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A URN Namespace for Network Resources

Status of This Document

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Abstract

This document specifies URNs in the `urn:ogf:network` namespace. URNs in this namespace can be used to define logical network resources, such a devices, (logical) ports, and (logical) links.

Contents

1 introduction

Uniform Resource Names (URNs) are persistent, globally unique identifiers [RFC 2141].

Topology exchange between network operators requires globally unique identifiers for network resources. The `urn:ogf:network` namespace provides globally unique identifiers for naming network resources without central registration. This document defines and registers the `urn:ogf:network` namespace in accordance with [GFD-C.xxx].

Notational Conventions

The key words "MUST" "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in [RFC 2119].

2 Registration

2.1 Namespace Identifier

"`urn:ogf:network:`"

2.2 Document Version

Registration version number: 1
Registration date: 2011-07-01

3 Syntax

3.1 Syntactic Structure

A network resource URN (NRURN) is defined by the following rules. These rules follow Augmented BFR [RFC 5234] format.

```
NRURN = "urn:ogf:network:" DOMAIN ":" OPAQUE-PART
DOMAIN = *1DP 1*(ALPHA / DIGIT / "-" / ".") ; Domain name
DP = "domain=" ; domain prefix (deprecated)
OPAQUE-PART = *(ALPHA / DIGIT / OTHER)
OTHER = ALLOWED / RESERVED
```

```
ALLOWED = "+" / "," / "-" / "." / ":" / ";" / "=" / "_"
RESERVED = "!" / "$" / "'" / "(" / ")" / "*" / "@"
```

ALPHA and DIGIT are defined by [RFC 5234], OTHER is equal to <other> as defined by [RFC 2141].

OPAQUE-PART MUST NOT contain percentage-encoded characters ("%" HEXDIG HEXDIG). The following pchar characters which are allowed in an URI are never allowed in a network resource URN: "%", "/", "?", "#", "&", and "~".

DP is a prefix ("domain=") of the DOMAIN for backward compatibility with a previous syntax (see section 8.2). It is deprecated and SHOULD NOT be used for the assignment of new network resource URNs.

DOMAIN is domain name of the URN assigning organisation in LDR format [RFC 5890]. Valid examples are example.net and example.xn--jxalpdlp. _http._tcp.example.net is an invalid example.

The full lengths of NRURN MUST NOT exceed 255 bytes.

OPAQUE-PART is opaque, and MUST NOT be parsed or interpreted by any organisation except for the organisation that assigned the URN.

3.2 Encoding

No percentage-encoded bytes are allowed, as these may prompt users to give meaningful names to network resource URNs. This is discouraged, as described in section 5.2.

3.3 Rules for Lexical Equivalence

Network resource URNs are lexical equivalent if and only if they are byte-equivalent after case normalisation.

Consider the following URNs:

1- urn:ogf:network:example.net:path-glif-0418
2- UrN:oGf:NeTwOrK:eXaMpLe.NeT:pAtH-gLiF-0418
3- URN:OGF:NETWORK:EXAMPLE.NET:PATH-GLIF-0418 4- urn:ogf:network:domain=example.net:path-gl

URNs 1, 2, and 3 are lexically equivalent to each other. URN 4 is not equivalent to any other listed URN.

3.4 Assignment

The characters defined in `RESERVED` SHOULD NOT be used in assignment of network resources URNs, and are reserved for future use. Only characters in `ALPHA / DIGIT / ALLOWED` SHOULD be used in the `OPAQUE-PART`.

3.5 Validation

No specific validation service or resolution service is defined in this document.

A recipient of a network resource URN MUST either accept or reject the received URN, but MUST NOT rewrite or normalise it. In a data exchange, the URN MUST retain the same capitalisation. An network resource URN that does not follow the specified syntax SHOULD be rejected.

For example, percentage-decoding of the URN as described in section 6.2.2.2. of [RFC 3986] MUST NOT take place.

4 Namespace Considerations

4.1 Scope

The `urn:ogf:network` namespace is created to allow network operators to uniquely define resources in their network and facilitate unambiguous exchange of topology data with other network operators.

The only requirement for naming network resources is *persistent* administrative ownership of a DNS domain (see section 5.2). No other central registration is required.

The intended use of the `urn:ogf:network` namespace is to describe logical network resources roughly on OSI layers 1 and OSI layer 2. "Logical network resources" intends to mean elements in a functional topology description, rather than physical resources. It is expected that a peering network is only interested in the functional description of the network, not of its (physical) implementation. Nevertheless, this document does not forbid the description of other resources, such a physical network resources for inventory management.

4.2 Resource Type Described

The exact type of resource described by a URN can not and MUST NOT be determined from the syntax of the URN. This information MUST be provided by the context or through other means by the data exchange protocol.

Network resources URNs SHOULD identify *manifestations* of a network resources — they should refer to a functional component in a network that remains in place for a prolonged period of time. New version of the resource SHOULD NOT receive a new identifier. The change of attributes over time SHOULD be dealt with by a protocol, not by a change of the URN.

4.3 Identifier uniqueness considerations

URN identifiers MUST be assigned uniquely – they are assigned to at most one resource, and MUST NOT be re-assigned.

URN assigning organisations MUST follow these requirements before assigning URNs to network resources.

5 Community Considerations

5.1 Process of identifier assignment

Network resource URNs MAY be assigned by any interested party. No registration for the URN delegation is required.

The assigning organisation MUST be administrative owner of a domain namečiterfc5890. The assigning organisation MUST be committed to remain administrative owner of this domain name for a prolonged period of time, at least longer then the expected lifetime of the network resources to be identified. It is recommended that a short and stable domain name is chosen. The domain name does not need have an actual DNS record (e.g. it is allowed to pick "`network.example.net`" if the organisation is administrative owner of "`example.net`", even if `network.example.net` does not exist)

The assigning organisation uses the chosen domain name as the `DOMAIN` part of the network resource URN.

The assigning organisation then assigns `OPAQUE-PART`s to it network resources. The following requirements apply to the `OPAQUE-PART`:

- The `OPAQUE-PART` MUST uniquely define at most one network resource;
- The `OPAQUE-PART` MUST NOT be re-assigned;
- The `OPAQUE-PART` SHOULD NOT specify any properties of the network resource;
- The `OPAQUE-PART` MAY contain some structure according to some policy internal to the assigning organisation.

The reason that the OPAQUE-PART SHOULD NOT contain any properties is because a URN MUST be persistent: it MUST NOT change, even after the properties of the described resource change. Naming these properties in the URN gives a false sense of meaning to the URN. Peer may indadvertedly assume the identifier describes certain properties, and act upon that, even if the properties have long changed.

Good examples of URNs:

```
urn:ogf:network:example.net:9ad7ef-mcasip-139284
urn:ogf:network:example.net:link:925-175
urn:ogf:network:example.net:port:2011:129
```

Not so good examples of URNs:

```
urn:ogf:network:example.net:link:24x7-protected:925-175
urn:ogf:network:example.net:path:US_CHI-NL_AMS-3937
```

A useful syntax for OPAQUE-PART is <type>:<year of creation>:<sequence number>, e.g. port:2011:129.

While port:2011:129 contains attributes (type and year of creation), these may be acceptable as they will never change. link:24x7-protected:925-175 contains attributes about the type of link, which may change in the future, and is therefore not a good URN. link:US_CHI-NL_AMS-3937 is not a good URN. It does contain the end points of a path, which are unlikely to change. However, if the path is actually an Ethernet LAN, it is possible to add another end-point, changing these properties. The network domains along the path may use this identifier for monitoring and do not accept a change in identifier. For that reason, it is best never to add attributes to a URN identifier.

5.2 Identifier persistence considerations

[RFC 3406] requires that URNs MUST NOT be re-assigned.

In practice, this is a meaningless requirement. Perhaps in five generations from now, URNs will not be used in the first place.

This document specifies that URNs MUST NOT get re-assigned within the lifetime of the *resource identifier*. This is a **longer period than the lifetime of the resource** itself. For example, a monitoring system may still use the identifier of a resource to display historic monitoring data, long after the resource is decommissioned.

Given the lifetime of network resources may last a decade, it is reasonable to require that an assigning domain SHOULD validate resource identifiers for 5 to 10 year after the decommissioning of the resource. It is reasonable to require that an assigning domain MUST take

measure to ensure that a resource identifier is not re-assigned within a couple of decades (20-30 years).

This persistence requirement poses a substantial requirement about the stability of the chosen `DOMAIN` part in the URN. [RFC 3406] specifically states:

> "Operationally, there is nothing that prevents a domain name from being reassigned; indeed, it is not an uncommon occurrence. This is one of the reasons that [domain names in a URN] makes a poor URN namespace in practice, and is therefore not seriously being proposed as it stands."

In short, the domain must be chosen such that the administrative ownership will remain with the current owner for over 30 years after assigning the last identifier with that given namespace. This holds true even if the network operator changes name, is merged, split or files for bankruptcy.

Any organisation that wishes to assign names in the `urn:ogf:network` namespace must to so after due diligence.

The authors of this document have considered using alternative naming strategies for the `DOMAIN` part, but decided not to do so for these reasons:

- There was prior use of domain names in the urn:ogf:network namespace;
- The use of autonomous systems (AS) numbers was not possible because not all networks that wanted to assign identifiers has their own AS number;
- Creating a separate naming authority would provide too much overhead and hinder uptake of the `urn:ogf:network` namespace.

6 Examples

Syntactically valid network resource URNs include:

```
urn:ogf:network:example.net:9ad7ef-mcasip-139284
urn:ogf:network:example.net:link:925-175
urn:ogf:network:example.net:port:2011-07-129
urn:ogf:network:domain=example.net:node=packrat:port=eth0 urn:ogf:network:example.ne
```

7 Security Considerations

The allowed syntax is so limited that it not expected that similar-looking malicious URNs will be an issue. Users should be able to see the differences between `urn:ogf:network:example.c0m:4638I27`

and `urn:ogf:network:example.com:4638127`.

Software that takes input from a user MUST ensure that the URN is syntactically correct before transmitting it. It SHOULD remove any trailing spaces from the user input.

Recipients of a URN MUST NOT assume that a URN was crafted by the domain specified in the `DOMAIN` part of the URN, without a proper validation check.

Information in the `OPAQUE-PART` MUST NOT be interpreted to have any meaning whatsoever. While the originating domain may have included meaningful attributes in the URN, these attributes may be out-of-date.

8 Prior Usage

URN identifiers in the `urn:ogf:network` namespace have been in use in two communities, with mutually conflicting syntaxes.

8.1 GLIF Community

The global lambda integrated facility (GLIF) is a community of research and education networks. Operators in this community agreed to use unique identifier for *lightpaths*, dedicated inter-domain circuits for researchers.

These identifiers take the form:

```
GLOBAL-ID = "urn:ogf:network:" DOMAIN ":" LOCAL-PART
DOMAIN = 1*(ALPHA / DIGIT / "-" / ".") ; Domain name
LOCAL-PART = 1*(ALPHA / DIGIT / "-" / ".")
```

For example:

```
urn:ogf:network:canarie.ca:kisti-uninett-glif-001
urn:ogf:network:es.net:4005
urn:ogf:network:dcn.internet2.edu:6811
```

All identifiers described by the GLIF community are valid network resource URNs.

The syntax is described in [GLIF-ID].

8.2 PerfSONAR Community

PerfSONAR is an distributed system for network performance monitoring on paths crossing several networks. Much of the perfSONAR protocols are standardised by the OGF in

the Network Measurement (NM) and Network Measurement and Control (NMC) working groups. URNs in the `urn:ogf:network` namespace are used for topology description.

These identifiers take the form:

```
PS-URN = "urn:ogf:network" 1DOMAIN-PART *1NODE-PART *1PORT-PART
         *1LINK-PART *1PATH-PART *1SERVICE-PART *1WILDCARD
DOMAIN-PART = ":domain=" 1*DOMAIN
NODE-PART = ":node=" 1*PART-CHAR
PORT-PART = ":port=" 1*PART-CHAR
LINK-PART = ":link=" 1*PART-CHAR
PATH-PART = ":path=" 1*PART-CHAR
SERVICE-PART = ":service=" 1*PART-CHAR
DOMAIN = 1*(ALPHA / DIGIT / "-" / ".") ; Domain name
PART-CHAR = (ALPHA / DIGIT / "-" / "." / "/" / "_") ; Undefined
WILDCARD = ":*" ; Used for queries. Unclear if this is a query or URN.
```

For example:

```
urn:ogf:network:domain=example.net
urn:ogf:network:domain=example.net:node=packrat
urn:ogf:network:domain=example.net:link=WASH_to_ATLA
urn:ogf:network:domain=example.net:node=packrat:port=eth0
urn:ogf:network:domain=example.net:port=Interface_To_Geant
urn:ogf:network:domain=example.net:node=packrat:service=Optical_Converter
urn:ogf:network:domain=example.net:node=packrat:port=eth0:link=WASH_to_ATLA
urn:ogf:network:domain=example.net:path=IN2P3_Circuit
urn:ogf:network:domain=example.net:node=packrat:*
```

All identifiers described by the perfSONAR topology service are valid network resource URNs. However, the meaning of the perfSONAR URNs is fundamentally different from network resource URNs: whereas perfSONAR URNs should specifically be parsed to find properties of the resource, this is not allowed for network resource URNs.

This document does not define a specific migration strategy for perfSONAR URNs.

The syntax is described in [perfSONAR-URN].

9 Contributors

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