6lowapp
Internet-Draft
Intended status: Informational

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October 15, 2009

Service Discovery for 6LowApp
draft-sturek-6lowapp-servicediscovery-00

Status of this Memo

This Internet-Draft will expire on April 18, 2010.

Abstract

IEEE 802.15.4 networked solutions employing [RFC4944] for applications like Smart Grid Home Area Networking require unattended service discovery which can be supported with small, single packet (or few packet) exchanges. At the same time, it is desirable to mix wired devices into the same network so interoperation of service discovery between devices with differing operational characteristics is desired.

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1. Introduction

Service Discovery for 6LowAPP envisions extending the Service Location Protocol ([RFC2608]) for deployment on small packet size devices. The focus for Service Discovery for 6LowAPP is around extending SLP to permit tokenized exchange of XML strings.

A previous expired Internet Draft exists extending SLP for embedded device. This prior Internet Draft was evaluated but did not include full exchange of tokenized strings.

This internet-draft addresses requirements stated in [I-D.bormann-6lowpan-6lowapp-problem].

2. Description

The IETF Service Location Protocol ([RFC2608]) is a standards track RFC deployed for internet applications. SLP enables definition of service scopes, services and attributes. The discovery mechanism utilizes User Agents (devices wishing to locate services), Service Agents (devices supplying services) and Directory Agents (proxies which can cache service information on behalf of Service Agents). SLP utilizes text strings in the service request and response messages.

2.1 Service Discovery Messaging

The specification of Service Discovery for 6LowAPP envisions the following:

- Creation of a new RFC which preserves the core features of SLP but replaces the message exchange with tokenized fields

The new RFC preserves the semantics of the following SLP messages:

- Service Request
- Service Reply
- Service Registration
- Service Acknowledgement
- Directory Agent Advertisement
- Service Agent Advertisement

The new RFC envisions extending the SLP messages to include the following:

- (new command) Directory Agent Token Map Request
- (new command) Directory Agent Token Map Response

The new Internet Draft supports the following message semantics:

- Scope and Scope Lists
- Services and Service Lists
- Attributes and Attribute Lists
- (new message semantic) Token Map for Scope, Services and Attributes

2.2 Service Discovery Semantics

The key architectural aspect of the proposed Internet Draft is a mapping of the features and capabilities of the binary service discovery protocol used in previous IEEE 802.15.4 deployments to the features and capabilities of [RFC2608]. The similarities between the ZigBee binary protocol and SLP ([RFC2608]) include:

- Held discovery information in Service Agents (self describing data held in the individual devices)
- Unicast and Multicast discovery requests via Service Request primitives
- Unicast discovery responses via Service Reply
- (Optional) Service Registration (Directory Agent support for cached discovery information)

Here are the proposed architectural principles for the proposed Internet Draft:

- Use the Directory Agent to cache (via an XML Schema exchange) a mapping between Scope strings and a well known token
- Use the Directory Agent to cache (via an XML Schema exchange) a mapping between Service strings and a well known token
- Use the Directory Agent to cache (via an XML Schema exchange) a mapping between Attribute strings and well known tokens

The above mapping works in an IEEE 802.15.4 network and, importantly, interoperates with SLP with networked wired devices if the following is performed operationally:

- Create a small set of well known Scope strings for the deployment. This set can be extended via a schema exchange but the management of the set of Scope strings is important to maintain in a consistent manner
- Create a small set of well known Service strings and Attribute strings.
- Host the exchange of XML strings and tokens in the same Directory Agent supported by SLP.
- Support Service Discovery for 6LowAPP using a well known UDP port enabling interoperation with SLP on TCP port 427
- Support a setup phase where the IEEE 802.15.4 devices exchange well known XML strings (operationally defined) for well known tokens. After the initial exchange of XML strings for tokens, all requests and responses are via tokens.

2.3 Service Discovery Operations

The following operations are proposed for the new Internet Draft:

- Identify a Directory Agent for each instance of the HAN. Unlike RFC 2608 [RFC2608], the main role of the DA in the proposed I-D is for storage of the mapping between well known tokens and the SLP Scope, Service and Attribute strings.
- Devices joining the network perform DA discovery then use the new DA Token Map Request and populate their local tables with the DA Token Map Response.
- Devices use the new I-D Service Request and Service Reply where the tokens in the map replace the strings used in RFC 2608 [RFC2608]. For search functions, the portion of the string operations needed to perform the service match must be included in the proposed I-D messaging

The following operational aspects are desired for the proposed I-D:

- Outside of the initial download of the Token Map, the operations proposed mirror the features currently deployed in existing IEEE 802.15.4 deployments like ZigBee. The intent is that we use Service Agents (SA) not the Directory Agent (DA) but we have the flexibility to use the DA for sleeping devices if we want
- Since the proposed I-D maps to SLP RFC 2608 [RFC2608], it is envisaged that both can be supported in the same network with a mechanism to communicate to the requesting device which service discovery method is supported by a given device.

Here are a couple of points to keep in mind with new I-D:

- The proposed I-D proposes to maintain the same types of SLP messages but not retain the exact packet format. In particular, the proposed I-D will reformulate the message frames to remove some fields and to tokenize the rest
- The proposed I-D seeks to maintain a mapping to SLP RFC 2608 [RFC2608] to enable use of either service discovery method in the same network (supported through the Token Map)
- The proposed I-D seeks to maintain the same unicast, multicast and advertisement communication paradigm as RFC 2608 [RFC2608].

3. Future Work

The outline of work presented in this I-D needs to be evaluated against the requirements presented in the 6LowAPP charter and against RFC 2608 [RFC2608]. If accepted, the next step is to create a concrete protocol proposal.

4. Conclusions

[RFC2608] forms a good basis of design for service discovery. However, the use of XML strings in the protocol are problematic for IEEE 802.15.4 devices. This I-D seeks to extend the concepts of SLP into a parallel binary service discovery protocol which enables operations from a common Directory Agent.

5. Security Considerations

No new security issues have been identified in this draft. This I-D envisions using the same security considerations employed in RFC 2608 [RFC2608].

6. IANA Considerations

This draft envisions assignment of a dedicated port for 6LowAPP Service Discovery.

7. Acknowledgments

8. References

8.1. Normative References

[I-D.bormann-6lowpan-6lowapp-problem]
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[RFC4944] Montenegro, G., Kushalnagar, N., Hui, J., and D. Culler, "Transmission of IPv6 Packets over IEEE 802.15.4 Networks", RFC 4944, September 2007.

[RFC2608] Guttman, E., Perkins, C., Veizades, J., Day, M., "Service Location Protocol, Version 2", RFC 2608, June 1999.
Protocol", RFC 5023, October 2007.

8.2. Informative References

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