
2020 OFA Virtual Workshop

# TOWARD AN OPEN FABRIC MANAGEMENT ARCHITECTURE

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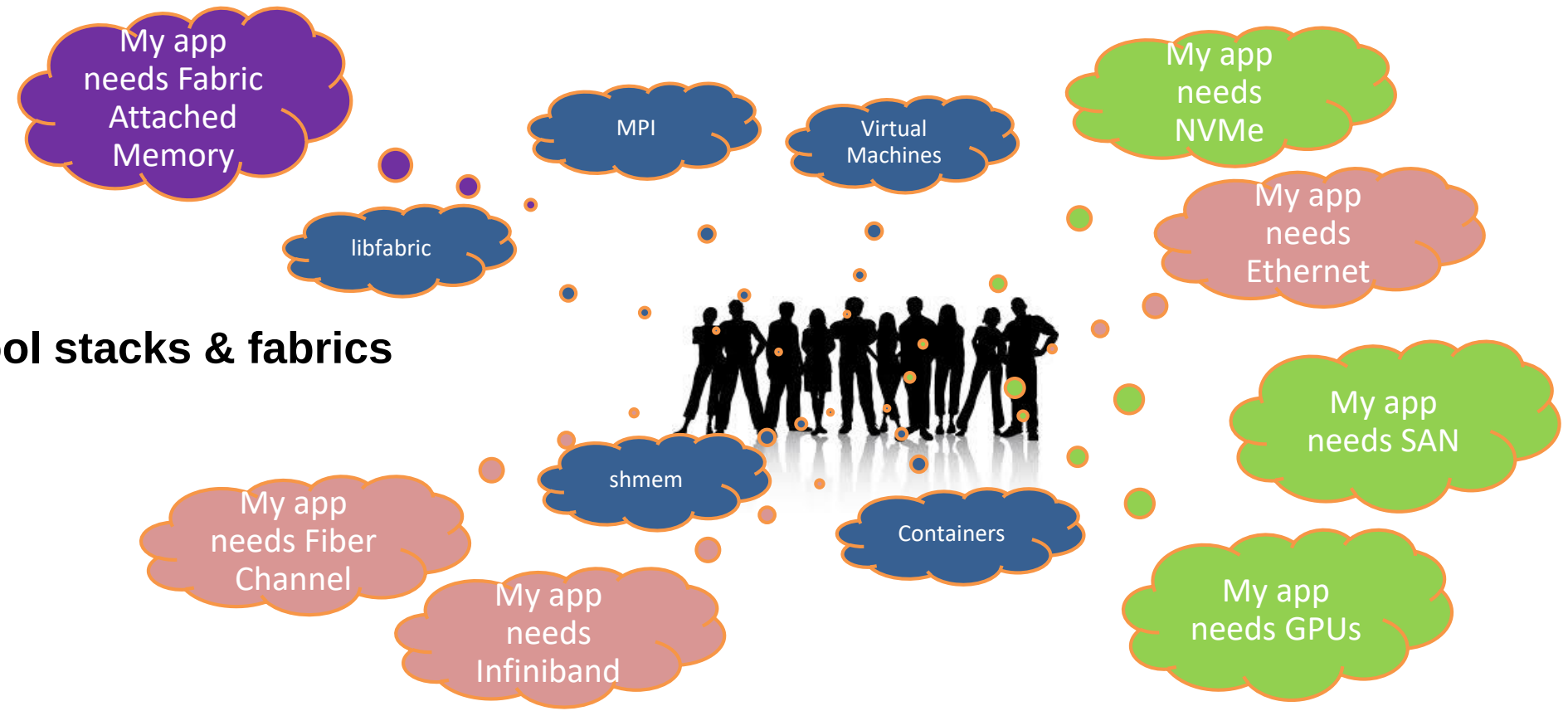
# THE M X N FABRIC MANAGEMENT PROBLEM

## where we are today




**M x N combinations of tool stacks & fabrics**

- Ethernet
- FC
- IB
- All different interfaces
- None covers FAM

**No interoperability**

# THE M X N FABRIC MANAGEMENT PROBLEM

## the cast of characters

**The Client:  the end user of a total solution package**

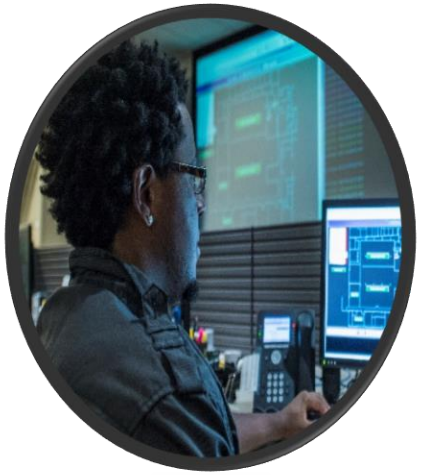
**Relies on the access point**

**The Application Developer:  Creates an application suite that fulfills the Client's needs**

**Relies on development tools**

**The Solution Provider:  Integrates the application with suitable infrastructure and delivers the solution to the Client**

**Relies on orchestration tools**



# THE FABRIC SW STACK

## From the Client's View

I need a diagnosis of these symptoms STAT

I need access to these 12 test results out of 100,000 from over the past 3 years

I really can't do my job without these 17 critical applications at my beck and call anytime, anywhere.

- Applications (monolithic and cloud native)
- Middleware
- Fabric Interface / API
- Fabric Provider
- Fabric Services
- Hardware

### The Client view

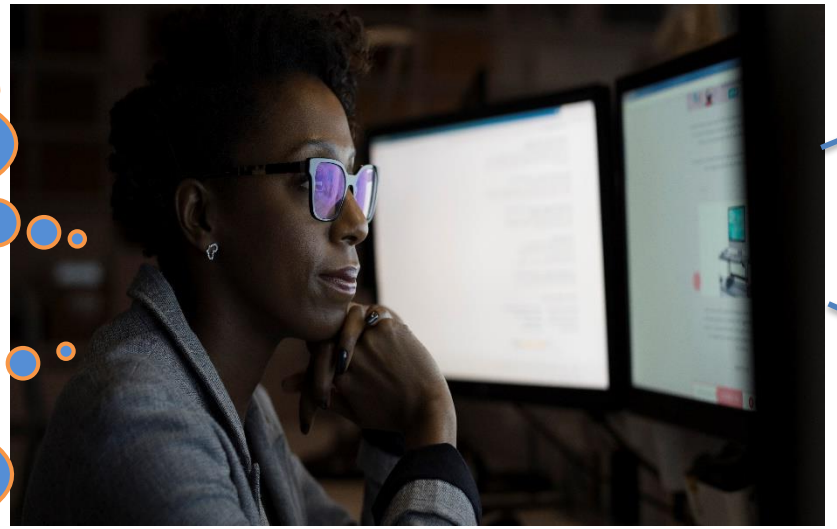
- Only sees the apps, not the stacks
- More than willing to pay for what they use. *Just not more.*

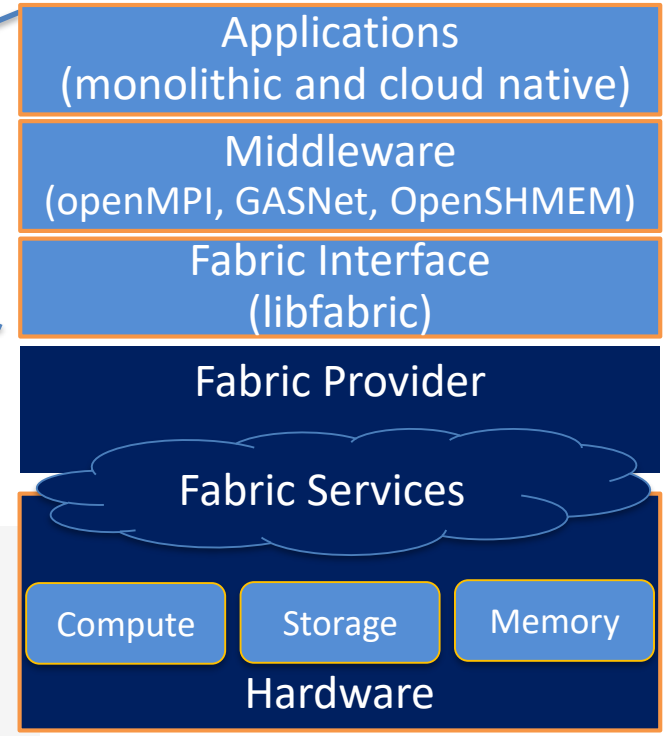
# THE FABRIC SW STACK

## From the Application Developer's View

I need shared features, compute, memory, and storage

I need an MPI cluster and the libraries to program it with






### The Application Developer view

- The fabric exists only because the library exists
- The libraries exist to meet the app's requirements
- The developer uses the library so the code is portable
- The customer intent defines the required platform and fabric characteristics
- It's someone else's problem to couple the resources the app needs to the right fabric at runtime

# THE FABRIC SW STACK

## From the Solution Provider's View

App, containers, SAN, vLan…. Template …. check

And a fabric for MPI and shared FAM

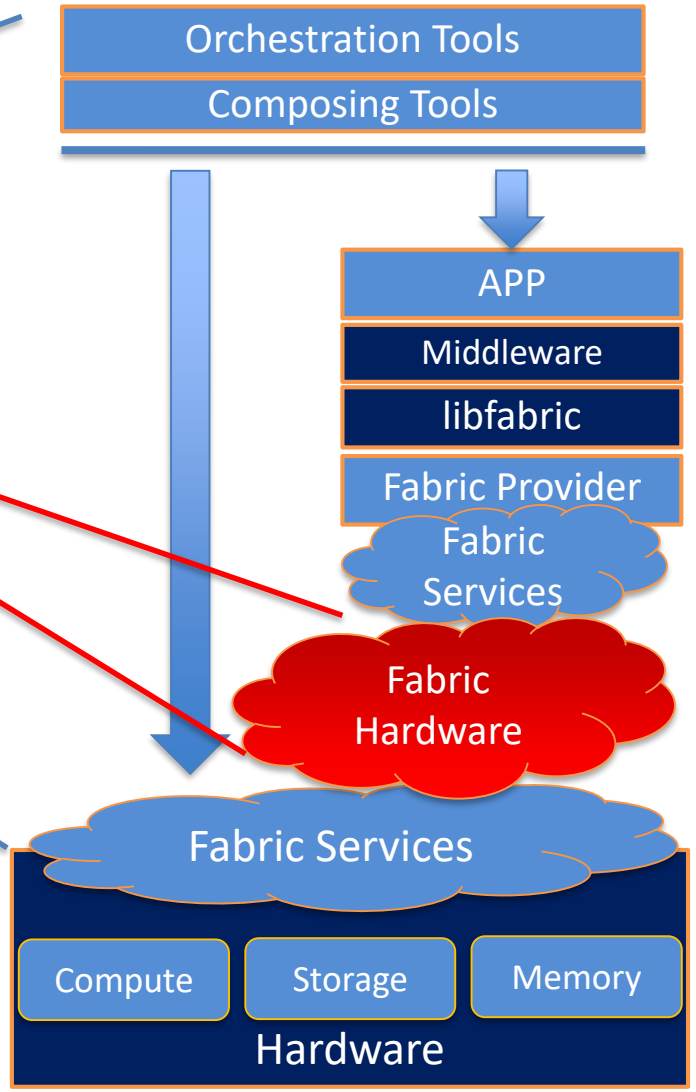
This app needs Infiniband

This app needs Fiber Channel

This app needs Ethernet

### The Solution Provider view

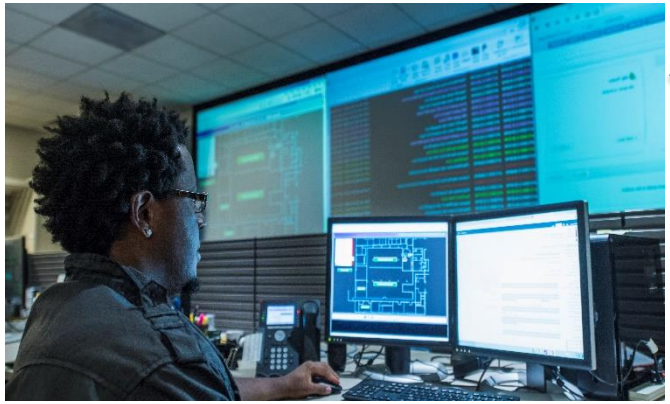
- Orchestration and Composition tools wrangle the virtual platform resources into an execution environment **connected by the required fabric(s).**
- **Each fabric has its own management application, often not well integrated into the Orchestration and Composition tools**




**A Fabric Admin is needed at runtime!**

# THE FABRIC SW STACK

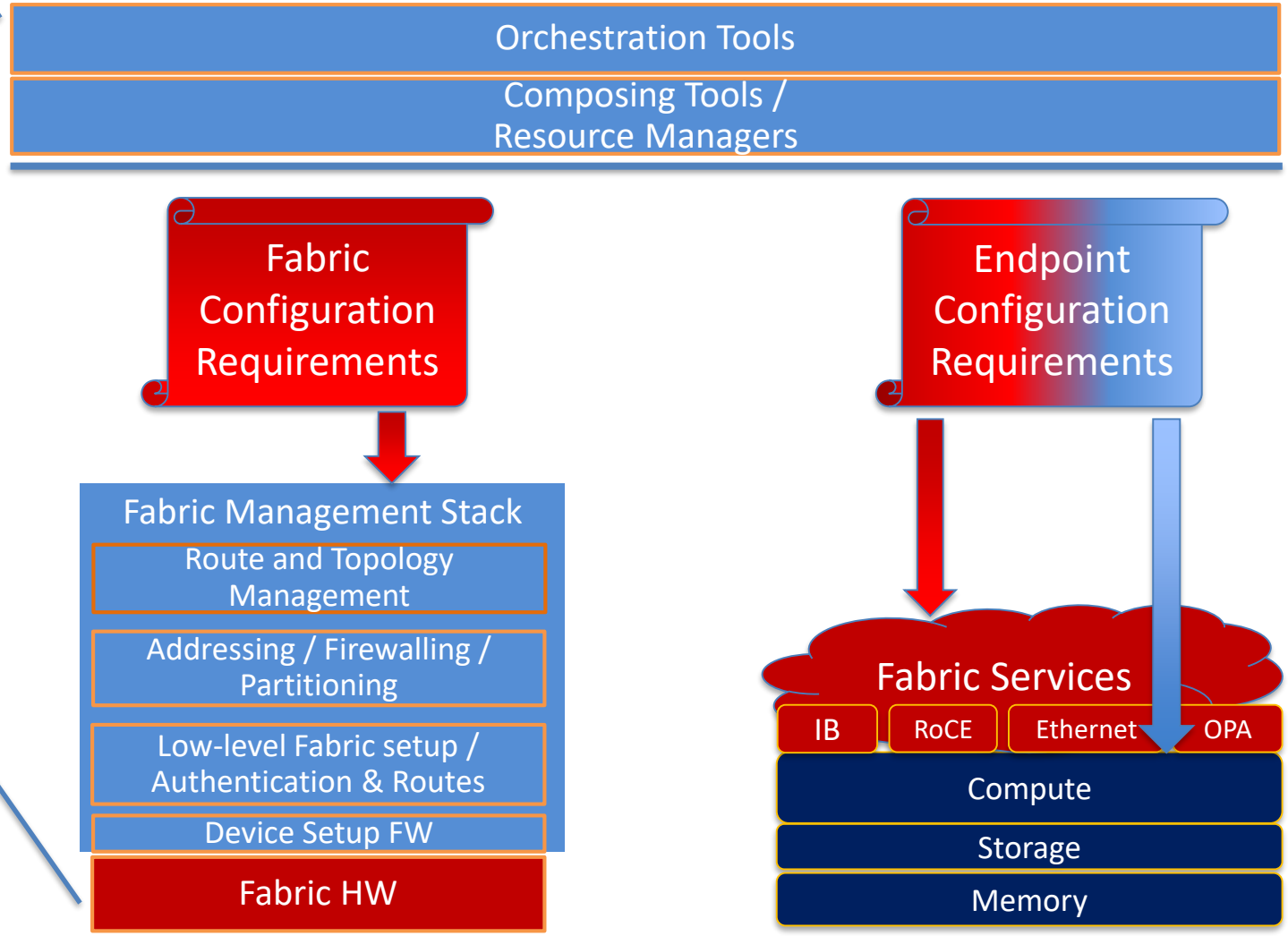
## From the Fabric Admin's View



### The Fabric Admin view

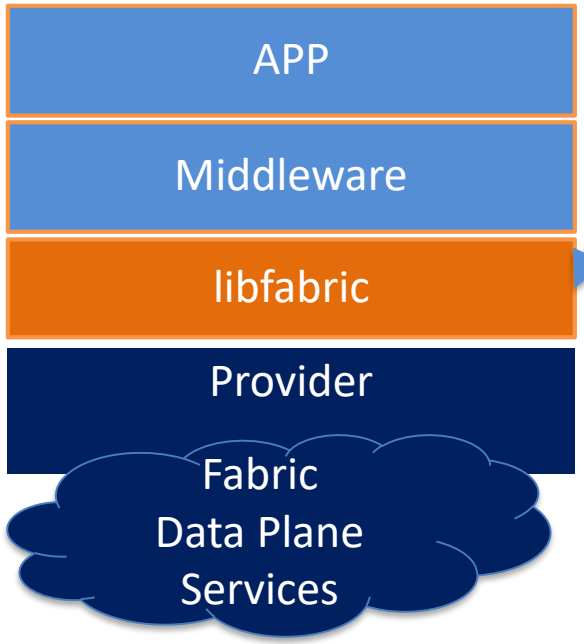
- Each fabric is different, and the configuration requirements are applied to many different components
- The Solution Provider / Fabric Admin needs M x N tool stacks

**Need a common interface**



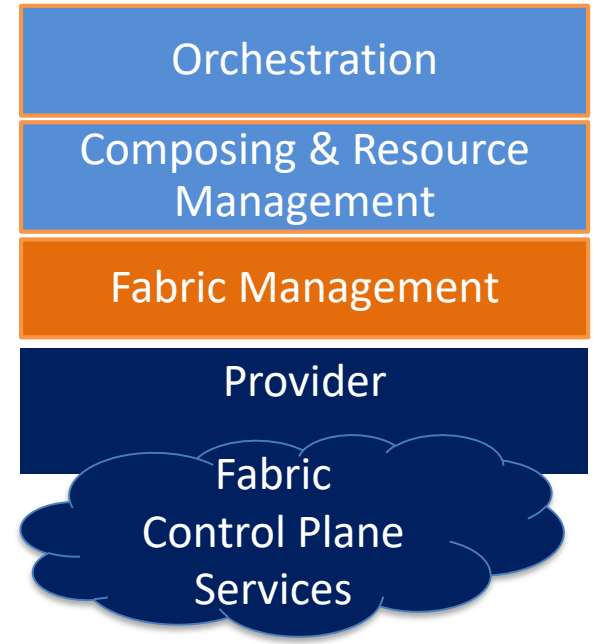
# THE FABRIC SW STACK

## From OFA View



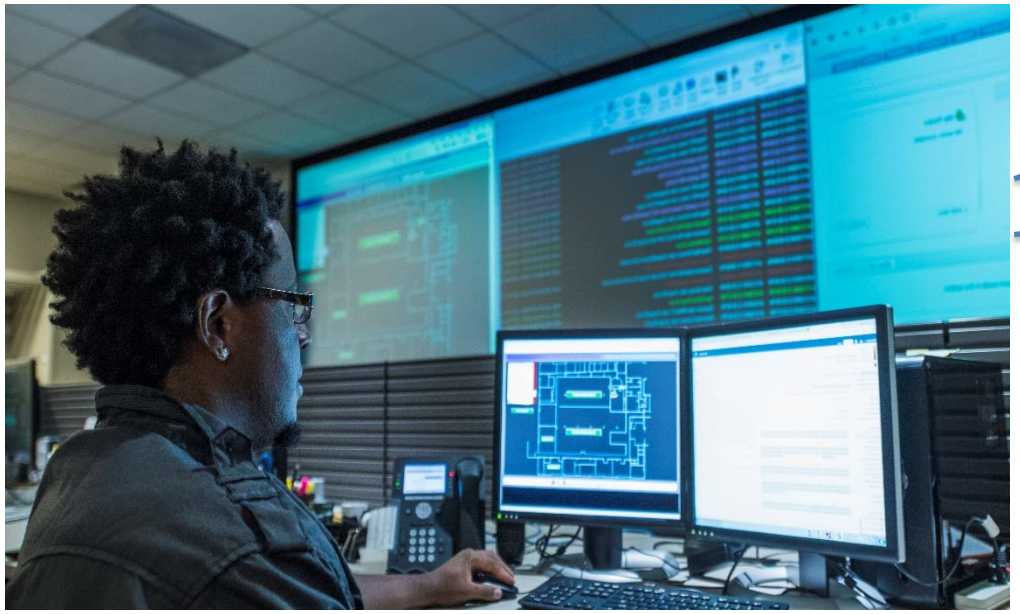

### The Open Fabrics Alliance View

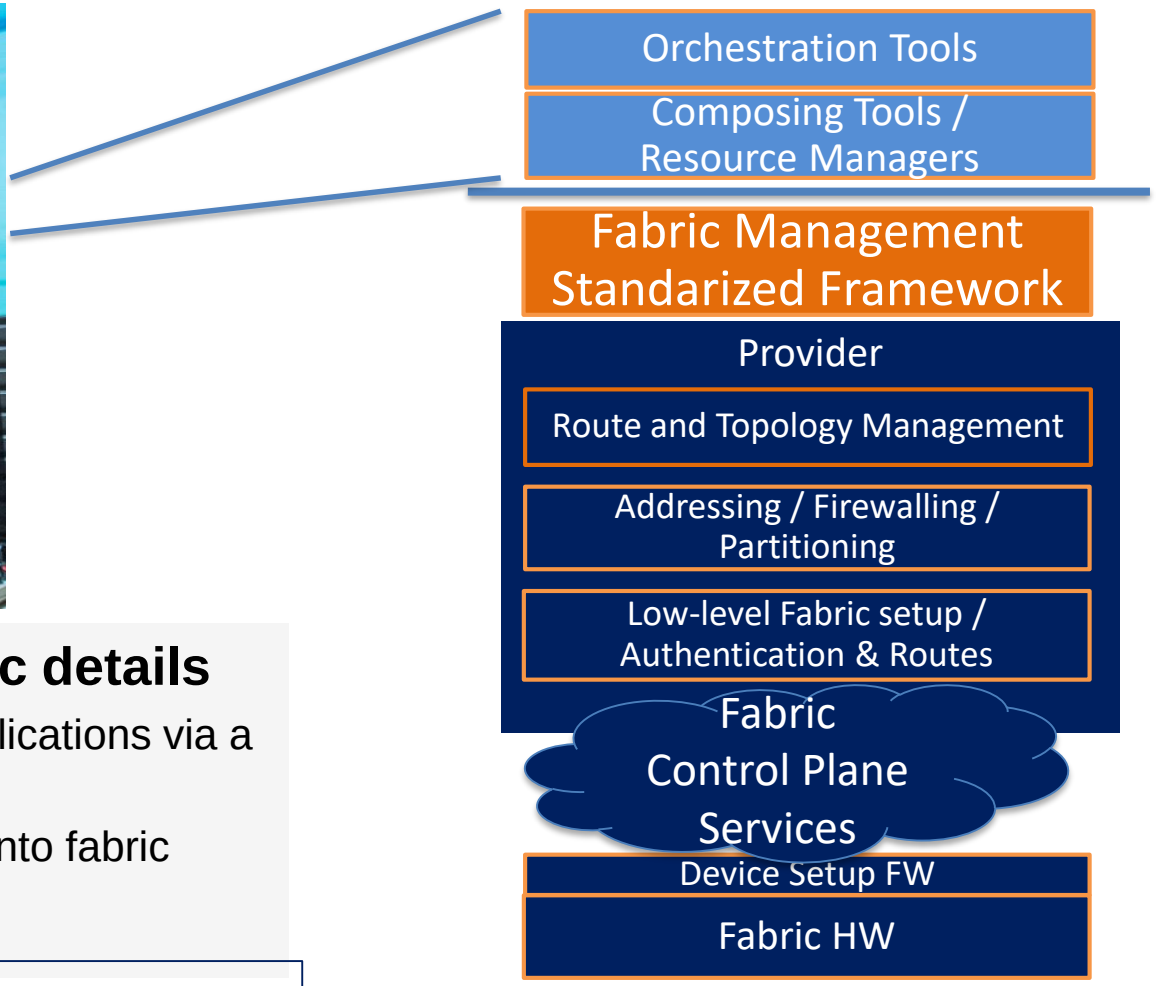
- **What OFA did for Application Developers**
  - Created a common library and API to present fabric data plane services to applications and middleware
  - Developer needs drove library and API requirements
  - Fabric specific providers convert the standard calls into fabric specific traffic
- **What OFA can do for Solution Providers**
  - Create a common Fabric Management framework and interface to present fabric control plane services to orchestration and composition applications
  - Solution Provider needs drive the framework requirements
  - Fabric specific providers convert the framework calls into fabric specific management traffic



# THE DESIRED FABRIC SW STACK

## From Solution Provider View






### Solution Provider no longer sees low level fabric details

- The fabrics are presented to orchestration and composing applications via a standardized framework / interface
- Fabric Specific Providers translate the common function calls into fabric specific traffic to do configuration and management at runtime

**What are the requirements of this framework?**

# DEFINING THE COMMON MANAGEMENT FRAMEWORK

## What makes up a fabric?

### Hosts

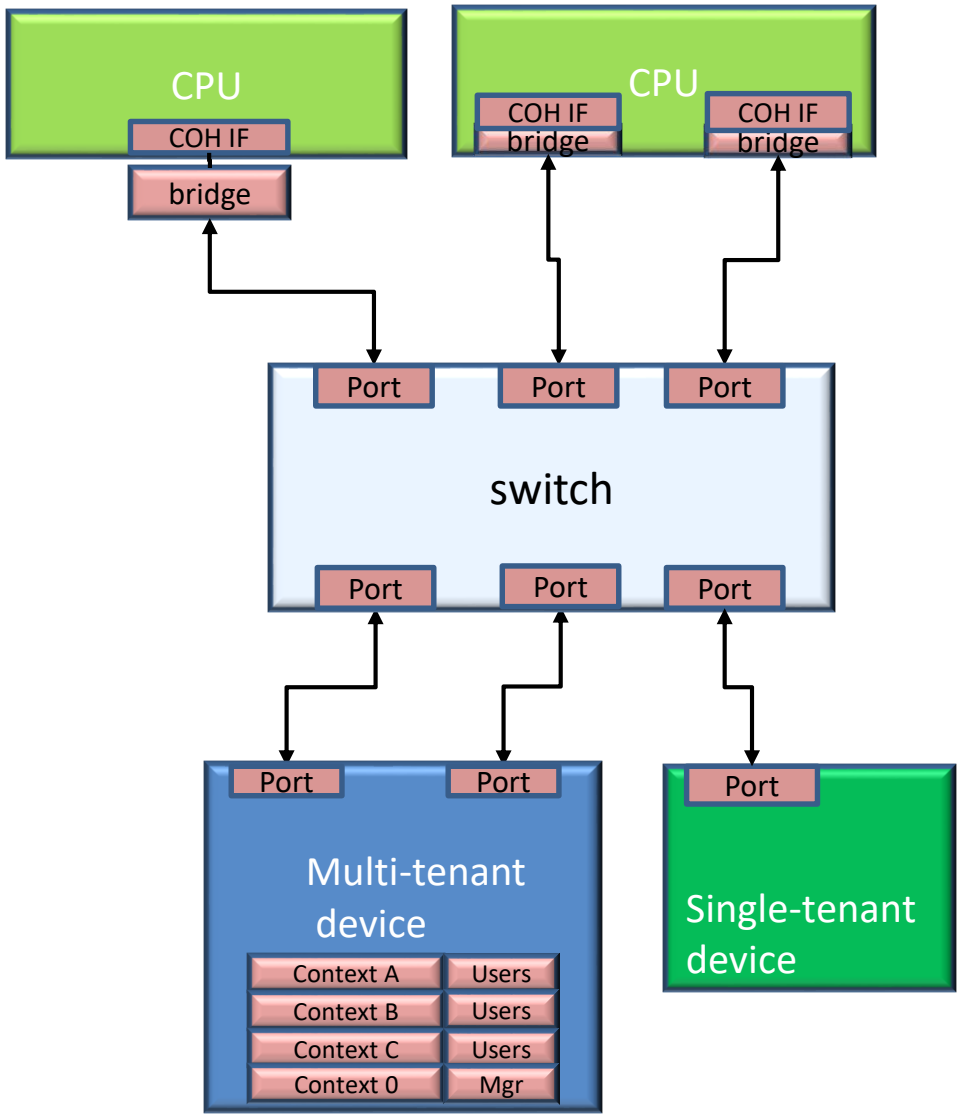
- Server / CPU / SoC / GPU / Fabric Adapter / Bridge
- Processing entity gives software threads access to fabric resources

### Fabric Switches

- Packet Routing provider for the fabric
- Part of *shared infrastructure* on a multi-host, multi-tenant fabric

### Endpoints (Memory, Storage, eNics, Service gateways)

- Single-tenant
- Multi-tenant



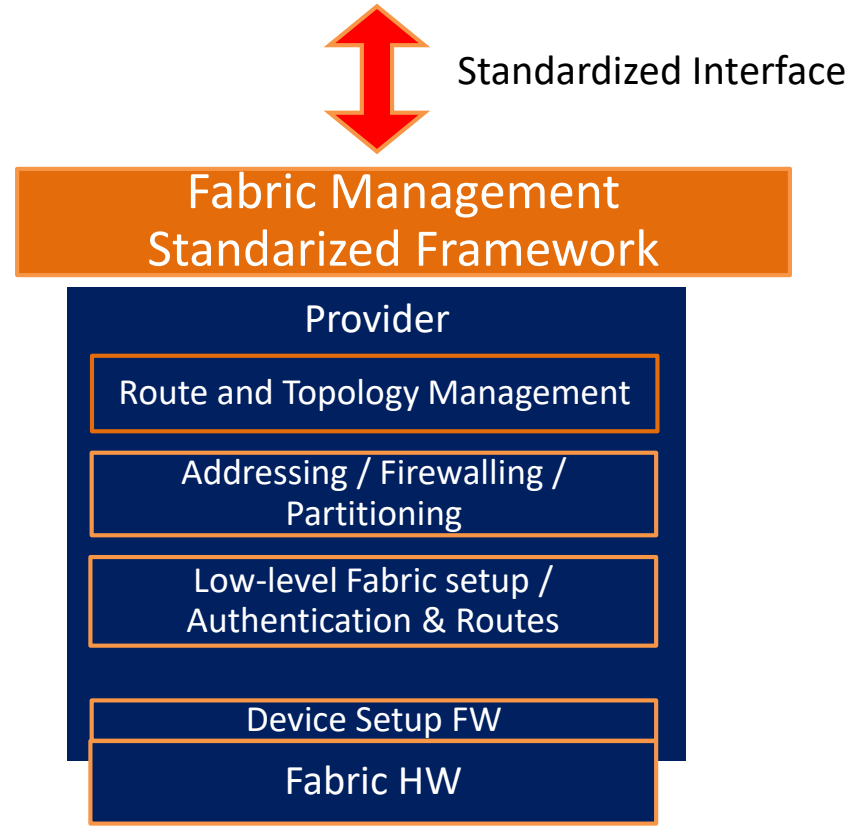
# GENERIC FABRIC MANAGER

**The Objective**

- provide a north bound interface to describe the fabric and its resources and services (model)
- allow clients to control host, fabric, and endpoint resources (actions applied to model)
- enable fabric specific providers to program to a common set of APIs

**Example functionality required in the northbound API:**

- **Crawl fabric, discover and enumerate resources**
- **Publish the resource inventory,**
- **service the client requests for resource configurations**
- **Provide methods to Enable / Disable Access**
- **Create / Delete Mappings of Resources to the Fabric**
- **Create Routes (endpoint A to endpoint B)**
  - Host to endpoint
  - Endpoint to endpoint
  - Host to host
- **Enable QoS, resiliency, etc. as given**



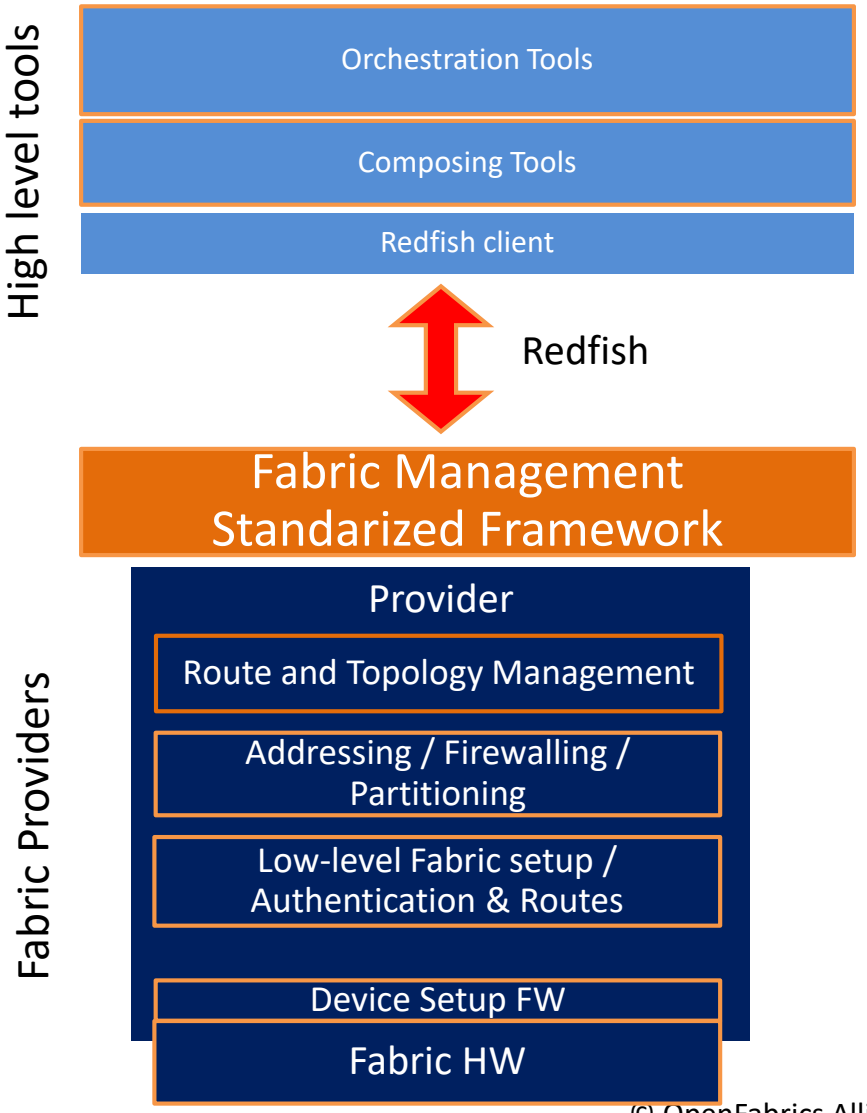

**Common Data Model?**

# THE REDFISH SOLUTION

**Redfish is an industry standard which gives the various orchestration and automation layers a common data model for dealing with different fabrics.**

- Redfish describes all fabric resources as objects
- Resource state and configuration is managed by *manipulating the resource objects*
- Redfish does not define *fabric-level actions* like enumeration or routing

**Common model, common actions**



# WHAT IS REDFISH?

- **Industry Standard Software Defined Management for Converged, Hybrid IT defined by the DMTF**
  - RESTful interface using HTTPS in JSON format
  - Schema-backed but human-readable payload usable by GUIs, Scripts and browsers
  - Extensible, Secure, Interoperable
  - Accepted by ISO as ISO/IEC 30115:2018
  - Developer hub at redfish.dmtf.org
- **Initial release in 2015**
  - Additional features coming out approximately every 4 months
  - Started as secure, multi-node capable replacement for IPMI-over-LAN
  - Represent full server category: Rackmount, Blades, HPC, Racks, Future
  - Scope expanded to cover Storage, Networking, Fabrics, Datacenter Infrastructure
  - Shipping on almost every industry standard server shipped today
- **Current releases address the rest of IT infrastructure**
  - Alliances with multiple other standards bodies to define Redfish support
  - Working with SNIA to cover more advanced **Storage** (Swordfish)
  - Working with OCP & ASHRAE to cover **Facilities** (DCIM)
  - Adapt & translate YANG models to cover some level of Ethernet **Switching**
  - Work with Gen-Z & others to cover **Fabrics**
  - Work within the DMTF for internal support (MCTP/PLDM, RDE, SPDM etc.)

# GEN-Z

**The Gen-Z Fabric is proposed as the first test case because it has *memory semantics* and supports disaggregated memory, storage, and compute. These features drive new requirements for the Redfish models and schema.**

**The Gen-Z Consortium has a work record with DMTF to do such enhancements.**

- Zones embody path enablement between endpoints and fabric isolation policies
- Address pools dictate fabric ID assignment choices
- Memory Chunks embody memory regions and fine grained access controls to multi-tenant media controllers
- Manager objects enable multiple types of manager entities, multiple manager instances for scaling and redundancy

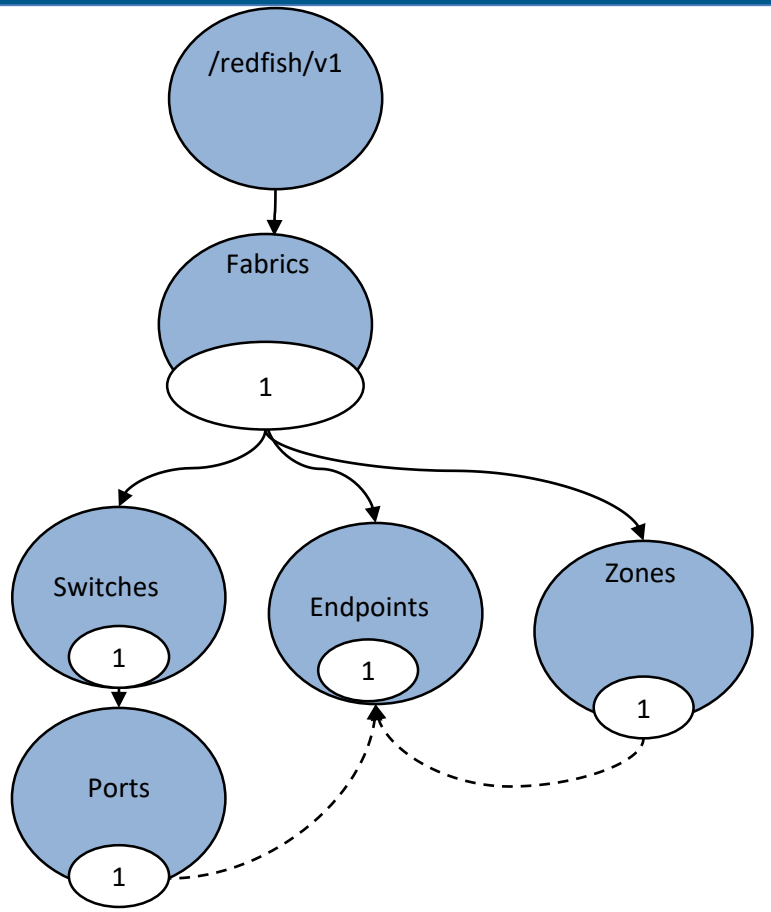



Diagram Courtesy of DMTF.org

# CALL TO ACTION

## Establish a Work Group / Task Force to Officially Architect a Universal Fabric Manager

**The OFA is contemplating the development of an "abstract fabric manager" built on the concepts of Redfish.**

**The intention is to use Gen-Z as a strawman target for such a fabric manager.**

**Similar to libfabric, such an abstract fabric manager would likely be built on a 'framework/provider' architecture.**

- **Summary**
  - There's a problem
  - There's a known approach
  - There's an existing starting point
  - There's a development test case
- **OFA and Gen-Z organizations have agreed to collaborate**
- **Next Steps**
  - Come to the BOF
  - Refine a detailed requirements list for a 'universal fabric manager'
  - Form an OFA Working Group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# THANK YOU

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