A Uniform Resource Name (URN) for Services
draft-ietf-ecrit-service-urn-01

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Abstract

   The content of many communication services depend on the context,
   such as the user's location. We describe a 'service' URN that allows
   to register such context-dependent services that can be resolved in a
   distributed manner.

Table of Contents

1. Introduction

   In existing telecommunications systems, there are many well-known
   communication and information services that are offered by loosely
   coordinated entities across a large geographic region, with well-
   known identifiers. Some of the services are operated by governments
   or regulated monopolies, others by competing commercial enterprises.
   Examples include emergency services (reached by dialing 911 in North
   America, 112 in Europe), community services and volunteer
   opportunities (211 in some regions of the United States),telephone
   directory and repair services (411 and 611 in the United States and
   Canada), government information services (311 in some cities in the
   United States), lawyer referral services (1-800-LAWYER), car roadside
   assistance (automobile clubs) and pizza delivery services.
   Unfortunately, almost all of them are limited in scope to a single
   country or possibly a group of countries, such as those belonging to
   the North American Numbering Plan or the European Union. The same
   identifiers are often used for other purposes outside that region,
   making accessing such services difficult when users travel or use
   devices produced outside their home country.

   These services are characterized by long-term stability of user-
   visible identifiers, decentralized administration of the underlying
   service and a well-defined resolution mechanism. (For example, there
   is no national coordination or call center for "9-1-1" in the United
   States; rather, various local government organizations cooperate to
   provide this service, based on jurisdictions.)

   In this document, we propose a URN namespace that, together with
   resolution protocols beyond the scope of this document, allows to
   define such global, well-known services, while distributing the
   actual implementation across a large number of service-providing
   entities. While there are many ways to divide provision of such
   services, we focus on geography as a common way to delineate service
   regions. In addition, users can choose different directory providers
   that in turn manage how geographic locations are mapped to service
   providers.

   Availability of such service identifiers simplifies end system
   configuration. For example, an IP phone could have a special set of
   short cuts or buttons that invoke emergency services, as it would not
   be practical to manually re-configure the device with local emergency
   contacts for each city or town a user visits with his or her mobile
   device. Also, such identifiers allow to delegate routing decisions
   to third parties and mark certain requests as having special
   characteristics while preventing these characteristics to be
   accidentally invoked on inappropriate requests.

This URN allows to identify services independent of a particular
protocol to deliver the services. It may appear in protocols that
allow general URIs, such as the Session Initiation Protocol (SIP) [5]
request URIs, web pages or mapping protocols.

The service URN is generally not expected to be visible to humans.
For example, it is expected that callers will still dial '9-1-1' in
the United States to reach emergency services. In some other cases,
speed dial buttons might identify the service, as is common practice
on hotel phones today. (Speed dial buttons for summoning emergency
help are considered inappropriate by most emergency services
professionals, at least for mobile devices, as they are too prone to
being triggered accidentally.) Rather, protocol elements would carry
the service URN described here, allowing universal identification.
The translation of dial strings to service URNs is beyond the scope
of this document; it is likely to depend on the location of the
caller and may be many-to-one. For example, a phone for a traveler
could recognize the emergency dial string for both the traveler's
home location and the traveler's visited location, translating both
to the same universal service URN, urn:service:sos.

Existing technologies address the mapping of service identifiers to a
service for a particular DNS domain (DNS SRV [13], DNS NAPTR [15]) or
a local area network (SLP [12]).

We discuss alternative approaches in Appendix A. For example, the
tel URI [20] allows to express service codes such as "911" for
emergency services by adding a context parameter, but does not
address the problem of global validity.

Since service URNs are not routable, a proxy or user agent has to
translate the service URN into a routable URL for a location-
appropriate service provider, such as a SIP URL. LoST [24] is one
resolution system for mapping service URNs to URLs based on
geographic location. It is anticipated that there will be several
such systems.

For SIP, the service URN will likely appear in either the request URI
or the To header field, depending on which SIP element recognizes the
request as identifying an emergency call. If the mapping is done by
a proxy, the call may no longer be recognizable as an emergency call.
Section 3 uses the service URN in a new SIP feature tag.

2. Registration Template

Below, we include the registration template for the URN scheme
according to RFC 3406 [19].

Namespace ID: service
Registration Information: Registration version: 1; registration date:
   2005-07-10
Declared registrant of the namespace: TBD
Declaration of syntactic structure: The URN consists of a
   hierarchical service identifier, with a sequence of labels
   separated by periods. The left-most label is the most significant
   one and is called 'top-level service', while names to the right
   are called 'sub-services'. The set of allowable characters is the
   same as that for domain names [1] except that there is no
   restriction on the first character being a letter; labels are
   case-insensitive and SHOULD be specified in all lower-case. Any
   string of service labels can be used to request services that are
   either more generic or more specific. In other words, if a
   service 'x.y.z' exists, the URNs 'x' and 'x.y' are also valid
   service URNs.

   "URN:service:" service
   service   = top-level-service *("." sub-service)
   top-level-service = service-identifier
   sub-service   = service-identifier
   service-identifier = 1*(ALPHA / DIGIT / "-")

Relevant ancillary documentation: None
Community considerations: The service URN is believe to be relevant
   to a large cross-section of Internet users, including both
   technical and non-technical users, on a variety of devices, but
   particularly for mobile and nomadic users. The service URN will
   allow Internet users needing services to identify the service by
   kind, without having to determine manually who provides the
   particular service in the user's current context, e.g., at his
   current location. For example, a traveler will be able to use his
   mobile device to request emergency services without having to know
   the local emergency number. The assignment of identifiers is
   described in the IANA Considerations (Section 5). The service URN
   does not prescribe a particular resolution mechanism, but it is
   assumed that a number of different entities could operate and
   offer such mechanisms. The ECRIT working group is currently
   discussing several approaches, including solutions based on DNS,
   IRIS and a web-services protocol. Software prototypes for some of
   these are currently already available and are believed to be
   readily developed.
Namespace considerations: There do not appear to be other URN
   namespaces that serve the same need of uniquely identifying
   widely-available communication and information services. Unlike
   most other currently registered URN namespaces, the service URN
   does not identify documents and protocol objects (e.g., [17],
   [18], [22], [23]), types of telecommunications equipment [21],

people or organizations [16]. tel URIs [20] identify telephone
numbers, but numbers commonly identifying services, such as 911 or
112, are specific to a particular region or country.

Identifier uniqueness considerations: A service URN identifies a
logical service, specified in the service registration (see IANA
considerations). Resolution of the URN, if successful, will
return a particular instance of the service, and this instance may
be different even for two users making the same request in the
same place at the same time; the logical service identified by the
URN, however, is persistent and unique.

Identifier persistence considerations: The 'service' URN for the same
service is expected to be persisent, although there naturally
cannot be a guarantee that a particular service will continue to
be available globally or at all times.

Process of identifier assignment: Details of the service assignment
depend on the service and national regulations. In general, it is
assumed that providers of services can register through a service
mapping mechanism for a particular service in a particular
geographic area. The provision of some services may be restricted
by local or national regulations. (As a hypothetical example,
providing emergency services may be restricted to government-
authorized entities, which may limit the region where each entity
can advertise its services.) The rules for each service are
described in a service-specific document.

Process for identifier resolution: 'service' identifiers are resolved
by the mapping protocols, an instance of a Resolution Discovery
System (RDS) as described in RFC 2276 [3]. There could be several
such mapping protocols in concurrent use, as long as there are
reasonable guarantees that all services are available in all
mapping protocols. Section 4 describes the DDDS service that uses
DNS NAPTR records to find an instance of a mapping service.

Rules for Lexical Equivalence: 'service' identifiers are compared
according to domain name comparison rules. The use of homographic
identifiers is NOT RECOMMENDED.

Conformance with URN Syntax: There are no special considerations.

Validation mechanism: The RDS mechanism is also used to validate the
existence of a resource. As noted, by its design, the
availability of a resource may depend on where service is desired
and there may not be service available in all or most locations.
(For example, roadside assistance service is unlikely to be
available on about 70% of the earth's surface.)

Scope: The scope for this URN is public and global.

3. **SIP Media Feature Tag Registration:** Service

This section is specific to SIP.

If a user agent recognizes an emergency call, it inserts the service

URN into the "To" header field of the INVITE request. If a proxy
recognizes a call as an emergency call, but the user agent did not,
the To header field will contain another URL, such as a tel or SIP
URL. As part of the mapping process, the request URI will be
replaced with the URL of the entity providing the service. Thus, the
INVITE request is no longer recognizable as an emergency call,
although this is desirable to prevent misuse of authorization bypass
for emergency calls and for appropriate policy and priority handling
of emergency calls.

To address this problem, we propose the use of a new media feature
tag [8], sip.service, that describe the desired communication
service.

For example, a user agent could request to be routed to marine rescue
by including the following SIP header field:

  Accept-Contact: *;sip.service="urn:service:sos.marine"

The IANA registration can be found in Section 5.

4. The Service Application Specification

This template defines the service URN DDDS Application according to
the rules and requirements found in [6]. The DDDS database used by
this Application is found in [7] which is the document that defines
the NAPTR DNS Resource Record type.

In summary, a client that wants to resolve a service URN obtains a
domain name through a variety of means, looks up the NAPTR record for
the resolution service and used the regular expression in that record
to transform the service URN into a protocol URL that leads to the
mapping service. This approach allows different domains to offer
different instances of the mapping server and to have different
services be handled by different mapping servers.

[Note: An alternative is to map the URN to a set of labels, ENUM-
style, so that urn:service:sos.fire becomes fire.sos.example.com.
This only works if the service labels are also valid DNS labels.]

4.1 Application Unique String

The Application Unique String (AUS) is the service URN. This URN
MUST be canonicalized and hex encoded according to the "absolute-uri"
production found in the Collected ABNF from RFC 2396.

4.2 First Well Known Rule

The first well known rule extracts a key from the AUS. For this
application, the first well known rule extracts the service portion
from the URN, i.e., the "service" part described in Declaration of
Syntactic Structure (Section 2).

4.3 Valid Databases

The key resulting from the first well known rule is looked up in a
single database, the DNS [7]. The domain is determined by local
configuration, including through DHCP [10]. For SIP services, the
host part of the address-of-record (AOR) SHOULD be a valid NAPTR
record.

4.4 Expected Output

The result of the application is a DNS record for the server to
contact.

4.5 Flags

Since the NAPTR record provides a URI, the "u" flag is used.

4.6 Services

The service consists of a token identifying the mapping protocol ,
followed by a transport identifier. The string is defined by the
mapping protocol.

4.7 Example

The following example maps service URNs to HTTP URLs of the form
http://example.com/map/[service], using the LoST [24] protocol.

```
example.com.
;       order pref flags service      regexp  replacement
IN NAPTR 50   50  "u"   "LOST+D2T"
   "!urn:service:(.*)!http://example.com/map/\1!i"  .
```

5. IANA Considerations

New service-identifying tokens and sub-registrations are to be
managed by IANA, according to the processes outlined in [4]. The
policy for top-level service names is 'IETF Consensus'. The policy
for assigning names to sub-services may differ for each top-level
service designation and MUST be defined by the document describing

the top-level service.

This section also registers a new SIP media feature tag.

5.1 sos Service Types

The 'sos' service type describes emergency services and services
related to public safety and health, typically offered by various
branches of the government or other public institutions. Additional
sub-services can be added after expert review and should be of
general public interest.

urn:service:sos The generic 'sos' service reaches a public safety
   answering point (PSAP), that in turn dispatches aid appropriate to
   the emergency. It encompasses all of the services listed below.
urn:service:sos.ambulance This service identifier reaches an
   ambulance service that provides emergency medical assistance and
   transportation.
urn:service:sos.animal-control Animal control is defined as control
   of dogs, cats, and domesticated or undomesticated animals.
urn:service:sos.fire The 'fire' service identifier summons the fire
   service, also known as the fire brigade or fire department.
urn:service:sos.gas The 'gas' service allows the reporting of natural
   gas (and other flammable gas) leaks or other natural gas
   emergencies.
urn:service:sos.mountain The 'mountain' service refers to mountain
   rescue services, i.e., search and rescue activities that occur in
   a mountainous environment, although the term is sometimes also
   used to apply to search and rescue in other wilderness
   environments.
urn:service:sos.marine The 'marine' service refers to maritime search
   and rescue services such as those offered by the coast guard,
   lifeboat or surf lifesavers.
urn:service:sos.physician The 'physician' emergency service connects
   the caller to a physician referral service.
urn:service:sos.poison The 'poison' service refers to special
   information centers set up to inform citizens about how to respond
   to potential poisoning. These poison control centers maintain a
   database of poisons and appropriate emergency treatment.
urn:service:sos.police The 'police' service refers to the police
   department or other law enforcement authorities.
urn:service:sos.suicide The 'suicide' service refers to the suicide
   prevention hotline.
urn:service:sos.mental-health The 'mental-health' service refers to
   the "[d]iagnostic, treatment, and preventive care that helps
   improve how persons with mental illness feel both physically and
   emotionally as well as how they interact with other persons."
   (U.S. Department of Health and Human Services)

5.2 **SIP Media Feature Tag Registration:** Service

   This specification defines an additional media feature tag, extending
   the SIP tree entries described in [8] and following the registration
   process in Section 12.1 of that document. This section serves as the
   IANA registration for the service feature tags, which are made into
   the SIP media feature tag tree.

   Media feature tag name: sip.service
   ASN.1 Identifier: New assignment by IANA.
   Summary of the media feature indicated by this tag: Each feature tag
      indicates the type of service requested.
   Values appropriate for use with this feature tag: Service URNs, as
      described in this specification, with an equality relationship.
   The feature tag is intended primarily for use in the following
   applications, protocols, services, or negotiation mechanisms: This
      feature tag is most useful in a communications application, for
      describing the capabilities of a user agent providing a particular
      type of communication service.
   Examples of typical use: Routing calls to an appropriate service
      provider, such as a provider of emergency services.
   Related standards or documents: RFC3840.
   Security Considerations: Security considerations for this media
      feature tag are discussed in Section 11.1 of RFC3840.

6. **Security Considerations**

   As an identifier, the service URN does not appear to raise any
   particular security issues. The services described by the URN are
   meant to be well-known, even if the particular service instant is
   access-controlled, so privacy considerations do not apply to the URN.
   There are likely no specific privacy issues when including a service
   URN on a web page, for example. On the other hand, ferrying the URN
   in a signaling protocol can give attackers information on the kind of
   service desired by the caller. For example, this makes it easier for
   the attacker to automatically find all calls for emergency services
   or directory assistance. Appropriate, protocol-specific security
   mechanisms need to be implemented for protocols carrying service
   URNs. The mapping protocol needs to address a number of threats, as
   detailed in [25]. Security considerations for the media feature tag
   are described in [8].

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Appendix A. Alternative Approaches Considered

   The "sos" SIP URI reserved user name proposed here follows the
   convention of RFC 2142 [11] and the "postmaster" convention
   documented in RFC 2822 [14]. The approach has the advantage that
   only the home proxy for a user needs to understand the convention and
   that the mechanism is likely backwards-compatible with most SIP user
   agents, with the only requirement that they have to be able to
   generate alphanumeric URLs. One drawback is that it may conflict
   with locally assigned addresses of the form "sos@domain". Also, if
   proxies not affiliated with the domain translate the URL, they
   violate the current SIP protocol conventions.

   There are a number of possible alternatives, each with their own set
   of advantages and problems:

   tel:NNN;context=+C This approach uses tel URIs [20]. Here, NNN is
      the national emergency number, where the country is identified by
      the context C. This approach is easy for user agents to implement,
      but hard for proxies and other SIP elements to recognize, as it
      would have to know about all number-context combinations in the
      world and track occasional changes. In addition, many of these
      numbers are being used for other services. For example, the
      emergency number in Paraguay (00) is also used to call the
      international operator in the United States. A number of
      countries, such as Italy, use 118 as an emergency number, but it
      also connects to directory assistance in Finland.
   tel:sos This solution avoids name conflicts, but is not a valid "tel"
      [20] URI. It also only works if every outbound proxy knows how to
      route requests to a proxy that can reach emergency services since
      tel URIs. The SIP URI proposed here only requires a user's home
      domain to be appropriately configured.
   sip:sos@domain Earlier work had defined a special user identifier,
      sos, within the caller's home domain in a SIP URI, for example,
      sip:sos@example.com. This approach had the advantage that dial
      plans in existing user agents could probably be converted to
      generate such a URI and that only the home proxy for the domain
      has to understand the user naming convention. However, it
      overloads the user part of the URI with specific semantics rather
      than being opaque, makes routing by the outbound proxy a special
      case that does not conform to normal SIP request-URI handling
      rules and is SIP-specific. The mechanism also does not extend
      readily to other services.
   SIP URI user parameter: One could create a special URI, such as "aor-
      domain;user=sos". This avoids the name conflict problem, but
      requires mechanism-aware user agents that are capable of emitting
      this special URI. Also, the 'user' parameter is meant to describe
      the format of the user part of the SIP URI, which this usage does

not do. Adding other parameters still leaves unclear what, if
any, conventions should be used for the user and domain part of
the URL. Neither solution is likely to be backward-compatible
with existing clients.

Special domain: A special domain, such as "sip:fire@sos.int" could be
used to identify emergency calls. This has similar properties as
the "tel:sos" URI, except that it is indeed a valid URI. To make
this usable, the special domain would have to be operational and
point to an appropriate emergency services proxy. Having a
single, if logical, emergency services proxy for the whole world
seems to have undesirable scaling and administrative properties.

Appendix B. Acknowledgments

This document is based on discussions with Jonathan Rosenberg and
benefitted from the comments of Leslie Daigle, Benja Fallenstein and
Paul Kyzivat.

Intellectual Property Statement