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A Common Profile for Instant Messaging (CPIM)
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Status of this Memo

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Abstract

This memo describes a common set of Instant Messaging formats and services, independent of underlying IM infrastructure. The profile meets the requirements specified in RFC 2779 using a minimalist approach allowing interoperation of a wide range of IM systems.

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1. Introduction

To achieve interoperation of IM systems that are compliant with RFC 2779[1], there must be a common agreement on both Instant Messaging and Presence services. This memo defines such an agreement according to the philosophy that there must be no loss of information between IM systems that are minimally conformant to RFC2779.

This memo focuses on interoperation. Accordingly only those aspects of IM that require interoperation are discussed. For example, the "open instant inbox" operation is not applicable as this operation occurs within a single IM system and not across systems.

Service behavior is described abstractly in terms of operations invoked between the consumer and provider of a service. Accordingly, each IM service must specify how this behavior is mapped onto its own protocol interactions. The choice of strategy is a local matter, providing that there is a clear relation between the abstract behavior of the service (as specified in this memo) and how it is faithfully realized by a particular IM service.

The parameters for each operation are defined using an abstract syntax. Although the syntax specifies the range of possible data values, each IM service must specify how well-formed instances of the abstract representation are encoded as a concrete series of bits.

For example, one strategy might transmit presence information as key/value pairs, another might use a compact binary representation, and a third might use nested containers. The choice of strategy is a local matter, providing that there is a clear relation between the abstract syntax (as specified in this memo) and how it is faithfully encoded by an particular IM service.

1.1 Terminology

This memos makes use of the vocabulary defined in RFC 2778[2]. Terms such as as CLOSED, INSTANT INBOX, INSTANT MESSAGE, OPEN, PRESENCE SERVICE, PRESENTITY, SUBSCRIPTION, and WATCHER are used in the same meaning as defined therein.

1.2 A Note on The Examples

In the examples which follow, this memo uses time-sequence diagrams annotated with XML fragments to illustrate operations and their parameters. The use of XML is an artifact of this memo's presentation style and does not imply any requirement for the use of XML in an IM system.

2. Abstract Messaging Service

2.1 Overview of the Messaging Service

When an application wants to send a message to an INSTANT INBOX, it invokes the message operation, e.g.,


```
<message source='im:fred@example.com'
         destination='im:barney@example.com'
         transID='1' />
    ...
Content-Type: text/plain; charset="us-ascii"

Yabba, dabba, doo!
```

The service immediately responds by invoking the response operation containing the same transaction-identifier, e.g.,


```
<response status='success' transID='1' />
```

2.2 Addressing of INSTANT INBOXes

An INSTANT INBOX is specified using the IM URI (Section 5.1) scheme. Briefly, the "addr-spec" syntax of RFC 822[3] (i.e., "local@domain") is used, where the local-part MUST be interpreted and assigned semantics only by the host specified in the domain part of the address.

2.2.1 Address Resolution

A client determines the address of an appropriate host running a server by resolving a destination domain name to either an intermediate relay host or a final target host.

Only resolvable, fully-qualified, domain names (FQDNs) are permitted when domain names are used in the messaging service (i.e., domain names that can be resolved to SRV[4] or A RRs).

2.2.1.1 Domain Name Lookup

A client lexically identifies a domain to which instant messages will be delivered for processing, a DNS lookup MUST be performed to resolve the domain[5]. The names MUST be fully-qualified domain names (FQDNs) -- mechanisms for inferring FQDNs from partial names or local aliases are a local matter.

The lookup first attempts to locate SRV RRs associated with the domain. If a CNAME RR is found instead, the resulting domain is processed as if it were the initial domain.

If one or more SRV RRs are found for a given domain, a sender MUST NOT utilize any A RRs associated with that domain unless they are located using the SRV RRs; otherwise, if no SRV RRs are found, but an A RR is found, then the A RR is treated as if it was associated with an implicit SRV RR, with a preference of 0, pointing to that host.

2.2.1.2 Processing SRV RRs

To process an IM URI, a lookup is performed for SRVs for the target domain and a desired IM transport protocol.

For example, if the destination INSTANT INBOX is "im:fred@example.com", and the sender wishes to use an IM transport protocol called "SIP", then a SRV lookup is performed for:

    _im._sip.example.com.

The returned RRs, if any, specify the next-hop server.

The choice of IM transport protocol is a local configuration option for each system.

Using this mechanism, seamless routing of IM traffic is possible, regardless of whether a gateway is necessary for interoperation. To achieve this transparency, a seperate RR for a gateway must be present for each transport protocol and domain pair that it serves.

2.2.1.3 Processing Multiple Addresses

When the lookup succeeds, the mapping can result in a list of alternative delivery addresses rather than a single address, because of multiple SRV records, multihoming, or both. For reliable operations, the client MUST be able to try each of the relevant addresses in this list in order, until a delivery attempt succeeds. However, there MAY also be a configurable limit on the number of alternate addresses that can be tried. In any case, the client SHOULD try at least two addresses. Two types of information are used to rank the host addresses: multiple SRV records, and multihomed hosts.

Multiple SRV records contain a preference indication that MUST be used in sorting. Lower numbers are preferrable to higher ones. If there are multiple destinations with the same preference, and there is no clear reason to favor one (e.g., by recognition of an easily-reached address), then the sender MUST randomize them to spread the load across multiple servers for a specific destination.

The destination host (perhaps taken from the preferred SRV record) may be multihomed, in which case the resolver will return a list of alternative IP addresses. It is the responsibility of the resolver to have ordered this list by decreasing preference if necessary, and the sender MUST try them in the order presented.

2.3 Format of Instant Messages

An INSTANT MESSAGE comprises a MIME[6] content.

Note that the IETF provides numerous technologies that allow end-users to exchange authenticated and private messages formatted as MIME objects, c.f., PGP-MIME[7] and S/MIME[8].

2.4 The Messaging Service

Section 6 and Section 7 define the abstract syntax of the operations invoked with the service.

Note that the transaction-identifier parameters used with the service are potentially long-lived. Accordingly, the values of transaction-identifiers should appear to be unpredictable.

2.4.1 The Message Operation

When an application wants to send an INSTANT MESSAGE, it invokes the message operation.

The message operation has these parameters:

- the source parameter specifies the INSTANT INBOX on whose behalf this message is sent (using an IM URI);
- the destination parameter specifies the INSTANT INBOX that the message should be delivered to (using an IM URI);
- the transID parameter specifies the transaction-identifier associated with this operation; and,
- the message to be sent.

When the service is informed of the message operation, it performs these steps:

1. If the source or destination does not refer to a valid INSTANT INBOX, a response operation having status "failure" is invoked.

2. If access control does not permit the application to request this operation, a response operation having status "failure" is invoked.

3. Otherwise:

    1. If the service is able to successfully deliver the message, a response operation having status "success" is invoked.

    2. If the service is unable to successfully deliver the message, a response operation having status "failure" is invoked.

    3. If the service must delegate responsibility for delivery, and if the delegation will not result in a future authoritative indication to the service, a response operation having status "indeterminant" is invoked.

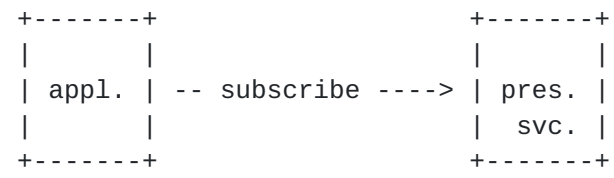
    4. If the service must delegate responsibility for delivery, and if the delegation will result in a future authoritative indication to the service, then a response operation is invoked immediately after the indication is received.

When the service invokes the response operation, the transID parameter is identical to the value found in the message operation invoked by the application.

3. Abstract Presence Service

3.1 Overview of the Presence Service

When an application wants to (periodically) receive the presence information associated with a PRESENTITY, it invokes the subscribe operation, e.g.,



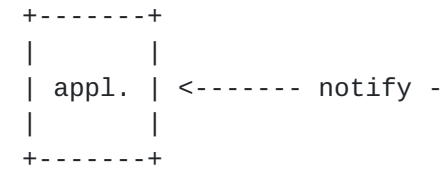

```
<subscribe watcher='pres:wilma@example.com'
           target='pres:fred@example.com'
           duration='86400' transID='2' />
```

The service immediately responds by invoking the response operation containing the same transaction-identifier, e.g.,


```
<response status='success' transID='2' duration='3600' />
```

A WATCHER may have at most one subscription for a PRESENTITY.

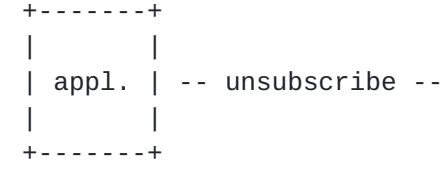
If the response operation indicates success, then for up to the specified duration, the service invokes the notify operation whenever there are any changes to the PRESENTITY's presence information, e.g.,




```
 <notify watcher='pres:wilma@example.com'
         target='pres:fred@example.com'
         transID='1234'>
     <presence entityInfo='http://www.example.com/fred/'>
         <tuple destination='im:fred@example.com'
                status='open' />
     </presence>
 </notify>
```

If the duration parameter is zero-valued, exactly one notify operation is invoked, achieving a one time poll of the presence information. Regardless, there is no application response to the notify operation (i.e., the application does not invoke a response operation when a notify operation occurs).

The application may prematurely cancel a subscription by invoking the unsubscribe operation, e.g.,




```
 <unsubscribe watcher='pres:wilma@example.com'
              target='pres:fred@example.com'
              transID='3' />
```

The service immediately responds by invoking the response operation containing the same transaction-identifier, e.g.,


```
<response status='success' transID='3' />
```

3.2 Addressing of PRESENTITIES

A PRESENTITY is specified using the PRES URI (Section 5.2) scheme. Briefly, the "addr-spec" syntax of RFC 822[3] (i.e., "local@domain") is used, where the local-part MUST be interpreted and assigned semantics only by the host specified in the domain part of the address.

To resolve addresses associated with the Presence service, the mechanism defined in Section 2.2.1 is used, except that the processing of a PRES URI is performed by looking up SRV RRs for a desired presence transport protocol.

For example, if the destination PRESENTITY is "pres:fred@example.com", and the sender wishes to use a presence transport protocol called "PEPP", then a SRV lookup is performed for:

    _pres._pepp.example.com.

3.3 Format of Presence Information

Section 8 defines the abstract syntax for presence information using an XML DTD. Note that this memo does not require that XML be used between the application and the service. Accordingly, each IM system must define how well-formed presence information is encoded in transit.

Each PRESENTITY's presence information contains an "entityInfo" attribute, and contains one or more "tuple" elements:

- the "entityInfo" attribute specifies arbitrary information about the PRESENTITY (using a URI); and,
- each "tuple" element specifies information associated with the PRESENTITY.

Each "tuple" element has a "destination" attribute, a "status" attribute, and contains arbitrary content:

- the "destination" attribute specifies a URI;
- the "status" attribute is either OPEN or CLOSED; and,
- the content of the "tuple" element contains arbitrary information about the tuple.

3.4 The Presence Service

Section 6 and Section 8 define the abstract syntax of the operations invoked with the service.

An implementation of the service must maintain information about both presence information and in-progress operations in persistent storage.

Note that the transaction-identifier parameter used with the service is potentially long-lived. Accordingly, the values generated for this parameter should appear to be unpredictable.

3.4.1 The Subscribe Operation

When an application wants to (periodically) receive the presence information associated with an PRESENTITY, it invokes the subscribe operation.

The subscribe operation has these parameters:

- the watcher parameter specifies the WATCHER associated with the subscription;
- the target parameter specifies the PRESENTITY associated with the presence information;
- the duration parameter specifies the maximum number of seconds that the SUBSCRIPTION should be active; and,
- the transID parameter specifies the transaction-identifier associated with this operation.

When the service is informed of the subscribe operation, it performs these steps:

1. If the watcher or target parameter does not refer to a valid PRESENTITY, a response operation having status "failure" is invoked.

2. If access control does not permit the application to request this operation, a response operation having status "failure" is invoked.

3. If the duration parameter is non-zero, and if the watcher and target parameters refer to an in-progress subscribe operation for the application, a response operation having status "failure" is invoked.

4. Otherwise:

    1. A response operation having status "success" is immediately invoked. (If the service chooses a different duration for the subscription then it conveys this information in the response operation.)

    2. A notify operation, corresponding to the target's presence information, is immediately invoked for the watcher.

    3. For up to the amount of time indicated by the duration parameter, if the target's presence information changes, and if access control allows, a notify operation is invoked for the watcher.

    Note that if the duration parameter is zero-valued, then the subscribe operation is making a one-time poll of the presence information. Accordingly, Step 4.3 above does not occur.

When the service invokes a response operation as a result of this processing, the transID parameter is identical to the value found in the subscribe operation invoked by the application.

3.4.2 The Notify Operation

The service invokes the notify operation whenever the presence information associated with a PRESENTITY changes and there are subscribers to that information.

The notify operation has these parameters:

- the watcher parameter specifies the WATCHER associated with the subscription;
- the target parameter specifies the PRESENTITY associated with the presence information;
- the transID parameter specifies the transaction-identifier associated with this operation; and,
- the presence information for the PRESENTITY.

There is no application response to the notify operation.

3.4.3 The Unsubscribe Operation

When an application wants to terminate a subscription, it invokes the unsubscribe operation.

The unsubscribe operations has these parameters:

- the watcher parameter specifies the WATCHER associated with the subscription;
- the target parameter specifies the PRESENTITY associated with the presence information; and,
- the transID parameter specifies the transaction-identifier associated with a subscription.

When the service is informed of the unsubscribe operation, it performs these steps:

1. If the wather and target parameters do not refer to an in-progress subscribe operation for the application, a response operation having status "failure" is invoked.
2. Otherwise, the in-progress subscribe operation for the application is terminated, and a response operation having status "success" is invoked by the service.

Note that following a successful unsubscribe operation, the WATCHER may receive further notifications. Although the service will no longer invoke the notify operation after successfully processing a unsubscribe operation, earlier notify operations may still be in progress.

4. Security Considerations

This memo makes no specific requirements on security procedures for interoperation between IM systems. Accordingly, trust between interconnected IM systems is determined in a bilateral matter.

However, this memo does require that each IM system control access to its Instant Messaging and Presence services. Consult both RFC 2778 and RFC2779 for a discussion of security considerations for for IM systems.

5. IANA Considerations

The IANA assigns the "im" and "pres" URL schemes.

5.1 The IM URI Scheme

The Instant Messaging (IM) URI scheme designates an Internet resource, namely an INSTANT INBOX.

The syntax of an IM URL has the form:

"im:" addr-spec

where "addr-spec" is defined in RFC 822.

5.2 The PRES URI Scheme

The Presence (PRES) URI scheme designates an Internet resource, namely a PRESENTITY or WATCHER.

The syntax of a PRES URL has the form:

"pres:" addr-spec

where "addr-spec" is defined in RFC 822.

6. The Common Service DTD

```
<!--
  DTD for the IM common profile, as of 2000-08-16


  Refer to this DTD as:

    <!ENTITY % IMCOMMON PUBLIC "-//Blocks//DTD IM COMMON//EN"
               "http://xml.resource.org/syntaxes/IM/im-common.dtd">
    %IMCOMMON;
  -->


<!--
  DTD data types:

       entity        syntax/reference     example
       ======        ================     =======
    a language tag
        LANG         c.f., [RFC-1766]      "en", "en-US", etc.

    seconds
        SECONDS      0..2147483647        600

    unique-identifier
        UNIQID       1..2147483647        42

    authoritative identity
        URI          c.f., [RFC-2396]      http://invisible.net/
  -->

<!ENTITY  % LANG      "NMTOKEN">
<!ENTITY  % SECONDS   "CDATA">
<!ENTITY  % UNIQID    "CDATA">
<!ENTITY  % URI       "CDATA">


<!--
  Abstract syntax for the response operation
  -->

<!ELEMENT response   (#PCDATA)*>
<!ATTLIST response
          status     (success|failure|indeterminant)
                                        #REQUIRED
          transID     %UNIQID;          #REQUIRED
          duration    %SECONDS;         #IMPLIED
          xml:lang    %LANG;            #IMPLIED>
```

7. The Messaging Service DTD

```
<!--
  DTD for the abstract IM messaging service, as of 2000-08-16


  Refer to this DTD as:

    <!ENTITY % IMMESSAGING PUBLIC "-//Blocks//DTD IM MESSAGING//EN"
               "http://xml.resource.org/syntaxes/IM/im-messaging.dtd">
    %IMMESSAGING;
  -->


<!ENTITY % IMCOMMON PUBLIC "-//Blocks//DTD IM COMMON//EN"
           "http://xml.resource.org/syntaxes/IM/im-common.dtd">
%IMCOMMON;


<!--
  DTD data types:

       entity        syntax/reference     example
       ======        ================     =======
       INBOX         c.f., Section 5.1    im:fred@example.com
  -->

<!ENTITY  % INBOX    "CDATA">


<!--
  Abstract syntax for the message operation
  -->

<!ELEMENT message    (#PCDATA)*>
<!ATTLIST message
          source      %INBOX;           #REQUIRED
          destination %INBOX;           #REQUIRED
          transID     %UNIQID;          #REQUIRED>
```

8. The Presence Service DTD

```
<!--
  DTD for the abstract IM presence service, as of 2000-08-16


  Refer to this DTD as:

    <!ENTITY % IMPRESENCE PUBLIC "-//Blocks//DTD IM PRESENCE//EN"
           "http://xml.resource.org/syntaxes/IM/im-presence.dtd">
    %IMPRESENCE;
  -->


<!ENTITY % IMCOMMON PUBLIC "-//Blocks//DTD IM COMMON//EN"
           "http://xml.resource.org/syntaxes/IM/im-common.dtd">
%IMCOMMON;


<!--
  DTD data types:

       entity        syntax/reference     example
       ======        ================     =======
       PRESENTITY    c.f., Section 5.2    pres:fred@example.com
  -->

<!ENTITY  % PRESENTITY "CDATA">




<!--
  Abstract syntax for presence information
  -->

<!ELEMENT presence    (tuple+)>
<!ATTLIST presence
          entityInfo  %URI;            "">

<!ELEMENT tuple    (#PCDATA)*>
<!ATTLIST tuple
          destination %URI;            #REQUIRED
          status      (open|closed)    #REQUIRED>
```

```
<!--
  Abstract syntax for the subscribe operation
  -->

<!ELEMENT subscribe   EMPTY>
<!ATTLIST subscribe
          watcher     %PRESENTITY;      #REQUIRED
          target      %PRESENTITY;      #REQUIRED
          duration    %SECONDS;         #REQUIRED
          transID     %UNIQID;          #REQUIRED>


<!--
  Abstract syntax for the notify operation
  -->

<!ELEMENT notify      (presence)>
<!ATTLIST notify
          watcher     %PRESENTITY;      #REQUIRED
          target      %PRESENTITY;      #REQUIRED
          transID     %UNIQID;          #REQUIRED>


<!--
  Abstract syntax for the unsubscribe operation
  -->

<!ELEMENT unsubscribe EMPTY>
<!ATTLIST unsubscribe
          watcher     %PRESENTITY;      #REQUIRED
          target      %PRESENTITY;      #REQUIRED
          transID     %UNIQID;          #REQUIRED>
```

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[1] Day, M., Aggarwal, S. and J. Vincent, "Instant Messaging / Presence Protocol Requirements", RFC 2779, February 2000.

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Appendix A. Issues of Interest

This appendix briefly discusses issues that may be of interest when designing an interoperation gateway.

A.1 Address Mapping

When mapping the service described in this memo, mappings which place special information into the IM address local part SHOULD use the meta-syntax defined in RFC 2486[9].

A.1.1 Source-Route Mapping

The easiest mapping technique is a form of source-routing and usually is the least friendly to humans having to type the string.

The transformation places the entire, original address string into the IM address local part and names the gateway in the domain part.

For example, if the destination INSTANT INBOX is "pepp://example.com/fred", then, after performing the necessary character conversions, the resulting mapping is:

    im:pepp=example.com/fred@relay-domain

where "relay-domain" is derived from local configuration information.

Experience shows that it is vastly preferrable to hide this mapping from end-users -- if possible, the mapping should be performed automatically by the underlying software.

Full Copyright Statement

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