Power Matters.™

Microsemi

Next generation of ecosystem storage management

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Introduction

- With the current hyperscale datacenters, managing multi-vendor storage hardware using one simple user friendly tool is the datacenter admins desire. Server and storage Industries are trying to solve this common problem by providing a standard way of storage management. DMTF and SNIA have attempted to standardize the storage management using CIM and SMI-S standards for a decade. Now DMTF and SNIA have reviewed the lessons we learnt in a decade and have come up with Redfish and Swordfish. A simplified and easy to implement and use standards for the next generation of storage management. In addition to the standard based storage management, below are the common ask on the next generation of storage management.
- AI/ML based data analysis for prediction, notification and automated error recovery
- In-band and Out of band management
- Capability to run as containerized / server less application

Flavors of storage management tools

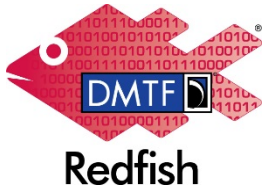
- GUI
- CLI
- APIs (SDKs, RESTFul service,..)
- Plugins (vSphere WC, OpenStack Horizon, LSMCLI,…)
- Standalone scripts
- Microservices for a specific functionality

Storage management tools requirements

- **Secure**
- **Standard based**
- **Easy to configure and provision the storage device**
- **Monitoring**
- **Notification**
  - Alerts and events
  - Email and SMS notification
  - Push notification on mobile devices
- Firmware upgrade
- Progress task management
- Online help
- Discovery service
- Log management
- Scheduler service
- Statistics
- Topology view
- **Fault detection and remediation**

Storage management specification / protocol

- CIM / SMI-S
- Redfish / Swordfish



DMTF CIM (Common Information Model)

- The DMTF's Common Information Model (CIM) provides a common definition of management information for systems, storages, networks, applications and services, and allows for vendor extensions.
- The CIM standard includes a Specification and a Schema, as well as a Metamodel.
- The CIM Specification describes an object-oriented meta model. It defines the syntax and rules for describing managed objects in terms of meta schema elements.
- The CIM Schema provides the actual model descriptions.
- The CIM Metamodel defines the semantics for the construction of *new* conformant models and the schema that represents those models.

SNIA SMI-S

- The Storage Management Initiative-Specification (SMI-S) is an ISO approved international standard that provides access to common storage management functions and features for the different storage vendors storage devices.
- The SMI Architecture is based on Web-Based Enterprise Management (WBEM) from the Distributed Management Task Force (DMTF). The architecture is a client-server model that uses CIM-XML as the protocol. The client interface is the combination of the operations (e.g. get, modify, delete, enumerate, ...) defined in CIM-XML and the model defined in the Storage Management Initiative Specification (SMI-S).

https://www.snia.org/forums/smi/tech_programs/smis_home

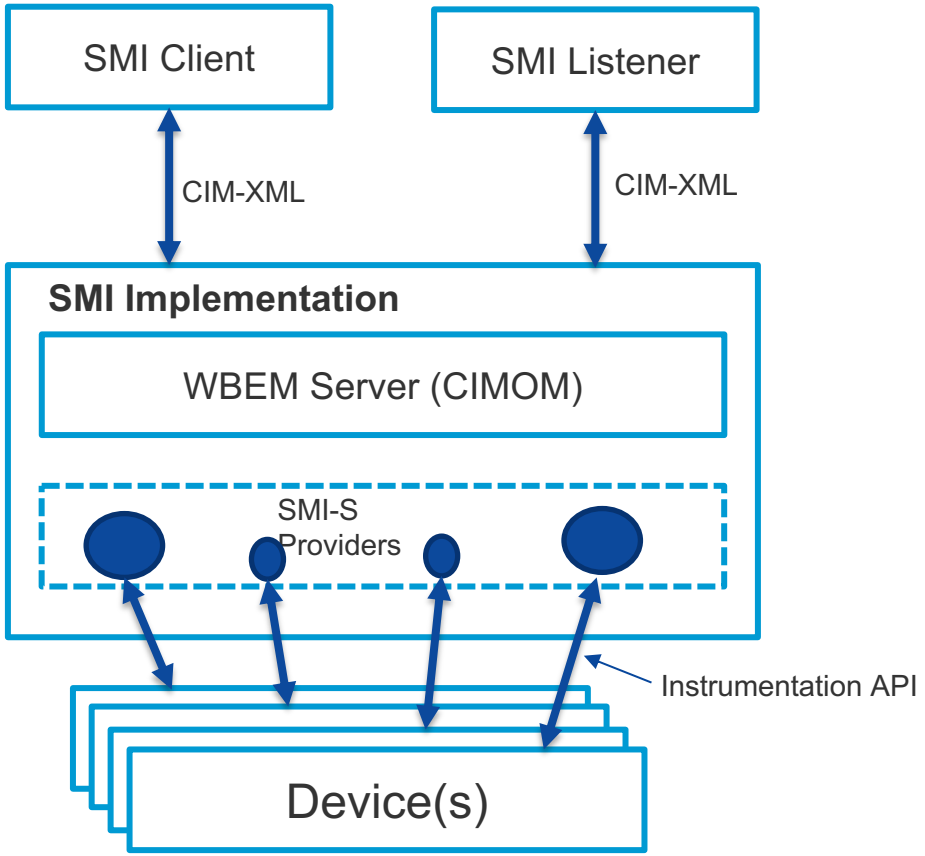
DMTF Redfish

- The Redfish Scalable Platforms Management API ("Redfish") is a management standard using a data model representation inside of a hypermedia RESTful interface.
- Because it is based on REST, Redfish is easier to use and implement than many other solutions.
- Since it is model oriented, it is capable of expressing the relationships between components in modern systems as well as the semantics of the services and components within them.
- Uses Http(s) as web protocol and Odata-JSON for data format

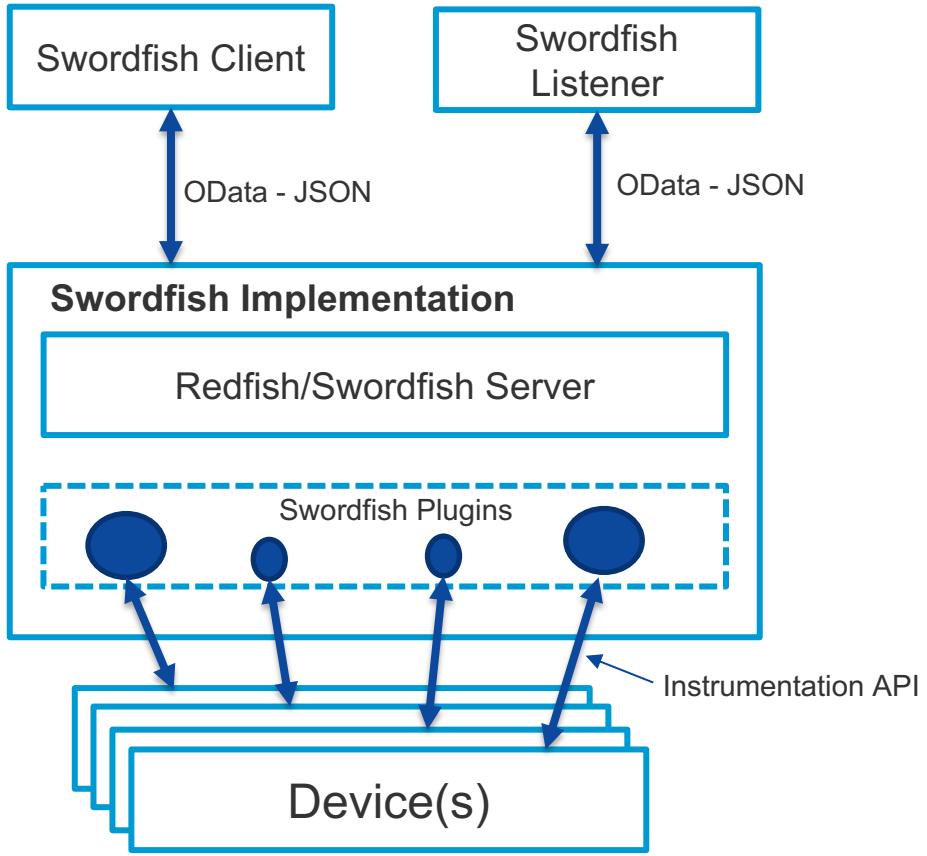
SNIA Swordfish

- The Swordfish Scalable Storage Management API ("Swordfish") defines a RESTful interface and a standardized data model to provide a scalable, customer-centric interface for managing storage and related data services. It extends the Redfish Scalable Platforms Management API Specification (DSP0266) from the DMTF.

Architectural implementation view



SNIA SMI | STORAGE MANAGEMENT



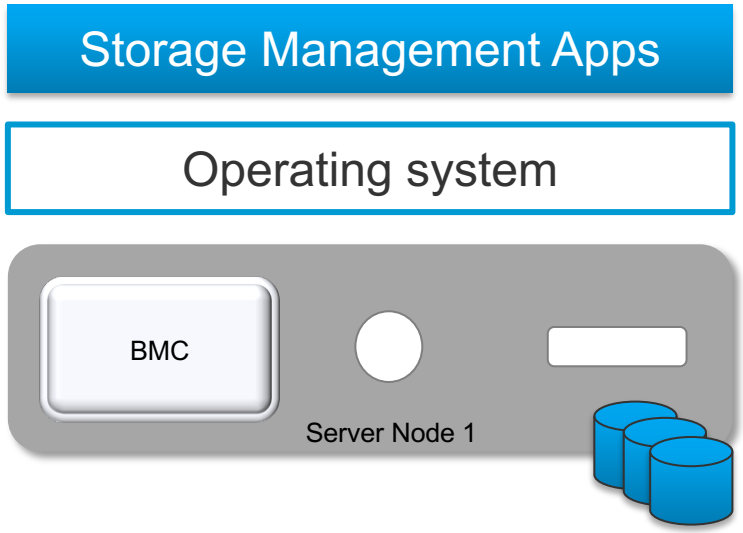
Swordfish

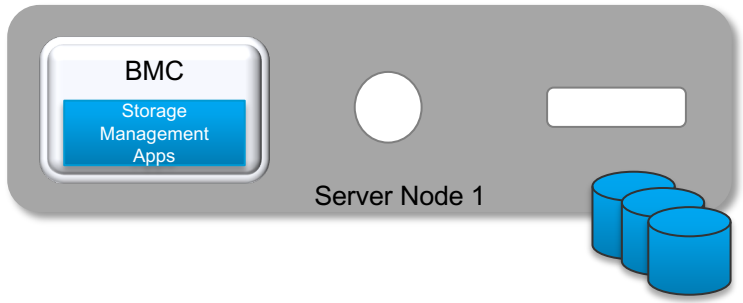
Storage management communication paths

- In band
  - Traditional way for managing the storage products
  - Run on the operating systems
  - Standalone or a remotely manageable

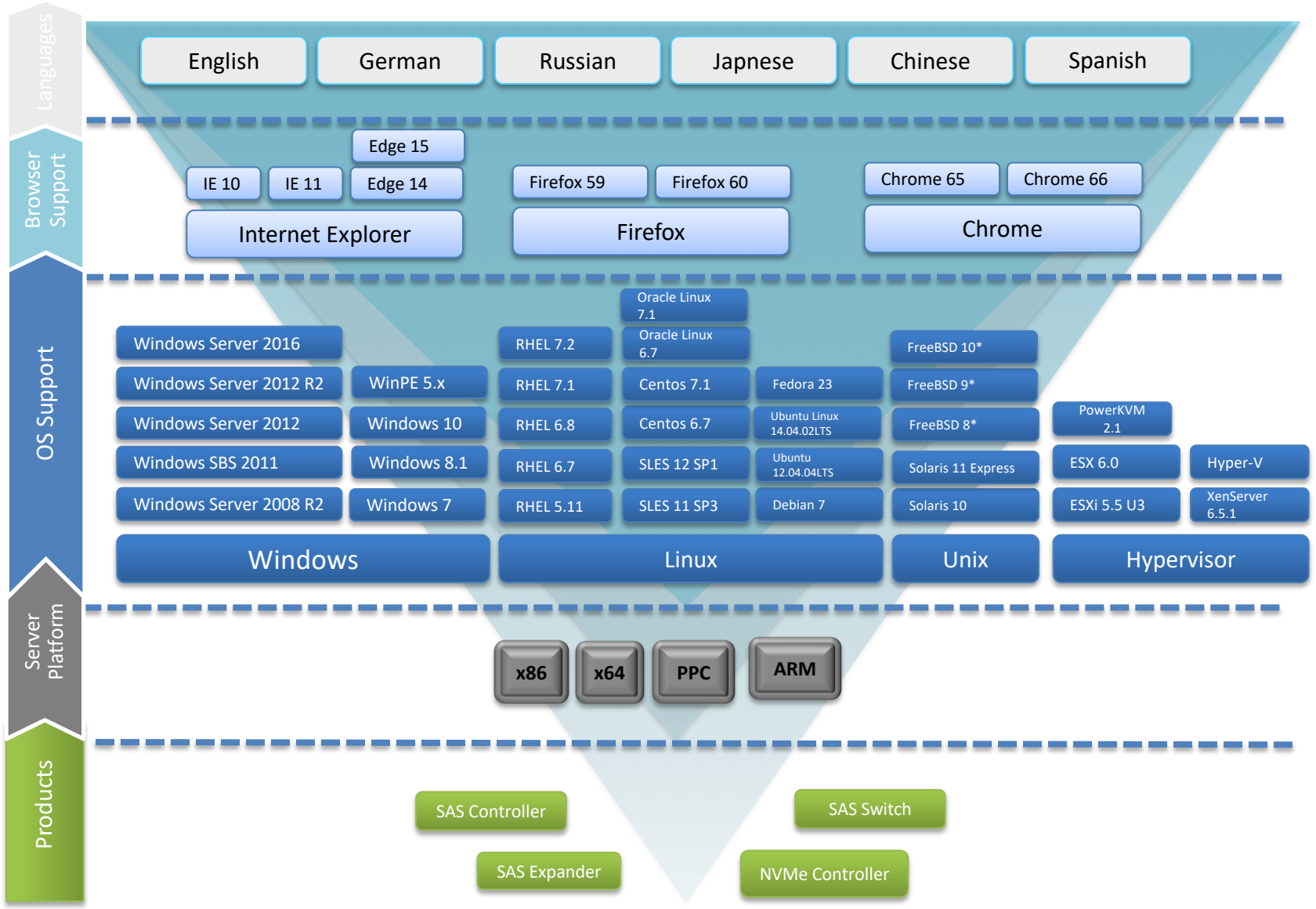
- Out Of Band / Side Band
  - BMC based OOB is in use for more than a decade.
  - IPMI is used as a major communication protocol
  - Redfish is picking it’s share
  - All the new version of enterprise datacenter server are shipping with redfish based OOB

In-band Vs Out-Of-Band





Storage management : products, server platforms, OS, browsers and language support



Common challenges in In-band application deployment

- Even though we develop and validate the storage management application in multiple architecture and OS platforms, still the customer deployment environment vary a lot.
- Other vendor applications conflicting with the network ports, libraries versions and other shared resources.

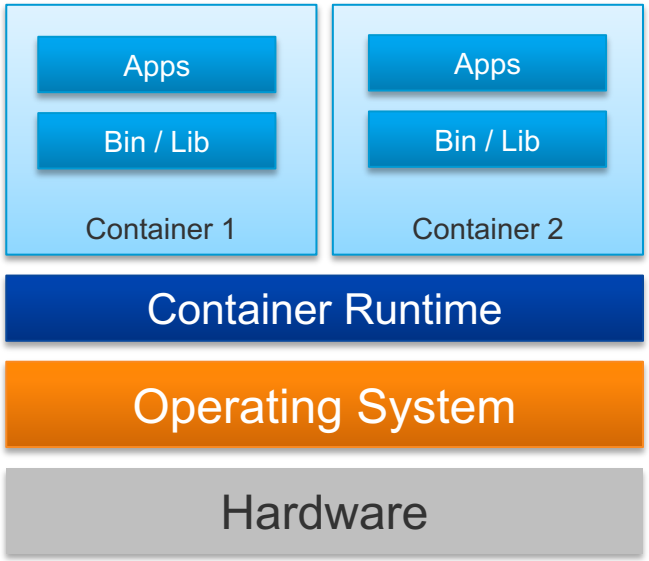
Containerizing the application

Containers offer a logical packaging mechanism in which storage management applications can be abstracted from the environment in which they actually run. This decoupling allows container-based applications to be deployed easily and consistently, regardless of whether the target environment is a private data center, the public cloud, or even a admin/developer's laptop.

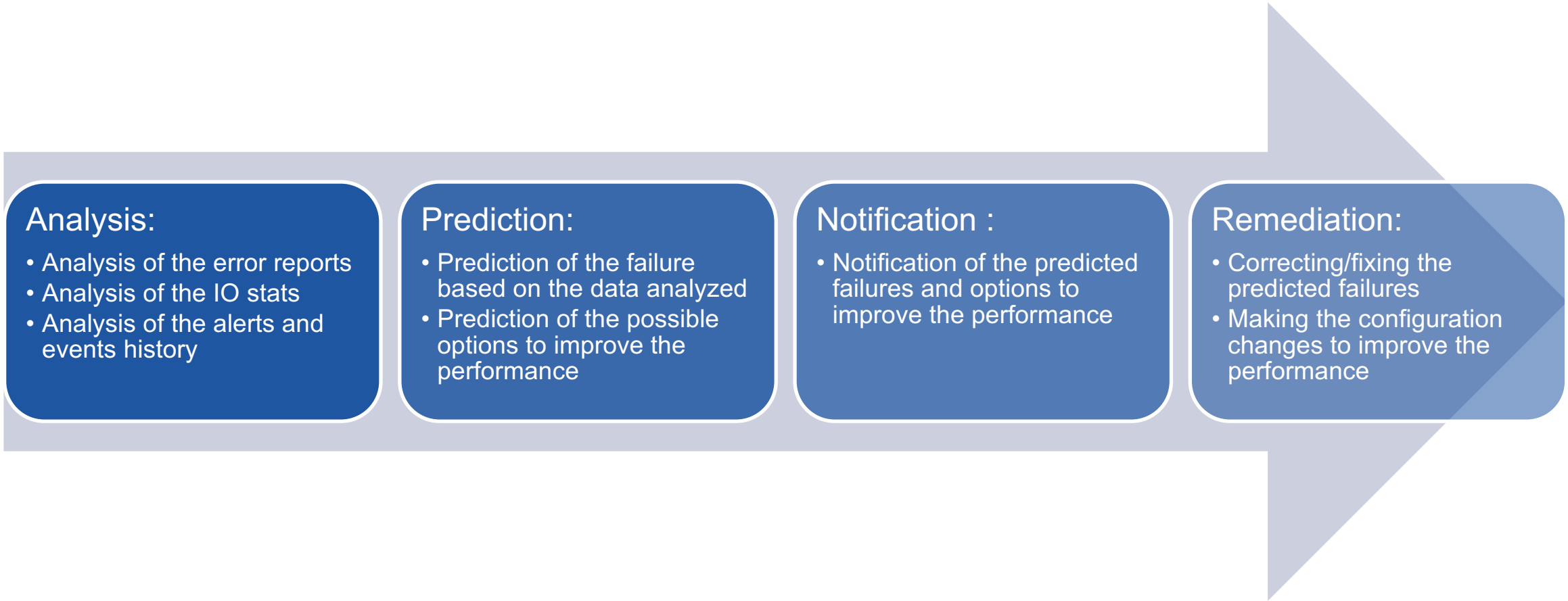
Consistent Environment
Containers can include software dependencies needed by the application, such as specific versions of programming language runtimes and other software libraries. From the developer's perspective, all this is guaranteed to be consistent no matter where the application is ultimately deployed.

Run Anywhere
Containers are able to run virtually anywhere, greatly easing development and deployment: on Linux, Windows, and Mac operating systems; on virtual machines or bare metal; on a developer's machine or in data centers on-premises; and of course, in the public cloud.

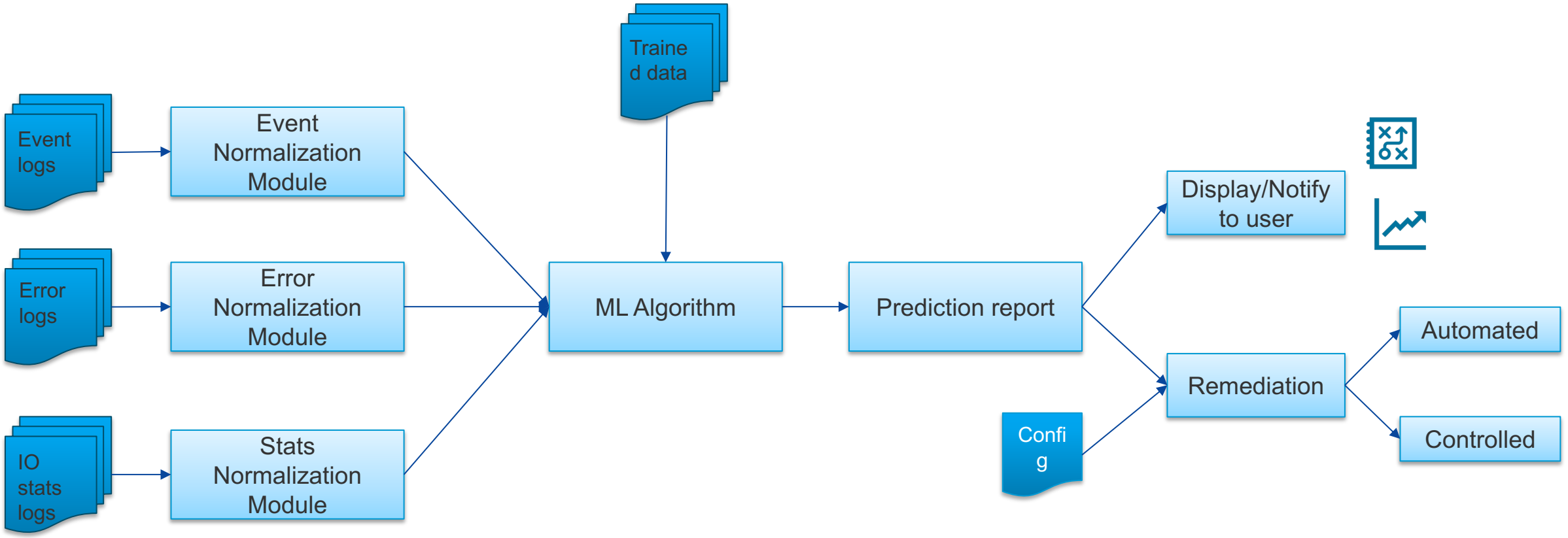
Isolation
Containers virtualize CPU, memory, storage, and network resources at the OS-level, providing developers with a sandboxed view of the OS logically isolated from other applications.



AI/ML in storage management



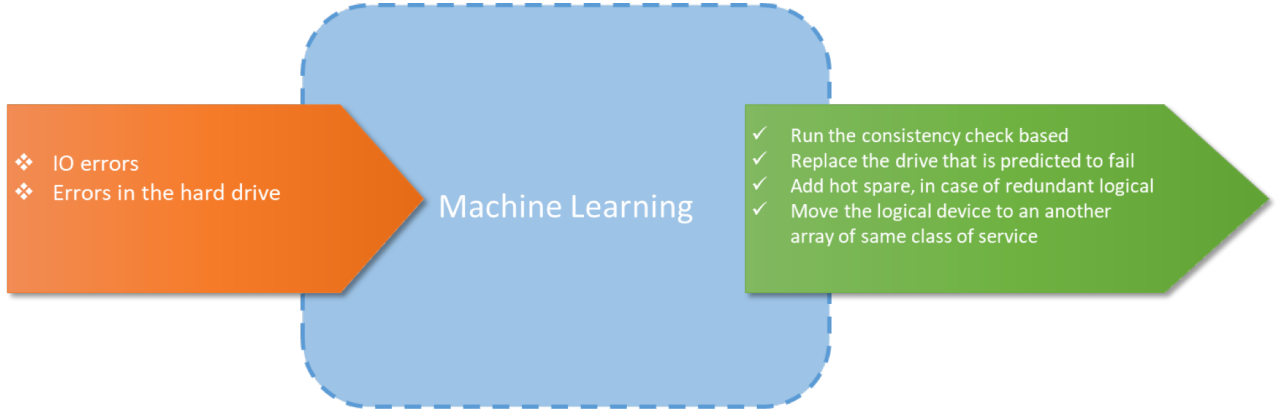
Storage management ML architecture



Logical device failure prediction and correction

Input for ML

- IO errors
- Errors in the hard drive

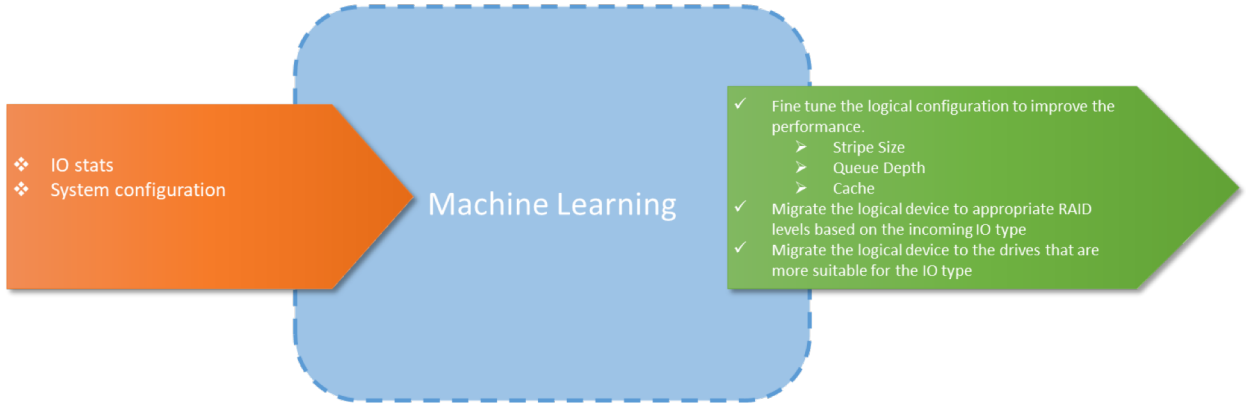


Corrective actions:-

- ✓ Run the consistency check based
- ✓ Replace the drive that is predicted to fail
- ✓ Add hot spare, in case of redundant logical
- ✓ Move the logical device to an another array of same class of service

Logical device performance enhancement

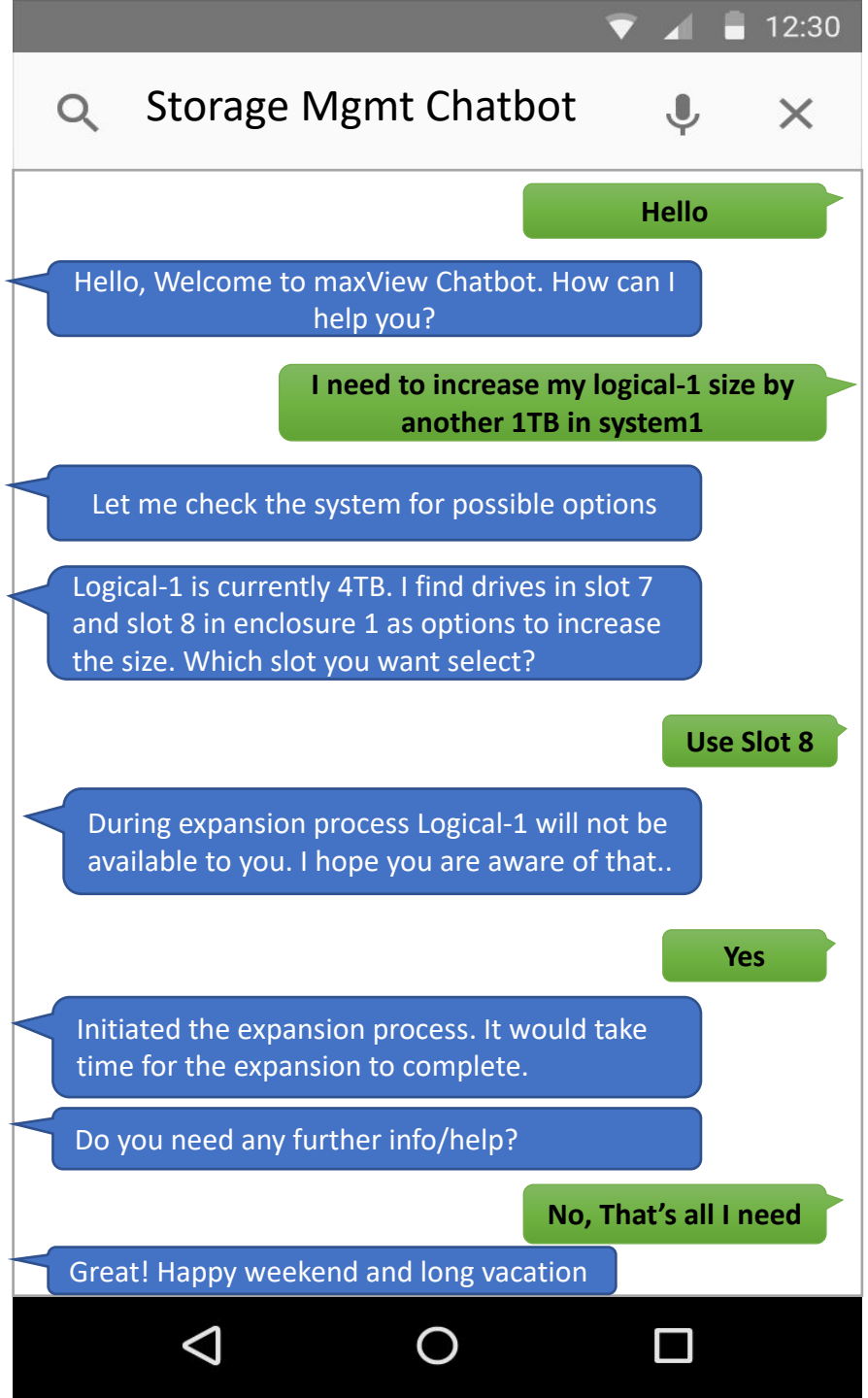
- Input for ML
  - ❖ Analysis of IO stats
  - ❖ Analysis of the configuration



- Corrective actions:-

  List the options to improve the performance based on the IO stats and logical device configuration in comparison with the pre-defined trained data

  - ✓ Fine tune the logical configuration to improve the performance.
    - ✓ Stripe Size
    - ✓ Queue Depth
    - ✓ Cache
  - ✓ Migrate the logical device to appropriate RAID levels based on the incoming IO type
  - ✓ Migrate the logical device to the drives that are more suitable for the IO type


12:30
Storage Mgmt Chatbot
Hello
Hello, Welcome to maxView Chatbot. How can I help you?
I need to increase my logical-1 size by another 1TB in system1
Let me check the system for possible options
Logical-1 is currently 4TB. I find drives in slot 7 and slot 8 in enclosure 1 as options to increase the size. Which slot you want select?
Use Slot 8
During expansion process Logical-1 will not be available to you. I hope you are aware of that..
Yes
Initiated the expansion process. It would take time for the expansion to complete.
Do you need any further info/help?
No, That's all I need
Great! Happy weekend and long vacation

Q & A

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