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This document provides an overview of the architecture of an EMC Industry Solution developed by EMC Global Solutions Operations.

**Purpose**

Information in this document can be used as the basis for a solution build, white paper, best practices document, or training.

Information in this document can also be used by other EMC organizations (for example, the technical services or sales organization) as the basis for producing documentation for a technical services or sales kit.

**Audience**

This document is a public document. As such, is intended for EMC personnel, partners, customers, and prospective customers.

**Scope**

This document describes the architecture of an EMC Industry Solution built and tested at the EMC Global Solutions lab in Hopkinton, MA.

Implementation instructions and sizing guidelines are beyond the scope of this document.

**Related documents**

The following documents provide additional, relevant information:

- Documents accessible from the IPTV Solution landing page on EMC Powerlink
- *Enabling IPTV: What Carriers Need to Know to Succeed*, an IDC white paper accessible on www.EMC.com
About this Document
This chapter includes the following sections:

- The business problem ................................................................. 8
- The technology solution ............................................................... 10
The business problem

Service providers are drawn to new services that can add revenue and create a new or expanded customer base. One attractive opportunity lies in the rapidly emerging area of Internet Protocol Television (IPTV). IPTV opens the door to a wide range of services (movies, gaming, interactive video, and other content) but also presents a variety of challenges.

Understanding the content value chain

To offer IPTV services successfully, service providers must understand how content flows — from creation to consumption. This means that service providers must understand and deal with all of the components of the content value chain, from how to acquire rich media content to how to protect, manage, and distribute that content to end users.

Managing diverse content from different sources

Service providers must deal with content that is acquired (leased) from other sources. IPTV is a value chain that includes content creators, content providers, aggregators, and others. Gaining access to and managing large amounts of content brings service providers into unfamiliar areas. As the content library grows, a key challenge for service providers is how to manage all of this content to satisfy end-user expectations for dependable and quality viewing. Additional challenges include establishing business models with content suppliers, guaranteeing that service levels are met by tracking content delivery, providing security, ensuring digital rights management (DRM), and managing and distributing content to edge locations to meet a variety of specific market demands.

Ingesting, normalizing, and protecting content

At the front end of the process, a service provider must determine how content is ingested into the service provider’s network. Content can be received in a variety of ways, formats, and locations. The systems for encoding, normalizing metadata, and ingestion must be flexible enough to handle multiple ingestion paths and content formats. Once ingested, the content needs to be protected both digitally and physically, whether it is stored in a central repository or at multiple edge locations. Protecting content also means that backup and recovery strategies become business-critical.
Delivering content the ‘last mile’

Further downstream, a service provider needs to ensure that its architecture for content delivery is not only robust but also cost-effective, since there must be multiple edge locations to deliver content the ‘last mile.’

Meeting constantly increasing content demand and customer expectations

On the back end, service providers must ensure that their customer response systems, content management systems, and billing functions can meet growing customer needs.

As on-demand content libraries expand and advertising insertion increases, customer expectations for the service will also grow. The delivery of video content over IP will require flexible server and storage architectures that can grow and scale separately to meet customer expectations — to satisfy the Long Tail requests for archived media of all forms. (A definition of Long Tail is provided on page 39.)

Summary of challenges

In summary, the content management challenges include:

- Automatic content ingestion
- Content and metadata packaging
- Publication workflow management

The content delivery challenges include:

- Secure and reliable content delivery
- One-to-many content delivery capabilities
- Policy-based actions for automated content ingestion and offer creation

The IPTV integration challenges include:

- Scalable solution components
- Flexible content distribution
The technology solution

The EMC IPTV Media Content Management solution addresses the challenges currently facing service providers in the content delivery space. Developed by EMC in collaboration with Kasenna Inc. and Signiant Inc., it is a carrier-grade solution designed specifically for IPTV media content management.

The EMC IPTV Media Content Management solution facilitates automatic content ingestion, metadata normalization, content workflows, a content repository, and automated content distribution. It includes both hardware and software and directly supports EMC’s focus on Information Lifecycle Management.

The EMC IPTV Media Content Management solution is built on the robust and flexible EMC Framework for Digital Media (EFDM).

EMC Framework for Digital Media

Next generation services such as IPTV and VOD require new methods for handling massive amounts of rich media. To address these challenges in an automated, efficient manner, EMC has created the Framework for Digital Media (EFDM). The framework combines EMC solutions for content management and transformation with integrated offerings from our media and broadcasting partners. At the core of EFDM is a combination of EMC Documentum Digital Asset Management (DAM), Business Process Management (BPM) and Media Transformation Services (MTS) software. The core is linked to the Digital Media Distribution Management (DMDMS) software suite from EMC’s Select Partner, Signiant. This combination of products delivers the ability to create automated processes for ingestion, management, and distribution of digital media files to form an end-to-end, integrated service delivery environment.

The EMC Framework for Digital Media (EFDM) delivers the following benefits:

- Core products and an integration framework that provide automated content ingestion, delivery, and loading to various platforms
- Web-based work in progress reporting and media file distribution notification
- Scalable management for thousands of rich media assets organized in packages to fit delivery destinations
- Built-in file transformation tools for rapid reuse of media files
Opportunities and Challenges

- Graphical editors to handle review of metadata and cataloging of assets with supporting files
- Customized adaptors to facilitate delivery to servers and portals
- Support for open formats and common media metadata standards

Media ingestion and transformation processes

At the heart of the media handling process are software tools that help manage digital media and workflows. After files have been successfully transferred to the service provider's data center, EFDM kicks off automated processes to ingest files and metadata into a repository, review and transform metadata, and load files into staging systems as preparation for later delivery to outbound servers or portals. During these processes the EFDM makes use of Signiant's Digital Media Distribution Management Suite (DMDMS) capabilities for workflow and distribution automation combined with the Documentum Business Process Management workflow tool set.

Automated workflows are a key component of EFDM as they allow service providers to quickly react to changes in content delivery requirements or new content suppliers. For example, business contract changes may necessitate the addition of configuration data for another delivery end-point or changes may be needed to edit metadata files for personalized content packages or Electronic Program Guides. Graphical user interfaces allow the service provider or aggregator to check incoming content for the application of correct price band tags, digital rights rules, associated trailer or trick files, video clips or thumbnail images -- thus speeding the process of prepping material for delivery to IPTV, VOD and Internet servers or Mobile portals.
Automated management of media catalogs

EFDM works in combination with EMC backup and archiving tool sets such as Avalon to handle management of media files during all stages of their lifecycle - from initial creation, through cataloging in repositories, to daily use, distribution and retirement into historical archives. To extract maximum value from media assets (especially "hot" stories or clips) EMC software and partner solutions facilitate the storage, transformation, and retrieval of rich media files. A process that’s especially vital when handling multiple versions of the same file (i.e. different delivery protocols, operating system formats and languages).
This management extends to the security and digital rights management features which have been built into the environment to assure adherence to the business policies between service providers and content suppliers.

Once established, workflows created by the EFDM can handle hundreds of files an hour -- keeping operational daily time requirements to a minimum. The workflows can be easily altered to accommodate new formats, metadata standards, business policies or destination server configurations so that production personnel may apply new rules and test systems before putting new services into play.
This chapter includes the following sections:

- Content workflow overview .......................................................... 16
- Logical architecture ....................................................................... 20
- Physical architecture ...................................................................... 21
- Application software component interrelationships .................. 26
- Implementation considerations .................................................... 27
Content workflow overview

A typical content workflow for IPTV starts with content aggregators and content providers delivering content to one or more ingestion points, as part of a hand-off of content. From that point on, it is the responsibility of the IPTV provider (telecommunications or cable company or outsourced service provider) to ingest, manage, secure, and deliver the content to subscribers.

A content workflow within the EMC IPTV Media Content Management solution is identical to the workflow described above. First, content (new movies, TV shows, documentaries, and so on) is created. The content is then aggregated or directly distributed to IPTV provider networks. Once the content arrives at an IPTV provider's network, the content undergoes metadata normalization, content validation checks, and various content preparation processes before being distributed to the IPTV video-on-demand (VOD) servers. With the content on the IPTV VOD servers, user-offers and content are streamed to set-top boxes (STBs) by the VOD servers. Figure 2 illustrates this workflow.

![Basic content workflow](GS-000023)
Solution Design

Step 1. Content aggregation

The EMC IPTV Media Content Management solution is designed to automatically handle multiple content aggregators or providers serving content to an IPTV environment. Utilizing rules-based ingestion triggers, a content provider can upload content to suit the provider's delivery schedule. The content is automatically discovered by specialized EMC application agents, known as Hot Folder Managers, in the service provider's environment. The Hot Folder Managers initiate the ingestion of content into an EMC® Documentum® repository.

Step 2. Content normalization

During the automatic ingestion of content into an EMC Documentum repository, the content provider’s or content aggregator’s metadata must be normalized. Metadata normalization is a critical step in handling content from multiple sources.

While video content formats such as MPEG-2, H.264, and WMV are well defined, the supporting VOD metadata formats are not necessarily well defined. Even though industry-standard specifications exist, such as the CableLabs Asset Distribution Interface (ADI), metadata from content providers and vendors often deviates from these standards. Often, the supporting metadata is not in a format supported by the VOD servers, or the metadata must support multiple VOD platforms. Further, there are significant differences between ADI 2.0, the latest CableLabs specification, and ADI 1.1.

To address the complex problem of normalizing disparate metadata, the automatic ingestion process uses XSL transformations stored in the Documentum repository to convert metadata into a common, internal XML format. This common format can be an industry-defined XML format, such as ADI 2.0, or a particular service provider's proprietary XML format.

Once the metadata is converted to the common format, it is validated and later transformed into one or more delivery formats, depending on VOD platform requirements.

It is also possible to transform the common format to formats used by other channels, such as the formats used by the various mobile video platforms. Both video and mobile video can be transformed at the same time.

Note: New XSL transformations can be added to the Documentum repository at any time to accommodate metadata feeds from additional content providers.
Step 3. Content ingestion

After the metadata is normalized, an ingestion process loads the content onto an EMC Documentum-based content server and attached SAN. The process then initiates a workflow and lifecycle tailored to the content provider’s specific requirements.

Step 4. Content and metadata validation

During content validation, EMC Documentum provides a robust tool set to ensure content follows a defined workflow and reaches the appropriate lifecycle stage. Validation falls into two categories: Content validation and metadata validation.

Content validation might include ensuring that trick files can be created from the content, the content quality can be reviewed, additional content editing can be performed, and promotional clips can be created.

Metadata validation might include ensuring that standard VOD-offering metadata exists. This metadata includes descriptions for program guides, actor lists, category or genre lists, and content pricing. The validated metadata provides a mechanism to create VOD retail offers based on indexed metadata (for example, an offer consisting of movies starring Clint Eastwood). The validated metadata also provides a mechanism to link to advertising playlists associated with a specific metadata attribute, such as content genre.

Step 5. Content distribution

Once the content reaches a state where it can be published, distribution rules are applied to ensure that the content arrives at the appropriate regional or edge locations. Because of regional and edge storage requirements and content popularity, not all content is distributed to all locations.

A rule-based distribution process ensures that all content and its associated metadata arrive at the appropriate locations. The distribution process also includes VOD server staging, or caching.

Depending on the VOD environment, distribution may include pregenerated trick files used by specific VOD servers. This eliminates the need to generate separate trick files for each VOD server cluster.

The Documentum repository contains detailed metadata for all movie titles. Using this metadata, Documentum can categorize and index the movie titles. This information can then be used to establish content distribution policies.
For example, a basic policy might distribute all newly released content to both the Video Library server and the VOD (cache) servers and at a regional or edge location.

A more sophisticated policy might distribute specific content genres to regional or edge locations that typically stream content to a special-interest community.

Kasenna Media Server usage-based policies distribute content according to the frequency of requests. Less popular content is removed from VOD cache servers but can be streamed from the Video Library server on request. If demand for a particular movie title suddenly rises, Kasenna Media Server responds to the surge in requests by automatically populating the VOD cache servers with the movie title.

**Step 6. Content streaming**

The VOD servers at an edge location utilize a Video Library. The Video Library is a high-performance, high-capacity (several terabytes or more) shared disk library that feeds several VOD server clusters. This integration allows VOD servers to present a large online video library that does not rely on VOD cluster RAM or internal VOD storage. All video content — popular titles as well as Long Tail content, whether standard-definition or high-definition — resides in the Video Library. Copies of the content are streamed to the VOD servers in response to user requests. In the event of a VOD server storage failure, even the most popular content can be rapidly recopied from the Video Library instead of needing to be repitched from the central data center or super headend sites.
Logical architecture

Figure 3 illustrates the logical architecture of the IPTV Media Content Management solution.

Figure 3  Logical architecture of the IPTV Media Content Management solution
Physical architecture

Two main component types make up the physical architecture of the IPTV Media Content Management solution: A central content repository and multiple regional and edge repositories. EMC recommends that service providers use a single central repository to hold a master copy of all content and additional copies of all content to feed the regional and edge repositories.

Central repository architecture

The central repository is designed to manage the master copy of the entire content library and is responsible for content ingestion, content management, and content distribution to regional and edge locations. Figure 4 on page 22 illustrates the central repository.

A successful central repository performs the following tasks:

- Provides a secure staging area for ingesting content received from providers and aggregators
- Normalizes metadata
- Implements business processes for content workflow and lifecycle management
- Manages digital authoring and content revision
- Categorizes content for retail offer packaging
- Initiates content distribution to regional and edge locations
- Manages user and content viewing reports published or pulled from the VOD environment
- Secures metadata and content in the repository against unauthorized access
Table 1 on page 23 lists and describes each component of the central repository.
### Table 1  Components of the central repository

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Host details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Folder server</td>
<td>Access point or target site to which content providers and aggregators upload content for ingestion into the IPTV network. Resides closest to the firewall.</td>
<td>Mounts EMC Celerra® Multi-Path File System (MPFS) share. Runs DMDMS agent. Supports one or more content ingestion processes. Multiple Hot Folder servers can support a central repository.</td>
</tr>
<tr>
<td>Content server</td>
<td>Content management and repository server running EMC Documentum Administrator (DA), Digital Asset Manager (DAM), and Business Process Manager (BPM).</td>
<td>Mounts MPFS share. Integrated with SAN. Holds content provider ingestion configuration parameters that define metadata normalization, content storage locations, and content workflows. Uses SAN to hold all ingested and versioned content. Manages content workflows and lifecycles. Generates content packaging or promotional metadata. Initiates the generation of VOD trick files and manages them. The addition of EMC Documentum Business Process Services (BPS) provides BPM integration with external systems such as VOD Web service interfaces and billing systems.</td>
</tr>
<tr>
<td>VOD server</td>
<td>Pregenerates trick files for faster content ingestion at edge VOD locations.</td>
<td>Performs trick file generation. Exports trick file generation results to DMDMS agent.</td>
</tr>
<tr>
<td>DMDMS server</td>
<td>Handles all DMDMS tasks and scheduled events.</td>
<td>Provides data transformation management of content throughout the IPTV network. Manages the hosts and jobs that detect new content arriving from content providers. Manages hosts and jobs that distribute content to and load content onto the edge servers. Has DMDMS Data Transfer Manager software installed.</td>
</tr>
<tr>
<td>EMC Celerra MPFS</td>
<td>High-performance file system shared by the Hot Folder server, Ingestion server, and Content server. MPFS reduces the latency caused by moving files 1 GB - 10 GB in size from ingestion to staging to EMC Documentum.</td>
<td>Uses EMC CLARiiON®- or Symmetrix®-based SAN and EMC Celerra. MPFS agents run on Celerra.</td>
</tr>
</tbody>
</table>
Regional and edge repository architecture

Each central repository distributes content to one or more regional or edge repositories. Regional and edge repositories are dedicated to presenting IPTV offerings and streaming content to STBs. The content residing at the regional and edge repositories is a copy of the content that resides at the core repository.

Depending on the distribution model and IPTV offerings, regional and edge repositories can hold a limited selection of content, or they can be designed to handle both Long Tail and popular content offerings. The main architectural difference between a limited-content site and a site with both Long Tail and popular content is that the former relies on VOD and RAM storage while the latter has high-performance, back-end storage that supports the VOD and RAM servers. Figure 5 illustrates the latter configuration.

Figure 5 Regional or edge repository with high-performance back-end storage to support the VOD and RAM servers
With the configuration illustrated in Figure 5, content is copied from a large, high-performance, back-end storage library to streaming VOD servers. While the most popular content may reside on the internal disks or RAM of the VOD servers, less popular offerings can be retrieved from the back-end storage and loaded onto the VOD servers within seconds of a customer purchase.

**Note:** Having a large, high-performance, back-end storage library also provides the ability to load or reload content onto a new or replacement VOD server rapidly.

A successful regional or edge repository performs the following functions:

- Provides high-performance VOD streaming capabilities
- Offers user portal services
- Serves any piece of content from its large, back-end video library to a streaming server within seconds (~100 MB/s).

*Table 2* describes the components of a regional or edge repository.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Components of a regional or edge repository</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Component</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Video Library</td>
<td>Stores all content available to IPTV customers. Seamlessly pushes requested content to VOD servers for streaming to STBs. Can be thought of as a hierarchical storage management system for video content.</td>
</tr>
<tr>
<td>VOD server</td>
<td>Handles streaming requirements for the region being served. Accesses the Video Library using an MFPS shared mount point.</td>
</tr>
<tr>
<td>Video Portal server</td>
<td>Server that acts as a portal through which STBs gain access to the IPTV network. Provides user access to VOD servers, electronic programming guides, and other IPTV services.</td>
</tr>
</tbody>
</table>
Application software component interrelationships

The relationships between the solution’s numerous application software components are illustrated in Figure 6.

Figure 6  Solution software component interrelationships

The upper left-hand corner of the diagram shows the Aggregation process, where content is created and aggregated for distribution to other networks or broadcast locations. The Hot Folder Manager (HFM) automatically detects the arrival of new content at a location shared with the Auto-Ingest application. The arrival of new content triggers the HFM to stage the content for ingestion and call the Auto-Ingest application. The Auto-Ingest application, in conjunction with EMC Documentum Digital Asset Manager (DAM), Business Process Manager (BPM), and Business Process Services (BPS), transforms the XML content, ingests it into a Documentum content store, and initiates a content workflow and
lifecycle. At this point a package has been created, which contains both metadata and content. The HFM and Auto-Ingest application can handle multiple Aggregators as well as multiple XML formats.

At the In Progress stage, the package can be manipulated. For example, the price or description of the film can be changed. It is at this stage that the content offer is finalized.

Once the offer has been finalized it is ready to be published. At this stage additional workflows can be added, such as a workflow to obtain approval for the specific offer or package to be published.

Next, the package moves to the DMDMS application. Based on business processes (defined using EMC Documentum Business Process Manager and Business Process Services) and distribution rules (defined using DMDMS), DMDMS sends the content to the regional or edge locations. Depending on the distribution rules, DMDMS places the content on the VOD server or creates an offer on the Video Portal server to be presented to the STBs.

The content can now be requested by an end user. Using an STB and a portal interface, the end user sends a request to the Video Portal server. The Video Portal server then directs the VOD server to stream the content to the STB, where the end user consumes the content.

**Implementation considerations**

Before any IPTV solution is built or designed, service providers must consider how the solution will be used (see the IDC white paper posted on www.EMC.com, entitled *Enabling IPTV: What Carriers Need to Know to Succeed*). Service providers define the process of content acquisition, processing, and delivery.

Success depends on the total system bandwidth supported by the storage systems. A common design mistake is evaluating storage capacity needs without considering system throughput requirements. Required total system bandwidth is the sum of content acquisition, content processing, and delivery. Required total system bandwidth is expressed as disk demand in megabits per second (Mb/s).

\[
\text{Acquisition + Processing + Delivery = Required total system bandwidth expressed as disk demand in MB/s}
\]

Because there are a limited number of content providers today, IPTV has a low acquisition bandwidth. This creates a highly asymmetrical (one-to-many) delivery solution. As more consumers create, share, and demand content, the bandwidth requirement will increase and the delivery
solution will need to become symmetrical. A storage system that can support future operational behaviors should be chosen — a storage system that can support, without disruption, a delivery solution that evolves from asymmetrical to symmetrical operation.

An enterprise IPTV solution can have multiple regional and edge repositories serving various amounts of content, as shown in Figure 7. The most popular content in one region may not be as popular in other regions (for example, Boston versus Beijing versus Rome).

![Figure 7](image)

**Figure 7** Example of an enterprise-scale IPTV solution architecture
This chapter includes the following sections:

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- Host hardware resources ......................................................... 30
- Host software resources ......................................................... 32
- SAN hardware resources ......................................................... 34
Resource overview

The IPTV Media Content Management solution offering includes both hardware and software.

Hardware

Hardware includes EMC CLARiiON SAN and/or Celerra NAS for regional video content libraries.

Software

Software includes:

- Kasenna MediaBase XMP and Kasenna LivingRoom application software
- Signiant DMDMS software for heterogeneous, host-based file transfer and remote command execution
- EMC Documentum Business Process Manager for automated workflow
- EMC Documentum Digital Asset Manager for video, image, and metadata distribution
- EMC Celerra Multi-Path File System (MPFS) for high-performance I/O to the regional Video Libraries

Host hardware resources

The IPTV Media Content Management solution was validated using the host hardware described in Table 3.

<table>
<thead>
<tr>
<th>Server</th>
<th>Hardware (minimum req.)</th>
<th>OS</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| Hot Folder server | 1 GHz CPU  
512 MB memory | Microsoft Windows Server 2003 SP1
or Red Hat Linux ES 4.0 | Monitors new content delivery locations for new content and initiates automatic ingestion process |
| Ingestion server | 1 GHz CPU  
512 MB memory | Microsoft Windows 2000 Professional  
or Microsoft Windows XP Professional | Performs content normalization and triggers the ingestion of content into Documentum |
| DMDMS server    | 700 MHz Pentium 3 CPU  
512 MB memory  
5 GB available disk space | Red Hat Linux ES 3.0 | Provides data transfer, scheduling, and management functionality to support content ingestion and delivery |
Table 3  | Host hardware specifications (continued)

<table>
<thead>
<tr>
<th>Server</th>
<th>Hardware (minimum req.)</th>
<th>OS</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content server</td>
<td>1 GHz CPU</td>
<td>Microsoft Windows Server 2003 SP1</td>
<td>Main repository for IPTV content including, but not limited to, movie files, metadata, and offer information</td>
</tr>
<tr>
<td></td>
<td>512 MB memory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Database server</td>
<td>1 GHz CPU</td>
<td>Microsoft Windows Server 2003 SP1</td>
<td>Oracle database server to support EMC Documentum applications</td>
</tr>
<tr>
<td></td>
<td>512 MB memory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Process server</td>
<td>1 GHz CPU</td>
<td>Microsoft Windows Server 2003 SP1</td>
<td>Integrates business process management with external processes via SMTP, FTP, and Web services</td>
</tr>
<tr>
<td></td>
<td>512 MB memory</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>40 MB available disk space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video Portal server</td>
<td>2.8 GHz Pentium 4 CPU</td>
<td>Red Hat Linux ES 4.0</td>
<td>Provides STBs with a portal interface, enabling subscribers to preview and select video content and gain access to IPTV functionality such as an electronic programming guide (EPG) or a digital video recorder (DVR)</td>
</tr>
<tr>
<td></td>
<td>200+ GB mirrored hard drives</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 GB memory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VOD server</td>
<td>1.0 GHz Pentium 4 or Xeon CPU</td>
<td>Red Hat Linux ES 4.0</td>
<td>High-performance server that streams video content to STBs using the real-time streaming protocol (RTSP)</td>
</tr>
<tr>
<td></td>
<td>512 MB memory</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Host software resources

The IPTV Media Content Management solution was validated using the host software described in Table 4.

**Note:** For detailed system requirements for the host software applications, refer to the most recent release notes for EMC Documentum Content Server, Signiant DMDMS, Kasenna MediaBase XMP, and Kasenna LivingRoom.

### Table 4  
Software resource specifications

<table>
<thead>
<tr>
<th>Server</th>
<th>Software component and version</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Folder server</td>
<td>Signiant DMDMS 6.2 Build 1569</td>
<td>DMDMS client</td>
</tr>
<tr>
<td></td>
<td>Hot Folder Manager</td>
<td>MPFS client</td>
</tr>
<tr>
<td>Ingestion server</td>
<td>Sun JRE 1.4.2.08</td>
<td>iptv.jar, DMDMS client, MPFS client</td>
</tr>
<tr>
<td></td>
<td>EMC Documentum Foundation Classes 5.3 SP4</td>
<td>EMC Documentum Content Server 5.3 SP4</td>
</tr>
<tr>
<td>DMDMS server</td>
<td>Signiant DMDMS 6.2 Build 1569</td>
<td>n/a</td>
</tr>
<tr>
<td>Content server</td>
<td>Apache Tomcat (application server) 5.1</td>
<td>Sun JRE 1.4.2</td>
</tr>
<tr>
<td></td>
<td>EMC Documentum Content Server 5.3 SP4</td>
<td>Relational database Sun JRE 1.3.1</td>
</tr>
<tr>
<td></td>
<td>EMC Documentum Foundation Classes 5.3 SP4</td>
<td>EMC Documentum Content Server 5.3 SP4</td>
</tr>
<tr>
<td></td>
<td>EMC Documentum Administrator 5.3 SP4</td>
<td>Application server EMC Documentum Content Server 5.3 SP4</td>
</tr>
<tr>
<td></td>
<td>EMC Documentum Application Builder 5.3 SP4</td>
<td>EMC Documentum Content Server 5.3 SP4</td>
</tr>
<tr>
<td></td>
<td>EMC Documentum Digital Asset Manager 5.3 SP4</td>
<td>Application server EMC Documentum Content Server 5.3 SP4</td>
</tr>
<tr>
<td></td>
<td>EMC Documentum Business Process Manager 5.3 SP4</td>
<td>EMC Documentum Content Server 5.3 SP4</td>
</tr>
<tr>
<td>Server</td>
<td>Software component and version</td>
<td>Prerequisites</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------------------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td>Database server</td>
<td>Microsoft SQL Server 2000 SP4 or Oracle 9.2</td>
<td>SAN devices configured for best performance</td>
</tr>
<tr>
<td>Business Process server</td>
<td>EMC Documentum Business Process Services 5.3 SP4</td>
<td>EMC Documentum Content Server 5.3 SP4</td>
</tr>
<tr>
<td>Video Portal server</td>
<td>Apache Tomcat (application server) 5.0.28</td>
<td>Sun JDK 1.4.x</td>
</tr>
<tr>
<td></td>
<td>Kasenna LivingRoom 2.0</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>MySQL (database) 4.0.16</td>
<td>MPFS client</td>
</tr>
<tr>
<td>VOD server</td>
<td>Kasenna MediaBase XMP 8.1</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>MySQL (database) 4.0.16</td>
<td></td>
</tr>
</tbody>
</table>
SAN hardware resources

The IPTV Media Content Management solution was validated using EMC CX700 (CLARiiON) SAN disks. The disks were used for the operating systems, application binaries, content stores, and database files.

Central repository hardware specifications

The central repository location used RAID5. Table 5 lists the central repository hardware specifications.

Note: An EMC Celerra NS502G presents NAS and MPFS shared mount points.

Table 5 Central repository hardware specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Disk configuration</th>
<th>RAID type</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC CX700</td>
<td>30 x 146 GB</td>
<td>RAID 5 (4 + 1) for all RAID groups</td>
</tr>
<tr>
<td>EMC NS502G</td>
<td>NAS and MPFS</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Central repository host storage allocation

Table 6 provides the central repository host storage allocation details.

Table 6 Central repository host storage allocation details

<table>
<thead>
<tr>
<th>Host name</th>
<th>Mount point</th>
<th>Storage allocation</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Folder server</td>
<td>C:\</td>
<td>50 GB</td>
<td>Binaries</td>
</tr>
<tr>
<td></td>
<td>D:\</td>
<td>100 GB</td>
<td>MPFS shared mount points</td>
</tr>
<tr>
<td>Ingestion server</td>
<td>C:\</td>
<td>50 GB</td>
<td>Binaries</td>
</tr>
<tr>
<td></td>
<td>D:\</td>
<td>100 GB</td>
<td>MPFS shared mount points</td>
</tr>
<tr>
<td>DMDMS server</td>
<td>swap</td>
<td>512 MB</td>
<td>System swap space</td>
</tr>
<tr>
<td></td>
<td>/</td>
<td>5 GB</td>
<td>Root file system</td>
</tr>
<tr>
<td></td>
<td>/boot</td>
<td>100 MB</td>
<td>Boot configuration</td>
</tr>
<tr>
<td></td>
<td>/var</td>
<td>3 GB</td>
<td>Binaries and configuration</td>
</tr>
<tr>
<td>Content server</td>
<td>C:\</td>
<td>50 GB</td>
<td>Binaries</td>
</tr>
<tr>
<td></td>
<td>D:\</td>
<td>100 GB</td>
<td>Managed content</td>
</tr>
</tbody>
</table>
Regional and edge repository host storage allocation

*Table 7* provides the regional and edge repository host storage allocation details.

### Table 7 Regional and edge repository host storage allocation details

<table>
<thead>
<tr>
<th>Host name</th>
<th>Mount point</th>
<th>Storage allocation</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOD server</td>
<td>swap</td>
<td>8 GB</td>
<td>System swap space</td>
</tr>
<tr>
<td></td>
<td>/</td>
<td>50 GB</td>
<td>Root file system</td>
</tr>
<tr>
<td></td>
<td>/boot</td>
<td>512 MB</td>
<td>Boot configuration</td>
</tr>
<tr>
<td></td>
<td>/var</td>
<td>3 GB</td>
<td>Binaries and configuration</td>
</tr>
<tr>
<td></td>
<td>/content</td>
<td>500 GB</td>
<td>Video content storage for streaming</td>
</tr>
<tr>
<td>Video Portal server</td>
<td>swap</td>
<td>512 MB</td>
<td>System swap space</td>
</tr>
<tr>
<td></td>
<td>/</td>
<td>50 GB</td>
<td>Root file system</td>
</tr>
<tr>
<td></td>
<td>/boot</td>
<td>512 MB</td>
<td>Boot configuration</td>
</tr>
<tr>
<td></td>
<td>/var</td>
<td>3 GB</td>
<td>Binaries and configuration</td>
</tr>
<tr>
<td></td>
<td>/contentStore</td>
<td>1 TB</td>
<td>Video content storage on MPFS</td>
</tr>
</tbody>
</table>

### Additional SAN hardware resource considerations

Additional SAN resources for EMC Documentum might be required depending on business requirements or growth requirements of the content or database servers. The following formula can be used as a guideline:

\[
\text{content disk space} = (\text{number of documents}) \times (\text{number of versions}) \times \left(\text{average content size} + \text{renditions} + \text{full text} + \text{annotations}\right)
\]
The full text index is typically one-third of the content size.

**Note:** For additional information about these calculations, refer to the *EMC Documentum Content Server Installation Guide*.

Additional SAN resources for VOD servers might be required depending on the amount of media content available for delivery, business requirements, and growth factors. The following formula can be used as a guideline:

\[
\text{content disk space} = (\text{average movie size}) \times (\text{number of movies}) \times 1.2
\]

The factor 1.2 accounts for additional posters, previews, and metadata files to support the movies.
This glossary defines technical and industry-specific terms used in this document.

**A**

**Application Builder** EMC Documentum graphical development environment that provides the ability to build content management applications based on the EMC Documentum platform.

**Auto-Ingest application** EMC IPTV application that transforms XML content, ingests it into an EMC Documentum content store, and initiates a content workflow and lifecycle.

**B**

**BPM** EMC Documentum Business Process Manager. Software that provides the ability to implement process models and deploy them for execution in EMC Documentum Process Engine. This graphical tool uses a set of predefined palettes for various business processes as well as templates for activities such as automated tasks, user-handled tasks, and integrations with external systems.

**BPS** EMC Documentum Business Process Services. Software that works with EMC Documentum Process Engine and EMC Documentum Content Server to deliver a universal integration service. BPS provides the ability to integrate EMC Documentum process, content, and repository services with external processes through a service-oriented architecture (SOA) implementation. External systems – enterprise applications, enterprise application integration (EAI) frameworks, message brokers, and individual users – leverage the full range of EMC Documentum
capabilities and events such as workflow tasks or lifecycle stage changes that can invoke services from external systems.

D

DAM  EMC Documentum Digital Asset Manager. A Documentum Webtop interface specifically designed for managing digital media assets. The interface provides thumbnail views of content and access to a wide range of media transformations available within Content Transformation Services.

DCS  EMC Documentum Content Server. Software that provides document management services, such as versioning and workflow management.

DMDMS  Signiant Digital Media Distribution Management Suite. An integrated and open software solution that manages, secures, automates and accelerates digital media workflows.

E

EFDM  EMC Framework for Digital Media. Software for creating automated processes for ingestion, management, and distribution of digital media files to form an end-to-end, integrated service delivery environment.

H

HFM  Hot Folder Manager. An EMC IPTV application and process that monitors folders for incoming content and automatically initiates the ingestion of content into the repository.

I

IPTV  Internet Protocol Television. A system made up of a two-way digital broadcast signal sent through a switched telephone or cable network by a broadband connection and a set-top box with software that handles viewer requests to access media sources. The set-top box, which is connected to a television, decodes the IP video and converts it to standard television signals.

L

LivingRoom  Software from Kasenna Inc. that manages the living room experience within the context of IPTV. LivingRoom is VOD middleware, which
provides an electronic program guide interface that subscribers can access from a set-top box.

**Long Tail**
A term originated by Chris Anderson in an October 2004 article for Wired Magazine entitled *The Long Tail*. The term refers to the back catalog of older items stored in music, book, DVD, and other media archives. According to the author, even though Long Tail content is not readily accessible to the public, it can be retrieved and sent to consumers. Based on current media buying habits, the author suggests that there is a large market for media properties outside the current inventory available to the average retailer. The author also suggests that companies that own Long Tail assets make it available at prices that are lower than current retail prices, and make it easy for consumers to locate the assets.

**M**

**MediaBase**
Software from Kasenna Inc. for managing the distribution and streaming of media assets to end users.

**Metadata**
For IPTV and VOD, refers to elements associated with movie content, such as titles, plot summaries, lists of actors, lists of directors, and so on. Metadata also refers to internal system attributes, such as asset IDs, associated with the previously mentioned elements and the movie content itself.

**MPFS**
EMC Celerra Multi-Path File System.

**S**

**SAN**
Storage-area network.

**STB**
Set-top box used with IPTV.

**SHE**
Super headend. A large, central location for VOD infrastructure.

**SVS**
Switched video service. A service, made possible by IPTV, that enables viewers to access broadcast network channels, subscription services, and movies on demand.

**T**

**TCS**
EMC Documentum Trusted Content Services. Software that provides advanced security features such as digital signing and digital shredding.
<table>
<thead>
<tr>
<th><strong>trick files</strong></th>
<th>Special video content files that support fast-forward and rewind reviewing capabilities.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Video Library</strong></td>
<td>A high-performance, high-capacity storage system that stores content in close proximity to video servers for fast content delivery.</td>
</tr>
<tr>
<td><strong>VOD</strong></td>
<td>Video on demand. A service that enables end users to request and receive video services interactively. Video services can be derived from previously stored media or a live connection.</td>
</tr>
</tbody>
</table>