OpenSIPS 3.3 - Messaging in the IMS and UC Ecosystems

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About Me

- opensips developer & maintainer
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RCS Forecasts

2022: 1.2B subscribers
2026: 3.2B subscribers

Figure 2: Global Number of Mobile Subscribers that Are RCS Capable in 2022, Split by 8 Key Regions: 1.2 Billion

Source: Juniper Research
OpenSIPS 3.3

.. is “Instant Messaging” focused

- IM was always neglected in SIP
- IM is now important in IMS ecosystem (RCS)
- There is no Unified Communication without IM
Instant Messaging
IM using “Pager Mode”

- SIP MESSAGE (RFC 3428)
- standalone messages (no session)
- media payload is part of the SIP message itself
IM using “Pager Mode”

MESSAGE sip:12233445566@1.2.3.4:5060 SIP/2.0.
Via: SIP/2.0/UDP 4.5.6.7:5060;branch=z9hG4bK1sansay666699265rdb3932.
Record-Route: <sip:sansay666699265rdb3932@4.5.6.7:5060;lr;transport=udp>.
To: <sip:12233445566@1.2.3.4>.
From: <sip:141776@4.5.6.7>;tag=sansay666699265rdb3932.
Call-ID: 200167691-1-1088023530@4.5.6.75.
CSeq: 1 MESSAGE.
Max-Forwards: 69.
Content-Type: text/plain.
Content-Length: 153.

PragerU: How did the Framers ensure that presidents wouldn't turn into tyrants?
https://itbl.co/IhC~VA7I7

Msg&data rates may apply. Text 'STOP' to quit.
IM using “Session Mode”

Message Session Relay Protocol (MSRP)
RFC 4975

- Groups messages in sessions
- Uses SIP as a rendezvous protocol and the MSRP protocol for transporting the media
- Is better suited for building more advanced messaging services such as read/write receipts, group chat, file transfer, photo sharing
IM using “Session Mode”
The MSRP Protocol
MSRP overview

- Text-based, connection-oriented protocol for exchanging arbitrary MIME content, especially IM
- Sessions are established in SIP, using SDP with a few extra MSRP specific attributes
- Is peer-to-peer at its roots but can also use intermediaries called Relays (defined in RFC 4976)
- Uses TCP/TLS for peer-to-peer connections or TLS when a relay is employed
- Has a request-response model with transactions and separate optional success reporting or failure reporting for delivery status
- May chunk messages in multiple requests in order to interrupt sending or split up large messages (e.g., files)
Example MSRP session setup

INVITE sip:bob@biloxi.example.com SIP/2.0
To: <sip:bob@biloxi.example.com>
From: <sip:alice@atlanta.example.com>;tag=786
Call-ID: 3413an89KU
Content-Type: application/sdp

c=IN IP4 atlanta.example.com
m=message 7654 TCP/MSRP *
a=accept-types:text/plain
a=path:msrp://atlanta.example.com:7654/jshA7weztas;tcp
Example MSRP session setup

SIP/2.0 200 OK
To: <sip:bob@biloxi.example.com>;tag=087js
From: <sip:alice@atlanta.example.com>;tag=786
Call-ID: 3413an89KU
Content-Type: application/sdp

c=IN IP4 biloxi.example.com
m=message 12763 TCP/MSRP *
a=accept-types:text/plain
a=path:msrp://biloxi.example.com:12763/kjhd37s2s20w2a;tcp
Example MSRP exchange

MSRP a786hjs2 SEND
To-Path: msrp://biloxi.example.com:12763/kjhd37s2s20w2a;tcp
From-Path: msrp://atlanta.example.com:7654/jshA7weztas;tcp
Message-ID: 87652491
Byte-Range: 1-25/25
Content-Type: text/plain

Hey Bob, are you there?
-------a786hjs2$
Example MSRP exchange

MSRP a786hjs2 200 OK
To-Path: msrp://atlanta.example.com:7654/jshA7weztas;tcp
From-Path:
msrp://biloxi.example.com:12763/kjhd37s2s20w2a;tcp
-------a786hjs2$
The MSRP Stack in OpenSIPS 3.3
MSRP stack in OpenSIPS 3.3
MSRP Relay
**MSRP Relay module**

- MSRP requires clients to do **HTTP Digest Authentication** when using a Relay (via the **AUTH** method in MSRP)

- The module provides dedicated script routes for:
  - providing the authentication credentials
  - performing bridging between multiple interfaces
MSRP Relay config example

socket=msrp:10.0.0.14:2855

modparam("msrp_relay", "my_uri", "msrp://10.0.0.14:2855;tcp")
modparam("msrp_relay", "socket_route", "msrp_routing")

route[msrp_auth] {
    avp_db_query("SELECT ha1 FROM subscriber WHERE username='\$
    var(username)'", "\$
    avp(hash)");
    $var(password_hash) = $avp(hash);
}

route[msrp_routing] {
    xlog("MSRP request coming from $si:$sp on $socket_in socket\n");
    xlog("trying to go to $var(dst_schema)://$var(dst_host)\n");

    $socket_out = "msrp:1.2.3.4:9999";
}
MSRP User Agent
MSRP stack in OpenSIPS 3.3
MSRP UA API

**MI commands**
- `msrp UA_start_session`
- `msrp UA_end_session`
- `msrp UA_send_message`
- `msrp UA_list_sessions`

**Events**
- `E_MSRP_SESSION_NEW`
- `E_MSRP_SESSION_END`
- `E_MSRP_MSG_RECEIVED`

**Functions**
- `msrpuA_start/end_session()`
- `msrpuA_send_message()`

**Callbacks**
- `accept_session`
- `receive_message`
- `session terminated/failed`

- OpenSIPS Script
- External API
- Internal API

- Call Controlling
- MSRP UA (user agent)
Start A Session From An External App

Application

MI & Events

msrp_ua_start_session

msrp_ua_send_message

msrp_ua_send_message

E_MSRP_MSG_RECEIVED

msrp_ua_end_session

OpenSIPS MSRP API

SIP & MSRP

INVITE w/ MSRP

200 OK w/ MSRP

MSRP SEND

MSRP SEND

E_MSRP_MSG_RECEIVED

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Answer A Session From OpenSIPS

MI & Events

E_MSRP_SESSION_NEW

msrp ua_answer()

200 OK w/ MSRP

ACK

E_MSRP_SESSION_END

msrp ua_send_message

E_MSRP_MSG_RECEIVED

SIP & MSRP

INVITE w/ MSRP

MSRP SEND

MSRP SEND

E_MSRP_SESSION_END

BYE
Unified Communication
Supporting all SIP chat clients

Before UC, we need to Bridge / Gateway between:

- SIP clients with Page Mode (SIP MESSAGE)
- MSRP-based (“Session Mode”) Instant Messaging
MSRP stack in OpenSIPS 3.3
Gatewaying From MESSAGE To MSRP

SIP Client
MESSAGE only

SIP Client
WebRTC

OpenSIPS
MESSAGE to MSRP
gateway

SIP MESSAGE

msg_to_msrp()

INVITE w/ MSRP

200 OK w/ MSRP

MSRP SEND

MSRP SEND

MSRP SEND

BYE

SIP & MSRP

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Gateways from MSRP Call to MESSAGE

- INVITE with MSRP
- MSRP SEND
- SIP & MSRP
- 200 OK with MSRP
- ACK
- MSRP SEND
- MSRP SEND
- MSRP SEND
- msg_to_msrp()
Call Center: UC Enhancements
In addition to voice/video, a Contact Center may support Messaging/Chat, emails or tickets as communication channels between Customers and Agents.

1. Agents, beside skills, will have multiple supported communication types.
2. Certain communication types may support multiple parallel channels (like an agent may do 4 chats simultaneous)
3. An agent cannot do different communication types in the same time
Call Distribution: “balancing” mode

OpenSIPS Contact Center

Call Queue

RTP Call 5

A1

A2

A3

A4

Call 1

Call 2

Call 3

Call 4
Call Distribution: “full-load” mode
**Call Distribution: DYI (external)**
IMS
IMS - Diameter ++

- OpenSIPS 3.2 introduced a first version of the support for DIAMETER protocol
- OpenSIPS 3.3 now offers a way of building and sending arbitrary DIAMETER protocol requests, from the opensips.cfg script

⇒ implement custom DIAMETER based services, not only Auth and Accounting
Status & Report support
$ opensips-cli -x mi sr_list_reports drouting

[ {
    "Name": "Default",
    "Reports": [
        {
            "Timestamp": 1647526996,
            "Date": "Thu Mar 17 16:23:16 2022",
            "Log": "starting DB data loading"
        },
        {
            "Timestamp": 1647526996,
            "Date": "Thu Mar 17 16:23:16 2022",
            "Log": "DB data loading successfully completed"
        },
        {
            "Timestamp": 1647526996,
            "Date": "Thu Mar 17 16:23:16 2022",
            "Log": "2 gateways loaded (0 discarded), 2 carriers loaded (0 discarded), 1 rules loaded (0 discarded)"
        }
    ]
}]
Enhanced TCP control
(new “tcp_mgm” module)
TCP Connection Profile

tcp_connect_timeout

tcp_con_lifetime

tcp_max_msg_time

tcp_threshold

tcp_no_new_conn_bflag

tcp_accept_aliases

tcp_parallel_read_on_workers

tcp_keepalive

tcp_keepcount

tcp_keepidle

tcp_keepinterval

TCP Connection Profile

.connect_timeout

.con_lifetime

.msg_read_timeout

.send_threshold

.no_new_conn

.alias_mode

.parallel_read

.keepalive

.keepcount

.keepidle

_keepinterval
```sql
MariaDB [opensips]> desc tcp_mgm;

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<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Null</th>
<th>Key</th>
<th>Default</th>
<th>Extra</th>
</tr>
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<td>id</td>
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<td>NO</td>
<td>PRI</td>
<td>NULL</td>
<td>auto_increment</td>
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<tr>
<td>proto</td>
<td>char(8)</td>
<td>NO</td>
<td></td>
<td>any</td>
<td></td>
</tr>
<tr>
<td>remote_addr</td>
<td>char(43)</td>
<td>YES</td>
<td></td>
<td>NULL</td>
<td></td>
</tr>
<tr>
<td>remote_port</td>
<td>int(10) unsigned</td>
<td>NO</td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>local_addr</td>
<td>char(43)</td>
<td>YES</td>
<td></td>
<td>NULL</td>
<td></td>
</tr>
<tr>
<td>local_port</td>
<td>int(10) unsigned</td>
<td>NO</td>
<td></td>
<td>0</td>
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<tr>
<td>priority</td>
<td>int(11)</td>
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<td></td>
<td>0</td>
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<tr>
<td>attrs</td>
<td>char(255)</td>
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<td></td>
<td>NULL</td>
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</tr>
<tr>
<td>connect_timeout</td>
<td>int(10) unsigned</td>
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<td></td>
<td>100</td>
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<td></td>
<td>4</td>
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</tr>
<tr>
<td>send_threshold</td>
<td>int(10) unsigned</td>
<td>NO</td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>no_new_conn</td>
<td>int(10) unsigned</td>
<td>NO</td>
<td></td>
<td>0</td>
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</tr>
<tr>
<td>alias_mode</td>
<td>int(10) unsigned</td>
<td>NO</td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>parallel_read</td>
<td>int(10) unsigned</td>
<td>NO</td>
<td></td>
<td>0</td>
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</tr>
<tr>
<td>keepalive</td>
<td>int(10) unsigned</td>
<td>NO</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>keepcount</td>
<td>int(10) unsigned</td>
<td>NO</td>
<td></td>
<td>9</td>
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</tr>
<tr>
<td>keepidle</td>
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<td></td>
<td>7200</td>
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<tr>
<td>keepinterval</td>
<td>int(10) unsigned</td>
<td>NO</td>
<td></td>
<td>75</td>
<td></td>
</tr>
</tbody>
</table>
```
Take-Away Message

Be chat worry-free with OpenSIPS 3.3!

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