Akraino & Starlingx: a technical overview

Agenda

- Why Edge Computing?
- What's Edge Computing?
- Akraino and its Building Blocks
- StarlingX and its Technical Overview
- Collaboration in Akraino Community

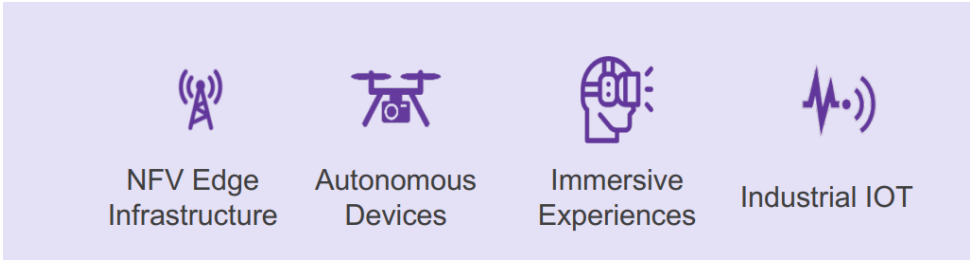
Emerging technologies in iot and networks

are demanding lower latency and accelerated processing at the edge

NFV Edge Infrastructure	Wireless (vRAN,vEPC)	Wireline (PON)	uCPE (SD-WAN)	IP Enterprise Services
Autonomous Devices	Drones	Autonomous Vehicles	Industry Robots	Medical
Immersive Experiences	Virtual Reality	Augmented Reality	360 Video	Wearable Cognitive Assistance
IoT & Analytics	Industrial Sensors	Home Devices	Retail	Healthcare
On-Demand NFV	Hardware Acceleration	A.I.	Microservices	5G

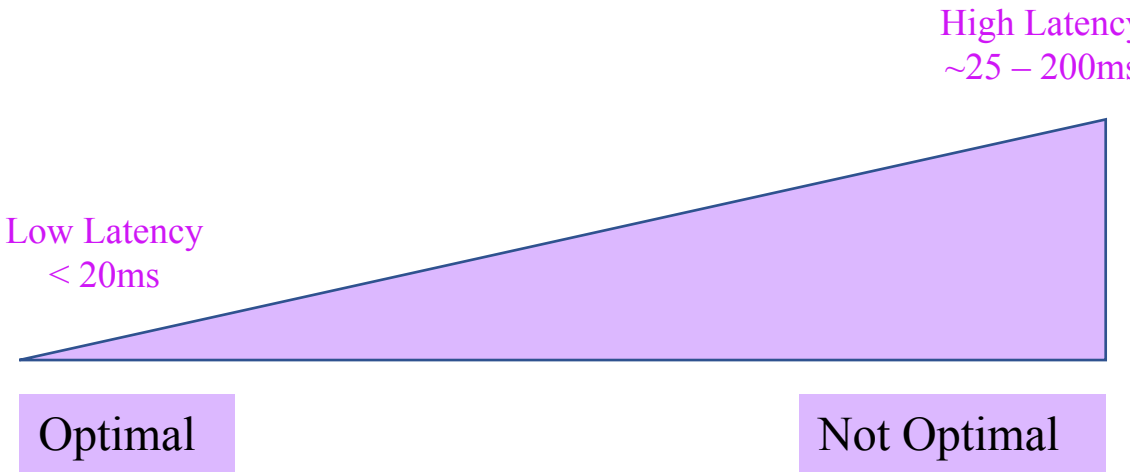
Why Edge computing?

Emerging technologies are demanding lower latency and accelerated processing at the edge



Edge Cloud

Performs data processing at the edge of the network, near data sources



Central Cloud

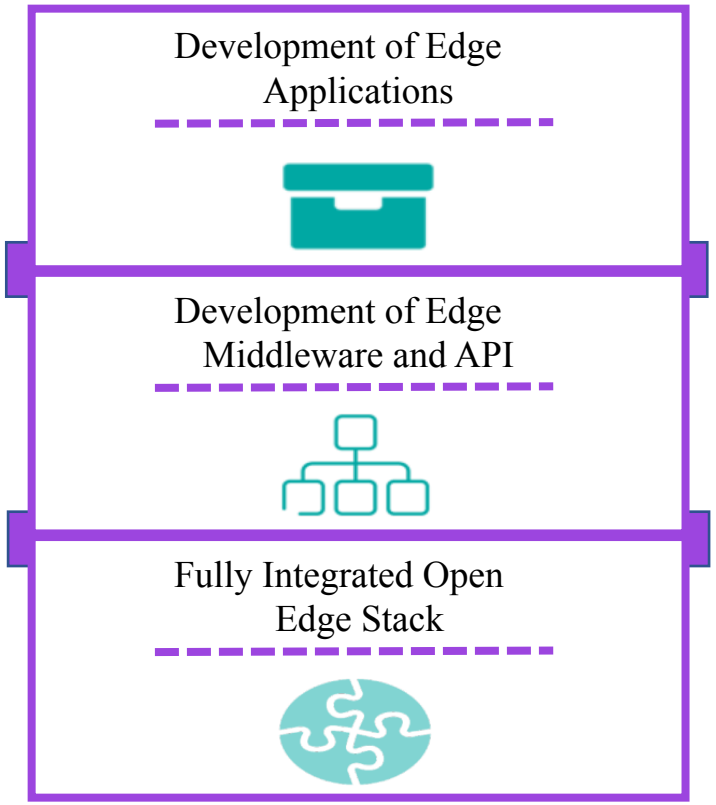
Highly centralized computing resources of cloud service providers

Edge computing

- Extensions Beyond Cloud Computing and Data Centers
- Close to Users and Data Sources, Edge Sides
- Converged Platform of Networks, Compute, Storage and Applications
- Real-Time, Optimized, Data Localization, Intelligence, Security and Privacy
- High Performance and Low Latency
- Large-Scale but Small-Size
- Zero Touch Provisioning and Automation, Remote Management, Autonomous Devices
- Self-Healing, Easy Upgrading, and Long Life Power Supplier

What is akraino?

Everything about edge – akraino is the edge stack



- Develop Edge applications and create an app/VNF ecosystem

- Development of Edge API, Middleware, SDKs
- Cross Platform Interoperability (3rd party clouds)

- Fully integrated, working Edge blueprints
- Edge Stack Life Cycle – CI/CD & Tooling
- Upstream collaboration

AKRAINO EDGE STACK

New edge requires end-to-end automation & interworking

Services Cloud Services | Residential Services | Enterprise Services | IOT Services | AI Services

Software & Automation

openstack. airship StarlingX CLOUD NATIVE COMPUTING FOUNDATION LF NETWORKING AKRAINO EDGE STACK EDGEXFOUNDRY

Cloud Automation | Network Automation | IOT Automation

AKRAINO EDGE STACK

Infrastructure

Enterprise
Software Defined Data Centers (SDDC)

Data Centers | Carrier Network | Cloud Network

Service Providers
MSO/CableCo

Public/Hybrid
Cloud Service Providers
Cloud Hosting
Private Cloud Providers
Web Service Providers

intel experience what's inside™

The new edge requirements for akraino project

Edge Challenges

Large Scale
>1000 Locations

Need Simple Operations
Zero-touch provisioning
Zero-touch operations
Zero-touch lifecycle

Low Cost
Start-up, Build, Run

Multiple Edge Use Cases
Faster innovation but with right integration

Akraino Edge Stack is the first open source collaborative community project exclusively focused on integrated distributed cloud edge platform.

Solution

AKRAINO EDGE STACK

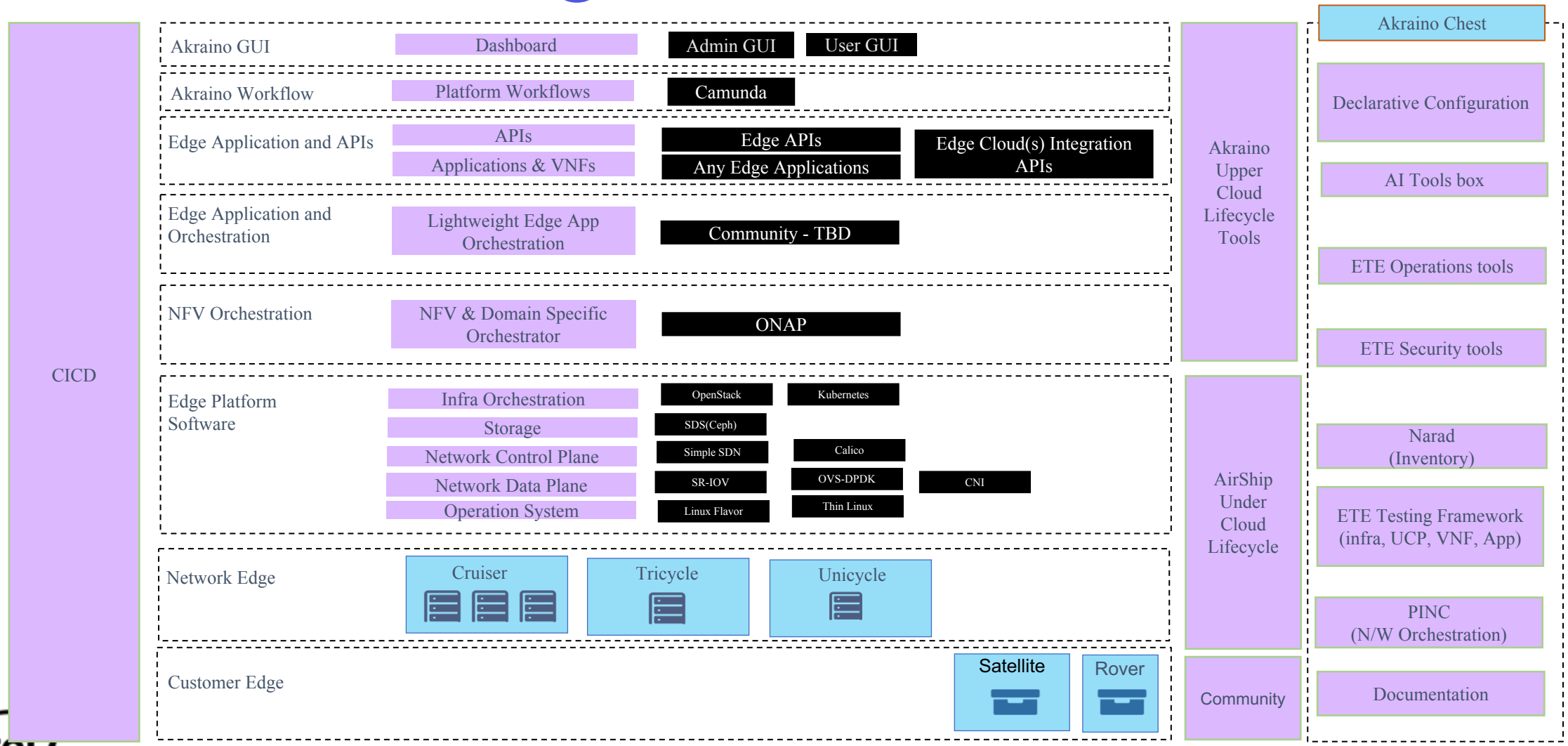
Akraino Edge Stack integrates multiple open sources to supply holistic Edge Platform, Edge Application, and Developer APIs ecosystem.

LF Announcement march 2018

- First Open Source Project at Edge gathers momentum, complements other standards & consortiums
- Edge now an integral part of Open Source Software Ecosystem

The Linux Foundation Announces Expanded Industry Commitment to Akraino Edge Stack

Akraino building blocks



Source: AT&T

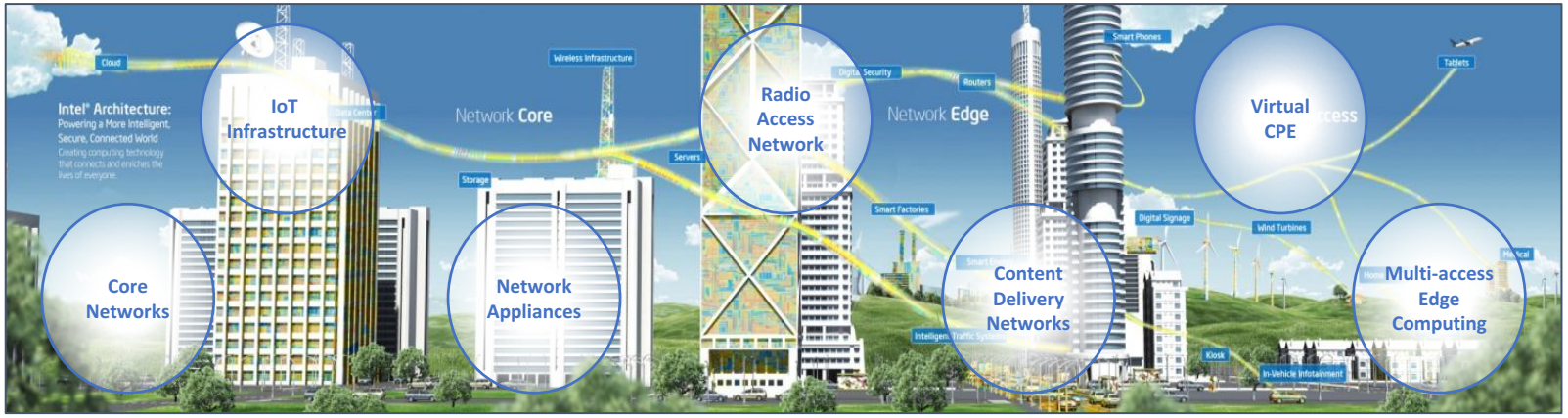
What is starlingx?

- StarlingX is a new project being hosted by the OpenStack Foundation
- Formed with seed code from the Wind River Titanium Cloud portfolio
- Project will provide a fully integrated OpenStack platform with focus high availability, Quality of Service, performance and low latency needed for industrial and telco use cases
- Aligned with the OpenStack Foundation Edge Working Group and the Linux Foundation Akraino Edge Stack

Starlingx addresses edge gaps

Based on Wind river titanium cloud

Telco Infrastructure



- Proven, Integrated virtualization platform saves Time-To-Market
- Delivered latency, resiliency and performance for Edge use cases
- Streamlined installation, commissioning and maintenance
- End-to-End security and Ultra-low latency for Edge applications
- 100% compatible with open industry and de facto standards
- Full support for multi-layer HW and SW decoupling

Infrastructure
OPNFV VERIFIED
2018.01

Energy

Smart Buildings

Manufacturing

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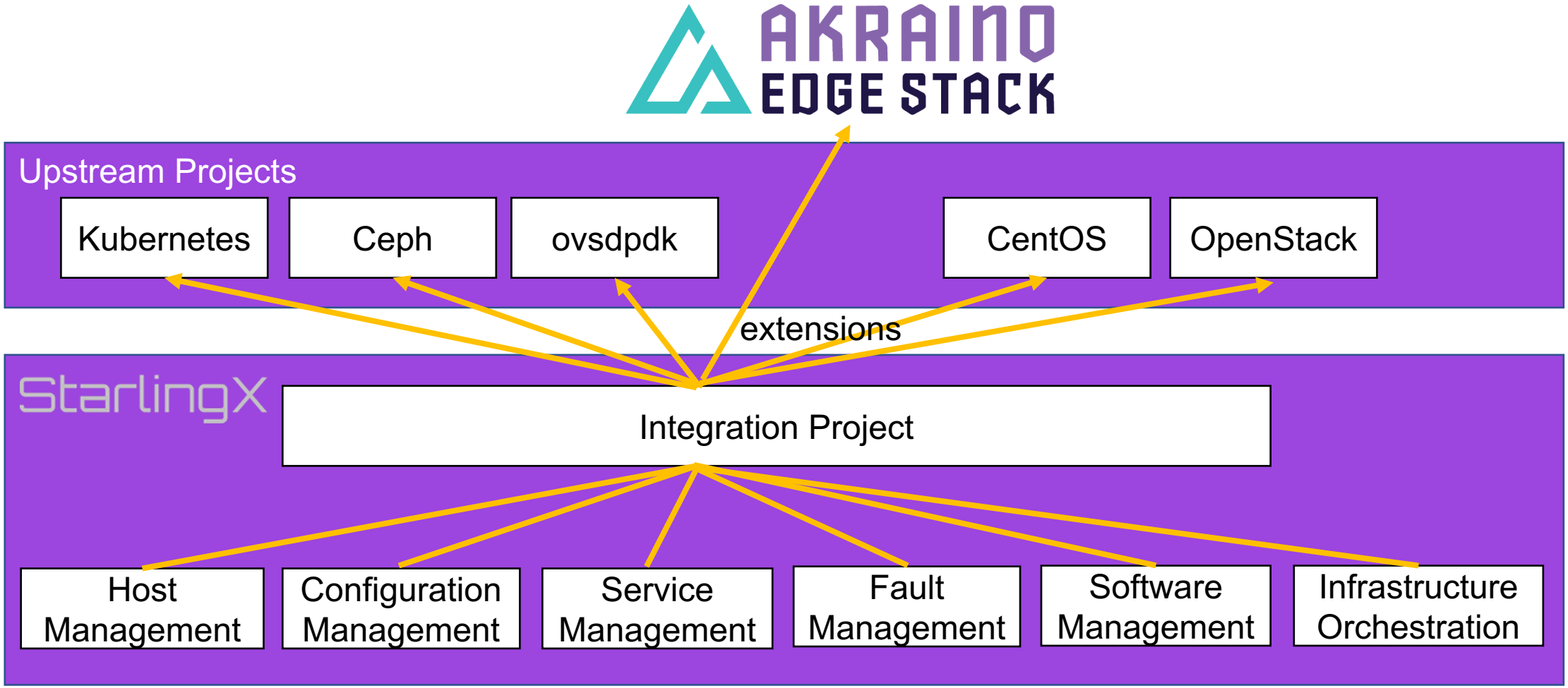
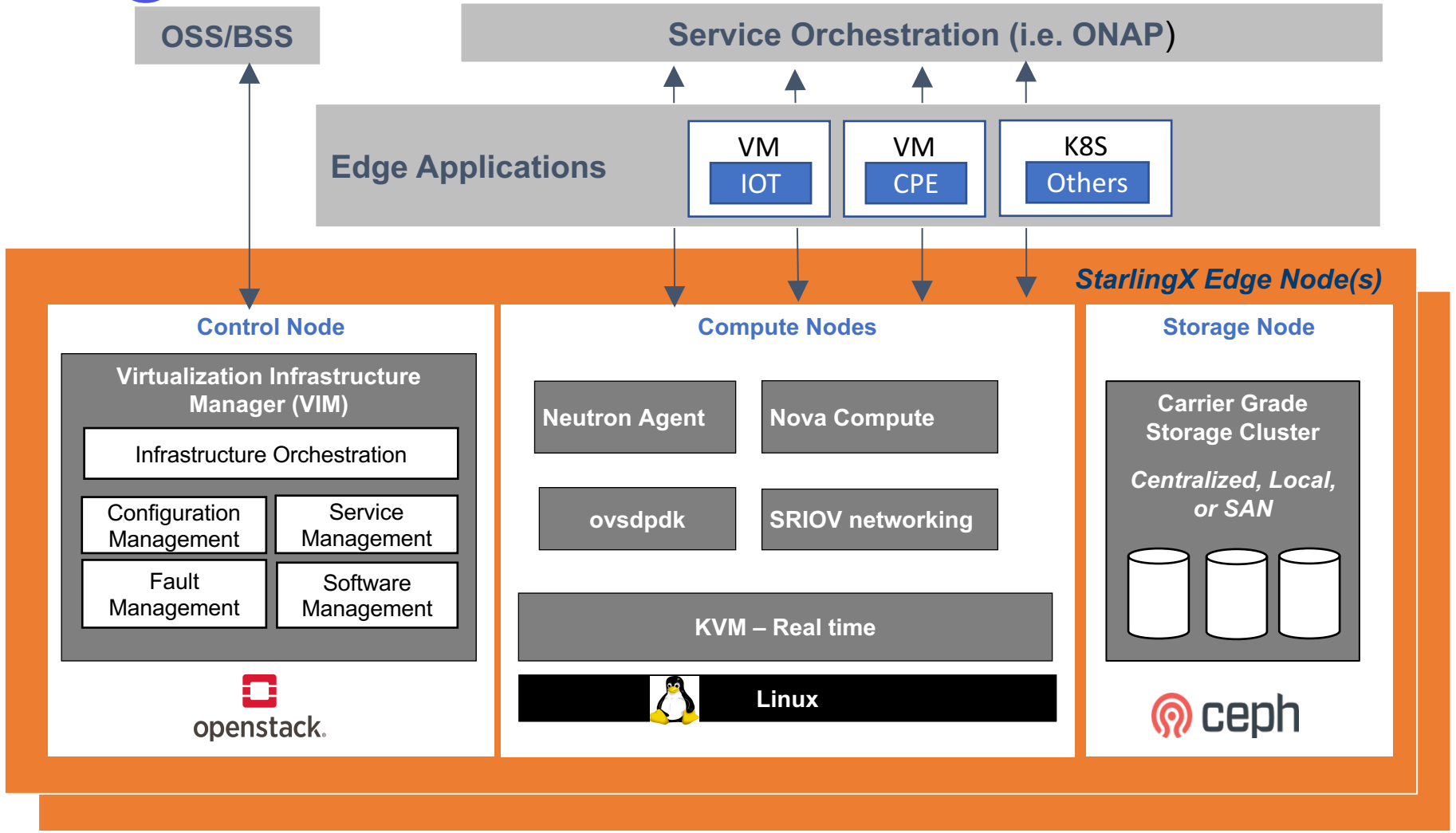
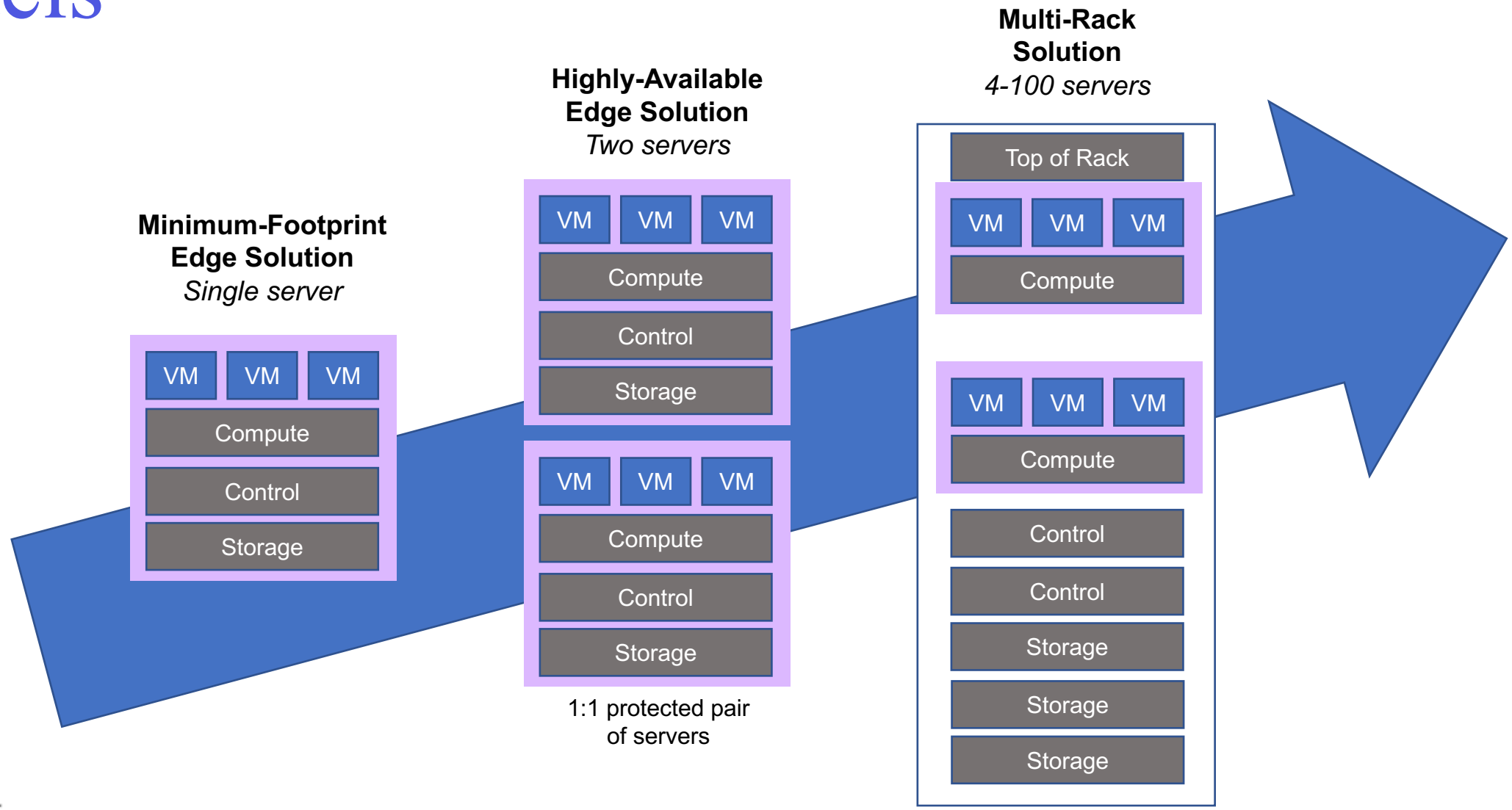
High level project structure



Starlingx architecture details



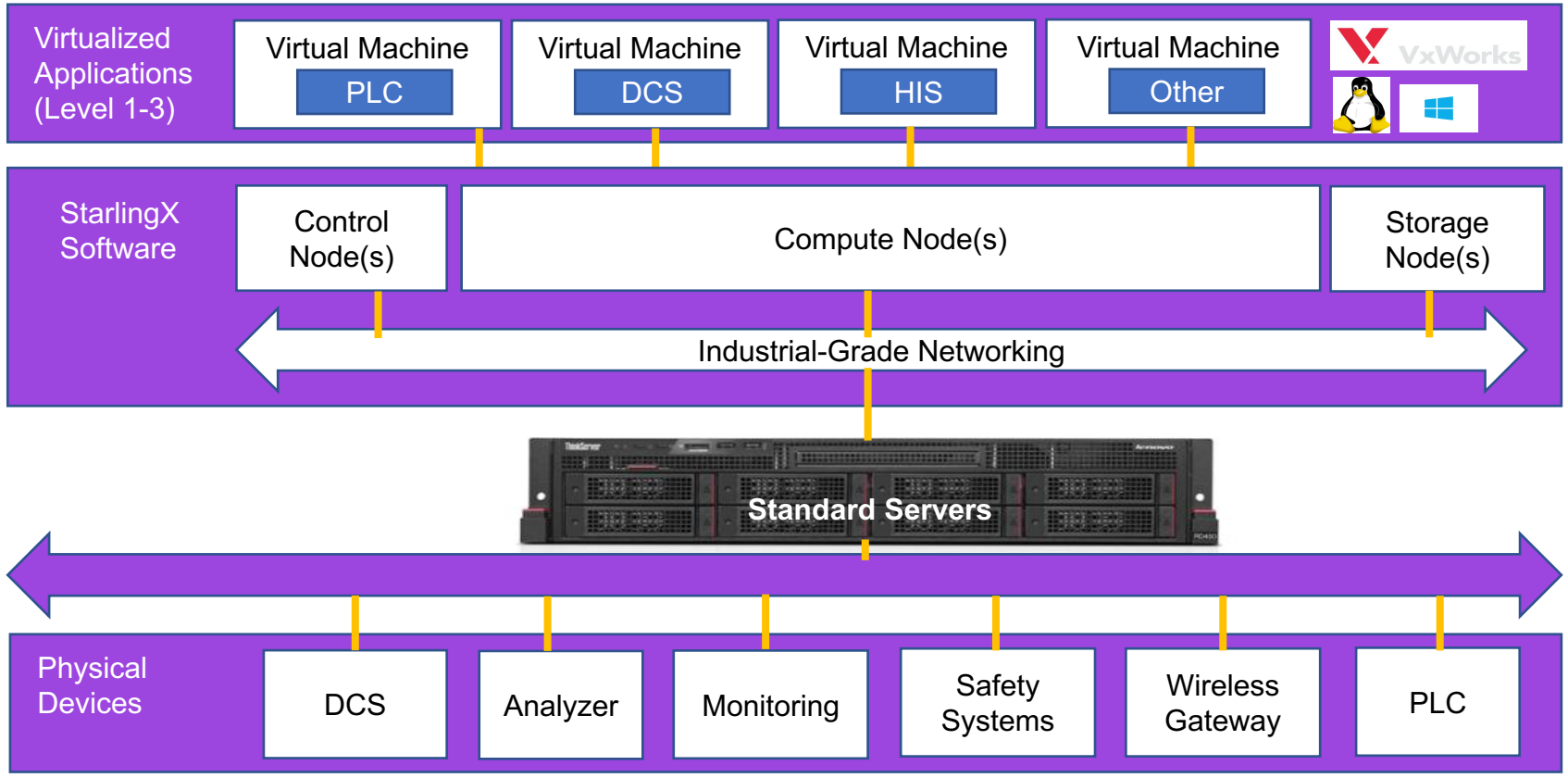
Scalability for all edge use case deployment models



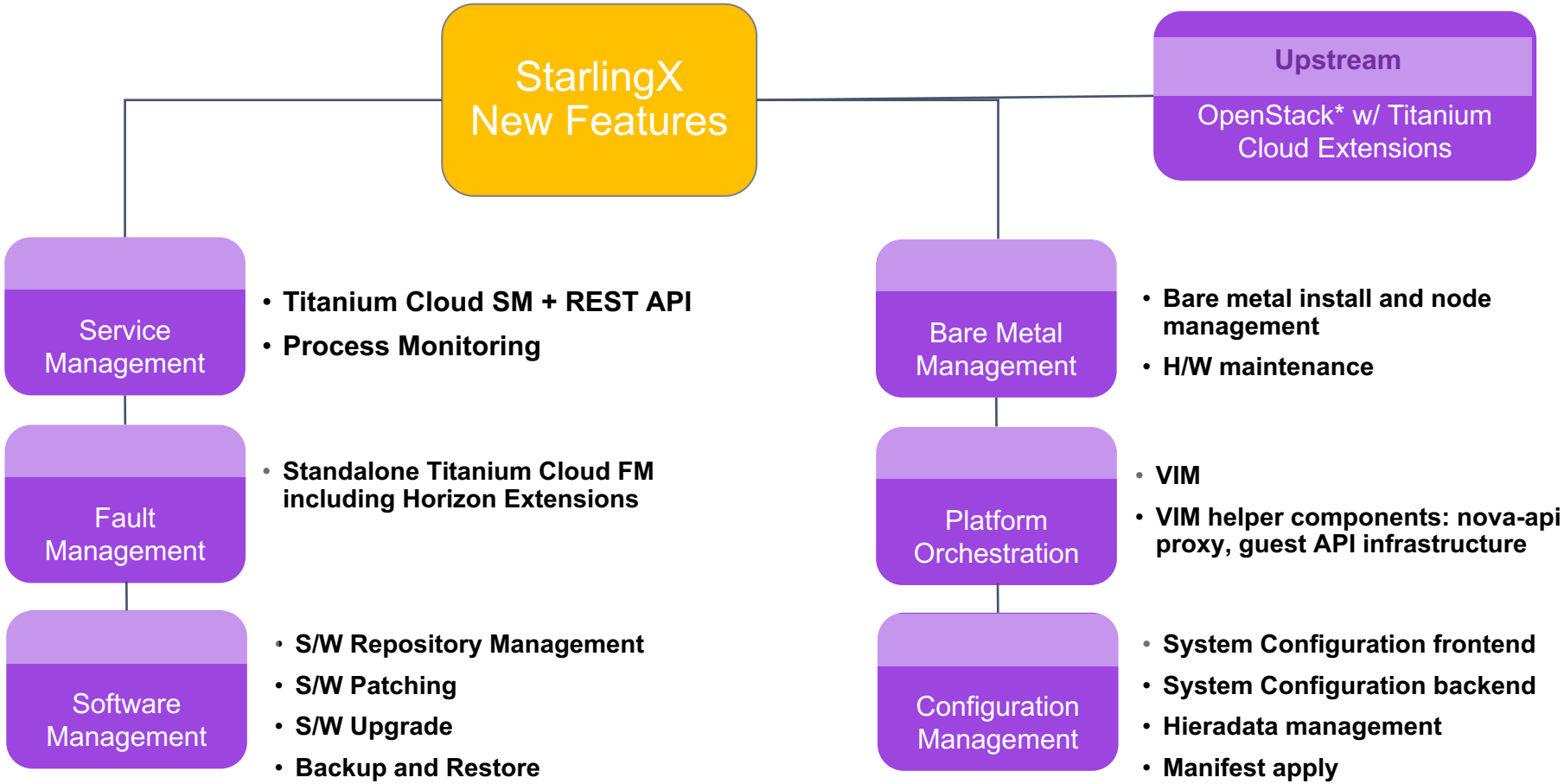
Addressing the challenges of industrial edge

Reliability, management, performance, scalability, security, open standards

- Integrated software platform for on-premise critical infrastructure applications
- Addresses all the key challenges for industrial-grade virtualization and security

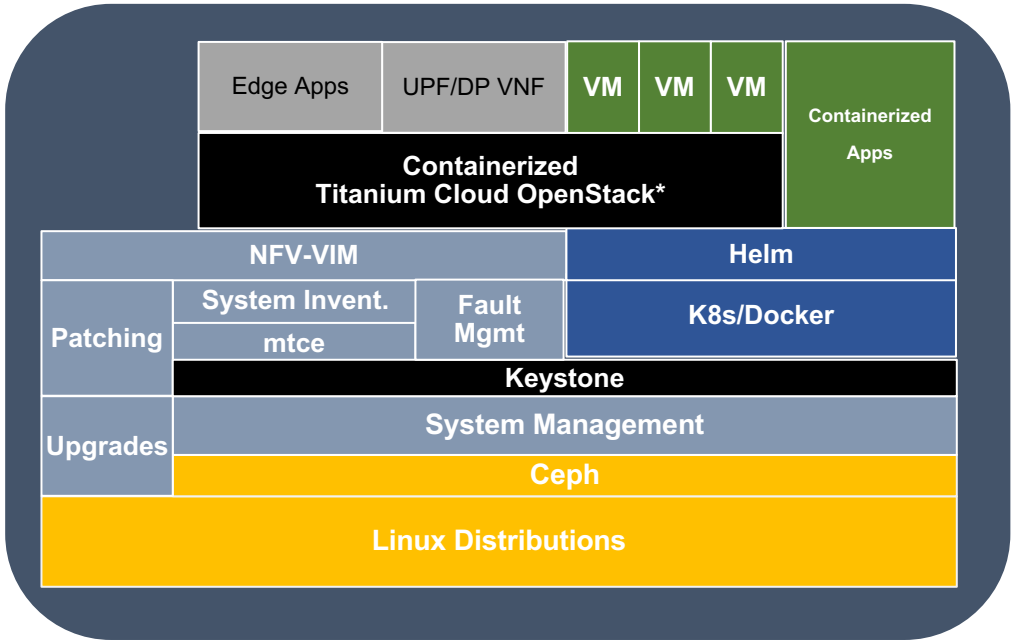


Key capabilities for edge stack



Directional vision for akraino

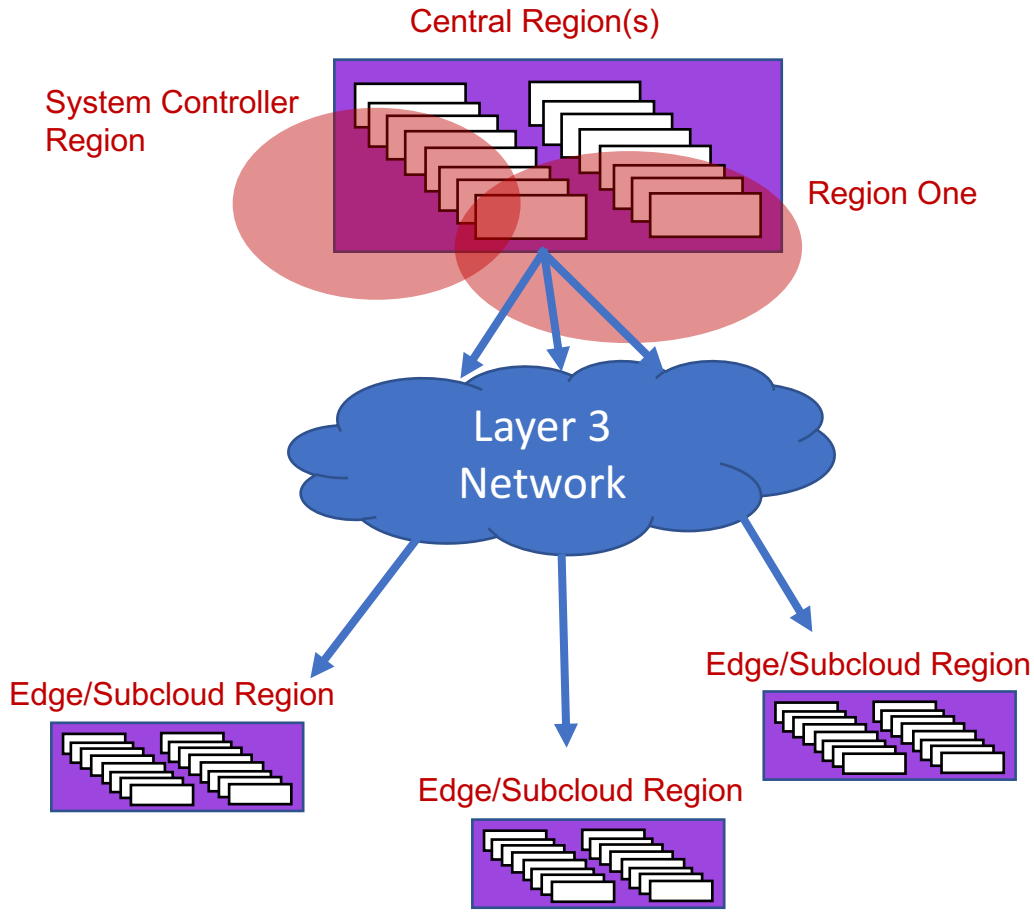
- Current open source component
- Commercial Wind River® Titanium Cloud component (open sourced in StarlingX*)
- New StarlingX component
- OpenStack* with Wind River Titanium Cloud patches
- Applications



- Combining OpenStack* with components from Wind River® Titanium Cloud with new extensions to support k8s with Docker* runtime
- Keystone runs as a shared service on the platform with Ceph for persistent storage
- Kubernetes* applications deployed by Helm
  - OpenStack is containerized
  - Calico used for container networking backend
- Retains Wind River Titanium Cloud installation mechanism for bare metal installation
- Deployment for Intel seed will use Puppet for bare metal and Helm for OpenStack and Containerized Apps
- Lifecycle for Intel seed will use existing Wind River Titanium Cloud services for bare metal and K8s for remaining

Distributed cloud incubation project

- Based on OpenStack Regions
- Central Region (System Controller)
  - Hosting shared services
  - System wide infrastructure orchestration functions
    - Deployment and management of Edge clouds
    - Configuration portal for shared configuration across all Edges (host and OpenStack)
    - Fault aggregation
    - Portal for system wide patch (s/w updates) application
- Geographically dispersed remote Edge regions
  - Connected to the system controller via L3 network
- Inter-region communications via REST APIs
- Edge clouds run a reduced control plane



In flight seed code evolution based on titanium cloud

- K8S management of platform/infrastructure services
  - Docker runtime
  - Calico CNI plugin
  - Ceph as persistent storage backend
  - Helm as the package manager
  - Local docker image registry
- Initial services
  - OpenStack and dependencies (i.e. mariadb, Keystone) leveraging OpenStack Helm
  - Infrastructure orchestration services
- K8S cluster available for end user applications (control plane apps)

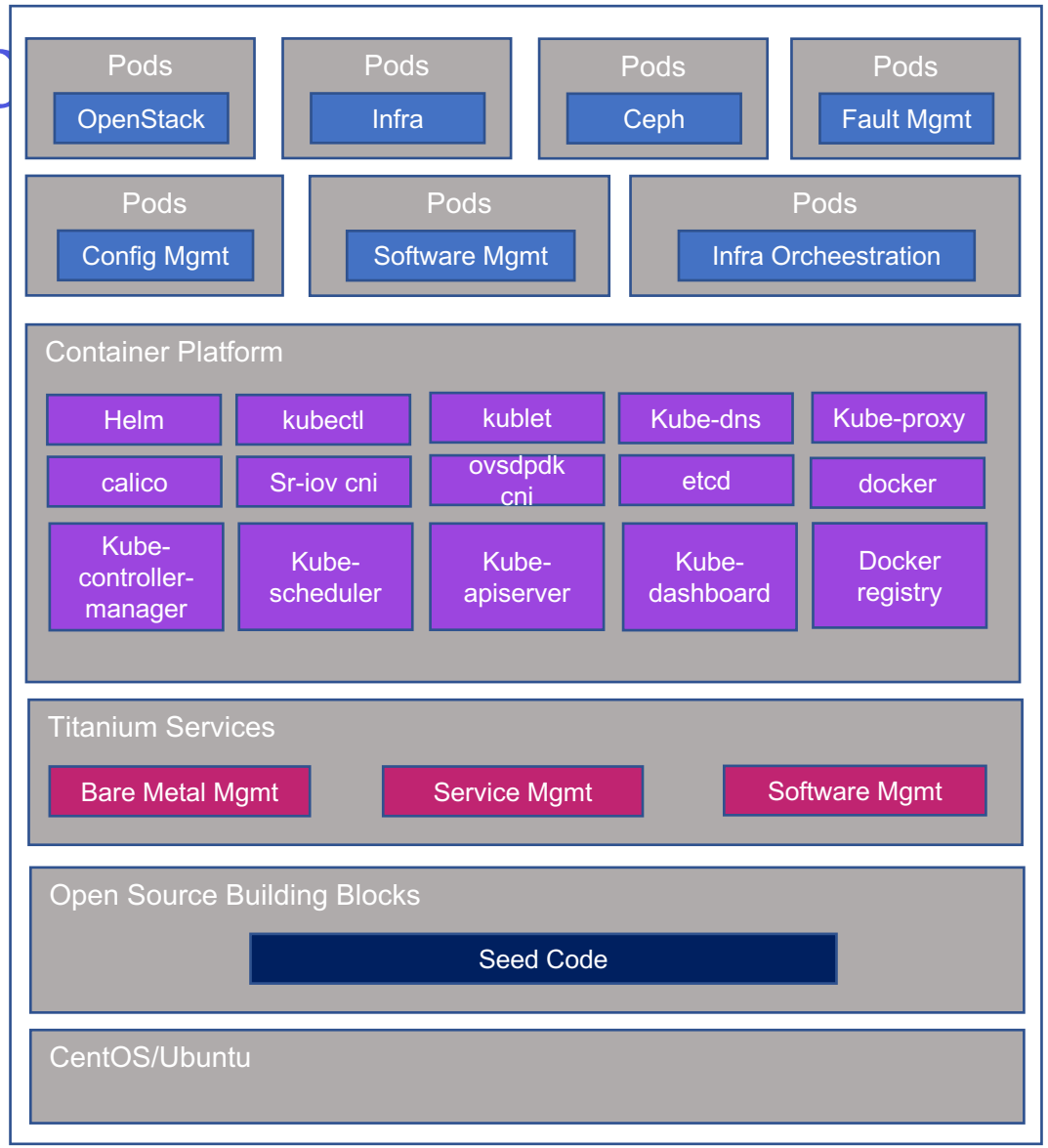
Performance features

- Compute node performance profiles
  - Select performance characteristics that match the workload requirements
- Optional RT KVM support
- House keeping functions including interrupts offloaded to dedicated CPU(s)
- Huge page backend VM's (2M or 1G)
- Dedicated and shared VM CPUs
  - Including hybrid model for VM
- High Performance Networking
  - OVS-DPDK
  - SR-IOV
  - PCI-passthrough
- GPU passthrough support

- EPA Features
  - HT placement/scheduler policy support
  - Ability to specify CPU models for VMs to leverage advanced features of CPU architectures
  - NUMA node awareness
    - Specify multiple virtual NUMA nodes and required memory per virtual NUMA node
    - Specify mapping of a virtual NUMA node to a physical NUMA node
    - NUMA affinity (relative to vswitch and/or PCI-PT/SRIOV
    - Network load balancing across NUMA nodes
  - vcpu scale up/down
    - Nova-api extension with Heat integration
  - RDT cache allocation technology (CAT) support
    - Enable VMs to reserve slice of L3 cache

Vision for future collabo

- VM's and bare metal containers as first class citizens
  - Meeting the performance, latency and reliability requirements for the Edge
  - Co-existence in a single deployment
- Infrastructure
  - Migration of remaining infrastructure services to containers
- Full support for applications
  - Accelerated container networking with SR-IOV and OVS-DPDK
  - Multi-tenancy support for containers
  - Support for additional container runtimes including Kata containers



Vision for future collaboration

- Ubuntu OS support
- Edge deployment simplification enabling zero touch provisioning
- Centralizing infrastructure management of Edge deployments
- Securing the edge
  - Remote attestation
- PTP support – and eventually TSN support
- Identify and work to drive synergies with EdgeX and NEV SDK within Akraino
- Enable 5G use cases at the Edge vRAN

Akraino is complementary

Akraino interfaces with adjacent projects
standards, ref arch and ref impl

LF NETWORKING

ONAP
OPEN NETWORK AUTOMATION PLATFORM

AKRAINO EDGE STACK
Zero Touch Edge Cloud Automation

kubernetes
Container Orchestration
Multi-cloud portability

EDGE X FOUNDRY™
IIOT Framework at Edge

ceph

openstack.
Open Source Software for Creating Private and Public Clouds

Acumos AI
AI Framework Across Projects
Networking
Analytics/Automation

DANOS
airship
StarlingX
Disaggregated Networking
Whitebox Operating Systems

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Akraino benefits

enable new business ecosystem & cost savings

Users (Enterprises) 	New Services	Open Source-Based		
Application Developers 	New Edge Applications	Global Open Source Collaboration		
Public Cloud Provider 	New Cloud Services	More Footprint	ROI – New Offerings to Existing Customer Base	
Suppliers 	Infrastructure (H/W)	Support as a Service	Extended Portfolio	
Telco Operator 	Edge Processing – Reduced Backhaul Traffic	NFV Infrastructure (5G, Etc.)	Edge Services (Public Edge Cloud, API, Analytics)	Edge Real Estate

For More Information, Please
Visit www.akraino.org and www.starlingx.io