OpenSAF – More than HA

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Presentation Layout

• OpenSAF Background
• OpenSAF Advantages
• Where are we and how did we get here?
• High Level Architecture
• Use Cases
What is OpenSAF

- Base platform middleware developed by OpenSAF Project
- Provides **availability**, **manageability**, **utility** and **platform services** needed to develop highly available distributed applications
- LGPLv2.1 license
- Implements SA Forums AIS Specification
- Supported by OpenSAF Foundation
OpenSAF Advantages

• Applicable across the availability spectrum
  – Enterprise
    • Easy legacy application migration
    • Supports LSB init.d scripts
  – Telecom and aerospace/defense: millisecond failover
    • Integration and use of OpenSAF services

• Unified and Model Based Management
  – All services store configuration in the central information model, managed by Information Model Management (IMM)
  – All services allow for administrative operations through IMM
OpenSAF Key Technical Points

• Consistent and streamlined architecture
  – Applications and OpenSAF services use same core services
    • Information model – IMM
    • Notifications – NTF (availability actions or informational)
    • Logging – LOG

• Platform Management – hardware integration
  – Fail-overs triggered by hardware events
  – Isolation / Fencing
  – Hardware validation
Where are we and how did we get here?
Architectural Changes: From 2.0 till 4.2
Architectural Changes: Retirement of non-AIS Compliant Services

Retired Proprietary Services:

- PSSv
- SRRSv
- MAV
- IPSv
- HGSv

OpenSAF

The Open Service Availability Framework
Architectural Changes: Added AIS Services

New AIS Compliant Services

- IMM
- PLM
- SMF
- NTF
- LOG
- AMF
- MSG
- EVT
- CLM
- CKPT
- LCK
- RDE, FM
- MDS
- MBCSv
- Logtrace
Architectural Changes: Modularizing

- IMM
- NTF
- LOG
- AMF
- CLM
- RDE, FM
- MDS
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- PLM
- MSG
- CKPT
- EVT
- LCK
- SMF
Architecture Change: Modularized

OpenSAF Core:
- IMM
- NTF
- LOG
- RDE, FM
- MDS
- MBCSv
- Logtrace
- AMF
- CLM

OpenSAF Optional Services:
- PLM
- SMF
- MSG
- EVT
- CKPT
- LCK
OpenSAF 4.2 Architecture

Management Systems

- SNMP / Netconf / SOAP / HTTP / RPC / …
- CM, FM

Management Daemons

- Optional, Modular, Pluggable

OpenSAF Core

- OpenSAF Infrastructure Services
  - RDE, FM
  - MDS
  - MBC
  - Logtrace

OpenSAF Core

- OpenSAF Optional Services
  - SMF
  - PLM
  - CKPT
  - EVT
  - MSG
  - LCK

Optional Services

- AMF – Availability Management Framework
- CKPT – Checkpoint Service
- CLM – Cluster Membership Service
- EVT – Event Service
- IMM – Information Model Management Service
- LCK – Lock Service
- LOG – Log Service
- MSG – Message Service
- PLM – Platform Management Service
- SMF – Software Management Framework

Python Bindings

Java Bindings
OpenSAF Roadmap

2008

1.0
Initial Release

2009

2.0
• PLM, SMF
• Retired closed services
• Modularized Architecture
• Streamlined Architecture

2010

3.0
• Performance enhancements
• SMF Rollback & API
• Messaging over TCP
• AM4J/AMF Agent

2011

4.0
• 64-Bit support
• AIS – LOG Service

2012

4.1
• HW Integration C7000
• Java Mapping
• IMM

4.2
• Python Mapping
• Non-Root User
• Retired DTSv
OpenSAF Architecture
Concepts

- Defines two types of nodes
  - System Controller Node
  - Payload Node

- System Controller Node
  - Management Access Point for Entire Cluster
  - Hosts Centralized Functions of OpenSAF Services
  - 2N Redundancy
  - Can also host OpenSAF controlled applications

- Payload Node
  - Contains Node-Scoped functions of OpenSAF Services
  - Hosts OpenSAF controlled applications
OpenSAF 2-tier Architecture

- Server on Controller
- Only library on Payload, used to talk directly to the Server
- Examples
  - PLM
  - LOG
  - NTF
  - EVT
OpenSAF 3-tier Architecture

- Director on Controller
- Node Director on Payload, handles node-scoped activities and communicates with Director
- Examples
  - AMF
  - CKPT
  - CLM
  - IMM
  - SMF
OpenSAF Core Services

- **AMF - Availability Management Framework**
  - Manages **redundant service providers** for each service
    - instantiate, terminate and monitor **service providers**
    - Dynamically (re)assigning **services** to **service providers**
    - Model driven

- **IMM - Information Model Management Service**
  - Manages the **Information Model**
  - Allows **objects** of the **Information Model** to be created, accessed, and managed by system management applications

- **LOG - Log Service**
  - Enable application to express and forward **log records** through well-known **log streams** that lead to particular output destinations such as named files
OpenSAF Core Services

- **CLM - Cluster Membership Service**
  - Deciding which nodes are part of the specific cluster

- **NTF - Notification Service**
  - Notification **producers** generate **notifications**
  - Notification **consumers** consume **notifications** generated by **producers**, and can be either of **subscriber** or **reader** type
  - Support for Notification filters
OpenSAF Optional Services

- SMF - Software Management Framework
  - **Software Upgrade**: Support for migrating a target system in operation from one deployment configuration to another is realized following an **upgrade campaign** specification
  - **In Service Upgrade**: SMF uses AMF to upgrade applications in a controlled fashion

- CKPT - Checkpoint Service
  - Manages checkpoints that a process uses to save its state to minimize the impact of failure
  - A checkpoint is a cluster-wide entity, with a unique name, that is structured into areas called sections
  - A copy of the data that are stored in a checkpoint is called a checkpoint replica
OpenSAF Optional Services

- PLM - Platform Management Framework
  - Service providing management of hardware (via HPI) and low-level software
  - Handles HW entities as well as Execution Environments
    - Virtual machines & Host OS
  - Validation of HW
  - Isolation / Fencing
OpenSAF Optional Services

- **EVT - Event Service**
  - Publish/subscribe multipoint-to-multipoint communication mechanism based on cluster-wide event channels

- **LCK - Lock Service**
  - The Lock Service is a distributed lock service that allows different application processes on the same or different nodes in the cluster to compete for access to a shared resource in the cluster

- **MSG - Message Service**
  - Buffered message passing system, for processes on the same or different nodes, that is based on the concept of a message queue
Use Case 1 - Apache Web Server

• Requirements
  – Static content => No shared disk needed
  – Migrating IP address
  – Lifecycle management
  – Health Monitoring
  – No altering of the code
  – Cold standby
Use Case 1 – Apache Web Server

- **Suggested Solution**
  - Wrapper component for httpd interacts with AMF
  - Use httpd init script for lifecycle and health checks
  - PID supervision
  - IP part is non-saf aware component
Use Case 1 – Apache Web Server

• Benefits
  – No coding
    • Wrapper part of samples
  – Legacy application intact
  – Fast migration

• Cons
  – Fail-over takes longer

Calls
/etc/init.d/httpd start
/etc/init.d/httpd stop
/etc/init.d/httpd status
Use Case 2 – Video Streaming Server

• Requirements
  – Fail-over with no interruption in video (ms)
    • Requires full AIS with checkpointing
    • Requires hot standby
  – Fail-over due to certain HW events
    • Requires PLM and subscription to notifications (NTF)
  – No changes to Video Server code (VLC)
    • Need a proxy to talk to OpenSAF
    • Proxy needs to have full control of VLC
    • VLC Libraries to be used
Use Case 2 – Video Streaming Server

Hardware

Controller 1
Controller 2
Payload 1
Payload 2

VLC Server
Active

VLC Server
Standby

Stream

OpenSAF
OpenHPI
OS

Client
Use Case 2 – Video Streaming Server

Fail-over decisions Based on HW events
libvlc calls Writes checkpoints
Responds to health checks

OpenSAF

NTF

PLM

PLM HSM

OpenHPI

Hardware

HW Generated HPI Events

OpenSAF™
The Open Service Availability Framework

Use Case 2 – Video Streaming Server

Fail-over decisions
Based on HW events

libvlc calls
Writes checkpoints
Responds to health checks

OpenSAF

NTF

PLM

PLM HSM

OpenHPI

Hardware

HW Generated HPI Events

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Use Case 2 – Video Streaming Server

• Benefits
  – Core application intact
    • Will survive upgrades
  – Rapid fail-over
  – HW health problems detected and addressed prior to customers noticing

• Cons
  – Coding work has to be done
Backup Slides
Project Focus Areas

Architecture

- Streamlined
- Modularity
- Functionality

Usability

“Solve simple problems in simple way”
- Documentation
- Tools
- Migration Support

Ecosystem

- 3PP Plugins
- Distros (visibility)

4.0
Project Focus Areas

- **Architecture**
  - Streamlined
  - Modularity
  - Functionality
  - “Solve simple problems in simple way”
  - Documentation
  - Tools
  - Migration Support
  - 3PP Plugins
  - Distros (visibility)

- **Usability**

- **Ecosystem**
  - 4.2 / Today