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MALAYSIAN ACCESS FEDERATION
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Running Identity Federation Services on Containers and K8s

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Background

- Since 2018, SIFULAN Malaysian Access Federation (SIFULAN) has been operating in production mode by using Virtualization Machine (VM) to run several identity federation services.
- As the federation grows, SIFULAN plans to offer IdP-as-a-service to the existing and potential future members as an additional service.
- However, the current infrastructure setup has some limitations to support the plan as multi-tenant services were not part of the initial infrastructure design.
- Hence, SIFULAN migrated its federation infrastructure from a VM based to a container-based infrastructure and use Kubernetes (K8s) as the orchestration manager for the containers.

Dissecting Federation Services

- Typical federation core services:
  - Federation Manager – Jagger (a LAMP based application)
  - Metadata signer – xmlsectool (java based application)
  - Metadata repository – basic web repository (apache/nginx)
  - Discovery Services/WAYF – SwitchWAYF (php based application)

- Federation auxiliary services:
  - SAML IdP – Shibboleth/SimpleSAMLphp (java/php based application)
  - Directory Services – OpenLDAP
  - Others (e.g. filesender)

Possible Implementation of Federation Services

- Dedicated baremetal server per application = the best performance, but costly and need to manage many servers

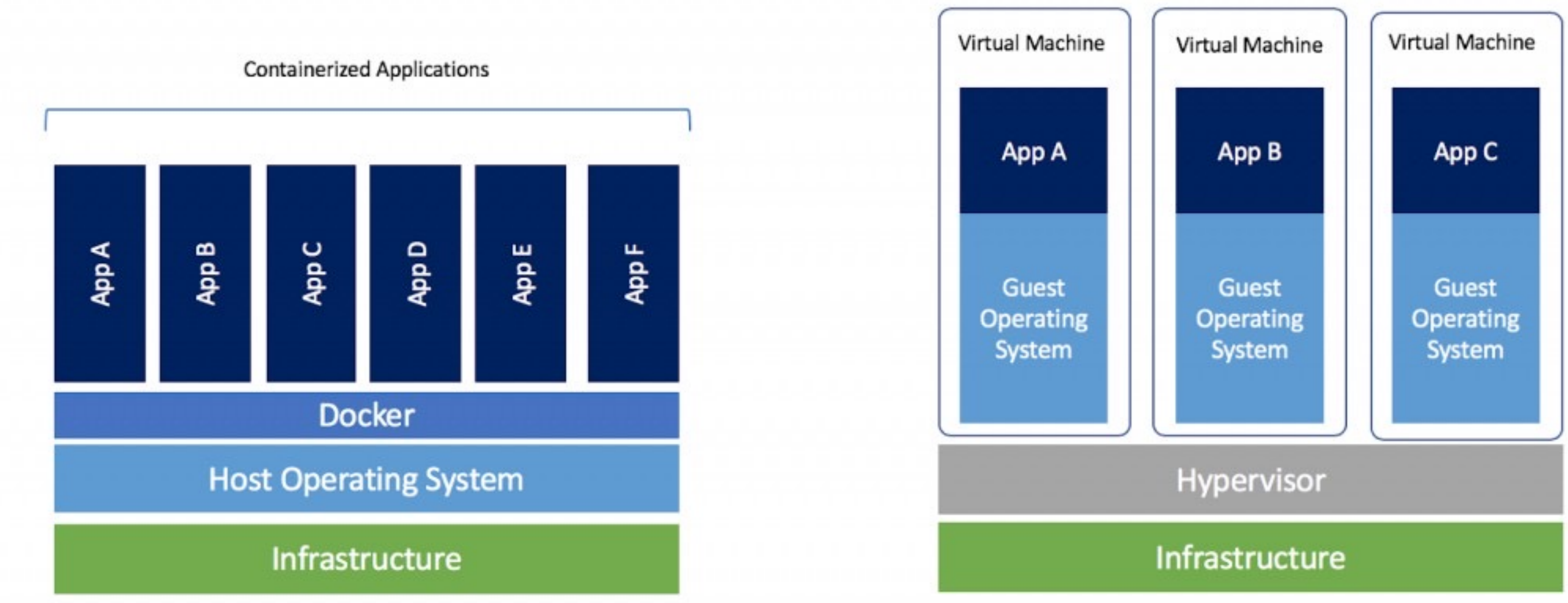
- Dedicated VM per application = cost effective, but still need to manage many VMs and has additional performance overhead

- Dedicated Container per application = cost effective, nearline baremetal performance, but certain limitations when preparing the container apply

Linux Containers

- **LXC** (**Linux Containers**) is an operating-system-level virtualization method for running multiple isolated Linux systems (containers) on a control host using a single Linux kernel.
- Application is contained in a container image along with its runtime libraries.
- Unlike VM which has a dedicated operating system (OS) kernel, the container shares the same OS kernel with the host, hence its performance is nearline to a “baremetal” performance.
- Docker is the most popular containers platform.

Linux Containers (cont.)



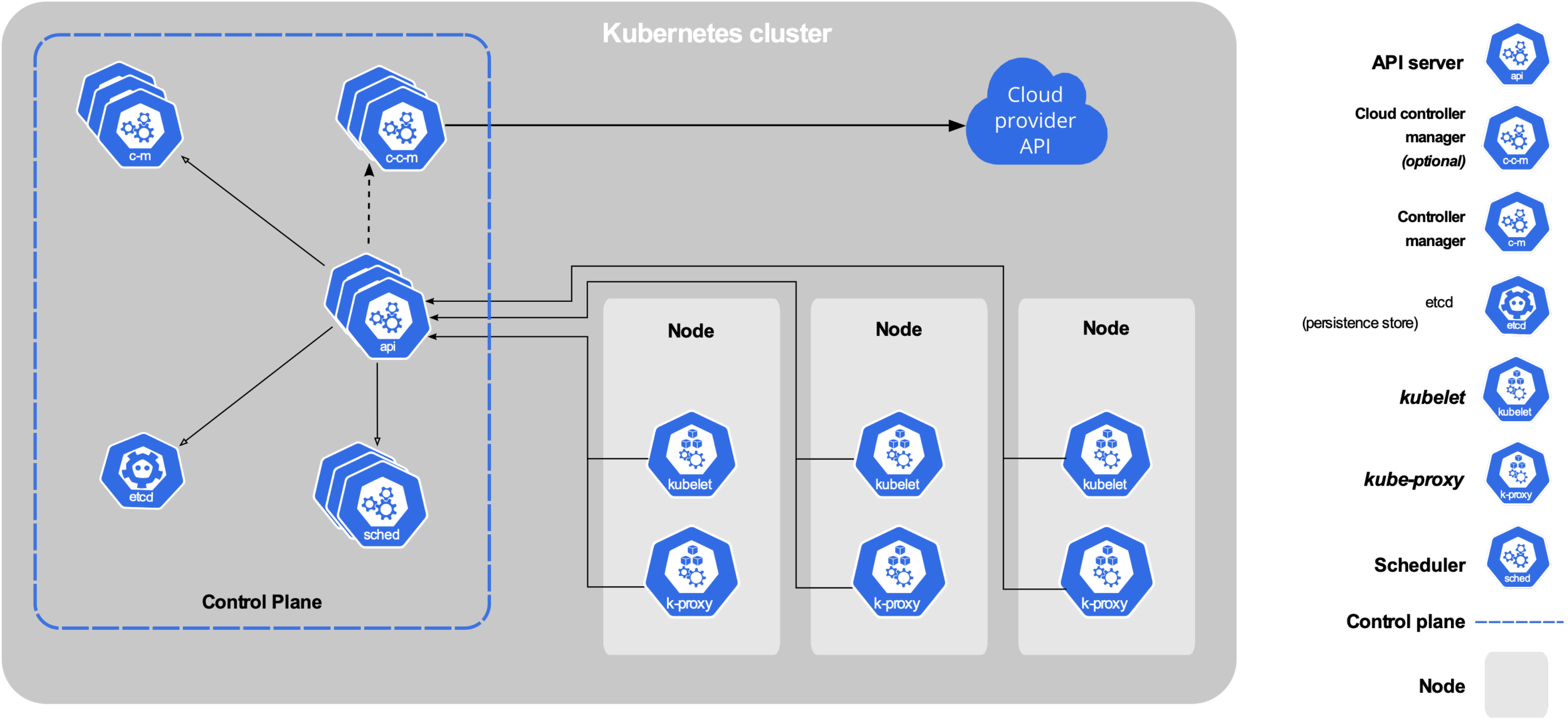
Linux Containers Operational Challenges

- Even though container is good, however the runtime APIs are well suited to managing individual containers.
- It would become a big challenge when it comes to managing applications that might comprise hundreds of containers spread across multiple hosts, like running multiple shibboleth IdP or LDAP for IdP-as-a-service services.
- Containers need to be managed and connected to the outside world for tasks such as scheduling, load balancing, and distribution.
- Therefore, container orchestration system like Kubernetes comes to rescue.

Kubernetes

- Kubernetes (K8s), developed by Google, is an open-source container-orchestration system for automating computer application deployment, scaling, and management.
- It serves as an infrastructure framework for system developer to develop and run their containerized applications.
- K8s has several great features such as load-balance, failover, high-availability, partitioning (namespaces), key-value database (configmap, secrets), and among others.
- K8s is horizontally scaled, i.e. the more worker node is added to the cluster, the bigger your K8s system capacity.

Kubernetes Architecture



Migrating Federation Services from VM to Containers: SIFULAN Experience

- Before:
  - Federation manager, metadata repository, and discovery service/WAYF were running on a single VM and partitioned by using Apache's VirtualHost configuration.
  - Metadata signer was running on a separate VM which only have one way access to the internet and a security token attached (Nitrokey HSM)
  - Other Aux services are running on another VM.

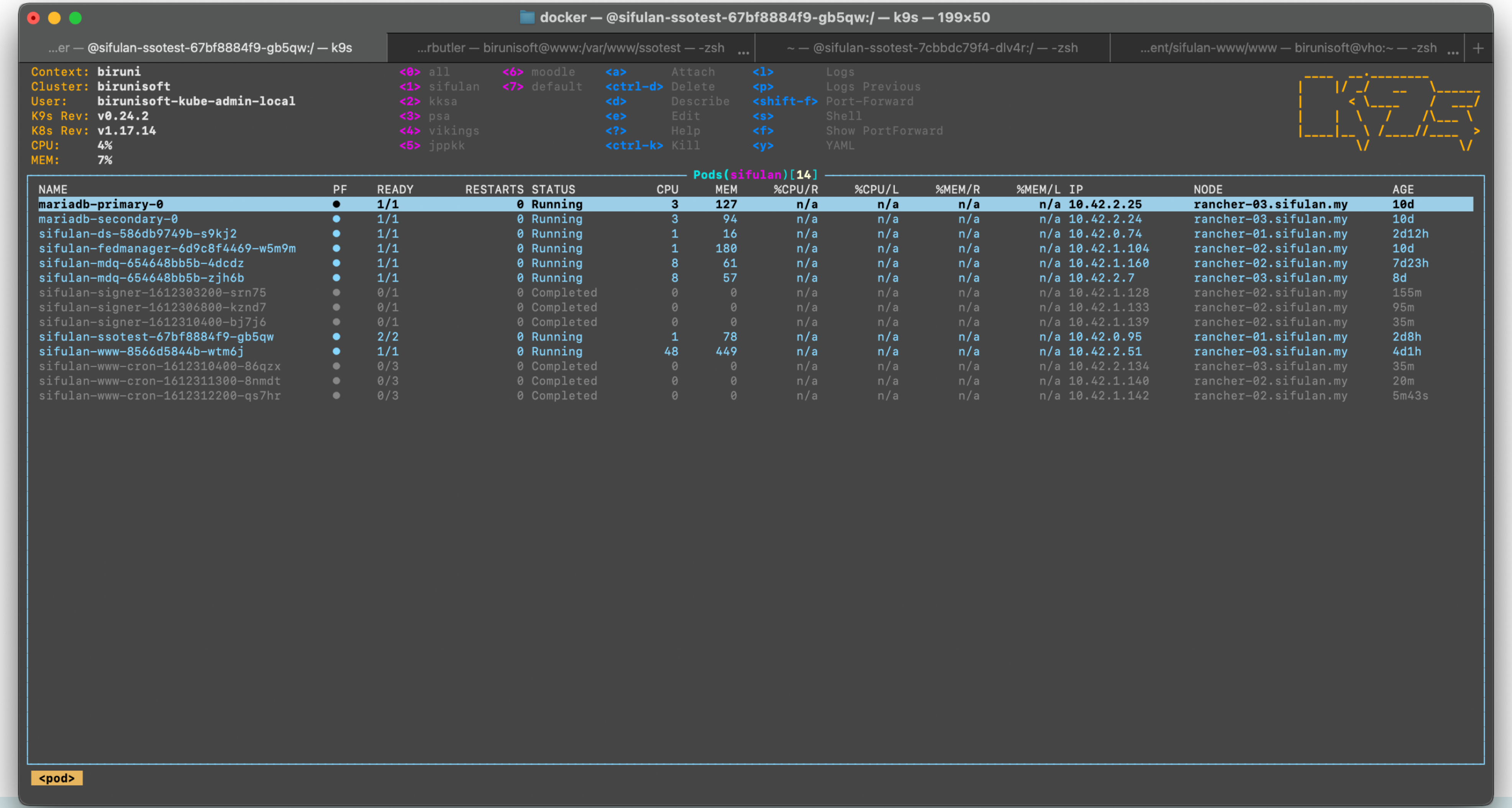
Migrating Federation Services from VM to Containers: SIFULAN Experience (cont.)

- After:
  - We use Rancher Kubernetes Engine (RKE) and Docker
  - Federation manager, metadata repository, and discovery service/WAYF are running on a dedicated container.
  - This separation allows each service to scale-out according to their need without affecting other service.
  - Metadata signer is running on a dedicated container. However, the digital certificates are stored as a Secrets object instead inside the HSM.
  - Other Aux services are running on its own container.

Migrating Federation Services from VM to Containers: SIFULAN Experience (cont.)

- After:
  - Each organization who would like to subscribe IdP as a service, can have their own Namespace, and each service (e.g. Shibboleth IdP, OpenLDAP) run individually in a container.
  - Each container image was created as generic as possible so that it can be reusable by other federation/interested party
  - All specific configurations are stored as ConfigMAP object.

Migrating Federation Services from VM to Containers: SIFULAN Experience (cont.)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mariadb-secondary-0                  ●    1/1             0 Running        3     94     n/a     n/a     n/a     n/a 10.42.2.24     rancher-03.sifulan.my 10d
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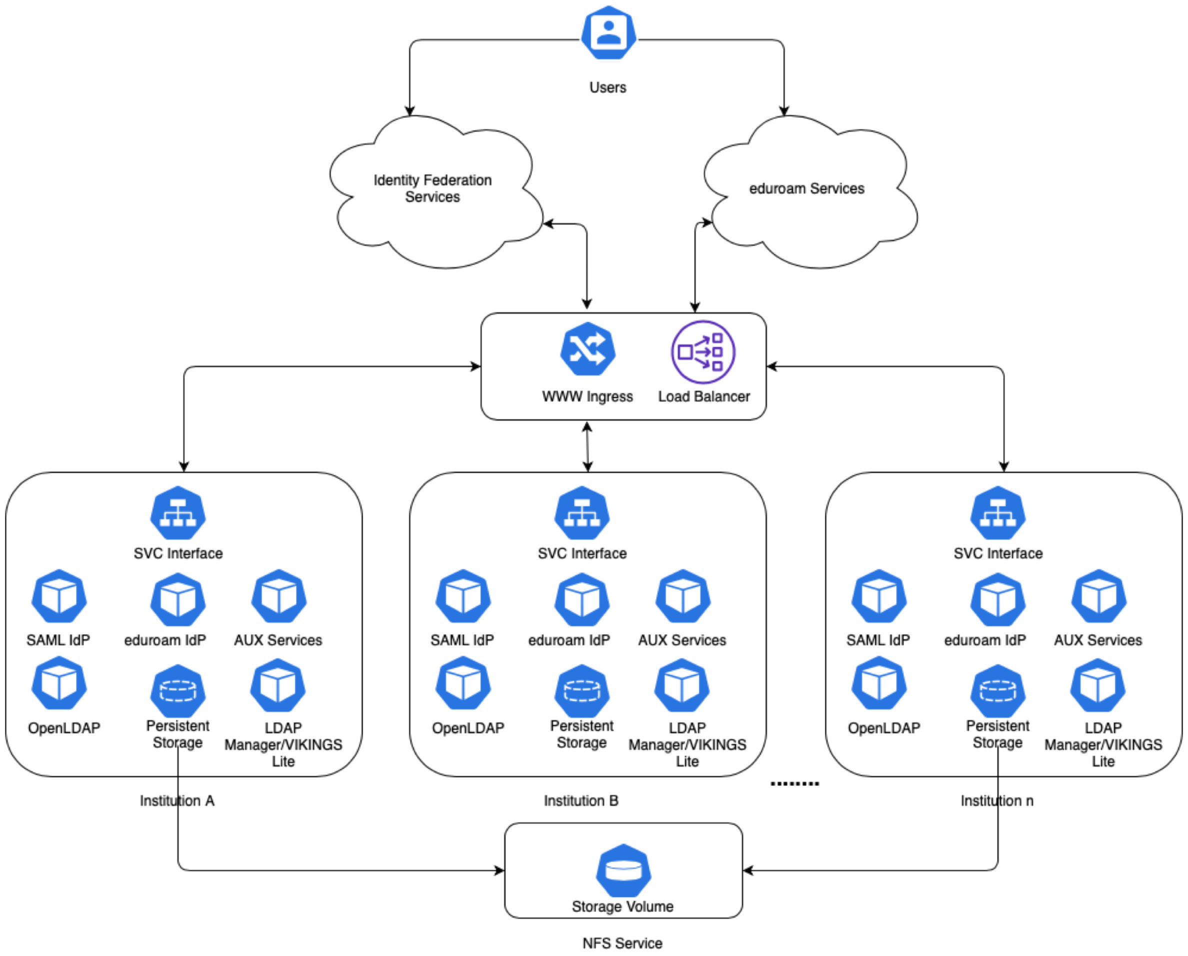
Possible IDMS-as-a-Service Implementation with K8s



شكراً جزيلاً
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kam sah hamnida
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merci