

NETCONF Working Group
Internet-Draft
Intended status: Standards Track
Expires: January 2, 2019

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July 1, 2018

Inline Action Capability for NETCONF
draft-zheng-netconf-inline-action-capability-01

Abstract

This document defines capability based extension to NETCONF protocol that enables modification of <edit-config> operation and <edit-data> operation to accept action parameters and attributes and allows multiple sub-operations with inline action operation that apply to either different or the same conceptual node in the underlying data model in one transaction.

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1. Introduction

YANG 1.1 define the syntax and semantics of version 1.1 of the YANG language, which can be used to model configuration data, state data, Remote Procedure Calls, and notifications for network management protocols. One key Difference from YANG 1.0, is a new statement "action", is added to YANG 1.1 to define operations connected to a specific container or list data node in a datastore. However which data node is applied to which configuration datastore is not specified under "action".

The <edit-data> operation defined in [I-D.ietf-netconf-nmda-netconf] and the <edit-config> operation defined in [RFC6241], are used to changes the contents of a writable Datastore. Containers and List entries can be created, deleted, replaced, and modified through <edit-config> by using the "operation" attribute in the container's and List's XML element. However the action is not part of <config> element in either <edit- data> operation or <edit-config> operation. Therefore the action operation and <edit-data> operation or <edit-config> operation connected to the same data node can not automatically handled in sequence in one transaction.

This document defines capability based extension to NETCONF protocol that enables modification of <edit-config> operation and <edit-data> operation to accept action parameters and allows multiple sub-operations with inline action operation that apply to different or same conceptual node in the underlying data model in one transaction.

1.1. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

2. Inline-Action Capability

2.1. Description

The `:inline-action` capability indicates that the device supports Inline-action operation within `<edit-config>` and `<edit-data>` operation on writable configuration datastore. In other words, the device supports `<inline-action>` operation is included in `<edit-config>` and `<edit-data>` operations.

2.2. Dependencies

None.

2.3. Capability Identifier

The `:inline-action` capability is identified by the following capability string:

```
urn:ietf:params:netconf:capability:inline-action:1.1
```

2.4. New Operations

None.

2.5. Modifications to Existing Operations

2.5.1. `<edit-config>` and `<edit-data>`

The `:inline-action:1.1` capability modifies the `<edit-config>` `<edit-data>` operation to accept the `<action>` parameter and `<action>` attribute value within operation attribute.

As described in [RFC6241], "operation" attribute is defined in a element within `<config>` subtree and identify the point in the configuration to perform the operation and MAY appear on multiple elements throughout the `<config>` subtree. In this document, a new "operation" attribute value is added as follows:

`inline-action`: The configuration data identified by the element containing this attribute is accompanied with action operation applied to a subset of configuration within `<config>` subtree before edit operation is applied to the same configuration at the corresponding level in the configuration datastore identified by the `<target>` parameter.

In addition, the `inline-action` operation attribute and other "operation" attributes can apply to the same conceptual nodes in the underlying data model. The assumption is the `inline-action` operation attribute and other "operation" attributes applied to the same conceptual nodes will not cause unexpected operation results.

As described in [RFC6241], the config subtree is expressed as a hierarchy of configuration data as defined by one of the device's data models. The contents MUST follow the constraints of that data model, as defined by its capability definition. If inline action capability is supported, the config subtree may contain a schema node with the name "input" and a schema node with the name "output" connected to a specific container or list data node containing action element in a datastore.

Example:

```
container interfaces {
  list interface {
    key "name";
    config true;

    leaf name {
      type string;
    }

    leaf mtu {
      type uint32;
    }
  }
  action ifstatenable {
    input {
      leaf enable {
        type boolean;
        mandatory true;
      }
    }
  }
}
```

Enable ifstatistics on 1000 interfaces from the running configuration before setting the MTU to 1500 on an interface named "Ethernet0/0"

and 1000 on an interface named "Ethernet0/1" in the running configuration:

```
<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="merge">
            <name>Ethernet0/0</name>
            <mtu>1500</mtu>
          </interface>
          <interface>
            <name>Ethernet0/1</name>
            <mtu>1000</mtu>
          </interface>
          <action xmlns="http://example.com/schema/1.2/config">
            <ifstatenable xc:operation="action">
              <input>
                <enable>true</enable>
              </input>
            </ifstatenable>
          </action>
        </interfaces>
      </top>
    </config>
  </edit-config>
</rpc>

<rpc-reply message-id="101"
  xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
  <ok/>
</rpc-reply>
```

3. Security Considerations

This document does not introduce any security vulnerability besides on defined in [RFC6241].

4. IANA Considerations

4.1. NETCONF Capability URN

IANA has created and now maintains a registry "Network Configuration Protocol (NETCONF) Capability URNs" that allocates NETCONF capability identifiers. Additions to the registry require IETF Standards Action.

IANA has added the following capabilities to the registry:

```
Index
  Capability Identifier
-----
:inline-action:1.1
  urn:ietf:params:netconf:capability:inline-action:1.1
```

5. Normative References

- [I-D.ietf-netconf-nmda-netconf]
Bjorklund, M., Schoenwaelder, J., Shafer, P., Watsen, K., and R. Wilton, "NETCONF Extensions to Support the Network Management Datastore Architecture", draft-ietf-netconf-nmda-netconf-06 (work in progress), May 2018.
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- [RFC6020] Bjorklund, M., Ed., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", RFC 6020, DOI 10.17487/RFC6020, October 2010, <<https://www.rfc-editor.org/info/rfc6020>>.
- [RFC6021] Schoenwaelder, J., Ed., "Common YANG Data Types", RFC 6021, DOI 10.17487/RFC6021, October 2010, <<https://www.rfc-editor.org/info/rfc6021>>.
- [RFC6241] Enns, R., Ed., Bjorklund, M., Ed., Schoenwaelder, J., Ed., and A. Bierman, Ed., "Network Configuration Protocol (NETCONF)", RFC 6241, DOI 10.17487/RFC6241, June 2011, <<https://www.rfc-editor.org/info/rfc6241>>.
- [RFC6242] Wasserman, M., "Using the NETCONF Protocol over Secure Shell (SSH)", RFC 6242, DOI 10.17487/RFC6242, June 2011, <<https://www.rfc-editor.org/info/rfc6242>>.

[RFC6470] Bierman, A., "Network Configuration Protocol (NETCONF) Base Notifications", RFC 6470, DOI 10.17487/RFC6470, February 2012, <<https://www.rfc-editor.org/info/rfc6470>>.

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