

Uniform Resource Names (urnbis)  
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**URN Semantics Clarification**  
**draft-ietf-urnbis-semantics-clarif-02.txt**

Abstract

Experience has shown that identifiers associated with persistent names have properties and requirements that may be somewhat different from identifiers associated with the locations of objects. This is especially true when such names are expected to be stable for a very long time or when they identify large and complex entities. In order to allow Uniform Resource Names (URNs) to evolve to meet the needs of the Library, Museum, Publisher, and Information Science communities and other users, this specification separates URNs from the semantic constraints that many people believe are part of the specification for Uniform Resource Identifiers (URIs) in [RFC 3986](#), updating that document accordingly. The syntax of URNs is still constrained to that of [RFC 3986](#), so generic URI parsers are unaffected by this change.

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## [1.](#) Introduction

The Generic URI Syntax specification [[RFC3986](#)] covers both locators and names and mixtures of the two (See its [Section 1.1.3](#)) and describes Uniform Resource Locators (URLs) -- first documented in the IETF in [RFC 1738](#) [[RFC1738](#)] -- as an embodiment of the locator concept and Uniform Resource Names (URNs), specifically those using the "urn" scheme [[RFC2141](#)], as an embodiment of the names that do not directly provide for resource location. This specification is concerned only about URNs of the variety described in [RFC 2141](#) [[RFC2141](#)] and its successors [[RFC2141bis](#)] (i.e., those that use the "urn" scheme). URLs, other types of names, and any URI types that may not fall into

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one of the above categories are out of its scope and unaffected by it.

Experience with URNs since the publication of [RFC 3986](#) has identified several ways in which their inclusion under its scope has hampered understanding, adoption, and especially extension (specifically extensions of types that were anticipated in [RFC 2141](#)). The need for extensions to the URN concept is now being felt in some communities, especially those that include libraries, museums, publishers, and other information scientists.

In particular, the Generic URI Syntax specification goes beyond syntax to specify the meaning and interpretation of various fields, especially the "query" and "fragment" ones and the various syntax forms and interpretations it allows for <hier-part>. This specification excludes URNs from those definitions of meaning and interpretation so that [RFC 3986](#) applies to their syntax only. The meaning --and any more specific syntax rules-- for those fields for URNs are now defined in a URN-specific document [[RFC2141bis](#)]. URNs remain members of the URI family and parsers for generic URI syntax are not affected by this specification although parsers that make assumptions based on other URI schemes obviously might be.

This specification does not discuss DDDS [[RFC3401](#)] resolution or conversion to (and interpretation of) URCs [[RFC2483](#)] or URN "resolution" more generally. Any of those topics that do need to be addressed should be covered in other documents. The document also does not discuss alternatives to URNs, either those that might use a different scheme name within the [RFC 3986](#) URI framework or those that might use a different framework entirely. In particular, some externally-defined content or object identification systems could be represented either by a URN namespace or through separate URI schemes. This specification does not offer advice on that choice other than to suggest that the two options not be confused (or both used in a way that would be confusing).

This document updates [RFC 3986](#) to make the distinction between syntax and semantics clear for URNs and to isolate URNs from presumed URI semantic requirements. It is important to note that some readers of [RFC 3986](#) are convinced that the separation is clear in that specification and therefore that no changes to that document are needed. For them, this specification is only a confirming clarification.

In the long term, as the expanded syntax and uses of URNs become commonplace and [RFC 3986](#) is updated, this specification is likely to become of historical interest only, providing an extended rationale

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for decisions made and adjustment of the boundary between URN specifications and generic URI ones.

## **2. Pragmatic Goals**

Despite the important background and rationale in the sections that follow, the change made (or clarification provided) by this specification is driven by a desire to avoid philosophical debates about terminology or ultimate truths. Instead, it is motivated by three very pragmatic principles and goals:

1. Accommodate all of those who think URNs are necessary, i.e., that they can and should be usefully distinguished from other URIs, at least location-oriented ones including URI schemes defined prior to the time work started on this document in August 2014. In particular, provide a foundation for extensions to the URN syntax (as allowed by and defined in [RFC 2141](#)) to support requirements encountered by some of those communities.
2. Provide a path to avoid getting bogged down in declarative statements about definitions and debates about what is and is not correct in the abstract.
3. Avoid a fork in the standard that would be likely to lead to multiple, conflicting, definitions or criteria for URNs.

In addition, this document is intended to move past debates about whether or not URNs are intended to be parsed at all (i.e., whether a "urn"-scheme URI is simply opaque to a URI parser once the scheme name is identified) and, if not, how much of it is actually expected to be understood and broken into identifiable parts by such a parser. It establishes a principle that, for the "urn" scheme, parsing into the components identified in [RFC 3986](#) will be performed but that any meanings or interpretation assigned to those components (including that applicability of the normal English meanings of such terms as "query" or "fragment" are a matter for URN-specific specifications. It helps lay the foundation for the distinguishing terms "p-component", "q-component", and "f-component" in the accompanying URN definition specification [[RFC2141bis](#)].

## **3. The role of queries and fragments in URNs**

Part of the concern that led to this document was a desire to accommodate URN components that would be analogous to the query and fragment components of generalized URNs but that might have different properties. For many cases, the analogy cannot be exact. For example, [RFC 3986](#) ties the interpretation of fragments to media types. Since media type is a function of specific content, URNs that



are never resolved cannot have an associated media type, nor can URNs that resolve to, for example, other URIs that may then not be resolved further. Similarly, while the [RFC 3986](#) syntax for queries (and fragments) may be entirely appropriate for URN use, terminology like "Service Request" (see [Appendix B](#) of the predecessor "URNs are not..." draft [[ServiceRequests](#)] for additional discussion) may be more suitable to the URN context than "query" (if, indeed, the portion of the URN that is syntactically equivalent to a URI query is where those requests belong).

#### **4. Changes to [RFC 3986](#)**

This specification removes URN semantics from the scope of [RFC 3896](#). It makes no changes to the generic URI syntax. That syntax still applies to URNs as well as to other URI types. Even as regard to semantics, it has no practical effect for URNs defined in strict conformance to the prior URN specification [[RFC2141](#)] or the associated registration specification [[RFC3406](#)].

In particular, the generic URI syntax for path segments that appear after the NID and NSS of a URN, i.e., after an initial "/", for "queries" (strings starting with "?" and continuing to the end of the URI or to a "#"), and for "fragments" (strings starting with "#" and continuing to the end of the URI) is unchanged, but the terms for those path segments, "query" and "fragment" become, for URNs, terms of convenience that are defined in URN-specific ways as p-components, q-components, and f-components [[RFC2141bis](#)].

#### **5. Actions Occurring in Parallel with this Specification**

The basic URN syntax specification [[RFC2141](#)] was published well before [RFC 3986](#) and therefore does not depend on it. The successor to that specification [[RFC2141bis](#)], fully spells out, or references documents that spell out, the semantics and any required within-field syntax of URNs. It uses great care about generic or implicit reference to any URI specification and delegates further details to specific namespaces.

[[CREF1: Note in Draft: Perhaps this section can be dropped entirely.]]

#### **6. Acknowledgments**

This specification was inspired by a search in the IETF URNBIS WG for an approach that would both satisfy the needs of persistent name-type identifiers and still fully conform to the specifications and intent of [RFC 3986](#). That search lasted several years and considered many alternatives. Discussions with Leslie Daigle, Juha Hakala, Barry





Leiba, Keith Moore, Andrew Newton, and Peter Saint-Andre during the last quarter of 2013 and the first quarter of 2014 were particularly helpful in arriving at the conclusion that a conceptual separation of notions of location-based identifiers (e.g., URLs) and the types of persistent identifiers represented by URNs was necessary. Juha Hakala provided useful explanations and significant working text about the needs of the library community and their perception of identifiers and consequent implications for URN structure. Peter Saint-Andre provided significant text in a pre-publication review. The author also appreciates the efforts of several people, notably Tim Berners-Lee, Leslie Daigle, Larry Masinter, Keith Moore, Juha Hakala, Julian Reschke, Lars Svensson, Henry S. Thompson, and Dale Worely, to challenge text and ideas and demand answers to hard questions. Whether they agree with the results or not, their insights have contributed significantly to whatever clarity and precision appears in the present document.

The specification was changed considerably and its focus narrowed after an extended discussion at the WG meeting during IETF 90 in July 2014 [[IETF90-URNBISWG](#)] and subsequent comments and clarifications on the mailing list [[URNBIS-MailingList](#)]. The contributions of all of the participants in those discussions, only some of whose names appear above, are gratefully acknowledged.

## **7. Contributors**

Juha Hakala contributed considerable text, some of which was removed from later versions of the document to streamline it.

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## **8. IANA Considerations**

[[CREF2: RFC Editor: Please remove this section before publication.]]

This memo is not believed to require any action on IANA's part. In particular, we note that there is a collection of "Uniform Resource Identifier (URI) Schemes" that does not include URNs and a series of URN-specific registries that do not rely on the URI specificstions.



## **9. Security Considerations**

This specification changes the semantics of URNs to make them self-contained (as specified in other documents), relying on the generic URI syntax specification for syntax only. It should have no effect on Internet security unless the use of a definition, syntax, and semantics that are more clear reduces the potential for confusion and consequent vulnerabilities.

## **10. References**

### **10.1. Normative References**

[RFC2141] Moats, R., "URN Syntax", [RFC 2141](#), DOI 10.17487/RFC2141, May 1997, <<http://www.rfc-editor.org/info/rfc2141>>.

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Saint-Andre, P. and J. Klensin, "Uniform Resource Name (URN) Syntax", June 2015, <<https://datatracker.ietf.org/doc/draft-ietf-urnbis-rfc2141bis-urn/>>.

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### **10.2. Informative References**

[DeterministicURI]  
Mazahir, O., Thaler, D., and G. Montenegro, "Deterministic URI Encoding", February 2014, <<http://www.ietf.org/id/draft-montenegro-httpbis-uri-encoding-00.txt>>.

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[RFC2483] Mealling, M. and R. Daniel, "URI Resolution Services Necessary for URN Resolution", [RFC 2483](#), DOI 10.17487/RFC2483, January 1999, <<http://www.rfc-editor.org/info/rfc2483>>.



- [RFC3401] Mealling, M., "Dynamic Delegation Discovery System (DDDS) Part One: The Comprehensive DDDS", [RFC 3401](#), DOI 10.17487/RFC3401, October 2002, <<http://www.rfc-editor.org/info/rfc3401>>.
- [RFC3406] Daigle, L., van Gulik, D., Iannella, R., and P. Faltstrom, "Uniform Resource Names (URN) Namespace Definition Mechanisms", [BCP 66](#), [RFC 3406](#), DOI 10.17487/RFC3406, October 2002, <<http://www.rfc-editor.org/info/rfc3406>>.
- [ServiceRequests] Klensin, J., "Names are Not Locators and URNs are Not URIs, [Appendix B](#)", July 2014, <<http://www.ietf.org/id/draft-ietf-urnbis-urns-are-not-uris-01.txt>>.
- [URN-transition] Klensin, J. and J. Hakala, "Uniform Resource Name (URN) Namespace Registration Transition", August 2015, <<https://datatracker.ietf.org/doc/draft-ietf-urnbis-ns-reg-transition/>>.
- [URNBIS-MailingList] IETF, "IETF URN Mailing list", 2014, <<https://www.ietf.org/mailman/listinfo/urn>>.

## **[Appendix A](#). Background on the URN - URI relationship**

The Internet community now has many years of experience with both name-type identifiers and location-based identifiers (or "references" for those who are sensitive to the term "identifier" such as many members of the library and information science communities.. The primary examples of these two categories are Uniform Resource Names (URNs [[RFC2141](#)] [[RFC2141bis](#)]) and Uniform Resource Locators (URLs [[RFC1738](#)]). That experience leads to the conclusion that it is impractical to constrain URNs to the high-level semantics of URLs. The generic syntax for URIs [[RFC3986](#)] is adequately flexible to accommodate the perceived needs of URNs, but the specific semantics associated with the URI syntax definition -- what particular constructions "mean" and how and where they are interpreted -- appear to not be. Generalization from URLs to generic Uniform Resource Identifiers (URIs) [[RFC3986](#)], especially to name-based, high-stability, long-persistence, identifiers such as many URNs, has failed because the assumed similarities do not adequately extend to all forms of URNs. Ultimately, locators, which typically depend on particular accessing protocols and a specification relative to some physical space or network topology, are simply different creatures from long-persistence, location-independent, object identifiers. The syntax and semantic constraints that are appropriate for locators are

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either irrelevant to or interfere with the needs of resource names as a class. That was tolerable as long as the URN system didn't need additional capabilities (over those specified in [RFC 2141](#)) but experience since [RFC 2141](#) was published has shown that they are, in fact, needed.

## **[Appendix B](#). Change Log**

[[CREF3: RFC Editor: Please remove this appendix before publication.]]

### **[B.1](#). Changes from [draft-ietf-urnbis-urns-are-not-uris-00](#) (2014-04-07) to -01 (2014-07-03)**

- o Revised [Section 1](#) slightly and added some new material to try to address questions raised on the mailing list.
- o Added [Section 2](#), reflecting an email exchange.
- o Added a Security Considerations section, replacing the placeholder in the previous version.
- o Added later-deleted [Appendix B](#) and inserted a note in the material titled "A Perspective on Locations and Names" pointing to it (that material was removed from [draft-ietf-urnbis-semantics-clarif-01](#), but was [Section 2](#) and then [Section 3](#) in earlier versions).
- o Added temporary [Appendix B](#) for this version only.
- o Enhanced and updated the Acknowledgments section.
- o The usual small clarifications and editorial changes.

### **[B.2](#). Changes from [draft-ietf-urnbis-urns-are-not-uris-01](#) to [draft-ietf-urnbis-semantics-clarif-00](#) (2014-08-25)**

- o Changed title and file name to better reflect changes summarized below. Note that the predecessor of this document was [draft-ietf-urnbis-urns-are-not-uris-01](#).
- o Revised considerably as discussed on the mailing list and at IETF 90. In particular, the document has been narrowed to change semantics only without affecting the relationship to URI syntax and the document title and other details changed to match.
- o Dropped much of the original Introduction (moving it temporarily to an appendix) and trimmed the abstract to be consistent with the new, more limited. scope.





- o Revised an earlier version of [Appendix B](#) to make "perceived requirement" more clear.
- o Removed the former [Appendix B](#), as promised in the previous draft, moved considerably more text into appendices, and added some new appendix text.
- o Added new material to discuss the next round of decisions the WG will have to make, assuming this provisions of this specification are approved. That material was removed from [draft-ietf-urnbis-semantics-clarif-01](#).

**B.3. Changes from [draft-ietf-urnbis-semantics-clarif-00](#) (2014-08-25) to -01**

- o Removed some appendices and the topic discussion material, as discussed in the previous draft.
- o Aligned the document and its terminology somewhat better with [draft-ietf-urnbis-rfc2141bis-urn-09](#) including providing for p-components and using the p-/q-/f-component terminology.
- o Made several clarifying changes to reflect mailing list discussions (mostly of 2141bis) since the earlier version was posted.
- o Revised earlier portions of this change tracking appendix to remove referenced to deleted material. It is not possible to reconstruct what earlier versions of this document contained by examining these change summaries.
- o Moved specific comments about the IETF 90 discussions to Acknowledgments and removed or edited some material that was only appropriate for a discussion piece.
- o Made several small editorial changes as usual.

**B.4. Changes from [draft-ietf-urnbis-semantics-clarif-01](#) (2015-02-14) to -02**

- o Reissued to keep draft alive; no substantive changes.
- o Updated references, including some that were already outdated in -01.



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