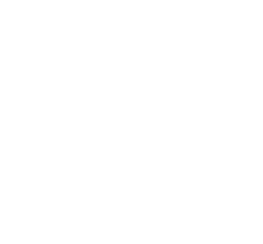
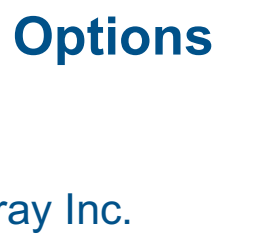
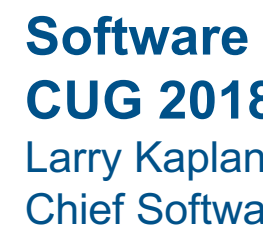


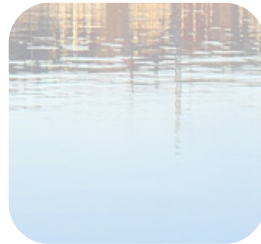
**CRAY**



## Software Integration Options CUG 2018

Larry Kaplan

Chief Software Architect, Cray Inc.



# Vision and Purpose

- **Easy integration of third party software is critical for Cray systems**
  - Cray provides a complete software stack, but makes decisions on its content based on aggregate customer requirements
  - Some customers may prefer alternative stacks or components
- **By deploying modular software with well-defined APIs, customers will have choice**
- **This talk (and paper) surveys the various parts of the Cray software ecosystem and describes the plethora of integration options possible**

# Feedback and Benefits

- **To best support and exploit the benefits of this flexibility, Cray must understand the types of software integrations customers are interested in doing**
- **In addition to this presentation (and short Q&A), a BOF is scheduled to help collect your feedback in this area**
  - BOF 10A 5:10pm today



- **Three categories of software**

- **Component Management**

Individual hardware components and their associated controllers, usually presenting a RedFish API

- **System Management**

Responsible for the configuration, operation, and monitoring of the entire system, focused on RESTful APIs

- **Managed Ecosystem**

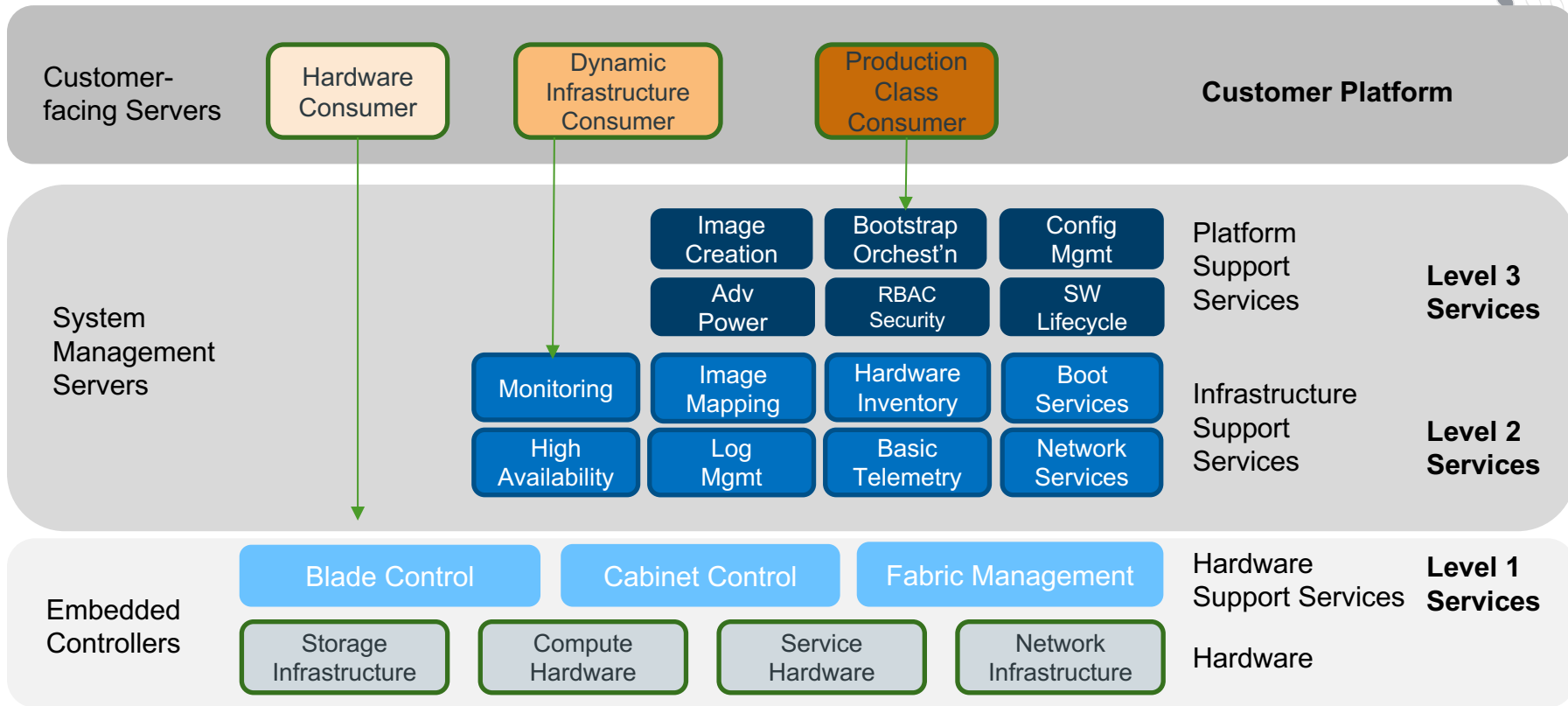
Operating system and services used on compute and service nodes (e.g. CLE)



# Major Integration Points

- **Allows replacement of most or all Cray software in a category or layer**
  - Completely replace the managed ecosystem with something other than CLE
  - Completely replace Cray System Management or the upper layers
    - Different customer types may integrate to different layers
  - Components are what they are, including their controllers
    - Details depend on specific system
    - Software API is based on Redfish<sup>®</sup> to allow easy use of other System Management stacks

# System Management Software Components



COMPUTE | STORE | ANALYZE

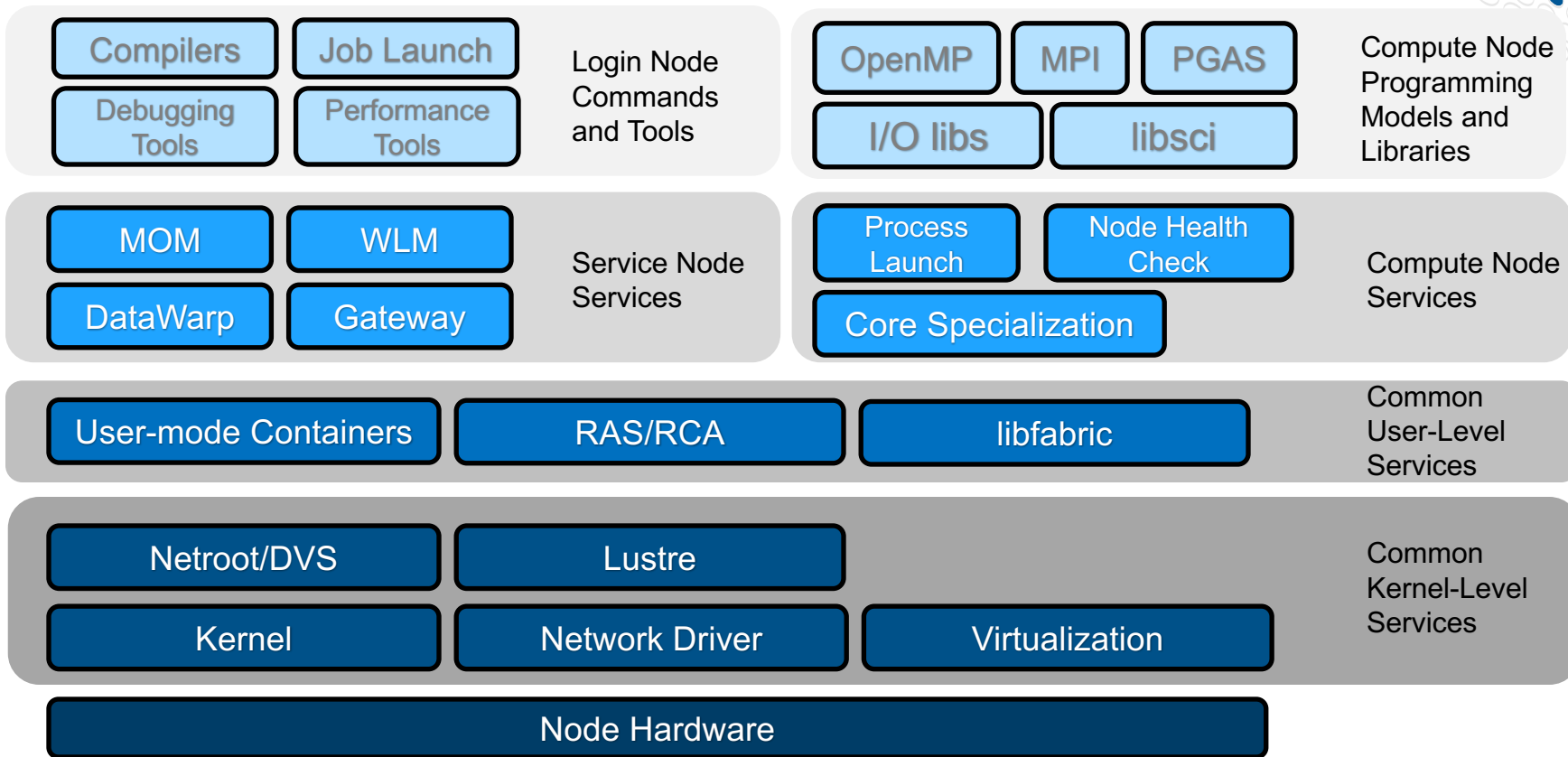
# System Management Functionality Tiers

- **Systems Management implements three levels of services – each building upon the one below:**
  - Level 1 – Hardware management capabilities
    - Command and control for cabinets and blades
    - Basic fabric management
    - All centered around the Redfish management standard from the Distributed Management Task Force (DMTF)
  - Level 2 – Basic software infrastructure support service
    - For deploying arbitrary managed software stacks onto the system
    - Core capability to bootstrap a generic image onto a specified resource and initialize it to the point at which it is running and connected to the network
  - Level 3 – Full support of system management services
    - For deployment of Cray’s custom capability software stack at scale
    - Support for the complete software lifecycle of the Cray Linux Environment (CLE)
    - Functionally equivalent to Rhine System Management environment on the XC today
    - Can be leveraged by other managed ecosystems if they fulfill the dependencies



Redfish

# CLE Software Components (Managed Ecosystem)



COMPUTE

STORE

ANALYZE





# Minor Integration Points

- Cray provided categories and layers mostly remain
- Individual components are replaced as desired
- Other components are added to augment system
  
- **System Management examples:**
  - Image creation, monitoring analysis tools, orchestration
  
- **Managed Ecosystem examples:**
  - Workload manager, programming tools, runtime libraries

- **Containers and virtualization ease the integration of third party software**
  - Provide complete environments with many of the dependencies
  - Isolate components from each other except where required
  - Useful for both major and minor integrations
  - Current focus on user-mode containers
- **Depending on component and complexity, orchestration may also be needed**
  - For issues such as scaling, resiliency, and availability



# Conclusion

- Cray is embarking on a new era of software flexibility and integrability
- Modularity and the use of well-documented APIs is essential
- RESTful interfaces provide a good model for such APIs, including Redfish
- **What software would you like to integrate?**

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# Q&A

A scenic view of a historic city, likely Copenhagen, with colorful buildings and a prominent church spire, reflected in a body of water. The sky is clear and blue.

Larry Kaplan  
[lkaplan@cray.com](mailto:lkaplan@cray.com)