# IEC Type1&2 Report

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## Agenda

- Akraino IEC Blueprints
- > IEC Introduction
- > IEC Reference Stack
- > IEC Type1&2 Deployment Reference Cluster
- > IEC Type1&2 work in R2
- Insight into IEC
- Future Work & Challenges



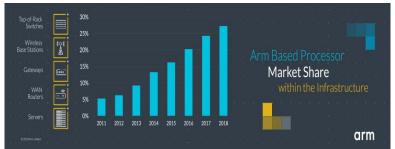
## Akraino Blueprints

- 30+ blueprint projects proposed in Akraino
- Arm proposed and is leading Integrated Edge Cloud (IEC) as PTL
  - IEC Type 1: small deployment
  - IEC Type 2: medium deployment
- Arm is also discussing feature projects with partners in Akraino

Blueprint Family	Blueprint Species Name	Submitter
Integrated Edge Cloud	IEC Type 1: small deployment	Arm
	IEC Type 2: medium deployment	Arm
	IEC Type 4: AR/VR oriented Edge Stack	Tencent, Arm Juniper, Inwinstack, Mobiledgex, Organge
	IEC Type 3: Android cloud native applications on Arm servers in edge	China Mobile, Byte Dance, Arm
	IEC Type 5: SmartNIC	Byte Dance, Mellanox, Broadcom, China Mobile, Arm, Phytium

## **IEC** Introduction

- IEC (Integrated Edge Cloud) is a platform that enables new functionalities and business models on the network edge. It targets telco applications and medium deployment of Edge Cloud. In this release it is based on Kubernetes and Calico and installation is automated with the foundation building and the focus on SEBA use-case.
- Edge use case to address
  - > Telco/enterprise Edge cloud for example, MEC or branch office data center...
  - > Telco/enterprise remote edge locations edge platform with limited resources, for example, SD-WAN, IoT gateway...



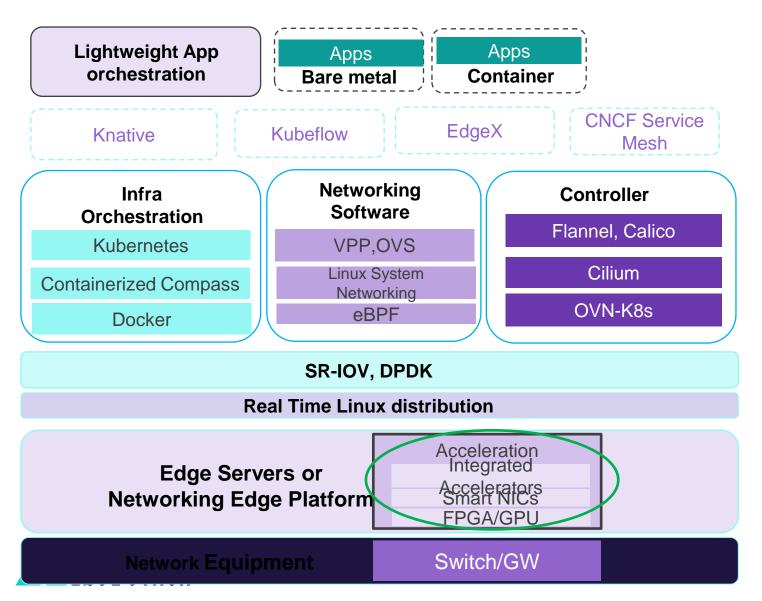






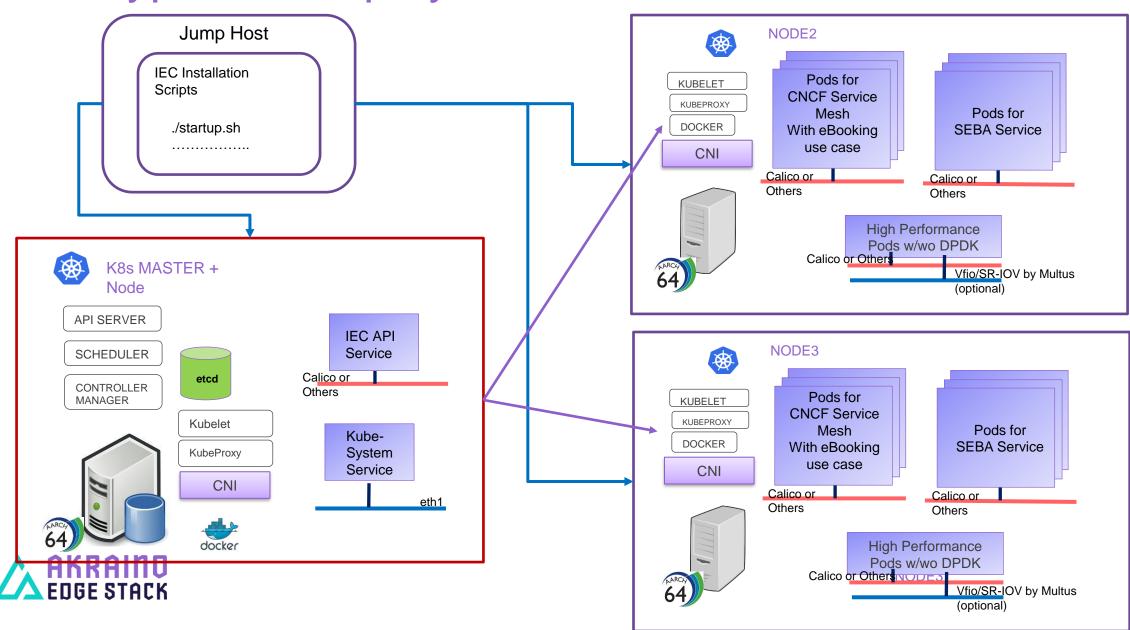


## IEC Reference Stack



- Heterogeneous Architecture
  - VM, container, bare metal
  - Servers and customized Edge platforms
  - Virtualized NFs and Physical NFs
  - Accelerator interface
- Resource constraints
  - Kubernetes
  - SDN Controller for K8s
- HW Accelerations
  - Integrated accelerators
  - PCIe/CCIX attached accelerator (Smart NICs...)

# IEC Type1&2 Deployment Reference Cluster



# IEC Type 1

#### **Features**

- Platform works on aarch64 architecture, typically arm64 SoC with low power consumption;
- It supports both single node deployment and a 3-node deployment
- Deployment is can be automated from a jumpserver <a href="https://jenkins.akraino.org/view/iec/">https://jenkins.akraino.org/view/iec/</a>
- The SEBA on arm use-case is enabled and integrated with the IEC Type1 platform(Smallest SEBA itw?)
- The installation scripts which deploys Kubernetes cluster, Calico CNI, Helm/Tiller and related verifying Kubernetes applications/services with 1 master and 2 slave nodes. The scripts can be run from the jumpserver, or with manual installation from the servers on which it run. The installation methods is introduced in <a href="IEC Blueprints Installation">IEC Blueprints Installation</a>
  Overview.
- Currently IEC uses project <u>Calico</u> as the main container networking solution which provides high performance, rich network policy, widely supported from Linux system and easy installation. In the future, Contiv/VPP or OVN-Kubernetes can be used as a high performance substitute since those 2 solutions can support DPDK enabled high speed interface access.



# IEC Type 2

#### Features

- Platform works both on x86 64 and aarch64 architectures
- It supports both single node deployment and a 3-node deployment
- Deployment is automated in CI with https://jenkins.akraino.org/view/iec/
- The SEBA (on arm) use-case is integrated with the IEC platform
- The IEC supported hardware are edge servers mainly based on arm64, such as Marvell ThunderX series, Ampere Arm64 servers; the desired network connections are above 10Gbit/s which may satisfy most current IEC applications requirement.
- The installation scripts which deploys Kubernetes cluster, Calico CNI, Helm/Tiller and related verifying Kubernetes applications/services with 1 master and 2 slave nodes. The scripts can be run from the jumpserver, or with manual installation from the servers on which it run. The installation methods is introduced in IEC Blueprints Installation Overview.
- Currently IEC uses project Calico as the main container networking solution which provides high performance, rich network policy, widely supported from Linux system and easy installation. In the future, Contiv/VPP and OVN-Kubernetes may be used as a high performance substitute since those 2 solutions can support DPDK enabled high speed interface access.
- IEC support Akraino CI/CD requests: IEC Daily jobs (scheduled to run recurrently) deploy IEC using one of the agreed installers; run testing suites; collect logs and publish them.





Ampere eMAG 64bit Arm Server



# High Performance CNIs available for Arm Edge Stack

Things now available in Akraino IEC Arm edge stack as a ref:

IEC Arm Edge Stack

#### Calico

- pure IP networking fabric
- high-level network policy management by iptables
- Good scalability

Support direct(nonoverlay) and overlay(IPINIP, VxLAN) network connection

#### Cilium

- Linux-Native, API-Aware Networking and Security for Containers
- Linux eBPF
  based network
  policy, load
  balance and
  security which is
  believed to be
  with incredible
  performance
- L3 networking between hosts

#### Contiv-VPP

- uses <u>FD.io</u>
  <u>VPP</u> to provide network connectivity between PODs
- Native DPDK interface support for phy NIC
- Native VPP ACL/NAT based network policy and access
- Good
  performance but
  with rather
  complex
  configuration

#### OVN-K8s

- OVS/OVNcontroller based K8s networking solution
- Rather good performance with OVS inherited
- Use OVN logical switches/routers to connect Pods and for outside access
- No OVS-DPDK support now

#### SRIOV

- Direct physical interfaces(**PF/VFs**) support for Pods
- High performance with direct Linux kernel eth driver or DPDK PMD driver
- Usually co-work with other CNIs, such as Flannel, Calico by Multus or other glue CNI
- Need resource description or annotation when do the configuration for CNI and Pod setup

#### Flannel

- Widely used and almost easiest deployment for a simple K8s networking
- Linux network bridge for pod connection and overlay based communication for inter-hosts access
- Easy to be integrated into other container networking solution, e.g., Cilium

No good network policy support

#### Code Review / iec.git / tree

summary | shortlog | log | commit | commitdiff | review | tree history | HEAD | snapshot

fix issue that deploy cilium on latest image

[iec.git] / src / foundation / scripts / cni /

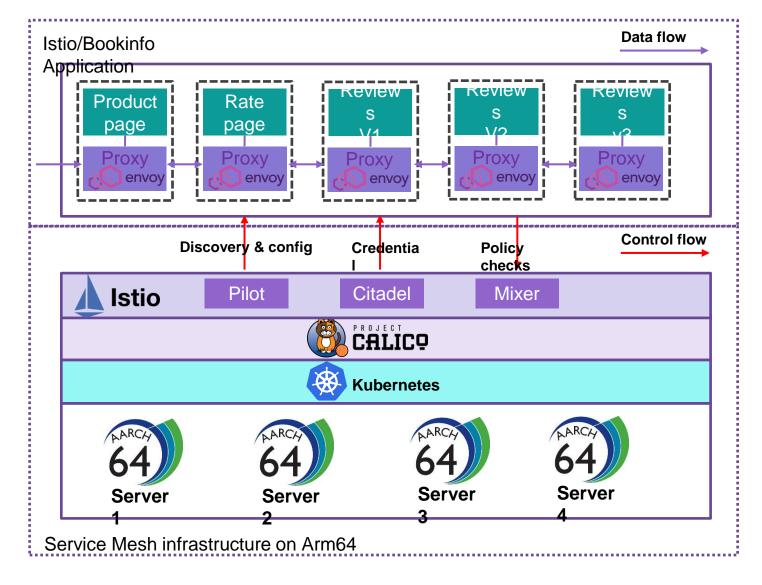
drwxr-xr-x		<u></u>	
drwxr-xr-x	-	<u>calico</u>	tree   history
drwxr-xr-x	-	<u>cilium</u>	tree   history
drwxr-xr-x	-	<u>contivpp</u>	tree   history
drwxr-xr-x	-	danm	tree   history
drwxr-xr-x	-	<u>flannel</u>	tree   history
drwxr-xr-x	-	<u>multus</u>	tree   history
drwxr-xr-x	-	<u>ovn-kubernetes</u>	tree   history

#### Repo:

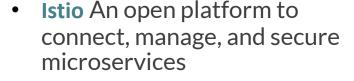
https://gerrit.akraino.org/r/admin/repos/iec



## Istio – A Robust Service Mesh – on Arm64









- Calico Simple, scalable and secure Container Network Interface
- Envoy High-performance edge/middle/service proxy

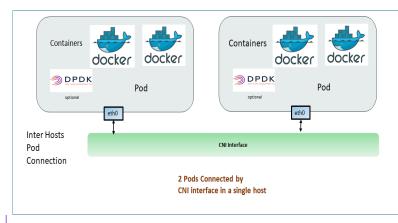


#### **Integrated into IEC:**

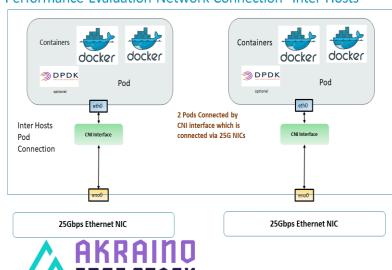
https://gerrit.akraino.org/r/gitweb?p=iec.git;a=tree;f=sr c/foundation/service\_mesh;h=2e7a4f541a191decfa5c e8136091224bac710b23;hb=HEAD

## Benchmarking metrics, environment and tools

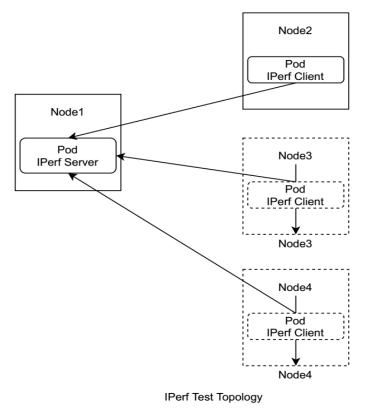
#### Performance Evaluation Network Connection- Intra Host



#### Performance Evaluation Network Connection- Inter Hosts



### IPerf(v2)



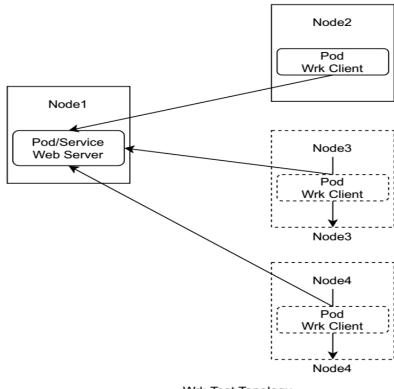
**Test Command:** 

Client: iperf -c \${SERVER\_IP} -t \${time} -i 1 -w 100K -P 4

Server:

**Iperf-s** 

#### Wrk



Wrk Test Topology

Test command:

wrk -t12 -c1000 -d30s http://\$IP/files/\$file

For More Information, Please Visit www.akraino.org

謝謝! Thank You!

