

WHITEPAPER: Preparing for the Promise of Voice-over Internet Protocol (VoIP)

Cox Communications' Strategic Approach to Maximizing the Business
of Cable Telephony

EXECUTIVE SUMMARY

Voice over Internet Protocol (VoIP) technology enables transmission of phone calls via the same networks that carry Internet traffic. While IP-based phone services aren't yet a fixture in many homes, the convergence of data and voice technologies is well underway, and VoIP services are expected to be widely available to residential consumers within the next few years. For companies like Cox Communications, the nation's fourth-largest broadband cable company and already a successful provider of circuit-switched phone services, VoIP offers exciting potential growth opportunities. It also poses numerous outstanding questions.

Because VoIP is not yet viable for widespread deployment of residential, primary-line, lifeline phone service, Cox has not committed to specifics related to deployment of IP phone services. However, the company is actively pursuing VoIP, is conducting trials of the technology, and foresees several compelling benefits, including opportunities to:

- Leverage its existing nationwide IP backbone network
- Expand phone service into new markets
- Leverage its considerable telecom expertise, experience and infrastructure
- Protect the investment in its circuit-switched telecom operations, since VoIP would be complementary to its existing technology
- Generate cost efficiencies by regionalizing many components of delivering phone service
- Reduce costs by transporting long distance calls over its IP network
- Offer customers exciting new phone features

Despite the attractiveness of VoIP, Cox is nevertheless prudent in its approach to the technology. Further, the company disagrees with what it believes to be overstated, potentially misleading cost comparisons of VoIP vs. circuit-switched technologies. Widely reported predictions that VoIP will be less than half the cost of circuit-switched technology focus only on specific VoIP equipment and devices, and exclude costs related to the network and other necessary pieces of transport architecture. Cox estimates about an 8-to-10 percent cost improvement when VoIP services are compared apples-to-apples with primary-line, circuit-switched, network-powered phone services. Excluding those functions and related equipment – meaning that subscribers

would purchase their own in-home VoIP equipment and be responsible for powering it – the cost of VoIP vs. circuit-switched would improve significantly, but then the two services would be vastly different in quality, reliability and robustness. Further, outstanding questions related to powering, law enforcement requirements, emergency 911 and other issues increase the difficulty of accurately predicting ultimate operational details and cost benefits of VoIP.

Ultimately, Cox feels it is in an ideal position relative to development of VoIP-based services. Because the company is already a successful telecom provider and is generating continued record growth with its circuit-switched services, the company is not forced to abandon or radically alter its strategy in order to compete effectively in the telecom business. Cox will not launch VoIP services until the technology is ready for widespread deployment and when it makes prudent business sense. At that point, Cox believes it will be able to launch VoIP successfully and seamlessly in a manner that complements its existing technology, and will do so efficiently and at a lower cost than other providers given Cox's extensive telephony operations and expertise.

COX TELEPHONY MARKETS



Cox Digital Telephone service is available to more than 3.8 million homes in San Diego and Orange County, Calif., Phoenix, Ariz., Oklahoma City, Okla., Omaha, Neb., New Orleans, La., Hampton Roads, Va., Meriden, Conn. and Rhode Island. Cox will launch the service in an additional market in 2003.

Unless otherwise noted, subscriber numbers, penetration rates and all other statistics provided herein are as of December 31, 2002.

INTRODUCTION

Over the past few years, Cox Communications has grown from a single-service cable television company into a multi-service broadband communications provider. Via its powerful broadband delivery network, Cox now offers customers in most of its markets multiple communications and entertainment services, including traditional and digital cable TV, high-speed Internet access and residential telephone, and is beginning to offer additional services such as high-definition TV and video-on-demand. The company also delivers a variety of video, voice and data solutions to commercial business customers. Cox has not only leveraged the power of its broadband network and created multiple revenue streams, but also has created more profitable, longer-term customer relationships. Cox customers continually validate the company's strategies, as evidenced by the impressive growth experienced by these new services.

COX DIALS UP TELECOM SUCCESS

No discussion of Cox's VoIP plans can start without first exploring the company's success as a circuit-switched telecom provider. Cox first launched its Cox Digital Telephone service to 1,500 homes in Orange County, California, in September 1997. Today Cox processes more than 24 million phone calls a day over its broadband network. The company's 740,000 residential phone customers make it the nation's 12th largest local phone provider, and second largest in many of the states in which it offers phone service. Seventeen percent of homes to which Cox has marketed the service subscribe to it, while in areas where the service has been available the longest, penetration is much higher, up to 40 percent. Moreover, the company's most recent customer research revealed that nine out of 10 Cox Digital Telephone customers are satisfied or very satisfied with the service, while 94 percent would recommend it to a friend, and 97 percent are likely to keep the service.

After only five years, Cox's phone service is profitable, delivering operating margins in the mid-twenty-percent range for the full year 2001, and margins approaching 35 percent in 2002. The company expects to reach and maintain steady-state telephony margins of around 40 percent. Phone revenue averages \$50 per customer per month, which is higher than initial expectations. Additionally, the service is having a positive impact on Cox's overall operations by helping improve customer retention across all services. Ninety percent of Cox Digital Telephone customers subscribe to an additional Cox service, while 40 percent subscribe to the full three-product bundle. Notably, among three-product customers, churn is reduced by 50 percent over rates among single-service customers.

Cox's telephony business, in particular, clearly distinguishes the company from its peers and competitors. In the mid 1990s, Cox began installing switches and other telecom equipment in select markets, preparing to capitalize on the Telecommunications Act of 1996, which officially opened the telecom market to competition. Cox first launched local phone service in 1997; today it is available to 4 million customers in nine markets (Cox will launch its 10th telephony market in 2003). During that time, Cox has amassed a wealth of telecom expertise by successfully entering this complex business and perfecting the many operational processes and procedures associated with delivering phone service. To this point, Cox is one of only two major U.S. broadband companies to aggressively pursue and widely offer local phone service. Some broadband companies that have not yet launched telephony services are ostensibly awaiting commercial availability of other telecom technologies – most notably, Voice over Internet Protocol (VoIP).

Telecom observers have long heralded the coming of VoIP, touting potential benefits such as cost savings and robust new features enabled by this flexible, dynamic technology. "We've been asked by some critics, 'Why didn't you wait for VoIP?'" notes Chris Bowick, Cox's Senior Vice President of Engineering and Chief Technical Officer. "The simple answer: *We'd still be waiting*. Instead, because we pioneered cable telephony via circuit-switched technology, we have more than five years of in-the-trenches experience as a telecom provider. We've navigated the complexities of the business; we've built a tremendous technological and operational base on which to deliver phone service; we've delivered significant financial results from it already; and, above all, we have proved to nearly 750,000 customers that they can depend on Cox for their phone services – for multiple services, in fact."

Today, VoIP technology has not been widely deployed for residential local-loop, primary-line, lifeline phone service. However, the pieces are falling into place, and development is proceeding on numerous fronts. Most experts predict wide commercial deployment of residential telecom services via IP technology in the near future – most likely by 2004.

Cox recognizes the potential viability of VoIP and is actively evaluating and pursuing the technology. The company has conducted one technical trial of alternate-line phone service utilizing a hybrid-IP-circuit-switch architecture and is planning a second alternate-line trial via the cable industry's soft-switch-based PacketCable architecture. The company also is exploring development of other enhanced services that could be enabled by VoIP architecture. "We are in a great position relative to the development of VoIP services," Bowick says. "We are already a successful telecom provider. When we also develop and deliver phone service via VoIP technology, we will have the luxury of not doing so until it makes good business sense from a technical, financial and operational perspective, and when the technology is robust and reliable enough to integrate seamlessly with our circuit-switched operations. Importantly, we won't be forced to abandon our existing technology in favor of VoIP, because we believe the two technologies will be complementary. When VoIP technology is viable for wide residential deployment, we really see it as a potential win-win scenario, one in which we control our destiny and in which we can leverage our tremendous base of telephony expertise and infrastructure for maximum benefit to Cox and our stakeholders."

COX'S STRONG BASE

Already a successful telephone provider, Cox attributes much of its success to the strong operational base on which it built the service. To start with, Cox has long enjoyed excellent relationships with customers, which the company accurately wagered would translate into customer loyalty. "If you haven't proved to your customers that you're capable of delivering traditional cable service efficiently and at a high value to them, they're never going to trust you to deliver their lifeline phone service. A lot of companies seem to underestimate the critical importance of this fact. It's one thing to have your network and technology in place, but entirely different and more difficult to also possess the know-how and track record of actually serving customers' many needs effectively. It is a fundamental requirement that can't be underestimated or minimized," says Bowick. Additionally, Cox is fortunate to have strong management teams across the company. In its local operations, Cox managers and their staffs can tailor key pieces of product development, marketing and service deployment to the individual needs of their markets, while at the same time benefiting from the companywide standardization, resources and expertise deployed to the phone business.

Another key asset contributing to Cox's success as a telecom company is its powerful network. Over the past decade, the company has upgraded the network in its local markets to deliver capacity and reliability on which to layer advanced services. Presently, about 90 percent of the company's homes-passed are at least 750Mhz, two-way activated. In its telephony markets, Cox's ring-in-ring network architecture delivers the redundancy and reliability necessary to deliver lifeline telecom services. Moreover, Cox's phone service is network powered, offering an extra layer of reliability and backup in the event of power outages. The company's phone service meets the Bell Core reliability standard of 99.999 percent reliability. Cox has effectively managed its spectrum for ample capacity for all of the services it delivers – existing services as well as advanced offerings coming in the near and distant future. Cox has devoted only 8-12 Mhz of bandwidth to its phone service, a relatively small but nevertheless ample space to support its present state and future growth.

Just as important as the power of the network is the complex system of back-office functions and processes that must be perfected in order to effectively deliver service. These functions include call processing, emergency 911 services, billing, data sharing, phone number administration, local number portability, operator services, directory assistance, directory listings, inter-exchange agreements with incumbent phone companies, calling cards, and numerous other requirements. "Customers are oblivious to the inner-workings of a telephone network – as they should be," says Jim Renken, Vice President of Operations Support. "But service providers can't be oblivious. We must be on top of countless operational details to ensure that a call goes through seamlessly from point A to point B. You simply can't underestimate the importance of standardized methods and procedures. Individually, some of these procedures are small, but their significance is huge if anything goes wrong. At Cox, we have an organization devoted exclusively to perfecting support and delivery processes. This group develops methods, procedures, audit processes and measurements that impose discipline and efficiency on the delivery and support of all of our video, voice and data services."

A key asset in Cox's ability to manage the back-office functions of delivering phone service is its integrated customer management system. Cox is the only major broadband company that operates 100 percent of its field locations and all of its video, voice and data services on a single back-office platform. The vast capabilities of this system help provide a smooth experience for Cox customers at all stages of the relationship. Cox's system ensures seamless flow of functions, including order entry, scheduling, installation, billing and service provisioning. The value of this integration is tremendous, allowing Cox's customer service representatives to efficiently sell and activate all services utilizing a single system, at one time, with one phone call, and one view of all relevant customer data. Cox also is able to offer customers the flexibility of receiving one

billing statement for multiple services, choosing a single bill for each, or selecting a combination of those options. Lastly, the back-office integration supports a high degree of automation, eliminating paper and manual processes that erode margins and cause errors and customer dissatisfaction.

“The steep learning curve in the telephony business is rooted in large part in back-office functions – provisioning services, managing data, and integrating information about multiple services into one central location,” emphasizes Scott Hatfield, Senior Vice President and Chief Information Officer. “Mastering these functions is not easy, but Cox has successfully navigated the lengthy, difficult learning curve. To successfully deliver phone service, a company has to not only build this capability, but also must migrate each operation. This requires a complete reorientation away from traditional local, stand-alone systems and procedures to highly scalable, reliable, standardized processes. Companies that have not yet begun to face these issues are in for a rude awakening. On the other hand, Cox has faced them, has had several years of experience perfecting them, and has built a powerful base of knowledge and expertise in them. This base of knowledge and resources is an important requirement, whether you’re using circuit-switched or VoIP technology. Our back-office systems and processes will be highly leveraged for our VoIP services.”

Cox has the backbone

In 2001, Cox created a companywide OC-48 IP backbone network on which it now transports Cox High Speed Internet and Cox Business Internet services (see diagram, page 5). The backbone interconnects all Cox markets and passes through other major metropolitan hubs including Chicago, Dallas, Los Angeles and New York. The network includes 11 regional data centers (RDCs) and three services data centers (SDCs). These centers provide Cox with both a national presence, well beyond the local-only networks typical in the cable business, and an attractive economic foundation for realizing significant geographic efficiencies enabled by the network. Instead of dedicated equipment in every data market, Cox regionalizes some components of service delivery into these centers. This architecture offers attractive possibilities for further leveraging the backbone to integrate data and telephony services. In addition to hosting and sharing mail, news, web space and other components of Internet service, the SDCs potentially could serve as hosting locations for VoIP soft-switch technology for nationwide telephony coverage.

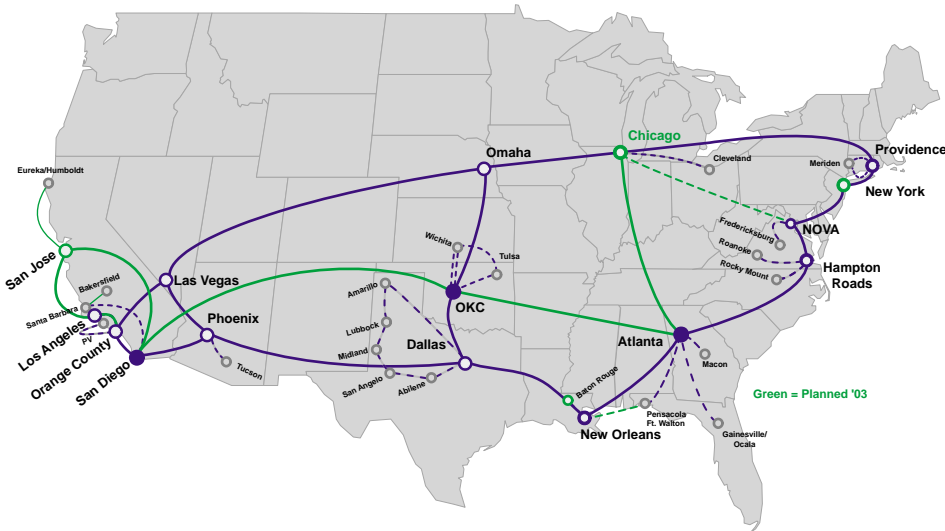
WHAT IS VOIP?

Despite common misconceptions, VoIP isn't a service. It's a technology protocol that enables phone calls to be transported over an IP-based data network and permits the layering of multiple services, including commercial telephony, primary-line residential service and secondary-line residential service, on the network. With VoIP technology, voice "packets" are transported along with data packets over private, managed networks.

Managed VoIP vs. Internet telephony

The VoIP services that telecom providers like Cox will likely offer residential customers in the future will be delivered over managed networks with end-to-end quality-of-service monitoring, as opposed to Internet telephony. Today, with Internet telephony, calls delivered from one computer to another are transmitted via the public

Cox High Speed Internet Backbone



Cox's IP (Internet Protocol) backbone network supports delivery of its Cox High Speed Internet and Cox Business Internet services. The backbone, which interconnects all of Cox's operations as well as other major metro hubs, could be leveraged for deployment of VoIP services. It presents the company with numerous opportunities to realize cost and operational efficiencies.

web of networks that comprise the Internet. They are unmanaged and susceptible to the same slowdowns as data traffic on the Internet. In fact, voice transmissions are treated the same as data transmissions, and providers have little control over the quality of the transmissions once they hit the public Internet. Further, Internet telephony doesn't offer emergency 911, operator services or quality-of-service guarantees and,

therefore, shouldn't be relied upon for primary-line service. Internet telephony is essentially an enhanced feature of an Internet service, like email or web access. In the managed VoIP model, on the other hand, voice packets are labeled with identifiers; if there ever is a question of network traffic capacity at any point in the transport chain, the voice packets would automatically take priority.

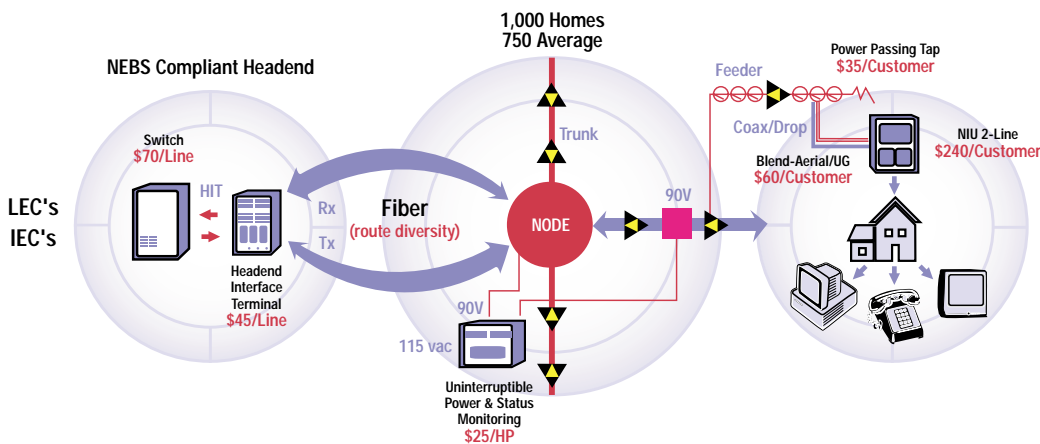
The VoIP market

Today, because of its transport efficiency, IP is already utilized to carry voice – primarily in the long-distance transport network. However, for wide commercial and residential deployment all the way down to individual homes and businesses, service providers are awaiting development of the remaining pieces of technology that will ensure quality transport in the last mile – the connection from homes and businesses to the IP backbone. In Cox’s case, when the equipment and processes are in place for residential

deployment, its commercial sales unit would be able to leverage those same systems for wider launch of VoIP services for its business customers.

Cox Digital Telephone Service - Circuit Switched

(Capital requirements for "telephone ready homes passed")



COST COMPARISON - DIAGRAM A

The major equipment and network components required for delivering Cox Digital Telephone are depicted here. As calculated below, the cost per customer for circuit-switched, primary line, lifeline phone service is approximately \$610. The diagrams on the following two pages compare relative estimated costs for two versions of packet-switched VoIP phone service.

| | \$/Line | \$/Customer (1.3 lines/Cust.) |
|--------------|--------------|----------------------------------|
| NIU | \$185 | \$240 |
| Drop | \$46 | \$60 |
| Tap | \$27 | \$35 |
| HIT | \$45 | \$59 |
| Switch | \$70 | \$91 |
| Power* | \$125 | \$125 |
| Total | \$498 | \$610 |

*Assumes 20% penetration of homes passed.

if voice is being transported at any given time. In a dial-up connection to the Internet, for instance, that phone line is locked in as long as the user is logged on, regardless if he or she is even at the computer. VoIP technology uses available bandwidth more efficiently. When users aren't talking or data isn't being transmitted, bandwidth is not tied up and is therefore available for other uses and users. In a broadband environment using VoIP, a single connection would enable users to talk on the phone and surf the Internet at the same time. Additionally, the packets transported over VoIP architecture are broken into capsules that are merged efficiently onto a network highway, so to speak, with traffic from other calls, emails, etc.

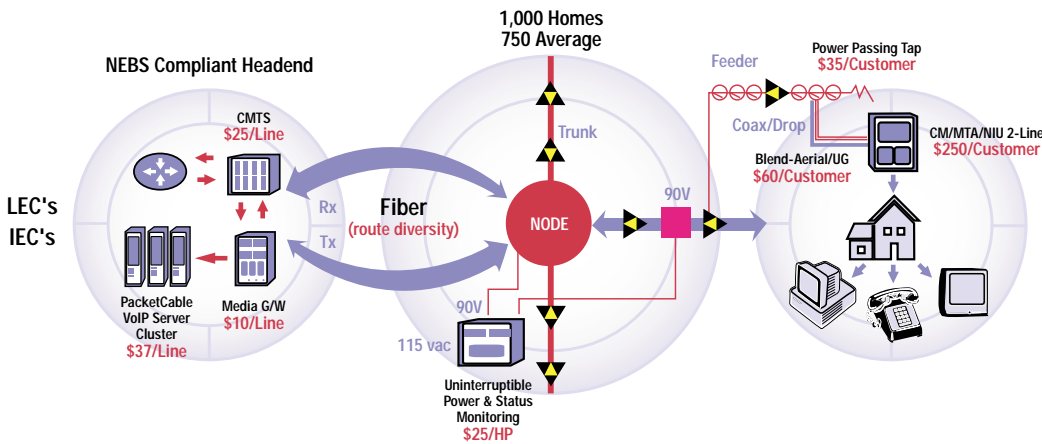
The hardware, techniques and protocols for VoIP are largely off-the-shelf, interchangeable and being developed rapidly by numerous vendors, which would likely create cost efficiencies and a dynamic, continually advancing environment for VoIP-based services.

In comparison, circuit switched technology is more mature. Because the functionality in the VoIP space is the same functionality driving the Internet, it is therefore perceived as more open and flexible, ostensibly allowing providers to take advantage of the equipment and technology at a higher level of productivity and cost savings.

The scalability of VoIP technology also has been touted as a harbinger of cost savings. For instance, circuit switches are geographically restricted, with a switch required for each distinct service area. With VoIP technology, on the other hand, it is

Telephone Service - Packet Switched - Network Powered

(Capital required for IP NIU-based "telephone ready homes passed")



COST COMPARISON - DIAGRAM B

The VoIP "soft-switch" option depicted here represents an "apples-to-apples" comparison with Cox's current circuit-switched offering, including network powering. The estimated 8 percent cost savings is derived primarily from the lower cost of the data-based Cable Modem Terminating System (CMTS) versus the Headend Interface Terminal (HIT), and of the soft-switch components versus a circuit switch.

| | \$/Line | \$/Customer (1.3 lines/Cust.) |
|--------------|--------------|----------------------------------|
| NIU / MTA | \$192 | \$250 |
| Drop | \$46 | \$60 |
| Tap | \$27 | \$35 |
| CMTS | \$25 | \$32 |
| Soft Switch | \$47 | \$62 |
| Power* | \$125 | \$125 |
| Total | \$462 | \$564 |

*Assumes 20% penetration of homes passed.

Another likely advantage of VoIP is the capacity for advanced service features. Among the options predicted are unified messaging; personal portals; caller ID on the TV set; point, click and call personal directories; talking email; and customized dial tones and greetings. These value-added differentiators could position competitive local phone companies like Cox favorably against traditional local exchange carriers, as the RBOCs likely will be more limited in their ability to match such options given the limitations of their twisted pair wiring and existing architecture. This advantage could potentially expand the competitive carriers' offerings beyond "me too" services, giving them a distinct advantage over incumbents' services.

foreseen that a "soft switch" can be installed at the regional level, allowing multiple markets to utilize it, with only limited equipment required locally. This would be particularly beneficial in an operator's smaller markets where the potential customer base doesn't justify the cost of a switch. It would help the operator defray the significant up-front investment and recoup it faster.

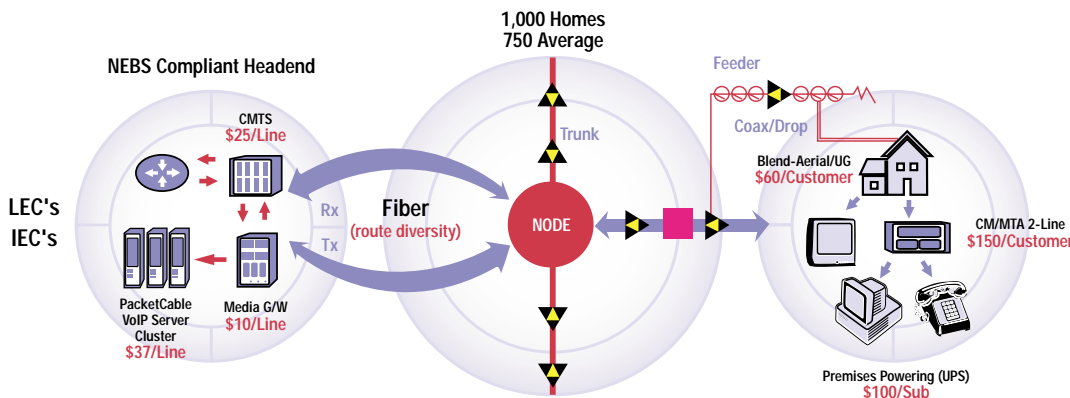
Another likely advantage

CAUTION

“Certainly, there are several key advantages that we would likely be able to realize with VoIP, and that makes this technology very exciting and potentially viable for our company,” notes Bowick. “However, it’s critical to remember that many of these perceived benefits are based on assumptions and that the savings remain hard to quantify. There are numerous outstanding issues concerning equipment, powering options, integration of devices, etc., that make it imprudent to draw too many conclusions – especially with

Telephone Service - Packet Switched - Premises Powered

(Capital required for internal MTA-based "telephone ready homes passed")



COST COMPARISON - DIAGRAM C

This VoIP soft-switch option, based on premises powering inside the home, is estimated to be 34 percent less expensive than circuit-switched telephony and 28 percent less than network-powered VoIP. However, the service depicted here is not a primary-line, lifeline service and therefore is not an apples-to-apples comparison with either of the other two options.

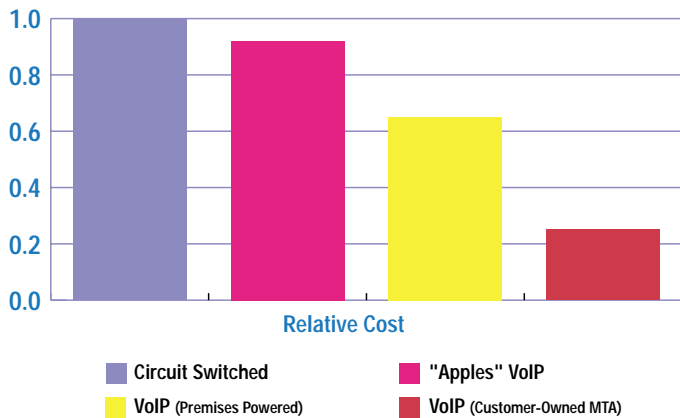
| | \$/Line | \$/Customer (1.3 lines/Cust.) |
|-------------------|--------------|----------------------------------|
| Cable Modem / MTA | \$115 | \$150 |
| Drop | \$46 | \$60 |
| Tap | \$0 | \$0 |
| CMTS | \$25 | \$32 |
| Soft Switch | \$47 | \$62 |
| Power | \$77 | \$100 |
| Total | \$310 | \$404 |

financial considerations. In particular, many of the rosy predictions of significant cost savings that have been floated publicly are incomplete and potentially misleading, and are not true ‘apples’ comparisons with lifeline, network-powered, circuit-switched telephony.” He notes that some predictions are that VoIP telephony will be more than 50 percent less expensive than circuit-switched telephony. However, those figures focus only on specific VoIP equipment and devices,

and exclude costs related to the network and other necessary pieces of the architecture required to provide a lifeline service. As such, these claims are misleading; in actuality, the savings would be reduced when the other necessary costs are factored in.

“Therefore,” Bowick cautions, “any comparison of the ultimate price of IP services versus circuit-switched services must be on an apples-to-apples basis, taking into consideration powering, the transport network, emergency 911, and many other necessary components of phone service. We estimate that VoIP might initially offer an 8-to-10-percent cost improvement over circuit-switched technology for primary-line service with network powering. If you exclude the cost of network powering, NIUs and related functions and equipment, you will likely see savings more in line with the predictions in the 50-to-70-percent range. But the resulting service would be very different than lifeline circuit-switched service, so you would need to be very careful to clearly distinguish between the two.”

Summary CapEx Cost Comparison (Circuit Switched vs VoIP)



- "Apples" VoIP cost is 92% of Circuit Switched
 1. CMTS cost roughly 54% of a HIT
 2. Soft switch cost roughly 68% of a circuit switch
 3. Includes network-powered side-of-home NIU/MTA
 4. CMTS and soft switch are only a small piece of total "apples" cost
- Premises Powered VoIP cost is 66% of Circuit Switched
 1. Delete network powering costs and NIU/MTA
 2. Substitute a lower-cost in-home MTA and UPS power supply
 3. Operational costs of premises powering unknown
 4. No longer an "apples" comparison
- VoIP with customer-owned MTA cost is 25% of Circuit Switched
 1. Removes all CPE and powering from MSO and becomes the responsibility of the subscriber
 2. No longer an "apples" comparison

COST COMPARISON - FINAL

The analysis above compares the relative cost of the options depicted in the previous three diagrams, as well as an option in which powering equipment is customer-owned and maintained.

Outstanding considerations which will impact the amount of ultimate savings from VoIP deployment include:

- Primary or alternate line – Whether to offer primary- or alternate-line services will certainly affect cost considerations. For instance, factors such as law enforcement issues and emergency 911 requirements may make it problematic for providers to deliver VoIP offerings only as second-line services.
- Powering options – There are three primary choices for powering telephone service: network powering, premises powering with batteries installed in customers' homes, or no back-up powering, which would make customers responsible for powering. Beyond evaluation of the technical issues related to these options, further research also is needed to gauge customers' interests and concerns with powering issues.
- Back-office capabilities – Given the critical importance of these functions, companies without an integrated back-office system already in place to support phone operations face a daunting challenge to develop, deploy and master them. Again, amassing the expertise necessary to effectively deliver phone service is not an overnight task; it takes years of intense learning and planning.
- Ultimate availability of the necessary equipment – While much of the VoIP equipment is available currently or at least in development, the technology remains incomplete to support a wide residential deployment of primary line, lifeline services today. It will probably be 2004 before the

functions are sufficiently integrated to allow for robust services to be offered widely to customers, especially if a company intends to take advantage of DOCSIS 1.1 and PacketCable standards that define quality-of-service mechanisms for data and IP services, respectively.

- Differing technical approaches – Individual companies will have to decide which technical architecture to pursue, and how to provision, deliver and integrate VoIP-based services with existing services.
- Network redundancy – In Cox’s case, its ring-in-ring redundant architecture provides an important extra level of reliability for phone services. Without it, there would be some degradation in the number of minutes the service is out in a given period. However, when evaluating VoIP rollouts in new areas, companies including Cox will have to weigh the cost of installing such redundancy with the question of what level of reliability to provide.
- Regulatory treatment – Regulatory commissions are only now beginning to examine and understand VoIP technology. Over the next several years, as commissions delve into questions of how to classify VoIP-based services and many other related issues, their decisions will have significant bearing on providers’ development and delivery of the services.

COX’S VOIP STRATEGY

Despite outstanding issues, Cox is prudently bullish on the potential of VoIP. While measured in its approach and not ready to answer definitively whether VoIP is a sound option for wide residential deployment, the company is actively exploring this technology and foresees several potential advantages that could likely be realized by developing and delivering voice services via the technology.

If current assumptions and hypotheses of VoIP technology are realized, Cox foresees the following benefits of VoIP:

- It will allow the company to leverage its existing nationwide IP backbone, telephony infrastructure and back-office functionality to realize potentially significant cost efficiencies in the expansion of its phone service.
- VoIP technology will permit geographic expansion of Cox’s phone services, allowing the company to launch telephony in markets where the economics don’t justify the cost of a circuit switch. Further, it will provide the flexibility to determine market-by-market whether to expand service in existing phone markets with a circuit-switched-only approach, or with a complementary VoIP overlay.

- The company will be able to regionalize many of the functions and much of the equipment associated with delivering phone service, spreading the costs across multiple markets, for cost savings and efficiencies.
- Cox will leverage its considerable telecom expertise, people power, and internal processes and procedures amassed over more than five years as a successful provider of residential and commercial phone services.
- VoIP technology will enable Cox to introduce phone services to customers the company isn't currently reaching – without stranding the capital it has invested in its circuit-switched operations. The company would not abandon its circuit-switched business. There would be no reason for an existing customer to move from circuit-switched to VoIP technology, unless they wanted the expanded features likely enabled by VoIP. Otherwise, the technology would be transparent to customers. Cox fully intends to be able to completely utilize the capacity of existing switches.
- With VoIP, Cox anticipates that payback on capital investment would be accelerated, not only because upfront costs may be less and the equipment could be leveraged over a larger geographic area, but also because of the potential for new service features for which customers likely will be willing to pay more.
- VoIP offers Cox the potential to deliver long distance service over its own IP backbone network. Presently, the company is a reseller of long distance transport purchased from wholesalers, but the company's national backbone gives it the option of transporting long distance voice traffic. With its network, Cox could potentially transport all of the long distance traffic to its own business locations, as well as its customers' long distance calls, thus minimizing reliance on third-party wholesale long distance providers.
- The company could offer unique calling features to customers of a VoIP service, which would further integrate its video, voice and Internet offerings, increase revenue per customer and enhance Cox's competitive position versus other telephone competitors, who would likely be technologically constrained from matching the features.
- Further enhancing the synergies among all of its product suites is consistent with Cox's "bundling" strategy. VoIP will likely help the company reach its goal of making a three-product bundle of services available to all of its homes passed.

Maximizing network capabilities

The ability to integrate Cox's data and telephony platforms is enabled in large part by cable industry standards embedded in the new generation of cable modems and related

equipment. DOCSIS 1.1 standards, for instance, establish quality-of-service levels for cable modems and delivery of high-speed Internet service on the hybrid-fiber-coax (HFC) plant, between the customer and the cable company's head-end. CableLabs, the organization that established DOCSIS standards, has developed PacketCable standards that standardize protocol and equipment and define the end-to-end quality-of-service from the head-end or MTC to the rest of the transport chain and interface to the public switched network. PacketCable, along with DOCSIS, will ensure that telephony and data platforms are compatible.

"One of the most attractive possibilities of VoIP is the opportunity to integrate our data and telephony platforms, and gain potential cost savings in the process," says Jay Rolls, Vice President of Data Engineering. "For instance, the CMTS, which is in essence the traffic cop directing data traffic on our IP network, also has the capability to deliver voice packets." The newest versions of CMTSs are voice-compliant, and Cox started buying these upgraded versions in 2001.

TECHNICAL TRIALS

Hybrid overlay

Cox has identified several possible technical approaches to deploying VoIP and has begun testing them in a lab environment and onsite at Cox field operations. In early 2002, the company conducted a technical trial in its Oklahoma City, Oklahoma, operation. The objective was to test a VoIP alternate-line architecture overlaid on existing circuit switched architecture. In this hybrid design, which links circuit-switched TDM technology and IP technology, a GR303 Gateway was installed to bridge the two architectures. The primary goals of the trial were to 1) test the concept of an alternate-line service, 2) evaluate the integration of the architecture with Cox's ICOMS customer management system, 3) learn how to provision service on a Media Terminal Adaptor (MTA), 4) test the performance of several types of MTA's, 5) evaluate the performance of the CMTS, routers and other last-mile equipment that typically carry data traffic in delivering phone service, and, above all, 6) identify and quantify the economies of scale from using the existing Cox network investment. "We wanted to break down every process to its most basic elements to understand all of the implications of IP versus circuit-switched technology, as well as the integration of data and IP telephony services. Basically, we wanted to determine how different VoIP services are from existing telephony operations – down to specifics like identifying and issuing IP addresses and phone numbers," notes Albert Young, Vice President of Telephony Engineering.

PacketCable

Cox successfully concluded the six-month trial, and will compare its findings with a trial of a different architecture that Cox is presently conducting in a lab environment and will move into one of its non-circuit-switched markets in 2003. In addition to all of the objectives evaluated in the Oklahoma City trial, Cox will further test the delivery of class-5 calling features via VoIP technology. Because the previous trial tested an overlay to the TDM switched architecture, all calling features including caller ID, call-waiting and call forwarding were handled by an existing switch. In the second trial, the company will evaluate how to best develop and provide these services in a non-circuit-switched environment. "Compared to the TDM switch, which is essentially one big 'box' with all of the necessary components, the PacketCable architecture has numerous separate components – 12-to-15 different pieces of equipment. Therefore, a primary objective of this trial will be to properly integrate all of these pieces," says Dianna Mogelgaard, Director of Product Development. "We see a large potential benefit there, because the multiple pieces of equipment lend themselves to additional flexibility and allow us to select the 'best of breed' for each component." Following completion of the PacketCable trial and evaluation of its results to the hybrid overlay trial, Cox will determine its next steps, leading to a possible marketing trial and commercial launch of voice services via VoIP technology.

Long distance transport

The third level on which Cox is exploring VoIP is long distance transport over its IP backbone. Cox is in a unique position to leverage and take full advantage of its existing data network and use it to transport its own long distance service and is actively investigating the feasibility of such a step. The perceived primary benefits of carrying long distance traffic on its own backbone would be 1) reduced exposure to an unstable long-distance carrier market beset by recent bankruptcies and business failures, 2) increased cost savings by leveraging the capital investment in its new IP network, 3) reduction in overall transport cost for long distance minutes of use, and 4) better utilization of the full capabilities of its IP backbone. Nearly 20 percent of the outbound calls made by current Cox phone customers are to customers in other Cox circuit-switched markets, highlighting a tremendous opportunity. The first of several phases of implementation would focus on calls between any two of Cox's circuit-switched markets. Subsequent phases could include intra-corporate long-distance calls between Cox's circuit-switched markets and all other business locations of its primary shareholder, Cox Enterprises, which has businesses including newspapers, TV stations, radio stations and automobile auctions in numerous markets nationwide. Intra-corporate long distance transport would start with those businesses located in the nine circuit-switched markets, expanding later to all operations of Cox Communications and Cox Enterprises. Another phase would focus on delivery of calls from Cox circuit-

switched markets to major metropolitan hubs that Cox's backbone reaches – non-Cox markets like Chicago, Dallas, Los Angeles and New York. In these cases, Cox envisions having to pay only the local interconnect charges, since the primary transport will be via its backbone, yielding considerable savings.

CONCLUSION

The potential savings, efficiencies and dynamic operational opportunities of VoIP technology are certainly attractive to Cox Communications. The company has long followed a clear business strategy based on maximizing the power of its network – a philosophy that has made the company arguably the most successful “triple-play” broadband cable company, delivering the full complement of video, Internet and voice services. Telephony is a critical component of the triple play, and Cox remains completely committed to its strategy. VoIP could be a worthwhile addition to that strategy. Cox anticipates that VoIP services could help expand its telephony operations into new markets and to more customers, while integrating seamlessly with its existing circuit-switched technology. When VoIP technology is available to ensure reliable, robust residential offerings on a wide scale, the company feels it will be in an ideal position to offer them. “That is,” Bowick concludes, “assuming it makes prudent business sense from a technical, financial and operational perspective – for the maximum benefit to the company, our customers and shareholders.”