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A Uniform Resource Name (URN) for Services
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Abstract

The content of many communication services depends 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.

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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 us to define such global, well-known services, while distributing the actual implementation across a large number of service-providing entities. There are many ways to divide provision of such services, such as dividing responsibility by geographic region or by the service provider a user chooses. 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 make it possible to delegate routing decisions to third parties and to mark certain requests as having special characteristics while preventing these characteristics to be accidentally invoked on inappropriate requests.

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This URN identifies 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.

Since service URNs are not routable, a proxy or user agent has to translate the service URN into a routable URI for a location-appropriate service provider, such as a SIP URL. LoST [21] is one resolution system for mapping service URNs to URLs based on geographic location. It is anticipated that there will be several such systems, possibly with different systems for different services.

Services are described by top-level service type, and may contain a hierarchy of sub-services further describing the service, as outlined in Section 3. Mapping protocols SHOULD always provide a mapping just for the top-level service even if sub-services are in use. This mapping for the top-level service MAY also be used if an entity is presented with an invalid sub-service and presenting an error condition to the user is inappropriate, e.g., during an emergency.

We discuss alternative approaches for creating service identifiers, and why they are unsatisfactory, in Appendix A.

2. Terminology

In this document, the key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in RFC 2119 [2].

Terminology specific to emergency services is defined in [23].

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3. Registration Template

Below, we include the registration template for the URN scheme according to RFC 3406 [15].

Namespace ID: service

Registration Information: Registration version: 1; registration date: 2006-04-02

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] and a subset of the labels allowed in [6]. Labels are case-insensitive and SHOULD be specified in all lower-case. For any given service URN, service-identifiers can be removed right-to-left and the resulting URN is still valid, referring a more generic service. 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 *("." sub-service)
let-dig      = ALPHA / DIGIT
let-dig-hyp  = let-dig / '-'
sub-service  = let-dig [ *let-dig-hyp let-dig ]
top-level    = let-dig [ *25let-dig-hyp let-dig ]
```

Relevant ancillary documentation: None

Community considerations: The service URN is believed 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 the user's current location. For example, travelers will be able to use their mobile devices to request emergency services without having to know the emergency dial string of the visited country. 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.

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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., [13], [14], [18], [19]), types of telecommunications equipment [17], people or organizations [12]. tel URIs [16] 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. Service URNs MUST be unique for each unique service; this is guaranteed through the registration of each service within this namespace, described in Section 5.

Identifier persistence considerations: The 'service' URN for the same service is expected to be persistent, 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: The process of identifier assignment is described in the IANA Considerations (Section 5).

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]. Each top-level service can provide its own distinct set of mapping protocols. Within each top-level service, all mapping protocols MUST return the same set of mappings. Section 4 describes how the S-NAPTR mechanism is used to find an instance of a mapping service.

Rules for Lexical Equivalence: 'service' identifiers are compared according to case-insensitive string equality.

Conformance with URN Syntax: The BNF in the 'Declaration of syntactic structure' above constrains the syntax for this URN scheme.

Validation mechanism: Validation determines whether a given string is currently a validly-assigned URN [15]. The S-NAPTR mechanism also allows to determine if a mapping protocol for a particular top-level service exists. The mapping protocol itself would then answer the question whether the service identifier exists. (The

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issue of whether a particular combination of service and location yields a usable answer is beyond the scope of this specification.)

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

4. Finding the Mapping Server

When a network entity receives a service URN, it uses the S-NAPTR [6] mechanism to determine how to map the service URN, possibly using other information such as geographic location, to a routable URI. Each top-level service may define one or more such mapping protocols and mapping protocol servers may be operated by a range of providers. Thus, the network entity that needs to resolve the service URN queries an appropriate domain, typically its home or service provider domain, for NAPTR records and then selects records that match the service and the mapping protocols it supports. The application service for this URN is registered in IANA Considerations (Section 5) of this document; the application protocols are registered in the appropriate protocol document.

try until a working server has been found DNS name provided by DHCP (option X) reverse DNS lookup for all ICE derived addresses [20] application service provider

The S-NAPTR entry MAY contain the "s" flag if the resolving client needs to perform an SRV resolution on the replacement string.

The first entry in the following example indicates that 'sos' service URNs should be mapped to URIs using the LoST [21] protocol server at lost.example.com, a DNS A record. The second entry is for an imaginary top-level service 'pizza', using the equally imagined 'Pizza Location Protocol', offered by the pizzahouse.example.net server, which should be queried for the appropriate DNS SRV record. Note that these NAPTR records are maintained by example.com, i.e., example.com does not actually provide the mapping service itself.

```
example.com.
;      order pref flags service      regexp
IN NAPTR 50 50 "a" "SURN.sos:LoST" ""
; replacement
lost.example.org

IN NAPTR 10 50 "s" "SURN.pizza:PLP" ""
    _plp._tcp.pizzahouse.example.net
```

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5. IANA Considerations

5.1 New Service-Identifying Labels

New service-identifying labels and sub-services 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 labels to sub-services may differ for each top-level service designation and MUST be defined by the document describing the top-level service.

To allow use within the constraints of S-NAPTR [6], all top-level service names MUST NOT exceed 27 characters.

5.2 S-NAPTR Application Service Tag

Since each top-level service could use one or more different resolution protocols, we need to indicate the top-level service in the S-NAPTR application service tag. To indicate the URN-to-service mapping service, all such services start with the string "SURN." (for "service URN"), followed by the top-level service identifier. Note that application service tags are case-insensitive and rendered here in mixed case purely for readability.

This document effectively creates a sub-registry of labels under SURN, but the contents of that registry are exactly the same as those defined in Section 5.1 and thus no separate IANA action is needed.

This document registers the label "SURN.sos" as the S-NAPTR application service tag according to [6] for emergency services and defines the intended usage, interoperability considerations and security considerations (Section 7).

5.3 Sub-Services for the 'sos' Service

The 'sos' service type describes emergency services requiring an immediate response, 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 and have a similar emergency nature. The expert review should take into account whether these emergency services are offered widely and in different countries, with approximately the same caller expectation in terms of services rendered. The 'sos' service is not meant to invoke general government, public information or social services.

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urn:service:sos The generic 'sos' service reaches a public safety answering point (PSAP) which 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.

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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.

5.4 Sub-Services for the 'counseling' Service

The 'counseling' service type describes services where callers can receive advice and support, often anonymous, but not requiring an emergency response. (Naturally, such services may transfer callers to an emergency service or summon such services if the situation warrants.) Additional sub-services can be added after expert review and should be of general public interest. The expert review should take into account whether these services are offered widely and in different countries, with approximately the same caller expectation in terms of services rendered.
urn:service:counseling The generic 'counseling' service reaches a call center that transfers the caller based on his or her specific needs.

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urn:service:counseling.mental-health The 'mental-health' service refers to the "diagnostic, 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)

urn:service:counseling.children The 'children' service refers to counseling and support services that are specifically tailored to the needs of children. Such services may, for example, provide advice to run-aways or victims of child abuse.

6. International Considerations

The service labels are protocol elements and not normally seen by users. Thus, the character set for these elements is restricted, as described in Section 3.

7. 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 instance 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 [22].

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Appendix A. Alternative Approaches Considered

The discussions of ways to identify emergency calls has yielded a number of proposals. Since these are occasionally brought up during discussions, we briefly summarize why this document chose not to pursue these solutions.

tel:NNN;context=+C This approach uses tel URIs [16]. 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. As another example, 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"

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[16] 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. Such a user identifier follows the convention of RFC 2142 [8] and the "postmaster" convention documented in RFC 2822 [10]. 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.

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