Anuket NFVI
Network Configuration Automation
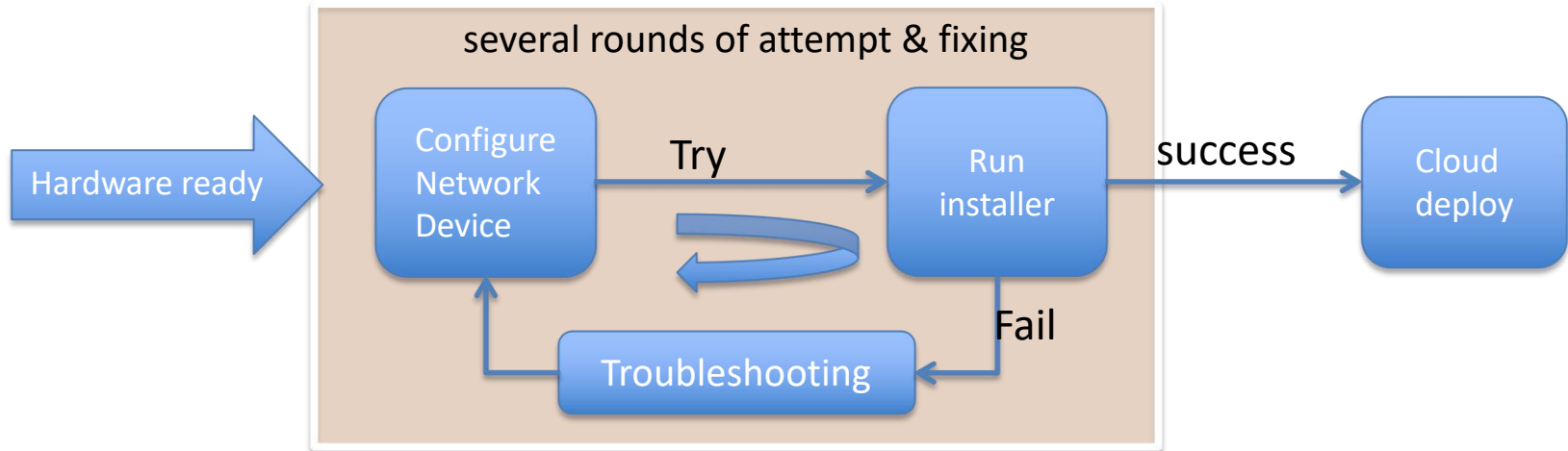
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Agenda

➢ Background

➢ Tool capability

➢ Benifits

➢ Ideas about How to Automate

➢ Proposal

Background

While are implementing automation to accelerate the construction of NFVi, although the auto-installer becomes mature, it's still takes weeks of time when it comes to the fresh deployment in real resource pool. One of the major issue we observed in CMCC CI/CD practice is, it takes up to 4 weeks to configure network devices and troubleshoot network issues, until all the requirement of deployment is satisfied, and auto-installer will then run successfully.

So, inorder to accelerate the deployment of NFVi, we need tools for network configuration automation.

several rounds of attempt & fixing

Hardware ready → Configure Network Device — Try → Run installer — success → Cloud deploy

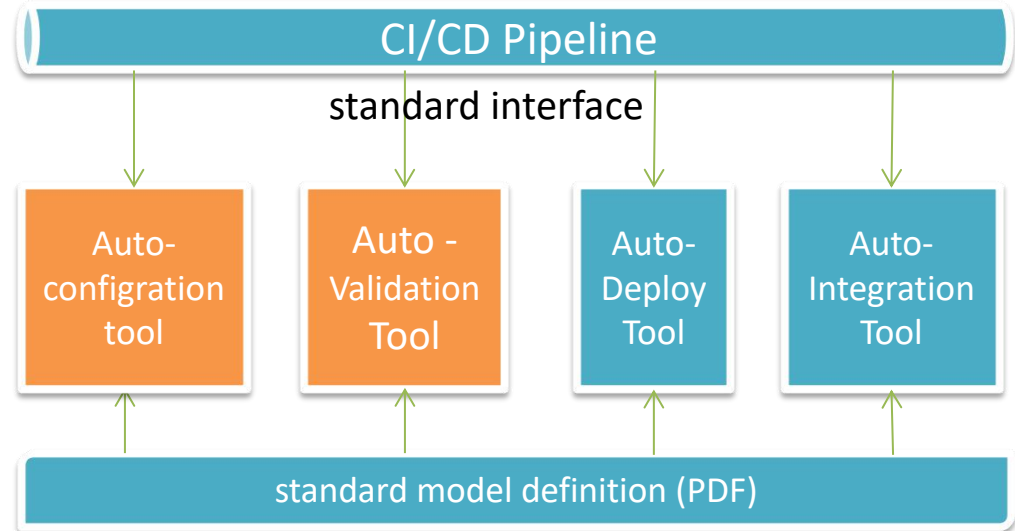Run installer — Fail → Troubleshooting → Configure Network Device

Tool capability

Network configuration automation tools could be integrated in CICD as part of configuration tool and validation tool.

Automatically configuring network device(TOR&EOR): for vendors or integrator without network configuration tool, or if vendor already have the ability to automated network configuration, we can choose which one to use in CI/CD

Automatically verify network configuration on TOR & EOR: network automation verification before installer actually deploy the cloud, will reduce the failure attempts

CI/CD Pipeline

standard interface

| Auto-configration tool | Auto - Validation Tool | Auto-Deploy Tool | Auto-Integration Tool |

standard model definition (PDF)

Benifits

Developing network configuration automation tools can bring a lot of benifits to the industry. We suggest develop this tool in CIRV project, it could be used as single tool, or integrated in CICD.

- Benifits to installer and CICD of cloud deploy:
    - Reduce effort and increase the accuracy of network configuration
    - Reduce effort cost by network trouble-shooting before running cloud installer
    - CICD will be more adaptive to vendors with or without automation ability.
   - CI/CD will work work more seemlessly

How to Automate

With the PDF 2.0 as data source, knowledge from NFVi network topology, TOR & EOR configuration requirement, we should be able to automate configuration and validation. Generally in below steps:

1. Design network planing table with VIM and storage vendor, including VLAN for each network plane, allocated IP range, node set for each VLAN ID.

2. With wiremap of each cable from the PDF, we would be able to trace the connected TOR/EOR port, then we will be able to get VLAN configurations for each port inTOR&EOR

3. Extract a list of rules from TOR&EOR configuration manual and NFV network topology and requirements.

4. Develop tools according to the resource info and configuration rules configuration and validation

Resource needed

Data and configuration rules are needed for developing auto-configuration and auto-verification tool
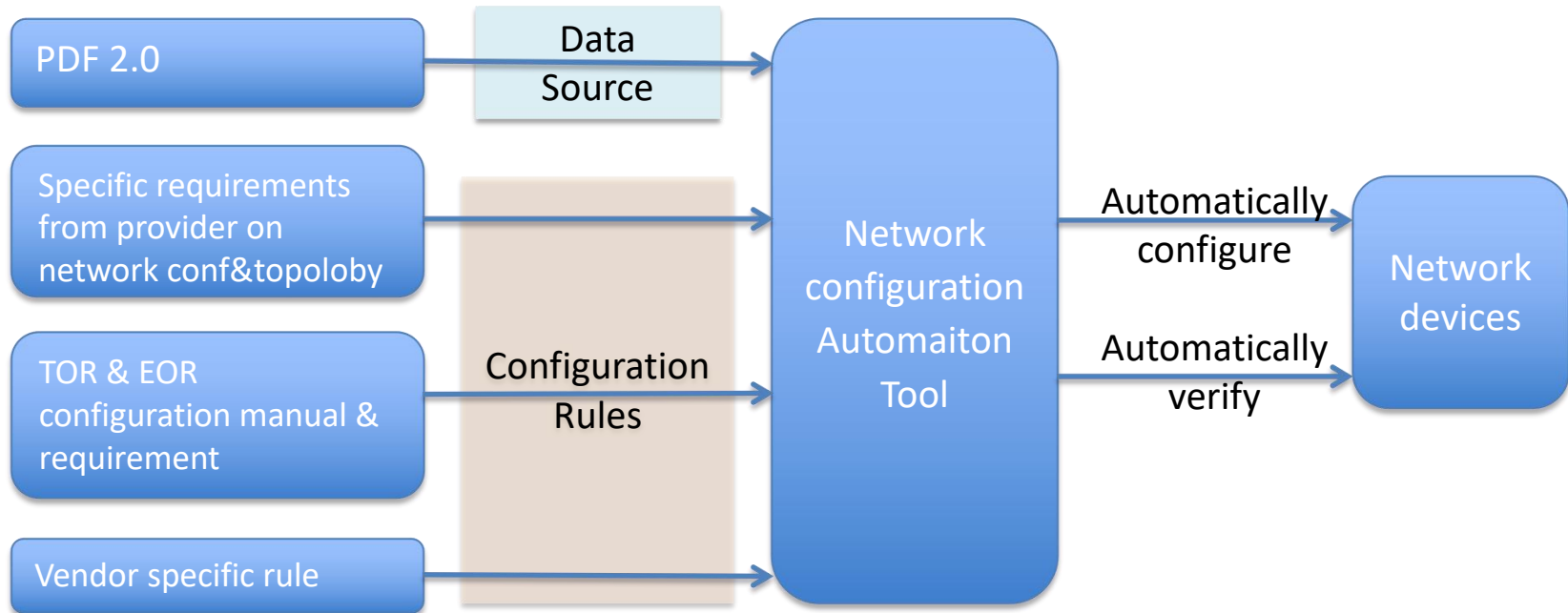
Resource needed

- PDF 2.0:
    - Descriptor is providing the network planning table, TOR & EOR configuration for each port; information for each network device

- Specific Requirement from provider:
    - Naming rule for network device;
    - NTP configuration requirement;
    - MC-LAG and trunk interface configuration requirement;
    - VPN configuration rule and naming rule;
    - Connection rules between server&TOR, TOR&TOR, TOR&EOR in Manage, compute, storage plane
    - Vlan planning rule

Resource needed

- TOR & EOR configuration requirements:
  - TOR&EOR working mode like whether to apply Master&backup mode or load-balance mode;
  - Port Type
  - trunk interface naming rule;
  - how to setup peer-link and hearbeat between TOR&TOR, EOR&EOR;
  - how to setup trunk interface between server-TOR, TOR-TOR, TOR-EOR, EOR-EOR;

- Vendor Specific Rules:
  - PVID setting
  - Vlan type
  - command template for switches of different vendor

The difficulties

Base on the current experience, network configurations are mostly done by half auto half human operation depending on the engineer's experience, the variety of the configuration rules brings the complexity, It's very difficult to have a high-level role who collect all the rules from all different vendor in different role, and some rules are very dependent on the compute service running on the infrasturcture, it's also unrealistic to define and unify the specific rules for different vendor, and unrealistic to make vendor specific rules transparent in the industry.

| Provider/User requirments | VIM requirements | Storage Requirements | Integrator experience |

Network configuration
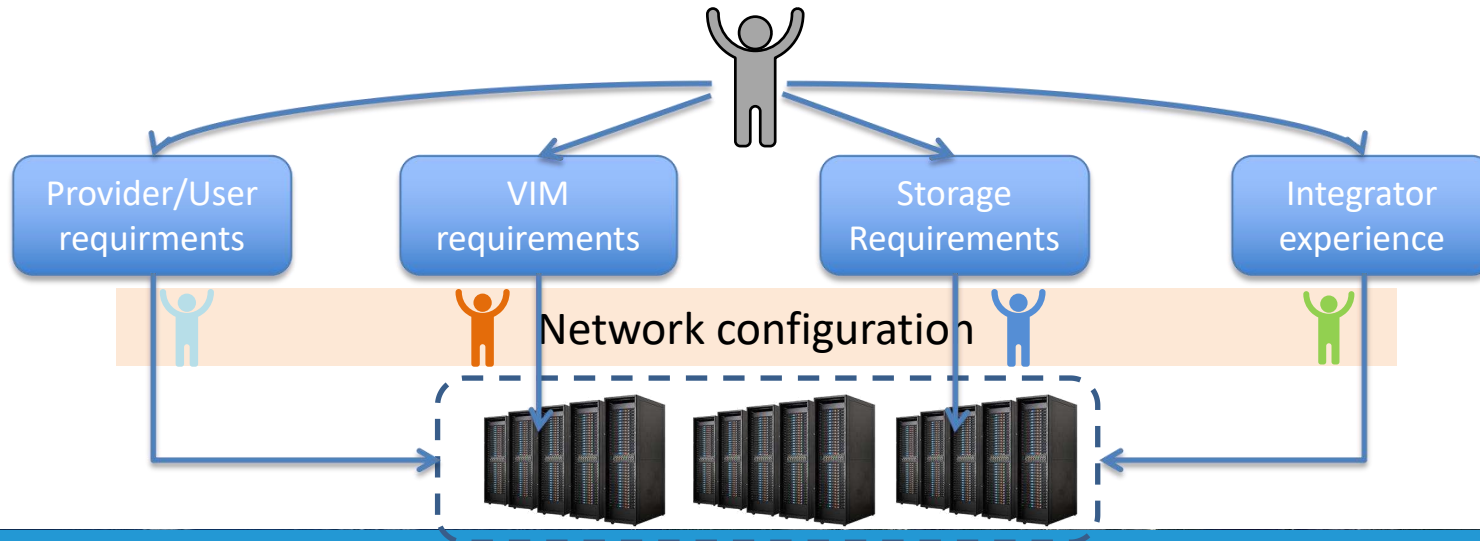
Proposal

In CMCC CI/CD practice, we see that the network automation tool is highly desired, we have a basic idea of how to do it, but the actual NFVi network topology and deployment could be more complex, and customized between different vendors.

So in order to accelerate NFVi deployment, we suggest add basic and common network configuration model as definition in RM,RA,RI,RC, so we can start design and devlop automaiton tool in the CIRV project according to the reference.

We are expecting the automation framework could be highly extensible, we just add different type of rules and the framework adapts it, so the tool can support very specific rules and adapt from small scale to large scale.

We also expecting people who interested in this topic will join us to define the reference and devlop the tool.

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