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Guidelines and Registration Procedures for URI Schemes
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Abstract

   This document updates the guidelines and recommendations, as well as
   the IANA registration processes, for the definition of Uniform
   Resource Identifier (URI) schemes. It obsoletes RFC 4395.

Status of This Memo

   This Internet-Draft is submitted in full conformance with the
   provisions of BCP 78 and BCP 79.

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   time. It is inappropriate to use Internet-Drafts as reference
   material or to cite them other than as "work in progress."

   This Internet-Draft will expire on April 23, 2015.

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1. Introduction

   The Uniform Resource Identifier (URI) protocol element and generic
   syntax is defined by [RFC3986]. Each URI begins with a scheme name,
   as defined by Section 3.1 of RFC 3986, that refers to a specification
   for identifiers within that scheme. The URI syntax provides a
   federated and extensible naming system, where each scheme's
   specification can further restrict the syntax and define the
   semantics of identifiers using that scheme.

   This document obsoletes [RFC4395], which in turn obsoleted [RFC2717]
   and [RFC2718]. Recent documents have used the term "URI" for all

resource identifiers, avoiding the term "URL" and reserving the term
"URN" explicitly for those URIs using the "urn" scheme name
([RFC2141]). URN "namespaces" ([RFC3406]) are specific to the "urn"
scheme and are not covered explicitly by this specification.

This document provides updated guidelines for the definition of new
schemes, for consideration by those who are defining, registering, or
evaluating those definitions, as well as a process and mechanism for
registering schemes within the IANA URI Schemes registry. There is a
single namespace for registered schemes. The intent of the registry
is to:

o provide a central point of discovery for established URI scheme
   names, and easy location of defining documents for standard
   schemes;

o discourage multiple separate uses of the same scheme name;

o help those proposing new scheme names to discern established
   trends and conventions, and avoid names that might be confused
   with existing ones;

o encourage registration by setting a low barrier for registration.

As originally defined, URIs only allowed a limited repertoire of
characters chosen from US-ASCII. An Interationalized Resource
Identifier (IRI), as defined by [RFC3987], extends the URI syntax to
allow characters from a much greater repertoire, to accomodate
resource identifiers from the world's languages. RFC 3987 [RFC3987]
also defined a mapping between URIs and IRIs. A URI scheme name is
the same as the corresponding IRI scheme name. Thus, there is no
separate, independent registry or registration process for IRI
schemes: the URI Schemes registry is used for both URIs and IRIs.
Those who wish to describe resource identifiers that are useful as
IRIs should define the corresponding URI syntax, and note that the
IRI usage follows the rules and transformations defined in [RFC3987].

[RFC3986] defines the overall syntax for URIs as:

        URI = scheme ":" hier-part ["?" query] ["#" fragment]

A scheme definition cannot override the overall syntax for URIs. For
example, this means that fragment identifiers (#) cannot be re-used
outside the generic syntax restrictions. A scheme definition must
specify the scheme name and the syntax of the scheme-specific part,
which is clarified as follows:

```
URI = scheme ":" scheme-specific-part [ "#" fragment ]

scheme-specific-part = hier-part [ "?" query ]
```

2. Terminology

Within this document, the key words MUST, MAY, SHOULD, REQUIRED, RECOMMENDED, and so forth are used within the general meanings established in [RFC2119], within the context that they are requirements on future registrations.

This document distinguishes between a "scheme specification", being a document defining the syntax and semantics of a scheme, vs. a "scheme registration request" being the request submitted to IANA. The term "scheme definition" refers generically to the syntax and semantics of a scheme, typically documented in a scheme specification.

3. Requirements for Permanent Scheme Definitions

This section gives considerations for new schemes. Meeting these guidelines is REQUIRED for permanent scheme registration. Permanent status is appropriate for, but not limited to, use in standards. For IETF Standards-Track documents, Permanent registration status is REQUIRED.

3.1. Demonstrable, New, Long-Lived Utility

In general, the use and deployment of new schemes in the Internet infrastructure can be costly; some parts of URI processing are often scheme-dependent. Introducing a new scheme might require additional software, not only for client software and user agents but also in additional parts of the network infrastructure (gateways, proxies, caches) [W3CWebArch]. Since scheme names share a single, global namespace, it is desirable to avoid contention over use of short, mnemonic scheme names. New schemes ought to have utility to the Internet community beyond that available with already registered schemes. The scheme specification SHOULD discuss the utility of the scheme being registered.

3.2. Syntactic Compatibility

[RFC3986] defines the generic syntax for all URI schemes, along with the syntax of common URI components that are used by many URI schemes to define hierarchical identifiers. [RFC3987] extended this generic syntax to cover IRIs. All scheme specifications MUST define their own URI <scheme-specific-part> syntax. Care must be taken to ensure

that all strings matching their scheme-specific syntax will also
match the <absolute-URI> grammar described in [RFC3986].

New schemes SHOULD reuse the common URI components of [RFC3986] for
the definition of hierarchical naming schemes. If there is a strong
reason for a scheme not to use the hierarchical syntax, then the new
scheme definition SHOULD follow the syntax of previously registered
schemes.

Schemes that are not intended for use with relative URIs SHOULD avoid
use of the forward slash "/" character, which is used for
hierarchical delimiters, and the complete path segments "." and ".."
(dot-segments).

Schemes SHOULD avoid improper use of "//". The use of double slashes
in the first part of a URI is not a stylistic indicator that what
follows is a URI: Double slashes are intended for use ONLY when the
syntax of the <scheme-specific-part> contains a hierarchical
structure. In URIs from such schemes, the use of double slashes
indicates that what follows is the top hierarchical element for a
naming authority. (Section 3.2 of RFC 3986 has more details.)
Schemes that do not contain a conformant hierarchical structure in
their <scheme-specific-part> SHOULD NOT use double slashes following
the "<scheme>:" string.

New schemes SHOULD clearly define the role of [RFC3986] reserved
characters in URIs of the scheme being defined. The syntax of the
new scheme should be clear about which of the "reserved" set of
characters are used as delimiters within the URIs of the new scheme,
and when those characters must be escaped, versus when they can be
used without escaping.

3.3. Well-Defined

While URIs might or might not be defined as locators in practice, a
scheme definition itself MUST be clear as to how it is expected to
function. Schemes that are not intended to be used as locators
SHOULD describe how the resource identified can be determined or
accessed by software that obtains a URI of that scheme.

For schemes that function as locators, it is important that the
mechanism of resource location be clearly defined. This might mean
different things depending on the nature of the scheme.

In many cases, new schemes are defined as ways to translate between
other namespaces or protocols and the general framework of URIs. For
example, the "ftp" scheme translates into the FTP protocol, while the
"mid" scheme translates into a Message-ID identifier of an email

message. For such schemes, the description of the mapping MUST be
complete, and in sufficient detail so that the mapping in both
directions is clear: how to map from a URI into an identifier or set
of protocol actions or name in the target namespace, and how legal
values in the base namespace, or legal protocol interactions, might
be represented in a valid URI. See Section 3.6 for guidelines for
encoding binary or character strings within valid character sequences
in a URI . If not all legal values or protocol interactions of the
base standard can be represented using the scheme, the definition
SHOULD be clear about which subset are allowed, and why.

3.4. Definition of Operations

As part of the definition of how a URI identifies a resource, a
scheme definition SHOULD define the applicable set of operations that
can be performed on a resource using the URI as its identifier. A
model for this is HTTP methods; an HTTP resource can be operated on
by GET, POST, PUT, and a number of other methods available through
the HTTP protocol. The scheme definition SHOULD describe all well-
defined operations on the resource identifier, and what they are
supposed to do.

Some schemes don't fit into the "information access" paradigm of
URIs. For example, "telnet" provides location information for
initiating a bi-directional data stream to a remote host; the only
operation defined is to initiate the connection. In any case, the
operations appropriate for a scheme SHOULD be documented.

Note: It is perfectly valid to say that "no operation apart from GET
is defined for this URI". It is also valid to say that "there's only
one operation defined for this URI, and it's not very GET-like". The
important point is that what is defined on this scheme is described.

Scheme definitions SHOULD define a "default" operation for when a URI
is invoked (or "dereferenced") by an application. For example, a
common "default" operation today is to launch an application
associated with the scheme name, and let it use the other URI
components as inputs to do something. The default invocation, or
dereferencing, of a URI SHOULD be "safe" in the sense described by
section 3.4 of [W3CWebArch]; i.e., performing such an invocation
should not incur any additional obligations by doing so.

3.5. Context of Use

In general, URIs are used within a broad range of protocols and
applications. Most commonly, URIs are used as references to
resources within directories or hypertext documents, as hyperlinks to
other resources. In some cases, a scheme is intended for use within

a different, specific set of protocols or applications. If so, the
scheme definition SHOULD describe the intended use and include
references to documentation that define the applications and/or
protocols cited.

3.6. Internationalization and Character Encoding

When describing schemes in which (some of) the elements of the URI
are actually representations of human-readable text, care should be
taken not to introduce unnecessary variety in the ways in which
characters are encoded into octets and then into URI characters; see
[RFC3987] and Section 2.5 of [RFC3986] for guidelines. If URIs of a
scheme contain any text fields, the scheme definition MUST describe
the ways in which characters are encoded and any compatibility issues
with IRIs of the scheme.

The scheme specification SHOULD be as restrictive as possible
regarding what characters are allowed in the URI, because some
characters can create several different security considerations (see,
for example [RFC4690]).

All percent-encoded variants are automatically included by definition
for any character given in an IRI production. This means that if you
want to restrict the URI percent-encoded forms in some way, you must
restrict the Unicode forms that would lead to them.

3.7. Clear Security Considerations

Definitions of schemes MUST be accompanied by a clear analysis of the
security implications for systems that use the scheme; this follows
the practice of Security Consideration sections within IANA
registrations [RFC5226].

In particular, Section 7 of RFC 3986 [RFC3986] describes general
security considerations for URIs, while [RFC3987] gives those for
IRIs. The definition of an individual scheme should note which of
these apply to the specified scheme, in addition to any more scheme-
specific concerns.

3.8. Scheme Name Considerations

Section 3.1 of RFC 3986 defines the syntax of a URI scheme name; this
syntax remains the same for IRIs. New registered schemes
registrations MUST follow this syntax, which only allows a limited
repertoire of characters (taken from US-ASCII). Although the syntax
for the scheme name in URIs is case insensitive, the scheme names
itself MUST be registered using lowercase letters.

Scheme names SHOULD be short, but also sufficiently descriptive and
distinguished to avoid problems.

Schemes SHOULD NOT use names or other symbols that might cause
problems with rights to use the name in IETF specifications and
Internet protocols. For example, be careful with trademark and
service mark names. (See Section 7.4 of [RFC3978].)

Schemes SHOULD NOT use names that are either very general purpose or
associated in the community with some other application or protocol.
Schemes also SHOULD NOT use names that are overly general or
grandiose in scope (e.g., that allude to their "universal" or
"standard" nature.)

A scheme name is not a "protocol" although, like a service name as
defined in section 5 of [RFC6335], it often identifies a particular
protocol or application. If a scheme name has a one-to-one
correspondence with a service name, then the names SHOULD be the
same.

Some organizations desire their own namespace for URI scheme names
for private use (see Section 6). In doing so, it is important to
prevent collisions, and to make it possible to identify the owner of
a private use scheme. To accomplish these two goals, such
organizations SHOULD use a prefix based on their domain name,
expressed in reverse order. For example, a URI scheme name of
com.example.info might be used by the organization that owns the
example.com domain name. Care must be taken, however, if the
organization later loses the domain name embedded in their scheme
names, since domain name registrations are not permanent. The URI
scheme name registration procedure can be used in such an event.

Furthermore, to prevent collisions with private use scheme names, new
scheme names registered MUST NOT contain a "." unless actually
constructed from a reversed domain name.

4. Guidelines for Provisional URI Scheme Registration

Provisional registration can be used for schemes that are not part of
any standard, but that are intended for use (or observed to be in
use) that is not limited to a private environment within a single
organization. Provisional registration can also be used as an
intermediate step on the way to permanent registration, e.g., before
the scheme specification is finalized as a standard.

For a provisional registration, the following are REQUIRED:

o The scheme name meets the syntactic requirements of Section 3.8.

o There must not already be an entry with the same scheme name. In
   the unfortunate case that there are multiple, different uses of
   the same scheme name, the Designated Expert can approve a request
   to modify an existing entry to note the separate use.

o Contact information identifying the person supplying the
   registration is included. Previously unregistered schemes
   discovered in use can be registered by third parties (even if not
   on behalf of those who created the scheme). In this case, both
   the registering party and the scheme creator SHOULD be identified.

o If no permanent, citable specification for the scheme definition
   is included, credible reasons for not providing it SHOULD be
   given.

o The scheme definition SHOULD include a clear Security
   Considerations (Section 3.7) or explain why a full security
   analysis is not available (e.g., in a third-party scheme
   registration).

o If the scheme definition does not meet the guidelines laid out in
   Section 3, the differences and reasons SHOULD be noted.

5. Guidelines for Historical URI Scheme Registration

In some circumstances, it is appropriate to note a scheme that was
once in use or registered but for whatever reason is no longer in
common use or the use is not recommended. In this case, it is
possible for an individual to request that the URI scheme be
registered (newly, or as an update to an existing registration) as
'historical'. Any scheme that is no longer in common use MAY be
designated as historical; the registration SHOULD contain some
indication to where the scheme was previously defined or documented.

6. Guidelines for Private URI Scheme Use

Unregistered schemes can cause problems if use is not limited to a
private environment within a single organization, since the use could
leak out beyond the closed environment. Even within a closed
environment, other colliding uses of the same scheme name could
occur. As such, a unique namespace (see Section 3.8) MUST be used,
and it is strongly encouraged to do a Provisional registration unless
the scheme name is constructed from a domain name.

7. URI Scheme Registration Procedure

7.1. General

The IANA policy (using terms defined in [RFC5226]) for Provisional registration was formerly Expert Review and is now changed to simply use a First Come First Served policy. The policy for Permanent and Historic registration continues to be Expert Review.

The registration procedure is intended to be very lightweight for non-contentious registrations. For the most part, we expect the good sense of submitters and reviewers, guided by these procedures, to achieve an acceptable and useful consensus for the community.

In exceptional cases, where the negotiating parties cannot form a consensus, the final arbiter of any contested registration shall be the IESG.

7.2. Registration Procedures

Someone wishing to register a new scheme MUST:

1. Check the IANA URI Schemes registry to see whether there is already an entry for the desired name. If there is already an entry under the name, choose a different scheme name, or update the existing scheme specification.

2. Prepare a scheme registration request using the template specified in Section 7.4. The scheme registration request can be contained in an Internet Draft, submitted alone, or as part of some other permanently available, stable, protocol specification. The completed template can also be submitted in some other form (as part of another document or as a stand-alone document), but the completed template will be treated as an "IETF Contribution" under the guidelines of [RFC3978].

3. If the registration request is for a Permanent registration:

    1. Review the requirements in Section 3.

    2. Send a copy of the completed template or a pointer to the containing document (with specific reference to the section with the completed template) to the mailing list uri-review@ietf.org , requesting review. In addition, request review on other relevant mailing lists as appropriate. For example, general discussion of URI syntactical issues could be discussed on uri@w3.org; schemes for a network protocol

could be discussed on a mailing list for that protocol.
Allow a reasonable time for discussion and comments. Four
weeks is reasonable for a permanent registration request.

3. Respond to review comments and make revisions to the proposed
registration as needed to bring it into line with the
guidelines given in this document.

4. Submit the (possibly updated) registration template (or pointer
to document containing it) to IANA at iana@iana.org.

Upon receipt of a scheme registration request, the following steps
MUST be followed:

1. IANA checks the submission for completeness; if sections of the
template are missing or any citations are not correct, IANA will
reject the registration request.

2. If the request is for Provisional registration and no entry
already exists in the current registry for the same name, IANA
adds the registration to the registry, under the First Come First
Served policy.

3. Otherwise, IANA enters the registration request in the IANA
registry, with status marked as "Pending Review" and the
remainder of this section applies.

4. IANA requests Expert Review of the registration request against
the corresponding guidelines from this document.

5. The Designated Expert will evaluate the request against the
criteria of the requested status.

6. In the case of a Permanent registration request, the Designated
Expert may:

    * Accept the specification of the scheme for permanent
       registration.

    * Suggest provisional registration instead.

    * Request IETF review and IESG approval; in the meanwhile,
       suggest provisional registration.

    * Request additional review or discussion, as necessary.

7. If an entry already exists for the same name, the Designated
Expert will determine whether the request should be rejected, or

whether the existing entry should be modified to note the
separate use. This conflict process applies regardless of the
requested status or the status of the existing entry.

8. Once Expert Review approves registration for a given status, IANA
adds the registration to the registry.

Either based on an explicit request or independently initiated, the
Designated Expert or IESG can request the upgrade of a 'provisional'
registration to a 'permanent' one. In such cases, IANA will update
the status of the corresponding entry. Typically this would only
occur if the use is considered a standard (not necessarily an IETF
standard).

7.3. Change Control

Registrations can be updated in the registry by the same mechanism as
required for an initial registration. In cases where the original
definition of the scheme is contained in an IESG-approved document,
update of the specification also requires IESG approval.

Provisional registrations can be updated by the original registrant
or anyone designated by the original registrant. In addition, the
IESG can reassign responsibility for a provisional registration
scheme, or can request specific changes to a scheme registration.
This will enable changes to be made to schemes where the original
registrant is out of contact, or unwilling or unable to make changes.

Transition from 'provisional' to 'permanent' status can be requested
and approved in the same manner as a new 'permanent' registration.
Transition from 'permanent' to 'historical' status requires IESG
approval. Transition from 'provisional' to 'historical' can be
requested by anyone authorized to update the provisional
registration.

7.4. URI Scheme Registration Template

This template describes the fields that MUST be supplied in a scheme
registration request:

Scheme name:
  See Section 3.8 for guidelines.

Status:
  This reflects the status requested, and must be one of 'permanent',
  'provisional', or 'historical'.

Applications/protocols that use this scheme name:

      See [Section 3.5](#).

   Contact:
      Person (including contact information) to contact for further
      information.

   Author/Change controller:
      Person (including contact information) authorized to change this.

   References:
      Include full citations for all referenced documents. Registration
      templates for provisional registration can be included in an
      Internet Draft; when the documents expire or are approved for
      publication as an RFC, the registration will be updated. A scheme
      specification is only required for Permanent registration.

   The following fields are no longer required in a scheme registration
   request. The answers instead belong in the scheme specification.

   Scheme syntax:
      See [Section 3.2](#) for guidelines.

   Scheme semantics:
      See [Section 3.3](#) and [Section 3.4](#) for guidelines.

   Encoding considerations:
      See [Section 3.3](#) and [Section 3.6](#) for guidelines.

   Interoperability considerations:
      If the person or group registering the scheme is aware of any
      details regarding the scheme that might impact interoperability,
      identify them here. For example: proprietary or uncommon encoding
      methods; inability to support multibyte character sets;
      incompatibility with types or versions of any underlying protocol.

   Security considerations:
      See [Section 3.7](#) for guidelines.

[8](#). The "example" Scheme

   There is a need for a scheme name that can be used for examples in
   documentation without fear of conflicts with current or future actual
   schemes. The scheme "example" is hereby registered as a Permanent
   scheme for that purpose.

   The "example" scheme is specified as follows:

Scheme syntax: The entire range of allowable syntax specified in
   [RFC3986] is allowed for "example" URIs.

Scheme semantics: URIs in the "example" scheme are to be used for
   documentation purposes only. The use of "example" URIs must not be
   used as locators, identify any resources, or specify any particular
   set of operations.

Encoding considerations: See Section 2.5 of [RFC3986] for
   guidelines.

Interoperability considerations: None.

Security considerations: None.

8.1. "Example" Scheme Registration Request

Scheme name: example

Status: permanent

Applications/protocols that use this scheme name: An "example" URI
   is to be used for documentation purposes only. It MUST NOT be used
   for any protocol.

Contact: N/A

Author/Change controller: IETF

References: Section 8 of this RFC XXXX.
   RFC Editor Note: Replace XXXX with this RFC's reference.

9. IANA Considerations

Previously, the former "URL Scheme" registry was replaced by the
"Uniform Resource Identifier (URI) Schemes" registry. The process
was based on [RFC5226] "Expert Review" with an initial (optional)
mailing list review.

The updated template has an additional field for the status of the
scheme, and the procedures for entering new name schemes have been
augmented. Section 7 establishes the process for new scheme
registration.

IANA is requested to do the following:

o Update the URI Schemes registry to point to this document.

   o Combine the "Permanent URI Schemes", "Provisional URI Schemes",
      and "Historical URI Schemes" sub-registries into a single common
      registry with an additional "Status" column containing the status
      (Permanent, Provisional, Historical, or Pending Review), and an
      additional "Notes" column which is normally empty, but may contain
      notes approved by the Designated Expert.

   o Add the "example" URI scheme to the registry (see the template in
      Section 8.1 for registration).

10. Security Considerations

   All registered values are expected to contain accurate security
   consideration sections; 'permanent' registered scheme names are
   expected to contain complete definitions.

   Information concerning possible security vulnerabilities of a
   protocol might change over time. Consequently, claims as to the
   security properties of a registered scheme might change as well. As
   new vulnerabilities are discovered, information about such
   vulnerabilities might need to be attached to existing documentation,
   so that users are not misled as to the true security properties of a
   registered scheme.

11. Acknowledgements

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   apps-discuss@ietf.org mailing list for their comments on this
   document.

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   other members of the uri@w3.org mailing list for their comments on
   earlier versions.

   Parts of this document are based on [RFC2717], [RFC2718] and
   [RFC3864]. Some of the ideas about use of URIs were taken from the
   "Architecture of the World Wide Web" [W3CWebArch].

12. References

12.1. Normative References

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Appendix A. Changes Since RFC 4395

   1.   Combined the Historical, Permanent, and Provisional URI Schemes
        registries into one registry with a status column. This is done
        to make it easier to prevent duplicates and see existing
        conventions.

   2.   Added a Notes column in the registry for notes approved by the
        Designated Expert.

   3.   Moved the following fields out of the scheme registration
        request template and into the requirements for a scheme
        specification: Scheme syntax, Scheme semantics, Encoding
        considerations, Interoperability considerations, and Security
        considerations.

   4.   Simplified the process for Provisional registration
        significantly: changed from Expert Review to First Come First
        Served, and clarified that mailing list review is not required.

   5.   Updated process for handling of scheme name conflicts, so that
        adding a note can be approved by the Designated Expert rather
        than the IESG.

   6.   Clarified that a "URI scheme name" and an "IRI scheme name" are
        the same thing and thus use the same IANA registry.

   7.   Clarified that a registration request falls under the "IETF
        Contribution" rules, but the scheme's specification need not.

   8.   Added the "example:" URI scheme.

   9.   Added text about when to use Provisional registration.

   10. Updated convention for Private use schemes to use "." (instead
        of "-") between domain name labels, to reduce chance of
        collision, and recommended use of a reverse domain name prefix
        to allow identifying the owning organization.

   11. Recommended that scheme definitions define a "default" operation
        for when a URI is invoked.

   12. Recommended that a scheme name be the same as the service name,
        when there exists a 1:1 correspondence.

   13. Elaborated on when a Provisional request should be upgraded to
        Permanent.

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