Packet Ship Endeavour
Hospitality Platform

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Introduction

The Packet Ship Endeavour Hospitality Platform is an integrated set of software components designed for guest entertainment in hospitality-based markets, including hotels, cruise vessels and hospitals, allowing Systems Integrators and OEMs to create high-performance digital media products and services. This White Paper describes the overall philosophy of the platform, and the capabilities of each individual component set, then provides some real examples of their use.

This paper is intended primarily for a technical readership, particularly systems architects and CTOs. However, we hope that it will give an overview of Packet Ship's offering for non-technical readers as well.

Capabilities

Here are some of the products and services that the Endeavour platform enables:

- Live IPTV with full grid EPG
- Next generation TV services including catch-up TV, network PVR and pause live TV
- Video and music on demand
- Hospitality services such as information portal, guest messaging, view bill
- Centrally managed automatic content distribution to remote sites with aggregated usage reporting

Product lines

The Packet Ship Endeavour Platform is divided into a number of inter-operating product lines:

Guideline

Fully skinnable, multi-device and multi-language user interface for IPTV set-top boxes, connected TVs and mobile devices

Streamline

Video server for delivering broadcast-quality video to set-top boxes, smart TVs and other clients

Timeline

IPTV Recorder for catch-up TV, pause live TV and EPG generation

Gridline

Distributed content packaging, delivery and caching system

Centreline

Service management application for ingest of content & metadata, routing and reporting

Each product line is described individually later. First, though, we will look at the overall philosophy and architecture of the platform as a whole.

Platform philosophy

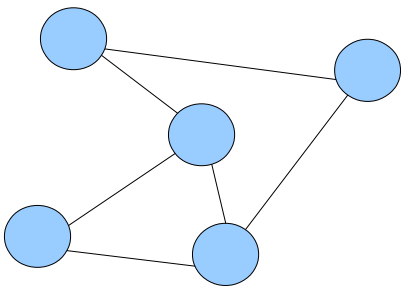
The philosophy of the Packet Ship Endeavour Hospitality Platform is to provide a set of high-performance components which do the 'heavy lifting' involved in creating a digital media product or service, while allowing Systems Integrators and OEMs the freedom to wrap their own branding, back-office systems and integration interfaces around them. This is similar to how chip manufacturers provide components and reference designs, and leave product manufacturers to build end-user products using them. Hence what we provide could be termed "software chips", but we will use the more conventional "software components".

Another part of the component philosophy – as with chips – is that although the components can be used alone they also integrate seamlessly together to provide a complete platform, saving product developers time in sourcing and integrating multiple incompatible products. Crucially, the integration is open and transparent, through documented XML messaging interfaces, so there is always the option to replace or augment a component if required.

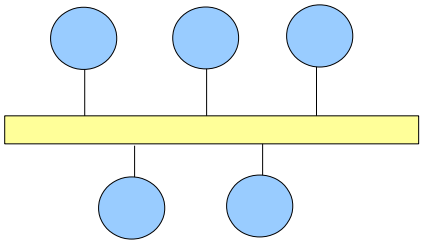
Finally, we believe that a good software component should be 'well behaved' and follow the standard way of installing, configuring and managing it on the target platform. This means that our software can be run on standard operating system platforms alongside other services if required – it is not necessary to dedicate a separate machine to run them.

Technical architecture

In technical terms, most of our components are high-performance C++ server processes ('daemons'), with Linux (Ubuntu, Debian or CentOS) as the reference platform. The components communicate through sending XML messages to each other through a 'message bus' system called XMLMesh. The advantage of a 'bus' is that all the components can plug into the same bus without having to be configured to know of each other's existence. This also makes the platform naturally distributed, and components can be located on the same machine or on different machines to suit the required level of performance.



Point-to-Point Integration



Bus Integration

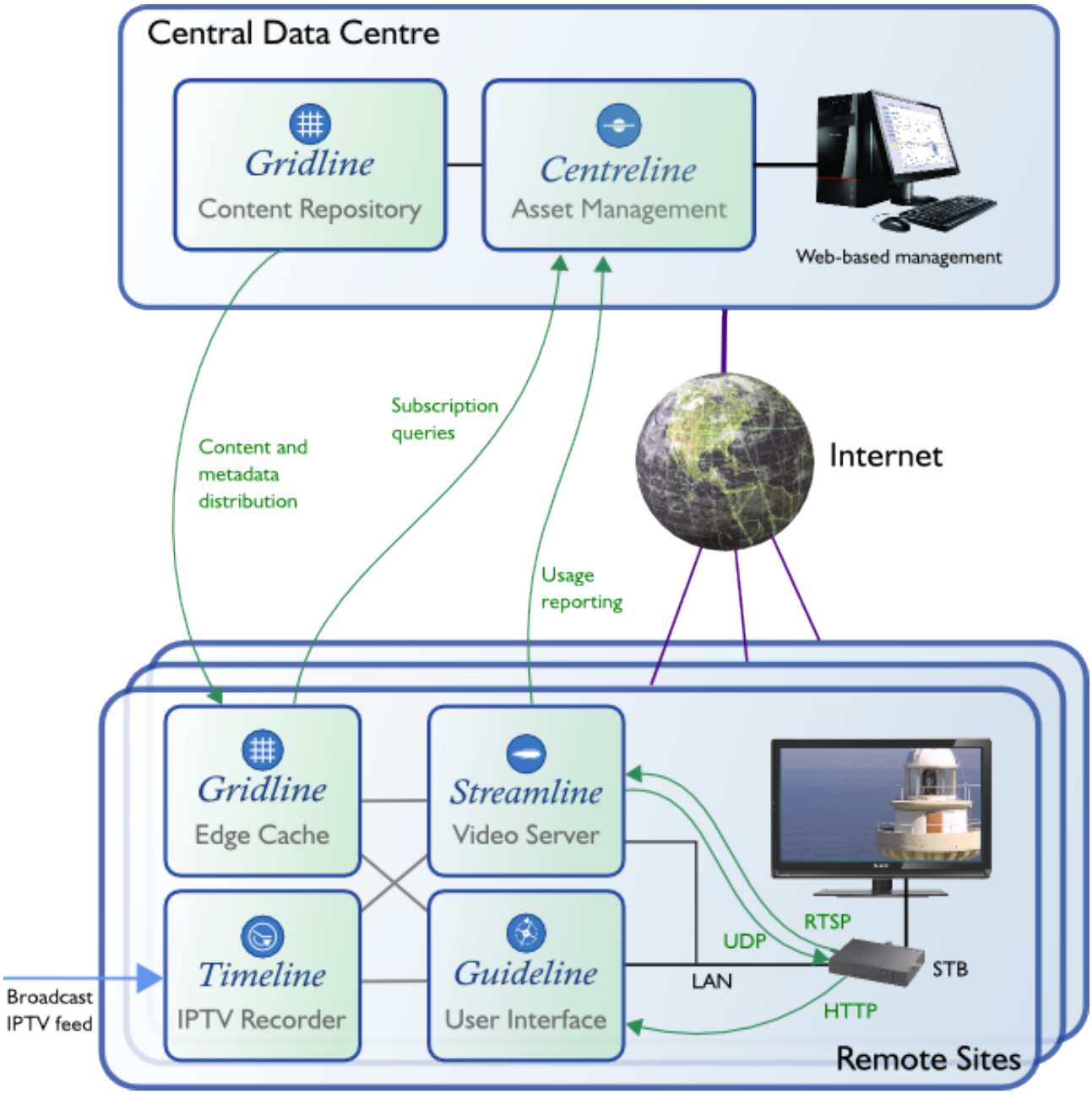
However, we tend to show the components communicating *as if* they were connected directly together to show the relationships between them more clearly.

The server components also provide external integration APIs either through XMLMesh or conventional SOAP over HTTP. API libraries are available for PHP, Java and Javascript to make it as simple as possible to integrate Packet Ship components with external systems.

The Guideline client user interface is implemented in pure Javascript which communicates directly to the C++ back-end servers using AJAX. All page generation is done locally on the client which makes the solution highly responsive and very scalable.

Architectural Overview

The following diagram illustrates how all the components of the Endeavour platform fit together in an integrated, multi-side video-on-demand and NPVR/catchup TV system with fully distributed content management:



On the other hand, an installation can be as simple as a single instance of Streamline Video Server producing a few multicast video loops for digital signage. The platform can scale from the very small to the very large and is priced to be cost-effective at every scale.

OEM software

Packet Ship offers all its software components on an OEM basis, by which we mean licensing them to hardware manufacturers to embed in their own standardised product lines, as well as to Systems Integrators who will take our software and install on standard hardware on a project-by-project basis.

Our software can either form the basis of a standalone product, or can provide additional functionality within an existing product line to provide features that you may have been missing. We will work with you to define a volume pricing structure which fits with your market price expectations.

The server components can be built for any Linux platform on any chipset (i386, AMD64, ARM, MIPS...) and delivered in whatever form (raw binaries, `.deb`, `.rpm` …) is required. Working with you we can also build the software on any embedded platform/RTOS with a GCC compiler toolchain.

Guideline User Interface

Packet Ship's Guideline is a user interface 'middleware' providing a complete TV, video and services experience for guests in hotels, hospitals, ships and other vertical markets.

Guideline is a pure Javascript application, retaining the maintenance benefits of server-managed user interface with the performance and scalability of client-resident code.

Features

- Highly portable Javascript with minimal hardware adaptation layer, runs on any browser-enabled device
- Fully skinnable with comprehensive configuration system and CSS
- Integrated with market-leading set-top boxes such as Amino (130H/H140/H150,Aria 6xx), Dune, Abox42, any Android-based STB; LG and Samsung smart TVs
- Supports mobile devices running Android and IOS with a full touch-driven interface
- Provides a full client application with RTSP streaming client for MacOS (e.g. iMac)
- Full grid-based Electronic Programme Guide (EPG) or simple channel selector
- Supports catch-up TV, network PVR and pause live TV
- Multi genre video- and music-on-demand browser with metadata and posters
- Highly flexible information portal with textual, graphical and video information and links to external resources such as RSS feeds, webcams and web apps.
- Guest messaging from management portal or through PMS integration
- Multi-location iconographic weather forecast using Weather Underground data
- View bill option (subject to PMS integration)
- Web-based installation and management back office

Integration with other products

The Guideline user interface obtains its content, look and feel and configuration from a Gridline content repository. This allows content and configuration to be managed centrally and automatically replicate to multiple sites. The grid-based EPG also obtains EPG data from a Timeline IPTV Recorder.

Dynamic service data such as room/cabin mappings, guest information, channel rights etc. can either be stored in Packet Ship's own service management system (a simplified version of our operator OverView:DRM product) or obtained from an external CRM through HTTP/XML integration.

Performance

The Guideline user interface is entirely client-resident Javascript; there is no server-side page generation. All communication with back-end servers is through AJAX which combined with the in-memory caching employed by the servers themselves makes the UI very responsive. The look and feel can be adapted to specific devices so that effects such as fading and animation can be enabled or disabled according to client device performance.

Streamline Video Server

The Packet Ship Streamline video server provides high-quality streaming media (video or audio) for IPTV set-top boxes, PC, tablet and mobile video clients. It uses standard protocols and hence can interoperate with the majority of existing clients, either in-building or across the public Internet (OTT streaming). As well as simple playback, pause and seek, it also provides full 'trick-play' visual fast forward/rewind

Features

- Integrated with market-leading set-top boxes such as Amino, Exterity, Motorola
- Server-initiated streaming mode (temporary multicast) for smart TVs
- Supports HLS streaming to Apple and Android mobile and tablet
- Supports PC/Mac clients such as VLC
- Protocols: RTSP/UDP, RTSP/TCP, Progressive HTTP, HTTP Live Streaming (HLS)
- Formats: MPEG-2, H.264, H.265 at any bit-rate
- Multiple protocols from the same single asset file
- Variable bit-rate (VBR) streaming
- Visual fast-forward / rewind (trick play) at any speed
- Seamless playlists and looping multicasts

Integration with other products

The video server is able to interrogate a Gridline cache to obtain details of video files. This allows Gridline to be used to deliver content for streaming on multiple video servers.

Streamline can also interface with a Timeline IPTV Recorder to deliver on-demand programming based on simple channel and event ID or time-based URLs.

Performance

The performance of the video server is totally dependent on the hardware it is running on, and in particular on the performance of the disks. Typically, however, it is quite feasible to obtain 200Mbit/sec (50 typical VOD streams) from a standard server with a single disk, and 500Mb/sec (125 streams) from a dual-processor server with twin conventional disks (RAID-0 striped). Up to 1Gbit/sec streaming can be obtained with larger arrays of conventional drives, and up to 5Gbit/sec per server using Solid State Drives (SSD).

Timeline IPTV Recorder

The Packet Ship Timeline IPTV Recorder captures multicast IPTV channels and records them to disk, either as discrete events or as a continuous loop. The recordings can then be streamed back out using the Streamline video server to provide catch-up TV or NPVR services, pause and rewind live TV options. The IPTV Recorder also captures electronic programme guide (EPG) data, either from the stream itself or from external XML sources, and provides a high-performance API for user interfaces to generate dynamic forward and backward EPGs.

Features

- Captures from standard IPTV multicasts using IGMP
- Records individual programmes on request or a continuous loop, independently for each channel
- Supports MPEG-2, H.264 and H.265 video
- Access to recorded programmes by channel, event ID or time
- Delayed streams for pause live TV
- Real-time indexing for rewind / fast-forward live TV
- Captures EPG data (EIT) and stores in a high-performance in-memory database with disk backup
- SOAP and Javascript APIs for user interface to query EPG data and manage recordings

Integration with other products

The Timeline IPTV Recorder is fully integrated with the Streamline Video Server which is used to stream the recordings back out again. The video server can look up programme information in the Timeline recordings by channel and either event ID or time of day. It can also obtain a near-live stream which it can then pause or rewind just like a VOD asset.

The Guideline user interface (or any third-party 'middleware') can obtain EPG data and channel listings from the internal in-memory database.

Performance

The Timeline IPTV Recorder is a high-performance C++ application and only requires about 1% of a mid-range CPU to capture and index each 1 Mbit/sec of input. In other words a typical 4Mbit/sec SD channel takes 4% of a CPU, a 10Mbit/sec HD channel around 10%. Hence a modern 4-core CPU (400% CPU) can handle 400Mbit/sec of input, equivalent to 100 SD channels or 40 HD channels, or any combination. An 8-core processor can handle over 1Gbit/sec (subject to disk speed) of outbound streaming at the same time.

Gridline Content Management & Delivery

The Packet Ship Gridline Content Management & Delivery System provides a general purpose content management system allowing creation of complex hierarchical structures of any type of content, optimised for large media files. In addition, it allows distribution of some or all of the content to multiple distributed caches, and provides an integrated metadata database for creation of user interfaces.

Features

- Content management system designed for large media files
- Storage of integrated content and metadata
- Automated content processing workflow
- Automatic content replication / CDN
- Secure delivery with SSL and PKI authentication
- High-performance metadata database with in-memory category indexing at edges

Integration with other products

Gridline can act as a content repository for a Streamline Video Server with stream URLs referring directly to content bundle IDs within the Gridline repository.

Gridline can also integrate with DRMs to provide automatic encryption of assets on ingest and key distribution to edge sites if required.

Gridline is used as the primary content and configuration storage mechanism for the Guideline user interface.

Performance

Gridline has been designed from the ground up to handle large numbers of huge files and large numbers of subscribers. Unlike many content management systems it does not use SQL database technology, but the native filesystem, with metadata stored in standard XML files.

The repository structure and metadata is then cached and indexed in memory within the cache daemon, providing very high speed access for navigation. The multi-level cache system allows the creation of a distributed Content Delivery Network (CDN) for unlimited scalability.

Centreline Asset Management

The Packet Ship Centreline Asset Management System is a Web-based interface on top of a Gridline content repository providing ingest and management of content and metadata, management and tracking of content delivery to remote sites and usage statistics aggregation and reporting.

Features

- Ingest of media files and tracking of automatic workflow processes
- Entry of content metadata and upload of associated graphics
- Categorisation of content into arbitrary genre structures
- Setting release window information
- Management of remote sites and groups of sites
- Assignment of content for delivery to sites or groups or sites
- Tracking of delivery to remote sites
- Aggregation and reporting of usage statistics from multiple remote sites
- Multiple users with different access rights

Integration with other products

Centreline acts as a Web front-end to a Gridline central content repository and provides the subscription data to control which content is downloaded by Gridline edge caches.