



XMPP

XEP-0282: DMUC2: Distributed MUC

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Multi-User Chats, distributed over several nodes in the XMPP network, using a primary/replica architecture

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Contents

1	Introduction	1
2	Requirements	2
3	Terminology	2
3.1	Dramatis Personae	2
4	PRIMARY/REPLICA Protocol	3
4.1	Replica Requirements	3
4.2	Creating a Replica	3
4.3	Initial Room Roster	3
4.4	Initial Room History	4
4.5	ENTER	4
4.6	LEAVE	5
4.7	Presence Update	5
4.8	Replica Forwards Stanza to Primary	6
4.9	Message Broadcast	6
4.10	Primary-Replica Keepalive	7
4.11	Netsplit	7
4.11.1	Netsplit Detection	7
4.11.2	Netjoin	8
5	Use-Cases	8
5.1	Entering a Room	9
5.2	Sending a Message to All Occupants	13
6	Security Considerations	15
7	IANA Considerations	15
8	XMPP Registrar Considerations	15
9	XML Schema	15

1 Introduction

This document is one of several proposals for distributing XMPP chat rooms across multiple chat services. It is expected that the various approaches will be refined and harmonized before a final protocol is developed.

The architecture is that of a single root node, called PRIMARY and several repeater nodes, each called REPLICA. Every stanza is submitted via the replicas to the primary, control is centralized there. The primary then sends a copy of the stanza to each of the replicas where it is processed and then distributed to each of the replica's leaf nodes, local users at this point. During redistribution, the replica shall not change the stanza's 'from' attribute, which is only possible if the replica is in the same security domain as the user. The result of that is a decreased number of messages on the server-to-server links between the primary's server and each of the replica servers.

```
BigCheese ----> vesa.yeggmaex.irc ----> wallops MUC ----> killrc.
      oulubox.irc ----> Wumpus
                                killrc.
                                oulubox.
                                irc
                                ---->
                                Phaedrus
                                killrc.
                                oulubox.
                                irc
                                ---->
                                Valdis
                                wallops MUC ----> eris.dclxvii
                                .irc ----> WiZ
                                eris.dclxvii
                                .irc
                                ---->
                                Troy
                                wallops MUC ----> vesa.
                                yeggmaex.irc ---->
                                BigCheese
                                vesa.
                                yeggmaex
                                .irc
                                ---->
                                Efchen
```

Note that this only applies to stanzas that are directed to all occupants, such as the change of availability status and messages whose 'type' attribute is set to 'groupchat'.

While 1-1 stanzas such as in-room private messages or vcard-temp requests may also travel along that path they are currently unaffected by this.

2 Requirements

This specification addresses the following requirements:

- The existence of the replica shall be transparent for the user.
- Enable detection of connection loss.
- Enable occupants to remain in instance of the conference if connectivity is lost to other instances.
- Enable occupants to leave a chatroom while connectivity is lost.
- Enable syncing of history and room rosters on reconnect.
- Improve distribution of 'broadcast' stanzas'.

3 Terminology

3.1 Dramatis Personae

Most of the examples in this document use the scenario of the 1990 war that split the Internet Relay Chat into several incompatible networks. The battlefield is represented here by the "wallops@channel.avalon.irc" chatroom. The characters are as follows:

Room Nickname	Full JID	Role
Wumpus	argl@killrc.oulubox.irc/laptop	Moderator
Valdis	valdis@killrc.oulubox.irc/desktop	Participant
Phaedrus	phaedrus@killrc.oulubox.irc/phone	Participant
WiZ	squit@eris.dclxvii.irc/jupiter	Moderator
Troy	troy@eris.dclxvii.irc/screwdriver	Moderator
BigCheese	rubenro@vesa.yeghmaex.irc/shaver	Participant
Efchen	msa@vesa.yeghmaex.irc/bicycle	Participant

In our example we are presuming that three replicas from three hosts have registered with the primary for traffic redistribution. They are doing so using replica@host jids, but they could be using any temporary jid the implementor finds useful to choose.

4 PRIMARY/REPLICA Protocol

This section describes the protocol between the primary and the replicas, the interaction between each replica and its users are described in the next section.

4.1 Replica Requirements

The replica

- must be able to intercept any stanzas sent to the primary's jid,
- must be able to verify if a local user has sent directed presence to the primary's jid,
- must store room roster,
- must store local room roster
- must store room history (if desired by primary)

4.2 Creating a Replica

to follow

Might include things like negotiation of keepalive frequency and amount of room might be useful to set some things like keepalive frequency, keeping/storing room history etc.

4.3 Initial Room Roster

After the creation of a new replica, the primary must send the room roster (which at that time only consists of remote participants) to the replica:

Listing 1: Primary Sends Room Roster to Replica

```
<presence
  from='wallops@channel.avalon.irc/Wumpus'
  to='replica@vesa.yeggmaex.irc'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='owner' role='moderator'/>
  </x>
</presence>
<presence
  from='wallops@channel.avalon.irc/Valdis'
  to='replica@vesa.yeggmaex.irc'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='none' role='participant'/>
  </x>
```

```

</presence>
<presence
  from='wallops@channel.avalon.irc/Phaedrus'
  to='replica@vesa.yeggmaex.irc'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='none' role='participant'/>
  </x>
</presence>
<presence
  from='wallops@channel.avalon.irc/WiZ'
  to='replica@vesa.yeggmaex.irc'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='admin' role='moderator'/>
  </x>
</presence>
<presence
  from='wallops@channel.avalon.irc/Troy'
  to='replica@vesa.yeggmaex.irc'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='participant' role='moderator'/>
  </x>
</presence>

```

4.4 Initial Room History

After the creation of a new replica, the primary MAY also send the discussion history to the replica. The replica shall store this and deliver it to entering participants.
 from=primaryjid to=replicajid?

4.5 ENTER

If a new occupant requests to enter the room, the primary first sends a presence update to all participants to inform them of the presence of the new user. Then, the primary sends the affected replica a stanza requesting it to add the user to the distribution list

Listing 2: Primary informs Replica of New Occupant

```

<presence
  from='wallops@channel.avalon.irc/BigCheese'
  to='replica@vesa.yeggmaex.irc'>
  <x xmlns='urn:xmpp:tmp:dmuc:0'>
    <enter jid='rubenro@vesa.yeggmaex.irc/shaver'/>
    <history maxstanzas='20'/>
  </x>
  ...
</presence>

```

The replica MUST verify that the user has sent directed presence to the primary's JID before. This helps to ensure that the user intended to enter the room. If this is true, the replica shall add the user to the distribution list and send the room roster, occupants own presence in room and discussion history to the full jid of the added user.

4.6 LEAVE

If an occupant sends an unavailable presence to the room, the primary sends the affected replica a stanza requesting it to remove the user from the distribution list.

Listing 3: Primary informs Replica of Occupant's Departure

```
<presence
  from='wallops@channel.avalon.irc/BigCheese'
  to='replica@vesa.yeggmaex.irc'
  type='unavailable'>
  <x xmlns='urn:xmpp:tmp:dmuc:0'>
    <leave jid='rubenro@vesa.yeggmaex.irc/shaver' />
  </x>
  ...
</presence>
```

The replica removes user and forwards the stanza to user.
The primary then sends a presence update to all replicas to announce the occupants departure.

4.7 Presence Update

Presence updates are distributed by the primary to all replicas.

Listing 4: Primary sends presence update

```
<presence
  from='wallops@channel.avalon.irc/BigCheese'
  to='replica@killrc.oulubox.irc'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='none'
      jid='rubenro@vesa.yeggmaex.irc/shaver'
      role='participant' />
  </x>
  ...
</presence>
<presence
  from='wallops@channel.avalon.irc/BigCheese'
  to='replica@eris.dclxvii.irc'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
```

```

    <item affiliation='none'
        jid='rubenro@vesa.yeggmaex.irc/shaver'
        role='participant' />
    </x>
    ...
</presence>
<presence
    from='wallops@channel.avalon.irc/BigCheese'
    to='replica@vesa.yeggmaex.irc'>
    ...
</presence>

```

Note that the primary MUST NOT send the full jid of the user to any replicas without members that are moderators.

When rebroadcasting this stanza to its local occupants, the replica MUST remove the participants full JID subject to the rules of XEP-0045. In addition, the replica stores the resulting changes to the room roster, so that it can send the correct state to entering users.

4.8 Replica Forwards Stanza to Primary

The replica may relay messages from local users to the primary. When doing so, it MUST NOT modify the stanzas 'from' attribute but MUST retain the original address of the sender.

Listing 5: Replica Relays a Message to the Primary

```

<message
    from='rubenro@vesa.yeggmaex.irc/shaver'
    to='wallops@channel.avalon.irc'
    type='groupchat'>
    <body>Phaedrus, we're all having a truly rotten time.</body>
</message>

```

4.9 Message Broadcast

When relaying a message, the primary SHOULD add a urn:xmpp:delay element inside dmuc element so that the replica can provide proper timestamps to new users. The primary then sends a copy of the stanza to each replica.

Listing 6: Message from Primary to all Replicas

```

<message
    from='wallops@channel.avalon.irc/BigCheese'
    to='replica@killrc.oulubox.irc'
    type='groupchat'>
    <body>Phaedrus, we're all having a truly rotten time.</body>
    <x:xmlns='urn:xmpp:tmp:dmuc:0'>

```

```

<<<<<<<delay xmlns='urn:xmpp:delay'
<<<<<<<from='wallops@channel.avalon.irc/BigCheese'
<<<<<<<stamp='1990-10-13T23:58:37Z' />
<<<<<<</x>
</message>
<message
  <<<<from='wallops@channel.avalon.irc/BigCheese'
  <<<<to='replica@eris.dclxvii.irc'
  <<<<type='groupchat'>
  <<<<body>Phaedrus, we're all having a truly rotten time.</body>
    <x xmlns='urn:xmpp:tmp:dmuc:0'>
      <delay xmlns='urn:xmpp:delay'
        <<<<from='wallops@channel.avalon.irc/BigCheese'
        <<<<stamp='1990-10-13T23:58:37Z' />
      </x>
    </message>
  <message
    <<<<from='wallops@channel.avalon.irc/BigCheese'
    <<<<to='replica@vesa.yeggmaex.irc'
    <<<<type='groupchat'>
    <<<<body>Phaedrus, we're all having a truly rotten time.</body>
  <<<<x xmlns='urn:xmpp:tmp:dmuc:0'>
    <<<<<<<<delay xmlns='urn:xmpp:delay'
    <<<<<<<<from='wallops@channel.avalon.irc/BigCheese'
    <<<<<<<<stamp='1990-10-13T23:58:37Z' />
    <<<<<<<</x>
  </message>

```

After saving the stanza for the purpose of keeping a room history, the replica SHOULD remove the urn:xmpp:tmp:dmuc:0 element and send the stanza to each local user.

4.10 Primary-Replica Keepalive

To ensure a working connecting, the primary SHOULD send an XMPP Ping stanza to each replica if there has been no traffic for a certain amount of time.

Likewise, each replica should ping the primary if there has been no traffic for more than the usual amount of time.

4.11 Netsplit

4.11.1 Netsplit Detection

A 'lost connection' can be detected by either replica or primary when a stanza sent to the primary or a replica respectively bounced.

If the primary receives a stanza with type=error from the replica JID, it MUST:

- mark the replica as 'split', making sure that any further broadcasts are not sent to the affected replica
- start sending pings to the replica with a higher frequency to get a timely notification if the replica reappears
- resync when the replica reappears as described below

In addition, the primary MAY send a presence update for each user on the affected replica, marking them as away.

If the replica receives a stanza with type=error from the primary's JID, it MUST:

- stop submitting messages to the primary
- react to people sending presence updates or leaving the room and broadcast those changes to local users

In addition, the replica MAY (and be careful when using this):

- enable local participants to continue their in-room conversation with other local participants
- enable local participants to continue 1-1 messaging in the context of a room (such as private chat or vcard retrieval)
- enable local users to enter the room (DANGER!!!)
- enable moderators (as designated by the primary) to kick participants
- mark non-local users as away

4.11.2 Netjoin

to follow

5 Use-Cases

This section narratively describes the primary-replica protocol in context with client interactions.

5.1 Entering a Room

The user seeks to enter the wallops chatroom with the room nickname BigCheese:

Listing 7: User Seeks to Enter Room

```
<presence
  from='rubenro@vesa.yeggmaex.irc/shaver'
  to='wallops@channel.avalon.irc/BigCheese'>
  <x xmlns='http://jabber.org/protocol/muc' />
</presence>
```

The primary sends the presence update to each replica to inform the current occupants of BigCheese's arrival:

Listing 8: Primary Sends Presence Update to all Replicas

```
<presence
  from='wallops@channel.avalon.irc/BigCheese'
  to='replica@killrc.oulubox.irc'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='none'
      jid='rubenro@vesa.yeggmaex.irc/shaver'
      role='participant' />
  </x>
  ...
</presence>
<presence
  from='wallops@channel.avalon.irc/BigCheese'
  to='replica@eris.dclxvii.irc'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='none'
      jid='rubenro@vesa.yeggmaex.irc/shaver'
      role='participant' />
  </x>
  ...
</presence>
<presence
  from='wallops@channel.avalon.irc/BigCheese'
  to='replica@vesa.yeggmaex.irc'>
  ...
</presence>
```

Each replica then distributes this presence update:

Listing 9: Replicas Distribute Presence Update to Users - killrc Replica

```
<presence
  from='wallops@channel.avalon.irc/BigCheese'
```

```

    to='argl@killrc.oulubox.irc/laptop'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='none'
      jid='rubenro@vesa.yeggmaex.irc/shaver'
      role='participant' />
  </x>
  ...
</presence>
<presence
  from='wallops@channel.avalon.irc/BigCheese'
  to='valdis@killrc.oulubox.irc/desktop'>
  ...
</presence>
<presence
  from='wallops@channel.avalon.irc/BigCheese'
  to='phaedrus@killrc.oulubox.irc/phone'>
  ...
</presence>

```

Listing 10: Replicas Distribute Presence Update to Users - eris Replica

```

<presence
  from='wallops@channel.avalon.irc/WiZ'
  to='squit@eris.dclxvii.irc/jupiter'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='none'
      jid='rubenro@vesa.yeggmaex.irc/shaver'
      role='participant' />
  </x>
  ...
</presence>
<presence
  from='wallops@channel.avalon.irc/WiZ'
  to='troy@eris.dclxvii.irc/screwdriver'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='none'
      jid='rubenro@vesa.yeggmaex.irc/shaver'
      role='participant' />
  </x>
  ...
</presence>

```

Listing 11: Replicas Distribute Presence Update to Users - vesa Replica

```

<presence
  from='wallops@channel.avalon.irc/BigCheese'
  to='rubenro@vesa.yeggmaex.irc/shaver'>
  ...
</presence>

```

The primary then informs the replica of the entered user about a new occupant:

Listing 12: Primary Informs Replica of New Occupant

```
<presence
  from='wallops@channel.avalon.irc/BigCheese'
  to='replica@vesa.yeggmaex.irc'>
  <x xmlns='urn:xmpp:tmp:dmuc:0'>
    <enter jid='rubenro@vesa.yeggmaex.irc/shaver' />
  </x>
  ...
</presence>
```

The replica sends presence from existing occupants to new occupant:

Listing 13: Replica Sends Presence from Existing Occupants to New Occupant

```
<presence
  from='wallops@channel.avalon.irc/Wumpus'
  to='rubenro@vesa.yeggmaex.irc/shaver'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='owner' role='moderator' />
  </x>
</presence>
<presence
  from='wallops@channel.avalon.irc/Valdis'
  to='rubenro@vesa.yeggmaex.irc/shaver'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='none' role='participant' />
  </x>
</presence>
<presence
  from='wallops@channel.avalon.irc/Phaedrus'
  to='rubenro@vesa.yeggmaex.irc/shaver'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='none' role='participant' />
  </x>
</presence>
<presence
  from='wallops@channel.avalon.irc/WiZ'
  to='rubenro@vesa.yeggmaex.irc/shaver'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='admin' role='moderator' />
  </x>
</presence>
<presence
  from='wallops@channel.avalon.irc/Troy'
  to='rubenro@vesa.yeggmaex.irc/shaver'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
```

```

    <item affiliation='participant' role='moderator' />
  </x>
</presence>
<presence
  from='wallops@channel.avalon.irc/Efchen'
  to='rubenro@vesa.yeggmaex.irc/shaver'>
  <x xmlns='http://jabber.org/protocol/muc#user'>
    <item affiliation='none' role='participant' />
  </x>
</presence>

```

and concludes the room roster by sending the new occupant's presence to the new occupant:

Listing 14: Replica Sends New Occupant's Presence to New Occupant

```

<presence
  from='wallops@channel.avalon.irc/BigCheese'
  to='rubenro@vesa.yeggmaex.irc/shaver'
  ...
</presence>

```

After that, the replica will send the discussion history to the new occupant:

Listing 15: Replica Sends Discussion History to New Occupant

```

<message from='wallops@channel.avalon.irc/Trillian'
  to='rubenro@vesa.yeggmaex.irc/shaver'
  type='groupchat'>
  <body>Honest! He did!!</body>
  <delay xmlns='urn:xmpp:delay'
    from='wallops@channel.avalon.irc/Trillian'
    stamp='1990-01-23T19:50:01Z' />
</message>
<message from='wallops@channel.avalon.irc/BlondeBoy'
  to='rubenro@vesa.yeggmaex.irc/shaver'
  type='groupchat'>
  <body>Was that absolutely necessary????????</body>
  <delay xmlns='urn:xmpp:delay'
    from='wallops@channel.avalon.irc/BlondeBoy'
    stamp='1990-01-23T19:50:30Z' />
</message>
<message from='wallops@channel.avalon.irc/DCLXVI'
  to='rubenro@vesa.yeggmaex.irc/shaver'
  type='groupchat'>
  <body>SUUUUUUUURE he did</body>
  <delay xmlns='urn:xmpp:delay'
    from='wallops@channel.avalon.irc/DCLXVI'
    stamp='1990-01-23T19:50:51Z' />
</message>

```

```

<message from='wallops@channel.avalon.irc/Cerebus'
  to='rubenro@vesa.yeggmaex.irc/shaver'
  type='groupchat'>
  <body>He did. really truly he did.</body>
  <delay xmlns='urn:xmpp:delay'
    from='wallops@channel.avalon.irc/Cerebus'
    stamp='1990-01-23T19:51:20Z' />
</message>

```

5.2 Sending a Message to All Occupants

Listing 16: Occupant Sends a Message to All Occupants

```

<message
  from='rubenro@vesa.yeggmaex.irc/shaver'
  to='wallops@channel.avalon.irc'
  type='groupchat'>
  <body>Phaedrus, we're all having a truly rotten time.</body>
</message>

```

The primary will broadcast this message to all replicas:

Listing 17: Primary Distributes Message to all Replicas

```

<message
  from='wallops@channel.avalon.irc/BigCheese'
  to='replica@killrc.oulubox.irc'
  type='groupchat'>
  <body>Phaedrus, we're all having a truly rotten time.</body>
  <x xmlns='urn:xmpp:tmp:dmuc:0'>
    <delay xmlns='urn:xmpp:delay'
      from='wallops@channel.avalon.irc/BigCheese'
      stamp='1990-10-13T23:58:37Z' />
    </x>
  </message>
<message
  from='wallops@channel.avalon.irc/BigCheese'
  to='replica@eris.dclxvii.irc'
  type='groupchat'>
  <body>Phaedrus, we're all having a truly rotten time.</body>
  <x xmlns='urn:xmpp:tmp:dmuc:0'>
    <delay xmlns='urn:xmpp:delay'
      from='wallops@channel.avalon.irc/BigCheese'
      stamp='1990-10-13T23:58:37Z' />
    </x>
  </message>
<message
  from='wallops@channel.avalon.irc/BigCheese'

```

```

    to='replica@vesa.yeggmaex.irc'
    type='groupchat'>
    <body>Phaedrus, we're all having a truly rotten time.</body>
  <x:xmlns='urn:xmpp:tmp:dmuc:0'>
    <delay xmlns='urn:xmpp:delay'
    <<<from='wallops@channel.avalon.irc/BigCheese'
    <<<stamp='1990-10-13T23:58:37Z' />
  </x>
</message>

```

And each replica distributes to local occupants

Listing 18: Replica Distributes Message to Occupants - killrc Replica

```

<message
  from='wallops@channel.avalon.irc/BigCheese'
  to='argl@killrc.oulubox.irc/laptop'
  type='groupchat'>
  <body>Phaedrus, we're all having a truly rotten time.</body>
</message>
<message
  <<<from='wallops@channel.avalon.irc/BigCheese'
  <<<to='valdis@killrc.oulubox.irc/desktop'
  <<<type='groupchat'>
  <<<body>Phaedrus, we're all having a truly rotten time.</body>
</message>
<message
  from='wallops@channel.avalon.irc/BigCheese'
  to='phaedrus@killrc.oulubox.irc/phone'
  type='groupchat'>
  <body>Phaedrus, we're all having a truly rotten time.</body>
</message>

```

Listing 19: Replica Distributes Message to Occupants - eris Replica

```

<message
  from='wallops@channel.avalon.irc/BigCheese'
  to='squit@eris.dclxvii.irc/jupiter'
  type='groupchat'>
  <body>Phaedrus, we're all having a truly rotten time.</body>
</message>
<message
  <<<from='wallops@channel.avalon.irc/BigCheese'
  <<<to='troy@eris.dclxvii.irc/screwdriver'
  <<<type='groupchat'>
  <<<body>Phaedrus, we're all having a truly rotten time.</body>
</message>

```

Listing 20: Replica Distributes Message to Occupants - vesa Replica

```
<message
  from='wallops@channel.avalon.irc/BigCheese'
  to='rubenro@vesa.yeggmaex.irc/shaver'
  type='groupchat'>
  <body>Phaedrus, we're_all_having_a_truly_rotten_time.</body>
</message>
<message
  from='wallops@channel.avalon.irc/BigCheese'
  to='msa@vesa.yeggmaex.irc/bicycle'
  type='groupchat'>
  <body>Phaedrus, we're all having a truly rotten time.</body>
</message>
```

6 Security Considerations

to follow

Careful with channel overtakes :-)

7 IANA Considerations

This document requires no interaction with the [Internet Assigned Numbers Authority \(IANA\)](#)¹.

8 XMPP Registrar Considerations

This document requires no interaction with the [XMPP Registrar](#)².

9 XML Schema

to follow

¹The Internet Assigned Numbers Authority (IANA) is the central coordinator for the assignment of unique parameter values for Internet protocols, such as port numbers and URI schemes. For further information, see <http://www.iana.org/>.

²The XMPP Registrar maintains a list of reserved protocol namespaces as well as registries of parameters used in the context of XMPP extension protocols approved by the XMPP Standards Foundation. For further information, see <https://xmpp.org/registrar/>.