Launching StarlingX

The Journey to Drive Compute to the Edge

Pilot Project Supported by the OpenStack Foundation

Ian Jolliffe, WIND RIVER SYSTEMS
Director Engineering

@ian_jolliffe

Project Overview

An OpenStack* Pilot Project

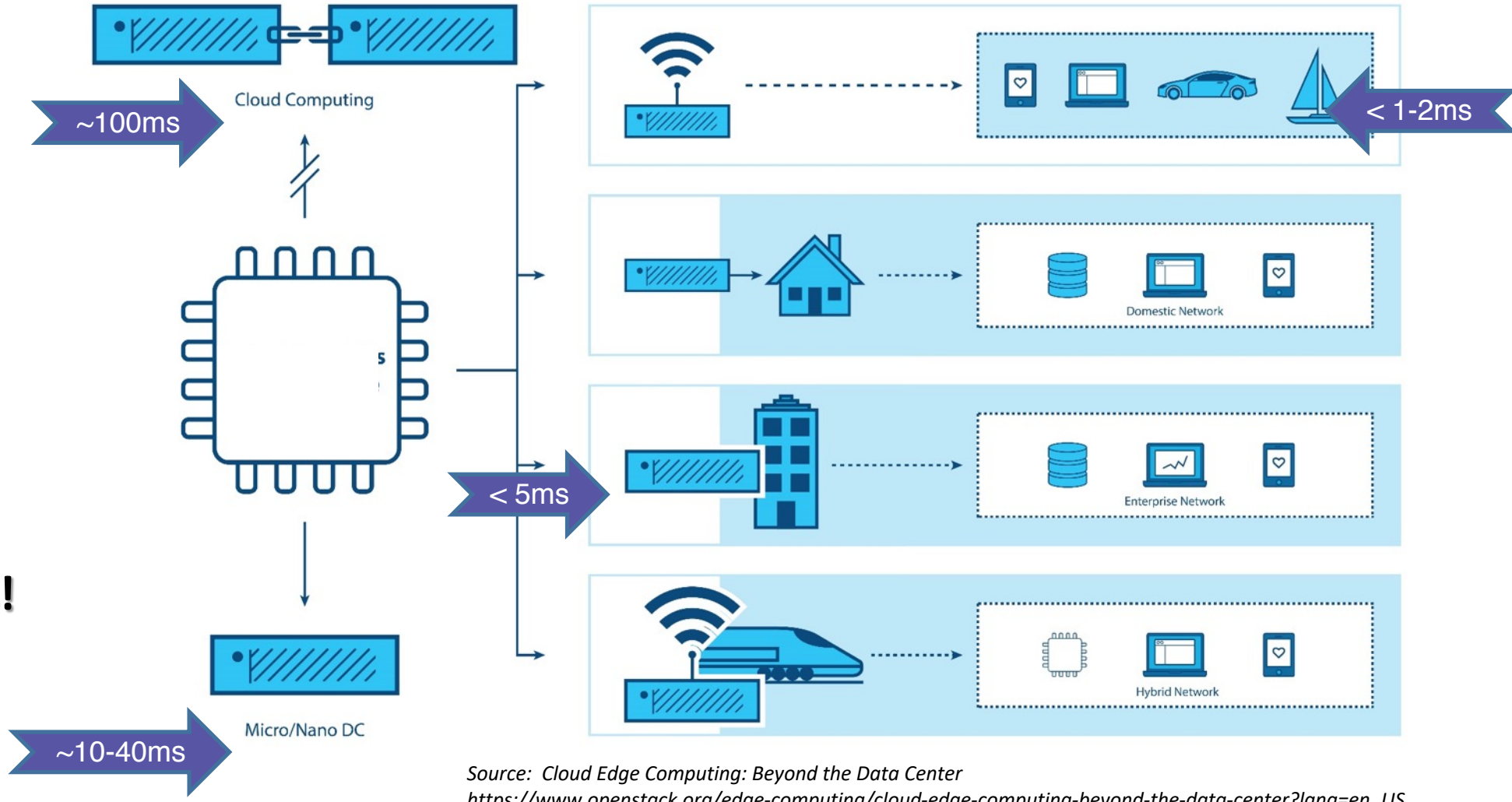
StarlingX is a Pilot Project under the governance of the OpenStack Foundation with an Apache 2.0 license

- The first community release of StarlingX was October 24th, 2018
- StarlingX provides high performance, low latency, and high availability for Edge Cloud applications
- 84 Contributors in first release and 1200+ commits
- StarlingX Web Site: https://www.starlingx.io/

What Is Edge Computing?

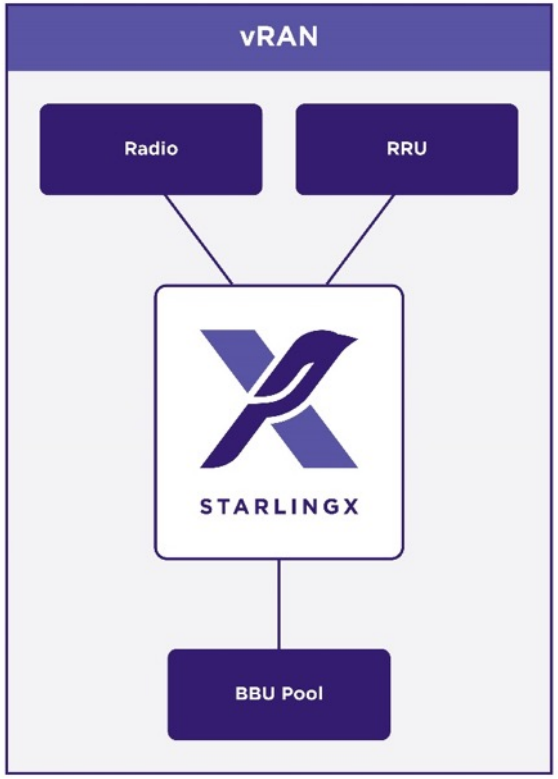
A. **Latency**
B. **Bandwidth**
C. **Security**
D. **Connectivity**

“WHERE” Matters!

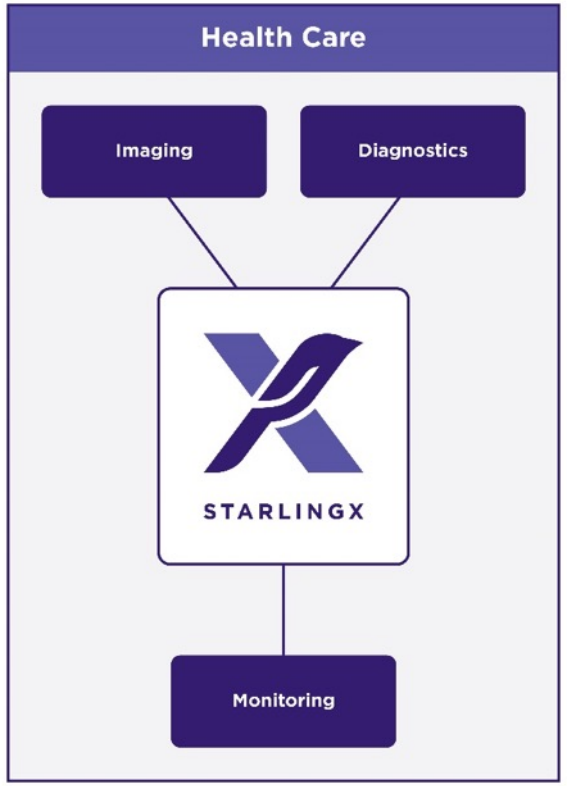


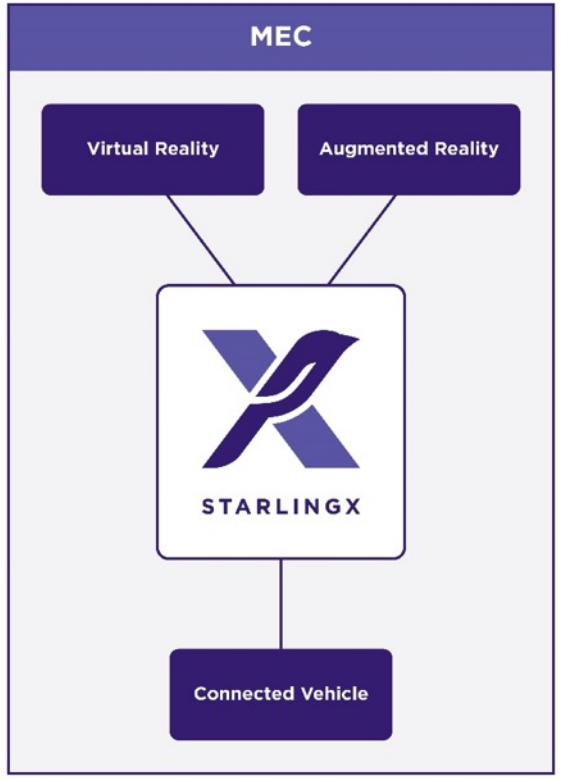
Source: Cloud Edge Computing: Beyond the Data Center
https://www.openstack.org/edge-computing/cloud-edge-computing-beyond-the-data-center?lang=en_US

Edge Computing Use Cases



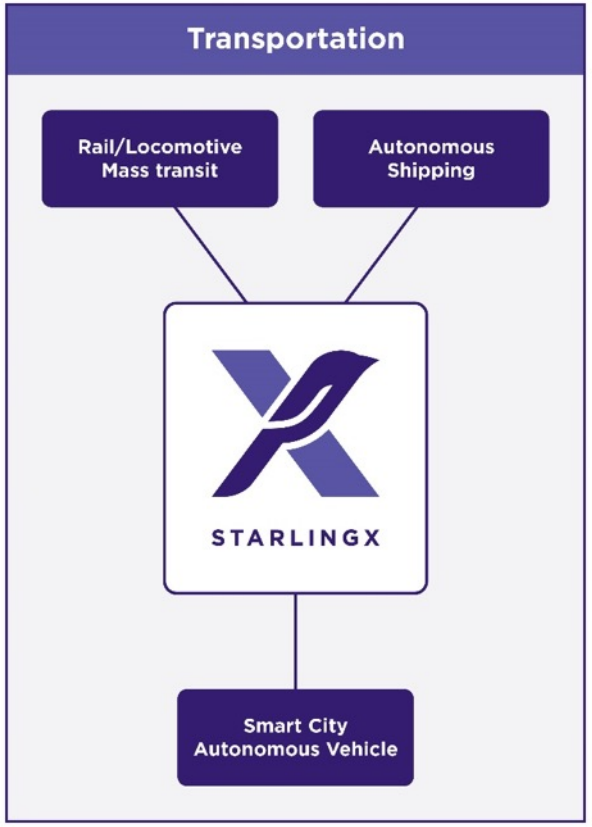
vRAN == virtual Radio Access Network

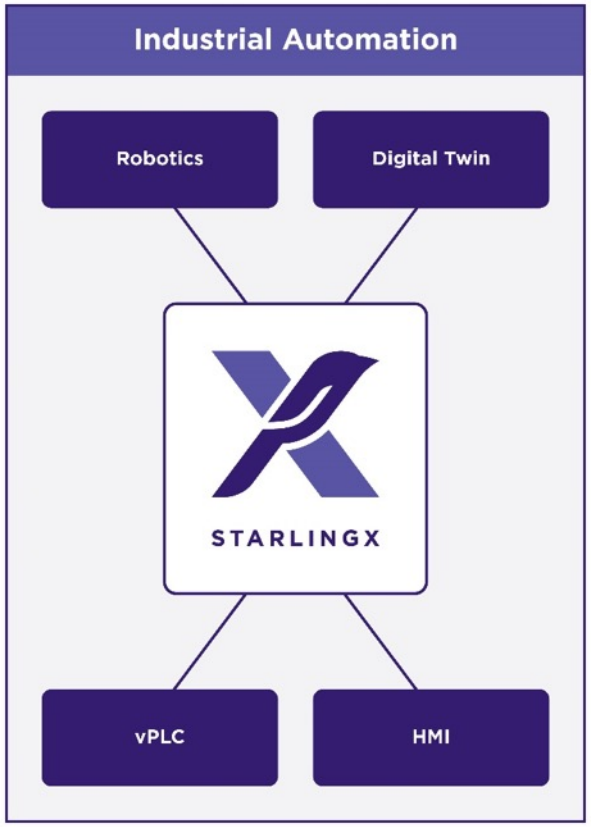




MEC == Multi-access Edge Computing

Edge Computing Use Cases

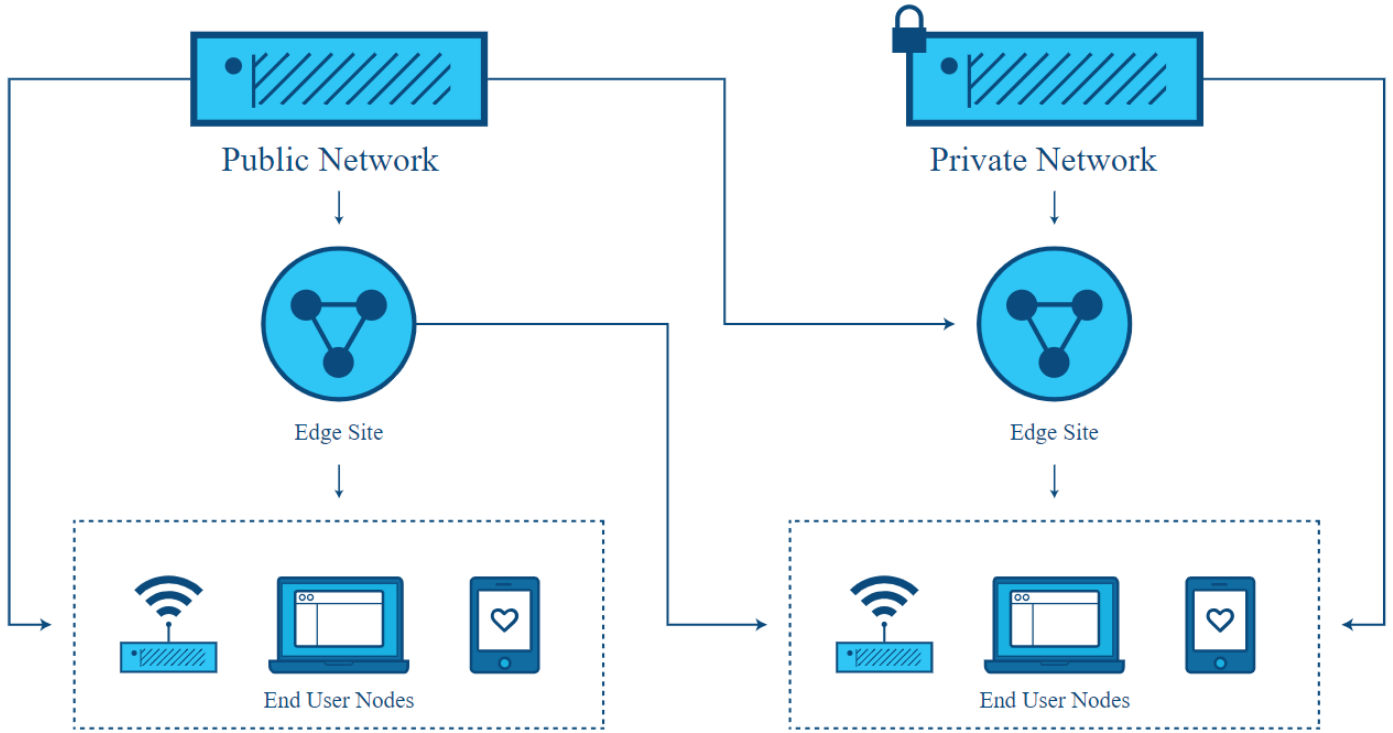




What Problems Is StarlingX Solving?

Data growth is massive

Network needs to be smarter



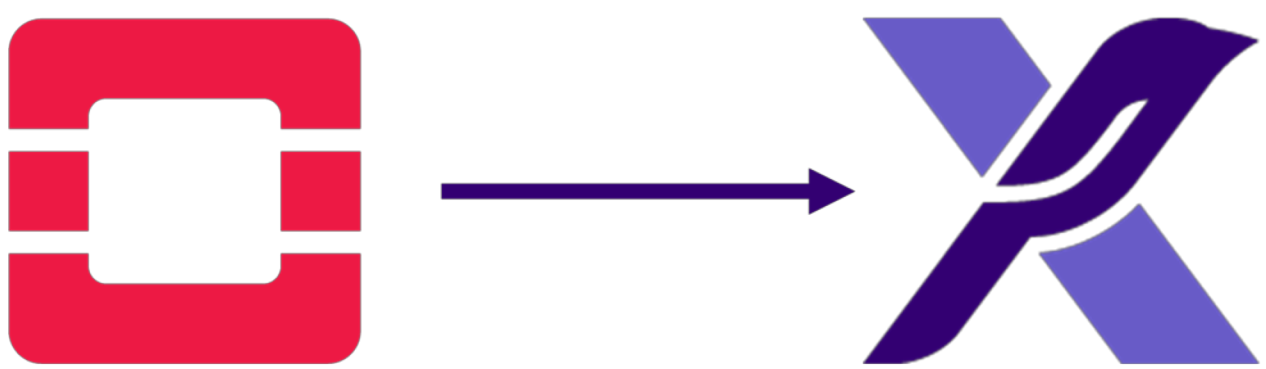
1. Distributing applications across Cloud and Edge requires a different architecture
2. The maturity and robustness of Cloud is required everywhere
3. Managing a geographically distributed compute environment is hard

Source: Cloud Edge Computing: Beyond the Data Center
https://www.openstack.org/edge-computing/cloud-edge-computing-beyond-the-data-center?lang=en_US

Intent of the StarlingX Project

Re-Configure Proven Cloud Technologies for Edge Compute

- Orchestrate system-wide
  - Deploy and manage Edge clouds, share configurations
- Simplify deployment to geographically dispersed, remote Edge regions



Transportation	Energy
Manufacturing	Retail
Video	Smart cities
Healthcare	Drones

StarlingX Technology

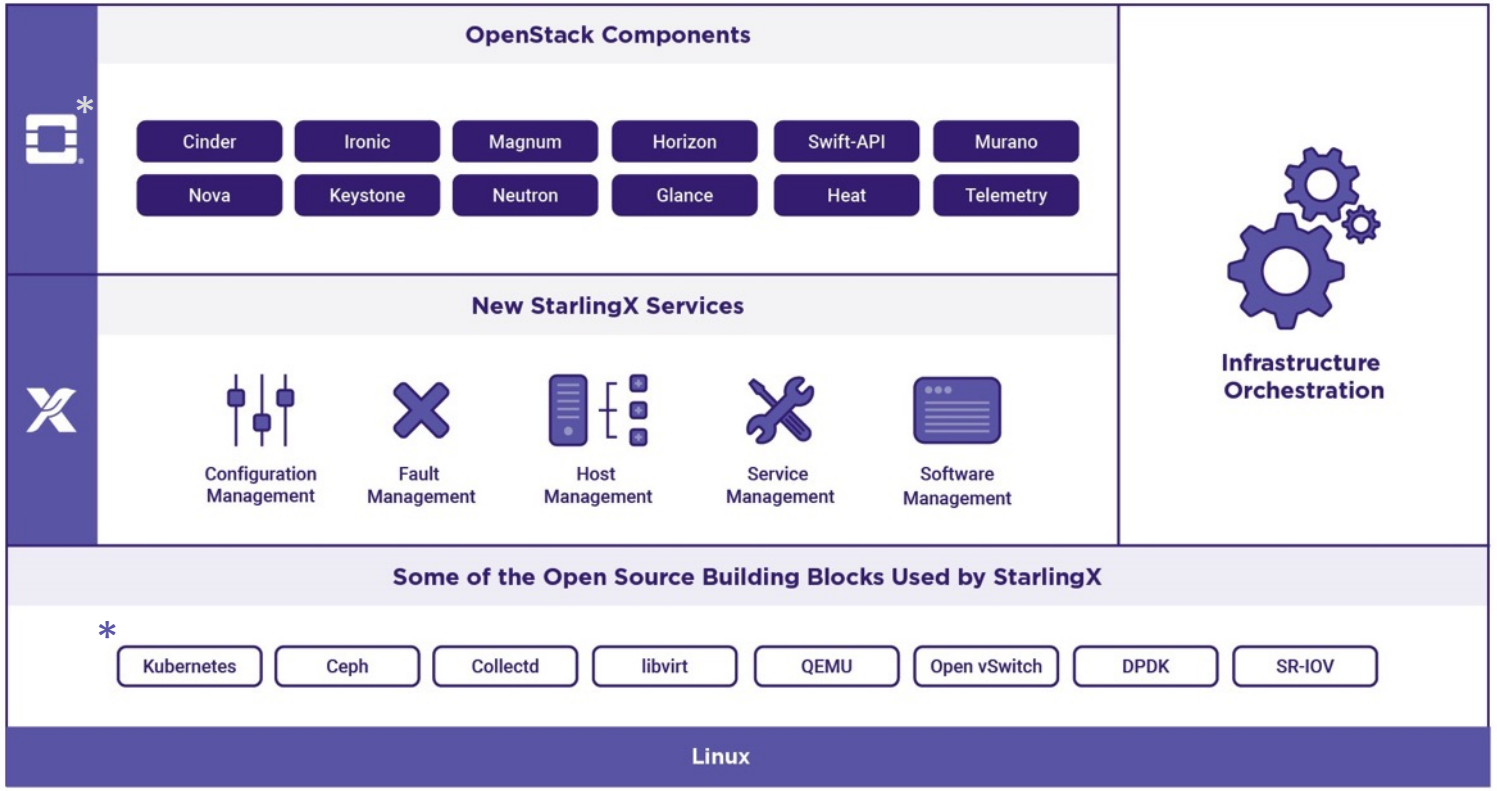
StarlingX – Edge Virtualization Platform

StarlingX provides a deployment-ready, scalable, highly reliable Edge infrastructure software platform

Services from the StarlingX virtualization platform provide:

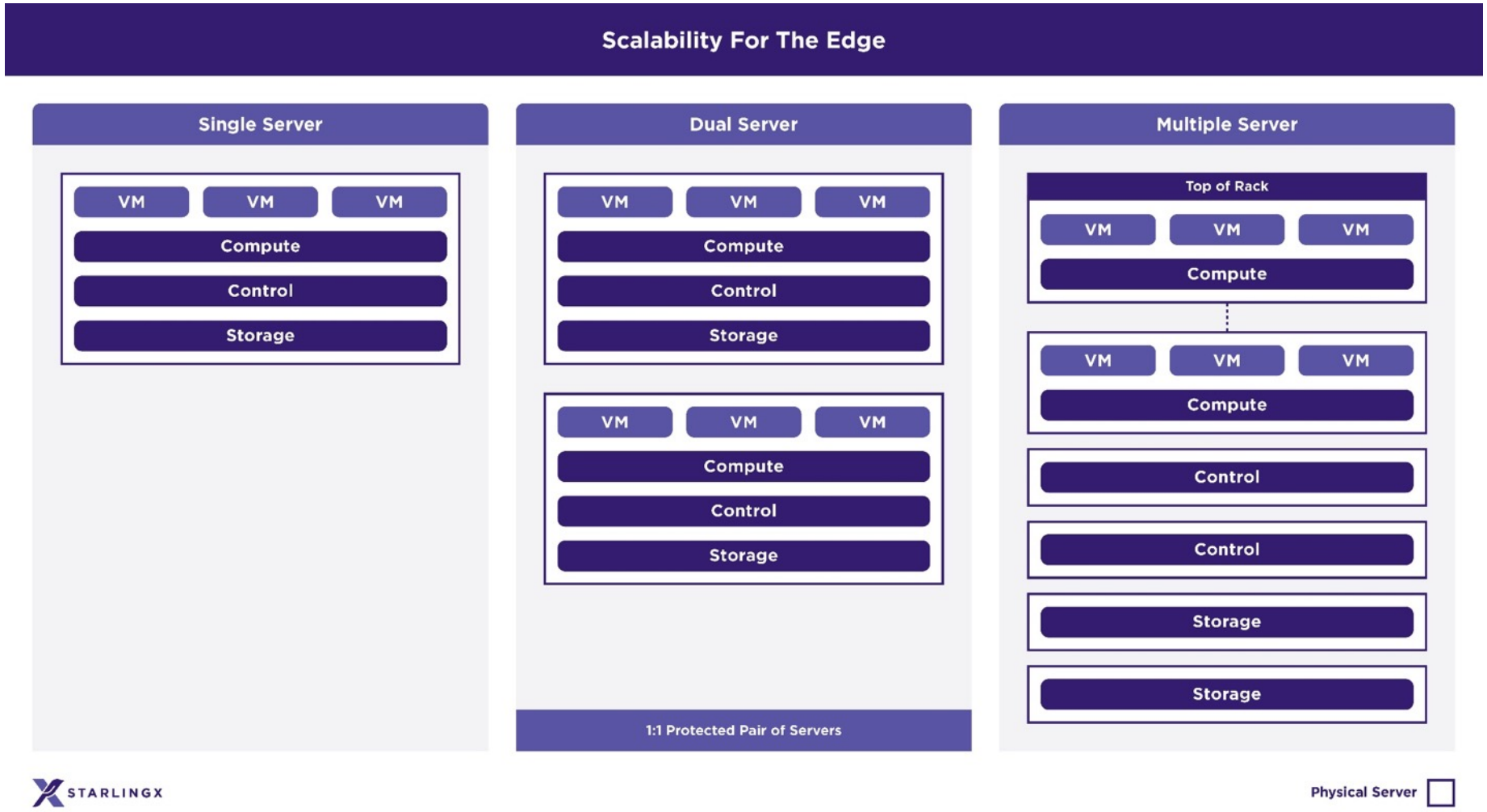
- Easy deployment
- Low touch manageability
- Rapid response to events
- Fast recovery

Think control at the Edge, control between IoT and Cloud, control over your virtual machines.



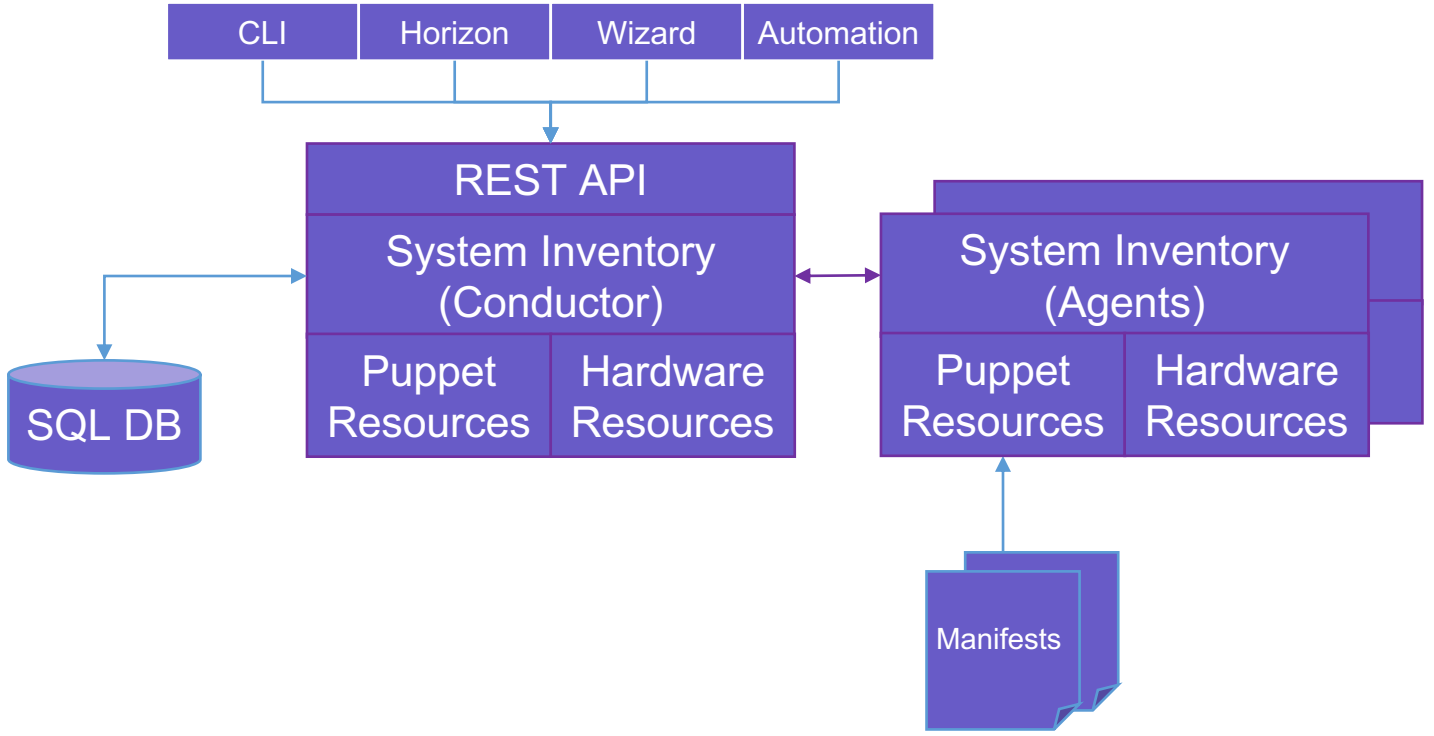
StarlingX Scalability

- Single Server
  - Runs all functions
- Dual Server
  - Redundant design
- Multiple Server
  - Fully resilient and geographically distributable



StarlingX – Configuration Management

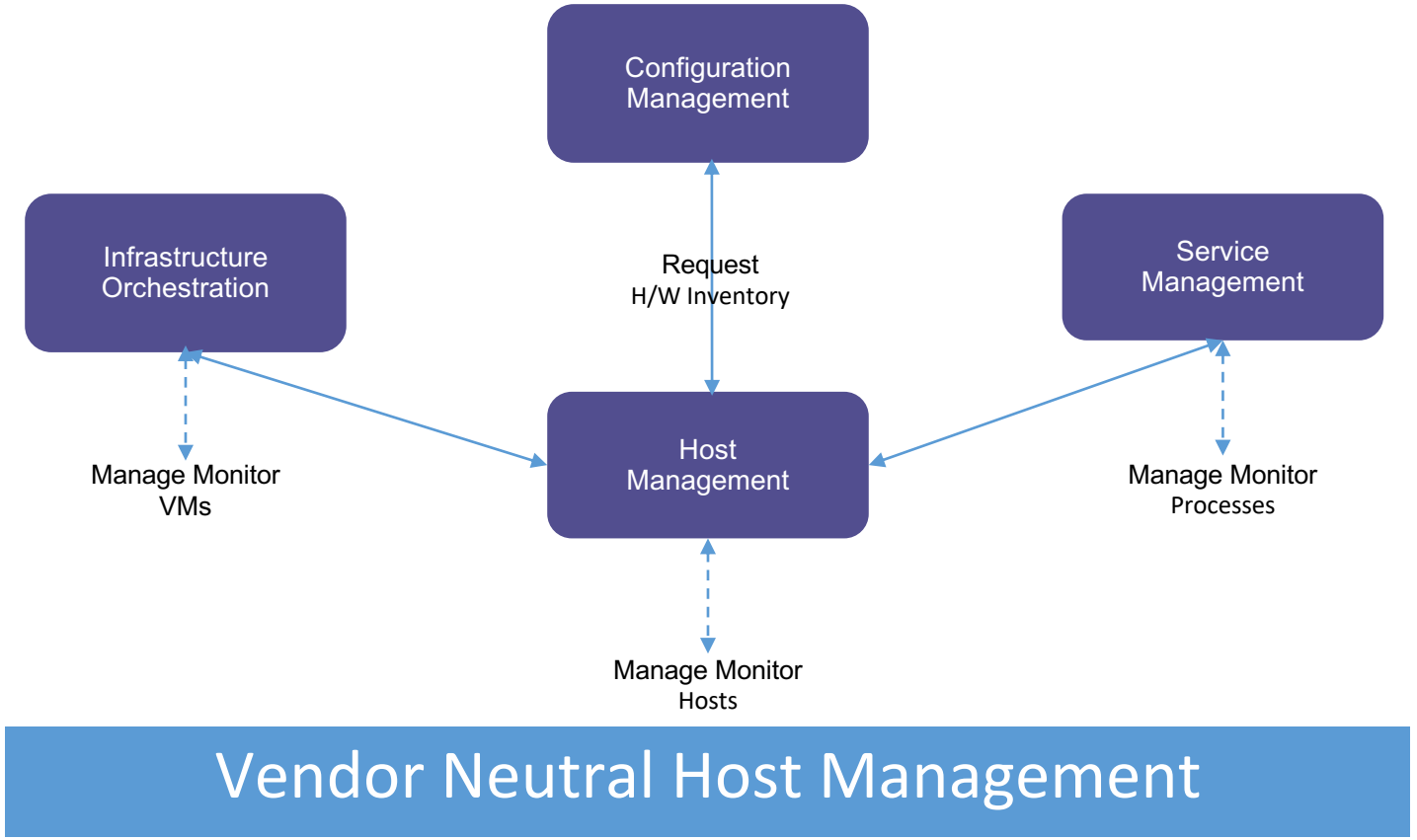
- Manages Installation
  - Auto-discover new nodes
  - Manage installation parameters (i.e. console, root disks)
  - Bulk provisioning of nodes through xml file
- Nodal Configuration
  - Node role, role profiles
  - Core, memory (including huge page) assignments
  - Network Interfaces and storage assignments
- Inventory Discovery
  - CPU/cores, SMT, processors, memory, huge pages
  - Storage, ports
  - GPUs, storage, Crypto/compression H/W



System Configuration and Setup

StarlingX – Host Management

- Full life-cycle management of the host
- Detects and automatically handles host failures and initiates recovery
- Monitoring and alarms for:
  - Cluster connectivity, critical process failures
  - Resource utilization thresholds, interface states
  - H/W fault / sensors, host watchdog
  - Activity progress reporting
- Interfaces with board management (BMC)
  - For out of band reset
  - Power-on/off
  - H/W sensor monitoring
- Manage the host via REST API

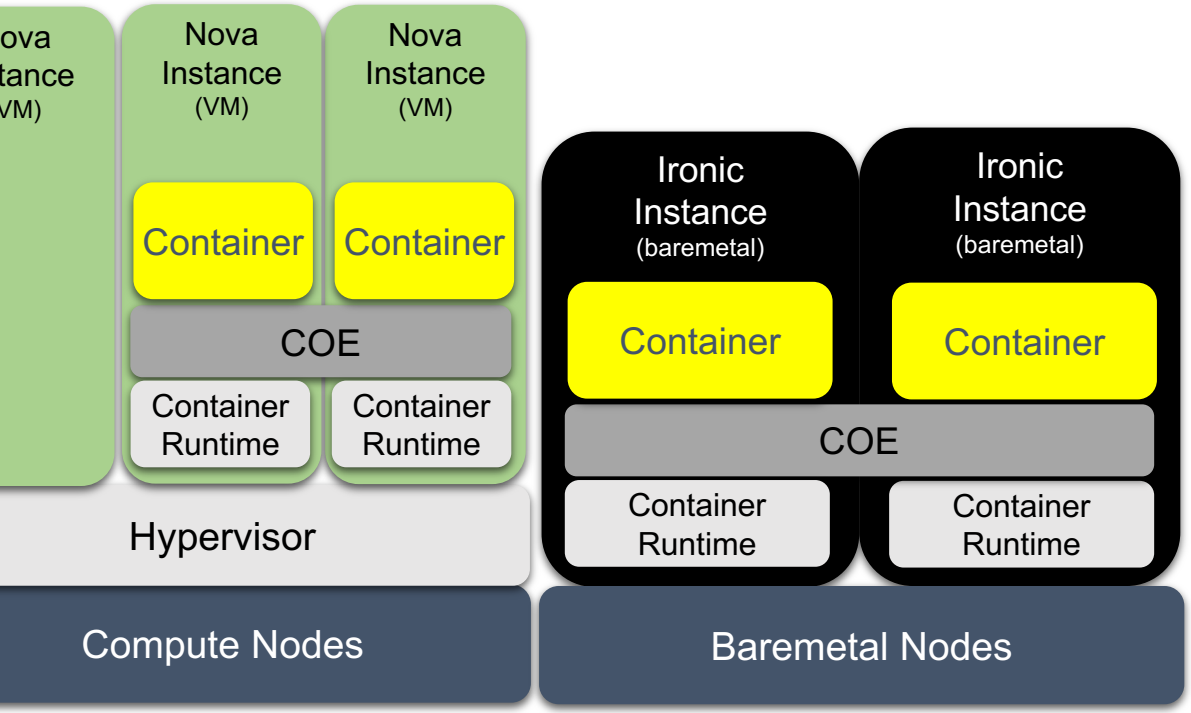


StarlingX – Software Management

- Automated deploy of software updates for security and/or new functionality
- Integrated end-to-end rolling upgrade solution
  - Automated, low number of steps
  - No additional hardware required for upgrade
  - Rolling Upgrade across Nodes
- In-service and reboot required patches supported
  - Reboot required for kernel replacement etc.
  - For patches that require a reboot, VM's are live migrated off of node
- Manages Upgrades of all Software
  - Host OS changes,
  - New / upgraded StarlingX Service Software,
  - New / Upgraded OpenStack Software.

Software Upgrades and Patching

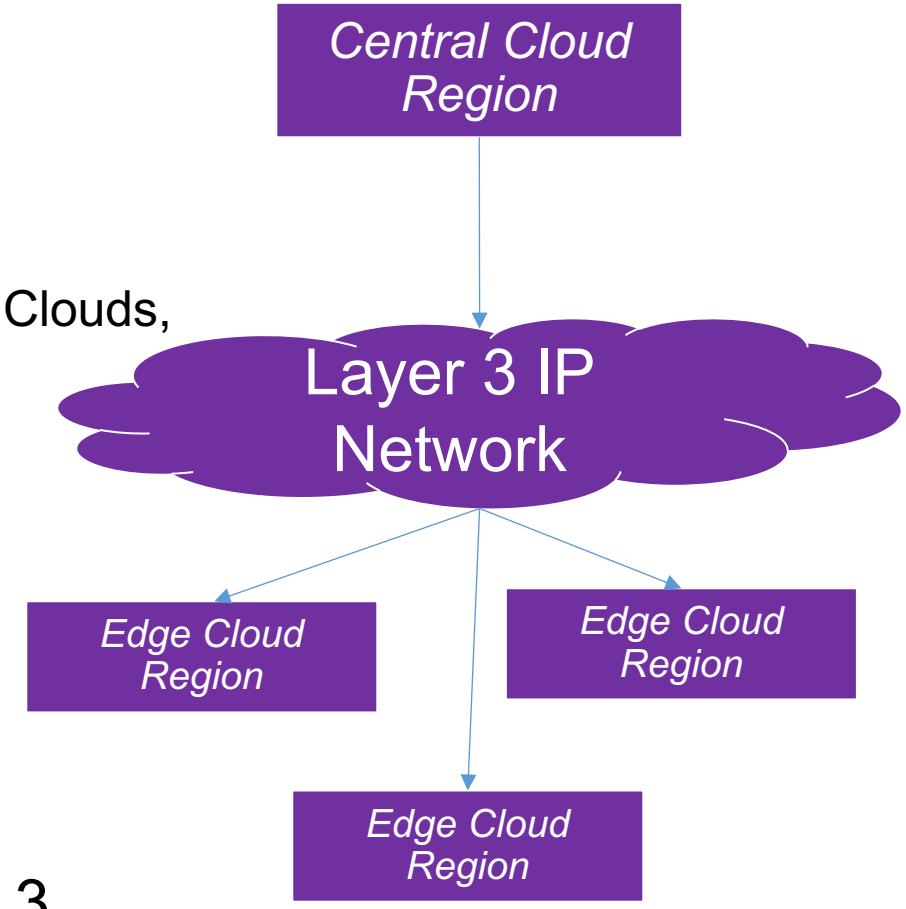
Container Support



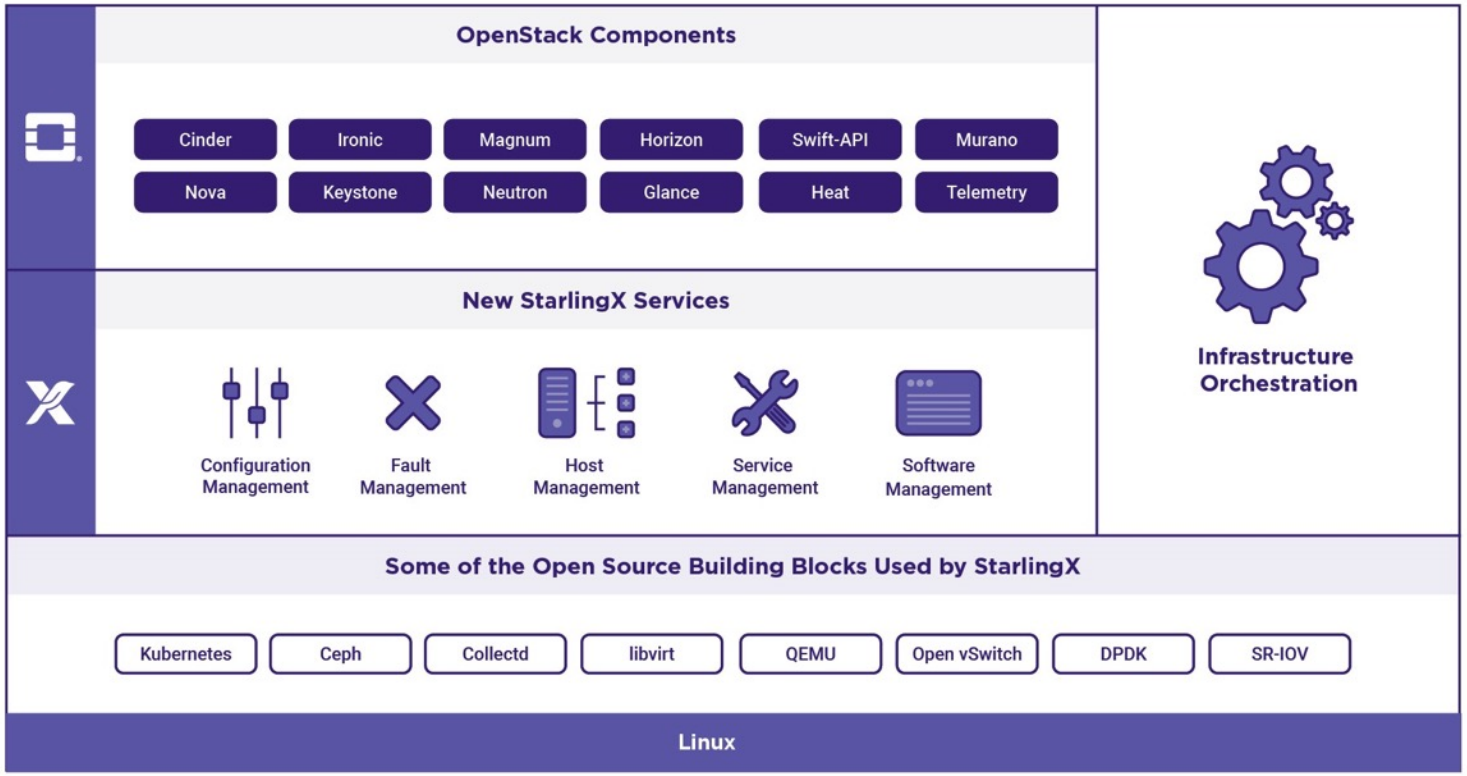
- OpenStack Magnum
  - Container Orchestration Engine management
- Containers in VMs,
  - Via OpenStack Nova
- Containers on Bare Metal Servers,
  - Via OpenStack Ironic
- Kubernetes, Swarm and Mesos
- Container Runtime : docker
- Container Networking : flannel, calico
- Container Storage : cinder

Distributed Edge Computing

- Based on OpenStack Regions,
- Central Cloud Region:
  - Hosting Shared Services
  - System-wide Infrastructure Orchestration functions:
    - Deployment and Management of Edge Clouds,
    - Configuration portal for shared configuration across all Edge Clouds,
    - Fault aggregation across all Edge Clouds,
    - Patching orchestration across all Edge Clouds.
- Remote Edge Cloud Regions:
  - Geographically dispersed,
  - Scalable from 1 to 100s of Servers,
  - Connected via L3 IP Network,
  - Running reduced Control Plane.
- Inter-Region Communications strictly REST APIs / L3.

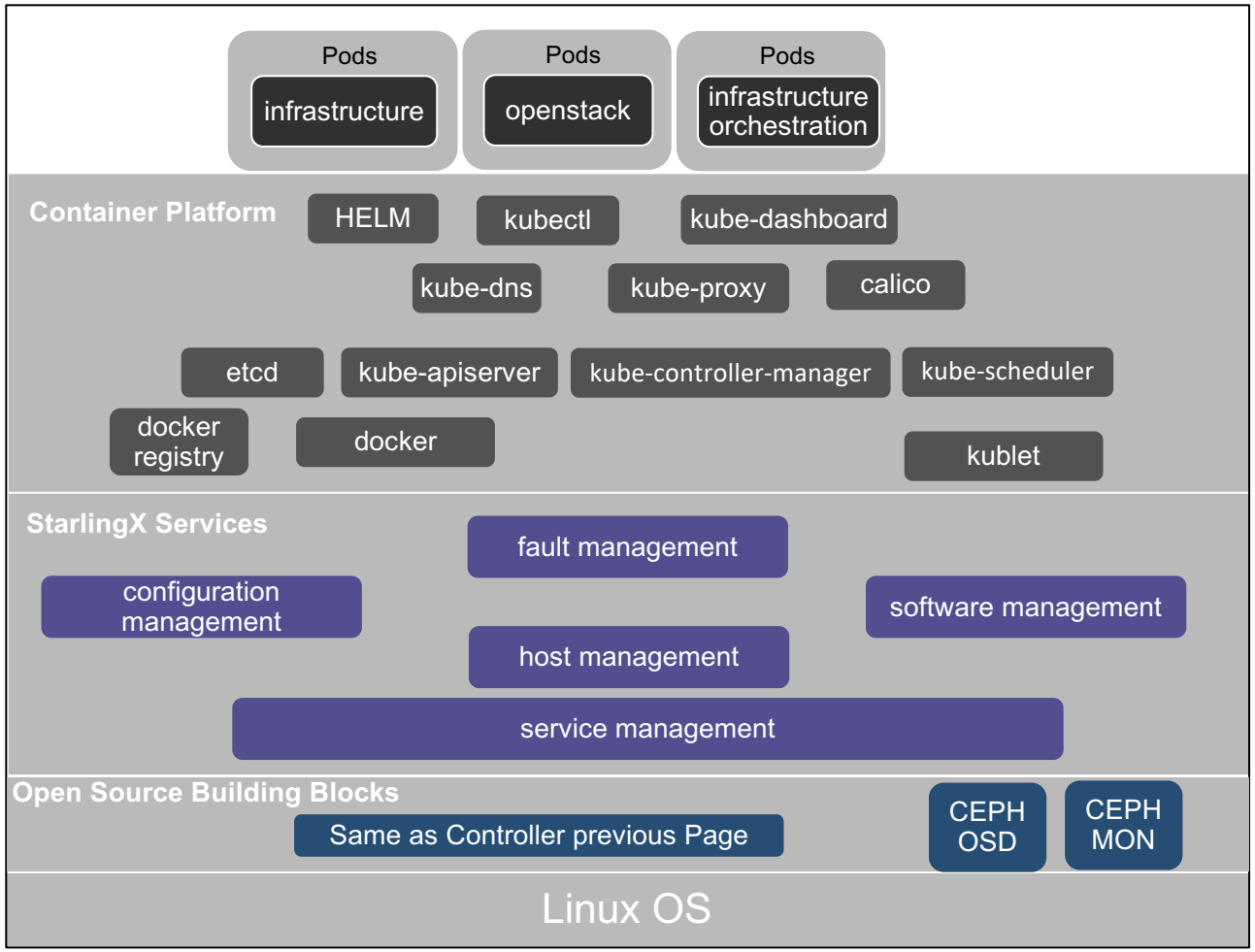


StarlingX – Current Architecture



StarlingX – Next-Gen Container Architecture

- StarlingX is evolving to
  - Running OpenStack containerized,
  - On top of a Bare Metal Kubernetes Cluster,
  - With OpenStack Helm managing the Lifecycle of the OpenStack Cluster.
- With Kubernetes Cluster initially supporting
  - Docker runtime
  - Calico CNI plugin
  - CEPH as persistent storage backend
  - HELM as the package manager
  - Local Docker Image Registry.
- Along with Kubernetes cluster available for non-OpenStack end user applications.



Full Support for VMs and Containers

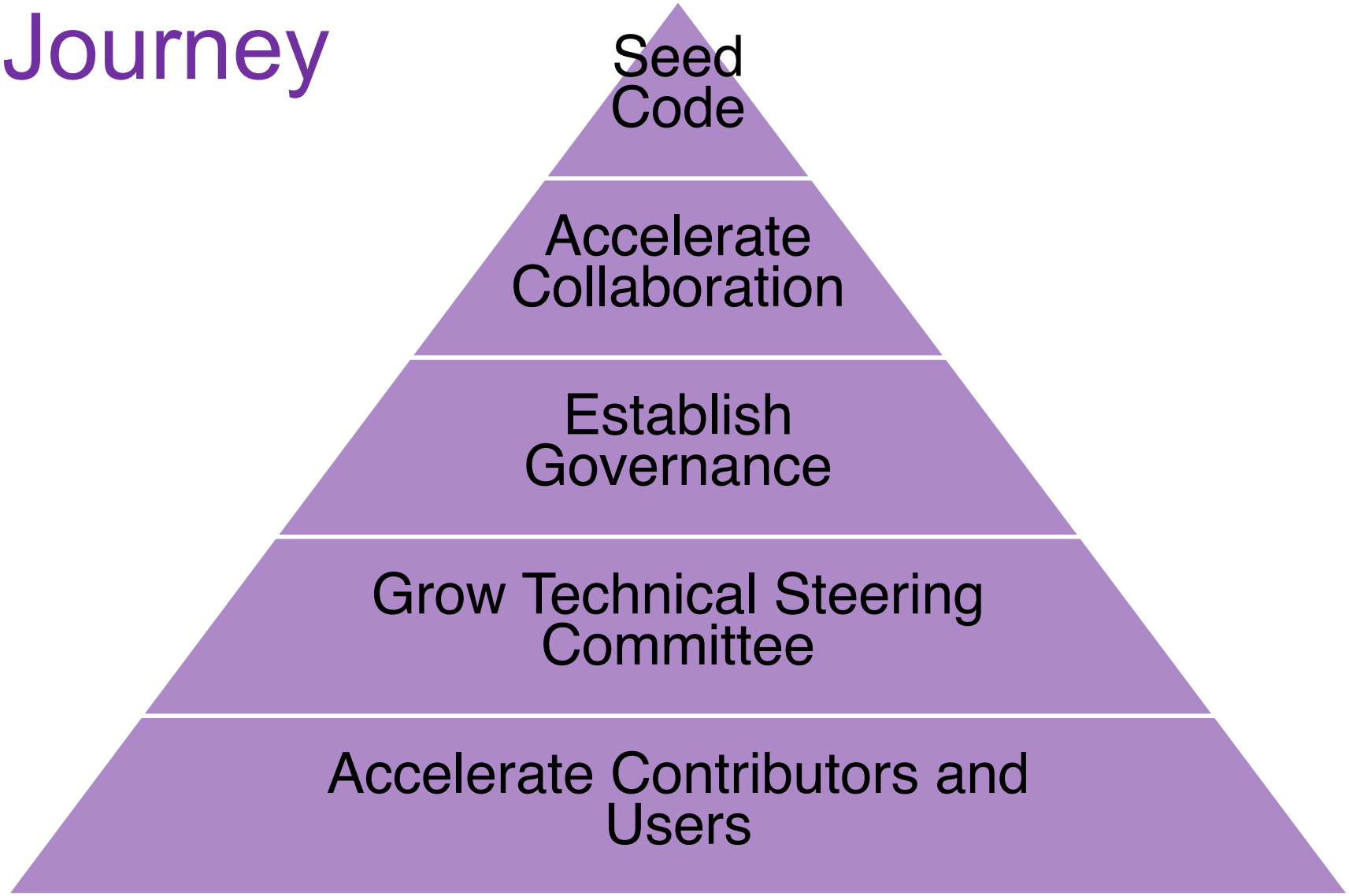
The Road to the Edge

- Build it yourself from open source components
  - Building blocks need refinement
  - Time consuming
  - Gaps to fill

- Use StarlingX
  - New services provide **improved manageability** for the platform and **high availability for your applications** to meet **Edge Cloud requirements**
  - Tested and available as a **complete stack**
  - **Mission-ready** for your applications

Community and Contributing

The Journey


Seed Code
Accelerate Collaboration
Establish Governance
Grow Technical Steering Committee
Accelerate Contributors and Users

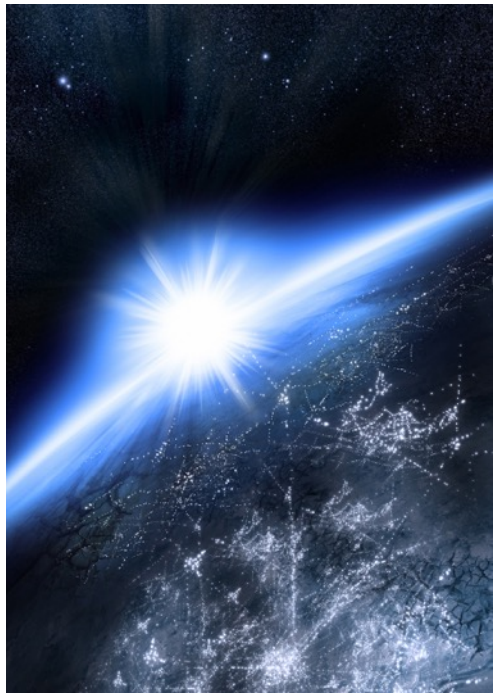
Principles

- The StarlingX project follows the “four opens,”
  - Open Collaboration
  - Open Design
  - Open Development
  - Open Source
- Technical decisions are made by technical contributors and a representative Technical Steering Committee.
- The community is committed to diversity, openness, encouraging new contributors and leaders to rise up.

Invitation to Join the Community

- We cordially invite you to join the StarlingX community
  - Please try out the code and read the documents on StarlingX.io
  - Please sign up for the mailing list
  - Please attend community meetings
  - Please consider joining as a member

Journey



Technology

Community

Community resources

- Code and documentation are available through git
  - git.starlingx.io
- Apache 2 license
- IRC: #starlingx@Freenode
- Mailing List for daily discussions
  - http://lists.starlingx.io/cgi-bin/mailman/listinfo/starlingx-discuss
- Weekly meetings:
  - Zoom calls
  - https://wiki.openstack.org/wiki/Starlingx/Meetings