

# Tungsten Fabric

CNI Use-Case -- Free5GC deployment

# Akraino ICN Private LTE/5G Blueprint

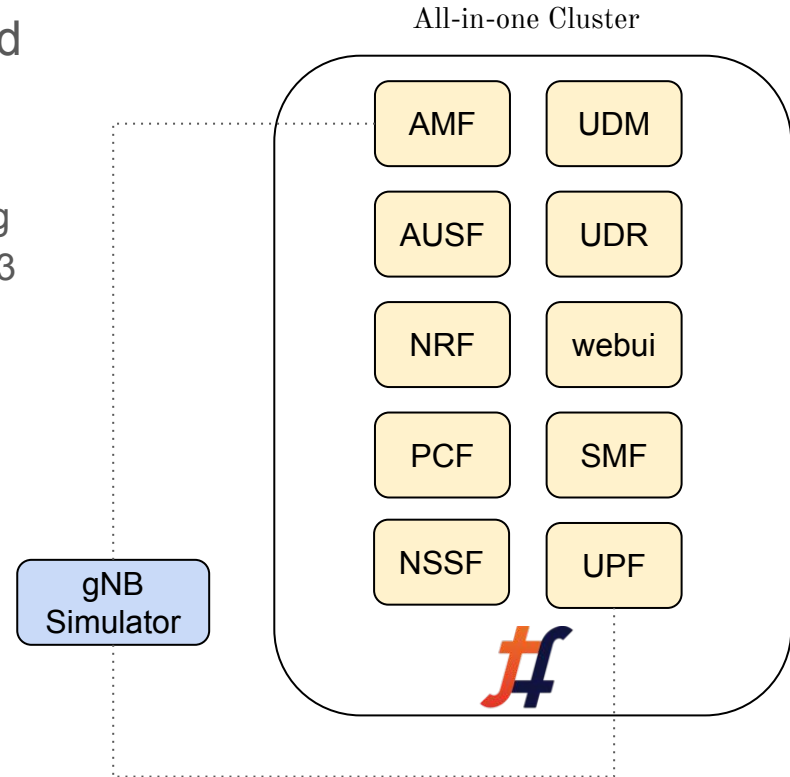
- Community Participation representing Tungsten Fabric
  - Juniper - Sukhdev Kapur, Qasim Arham
  - ATS/Aarna - Prabhjot Singh Sethi
  
- Intent - propose and support Blueprint needs with TF as CNI provider
  - Multiple network support using single CNI

# Tungsten Fabric - Installation

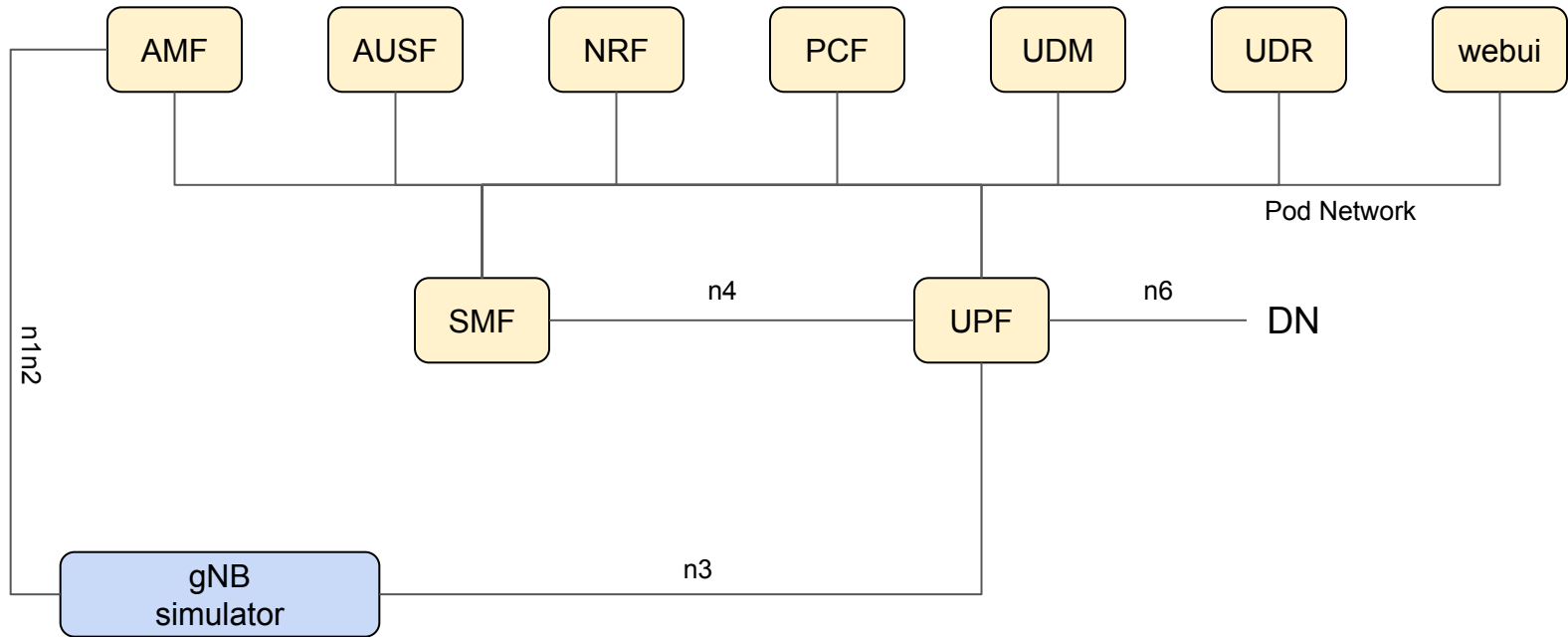
- Single node all-in-one setup installation
- Work with linux kernel version 5.0+
- Operator based installation was not yet available upstream while this work started
- Ansible deployer
- Constraints added as per TF support --- use Ubuntu OS
  - Dynamic building of kernel module is only supported with Ubuntu
  - Only Supports upto Kubernetes version 1.18

# Free5GC deployment - single node

- All-in-one packed application installed
  - Rollout as a single helm chart
- Connecting to gNodeB
  - External Entity should be connected using provider Network for Network n1n2 and n3



# Network Topology



# Bugs Observed

- Secondary Network support with Tungsten Fabric does not work while running with Multus enabled
  - Work around disable multus (but means no support for SRIOV CNI as well)
- Pod stuck in containercreating state
  - Kube-Manager expects strict order dependency with network create and pod creation
  - Work around create networks as a separate process/helm chart before rolling out the application itself

# Missing Functionality -- 1

- TF does not support Service Discovery on secondary networks
  - Mostly unavailable other CNIs as well.
- TF does not support associating explicit IP Address with an interface

## Issue Observed

- Application cannot connect to each other over secondary networks

## Work Around

- Patched Kube-Manager to support associating explicit IP Address on secondary interfaces

# Static IP - Patch

```
annotations:
  k8s.v1.cni.cncf.io/networks: '[{
    "name": "n3",
    "namespace": "default",
    "interface": "net3",
    "ip": "192.168.10.20"
  },
  {
    "name": "n4",
    "namespace": "default",
    "interface": "net4",
    "ip": "172.16.30.30"
  },
  {
    "name": "n6",
    "namespace": "default",
    "interface": "net6",
    "ip": "172.16.31.30"
  }
  ]'
```

Kube Manager Patched to handle instruction to allocate explicit IP from a network

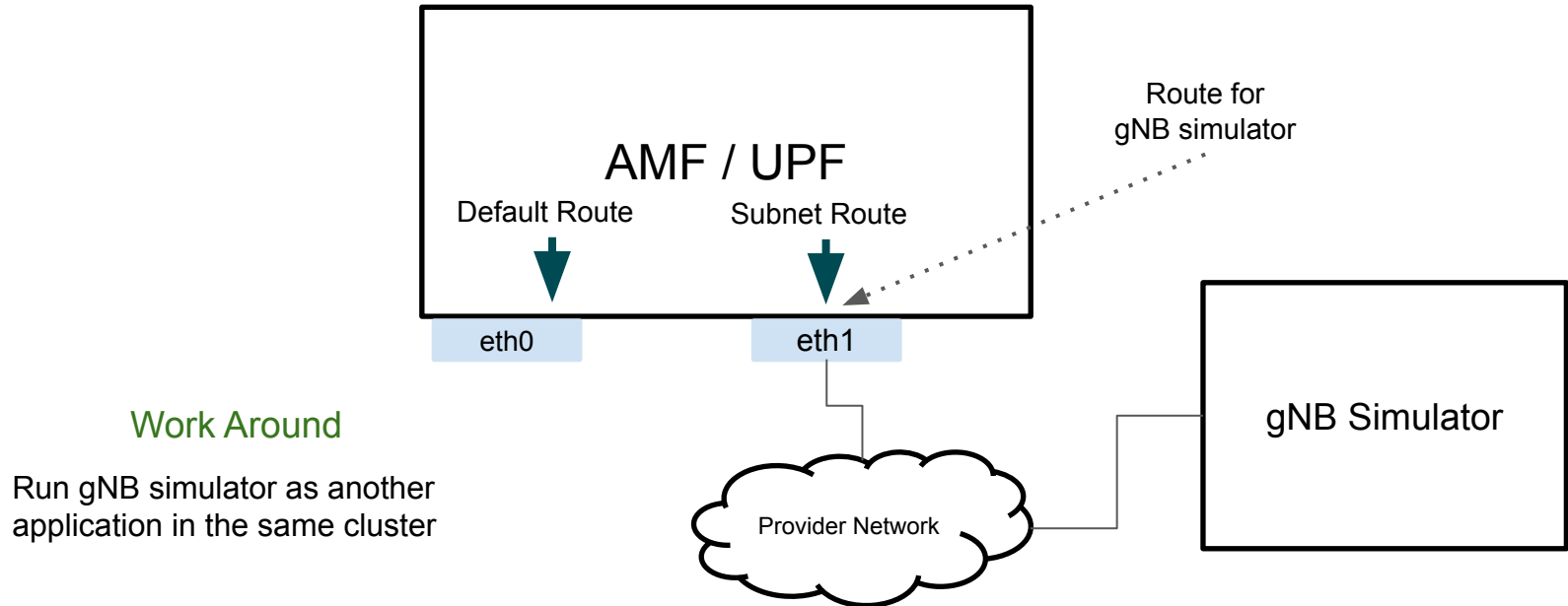
\* fails if ip is already in use

Alternatively do service discovery and load-balancing on secondary networks



## Missing Functionality -- 2

- TF does not support route propagation to container for secondary Networks



# Other CNI

```
apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: sriov-net1
  annotations:
    k8s.v1.cni.cncf.io/resourceName: intel.com/intel_sriov_netdevice
spec:
  config: '{
    "type": "sriov",
    "cniVersion": "0.3.1",
    "name": "sriov-network",
    "ipam": {
      "type": "host-local",
      "subnet": "10.56.217.0/24",
      "routes": [{
        "dst": "0.0.0.0/0"
      }],
      "gateway": "10.56.217.1"
    }
  }'
```

Specify routes to program

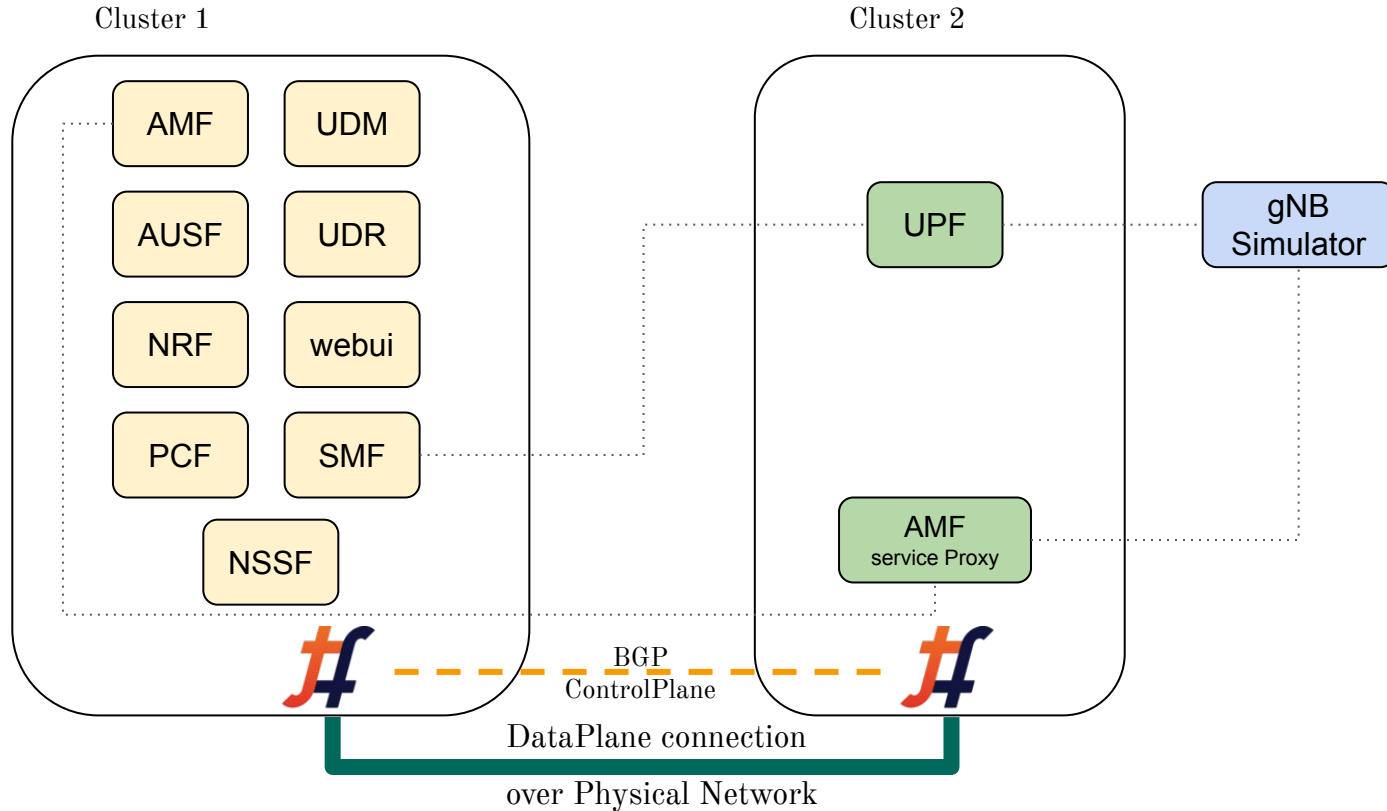


# Future Steps

# Action Items/Plan

- Someone from TF community need to support this effort further
  - Akraino blueprint team needs support and facing issues with automating the deployment of tungsten fabric
- Simplify deployment for interoperability
  - Operator Framework might be the future
- Patches needs to be contributed upstream or a relevant solution needs to be worked out
  - Work with PTL for relevant project/module
- Bugs Observed to be fixed
- Missing functionalities
  - Open for community discussion
- Ongoing support for future K8s versions

# Multi Cluster Deployment



# OnBoarding - Magma

- Work with kubevirt
  - AGW - monolith

Thank you