

# Sun™ Reference Architecture for IPTV

## Integrated VoD and nPVR Infrastructure

### Highlights

- The fully-integrated Sun Reference Architecture for IPTV provides personalized information and entertainment, rich interactive services, and unmatched availability.
- The innovative and massively scalable Sun Streaming System offers memory-based streaming, storage, and distributed Sun Streaming Software.
- IMAKE OpenVision backoffice components ingest, manage, and distribute video assets, entitle VoD products and services, manage bandwidth, and provide session set-up.
- Digisoft's DigiHost application server offers compelling presentation, customizable look and feel, interactive advertising, and next-generation interactive services.
- The Verimatrix Video Content Authority System (VCAS) provides an advanced suite of technology that addresses content security challenges.
- Harmonic provides standard definition (SD) and high definition (HD) encoders for MPEG-4/AVC (H.264) encoding.



Fundamental changes are taking place in the ways that people view television and video. Through Video on Demand (VoD), network personal video recording (nPVR), pay per view (PPV), and other technologies, viewers are taking an active role in what, where, and when they watch. These trends offer considerable promise to telecommunications, cable, and wireless providers, as they seek to attract and retain customers with new IPTV services. Based on the massively scalable Sun™ Streaming System, the Sun Reference Architecture for IPTV integrates key partner technologies to provide an end-to-end video services infrastructure.

### Delivering effective IPTV

No matter what the promise, video services infrastructure remains challenging to integrate for many organizations. By its very nature, video infrastructure can be complex to design, integrate, and deploy. At the same time, some existing proprietary solutions pose arbitrary limitations, resulting in inflexible, expensive, and non-scalable implementations. Complicating matters, video services customers naturally have very high expectations for seamless and uninterrupted service — with low tolerance for outages.

Deploying IPTV effectively requires video services infrastructure that can rise to the challenge. To succeed, effective IPTV infrastructure needs:

- *Multidimensional scalability* — Video services solutions must not only provide a seamless service, but need to scale dynamically to meet growing demands.
- *Consolidated and manageable infrastructure* — The inherent limitations of disk-based video servers have caused considerable server sprawl and complexity, excessive numbers of components, and overwhelming management costs.
- *Open and standard protocols* — Some vendors ship proprietary IPTV solutions that are designed to lock organizations into their product set, arbitrarily limiting innovation.

Beyond the capabilities of individual video servers, delivering video over IP also requires integration of specialized technologies:

- Effective security and digital rights management for valuable and vulnerable content
- Capabilities to ingest, entitle, and distribute large numbers of digital video assets, while managing bandwidth, and session set-up
- A flexible and compelling custom viewing experience for the applications that run on set top boxes (STBs)
- Effective encoding and encryption for distribution of titles across the network

To meet these demands, the *Sun Reference Architecture for IPTV* brings together multiple leading IPTV vendors with industry-leading solutions. Serving as a consolidated foundation, the innovative Sun Streaming System can greatly simplify deployment, save on management costs, cut CAPEX, and reduce OPEX by lowering datacenter floor/rack space, power consumption, and required cooling. Breakthrough technology such as the Sun Fire™ X4950 Streaming Switch provides very high levels of video throughput while the Sun Fire X4500 server adds large scale cost-effective storage. The Sun Streaming Software provides open and standard interfaces that allow integration with a carefully selected and integrated list of industry-leading third party components. Building on these components, this reference architecture can help take the cost and risk out of deploying IPTV.

## Sun Reference Architecture for IPTV

Sun Reference Architectures have been designed, tested, tuned, and documented so that customers can accelerate time-to-revenue as well as help reduce the complexity, costs, and risks of deploying new technology in the enterprise. Sun Reference Architectures include:

- A documented multitiered architecture
- Recommended technology products from Sun and other vendors
- Technical documents that guide architecture, sizing, and implementation

Before choosing to implement the Sun Reference Architecture for IPTV, organizations can also run a proof-of-concept at any of a number of Sun Solution Centers. For more information on Sun Reference Architectures, see [sun.com/service/refarch](http://sun.com/service/refarch).

### Architecture design

Throughout the process of designing the Sun Reference Architecture for IPTV, certain requirements were emphasized, such as reliability, high-availability, resiliency, cost-effectiveness, a high degree of scalability, and use of best-in-class products. By adhering to these fundamental criteria and investing extensive effort in development, integration, testing, and tuning the architecture, Sun technologists have produced an effective and scalable IPTV reference architecture that is well suited for enterprise applications. Figure 1 depicts the reference architecture implementation with video services components identified. Third party components are described in the sections that follow.

### IMAKE OpenVision

IMAKE's IPTV backoffice solution addresses several issues in today's IPTV market. These issues include scalability, distribution of content across different platforms, ability to "price and offer" a combination of on-demand product offerings and broadcast TV, open systems, and targeted advertising.

The IMAKE OpenVision components used in the Sun Reference Architecture for IPTV include:

- The *Asset Management System*, comprising a set of core components to allow for receiving assets, validating metadata, implementing business rules, and distributing content.
- The *Entitlement/Subscriber Management System*, a real-time distributed subscriber database that provides an API for billing systems and has been integrated with DST Innovis and CSG Systems billing systems for service and event management.
- The *Session Resource Manager*, responsible for receiving the session requests from a population of clients, allocating the resources required to service those requests and managing the individual resources for the duration of the request.
- The *Streaming Broadcast Manager*, providing the ability to ingest a program guide feed from the Electronic Program Guide (EPG) File Server, edit the feed, and generate numerous other feeds that are targeted to the customer's VoD and nPVR service offerings.

Together these components comprise the portion of the reference architecture that ingests, manages, and distributes VoD assets,

entitles VoD products and services, manages bandwidth and session set-up, and handles EPG feed ingestion and channel mapping.

### Digisoft DigiHost Platform

Digisoft provides a state of the art Navigation server, working hand-in-hand with *DigiHost* a service delivery platform (SDP) engine that enables operators to deploy new interactive services rapidly. This highly flexible and scalable application server comes complete with software developer's kits (SDKs) for integration, server-side extension, and client development. All SDKs are Java™ technology based, and integrated with the NetBeans™ integrated development environment (IDE).

With these tools, organizations can build next generation applications that provide both market differentiation and revenue generation. The server-side components include:

- An *Integration SDK* to connect with other existing infrastructure
- A *Server SDK* to allow providers to extend the platform

On the client side, a Java Platform, Micro Edition (Java ME platform) enabled Set Top Box and Java applications for TV such as an

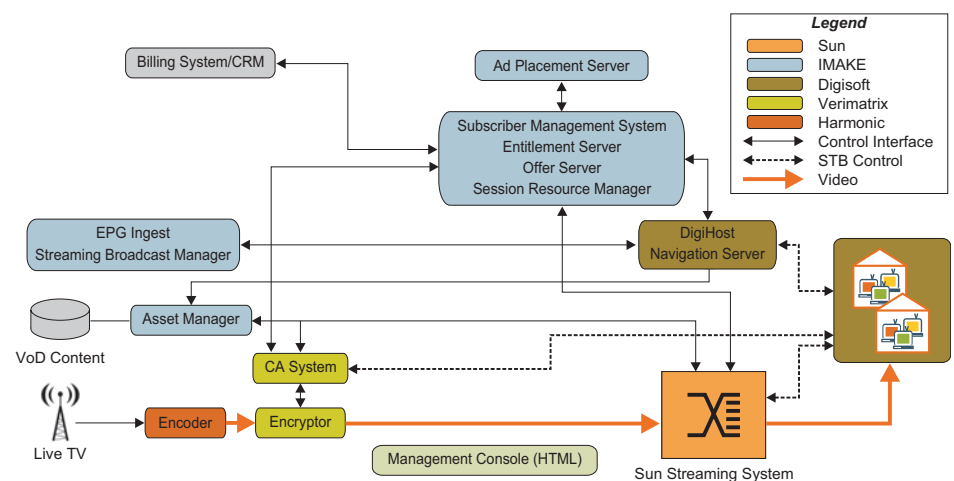


Figure 1: The Sun IPTV Reference Architecture provides an integrated end-to-end solution for deploying digital video services

Interactive Program Guide, Distance Learning, and Voting are also supplied.

Client-side components include:

- A *Client SDK* to enable providers to create user interfaces and applications
- An *interactive program guide* to allow organizations to develop their own Java components and define the customer experience at a source code level

### Verimatrix Content Authority System (VCAS)

In the content security domain, the very technologies that make IPTV architectures possible can also pose a threat to the business model. Sophisticated content piracy and widespread broadband Internet access are a legitimate concern to the owners of valuable content. Success of the IPTV industry ultimately depends on robust security technology.

The *Verimatrix Content Authority System (VCAS)* offers an advanced suite of technologies that address the content security challenges of the networks of today, and those of tomorrow. Verimatrix has designed its content security solutions around the proven power of two-way IP connectivity and Internet cryptographic standards. As a software based content security solution, this approach offers more robust protection than previous-generation systems based on smart-card architectures. Software based content security offers inherently lower-cost client devices, and the opportunity to regularly download updates to the security regime to counter inevitable piracy attacks. The VCAS solution also offers additional security technologies, including advanced clone detection and user-specific forensic watermarking of video to extend the protection regime.

### Harmonic

In IPTV architectures, network transmissions are limited to channels or programs requested by users in the home. As a result, compression efficiency is very important, since it can ultimately limit the number of streams that can be

watched and recorded. Furthermore, having IP based headend infrastructure for IPTV can help lower costs, simplify operations, enhance reliability, and offer the most flexibility to the operator.

As a part of the Sun Reference Architecture for IPTV, Harmonic provides both the DiviCom Electra 5400 and 7000 encoders.

- The high performance DiviCom Electra 5400 encoder is Harmonic's third generation MPEG-4 AVC standard definition (SD) encoder. Operators can deliver up to four simultaneous variable bit rate (VBR) or constant bit rate (CBR) MPEG-4 AVC channels, in both high and low resolution formats.
- The DiviCom Electra 7000 encoder is the world's first multichannel, multiservice high definition (HD) MPEG-4 AVC (H.264) encoder. The DiviCom Electra 7000 encoder supports up to four full resolution HD channels, and can simultaneously create low-resolution services for picture-in-picture (PiP) or multi-channel mosaic applications.

### The Sun Streaming System for massive streaming scalability

Together with the other components of the reference architecture, the Sun Streaming System represents an integrated, flexible, and scalable architecture. Though comprised of

multiple systems, the Sun Streaming System functions as an integral whole, and is treated and managed as a singular entity. The Sun Streaming System presents several important technology innovations, including:

- Memory-based streaming, decoupled from storage
- Network integration and consolidation
- Scalable session management
- Network based redundancy

Designed specifically for the needs of video streaming providers, the Sun Streaming Software maps each of the software functional nodes to the corresponding hardware components of the Sun Streaming System. Sun Streaming System hardware and software components are depicted in Figure 2, and are described in the sections that follow.

### Sun Fire X4950 Streaming Switch

The Sun Fire X4950 Streaming Switch represents a key innovation for the Sun Streaming System. Each switch offers cost-effective scalable memory-based caching and streaming, and provides:

- Up to 2 terabytes (TB) of memory
- A 320 Gbps non-blocking cross bar switch with a one-to-one input-to-output ratio
- Up to 32 10 Gb Ethernet optical networking ports at wire speed direct from the streaming cache memory (320 Gbps/switch total)

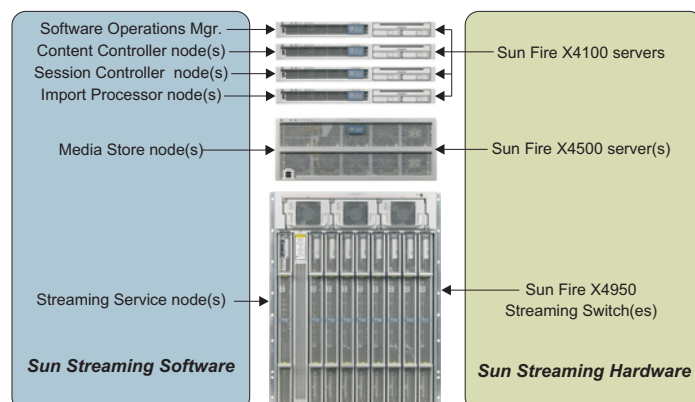


Figure 2: The Sun Reference Architecture for IPTV is based on the scalable Sun Streaming System, comprised of innovative Sun hardware and Sun Streaming Software.

Each Sun Fire X4950 Streaming switch deployed as a part of the Sun Streaming System acts as a *Streaming Service node*, and can support up to 160,000 2 Mbps SD H.264/AVC streams or up to 40,000 8 Mbps HD H.264/AVC streams.

#### Sun Fire X4500 server

The Sun Streaming System uses the Sun Fire X4500 server for storage of video titles. Each server stores up to 24 terabytes of raw video content (or up to 9,400 hours of 2 Mbps MPEG4 video, including trick-play streams). In the Sun Streaming System, each Sun Fire X4500 server interfaces directly to at least one Sun Fire X4950 Streaming Switch via a 10 Gb Ethernet connection. Up to a total of 32 Sun Fire X4500 servers can be deployed in a single Sun Streaming System — capable of storing about 300,000 hours of video at 2 Mbps. Each Sun Fire X4500 server acts as a *Media Store node*.

#### Sun Fire X4100 servers

In the Sun Streaming System, multiple Sun Fire X4100 servers provide scalable and high-performance resources for a range of management and control functions. These systems interface with third-party asset management and other middleware components in the reference architecture. Overall system management, session control, content control, and import processing functions are provided by the Sun Streaming Software nodes.

- *Software Operations Manager (SOM)* — This Supervisor node functions as the central point for monitoring and controlling the entire Sun Streaming System, and also serves as a boot server for all of the other nodes.

- *Session controller nodes* — One or more Session Controller nodes manage the establishment of sessions for streaming within the Sun Streaming System, communicating with the third-party components such as the Session Resource Manager (SRM) and set top boxes using the standard RTSP protocol.
- *Content Controller nodes* — Content Controller nodes allow a third-party asset management system to load and unload VoD or nPVR assets, verifying that sufficient Import Processor node bandwidth exists and that sufficient disk space remains on a Media Store node (Sun Fire X4500 server) to store the content.
- *Import Processor nodes* — One or more Import Processor nodes process MPEG2 or MPEG4 H.264/AVC video streams from either FTP servers or encoders, generating trick-play files and optimizing video structure before storing content on a Media Store node.

#### Putting the Sun Reference Architecture for IPTV to work

With the Sun Reference Architecture for IPTV, Sun can help design and deploy effective video services infrastructure for telecommunications, cable, and wireless providers. Easily tailored to suit a wide range of diverse needs, this carefully designed approach helps enable organizations to implement enterprise IPTV architecture quickly for faster time-to-market. With effective video services infrastructure, providers can attract and retain customers with compelling and scalable video services — all with lower levels of risk and complexity.

#### Learn More

To learn more about the Sun Reference Architecture for IPTV, visit [sun.com/service/refarch](http://sun.com/service/refarch) or contact your Sun representative. For a prototype of this Reference Architecture, visit the Sun Solution Centers at [sun.com/solutioncenters](http://sun.com/solutioncenters)