

National Managed Broadband Service for Government

The Power of the Converged Broadband Architecture

For today's government agencies with distributed field offices, integrating voice, video, and data connectivity onto a single communications platform holds the promise of reducing costs and complexity compared to multiple networks. But many challenges hinder realization of that promise, including maintaining network uptime, warding off security threats, keeping pace with compliance regulations, and reining in information technology (IT) budgets. This white paper presents an overview of the advanced networking solutions available from Hughes that overcomes these challenges. Based on the Hughes Converged Broadband Architecture (CBA) with a powerful, new enabling technology called Hughes ActiveQoS™, these solutions enable agencies to use affordable broadband to connect all their field offices nationwide via the Hughes National Managed Broadband Service.

Challenges of the Distributed Government Agency Network

Today's distributed agencies are deploying sophisticated applications at field office locations to drive productivity and efficiency, which in turn increase the demands on the wide area network (WAN). Additionally, exciting IT developments such as virtualization and Cloud computing are demanding high levels of application performance and service availability across a WAN. As a result, not only are the added applications straining the network, but also security threats are intensifying, compliance regulations are escalating, and IT departments are being stretched to their limits, both in terms of budget and depth of expertise.

These new challenges join the old, such as voice and data convergence. Although selective deployment of VoIP/data convergence at headquarters and main offices has demonstrated significant benefits, pervasive deployment at field office sites of distributed agencies remains untapped. As illustrated in Figure 1, the reason is clear: The high access cost of a convergence-enabling, private WAN usually outweighs its many benefits.

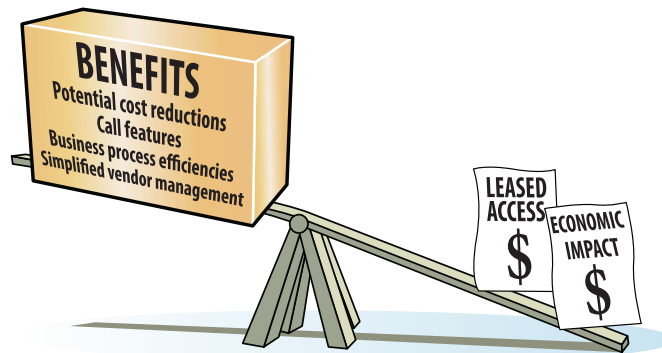


Figure 1. Challenges of Voice/Data Convergence in Agency Networks

While carrier offerings for IP core networking have evolved to become based on MPLS, last-mile access has remained centered around the familiar T1 line. T1 and other leased access MPLS networks deliver a sound convergence platform; however, in the context of the agency network, significant issues emerge in practice:

- Field office networks are experiencing rapid growth in bandwidth demand, and T1 bandwidth capacity is already—or is in danger of—becoming inadequate, particularly when converged with VoIP traffic.
- Ethernet access is touted as the next hot access technology with scalability up to 100 Mbps, but it is still limited in geographic availability to be of real value to the IT executive evaluating choices for the distributed network.

Furthermore, although it is perfectly appropriate for larger field offices, the pricing of high-bandwidth leased access delivers sticker shock to the IT manager for large-scale deployment. Hughes solves that problem with the Hughes National Managed Broadband Service powered by the CBA, which replaces expensive T1 access with the most secure and cost-effective mix of DSL, cable, wireless, and satellite broadband technologies to all sites.

Transforming Distributed Agency Networking

The dramatic price/performance curve and massive scale achieved by broadband networks is illustrated in Figure 2ⁱ—with unit bandwidth prices plummeting over 40 percent in the past five years, while average connection speeds have increased over 20 percent in the last two years.ⁱⁱ The Hughes CBA employing ActiveQoS technology fully exploits the potential of affordable broadband for distributed agencies at all field office locations, delivering end-to-end Class of Service (CoS) over broadband VPNs with high security, agency-grade manageability, and integral WAN optimization.

The result is a new transformative, cost-effective solution that is ideally suited for agencies looking to adopt converged private networks throughout their field offices.

The Hughes CBA employing ActiveQoS technology is an advanced architecture that enables cost-effective data, voice, and video convergence for distributed agencies. Incorporating sophisticated edge intelligence and backed by agency-grade SLAs, Hughes CBA delivers MPLS-like performance over broadband VPNs at significant savings. Equally important, it enables distributed agencies to meet their most critical initiatives such as security, cost containment, workforce management, loss prevention, and improved constituent experience.

As illustrated in Figure 3, by converging all network elements—transport, devices, and applications—into one seamless, reliable network, Hughes CBA with ActiveQoS enables better network performance, higher reliability, and assured security.

- **Performance**—With built-in WAN Optimization technology, Hughes CBA solutions efficiently utilize bandwidth for the highest WAN performance possible, eliminating costly upgrades and freeing up bandwidth as needed for new and expanded applications. ActiveQoS technology ensures that voice packets are prioritized to deliver high voice quality, end-to-end.
- **Reliability**—Blending the most cost-effective mix of wireline and wireless technologies, Hughes CBA solutions provide diverse broadband paths with no single point of failure.
- **Security**—Compliant with industry security standards, Hughes CBA solutions offer a flexible range of security architectures and services to meet all agency and compliance policies.

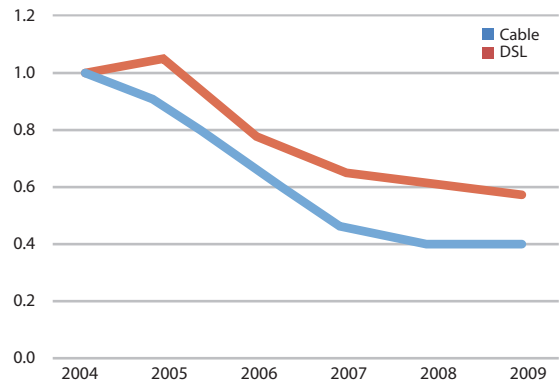


Figure 2. Cost-Efficient Bandwidth Delivered by Broadband

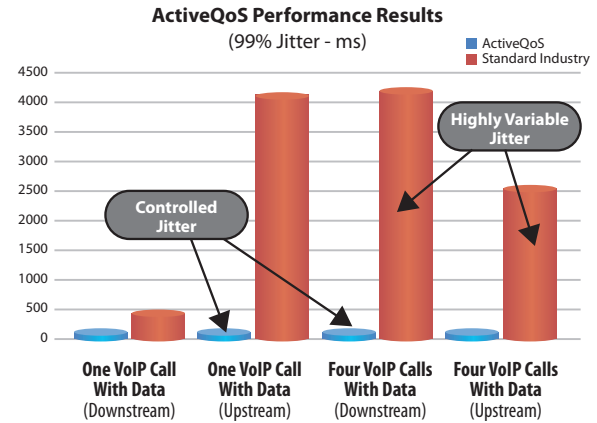


Figure 3. Hughes Converged Broadband Architecture

Hughes ActiveQoS—Core Enabling Technology

ActiveQoS is the key enabling technology developed by Hughes to achieve high quality convergence over broadband where real-time traffic, such as voice, is not normally prioritized and supported consistently. CoS markings are typically ignored by generic broadband networks, and variable performance renders edge prioritization ineffective. This has two significant consequences on field office traffic. First, real-time traffic is impacted by packet loss and jitter within the network; and second, lower priority traffic enters the WAN and degrades the performance of high-priority, mission-critical traffic.

A key enhancement to the Hughes WAN Optimization offering, Hughes ActiveQoS resolves these issues by intelligently monitoring the bandwidth over the WAN and balancing the proper volume of traffic sent through the pipe to ensure that voice, video, and real-time data can all get through. Hughes ActiveQoS balances upstream and downstream traffic to network capacity on a site-by-site basis, and is scalable to any number of sites. As a result, real-time traffic is actively prioritized while packet loss, jitter, and latency are reduced—resulting in significant cost savings.



Tested in Hughes Engineering Labs:
 • 384 kbps/1.5 Mbps ADSL connected running IPSec over Internet
 • G.729 with 40 ms packetization VoIP traffic; data combination of file transfer and Web traffic

Figure 4. Hughes ActiveQoS

WAN Optimization for Application Performance

WAN Optimization is a suite of capabilities that seeks to optimize network utilization and accelerate a broad range of applications accessed by distributed agency users via a variety of methods, including:

- Traffic management methods that give priority to mission-critical applications and related traffic during “rush hour” congestion
- TCP and other protocol-specific acceleration algorithms to minimize the effects of network latency
- Data reduction techniques, including compression and protocol redundancy removal, to improve network throughput

Hughes CBA provides a wide range of high-performance and cost-effective broadband access options at even the smallest of field offices in a typical, multi-site distributed agency. Hence, any agency WAN serving multiple field offices with standard broadband access can now enjoy big-pipe, MPLS performance without the attendant price premium via:

- Application prioritization
- Data reduction
- TCP and Web acceleration
- Scalable bandwidth

Hughes Converged Broadband Architecture—One Set of Solutions

Hughes CBA with ActiveQoS technology enables an efficient, converged set of voice, video and data solutions to create a National Managed Broadband Service for all field offices of a distributed agency. The service is fully managed end-to-end by Hughes, delivering better performance, higher reliability, and assured security.

- Data, voice, and video enabled with ActiveQoS
- Multi-transport, cost-effective broadband network—any mix of DSL, cable, 3G, satellite technologies
- Tailored architecture for security and IT requirements
- WAN Optimization to deliver excellent application performance
- Enterprise-grade SLAs

Hughes WAN Optimization accelerates a broad range of business applications over the network by staging data in local caches such as hard drives, compressing and prioritizing data, and streamlining chatty protocols. These processes derive higher throughput and improved performance over the existing bandwidth. As a result, agencies realize improved application performance, easier migration to Cloud-based services, and virtualization.

Harnessing the Power of VoIP

Delivering real-time CoS over DSL and cable broadband, Hughes CBA enables high- quality VoIP services. Hughes' VoIP enables agency field offices to take advantage of sophisticated voice and data applications without incurring costly networking charges. Agencies can enhance the constituent and workforce experiences with advanced VoIP features and perform sophisticated data mining with detailed call records.

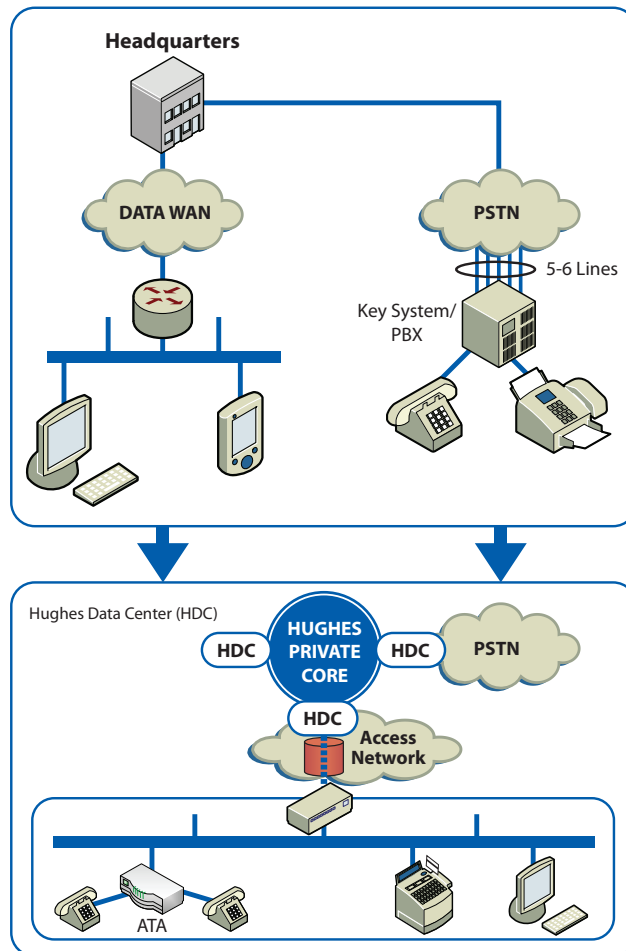


Figure 5. Hughes VoIP

Hughes VoIP also enables cost reductions at multiple levels. At the transport level, economical broadband replaces costly T1 lines. At the telephony level, hosted VoIP can yield a savings of 30 percent or greater over traditional POTS lines. In addition, SIP (session initiation protocol) trunking provides savings through the use of networkwide concurrent paths for agency-level trunk optimization. And at the business level, benefits include common management of agencywide calls, flexible call control, and VoIP PBX features, such as Web portal administration and advanced call routing capabilities from a Cloud-based solution. In addition, large distributed agencies typically must deal with many service providers to meet voice and data needs at all their locations. Hughes VoIP enables agencies to avoid these headaches and consolidate all their voice and data nationwide under a single vendor.

Key Initiatives and Applications with Hughes CBA

An important aspect of Hughes CBA is that it enables a myriad of layered solutions such as Digital Media, Guest Wi-Fi, and Rogue Wireless Scanning to address the challenges of the evolving distributed agency. As shown in Figure 6, the top layer of the Hughes CBA with ActiveQoS, rendered in dark blue, indicates core network functionality. The middle layer (red) illustrates an extensive range of applications enabled by Hughes CBA, and the bottom layer (light blue), illustrates how Hughes CBA enables tailored industry solutions.



Figure 6. CBA Layered Applications/Solutions

The Field Office of the Future

Tomorrow’s field offices will look very different from those of today. They will be equipped with technological advancements such as constituent- and employee-facing digital signage, interactive kiosks, and rich media training for employees, to name a few.

The keys to achieving this field office of the future are converging all network elements into a single seamless network, linking solutions to agency strategies, and connecting all field offices with a national managed broadband service. As shown in Table 1, Hughes CBA-enabled applications are matched to key agency initiatives.

Agency Initiative	Hughes CBA-enabled Solutions
Centralization/Virtualization	<ul style="list-style-type: none"> ■ WAN Optimization ■ High-Availability VPN ■ Field Office Server
Workforce Management	<ul style="list-style-type: none"> ■ Training and Learning (interactive, video, field office, and Cloud-based)
Loss Prevention	<ul style="list-style-type: none"> ■ Managed Video Services
Constituent Experience	<ul style="list-style-type: none"> ■ Digital Signage ■ Interactive Kiosks ■ Guest Wi-Fi ■ Enterprise Wi-Fi
Network Security	<ul style="list-style-type: none"> ■ Centralized and distributed Unified Threat Management (UTM) ■ Rogue Wi-Fi Scanning ■ Managed Firewall
Cost Containment	<ul style="list-style-type: none"> ■ Broadband-based high-performance networking
Voice Integration	<ul style="list-style-type: none"> ■ Cost-effective, full-featured VoIP over broadband

Table 1. Matching CBA-enabled Solutions to Key Agency Initiatives

Conclusion

The Hughes National Managed Broadband Service, powered by Hughes CBA with ActiveQoS, brings government agencies the enormous benefits of convergence over broadband. By converging all network elements—transport, devices, and applications—into one seamless, reliable network, Hughes delivers MPLS-like performance over affordable broadband technology. Leveraging Hughes proprietary WAN optimization and ActiveQoS technology, the Hughes CBA enables expansive bandwidths, high availability and security, superior application performance, and true network flexibility at every site. In the future, Hughes CBA will also deliver mobile applications over cost-effective broadband.

Setting the next-generation standard for agency private networks, Hughes CBA with ActiveQoS enables the agency to connect all its offices efficiently and cost-effectively via the Hughes National Managed Broadband Service. As a result, the agency can do more with less, exploit its existing networking infrastructure for greater performance and capabilities, and affordably improve its service to the public by deploying the latest applications—ultimately transforming the WAN into an essential asset to serve the government field offices of the future.

Hughes National Managed Broadband Service

- Fully managed services from a single provider
- Most cost-effective combinations of satellite, landline, and/or wireless technologies
- Integrated, managed connectivity, security, and flexibility
- Superior national broadband coverage
- Turnkey implementation

¹Shane Greenstein and Ryan McDevitt, Northwestern University, 2010.

²The State of the Internet, Akamai, 2008 and 2010.

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