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**RESTCONF Extensions to Support the Network Management Datastore
Architecture
draft-ietf-netconf-nmda-restconf-05**

Abstract

This document extends the RESTCONF protocol defined in [RFC 8040](#) in order to support the Network Management Datastore Architecture defined in [RFC 8342](#).

This document updates [RFC 8040](#) by introducing new datastore resources, adding a new query parameter, and requiring the usage of I-D.ietf-netconf-rfc7895bis by RESTCONF servers implementing the Network Management Datastore Architecture.

RFC Ed.: Please replace "I-D.ietf-netconf-rfc7895bis" above with its final RFC assignment and remove this note.

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Table of Contents

1.	Introduction	2
1.1.	Terminology	3
2.	D datastore and YANG Library Requirements	3
3.	RESTCONF Extensions	3
3.1.	New Datastore Resources	3
3.2.	Protocol Operations	4
3.2.1.	With-defaults query parameter on the operational state datastore	5
3.2.2.	New "with-origin" Query Parameter	5
4.	IANA Considerations	6
5.	Security Considerations	6
6.	Normative References	7
	Authors' Addresses	7

[1.](#) Introduction

This document extends the RESTCONF protocol defined in [[RFC8040](#)] in order to support the Network Management Datastore Architecture (NMDA) defined in [[RFC8342](#)].

This document updates [[RFC8040](#)] in order to enable RESTCONF clients to discover which datastores are supported by the RESTCONF server, determine which modules are supported in each datastore, and to interact with all the datastores supported by the NMDA. Specifically, the update introduces new datastore resources, adds a new query parameter, and requires the usage of [[I-D.ietf-netconf-rfc7895bis](#)] by RESTCONF servers implementing the NMDA.

The solution presented in this document is backwards compatible with [RFC8040]. This is achieved by only adding new resources and leaving the semantics of the existing resources unchanged.

1.1. Terminology

This document uses the terminology defined by the NMDA [RFC8342].

The keywords "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. Datastore and YANG Library Requirements

RFC Ed.: Please update 201X-XX-XX below with correct date and remove this note.

An NMDA-compliant RESTCONF server MUST support the operational state datastore and it MUST implement at least revision 201X-XX-XX of the "ietf-yang-library" module defined in [I-D.ietf-netconf-rfc7895bis].

Such a server identifies that it supports the NMDA both by implementing the `{+restconf}/ds/ietf-datastores:operational` resource, and by implementing at least revision 201X-XX-XX of the "ietf-yang-library" module.

A RESTCONF client can test if a server supports the NMDA by using either the HEAD or GET methods on `{+restconf}/ds/ietf-datastores:operational`.

A RESTCONF client can discover which datastores and YANG modules the server supports by reading the YANG library information from the operational state datastore.

3. RESTCONF Extensions

This section describes the RESTCONF extensions needed to support the NMDA.

3.1. New Datastore Resources

This document defines a set of new resources representing datastores as defined in [RFC8342]. These resources are available using the following resource path template:

```
{+restconf}/ds/<datastore>
```


The <datastore> path component is encoded as an "identityref" according to the JSON encoding rules for identities, defined in [Section 6.8 of \[RFC7951\]](#). The namespace-qualified form MUST be used. Such an identity MUST be derived from the "datastore" identity defined in the "ietf-datastores" YANG module [[RFC8342](#)].

Specifically:

- o The resource `{+restconf}/ds/ietf-datastores:operational` refers to the operational state datastore.
- o The resource `{+restconf}/ds/ietf-datastores:running` refers to the running configuration datastore.
- o The resource `{+restconf}/ds/ietf-datastores:intended` refers to the intended configuration datastore.

An NMDA-compliant server MUST implement `{+restconf}/ds/ietf-datastores:operational`. Other datastore resources MAY be implemented.

YANG actions can only be invoked in `{+restconf}/ds/ietf-datastores:operational`.

If a server implements other datastores, such as the example datastore "ds-ephemeral" in the module "example-ds-ephemeral", the server would implement the resource `{+restconf}/ds/example-ds-ephemeral:ds-ephemeral`.

[3.2.](#) Protocol Operations

The protocol operations available for the new datastore resources ([Section 3.1](#)) are the same as the protocol operations defined in [[RFC8040](#)] for the `{+restconf}/data` resource with the following exceptions:

- o Dynamic configuration datastores are excluded, as each dynamic configuration datastore definition needs to be reviewed for what protocol operations it supports.
- o Some datastores are read-only by nature (e.g., <intended>), and hence any attempt to modify these datastores will fail. A server MUST return a response with a "405 Method Not Allowed" status-line and error-tag value "operation-not-supported".
- o The semantics of the "with-defaults" query parameter ([\[RFC8040\]](#), [Section 4.8.9](#)) differs when interacting with the operational state datastore. The semantics are described below, in [Section 3.2.1](#).

- o [\[RFC8040\], Section 3.5.4](#), paragraph 3 does not apply when interacting with any resource under `{+restconf}/ds`.

3.2.1. With-defaults query parameter on the operational state datastore

The "with-defaults" query parameter ([\[RFC8040\], Section 4.8.9](#)) is OPTIONAL to support when interacting with `{+restconf}/ds/ietf-datastores:operational`. The associated capability to indicate a server's support is identified with the URI:

`urn:ietf:params:restconf:capability:with-operational-defaults:1.0`

For servers that support it, the behavior of the "with-defaults" query parameter on the operational state datastore is defined as follows:

- o If no "with-defaults" query parameter is specified, or if it is set to "explicit", "report-all", or "report-all-tagged", then the "in use" values, as defined in [\[RFC8342\] section 5.3](#), are returned from the operational state datastore, even if a node happens to have a default statement in the YANG module and this default value is being used by the server. If the "with-defaults" parameter is set to "report-all-tagged", any values that match the schema default are tagged with additional metadata, as described in [\[RFC8040\], Section 4.8.9](#).
- o If the "with-defaults" query parameter is set to "trim", all "in use" values are returned, except that the output is filtered to exclude any values that match the default defined in the YANG schema.

Servers are not required to support all values in the "with-defaults" query parameter on the operational state datastore. If a request is made using a value that is not supported, then the error handling behavior is as described in ([\[RFC8040\], Section 4.8.9](#)).

3.2.2. New "with-origin" Query Parameter

A new query parameter named "with-origin" is added to the GET operation. If present, it requests that the server includes "origin" metadata annotations in its response, as detailed in the NMDA. This parameter is only valid when querying `{+restconf}/ds/ietf-datastores:operational` or any datastores with identities derived from the "operational" identity. Otherwise, if an invalid datastore is specified then the server MUST return a response with a "400 Bad Request" status-line, using an error-tag value of "invalid-value". "origin" metadata annotations are not included unless a client explicitly requests them.

Data in the operational state datastore can come from multiple sources. The server should return the most accurate value for the "origin" metadata annotation as possible, indicating the source of the operational value, as specified in [Section 5.3.4 of \[RFC8342\]](#).

When encoding the origin metadata annotation for a hierarchy of returned nodes, the annotation can be omitted for a child node when the value matches that of the parent node, as described in "ietf-origin" YANG module [\[RFC8342\]](#).

The "with-origin" query parameter is OPTIONAL to support. It is identified with the URI:

```
urn:ietf:params:restconf:capability:with-origin:1.0
```

4. IANA Considerations

This document defines two capability identifier URNs in the "RESTCONF Capability URNs" registry defined in [\[RFC8040\]](#):

```
Index
Capability Identifier
-----
```

```
:with-origin
urn:ietf:params:restconf:capability:with-origin:1.0
```

```
:with-operational-defaults
urn:ietf:params:restconf:capability:with-operational-defaults:1.0
```

5. Security Considerations

This document extends the RESTCONF protocol by introducing new datastore resources. The lowest RESTCONF layer is HTTPS, and the mandatory-to-implement secure transport is TLS [\[RFC8446\]](#). The RESTCONF protocol uses the network configuration access control model [\[RFC8341\]](#), which provides the means to restrict access for particular RESTCONF users to a preconfigured subset of all available RESTCONF protocol operations and content.

The security constraints for the base RESTCONF protocol (see [Section 12 of \[RFC8040\]](#)) apply to the new RESTCONF datastore resources defined in this document.

6. Normative References

- [I-D.ietf-netconf-rfc7895bis]
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