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          Vendor Extensions for Service Location Protocol, Version 2
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Status of this Memo

Abstract

   The Service Location Protocol, Version 2 [1] contains a number of
   features which are left up to vendors. This document describes how
   each of these features can be used safely (with no possibility of
   name collisions). This document also describes how vendors can
   extend the protocol safely without requiring any IETF standardization
   work. Finally, this document defines a new extension to the SLPv2:
   The Vendor Opaque extension.

   This document UPDATES RFC 2608.

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1.0 Introduction

The Service Location Protocol, Version 2 [1] defines a number of
features which are extensible. This document clarifies exactly
which mechanisms can be used to that end (Sections 3-5) and which
cannot (Section 6). Conventions are specified which ensure that
the protocol extension mechanisms in the SLPv2 specification will
not possibly have ambiguous interpretations.

This specification introduces only one new protocol element, the
Vendor Opaque Extension. This Extension makes it possible for a
vendor to extend SLP independently, once the vendor has registered
itself with IANA and obtained an Enterprise Number. This is useful
for vendor-specific applications, for which interoperability with
other vendors may not be required or even desirable.

1.1 Terminology

In this document, the key words "MAY", "MUST, "MUST NOT", "optional",
"recommended", "SHOULD", and "SHOULD NOT", are to be interpreted as

described in [2].

Service Location Protocol terminology is defined in [1]. IANA
registration terminology is defined in [6].

2.0 Enterprise Number

Enterprise Numbers are used to distinguish different vendors in IETF
protocols. Vendor Extensions to SLPv2 SHOULD use these values to
avoid any possibility of a name space collision. Each vendor is
responsible for ensuring that vendor extensions under their own
authority are non-conflicting.

RFC 1700 lists the Enterprise Numbers registered at the time of
publication as well as rules on how to register new numbers:

   To request an assignment of an Enterprise Number send the
   complete company name, address, and phone number; and the
   contact's person complete name, address, phone number, and
   email mailbox in an email message to <iana-mib@isi.edu>. [3]

The complete up-to-date list is maintained by IANA [4].

All a Vendor must do is register their Vendor ID and they are then
able to extend SLPv2 in many ways without requiring any additional
interaction with any standards organization.

3.0 Naming Authorities

Naming Authorities are defined by SLPv2 [1] as an agency or group
which catalogues Service Types and attributes.

A Service Type is a string representing a service which can
be discovered by SLPv2. Attributes may be associated
with a particular Service Type which is advertised by SLPv2.

Service Type strings and service attributes may be registered with
IANA by creating a Service Template [5]. The template is included
in an internet draft and an email message is sent to
srvloc-list@iana.org requesting that the template be included in
the Service Template registry. In this case the naming authority
for the service type is IANA.

It is also possible for a Vendor to create their own naming
authority. In this case, any service type or attributes may be used.
SLPv2 allows arbitrary naming authorities to coexist. To use an
explicit naming authority, a vendor simply employs their Enterprise
Number as a naming authority. For example, for the following
(fictitious) Enterprise Number

   9999 Acme, Inc.   Erik Guttman femur@neato.org

the Naming Authority string to use would be "9999". A service: URL

which used this Naming Authority to advertise a Roadrunner Detector
service could look like

    service:roadrunner-detector.9999://neato.org:9341

Service types which are defined under a naming authority based on an
Enterprise Number are guaranteed not to conflict with other service
type strings which mean something entirely different. That is also
true of attributes defined for service types defined under a naming
authority.

To create a safe naming authority with no possibility of name
collisions, a vendor SHOULD use their Enterprise Number as a
naming authority.

4.0 Vendor Defined Attributes

SLPv2 [1] suggests that

    Non-standard attribute names SHOULD begin with "x-",
    because no standard attribute name will ever have those
    initial characters.

It is possible that two non-standard attributes will conflict that
both use the "x-" prefix notation. For that reason, vendors SHOULD
use "x-" followed by their Enterprise Number followed by a "-" to
guarantee that the non-standard attribute name's interpretation is
not ambiguous.

For example, Acme, Inc.'s Enterprise Number is 9999. Say the
Service Template for NetHive (a fictitious game) was:

    ----
    template-type=NetHive

    template-version=1.0

    template-description=
      The popular NetHive game.

    template-url-syntax=
      url-path = ; There is no path for a NetHive service URL.

    features= string M O
    # The list of optional features the NetHive server supports.
    secure session, fast mode

    current-users= string M
    # The list of users currently playing

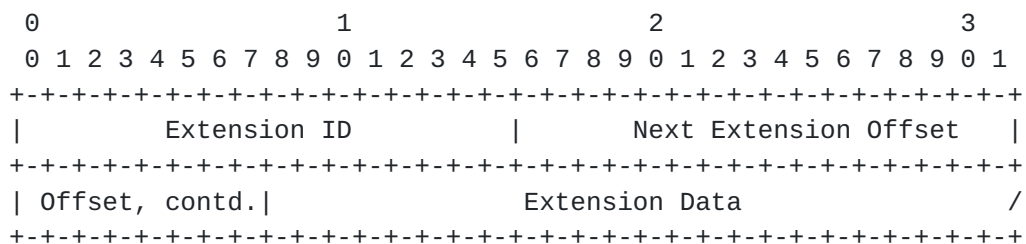---

Acme's server advertises a feature which is not on the list
of standard features, "x-9999-cheat-mode". Only an Acme
client would request this attribute to discover servers,
since it is not standard.

5.0 Vendor Opaque Extension

SLPv2 [1] defines a protocol extensibility mechanism. SLPv2
Extensions are added at the end of a message and have the
following format:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Extension ID         |      Next Extension Offset    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Offset, contd.|              Extension Data                   /
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

The format of the Extension Data depends on the Extension ID. Refer
to [6] for a full description of different mechanisms available for
registration of values with IANA.

Extension ID Range	Assignment By	Protocol Action
0x0000 - 0x3FFF	Designated Expert	Ignore Extension if Extension ID unrecognized
0x4000 - 0x7FFF	Designated Expert	Drop message if Extension ID unrecognized
0x8000 - 0x8FFF	(No one!)	Ignore Extension if Extension ID unrecognized
0x9000 - 0xFFFF	(No one!)	Reserved.

Vendors may extend SLPv2 in any of three ways. First, they may
define a new extension to SLPv2 in an internet draft. The vendor
then requests that the IESG contact the designated expert for SLP
who will review the document. If the document is sound, the
document will be published as an Informational RFC with the new
Extension ID assigned.

An experimental extension may be done using the range 0x8000 to
0x8FFF. There is always the risk, however, that another vendor
will use the same ID, since these IDs are not registered.

Finally, the following OPTIONAL to implement extension allows a

Vendor to define their own extensions which are guaranteed to have
a unique interpretation.

5.1. Vendor Opaque Extension Format

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Extension ID = 0x0003      |       Next Extension Offset  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Offset, contd.|             Enterprise Number                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Ent. #, contd.|              Extension Data                   /
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

The Enterprise Number is included in the Extension as a 4 byte
unsigned integer value. The Extension Data following is guaranteed
to have an unambiguous interpretation determined by the vendor.

5.2 Example: Acme Extension for UA Authentication

For example, the Acme Corporation, whose Enterprise Number is 9999,
can define three extensions to SLP to create an application level
access control to service information. (Note that the first byte in
the Extension Data is used to differentiate the different extensions
under the authority of the vendor.)

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Client ID = 1 |       Client ID Length        |   Client ID   /
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

The Acme UA multicasts a SLP request includes the Vendor Opaque
Extension, with the Enterprise Number set to 9999 and the Extension
Data as above. The Client ID is a string formatted in the Acme
Client ID format (not described here).

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Challenge = 2 |        Challenge Length       |Challenge data /
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

An Acme SA which receives a SLP request for 'restricted services' will
ignore it unless the request includes a Vendor Opaque Extension with
an Acme Client ID. In that case it sends a reply to the requesting

UA with zero results and a Vendor Opaque Extension with the Enterprise
ID set to 9999 and containing the above "Challenge" data in the

Extension Data. The challenge is in the Acme Challenge format (not
described here).

```
     0                   1                   2                   3
     0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    | Response = 3 |        Response Length       |   Response    /
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

An Acme UA which receives a reply with zero results and a Vendor
Opaque Extension with a "challenge", as above, may unicast a request
to the SA which sent the challenge. The request will be the same as
the initial one (which contained the "Client ID" Acme vendor
extension), however in this case it will include a Vendor Opaque
extension with the Enterprise Number set to 9999 and the Extension
data including the "Response" data as above. The "Response" data is
in the Acme format (not described here).

The SA will then process the response and if the UA has
authenticated itself, the SA will uncast a reply including the
requested information.

6.0 Extensions Requiring IETF Action

Terminology and procedures for IETF Actions related to registration
of IDs with IANA are defined in [6].

SLPv2 [1] defines a number of features whose modification cannot
be done by simple vendor extension. These include:

- Block Structure Descriptors (BSD) identifies the format
     of the Authenticator in the Authentication Block included
     in some SLP messages. BSD values from 0x0003-0x7FFF are
     assigned by IETF Consensus.

- New function-IDs in the range 12-255 are standardized
     by the method of IETF Consensus.

- New error numbers in the range 15-65535 are assigned on
     the basis of a Standards Action.

- New SLP Extensions with types in the range 2-65535 are
     registered following the review of the Designated Expert.

- New Service Types are defined and registered with IANA
     following the review of the Designated Expert. See [5].

Only changes to the base "required to implement" protocol require

IETF Consensus. Extensions are all defined to be done using the
approval of a Designated Expert, though in some cases this involves

publishing an Informational RFC.

7.0 IANA Considerations

This document discusses vendor extensibility to SLPv2 but does not
introduce any new number or name spaces which need to be administered
by IANA. The techniques described in this document make it possible
for vendors to extend SLPv2 by doing nothing more than registering
an Enterprise Number with IANA (as described in RFC 1700 [4]).

According to RFC 2608:

> New SLP Extensions with types in the range 2-65535 may be
> registered following review by a Designated Expert [5].

The extension ID number for the Vendor Extension is 0x0003.

8.0 Security Considerations

Vendor extensions may introduce additional security considerations
into SLP.

This memo describes mechanisms which are standardized elsewhere [1]
[3] [5]. The only protocol mechanism described in this document (see
Section 5 above) is no less secure than 'private use' extensions
defined in SLPv2 [1].

The example in Section 5.2 above shows how Vendor Opaque Extensions
can be used to include a challenge response mechanism to SLP so that
SAs can enforce an access control policy using a cryptographicly
secure authentication mechanism. This is merely an example and
protocol details were intentionally not provided. A vendor could,
however, create a mechanism similar to this one and provide
additional security services to SLPv2 in the manner indicated in the
example.

References

[1] Guttman, E., Perkins, C., Veizades, J., Day, M., "Service
        Location Protocol, Version 2", RFC 2608, July 1999.

[2] Bradner, S., "Key words for use in RFCs to Indicate Requirement
        Levels", BCP 14, RFC 2119, March 1997.

[3] Reynolds, J., Postel, J., "Assigned Numbers", RFC 1700, October
        1994.

[4] ftp://ftp.isi.edu/in-notes/iana/assignments/enterprise-numbers

    [5] Guttman, E., Perkins, C., Kempf, J., "Service Templates and
            URLs", RFC 2609, July 1999.

    [6] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA
            Considerations Section in RFCs, BCP 26, RFC 2434, October
            1998.

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