EXHIBIT A

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Live TV on Your Cellphone

A much improved service could be in hand next year

By Ken Kerschbaumer -- Broadcasting & Cable, 5/2/2005

In this story:

Today, cellphone users can watch prerecorded TV snippets on Sprint and Cingular's MobiTV or Verizon's Vcast. But by next year, they may be able to watch *live* TV content from a variety of cellular phones.

As a step toward inaugurating its Digital Video Broadcasting-Handheld (DVB-H) service, Houston-based Crown Castle International has licensed 5 MHz of spectrum nationwide in an FCC auction—at the surprisingly low price of $12 million. Crown Castle is testing the system in Pittsburgh now but ought to be able to deploy its signal over a wide portion of the U.S. by the end of next year.

"We can conservatively fit eight TV channels and 12 audio channels in our spectrum," says Crown Castle Mobile Media President Michael Schueppert. "We still have a lot of things to pull together, like getting handsets and aggregating the content, but things are going well."

CHEAPER, BETTER

Unlike current mobile video services such as Vcast and MobiTV, Crown Castle's DVB-H is not a unicast, or one-to-one, transmission. The unicast model is expensive to build and maintain because the cellular network needs enough capacity to send out individual streams to subscribers. As it grows in popularity, the infrastructure to push the content needs to be expanded.

Not so with DVB-H. As long as the cellphone has a DVB-H receiver chip, it will be able to pull down local TV signals retransmitted by Crown Castle.

"One of the big advantages is that, because it uses terrestrial transmission, we can carry local content in the same way as TV stations and offer different local services in different markets," says Schueppert. "We'll want to work with local broadcasters because they do the best job with local news, weather and sports." But it is also clear that DVB-H, which Crown Castle will brand with a less cumbersome name at some point, can also deliver cable news and sports networks. Crown Castle says it will pay retransmission fees to content providers; the product is new enough that Crown Castle doesn't know what consumers will be charged.

Peter MacAvock, who heads the effort in Europe to continue evolving DVB-H standards (the service is already available in Finland and the UK, and coming to China soon), is more bullish on the channel capacity. He says that, depending on compression level, it is possible to deliver 15-30 channels.

Microsoft will provide Crown Castle with VC1 compression, streaming and digital-rights-management (DRM) technology. SES Americom will provide satellite space for delivering TV signals to the transmitters that will eventually be located across

the country.

VC1 compression takes less memory to decode the TV signal, an important feature because it means the phone's processor doesn't have to be as large and won't drain as much of the battery.

Crown Castle's plans include expanding the network to nine "always on" sites for a more in-depth trial than the one it has been running in Pittsburgh, says Crown Castle Mobile Media CTO Nick Davies. The company needs to probe data rates and quality issues like indoor reception, plus end-user requirements, including display resolution.

The company still has to negotiate with content and cellular providers. Crown Castle wants a large footprint, so it is not interested in exclusive deals. It could also deliver TV pictures over other mobile devices, but, for now, the focus is on the cellphone. "That's the device Joe Public will want to use," says Schueppert.

BROADCASTERS WAIT AND SEE

When Crown Castle showed off the technology at the National Association of Broadcasters Show last month, the techies were interested, but broadcasters weren't putting it on their to-do lists right away. That doesn't concern Schueppert: "Right now, our customers are the wireless carriers, because their primary business model is pay-TV services to cellphones."

And he believes content providers will eventually get it. "Our value proposition," he says, "is helping them repurpose content and build other revenue streams without cannibalizing existing services."

The biggest challenge for Crown Castle may be overcoming a prejudice that exists against such services. "Just six months ago, people were very skeptical because they looked at MobiTV and saw two frames per second of performance," says Schueppert. "But we have vastly better economics and more value because of our transmission method."

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SBC Plans a Network Overhaul

Telco giant sees enhanced IP service as competitive wedge against cable

By Ken Kerschbaumer -- Broadcasting & Cable, 11/29/2004

In a bold bid to remake its network to deliver TV over the Internet (IPTV), phone giant SBC struck a 10-year, $400 million deal with Microsoft. By the end of 2005, SBC expects to begin rolling out a four-tier IP-based video, phone, cellular and data service. SBC thinks this option gives it a competitive edge against the triple play of voice, video and data offered by cable operators.

Telco TV Snapshot

Upside

Flexible IP-based infrastructure

More channel capacity

Consumer trust

Downside

Spending billions on fiber

IPTV technology unproven

Higher costs, lower margins

"Our intent is more than just cutting prices and hoping we get market share," says Jeff Weber, SBC's vice president, product and strategy. The goal is to attract subscriptions through added service.

In order to offer the enhanced IP service, SBC, the nation's second-largest phone company, will spend nearly $4 billion digging up roads to lay ADSL2 fiber so it can deliver 20-25 Mbps of data to homes. Those settings provide enough power to deliver SD and HD cable services, voice and data.

But Dave Spear, executive vice president, strategy and market development for Cedar Point, whose switch-based voice-over-IP (VoIP) technology is designed for cable systems, believes those build-out requirements will be a strain. "It's going to be tough," he says of SBC's plan. "Cutting through the streets and getting right of access to the street can be complicated."

Still, once that initial buildout is complete, IPTV could change the nature of the medium. IP places data, voice, and video services on the same signal-transportation platform. "This changes the ground rules in terms of the types of service that can be provided," says Ed Gracyzk, Microsoft TV Group. With the TV and set-top boxes sitting on the same network and using the same language as a PC, gaming consoles, mobile phones and other ground-breaking services can be added.

Sharing the same IP infrastructure means systems can also communicate with each other. For instance, a football fan stuck in traffic when the big game begins could send a text message from a cellphone to his DVR telling it to begin recording. Or a couple tired of sitting in front of the living-room TV could redirect a program on

the DVR into the bedroom.

That connectivity spells more opportunity for TV stations and networks, too.

"A network like HBO could send out a 30-second clip to a cellphone, and then the person could dial back into the DVR," says Gracyzk. In addition, an IP-based switched-architecture technology is far more efficient in terms of bandwidth than the traditional cable plant, since it delivers only the channel requested to the viewer. A cable plant broadcasts every channel to the subscriber's home at all times.

In SBC's case, all content will pass through Microsoft servers located at video-distribution points that serve a certain neighborhood or town. Microsoft Foundation software will provide the electronic programming guide and user interface through which viewers access the channels.

Conceivably, an operator could offer more than 1,000 channels on the program guide, says Gracyzk. The number doesn't affect how much bandwidth is needed into the home. To ensure that the service is bandwidth-efficient, it employs Windows Media 9 advanced video- compression format. That format typically needs half the bandwidth of video currently used in MPEG2.

In addition to the mega-channel listing, there is an opportunity to explore other services: video teleconferencing over the television set, retrieval of voice mail through the TV, forwarding calls to phones outside the home. Meanwhile, TV networks and stations can investigate a new level of two-way interactivity.

"This is clearly a better two-way platform than anything on the market," says Weber. "And as content providers look to do more interesting iTV applications, we're clearly the platform that makes the most sense."

In fact, SBC and other telcos are embracing IP-based delivery of video signals for a bottom-line reason: survival. They've seen their traditional phone-line business snatched away by wireless companies, and now cable operators are going after digital-phone service.

"Cable is very bullish right now," says Spear. For the telcos, the trick is not just offering the service. It's turning the service into a business.

But some industry insiders remain skeptical. "The cable industry's flexibility to offer new services is superior to the telcos', so I think they're going to capture [the triple-play] market and capture it quickly," says Spear.

Companies like Cedar Point are working with cable operators to ready VoIP services. Every month, the telcos lay fiber that the cable companies can use to sign up new voice customers.

More important, the cost for cable operators to add voice is small compared with the costs telcos will incur for launching video services. (Deploying voice services typically requires about $150 per subscriber; video services are usually $600.) The cost a distributor pays for a cable channel is closely tied to the amount of distribution: more distribution, lower cost per subscriber. "Content-wise, the telcos will have more expensive negotiations than the MSOs," adds Spear.

Whether the telcos can pull off the triple play remains to be seen. One thing, however, is certain. During the next 12 months, both telcos and cable companies will embrace IP technologies. "It's all about broadband and sending packets and

bits," says Spear. "The world is going IP everywhere."

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Stream Dream

UTStarcom wants to help telcos tap TV over IP

By Ken Kerschbaumer -- Broadcasting & Cable, 10/18/2004

Forget voice over Internet Protocol (VoIP): for UTStarcom, it's TV over the Internet. The 13-year-old company has built a business based on IP networking, service and support that is expected to have revenue of $2.8 billion in 2004. The company recently rolled out its mVision system, an IP-based video-on-demand system that the company says gives access to 100,000 hours of content without actually storing all of the content in a viewer's set-top box. So far, no customers have signed up for the service. Jeff Paine, vice president of strategic marketing for UTStarcom, spoke with B&C's *Ken Kerschbaumer about a market that faces its own set of challenges and opportunities.*

How do you view the TV-over-IP market?

In the short term, TV-over-IP's market really comes from the traditional telcos. Those are the guys who can deliver services over either copper DSL or some flavor of fiber to the home. And what's going to make it compelling for them is, they have serious subscriber problems. They're losing land lines.

About 10 months ago, the telcos had an epiphany where they realized that IP services were where they needed to go. And they realized they could go after additional IP services, particularly in the entertainment/media content space and get some nice numbers out of it [using their DSL service]. The corollary was that, if VoIP could deliver about $10 a month, then entertainment content delivered over copper or fiber becomes $30 to $40 a month.

You say your system can store 100,000 hours of content in a single rack at the headend. How?

We're not actually storing the movies, per se, at the edge. We're an IP company, and we're using switched video delivery to the edge. So we store the first four minutes of every piece of content on the edge server. And the minute the user orders the content they want, it downloads that four minutes. And we have a smart protocol that starts shipping more segments out to the system.

Also, our system allows the content to be stored at the movie studio. We have a media-location registry that knows where everything is and where people are. So we have a way to provide hundreds of thousands of pieces of content at the same time.

What about the other cable content?

Depending on the country and rebroadcast regulations, we could not only stream content over the network but store content in the network. So it's feasible to have premium- and standard-cable programming stored as well as weeks' worth of local broadcasts.

So when do you expect to see some deployments?

We have a substantial deployment under way right now, but we can't talk about it. I think this stuff really starts to roll out in the middle of next year. It's going to happen everywhere, but it's just going to take a while for the U.S. telcos to figure out the economics.

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Net TV: Next Killer Ap?

By Bill McConnell -- Broadcasting & Cable, 9/15/2004 4:12:00 PM

TV over the Internet is going to be the next big thing, Federal Communications Commission chairman Michael Powell said Wednesday.

Companies all over Silicon Valley are making Internet television their "number one effort," he said.

For example, TiVo has partnered with NetFlix for delivery of movies to their subscribers, almost every major phone company has an initiative underway and Microsoft and Intel are big players in the effort. One or more of these companies' will develop the killer-ap needed to generate demand for Internet connections fast enough to handle video, he said.

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Coming eventually: TV on the PC

The world waits and waits for mass deployment of broadband

By Kira Greene -- Broadcasting & Cable, 12/11/2000

When video over the Internet first made its debut some four years ago, it was slow, jerky, grainy and small. For most Internet users today, it's still slow, jerky, grainy and small. But despite the promise that broadband-essentially high-speed Internet connections-would bring TV-quality video online to the masses, the waiting continues.

Predictions vary as to when the world will have a true television experience on the PC, and opinions differ on the magical bit rate that will make that happen. But one thing is certain: There's a race to get there first.

In the near term, the competition between the two dominant providers of broadband service promises to be interesting. The cable industry has a massive lead on the phone companies' digital-subscriber line (DSL) platform. But then, cable had a head start. Of all U.S. households with high-speed Internet connections, 75% are signed up with cable, while 25% are wired for DSL, according to Cambridge, Mass.-based Forrester Research.

But DSL is gaining fast and is widely expected to catch up with or even surpass cable by 2004, according to Forrester. Look for wireless residential broadband including satellite, MMDS and fixed-wireless local loop in the arena as well, but those platforms are expected to serve only niche markets in geographical areas not served by cable or DSL.

"There's an ongoing fight about who is better," says Mark Zohar, research director for Forrester. "But it comes down to this: Nobody cares. People just want broadband. Whoever gets to the market first wins. If the cable company is there with cable-modem service, people will get that. If there's DSL, they'll get that. If there's both, then there's competition, and it will be whoever has the best price, service and brand name."

Indeed, the demand is there. According to a Forrester survey, 55% of traditional dial-up users say they are prepared to switch to broadband service once it becomes available. But with only 3% of the nation's 100 million households wired for high-speed connections, the waiting game will continue for most Americans, who are rapidly going online.

More than half of U.S. households, nearly 54 million, now have computers, and about 42% of those have Internet access, up from 26% in 1999 and only 19% in 1998, according to a Commerce Department study of computer usage released in October. The FCC's most recent report on broadband access, released in August, refers to predictions that the number of households online will double within five years, encompassing two-thirds of all U.S. households.

The reality is that cable and DSL are plagued by problems, including network constraints that keep the services out of reach for most consumers. The big issue: the so-called "last mile" to the home.

Although cable networks today employ a combination of new fiber-optics and traditional coaxial cables-a hybrid fiber coax-the same coaxial wires that have been in use for years still complete the connection to the home. Upgraded electronics, however, do help boost capacity.

Cable's main drawback

But cable's big weakness lies in its party-line nature: The greater the number of customers logged on in a neighborhood, the lower the bandwidth and the slower the stream. As MSOs sign up more customers for modem service, the shared-network design is a growing problem. But the industry has come up with a solution to the issue: node splitting. Fiber from the network terminates in nodes located on neighborhood street corners where coax takes over and runs into the home. Fiber-optic lines can be split at the node, creating a second line to relieve the original fiber of half its load.

With DSL, users effectively have their own dedicated service directly from their home to the local telephone company's network. As a result, DSL service does not deteriorate as more users sign on. But video service can be pushed only over short distances, no more than 12,000 feet of line from the central office. SBC, however, is addressing that problem, among others, as it spends $6 billion over the next three years to rebuild its plant for the digital age. By laying fiber to what it calls "neighborhood broadband gateways," or remote terminals, and copper to the customer's curb, the company is extending its reach to homes that otherwise would have been outside the service area.

Another difficulty telcos face is that copper lines upgraded with digital-loop carriers (DLCs) do not tolerate the massive compression needs of DSL and must be replaced with fiber. Bell South, in particular, must deal with this issue, since up to 30% of its network has been built out with DLC.

Satellite did not offer true broadband connections until early November, when StarBand Communications-a joint venture of Gilat Satellite Networks, EchoStar Communications and Microsoft-launched a two-way, always-on, high-speed satellite service for consumers. Hughes Network Systems will be next in early 2001, when it upgrades its one-way system-DirecPC-to two-way.

Late next year, iSky-a fledgling satellite company owned by Liberty Media, TV Guide, TRW, EchoStar and TeleSat-is also scheduled to deliver two-way high-speed data to residential markets. That venture intends to use Ka-band spectrum and spot-beam technology. And WildBlue, a Denver start-up, plans to get into the two-way game in 2002. WildBlue, in partnership with EchoStar, which owns 12% of the company, will offer consumers a bundled satellite TV service and Ka-band satellite broadband Internet service. The partners are developing a single dish and single box, which will combine the set-top box and PC modem.

It is estimated that there are 20 million to 30 million homes that will be unable to receive cable or DSL anytime soon, a natural market for satellite-delivered broadband. But high-speed Internet by satellite is more expensive for consumers-who will pay $59.99 per month for StarBand compared to a little more than $40 for cable modem or DSL service-and for the companies that launch the birds. Satellite deployment is an expensive undertaking.

Moreover, satellite Internet service is not without its own technical difficulties: It can be affected by weather conditions such as wind and lightning, by the distance signals must travel from the satellite and by too many PCs hooked up to a single dish.

The wireless-based broadband-distribution platform, MMDS, is providing Internet-access services today. Some already consider it a solid player in niche markets for broadband. Long-distance providers MCI WorldCom and Sprint together spent about $3 billion last year acquiring companies that held MMDS spectrum. Both Sprint and MCI WorldCom have DSL initiatives, which they view as a way to reach customers unlikely to receive wireline DSL.

A study conducted by investment analyst Sanford C. Bernstein and McKinsey & Co., called "Broadband!," concluded that, while MMDS has promise, it's "late to the game and will certainly be far behind cable and DSL by the time new MMDS equipment is available in 2001, at the earliest." The study also reports, "There are too many technological uncertainties to view MMDS as a likely candidate to become a near-ubiquitous third network."

The broadband study speculates that complementary broadband plays-combining a satellite channel with DSL or digital television with DSL-could find attractive niche markets in users with demand for Internet-based video or in markets where cable is slow to upgrade. More interesting, the study points out that these alliances could, over time, compete with cable's offer of video, voice and data. However, the McKinsey study says, in the long-run, cable has the edge. "Even if continued advances in VDSL [very high-speed DSL] and MPEG video technology allow telcos to offer improved video packages, we expect that hybrid fiber-coax players [cable], with their greater bandwidth and inherently more video-friendly networks, will be able to stay at least one step ahead."

Bandwidth-the next level?

But infrastructure is only part of the deployment needed to get to the next level of TV on the Internet. Bandwidth, which has quadrupled in the past four years, must continue to grow to accommodate the stringent requirements of streaming video, as well as the increasingly discriminating tastes of viewers in video quality.

These days, the fastest transmission speeds touted by cable and DSL services are in the range of 500 kilobits per second (kb/s) to 640 kb/s for downstream signals and up to 384 kb/s upstream. VHS quality is pegged at 300 kb/s, while DVD comparable video would require nearly 4 megabits, according to industry experts. With most high-speed services, connection rates of 300 kb/s to 400 kb/s are common and considered reasonable quality video over PCs. Streaming video on the Web requires roughly 175 kb/s, and television-quality over the Internet takes 750 kb/s or more. Traditional telephone modems deliver data at roughly 44 kb/s to 56 kb/s. From the FCC's point of view, high-speed services are those offering more than 200 kb/s in at least one direction.

Bit rates that deliver at least tolerable video are, indeed, here and now. But there are many factors that degrade video streams: the number of users on the network, dropped connections, noise and other kinds of traffic. Servers can also contribute to the slowdown.

Even with a cable modem or DSL, users can encounter jerky motion simply as a result of congestion on the Internet itself, not because of last-mile problems. Packets, blocks of data that carry the information necessary to be delivered to an address, are routinely dropped when there is heavy traffic on the Web and must be re-requested from the Web site before being delivered to the user's PC. With content such as e-mail or any file transfer, the arrangement of packets is not important. But with video or audio streaming, packets must be sent in the appropriate sequence or the stream will not go through.

Companies such as Cidera, PanAmSat's NET-36 venture, Akamai Technologies

and iBeam Broadcasting are bypassing Internet bottlenecks using satellites to bring video streams to edge servers located closer to users.

"The Internet is just not designed to support streaming. Never was. That's the fundamental issue," says Rex Bullinger, director of broadband technology, National Cable Television Association. "The only way to fight [packet loss] is with brute force: powerful routers and networks."

However, bandwidth requirements do vary according to content. Video with lots of motion such as sports content call for higher bit rates than a newscast or a lecture. And when it comes to movies, while not always action-packed, viewers expect a certain level of quality.

Granted, 300 kb/s does not provide a television experience. But as Jupiter Research analyst David Card points out, users currently are willing to accept lower quality for content not available elsewhere, such as concerts or short films. The short form, in fact, has become popular simply because Web sites now offer the genre, for which outlets have been scarce.

The nightmare: 'Everyone gets broadband'

If the magical bit rate that delivers true TV over the Internet is upwards of 750 kb/s, then how soon will the many millions of homes be tuned in?

"That's beyond our forecast horizon," says Jupiter's Card. "Right now, real honest-to-goodness DVD quality probably requires something like a 4-Mb/s bandwidth. Nobody is deploying that."

Card ventures a guess anyway, and says the day may come in fewer than 10 years, but it will definitely be more than five years. "Let's say you do it by building out the infrastructure, putting in a lot of fiber, put a lot of content at the edge of the network. We're not even talking multicasting, which doesn't work yet either. But store movies in the local cable headend rather than in the center of the Internet. You could technically do it, but it would be very, very expensive."

Others are more optimistic. SBC's Mark Hubsher figures broadband service will be in 20 million homes within three years, an estimate that EchoStar Data Network's Jim Stratigos agrees with. Peter Negulescu of Excite @ Home thinks it could happen in less than two years.

Independent consultant and former Forrester analyst Jeremy Schwartz forecasts high-speed access will reach a "critical mass of homes by 2002 or 2003." The research company estimates penetration at 18.8 million households by 2002 and 40 million by 2005, and those numbers do not include offices and multidwelling housing. By comparison, there are 100 million TV households in the U.S. and 75 million homes with cable.

Nevertheless, Forrester's Zohar points out that massive numbers of users on the Internet could be "a huge nightmare." He believes that, when content-delivery company Akamai streamed Steve Jobs' speech to MacWorld earlier this year, nearly 6% of the Internet's capacity was consumed by users logging in for the event. Attributing the line to Akamai, Zohar says, "The worst thing that can happen to the Internet is for everyone to get broadband. Each part of the Internet needs to be bolstered, not just the last mile."

Zohar concedes that a number of companies are working on the problem with satellite solutions or terrestrial content-distribution services. But even so, he says,

"the notion of getting 50 million households on concurrently is beyond our thinking right now. We forecast only about 47 million households with broadband access by 2005. I'd say it will be 2007, 2008 before we start to see that kind of world."

Despite connectivity and bandwidth impediments and the inevitable billions it will require to overcome those problems, the day will come when the PC will deliver broadcast-quality video. "It's going to happen," says NCTA's Bullinger. "Some day I expect to be sitting at home surfing channels, and I won't know-or care-whether I'm getting that video feed from a TV channel or a cable channel or a satellite or from a Web site. Some day I won't care."

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