - High speed fax
        - High speed information service access
        - Low resolution video
        - Encrypted voice
        - Other
3. Backbone network adequate to support interactive video services.

VI. Serving Specific Customer Groups

Identify potential customer groups to be targeted for interactive video capability, e.g.

- Colleges and Universities
- Major Health Care Facilities
- Secondary Schools
- Industrial Parks
- Large Business Locations
- Secondary Health Care Facilities (Clinics, Groups of Doctors)
- Community Centers
- Primary Schools

Prioritize, based on:

- Perceived public benefit
- Ability to use services effectively
- Cost of provision

Establish appropriate regulatory policy (wait for market demand or establish specific goals)

VII. Possible Implementation Approach

1. Establish principles and objectives for regulatory reform and infrastructure upgrade

2. Require every telephone company to file a network infrastructure and regulatory reform proposal with the KCC, which contains:

   Specific plans and schedules for meeting defined infrastructure objectives

   - Objectives to be specified in terms of service capability penetrations, possibly differing by
     - Telephone company size
     - Local demographics (rural, urban)
   - Objectives can be limited to common use equipment, or include particular customer groups and applications.

2. File associated proposals for:

   - Transitioning to competition
   - Rebalancing rates (if desired)
   - Ongoing regulation of non-competitive services

3. Encourage cooperation between cable companies and LECs in rural areas

VIII. Possible Elements of Infrastructure Plan

1. Criteria to be Established by Legislature or Commission

- Dates for 100% deployment of SS7
- Dates for full accessibility of basic rate ISDN
- Dates for 100% fiber connectivity
- Sequencing and dates for interactive video deployment to specific customer groups

2. Considerations in Setting Objective Dates

- Dates may differ depending upon telephone company size
- Dates may differ depending on local demographics
- Cost data may be used to develop initial objectives
- Processes for periodic review and criteria for change should be established

Theory and Practice of Price Caps

Weber Temin & Co./DCI

Presentation for the
Kansas Telecommunications Strategic Planning Committee

May 9, 1995

House Sel/Comm. Telecomm
1-17-1996
Attachment 3

I. Problems with Rate of Return Regulation

(From Economics Literature)

- No incentive for telcos to operate efficiently
- Incentive for telcos to misrepresent costs
- Incentive for telcos to "gold plate" investment
- "Value of Service" prices are inefficient
- Opportunity for cross-subsidization of competitive services
- Opportunity for "rent seeking" in regulatory proceedings
- Large administrative costs

II. Advantages of Price Caps

(From Economics Literature)

- Incentive for telcos to operate efficiently
- Incentive for telcos to innovate
- No reason for telcos to distort cost data
- No reason for telco to "gold plate"
- Prices can evolve towards more efficiency
- No opportunity for cross subsidization
- Less opportunity for "rent seeking"
- Lower cost of regulation

III. Price Caps in Practice

Impossible to set a formula once and for all

- Lack of information prevents an eternal rule

Actual price caps are hybrids

- Telcos keep gains temporarily under both systems
  - Reviews less frequent under price caps
- Some price caps set profit ranges for telcos
  - e.g. California

IV. Differences of Regulatory Systems in Practice

Price caps allow pricing flexibility within "Baskets"

- Allows prices to become more efficient

Regulatory lag for price caps is fixed

- Longer intervals between reviews
- Fixed intervals, although they can change periodically

Price cap regulation is forward looking

- Rate of return regulation looks at historical cost
- Price caps attempt to anticipate future costs

V. Survey of State Actions

(From FCC Reports)

Price Caps (11)

DE, IL, IN, KS, MI, NE, ND, OH, VA, WV, WI

Mixed Regulation (6)

CA, CO, DC, FL, GA, PA

Incentive Rate of Return or Planning for Price Caps (14)

AL, ID, LA, MD, MN, MI, MO, NV, NJ, NY, OR, RI, TN, TX

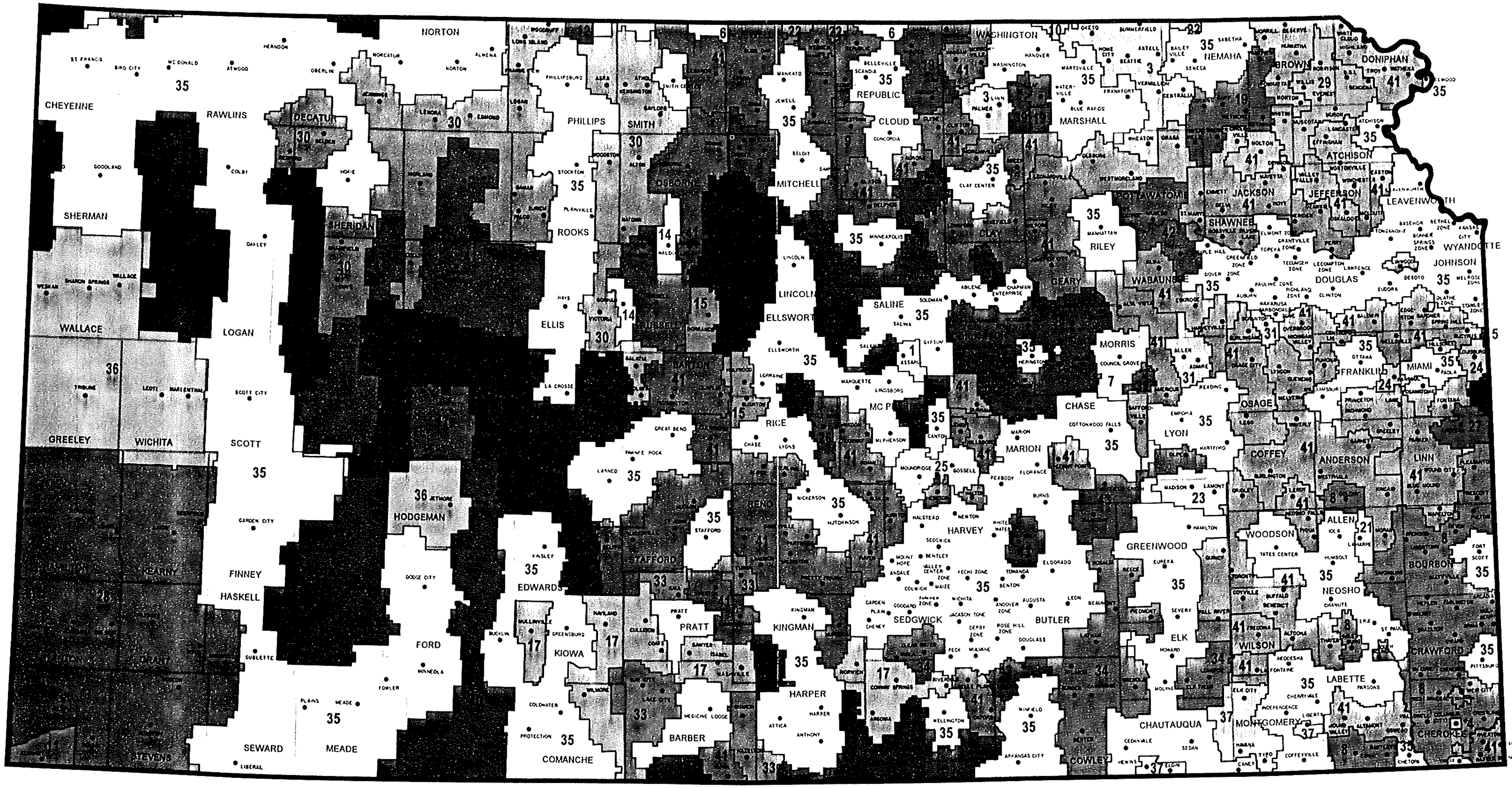
Rate of Return with some Incentives (5)

CT, IA, NH, NM, SC

Traditional Rate of Return (15)

AL, AZ, AR, HI, KY, ME, MA, MT, NC, OK, SD, UT, VT, WA, WY

Note: Some of these are known to be incorrect, but it's probably fairly accurate.



KANSAS LOCAL EXCHANGE CARRIERS

KTA KANSAS TELECOMMUNICATIONS ASSOCIATION

- 1 The Assaria Telephone Exchange, Inc.
- 2 Benkelman Telephone Company, Inc.
- 3 The Blue Valley Telephone Company
- 4 Columbus Telephone Company, Inc.
- 5 Contel Of Missouri, Inc.
- 6 Great Plains Communications
- 7 Council Grove Telephone Company
- 8 The Craw-Kan Telephone Cooperative, Inc.
- 9 Cunningham Telephone Company, Inc.
- 10 Diller Telephone Company
- 11 Elkhart Telephone Company, Inc.
- 12 GTE North, Inc.
- 13 The Golden Belt Telephone Assn., Inc.
- 14 The Gorham Telephone Company
- 15 H & B Communications, Inc.
- 16 Hartman Telephone Exchange
- 17 The Haviland Telephone Company, Inc.
- 18 Home Telephone Company, Inc.
- 19 J.B.N. Telephone Company, Inc.
- 20 The Kan-Okla Telephone Assn., Inc.
- 21 La Harpe Telephone Company, Inc.
- 22 Lincoln Telephone Company
- 23 Madison Telephone Company, Inc.
- 24 Mo-Kan Dial, Inc.
- 25 Moundridge Telephone Company
- 26 Mutual Telephone Company
- 27 Peoples Mutual Telephone Company
- 28 The Pioneer Telephone Assn., Inc.
- 29 The Rainbow Telephone Cooperative Assn., Inc.
- 30 Rural Telephone Service Company, Inc.
- 31 S & A Telephone Company, Inc.
- 32 The S & T Telephone Cooperative Assn., Inc.
- 33 South Central Telephone Assn., Inc.
- 34 The Southern Kansas Telephone Company, Inc.
- 35 Southwestern Bell Telephone Company
- 36 Sunflower Telephone Company, Inc.
- 37 The Totah Telephone Company, Inc.
- 38 The Tri-County Telephone Assn., Inc.
- 39 Twin Valley Telephone, Inc.
- 40 United Telephone Assn., Inc.
- 41 United Telephone Company Of Kansas
- 42 Wamego Telephone Company, Inc.
- 43 The Wheat State Telephone Company, Inc.
- 44 Wilson Telephone Company, Inc.
- 45 Zenda Telephone Company, Inc.

Note: This map is intended to provide a general perspective of LEC boundaries and represents a near approximation only.

House Select Telecommunications
1-17-96
Attachment #4

MEMORANDUM

Kansas Legislative Research Department

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Room 545-N -- Statehouse
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January 16, 1996

POLICY QUESTIONS ON TELECOMMUNICATIONS COMPETITION AND UNIVERSAL SERVICE

Competition

1. Should LEC regulation be relaxed for competitive services?

2. If yes, how should *competitive services* be defined?

3. For which telecommunications services is there currently an absence of effective competition?

4. Should there be any order in which local exchange competition is promoted?

Universal Service

5. Who should be responsible for defining *universal service* and updating the definition thereof?

6. Should a state universal service fund be created and who should be ultimately responsible for determining the specific nature of the fund? (size, eligible recipients, eligible contributors, form of payments and method of assessment, criteria governing provision of support, etc.)

7. Should a Lifeline Program be established for low-income subscribers?

8. If yes, what form should such a program assume?

Resale

9. What are the positive and/or negative effects of resale?

10. If resale should be required, should resale be required for *all* LECs?

11. Under what conditions and when should LECs be required to lift restrictions on resale?

12. How should resold services be priced?

House Sel/Comm. Telecomm
1-17-1996
Attachment 5

13. What services, if any, should the Kansas Corporation Commission require to be resold?

14. What unbundled services, if any, should be available for resale?

15. Should LECs be allowed to resell services below cost?

16. If yes, how should the resale of services be handled for those services that are priced below cost?

17. Who should be allowed to purchase resold services?

Interconnection/Unbundling

18. What interfaces must be opened by LECs and where?

19. What interconnection functions and services should be shared?

20. Is unbundling of network switched services necessary? Cite reasons for response.

21. Should unbundling be required of *all* LECs?

22. If unbundling is required for any or all LECs, what network components should be subject to unbundling requirements and upon what basis should such components be selected for unbundling?

23. What process should be used for ensuring necessary interconnection and under what terms?

24. How should unbundled services be priced?

Regulatory Plan Issues

25. What criteria should be used to determine which services should be subject to price caps?

26. How should the initial price of a service subject to price cap be established?

27. Under what conditions should price capped services be deregulated?

28. If services are deregulated, under what conditions should they be reregulated?

29. Should price floors be established for services subject to price caps?

30. If yes, should price floors apply to each service within a basket?

31. Should such services be based on cost studies and under what terms?

32. What conditions should trigger the reduction by the Kansas Corporation Commission of prices within a given basket?

33. Should price caps be subject to periodic adjustment?

34. If yes, how should price caps be adjusted (formula or index) and why should they be adjusted in such manner?

35. If price cap adjustments are recommended, should there be a limit on monthly per line adjustment increases and, if yes, by how much?

36. Should the specific method of price cap adjustment be subject to periodic review? If yes, at what intervals?

37. Is rate rebalancing necessary? Why or why not?

38. If rate rebalancing is necessary, over what period of time should rate rebalancing occur?

39. Should rate rebalancing occur throughout the entire state or only in certain geographic areas? Explain.

Telecommunications Infrastructure

40. Should each LEC be required to file a network infrastructure plan, such as the one specified in the proposed *Policy Framework*, with the Kansas Corporation Commission?

41. Should this requirement be explicitly linked to any Commission determinations calling for relaxed regulation? Why or why not?

42. What facilities and services should be included in a network infrastructure plan? Should other issues, such as quality of service, be included as part of such a plan? Why or why not?