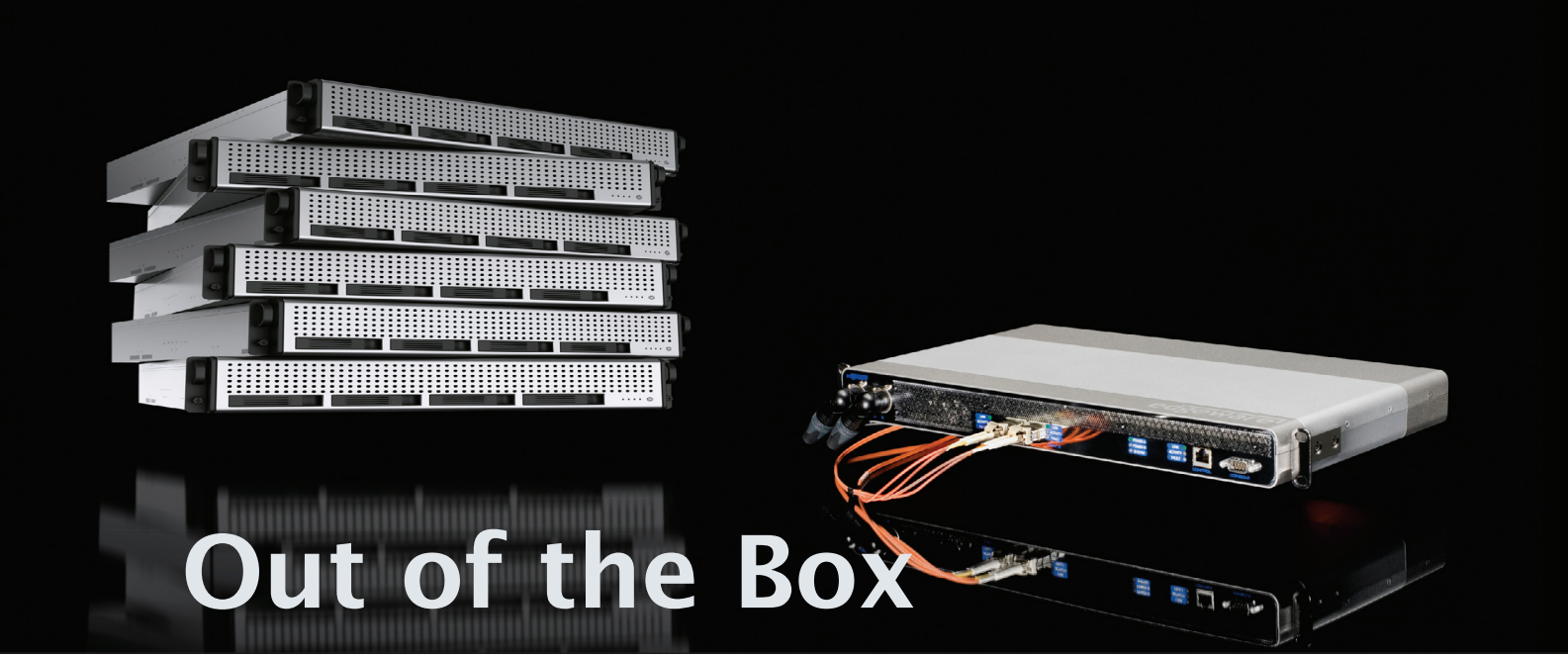


Out of the Box

Duncan Potter, chief marketing officer at Edgeware, explains how revolutionary server systems for distributed video delivery are bringing disruptive technology to the IPTV market

In 2005, Edgeware's founders set themselves the goal of helping network operators monetise the newly emerging video services by solving the problem of video delivery across an operator network. They had both the skills and pedigree to deliver and a different perspective inherited from their networking background. They did the 'simple math' of projected concurrent streams times bandwidth and realised that the only way that network infrastructures could be expanded to cope was to build distributed video delivery systems. However the conventional thinking of using COTS (Commercial Off the Shelf) PCs continues to fall short of the requirements for true network distribution. The Edgeware team identified three technologies as mandatory for a revolutionary approach:

- Content storage with a video aware file system in flash memory
- Streaming through highly reliable, network ready hardware acceleration.
- Distributed content propagation pulling popular content into edge servers based on local needs and trends.

Edgeware's Purpose Built Video Delivery Servers

The Edgeware video servers are based on common hardware known as the Orbit hardware platform and have been implemented as a series of network appliances designed to provide the necessary features for building advanced IPTV, cable TV and web TV applications. The servers are available in two versions:

Orbit - for streaming in managed networks using UDP (User Datagram Protocol), such as IPTV and cable TV systems.

WTV - for streaming applications in best-effort networks using TCP, such as the public Internet.

Architecture Design Considerations

Designing for Reliability

In order to be positioned in many areas of the network the system must be able to operate in a standard Point of Presence (PoP) rack unit that is constrained in height, depth and power/cooling. Edgeware servers eliminate all disk-based technology, making use of NAND memory (i.e. Flash memory) to store video content. In doing this, Edgeware has not merely produced a replace-disk-with-flash concept but has built an architecture that is optimised for video ingest, storage and transmission. This elimination of the disk subsystem in favor of using flash memory allows for the system to provide a double order of magnitude improvement in power consumption (85W peak) and increased reliability .

Designing for Performance

A second major differentiator of the Edgeware server system is in its approach to streaming. The traditional CPU intensive activities of streaming and shaping the video streams are implemented directly into hardware whilst retaining an embedded Linux platform to host higher function control-plane tasks such as RTSP server, firewall, configuration interfaces and other commonly needed facilities. This means that not only are the base protocol stacks implemented in hardware much like a multiprotocol switch or router, but sophisticated protocol manipulation at wire speed are possible such as multicast to unicast conversion, multicast asset propagation and CDN bandwidth management capabilities.

File System

The file system is key to both performance and efficient operation. The Edgeware File System provides full random access allowing continuous optimised functioning avoiding defragmentation issues, has a block size optimised for video and contains all of the links and data required for trick play functions such as pause, rewind, skip etc allowing the data to be read and transmitted by low level hardware with no processor involvement.

Sustained Transmission Performance

The Edgeware servers can stream full wire rate whilst simultaneously ingesting up to 1.2 Gbps (320 TV channels) of live video streams. The stream latency between ingest and output is less than one second, making the server ideal for time shifted TV applications in addition to more general nPVR services.

Designing for Network Optimisation

The Edgeware Distributed Delivery Architecture is based on 3 key elements

- Intelligent optimised servers
- Convoy Content Propagation and Management System
- Origin Management System

Key to network distribution is effective content handling. The Convoy Asset Propagation System (a distributed agent) provides the sophisticated distribution algorithms based on local decisions made by each server to draw the correct content from cache locally or from other usually more centralised content repositories. For example, the latest episode of a popular TV series is likely to be cached locally, but a title from the middle of the previous series may be

held centrally or downloaded only if the local server exceeds a specific number of requests. This threshold in most cases is managed by the Convoy distributed agent or can be managed centrally through the Convoy management system.

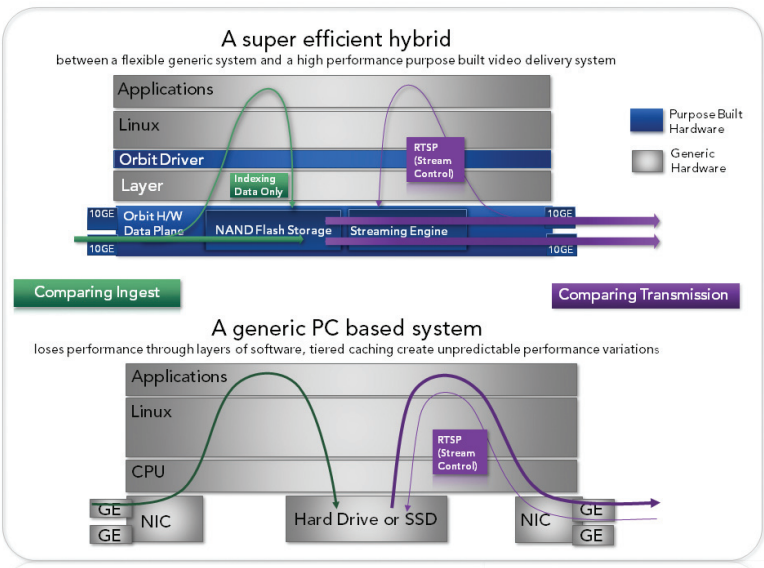
This distributed approach has many benefits:

- Enhanced reliability as content can be drawn from any available server.
- Enhanced resiliency as there is no central management server
- Higher local cache hit rate as content decisions can be made locally
- Lower overall network utilisation as local servers cache content that is requested by their local subscribers – especially important with linear and catch up TV as news is essentially local.

As a result of the high reliability, small form factor and low power consumption, Edgeware video servers put very limited requirements on their environment, in terms of cooling, space and accessibility. They are therefore ideal for distributed deployment deep in the network, allowing for architectures where streaming capacity is added where it´s needed, depending on the existing network resources. This limits the need for costly network upgrades.

The Convoy distributed agent and management systems together with the sophisticated bandwidth management capability of the Orbit hardware platform have also allowed Edgeware to implement CDN style management capabilities that will be discussed in more detail in later advertorials.

Comparing Purpose Built Hybrid architectures with General Purpose Server Architecture



General-purpose, PC-based architectures have many advantages such as commoditised components, low single system entry cost and flexibility. In fact, most networking systems started out based on a general-purpose architecture, which included bridges, routers and SAN devices. However, because of their general purpose nature, they are often sub-optimised for dealing with specific applications and are seen only at early entrance points of a market opportunity. For instance, in the video streaming market these legacy 'standard PC' architectures take 'stream from disk' or 'stream from DRAM' approaches based on their hierarchical approach to internal caching that makes them suitable for a wide range of activities. Unfortunately as you can see below this architecture is sub-optimised for the activities and functions that must be undertaken in this market.

Summary

Edgeware's Purpose Built Server	Generic/General Purpose PC Server
Flash based storage system eliminates moving parts, increasing reliability and reducing power and cooling requirements	Mechanical drives require more power, cooling and decrease MTBF. SSDs may increase reliability but do not address file system inadequacies.
Dedicated hardware that reads, transmits and implements trick pay functions allows sustained wirespeed throughput	Processor is continually involved in all transmission activities leading to non-deterministic performance
Processor used only for software management, indexing, high level protocol and management activities	Processor involved in all activities meaning management and ingest activities affect transmission performance
Video aware file system with integrated trick play functionality optimises performance and eliminates fragmentation of file storage	General purpose file system sub-optimised for sequenced large files and must keep multiple versions to support trick play functions
Small form factor allows implementation anywhere in network	Generic PC servers cannot be implemented in PoP, non-cooled or restricted space locations
Reduced power consumption (Max 85W) reduces power and cooling requirements	PCs require up to 20X power and cooling per server.
Sophisticated asset propagation and management system optimises content storage	Asset management systems not integrated with transmission system

Conclusions

Edgeware's approach provides several key advantages for the operator or carrier but all of these lead to one key conclusion – that Edgeware's focus on architectural excellence results in significant financial advantage for its customers.

Allowing Providers to Focus on the Service Not Just Architecture and Technology

By taking an holistic architectural view of the Edgeware Distributed Delivery Delivery Networks (D-VDN) and then focusing on the contribution of each component to the integrity of that architecture, Edgeware allows the implementation of a complete video and TV distribution architecture across a cable or Internet provider network.

A System Wide Architectural Approach Brings Financial Advantage

One Orbit-2X server with full configuration at maximum load consumes a maximum of 85W while still being able to serve up to 16,000 households (20 Gbps) and storing 6 TB of content. This equals power consumption as low as 5.3mW per stream which creates huge OPEX savings on electricity alone.

This can then be added to the huge potential CAPEX savings of distributed delivery, saving on the potential prohibitive costs of backhaul and associated equipment. For more information on your specific case, contact Edgeware through **www.edgeware.tv**