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Standard Practice

CREATING SERVICE IDENTIFIERS

FOREWORD

This standard is approved for use by all Departments of the Federal Aviation Administration (FAA).

This standard sets forth requirements for creating globally-unique identifiers for FAA [service-oriented architecture](#) (SOA)-based services.

This standard has been prepared in accordance with FAA-STD-068, Department of Transportation Federal Aviation Administration, *Preparation of Standards* [\[STD068\]](#).

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1 SCOPE

This standard applies to all Federal Aviation Administration (FAA) programs responsible for developing, publishing, and operating [services](#) that are part of the FAA's implementation of a [service-oriented architecture](#) (SOA). It provides rules and requirements for creating [service identifiers](#) that will uniquely and globally identify each service throughout its lifecycle.

- This standard does not prescribe or suggest any technological solutions for developing services.
- This standard does not specify any configuration management (CM) or quality assurance (QA) policies, rules or assertions that an FAA service may be subjected to.
- This standard does not implement or suggest an approach for assigning service identifiers that is specific to any FAA [organization](#) or Line of Business, but rather seeks to provide an extensible and flexible approach that may fit any FAA business domain.
- This standard does not specify any governance policies, rules or procedures that an FAA service may be subjected to.

1.1 Introduction

Over the last two decades, [SOA](#) has become an accepted approach for realizing information exchange in the National Airspace System (NAS) and the FAA as a whole. To ensure interoperability and achieve business objectives, all SOA-based components must follow a common set of standards, policies and processes. One of the most important of these is a standard for uniquely identifying SOA services.

The World Wide Web uses relatively simple technologies with sufficient scalability, efficiency and utility that they have resulted in a remarkable information space of interrelated [resources](#), growing across languages, cultures, and media [[Web-Arch](#)].

The Web's goal of building a global community in which information can be shared among all participating parties [[Web-Arch](#)] resonates with the FAA's objectives. Toward this end, SOA implementers take advantage of the Web infrastructure, while adhering to its architecture and standards.

The requirements presented in this standard effectively make use of two Web standards: [Uniform Resource Identifier](#) (URI) [[RFC-3986](#)] and [Hypertext Transfer Protocol](#) (HTTP) [[RFC-2616](#)], as well as other universally-recognized practices for annotating and locating resources in a global information space.

This standard addresses the following business needs:

- Supports service governance by ensuring consistency in identifying services across the FAA;
- Enhances service discovery and promotes service consumption by eliminating duplicative and ambiguous service identifiers;
- Provides high levels of service visibility within and beyond the FAA enterprise, consistent with open data policies and the principles of the World Wide Web.

1.2 Intended Audience

The intended audience for this standard includes all stakeholders involved in identifying, designing, developing, publishing and governing FAA services.

1.3 Basic Concepts

This section introduces major terms, concepts, and ideas relevant to this standard.

1.3.1 Service Identification

The FAA is increasingly employing SOA-based [services](#) in its business activities. As defined in [\[SOA-RM\]](#), SOA is a paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. Hence, there will be many stakeholders who interact with a service throughout its lifecycle:

- A service is developed by a [service provider](#) who wants to expose a new or existing business capability to potential [service consumers](#).
- A description of the service is published in a [service registry](#) such as the [NAS Service Registry and Repository \(NSRR\)](#). To allow consumers to discover services, the registry custodian manages the [service descriptions](#), which are based on metadata standards such as the Service Description Conceptual Model [\[SDCM\]](#).
- A service is deployed in a runtime environment from where it can be consumed by a service consumer.
- Finally, once a service consumer discovers a service that fits its business needs, the consumer will develop software components that use the service.

To enable this scenario, the stakeholders involved must share a common method for referencing the underlying service. This method, and the focus of this standard, is the [service identifier \(SID\)](#). The SID is designed to provide an industry standards-based uniform way of identifying an FAA service so that the service can be consistently and uniquely referenced in a local, regional, or global context.

A service identifier must satisfy the following criteria:

- *Unique*: no two services can share the same identifier.
- *Persistent*: the identifier must remain valid and unchanged throughout the service's lifecycle.
- *Machine-processable*: the identifier must be processable by software agents.
- *Standards-based*: to facilitate information exchange among FAA and its partners, the identifier must conform to international standards and industry best practices.

One such standard is RFC 3986 *Uniform Resource Identifier (URI)* [\[RFC-3986\]](#), which has been used to identify [resources](#) on the Web. By adopting the URI concept, a SID is effectively reusing an existing universal distributed naming scheme that is both well-described and tested.

1.3.2 Uniform Resource Identifiers (URI)

There have been several popular schemes for formulating [URIs](#). The following examples from [\[RFC-3986\]](#) illustrate different [URI schemes](#)¹ and variations in their common syntax components:

```
ftp://ftp.is.co.za/rfc/rfc1808.txt
http://www.ietf.org/rfc/rfc2396.txt
ldap://[2001:db8::7]/c=GB?objectClass=one
```

¹ For a complete list of URI schemes, see <https://www.iana.org/assignments/uri-schemes/uri-schemes.xhtml>.

mailto:John.Doe@example.com
news:comp.infosystems.www.servers.unix
tel:+1-816-555-1212
telnet://192.0.2.16:80/
urn:oasis:names:specification:docbook:dtd:xml:4.1.2

While a URI is designed for extensibility through the utilization of various URI schemes, the [SID](#) limits its usage to the **http** scheme only.² Rendering a SID as an [httpURI](#) provides multiple benefits:

- Uniqueness of the identifier is established “automatically” by some form of [Domain Name System](#) (DNS).
- Universally accessible mechanisms (DNS and Web servers) are available to support and ensure the uniqueness of each SID.
- Using [HTTP](#), a ubiquitous Web protocol, allows a SID to serve not only as a persistent identifier but also as a mechanism for retrieving useful information about the identified service. For example, a SID may be [dereferenced](#) by a person via a browser to aid understanding, or by a computer for automatic processing or identification of schemas, WSDL files, etc.
- Defining a SID as an extension of [httpURI](#) will ease the adaptation of such technologies as Semantic Web and Linked Data.

The typical scenario for creating a SID presumes that an [organization](#) registers a [domain name](#) within the DNS. This domain name is further used as a topmost element in SIDs for all services developed and operated under the purview of this organization (a.k.a. *domain owner*). The domain owner may delegate permission to service provider organizations to create and publish SIDs according to requirements prescribed by this standard as well as organization-specific practices and regulations. An informative example of how an FAA organization might create a SID is provided in [section 6.1](#) of this standard.

1.3.3 Using a SID to Access Service-Related Resources

At the most abstract level, a service is a business capability that is independent of any documents or technical implementations. For example, human or machine-readable [service descriptions](#) and [end points](#) for that service are [resources](#) closely related to yet distinguishable from the service itself. A SID may be used to invoke the service, and it may also be used to look up information *about* the service, such as a registry entry or online documentation.

While assignment of URIs to services is a responsibility of the [service provider](#), it is still beneficial to be able to redirect the requester to appropriate resources when a SID is requested. For example, a SID may be used to invoke the service, or it may allow a user to look up useful information about the service, such as a registry entry or other online documents, as illustrated in Figure 1.

² In 2009, the FAA released Standard Practice FAA-STD-063 *XML Namespaces*, a standard that prescribed URNs for identifying SOA-related resources, including services. Because of the limitations of using a URN to support retrieval of corresponding resources or associated information on the Internet, as well as an inefficient URN registration process, this approach is no longer taken in the FAA.

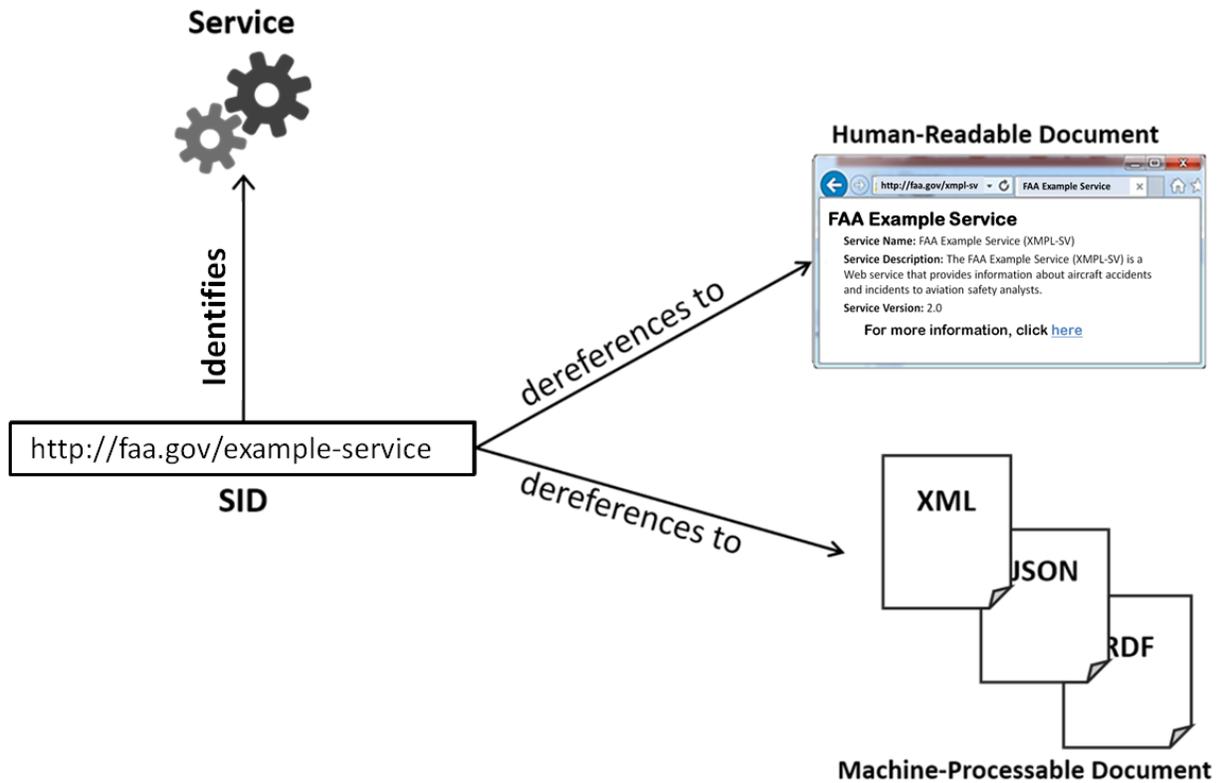


FIGURE 1. Accessing service-related resources

Additional explanatory information on using URIs to access or retrieve resources on the Web is provided in [section 6.2](#) of this standard.

2 APPLICABLE DOCUMENTS

2.1 Government Documents

- [STD068] FAA-STD-068, Preparation of Standards, 4 December 2009.
<http://www.tc.faa.gov/its/worldpac/standards/faa-std-068.pdf>
- [SDCM] Service Description Conceptual Model (SDCM) 2.0, SESAR CP 2.1, June 3, 2016.
<http://swim.aero/sdcm/2.0.0/sdcm-2.0.0.html>
- [CV] SWIM Controlled Vocabulary v1.0, 25 March 2019.
<https://semantics.aero/pages/swim-vocabulary.html>
- [TF3-WP] Guidance for Creating SWIM Service Identifiers, FAA, ICAO SWIM Task Force/3 Working Paper, 07-10 May 2019.
https://www.icao.int/APAC/Meetings/2019SWIMTF3/WP03_USA%20AI3d%20-%20Task%201-4_SWIM%20Service%20Identifier.pdf

2.2 Non-Government Documents

- [Web-Arch] Architecture of the World Wide Web, Volume One, W3C Recommendation, 15 December 2004.
<https://www.w3.org/TR/2004/REC-webarch-20041215/>
- [ASCII] Coded Character Set American Standard Code for Information Interchange, American National Standards Institute, ANSI X3.4, 1986
<http://unicode.org/L2/L2006/06388-review-incits4.pdf>
- [Cool-URIs] Berniers-Lee, Tim. Cool URIs don't change, W3C, 1998.
<https://www.w3.org/TR/cooluris/>
- [ICANN] ICANN Acronyms and Terms, Internet Corporation for Assigned Names and Numbers.
<https://www.icann.org/icann-acronyms-and-terms/en/nav/A>
- [SOA-RM] OASIS Reference Model for SOA 1.0, 12 October 2006.
<http://docs.oasis-open.org/soa-rm/v1.0/soa-rm.pdf>
- [OASIS] Reference Architecture Foundation for Service Oriented Architecture Version 1.0, OASIS Committee Specification 01, 4 December 2012.
<http://docs.oasis-open.org/soa-rm/soa-ra/v1.0/soa-ra.html>
- [RFC-1034] RFC 1034, Domain Names – Concepts and Facilities, Network Working Group, November 1987.
<https://tools.ietf.org/html/rfc1034>

- [RFC-2119] RFC 2119, Key words for Use in RFCs to Indicate Requirement Levels, Network Working Group, March 1997.
<https://www.rfc-editor.org/rfc/rfc2119.txt>

- [RFC-3986] RFC 3986, Uniform Resource Identifier (URI): Generic Syntax, Network Working Group, January 2005.
<http://www.rfc-editor.org/rfc/rfc3986.txt>

- [RFC-2616] RFC-2616: Hypertext Transfer Protocol (HTTP) v.1.1; Network Working Group, R. Fielding et al; June 1999.
<https://tools.ietf.org/html/rfc2616>

2.3 Order of Precedence

In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3 DEFINITIONS

3.1 Key Words

The key words "MUST," "MUST NOT," "REQUIRED," "SHALL," "SHALL NOT," "SHOULD," "SHOULD NOT," "RECOMMENDED," "MAY," and "OPTIONAL," in this standard are to be interpreted as described in RFC 2119 [RFC-2119]. These key words are capitalized when used to unambiguously specify requirements. When these words are not capitalized, they are meant in their natural-language sense.

All examples in the document are labeled as "non-normative", which means they are not to provide a canonical implementation, but merely to illustrate technical features of a particular approach.

3.2 Terms and Definitions

<i>Dereferenceable URI</i>	A URI is called dereferenceable when it can be used to obtain a representation (e.g., a human or machine-readable Web document) of the resource it identifies using the Internet protocol designated by the URI Scheme . [TF3-WP] The act of retrieving a representation of a resource identified by a URI is known as <i>dereferencing</i> the URI.
<i>Domain Name</i>	An identification string that defines a realm of administrative autonomy, authority or control within the Internet. [TF3-WP] The domain name itself identifies a specific address on the Internet that belongs to an entity such as a company, organization , institution, or individual. [ICANN]
<i>Domain Name System (DNS)</i>	A hierarchical decentralized naming system for computers, services , or other resources connected to the Internet. The DNS runs under the auspices of the Internet Corporation for Assigned Names and Numbers (ICANN) (https://www.icann.org/) , and its goal is to provide a service for mapping from URI to Internet Protocol (IP) addresses. [TF3-WP]
<i>httpURI</i>	A URI that uses an "http" scheme . [TF3-WP]
<i>Hypertext Transfer Protocol (HTTP)</i>	An application protocol for distributed, collaborative, and hypermedia information systems. [RFC-2616]
<i>Identifier (ID)</i>	A sequence of characters that unambiguously indicates a particular resource . [OASIS]
<i>Organization</i>	A unique framework of authority within which a person or persons act, or are designated to act, towards some purpose. Any department, service , or other entity within an organization which needs to be identified for information exchange. [CV]
<i>Resource</i>	An identifiable entity that has value to a stakeholder. [OASIS] Familiar examples include a service , an electronic document, an image, a source of information (e.g., "today's weather report for Los Angeles"), and a collection of other resources. [RFC-3986]
<i>Service</i>	A mechanism to enable access to one or more capabilities, where the access is provided using a prescribed interface and is exercised consistent with constraints and policies as specified by the service description . [SOA-RM]
<i>Service Consumer</i>	An organization that seeks to satisfy a particular need through the use of capabilities offered by means of a service . [SOA-RM]

Service Description	The information needed in order to use, or consider using, a service . [SOA-RM]
Service End Point	A network address at which a service may be accessed. [SDCM]
Service Identifier (SID)	A unique identifier assigned to a service and used throughout its lifecycle.
Service Provider	An organization that offers the use of capabilities by means of a service . [SOA-RM]
Service Registry	An enabling infrastructure that uses a formal registration process to store, catalog, and manage metadata relevant to a service . A registry supports the search, identification, and understanding of resources , as well as query capabilities. [CV]
Service-Oriented Architecture (SOA)	A paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. A SOA provides a uniform means to offer, discover, interact with, and use capabilities to produce desired effects consistent with measurable preconditions and expectations. [SOA-RM]
Subdomain	A domain that is a part of another (main) domain in the Domain Name System (DNS) hierarchy. [RFC-1034] For example, in the domain name <i>swim.faa.gov</i> , “swim” is a subdomain of the larger “faa.gov” domain.
Uniform Resource Identifier (URI)	A sequence of characters designed for the unambiguous identification of resources via the URI syntax rules and naming schemes prescribed by RFC 3986. [RFC-3986]
URI Scheme	A scheme name (e.g., “http”, “ftp”, “mailto”, etc.) at the beginning of each URI that refers to a specification for assigning identifiers within that scheme. [RFC-3986]

3.3 Acronyms and Abbreviations

ASCII	American Standard Code for Information Interchange
DNS	Domain Name System
FAA	Federal Aviation Administration
HTTP	Hypertext Transfer Protocol
ICANN	Internet Corporation for Assigned Names and Numbers
ID	Identifier
NAS	National Airspace System
OASIS	Organization for the Advancement of Structured Information Standards
SDCM	Service Description Conceptual Model
SID	Service Identifier
SOA	Service-Oriented Architecture
SWIM	System Wide Information Management
URI	Uniform Resource Identifier
URN	Uniform Resource Name

WSDL Web Service Description Language
W3C World Wide Web Consortium
XML eXtensible Markup Language

4 GENERAL REQUIREMENTS

This section describes requirements for [service identifiers](#) in general. Detailed requirements for the structure and syntax of a SID are provided in [section 5](#) of this standard.

- a. A [service](#) developed, published, or operated by the FAA SHALL be identified by a globally-unique service identifier (SID).
- b. The SID SHALL conform to the requirements presented in section 5 of this standard. Note: When creating or obtaining a SID, the [service provider](#) is encouraged to request assistance from an [organization](#) responsible for managing the hosting [domain](#).
- c. The SID SHOULD persist (remain unchanged) throughout the service's lifecycle.
- d. The SID SHALL be [dereferenceable](#), i.e., resolve to a Web [resource](#) such as a Web page or XML [service description](#).
- e. A Web resource to which the SID resolves MAY be a human or machine-readable document that describes the service, or one or more references to other resources that present relevant aspects of the service. Note: This requirement makes no assumption as to the document's content, level of expressiveness, or type.
- f. The links included in the Web resource MAY point to various online documents (e.g., a WSDL file, an XML Capability document) or a comprehensive service description in a [registry](#).

5 DETAILED REQUIREMENTS

This section describes requirements for the syntax, structure, and content of a [service identifier \(SID\)](#).

- a. A SID SHALL conform to RFC 3986 *Uniform Resource Identifier (URI): Generic Syntax* [\[RFC-3986\]](#).
- b. A SID SHALL be declared as an [HTTP](#)-based URI ([httpURI](#)). Note: This requirement mandates rendering a SID as a [URI](#) with default value for the [scheme](#) element = "http".
- c. A SID SHALL use a subset of ASCII [\[ASCII\]](#) characters.
- d. The complete character set that SHALL be used for a SID is: [0-9A-Za-z], "." (period), "-" (hyphen), and "_" (underscore).
- e. Hyphens SHOULD be used between words within a SID.
- f. Underscores MAY be used between words within a SID where the use of a hyphen is impractical or undesirable. Note: Although underscores may be used, hyphens are preferred because they are easier to see in displayed URIs and are more consistent with common practices for naming Web [resources](#).
- g. Spaces SHALL NOT be used within a SID.
- h. Lowercase spelling of words within a SID is RECOMMENDED. Note: Because RFC-3986 does not define requirements for case-sensitivity with respect to a URI, there is not a consensus among vendors as to how the usage of case should be addressed. Most Web servers resolve URIs as case-insensitive, but some support case-sensitive resolutions. To avoid potential conflicts, this standard recommends using only lowercase characters for creating a SID.
- i. A SID SHALL neither begin nor end with a punctuation character (period, hyphen, and underscore).
- j. A SID SHALL NOT contain multiple consecutive punctuation characters (period, hyphen, and underscore).
- k. A SID SHALL comply with the following syntax:

```
"http://" + authority + "/" [+ organization-specific fragment + "/" ] +  
service name [+ "/" + service version]
```

Where:

- An element surrounded by quotation marks "" is presented exactly as shown, i.e., literally.
 - An element surrounded by square brackets [] is optional.
 - The plus sign + is interpreted as "followed by".
- l. The [URI scheme](#) element `http://` SHALL be present in the SID.
 - m. The `authority` element SHALL represent a domain or a combination of [domain](#) and [subdomain](#) names registered by the FAA.
 - n. The `authority` element SHALL contain the domain name `"faa.gov"`.
 - o. The `authority` element MAY contain one or more subdomain names, e.g., `"swim.faa.gov"`.
 - p. The `organization-specific fragment` element MAY be present in the SID. Note: This element represents a part of the SID that could be defined by the [service provider organization](#) and may be required by organization regulations or policies. Usage of this element should be avoided if

possible, since using it is essentially classifying the resource being identified according to some organizational structure which is liable to change and render the URI invalid. Additional guidance on this subject is provided in [\[Cool-URIs\]](#).

- q. The `service name` element SHALL be present in the SID. Note: This element consists of the name of the service being identified, often presented as a commonly recognized abbreviation.
- r. The `service version` element MAY be present in the SID. Note: This element consists of the current version or revision level of the service.

The following are examples of valid SIDs:

- `http://asias.faa.gov/flight-incident-reporting-service`
- `http://swim.faa.gov/services/stds-apd/1.5`
- `http://faa.gov/weather/itws`

6 NOTES

This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.

6.1 Example of Creating and Using a SID (Informative)

This example (adapted from [TF3-WP]) presents a process-oriented view of the steps toward creating a [SID](#) for a fictitious FAA “Flight Plan Service”.

Participants:

Domain Owner – A fictitious FAA Air Navigation Services Group (ANSG) responsible for governing and managing the development of flight information services.

Service Provider – An [organization](#) within the ANSG responsible for the development of the Flight Plan Service.

Assumptions:

The FAA has given authority over the [domain name](#) `ansg.faa.gov` to the Air Navigation Services Group.

Steps:

- 1) The *Domain Owner* delegates creation of a SID within the domain `ansg.faa.gov` to the *Service Provider*.
- 2) The *Service Provider* creates the SID `http://ansg.faa.gov/fps` as prescribed in by this standard.
- 3) The *Service Provider* creates a Web page that [dereferences](#) the SID to retrieve a Web page containing a brief description of the Flight Plan Service, a link to detailed information about this service in a [registry](#) maintained by the *Domain Owner*, and a link to the service’s WSDL document. Note: In this example, a user would not invoke the actual service using the SID; information about how to invoke the service ([service end point](#)) is contained in the registered [service description](#).

Figure 2 depicts the architecture of this scenario.

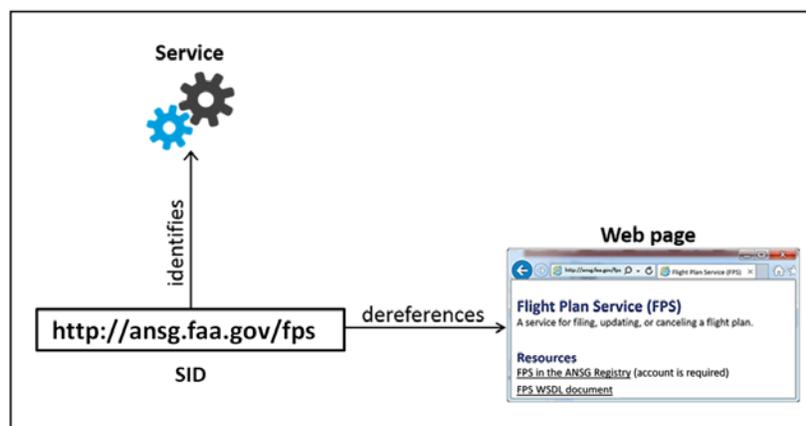


FIGURE 2. Architecture of SID creation and usage

Outcome:

The Flight Plan Service is uniquely identified in a global context by the SID `http://ansg.faa.gov/fps`. A user can look up information about the Flight Plan Service by dereferencing the value of the SID.

6.2 Using URIs to access or retrieve resources on the Web (Informative)

The following material from RFC 3986 *Uniform Resource Identifier (URI): Generic Syntax* [RFC-3986] is reproduced here to provide additional information on the use of URIs to access as well as identify [resources](#). The material also helps to add meaning to [URI](#)-related terminology such as “resolution” and “dereferencing” by employing them in the discussion.

RFC 3986 Section 1.2.2 paragraphs 1-3: Separating Identification from Interaction

A common misunderstanding of URIs is that they are only used to refer to accessible resources. The URI itself only provides identification; access to the resource is neither guaranteed nor implied by the presence of a URI. Instead, any operation associated with a URI reference is defined by the protocol element, data format attribute, or natural language text in which it appears.

Given a URI, a system may attempt to perform a variety of operations on the resource, as might be characterized by words such as “access”, “update”, “replace”, or “find attributes”. Such operations are defined by the protocols that make use of URIs, not by this specification. However, we do use a few general terms for describing common operations on URIs. URI “resolution” is the process of determining an access mechanism and the appropriate parameters necessary to dereference a URI; this resolution may require several iterations. To use that access mechanism to perform an action on the URI's resource is to “dereference” the URI.

When URIs are used within information retrieval systems to identify sources of information, the most common form of URI dereference is “retrieval”: making use of a URI in order to retrieve a representation of its associated resource. A “representation” is a sequence of octets, along with representation metadata describing those octets, that constitutes a record of the state of the resource at the time when the representation is generated. Retrieval is achieved by a process that might include using the URI as a cache key to check for a locally cached representation, resolution of the URI to determine an appropriate access mechanism (if any), and dereference of the URI for the sake of applying a retrieval operation. Depending on the protocols used to perform the retrieval, additional information might be supplied about the resource (resource metadata) and its relation to other resources.