



Overview

Networked Solutions Integrated Test Engineering: Delivering on the Promise of Innovation

About Networked Solutions Integrated Test Engineering

The Networked Solutions Integrated Test Engineering (NSITE) lab demonstrates the Cisco Systems® commitment to helping our customers improve the power and potential of their networks. NSITE's mission is to system test complex networking solutions that span multiple technologies and products to accelerate successful customer deployments and new technology adoption.

This means enabling our customers to successfully deploy Cisco® products into what is an increasingly complex network of solutions. Tactically, it means inviting customers to try all gears before embarking on major network projects. Several major North American cable operators used the NSITE lab in 2005 to test video over IP, voice over IP (VoIP), and similar advanced services.

To say that Cisco takes systems testing seriously is an understatement. In fact, Cisco considers part of its overall mission, when it comes to making sure its products and services work as codesigned with its customers, is to break complex systems in house – before they reach production networks. (See sidebar.)

The NSITE lab is part of the Cisco Development Engineering Group, which currently has a research and development budget of US\$3.2 billion and employs 12,500 engineers. It is one of 1100 Cisco labs focused on systems and solutions for the cable, landline, wireless, and enterprise sectors.

The \$300 million NSITE facility covers cable-specific systems tests and other related efforts. The Pineview facility, located in Research Triangle Park (RTP), North Carolina, employs more than 110 highly skilled engineers. At any time, those engineers are working on more than 30 projects.

This document describes the cable-specific systems.

NSITE Research Triangle Park Lab Facility

If visitors to the 18,000-square-foot NSITE facility in RTP are extremely attentive, they will count more than 6300 assets, within 1100 equipment racks, connected by over 8000 meters of Ethernet cable and 5600 meters of shielded T-1/twisted-pair cable.

The cable-specific portions of the lab show various complex MPEG and IP systems – including video over IP, VoIP, and triple-play configurations – feeding a mocked-up digital home environment. Visitors will observe broadcast video, entering a hybrid MPEG/IP digital set-top, as well as a multimedia terminal adaptor (MTA) for fielding VoIP calls. They will see a large-screen television fed by IP-based video over the applications point of presence (APOP) network configuration.

These applications are fed by the crux of the NSITE lab – a next-generation core aggregation and hub configuration built specifically for cable operators that uses the Cisco 12000 Series routers, 7600, and 1000 Series routers; Cisco CRS-1 Carrier Routing System; and Cisco Universal Broadband Router (uBR) cable modem termination systems (CMTSs).

The Cisco “Customer Zero” Philosophy

For cable operators, maintaining service continuity is critical. Cisco, with its NSITE teams and facilities, aims to meet this need by taking the role of the first customer to use any new, complex system.

It is a mindset we call “customer zero.” In a “customer zero” role, the NSITE team tests complex systems in environments that are similar, if not identical, to a cable operator's actual network. In essence, NSITE's role is to “break” Cisco equipment before it reaches customers. This allows us to build safeguards into products to make sure our equipment works as intended when it arrives at customer locations.

Testing with a customer zero mindset increases the interoperability, scalability, upgradability, and reliability of a complex system – before it is delivered to the customer.

Evolution and Testing

As cable operators continue to push IP connectivity deeper and deeper into their networks – from regional and metro networks into the last mile and into the home – the need arises to thoroughly test all involved components. The point of the NSITE cable testbed is to experiment with “convergence services” – where all video, voice, and data traffic runs over a fully IP network, from source to destination.

A laboratory environment devoted to complex systems integration testing can only operate at pace with existing production networks, operated by its cable customers. Many “convergence” services require phased testing on regional and metropolitan-area networks first – for instance, before they can be tested for effects on access and in-home networks.

The NSITE lab exists as that “advanced technology testbed” to provide desired test environments as they evolve. Currently, the cable portion of the NSITE lab is configured to simulate the triple cable offering of voice, video, and data services over IP.

“We are taking it as far as we can go right now,” says Bill Doyle, Manager, Software Development for the cable portions of the NSITE facility. “We are at the leading edge of the cable operator’s networks.”

The Cable Video Testbed

To simulate cable’s triple offering of voice, video, and data IP services, the NSITE lab installed a fully end-to-end, multivendor network. (See Figure 1.)

The video portion – Cisco Cable Video Networking Solutions – is designed to provide a basis for the migration of analog and digital broadcast video streams onto a converged IP transport network, rather than carrying video separately from voice and data. Applications including digital simulcasting and digital program insertion, to splice digital advertisements into digital programs, are important parts of the solutions.

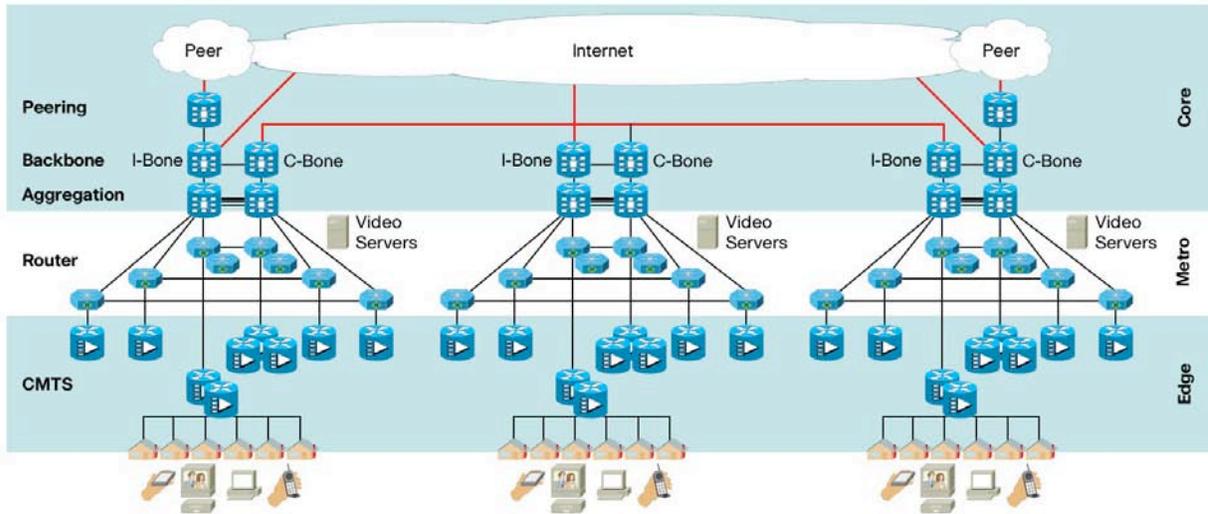
The solution begins on NSITE’s roof, where satellite receivers made by Scientific-Atlanta and Motorola Broadband pull video streams down from the Comcast Media Center (CMC) and Headend in the Sky (HITS) uplinks, in Littleton, Colorado. From the satellite receivers, the video streams enter multiplexers located in a simulated APOP. The APOP, in essence, is an aggregation point for application servers – video and voice for now; gaming, voice, video conferencing, and other emerging applications over time.

The APOP contains groomers, multiplexers, and advertising splicers made by a variety of industry suppliers. Video-on-demand servers complete the current video aggregation portion of the APOP.

From the APOP, video streams are multicast through the Cisco 7600 Series routers, into the simulated distribution hubs, and are terminated at edge quadrature amplitude modulators (QAMs).

The in-home environment includes an assortment of IP-based digital set-tops, as well as several traditional providers. Cisco MTAs and embedded MTAs (eMTAs) are also part of the in-home environment.

Figure 1
Cisco Cable Video Networking Solutions

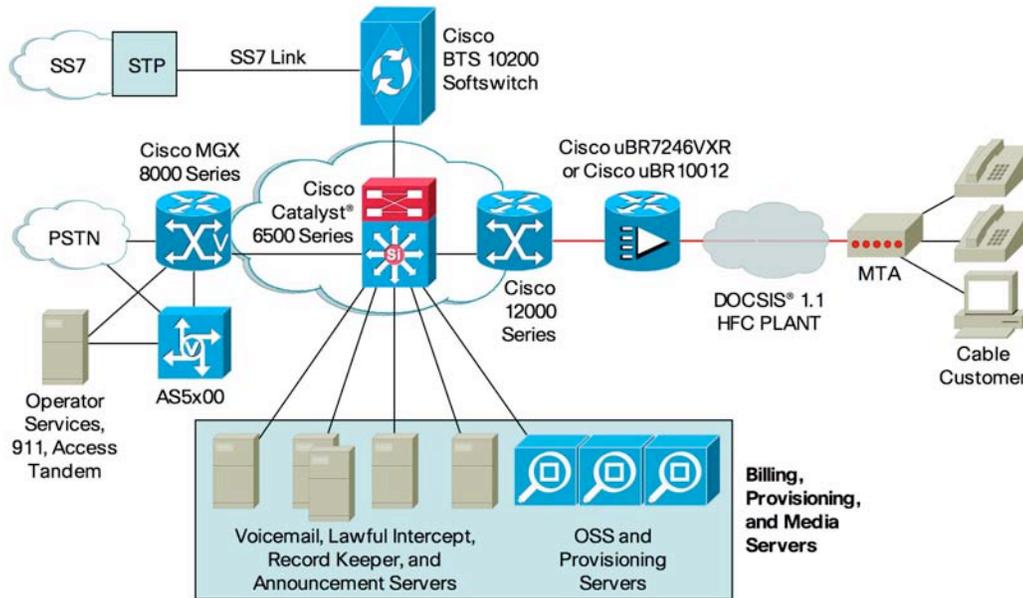


The Cable Voice Testbed

Because the APOP is an aggregation point for IP-based services, it follows that the NSITE lab is architected such that VoIP data “enters” the test lab there. As shown in Figure 2, the Cisco VoIP solution supports CableLabs® PacketCable™ specifications and spans:

- Session Initiation Protocol (SIP) interconnects for on-net-to-on-net calls
- SIP interconnects using SIP trunks
- Signaling System 7 (SS7) connectivity
- Cisco products and related MTAs

Figure 2
Cisco Cable Voice Solution



The NSITE voice testbed is testing the factors that can affect VoIP traffic. Rather than testing the components of the system, however, the role of the NSITE lab, relative to VoIP, is to determine how voice packets or sessions behave in the presence of other factors – other services requiring simultaneous bandwidth, for instance, or redundancy testing.

Current Test Activities: Cisco Cable IP Next-Generation Network

The next-generation network is an important topic among all cable operators. The Cisco Cable IP Next-Generation Network (NGN) vision and architecture address a broad transformation of a cable operator’s network and business – to help cable operators deploy new services, achieve greater efficiencies, and gain better control of their networks.

The Cisco IP NGN architecture focuses on three primary convergence areas:

- [Application convergence](#) is the profusion of new capabilities and end-user devices poised to provide a multitude of new service opportunities for carriers. Flexible and open, standards-based solutions support partner and third-party devices.
- [Service convergence](#) is the application and subscriber-level service control intelligence needed to efficiently and profitably deliver “mobile triple-play” services – voice, video, data, and mobility – across a wide range of access media. As an example, through our open Service Exchange Framework (SEF), Cisco supports IP Multimedia Subsystem (IMS) architectures and SIP services, as well as non-SIP multimedia services.
- [Network convergence](#) is the interconnection of disparate networks over a more efficient and cost-effective common infrastructure. For instance, Cisco technology allows operators to converge disparate service specifics to a single, more efficient and cost-effective IP/Multiprotocol Label Switching (MPLS)-based infrastructure, helping to significantly reduce costs.

The NSITE facility is currently focused on testing the IP NGN transport plans of several North American multiple system operators (MSOs), including IP-based regional area networks, cores, and metro-area networks.



The NSITE team is collaborating with MSO customers to capture current and future “quadruple play” requirements and to develop architectures that satisfy those requirements on an end-to-end basis. The architectures will directly feed into forthcoming test plans and address the extension of the converged IP NGN network into the last mile. For example, the roadmap includes plans to perform proof-of-concept (POC) tests on M-CMTS techniques and to decouple QAM modulators from CMTS devices and many related components of the CableLabs PacketCable Multimedia (PCMM) specifications.

Today, the NSITE team is also testing cases on IPv6 convergence and multicast convergence on the Cisco CRS-1 Carrier Routing System. Topics and techniques scheduled for test in 2006 will be conducted in phases. Phase 1 underway now includes PCMM components, including policy servers and SIP proxy servers, such as for videoconferencing, online gaming, and video over IP. Future test phases include wideband/channel bonding, IPv6, and M-CMTS configurations – all detailed within the forthcoming DOCSIS® 3.0 specifications from CableLabs. Wireless extensions to broadband services and devices are also included in the NSITE test roadmap.

Contact

Cisco wants to help you transform your network and business. Learn how NSITE can help you accelerate your new service or technology deployment. Contact your account representative today to schedule a tour or reserve testing.

**Corporate Headquarters**

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters

Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters

Cisco Systems, Inc.
168 Robinson Road
#28-01 Capital Tower
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

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