Project Ursa Major Open Source Release Document

This document describes the scope of Project Ursa Major's 1.0 release, including the system components and features.
Project Ursa Major aims to address scalability and resource utilization challenges of super large cloud platforms, and also provides a unified orchestration and management for various types of compute resources, including VMs, containers and serverless functions.

Release Theme: In this release, Project Ursa Major includes the key components and features from 3 sub-projects:

1. **Arktos:** a compute platform evolved from Kubernetes with fundamental improvements on unified VM/container support, multi-tenancy and scalability.

2. **Mizar Management Plane (Alcor)**: a cloud-native network control plane.

3. **Mizar**: a large-scale high-performance network data plane based on XDP/eBPF and Geneve protocol.

Release Content:

1. Arktos Release 0.1

2. Mizar Management Plane (Alcor) Release 0.1

3. Mizar Release 0.5

Arktos Release 0.1

1. Repos:

   a. Arktos: https://github.com/futurewei-cloud/arktos

   b. Arktos-cniplugins: https://github.com/futurewei-cloud/arktos-cniplugins

   c. Arktos-vm-runtime: https://github.com/futurewei-cloud/arktos-vm-runtime

2. Released Components:

   a. Unified Node Agent

   b. Unified Scheduler

   c. Partitioned and Scalable Controller Manager

   d. API Server/Core Server with Multi-Tenancy and Unified Pod Support

   e. Arktos VM Runtime Server

3. Features

   a. Multi-tenancy Features

      i. Introduce a new layer "tenant" before "namespace" in API resource URL schema, to provide a clear and isolated resource hierarchy for tenants.

      ii. Introduce a new API resource "tenant", to keep tenant-level configurations and properties.

       iii.   The metadata section of all exiting API resources has a new member: tenantName.

       iv.   API Server, ClientGo, Scheduler, Controllers and CLI changes for the new resource model.

  b. Unified VM/Container Support:

       i.   **Extend "pod" definition to both containers and VM. Now a pod can contain one VM, or one or more containers.**

       ii.   **Enhance scheduler to schedule container pods and VM pods in the same way (unified scheduling).**

       iii.   **Enhance kubelet to support multiple CRI runtimes (unified agent).**

       iv.   **Implement a VM runtime server evolved from project Virtlet, with new features like VM reboot, snapshot, restore, etc.**

       v.   **Enhance kubelet to handle VM state changes and configuration changes.**

       vi.   **Introduce a new API resource "action" and the corresponding handles (action framework) to support some VM specific actions which are not appropriate to be expressed as state machine changes, like reboot and snapshot.**

  c. Artkos Integration with OpenStack Neutron

       i.   Arktos network controller integrate with neutron.

       ii.   Arktos CNI plugins for neutron.

  d. Arktos integration with Mizar

       i.   Arktos CNI plugins for mizar-mp.

  e. Scalability

       i.   Partitioned and scalable controller managers with active-active support.

       ii.   API Server Partitioning (in progress)

       iii.   ETCD partitioning (in progress)

4. Design Doc: https://github.com/futurewei-cloud/arktos/tree/master/docs

Mizar Management Plane (Alcor) Release 0.1

1. Repo: https://github.com/futurewei-cloud/mizar-mp

2. Released Components:

  a. Controller v0.1 Alpha Release

  b. Control Agent v0.1 Alpha Release

  c. Kubernetes Plugin for Mizar-MP v0.3.1 Release

3. Features:

      a. MVP VPC features to manage Mizar data plane

      b. Controller Batch API for throughput optimization

      c. Novel goal state data model for controller-agent communication

      d. Preliminary implementation of Fast Path

      e. Onebox development setup for control plane E2E

      f. Integration with Kubernetes for container network provisioning

4. Wiki: https://github.com/futurewei-cloud/mizar-mp/wiki

Mizar Release 0.5

1. Repo: https://github.com/futurewei-cloud/mizar

2. Released Components:

      a. Transit Daemon

      b. Transit XDP

      c. Transit Agent

      d. Bouncer

      e. Divider

      f. Balancer

3. Features:

      a. Mizar Architecture Component Name Changes

      b. Performance Improvements

      c. Extensible packet processing pipeline support

      d. Fast path (beta)

      e. Scaled endpoint (beta)

      f. Integration with Kubernetes daemonset

      g. Codedeploy support

4. Wiki: https://github.com/futurewei-cloud/mizar/wiki