NSAC for datacenter using NETCONF
(Network System Automatic Control)

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Motivation

- Automatic management system for network system in a Data Center/Cloud
- Operator need to manage computer servers and network equipments
- We need to configure the system automatically to manage mega datacenter in low cost
- Evaluation of NETCONF product by AlaxalA network
  - AlaxalA provides Java API to use NETCONF
The management model in Data Center

System design → Spec decision → Configuration → Test → Operation → Expansion

Resource management
Network configuration

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What we did

- Defined VLAN datamodel by XML Schema
- Describe the system topology using XML
- Built database for topology, network resource, configuration, and scenario
- Implement GUI system to show a network system
  - Multi view GUI for each layer
- Defined a few scenario
  - Add/delete server
  - Add/delete VLAN
- Programming language: Java
- Assumption: all hardware is already mounted and installed in the datacenter. We can change the system resource by configuration.
Multi view
VLAN model (XML Schema)

```xml
<xsd:element name="tagged_vlan_domain" maxOccurs="unbounded">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element name="tagged_vlan_domain_id" type="xsd:string" />
      <xsd:element name="tagged_vlan" maxOccurs="4096">
        <xsd:complexType>
          <xsd:sequence>
            <xsd:element name="vlan_id">
              <xsd:simpleType>
                <xsd:restriction base="xsd:integer">
                  <xsd:minInclusive value="1" />
                  <xsd:maxInclusive value="4096" />
                </xsd:restriction>
              </xsd:simpleType>
            </xsd:element>
            <xsd:element name="vlan_name" type="xsd:string" />
            <xsd:element name="network_interface_list">
```
Network System Automatic Control (NSAC)
Add New Web Server

NSAC

Server Add

Add new Web Server

SI

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Automatic Resource assign

For the Service
- V-LAN ID
- IP address
  10.0.0.2

For the monitoring
- V-LAN ID
- IPアドレス
  11.0.0.2

NIC I/F
- Snsl2sw01:02 (for the service)
- Snsl2sw01:12 (for the monitoring)

- IP address (Service) request
- IP address (monitoring) request
- NIC I/F (Service) request
- NIC I/F (monitoring) request
Automatic configuration using NETCONF/OAN

For the Service
- V-LAN ID
- IP address 10.0.0.2

For the monitoring
- V-LAN ID
- IPアドレス 11.0.0.2

NIC I/F
- Snsl2sw01:02 (for the service)
- Snsl2sw01:12 (for the monitoring)
Prototype System

select layer of system

select operating scenario

view selected system each layer

view properties of equipment
Lessons learned

- It was important to decide use cases to implement NSAC.
  - To define datamodel
  - To design the databases

- Defining datamodel/meta-model is important for implementation of automatic management system.
  - AlaxaLA SW provided VLAN datamodel. NSAC used the datamodel. However, we defined our datamodel/meta-model for the system. Because for the system, we didn’t use all VLAN function, we needed to deal with relation other computer.
Lessons leaned (cont.)

- We had to consider system overview at the first, then designed the components for 4 levels
  - Protocol level (NETCONF)
  - Datamodel level
  - Implementation level
  - System level

- NSAC was for tight coupled system. The Internet is loose coupled system. Requirement for each system is very different.

  Tight  ←  Loose

  VLAN in datacenter  Wide area router network by BGP

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