

SERVICE PROVIDER

Solution Guide: Multiplay Solution for Independent Operating Companies

Describes a joint Brocade-Occam Networks solution for lowering costs in provider networks while providing turn-key services to generate new revenue opportunities with a Brocade multiplay solution.

BROCADE

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INTRODUCTION

The last decade marked a rapid increase in high-speed Internet access to the home through DSL and other Broadband technologies. As a result, more and more end-user services such as voice and data are migrating from legacy Time Division Multiplexing (TDM)-based technologies to IP-based networks. Moreover video has been added to the mix, and digital voice, video on demand, Internet gaming, and IPTV are becoming part of everyday life.

As multiplay services become a standard subscriber request to communications providers, rich media applications within those services are consuming increasing amounts of bandwidth. The challenge that service providers are facing is how to accommodate ever growing bandwidth demands while keeping subscriber fees at an attractive price point and maintaining reasonable operating margins.

The Challenge

Rural telco providers are seeking ways to enhance the subscriber experience through faster Broadband speeds and new services, which enable new revenue streams for the provider, while at the same time keeping the network costs in line.

The Solution

The Brocade flagship NetIron family of aggregation products consisting of NetIron CES switches and MLX routers combined with Brocade solution partner Occam Networks BLC 6000 and ONT series. Brocade's multiplay solution components include:

- Multi-services access
- Carrier Ethernet edge
- High-quality content center

The Brocade Advantage

Brocade is one of the few vendors in the industry offering both solution depth and breadth, spanning all areas of multiplay networks from the smallest to the largest provider. The Brocade solution promises lowest Total Cost of Ownership (TCO), highest investment protection and service performance to decrease Operating Expenses (OpEx) and enable new turn-key services to generate new revenue streams. In addition to lowest operating costs, key Brocade advantages include:

- | | |
|--------------------------|----------------------------|
| • Choice and flexibility | • Dense routing |
| • Service reliability | • Multicast delivery |
| • Service visibility | • Robust security |
| • Service management | • High-ceiling scalability |

Early Asymmetric Digital Subscriber Line (ADSL) devices were mostly tied to “nailed-up” circuits, which required expensive ATM switches on the network edge. These static allocations of bandwidth did not provide the most efficient means to transport highly dynamic Internet data traffic. As time went on the economics of combining voice, video, and data on a single transport network based in IP technologies became standard industry practice. While this transition brought much efficiency to the network, the combination of traffic flows made it necessary to aggregate more traffic upstream on the network while maintaining individual traffic profiles and treatment. Innovative service providers addressed the challenge of combining legacy and modern services by replacing traditional DSLAMS, DLCs and OLTs with Multi-Service Access Platforms (MSAPs), which are optimized to transport IP traffic. These access platforms not only aggregate a variety of physical interfaces but also can manage a diverse range of service flows. The interface between these MSAP platforms and the provider's metro aggregation platform is Ethernet.

A scalable, high-performance IP aggregation and core network is at the heart of today's multiplay networks. As time-sensitive voice and IPTV traffic are fed into the IP, regional core capabilities such as wire-speed switching, scalability, Quality of Service (QoS), and reliability play a far more important role.

Brocade® and Occam Networks together bring service providers a best-of-breed multiplay solution. The Occam Networks Broadband Loop Carrier (BLC) 6000 new generation of Multi Service Access Node (MSAN) terminates the heterogeneous last-mile interfaces and service flows while the Brocade NetTron® MLX high-performance, high-density routers aggregate and service these flows.

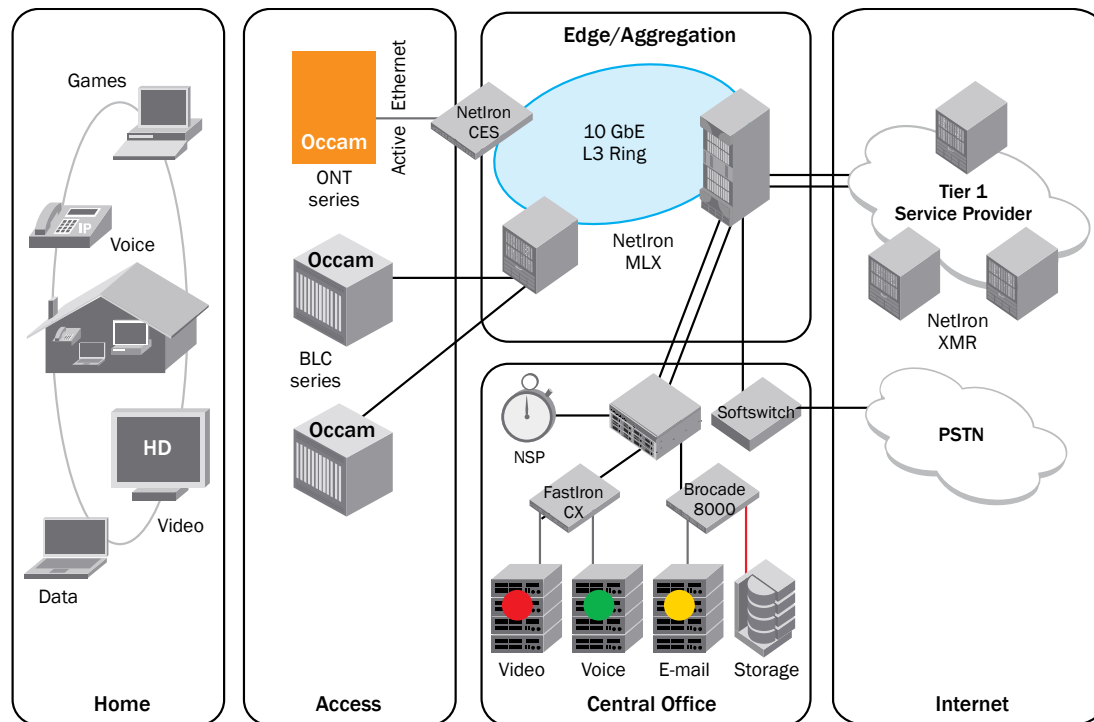


Figure-1. Brocade residential multiplay carrier solution

As Figure 1 shows, utilizing active Ethernet technology, the Occam 2000 series Optical Network Terminals (ONTs) terminate direct fiber lines, which can scale to a symmetrical 1 Gigabit per second (Gbps). Occam ONTs can be deployed in a wide range of environments and can deliver a variety of applications to single family residences, multiple tenant buildings, and commercial buildings with equal simplicity, flexibility, and cost efficiency. Occam is one of the few manufacturers offering ONT solutions for both gigabit active Ethernet and GPON (Ethernet PON) fiber networks to provide flexibility and choice. The Brocade NetTron CES Series of compact, highly scalable, fully Layer 3-capable switches can aggregate multiple ONTs and connect them to a high-speed, Layer 3 IP network. The NetTron utilizes Brocade Metro Ring Protocols (MRPs) on a high-speed, fault-tolerant 10 Gigabit Ethernet (GbE) ring to connect multiple regional rings.

NetTron MLX routers add Multi Protocol Label Switching (MPLS), Layer 3, and routing capabilities to the solution to enable connection to the Internet or remote data centers through a Layer 3 network. The traffic traversing the ring is aggregated by Brocade NetTron MLX routers and fed into a high-performance backbone composed of Brocade NetTron XMR flagship routers. The Brocade NetTron family of products are fully IP/MPLS capable routers on which Layer 2 (VLL or VPLS) and/or Layer 3 MPLS-based services can be provisioned to partition high-value services to residences or businesses. These high-value features are incorporated into the NetTron without the need for service-specific hardware or software licenses to be purchased, allowing service providers to preserve their initial investment and generate new revenue streams as opportunities arise. (To enable MPLS on the Brocade CES Series, an optional software license must be purchased and installed.)

As a technology leader in the data center, Brocade offers extensive data center solutions for data centers of all sizes. Brocade offers a range of Top of Rack (ToR) switches for 1 GbE and 10 GbE server connectivity with Ethernet, Fibre Channel (FC), and Fibre Channel over Ethernet (FCoE) capabilities. The Brocade BigIron® RX Series is a highly scalable data center aggregation solution available in varying chassis sizes and port densities. Brocade's combined LAN and SAN solutions can build co-located or remote data center infrastructure to deliver low-latency, high-bandwidth voice, video, and data content to the end users.

Overall, the Brocade-Occam multiplay solutions help providers retain investments in existing access infrastructure with investment protection as IP technology complements or replaces legacy technologies on the access side. Brocade's high-performance, high-density solutions consolidate more traffic onto a smaller footprint and lower operating costs—while highly scalable wire-speed service capabilities enable providers to generate new revenue streams through on-the-top applications.

As multiplay becomes part of every home and business, rich media applications consume more and more bandwidth. The challenge that providers face is how to accommodate growing bandwidth demands and still keep prices low enough in a very competitive market. A communication provider's biggest asset is its network, and the ROI from this asset is the largest indicator of profitability for providers. *The key is to improve the bottom line through lowered costs of operation and at the same time grow the top line.* And to grow the top line, providers need to find new ways of generating top-line revenue through more off-net and value-added services.

BROCADE SOLUTION

The challenge that providers face is a complex one and demands an innovative solution. The only way this can be accomplished is through lowering networks costs through consolidation, investment protection, and simplification of operations while generating new revenue streams through value-added services that can scale rapidly. Only a handful of network vendors offer the depth and breadth of solution and feature richness to help meet this multidimensional challenge. Brocade offers a comprehensive solution that encompasses every level of the problem end to end.

Brocade has a range of Ethernet/IP and storage networking products, which can solve current enterprise campus, data center, or service provider problems. Together with our solution partners, Brocade can extend solution offerings deeper into homes and businesses for complete end-to-end integration. Service and content providers in particular can benefit from Brocade NetIron high-performance, service-rich routers. The NetIron Series includes the compact NetIron CES and multiple-density NetIron MLX and XMR chassis solutions to fit all size of provider needs.

The **Brocade NetIron CES Series** is a family of compact 1U, carrier edge/aggregation switches that combine powerful capabilities with high performance and availability in a smaller footprint. The switches provide a broad set of advanced Layer 2, IPv4, and MPLS capabilities in the same device. As a result, the NetIron CES supports a diverse set of applications in carrier edge and service provider networks.

The **Brocade NetIron MLX and XMR Series** of routers include 4, 8, 16, and 32-slot chassis options with varying port densities and performances. The series offers industry-leading port capacity and density with up to 640 GbE, 128 x 10 GbE, 64 x OC192, or 256 x OC48 ports in a single system. The Brocade NetIron family of products provide a high-performance, high-bandwidth solution to accommodate bandwidth-hungry video applications.

The Brocade solution partner product, Occam Networks BLC 6000 chassis, provides flexible deployment configurations for the loop carrier system. With these chassis, BLC 6000 blades can be deployed as standalone assemblies for low-density applications, as stacks for mixed-capability, medium-density applications, and in high-capacity configurations at sites requiring the greatest density. Occam Networks offers telecommunication companies a complete fiber networking solution, including a variety of Optical Network Terminals (ONTs) for high-bandwidth transport and fiber line termination.

KEY SEGMENTS OF THE BROCADE-OCCAM MULTIPLAY IOC NETWORK

Multi-Service Access

The Occam Networks BLC 6000 integrates the functions of an NGDLC, FTTx System, IP DSLAM, Optical Multiplexor, VoIP Line Access Gateway, Line Test System, and Ethernet switch into an environmentally hardened loop carrier system. The system includes plug-in blades, chassis, cabinets, and management software. It supports standard lifeline POTS phones and DSL modems and integrates into CLASS 5 switching via TRO8 or GR 303. And it supports IP IADs, Terminal Adapters, or IP phones into IP softswitches. One or the other, or mix and match simultaneously.

The BLC 6000 series features the Occam Intelligent Blade Interconnect Architecture (IBA), which combines distributed traffic processing on the blades with a unique blade interconnect system to achieve unprecedented flexibility for cost-effective configurations in low-, medium-, and high-capacity deployments. Distributed traffic processing eliminates the cost of duplicating equipment used in common, and the BLC 6000 blade interconnect system removes the future-proofing limits of traditional backplanes.

Occam ONTs can be deployed in a wide range of environments and can deliver a variety of applications to single family residences, multiple tenant buildings, and commercial buildings with equal simplicity, flexibility, and cost efficiency. Occam is one of the few manufacturers offering ONT solutions for both gigabit active Ethernet and GPON fiber networks to provide service providers with the flexibility to choose the solution that is right for their business.

Carrier Ethernet Edge

The Brocade NetIron MLX Carrier Ethernet edge provides intelligent and scalable Carrier Ethernet services to aggregate voice, video, and data. The NetIron family of products is built on the same Brocade Multi-Service IronWare® operating system, simplifying integration with existing networks. Brocade NetIron MLX switches centralize the intelligence and simplify operations to limit change management to a single point rather than hundreds of MSANs.

Key capabilities include an industry-standard interface, support for robust routing protocols, QoS, MPLS VPNs, advanced Layer 2 protocols, a broad range of OAM protocols, advanced security, and simplified management. In addition, IronWare supports Provider Bridge (PB) and Provider Backbone Bridge (PBB) functionalities. Because the NetIron complies with the MEF 9 and MEF 14 specifications, providers can offer E-LINE, E-LAN, and E-TREE services—the standardized service names for point-to-point, multipoint, and rooted multipoint services respectively. These services can be offered using 802.1Q VLANs, PBs, PBBs, or MPLS Layer 2 VPNs.

In addition to 7.68 Terabits per second (Tbps) forwarding capacity and very strong routing and multicast capabilities at wire speed, the NetIron MLX offers advanced bandwidth control capabilities with two rate-three color traffic policers, which provide committed bandwidth to users and/or applications. NetIron MLX routers also offer advanced packet marking, prioritization, queuing, and scheduling with Weighted Random Early Discard (WRED) congestion management for optimal and granular control of bandwidth utilization throughout the network for voice and video handling. A comprehensive suite of advanced traffic management and QoS functions enables the deployment of multiplay networks with granular per-subscriber, per-DSLAM, and per-port QoS and accounting—all of which provides a quality end-user experience—which translates into customer retention.

High-Quality Content Center

A content provider's data center is really a content center as these days it is all about content. Brocade's comprehensive performance solution for content delivery is one of the best in the industry. To serve up rich media such as video, The fully Layer 3 and multicast-capable Brocade FastIron® EdgeX and CX Top-of-Rack switches provide deep buffering and wire-speed performance in compact form factors that save space and power. To provide time-sensitive voice or for future-proofing, consider the low-latency, high-throughput Brocade TurboIron® 24X 1/10 GbE capable Top-of-Rack switches. If multi-VRF based zoning and end-to-end isolation and virtualization are required, the Brocade NetIron CES could solve the problem. Furthermore most of the Brocade access switches have a choice of copper or fiber for flexibility.

The Brocade BigIron RX is a data center flagship switching solution for Middle-of-Row, End-of-Row aggregation. Available in four different chassis sizes and scalable up to 5.12 Tbps, 1536 x GbE and 512 x 10 GbE ports in a single chassis, BigIron RX offers leading performance and scalability for the smallest to the largest data center. If you need an end-to-end virtualized environment, the NetIron MLX can fulfill the need. Either BigIron RX or NetIron MLX alone can easily provide a collapsed-layer, flat data center design, which delivers an optimal price-performance ratio for small providers or Independent Operating Companies (IOCs).

Brocade also has extensive server and storage solutions to store and serve rich content. Brocade's embedded and standalone SAN backbones, directors, and switches offer a wide range of connectivity options for storage along with its Host Bus Adapter (HBA) and Converged Network Adapter (CNA) family. Brocade's industry-leading OEM partners such as IBM and HP offer a large choice of servers, Brocade offers complete Business Continuity/Disaster Recovery (BC/DR) solutions. Content providers have cost-effective choices with Brocade data center solutions to serve content to their customers.

BROCADE SOLUTION BENEFITS

Service Reliability

Designed to enable reliable converged infrastructures and support mission-critical applications, the NetIron MLX and XMR feature advanced 1+1 management and N+1 redundant switch fabric and power supply architecture for high availability. The NetIron CES also offers built-in redundant power supplies. In addition, the Multi-Service IronWare operating system provides hitless management failover with BGP and OSPF graceful restart capabilities, as well as hitless (in-service) software upgrades for further enhancing both system availability and overall network availability on which 24x7 service availability depends.

To provide higher reliability in carrier services, the NetIron CES supports Metro Ring Protocol (MRP/MRP-II), the ring resiliency protocol of choice for many metro networks worldwide. The Brocade MRP/MRP-II implementation enables the delivery of Carrier Ethernet services over ring-based topologies, including overlapping rings that help optimize the use of fiber in metro rings and provide recovery from node/link failures in milliseconds. Brocade MRP/MRP-II can also be used within PB/PBB networks. Standard Layer 2 protocols such as MSTP, RSTP, and STP are also supported.

Service Visibility

All Brocade NetIron products have sFlow sampling capabilities, providing deep flow-level visibility that is directly tied to service awareness and quality. The simplified and scalable monitoring model across Brocade products reduces operational costs and simplifies network operations. Combined with Brocade IronView Network Manager (INM) or other sFlow collector, providers can sample their network traffic and use the results for monitoring, trending, or capacity planning.

Service Management

Specifications such as IEEE 802.1ag-2007 (Connectivity Fault Management) and MEF 17 (Service OAM Framework and Specifications) enable fast, proactive identification and isolation of faults in the network or service, helping to increase service uptime and the ability to meet Service Level Agreements (SLAs).

The NetIron supports all the capabilities in IEEE 802.1ag, including Connectivity Check Messages, Loopback Message/Response, and LinkTrace Message/Response. It allows flexible association and definition of both Maintenance End Points (MEPs) and Maintenance Intermediate Points (MIPs) within a network. Fault management functions of MEF 17 Service OAM are also supported. Together, these tools provide the capabilities to monitor, diagnose, and centrally manage the network.

Dense Routing

For edge/aggregation routing, the NetIron MLX includes advanced hardware-based routing technology, Brocade Direct Routing (BDR). BDR offers operators secure and robust routing with dual-stack IPv4/IPv6 wire-speed routing performance. NetIron MLX switching routers offer capacities up to 512,000 IPv4 routes in the hardware Forwarding Information Based (FIB) and up to 2 million BGP routes in the BGP Routing Information Base (RIB), thereby enabling high-performance, scalable, and cost-effective Internet edge/aggregation deployments. Along with graceful restart capabilities, routing failures can be gracefully recovered and converged without connectivity losses or service disruptions for end users.

Multicast Delivery

Multicast transport is a key enabler of next-generation services such as IPTV as well as the use of video, financial, and other one-to-many applications. The NetIron provides comprehensive support for multicast switching and routing through a variety of protocols, including PIM-SM, PIM-DM, PIM-SSM, MSDP, IGMP v2/v3, and other platform-independent capabilities. Egress interface-based replication optimizes switch performance and buffer usage within the system to help maximize network performance for multicast traffic.

Robust Security

Brocade Multi-Service IronWare contains many security capabilities that are available on the NetIron. These capabilities support inbound and outbound Access Control Lists (ACLs), ACL logging, advanced Layer 2 controls, limits for broadcast/unknown unicast/multicast, Multi-VRF, Layer 2 VPNs, and more. Receive ACLs assist in placing controls on unwanted traffic targeted toward the control plane. Through tools such as ACL-based traffic policers, ACL-based sFlow, and ACL-based mirroring, malicious traffic can be easily identified and preventive measures taken in the network. In addition, Multi-VRF can help segment the network into different zones for security and isolation.

High-Ceiling Scalability

The Brocade NetIron provides highly scalable services at wire speed. The NetIron CES Series supports up to 128,000 MAC addresses per system. The NetIron MLX routers offer capacities up to 512,000 IPv4 routes and up to 2 million BGP routes in hardware, thereby enabling high-performance, scalable, and cost-effective edge/aggregation/core deployments. The use of up to 32 x 10 GbE (320 GbE) Link Aggregation Groups (LAGs) enables the aggregation of multiple links to provide a very high bandwidth interconnects.

To support highly scalable Carrier Ethernet services, Brocade has developed an innovative framework called Ethernet Service Instance (ESI). Using the ESI framework, providers can flexibly define and assign VLANs to service instances within the network, allowing them to rapidly instantiate and easily manage E-LINE, E-LAN, and E-TREE services.

Lower Operating Costs

Each Brocade NetIron router has the lowest power consumption and heat dissipation among routers in its class. The leading density of each router in this series and its small form factor yield significant real estate savings for network operators. These unique aspects yield significant savings on power, cooling, and rack space, thereby reducing the overall OpEx. To help optimize technology investments, Brocade and its partners offer complete solutions that include education, support, and services.

ABOUT BROCADE

As a leading provider of high-performance data center, enterprise campus, and service provider networking solutions and services, Brocade enables today's complex, data-intensive businesses to optimize information connectivity and maximize the business value of their data. Brocade has pioneered numerous switching, routing, security, and application traffic management technologies to ensure highly reliable and secure data center connectivity. Today most of the world's data flows through Brocade equipment and data center networks built on Brocade technologies, so it's no wonder that Global 500 companies rely on Brocade to keep their businesses running smoothly. For more information, contact a Brocade sales representative or visit www.brocade.com.

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