

With **System** Capability for NETCONF

draft-ma-netconf-with-system-01

Feng Chong(frank.fengchong@huawei.com)

Qiufang Ma(maqiufang1@huawei.com) **Presenter**

Motivation and Goal

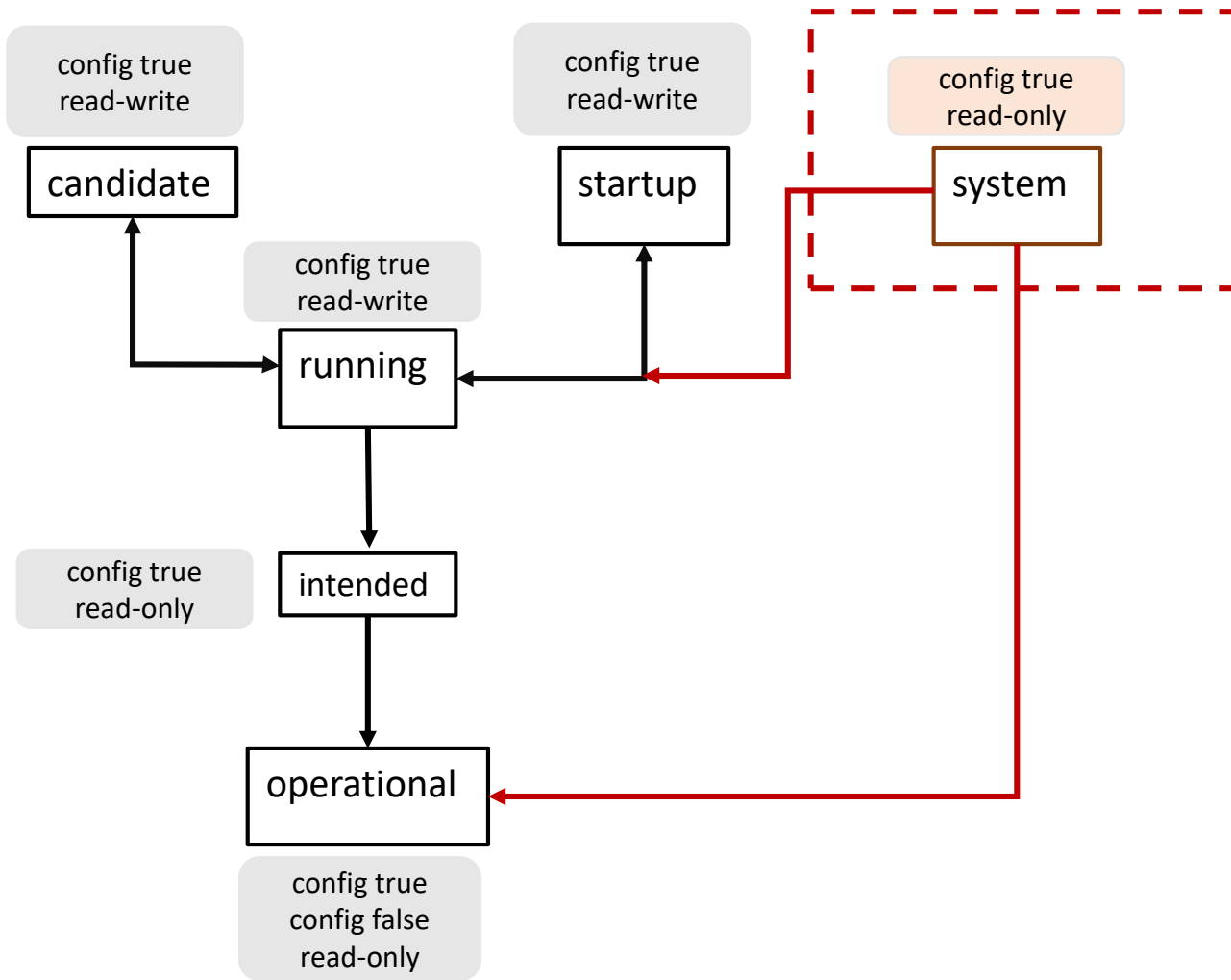
- Motivation

- Default data handling including Data Retrieval and Create/Delete Operation has been well specified in RFC6243;
- Before NMDA (RFC8342) is introduced, System configuration data can be located anywhere in the device, there is no standard behavior for system data handling;
- After NMDA is introduced, system configuration is defined by RFC8342 and has been moved to <operational>. When referencing system configured data item (e.g., A leafref B, or system configured data item in the when/must statement) in the <operational>, the duplicated system configured data item need to be retrieved (e.g., using origin-filter with value or:system)from <operational> and overridden by the client (i.e., copy the data from <operational> and put it into the <running>);
 - Weak reference (set “require-instance” as false and ignore the referenced data) has its limitation
 - When system configuration gets updated, there is no standard mechanism to synchronize the data into <running> and the client can not detect the update automatically.

- Goal:

- Define system configuration data handling including Data Retrieval and Create/Delete Operation

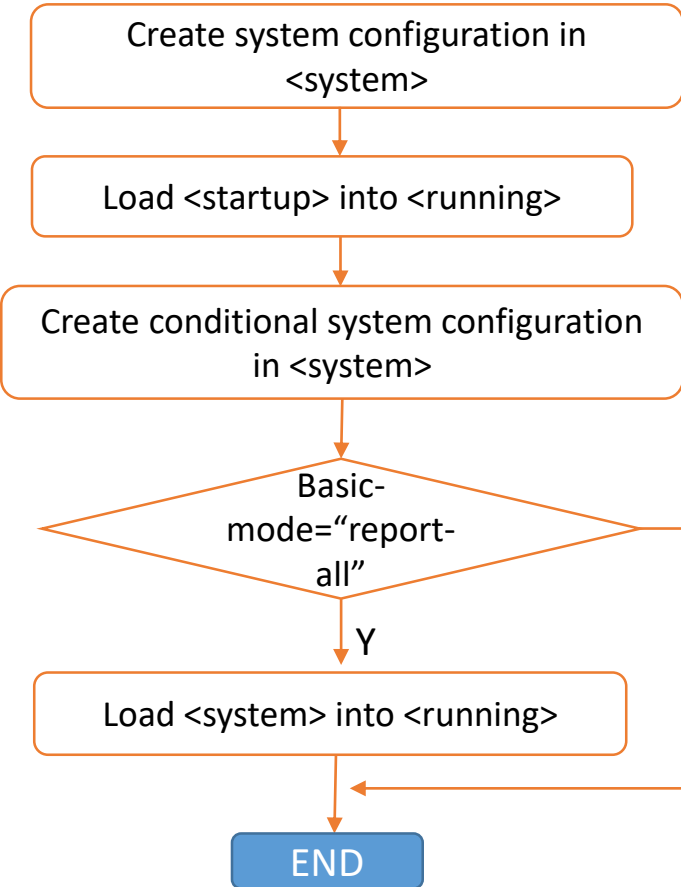
Solution Overview



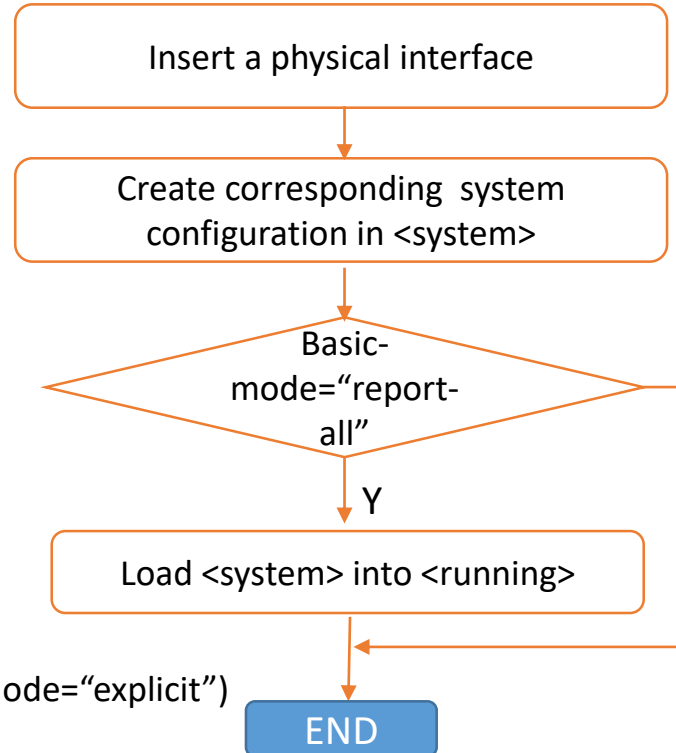
- A new datastore named 'system' is introduced.
 - It doesn't persist across reboots. At boot time, the device generates system configuration in <system>
 - The <running> datastore is automatically synced up with <system> in "report-all" basic mode
 - e.g., the system configuration is automatically loaded into <running> when the device is powered on or the physical resource is present.
 - e.g., when the system configuration is updated, it will be synced up into <running>
 - A server using "explicit" basic mode will not update <running> with <system> automatically
- In addition, two data handling behaviors is defined
 - data retrieval operation
 - create/delete operation

system configurations synchronization between system and running datastore

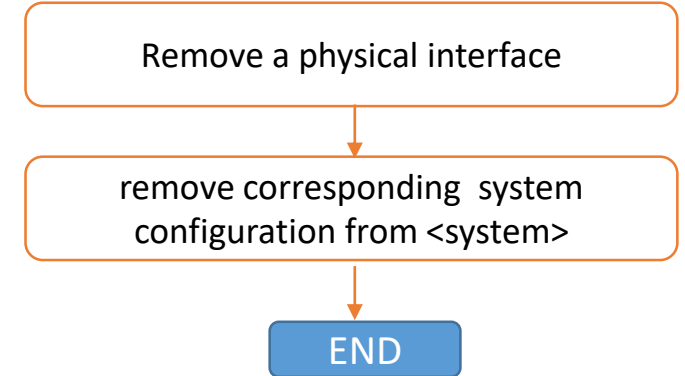
Initialization during reboot



Insert a physical resource



Remove a physical resource



N (i.e, basic-mode="explicit")

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Data Retrieval Usage Example

Example configuration data snippet

```
<data
xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <interfaces
xmlns="http://example.com/ns/interfaces">
    <interface>
      <name>lo0</name>
      <ip-address>127.0.0.1</ip-address>
      <ip-address>::1</ip-address>
    </interface>
    <interface>
      <name>lo1</name>
      <description>loopback</description>
      <ip-address>127.0.0.1</ip-address>
      <ip-address>::2</ip-address>
    </interface>
    <interface>
      <name>lo2</name>
      <description>loopback</description>
      <ip-address>127.0.0.1</ip-address>
      <ip-address>::3</ip-address>
    </interface>
    <interface>
      <name>lo3</name>
      <ip-address>127.0.0.1</ip-address>
      <ip-address>::1</ip-address>
    </interface>
  </interfaces>
</data>
```

set by the server

set by the client

set by the client

- All the interface configuration data snippets including system configuration are shown in the left
- Below is XML responses to the <get> operation with different with-system parameters
- In this example, the server's basic mode is "report-all"

XML response to the <get> operation with different with-system parameters

With-system parameter is **report-all**

```
<rpc-reply message-id="101"
xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <data>
    <interfaces xmlns="http://example.com/ns/interfaces">
      <interface>
        <name>lo0</name>
        <ip-address>127.0.0.1</ip-address>
        <ip-address>::1</ip-address>
      </interface>
      <interface>
        <name>lo1</name>
        <description>loopback</description>
        <ip-address>127.0.0.1</ip-address>
        <ip-address>::2</ip-address>
      </interface>
      <interface>
        <name>lo2</name>
        <description>loopback</description>
        <ip-address>127.0.0.1</ip-address>
        <ip-address>::3</ip-address>
      </interface>
      <interface>
        <name>lo3</name>
        <ip-address>127.0.0.1</ip-address>
        <ip-address>::1</ip-address>
      </interface>
    </interfaces>
  </data>
</rpc-reply>
```

With-system parameter is **explicit**

```
<rpc-reply message-id="101"
xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <data>
    <interfaces xmlns="http://example.com/ns/interfaces">
      <interface>
        <name>lo0</name>
        <ip-address>::1</ip-address>
      </interface>
      <interface>
        <name>lo1</name>
        <description>loopback</description>
        <ip-address>::2</ip-address>
      </interface>
      <interface>
        <name>lo2</name>
        <description>loopback</description>
        <ip-address>::3</ip-address>
      </interface>
    </interfaces>
  </data>
</rpc-reply>
```

With-system parameter is **trim**

```
<rpc-reply message-id="101"
xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <data>
    <interfaces xmlns="http://example.com/ns/interfaces">
      <interface>
        <name>lo1</name>
        <description>loopback</description>
        <ip-address>::2</ip-address>
      </interface>
      <interface>
        <name>lo2</name>
        <description>loopback</description>
        <ip-address>::3</ip-address>
      </interface>
    </interfaces>
  </data>
</rpc-reply>
```

Create and delete operations behavior definition

Basic mode	create and delete operations towards <running>
report-all	Precondition: for a data node that is loaded from <system> automatically <ul style="list-style-type: none">➤ A valid 'create' operation attribute must fail with a 'data-exists' error-tag;➤ A valid 'delete' operation attribute must succeed;
Explicit	Precondition: for a system configuration data node that is not explicitly set by the client <ul style="list-style-type: none">➤ A valid 'create' operation attribute must succeed;➤ A valid 'delete' operation attribute must fail. A valid 'delete' operation attribute for a data node explicitly set by the client must succeed;

- Report-all
 - Update <running> with <system> automatically
- Explicit
 - Any <system> update will not be loaded into <running> automatically

Follow up

- One of the open issues in draft-netconf-trust-anchors:
 - For some built-in trust anchors, they must first be copied into <running> in order for being referenced.
 - Key values of with-system capability for NETCONF
 - Helping avoid synchronizing into <running> manually (e.g., retrieve from <operational> firstly, and then copy into <running>) when referencing system configuration
 - Proposing a standard system configuration data handling behavior
- Address comments raised in the meeting.
- Collect more suggestions and comments.
- Contributions/coauthors are welcome! 😊