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Network Configuration Protocol Base Notifications  
draft-ietf-netconf-system-notifications-04

## [Abstract](#)

The NETCONF protocol provides mechanisms to manipulate configuration datastores. However, client applications often need to be aware of common events such as a change in NETCONF server capabilities, that may impact management applications. Standard mechanisms are needed to support the monitoring of the base system events within the NETCONF server. This document defines a YANG module that allows a NETCONF client to receive notifications for some common system events.

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## [Table of Contents](#)

\*1. [Introduction](#)

- \*1.1. [Terminology](#)
- \*2. [YANG Module for NETCONF Base Notifications](#)
- \*2.1. [Overview](#)
- \*2.1.1. [Notifications](#)
- \*2.2. [Definitions](#)
- \*3. [IANA Considerations](#)
- \*4. [Security Considerations](#)
- \*5. [Acknowledgements](#)
- \*6. [References](#)
- \*Appendix A. [Change Log](#)
- \*Appendix A.1. [03-04](#)
- \*Appendix A.2. [02-03](#)
- \*Appendix A.3. [01-02](#)
- \*Appendix A.4. [00-01](#)
- \*Appendix A.5. [00](#)
- \*[Author's Address](#)

## **[1. Introduction](#)**

The NETCONF protocol [\[I-D.ietf-netconf-4741bis\]](#) provides mechanisms to manipulate configuration datastores. However, client applications often need to be aware of common events such as a change in NETCONF server capabilities, that may impact management applications. Standard mechanisms are needed to support the monitoring of the base system events within the NETCONF server. This document defines a YANG module [\[RFC6020\]](#) that allows a NETCONF client to receive notifications for some common system events.

### **[1.1. Terminology](#)**

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [\[RFC2119\]](#). The following terms are defined in [\[I-D.ietf-netconf-4741bis\]](#):

\*client

\*datastore

\*operation

\*server

The following terms are defined in [\[RFC5277\]](#):

\*event

\*stream

\*subscription

The following term is defined in [\[RFC6020\]](#):

\*data node

## **[2.](#) YANG Module for NETCONF Base Notifications**

### **[2.1.](#) Overview**

The YANG module defined within this document specifies a small number of notification event messages for use within the 'NETCONF' stream, and accessible to clients via the subscription mechanism in [\[RFC5277\]](#).

These notifications pertain to configuration and monitoring portion of the managed system, not the entire system. A server **MUST** report events that are directly related to the NETCONF protocol. A server **MAY** report events for non-NETCONF management sessions, using the 'session-id' value of zero.

The YANG language is defined in [\[RFC6020\]](#).

#### **[2.1.1.](#) Notifications**

This module defines some events for the 'NETCONF' stream to notify a client application that the NETCONF server state has changed.

##### **netconf-config-change:**

Generated when the NETCONF server detects that the <running> or <startup> configuration datastore has changed. Summarizes each edit being reported.

##### **netconf-capability-change:**

Generated when the NETCONF server detects that the server capabilities have changed. Indicates which capabilities have been added, deleted, and/or modified.

##### **netconf-session-start:**

Generated when a NETCONF server detects that a NETCONF session has started. A server **MAY** generate this event for

non-NETCONF management sessions. Indicates the identity of the user that started the session.

**netconf-session-end:**

Generated when a NETCONF server detects that a NETCONF session has terminated. A server MAY optionally generate this event for non-NETCONF management sessions. Indicates the identity of the user that owned the session, and why the session was terminated.

**netconf-confirmed-commit:**

Generated when a NETCONF server detects that a confirmed-commit event has occurred. Indicates the event and the current state of the confirmed-commit operation in progress.

**[2.2. Definitions](#)**

```

<CODE BEGINS> file="ietf-netconf-base-notifications@2011-06-13.yang"

module ietf-netconf-base-notifications {

    namespace
        "urn:ietf:params:xml:ns:yang:ietf-netconf-base-notifications";

    prefix ncbase;

    import ietf-inet-types { prefix inet; }
    import ietf-netconf { prefix nc; }

    organization
        "IETF NETCONF (Network Configuration Protocol) Working Group";

    contact
        "WG Web:   <http://tools.ietf.org/wg/netconf/>
        WG List:   <mailto:netconf@ietf.org>

        WG Chair: Bert Wijnen
                  <mailto:bertietf@bwijnen.net>

        WG Chair: Mehmet Ersue
                  <mailto:mehmet.ersue@nsn.com>

        Editor: Andy Bierman
                <mailto:andy.bierman@brocade.com>";

    description
        "This module defines an YANG data model for use with the
        NETCONF protocol that allows the NETCONF client to
        receive common NETCONF base notification events.

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        the document authors. All rights reserved.

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        set forth in Section 4.c of the IETF Trust's Legal Provisions
        Relating to IETF Documents
        (http://trustee.ietf.org/license-info).

        This version of this YANG module is part of RFC XXXX; see
        the RFC itself for full legal notices.";
    // RFC Ed.: replace XXXX with actual RFC number and remove this note

    // RFC Ed.: remove this note
    // Note: extracted from

```

```

// draft-ietf-netconf-system-notifications-04.txt

revision 2011-06-13 {
    description
        "Initial version.";
    reference
        "RFC XXXX: NETCONF Base Notifications";
}
// RFC Ed.: replace XXXX with actual
// RFC number and remove this note

grouping common-session-parms {
    description
        "Common session parameters to identity a
        management session.";

    leaf username {
        description
            "Name of the user for the session.";
        type string;
        mandatory true;
    }

    leaf session-id {
        description
            "Identifier of the session.
            A non-NETCONF session will be identified by the value zero.";
        type nc:session-id-or-zero-type;
        mandatory true;
    }

    leaf source-host {
        description
            "Address of the remote host for the session.";
        type inet:ip-address;
    }
}

grouping changed-by-parms {
    description
        "Common parameters to identify the source
        of a change event, such as a configuration
        or capability change.";

    container changed-by {
        description
            "Indicates the source of the change.
            If caused by internal action, then the

```

```

    empty leaf 'server' will be present.
    If caused by a management session, then
    the name, remote host address, and session ID
    of the session that made the change will be reported.";
choice server-or-user {
    mandatory true;
    leaf server {
        type empty;
        description
            "If present, the change was caused
            by the server.";
    }

    case by-user {
        uses common-session-parms;
    }
} // choice server-or-user
} // container changed-by-parms;
}

```

```

notification netconf-config-change {
    description
        "Generated when the NETCONF server detects that the
        <running> or <startup> configuration datastore
        has changed by a management session.
        Summarizes each edit being reported.
        The server MAY choose to also generate this
        notification while loading a datastore during the
        boot process for the device.";

    uses changed-by-parms;

    leaf target-datastore {
        type enumeration {
            enum running {
                description "The <running> datastore has changed.";
            }
            enum startup {
                description "The <startup> datastore has changed";
            }
        }
        description
            "Indicates which configuration datastore has changed.";
        default "running";
    }

    list edit {
        description

```

"An edit record SHOULD be present for each distinct edit operation that the server has detected on the target datastore. This list MAY be omitted if the detailed edit operations are not known. The server MAY report entries in this list for changes not made by a NETCONF session (e.g., CLI).";

```
leaf target {
  type instance-identifier;
  description
    "Topmost node associated with the configuration change.
    A server SHOULD set this object to the node within
    the datastore that is being altered. A server MAY
    set this object to one of the ancestors of the actual
    node that was changed, or omit this object, if the
    exact node is not known.";
}

leaf operation {
  type nc:edit-operation-type;
  description
    "Type of edit operation performed.
    A server MUST set this object to the NETCONF edit
    operation performed on the target datastore.";
}
} // list edit
} // notification netconf-config-change
```

```
notification netconf-capability-change {
  description
    "Generated when the NETCONF server detects that
    the server capabilities have changed.
    Indicates which capabilities have been added, deleted,
    and/or modified.";

  uses changed-by-parms;

  leaf-list added-capability {
    type inet:uri;
    description
      "List of capabilities that have just been added.";
  }

  leaf-list deleted-capability {
    type inet:uri;
    description
      "List of capabilities that have just been deleted.";
  }
}
```



```

leaf-list modified-capability {
  type inet:uri;
  description
    "List of capabilities that have just been modified.
    A capability is considered to be modified if the
    base URI for the capability has not changed, but
    one or more of the parameters encoded at the end of
    the capability URI has changed.
    The new modified value of the complete URI is returned.";
}
} // notification netconf-capability-change

```

```

notification netconf-session-start {
  description
    "Generated when a NETCONF server detects that a
    NETCONF session has started. A server MAY generate
    this event for non-NETCONF management sessions.
    Indicates the identity of the user that started
    the session.";
  uses common-session-parms;
} // notification netconf-session-start

```

```

notification netconf-session-end {
  description
    "Generated when a NETCONF server detects that a
    NETCONF session has terminated.
    A server MAY optionally generate this event for
    non-NETCONF management sessions. Indicates the
    identity of the user that owned the session,
    and why the session was terminated.";

  uses common-session-parms;

  leaf killed-by {
    when "../termination-reason = 'killed'";
    type nc:session-id-type;
    description
      "The session ID that issued the <kill-session>,
      if the session was terminated by this operation.
      If the session was abnormally terminated by a
      non-NETCONF client operation, the value '0' will be
      used instead.";
  }
}

```

```

leaf termination-reason {
  type enumeration {
    enum "closed" {

```

```

        value 0;
        description
            "The session was terminated by the client in normal
            fashion, e.g., by the NETCONF <close-session>
            operation.";
    }
    enum "killed" {
        value 1;
        description
            "The session was terminated by the client in abnormal
            fashion, e.g., by the NETCONF <kill-session>
            operation.";
    }
    enum "dropped" {
        value 2;
        description
            "The session was terminated because the transport layer
            connection was unexpectedly closed.";
    }
    enum "timeout" {
        value 3;
        description
            "The session was terminated because of inactivity,
            e.g., waiting for the <hello> message or <rpc>
            messages.";
    }
    enum "bad-hello" {
        value 4;
        description
            "The client's <hello> message was invalid.";
    }
    enum "other" {
        value 5;
        description
            "The session was terminated for some other reason.";
    }
}
mandatory true;
description
    "Reason the session was terminated.";
}
} // notification netconf-session-end

notification netconf-confirmed-commit {
    description
        "Generated when a NETCONF server detects that a confirmed-commit
        event has occurred. Indicates the event and the current state
        of the confirmed-commit operation in progress.";
}

```

```

reference
    "I-D draft-ietf-netconf-4741bis section 8.4";

uses common-session-parms {
    when "../confirm-event != 'timeout'";
}

leaf confirm-event {
    description
        "Indicates the event that caused the notification.";
    type enumeration {
        enum "start" {
            value 0;
            description
                "The confirmed-commit procedure has started.";
        }
        enum "cancel" {
            value 1;
            description
                "The confirmed-commit procedure has been canceled,
                e.g., due to the session being terminated, or an
                explicit <cancel-commit> operation.";
        }
        enum "timeout" {
            value 2;
            description
                "The confirmed-commit procedure has been canceled,
                due to the confirm-timeout interval expiring.
                The common session parameters will not be present
                in this sub-mode.";
        }
        enum "extend" {
            value 3;
            description
                "The confirmed-commit timeout has been extended,
                e.g., by a new <confirmed-commit> operation.";
        }
        enum "complete" {
            value 4;
            description
                "The confirmed-commit procedure has been completed.";
        }
    }
    mandatory true;
}

leaf timeout {
    when
        "../confirm-event = 'start' or ../confirm-event = 'extend'";
}

```

```

    description
      "The configured timeout value if the event type
       is 'start' or 'extend'. This value represents the
       the approximate number of seconds from the event
       time when the 'timeout' event might occur.";
    units "seconds";
    type uint32;
  }
} // notification netconf-confirmed-commit

}

<CODE ENDS>

```

### 3. IANA Considerations

This document registers one XML namespace URN in the 'IETF XML registry', following the format defined in [\[RFC3688\]](#).

Registrant Contact: The NETCONF WG of the IETF.

XML: N/A, the requested URI is an XML namespace.

\*URI: urn:ietf:params:xml:ns:yang:ietf-netconf-base-notifications

This document registers one module name in the 'YANG Module Names' registry, defined in [\[RFC6020\]](#) .

\*name: ietf-netconf-base-notifications

\*prefix: ncbase

\*namespace: urn:ietf:params:xml:ns:yang:ietf-netconf-base-notifications

\*RFC: XXXX // RFC Ed.: replace XXXX and remove this comment

### 4. Security Considerations

The YANG module defined in this memo is designed to be accessed via the NETCONF protocol [\[RFC4741\]](#). The lowest NETCONF layer is the secure transport layer and the mandatory-to-implement secure transport is SSH [\[RFC4742\]](#).

Some of the readable data nodes in this YANG module may be considered sensitive or vulnerable in some network environments. It is thus important to control read access (e.g., via <get>, <get-config>, or <notification>) to these data nodes. These are the subtrees and data nodes and their sensitivity/vulnerability:

**/netconf-config-change:**

Event type itself indicates that the system configuration has changed, and may be now be vulnerable to unspecified attacks.

**/netconf-config-change/changed-by:**

Indicates whether the server or a specific user management session made the configuration change. Identifies the user name, session-id, and source host address associated with the configuration change, if any.

**/netconf-config-change/datastore:**

Indicates which datastore has been changed. This data can be used to determine if the non-volatile startup configuration data has been changed.

**/netconf-config-change/edit:**

Identifies the specific edit operations and specific datastore subtree(s) that have changed. This data could be used to determine if specific server vulnerabilities may now be present.

**/netconf-capability-change:**

Event type itself indicates that the system capabilities have changed, and may be now be vulnerable to unspecified attacks.

**/netconf-capability-change/changed-by:**

Indicates whether the server or a specific user management session made the capability change. Identifies the user name, session-id, and source host address associated with the capability change, if any.

**/netconf-capability-change/added-capability:**

Indicates the specific capability URIs that have been added. This data could be used to determine if specific server vulnerabilities may now be present.

**/netconf-capability-change/deleted-capability:**

Indicates the specific

capability URIs that have been deleted. This data could be used to determine if specific server vulnerabilities may now be present.

**/netconf-capability-change/modified-capability:**

Indicates the specific capability URIs that have been modified. This data could be used to determine if specific server vulnerabilities may now be present.

**/netconf-session-start:**

Event type itself indicates that a NETCONF or other management session may start altering the device configuration and/or state.

**/netconf-session-start/username:**

Indicates the user name associated with the session.

**/netconf-session-start/source-host:**

Indicates the source host address associated with the session.

**/netconf-session-end:**

Event type itself indicates that a NETCONF or other management session may be finished altering the device configuration and/or state.

**/netconf-session-end/username:**

Indicates the user name associated with the session.

**/netconf-session-end/source-host:**

Indicates the source host address associated with the session.

**/netconf-confirmed-commit:**

Event type itself indicates that the <running> datastore may have changed.

**/netconf-confirmed-commit/username:**

Indicates the user name associated with the session.

**/netconf-confirmed-commit/source-host:**

Indicates the source host address associated with the session.

**/netconf-confirmed-commit/confirm-event:**

Indicates the specific confirmed-commit state change that occurred. A value of 'complete' probably indicates that the <running> datastore has changed.

## **/netconf-confirmed-commit/timeout:**

Indicates the number of seconds in the future when the <running> datastore may change, due to the server reverting to an older configuration.

## **5. Acknowledgements**

Thanks to Martin Bjorklund, Juergen Schoenwaelder, Kent Watsen, and many other members of the NETCONF WG for providing important input to this document.

## **6. References**

[RFC2119]	<a href="#">Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels"</a> , BCP 14, RFC 2119, March 1997.
[RFC3688]	Mealling, M., " <a href="#">The IETF XML Registry</a> ", BCP 81, RFC 3688, January 2004.
[RFC5277]	Chisholm, S. and H. Trevino, " <a href="#">NETCONF Event Notifications</a> ", RFC 5277, July 2008.
[RFC6020]	Bjorklund, M., " <a href="#">YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)</a> ", RFC 6020, October 2010.
[RFC6021]	Schoenwaelder, J., " <a href="#">Common YANG Data Types</a> ", RFC 6021, October 2010.
[I-D.ietf-netconf-4741bis]	Enns, R, Bjorklund, M, Schoenwaelder, J and A Bierman, " <a href="#">Network Configuration Protocol (NETCONF)</a> ", Internet-Draft draft-ietf-netconf-4741bis-10, March 2011.

## **Appendix A. Change Log**

-- RFC Ed.: remove this section before publication.

### **Appendix A.1. 03-04**

Renamed module to NETCONF Base Notifications. The module is now ietf-netconf-base-notifications. The namespace and prefix are now changed as well.

Changed notifications so a server can report non-NETCONF initiated events.

Replaced security considerations, according to template in RFC 6087.

Added Acknowledgements section.

## [Appendix A.2.](#) 02-03

Renamed module back to NETCONF system notifications. The module is now ietf-netconf-system-notifications. The namespace and prefix are now changed as well.

Leaf user-name is now username, and is now mandatory, to be consistent with netconf monitoring module.

Leaf remote-host is now source-host to be consistent with netconf monitoring module.

The changed-by choice (server-or-user) is now mandatory.

The netconf-config-change description was updated and leaf target-database is now named target-datastore.

Term 'database' changed to term 'datastore' in text.

netconf-confirmed-commit: changed uses common-session-parms to use when-stmt not refine-stmt.

netconf-capability-change: updated description text.

## [Appendix A.3.](#) 01-02

Renamed module NETCONF Events instead of NETCONF system notifications. Note that ietf-netconf-notifications is being reserved for the XML content defined in RFC 5277.

Made changes based on mailing list comments and latest WG consensus.

Filled in IANA section.

## [Appendix A.4.](#) 00-01

Removed sys-startup notification.

Make changed-by into a grouping, and added usage to sys-config-change notification.

Added target-database leaf to sys-config-change to distinguish between running and startup changes.

Removed 'bad-start' from termination-reason leaf in sys-session-end notification.

## [Appendix A.5.](#) 00

Initial version, based on draft-bierman-netconf-system-monitoring-00.txt.

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