Launching StarlingX

The Journey to Drive Compute to the Edge

Pilot Project Supported by the OpenStack Foundation

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Project Overview
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 24\textsuperscript{th}, 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: \url{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
Edge Computing Use Cases

vRAN == virtual Radio Access Network

Health Care
- Imaging
- Diagnostics

MEC == Multi-access Edge Computing
- Virtual Reality
- Augmented Reality

BBU Pool

Monitoring

Connected Vehicle
Edge Computing Use Cases

Transportation
- Rail/Locomotive
- Mass transit
- Autonomous Shipping
- Smart City
- Autonomous Vehicle

Industrial Automation
- Robotics
- Digital Twin
- vPLC
- HMI
What Problems Is StarlingX Solving?

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
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

*Other names and brands may be claimed as the property of others
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.

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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
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

OpenStack Components
- Cinder
- Ironic
- Magnum
- Horizon
- Swift-API
- Murano
- Nova
- Keystone
- Neutron
- Glance
- Heat
- Telemetry

New StarlingX Services
- Configuration Management
- Fault Management
- Host Management
- Service Management
- Software Management

Some of the Open Source Building Blocks Used by StarlingX
- Kubernetes
- Ceph
- Collectd
- Ilibet
- QEMU
- Open vSwitch
- DPDK
- SR-IOV

Linux
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