



IMS

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- **IMS** - 3GPP IMS
- **Diameter** - Sh Ro
- **SIP** -

- **XML** - E.164 AU US PF
- **E.164** - AU US PF

MMTel-Config

- **MMTel-Config** - CFA CFB CFNRy CFNRc
- **CLI** - SIP
- **OCS** - OCS
- **SMS** - SMS
- **IMS** - 3GPP RFC 4579 RFC 4575

Web UI

- **Web UI** - HTTPS 443
 -
 -
 -
 - Diameter
 -
 - Sh OCS HLR
- **REST API** - API/Swagger 8444
- **Prometheus** - 3 8080 9090 9093

MMTel-Config

- **HSS/ (Sh)** - MMTel-Config
- **OCS (Ro)** - OCS
- **HLR (SS7 MAP)** - HLR
- **SMSc** - SMSc
- **OpenAI TTS** - OpenAI TTS
- **SBCs/** - SIP

config/runtime.exs

config :tas,

fs_event_socket: %{

host: "127.0.0.1",

port: 8021,

```
secret: "YourSecretPassword"
}
```

```
#  IP
config :tas,
  allowed_sbc_source_ips: ["10.5.198.200"],
  allowed_cscf_ips: ["10.8.3.34"]

# 
config :tas,
  number_translate: %{
    country_code: :AU, # :AU, :US, :PF
    localAreaCode: "617"
  }

# 
config :tas,
  online_charging: %{
    enabled: true,
    periodic_ccr_time_seconds: 10,
    schedule_hangup_auth: false,
    skipped_regex: ["^2222", "^911"] #  OCS
  }

# 
config :tas,
  emergency_call_codes: ["911", "112", "000", "sos"]

# 
config :tas,
  voicemail: %{
    timezone: "Pacific/Tahiti",
    smsc: %{
      smsc_url: "http://10.8.81.215",
      smsc_api_key: "your_api_key",
      source_msisdn: "2222"
    }
  }
}
```

- : <https://your-server-ip/ config/runtime.exs>
- **REST API:** <https://your-server-ip:8444/api/swaggerui>
- **Prometheus**:
 - <http://your-server-ip:8080/metrics> TAS Diameter OCS HLR

- <http://your-server-ip:9090/metrics>
- <http://your-server-ip:9093/esl?module=defaultRTP/RTCP>

XML [priv/templates/](#)

- [mo_dialplan.xml](#) -
- [mt_dialplan.xml](#) -
- [mo_emergency_dialplan.xml](#) -

[/](#)

README

1. [/](#)
2. [/](#)
3. <https://your-server-ip/>

1. [/](#)
2. [/](#)
3. [Sh SS7 MAP](#)
4. [/](#)

1. [REST API](#) OpenAPI/Swagger
2. [/](#) Prometheus
3. [/](#) API

- [/](#) - XML
- [/](#) - E.164
- [/](#) - CLI

- [Sh](#) - HSS/ (Ro/OCS)
- [SS7 MAP](#) - HLR

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- -

- - SMS
- [TTS](#) -
- [IMS](#) -

- Elixir/OTP
- PostgreSQL SQLite CDR
- IMS (S-CSCF)
- - DRA/HSS (Diameter: Sh Ro)
 - SIP/SBC
 - SS7 MAP OpenAI TTS API

-
- [doc/metrics.md](#)
- **API** Swagger UI <https://your-server-ip:8444/api/swaggerui>
- <https://your-server-ip/>

- Omnitouch



Prometheus



OmniTAS Prometheus



http://<tas-ip>:8080/metrics



duration_unit: false

1. Prometheus Elixir _milliseconds
2. Erlang
3. System.convert_time_unit/3
4. duration_unit: false ~1,000,000



```
#
Histogram.declare(
  name: :http_dialplan_request_duration_milliseconds,
  help: "HTTP",
  labels: [:call_type],
  buckets: [100, 250, 500, 750, 1000, 1500, 2000, 3000, 5000],
  duration_unit: false #
)

#
start_time = System.monotonic_time()
# ...
end_time = System.monotonic_time()
duration_ms = System.convert_time_unit(end_time - start_time, :native, :millisecond)
Histogram.observe([name: :http_dialplan_request_duration_milliseconds], duration_ms)
```

◆◆◆◆◆◆

Diameter ◆◆

diameter_response_duration_milliseconds

◆◆◆ ◆◆◆

◆◆◆ application (ro, sh), command (ccr, cca, ◆), result (success, error, timeout)

◆◆ 10, 50, 100, 250, 500, 1000, 2500, 5000, 10000 ms

◆◆◆ Diameter ◆◆◆◆◆◆◆◆◆◆◆◆

◆◆◆

```
# ◆◆ Diameter ◆◆◆◆
```

```
rate(diameter_response_duration_milliseconds_sum[5m]) /  
rate(diameter_response_duration_milliseconds_count[5m])
```

```
# P95 Diameter ◆◆
```

```
histogram_quantile(0.95,  
rate(diameter_response_duration_milliseconds_bucket[5m]))
```

◆◆◆◆◆

- P95 > 1000ms - Diameter ◆◆◆◆

diameter_requests_total

◆◆◆ ◆◆◆

◆◆◆ application (ro, sh), command (ccr, udr, ◆)

◆◆◆ ◆◆◆ Diameter ◆◆◆◆

◆◆◆

```
# ◆◆◆◆
```

```
rate(diameter_requests_total[5m])
```

diameter_responses_total

◆◆◆ ◆◆◆

◆◆◆ application (ro, sh), command (ccr, udr, ◆), result_code (2001, 3002, 5xxx, ◆)

◆◆◆ ◆◆◆◆ Diameter ◆◆◆◆

◆◆◆

```
# ◆◆◆
```

```
rate(diameter_responses_total{result_code="2001"}[5m]) /  
rate(diameter_responses_total[5m]) * 100
```

diameter_peer_state

◆◆◆ ◆◆◆

```
peer_host, peer_realm, application (ro, sh)
Diameter (1=, 0=)
10
```

```
# 
diameter_peer_state == 0
```

```
• 1
```

1. HTTP

http_dialplan_request_duration_milliseconds

```

call_type (mt, mo, emergency, unknown)
HTTP HTTP 
Diameter (Sh/Ro) HLR (SS7 MAP) XML
```

```
# HTTP 
rate(http_dialplan_request_duration_milliseconds_sum[5m]) /
rate(http_dialplan_request_duration_milliseconds_count[5m])

# P95
histogram_quantile(0.95,
  rate(http_dialplan_request_duration_milliseconds_bucket[5m])
) by (call_type)

# MT MO 
histogram_quantile(0.95,

rate(http_dialplan_request_duration_milliseconds_bucket{call_type="mt"}[5m])
)
vs
histogram_quantile(0.95,

rate(http_dialplan_request_duration_milliseconds_bucket{call_type="mo"}[5m])
)
```

- P95 > 2000ms - HTTP
- P95 > 3000ms -
- P99 > 5000ms -
- call_type="unknown" -


```
# Sh 11111
(rate(subscriber_data_lookups_total{result="success"}[5m]) /
 rate(subscriber_data_lookups_total[5m])) * 100
```

11111

- 111 > 5% - HSS 1111
- 111 > 20% - 11 HSS 11

2. HLR 1111

hlr_data_duration_milliseconds

111 111

111 result (success, error)

111 11 SS7 MAP 11 HLR 11111111

111

```
# 11 HLR 1111
rate(hlr_data_duration_milliseconds_sum[5m]) /
rate(hlr_data_duration_milliseconds_count[5m])
```

```
# 1 95 111 HLR 1111
histogram_quantile(0.95,
 rate(hlr_data_duration_milliseconds_bucket[5m])
)
```

11111

- P95 > 500ms - SS7 MAP 1111
- P95 > 2000ms - 11 SS7 MAP 11

hlr_lookups_total

111 111

111 result_type (msrn, forwarding, error, unknown)

111 11111111 HLR 11

111

```
# 1111 HLR 1111
rate(hlr_lookups_total[5m])
```

```
# MSRN 1111 (1111)
rate(hlr_lookups_total{result_type="msrn"}[5m])
```

```
# 11111111
rate(hlr_lookups_total{result_type="forwarding"}[5m])
```

```
# HLR 111
```

```
rate(hlr_lookups_total{result_type="error"}[5m])
```

❖❖❖❖❖

- ❖❖❖ > 10% - SS7 MAP ❖❖
- MSRN ❖❖❖❖❖❖❖ - ❖❖❖❖❖❖❖❖

❖❖❖

- ❖ MSRN ❖❖❖❖❖❖❖❖❖❖❖❖
- ❖❖❖❖❖❖❖❖❖❖❖❖❖❖
- ❖❖❖❖❖❖❖❖❖❖❖❖❖❖❖❖❖❖❖❖❖❖

3. OCS ❖❖❖❖

ocs_authorization_duration_milliseconds

❖❖❖ ❖❖❖

❖❖❖ result (success, error)

❖❖❖ OCS ❖❖❖❖❖❖❖❖❖

❖❖❖

```
# ❖❖ OCS ❖❖❖❖
```

```
rate(ocs_authorization_duration_milliseconds_sum[5m]) /  
rate(ocs_authorization_duration_milliseconds_count[5m])
```

```
# ❖ 95 ❖❖❖ OCS ❖❖❖❖
```

```
histogram_quantile(0.95,  
  rate(ocs_authorization_duration_milliseconds_bucket[5m])  
)
```

❖❖❖❖❖

- P95 > 1000ms - OCS ❖❖❖❖
- P95 > 5000ms - ❖❖ OCS ❖❖❖❖❖

ocs_authorization_attempts_total

❖❖❖ ❖❖❖

❖❖❖ result (success, error), skipped (yes, no)

❖❖❖ OCS ❖❖❖❖❖❖❖❖

❖❖❖

```
# OCS ❖❖❖❖
```

```
rate(ocs_authorization_attempts_total{skipped="no"}[5m])
```

```
# OCS ❖❖❖
```

```
rate(ocs_authorization_attempts_total{result="error",skipped="no"}[5m])
```

```
# OCS ❖❖❖ (❖❖❖❖❖❖❖❖❖)
```

OCS      

```
(rate(ocs_authorization_attempts_total{result="success",skipped="no"}[5m]) /  
rate(ocs_authorization_attempts_total{skipped="no"}[5m])) * 100
```

◆ ◆ ◆ ◆ ◆

- $\hat{\theta} > 5\%$ - OCS $\hat{\theta}$
- $\hat{\theta} < 95\%$ - OCS $\hat{\theta}$

?

-  / 
-  OCS 
- 

4. $\diamondsuit \diamondsuit \diamondsuit \diamondsuit \diamondsuit \diamondsuit$

call_param_errors_total

error_type (parse_failed, missing_required_params)

???


```
rate(call_param_errors_total[5m])
```



```
rate(call_param_errors_total[5m]) by (error_type)
```







- $\diamond\diamond\diamond\diamond > 0$ - $\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond$
- $\diamond\diamond > 1\%$ $\diamond\diamond\diamond\diamond$ - $\diamond\diamond\diamond\diamond$

authorization_decisions_total

??? disposition (mt, mo, emergency, unauthorized), result (success, error)

???

? ? ? ? ? ? ?

```
rate(authorization_decisions_total[5m]) by (disposition)
```

MT

```
rate(authorization_decisions_total{disposition="mt"}[5m])
```

```
# MO 111
rate(authorization_decisions_total{disposition="mo"}[5m])

# 11111
rate(authorization_decisions_total{disposition="emergency"}[5m])

# 111111
rate(authorization_decisions_total{disposition="unauthorized"}[5m])
```

```
11111
• 1111 > 1% - 1111111111111111
• 11111111 - 1111111111
• MT/MO 1111111111 - 1111111
```

```
111
• MT/MO 1111111111
• 11111111111111111111
• 1111111111111111
```

freeswitch_variable_set_duration_milliseconds

```
1111 111
111 batch_size (1, 5, 10, 25, 50, 100)
111 11111111111111111111
```

```
111
```

```
# 1111111111
rate(freeswitch_variable_set_duration_milliseconds_sum[5m]) /
rate(freeswitch_variable_set_duration_milliseconds_count[5m])

# 1111111111111111
histogram_quantile(0.95,
  rate(freeswitch_variable_set_duration_milliseconds_bucket[5m])
) by (batch_size)
```

```
111111
• P95 > 100ms - 1111111111
• 11111 - 1111111111111111
```

5. 1111111

dialplan_module_duration_milliseconds

```
1111 111
111 module (MT, MO, Emergency, CallParams, 1), call_type
111 11111111111111111111
```

```
111
```

```
# 1 1 1 1 1 1 1 1
histogram_quantile(0.95,
  rate(dialplan_module_duration_milliseconds_bucket[5m])
) by (module)

# MT 1 1 1 1 1 1
histogram_quantile(0.95,
  rate(dialplan_module_duration_milliseconds_bucket{module="MT"}[5m])
)
```

1 1 1 1 1

- 1 1 1 1 P95 > 500ms - 1 1 1 1
- 1 1 1 1 1 1 1 1 1 1 - 1 1 1 1 1 1 1 1

1 1 1

- 1 1 1 1 1 1 1 1
- 1 1 1 1 1 1 1 1 1 1
- 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

6. 1 1 1 1 1

call_attempts_total

```
1 1 1 1 1 1
1 1 1 call_type (mt, mo, emergency, unauthorized), result (success, rejected)
1 1 1 1 1 1 1 1
```

1 1 1

```
# 1 1 1 1 1 1
rate(call_attempts_total[5m])

# 1 1 1 1 1 1 1 1 1
(rate(call_attempts_total{result="success"}[5m]) /
  rate(call_attempts_total[5m])) * 100 by (call_type)

# 1 1 1 1 1 1 1
rate(call_attempts_total{result="rejected"}[5m])
```

1 1 1 1 1 1

- 1 1 1 1 1 1 1 > 5% - 1 1 1 1 1
- 1 1 1 1 1 1 1 - 1 1 1 1
- 1 1 1 1 1 1 1 - 1 1 1 1 1

active_calls

```
1 1 1 1 1 1
1 1 1 call_type (mt, mo, emergency)
1 1 1 1 1 1 1 1
```


◆◆◆◆◆

- P95 > 500ms - SS7 MAP ◆◆◆◆
- ◆◆◆ > 50% - ◆◆ SS7 MAP ◆◆

ss7_map_operations_total

◆◆◆ ◆◆◆

◆◆◆ operation (sri, prn), result (success, error)

◆◆◆ SS7 MAP ◆◆◆◆◆

9. ◆◆◆◆◆◆

online_charging_events_total

◆◆◆ ◆◆◆

◆◆◆ event_type (authorize, answer, reauth, hangup), result (success, nocredit, error, timeout)

◆◆◆ ◆◆◆◆◆◆◆◆◆◆◆

◆◆◆

OCS ◆◆◆◆

rate(online_charging_events_total{result="nocredit"}[5m])

◆◆◆◆◆

- ◆◆◆◆◆◆

10. ◆◆◆◆◆◆

tracked_registrations

◆◆◆ ◆◆◆

◆◆◆ ◆◆◆◆◆ SIP ◆◆◆◆◆◆◆◆ FreeSWITCH Sofia ◆◆◆◆◆◆

◆◆◆◆◆◆ ◆ 10 ◆

◆◆◆

- ◆◆◆◆◆◆◆◆◆◆◆◆ FreeSWITCH ◆◆◆◆◆◆

tracked_call_sessions

◆◆◆ ◆◆◆

◆◆◆ ◆◆◆ ETS ◆◆◆◆◆◆◆◆◆◆◆◆

◆◆◆◆◆◆ ◆ 10 ◆

11. HTTP

http_requests_total

endpoint (dialplan, call_event, directory, voicemail, sms_ccr, metrics), status_code (200, 400, 500,)
HTTP

```
# HTTP
rate(http_requests_total{status_code=~"5.."}[5m]) /
rate(http_requests_total[5m]) * 100
```

- HTTP 5xx > 10%

12.

call_rejections_total

call_type (mo, mt, emergency, unknown), reason (nocredit, unauthorized, parse_failed, missing_params, hlr_error,)

```
#
sum by (reason) (rate(call_rejections_total[5m]))
```

- > 1/ -

13.

event_socket_connected

connection_type (main, log_listener)
(1=, 0=)

```
#
event_socket_connected
```

- 30

event_socket_reconnections_total

connection_type (main, log_listener), result (attempting, success, failed)

Grafana

Prometheus Grafana

1

-
- (MO/MT/)
-

2Diameter

-
-
-
-

3

-
- " " "
- OCS

4

- (P50/P95/P99)
- SS7 MAP
-

Grafana

1

-
-
-

2

- P95 HTTP () -
- P95 Sh
- P95 HLR
- P95 OCS

- P95 1234567890 (123)

34567

- Sh 12345
- HLR 123456
- OCS 1234567
- 123456789

456789

- 12345 P95 12345
- 123456789

56789

- 12345
- 1234567
- Sh 12
- HLR 12
- OCS 12

6789

789 123456789

```
# 123456789
rate(call_attempts_total[5m]) == 0

# HSS 12345
rate(subscriber_data_lookups_total{result="error"}[5m]) /
rate(subscriber_data_lookups_total[5m]) > 0.9

# OCS 12345
rate(ocs_authorization_attempts_total{result="error"}[5m]) /
rate(ocs_authorization_attempts_total[5m]) > 0.9
```

890 23456789

```
# 123456789
histogram_quantile(0.95,
  rate(dialplan_generation_duration_milliseconds_bucket[5m])
) > 1000

# HSS 12345
rate(subscriber_data_lookups_total{result="error"}[5m]) /
rate(subscriber_data_lookups_total[5m]) > 0.2

# OCS 12345
rate(ocs_authorization_attempts_total{result="error"}[5m]) /
rate(ocs_authorization_attempts_total[5m]) > 0.1
```

901 3456789

```
# HSS
histogram_quantile(0.95,
  rate(subscriber_data_duration_milliseconds_bucket[5m])
) > 100

# OCS
histogram_quantile(0.95,
  rate(ocs_authorization_duration_milliseconds_bucket[5m])
) > 1000

#
rate(call_attempts_total{result="rejected"}[5m]) /
rate(call_attempts_total[5m]) > 0.05
```

◆◆◆◆

Diameter ◆◆◆◆◆

```
alert: DiameterPeerDown
expr: diameter_peer_state == 0
for: 1m
annotations:
  summary: "Diameter ◆◆◆ {{ $labels.peer_host }} ◆◆"
```

◆ Diameter ◆◆

```
alert: HighDiameterLatency
expr: histogram_quantile(0.95,
  rate(diameter_response_duration_milliseconds_bucket[5m])) > 1000
for: 5m
annotations:
  summary: "Diameter P95 ◆◆◆◆ 1s"
```

OCS ◆◆◆◆◆

```
alert: HighOCSCreditFailures
expr: rate(online_charging_events_total{result="nocredit"}[5m]) > 0.1
for: 2m
annotations:
  summary: "◆ OCS ◆◆◆◆◆"
```

SS7 MAP ◆◆◆◆◆

```
alert: SS7MapErrors
expr: rate(ss7_map_operations_total{result="error"}[5m]) /
rate(ss7_map_operations_total[5m]) > 0.5
for: 3m
annotations:
  summary: "SS7 MAP ◆◆◆◆◆ 50%"
```



```

start = System.monotonic_time()
# ...
duration_ms = System.convert_time_unit(
    System.monotonic_time() - start,
    :native,
    :millisecond
)
Histogram.observe([name: :some_duration_milliseconds], duration_ms)

```

~~~~~

1. ~~~~~ duration\_unit: false
2. ~~~~~
3. ~~~~~

~~~~~

```

# ~~~~~ - ~~~~~
Histogram.declare(
  name: :http_dialplan_request_duration_milliseconds,
  buckets: [5, 10, 25, 50, 100, 250, 500, 1000, 2500]
)

# ~~~~~ - ~~~~~
Histogram.declare(
  name: :http_dialplan_request_duration_milliseconds,
  buckets: [100, 250, 500, 750, 1000, 1500, 2000, 3000, 5000],
  duration_unit: false
)

```

~~~~~ **"unknown"**

~~~~~

- ~~~~~ call_type="unknown" ~~~~~ mt~mo ~ emergency
- ~~~~~

~~~~~ ~~~~~

~~~~~

1. ~~~~~ "HTTP ~~~~~" ~~~~~ - ~~~~~
2. ~ process_call/1 ~ {xml, call_type} ~~~~~ xml
3. ~ fsapi_conn/1 ~~~~~ {xml, call_type} = process_call(body)

~~~~~ ~~~~~

~~~~~

~~~~~

1. ~ http\_dialplan\_request\_duration\_milliseconds P95 - ~~~~~
2. ~~~~~

- subscriber\_data\_duration\_milliseconds Sh
  - hlr\_data\_duration\_milliseconds HLR
  - ocs\_authorization\_duration\_milliseconds OCS
  - dialplan\_module\_duration\_milliseconds
3. call\_type="unknown" -
  4. MT MO
  - 5.

1. call\_attempts\_total{result="rejected"}
2. subscriber\_data\_lookups\_total{result="error"} Sh
3. hlr\_lookups\_total{result\_type="error"} HLR
4. ocs\_authorization\_attempts\_total{result="error"} OCS
5. authorization\_decisions\_total{disposition="unauthorized"}

1. active\_calls
2. call\_attempts\_total
- 3.
4. MT MO
- 5.

1. hlr\_lookups\_total{result\_type="msrn"}
2. hlr\_data\_duration\_milliseconds
3. HLR
4. MSRN

HLR

- **HTTP** P50: 100-500ms, P95: 500-2000ms, P99: 1000-3000ms
- **Sh** P50: 15ms, P95: 50ms, P99: 100ms
- **HLR** P50: 100ms, P95: 300ms, P99: 800ms

- **OCS** P50: 150ms, P95: 500ms, P99: 1500ms
- P50: 1-5ms, P95: 10-25ms, P99: 50ms
- **Sh** > 99%
- **HLR** > 95% ( )
- **OCS** > 98%
- > 99%

HTTP Sh + HLR + OCS + / ~100ms Sh ~2000ms

- call\_attempts\_total
- active\_calls
- P95
- 

- 80%
- P95
- 

1. → ERROR
2. → WARNING
3. ID
- 4.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

API 8080

Prometheus prometheus.yml





- 
- 
-  HLR  Sh 

???

???

???

???

1. ?? HLR ?
2. ? ? ? ? ? ? ? ?
3. ?? "?? HLR ?"
4. ? ? ? ? ? ? MSRN
5. ?? MSRN ? ? ? ? ? ? ? ? ? ? ? ? MSRN ? ? ? ?
6. ? ? ? ? MSRN ? ? ? ? ? ? ? ? ? ? ? ? MSRN ?

???

???

???

1. ?? HLR ?
2. ? ? ? ? ? ? ? ?
3. ?? "?? HLR ?"
4. ? ? ? ? ? ? " ? ? ? ? "
5. ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
6. ? ? ? ? ? ? ? ?
7. ? ? ? ? HLR ? ? ? ? ? ? ? ? Sh/HSS ? ?

?? **HLR** ? ? ?

?? ? ? SS7 MAP ? ? ? ? ? ? ? ?

???

1. ?? HLR ?
2. ? ? ? ? ? ? ? ? ? ?
3. ?? "?? HLR ?"
4. ? ? ? ? ? ? " ? ? "
5. ? ? ? ? ? ? ? ? SS7 MAP ? ? ? ? ?
6. ? ? ? ? ? ?
  - o "SS7 MAP ? ? ?" - ? ? ? ?
  - o " ? ? " - ? HLR ? ? ? ? ?
  - o " ? ? VLR ? ? " - ? ? ? ? ? ? ? ? ?

- [illegible]

- MO 1111111111111111
- 1111111111111111

5. 11

- 11 OCS 1111111111111111
- 11 HLR 111111 SS7 MAP 1111111111111111

11

1111111111111111

1. 11111111

- MT11111111
- 1111111111111111
- 1111111111111111

2. 1111111111

- 11111111 Sh 1111HSS1111
- **HLR** 111111 SS7 MAP 11111111 MT11
- **OCS** 1111111111111111 MO11
- 1111111111111111111111111111 MO11

3. 1111111111111111

- 1111111111111111
- 1111111111111111
- 11111111111111111111111111111111111111111111111

4. 111111

- 1111111111111111
- 1111111111111111
- 11111111111111111111111111111111111111111111111

111111

11111111

1111 11111111111111111111111111111111111111111111111

1111

1. 1111/11111111111111111111111111111111111111111111111
2. 1111111111111111
3. 1111111111111111

- ? ? ? SBC ? ? ? MT ? ?
  - ? ? ? CSCF ? ? ? MO ? ?
  - ? ? ? ?
  - ? ? ? ?
  - ? ? ? ? ?
4. ? ? ? ? ? ? ? ? ? ?
  5. ? ? ? ? ? ? ? ? ? ? ? ?
  6. ? ? ? ? ? ? ? ? ? ? ?

**?? MT ? ? ? ?**

?? ? ? ? ? ? ? ? ?

?? ?

1. ? ? ? ? ? ? ?
2. ? ? ? ? ? ? ? ? ?
3. ? ? ? ? ? ? ? ?
4. ?? IP ? ? ? ? ? SBC IP
5. ? ? ? ? ? ? ? ? ? " ? ? "
6. ?? " ? ? ? ? "
7. ?? ? ? ? ? ? ? ? ? ? Sh ? ? ? ?
8. ?? HLR ? ? ? ? ? ? ? MSRN ? ? ?
9. ? ? ? ? ? ? ? ? ? hangup\_case
10. ?? hangup\_case ? "UNALLOCATED\_NUMBER" ? ? ? ? ? ?
11. ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

**?? MO ? ? ? ?**

?? ? ? ? ? ? ? ?

?? ?

1. ? ? ? ? ? ? ?
2. ? ? ? ? ? ? ? ? ?
3. ? ? ? ? ? ? ? ? ?
4. ?? IP ? ? ? ? ? CSCF IP
5. ? ? ? ? ? ? ? ? ? ? ? ? " ? ? OCS ? ? "
6. ?? " ? ? ? ? ? "
7. ? ? ? ? ? ? ? ? ? ? ? ? Sh ? ? ? ?
8. ?? OCS ? ? ? ? ? ? ? ? ? / ? ?
9. ? ? ? ? ? ? ? ? ? ? ? ? ?
10. ? ? ? ? ? ? ? ? ? allocated\_time ? hangup\_case
11. ?? hangup\_case ? "OUTGOING\_CALL\_BARRED" ? OCS ? ? ? ? ?

?? ? ? ? ? ? ? ?

?? ? ? ? ? ? ? ? ? ? ? ? ? ?

???

1. ? ? ? ? ? ? ?
2. ? ? ? ? ? ? ? ?
3. ? ? ? ? ? "urn:service:sos"
4. ? ? ? ? ? IP ? ? ? ? ? ? ? IP ? ? ?
5. ? ? "? ? ? ? ?"
6. ? ? ? ? ? ? ? ? ? ? "(SOS)"
7. ? ? hangup\_case ? "none" ? ? ? ? ? ? ? ? ? ?
8. ? ? OCS ? HLR ? ? ? ? ?
9. ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

???

?? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

???

1. ? ? ? ? ? ? ?
2. ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
  - ? ? MT ? ? ? ? ? Sh + HLR ? ?
  - ? ? MO ? ? ? ? ? OCS ? ?
  - ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
  - ? ? ? ? ? ? ? ? ? ? IP ? ? ? ? ?
3. ? ? ? ? ? ? ? ? ?
4. ? ? ? ? ? ? ? ? ? ? ? ? ?
5. ? ? ? ? ? ? ? ? ? ? ? ? ?

?? Sh ? HLR ??

?? ? ? ? HLR ? ? ? ? Sh ? ?

???

1. ? ? MT ? ? ? ? ? ? ? ?
2. ? ? ? ? ? "? ? ? HLR ? ? ?"
3. ? ? "? ? ? ? ?"
4. ? ? ? ? ? ? ? ? ? ? HLR ? ? ? ? ?
5. ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
6. ? ? ? ? HLR ? ? ? ? ? ? ? ?
  - MSRN
  - call\_forward\_all\_destination
  - call\_forward\_not\_reachable\_destination

??

- ? ? ? ? ? ? ? ? ? ? ? ? ? ? " ? ? ? OCS ? ? ? " ? ? ? ? ? HLR ? ? ? " ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

- " " IP
- 
- 
- 

- 
- 
- OCS OCS
- CDR
- 

- Sh HSS
- SS7 MAP HLR
- OCS
- 
- 

Prometheus

- HLR hlr\_lookups\_total
- call\_simulations\_total{call\_type, source}
- 

- 
- 
- 

[metrics.md](#)

1.

- 
- 
-

## 2. **HLR**

- 
- HLR
- SS7 MAP

## 3.

- 
- 
- 

## 4.

- 
- 
- 

## 5.

- 
- MT/MO/
- OCS HLR

**HLR**

"SS7 MAP"

- config/runtime.exs ss7\_map.enabled
- 

- SS7 MAP
- HLR
- ss7\_map.timeout\_ms

"VLR"

- HLR
- 
- 

"Sh"

- ? ? ? ? HSS ? ? ?
- HSS ? ? ? ?
- ? ? diameter.sh\_application ? ?

?? ? ? ? ? " ? IP ? ? ? ? "

- IP ? ? allowed\_sbc\_source\_ips ? allowed\_cscf\_ips ?
- ? ? " ? ? ? ? ? " ? ? ? ? ? IP ? ? ?

?? ? ? ? ? " ? ? ? ? ? ? ? "

- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? IP ? ?

?? ? ? ? ? ? ?

- ? ? ? ? ? OCS ? ? ? ? ? ? ? " ? ? OCS ? ? "
- ? ? ? ? ? HLR ? ? ? ? ? ? ? " ? ? HLR ? ? "
- ? ? ? ? ? ? ? ? ? ? Sh/HLR/OCS ? ? ? ? ?

? ?

?? ? ? ? ? ? ? ? ? ? ?

1. ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
2. ? ? ? ? ? Sh ? HLR ? OCS ?
3. ? ? ? ? ? ? ? ? ? ? ?
4. ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?



# IMS -

IMS 3GPP IMS (RFC 4579, RFC 4575, TS 24.147) IMS

IMS OmniTAS

- **URI** SIP URI
- 
- 
- 

## IMS

TAS TS 24.147 RFC 4579 3GPP

(RFC 4579)

URI

(RFC 4575)

Web UI OmniTAS

## Web

/conference " "

## OmniTAS

ims\_conference OmniTAS

Web IMS

- 
- 
- 
-



```
omnitas@server> ims_conference list
```

```
IMS
```

```
ID URI
```

```
1-1765699908 sip:conf-1-1765699908@conference.ims.local 3 19078720151
```

```
1
```

## info

```
ims_conference info <conf_id>
```

```
ID1-1765699908
```

```
omnitas@server> ims_conference info 1-1765699908
```

```
ID: 1-1765699908
```

```
URI: sip:conf-1-1765699908@conference.ims.local
```

```
: ims-conf-1-1765699908
```

```
: 19078720151
```

```
: 1
```

```
: 3/10 (: 2)
```

```
: :
```

```
: :
```

```
: :
```

```
- sip:1235;phone-
```

```
context=ims.mnc380.mcc313.3gppnetwork.org@ims.mnc380.mcc313.3gppnetwork.org;user=phone;method=INVITE  
(342d50e0-9f67-4cc5-9179-4acae6f65f34)
```

```
: 3, : 0, : :
```

```
- sip:1235;phone-
```

```
context=ims.mnc380.mcc313.3gppnetwork.org@ims.mnc380.mcc313.3gppnetwork.org;user=phone;method=INVITE  
(bd98ca37-64fd-4618-b2db-aaba108c73e2)
```

```
: 3, : 0, : :
```

```
- 19078720151 (6270da85-9b94-4285-8130-8769b11d0aa2)
```

```
: 3, : 1, : :
```

## stats

```
omnitas@server> ims_conference stats
```

```
IMS
```

```
1
```

```
3
```

```
1
```

```
0
```

```
conference.ims.local
```

```
URI:sip:conference-factory@conf-factory.ims.mnc380.mcc313.3gppnetwork.org
```

```
MNC/MCC380/313
```

```
3GPP-E-UTRAN-FDD
```

```
10
```

```
:
```

```
:
```

```
:
```

```
===
```

## create

```
ims_conference create <creator_uri>
```



```
omnitas@server> ims_conference record 1-1765699908 start
1-1765699908
```

```
omnitas@server> ims_conference record 1-1765699908 stop
1-1765699908
```

## announce

ims\_conference announce <conf\_id> <message>

```
omnitas@server> ims_conference announce 1-1765699908 "5"
1-1765699908
```

## subscribers

info

ims\_conference subscribers <conf\_id>

```
omnitas@server> ims_conference subscribers 1-1765699908
1-1765699908
- sip:1235;phone-
context=ims.mnc380.mcc313.3gppnetwork.org@ims.mnc380.mcc313.3gppnetwork.org;user=phone;method=INVITE
- 19078720151
```

- 0
- 1
- 2
- 3

- 0
- 1
- 2
- 3
- 4
- 5

- 0
- 1

1. (/conference)
- 2.
- 3.
- 4.

CLI









# ANSI R226

     OmniTAS IMS     R226-3  R226-7     
ANSI R226        

            ANSI 

  R226 -        

---

## 1.

### 1.1

    OmniTAS IMS      
     (TAS)  
    IMS (IP            
    SIP, Diameter, HTTP/HTTPS, SS7/MAP  
       

-    (SIP)   B2BUA 
- IMS    (iFC) 
-     
-    (E.164 PSAP 
-    (CDR) 

-   IMS S-CSCF  (SIP  TCP/UDP)
-   SBC/  (SIP 
- **Diameter**  Sh (  ), Ro (  
- **SS7**  MAP    HLR/MSR 
- **HTTP/HTTPS**    (SMS, TTS, MAP 

-     



- Diameter  $\diamond\diamond\diamond\diamond/\diamond\diamond$  (Sh, Ro  $\diamond\diamond$ )
- HTTP/HTTPS  $\diamond\diamond/\diamond\diamond\diamond\diamond$

### 1.2.3 $\diamond\diamond\diamond\diamond$

$\diamond\diamond\diamond\diamond\diamond\diamond\diamond$

- Web UI  $\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond$ 
  - $\diamond\diamond\diamond\diamond$  ( $\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond$ )
  - $\diamond\diamond/\diamond\diamond\diamond\diamond$
  - $\diamond\diamond\diamond\diamond\diamond\diamond$
  - $\diamond\diamond\diamond\diamond\diamond\diamond\diamond$
  - $\diamond\diamond\diamond\diamond$

$\diamond\diamond\diamond\diamond\diamond$

- $\diamond\diamond\diamond\diamond\diamond\diamond\diamond$  CDR  $\diamond\diamond\diamond\diamond$ 
  - $\diamond\diamond\diamond\diamond$
  - $\diamond\diamond/\diamond\diamond\diamond\diamond$
  - $\diamond\diamond\diamond\diamond$  ( $\diamond\diamond\diamond\diamond\diamond\diamond$ )
  - $\diamond\diamond\diamond\diamond/\diamond\diamond$
  - $\diamond\diamond\diamond\diamond\diamond\diamond$

$\diamond\diamond\diamond\diamond\diamond$

- $\diamond\diamond\diamond\diamond\diamond\diamond$
- $\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond$ 
  - IMS  $\diamond\diamond\diamond\diamond$  URI
  - P-Access-Network-Info  $\diamond$  ( $\diamond\diamond\diamond\diamond$ )
  - IP  $\diamond\diamond\diamond\diamond\diamond\diamond\diamond$
- $\diamond\diamond\diamond\diamond\diamond\diamond$

$\diamond\diamond\diamond\diamond\diamond$

- $\diamond\diamond\diamond\diamond\diamond$  (Prometheus  $\diamond\diamond$ )
- $\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond$
- Diameter  $\diamond\diamond\diamond\diamond$
- $\diamond\diamond\diamond\diamond\diamond\diamond$

$\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond$   $\diamond\diamond\diamond$  [metrics.md](#)  $\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond$

$\diamond\diamond\diamond\diamond\diamond$

- $\diamond\diamond\diamond\diamond\diamond\diamond\diamond$
- E.164  $\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond\diamond$  ( $\diamond\diamond\diamond\diamond$    $\diamond\diamond$ )
- $\diamond\diamond\diamond\diamond\diamond\diamond$  (PSAP  $\diamond\diamond$ )

## 1.3 1111

### 1.3.1 111111

111111

- Diameter TLS 1111
- Web 111 API 1 HTTPS
- 111111111 (1111)

111111

- Web UI 1111111111111111 (RBAC)
- 11 SHA-512 1111111111 (65,532 1111)

111111

- 1111111111111111
- 1111111111
- 111111111111
- 1111111111

### 1.3.2 111111

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- 1111111111111111 TLS (1111)
- 11111111111111
- 1111111111 (PFS) 1111

111111

- 11 CDR 11111
- 11111111111111
- 1111111111
- 1111111111 (11111111/11/111111)

111111

- 1111111111
- 111111111111
- 1111111111 (111111111111)

## 1.4 1111111111

11111111

## 1. SIPREC 11 (11111111 - RFC 7866)11

2. CDR

- CDR
- (CSV, JSON)
- (HTTPS)

3.

- 
- CDR SQL
- 
- 

4. API

- RESTful API
- 
- CDR
- 

- (MSISDN, IMSI, SIP URI)
- 
- / SIPREC

- 
- 
- ( )

- 
- 
- 

---

2.

2.1

OmniTAS IMS  
ANSSI

## 2.2

### 2.2.1 TLS/SSL

- TLS 1.2 (RFC 5246)
- TLS 1.3 (RFC 8446)
- SSL 2.0/3.0 ( )
- TLS 1.0/1.1 ( )

( )

- TLS 1.3

- TLS\_AES\_256\_GCM\_SHA384
- TLS\_CHACHA20\_POLY1305\_SHA256
- TLS\_AES\_128\_GCM\_SHA256

- TLS 1.2

- TLS\_ECDHE\_RSA\_WITH\_AES\_256\_GCM\_SHA384
- TLS\_ECDHE\_RSA\_WITH\_AES\_128\_GCM\_SHA256
- TLS\_ECDHE\_RSA\_WITH\_CHACHA20\_POLY1305\_SHA256
- TLS\_DHE\_RSA\_WITH\_AES\_256\_GCM\_SHA384
- TLS\_DHE\_RSA\_WITH\_AES\_128\_GCM\_SHA256

- (PFS)
- Diffie-Hellman (2048 )
- NIST P-256, P-384, P-521
- (SNI)
- OCSP stapling

- X.509
- RSA 2048 4096
- ECDSA (P-256, P-384)
- 
- CRL OCSP
- ( )
- CA

- Web UI API HTTPS

- TLS ◇◇ Diameter

## 2.3 ◇◇◇◇◇◇

### 2.3.1 ◇◇◇◇◇

#### SQLite ◇◇◇

- ◇◇ SQLCipher ◇◇
- AES-256 ◇◇
- ◇◇◇◇◇◇◇◇◇◇ (CDR, ◇◇◇◇◇)

### 2.3.2 ◇◇◇◇◇◇◇

#### ◇◇◇◇◇◇◇

- CDR ◇◇◇AES-256 ◇◇ (◇◇)
- ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇
- ◇◇◇◇◇◇◇◇◇◇◇ (PKCS#12, PEM ◇◇◇◇)
- ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇

#### ◇◇◇◇◇◇

- ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇
- ◇◇◇◇◇◇◇◇◇◇◇◇

## 2.4 ◇◇◇◇◇◇◇◇◇◇

### 2.4.1 ◇◇◇◇◇

#### ◇◇◇ SHA-512 ◇◇

#### ◇◇◇

- ◇◇◇◇◇◇◇ (128 ◇◇◇)
- 65,532 ◇◇◇◇◇◇◇ (◇◇◇◇)
- ◇◇◇◇◇◇◇◇◇◇◇◇
- ◇◇◇◇◇◇◇◇◇◇◇◇

#### ◇◇◇◇◇◇

\$6\$rounds=65532\$<salt>\$<hash>

#### ◇◇◇

- Web UI ◇◇◇◇◇◇◇◇
- API ◇◇◇◇◇
- ◇◇◇◇◇◇◇◇◇◇◇◇

- $\diamond \diamond \diamond \diamond \diamond \diamond \diamond$

## 2.4.2 SSH $\diamond \diamond \diamond \diamond \diamond \diamond$

$\diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond$

- RSA  $\diamond 1024$ -4096  $\diamond$  ( $\diamond \diamond$  2048  $\diamond \diamond \diamond$ )
- DSA  $\diamond 1024$ -4096  $\diamond$  ( $\diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond$  RSA)
- ECDSA  $\diamond$  P-256, P-384, P-521  $\diamond \diamond$
- Ed25519  $\diamond 256$   $\diamond$  ( $\diamond \diamond \diamond \diamond \diamond \diamond$ )

$\diamond \diamond \diamond \diamond \diamond$

- $\diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond$
- $\diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond$
- $\diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond$
- $\diamond \diamond \diamond \diamond \diamond \diamond$
- $\diamond \diamond \diamond \diamond \diamond \diamond$

## SSH $\diamond \diamond \diamond$

- $\diamond \diamond \diamond$  SSH-2  $\diamond \diamond$  ( $\diamond \diamond$  SSH-1)
- $\diamond$  MAC  $\diamond \diamond$  (HMAC-SHA2-256, HMAC-SHA2-512)
- $\diamond \diamond \diamond \diamond \diamond$  curve25519-sha256, ecdh-sha2-nistp256, diffie-hellman-group14-sha256

## 2.5 Diameter $\diamond \diamond \diamond \diamond$

### 2.5.1 Diameter $\diamond \diamond \diamond \diamond$

$\diamond \diamond \diamond \diamond \diamond \diamond$

- TLS  $\diamond \diamond$  TCP  $\diamond \diamond$  Diameter  $\diamond \diamond \diamond \diamond$
- $\diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond$

$\diamond \diamond \diamond \diamond \diamond \diamond$

- $\diamond \diamond$  Origin-Host/Origin-Realm  $\diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond$
- $\diamond \diamond \diamond \diamond \diamond \diamond \diamond$  ( $\diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond$ )
- $\diamond \diamond \diamond \diamond \diamond$  AVP ( $\diamond \diamond$ - $\diamond \diamond$ )  $\diamond \diamond$
- $\diamond \diamond$  CMS ( $\diamond \diamond \diamond \diamond \diamond \diamond$ )  $\diamond \diamond \diamond \diamond \diamond \diamond$

## 2.6 SIP $\diamond \diamond \diamond \diamond$

### P-Asserted-Identity $\diamond$

- $\diamond \diamond \diamond \diamond \diamond \diamond \diamond$
- $\diamond \diamond \diamond \diamond \diamond \diamond \diamond$

- 22232

222 2222222 IMS 22 (P-CSCF/S-CSCF) 222222 TAS2

## 2.7 222222222222

### 2.7.1 222222

2222222

- SIP 22222222/222
- Diameter 2222 (AVP 22)
- TLS 2222
- 2222222

22222

- Wireshark/tcpdump 2222222
- SSLKEYLOGFILE 2222 TLS 22 (222222)
- PCAP 22222222

### 2.7.2 222222

222222222

- SIP 2222222 MD5 22 (2222222222)
- 2222222222 (2222)
- 22222222 (222222/22)

22222

- 22222222222
- 2222222
- 222222222
- 2222222

## 2.8 22222222

### 2.8.1 2222

2222222

- RSA 22222OpenSSL 2 (22 FIPS 140-2 22222)
- 2222222/dev/urandom (Linux 22 CSPRNG)
- 222222 RNG22222

## 2.8.2

- (0600)
- PEM
- 

- 
- 
- ( )

## 2.8.3

- Web UI
- API
- ACME (Let's Encrypt)

- Diameter
- TLS Diffie-Hellman
- 

## 2.9

- NIST SP 800-52 TLS
- NIST SP 800-131A
- RFC 7525 TLS
- ETSI TS 133 310 IMS
- 3GPP TS 33.203 IMS

- ( )
- ANSSI ( )
- ( )

2.10      

2.10.1    

-       /     
-             
-           
-      

2.10.2    

- TLS     (     )
-       (    TLS)
-       (   )

-          
-      
-       
-          

---

3.       

3.1        

-             
- SIPREC         
- CDR        
-          

-      (      )
-      
-       
-        

3.2

- CDR ( 90 1 )
- 
- 1
- 

- 
- ( )
- 

3.3

- ETSI LI ( ) ( )
- SIPREC LI
- X1X2X3 ( )

- IRI ( )CDR
- CC ( )SIP + ( MRF)
- XML, JSON

4.

4.1

- (ANSI R226 )
- 
- 
- 

4.2

- ( SIP, Diameter, HTTPS)
-

- IP 10.10.10.10

## 4.3 4.3.1

4.3.1.1

- 10.10.10.10
- 10.10.10.10
- 10.10.10.10 Diameter 10.10.10.10
- 10.10.10.10 (SIEM 10.10)

---

## 5. 5.1

### 5.1 5.1.1

5.1.1.1

- **README.md** 10.10.10.10
- **doc/deployment\_guide.md** 10.10.10.10 (10.10.10)
- **doc/configuration.md** 10.10.10.10 (10.10.10)

### 5.2 5.2.1

- 10.10.10.10 [10.10.10.10]
- 10.10.10.10 [10.10.10.10]
- 10.10.10.10 OpenSSL FIPS 140-2 10.10

### 5.3 5.3.1

- **ANSSI R226** 10.10.10.10
- 10.10.10.10 10.10.10.10 10.10.10.10

---

## 6. 6.1

6.1.1

- 10.10.10.10 Omnitouch Network Services Pty Ltd
- 10.10.10.10 PO BOX 296, QUINNS ROCKS WA 6030, AUSTRALIA
- 10.10.10.10
- 10.10.10.10 [compliance@omnitouch.com.au](mailto:compliance@omnitouch.com.au)

6.1.1.1

- 10.10.10.10

- [compliance@omnitouch.com.au](mailto:compliance@omnitouch.com.au)

??/?/?/?/?/?

- [compliance@omnitouch.com.au](mailto:compliance@omnitouch.com.au)

??

## ?? A?SIP ?/?/?/?/?

### A.1 ?/?/?/?/?/?/?/?/?/?

??? [??] = ?/?/?/?/?/?/?/?/?/?

### A.2 ?/?/?/?/?/?/?/?/?

### A.3 SIPREC ?/?/?/?/?/?

## ?? B?CDR ??

OmniTAS ?/?/?/?/? /etc/freeswitch/db/cdr.db ? SQLite ?/?/?/?/?/?/?/?/?/?/?/?  
(FreeSWITCH CDR ?/?)?

### B.1 ?/?/?/?/?/?/? CDR ??

| ?????                  | ??       | ??                     | ?????                    |
|------------------------|----------|------------------------|--------------------------|
| uuid                   | TEXT     | ?????/?/?/?/?/?/?/?    | ????/?                   |
| caller_id_number       | TEXT     | ?????/? (MSISDN)       | ????/?/?/?/?/?/?/?/?/?/? |
| caller_id_name         | TEXT     | ??/?/?/?/?/?/?/?/?     | ????/?/?                 |
| destination_number     | TEXT     | ????/?/?/?             | ????/?/?/?/?/?/?/?       |
| start_stamp            | DATETIME | ????/?/?/?/?/?/?/?     | ????/?/?/?/?/?           |
| answer_stamp           | DATETIME | ????/?/?/?/?/?/?/?     | ????/?/?/?/?/?/?         |
| end_stamp              | DATETIME | ????/?/?/?/?/?/?/?     | ????/?/?/?/?/?/?/?/?/?   |
| duration               | INTEGER  | ????/?/?/?/?/?/?/? (?) | ????/?/?/?               |
| billsec                | INTEGER  | ????/?/?/?/?/? (?)     | ????/?/?/?/?/?/?/?/?/?   |
| hangup_cause           | TEXT     | ????/?/?/?/?/?         | ????/?/?/?/?/?/?         |
| sip_hangup_disposition | TEXT     | SIP ?/?/?/?/?          | ????/?/?/?/?/?           |
| network_addr           | TEXT     | ?? IP ??               | ????/?/?/?/?/?           |
| sip_from_user          | TEXT     | SIP From ?/?/?/?/?/?   | ?? SIP ?/?               |
| sip_to_user            | TEXT     | SIP To ?/?/?/?/?/?     | SIP ?/?/?                |
| sip_call_id            | TEXT     | SIP Call-ID ?          | <b>SIP</b> ?/?/?/?/?     |

## B.2 CDR

Example 1

```
SELECT * FROM cdr
WHERE caller_id_number = '+33612345678'
      OR destination_number = '+33612345678'
ORDER BY start_stamp DESC;
```

Example 2

```
SELECT * FROM cdr
WHERE start_stamp BETWEEN '2025-11-01 00:00:00' AND '2025-11-30
23:59:59'
      AND (caller_id_number = '+33612345678' OR destination_number =
'+33612345678')
ORDER BY start_stamp DESC;
```

Example 3

```
.mode csv
.output /tmp/interception_report.csv
SELECT caller_id_number, destination_number, start_stamp, end_stamp,
duration, hangup_cause
FROM cdr
WHERE caller_id_number = '+33612345678'
ORDER BY start_stamp DESC;
.output stdout
```

## B.3 CDR API

TAS Tas.Cdr

# Example 1

```
Tas.Cdr.get_records_by(:caller_id_number, "+33612345678")
```

# Example 2

```
Tas.Cdr.get_records_by_date_range("2025-11-01 00:00:00", "2025-11-30
23:59:59")
```

# Example 3

```
Tas.Cdr.get_filtered_records(search: "33612345678", limit: 1000)
```

# Example 4

```
Tas.Cdr.get_statistics()
```

**B.4 CDR**

- (90 1 )
- 
- Web UI /cdr API
- SQLite CSV/JSON

**C SIPREC**

SIPREC ( ) OmniTAS

**C.1 SIPREC**

**C.2 SIPREC**

- (caller\_id\_number)
- (destination\_number)
- SIP URI

- (911, 112 )
- /
- 

- ( P-Access-Network-Info )
- IP

**C.3 SIPREC**

SIPREC SRS

- SIP (From, To, P-Asserted-Identity)
- ID
- ( )
- /

- 1 RTP ( )
- 2 RTP ( )
- 
- DTMF

## C.4

- **X1** ( )
- **X2** (IRI) -
- **X3** (CC) -

OmniTAS (SRC) IRI CC SRS

**D**

## D.1

**TLS**

```
#
openssl genrsa -out server.key 4096

#
openssl req -new -key server.key -out server.csr

# ( )
openssl x509 -req -days 365 -in server.csr -signkey server.key -out
server.crt

# CA
```

SIP IMS TLS SIP TCP/UDP

## D.2 Web UI HTTPS

**API/Web TLS (config/runtime.exs)**

```
config :api_ex,
  api: %{
    enable_tls: true,
    tls_cert_path: "priv/cert/server.crt",
    tls_key_path: "priv/cert/server.key",
    tls_versions: [:"tlsv1.2", ::"tlsv1.3"],
    ciphers: [
      "ECDHE-RSA-AES256-GCM-SHA384",
      "ECDHE-RSA-AES128-GCM-SHA256",
```

```

        "TLS_AES_256_GCM_SHA384",
        "TLS_AES_128_GCM_SHA256"
    ]
}

```

### D.3 SIP

SIP TCP/UDP TLS

#### FreeSWITCH SIP

```

<!-- SIP TCP/UDP -->
<profile name="external">
    <settings>
        <param name="sip-port" value="5060"/>
        <param name="context" value="public"/>
    </settings>
</profile>

```

### D.4 Diameter TLS

#### Diameter TLS

```

# Diameter TLS
config :diameter_ex,
  peers: [
    %{
      host: "dra.example.com",
      port: 3868,
      transport: :tls,
      tls_opts: [
        certfile: "priv/cert/diameter.crt",
        keyfile: "priv/cert/diameter.key",
        cacertfile: "priv/cert/ca.crt",
        verify: :verify_peer
      ]
    }
  ]
]

```

### D.5

#### SQLCipher SQLite

```

# config/runtime.exs
config :exqlite,
  encryption: true,
  encryption_key: System.get_env("DB_ENCRYPTION_KEY")

```



- **MRF** 3 2 2 2 2 2 - 3 2 2 2 (2 2 2 2 2 2 2)
- **UE** 2 2 2 2 - 2 2 2 2 2 2 2
- **PSAP** 2 2 2 2 2 2 2 - 2 2 2 2 2 2 2
- **DRA** Diameter 2 2 2 2 - Diameter 2 2 2 2

2 2 2 2

- **LI** 2 2 2 2 - 2 2 2 2 2 2 2 2
- **IRI** 2 2 2 2 2 2 - 2 2 2 2 2 2 2 2 2
- **CC** 2 2 2 2 - 2 2 2 2/2 2 2 2
- **SRC** 2 2 2 2 2 2 2 - SIPREC 2 2 2 (OmniTAS 2 2)
- **SRS** 2 2 2 2 2 2 2 - SIPREC 2 2 2 2 2 2 2 2 2
- **X1** 2 2 2 LI 2 2 2 2 (2 2 2 2)
- **X2** 2 2 2 LI 2 2 2 2 IRI 2 2
- **X3** 2 2 2 LI 2 2 2 2 CC 2 2
- **R226** 2 2 2 2 2 R226-3 2 R226-7 2 2 2 2 2 2 2 2 2

2 2 2 2

- **CDR** 2 2 2 2 2 2 - 2 2 2 2 2 2 2 2 2 2 2
- **B2BUA** 2 2 2 2 2 2 - 2 2 2 2 2 2 2 2 2 2 2 SIP 2 2
- **DTMF** 2 2 2 2 - 2 2 2 2 2
- **MSISDN** 2 2 2 2 2 2 2 2 2 2 2 - 2 2 2 2
- **IMSI** 2 2 2 2 2 2 2 2 - 2 2 2 2 2 2 2
- **E.164** 2 2 2 2 2 2 2 2 2 2 2 2

2 2 2 2 2

- **TLS** 2 2 2 2 2 (RFC 5246, RFC 8446) - 2 2 2 2
- **PFS** 2 2 2 2 2 2 - 2 2 2 2 2 2 2 2 2 2 2
- **SHA-512** 2 2 2 512 2 2 2 2 2 2 2 2
- **AES** 2 2 2 2 2 2
- **RSA** Rivest-Shamir-Adleman - 2 2 2 2 2 2
- **ECDSA** 2 2 2 2 2 2 2 2 2 2
- **PKI** 2 2 2 2 2 2 - 2 2 2 2 2 2
- **CA** 2 2 2 2 2 2 - 2 2 2 2 2 2
- **CRL** 2 2 2 2 2 2
- **OCSP** 2 2 2 2 2 2 2 2

2 2 2 2 2

- **MAP** 2 2 2 2 2 2 - SS7 2 2 2 2 2 2 2
- **HLR** 2 2 2 2 2 2 - 2 2 2 2 2 2 (2 2)
- **SS7** 2 2 2 2 2 7 2 - 2 2 2 2 2 2
- **NANP** 2 2 2 2 2 2
- 2 2/2 2 **ID** 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

?? ? ? ? ? ?

- **SQLite** ? ? ? ? ? ? ? ?
- **SQLCipher** ? ? ? ? ? SQLite ? ?
- **CSV** ? ? ? ? ? - ? ? ? ?
- **JSON** ? JavaScript ? ? ? ? ? - ? ? ? ? ? ?
- **XML** ? ? ? ? ? ? ? - ? ? ? ? ? ? ?

?? ? ?

- **API** ? ? ? ? ? ? ? ? - ? ? ? ?
- **UI** ? ? ? ? ? - ? ? Web ? ? ? ? ?
- **RBAC** ? ? ? ? ? ? ? ? ? - ? ? ? ?
- **UUID** ? ? ? ? ? ? ? ? - ? ? ? ?

---

?? ? ? ? 1.0

?? ? 2025-11-29

?? ? ? ? ? ANSSI R226 ? ? ? ?

?? ? ? ? ? ? ? ? ? - ? ?



? [? ? ? ? ?](#)

? ? ? ? ? ? TAS ? ? ? ? ? ? ? ? ? ? ? ?



- ? [? \*\*README\*\*](#) - ? ? ? ? ? ? ?
- ? [? ? ? ? ?](#) - ? ? ? ? ? ? ?
- ? [? ? ? ? ?](#) - Prometheus ? ? ? ? ?



- ? [Sh ? ?](#) - ? HSS/Repository ? ? ? ? ? ? ?
- ? [? ? ? ? ? \(Ro\)](#) - OCS ? ? ? ? ? ? ?
- ? [SS7 MAP](#) - HLR ? ? ? ? ? ? ? ? ?



- ? [? ? ? ? ? ? ?](#) - XML ? ? ? ? ? ? ? ? ? ?
- ? [? ? ? ? ?](#) - E.164 ? ? ? ? ?
- ? [? ? ? ? ?](#) - ? ? ? ? ? CLI ? ? ? ? ? ? ?



- ? [? ? ? ? ?](#) - ? SMS ? ? ? ? ? ? ? ? ?
- ? [TTS ? ?](#) - ? ? ? ? ? ? ? ? ?
- ? [IMS ? ? ? ? ? ?](#) - ? ? ? ?



- ? [HLR ? ? ? ? ? ? ?](#) - ? ? ? ?
- ? [ANSSI R226 ? ? ? ?](#) - ? ? ? ? ? ? ? ?



? ? ? ? ? ? ? ?

- SIP / SBC
- DRA HSS Sh
- DRA OCS Ro
- 
- /
- 
- 
- 
- (Prometheus)

TAS

config/runtime.exs

```
config :tas,
  fs_event_socket: %{
    host: "127.0.0.1",
    port: 8021,
    secret: "YourSecretPassword"
  }
```

- **host** ( ) IP
  - "127.0.0.1" ( )
  - TAS
  - IP
  - "10.8.82.60"
- **port** ( ) TCP
  - 8021
  - 8021
  - 
  - 8021
- **secret** ( )
  - 
  - ESL
  - 
  - "cd463RZ8qMk9AHMMDGT3V"



?????

- **page\_order** (?????) ??????????????????
  - ??????????????????
  - ????["/application", "/configuration"]
  - ??????????????????

## Web ?????

- **url** (??)????????? URL ??
  - **host**????? URL ??????????"tas.example.com" ? "0.0.0.0"?
  - **path**?????????????????"/"?
  - ?????????????????? URL
- **https** (??)????????? HTTPS/TLS ??
  - **port** (??)??HTTPS ?????? 443?
  - **keyfile** (???)?TLS ??????PEM ???
  - **certfile** (???)?TLS ??????PEM ???
  - ?????????? TAS ??????

?????

????????? TLS ?????? HTTPS ???

1. ?????????/?????

```
openssl req -x509 -newkey rsa:4096 -keyout priv/cert/server.key \
-out priv/cert/server.crt -days 365 -nodes
```

2. ??????

- ??????????????????CA?????
- ??????????Let's Encrypt????? CA
- ??????????????????
- ??????????????chmod 600?????

?????

?????????????????

- ??????????????????
- ?????????? MSISDN ??????
- ?????? Diameter ??????
- ??????????????????





- `enable_tls: true`
- `TAS`
- `chmod 600`
- `"priv/cert/server.key"`

## API

### REST API

- 
- `(CDR)`
- 
- `Diameter`
- 
- 
- 

## OpenAPI/Swagger

### API OpenAPI (Swagger)

- `Swagger UI` `https://hostname:port/api/swaggerui`
- `OpenAPI JSON` `https://hostname:port/api/openapi`
- `API`
- `/`

### 

- `API`
- `API`
- `TLS` `(enable_tls: true)`
- `API`
- `API`
- `API`

### 

```
# curl API
curl -k https://localhost:8444/api/health
```

```
# Swagger
https://localhost:8444/api/swaggerui
```

### 

#### 1. API

```
listen_ip: "127.0.0.1" #
enable_tls: false      # HTTP
```

## 2. **TLS API**

```
listen_ip: "0.0.0.0"      # listen_ip
enable_tls: true          # enable_tls HTTPS
hostname: "api.operator.com"
```

## 3. **/**

```
listen_ip: "0.0.0.0"
enable_tls: false         # enable_tls HTTP
port: 8080                # port
```

**Notes**

- **root** **< 1024**
- **TLS**
- **hostname** (CN) **SAN**
- **API 404** **API**

---

## **SIP**

**Ansible XML**

**CSCF** **IP** **/**  
**SBC** **MT** **CSCF** **MO**  
**allowed\_sbc\_source\_ips** **allowed\_cscf\_ips**

**-** **TAS** **MO** **MT**  
**TAS IP** **IP**

```
config :tas,  
  allowed_sbc_source_ips: ["10.5.198.200", "103.26.174.36"],  
  allowed_cscf_ips: ["10.8.3.34"],
```

**Web UI**

- **SIP**
- **SIP**
- **SIP**
- 
- **Ping** **SIP OPTIONS** **SIP OPTIONS**
- 
- **/** **/** **/**
- **SIP OPTIONS ping**
- **SIP OPTIONS ping**
-



## register

- SIP REGISTER
- true | false
- true
- IP false

## username

- SIP
- REGISTER
- register="true"
- value="trunk\_account\_123"

## password

- SIP
- 
- register="true"
- value="MySecureP@ssw0rd"

## realm

- SIP
- -
- value="sip.carrier.com"

## auth-username

- username
- From
- value="auth\_user\_456"

## register-transport

- REGISTER
- udp | tcp | tls
- proxy
- value="tcp"

## register-proxy

- REGISTER
-

- `value="register.carrier.com:5060"`

## retry-seconds

- `30`
- `30`
- `30`
- `value="30"`

## expire-seconds

- `3600`
- `3600`
- `3600`
- `value="1800" 30`

## caller-id-in-from

- `SIP From ID`
- `true | false`
- `true From`
- `false From`
- `30 true`
- `value="true"`

`30`

## ping

- `N SIP OPTIONS ping`
- `30`
- `0`
- `15 60`
- `30 UI "Ping"`
- `value="25"`

## ping-max

- `ping`
- `ping`
- `value="3"`

`30`

## extension

- `30`
- `30 - 30`

- `value="+12125551234"`

## extension-in-contact

- `Contact`
- `true | false`
- `false`
- `value="false"`

## contact-params

- `Contact`
- `line=1;isup=true`

## from-user

- `From`
- `trunk_pilot`

## from-domain

- `From`
- `my-domain.com`

## outbound-proxy

- `SIP`
- `proxy - Route`
- `value="edge-proxy.carrier.com:5060"`

## context

- `public`
- `from-carrier`

## channels

- `100`

## dtmf-type

- DTMF 0000
- 00rfc2833 | info | inband | auto
- 0000rfc28330000
- rfc28330RTP 0000000000
- info0SIP INFO 00
- inband00000
- 000value="rfc2833"

## codec-prefs

- 000000000000
- 000000000000
- 000value="PCMU,PCMA,G729"
- 00000000PCMU0PCMA0G7290AMR0AMR-WB0G7220OPUS

## rtp-timeout-sec

- 000 N 00000 RTP000000
- 0000000
- 00000000
- 000value="120"

## rtp-hold-timeout-sec

- 000 RTP 00000000000
- 0000000
- 000value="1800"030 000

## SIP 0000

### sip-port

- 00000000 SIP 00
- 000000000000
- 0000
- 000value="5060"

### rtp-ip

- RTP 00000 IP 00
- 0000000000 RTP IP
- 000value="10.0.0.5"

### register-proxy-port

- 00000000
- 000000000000000000

- `value="5061"`

## contact-host

- `Contact`
- `NAT`
- `value="public-ip.example.com"`

## distinct-to

- `URI To`
- `true | false`
- `value="false"`

## cid-type

- `Remote-Party-ID P-Asserted-Identity ID`
- `rpipid | pid | none`
- `rpipidRemote-Party-ID`
- `pidP-Asserted-Identity`
- `value="pid"`

## extension-in-contact

- `Contact URI`
- `true | false`
- `value="true"`

## transport ( )

- `udp | tcp | tls | ws | wss`
- `proxy="203.0.113.50;transport=tcp"`

TLS SIP

```
<include>
  <gateway name="primary_carrier">
    <!-- -->
    <param name="proxy" value="sbc.carrier.com:5060;transport=tcp"/>
    <param name="register" value="true"/>
  </gateway>
</include>
```

```

<!-- 4444 -->
<param name="username" value="customer_trunk_01"/>
<param name="password" value="SecurePassword123"/>

<!-- 22 -->
<param name="register-transport" value="tcp"/>
<param name="expire-seconds" value="1800"/>
<param name="retry-seconds" value="30"/>

<!-- 333 ID -->
<param name="caller-id-in-from" value="true"/>

<!-- 22 -->
<param name="ping" value="30"/>

<!-- 22 -->
<param name="codec-prefs" value="PCMU,PCMA,G729"/>
<param name="dtmf-type" value="rfc2833"/>

<!-- 4444 -->
<param name="channels" value="100"/>

<!-- RTP 22 -->
<param name="rtp-timeout-sec" value="300"/>
</gateway>
</include>

```

4444444444

4444444444 sofia/gateway/name/destination 4444444444

```

<!-- 44444444 -->
<action application="bridge" data="sofia/gateway/
primary_carrier/+12125551234"/>

<!-- 4444444 -->
<action application="bridge" data="sofia/gateway/
primary_carrier/${tas_destination_number}"/>

<!-- 4444 SIP 4444 -->
<action application="bridge" data="{sip_h_X-Custom=Value}sofia/
gateway/primary_carrier/${tas_destination_number}"/>

<!-- 44444444444444 -->
<action application="bridge" data="sofia/gateway/
primary_carrier/${tas_destination_number}|sofia/gateway/
backup_carrier/${tas_destination_number}"/>

```

⬢⬢⬢⬢⬢⬢⬢⬢

⬢⬢⬢⬢⬢⬢⬢

- ⬢⬢ username ⬢ password ⬢⬢⬢⬢
- ⬢⬢ proxy ⬢⬢⬢⬢⬢⬢
- ⬢⬢ register-transport ⬢⬢⬢⬢⬢⬢⬢⬢⬢
- ⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢

⬢⬢⬢⬢⬢

- ⬢ Web UI (/gw) ⬢⬢⬢⬢⬢⬢⬢
- ⬢⬢ caller-id-in-from ⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢
- ⬢⬢⬢ codec-prefs ⬢⬢⬢⬢⬢⬢⬢
- ⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢ SIP ⬢ RTP ⬢⬢

⬢⬢⬢⬢⬢⬢

- ⬢⬢⬢⬢⬢⬢⬢⬢ ping ⬢⬢
- ⬢⬢ rtp-timeout-sec ⬢⬢⬢⬢⬢⬢
- ⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢
- ⬢⬢⬢⬢⬢⬢⬢⬢⬢

## Diameter ⬢⬢⬢⬢⬢

Diameter ⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢

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⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢ Ro ⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢⬢ Ro⬢

```
config :diameter_ex,  
  diameter: %{  
    service_name: :omnitouch_tas,  
    listen_ip: "10.8.82.60",  
    listen_port: 3868,  
    decode_format: :map,  
    host: "example-dc01-as01",  
    realm: "epc.mnc001.mcc001.3gppnetwork.org",  
    product_name: "OmniTAS",  
    request_timeout: 5000,  
    peer_selection_algorithm: :random,  
    allow_undefined_peers_to_connect: true,  
    log_unauthorized_peer_connection_attempts: true,  
    control_module: Tas.Control.Diameter,  
    processor_module: DiameterEx.Processor,  
    auth_application_ids: [],  
    acct_application_ids: [],
```

```

vendor_id: 10415,
supported_vendor_ids: [10415],
applications: [
  %{
    application_name: :sh,
    application_dictionary: :diameter_gen_3gpp_sh,
    vendor_specific_application_ids: [
      %{
        vendor_id: 10415,
        auth_application_id: 16_777_217,
        acct_application_id: nil
      }
    ]
  },
  %{
    application_name: :ro,
    application_dictionary: :diameter_gen_3gpp_ro,
    vendor_specific_application_ids: [
      %{
        vendor_id: 0,
        auth_application_id: 4,
        acct_application_id: nil
      }
    ]
  }
],
peers: [
  %{
    port: 3868,
    host: "example-dc01-dra01.epc.mnc001.mcc001.3gppnetwork.org",
    ip: "1.2.3.4",
    realm: "epc.mnc001.mcc001.3gppnetwork.org",
    tls: false,
    transport: :diameter_tcp,
    initiate_connection: true
  },
  %{
    port: 3869,
    host: "example-dc01-dra02.epc.mnc001.mcc001.3gppnetwork.org",
    ip: "1.2.3.44",
    realm: "epc.mnc001.mcc001.3gppnetwork.org",
    tls: false,
    transport: :diameter_tcp,
    initiate_connection: true
  }
]
}

```

◊◊◊◊ Web UI ◊ **Diameter** ◊◊◊◊◊ Diameter ◊◊◊◊◊◊◊◊

◊◊◊◊◊◊ Web UI ◊ **Sh** ◊◊◊◊◊◊◊◊ Sh ◊◊◊◊◊◊◊◊◊◊◊◊◊◊◊◊ Sh ◊◊◊◊◊



???

???

XML

???

???

- [README](#) -
- [SIP](#) -
- [MSRN/HLR](#) -

???

- [E.164](#) -
- [Sh](#) -
- [SS7 MAP](#) - MSRN/HLR
- [OCS](#) -

???

- [CLI](#) -
- [/](#) -
- [TTS](#) -

??

- -
- -

???

TAS XML XML TAS SS7 IMPI / IMPU

priv/templates

- mo\_dialplan.xml -
- mo\_emergency\_dialplan.xml -
- mt\_dialplan.xml -

Web UI

XML TAS

FreeSWITCH XML

OmniTAS FreeSWITCH XML

???

```
<extension name="description-of-what-this-does">
  <condition field="{variable}" expression="regex-pattern">
    <action application="app_name" data="parameters"/>
    <anti-action application="app_name" data="parameters"/>
  </condition>
</extension>
```

```
</condition>
</extension>
```

```
#####
```

```
#####
```

```
#####
```

```
#####
```

```
<condition field="{tas_destination_number}" expression="2222">
  <action application="log" data="INFO #####"/>
</condition>
```

```
#####
```

```
<condition field="{tas_destination_number}" expression="^(2222|3444|3445)$">
  <action application="log" data="INFO #####"/>
</condition>
```

```
#####
```

```
<condition field="{tas_destination_number}" expression="^1(8[0-9]{9})$">
  <!-- ## 1 ## 8 ## 9 ## -->
  <action application="log" data="INFO #####: $1"/>
  <action application="bridge" data="sofia/gateway/trunk/{tas_destination_number}"/>
</condition>
```

```
#####
```

```
<condition field="{tas_destination_number}" expression="^00">
  <!-- ## 00 ##### -->
  <action application="log" data="INFO #####"/>
</condition>
```

```
#####
```

```
<condition field="{msisdn}" expression="^5551241[0-9]{4}$">
  <!-- ## 55512410000 ## 55512419999 -->
  <action application="log" data="INFO #####"/>
</condition>
```

```
#####
```

```
#####
```

```
<condition field="{cli_withheld}" expression="true">
  <!-- ## CLI ##### -->
  <action application="set" data="effective_caller_id_number=anonymous"/>
  <action application="set" data="origination_privacy=hide_number"/>

  <!-- ## CLI ##### -->
  <anti-action application="log" data="DEBUG CLI #####"/>
  <anti-action application="set" data="effective_caller_id_number={msisdn}"/>
</condition>
```

```
continue="true" ##
```

```
#####continue="true" #####
```

```
## continue#####
```

```
<extension name="First-Check">
  <condition field="{tas_destination_number}" expression="^(.*)$">
    <action application="log" data="INFO #####"/>
  </condition>
</extension>
```

```
<extension name="Never-Reached">
  <!-- ***** -->
  <condition field="${tas_destination_number}" expression="^(.*)$">
    <action application="log" data="INFO *****"/>
  </condition>
</extension>
```

◆◆ continue="true":

```
<extension name="Print-Vars" continue="true">
  <condition field="${tas_destination_number}" expression="^(.*)$">
    <action application="info" data=""/>
  </condition>
</extension>
```

```
<extension name="Check-Balance" continue="true">
  <condition field="${hangup_case}" expression="OUTGOING_CALL_BARRED">
    <action application="log" data="ERROR *****"/>
    <action application="hangup" data="${hangup_case}"/>
  </condition>
</extension>
```

```
<extension name="Route-Call">
  <!-- ***** -->
  <condition field="${tas_destination_number}" expression="^(.*)$">
    <action application="bridge" data="sofia/gateway/trunk/${tas_destination_number}"/>
  </condition>
</extension>
```

◆◆ continue="true" ◆◆◆

- ◆◆◆◆/◆◆◆◆
- ◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆
- ◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆

◆◆◆◆

◆◆◆◆

answer - ◆◆◆◆◆◆◆◆ 200 OK◆

```
<action application="answer" data=""/>
```

hangup - ◆◆◆◆◆◆◆◆◆◆

```
<action application="hangup" data="NORMAL_CLEARING"/>
<action application="hangup" data="USER_BUSY"/>
<action application="hangup" data="NO_ANSWER"/>
```

bridge - ◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆

```
<!-- ***** -->
<action application="bridge" data="sofia/gateway/trunk/+12125551234"/>

<!-- ***** -->
<action application="bridge" data="{absolute_codec_string=AMR-WB,AMR,PCMA}sofia/internal/
sip:user@domain.com"/>

<!-- ***** -->
<action application="bridge" data="{originate_timeout=30}sofia/gateway/
trunk/${tas_destination_number}"/>
```

◆◆◆◆◆◆◆◆

set - ◆◆◆◆◆◆◆◆

```
<action application="set" data="my_variable=my_value"/>
```

```
<action application="set" data="sip_h_X-Custom-Header=CustomValue"/>
<action application="set" data="effective_caller_id_number=anonymous"/>
```

**unset** - ◇◇◇◇◇◇◇◇

```
<action application="unset" data="sip_h_P-Asserted-Identity"/>
```

**export** - ◇◇◇◇◇◇◇◇◇◇ B-leg◇◇◇◇◇◇◇◇

```
<action application="export" data="sip_h_X-Account-Code=ABC123"/>
```

◇◇◇◇◇◇◇◇

**playback** - ◇◇◇◇◇◇◇◇

```
<action application="playback" data="/sounds/en/us/callie/misc/8000/out_of_credit.wav"/>
<action application="playback" data="${base_dir}/sounds/custom_prompt.wav"/>
```

**sleep** - ◇◇◇◇◇◇◇◇◇◇

```
<action application="sleep" data="1000"/> <!-- ◇◇ 1 ◇ -->
```

**echo** - ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇

```
<action application="echo" data=""/>
```

**conference** - ◇◇◇◇◇◇◇◇◇◇

```
<action application="conference" data="room-${destination_number}@wideband"/>
```

◇◇◇◇◇◇◇◇

**voicemail** - ◇◇◇◇◇◇◇◇◇◇◇◇

```
<!-- ◇◇◇◇◇◇◇◇◇◇ -->
```

```
<action application="voicemail" data="default default ${msisdn}"/>
```

```
<!-- ◇◇◇◇◇◇◇◇◇◇ -->
```

```
<action application="voicemail" data="check auth default default ${msisdn}"/>
```

◇◇◇◇◇◇◇◇◇◇

**log** - ◇◇◇◇◇◇◇◇◇◇

```
<action application="log" data="INFO ◇◇◇◇◇◇◇◇ ${msisdn} ◇◇◇"/>
<action application="log" data="DEBUG ◇◇◇: ${tas_destination_number}"/>
<action application="log" data="ERROR ◇◇◇◇◇◇◇◇◇: ${hangup_cause}"/>
```

**info** - ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇

```
<action application="info" data=""/>
```

◇◇◇◇◇◇◇◇

**say** - ◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇

```
<action application="say" data="en number iterated ${tas_destination_number}"/>
```

**send\_dtmf** - ◇◇◇ DTMF ◇◇◇

```
<action application="send_dtmf" data="1234#"/>
```

◇◇◇◇◇◇◇◇

◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇

```
<extension name="Emergency-911">
  <condition field="${tas_destination_number}" expression="^(911|112)$">
```





- allocated\_time - OCS
- cli\_withheld - "true" "false"
- on\_net\_status - "true" "false"
- msrn - MSRN
- tas\_destination\_number - MSRN

emergency\_call\_codes

config/runtime.exs

```
config :tas,
  emergency_call_codes: ["911", "912", "913", "sos"],
  # ...
```

- emergency\_call\_codes
- SIP URN <urn:service:sos>
- 
- "911" "112" "000" "999" "sos"

Tas.Dialplan.Authorization.is\_emergency\_call?/2

1. SIP URI URN <urn:service:sos> "service:sos" URI
2. Caller-Destination-Number emergency\_call\_codes

lib/dialplan/authorization.ex

1. TAS
- 2.
3.
  - :emergency
  - mo\_emergency\_dialplan.xml
  - OCS
  - PSAP
4. call\_type: emergency

priv/templates/mo\_emergency\_dialplan.xml PSAP  
SIP URI

```
<extension name="Emergency-SOS">
  <condition field="{destination_number}" expression="^(911|912|913|sos)$">
    <action application="log" data="ALERT {msisdn}" />
    <action application="answer" data="" />
    <action application="bridge" data="sofia/gateway/psap_gw/{destination_number}" />
  </condition>
</extension>
```

- "sos" SIP URN

- 911112000999
- 
- **OCS** skipped\_regex
- **PSAP**
- 

**On-Net On-Net**

```
<action application="bridge" data="{absolute_codec_string=AMR-
WB,AMR,PCMA,PCMU,originate_retries=1,originate_timeout=60,sip_invite_call_id=${sip_call_id}}sofia/
internal/+$tas_destination_number}@10.179.3.60" />
```

10.179.3.60 TAS IP - TAS IP allowed\_sbc\_source\_ips



IMS Prometheus



- [9090](#)
- [9090](#) - [Sofia](#)
- [8080](#) - [TAS](#)
- [9093](#) - [RTP](#) - [RTCP](#)
- [Go](#)
- [Prometheus HTTP](#)
- [Grafana](#)

- [? ? ? ?](#)
- [? ? ? ? ? ? ? ? ? ?](#)
- [? ? ? ?](#)
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|                                 |                                     |                     |                                     |                           |
|---------------------------------|-------------------------------------|---------------------|-------------------------------------|---------------------------|
| <a href="#">? ?</a>             | <a href="#">? ?</a>                 | <a href="#">? ?</a> | <a href="#">? ? ? ? ? ? ? ? ? ?</a> | <a href="#">? ? ? ? ?</a> |
| 9090/metrics                    |                                     |                     |                                     | <a href="#">9090 ? ?</a>  |
|                                 |                                     |                     |                                     | →                         |
| 8080/metrics                    |                                     | TAS ? ? ?           | Diameter ? HLR ? OCS ? Erlang VM    | <a href="#">8080 ? ?</a>  |
|                                 |                                     | <a href="#">? ?</a> |                                     | →                         |
| 9093/esl?module=defaultRTP/RTCP | <a href="#">? ? ? ? ? ? ? ? ? ?</a> |                     |                                     | <a href="#">9093 ? ?</a>  |
|                                 |                                     |                     |                                     | →                         |

**9090** [? ?](#) - [? ? ? ?](#)

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|                                            |                         |      |                                             |                     |
|--------------------------------------------|-------------------------|------|---------------------------------------------|---------------------|
|                                            | <a href="#">? ? ? ?</a> |      | <a href="#">? ?</a>                         | <a href="#">? ?</a> |
| freeswitch_bridged_calls                   |                         | 9090 | <a href="#">? ? ? ? ? ? ? ? ? ?</a>         |                     |
| freeswitch_detailed_bridged_calls          |                         | 9090 | <a href="#">? ? ? ? ? ? ? ? ? ? ? ?</a>     |                     |
| freeswitch_current_calls                   |                         | 9090 | <a href="#">? ? ? ? ? ? ? ?</a>             |                     |
| freeswitch_detailed_calls                  |                         | 9090 | <a href="#">? ? ? ? ? ? ? ? ? ?</a>         |                     |
| freeswitch_current_channels                |                         | 9090 | <a href="#">? ? ? ? ? ? ? ?</a>             |                     |
| freeswitch_current_sessions                |                         | 9090 | <a href="#">? ? ? ? ? ? ? ?</a>             |                     |
| freeswitch_current_sessions_peak           |                         | 9090 | <a href="#">? ? ? ? ? ? ? ? ? ?</a>         |                     |
| freeswitch_current_sessions_peak_last_5min |                         | 9090 | <a href="#">? ? 5 ? ? ? ? ? ? ? ?</a>       |                     |
| freeswitch_sessions_total                  |                         | 9090 | <a href="#">? ? ? ? ? ? ? ? ? ? ? ? ? ?</a> |                     |
| freeswitch_current_sps                     |                         | 9090 | <a href="#">? ? ? ? ? ? ?</a>               |                     |
| freeswitch_current_sps_peak                |                         | 9090 | <a href="#">? ? ? ? ? ? ? ? ? ? ? ?</a>     |                     |
| freeswitch_current_sps_peak_last_5min      |                         | 9090 | <a href="#">? ? 5 ? ? ? ? ? ? ? ? ? ?</a>   |                     |
| freeswitch_max_sessions                    |                         | 9090 | <a href="#">? ? ? ? ? ? ? ?</a>             |                     |
| freeswitch_max_sps                         |                         | 9090 | <a href="#">? ? ? ? ? ? ? ? ? ?</a>         |                     |

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|                             |                         |                                                 |                                     |
|-----------------------------|-------------------------|-------------------------------------------------|-------------------------------------|
|                             | <a href="#">? ? ? ?</a> | <a href="#">? ?</a>                             | <a href="#">? ?</a>                 |
| freeswitch_current_idle_cpu | 9090                    | <a href="#">? ? CPU</a>                         | <a href="#">? ? ? ? ?</a>           |
| freeswitch_min_idle_cpu     | 9090                    | <a href="#">? ? ? ? ? CPU</a>                   | <a href="#">? ? ? ? ?</a>           |
| freeswitch_uptime_seconds   | 9090                    | <a href="#">? ? ? ? ? ? ?</a>                   |                                     |
| freeswitch_time_synced      | 9090                    | <a href="#">? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?</a> | <a href="#">1 = ? ? ? ? 0 = ? ?</a> |







|                                    |      |              |
|------------------------------------|------|--------------|
| ss7_map_operations_total           | 8080 | SS7 MAP      |
| ss7_map_http_duration_milliseconds | 8080 | SS7 MAP HTTP |
| tracked_registrations              | 8080 | SIP          |

## OCS

|                                         |      |     |
|-----------------------------------------|------|-----|
| ocs_authorization_attempts_total        | 8080 | OCS |
| ocs_authorization_duration_milliseconds | 8080 | OCS |
| online_charging_events_total            | 8080 |     |
| authorization_decisions_total           | 8080 |     |

## 

|                                               |      |                            |
|-----------------------------------------------|------|----------------------------|
| http_requests_total                           | 8080 | HTTP endpoint, status_code |
| http_dialplan_request_duration_milliseconds   | 8080 | HTTP                       |
| dialplan_module_duration_milliseconds         | 8080 |                            |
| freeswitch_variable_set_duration_milliseconds | 8080 |                            |

## 

|                                  |      |                 |
|----------------------------------|------|-----------------|
| event_socket_connected           | 8080 | 1=0=            |
| event_socket_reconnections_total | 8080 | connection_type |

## Erlang Mnesia

|                                        |      |  |
|----------------------------------------|------|--|
| erlang_mnesia_held_locks               | 8080 |  |
| erlang_mnesia_lock_queue               | 8080 |  |
| erlang_mnesia_transaction_participants | 8080 |  |
| erlang_mnesia_transaction_coordinators | 8080 |  |
| erlang_mnesia_failed_transactions      | 8080 |  |
| erlang_mnesia_committed_transactions   | 8080 |  |

|                                            |      |        |       |
|--------------------------------------------|------|--------|-------|
| erlang_mnesia_logged_transactions          | 8080 | mnesia | table |
| erlang_mnesia_restarted_transactions       | 8080 | mnesia | table |
| erlang_mnesia_memory_usage_bytes           | 8080 | mnesia | table |
| erlang_mnesia_tablewise_memory_usage_bytes | 8080 | mnesia | table |
| erlang_mnesia_tablewise_size               | 8080 | mnesia | table |

## Erlang VM

|                                        |      |       |                            |
|----------------------------------------|------|-------|----------------------------|
| erlang_vm_memory_atom_bytes_total      | 8080 | usage | used/free                  |
| erlang_vm_memory_bytes_total           | 8080 | kind  | system/                    |
| erlang_vm_memory_dets_tables           | 8080 | DETS  |                            |
| erlang_vm_memory_ets_tables            | 8080 | ETS   |                            |
| erlang_vm_memory_processes_bytes_total | 8080 | usage | used/free                  |
| erlang_vm_memory_system_bytes_total    | 8080 | usage | atom/binary/code/ets/other |

## Erlang VM

|                                                         |      |     |
|---------------------------------------------------------|------|-----|
| erlang_vm_statistics_bytes_output_total                 | 8080 |     |
| erlang_vm_statistics_bytes_received_total               | 8080 |     |
| erlang_vm_statistics_context_switches                   | 8080 |     |
| erlang_vm_statistics_dirty_cpu_run_queue_length         | 8080 | CPU |
| erlang_vm_statistics_dirty_io_run_queue_length          | 8080 | IO  |
| erlang_vm_statistics_garbage_collection_number_of_gcs   | 8080 | GC  |
| erlang_vm_statistics_garbage_collection_bytes_reclaimed | 8080 | GC  |
| erlang_vm_statistics_garbage_collection_words_reclaimed | 8080 | GC  |

|                                                  |      |      |        |       |
|--------------------------------------------------|------|------|--------|-------|
|                                                  | ◆◆◆◆ |      | ◆◆     | ◆◆    |
|                                                  |      |      |        | ◆◆◆◆◆ |
|                                                  |      |      |        | ◆◆    |
| erlang_vm_statistics_reductions_total            |      | 8080 | ◆◆◆◆◆◆ |       |
|                                                  |      |      | ◆◆◆    |       |
| erlang_vm_statistics_run_queues_length           |      | 8080 | ◆◆◆◆◆◆ |       |
|                                                  |      |      | ◆◆◆    |       |
|                                                  |      |      | ◆◆◆◆◆◆ |       |
| erlang_vm_statistics_runtime_milliseconds        |      | 8080 | ◆◆◆◆◆  |       |
|                                                  |      |      | ◆◆◆◆◆  |       |
| erlang_vm_statistics_wallclock_time_milliseconds |      | 8080 | ◆◆◆◆◆◆ |       |
|                                                  |      |      | ◆◆◆◆◆◆ |       |

## Erlang VM◆◆◆◆

|                                        |        |                    |    |
|----------------------------------------|--------|--------------------|----|
|                                        | ◆◆◆◆◆◆ | ◆◆                 | ◆◆ |
| erlang_vm_dirty_cpu_schedulers         | 8080   | ◆CPU◆◆◆◆◆◆         |    |
| erlang_vm_dirty_cpu_schedulers_online  | 8080   | ◆◆◆◆CPU◆◆◆◆◆       |    |
| erlang_vm_dirty_io_schedulers          | 8080   | ◆I/O◆◆◆◆◆◆         |    |
| erlang_vm_ets_limit                    | 8080   | ◆◆◆◆◆ETS◆◆◆        |    |
| erlang_vm_logical_processors           | 8080   | ◆◆◆◆◆◆◆◆◆◆         |    |
| erlang_vm_logical_processors_available | 8080   | ◆◆◆◆◆◆◆◆◆◆         |    |
| erlang_vm_logical_processors_online    | 8080   | ◆◆◆◆◆◆◆◆◆◆         |    |
| erlang_vm_port_count                   | 8080   | ◆◆◆◆◆◆◆◆◆          |    |
| erlang_vm_port_limit                   | 8080   | ◆◆◆◆◆◆◆◆◆          |    |
| erlang_vm_process_count                | 8080   | ◆◆◆◆◆◆◆◆◆          |    |
| erlang_vm_process_limit                | 8080   | ◆◆◆◆◆◆◆◆◆          |    |
| erlang_vm_schedulers                   | 8080   | ◆◆◆◆◆◆◆            |    |
| erlang_vm_schedulers_online            | 8080   | ◆◆◆◆◆◆◆◆           |    |
| erlang_vm_smp_support                  | 8080   | 1◆◆◆◆◆◆◆SMP◆0◆◆◆◆◆ |    |
| erlang_vm_threads                      | 8080   | 1◆◆◆◆◆◆◆◆◆◆0◆◆◆◆◆  |    |
| erlang_vm_thread_pool_size             | 8080   | ◆◆◆◆◆◆◆◆◆          |    |
| erlang_vm_time_correction              | 8080   | 1◆◆◆◆◆◆◆◆◆◆0◆◆◆◆◆  |    |
| erlang_vm_wordsize_bytes               | 8080   | Erlang◆◆◆◆◆◆◆◆     |    |
| erlang_vm_atom_count                   | 8080   | ◆◆◆◆◆◆◆◆◆          |    |
| erlang_vm_atom_limit                   | 8080   | ◆◆◆◆◆◆◆◆◆          |    |

## Erlang VM◆◆◆◆◆◆MSACC◆

◆◆◆◆◆◆◆◆◆◆◆◆◆◆type, id

|                                        |      |                   |    |
|----------------------------------------|------|-------------------|----|
|                                        | ◆◆◆◆ | ◆◆                | ◆◆ |
| erlang_vm_msacc_aux_seconds_total      | 8080 | ◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆  |    |
| erlang_vm_msacc_check_io_seconds_total | 8080 | ◆◆◆◆I/O◆◆◆◆◆◆◆◆◆◆ |    |
|                                        |      | ◆◆                |    |

|                                         |      |                       |
|-----------------------------------------|------|-----------------------|
| erlang_vm_msacc_emulator_seconds_total  | 8080 | Er <span>l</span> ang |
| erlang_vm_msacc_gc_seconds_total        | 8080 |                       |
| erlang_vm_msacc_other_seconds_total     | 8080 |                       |
| erlang_vm_msacc_port_seconds_total      | 8080 |                       |
| erlang_vm_msacc_sleep_seconds_total     | 8080 |                       |
| erlang_vm_msacc_alloc_seconds_total     | 8080 |                       |
| erlang_vm_msacc_bif_seconds_total       | 8080 | BIF                   |
| erlang_vm_msacc_busy_wait_seconds_total | 8080 |                       |
| erlang_vm_msacc_ets_seconds_total       | 8080 | ETS BIF               |
| erlang_vm_msacc_gc_full_seconds_total   | 8080 | GC                    |
| erlang_vm_msacc_nif_seconds_total       | 8080 | NIF                   |
| erlang_vm_msacc_send_seconds_total      | 8080 |                       |
| erlang_vm_msacc_timers_seconds_total    | 8080 |                       |

## Erlang VM

alloc, instance\_no, kind, usage

|                      |      |               |             |
|----------------------|------|---------------|-------------|
| erlang_vm_allocators | 8080 | carriers_size | blocks_size |
|                      |      | erts_alloc(3) |             |

temp\_alloc, sl\_alloc, std\_alloc, ll\_alloc, eheap\_alloc, ets\_alloc, fix\_alloc, literal\_alloc, binary\_alloc, driver\_alloc

[↑](#)

## 9093 -

RTP/RTCP

|                           |      |         |
|---------------------------|------|---------|
| freeswitch_info           | 9093 | version |
| freeswitch_up             | 9093 | 1=0=    |
| freeswitch_stack_bytes    | 9093 |         |
| freeswitch_session_total  | 9093 |         |
| freeswitch_session_active | 9093 |         |
| freeswitch_session_limit  | 9093 |         |
| rtp_channel_info          | 9093 | RTP     |

**RTP?? - ??????**

| ?????                           | ??   | ??               |
|---------------------------------|------|------------------|
| rtp_audio_in_raw_bytes_total    | 9093 | ???????????????? |
| rtp_audio_out_raw_bytes_total   | 9093 | ???????????????? |
| rtp_audio_in_media_bytes_total  | 9093 | ???????????????? |
| rtp_audio_out_media_bytes_total | 9093 | ???????????????? |

**RTP?? - ???????**

| ?????                             | ??   | ??           |
|-----------------------------------|------|--------------|
| rtp_audio_in_packets_total        | 9093 | ???????????? |
| rtp_audio_out_packets_total       | 9093 | ???????????? |
| rtp_audio_in_media_packets_total  | 9093 | ???????????? |
| rtp_audio_out_media_packets_total | 9093 | ???????????? |
| rtp_audio_in_skip_packets_total   | 9093 | ???????????? |
| rtp_audio_out_skip_packets_total  | 9093 | ???????????? |

**RTP?? - ??????-???**

| ?????                             | ??   | ??           |
|-----------------------------------|------|--------------|
| rtp_audio_in_jitter_packets_total | 9093 | ???????????? |
| rtp_audio_in_dtmf_packets_total   | 9093 | ???DTMF????  |
| rtp_audio_out_dtmf_packets_total  | 9093 | ???DTMF????  |
| rtp_audio_in_cng_packets_total    | 9093 | ???????????? |
| rtp_audio_out_cng_packets_total   | 9093 | ???????????? |
| rtp_audio_in_flush_packets_total  | 9093 | ???????????? |

**RTP?? - ???????**

| ?????                                | ??   | ??           |
|--------------------------------------|------|--------------|
| rtp_audio_in_jitter_buffer_bytes_max | 9093 | ???????????? |
| rtp_audio_in_jitter_seconds_min      | 9093 | ????????     |
| rtp_audio_in_jitter_seconds_max      | 9093 | ????????     |
| rtp_audio_in_jitter_loss_rate        | 9093 | ???????????? |
| rtp_audio_in_jitter_burst_rate       | 9093 | ???????????? |
| rtp_audio_in_mean_interval_seconds   | 9093 | ????????     |
| rtp_audio_in_flaw_total              | 9093 | ???????????? |
| rtp_audio_in_quality_percent         | 9093 | ??-100?      |
| rtp_audio_in_quality_mos             | 9093 | 1-5?5???     |

**RTCP**

rtcp\_audio\_bytes\_total 9093  
rtcp\_audio\_packets\_total 9093

**Go**

go\_goroutines 9090  
go\_threads 9090  
go\_info 9090  
go\_gc\_duration\_seconds 9090  
go\_memstats\_alloc\_bytes 9090  
go\_memstats\_alloc\_bytes\_total 9090  
go\_memstats\_heap\_alloc\_bytes 9090  
go\_memstats\_heap\_idle\_bytes 9090  
go\_memstats\_heap\_inuse\_bytes 9090  
go\_memstats\_heap\_objects 9090  
go\_memstats\_heap\_released\_bytes 9090  
go\_memstats\_heap\_sys\_bytes 9090  
go\_memstats\_sys\_bytes 9090

process\_cpu\_seconds\_total 9090  
process\_max\_fds 9090  
process\_open\_fds 9090  
process\_resident\_memory\_bytes 9090  
process\_virtual\_memory\_bytes 9090  
process\_virtual\_memory\_max\_bytes 9090  
process\_start\_time\_seconds 9090

**Prometheus HTTP**

promhttp\_metric\_handler\_requests\_in\_flight 9090  
promhttp\_metric\_handler\_requests\_total 9090



?????

```
freeswitch_sofia_gateway_status{status="UP"}
```

?????ping???

```
avg(freeswitch_sofia_gateway_pingtime)
```

??????

```
freeswitch_current_sps
```

???????

```
freeswitch_memory_uordblks
```

???????

?????MOS????

```
rtp_audio_in_quality_mos
```

?????????

```
rtp_audio_in_quality_percent
```

?????

```
rate(rtp_audio_in_jitter_packets_total[5m])
```

?????????

```
rtp_audio_in_jitter_loss_rate
```

?????

```
avg(rtp_audio_in_jitter_seconds_max -  
rtp_audio_in_jitter_seconds_min)
```

**RTP**??????

```
rate(rtp_audio_in_media_bytes_total[1m]) * 8
```

?????????

```
increase(rtp_audio_in_flaw_total[5m])
```

## TAS

active\_calls

## Diameter

diameter\_peer\_state{application="sh"}

rate(call\_attempts\_total[5m])

## HLR

histogram\_quantile(0.95, hlr\_data\_duration\_milliseconds)

## OCS

histogram\_quantile(0.99, ocs\_authorization\_duration\_milliseconds)

rate(subscriber\_data\_lookups\_total[5m])

## Diameter

rate(diameter\_responses\_total[5m]) /  
rate(diameter\_requests\_total[5m])

event\_socket\_connected

## Mnesia

rate(erlang\_mnesia\_committed\_transactions[5m])

## Mnesia

rate(erlang\_mnesia\_failed\_transactions[5m])

## Erlang VM

erlang\_vm\_process\_count

## Erlang VM



```
:native, :millisecond)
Histogram.observe([name:
:http_dialplan_request_duration_milliseconds], duration_ms)
```

A horizontal line represents a 1D lattice with four sites. The first site has an upward-pointing arrow. The next three sites each have a diamond shape containing a question mark.

# Grafana

    Prometheus     Grafana        










◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆

- `active_calls`
- `rate(call_attempts_total[5m])`
- `rate(call_rejections_total[5m])`
- `freeswitch_sofia_gateway_status`















- P95 HTTP
- P95 Sh
- P95 HLR
- P95 OCS
- P95 Diameter









- $\diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond \diamond$
- HLRL  $\diamond \diamond \diamond \diamond \diamond$
- OCS  $\diamond \diamond \diamond \diamond \diamond$
- Diameter  $\diamond \diamond \diamond \diamond \diamond$










- `??MOS??rtp_audio_in_quality_mos?`
- `??rtp_audio_in_quality_percent?`
- `???`
- `???`

◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆

- Erlang VM 
- Erlang VM 
- ETS 
- 

- `???`

`???`

- `???`
- `???`
- `???`
- Mnesia `???`

`???`

`???`

```
sum by (call_type) (active_calls)
```

**P95**`???`

```
histogram_quantile(0.95,
  rate(http_dialplan_request_duration_milliseconds_bucket[5m])
)
```

**Diameter**`???`

```
rate(diameter_responses_total{result="success"}[5m]) /
rate(diameter_requests_total[5m]) * 100
```

`???` - `??MOS`

```
avg(rtp_audio_in_quality_mos)
```

[↑ `???`](#)

`???`

`???`

`???` - `???`

```
alert: SystemDown
expr: rate(call_attempts_total[5m]) == 0
for: 2m
labels:
  severity: critical
annotations:
  summary: "TAS ??? - ???"
  description: "2 ???"
```

## Diameter

```
alert: DiameterPeerDown
expr: diameter_peer_state == 0
for: 1m
labels:
  severity: critical
annotations:
  summary: "Diameter{{ $labels.peer_host }}"
  description: "{{ $labels.application }}"
```

```
alert: EventSocketDisconnected
expr: event_socket_connected == 0
for: 30s
labels:
  severity: critical
annotations:
  summary: "{{ $labels.connection_type }}"
  description: ""
```

## Diameter

```
alert: HighDiameterLatency
expr: |
  histogram_quantile(0.95,
    rate(diameter_response_duration_milliseconds_bucket[5m])
  ) > 1000
for: 5m
labels:
  severity: high
annotations:
  summary: "Diameter"
  description: "P95{{ $value }}ms"
```

## OCS

```
alert: OCSAuthFailures
expr: |
  rate(ocs_authorization_attempts_total{result="no_credit"}[5m]) /
  rate(ocs_authorization_attempts_total[5m]) > 0.1
for: 5m
labels:
  severity: high
annotations:
```





```
# 1. 1.1.1.1.1.1.1
histogram_quantile(0.95,
rate(subscriber_data_duration_milliseconds_bucket[5m]))

# HLR 1.1
histogram_quantile(0.95,
rate(hlr_data_duration_milliseconds_bucket[5m]))

# OCS 1.1
histogram_quantile(0.95,
rate(ocs_authorization_duration_milliseconds_bucket[5m]))
```

3. 1.1.1.1.1.1.1.1.1

```
histogram_quantile(0.95,
  rate(dialplan_module_duration_milliseconds_bucket[5m])
) by (module)
```

1.1.1.1.1

- 1.1.1.1.1.1.1.1.1 HSS, HLR, OCS
- 1.1.1.1.1
- 1.1.1.1.1.1
- 1.1.1.1.1.1

1.1.1.1.1.1.1.1.1

1.1.1.1.1

1. 1.1.1.1.1.1.1.1.1

```
sum by (reason) (rate(call_rejections_total[5m]))
```

2. 1.1.1.1.1.1.1.1

```
sum by (decision) (rate(authorization_decisions_total[5m]))
```

3. 1.1.1.1.1.1.1.1.1

```
diameter_peer_state
```

4. 1.1.1.1.1.1.1.1.1

```
event_socket_connected
```

1.1.1.1.1.1.1.1

1.1.1.1.1.1



- Sh 50-150ms
- HLR 100-300ms
- OCS 100-250ms
- Diameter 50-200ms
- 10-50ms

- >95%
- >99%
- HLR >98%
- OCS >99%
- Diameter >99.9%

- MOS >4.0
- >80%
- <30ms
- <1%

- Erlang <50%
- Erlang <70%
- <5
- ETS <1000

- 500-1000
- 20-50 CPS
- 10,000-50,000

- >70%
- Erlang >70%
- P95
- >10

???

???

1. ?

- o ?
- o ?
- o ?KPI?

2. ?

- o ?
- o ?
- o ?

3. ?

- o ?5?
- o ?15?1?
- o ?/?

4. ?

- o ?
- o ?
- o ?

???

1. ?

```
groups:
- name: ims_as_aggregations
  interval: 30s
  rules:
    - record: job:call_attempts:rate5m
      expr: rate(call_attempts_total[5m])

    - record: job:dialplan_latency:p95
      expr: histogram_quantile(0.95,
rate(http_dialplan_request_duration_milliseconds_bucket[5m]))
```

2. ?

3. ?

- o ?[5m]

- [1h]
- [1d]

Prometheus

```
#
```

```
count by (__name__) ( {__name__=~".+"} )
```

- ID
- 
- >1000

- 
- 
- 

[↑](#)



E.164

◆ ◆ ◆ ◆



- ◆ ◆ ◆ ◆

- ?

- $\diamond ? + \underline{\diamond ? \diamond ? \diamond ? \diamond ?} - \diamond ? \diamond ? \diamond ? \diamond ? \diamond ?$

◆ ◆ ◆ ◆

E.164



































- 
- 
-  SIP  IMS 

E.164 [country code][area code] + number

- 61403123456
- 16505551234

- Sh
- HLR
- OCS
- XML

MT MO

```
config :tas,
  number_translate: %{
    country_code: :PF,      # ISO 3166-1 alpha-2
    localAreaCode: "617"    #
  }
```

- country\_code: :AU:US:PF ISO
- localAreaCode:

TAS

|     |                           |       | E.164 |
|-----|---------------------------|-------|-------|
| :AU | 0NSN10 SN8                | E.164 | 61    |
| :US | NPANXXXXXX10 1+NPANXXXXXX | E.164 | 1     |
| :PF | 6 8                       | E.164 | 689   |

lib/numbertranslation.ex

1. CLI





# 6161712345678 -  
# 000 localAreaCode

- +61403123456 61403123456 →
- 0403123456 country\_code →

**MO MT**

**MT**

- 
- SIP
- Sh

**MO**

- 
- 
- Sh
- /CDR

1.

- country\_code
- 

2.

- localAreaCode
- 

3.

- 
- 0NSN
- +CC
- 

4.

- " " "
- 
- E.164





skipped\_regex OCS Elixir  
"2222" 2222 "344[4-6]" 3444 3445 3446

```
config :tas,  
  ...  
  online_charging: %{  
    enabled: true,  
    periodic_ccr_time_seconds: 10,  
    schedule_hangup_auth: true,  
    skipped_regex: ["^2222", "^2223", "^8999", "^344[4-6]"] #  
  },
```

MO

1. CCR-I
2. OCS 120
3. periodic\_ccr\_time\_seconds
4. CCR-U
5. CCR-U
6. CCR-T

- 1 = (CCR-I) -
- 2 = (CCR-U) -
- 3 = (CCR-T) -
- 4 = - SMS

CCR-U

- 
- schedule\_hangup\_auth
- 

periodic\_ccr\_time\_seconds

- 5-10 OCS
- 30-60 OCS

- 00000000000000000000 OCS 0000 10-30 000

00000000

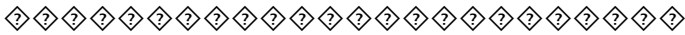
000000000000000000000000

- online\_charging\_events\_total{event\_type="reauth"} - 00000 CCR-U 0
- online\_charging\_events\_total{event\_type="reauth",result="success"}  
- 00000000
- online\_charging\_events\_total{event\_type="reauth",result="nocredit"}  
- 000000000000
- 0000000000000000 OCS 00000000

00000000000

0000000000000000

1. 00000000 "Sending periodic CCR-U for <call\_id>" 00 - 00000000000000
2. 00 "Periodic CCR failed - Stopping job" 00 - 00000000 OCS 00
3. 00 ocs\_authorization\_duration\_milliseconds 000000000000
4. 00 OCS 00000 CCA-U 00000000000000
5. 00 periodic\_ccr\_time\_seconds 00000000000000000000 OCS 00



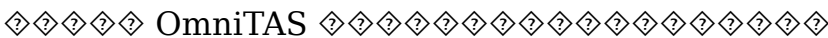
- 

- 

- 




-  **SS7 MAP** - HLR/MAP  
-       -          



- ? ? ? ? ?
- ? ? ? ? ? ? (CDR)

- ??????
- IMS ??????
- ????
- Diameter ??????
- ?????
- ?????
- ?????
- HLR/MAP ??
- ????

?
































?? ? ? ? ? ? ? ? ? /subscribers

?

- 
- 
  - SIP 
  -  URI
  - 
  -  IP 
  - 
  -  P-Access-Network-Info 
    - MCC/MNC  TAC/LAC  ID
    - 
    -  OpenStreetMap  OpenCellID 

???

     Sofia                          SIP  
REGISTER     P-Access-Network-Info       OpenCellID     
 

?

- 
- 
- 
- 

**◆◆◆◆◆ (CDR)**

CDR  TAS 















 /cdr






◆ ◆ ◆ ◆

1. 
  -  100  CDR  start\_stamp 
  - 
  -  **Previous / Next** 
  - 
2. 

- **Columns**
- 
- / /
- **Select All** **Deselect All**
- 
- 

3.

- 
- (▼)
- (▲)
- 
- 

4.

- **Search**
- 
- caller\_id\_number destination\_number uuid  
caller\_id\_name hangup\_cause
- **Apply**

5.

- **Start Date** **End Date**
- 
- 
- **Apply**

6.

- **Select Field to Filter**
  - 
  - ID
  - 
  -
- **Enter Filter Value**
- **Apply**

7.

- - + +
- 
- **Clear All**

8.

- `CDR`
- `caller_id_number`
- `destination_number`
- `uuid`
- `caller_id_name`
- `hangup_cause`

`term`

`term`

`term`

`CDR`

- `caller_id_number`
- `destination_number`
- `uuid`
- `caller_id_name`
- `hangup_cause`

`term`

1. `term`

- `term`
- `term`
- `SQL` `term` `LIKE '%term%'` `OR`
- `61480` `"61480123456"` `"55561480999"`

2. `term`

- `"term"`
- `term`
- `SQL` `term` `= 'term'` `OR`
- `"911"` `"911"` `"9115"` `"1911"`

3. `term`

- `!term`
- `term`
- `SQL` `term` `NOT LIKE '%term%'` `AND`
- `!NORMAL` `"NORMAL"`

4. `term`

- `!"term"` `+` `term`
- `term`
- `SQL` `term` `!= 'term'` `AND`

- `! "NORMAL_CLEARING" "NORMAL_CLEARING"`

## 5. `AND`

- `term1 AND term2 AND`
- `term1 AND term2 AND`
- `term1 AND term2 AND`
- `SQL AND`
- `"911" AND "12345" "911" "12345"`

`AND`

`CDR`

`!`

- `* / ** TRUE`
- `SQL field1 LIKE '%term%' OR field2 LIKE '%term%' OR ...`

`(!):`

- `* / ** TRUE`
- `SQL field1 NOT LIKE '%term%' AND field2 NOT LIKE '%term%' AND`

`...`

`AND`

- `TRUE → TRUE`
- `SQL (term1_conditions) AND (term2_conditions) AND ...`

`AND`

| 61480                      |                                        | <code>"61480" UUID</code>      |
|----------------------------|----------------------------------------|--------------------------------|
| "911"                      |                                        | <code>"911"</code>             |
| !NORMAL_CLEARING           |                                        | <code>"NORMAL_CLEARING"</code> |
| !"NORMAL_CLEARING"         |                                        | <code>"NORMAL_CLEARING"</code> |
| "911" AND "12345"          | <code>"911" "12345"</code>             | <code>= "12345" = "911"</code> |
| !NORMAL AND 61480          | <code>"NORMAL" "61480"</code>          | <code>"61480"</code>           |
| !"ANSWER" AND !NORMAL      | <code>"ANSWER" "NORMAL"</code>         | <code>"NORMAL"</code>          |
| 61480 AND !NORMAL_CLEARING | <code>"61480" "NORMAL_CLEARING"</code> | <code>"61480"</code>           |

???

- 61480123456 -
- "911" - "911"
- !NORMAL\_CLEARING -
- "61480123456" AND !NORMAL -
- !test AND !demo -
- 61480 AND !"ANSWER" AND !CANCEL -

??

CDR TAS CDR SQLite

?

**CDR**

CDR

CDR  
CDR

- CSV
- JSON API
- XML
- 
- 

CDR

??

- UUID
- 
- 
- "911"
- ID
- 
- 
- !NORMAL\_CLEARING
- 

??

???

config/runtime.exe cdrs\_field\_list LiveView

◆ ◆ CDR ◆ ◆ ◆

```
config :tas,  
  cdrs_field_list: [  
    "caller_id_number",  
    "destination_number",  
    "start_stamp",  
    "duration",  
    "hangup_cause"  
  ]
```

???

-  cdrs\_field\_list  CDR 
-  cdrs\_field\_list              
-     CDR        
-        
-            

?

- 
- 
- 
- 







```
#          
cdrs_field_list: [
    "start_stamp",
    "caller_id_number",
    "destination_number",
    "duration",
    "billsec",
    "hangup_cause"
]
```

$$\frac{CDR \text{ "Columns"} - }{\text{}} = \frac{}{} / \frac{}{} =$$

**API /** 

[illegible]

```
# Elixir API    
Tas.Cdr.get filtered records(search: "911")
```

```
Tas.Cdr.get_filtered_records(search: "\"911\"")
Tas.Cdr.get_filtered_records(search: "!NORMAL_CLEARING")
Tas.Cdr.get_filtered_records(search: "\"911\" AND \"12345\"")
```

lib/cdr/cdr.ex API

- 1.
- 2.
- 3.
- 4.

- 1. AND
- 2.
- 3.
- 4.

- 1.
- 2. UUID
- 3.
- 4. AND OR

- 
- + +
- 
- /
- 
- 
- -
- 
- 
- - "911"
  - ! !NORMAL\_CLEARING
  - AND "61480" AND !NORMAL
- -

???

?????

?? /calls

??

- ?
- ?
- **UUID** ? A-leg ? B-leg ?

---

## IMS

IMS 3GPP IMS RFC 4579 RFC 4575 TS 24.147

?? /conference

?? [IMS](#) ?

??

- ?
- ?
  - ?
  - ?
  - ?
  - ?
  - ?
  - ? MNC/MCC ?
- ?
  - ? ID ? SIP URI
  - ?
  - ?
- ?
  - ?
  - ?
  - ?
- ?
  - ? / ?
  - ? / ?
  - ?
- ? 5 ?

## OmniTAS

OmniTAS ims\_conference

```
ims_conference list #
ims_conference info <conf_id> #
ims_conference stats #
ims_conference lock <conf_id> #
ims_conference unlock <conf_id> #
ims_conference video <conf_id> on|off #
ims_conference record <conf_id> start|stop #
ims_conference add <conf_id> <sip_uri> #
ims_conference remove <conf_id> <uuid> #
ims_conference destroy <conf_id> #
```

- 
- 
- 
- 
- 

## 3GPP

3GPP IMS

- TS 24.147** IM
- RFC 4579** SIP -
- RFC 4575** SIP
- RFC 5239**

TAS SIP/gw

/gw

- 
- 
- Ping** SIP OPTIONS ping
-

???

- SIP ?
- Ping ? SIP OPTIONS ?
- ? / ?
- ? / ?
- ? ping ?

---

## Diameter ?

? Sh ? Ro ? Diameter ?

?? /diameter

??

- ?
- ? Diameter ? Sh ? Ro ?
- ? Diameter ?

---

????

???? TAS ? Elixir ? TAS ? FreeSWITCH ?

?? /logs

??

- ? TAS ?
- ? 1 ?
- ?
  - ? - ? / ?
  - ? / ? - ?
  - ? - ?
  - ? - ?
  - ? - ?
  - ? - ?
  - ? - ?
  - ? - ?
- ?
  - ? TAS ? - Elixir ?
  - ? TAS ? - FreeSWITCH ?
- ?
- ?
  - ? / TAS ? / TAS ?



- [illegible]



[?? ? ? ? ? ? ?](#)

?? ? ? ? ?

?? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

?? ? ? ? ? ? ? ? ? ? ? /simulator

?? ? ? ? ? ? ? ? [doc/HLR\\_AND\\_CALL\\_SIMULATOR.md](#)

??

- ?? ? ? ? ? ? ? ? MO ? MT ? ? ? ? ?
- ?? ? ? ? ? ? ?
  - ? ? ? ? ? ? ?
  - ? IP ? ? ? ? ? ? ? SBC/CSCF ?
  - ? ? ? ? ? ? ? ? ?
  - ? ? OCS ? ? ? ? ? ? ?
- ?? ? ? ? ? ?
  - ? ? ? ? ? ? ? ? ? ? ? ?
  - Sh/HLR ? ? ? ?
  - OCS ? ? ? ?
  - SS7 MAP ? ? ? ? ? ? ? ? ?
  - ? ? ? ? ? ? ? ? XML
- ?? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

??

- ?? ? ? ? ? ? ? ? ? ? ? ?
- ?? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ?
- ?? ? ? ? ? ? ? ? ? ?
- ?? OCS/HLR ? ?
- ? ? ? ? ? ? ? ?

---

## HLR/MAP ??

?? SS7 MAP ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

?? ? ? ? ? ? ? ? ? ? ? /hlr

?? ? ? ? ? ? ? ? [doc/HLR\\_AND\\_CALL\\_SIMULATOR.md](#)

??

- **SRI** ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- **PRN** ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

??

- ? ? HLR ? ? ?
- ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? MAP ? ? ? ?
- ? ? ? ? ? ? ? ? ?

---

## OCS ??

?? ? ? ? ? OCS ?? Diameter Ro ? ? ? ? ? ? ? ? ? ? ? ? ? ? CCR ? ? ? ?

?? ? ? ? ? ? ? ? ? ? ? /ocs\_test

??

- ? ? ? **CCR** ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

?? ? ? ?

### 1. ? ? ? ? ? ? ?

- ? ? **MSISDN** ? ? ? ? ? ? ? ? ? ? 61400123456 ?
- ? ? **MSISDN** ? ? ? ? ? ? ? ? ? ? 61400987654 ?
- ? ? ? ? ? ? ? sms ? call
  - SMS ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
  - ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? out ? ? MO ? in ? ? MT

### 2. ? ? **CCR** ? ? ?

- ? ? ? ? ? ? ? CCR ? ? ?
  - 1 – INITIAL\_REQUEST - ? ? ? ? ?

- 2 – UPDATE\_REQUEST - 11111111
- 3 – TERMINATION\_REQUEST - 1111111111111111
- 4 – EVENT\_REQUEST - 11111111SMS11111111
- 11111111111111111111111111111111

3. 111111

- 11 ID 11111111111111111111111111111111
- 11 "New ID" 11111111 ID 1111111111111111
- 1111111111 ID 1111111111111111
  - 11111111INITIAL\_REQUEST1111111111111111
  - 11111111UPDATE\_REQUEST111111112111111121314...11
  - 11111111TERMINATION\_REQUEST1111111131111111N+111

4. 111111

- 111111111111111111111111111111111111111111111111111
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5. 11111111

- 11 "Run CCR" 111111
- 11111111 CCA 11111111 AVP
- 111111111111111111111111111111111111111111111111111
- 111111111111111111111111111111111111111111111111111

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- OCS 111111111111111111111111111111111111111111111111111
- 111111111111111111111111111111111111111111111111111
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- 111111111111111111111111111111111111111111111111111
- 11111111 OCS 111111111111111111111111111111111111111111111111111
- 11 UPDATE 111111111111111111111111111111111111111111111111111
- 11 TERMINATION 111111111111111111111111111111111111111111111111111
- 111111111111111111111111111111111111111111111111111

## Sh

Diameter Sh UDR HSS

/sh\_test

- 20
- **HSS** HSS Diameter Sh
- XML AVP
- HSS ID
- Diameter

### 1.

- IMS
- sip:61400123456@ims.mncXXX.mccXXX.3gppnetwork.org
- tel:+61400123456

### 2.

- **RepositoryData (0)**
- **IMSPublicIdentity (10)**
- **IMSUserState (11)**
- **S-CSCFName (12)** S-CSCF
- **InitialFilterCriteria (13)** iFC
- **LocationInformation (14)**
- **ChargingInformation (16)** P-
- **MSISDN (17)**
- **IMSI (32)**
- **IMSPrivateUserIdentity (33)**
- ...

### 3.

- **"Fetch SH Data"** UDR
- UDA
- XML iFC
- HSS

- HSS
- **iFC**

- S-CSCF
- P-
- **HSS** Diameter Sh
- HSS
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- **IMSPublicIdentity (10)**
- **RepositoryData (0)**
- **IMSUserState (11)**
- **InitialFilterCriteria (13)**
- ID HSS
- Diameter 5001 =

/translate

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1.

- AUUSNZ
  - Tas.Config.number\_translate()[country\_code]
  - AU:AUau
- +61400111222040011122261400111222
- - originate route emergency

2.

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- ? ? ? ? ? ? ? ?
- ? ? ? **"Translate"** ? ? ? ?
- ? ? ? ? ? ? ? ?

### 3. ? ? ? ? ?

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- ? ? ? ? ? ? ? ? ? ? ? ? ? ? Elixir ? ? ? ? ? ? ?

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- ? ? ? ? ? ? ? ? E.164 ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
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- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? SIP ? ? ? ?
- ? ? ? ? ? ? ? ? MO ? MT ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

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- ? ? ? ? ? ? ? ? 0400111222 ? ? ? ? ? ? ? ? +61400111222 ?
- ? ? ? ? ? ? ? ? 000 ? 112 ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? MO ? MT ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
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- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? " ? ? ? ? ? ? ? ? ? ? "
- ? ? ? ? ? ? ? HTML5 ? ? ? ? ? - ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

## TTS ? ? ? ?

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- ? ? ? ? ? ? ? ? ? ? TTS ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
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### 1. ? ? ? ? ? ? ?

- ? ? ? ? ? ? ? TTS ? ? ? ? ? alloy ? nova ? shimmer ?
- ? ? ? ? ? ? ? ? ? ? ? wav ? mp3 ? opus ?
- ? ? ? ? ? ? ? TTS ? ? ? ? ? ? ?

### 2. ? ? ? ? ? ? ?

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- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? " ? " ? ? ? ? ? ? ? ? ? ? " ? "
- ? ? ? ? ? ? ? ? ? ? /KiB/MiB ? ? ?
- ? ? ? ? ? ? ? ? ? ? ?

### 3. ? ? ? ? ?

- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?  
■ ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?  
■ ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

■ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

4. 1 2 3 4 5 6 7

- ▶ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
  - 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
  - 1 2 3 4 5 6 7 8 9 10

5. 1 2 3 4 5

- 1 2 "▶ Play" 3 4 5 6
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
- 1 2 "Stop" 3 4 5 6 7

1 2 3 4

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

```
config :tas, :prompts,  
  voice: "nova",  
  response_format: "wav",  
  instructions: "Speak clearly and professionally.",  
  recordings: [  
    %{path: "/sounds/en/us/callie/voicemail/vm-enter_id.wav",  
      text: "Please enter your mailbox ID followed by pound"},  
    # ... 1 2 3 4  
  ]
```

1 2

- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
- 1 2 3 4 5 6 7 8 9 10 TTS 11 12 13 14 15 16 17 18 19 20
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 wav → mp3 31 32 33 34 35 36 37 38 39 40
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- 1 2 TTS 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

1 2

- 1 2 "Generate Missing" 3 4 5 6 7 8 - 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 "Re-record All"
- 1 2 "Re-record" 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 wav 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 TTS 21 22 23 24 25 26 27 28 29 30





- status - FreeSWITCH
- show channels -
- uuid\_dump <uuid> -
- sofia status - SIP
- reloadxml - XML
- version - FreeSWITCH

2.

- "Run"
- "Running..."
- 

3.

- "Output"
- 
- "ERROR:"
- 600px
- 

4.

- 
- "Recent:"
- 10
- 
- 

|                             |            |            |
|-----------------------------|------------|------------|
|                             |            |            |
| status                      | FreeSWITCH | FreeSWITCH |
| show channels               |            | "0 total"  |
| show calls                  |            |            |
| uuid_dump <uuid>            |            |            |
| uuid_kill <uuid>            |            | " +OK"     |
| sofia status                | SIP        |            |
| sofia status profile <name> |            |            |
| reloadxml                   | XML        | " +OK"     |
| version                     | FreeSWITCH |            |
| global_getvar <var>         |            |            |
| api help                    |            |            |

- uuid\_dump

- `status show calls` FreeSWITCH
- **SIP** `sofia status` SIP
- `reloadxml`
- `uuid_kill`
- 

---

- OmniTAS
- Sofia `sofia status profile internal`
- 

## CDR

- OmniTAS CDR
- CDR
- OmniTAS CDR

- CDR >1M
- CDR
- 

---

VPN



# TTS

[TTS](#)

OpenAI TTS (TTS)

- [README](#) -
- [TTS](#) - TTS
- [TTS](#) - TTS

- [TTS](#) -
- [TTS](#) -
- [TTS](#) -
- [TTS](#) -

playback

" " TTS OpenAI  
[openai.fm](#)

```
config :tas,  
  ...  
  prompts: %{  
    voice: "alloy",  
    instructions: "Speak with a prim, British accent.",  
    response_format: "wav",  
    recordings: [  
      %{  
        text:  
          "You do not have sufficient credit to make that call,  
please topup your service and then try again ",  
        path: "/sounds/en/us/callie/misc/8000/out_of_credit.wav"
```

```
    },
    %{
        text: "The destination you have called is unable to be
reached",
        path: "/sounds/en/us/callie/misc/8000/
unable_to_be_reached.wav"
    },
    %{
        text: "Your call is being transferred to emergency services",
        path: "/sounds/en/us/callie/misc/8000/
emergency_services_transfer.wav"
    }
]
}
```



# Sh

 [!\[\]\(45e0c2361dbe7932e5594a518e2c49cb\_img.jpg\)!\[\]\(959e222348bb8cd23dff76ee11921c2b\_img.jpg\)!\[\]\(19bd894bf1be161268e7f437f278f6a4\_img.jpg\)!\[\]\(879f5a909ba24cd3df6bbd9394dc14ce\_img.jpg\)](#)

Sh  Diameter  HSS/Repository 





-  [!\[\]\(b8c495fbe747e63af1de474a5449bf31\_img.jpg\) \*\*README\*\*](#) - 
-  [!\[\]\(f4b031e62ec49c85f11553d53381b2a4\_img.jpg\)!\[\]\(2503bc523643e7115972eb7776e7862f\_img.jpg\)!\[\]\(eb4341dce1a90dc8e46aa1ec2e2171b7\_img.jpg\)!\[\]\(70e749617c22be72b21adfdb3af8964f\_img.jpg\)](#) - Diameter 
-  [!\[\]\(0cf15a8dbdac7853c1c655e70a5ab519\_img.jpg\)!\[\]\(3536e8cd9254aee79aad3183588b5852\_img.jpg\)!\[\]\(09cdce2a37981bfd2e62200375aa7ca5\_img.jpg\)!\[\]\(fa7d834b8ed3c8bdba3c52917508c426\_img.jpg\)](#) -  Sh 



-  [!\[\]\(9608d381705116423748cb0424e8f4c7\_img.jpg\)!\[\]\(524a8abf2eee4595307e8bd9dd73c17b\_img.jpg\)!\[\]\(988fd855205b3add9205aadae7c16ef5\_img.jpg\)!\[\]\(6a04458ce12b9ec37467c674b88e4025\_img.jpg\)!\[\]\(46a3bb3f89be3ed39348f8ac23c9ea63\_img.jpg\)!\[\]\(6321bc9091698627f113018e868f9b02\_img.jpg\)!\[\]\(0a1337e63cc19dbb5b45a4b69f546f30\_img.jpg\)!\[\]\(274f2b743104bc26e9f36593df1bf40d\_img.jpg\)!\[\]\(337d1e5e8e67a269f58de90ab2d4ca4b\_img.jpg\)!\[\]\(1652c5b73f1c316040451c9cdd57ecaf\_img.jpg\)](#) -  Sh 
-   [!\[\]\(3e420a3ae4a90fbaa2518b21a1d3a94d\_img.jpg\)!\[\]\(23e45eb90a83ae1e85af2afd2671558a\_img.jpg\)!\[\]\(854d21b9679d31c14c27af6eb48817d2\_img.jpg\)!\[\]\(576a870d51baa10622dfdb0f3990c023\_img.jpg\)!\[\]\(672fd64d21218903d91f392f55ce9baf\_img.jpg\)!\[\]\(ef390d35bf61e20f6c5a63785980bf38\_img.jpg\)!\[\]\(0c6f5ade2d07e06086a8a56fa0bddfd1\_img.jpg\)!\[\]\(e32db3ab3aef7065b2d8b84394336b0a\_img.jpg\)](#) -  MMTel-Config
-  [!\[\]\(743ad7fb826d9e77744300fbb8ca5f89\_img.jpg\)!\[\]\(dcc132c17cd5ba700eb87767f160d935\_img.jpg\)!\[\]\(19d7b01506bd09169ce99becc24e7ae2\_img.jpg\)!\[\]\(041070333ec18358c96c999023d69d9a\_img.jpg\)!\[\]\(8c14c953a65977fb3f20436972b7e796\_img.jpg\)!\[\]\(a1816411a2da0081edc9bacf5b880793\_img.jpg\)!\[\]\(4bdf9a4c4210e762518ac74207274cb1\_img.jpg\)!\[\]\(d155910df5e8cf6749d089a27af6bb53\_img.jpg\)!\[\]\(1ec95f02bb44c67224729809b70eb6e2\_img.jpg\)!\[\]\(2fefe150ceca27a21a28f13de50d0bad\_img.jpg\)!\[\]\(93aaec5bbb6d735c8fda7a3ad45da56e\_img.jpg\)!\[\]\(cf58271a54ade62e4a6a0dc4c0d2dfe4\_img.jpg\)!\[\]\(9a335b8af4137615336d418e11501590\_img.jpg\)!\[\]\(914a47b9d99a8ec3988b38d1f4297620\_img.jpg\)!\[\]\(6bd0eddd6028290b5a9fea6023425048\_img.jpg\)!\[\]\(e17b2519508309ed1b4d0e2e27b5bfec\_img.jpg\)!\[\]\(b1d24ad973d75b96d11f5e2badf6ee7a\_img.jpg\)!\[\]\(5abf7b81608c36eab80bbe5ca3aedf5a\_img.jpg\)!\[\]\(5daaaed5423121c52ec9a6957f298a8c\_img.jpg\)!\[\]\(351849eecffd5afff0828964fe7a32db\_img.jpg\)!\[\]\(30fb10d59189e4d0df546d8cd2ed5024\_img.jpg\)!\[\]\(cb93582e5b5133cfbd7b08ca672c8f96\_img.jpg\)!\[\]\(320931d4b1dcc18e1ca5f49914977f8d\_img.jpg\)!\[\]\(3cedbacb9946973cf53515d02cdb8e03\_img.jpg\)!\[\]\(51c851de5635c473a43635f2269f9d7e\_img.jpg\)!\[\]\(bb215c3eaadd65614b381e6c8d3f3066\_img.jpg\)!\[\]\(7db35ffaa3cc7de379162b424a170ba8\_img.jpg\)!\[\]\(d7022a6db75918f5eac89d2cdbde7b36\_img.jpg\)!\[\]\(458d586829febb5be28a0c610a70d52e\_img.jpg\)!\[\]\(5a6173dc95bae89977a880cbe00b1d89\_img.jpg\)!\[\]\(57a423de5bbc27f60ce22ab9874e1c09\_img.jpg\)!\[\]\(3fc356de62ec72348daa27b0c7d37e9e\_img.jpg\)!\[\]\(0a6ae28af8ce28b3bb94296394c246d1\_img.jpg\)!\[\]\(160588b345040c6ca1c3b410fbeec73d\_img.jpg\)!\[\]\(7d2e8b32b6dca4f90801a1163911e154\_img.jpg\)!\[\]\(f45e2d8a7585f1b9a6036a886416e1be\_img.jpg\)!\[\]\(3c3ca57804f980eba534b2e07d2d0af0\_img.jpg\)!\[\]\(61735df4b3f906794f24c3d0e7e42252\_img.jpg\)!\[\]\(a195b93e58fac6f4483fed3bccc5fd0b\_img.jpg\)!\[\]\(8e028894378db53b6d3aec0d0ebc514f\_img.jpg\)!\[\]\(3a790fee8836375cda584796b1026b46\_img.jpg\)!\[\]\(e4da653b2d77da2ed6c3730384398fe2\_img.jpg\)](#)



-  [!\[\]\(86acc5ce94e94704a47ca4fa9e6f0fcb\_img.jpg\)!\[\]\(d8701850f50dc5c4eb7740ba1712af62\_img.jpg\)!\[\]\(20fc612414499524cbf5de83fe79a2b3\_img.jpg\)!\[\]\(9e298cb72344a28803d4f8a96ac0e254\_img.jpg\)!\[\]\(91f5c3cfc049362abbaf17a28f7c5569\_img.jpg\)!\[\]\(600695f04ee67d7c13723151942a8a59\_img.jpg\)!\[\]\(5b9eeb5f0fae4f06be8eeb4a04f029d5\_img.jpg\)!\[\]\(639670f016d71c781de2f3a9b7171292\_img.jpg\)!\[\]\(4871af83e86dd7a282f09dc4a70427a9\_img.jpg\)!\[\]\(4b03fb48f190188d26f3de16569db4d9\_img.jpg\)!\[\]\(24b7add92272bbf6d03f66556d79a57b\_img.jpg\)!\[\]\(e3aedb186f88aa1d4753f4cdf3aa28b7\_img.jpg\)!\[\]\(b095c902b73e5fe8bc58cfa2f43cb8c2\_img.jpg\)!\[\]\(63d759b0d4fae9da2b600cb9b39012f1\_img.jpg\)!\[\]\(e15b0a8716c7132b9e7fcb3af7786ec0\_img.jpg\)!\[\]\(3fe085d819c42a601dcd4097b8d57d29\_img.jpg\)!\[\]\(11bb02e3f70bea000d964b9c5e536331\_img.jpg\)!\[\]\(33cd381a9be093703eb71e6946b76885\_img.jpg\)!\[\]\(aa5a7cba85465474608c0c9c12c76ac6\_img.jpg\)!\[\]\(93c845e17cb616b3dba91b26ba84bd33\_img.jpg\)!\[\]\(eb8266a2e0d6f3db282e9b655e3a8799\_img.jpg\)!\[\]\(b6c2bd703ac398df1db5a49f0a38c560\_img.jpg\)!\[\]\(8e4e1ae9d4133a8450d6bbcd4ce26d2a\_img.jpg\)!\[\]\(19f1d61a5edea5e56cfc908e2249b290\_img.jpg\)!\[\]\(159891fe811f75a6113f698eab05667a\_img.jpg\)!\[\]\(e1aeace689d785b98de98c7f034749a3\_img.jpg\)!\[\]\(7f9c9e999ac2b5421f899cf0b1f1ccce\_img.jpg\)!\[\]\(8cf0508247687c30d00506dda145d31f\_img.jpg\)!\[\]\(0699df022a180bcede85047d1aff7d34\_img.jpg\)!\[\]\(634976c8e1d1893b3ae912878f29a262\_img.jpg\)!\[\]\(bb5c5ff1f7fe5c903f53169dae9dd4c9\_img.jpg\)!\[\]\(ceb7dabf197d441699779e06039f5153\_img.jpg\)!\[\]\(1be5c250c20f73ff2bc27946f3e31fae\_img.jpg\)!\[\]\(36c8f87065d9e5eb586f985d423bad61\_img.jpg\)!\[\]\(a6b709285b1090620f26f8fcb3d804ca\_img.jpg\)!\[\]\(95e393c8dbe64f754d4741c80763efbc\_img.jpg\)!\[\]\(ec72a24b91ec2c911ae8b27ba57b21f9\_img.jpg\)!\[\]\(a630683ff205bf4ffb020317e08bdc2d\_img.jpg\)!\[\]\(0090a817fa733ea5822d46e288481992\_img.jpg\)!\[\]\(1fdeaa0b88ac9d6d18878bf74e47d676\_img.jpg\)!\[\]\(f05f420ae5131ec190d6f91e8cf691ff\_img.jpg\)!\[\]\(c13d1a631553f814aef10f0f35972022\_img.jpg\)](#)
-  [!\[\]\(153cbafc8ea978c061200f810dc53d1a\_img.jpg\)!\[\]\(0b04c86422067acd1c9f93adf717e0fb\_img.jpg\)!\[\]\(52126ab0d03297a93e0f10c4676d9eb6\_img.jpg\)!\[\]\(ca38ff53652246e36b9db4efef3214ba\_img.jpg\)!\[\]\(31789024b32d1ce024a1600db1f27408\_img.jpg\)!\[\]\(568e8de20f5e740764765b2c13e0a56a\_img.jpg\)!\[\]\(9f22d0e9c7786b270037c6b49b600dc8\_img.jpg\)!\[\]\(b4b6ee02958dd1e51bc140192afb3d71\_img.jpg\)!\[\]\(04bfdfd675fa0f86abd77155387758a8\_img.jpg\)!\[\]\(4d4e1195a6b68a67ca74332d3caabeb2\_img.jpg\)!\[\]\(6bc5a3a3b7b82f57dc8b3528bdc4fe8e\_img.jpg\)!\[\]\(2e236c9886869e813098fc682b25b55b\_img.jpg\)!\[\]\(238a2f42e22595d43215aa44f22971dd\_img.jpg\)!\[\]\(f8e2eecdada3e11f3bd24fb1db044741\_img.jpg\)!\[\]\(819cb88b8217e67f27e60f966d075db8\_img.jpg\)!\[\]\(12e86b0014452086c957e60bd2369b89\_img.jpg\)!\[\]\(f89929b9ce6f6342e670d0ecfaeadfb9\_img.jpg\)!\[\]\(e68bc38dda74a864c9152ee71d3e6746\_img.jpg\)!\[\]\(e1ca2f61b4dc8ffb960d5c304bb5fd02\_img.jpg\)!\[\]\(d05d20c035f624c49cdeefd06d8471b6\_img.jpg\)!\[\]\(ec31b06dc356b340784799cf6e0bb2cd\_img.jpg\)!\[\]\(1305661231c7db9d137b648343a09018\_img.jpg\)!\[\]\(c3cbf965229a76672675bfeaf661b5e9\_img.jpg\)!\[\]\(682da448558d2b0ee3fc008b3f5f534e\_img.jpg\)!\[\]\(85fac24a009cb4d3b1248a18d1dd890c\_img.jpg\)!\[\]\(5a409c236b1bb49541f352f88894bd35\_img.jpg\)!\[\]\(90ac14798d8f9e81b7dce8f2e2eff30c\_img.jpg\)!\[\]\(16e98d7b5a5fb728da58d3aae4961daa\_img.jpg\)!\[\]\(ddfa3f2c508e5a18193c75ac36856c81\_img.jpg\)!\[\]\(c9173215df84c0da68dd9014b7486b6a\_img.jpg\)!\[\]\(ef795386bbdc55abdbcd002371bafab8\_img.jpg\)!\[\]\(cf1c81d76c6fa0b55ef83ca0e937cca8\_img.jpg\)!\[\]\(46f9ed714a39836aa669be46d5d67236\_img.jpg\)!\[\]\(c97d44a01b080fd4557a16f39354261e\_img.jpg\)!\[\]\(e032d3493a35914df8edb1f7061e5744\_img.jpg\)!\[\]\(59a68864c0ccf56bdeaee86e613d35e6\_img.jpg\)!\[\]\(2a3ffd2785d015fd6f29954630b58918\_img.jpg\)!\[\]\(48397d2ad887543c635754954caae64c\_img.jpg\)!\[\]\(6acc6f4813257a478c5df3506317bd5b\_img.jpg\)!\[\]\(ba1ce6e72363abf15c368c500ae70641\_img.jpg\)!\[\]\(d3cf473bc31b5b51244884289eebfd01\_img.jpg\)!\[\]\(983674d6ae2318a6182865772f29a1a2\_img.jpg\)](#)



-  [!\[\]\(3b96cb08300959cc13afd66590e558a4\_img.jpg\)!\[\]\(c2b63f0ed67c4b3187aa1c2a9c6f4ef5\_img.jpg\)!\[\]\(c3bdfde04d1e24c7c49ebe33b9d93943\_img.jpg\)!\[\]\(837d5ce8d418a86973064b2b2ed6d2c3\_img.jpg\)!\[\]\(a72054fcae735f05accf10144a4c9eed\_img.jpg\)!\[\]\(b3d826c73fbb4383ef43060c4cdae0fa\_img.jpg\)!\[\]\(79bdbb73d5f409d668dd4c7d68106cc4\_img.jpg\)!\[\]\(61c057235e562ea699897e0ffe237bcd\_img.jpg\)!\[\]\(9cf0f0a07afe92c2e06a2b7e749cfed2\_img.jpg\)!\[\]\(4b882f63d8ddc4c14d4baa435044457e\_img.jpg\)!\[\]\(937abf0fac1110ac77ff4c181b9a8d96\_img.jpg\)!\[\]\(48a7333c016860c62e1fcb80fd45117a\_img.jpg\)!\[\]\(cad019cbb12e4309bbed67c94ed1c389\_img.jpg\)!\[\]\(eeadf575544016f8c39cf304369a61fd\_img.jpg\)!\[\]\(922a4610e10dd3ca842a315235b7d04f\_img.jpg\)!\[\]\(4275b82ef893ad1058475de85e1a573c\_img.jpg\)!\[\]\(a9418d7cdb9e6a9bb605ed9b595463dd\_img.jpg\)!\[\]\(f4c8ee0d1558280c9aefd5fe4950e413\_img.jpg\)!\[\]\(44836772dae0b48a5f07fa920a1ed11a\_img.jpg\)!\[\]\(02f84987873ac3640614da81a5cb1370\_img.jpg\)!\[\]\(901a617afe7154efe895a9ad45c72e5f\_img.jpg\)!\[\]\(eda880ff5f0923fa3c0f8a7321696e02\_img.jpg\)!\[\]\(c477acdd4808cc1ebde0336773cfbb62\_img.jpg\)!\[\]\(620042ae032251c73d48539ad6e4b476\_img.jpg\)!\[\]\(3930099ba668e961d9625d8b0e6928be\_img.jpg\)!\[\]\(4c2e8a192367318ca9ef9703f5ed3af7\_img.jpg\)!\[\]\(ca47247a151c39b1624e43d829752ead\_img.jpg\)!\[\]\(c4834bd657635f33a63dd9e4bf680b60\_img.jpg\)!\[\]\(923ad4b8bfbe8b92c82940d5807f389b\_img.jpg\)!\[\]\(130605f23654f1c8da09dd18fd8379fe\_img.jpg\)!\[\]\(39bd23ffe6cdffb7a0bab98f4f28996b\_img.jpg\)!\[\]\(9eb8039547d7e6b8cf569ac68cba26e8\_img.jpg\)!\[\]\(25f465025ceae597eb51a2810d17880b\_img.jpg\)!\[\]\(be6afa03da667d2a57758f870fec2253\_img.jpg\)!\[\]\(5098f842d7928861e530e9b97d703715\_img.jpg\)!\[\]\(bcb17433b66e4524e18a28d31ac23ba0\_img.jpg\)!\[\]\(1eddec523991d2444ca4c43bc3e19f3d\_img.jpg\)!\[\]\(5db7581bc8ce251e208c1e3643a823e8\_img.jpg\)!\[\]\(e60e6ca8b9dd1bf83a589c33cf06f742\_img.jpg\)!\[\]\(5344609b29303fbffe9011f3d5ba30c4\_img.jpg\)!\[\]\(39cab17abe2d2fc511b02e3e9a2426d4\_img.jpg\)!\[\]\(1df48ae79748d649532859be81b46db0\_img.jpg\)](#)

---

# Sh

Sh 

 **Sh** 

Sh  TAS  HSS/RepositoryRepo

- IMS 
-  

## Sh

TAS Sh-User-Data XML

### 1. IMS

- **IMPI** username@domain -
  - {IMSI}@ims.mnc{MNC}.mcc{MCC}.3gppnetwork.org
  - 505014001234567@ims.mnc001.mcc505.3gppnetwork.org
- **IMPU** sip:+number@domain -
  - sip:++{MSISDN}@ims.mnc{MNC}.mcc{MCC}.3gppnetwork.org
  - sip:+61403123456@ims.mnc001.mcc505.3gppnetwork.org

### 2. S-CSCF

- S-CSCF
- IMS

### 3. MMTel

- **CFA**
- **CFB**
- **CFNRy**
- **CFNRc**

## MMTel-Config

MMTel-Config HSS/Repository

```
<MMTelSS>
  <CDIV>
    <SS-ActivationState>active</SS-ActivationState>
    <Ruleset>
      <Rule>
        <RuleCondition>communication-diverted</RuleCondition>
        <ForwardTo>+61403555123</ForwardTo>
        <NotificationType>notify</NotificationType>
      </Rule>
    </Ruleset>
  </CDIV>
</MMTelSS>
```

### MMTel

- **CDIV**
- **OIP**
- **TIP**

## Sh

Sh

| ims_private_identity | IMPI | 505014001234567@ims.domain  |  |
|----------------------|------|-----------------------------|--|
| ims_public_identity  | IMPU | sip:+61403123456@ims.domain |  |

|                                        |               |                                   |        |                                         |
|----------------------------------------|---------------|-----------------------------------|--------|-----------------------------------------|
|                                        | ??            | ??                                | ???    | ??                                      |
| msisdn                                 | IMPU??        | 61403123456                       |        | ??<br>??<br>??<br>+<br>??<br>??<br>IMSI |
| imsi                                   | IMPI??        | 505014001234567                   |        | ??<br>??<br>IMSI                        |
| ims_domain                             | IMPI/<br>IMPU | ims.mnc001.mcc505.3gppnetwork.org | IMS    | ?                                       |
| scscf_address                          | S-CSCF        | scscf01.ims.domain                | "none" | S-<br>CSCF<br>??<br>?                   |
| scscf_domain                           | S-CSCF        | ims.domain                        | "none" | S-<br>CSCF<br>?                         |
| call_forward_all_destination           | MMTel<br>CDIV | 61403555123                       | "none" | CFA<br>??                               |
| call_forward_not_reachable_destination | MMTel<br>CDIV | 2222                              | ???    | CFNRc<br>??<br>??                       |
| no_reply_timer                         | MMTel<br>CDIV | 30                                | ???    | CFNRy<br>??<br>??                       |

Sh

TAS

- Sh MMTel-Config -
- SS7 MAP HLR / Sh MT
- Sh

```
# Sh MMTel-Config
config :tas,
  call_forward_not_reachable_destination: "2222", #
  default_no_reply_timer: 30
```

Sh

- HSS
  - Sh " "
    - hangup\_case "UNALLOCATED\_NUMBER"
    - SIP
- HSS /
  - Sh 5000ms
  - 
  -
- MMTel-Config

- 2222222222222222
- 22 call\_forward\_not\_reachable\_destination 2 no\_reply\_timer 22222222
- 2222222222222222

## 22 Sh 22

22222

```
# Sh 22222
rate(subscriber_data_lookups_total{result="success"}[5m]) /
rate(subscriber_data_lookups_total[5m]) * 100
```

```
# Sh 22222P952
histogram_quantile(0.95,
  rate(subscriber_data_duration_milliseconds_bucket[5m]))
```

```
# Sh 2222
rate(subscriber_data_lookups_total{result="error"}[5m])
```

22222

- P95 22 > 100ms2HSS 2222
- 222 > 5%2HSS 2222
- 222 > 20%2HSS 2222

22222

1. 22 Web UI 22 Diameter 2222 (/diameter)
2. 2 Web UI 222 Sh 22 (/sh\_test) 222222
3. 22222222“2222”22
4. 22 TAS 2222222 HSS/Repository
5. 22 subscriber\_data\_lookups\_total 22222222

## 22 Sh 22

22 Web UI Sh 22222 (/sh\_test)2

1. 222222222222 /sh\_test
2. 22222 MSISDN2222+614031234562
3. 22“22 Sh”
4. 2222222222
  - IMPI/IMPU 22
  - S-CSCF 22
  - MMTel 22
  - 2222222

22222222

- 222222222222 HSS 2
- 2222222222222222
- 22 IMS 22222 S-CSCF 22
- 22 HSS 2222222222



# SS7 MAP / Gateway-MSC

 [🔗🔗🔗🔗🔗](#)

  HLR     SS7 MAP   MSRN                     

-  [🔗🔗 README](#) -       
-  [🔗🔗🔗🔗](#) - SS7 MAP    ss7\_map   
-  [🔗🔗🔗🔗](#) -       HLR/MAP  

-  [🔗🔗🔗🔗🔗🔗](#) -             MSRN  forwarded\_to\_number
-  [🔗🔗🔗🔗](#) -   HLR       Sh/MMTel 
-  [Sh 🔗🔗](#) - Sh   MAP     
-  [🔗🔗🔗🔗](#) - HLR       

-  [HLR 🔗🔗🔗🔗🔗🔗](#) -   HLR/MAP  
-  [🔗🔗🔗🔗](#) - HLR/MAP    

---

## Gateway-MSC

TAS     HLR         MSRN   MSC      2G/3G          

    msrn  forwarded\_to\_number                      

- enabled -   /   SS7 MAP  
- http\_map\_server\_url\_base - MAP   HTTP API    URL
- gmsc -   SRI/PRN      MSC  
- timeout\_ms - MAP     HTTP                   5000 

```
config :tas,
```

```
...
```



[illegible]

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- ◆ ◆ ◆ ◆

- ?

- $\diamondsuit ? + \underline{\diamondsuit ? \diamondsuit ? \diamondsuit ? \diamondsuit ?} = \diamondsuit ? \diamondsuit ? \diamondsuit ? \diamondsuit ? \diamondsuit ? \diamondsuit ? \diamondsuit ?$
- $\diamondsuit ? + \underline{\diamondsuit ? \diamondsuit ? \diamondsuit ? \diamondsuit ? \diamondsuit ? \diamondsuit ?} = \diamondsuit ? \diamondsuit ? \diamondsuit ? \diamondsuit ? \diamondsuit ?$

◆◆◆◆◆ / ◆◆ **CLI** / ◆◆◆◆◆

```

? ? ? ? ? CLI ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? / ? ? ? ? ? ? ? ? ? ? Sh ? ? ? ?
? ? ? MMTel-Config ? ? ? ? ? ? ?

```

```
config :tas,
  ...
  blocked_cli_prefix: ["*67"],
  call_forward_not_reachable_destination: "2222",
  default_no_reply_timer: 30,
```

```
emergency_call_codes: ["911", "912", "913", "sos"],
...
```

◆ ◆ ◆ ◆ ◆

- **blocked\_cli\_prefix** CLI ID
  - ["\*67"] - \*67
  - cli\_withheld
- **call\_forward\_not\_reachable\_destination** CFNRc
  - Sh MMTel-Config
  - "2222" -
- **default\_no\_reply\_timer** CFNRc
  - Sh MMTel-Config
  - 30 - 30
- **emergency\_call\_codes**
  - 
  - SIP URN <urn:service:sos>
  - ["911", "112", "000", "999", "sos"]
  -

◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆

```
TAS [?] [?] [?] [?] [?] [?] [?] [?] [?] [?] CLI [?] [?] [?] [?] [?] [?] [?] [?] cli_withheld [?] [?] [?] [?] [?] [?] [?] [?]
"true" [?]
```

**1**

blocked cli prefix

- ```
1. [REDACTED] *67555123456[REDACTED]  
2. [REDACTED] 555123456[REDACTED]  
3. cli_withheld [REDACTED] "true"  
4. [REDACTED]
```



```
blocked_cli_prefix: ["*67"] # 7
blocked_cli_prefix: ["#31#"] # 7 GSM 7
blocked_cli_prefix: ["*67", "#31#"] # 7
```

## 2 SIP From

UE/ SIP

1. TAS SIP From "anonymous"
2. cli\_withheld "true"
- 3.

### CLI

TAS cli\_withheld XML

```
<extension name="CLI-Privacy" continue="true">
  <condition field="{cli_withheld}" expression="true">
    <!-- -->
    <action application="set"
data="effective_caller_id_name=anonymous"/>
    <action application="set"
data="effective_caller_id_number=anonymous"/>
    <action application="set" data="origination_privacy=hide_number"/>

    <!-- P-Asserted-Identity -->
    <action application="set" data="sip_h_Privacy=id"/>
  </condition>
</extension>
```

### TAS CLI

TAS

|                        |         |                        |  |
|------------------------|---------|------------------------|--|
|                        |         |                        |  |
| cli_withheld           | "true"  | From CLI               |  |
|                        | "false" |                        |  |
| tas_destination_number |         | 555123456              |  |
| destination_number     |         | tas_destination_number |  |

cli\_withheld="true"

|                            |               |                     |
|----------------------------|---------------|---------------------|
|                            |               |                     |
| effective_caller_id_number | "anonymous"   |                     |
| effective_caller_id_name   | "anonymous"   |                     |
| origination_privacy        | "hide_number" | SIP                 |
| sip_h_Privacy              | "id"          | SIP RFC 3323        |
| sip_h_P-Asserted-Identity  |               | P-Asserted-Identity |

????????

```
<extension name="CLI-Privacy-Handler" continue="true">
  <condition field="${cli_withheld}" expression="true">
    <!-- ?????? -->
    <action application="log" data="INFO ? ? ?
${tas_destination_number} ? CLI ? ?"/>

    <!-- ?????? -->
    <action application="set"
data="effective_caller_id_name=anonymous"/>
    <action application="set"
data="effective_caller_id_number=anonymous"/>
    <action application="set" data="origination_privacy=hide_number"/>

    <!-- ?? SIP ?? -->
    <action application="set" data="sip_h_Privacy=id"/>

    <!-- ?????? P-Asserted-Identity -->
    <action application="unset" data="sip_h_P-Asserted-Identity"/>

    <!-- ?? cli_withheld ? false????? -->
    <anti-action application="log" data="DEBUG ? ? ? ? ? ? ? :
${msisdn}"/>
    <anti-action application="set"
data="effective_caller_id_number=${msisdn}"/>
  </condition>
</extension>

<!-- ?????? -->
<extension name="Route-Outbound-Call">
  <condition field="${tas_destination_number}" expression="^(.+)$">
    <action application="bridge" data="sofia/gateway/
trunk/${tas_destination_number}"/>
  </condition>
</extension>
```

?????

- ?????? SIP ?????
- ?????? ? ? ? ? ? ? ? ? ? ?
- cli\_withheld ? ? ? ? "true" ? "false" ? ? ? ? ? ? ?
- ? ? ? ? / ? ? CLI ? ? ? ? ? ? ? ? ? ? XML ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? MO ? ? ? ? ? ? ? ? ? ? ? ? ?

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## 1. □□□□□□ (CFA) - □□□□□

- □□□ call\_forward\_all\_destination
- □□□□□□ □□□□□□□□
- □□□□□ □□□□□□ HLR □□□□□
- □□□□□□ □□□□□□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□

## 2. □□□□□□ (CFB)

- □□□□□□ □□□□□□□□□□□□□□□□
- **SIP** □□□ 486 □□□□□□
- □□□□□□ □□□□□□□□□□□□□□□□

## 3. □□□□□□ (CFNRy)

- □□□ no\_reply\_timer
- □□□□□□ □□□□□□□□□□□□□□□□□□
- □□□□□□ 15-30 □
- □□□□□□ □□□□□□□□□□□□□□

## 4. □□□□□□ (CFNRc)

- □□□ call\_forward\_not\_reachable\_destination
- □□□□□□ □□□□□□□□□□□□□□□□
- **SIP** □□□ 480 □□□□□□
- □□□□□□ □□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□□□□□

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1. HLR □□ (SS7 MAP) [□□□□□ - □□□□□]  
↓ (□□□□□ HLR □□□□□)
2. MMTel-Config (Sh □□) [□□ HSS □□□□□□□□□]  
↓ (□□□□□□□ MMTel-Config)
3. □□□□□ [□□□□□□ - □□□□]

□□□□□□□□□□

- **HLR** □□□□□□□□□□□□□□□□/□□□□□
- **MMTel-Config**□□□□□□ IMS □□□□□□□
- □□□□□□□□□□□□□□□□□□□□□□

????????????

|                                        | ?? | ?            | ??            | ??? | ??          |
|----------------------------------------|----|--------------|---------------|-----|-------------|
| call_forward_all_destination           |    | Sh/<br>MMTel | "61403555123" | ??? | CFA ??      |
|                                        |    | "none"       |               |     |             |
| call_forward_not_reachable_destination |    | Sh/<br>MMTel | "2222"        |     | CFNRc ?     |
|                                        |    |              |               |     |             |
| no_reply_timer                         |    | Sh/<br>MMTel | 30            |     | CFNRy       |
|                                        |    |              |               |     |             |
| msrn                                   |    | HLR??<br>MT? | "61400123456" | ??  | HLR<br>MSRN |
|                                        |    |              |               |     |             |
| tas_destination_number                 |    |              | "2222"        |     |             |
|                                        |    |              |               |     |             |

????????????

?? MT ?????????

```
<!-- ?????????? HLR ?????????? -->
<extension name="Check-CFA" continue="true">
  <condition field="${call_forward_all_destination}"
expression="^(?!none$).+$">
    <action application="log" data="INFO ??????????"
${call_forward_all_destination}"/>
    <action application="set"
data="tas_destination_number=${call_forward_all_destination}"/>
  </condition>
</extension>

<!-- ?????????? -->
<extension name="Bridge-To-Subscriber">
  <condition field="${msrn}" expression="^none$">
    <!-- ?? MSRN ?????????? -->
    <action application="set" data="call_timeout=${no_reply_timer}"/>
    <action application="bridge" data="sofia/
internal/${tas_destination_number}@${scscf_address}"/>

    <!-- ?????????? -->
    <action application="log" data="INFO ??????????"/>
```

```

<!-- 配置 -->
<action application="set"
data="forward_destination=${call_forward_not_reachable_destination}"/>
<action application="log" data="INFO 配置
${forward_destination}"/>
<action application="answer"/>
<action application="voicemail" data="default default ${msisdn}"/>
</condition>
</extension>

```

配置

配置/config/runtime.exs 配置

```

config :tas,
  # 配置 CFNRc 配置 MMTel-Config 配置
  call_forward_not_reachable_destination: "2222", # 配置

  # 配置 CFNRy 配置 MMTel-Config 配置
  default_no_reply_timer: 30 # 配置 30 配置

```

配置

- 配置 HSS 配置 MMTel-Config
- Sh 配置
- 配置

配置

配置

### 1. 配置 Sh 配置

- 配置 Web UI /sh\_test 配置
- 配置 MMTel-Config 配置 CDIV 配置
- 配置 call\_forward\_all\_destination 配置

### 2. 配置

- 配置
- 配置 call\_forward\_all\_destination != "none"
- 配置 tas\_destination\_number 配置

### 3. 配置 HLR 配置 SS7 MAP 配置

- 配置 Web UI /hlr 配置
- HLR 配置 Sh 配置
- 配置 msrn 配置

#### 4. 配置

- 配置 call\_forward\_not\_reachable\_destination
- 配置 default\_no\_reply\_timer
- 配置 MMTel-Config

配置

配置

配置

```
<!-- 配置 -->
```

```
<extension name="Prevent-Forward-Loop" continue="true">
  <condition field="${sip_h_X-Forward-Hop-Count}" expression="^$">
    <action application="set" data="sip_h_X-Forward-Hop-Count=1"/>
    <anti-action application="set" data="sip_h_X-Forward-Hop-Count=${expr(${sip_h_X-Forward-Hop-Count}+1)}/>
  </condition>
</extension>
```

```
<extension name="Check-Forward-Hop-Limit">
  <condition field="${sip_h_X-Forward-Hop-Count}"
expression="^([3-9]|[1-9][0-9]+)$">
    <action application="log" data="ERROR: ${sip_h_X-Forward-Hop-Count}"/>
    <action application="hangup" data="LOOP_DETECTED"/>
  </condition>
</extension>
```

配置

配置

- 配置
- 配置 no\_reply\_timer
- 配置

配置

INFO 61403555123

INFO 2222

INFO

配置

- 配置
- 配置
- 配置

```
<extension name="Static-Route-Voicemail-Check">
  <condition field="${tas_destination_number}" expression="^(2222|55512411520)$">
    <action application="log" data="DEBUG Called Voicemail Check Number" />
    <action application="set" data="default_language=fr"/>
    <action application="answer" />
    <action application="set" data="voicemail authorized=true"/>
  </condition>
</extension>
```

```

    <action application="set" data='vm_post_body=mailbox=${msisdn}&action="clear"'/>
    <action application="set" data='api_hangup_hook=curl http://localhost:8080/vm_end
content-type application/x-www-form-urlencoded post ${vm_post_body}'/>
    <action application="voicemail" data="check auth default default ${msisdn}"/>
  </condition>
</extension>

```

MWI

```

    bindings = [
      caller: caller,
      day: day,
      month: month,
      hour: hour,
      minute: minute,
      message_count: message_count
    ]

```

message\_count 1

```

config :tas,
  ...
  voicemail: %{
    timezone: "Pacific/Tahiti",
    smsc: %{
      smsc_url: "http://10.8.81.215",
      smsc_api_key: "nicktestkey123",
      source_msisdn: "2222"
    },
    #
    voicemail_notification_text: %{
      not_left:
        "<%= caller %> 1 <%= day %>/<%= month %><%= hour %>:<%=
minute %>",
      single_voicemail:
        "<%= caller %> <%= day %>/<%= month %><%= hour %>:<%= minute
%> 2222",
      multiple_voicemails:
        "<%= message_count %> 2222"
    }
  }
}

```