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Introduction

The Enterprise IPTV and Video Streaming Solution enables organizations to produce and broadcast live and on-demand video to internal (employees) and external (partners, customers, investors, analysts) audiences over IP based networks. Broadcasts are delivered to auditoriums, conference rooms or desktops, and viewed with media players on desktop computers, or from dedicated Set Top Boxes and multimedia appliances. In essence, it enables organizations to reach dispersed audiences with the same powerful broadcast video capabilities.

In this document we first provide an overview of the Blue Coat ProxySG® and its MACH5 technology for Enterprise Content Delivery. We then provide an overview of the Jubilant ERM² Platform for IPTV Management, and discuss how ERM² integrates with the Blue Coat MACH5 technology suite to enable a seamless end-to-end solution for an enterprise.

Blue Coat ProxySG with MACH5 Technology for Enterprise Content Delivery

The Blue Coat ProxySG is a scalable, rich content delivery platform that enables enterprises to deliver a variety of content types including media and other large files throughout the organization at high speed. With over 11 years of experience delivering inline caching and content acceleration to the largest ISPs, enterprises and governments around the world, the ProxySG with MACH5 technology combines the industry leading content delivery platform with full featured WAN Optimization and policy control. This unique combination affords organizations precise control over their network as a content delivery service, stopping unnecessary content, accelerating video and other good content. By making rich content easier to distribute, along with techniques that free bandwidth for potentially intensive real-time video, ProxySG makes Enterprise Content Delivery feasible for a much broader range of organizations.

ProxySG appliances come with the following MACH5 technologies for Enterprise Content Delivery:
Object Caching - Allows the media content to be stored in a local object cache at the branch or remote location, removing almost all user wait time and WAN bandwidth requirements.

Byte Caching and Compression - Although most rich content is already aggressively compressed, byte caching and compression can dramatically improve the bandwidth and user performance characteristics of many of the applications and metadata that surround many rich media deployments.

Pre-positioning - Enables the administrator to determine the best times for wide distribution of corporate video such as elearning, or executive announcements, in order to avoid heavy WAN traffic periods, while ensuring content is where it’s needed, when it’s needed.

Stream Splitting Protocol Optimization - Allows the ProxySG to serve live video to multiple branch office users from a single real-time download, scaling video broadcasts without the complexity of network multicasts.

Specific Protocol Optimization - Improves the network characterizes numerous protocols including RTSP, RTP, RDT, MMS, HTTP/S to account for latency, jitter and packet loss.

Policy Control - Administrators can define policies for network access and priority based on user, user group, application, source, time of day and more to ensure adequate resources are dedicated to demanding rich media applications.

To further reduce the cost and complexity of deploying Enterprise Content Delivery systems, Blue Coat ProxySG offers a wide variety of management and deployment options. Using Blue Coat Director, organizations can see, manage, deploy and control hundreds of ProxySG appliances around a distributed enterprise. Director can additionally control network policy and content pre-population across the ProxySG ecosystem, to ensure a consistent user experience.

ProxySG with MACH5 technology brings the richest suite of tools to bear on the Enterprise Content Delivery challenge. Combined with the content creation and management features of the Jubilant platform, the ProxySG is a key part of a best-of-breed application and content delivery solution.

By deploying Blue Coat MACH5, an organization can realize tremendous benefits quickly in terms of reduced latency and significant reductions in bandwidth utilization of the WAN. The chart bellows some test results of these points.
Actual Test Results for VoD and Live Video Streaming with Blue Coat MACH5.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Bandwidth Used</th>
<th>Without ProxySG</th>
<th>Cold</th>
<th>Warm</th>
<th>More than 15 times faster</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Demand Test Scenario</td>
<td>1.28 Kbps WAN with 200ms latency</td>
<td>16 MB</td>
<td>14 MB</td>
<td>1 MB</td>
<td></td>
</tr>
<tr>
<td>Live Test Scenario with 5 users</td>
<td>1.544 Mbps WAN with 50ms latency</td>
<td>196 MB</td>
<td>39 MB</td>
<td>39 MB</td>
<td></td>
</tr>
</tbody>
</table>

Solution Architecture

An Enterprise IPTV/Video Streaming Solution is comprised of four key architectural elements, as follows:

- **Presentation Systems and Encoders** to incorporate audio, video, and other graphical elements such as Power Point presentations and PC content ( spreadsheets, documents, web content) to create multimedia presentations.

- **Endpoints** to ingest multimedia content, including desktops, Set Top Boxes, and portable media devices.

- **Distribution Systems** to efficiently and securely distribute multimedia content throughout the enterprise and on the Internet. This includes systems and technologies such as Enterprise Content Delivery Networks, Internet Content Delivery Networks, Multicast, and QoS.

- **IPTV Management System** coordinates and controls the Presentation Systems, Endpoints and distribution systems. It also integrates with existing enterprise applications such as portals, Identity Management systems and search engines.
The Enterprise IPTV Solution is comprised of an IPTV Management System and Multimedia Systems. The IPTV Management System integrates with existing Enterprise Applications, Communications Systems and Network Infrastructure.

The IPTV Management System is the central point of management for the Enterprise IPTV Solution and provides three key value propositions. First, it manages and coordinates all the systems that comprise the solution to enable a streamlined, automated workflow. Secondly, it provides a full suite of management capabilities for producers and administrators, to enable the scheduling, presentation, distribution, and publishing of multimedia content, with minimal support from corporate IT staff. Third, it integrates with existing enterprise applications and network infrastructure to enhance and optimize IPTV services in the enterprise.
Enterprise IPTV and Video Streaming with the Blue Coat ProxySG

Enterprise Content Delivery Platform

As mentioned previously, the Blue Coat ProxySG uses multiple techniques, together called MACH5, for accelerating rich media distribution. For most Jubilant/Blue Coat IPTV deployments, a combination of these approaches would be used for each scenario to obtain highly accelerated and controlled video content delivery.

Live Video Streaming

The individual Blue Coat ProxySG appliances residing at each branch office would pull a unicast live video stream from a server across the WAN and use stream splitting to deliver it to multiple unicast clients. It is important to note is that this stream splitting requires no change to the server or client; the ProxySG automatically begins splitting when multiple clients request the same live stream URL. It would require some minor modifications to the network.

The following diagram shows the Proxy SG deployment for Live Video Streaming integrated with Jubilant’s ERM² platform and camera and encoder.
Hybrid Unicast-to-Multicast/Multicast-to-Unicast Streaming

Unicast-to-multicast streaming is similar to stream splitting except that instead of taking a unicast stream and delivering it to several clients via unicast, a unicast stream is delivered to the clients via multicast to minimize the bandwidth impact on the network and the load on the ProxySG. This requires a multicast-enabled LAN. Alternately, if a customer has a multicast-enabled WAN and non-multicast-enabled LAN then they can use a ProxySG to subscribe to a multicast stream in from data centre and deliver it via unicast to clients on the LAN.

Video on Demand Streaming

Pull Caching for Video on Demand

The ProxySG can use its local object cache to store entire video on demand files. As a result, the file is effectively local, as if there were a video and web server in the branch office, reducing repeat traffic on the WAN. In this delivery scenario, the video quality is exceptional and there is no additional burden placed on WAN bandwidth after the first viewing.

The following diagram shows the Blue Coat MACH5 deployment with the Jubilant ERM² Platform and film encoder for Caching Video on Demand, (VoD).
Pre-Positioning for Video on Demand

Pre-positioning can be arranged for Video on Demand to schedule the delivery of VOD content on specific dates and times during off peak hours. This removes any delay for the first viewer, as the cache already has a copy of the needed files. The versatility of pre-positioning, especially the ability to pre-position web as well as almost any video file type, make it a powerful way to enable a variety of common media uses, such as e-learning and planned corporate announcements.

IPTV Management System

The IPTV Management System is the central point of management in the Enterprise IPTV Solution and provides three key value propositions. First, it manages and coordinates all the systems that comprise an IPTV solution, enabling a streamlined, highly automated workflow. Secondly, it provides a full suite of management capabilities for producers as well as administrators, to enable the scheduling, presentation, distribution, and publishing of multimedia content, with minimal support from corporate IT staff. Third, it integrates with existing enterprise applications and network infrastructure to enhance and optimize IPTV services in the enterprise.

Problems with IPTV in the Enterprise

In the past, producers had to interface with a variety of corporate IT staff responsible for enterprise applications (portal, security) as well as network infrastructure in order to plan and execute IPTV events. Furthermore, producers had to coordinate and manage a myriad of multimedia systems, including encoders, streaming servers, presentation systems, and Set Top Box Systems.
Before an event, producers needed to interact with IT staff to publish and announce upcoming events on corporate portals, and also interact with network engineering teams to plan for the distribution of multimedia traffic in the Internet as well as on the corporate network.

During an event, producers relied on support from IT staff to monitor the distribution of live multimedia traffic throughout the enterprise network, and after an event, producers had to interact with IT staff to publish Video-on-Demand content onto corporate portals and plan for the distribution of Video-on-Demand files on the Internet and throughout the corporate network.

These manual processes lead to errors, which in turn lead to unreliable services. The manual processes also incur significant hidden costs in the number of IT personnel involved in each broadcast.

### Error-prone manual processes and communications

![Diagram showing Enterprise Applications, Enterprise Communications, Presentation Systems, Encoders & Streaming Servers, Set Top Boxes & Multimedia Appliances, and Enterprise Network Infrastructure.]

**Solution: IPTV Management System**

The IPTV Management System eliminates these manual processes and enables a streamlined, automated workflow. It provides a full suite of management capabilities for producers and administrators, to enable the publishing, presentation, and distribution of multimedia content, without the need for support from corporate IT personnel.
Workflow

Pre-Production
Producers provide scheduling information for events to the IPTV Management System, which publishes and announces upcoming events on corporate portals, provisions network infrastructure such as Enterprise Content Delivery Networks and Internet Content Delivery Networks, and provisions multimedia systems such as encoders and Set Top Boxes. Producers also specify who can view what event during this phase to enable access control for live events.

Production
The IPTV Management System controls and monitors multimedia systems (encoders, Set Top Boxes), monitors the performance of the video streams, and gathers reporting information for each event. The IPTV Management System also enforces access control for users accessing content which was specified by producers prior to an event.

Post-Production
The IPTV Management System archives, processes and indexes recorded events, publishes content in a searchable Video-on-Demand library and also posts Video-on-Demand content onto portal pages. The IPTV Management System can also pre-position content on Enterprise or Internet Content Delivery Networks.
This streamlined workflow enables reliable IPTV services and greatly reduces the hidden costs associated with the number of technical support personnel involved in each broadcast. In the remainder of this section, we provide an overview of the Jubilant ERM² Platform for Enterprise Rich Media Management, which serves as the foundation of the Enterprise IPTV Solution. We first summarize the key capabilities provided by the platform, and then summarize the integration points that are possible between the platform and other enterprise applications and network infrastructure.

Capabilities
The following is a summary of the capabilities provided by ERM²:

- **Publishing**: announce upcoming events in a centralized Program Guide or portals and post Video on Demand content in existing web pages

- **Multimedia Search**: provide a searchable archive of Video on Demand (VoD) content

- **Event Management**: schedule live and rebroadcast events

- **Encoder and Presentation System Management**: configure, control and monitor remote encoders and Presentation Systems to synchronize audio, video, and other graphical content e.g. slides

- **User Management, Access Control & Digital Rights Management**: encrypt multimedia content and enforce access control

- **Content Management**: manage recorded events in a virtual folder hierarchy

- **Media Indexing**: automatically index recorded events to enable search based on phrases, keywords, acronyms, proper names

- **Distribution Management**: configure and provision both Internet and Enterprise Content Delivery Networks for the distribution of live and on-demand video content

- **Set Top Box Management**: configure and control remote Set Top Boxes, publish program guides on Set Top Boxes, and enforce conditional access from Set Top Boxes

- **Reporting**: provide information about who viewed what, where, and when

- **System Monitoring**: monitor encoders, Presentation Systems, application servers, Set Top Boxes, and Content Delivery Networks
Enterprise Integration

ERM\textsuperscript{2} integrates with existing enterprise applications and network infrastructure to enhance and optimize the performance of IPTV services in the enterprise. The following is a summary of the key integration points.

> **Identity Management Systems** enable group based access control

> **Portals** provide a launch point for Program Guides and Video on Demand Libraries

> **Search Engines** enable multimedia search capabilities for Video on Demand Libraries

> **Enterprise Content Delivery Network** on the customer’s network can be leveraged to optimize WAN bandwidth

> **Internet Content Delivery Networks** enable the reliable and secure delivery of high quality video on the Internet

Integration with Enterprise Content Delivery Networks

ERM\textsuperscript{2} enables producers to manage Enterprise Content Delivery Networks (eCDN) such as the Blue Coat MACH5 Platform, to enable the efficient and optimized distribution of multimedia content in the enterprise. ERM\textsuperscript{2} integrates with the MACH5 Platform to enable two key benefits.

First, ERM\textsuperscript{2} enables the distribution of Video on Demand (VoD) files via the eCDN. VoD content is centrally managed from one of the streaming servers, but local copies can be pre-positioned to the distributed MACH5 cache devices. Users accessing content are automatically redirected to stream the video from their local cache device, reducing the load on the WAN as users across the enterprise stream VoD to their desktops.

Second, ERM\textsuperscript{2} automates the configuration and provisioning of the eCDN for live broadcasts. As broadcasts are scheduled, producers specify which subset of cache devices should receive each broadcast i.e. based on region, business unit etc. Based on this information, ERM\textsuperscript{2} configures the eCDN for broadcasts, without requiring producers to communicate with network administrators to manually configure the eCDN for each broadcast.
ERM² provides an easy-to-use interface for producers and hides the complexity of the enterprise networks. In a large enterprise network environment, different content-delivery methods and user-redirection mechanisms often co-exist. For example, unicast, global multicast or local multicast streams may be required at different sites/locations for content distribution. This requires different MACH5 cache devices at different sites to be configured accordingly. Using ERM², a producer only needs to choose from a list of locations where he or she wants the content to be distributed to, for both live broadcasts as well as VoD content. ERM² automatically configures each MACH5 cache device at these locations to ensure that content in the appropriate format is distributed correctly to end users. For example, multicast stations will be created on MACH5 cache devices to provide local multicast to multicast-enabled sites. These multicast stations are automatically deleted after the live broadcast is over.

**Integration with Internet Content Delivery Networks**

ERM² enables producers to manage Internet Content Delivery Networks (iCDN) for the efficient and optimized distribution of multimedia content in the enterprise. ERM² integrates with industry leading iCDNs to enable two key benefits.

First, ERM² enables the distribution of (VoD) files via an iCDN. VoD content is centrally managed from the streaming servers, but content can be cached throughout an iCDN. Users accessing content are automatically redirected to stream the video from the iCDN caching servers instead of from the customer’s streaming servers, ensuring a high quality experience for users, and preventing performance bottlenecks for customers.

Second, ERM² automates the configuration of the iCDN service for broadcasts. As broadcasts are scheduled, producers specify whether a particular event should be available on the Internet. Based on this information, ERM² configures the iCDN for broadcasts, without requiring producers to communicate with network administrators to manually configure an iCDN for each broadcast.
Contact Information

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