COX COMMUNICATIONS

WHITEPAPER: Voice over Internet Protocol: Ready for Prime Time

Cox Communications' Successful Deployment of VoIP

DEFINING VoIP

VoIP is a technology — not a service. VoIP technology converts analog voice signals to packets, which are routed as data over an Internet Protocol (IP) network without ever having to rely on traditional circuit-switching. By doing so, the voice conversation does not tie up a dedicated path or channel. With traditional circuit-switching, a dedicated circuit is required. In fact, circuit-switching requires the circuit to remain open until the phone call is terminated.

Packets consisting of voice conversations can be sent over the same path as other data or voice packets. Due to the efficiencies of multiplexing inherent in an IP network, a common infrastructure can carry multiple services, including VoIP-based telephone, along with data and video.

FOREWORD

In February 2003, Cox Communications published "Preparing for the Promise of Voice over Internet Protocol (VoIP)," *its first whitepaper on the subject. At that time, VoIP technology was still in its infancy and the need still existed to educate industry analysts and media, as well as our peers, on several fronts, including: the state of VoIP technology and its applications; Cox's VoIP strategy in relation to the circuit-switched technology Cox has deployed since 1997; the anticipated economics associated with VoIP; and the company's time-to-market plan.*

In Cox's widely published whitepaper, it clearly stated that VoIP held great promise as an upcoming technology, yet it was not quite ready for prime time deployment. Yet, the paper stated, when VoIP is ready for deployment, it would be well-positioned to launch VoIP based on its significant circuit-switched telephone experience. This experience would allow Cox to leverage its telephone back-office operations, network platform and knowledge — without stranding any deployed circuit-switched capital.

Since publication of the first whitepaper, Cox continued its thorough approach to developing VoIP technology. During that time, Cox worked very closely with its vendors in the lab and in field trials to drive the technology toward a quality level that Cox deemed suitable for customers. This effort also involved discussions on the regulatory front with the Federal Communications Commission (FCC), the National Cable & Telecommunications Association (NCTA) and various state regulatory agencies to ensure that the regulatory landscape would meet the needs of Cox customers and the business needs of Cox.

Cox believes that VoIP is now ready for prime time as a complement to its circuit-switched deployments. This whitepaper will provide an update on Cox's successful deployment of VoIP technology and the company's telephone strategy.

EXECUTIVE SUMMARY

Cox, the 12th largest telephone company in the United States, has developed significant telephony infrastructure, operations, expertise and experience during its seven successful years of providing Cox Digital Telephone service, which is now available in 13 markets. Cox's success with circuit-switched technology is evident with more than 1 million satisfied residential customers and more than 100,000 Cox Business Services customer locations. Cox continues to demonstrate strong telephony growth; the company grew its residential telephone customer base by 38 percent in 2003. The fact that Cox is already a major telephone provider clearly distinguishes the company from many of its peers and competitors.

For more than two years, Cox tested and trialed VoIP technology in its laboratories and in field trials. Recently, Cox successfully launched the technology to residential customers in Roanoke, Va., and the company is preparing to launch additional VoIP telephone markets in 2004. Cox's commitment to customers has driven the development of a more robust VoIP technology that clearly differentiates Cox's VoIP architecture from many other VoIP offerings currently available in the marketplace. Regardless of the technology Cox provides — circuit-switched or VoIP — the company is committed to providing high-quality, full-featured telephone service to its customers. Indeed, as the competitive, regulatory and technological environment continues to evolve, Cox will leverage the flexibility it has built into its network to remain a customer-driven, efficient and successful provider in the telephone marketplace.

Based on extensive experience with both circuit-switched and VoIP technology, Cox expects the following distinct advantages as the company expands its telephone footprint with VoIP:

- As a successful telecom provider with solid customer growth in 12 circuit-switched markets and our first VoIP market, Cox will continue to extensively leverage its back-office systems, experienced people and processes for further VoIP market launches.

COX'S MANAGED VoIP VS. INTERNET TELEPHONY

Cox's commitment to customers has driven the development of the VoIP technology that it deploys today and clearly differentiates Cox's VoIP architecture from numerous VoIP technology offerings currently available in the marketplace. There are several compelling advantages to Cox's deployment of VoIP over a private, managed data network rather than the public Internet, including:

Call Management Control. Signaling for call set-up and call management is transported as packets on our own backbone data network, never traversing the public Internet.
In contrast, signaling for call set-up and call management for Internet Telephone calls travels through the Internet, a "best-effort" data network that is not engineered to handle voice's stringent requirements. Hence, these "best effort" calls are much more likely to fail during the initial call set-up or inadvertently dropped sometime during the conversation.

End-to-End Quality of Service (QoS). On Cox's managed VoIP network, voice packets are labeled and tagged to receive priority treatment and avoid bottlenecks that can cause delays, echoes, drop-outs or other negative impacts on voice quality. By contrast, Internet Telephone calls are transmitted via the public web of networks that comprise the Internet. With Internet Telephony, there is no way to distinguish a voice packet from a data packet. This makes voice packets susceptible to all of the potential problems described above.
In short, Cox's managed VoIP technology delivers the same high-quality phone calls as traditional phone technology, while Internet Telephony call quality may vary based on the amount of data traffic being carried at the time.

Emergency Services. Cox's managed VoIP technology enables Enhanced 911 (E-911) service, while some Internet Telephony providers do not. Some Internet Telephony companies provide 911 access – but it is not E-911, where the police or fire department receive the actual phone number and address/location of the calling party and the line stays open even if the calling party hangs up. Cox can accomplish this in Roanoke and in future VoIP deployments because it maintains complete control of its end-to-end managed network infrastructure and back-office functions.

Open Standards. Cox's VoIP architecture is compliant with PacketCable™ 1.0 and DOCSIS®, 1.1 standards to ensure quality-of-service levels, while Internet Telephony does not provide quality-of-service guarantees.

COX COMMUNICATIONS

- The Cox advantage, in terms of architecture, rests in the fact that it owns and operates its own end-to-end network infrastructure, including a nationwide OC-48 IP backbone network — a key differentiator from Cox's peers and competitors. This allows us to own and manage the complete end-to-end customer experience including sales, provisioning, transport, billing and quality-of-service (see "Architecture Variations" diagram, page 10).
- The regionally distributed architecture provides for an efficient deployment of the technology and its associated back-office operations. It also allows Cox to introduce phone services to customers in markets where the economics do not support the cost of a circuit-switched architecture (see "VoIP vs. Circuit-Switched Cost Comparison," page 11).
- The inherent flexibility already built into Cox's infrastructure will enable the company to remain a successful provider in the highly competitive, ever-changing regulatory world of telecommunications.
- Cox will not abandon its circuit-switched business. Rather, it will leverage the circuit-switched experience to launch new VoIP telephone markets — without stranding the capital it has invested in its circuit-switched operations. Moreover, Cox will have the capability to add capacity in circuit-switched markets via IP transport technology in relation to subscriber growth, when the existing circuit-switch capacity is exhausted.
- Cox will expand its phone service footprint via VoIP to commercial customers, thereby furthering its leadership position in voice among its peers in the commercial telecom marketplace.
- VoIP will help enable the company to reach its goal of providing a three-product bundle of services in all of its markets. Cox also looks forward to the future integration of video, voice and data into a series of unified communications products and services.

LESSON LEARNED

Cox's decision to use a number of different vendors for its VoIP architecture provided a significant integration challenge. For example, consider the number of equipment types (i.e. softswitch, gateways, CMTSs and MTAs) multiplied by numerous configuration variations multiplied by constantly shifting software versions.

One key to Cox's successful integration testing was the strong stance it took on software version control. By greatly reducing the number of "moving parts" and only allowing new software versions when it was deemed absolutely critical, Cox was able to make continuous progress towards a deployable solution.

INTRODUCTION

Voice over IP technology has arrived. Cox Communications first launched and marketed it as Cox Digital Telephone in Roanoke, Va. in December 2003 — bringing the same high-quality, full-featured telephone service to residents in Roanoke that it delivers to 12 other Cox telephone markets via circuit-switched technology.

Both the technical and operational foundations that Cox has deployed today have been for the sole purpose of providing high-quality, full-featured telephone service — a strategy that differentiates Cox from other competitive VoIP telephone providers. More so, as described within this whitepaper, Cox had the foresight to build flexibility into its architecture. As a result, Cox will have the capability to adapt its telephone product, if deemed necessary by competitive, regulatory and/or technological advancements.

With VoIP, voice calls are digitized into Internet Protocol (IP) data packets and transported in that form over Cox's managed IP network. Cox's VoIP solution is based on the technical and operational requirements of an end-to-end, private, managed IP network transport system with full Quality of Service (QoS) that provides telephone service

COX TELEPHONY MARKETS

Cox Digital Telephone service is available to more than 5 million homes in Orange County and San Diego, Calif.; Phoenix and Tucson, Ariz.; Omaha, Neb.; Meriden, Conn.; Rhode Island statewide; New Orleans, La.; Oklahoma City, Okla.; Wichita, Kansas; and Hampton Roads, Roanoke and Northern Virginia. Cox will launch the service in additional markets in 2004.

VoIP Comparison

	End-to-End Quality of Service	Full Regulatory Compliance (Company)	Interconnect Agreement	PacketCable Compliant	CPE Powering	Automated Provisioning
Cox	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**In-house**
Other MSOs	Not yet	No	No	Some	Not yet	Outsource
Internet Telephony Providers	No	Some Providers	Some	Not Applicable	No	Some Providers

	End-to-End Customer Service	Available to Customers Without Broadband	E-911	7 Digit Local Dialing (Where Applicable)	Local Number Portability
Cox	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Other MSOs	**Yes**	Some	**Yes**	**Yes**	Some MSOs
Internet Telephony Providers	No	No	No	No	Some

with enhanced 911 services, directory assistance, operator services, local phone number portability, equal access long distance and compliance with CALEA (Communications Assistance for Law Enforcement Act). This product direction is based on significant market research and Cox's proven success in providing a quality telephone solution.

COX'S EARLY ENTRY INTO TELEPHONE

No discussion of Cox's success with VoIP can start without first exploring the company's success as a circuit-switched telecom provider. Cox has grown from a single-service cable television company into a multi-service broadband communications provider. Via its flexible and powerful broadband delivery network, Cox now offers a number of communications and entertainment services, including analog and digital cable television, high-speed Internet, telephone and high-definition television in most of its residential and commercial markets. Cox has not only leveraged the power of its broadband platform to create multiple revenue streams, but has also created more profitable, longer-term customer relationships by offering bundled services to customers. Cox customers continually validate the company's strategies, as evidenced by the impressive growth of these new services.

Cox's telephone business, in particular, has distinguished the company from its peers. 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 in Orange County, Calif. Today, Cox Digital Telephone has more than 1 million residential customers and more than 100,000 Cox Business Services customer locations across 13 telephone markets. In 2003, Cox received the highest honor in J.D. Power and Associates' 2003 Residential Local Telephone Customer Satisfaction Study in the Western Region.

"Cox pioneered cable telephone via circuit-switched technology," notes Chris Bowick, Cox's Chief Technical Officer. "In doing so, we amassed more than seven years of in-the-trenches experience as a telecom provider.

BUILDING AN IP BACKBONE

Cox Communications decided to internally build and run most of its Internet services, thus eliminating most external dependencies for the delivery of its services. This included the construction of a nationwide IP backbone network.

One of the primary advantages of building a backbone is the ability to reduce data delivery costs via peering. While originally networks must pay to get data to and from the Internet, peering can help reduce or eliminate such costs.

Peering is defined as the exchange of data with other IP networks or ISPs on a settlement-free basis. Cox has been able to ramp up peering to more than 50 percent of its total Internet traffic in just over a year, saving more than half the cost of its transit bill. Peering has the added bonus of reducing latency and, hence, improving network performance for customers.

There are eight main locations for peering in North America: New York, Northern Virginia, Atlanta, Dallas, Chicago, Seattle, the San Francisco Bay Area and Los Angeles. In Cox's case, the backbone extends to most of these cities even though several are not Cox cable franchise areas. It can sometimes feel like a leap of faith adding such locations to your network topology, but it's necessary. Only in that way can you engage in peering relationships that will ultimately save on expenses.

In terms of security requirements, a best-of-breed service provider network requires at least four components: access control, configuration management, attack protection and security policies.

Access control is best defined as "Triple A," or Authentication (verify user), Authorization (determine privileges) and Accounting (track all activities). After reviewing the available tools and feature sets with existing AAA products, Cox's security team decided to build a more comprehensive solution using a combination of open-source and productized tools.

Attack protection was accomplished via a variety of methods, including firewalls, Intrusion Detection Systems (IDS), Access Control Lists (ACLs) and anti-Denial-of-Service (DoS) tools. Firewall and IDS boxes were installed at each regional data center location to protect distributed telemetry and provisioning servers, while every router interface is configured with ACLs to protect critical networks. Cox deployed a DoS protection system, which collects data (i.e., traffic samples from all routers) in order to detect attacks and provide trend analysis.

Continued on page 6

"Building an IP Backbone," continued

Finally, security policies were written to provide a baseline for continued network security. Operational guidelines, such as password management and DoS attack response procedures are covered, as well as restrictions on what sorts of protocols may be used for any given type of service or access. One valuable lesson learned was that a single comprehensive policy facilitates more widespread adherence than several topic-specific policy documents.

Services

Cox's backbone has, to date, far exceeded expectations. Performance has been excellent and peering (as well as competitively bidding transport and transit services) has helped us to reduce backbone costs.

On top of that, the backbone is beginning to be used as a strategic asset that can be applied toward other parts of the business. One of the first applications to take advantage of the backbone was Cox's own internal network, used for Cox's business needs (e-mail, billing, customer care, etc.). Most of this network has migrated over to our IP backbone from a leased frame relay network, saving millions of dollars in recurring expenses.

Cox is also beginning to use its own network to transport its long-distance telephone traffic. As the nation's 12th-largest telephone company and with 75 percent of the residential phone customers taking Cox's long distance offering, Cox purchases significant amounts of wholesale long distance minutes from third parties.

The company realized that a significant portion of these calls terminate in other markets where Cox either offers phone service or where the backbone terminates. By converting calls to VoIP and then transmitting these calls over Cox's IP backbone, the company is realizing cost savings totaling millions of dollars in expenses.

Lastly, as Cox launches VoIP services over the coming years, the IP backbone is perfectly suited to act as the transport mechanism for both telephone calls and call-control protocols. One of the keys to VoIP's success will be the ability to geographically distribute and share the assets necessary for running the service. The backbone is ideally suited to act as the glue that connects those assets together. Eventually, Cox will be able to interoperate between this "Class 5" infrastructure and the "Class 4" long-distance infrastructure mentioned above.

Continued on page 7

We navigated the complexities of the business, built a tremendous technological and operational base on which to distribute phone service and have already delivered significant financial results. Above all, we proved to both residential and commercial customers that they can depend on Cox for their phone services — for multiple services, in fact."

Cox attributes much of its success with launching VoIP technology to its pragmatic approach. "We reached the point where VoIP technology made good business sense from a technical, financial and operational perspective," said Bowick. "Today, the technology is robust and reliable and it integrates seamlessly with our circuit-switched operations. Importantly, we were not forced to abandon our circuit-switched technology in favor of VoIP because the two technologies are complementary. Cox's telephony strategy is a win-win scenario, one in which we control our destiny and our customers experience, thanks to our end-to-end managed network infrastructure and back-office functions, as well as our tremendous base of telephone expertise."

MAXIMIZING ALL OF THE PIECES

Key elements of Cox Digital Telephone with a VoIP architecture include:

- Network — Cox attributes much of its success to its powerful network. Over the past decade, the company has extensively upgraded the HFC network in its local markets to deliver a very high capacity, reliable and extremely flexible platform on which to layer advanced services. Presently, more than 92 percent of the company's homes-passed are at least 750Mhz and two-way activated. With fiber optic nodes serving an average of less than 700 homes passed, Cox continues to effectively manage spectrum for ample capacity for all of the services it delivers now and for future growth.

- Back-office — 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 telephone services. These

functions include call processing, enhanced 911 services, billing, phone number administration, local number portability, operator services, directory assistance, directory listings, interexchange agreements with other phone companies, calling cards and numerous other requirements. For many years, Cox has dedicated teams exclusively to perfecting support and delivery processes for telephone service. These teams develop methods, procedures, audit processes and measurements that impose discipline and efficiency on the delivery and support of all of video, voice and data services.

Indeed, Cox's back-office systems and processes are leveraged extensively for VoIP roll-outs. Thereby, Cox did not have an extensive learning curve for its first VoIP launch. Cox already had the processes and experienced people in place to provision services, manage data and integrate information about multiple services into one central location. This provides extraordinary value that Cox continues to reap every day.

A key asset is Cox's ability to manage the back-office functions of delivering phone service with 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 extraordinary, allowing Cox customer care representatives to sell efficiently and activate all services utilizing a single platform at one time with one phone call and one view of all relevant customer data. Cox is also 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 flexibility and automation, eliminating paper and manual processes that erode margins, cause errors and lead to customer dissatisfaction. Moreover, it eliminates the need to coordinate with third party companies, which can lead to delays in activating and servicing customers.

"Building an IP Backbone," continued

Enabling an IP backbone to accommodate the delivery of multiple services does not come without considerable preparation and testing, as well as the work involved with activation of advanced protocols. In Cox's case, quality of service (QoS) is implemented in core routers via DiffServ and TOS (type of service) bits, as well as by marking and remarking as appropriate all data that enters the backbone. Cox has created levels of priority-setting properties, such as packet-drop, packet delay and delay jitter. Cox has also activated the MPLS protocol for traffic engineering purposes.

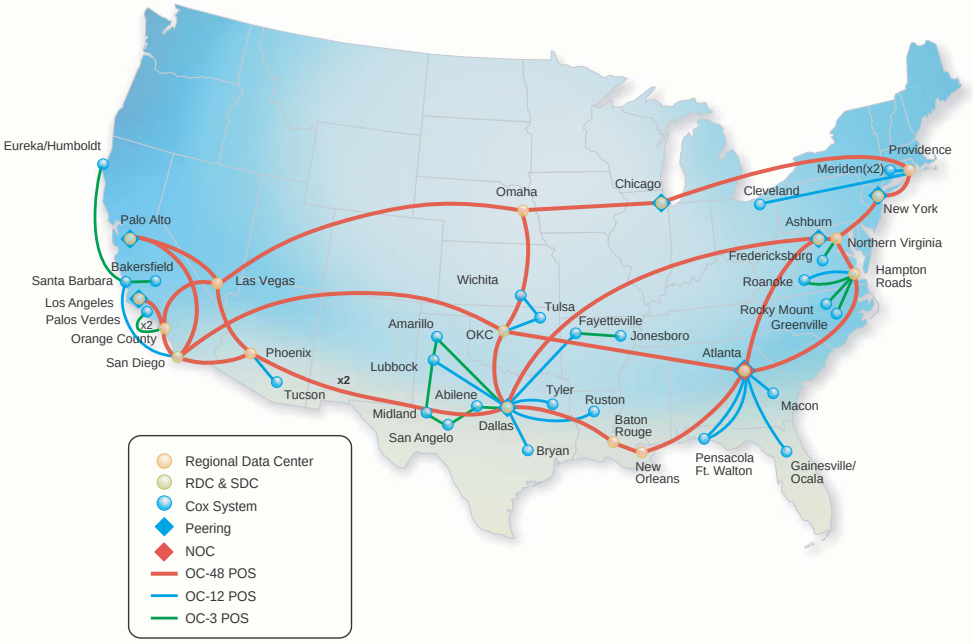
Just as Cox has for years referred to hybrid fiber/coax (HFC) as the "winning network," the company has gained an appreciation for the importance and value of its IP backbone as another powerful tool for delivering services to customers. By keeping this asset under Cox's own control, the company has been able to easily evolve the network to meet current and future needs without dependencies on outside partners. And due to the efficiencies of multiplexing inherent in an IP network, Cox is able to achieve significant cost savings by sharing a common infrastructure for multiple services.

For further information on building Cox's IP backbone, visit http://www.cedmagazine.com/ced/2004/0204/02c.htm

- Backbone — Cox's nationwide OC-48 IP backbone network was created in 2001. Today it transports Cox High Speed Internet, Cox Business Internet services, VoIP and more than 25 percent of Cox's long distance traffic.

  The backbone interconnects all Cox markets and connects other major metropolitan hubs including Chicago, Dallas, Los Angeles, San Francisco and New York. This extremely flexible and powerful network includes 14 regional data centers (RDCs) and three services data centers (SDCs). The SDCs serve as hosting locations for VoIP soft-switch technology for nationwide telephony coverage in addition to hosting and sharing mail, news, web space and other components of Cox High Speed Internet. These centers provide Cox with a national presence well beyond the local-only networks typical in the cable business and an attractive economic foundation for significant geographic efficiencies enabled by the network. Instead of replicating

Cox High Speed Internet Backbone



equipment in every data or VoIP market, Cox regionalizes some components of service delivery into these centers. This architecture enables Cox to further leverage its backbone to integrate data and telephony services.

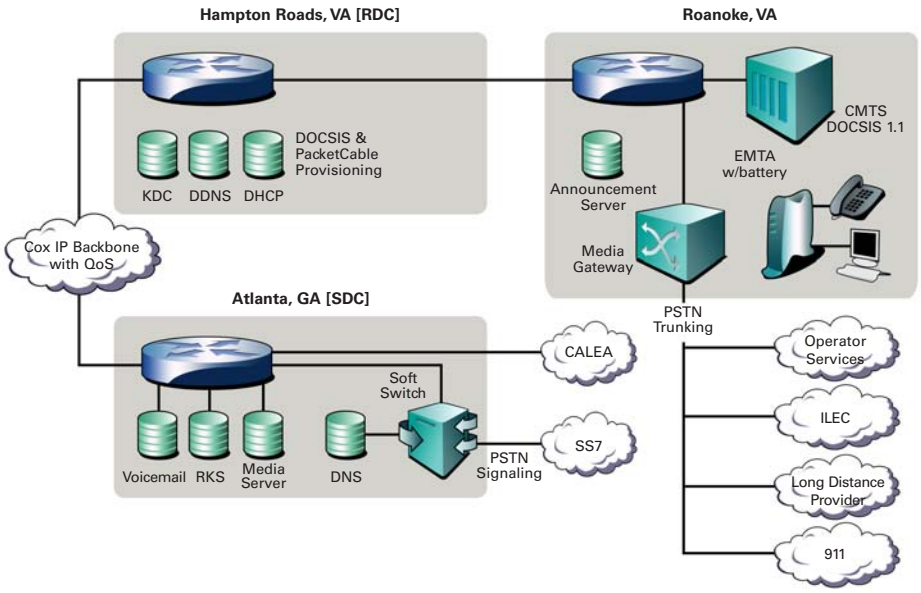
COX'S VoIP ARCHITECTURE

Cox's architecture is PacketCable™ compliant and purpose-built to provide nothing less than high-quality, full-featured telephone service. The network's primary components include DOCSIS 1.1 cable modem termination systems (CMTSs), media terminal adapters (MTAs), media gateways and a soft switch.

The highly distributed nature of Cox's VoIP architecture creates numerous leverage points throughout the network. The ability to leverage local, regional and national infrastructure, as well as processes and procedures, enables the operation to efficiently scale in size and scope.

Local. The media gateway and CMTS reside at the local (metro) network level. The existing CMTS equipment provides a key infrastructure leverage

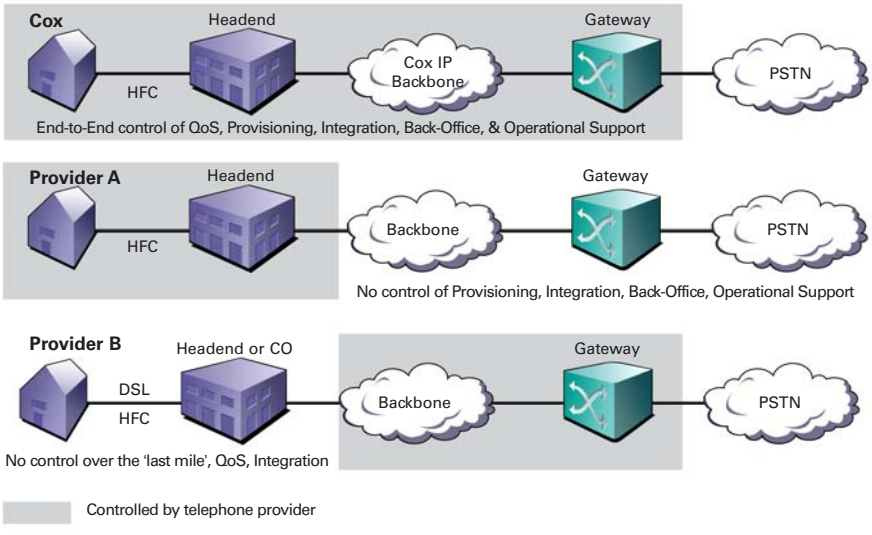
Cox VoIP Architecture



point since it is already deployed to support Cox High Speed Internet services. In addition, many of the back-office functions typically performed locally in decentralized circuit-switched markets are consolidated at the regional level, thereby eliminating the need to replicate operations groups for newly launched markets.

Regional. The Dynamic Host Configuration Protocol (DHCP), Domain Name Server (DNS) and provisioning functions are located at the regional level. In the traditional circuit-switched model, Cox's local markets maintain responsibility for many of the back-office functions. However, Cox's regional design enables the consolidation of many back-office functions, including directory assistance, E-911 and local number portability. "The regional back-office support structure can support multiple markets," said Bowick. "As a result, Cox has realized true efficiency gains by eliminating the need to train and staff employees for local telephone operations. This creates downward pressure on what is typically a steep learning curve, given the complex nature of the telephony business."

Architecture Variations



National. The soft switch resides at the national level of the architecture. The technical expertise required to support the soft switch is also maintained at this level, thereby creating a centralized technical

support structure. With this configuration, Cox's local markets do not have to develop the technical expertise necessary to support the soft switch. More so, the ability to have a single view of the whole network to facilitate efficient troubleshooting techniques and problem resolution is the true benefit of centralizing knowledge of the entire system architecture and diagnostics. Moreover, a single group within the Cox organization maintains secure, controlled access to the soft switch to produce inherent quality control.

THE ECONOMICS OF VoIP

Cox anticipates the cost of VoIP technology will continue to improve over time, much more rapidly than circuit-switched costs. Any comparison of the cost of VoIP versus circuit-switched should be done by evaluating similar telephone service components, including:

CPE, Switching and other Peripheral Headend/MTC Equipment. In these telephone-specific costs alone, VoIP potentially offers a capex advantage of almost 40 percent per customer when compared to an equivalent circuit-switched primary line replacement service. This significant cost advantage can largely be attributed to the lower cost of the MTA versus the NIU. Also, VoIP does not require the equivalent of a dedicated Headend Interface Terminal (HIT) for interface between the network and the switch. Instead, Cox's VoIP technology leverages the existing CMTS to support Cox's high-speed Internet platform. Further cost advantages for VoIP could be realized if Cox customers purchased the embedded MTA at retail locations (similar to the DOCSIS model) or if Cox provided a non-embedded MTA (one without a DOCSIS modem) to customers that already own a cable modem.

Network Readiness. Additional plant-related capex costs that could be attributed, at least partially, to the deployment of VoIP or circuit-switched telephone service include activities such as minor drop replacement and capitalized connect costs (to connect the NIU or MTA to the inside whole-house telephone wiring) and improved plant status monitoring and standby power. Regardless of VoIP, most of these activities would still be accomplished over time. In addition, these activities improve service quality and reliability for all of Cox's products – not just

Per Customer Cost Comparison: VoIP vs. Circuit-Switched[1]

	VoIP	Circuit-Switched
Telephone Cost		
MTA/NIU	$130[2]	$215
Switch	$86	$83
HIT	–	$53
Subtotal	**$216**	**$351**
Network Readiness Cost[3]		
Drop/Connect	$30	$85
Powering/Status Monitoring[4]	$21	$91
Total	**$267**	**$527**

1 Figures reflect current values at the time of publication. Given the dynamic nature of the marketplace, further maturation of VoIP technology will likely contribute to rapid decreases in VoIP costs. Price decreases will likely be seen in mature circuit-switched costs as well, albeit not as rapid as VoIP.

2 Includes the cost of an embedded cable modem.

3 Some published cost analyses may not include these factors as allocated costs for VoIP.

4 Based on 20% penetration.

telephone service. In these cost models, Cox assumes at least four hours of standby power in the HFC plant for both technologies, with in-home battery back-up for the VoIP MTA and network-supplied power for the circuit-switched NIU. Inclusion of these costs in the analysis will increase VoIP's per customer cost advantage to approximately 50 percent when compared to circuit-switched technology.

Cox has regionalized many of the functions and much of the equipment associated with delivering Cox High Speed Internet and VoIP, spreading the costs across multiple markets for savings and efficiencies. The following factors also contribute to the efficiency of its VoIP architecture:

- Regional and National Scalability — Cox's distributed VoIP architecture will drive savings in both operational and capital expense when compared to circuit-switched telephone. For instance, circuit switches are usually geographically restricted based on serving distance; therefore installed and maintained within each local circuit-switched market. With VoIP technology, Cox installs and maintains soft switches at the national level, serving multiple markets with only limited equipment and operations required locally. Current long-term plans are to deploy soft switches in three locations to serve all Cox markets. For Cox, this is particularly beneficial in smaller markets, where the potential customer base doesn't justify the cost of a circuit switch and associated infrastructure. This regional approach to scalability will also help the company defray the significant up-front investment in personnel and recoup its capital investment faster.
- Quality of Service (QoS) — Cox is complete in its upgrade to DOCSIS 1.1 software on its cable modem termination systems, a prerequisite for QoS. Cox believes that QoS is a requirement for providing high-quality, full-featured service and to prevent packets from suffering degradation during peak traffic periods or other periods of network congestion. Overall, Cox believes that end-to-end QoS also reduces operating costs by minimizing the number of customers who otherwise would be unsatisfied with the quality of their service. Cox's end-to-end QoS control is yet another inherent advantage of owning and controlling its network.

- Powering — Cox's research has found that consumers are more likely to choose a telephone service with power back-up than one without, thereby contributing to higher penetration rates. In Roanoke, Cox currently provides back-up powering of the in-home multimedia terminal adapter (MTA) using an internal battery that supplies several hours of back-up service. In the future, should market conditions and research indicate the need, Cox has the flexibility to provide customers with the option of taking telephone service without battery back-up for the MTA.

MARKETING VoIP

Cox has long enjoyed excellent relationships with its customers, which the company accurately predicted would translate into customer loyalty. According to Cox research, customer churn in two-product households is 18 percent lower than one-product, while three-product customer churn is 48 percent lower.

Cox's belief is simple: Prove to customers that you're capable of delivering traditional cable service and high-speed Internet efficiently and with high value. Without this, they'll never trust you to deliver high-quality, full-featured phone service. Many companies seem to underestimate the critical importance of this fact. It's one thing to have a 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. Indeed, Cox received the highest honor in J.D. Power and Associates' 2003 Residential Local Telephone Customer Satisfaction Study in the Western Region.

In marketing VoIP, it's important to remember that VoIP is an architecture — not a product. Company research shows that most customers are not interested in the technology behind their telephone service, so Cox prefers to focus on the benefits and features that customers truly care about, such as value, bundled savings, convenience, rich features and attractive packages.

In Roanoke, the company positions, packages and prices its VoIP technology as high-quality, full-featured residential telephone service, branded as Cox Digital Telephone and sold in an identical fashion as in Cox's switched telephony markets. Cox's marketing strategy and tactics used in Roanoke are similar to the successful approach used in markets where a circuit-switched telephone architecture was implemented. In contrast to Internet Telephony, a subscription to Cox's high-speed Internet service is not necessary to receive telephone service served by Cox's VoIP architecture. This enables Cox to serve voice customers who do not wish to subscribe to Internet service.

CONCLUSION

The inherent flexibility of Cox's end-to-end network infrastructure, from the CPE to transport and back-office functions, as described in this whitepaper, will enable Cox to remain a successful provider in the highly-competitive and uncertain regulatory world of telecommunications and to readily adapt and expand its telephone operations into new markets and to more customers.

In summary, Cox foresees the following:

- VoIP technology permits efficient geographic expansion of Cox's phone services, allowing the company to launch telephony in markets where the economics didn't justify the cost of a circuit-switched architecture. The company will launch several new Cox Digital Telephone markets utilizing VoIP in 2004.

- Cox will expand its phone service footprint via VoIP to commercial customers, thereby furthering its leadership position in voice among its peers in the commercial telecom marketplace.

- Cox's VoIP architecture provides the flexibility to expand service in existing circuit-switched phone markets with either a circuit-switched-only approach, or with a complementary VoIP overlay (once existing circuit-switch capacity is fully exhausted).

- VoIP technology enables 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 will not abandon its circuit-switched business. Cox will completely utilize the capacity of existing switches.

- VoIP technology enables Cox to deliver long distance (LD) traffic over its own IP backbone network. Currently, more than 25 percent of Cox's long distance customer calls are transported via the company's national backbone, reducing its reliance on third-party wholesale LD providers.

- VoIP provides an economically efficient method to provide high-quality telephone service in Cox markets, enabling the company to reach its goal of providing a three-product bundle of services in all of its markets.

- Regulatory agencies are only now beginning to examine appropriate treatment of VoIP technology. To date, it is not yet known how the technology will ultimately be classified. New and varied approaches to VoIP by traditional telephony providers and new market entrants further complicate the regulatory environment. Notwithstanding, Cox's flexible VoIP architecture and back-office infrastructure will continue to position the company well and enable Cox to adapt quickly and as necessary to this dynamic environment.

"As the leading provider of cable telephony services, we take great pleasure in the growth of our telephone customer base," said Bowick. "We've proven that cable providers can be successful as telephone providers and we look forward to continuing our leadership position by offering the service to a broader segment of our customer base in 2004."