



Z H O N E®

Cavalier Broadband TV case study

Cavalier uses UNE-L leased lines from Verizon to deliver voice, data and video over ADSL2+ using Paradyne by Zhone IP DSLAM's co-located in 215 Verizon central Offices.



Cavalier is a competitive local exchange carrier headquartered in Richmond Virginia and operating throughout the mid-Atlantic region. Cavalier has invested over \$250 million building a state-of-the-art telecommunications network. By

making the investment in its network, Cavalier is able to avoid the overhead of the incumbent telephone company. This strategy enables Cavalier to provide the highest quality customer service while passing significant savings on to both residential and business customers.

Cavalier's 1100 employees service approximately 35,000 businesses and 200,000 residential customers in Richmond, Hampton Roads, Northern Virginia, Maryland, Philadelphia, Delaware, Southern New Jersey, and the District of Columbia. Cavalier passes approximately 2,000,000 homes in these service areas with its fiber-based, IP backbone, SONET network. Over 15,000 new customers select Cavalier as their phone and/or broadband provider each month.

The Cavalier Broadband TV network

Cavalier Broadband TV harnesses the latest in digital technology to deliver an affordable alternative to cable or satellite TV services. Cavalier uses your existing phone line to deliver a powerful bundle of services: standard telephone, broadband DSL, and digital TV. The latest ADSL2+ technology, delivering up to 15 mbps to each customer, allows Cavalier to simultaneously deliver multiple channels of digital video, broadband DSL, and traditional phone services. The Cavalier service platform utilizes point-to-point switched video technology resulting in a simpler and more



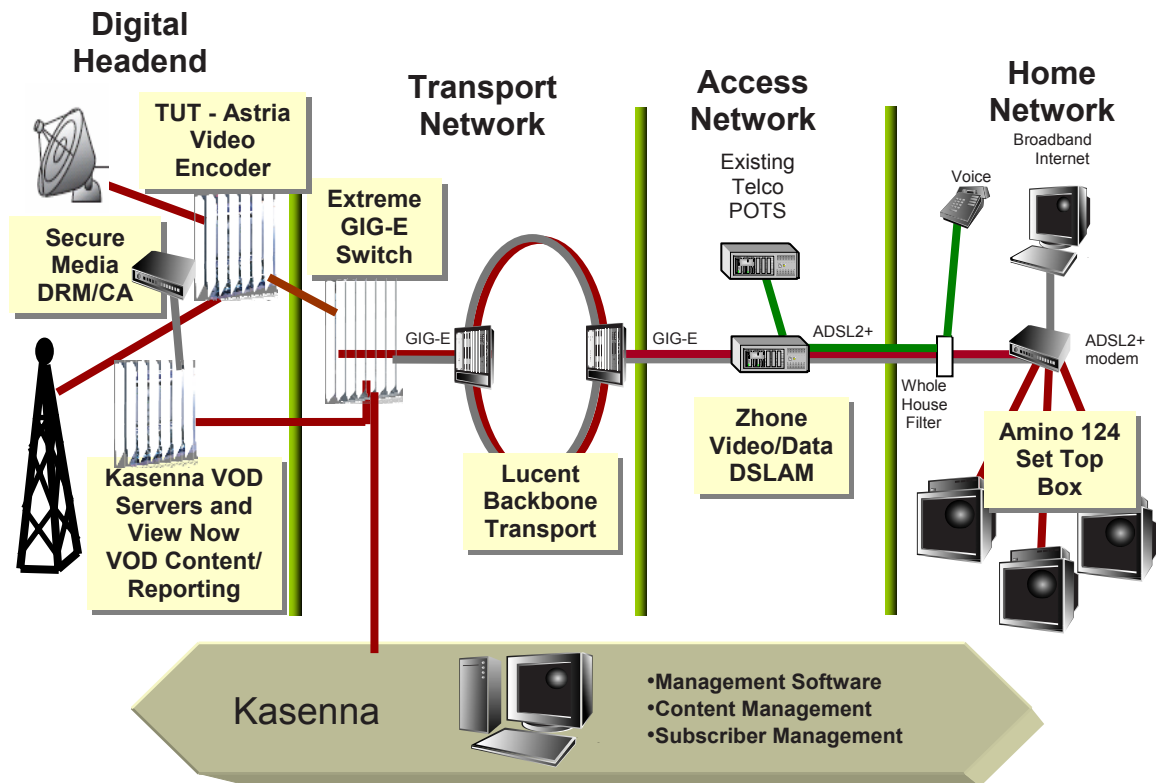


Figure 1. Cavalier Broadband TV network (diagram courtesy of Cavalier Telephone)

reliable network than the multicast broadband used in traditional cable systems. The digital headend, transport network, access network and the customer's home network comprise the Cavalier Broadband TV network as shown in Figure 1.

Cavalier's all-digital head-end in Richmond performs the broadcast content acquisition and coding/transcoding needed to convert all video streams to H.264/MPEG4 – making Cavalier as first to market with an all-MPEG4 IPTV implementation. Encryption of the MPEG4 content occurs at the head-end prior to distribution. The head-end also includes all the servers and storage needed to support VOD services.

All the management systems required to support broadcast and interactive services, network and facilities management, and back office interfaces reside at the head-end. Head-end systems also control service provisioning, encryption key distribution, and conditional access for each customer and set-top box.

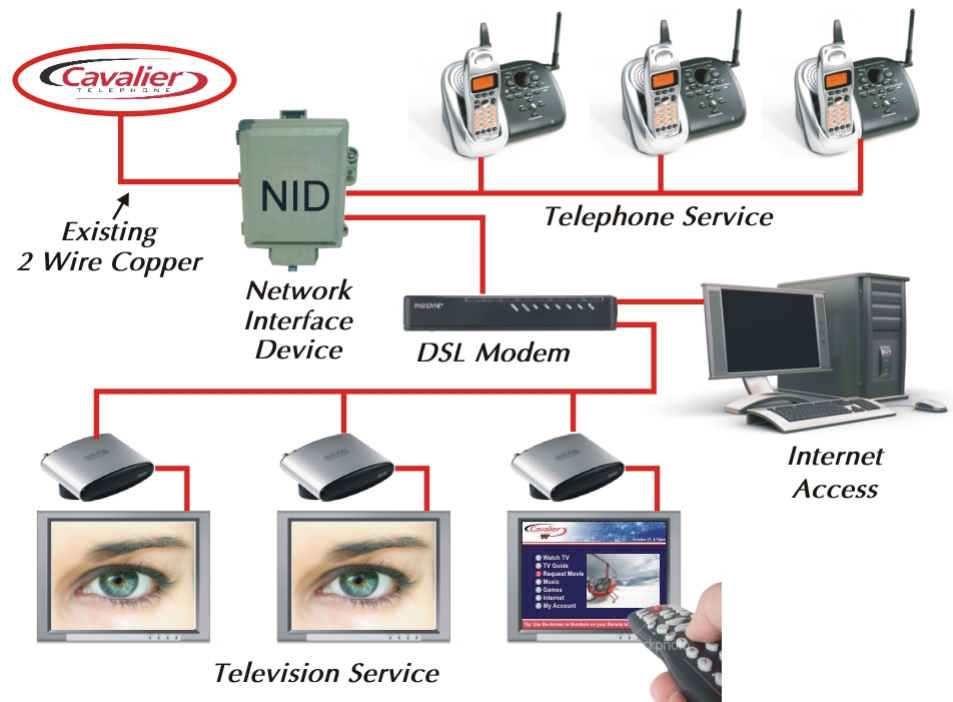


Figure 2. Triple Play home network

The transport network uses Gig-E switches and SONET rings to connect the Richmond head-end with the Central Offices throughout the Cavalier service areas. Each regional service area will include the necessary head-end functionality required to support local requirements, e.g., local channel retransmission, ad insertion, emergency services, etc.

From Zhone DSLAMs placed in Central Offices, Cavalier runs ADSL2+ to each Broadband TV customer over existing POTS copper. The ADSL2+ line-rate, up to 15 Mbps, to each customer allows for up to three separate video streams and well as broadband data (and phone) on a single copper pair. Figure 2 shows a diagram of the home network supporting all Cavalier services.

Each Set-top Box (STB) at the customer premises is uniquely identified and managed by the middleware in the Cavalier network. Application clients residing on the STB perform various functions including decryption, decoding, conditional access, etc. Analog-only STB video outputs (Composite, RGB, S-Video) prohibit access to the digital video signals resulting in a physically secure video delivery system. Macrovision copy protection on the analog video signals further enhances copy protection.

At the heart of the Cavalier Broadband TV service is the Interactive Programming Guide designed to maximize the enjoyment and ease of navigation of the Broadband TV service. The menus and buttons presented on the TV screen allow the user to navigate the many features available including:

- **On-Screen Channel Guide**

The on-screen guide not only shows the programming for each channel, but also allows customization to a “favorites” list of channels.

- **Integrated Applications**

As the single provider of residential services, Cavalier integrates features into the guide for display on-screen, e.g., caller ID, call waiting, bill viewing, etc.

- **Pay Per View**

Programming such as sporting events, wrestling matches, targeted movies and content can be ordered directly right up until the start of the program.

- **Video On Demand**

A vast library of on-demand content, including free informational programs as well as studio movies can be ordered anytime with full user control, i.e., fast-forward, rewind, pause, etc.

- **Parental Control**

Complete control of content based on standard TV ratings.

- **Games**

The interactive capabilities and picture quality of the system enhance the gaming experience.

Competitive landscape

The largest competitors in the Cavalier service areas are the traditional cable operators for video and broadband data, and Verizon for broadband data and voice services. In addition, Direct Broadcast Satellite (DBS) providers have captured a share of video-services market for US homes.

Cavalier Triple-Play opportunity

Cavalier combines its existing service portfolio, i.e., local/long distance phone service and broadband data with Broadband TV for a powerful triple-play bundle. Attractive pricing of the bundle leads to savings for customers of up to 33% over individually purchased services, and all on one convenient bill. Other benefits to customers include a wide array of crystal-clear video programming with multiple a la carte programming packages over Cavalier's reliable network.

In addition to reducing operating costs by selecting vendors offering the latest technology, Cavalier can further manage costs by:

- Leveraging its investment in existing facilities and extensive 3000 mile fiber backbone network.
- Utilizing its well managed and trained Customer & Field Service organization.
- Leveraging existing Billing and Customer Service capabilities.
- Marketing the Triple-Play to existing and new customers in areas where Cavalier has a brand and market presence.

Conclusion

Market conditions and the right mix of emerging technology, combined with a robust infrastructure create a compelling opportunity for Cavalier to enhance its product portfolio with Broadband TV service. The pricing and convenience advantage of the triple-play bundle of services: voice, broadband data, and broadband TV, put Cavalier in a favorable position when compared with the competition. The ability to manage costs by leveraging existing networks and systems further strengthens Cavalier's business case.

Cavalier, Watch What's Next.

www.cavtel.com



Zhone Technologies, Inc.
@ Zhone Way
7001 Oakport Street
Oakland, CA 94621
510.777.7000 phone
www.zhone.com

For more information about Zhone and its products, please visit the Zhone Web site at www.zhone.com or e-mail info@zhone.com

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