Inline Action Capability for NETCONF

draft-zheng-netconf-inline-action-capability-02

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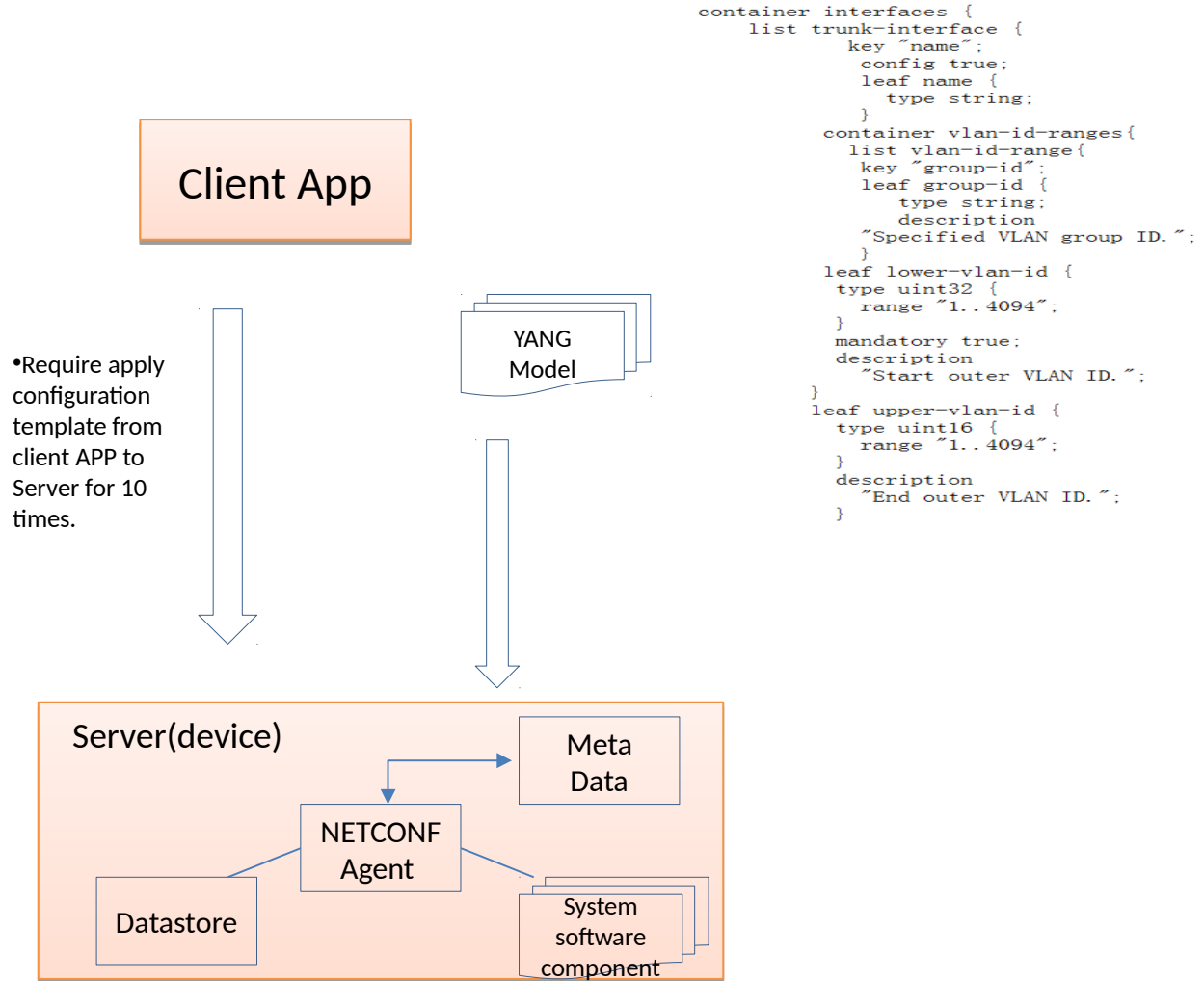zhengguangying@huawei.com

Recap

- Action is introduced in YANG 1.1 (RFC7950) after NETCONF 1.1(RFC6241) get published. NETCONF 1.1 doesn't define how action operation is handled.

- As specified in RFC8342 NMDA, Actions are always invoked in the context of the operational state datastore.

- In addition, as described in https://datatracker.ietf.org/meeting/100/materials/slides-100-netmod-sessa-07-post-lc-update-revised-datastores
  - In future(if required) the protocol and YANG can be extended to allow Actions/RPC to be targeted to other datastore than operational state datastore.
    - Indicate which datastore any parameter are evaluated against.

Use Case A : Action invoked on conventional configuration datastore

Configure 2 UserVLANTag range on trunk interface Ethernet0/0
UserVLANTag Range [1,5]
UserVLANTag Range [6,10]

Without consecutive range for VLAN tag, multiple data retrieval for vlan tag configuration on the interface may be required;

Using configuration template to replicate multiple copies on the same interface from the client to the server result in a significant amount of signaling traffic on a periodic basis or large size packet(edit-config operation related to protocol message).

Client App

•Require apply configuration template from client APP to Server for 10 times.

YANG Model

```
container interfaces {
    list trunk-interface {
        key "name";
        config true;
        leaf name {
            type string;
        }
    container vlan-id-ranges{
        list vlan-id-range{
            key "group-id";
            leaf group-id {
                type string;
                description
                "Specified VLAN group ID.";
            }
    leaf lower-vlan-id {
        type uint32 {
            range "1..4094";
        }
        mandatory true;
        description
        "Start outer VLAN ID.";
    }
    leaf upper-vlan-id {
        type uint16 {
            range "1..4094";
        }
        description
        "End outer VLAN ID.";
    }
```

Server(device)

Meta Data

NETCONF Agent

Datastore

System software component

Inline Action operation definition

- edit-config: create
- edit-config: delete
- Edit-config: merge
- Edit-config: replace
- Edit-config: remove
- Edit-config: record-merge
- Edit-data: record-merge

get-config: record-merge
get-data: record-merge

‹running›
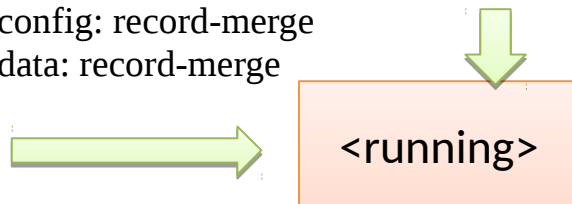
- Define the :inline-action capability indicates that the device supports Inline-action operation within protocol operation on specific datastore.

- Modifies the protocol operation such as ‹edit-config› ‹edit- data› to accept the ‹record-merge› and ‹record-split› attribute value within operation attribute.
  - **Record-split:** The range constraint of the configuration data identified by the element containing this attribute is split at the corresponding level in the configuration datastore identified by the ‹target› parameter.
  - **Record-merge:** The range constrait of the configuration data identified by the element containing this attribute is merged at the corresponding level in the configuration datastore identified by the ‹target› parameter.

Proposed Solution: Bulk Operation for record merge

Case A. configure trunk interface with multiple discrete vlan tag ranges w/o inline action support

```
<rpc message-id="101"
      xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
        <edit-config>
          <target>
            <running/>
          </target>
          <default-operation>none</default-operation>
          <config xmlns:xc="urn:ietf:params:xml:ns:netconf:base:1.1">
            <top xmlns="http://example.com/schema/1.2/config">
              <interfaces>
                <interface>
                  <name>Ethernet0/0</name>
                  <vlan-id-ranges>
                    <vlan-id-range xc:operation="delete">
                      <group-id>0</group-id>
                      <lower-vlan-id>1</lower-vlan-id>
                      <upper-vlan-id>3</upper-vlan-id>
                    </vlan-id-range>
                    <vlan-id-range xc:operation="delete">
                      <group-id>2</group-id>
                      <lower-vlan-id>5</lower-vlan-id>
                      <upper-vlan-id>6</upper-vlan-id>
                    </vlan-id-range>
                    <vlan-id-range xc:operation="delete">
                      <group-id>3</group-id>
                      <lower-vlan-id>7</lower-vlan-id>
                      <upper-vlan-id>8</upper-vlan-id>
                    </vlan-id-range>
                    <vlan-id-range xc:operation="delete">
                      <group-id>4</group-id>
                      <lower-vlan-id>9</lower-vlan-id>
                      <upper-vlan-id>10</upper-vlan-id>
                    </vlan-id-range>
                    <vlan-id-range xc:operation="create">
                      <group-id>0</group-id>
                      <lower-vlan-id>1</lower-vlan-id>
                      <upper-vlan-id>10</upper-vlan-id>
                    </vlan-id-range>
                  </vlan-id-ranges>
                </interface>
              </interfaces>
            </top>
          </config>
        </edit-config>
</rpc>
```

Case B. configure trunk interface with multiple discrete vlan tag ranges from the running configuration with Inline-action

```
<rpc message-id="101"
      xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
        <edit-config>
          <target>
            <running/>
          </target>
          <default-operation>none</default-operation>
          <config xmlns:xc="urn:ietf:params:xml:ns:netconf:base:1.1">
            <top xmlns="http://example.com/schema/1.2/config">
              <interfaces>
                <interface xc:operation="record-merge">
                  <name>Ethernet0/0</name>
                  <vlan-id-ranges>
                    <vlan-id-range>
                      <action xmlns="http://example.com/schema/1.2/config">
                        <range-merge>
                          <input>
                            <lower-vlan-id>1</lower-vlan-id>
                            <upper-vlan-id>10</upper-vlan-id>
                          </input>
                        </range-merge>
                      </action>
                    </vlan-id-range>
                  <vlan-id-ranges>
                </interface>
              </interfaces>
            </top>
          </config>
        </edit-config>
</rpc>
```

Record merge operation: Merge multiple interface records with different VLAN Range into one record.
Merging allow more efficient Query operation.

Configuration applying difference:

Case A: The configuration template is used at the client side(more calculation is required for record merge)
Case B: configuration template is used at the server(device) side

Proposed Solution: Bulk Operation for record split

A. delete one vlan tag 6 from this trunk interface with vlan range [1,10] w/o inline action support

```xml
<rpc message-id="102"
     xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
        <edit-config>
            <target>
                <running/>
            </target>
            <default-operation>none</default-operation>
            <config xmlns:xc="urn:ietf:params:xml:ns:netconf:base:1.1">
                <top xmlns="http://example.com/schema/1.2/config">
                    <interfaces>
                        <interface>
                            <name>Ethernet0/0</name>
                            <vlan-id-ranges>
                                <vlan-id-range xc:operation="delete">
                                    <group-id>0</group-id>
                                    <lower-vlan-id>4</lower-vlan-id>
                                    <upper-vlan-id>4</upper-vlan-id>
                                </vlan-id-range>
                                <vlan-id-range xc:operation="create">
                                    <group-id>0</group-id>
                                    <lower-vlan-id>1</lower-vlan-id>
                                    <upper-vlan-id>3</upper-vlan-id>
                                </vlan-id-range>
                                <vlan-id-range xc:operation="create">
                                    <group-id>1</group-id>
                                    <lower-vlan-id>4</lower-vlan-id>
                                    <upper-vlan-id>10</upper-vlan-id>
                                </vlan-id-range>
                            </vlan-id-ranges>
                        </interface>
                    </interfaces>
                </top>
            </config>
        </edit-config>
</rpc>
```

B. delete one vlan tag 6 from this trunk interface with vlan range [1,10] w/ inline action support

```xml
<rpc message-id="101"
     xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
        <edit-config>
            <target>
                <running/>
            </target>
            <default-operation>none</default-operation>
            <config xmlns:xc="urn:ietf:params:xml:ns:netconf:base:1.1">
                <top xmlns="http://example.com/schema/1.2/config">
                    <interfaces>
                        <interface xc:operation="record-merge">
                            <name>Ethernet0/0</name>
                            <vlan-id-ranges>
                                <vlan-id-range>
                                    <lower-vlan-id>1</lower-vlan-id>
                                    <upper-vlan-id>10</upper-vlan-id>
                                    <action xmlns="http://example.com/schema/1.2/config">
                                    <range-split>
                                    <input>
                                        <lower-vlan-id>4</lower-vlan-id>
                                        <upper-vlan-id>4</upper-vlan-id>
                                    </input>
                                    </range-split>
                                    </action>
                                </vlan-id-range>
                            </vlan-id-ranges>
                        </interface>
                    </interfaces>
                </top>
            </config>
        </edit-config>
</rpc>
```

- By introduce record split operation, it can split one record with a VLAN range into multiple interface records with different VLAN Range.

Next Step

- Do we agree the problem space?
- More comments and suggestions are welcome.