

Prometheus 配置

配置

OmniTAS 的 Prometheus 配置

配置

配置 `http://<tas-ip>:8080/metrics`

配置

Diameter 配置

`diameter_response_duration_milliseconds`

配置 Histogram

配置 `application` (ro, sh), `command` (ccr, cca, []), `result` (success, error, timeout)

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

配置 Diameter 配置

配置

```
# Diameter 配置
rate(diameter_response_duration_milliseconds_sum[5m]) /
rate(diameter_response_duration_milliseconds_count[5m])

# P95 Diameter 配置
histogram_quantile(0.95,
rate(diameter_response_duration_milliseconds_bucket[5m]))
```

□□□□

- P95 > 1000ms - Diameter □□□□

diameter_requests_total

□□□ Counter

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

□□□ □□□ Diameter □□□□

□□□

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

diameter_responses_total

□□□ Counter

□□□ 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

□□□ Gauge

□□□ peer_host, peer_realm, application (ro, sh)

□□□ Diameter □□□□□□ (1=up, 0=down)

□□□□□ □ 10 □

□□□


```

# HTTP 平均
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 vs 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])
)

```

結論

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

原因

- 遅い原因
- P50: 100-500ms, P95: 500-2000ms, P99: 1000-3000ms
- (Sh + HLR + OCS + ...)
- (subscriber_data, hlr_data, ocs_authorization)
- 100ms (遅い) vs 5000ms (遅い)

対策

- `dialplan_generation_duration_milliseconds` `XML`
- `FreeSWITCH/SBC`
- `SLA`

2. `subscriber_data_duration_milliseconds`

`subscriber_data_duration_milliseconds`

`Histogram`

`result` (success, error)

`Sh` (HSS)

```
# Sh
rate(subscriber_data_duration_milliseconds_sum[5m]) /
rate(subscriber_data_duration_milliseconds_count[5m])

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

- `P95 > 100ms` - HSS
- `P95 > 500ms` - HSS

`subscriber_data_lookups_total`

`Counter`

`result` (success, error)

```

# Sh 0000
rate(subscriber_data_lookups_total[5m])

# Sh 000
rate(subscriber_data_lookups_total{result="error"}[5m])

# Sh 000000
(rate(subscriber_data_lookups_total{result="success"}[5m]) /
rate(subscriber_data_lookups_total[5m])) * 100

```

00000

- 000 > 5% - HSS 0000
- 000 > 20% - 00 HSS 00

2. HLR 0000

`hlr_data_duration_milliseconds`

000 Histogram

000 `result` (success, error)

000 00 SS7 MAP 00 HLR 00000

000

```

# 00 HLR 0000
rate(hlr_data_duration_milliseconds_sum[5m]) /
rate(hlr_data_duration_milliseconds_count[5m])

# 0 95 000 HLR 0000
histogram_quantile(0.95,
rate(hlr_data_duration_milliseconds_bucket[5m])
)

```

00000

- P95 > 500ms - SS7 MAP 0000
- P95 > 2000ms - 00 SS7 MAP 00

hlr_lookups_total

Counter

result_type (msrn, forwarding, error, unknown)

HLR

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

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

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

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

- > 10% - SS7 MAP
- MSRN -

- MSRN
-
-

3. OCS

ocs_authorization_duration_milliseconds

Histogram

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

📄📄 Counter

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

📄📄📄📄

- $\text{rate} > 5\%$ - OCS rate
- $\text{rate} < 95\%$ - OCS rate

rate

- $\text{rate} > 5\%$ / rate
- $\text{rate} < 95\%$ OCS rate
- $\text{rate} < 95\%$

4. rate

`call_param_errors_total`

rate Counter

rate `error_type` (parse_failed, missing_required_params)

rate rate

rate

```
#  $\text{rate}$ 
rate(call_param_errors_total[5m])

#  $\text{rate}$ 
rate(call_param_errors_total[5m]) by (error_type)
```

rate

- $\text{rate} > 0$ - rate
- $\text{rate} > 1\%$ rate - rate

`authorization_decisions_total`

rate Counter

rate `disposition` (mt, mo, emergency, unauthorized), `result` (success, error)

rate rate

rate

```

# 授权决策率
rate(authorization_decisions_total[5m]) by (disposition)

# MT 授权决策率
rate(authorization_decisions_total{disposition="mt"}[5m])

# MO 授权决策率
rate(authorization_decisions_total{disposition="mo"}[5m])

# 紧急授权决策率
rate(authorization_decisions_total{disposition="emergency"}[5m])

# 未授权授权决策率
rate(authorization_decisions_total{disposition="unauthorized"}[5m])

```

授权决策率

- 授权决策率 > 1% - 授权决策率过高
- 授权决策率 - 授权决策率
- MT/MO 授权决策率 - 授权决策率

授权决策率

- MT/MO 授权决策率
- 授权决策率
- 授权决策率

freeswitch_variable_set_duration_milliseconds

授权决策率 Histogram

授权决策率 batch_size (1, 5, 10, 25, 50, 100)

授权决策率 授权决策率

授权决策率

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

# P95
histogram_quantile(0.95,
  rate(freeswitch_variable_set_duration_milliseconds_bucket[5m])
) by (batch_size)
```

結果

- P95 > 100ms - 平均値
- 平均値 - 標準偏差

5. 平均値

dialplan_module_duration_milliseconds

Histogram

module (MT, MO, Emergency, CallParams,), call_type

結果

結果

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

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

結果

- P95 > 500ms - 平均値
- 平均値 - 標準偏差

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- □□□□□□□□
- □□□□□□□□
- ❓❓❓ □□□□□□□□□□□□

6. □□□□□

call_attempts_total

□□□ Counter

□□□ call_type (mt, mo, emergency, unauthorized), result (success, rejected)

□□□ □□□□□□□□

□□□

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

□□□□□

- □□□□ > 5% - □□□□□
- □□□□□□□□ - □□□□□
- □□□□□□□□ - □□□□□□

active_calls

□□□ Gauge

□□□ call_type (mt, mo, emergency)

□□□ □□□□□□□□

□□□

```
# 查看当前
active_calls

# 按呼叫类型查看
active_calls by (call_type)

# 查看过去一小时的最大值
max_over_time(active_calls[1h])
```

注意

- $active_calls > 0$ - 呼叫
- $active_calls = 0$ - 无呼叫

7. 呼叫模拟

`call_simulations_total`

Counter

参数 `call_type` (mt, mo, emergency, unauthorized), `source` (web, api)

查看帮助

注意

```
# 查看当前
rate(call_simulations_total[5m])

# 按呼叫类型查看
rate(call_simulations_total[5m]) by (call_type)
```

注意

- 呼叫模拟
- 呼叫类型
- 呼叫来源

8. SS7 MAP

ss7_map_http_duration_milliseconds

Histogram

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

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

SS7 MAP HTTP

```
# SS7 MAP
rate(ss7_map_operations_total{result="error"}[5m]) /
rate(ss7_map_operations_total[5m]) * 100
```

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

ss7_map_operations_total

Counter

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

SS7 MAP

9.

online_charging_events_total

Counter

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

```
# OCS 仪表盘  
rate(online_charging_events_total{result="nocredit"}[5m])
```

仪表盘

-   仪表盘

10. 仪表盘

tracked_registrations

仪表盘 Gauge

仪表盘 仪表盘 SIP 仪表盘 FreeSWITCH Sofia 仪表盘
仪表盘 10 仪表盘

仪表盘

- 仪表盘 FreeSWITCH 仪表盘

tracked_call_sessions

仪表盘 Gauge

仪表盘 仪表盘 ETS 仪表盘
仪表盘 10 仪表盘

11. HTTP 仪表盘

http_requests_total

仪表盘 Counter

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

仪表盘 仪表盘 HTTP 仪表盘

仪表盘

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

□□□□□

- HTTP 5xx □□□ > 10%

12. □□□□□□□

call_rejections_total

□□□ Counter

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

□□□ □□□□□□□□□□□□

□□□

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

□□□□□

- □□□ > 1/sec - □□□□

13. □□□□□□□□□

event_socket_connected

□□□ Gauge

□□□ **connection_type** (main, log_listener)

□□□ □□□□□□□□□□ (1=connected, 0=disconnected)

□□□□□□ □□□□□□□□□□□□

□□□

```
# event_socket_connected
```

event_socket_connected

- 30

event_socket_reconnections_total

Counter

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

event_socket_reconnections_total

Grafana

Prometheus Grafana

1

-
- (MO/MT/)
-

2 Diameter

-
- /
-
-

3

-
- “”
- OCS

□□□ 4□□□□□

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

□□□ Grafana □□□□□

□ 1□□□□

- □□□□□□□□□□
- □□□□□□
- □□□□□□

□ 2□□□

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

□ 3□□□□

- Sh □□□□□
- HLR □□□□□
- OCS □□□□□
- □□□□□□□

□ 4□□□□□

- □□□□ P95 □□□□
- □□□□□□

□ 5□□□

- □□□□

- 呼叫失败
- Sh 失败
- HLR 失败
- OCS 失败

报警规则

报警 1 (失败)

```
# 呼叫失败
rate(call_attempts_total[5m]) == 0

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

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

报警 2 (失败)

```
# 呼叫失败
histogram_quantile(0.95,
  rate(dialplan_generation_duration_milliseconds_bucket[5m])
) > 1000

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

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

报警 3 (失败)

```

# 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 告警

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

SS7 MAP 告警

```
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 告警 50%"
```

告警

```
alert: EventSocketDown
expr: event_socket_connected == 0
for: 30s
annotations:
  summary: "告警 {{ $labels.connection_type }}"
```

告警

```
alert: HighCallRejectionRate
expr: rate(call_rejections_total[5m]) > 1
for: 2m
annotations:
  summary: "告警 {{ $value }} 告警"
```

HTTP 告警

```
alert: HighHTTPErrorRate
expr: rate(http_requests_total{status_code=~"5.."}[5m]) /
rate(http_requests_total[5m]) > 0.1
for: 3m
annotations:
  summary: "HTTP 5xx 告警 10%"
```

告警通知

告警通知 "unknown"

告警

- 告警通知 `call_type="unknown"` 告警 `mt` `mo` 告警 `emergency`
- 告警通知

告警通知 告警通知

告警

1. 告警通知 "HTTP 告警" 告警 - 告警通知
2. 告警通知

告警通知 告警通知

告警通知

告警

1. 告警 `http_dialplan_request_duration_milliseconds` P95 - 告警通知
2. 告警通知
 - 告警 `subscriber_data_duration_milliseconds` 告警 Sh 告警
 - 告警 `hlr_data_duration_milliseconds` 告警 HLR 告警
 - 告警 `ocs_authorization_duration_milliseconds` 告警 OCS 告警

◦ `dialplan_module_duration_milliseconds` 0000000000

3. `call_type="unknown"` - 0000000000

4. MT 0 MO 00000000

5. 00000000000000000000

00000 00000000

00000000

000

1. `call_attempts_total{result="rejected"}` 00

2. `subscriber_data_lookups_total{result="error"}` 000 Sh 00

3. `hlr_lookups_total{result_type="error"}` 000 HLR 00

4. `ocs_authorization_attempts_total{result="error"}` 000 OCS 00

5. `authorization_decisions_total{disposition="unauthorized"}` 00000
00

00000 00000000

00000000

000

1. `active_calls` 000

2. `call_attempts_total` 00

3. 0000000000000000

4. MT 0 MO 00

5. 000000000000000000

00000 0000000000

00000000

000

1. `hlr_lookups_total{result_type="msrn"}` 00

2. `hlr_data_duration_milliseconds` 時間
3. HLR 時間
4. MSRN

時間 HLR 時間

時間

時間

- **HTTP** 時間 P50: 100-500ms, P95: 500-2000ms, P99: 1000-3000ms
- **Sh** 時間 P50: 15ms, P95: 50ms, P99: 100ms
- **HLR** 時間 P50: 100ms, P95: 300ms, P99: 800ms
- **OCS** 時間 P50: 150ms, P95: 500ms, P99: 1500ms
- 時間 P50: 1-5ms, P95: 10-25ms, P99: 50ms
- **Sh** 時間 > 99%
- **HLR** 時間 > 95% (時間)
- **OCS** 時間 > 98%
- 時間 > 99%

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

時間

時間

- `call_attempts_total` 時間
- `active_calls` 時間
- 時間 P95 時間
- 時間

時間

- CPU 사용률 80% 초과
- 메모리 사용률 P95 초과
- 디스크 I/O 사용률 초과

시나리오

시나리오

1. CPU 사용률 → RED ERROR 상태
2. 메모리 사용률 → YELLOW WARNING 상태
3. 디스크 I/O → 디스크 ID 확인
4. 복구 조치

구현

1. Prometheus 설치
2. Prometheus 구성
3. Prometheus 모니터링
4. Alerting 구성
5. Alerting 테스트
6. Alerting 복구
7. Alerting 최적화
8. Alerting 유지보수

결과

Alerting 구성을 완료하고 API 호출 시 8080 포트에서

Alerting Prometheus 구성을 완료하고 `prometheus.yml` 파일을

HLR 查詢與更新 - 查詢

查詢

查詢 HLR 數據的步驟如下：

HLR 查詢

查詢

HLR 查詢使用 SS7 MAP 協議與 HLR 系統進行數據查詢。

查詢

查詢 URL 為 `/hlr`，查詢參數為 "HLR"。

查詢

查詢 HLR 數據的步驟如下：

1. MSRN 查詢

- 查詢 2G/3G 數據
- 查詢 HLR 數據
- 查詢 HLR 數據

2. 查詢

- 查詢 HLR 數據
- 查詢 HLR 數據
- 查詢 HLR 數據
- 查詢 HLR 數據

3. 查詢

- 0000000000
- 0000000000000000
- 00 HLR 000000 Sh 00

0000

000000

000 00000000? ? ? 00000000

000

1. 00 HLR 0000
2. 0000000000
3. 00 "00 HLR 00"
4. 000000 MSRN
5. 00 MSRN 000000000000 MSRN 0000
6. 0000 MSRN00000000 LTE/VoLTE 000000 MSRN0

000000

000 000000000000

000

1. 00 HLR 0000
2. 0000000000
3. 00 "00 HLR 00"
4. 000000 "0000"
5. 000000000000000000
6. 0000000000
7. 000HLR 000000 Sh/HSS 00

00 HLR 000

000 00 SS7 MAP 0000000000

000

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

HLR

- MSRN
- HLR
-
- SS7 MAP

??

/simulator " "

- 1.

- 認證
- MT 認證
- MO 認證

2. 認證

- 認證
- MT 認證
- MO 認證
- 認證 "urn:service:sos" 認證

3. IP 認證

- SIP 認證 IP 認證
- allowed_sbc_source_ips MT allowed_cscf_ips MO
- MT MO

4. 認證

- IP 認證
- MT 認證
- MO 認證
- 認證

5. 認證

- OCS 認證
- HLR 認證 SS7 MAP 認證

認證

認證

1. 認證

- MT MO 認證
- 認證
- 認證

2. 呼叫流程

- 呼叫流程 Sh 呼叫流程HSS
- **HLR** 呼叫 SS7 MAP 呼叫 MT
- **OCS** 呼叫 MO
- 呼叫 MO

3. 呼叫流程

- 呼叫流程
- 呼叫流程
- 呼叫流程

4. 呼叫

- 呼叫
- 呼叫
- 呼叫

呼叫

呼叫

呼叫 呼叫

呼叫

1. 呼叫/呼叫

2. 呼叫

3. 呼叫

- 呼叫 SBC 呼叫 MT
- 呼叫 CSCF 呼叫 MO
- 呼叫
- 呼叫
- 呼叫

4. 呼叫

5. 呼叫

6. 呼叫失败原因

呼叫 MT 失败

呼叫失败原因

原因

1. 呼叫失败
2. 呼叫失败原因
3. 呼叫失败原因
4. 呼叫 IP 地址 SBC IP
5. 呼叫失败原因 "失败"
6. 呼叫 "失败???"
7. 呼叫失败原因 Sh 失败
8. 呼叫 HLR 失败原因 MSRN 失败
9. 呼叫失败原因 hangup_case
10. 呼叫 hangup_case 为 "UNALLOCATED_NUMBER"失败
11. 呼叫失败原因

呼叫 MO 失败

呼叫失败原因

原因

1. 呼叫失败
2. 呼叫失败原因
3. 呼叫失败原因
4. 呼叫 IP 地址 CSCF IP
5. 呼叫失败原因 "失败 OCS 失败"
6. 呼叫 "失败"
7. 呼叫失败原因 Sh 失败
8. 呼叫 OCS 失败原因/失败
9. 呼叫失败原因
10. 呼叫失败原因 allocated_time 为 hangup_case

11. 當 `hangup_case` 為 "OUTGOING_CALL_BARRED" 時 OCS 會做什麼

會做什麼

當 會做什麼

會

1. 會
2. 會
3. 會 "urn:service:sos"
4. 會 IP 會 IP 會
5. 會 "會"
6. 會 "會SOS"
7. 當 `hangup_case` 為 "none" 會
8. 會 OCS 會 HLR 會
9. 會

會

當 會

會

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

會 **Sh** 會 **HLR** 會

會 會 HLR 會 Sh 會

□□

1. □□ MT □□□□□□□□
2. □□□□ "□□ HLR □□"
3. □□ "□□□□"
4. □□□□□□□□□□ HLR □□□□
5. □□□□□□□□□□□□□□
6. □□□□HLR □□□□□□□□
 - MSRN
 - `call_forward_all_destination`
 - `call_forward_not_reachable_destination`

□□

- □□□□□□□□□□□□ "□□ OCS □□" □ "□□ HLR □□" □□□□□□□□
- □□□□□□□□□□□□□□□□□□□□□□□□□□□□
- □□ "□□□□" □□□□□□□□□□□□ IP □□
- □□□□□□□□□□□□□□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□□□□□□□□□□□□□
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- □□□□□□□□□□
- □□□□□□□□□□
- □□□□ OCS □□□□□□□□□□ OCS□
- □□□□ CDR
- □□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□

- □□□□□□□□□□□□□□ Sh □□□□HSS□
- □□□□□□□□□□□□□□□□□□□□□□□□□□□□ HLR

- 000000000000 OCS
- 00000000000000000000
- 00000000

000000

000000 Prometheus 000000

- 000000 HLR 0000 `hlr_lookups_total`
- 000000 `call_simulations_total{call_type, source}`
- 00000000000000000000

000000

- 000000000000
- 0000000000
- 00000000000000

0000000000 0000 [metrics.md](#) 0000000000000000000000

000000

1. 0000000000

- 0000000000
- 000000000000
- 000000000000

2. 00 **HLR** 00

- 0000000000
- 0000 HLR 000000
- 00 SS7 MAP 0000

3. 000000

- 0000000000000000
- 0000000000000000
- 0000000000000000

4. 00000000

- 0000000000000000
- 0000000000000000
- 0000

5. 0000

- 000000000000
- 0000000000MT/MO/0000
- 00 OCS 0 HLR 00

00000000

HLR 0000

0000 "SS7 MAP 0000"

- 00 config/runtime.exe 00 ss7_map.enabled
- 000000000000

00000000

- 00 SS7 MAP 000000
- 0000 HLR 000000
- 00000000 ss7_map.timeout_ms

0000 "00 VLR 00"

- 00000000 HLR 000000
- 0000000000000000
- 0000000000000000

IMS 3GPP IMS - SIP

IMS

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

IMS

IMS OmniTAS SIP

- SIP URI
- SIP
- SIP
- SIP

IMS SIP

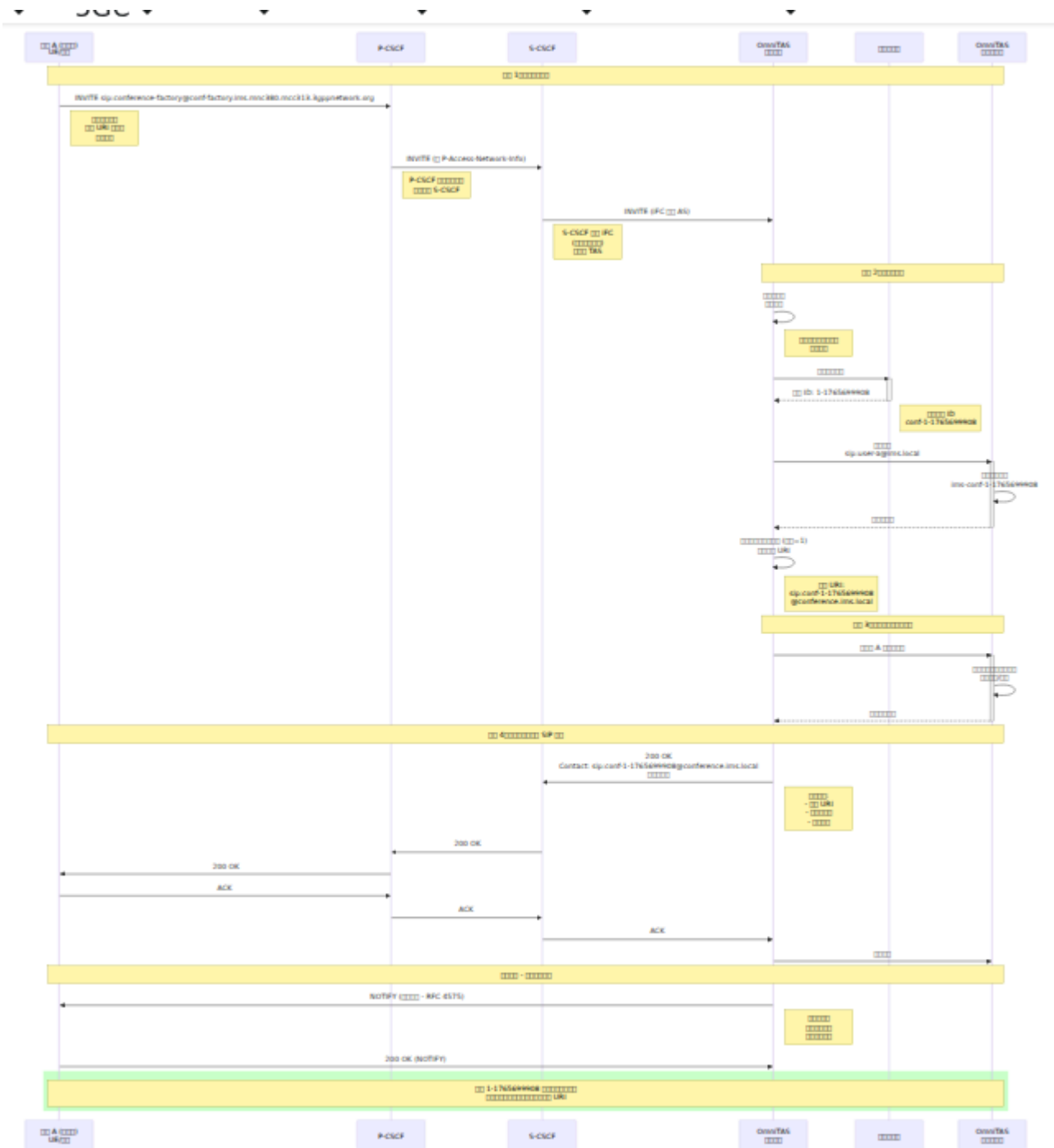
TAS TS 24.147 RFC 4579 3GPP SIP

```
Parse error on line 17: ... IMS SIP] Factory[  
<br/>sip... -----  
^ Expecting 'SEMI', 'NEWLINE', 'SPACE', 'EOF', 'subgraph', 'end', 'acc_title',  
'acc_descr', 'acc_descr_multiline_value', 'AMP', 'COLON', 'STYLE', 'LINKSTYLE',  
'CLASSDEF', 'CLASS', 'CLICK', 'DOWN', 'DEFAULT', 'NUM', 'COMMA',  
'NODE_STRING', 'BRKT', 'MINUS', 'MULT', 'UNICODE_TEXT', 'direction_tb',  
'direction_bt', 'direction_rl', 'direction_lr', got 'LINK_ID'
```

IMS

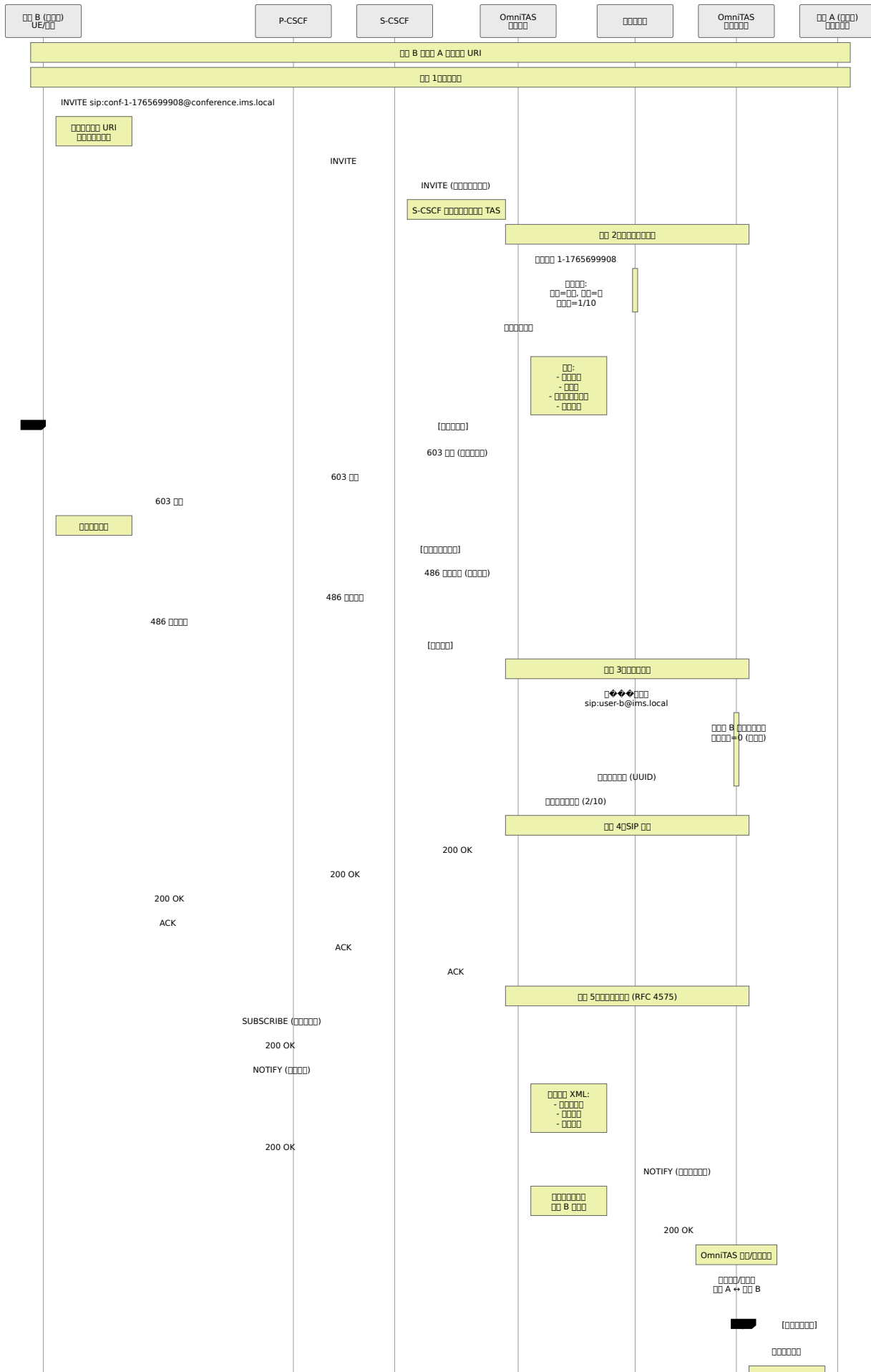
SIP (RFC 4579 SIP)

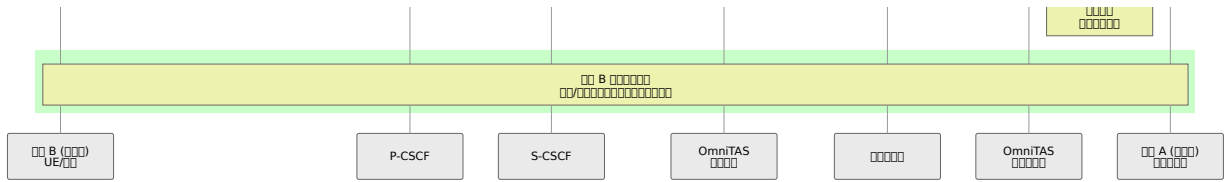
SIP URI SIP



□□□□□□

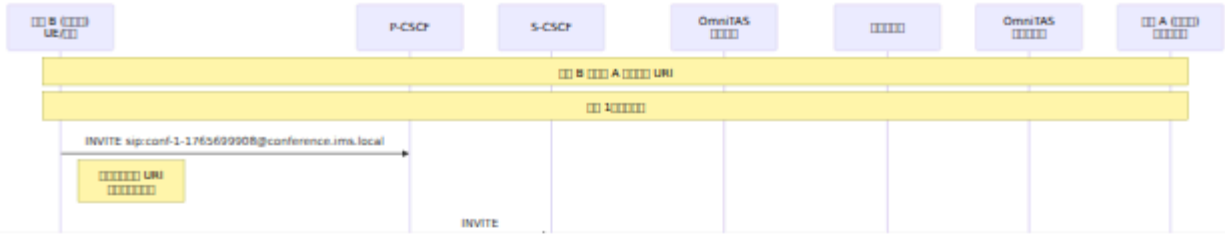
□□□□□□□□□□□□□□□□





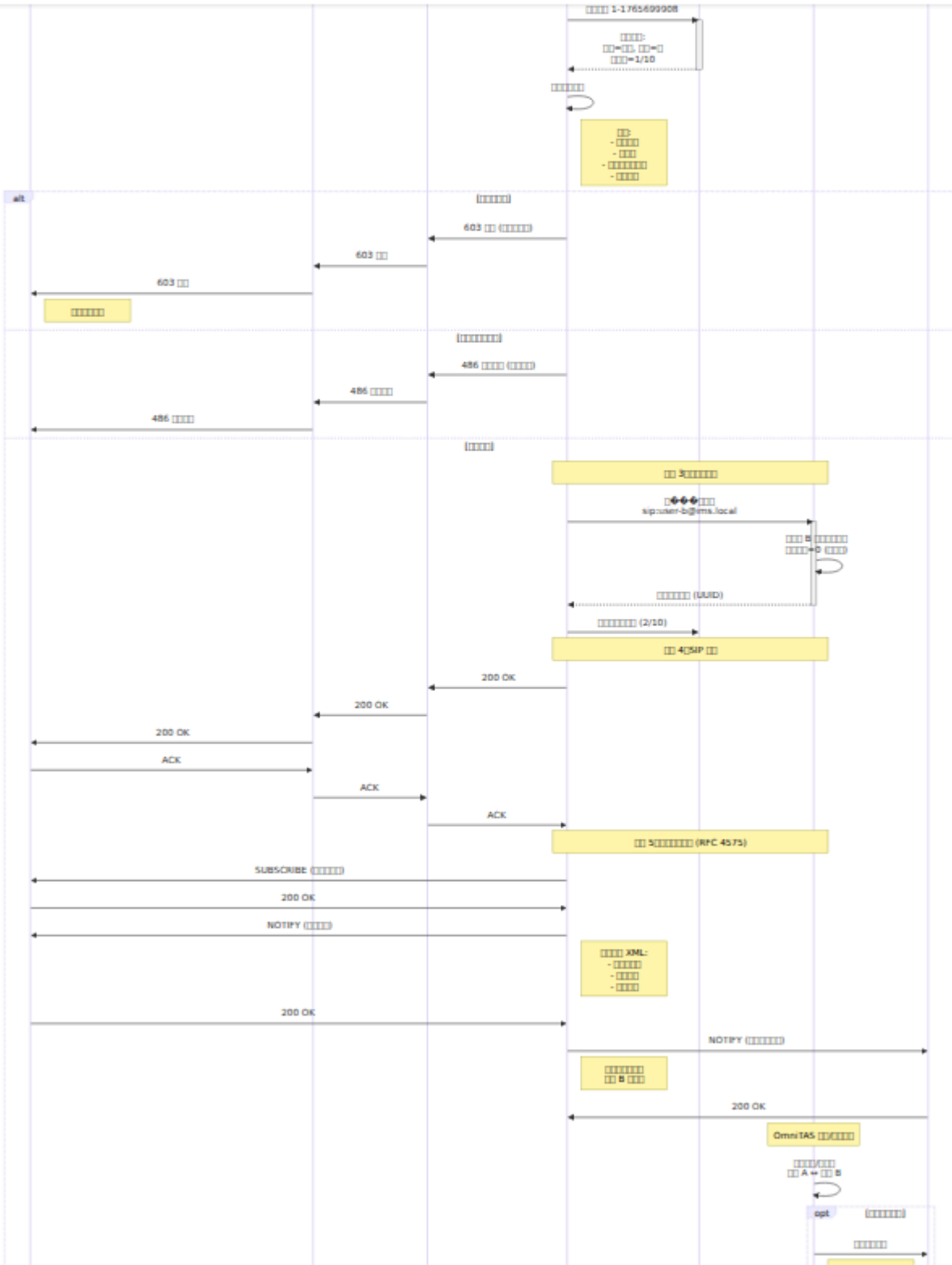
5G (RFC 4575)

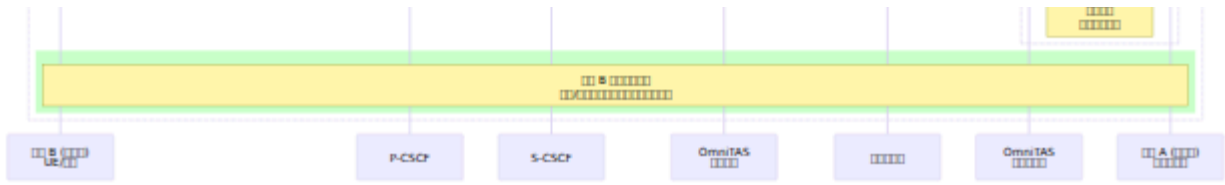
5G Network Architecture



ore OmniCore OmniCall OmniRAN OmniCharge Platform XA XXXX ▼

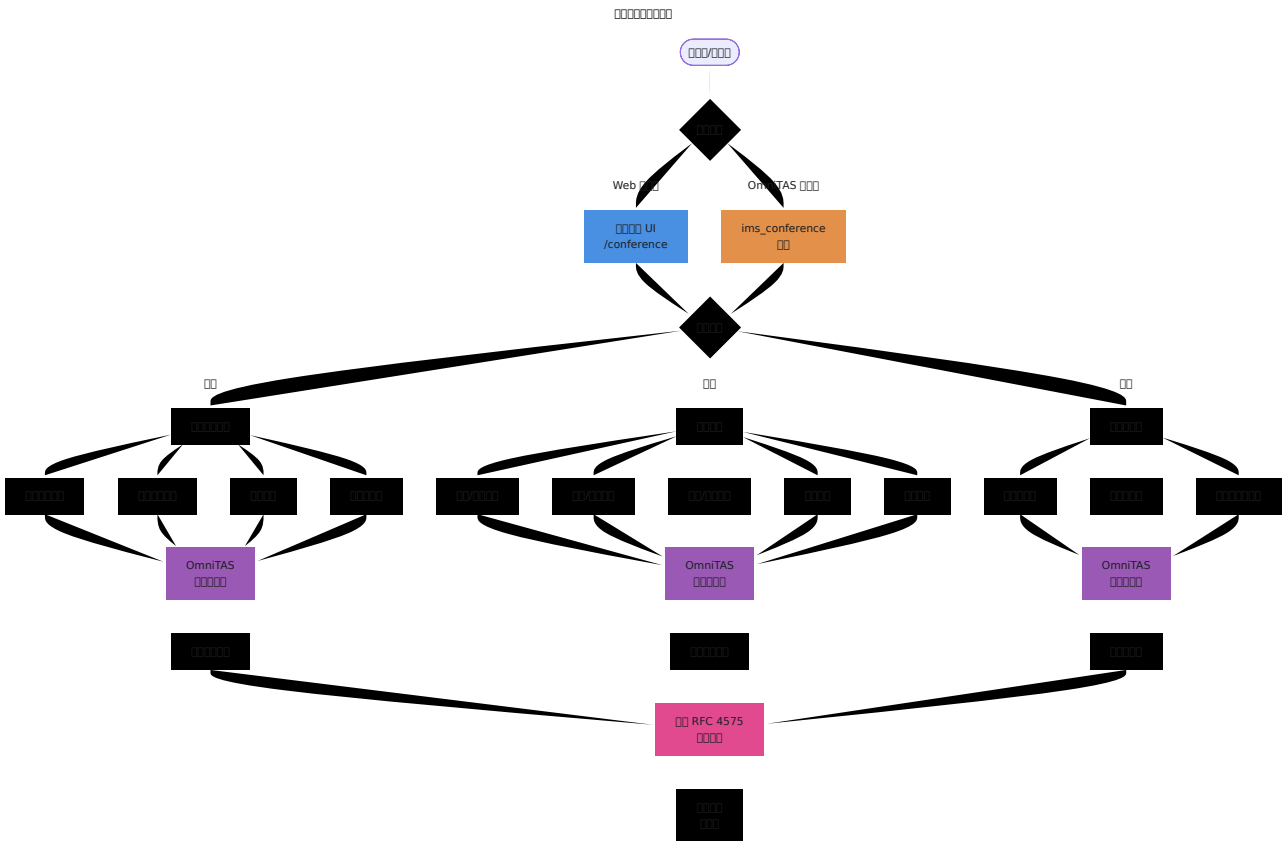
▼ 5GC ▼ ▼ ▼ ▼ ▼





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□□ Web UI □ OmniTAS □□□□□□□□



□□

Web □□

□□ /conference □□□□□□□□“□□”□□□□□□□□□□

OmniTAS □□□

□□ ims_conference □□□ OmniTAS □□□□□□□□□□□□

□□

□□□□□□

Web □□□□□□ IMS □□□□□□□□□□

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- □□□□□□□□ (□□□conference.ims.local)
- □□ **URI**□□□□□□□□□□ SIP URI
- **MNC/MCC**□□□□□□□□□□□□
- □□□□□□□□□□ (□□□3GPP-E-UTRAN-FDD)
- □□□□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□
- □□□□□□□□□□□□□□

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□□□□□□□□□□□□

- □□ **ID**□□□□□□□□□□
- **URI**□□□□□ SIP URI
- □□□□□□□□□□□□
- □□□□□□□□□□□□□□/URI

□□□□□□□□□□□□□□□□

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```
ims_conference <command> [arguments]
```

□□□□

list

□□□□□□ 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>
```

```
□□□ □□□ ID□□□□ 1-1765699908 □□□□□□□□□□□□□□
```

```
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.mcc313.3gppnetwo  
(342d50e0-9f67-4cc5-9179-4acae6f65f34)
```

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

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

```
context=ims.mnc380.mcc313.3gppnetwork.org@ims.mnc380.mcc313.3gppnetwo  
(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/MCC 380/313
  █ 3GPP-E-UTRAN-FDD
  ████████10
  ██████
  ██████
  ██████
  ██████=█████=█████=

```

create

██████████

███ `ims_conference create <creator_uri>`

```

omnitas@server> ims_conference create sip:19078720151@ims.local
███████1-1765699909
██ URI sip:conf-1-1765699909@conference.ims.local

```

destroy

██████████████████

███ `ims_conference destroy <conf_id>`

```

omnitas@server> ims_conference destroy 1-1765699908
██ 1-1765699908 ███

```

add

■■■■■■■■■■■■■■■■■■■■

```
■■■ ims_conference add <conf_id> <sip_uri>
```

```
omnitas@server> ims_conference add 1-1765699908
sip:19078720152@ims.local
■■■■ sip:19078720152@ims.local ■■■■ 1-1765699908
```

remove

■■■■■■■■■■■■■■■■■■■■

```
■■■ ims_conference remove <conf_id> <uuid>
```

```
■■■■■ info ■■■■■■■■■■■■■■■■■■■■■ UUID■
```

```
omnitas@server> ims_conference remove 1-1765699908 342d50e0-9f67-
4cc5-9179-4acae6f65f34
■■■■ 1-1765699908 ■■■■■■■■■
```

lock

■■■■■■■■■■■■■■■■■■■■

```
■■■ ims_conference lock <conf_id>
```

```
omnitas@server> ims_conference lock 1-1765699908
■■ 1-1765699908 ■■■
```

unlock

■■■■■■■■■■■■■■■■■■■■

```
■■■ ims_conference unlock <conf_id>
```

```
omnitas@server> ims_conference unlock 1-1765699908
[] 1-1765699908 []
```

video

```
[][][][][]
```

```
[][] ims_conference video <conf_id> on|off
```

```
omnitas@server> ims_conference video 1-1765699908 on
[] 1-1765699908 []
```

```
omnitas@server> ims_conference video 1-1765699908 off
[] 1-1765699908 []
```

record

```
[][][][][]
```

```
[][] ims_conference record <conf_id> start|stop
```

```
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.mcc313.3gppnetwo
- 19078720151
```

- 0:
- 1:
- 2:
- 3:

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

- 0:
- 1:

概要

目的

IMS 会議機能の動作確認

確認

1. 会議機能 (/conference)
2. 参加者制限
3. 録音機能
4. 転送機能

CLI 操作

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

確認

確認

確認

1. 会議 ID
2. `ims_conference info <conf_id>` の出力
3. 参加者数 (現在:)
4. 録音機能
5. 転送機能
6. OmniTAS の SIP 設定

確認

- `ims_conference unlock <conf_id>`
- `default_max_participants` の設定
- SIP 設定

1. 会議 ID

2. 会議名

```
ims_conference record <conf_id> start
```

3. 会議情報を取得する `info` 操作

4. 会議を終了

```
ims_conference record <conf_id> stop
```

5. 会議を OmniTAS で開始

操作手順

1. 会議 ID

2. 会議名

1. 会議を開始

```
ims_conference announce <conf_id> "会議名"
```

2. 会議情報を取得

3. 会議を終了

```
ims_conference destroy <conf_id>
```

4. 会議を OmniTAS で開始

IMS 操作

操作手順

1. 会議 ID URI を SIP INVITE

2. IMS 会議を開始

3. 会議を終了

4. 電話番号 ID の URI
5. 電話番号のフォーマット
6. 電話番号のフォーマットとダイヤル可能な電話番号
7. 電話番号 URI のフォーマット
8. 電話番号のフォーマットと URI の例

電話番号

電話番号 (例: 1)

- 電話番号/区別番号
- 電話番号のフォーマット
- 電話番号のフォーマット
- 電話番号

電話番号 (例: 0)

- 電話番号/区別番号
- 電話番号
- 電話番号/電話番号
- 電話番号

3GPP 電話番号

IMS 電話番号のフォーマット 3GPP 電話番号

- **TS 24.147** 電話番号 IP 電話番号 (IM) 電話番号 (CN) 電話番号
- **RFC 4579** 電話番号 (SIP) 電話番号 - 電話番号
- **RFC 4575** 電話番号 (SIP) 電話番号
- **RFC 5239** 電話番号

電話番号

- **P-CSCF** 電話番号 UE 電話番号 SIP 電話番号
- **S-CSCF** 電話番号
- **OmniTAS** 電話番号

- **HSS**□□□□□□□□□□□□

□□

□□□□□□□□ OmniTAS □□□□□□

□□□□

- `domain`□□□□□□□□
- `factory_uri`□□□□□□□□ SIP URI
- `mnc_mcc`□□□□□□□□
- `access_network`□□□□□□□□
- `default_max_participants`□□□□□□□□□□□□
- `allow_anonymous`□□□□□□□□□□
- `video_by_default`□□□□□□□□□□□□
- `recording_enabled`□□□□□□□□□□
- `announce_join`□□□□□□□□□□□□
- `announce_leave`□□□□□□□□□□□□
- `announce_count`□□□□□□□□□□

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- □□□□□□□□□□ CPU/□□
- □□□□□□□□□□□□□□

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- □□□□ URI □□□□
- □□□□□□□□□□□□□□

- 000000000000
- 0000000000
- 000000000000

0000

- 000000000000
- 000000/000
- 000000000000
- 0000000000
- 0000000000

0000000000 000 [metrics.md](#) 0000

- RTP/RTCP 0000000000 9093
- 00000000000000 9090
- 000 Erlang VM 000000 8080
- Prometheus 0000

0000

- 00 OmniTAS 0000000000000000
- 000000000000
- 0000000000000000
- 00 Omnitouch 00000000 ID 0000

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** HLR/MSC □□□ MAP □□□□
- **HTTP/HTTPS** □□□□□□ (SMS, TTS, MAP □□)

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- □□□□□□□□
- CDR □□□□□□
- □□□□□□□□ (Sofia SIP)
- □□□□□□ (SQLite)

1.2 □□□□

1.2.1 □□□□

SIP □□□□□□

- OmniTAS □□ IMS □□□□□□□□□□□□ SIP □□□□
- □□□□ SIP □□□□□□□□
 - □□□□□□ (From, P-Asserted-Identity)
 - □□□□□□ (To, Request-URI)
 - □□ URI □□□□□□
 - □□□□□□□□
 - □□□□□ (SDP)□□□□□□□□□□□□□□

□□□□□□□□

- □□□□□□□□□□ (CDR) □□□□□□□□□□□□
 - □□□□ (□□□□□□□□□□□□)
 - □□□□□□□□□□□□ (MSISDN, IMSI, SIP URI)
 - □□□□□□ (□□□□□□/□□)
 - □□□□□□ (□□□□□□□□□□□□)
 - □□□□□□□□□□□□
 - □□□□□□□□ (□□□□□□□□□□)

□□□□□□ (SIPREC)□

- SIPREC 記錄
- SIP 記錄
- 記錄
- SIPREC 記錄
- SIPREC 記錄

1.2.2 記錄

記錄

- RTP 記錄 B2BUA
- RTP 記錄
- 記錄
- SDP 記錄

記錄

- SIP 記錄
- Diameter 記錄 (Sh, Ro 記錄)
- HTTP/HTTPS 記錄

1.2.3 記錄

記錄

- Web UI 記錄
 - 記錄 (記錄)
 - 記錄/記錄
 - 記錄
 - 記錄
 - 記錄

記錄

- 記錄 CDR 記錄
 - 記錄
 - 記錄/記錄

- 网络 (Network)
- 网络/设备
- 网络性能

网络

- 网络性能
- 网络性能指标
 - IMS 网络 URI
 - P-Access-Network-Info 域 (网络)
 - IP 网络性能
- 网络性能

网络

- 网络性能 (Prometheus 域)
- 网络性能
- Diameter 网络
- 网络性能

网络性能指标 网络 [metrics.md](#) 网络性能指标

网络

- 网络性能
- E.164 网络性能 (网络性能)
- 网络性能 (PSAP 域)

1.3 网络性能

1.3.1 网络性能

网络性能

- Diameter TLS 网络
- Web 网络 API 网络 HTTPS
- 网络性能 (网络)

□□□□

- Web UI □□□□□□□□ (RBAC)
- □□ SHA-512 □□□□□□□□ (65,532 □□□)

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- □□□□□□□□
- □□□□□□□□

1.3.2 □□□□

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- □□□□□□□□ TLS (□□□)
- □□□□□□□□
- □□□□□□ (PFS) □□□□

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- □□ CDR □□□□
- □□□□□□□□
- □□□□□□□□
- □□□□□□ (□□□□□□/□□/□□□□)

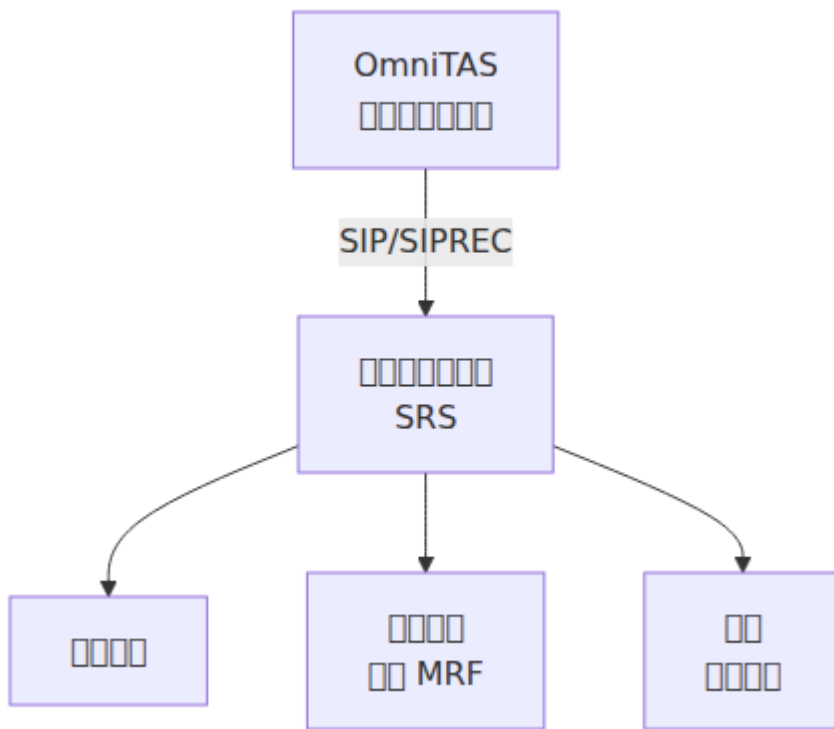
□□□□

- □□□□□□
- □□□□□□□□
- □□□□□□ (□□□□□□□□)

1.4 □□□□□□□□

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1. SIPREC □□ (□□□□□□ - RFC 7866)□



2. CDR □□□□

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

3. □□□□□□□□

- □□□□□□□□□□□□
- □ CDR □□ SQL □□□□
- □□□□□□□□
- □□□□□□

4. API □□□

- □□□□□□□ RESTful API
- □□□□□□□□
- □□ CDR □□
- □□□□□□

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□□□□□□□□

- 識別子 (MSISDN, IMSI, SIP URI)
- 電話番号
- SIPREC 録音

認証

- 証明書
- 秘密鍵
- 証明書 (CA)

暗号化

- 対称暗号
- 非対称暗号
- ハッシュ関数

2. 暗号化

2.1 暗号化

OmniTAS IMS 暗号化は、ANSI 暗号化を使用します。

2.2 暗号化

2.2.1 TLS/SSL 暗号化

暗号化

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

暗号化 (非推奨)

暗号化 - 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
- Diameter ☐☐ TLS

2.3 数据库加密

2.3.1 数据库加密

SQLite 加密

- 使用 SQLCipher 加密
- AES-256 加密
- 支持多种数据库 (CDR, 数据库)

2.3.2 数据库加密

数据库加密

- CDR 使用 AES-256 加密 (加密)
- 数据库加密
- 加密格式 (PKCS#12, PEM 格式)
- 数据库加密

数据库加密

- 数据库加密
- 数据库加密

2.4 数据库加密与解密

2.4.1 数据库加密

数据库 SHA-512 加密

数据库

- 数据库 (128 加密)
- 65,532 数据库 (加密)
- 数据库
- 数据库

数据库

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

□□□

- Web UI □□□□□□
- API □□□□
- □□□□□□□□
- □□□□□□□□

2.4.2 SSH □□□□□□

□□□□□□□□

- RSA□1024-4096 □ (□□ 2048 □□□)
- DSA□1024-4096 □ (□□□□□□ RSA)
- ECDSA□P-256, P-384, P-521 □□
- Ed25519□256 □ (□□□□□□)

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- □□□□□□□□□□
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- □□□□□□□□

SSH □□□

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

2.5 Diameter □□□□□

2.5.1 Diameter □□□□□

□□□□

- Diameter □□□□ TLS □□ TCP
- □□□□□□□□

□□□□□□

- □□ Origin-Host/Origin-Realm □□□□□□□□□□
- □□□□□□ (□□□□□□)
- □□□□□ AVP (□□-□□) □□
- □□ CMS (□◆◆□□□□) □□□□□□

2.6 SIP □□□□

P-Asserted-Identity□

- □□□□□□
- □□□□□□□□
- □□□□□□

□□□ □□□□□□□ IMS □□ (P-CSCF/S-CSCF) □□□□□□ TAS□

2.7 □□□□□□□□□□□□

2.7.1 □□□□□□

□□□□□□□□

- SIP □□□□□□□□□□/□□□□
- Diameter □□□□□□ (AVP □□)
- TLS □□□□□
- □□□□□□□□

□□□□□□

- Wireshark/tcpdump □□□□□□□□
- SSLKEYLOGFILE □□□□□ TLS □□ (□□□□□□)
- PCAP □□□□□□□□□□

2.7.2 安全配置

安全配置

- SIP 安全配置 MD5 认证 (认证配置)
- 安全配置 (认证)
- 安全配置 (认证/认证)

安全配置

- 安全配置
- 安全配置
- 安全配置
- 安全配置

2.8 安全配置

2.8.1 安全配置

安全配置

- RSA 安全配置 OpenSSL 库 (符合 FIPS 140-2 认证)
- 安全配置/dev/urandom (Linux 使用 CSPRNG)
- 安全配置 RNG 安全配置

2.8.2 安全配置

安全配置

- 安全配置 (0600)
- 安全配置 PEM 安全配置
- 安全配置

安全配置

- 安全配置
- 安全配置
- 安全配置 (认证)

2.8.3 安全

安全

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

安全

- Diameter 安全
- TLS 和 Diffie-Hellman 安全
- 安全

2.9 安全

安全

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

安全

- 安全 (安全)
- ANSSI 安全 (安全)
- 安全 (安全)

2.10 安全

2.10.1 安全

安全

- 安全/安全
- 安全

- 0000000000000000
- 0000000000

2.10.2 0000

00000

- TLS 0000 (0000)
- 000000 (0000 TLS)
- 000000 (0000)

000000

- 0000000000000000
- 0000000
- 0000000000000000
- 0000000000000000

3. 00000000

3.1 0000000000

00000

- 00000000000000000000
- SIPREC 0000000000000000
- CDR 0000000000000000
- 0000000000000000

0000000

- 00000 (0000000)
- 0000000000
- 00000000000
- 00000000000

3.2 呼叫记录

呼叫记录

- CDR 记录 (每 90 秒记录 1 次)
- 记录内容
- 记录格式 1 格式
- 记录内容

呼叫记录

- 记录内容
- 记录 (记录内容)
- 记录内容

3.3 呼叫记录

呼叫记录

- 记录 ETSI LI (记录) 记录 (记录内容)
- SIPREC 记录 LI 记录
- 记录 X1-X2-X3 记录 (记录)

呼叫记录

- IRI (记录)记录 CDR 记录
- CC (记录)记录 SIP 记录 + 记录 (记录 MRF)
- 记录 XMLJSON 记录

4. 呼叫记录

4.1 呼叫记录

呼叫记录

- 標準規格 (ANSI R226 等)
- 標準規格
- 標準規格
- 標準規格

4.2 標準規格

標準規格

- 標準規格 (SIP, Diameter, HTTPS)
- 標準規格
- IP 標準/規格

4.3 標準規格

標準規格

- 標準規格
- 標準規格
- 標準 Diameter 規格
- 標準規格 (SIEM 等)

5. 標準規格

5.1 標準規格

標準規格

- **README.md** 標準規格
- **doc/deployment_guide.md** 標準規格 (標準)
- **doc/configuration.md** 標準規格 (標準)

5.2 詳細

- 詳細 [詳細]
- 詳細 [詳細]
- 詳細 OpenSSL FIPS 140-2 詳細

5.3 詳細

- **ANSI R226** 詳細 詳細
 - 詳細 詳細
-

6. 詳細

詳細/詳細

- 詳細 Omnitouch Network Services Pty Ltd
- 詳細 PO BOX 296, QUINNS ROCKS WA 6030, AUSTRALIA
- 詳細
- 詳細 compliance@omnitouch.com.au

詳細

- 詳細
- 詳細 compliance@omnitouch.com.au

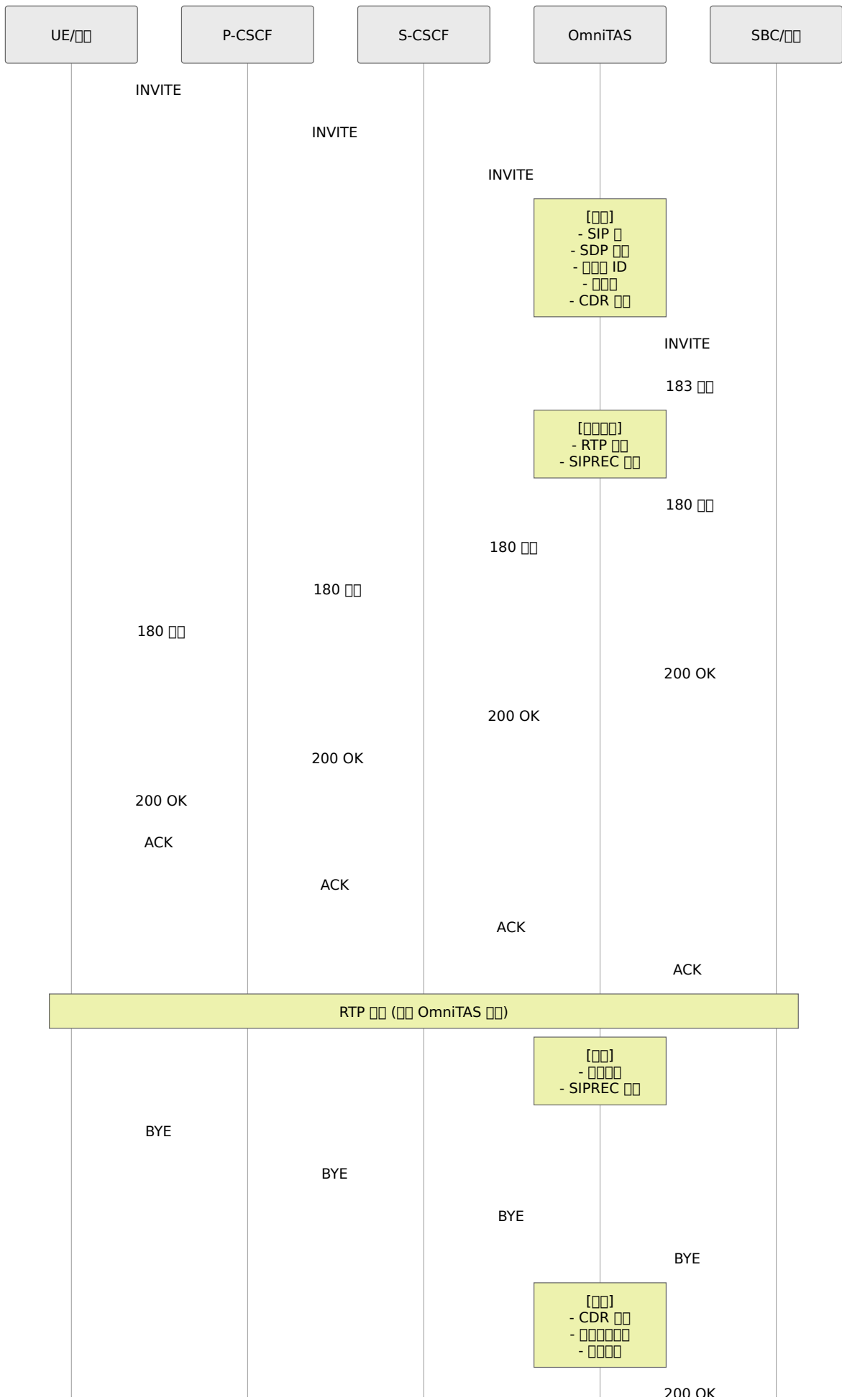
詳細/詳細

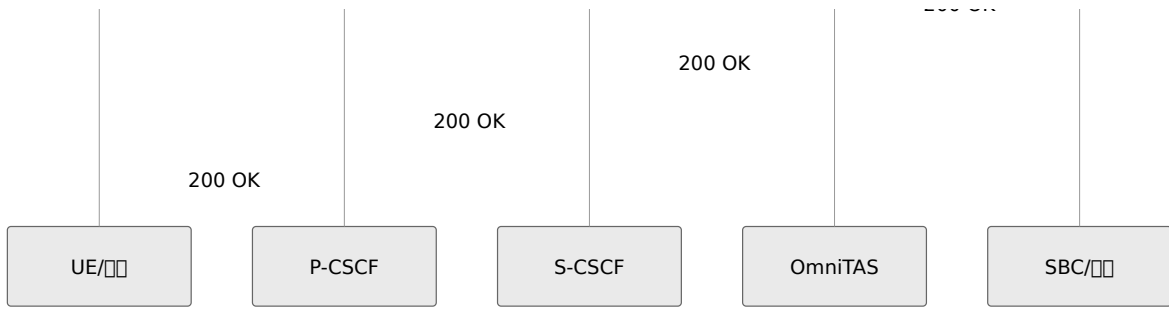
-  詳細
 - 詳細 compliance@omnitouch.com.au
-

□□

□□ **A: SIP** □□□□□

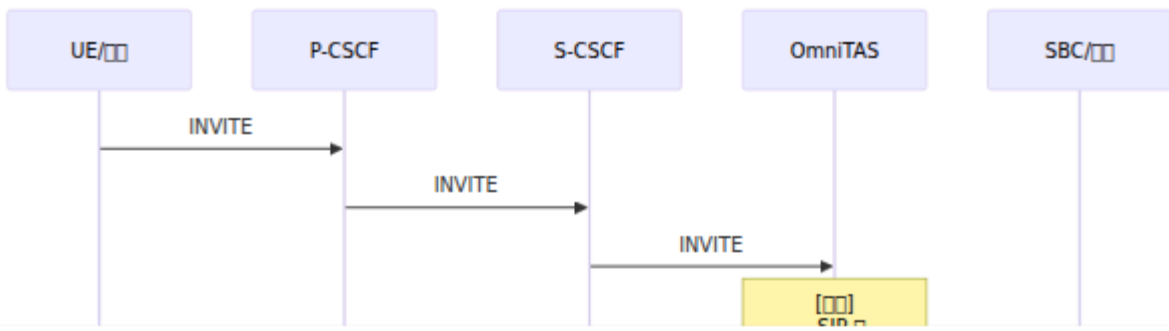
A.1 □□□□□□□□□□



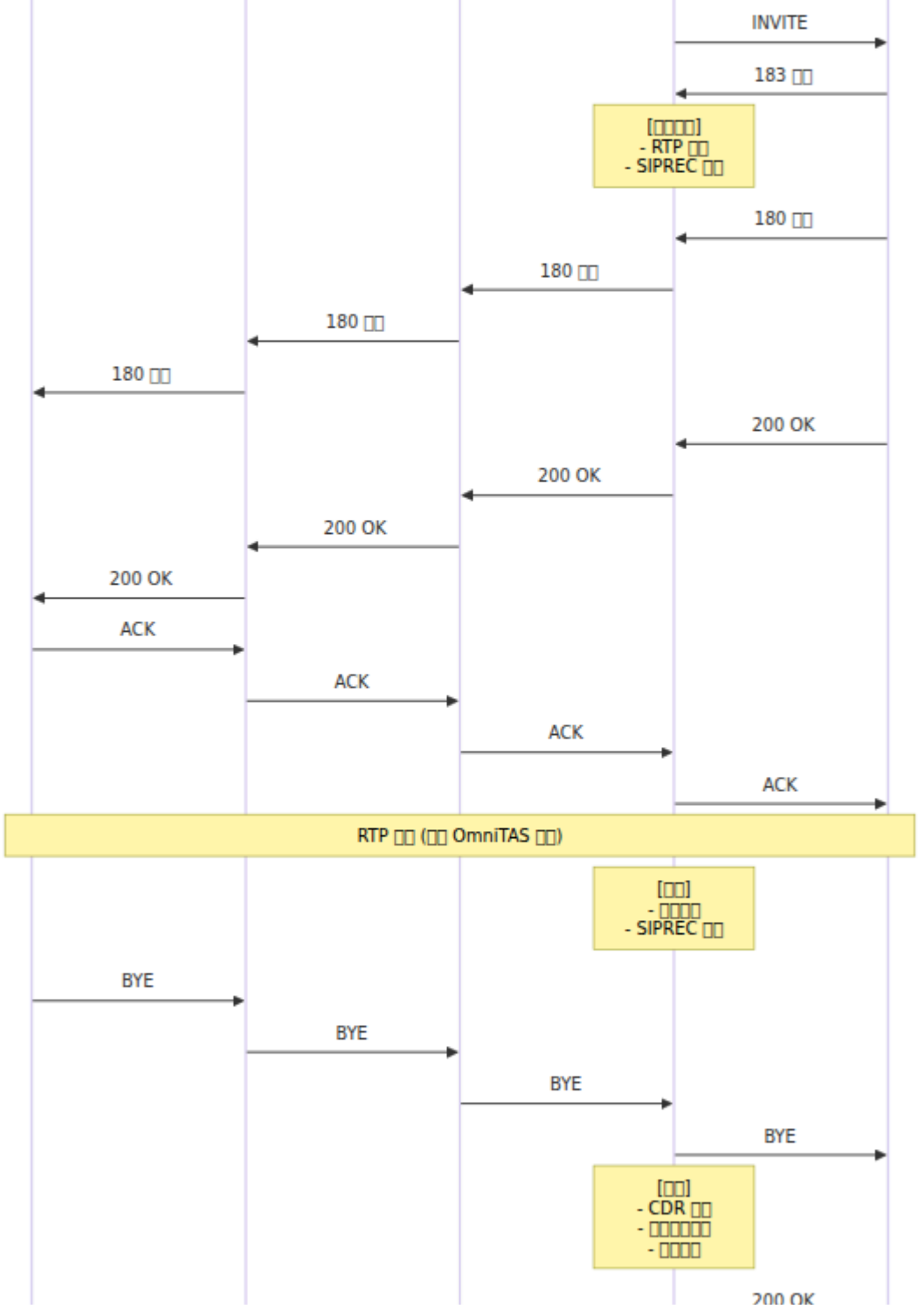


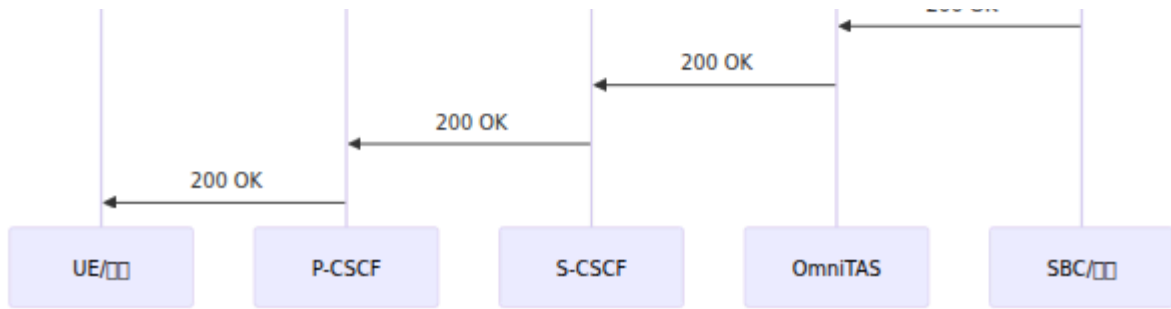
□□□ [□□] = □□□□□□□□□□

A.2 □□□□□□□□□□

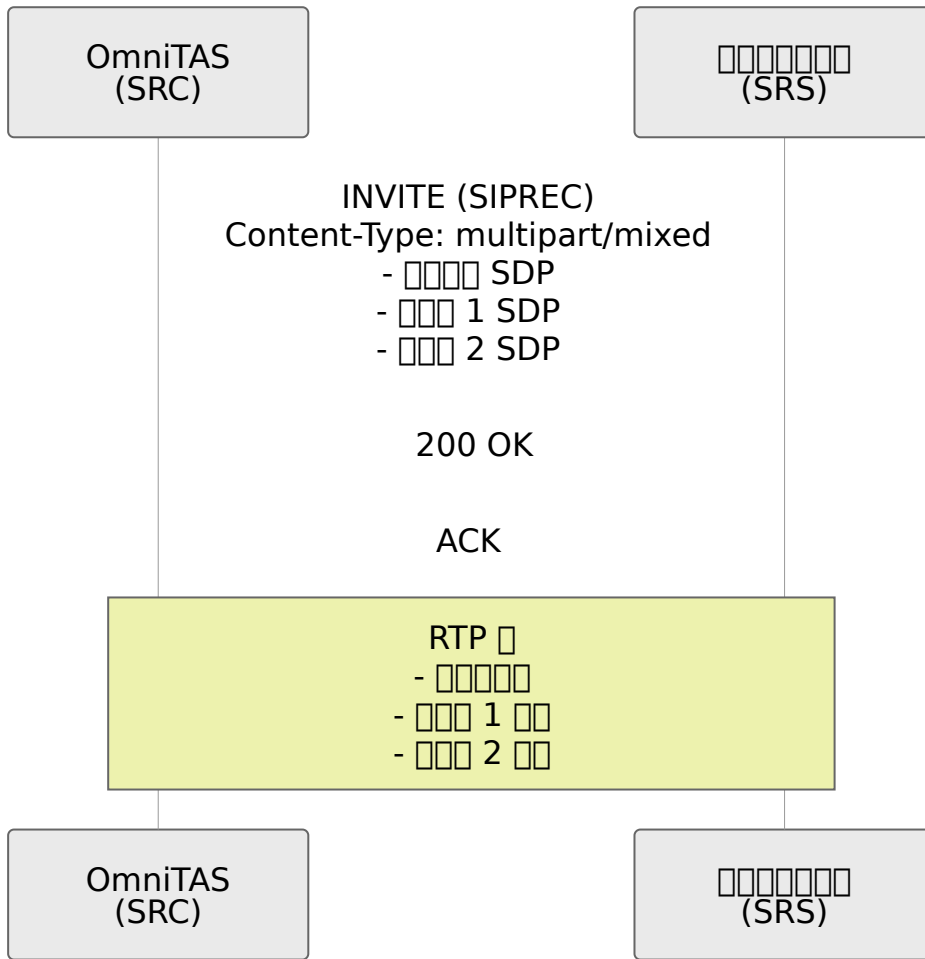


Core 5GC | OmniCore | OmniCall | OmniRAN | OmniCharge | Platform | 5A [] [] [] []





A.3 SIPREC



B: CDR

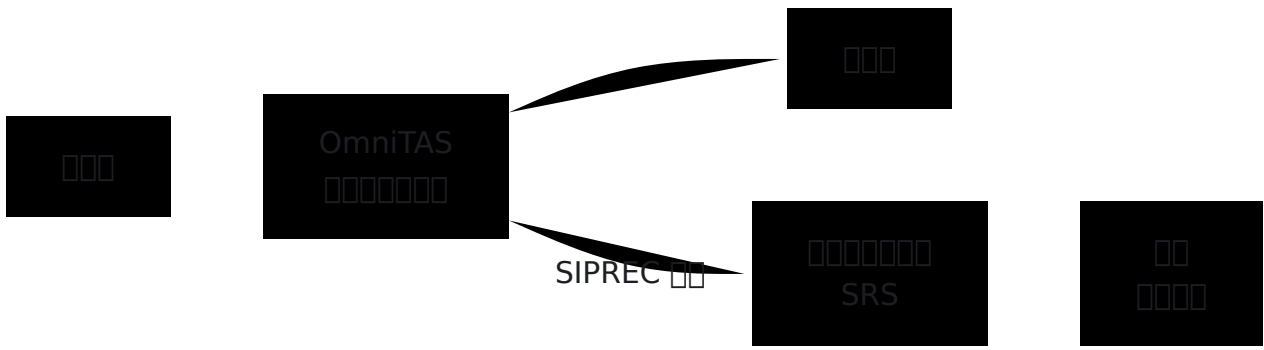
OmniTAS uses `/etc/freeswitch/db/cdr.db` SQLite (FreeSWITCH CDR)

B.1 CDR

欄名	型	説明	単位
uuid	TEXT	ユニーク識別子	文字列
caller_id_number	TEXT	発信者番号 (MSISDN)	文字列
caller_id_name	TEXT	発信者名前	文字列
destination_number	TEXT	宛先番号	文字列
start_stamp	DATETIME	開始時刻	時刻
answer_stamp	DATETIME	応答時刻	時刻
end_stamp	DATETIME	終了時刻	時刻
duration	INTEGER	通話時間 (秒)	秒
billsec	INTEGER	課金時間 (秒)	秒
hangup_cause	TEXT	通話終了原因	文字列
sip_hangup_disposition	TEXT	SIP 通話終了理由	文字列
network_addr	TEXT	ネットワーク IP アドレス	文字列
sip_from_user	TEXT	SIP From 名前	文字列
sip_to_user	TEXT	SIP To 名前	文字列
sip_call_id	TEXT	SIP Call-ID	SIP 文字列

B.2 CDR 形式

形式



C.2 SIPREC

SIPREC

SIPREC

- SIPREC (caller_id_number)
- SIPREC (destination_number)
- SIP URI

SIPREC

- SIPREC (911, 112)
- SIPREC
- SIPREC

SIPREC

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

C.3 SIPREC

SIPREC SRS

SIPREC

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

□□□□

- □□□ 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")

```

D.6

SHA-512

```

#
config :pbkdf2_elixir,
  rounds: 65_532,
  salt_len: 16

```


- **PSAP** 00000000 - 00000000
- **DRA** Diameter 0000 - Diameter 0000

0000

- **LI** 0000 - 00000000
- **IRI** 000000 - 00000000
- **CC** 0000 - 0000/0000
- **SRC** 00000000 - SIPREC 000 (OmniTAS 00)
- **SRS** 00000000 - SIPREC 0000000000
- **X1** 000 LI 0000 (0000)
- **X2** 000 LI 0000 IRI 00
- **X3** 000 LI 0000 CC 00
- **R226** 000000 R226-3 0 R226-7 0000000000

0000

- **CDR** 0000000 - 00000000000000
- **B2BUA** 0000000 - 000000000000 SIP 00
- **DTMF** 0000 - 000000
- **MSISDN** 0000000000000000 - 00000
- **IMSI** 0000000000 - 00000000
- **E.164** 0000000000

00000

- **TLS** 000000 (RFC 5246, RFC 8446) - 00000
- **PFS** 0000000 - 0000000000000000
- **SHA-512** 000000000000 512 0
- **AES** 00000000
- **RSA** Rivest-Shamir-Adleman - 00000000
- **ECDSA** 000000000000
- **PKI** 00000000 - 00000000
- **CA** 00000000 - 00000000
- **CRL** 00000000

- **OCSP** 証明書

その他

- **MAP** 証明書 - SS7 証明書
- **HLR** 証明書 - 証明書 ()
- **SS7** 証明書 7 - 証明書
- **NANP** 証明書
- 証明書 **ID** 証明書

その他

- **SQLite** 証明書
- **SQLCipher** SQLite 証明書
- **CSV** 証明書 - 証明書
- **JSON** JavaScript 証明書 - 証明書
- **XML** 証明書 - 証明書

その他

- **API** 証明書 - 証明書
- **UI** 証明書 - Web 証明書
- **RBAC** 証明書 - 証明書
- **UUID** 証明書 - 証明書

証明書 1.0

2025-11-29

ANSI R226 証明書

証明書 証明書 - 証明書

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□□□□TAS□□□□□□□□□□□□

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- □ **□ README** - □□□□□□□□
- □ □□□□ - □□□□□□□□
- □ □□□□ - Prometheus□□□□□□

□□□□

- □ **Sh**□□ - □HSS/□□□□□□□□□□□□
- □ □□□□□**Ro**□ - OCS□□□□□□□□
- □ **SS7 MAP** - □□□□□□□□□□□□HLR□□

□□□□

- □ □□□□□□□ - XML□□□□□□□□□□□□
- □ □□□□ - E.164□□□□□□
- ⚙ □□□□ - □□□□□□CLI□□□□□□□□

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- □ □□□□ - □□□□□□□□□□□□□□
- □ **TTS**□□ - □□□□□□□□□□
- □ **IMS**□□□□□□ - □□□□□

- `host` `"127.0.0.1"` `localhost`
- `host` `"10.8.82.60"` `localhost`
- `host` `"10.8.82.60"` `localhost`
- `port` (TCP)
 - `port` `8021`
 - `port` `8021`
 - `port` `8021`
 - `port` `8021`
- `secret` (secret)
 - `secret` `"cd463RZ8qMk9AHMMDGT3V"`
 - `secret` `"cd463RZ8qMk9AHMMDGT3V"`
 - `secret` `"cd463RZ8qMk9AHMMDGT3V"`
 - `secret` `"cd463RZ8qMk9AHMMDGT3V"`

API

- `calls`
- `calls` `/calls`
- `calls`
- `calls`
- `calls`

API

- `TAS`
- `TAS`
- `TAS`
- `TAS`

API

- `secret`

- TAS
- TAS localhost
-

Configuration

-
- secret
-
- TAS

Deployment

Web TAS CDR Diameter

config/runtime.exs

```

config :control_panel,
  page_order: ["/application", "/configuration"]

config :control_panel, ControlPanelWeb.Endpoint,
  url: [host: "0.0.0.0", path: "/"],
  https: [
    port: 443,
    keyfile: "priv/cert/server.key",
    certfile: "priv/cert/server.crt"
  ]

```

Configuration

Configuration

- **page_order** (array)
 -
 - ["/application", "/configuration"]
 -

Web

- **url** (URL) (URI) の形式は URL である
 - **host** は URL のホスト部分で、`"tas.example.com"` や `"0.0.0.0"` である
 - **path** は URL のパス部分で、`"/"` である
 - `URL` は URL の略称である
- **https** (HTTPS) (HTTP over TLS) である
 - **port** (ポート) は HTTPS のデフォルトポートである `443` である
 - **keyfile** (キーファイル) は TLS の秘密鍵を格納した PEM 形式のファイルである
 - **certfile** (証明書ファイル) は TLS の証明書データを格納した PEM 形式のファイルである
 - `TAS` (Transport API Service) である

証明書

証明書と TLS を使って HTTPS を行う

1. 証明書の作成/取得

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

2. 証明書

- 証明書は CA (Certificate Authority) によって発行される
- 証明書は Let's Encrypt などの CA によって発行される
- 証明書は `chmod 600` で権限を設定する

証明書

証明書と TLS を使って HTTPS を行う

- 証明書は `openssl` で生成する
- 証明書は `MSISDN` (Mobile Subscriber ISDN Number) を使って発行する
- 証明書は `Diameter` (Diameter Protocol) を使って発行する

- 配置 SSL 证书

配置 SSL

- 配置 SSL 证书
- 配置 CA 证书
- 配置 IP 地址
- 配置端口
- 配置 HTTPS - 配置 HTTP

配置 SSL

1. 配置 SSL

```
url: [host: "10.8.82.60", path: "/"] # 配置 SSL
```

2. 配置 SSL

```
url: [host: "tas.operator.com", path: "/"]  
https: [port: 443, ...]
```

3. 配置 SSL

```
url: [host: "tas.internal", path: "/panel"] # Nginx/Apache 配置
```

配置 SSL

- 配置 SSL 证书 `keyfile` `certfile`
 - 配置 SSL 证书 `443` 端口
 - 配置 **UI** 证书 `HTTPS`
 - **SSL** 证书 `PEM`
-

API

TAS REST API OpenAPI/Swagger TLS

config/runtime.exs

```
config :api_ex,
  api: %{
    port: 8444,
    listen_ip: "0.0.0.0",
    product_name: "OmniTAS",
    title: "API - OmniTAS",
    hostname: "localhost",
    enable_tls: true,
    tls_cert_path: "priv/cert/server.crt",
    tls_key_path: "priv/cert/server.key"
  }
```

- **port** (API TCP)
 - 8444
 -
 - HTTPS 443 API
 - 8444 8443 9443
- **listen_ip** (API IP)
 - "0.0.0.0"
 - "127.0.0.1" localhost
 - IP "10.8.82.60"
 - API "127.0.0.1"
- **product_name** (API)
 - API
 - "OmniTAS" "MyOperator-IMS"

- **title** (名前) APIのタイトル
 - OpenAPI/Swagger UIのタイトル
 - 例 "API - OmniTAS" "IMSのAPI"
- **hostname** (名前) APIのホスト名
 - OpenAPIのURL
 - APIのドメイン
 - 例 "localhost" "api.operator.com" "10.8.82.60"
- **enable_tls** (有無) APIのTLS/HTTPSの有無
 - true HTTPS API
 - false HTTP API
 - デフォルト true
- **tls_cert_path** (名前) TLSの証明書PEMファイル
 - enable_tls: true
 - TASの証明書
 - 例 "priv/cert/server.crt"
- **tls_key_path** (名前) TLSの秘密鍵PEMファイル
 - enable_tls: true
 - TASの秘密鍵
 - 権限 chmod 600
 - 例 "priv/cert/server.key"

API

REST API

-
- CDR
-
- Diameter
-

- `listen_ip`
- `enable_tls`

OpenAPI/Swagger

API Swagger 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" # localhost
enable_tls: false     # HTTP
```

2. TLS API

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

3. 0.0.0.0

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

0.0.0.0

- 0.0.0.0 0.0.0.0 root <1024
- **TLS** 0.0.0.0
- 0.0.0.0
- 0.0.0.0 hostname CN SAN
- **API 404** API

SIP

Ansible XML

CSCF IP/SBC

allowed_sbc_source_ips MT CSCF allowed_cscf_ips MO

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
- _ _

XML SBC PSTN SIP

```

<include>
  <gateway name="carrier_trunk">
    <param name="proxy" value="203.0.113.50;transport=tcp"/>
    <param name="register" value="true"/>
    <param name="caller-id-in-from" value="true"/>
    <param name="username" value="trunk_user"/>
    <param name="password" value="secure_password"/>
    <param name="register-transport" value="tcp"/>
    <param name="retry-seconds" value="30"/>
    <param name="ping" value="25"/>
  </gateway>
</include>

```

□□□□□□□□

```
<include>
  <gateway name="sbc_static">
    <param name="proxy" value="198.51.100.10"/>
    <param name="register" value="false"/>
    <param name="caller-id-in-from" value="true"/>
  </gateway>
</include>
```

□□□□

□□□□

name (□□□□)

- □□□□□□□□□□
- □□□□□□□□□□ `sofia/gateway/name/destination`
- □□□ `<gateway name="my_trunk">`

proxy

- SIP□□/□□□IP□□□□□□□□
- □□□□□□□□□□□□
- □□□
 - `value="203.0.113.50"` □□□□□5060□UDP□
 - `value="203.0.113.50:5061"` □□□□□□□□
 - `value="203.0.113.50;transport=tcp"` □TCP□□□□
 - `value="203.0.113.50:5061;transport=tls"` □TLS□□□□5061□□

register

- □□□□□□□□SIP□□
- □□ `true` | `false`
- □□□□□□□□□□□□□□ `true`
- □□□□□□□□IP□□□□□□□□□□ `false`

□□□□□□□□

username

- SIP
-
- 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

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

register-proxy

-

- 注册失败时，系统会自动重试
- `value="register.carrier.com:5060"`

retry-seconds

- 注册失败时，系统会自动重试
- 默认值 `30`
- 范围 `5` ~ `3600`
- `value="30"`

expire-seconds

- 注册成功后，系统会自动续订
- 默认值 `3600` ~ `1`
- 范围 `1` ~ `3600`
- `value="1800"` ~ `30`

caller-id-in-from

- SIP From 头域
- `true` | `false`
- `true` 时，From 头域包含 SIP 头域
- `false` 时，From 头域不包含 SIP 头域
- 默认值 `true`
- `value="true"`

其他

ping

- 通过 SIP OPTIONS ping
- 默认值 `0`
- 范围 `0` ~ `60`
- 默认值 `15` ~ `60`
- 默认值 `UI` 为 `"Ping"`
- `value="25"`

ping-max

- ping-max 参数
- ping 参数
- value="3"

ping-max

extension

- extension 参数
- extension - 参数
- value="+12125551234"

extension-in-contact

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

contact-params

- Contact 参数
- 参数
- value="line=1;isup=true"

contact-params

from-user

- From 参数
- 参数
- value="trunk_pilot"

from-domain

- From 参数
- 参数

- `value="my-domain.com"`

outbound-proxy

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

context

-
- `public`
-
- `value="from-carrier"`

channels

-
-
-
- `value="100"`

dtmf-type

- DTMF
- `rfc2833` | `info` | `inband` | `auto`
- `rfc2833`
- `rfc2833` RTP
- `info` SIP INFO
- `inband`
- `value="rfc2833"`

rtp-timeout-sec

- N RTP
- `0`
-

- `value="120"`

`rtp-hold-timeout-sec`

- RTP保持時間
- 単位: 秒
- `value="1800"` 30分

SIP

`sip-port`

- SIPポート
- 単位: ポート番号
- 範囲: 1-65535
- `value="5060"`

`rtp-ip`

- RTP IPアドレス
- 単位: IPアドレス
- `value="10.0.0.5"`

`register-proxy-port`

- 登録プロキシポート
- 単位: ポート番号
- `value="5061"`

`contact-host`

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

`distinct-to`

- URI別To
- `true` | `false`

- 00000000
- 000 value="false"

cid-type

- Remote-Party-ID P-Asserted-Identity
- 00 rpid | pid | none
- rpid Remote-Party-ID
- pid P-Asserted-Identity
- 000 value="pid"

extension-in-contact

- 00000000 Contact URI
- 00 true | false
- 000 value="true"

0000

transport (000000)

- 0000
- 00 udp | tcp | tls | ws | wss
- 000000000000
- 000 proxy="203.0.113.50;transport=tcp"

00 TLS 00000000 SIP 0000000000000000

0000000000

```

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

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

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

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

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

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

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

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

```

代理

代理 `sofia/gateway/name/destination` 代理

```

<!-- 配置呼叫 -->
<action application="bridge" data="sofia/gateway/primary_carrier/+121

<!-- 配置呼叫 -->
<action application="bridge" data="sofia/gateway/primary_carrier/ta

<!-- 配置SIP呼叫 -->
<action application="bridge" data="{sip_h_X-Custom=Value}sofia/gatewa

<!-- 配置呼叫 -->
<action application="bridge"
data="sofia/gateway/primary_carrier/${tas_destination_number}|sofia/g

```

配置呼叫

配置呼叫

- 配置 `username` 和 `password`
- 配置 `proxy`
- 配置 `register-transport`
- 配置呼叫

配置呼叫

- 配置 Web UI 地址 `/gw`
- 配置 `caller-id-in-from`
- 配置 `codec-prefs`
- 配置 SIP 和 RTP

配置呼叫

- 配置 `ping`
- 配置 `rtp-timeout-sec`
- 配置呼叫
- 配置呼叫

Diameter

Diameter

Ro Ro

The image shows a screenshot of a web application interface. At the top, the word "Diameter" is displayed. Below it, there are several database icons representing different components: "Sh", "OCS", "HA", and "OCS HA". A modal dialog box is open in the center, titled "Sizing your network?". The dialog contains the text: "Get a deployment estimate in 60 seconds. Pick a workload size, see the topology, and get pricing — no sales call needed." Below the text are two buttons: "Size my network" (a solid orange button) and "Talk to engineering" (an outlined orange button). A close button (an 'X') is located in the top right corner of the dialog. The background of the application is dimmed.

```

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],
    # destination_realm
    # destination_realm: "global.destination.realm",
    applications: [
      %{
        application_name: :sh,
        application_dictionary: :diameter_gen_3gpp_sh,
        # destination_realm
        # destination_realm: "sh.destination.realm",
        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,
        # destination_realm
        # destination_realm: "ocs.destination.realm",
        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
  }
]
}

```

Diameter

- **service_name** ([]) Diameter
- :omnitouch_tas
-
- **listen_ip** ([]) Diameter IP

- `"10.8.82.60"`
- `"0.0.0.0"`   `0.0.0.0`
- `0.0.0.0` IP
- **listen_port** (int) Diameter TCP
 - Diameter `3868`
 - `0.0.0.0`
- **host** (string) Diameter
 - `"example-dc01-as01"`
 - `realm` Origin-Host AVP
 - Diameter
- **realm** (string) Diameter
 - `"epc.mnc001.mcc001.3gppnetwork.org"`
 - Origin-Realm AVP
 - 3GPP
- **product_name** (string) CER/CEA
 - `"OmniTAS"`
 -
- **request_timeout** (int) Diameter
 - `5000` 5
 -
- **peer_selection_algorithm** (string)
 - `:random` | `:round_robin` | `:priority`
 - `:random`
 - `:round_robin`
- **vendor_id** (int) 3GPP ID
 - 3GPP ID `10415`

- Vendor-Specific-Application-Id AVP

□□□□□□

destination_realm □□□□□□ Diameter □□□□ Destination-Realm AVP □□ AVP □□
Diameter □◆◆ □□□ DRA □□□□□□□□□□

□□□□□□

1. □□□□□□□□□□□□□□□□□□□□□□□□ destination_realm
2. □□□□ Diameter □□□□□□□□ destination_realm
3. □□□□□□□□□□□□□□□□□□□□□□□□ realm □

□□□□□□

```

# 1
config :diameter_ex,
  diameter: %{
    realm: "epc.mnc001.mcc001.3gppnetwork.org",
    applications: [
      %{
        application_name: :sh,
        destination_realm:
"ocs.epc.mnc001.mcc001.3gppnetwork.org",
        # ...
      },
      %{
        application_name: :ro,
        destination_realm:
"ocs.epc.mnc001.mcc001.3gppnetwork.org",
        # ...
      }
    ]
  }

# 2
config :diameter_ex,
  diameter: %{
    realm: "epc.mnc001.mcc001.3gppnetwork.org",
    destination_realm: "dra.epc.mnc001.mcc001.3gppnetwork.org", #
    applications: [
      %{
        application_name: :sh,
        # "dra.epc.mnc001.mcc001.3gppnetwork.org"
      },
      %{
        application_name: :ro,
        destination_realm:
"ocs.epc.mnc001.mcc001.3gppnetwork.org", #
      }
    ]
  }

# 3
config :diameter_ex,
  diameter: %{
    realm: "epc.mnc001.mcc001.3gppnetwork.org",

```

```
#
applications: [
  %{
    application_name: :sh,
    # "epc.mnc001.mcc001.3gppnetwork.org"
  }
]
```

- Sh HSS Ro OCS
- **DRA** Destination-Realm
-
-

```
destination_realm
  ↓
destination_realm
  ↓
realm
```

Destination-Realm AVP

Web UI _Diameter_ Diameter

Web UI_Sh_Sh_Sh

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XML / TAS

TAS XML TAS XML TAS SS7 IMPI / IMPU

priv/templates

- mo_dialplan.xml -
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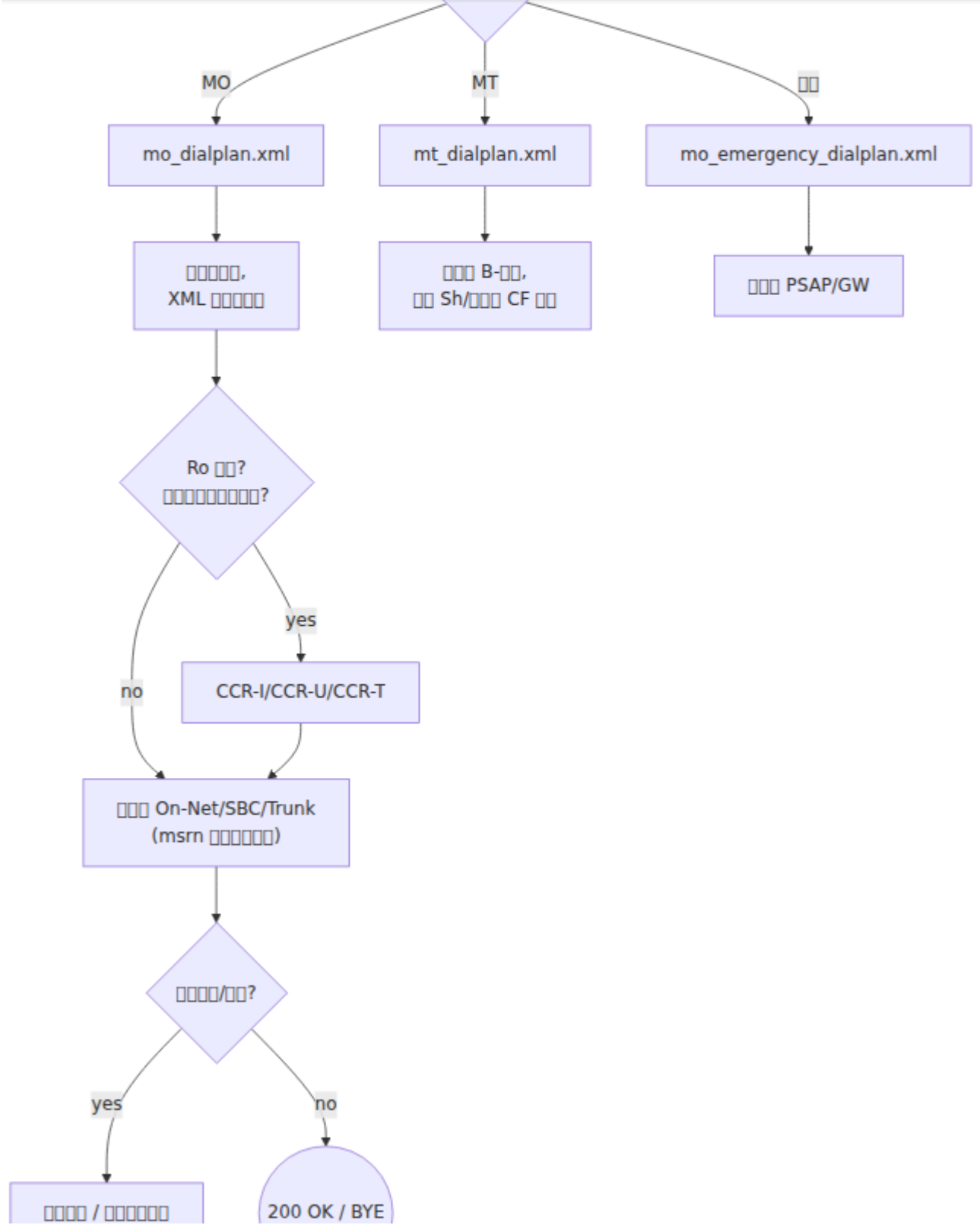
Web UI

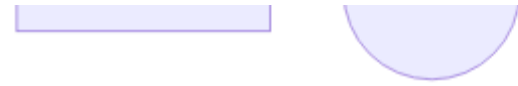
XML TAS

□□□□□□

INVITE

Core 5GC OmniCore OmniCall OmniRAN OmniCharge Platform 文A □□□□ ▼





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 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>
```

XXXXXXXXXX

```
<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>
```

XXXX

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

XXXX

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

XXXX

XX XXXXXXXXXXXXXXX XXXXXXX

```

<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 NOT  -->
  <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 - 橋を渡す

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

<!-- 橋を渡す @00 -->
<action application="bridge" data="{absolute_codec_string=AMR-
WB,AMR,PCMA}sofia/internal/sip:user@domain.com"/>

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

橋を渡す

set - 設定

```
<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 - 解除

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

export - 出力 B-leg

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

出力

playback - 音声を再生

```
<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 - 一定時間待機

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

echo - 入力した内容をそのまま返す

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

conference - 会議に参加

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

その他の機能

voicemail - 音声メッセージ

```
<!-- 音声メッセージの再生 -->  
<action application="voicemail" data="default default ${msisdn}"/>  
  
<!-- 音声メッセージの録音 -->  
<action application="voicemail" data="check auth default default  
${msisdn}"/>
```

その他の機能

log - ログ出力

```
<action application="log" data="INFO [msisdn] [msisdn]"/>
<action application="log" data="DEBUG [tas_destination_number]:"/>
<action application="log" data="ERROR [hangup_cause]: [hangup_cause]"/>
```

info - [info]

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

[info]

say - [say]

```
<action application="say" data="en number iterated [tas_destination_number]"/>
```

send_dtmf - [send_dtmf]

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

[send_dtmf]

[send_dtmf]

```
<extension name="Emergency-911">
  <condition field="[tas_destination_number]"
    expression="^(911|112)$">
    <action application="log" data="ALERT [msisdn] [msisdn]"/>
    <action application="answer" data=""/>
    <action application="playback"
      data="/sounds/emergency_services_transfer.wav"/>
    <action application="bridge"
      data="sofia/gateway/emergency_gw/[tas_destination_number]"/>
  </condition>
</extension>
```

□□□□□□□□□□

```
<extension name="Check-Credit">
  <condition field="${hangup_case}"
expression="OUTGOING_CALL_BARRED">
  <action application="answer" data=""/>
  <action application="playback"
data="/sounds/out_of_credit.wav"/>
  <action application="hangup" data="CALL_REJECTED"/>
</condition>
</extension>
```

On-Net □ Off-Net □□□□ HOMER X-CID □□□□

```
<extension name="Route-Decision">
  <condition field="${on_net_status}" expression="true">
    <!-- On-net: □□ TAS □□□□□□ MT □□ -->
    <action application="log" data="INFO □□□ on-net □□□"/>
    <action application="set" data="sip_copy_custom_headers=false"/>
    <action application="bridge" data="{sip_h_X-
CID=${original_call_id},absolute_codec_string='AMR-
WB,AMR,PCMA,PCMU'}sofia/internal/${tas_destination_number}@${local_ip}

    <!-- Off-net: □□□ SIP □□ -->
    <anti-action application="log" data="INFO □□□ off-net"/>
    <anti-action application="set" data="sip_copy_custom_headers=false"/>
    <anti-action application="bridge" data="{sip_h_X-
CID=${original_call_id},absolute_codec_string='AMR-
WB,AMR,PCMA,PCMU'}sofia/gateway/trunk/+$${tas_destination_number}"/>
  </condition>
</extension>
```

□□□ sip_h_X-CID □□□□□□□□□□ {sip_h_X-CID=...} □□□□□□□□□□ set□□□□
sip_copy_custom_headers=false □□□□□□□□□□ set □□□ sip_h_ □□□□□□□□□□□□□□□□
□□□□□□□□ **HOMER** □□□

□□□□□ ID □□□

```

<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"/>
  </condition>
</extension>

```

□□□□□□□□□□

```

<extension name="Try-Bridge-Then-VM">
  <condition field="{tas_destination_number}"
expression="^(555124115\d{2})$">
    <action application="set" data="call_timeout=30"/>
    <action application="bridge"
data="sofia/internal/{tas_destination_number}@domain.com"/>

    <!-- □□□□□□□□□□□□ -->
    <action application="log" data="INFO □□□□□□□□□□"/>
    <action application="answer" data=""/>
    <action application="voicemail" data="default default
{tas_destination_number}"/>
  </condition>
</extension>

```

□□□□□□□□

```

<extension name="Local-Numbers">
  <condition field="{tas_destination_number}" expression="^([2-9]\d{2})$">
    <!-- 3 digits 200-999 -->
    <action application="log" data="INFO digits: $1"/>
    <action application="bridge"
data="sofia/internal/$1@pbx.local"/>
  </condition>
</extension>

```

```

<extension name="National-Numbers">
  <condition field="{tas_destination_number}"
expression="^555\d{7}$">
    <!-- 7 digits -->
    <action application="log" data="INFO digits"/>
    <action application="bridge"
data="sofia/gateway/national_trunk/{tas_destination_number}"/>
  </condition>
</extension>

```

```

<extension name="International">
  <condition field="{tas_destination_number}"
expression="^00\d+$">
    <!-- 00 digits -->
    <action application="log" data="INFO digits"/>
    <action application="bridge"
data="sofia/gateway/intl_trunk/{tas_destination_number}"/>
  </condition>
</extension>

```

digits

digits

- **FreeSWITCH** digits
<https://freeswitch.org/confluence/display/FREESWITCH/Dialplan>
- **FreeSWITCH mod_dptools**
https://freeswitch.org/confluence/display/FREESWITCH/mod_dptools (digits)
- digits
<https://freeswitch.org/confluence/display/FREESWITCH/Regular+Expression>

- 00000

<https://freeswitch.org/confluence/display/FREESWITCH/Channel+Variables>

FreeSWITCH wiki 0000000000000000000000000000000000

00000000

TAS 0 XML 0000000000000000

00000000000000

000000

- `destination_number` - 00000000
- `tas_destination_number` - 00000000
- `effective_caller_id_number` - 00000000

00000

- `hangup_case` - "none"
- `ims_private_identity` - 0000000
- `ims_public_identity` - 0000000
- `msisdn` - 00000000 +0
- `imsi` - 00000000 IMSI
- `ims_domain` - 00000000

MT 00000000

- `ims_private_identity` - 0000000
- `ims_public_identity` - 0000000
- `msisdn` - 00000000 +0
- `imsi` - 00000000 IMSI
- `ims_domain` - 000000000000
- `call_forward_all_destination` - CFA 0000 "none"
- `call_forward_not_reachable_destination` - CFNRc 000
- `scscf_address` - S-CSCF 000 "none"
- `scscf_domain` - S-CSCF 00 "none"

- `no_reply_timer` - 000000
- `hangup_case` - "none" 0 "UNALLOCATED_NUMBER"
- `msrn` - 00 PRN 0 MSRN0000000000 SRI 00000000000000000000
- `tas_destination_number` - 000000000000 MSRN 00000000

MO 00000000

- `hangup_case` - "none", "OUTGOING_CALL_BARRED", 0 "UNALLOCATED_NUMBER"
- `ims_private_identity` - 00000000
- `ims_public_identity` - 00000000
- `msisdn` - 0000000000 +0
- `imsi` - 00000000 IMSI
- `ims_domain` - 0000000000
- `allocated_time` - OCS 000000000000000000
- `cli_withheld` - "true" 0 "false" 000
- `on_net_status` - "true" 0 "false" 0000000000000000
- `original_call_id` - UE 0000 A-leg SIP Call-ID0000 HOMER X-CID 0 B2BUA 0000 00
- `msrn` - 00000000 MSRN00000000
- `tas_destination_number` - MSRN 0000000000

00000

000000 `emergency_call_codes` 00000000000000000000000000000000

00

0000 TAS 00000000000000000000000000000000

000000

- `emergency_call_codes`: 00000000000000000000000000000000
- 0000: "911"000000"112"000000"000"00000000"999"000000"sos"
- 000000 SIP 00 URN000000 <urn:service:sos>0000000000
- 000000000000 00000 00

□□□□□□

- □□□□: ["911", "933"] - 911 □□□□□933 □□□□
- □□□□: ["112", "999"]
- □□□□□□: ["000", "106"] - 000 □□□□□106 □□□□□□
- □□□: ["911", "112", "000", "sos"]

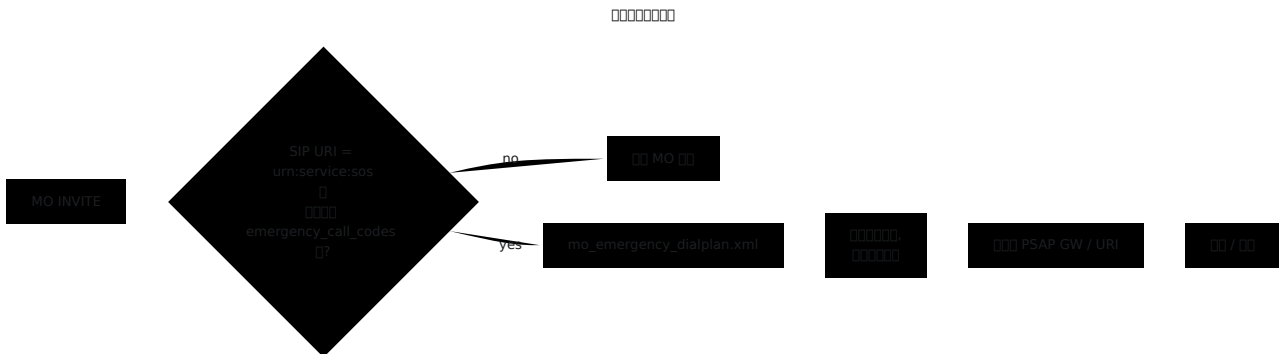
□□□□□□□□

□□□□□□□□□□

1. **SIP URI** □□□□ **URN:** □□ <urn:service:sos> □□□□□ "service:sos" □ URI
2. □□□□□□□: □ Caller-Destination-Number □□□□□ emergency_call_codes □□□□

□□ □□□□ □□□□□□□□□□□□□□

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□□□□□□□□□□

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
- 911 112 000 999
-
- OCS skipped_regex
- PSAP
-

IVR

IVR DTMF XML ivr

IVR

1. hosts/<environment>/group_vars/ivr_menus/ XML

```

<include>
  <menu name="my_menu"
    greet-
long="${base_dir}/sounds/en/us/callie/misc/8000/my_greeting.wav"
    greet-
short="${base_dir}/sounds/en/us/callie/misc/8000/my_greeting.wav"
    invalid-sound="silence_stream://250"
    exit-sound=""
    timeout="5000"
    max-failures="1"
    max-timeouts="1"
    digit-len="1">

    <!-- ████████████████████ -->
    <entry action="menu-exec-app" digits="1" param="playback
${base_dir}/sounds/option1.wav"/>
    <entry action="menu-exec-app" digits="1" param="bridge
sofia/internal/100@${domain}"/>

    <entry action="menu-exec-app" digits="2" param="playback
${base_dir}/sounds/option2.wav"/>
    <entry action="menu-exec-app" digits="2" param="bridge
sofia/internal/200@${domain}"/>

    <!-- ████████████████ -->
    <entry action="menu-exec-app" digits="timeout" param="bridge
sofia/internal/default@${domain}"/>
    <entry action="menu-exec-app" digits="invalid" param="bridge
sofia/internal/default@${domain}"/>
  </menu>
</include>

```

2. ████████████████████

```

<extension name="my_ivr_extension">
  <condition field="destination_number" expression="^1234$">
    <action application="answer"/>
    <action application="ivr" data="my_menu"/>
  </condition>
</extension>

```

3. Ansible

Ansible

Option	Description
<code>name</code>	Default value is <code>ivr</code>
<code>greet-long</code>	
<code>greet-short</code>	
<code>timeout</code>	
<code>max-failures</code>	Default value is <code>invalid</code>
<code>max-timeouts</code>	Default value is <code>timeout</code>
<code>digit-len</code>	

Ansible

Ansible `action="menu-exec-app"` is used to execute a menu application.

Option	Description
<code>digits="1"</code>	Default value is <code>1</code>
<code>digits="timeout"</code>	
<code>digits="invalid"</code>	

Ansible `playback`, `bridge`, `transfer`, `hangup`

On-Net 呼叫方案 On-Net 呼叫方案

呼叫方案on-net 呼叫方案 MO 呼叫 TAS 呼叫 MT 呼叫方案
呼叫 MT 呼叫方案 MSRN 呼叫方案

呼叫 MO 呼叫 MT

呼叫 MT 呼叫方案

- 呼叫方案
- 呼叫方案
- 呼叫方案 MSRN 呼叫
- 呼叫方案

呼叫 MT 呼叫方案 TAS

- 呼叫方案CFU、CFB、CFNRy、CFNRc
- 呼叫/呼叫方案
- 呼叫 CS 呼叫 MSRN 呼叫
- 呼叫方案
- 呼叫方案

呼叫

MO 呼叫方案 TAS 呼叫方案 TAS 呼叫 TAS 呼叫 MT 呼叫
呼叫 `mt_dialplan.xml` 呼叫方案

呼叫方案

```

<extension name="On-Net-Route">
  <condition field="{on_net_status}" expression="true">
    <action application="log" data="DEBUG On-Net MO [ ] - [ ] TAS" />

    <!-- [ ] [ ] [ ] [ ] [ ] [ ] -->
    <action application="set" data="sip_copy_multipart=false"/>
    <action application="set" data="sip_h_Request-Disposition=no-fork

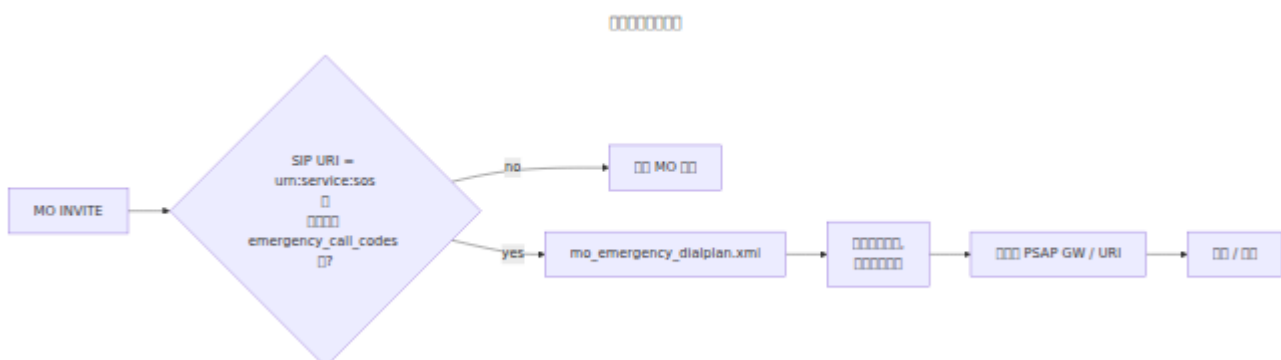
    <!-- [ ] TAS [ ] [ ] MT [ ] [ ] -->
    <action application="bridge"
      data="{absolute_codec_string='AMR-
WB,AMR,PCMA,PCMU',originate_retries=1,originate_timeout=60,sip_invite
/>
    <action application="hangup" data="" />
  </condition>
</extension>

```

[] [] [] []

- `{sip_local_network_addr}` - TAS IP [] [] [] [] [] [] `10.179.3.60` []
- `{tas_destination_number}` - [] [] [] MSISDN
- `sip_invite_call_id={sip_call_id}` - [] [] [] ID [] [] []
- `sip_copy_multipart=false` - [] [] [] [] [] [] [] []
- `sip_h_Request-Disposition=no-fork` - [] [] [] [] []

[] [] [] []



[] [] [] []

- TAS IP [] [] [] [] `10.179.3.60` [] [] [] [] `allowed_sbc_source_ips` [] [] [] []
- [] [] TAS [] [] [] [] [] [] [] [] MT [] []

- 2G/3G MSRN 2G/3G CS TAS MSRN
-

MSRN 2G/3G

2G/3G CS TAS MSRN MSRN

MSRN

MSRN VLR CS

MSRN

TAS SS7 MAP MSRN

MT 0000000000 MSRN 00

MT 00000000

00000000 (SRI)

SRI 000000

IMSI + VLR

IMS IMSI VLR

00000000 (PRN)

000000 IMS/PS

00 MSRN

0000

PRN 0000

0000 IMS S-CSCF

MSRN

MSRN

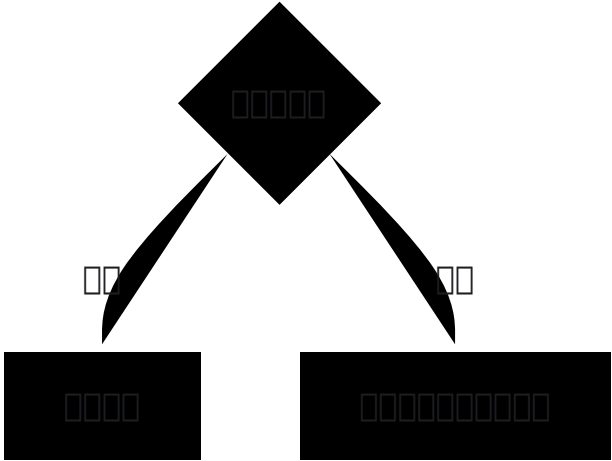
00 SRI 00 MSRN

00000000

00000000: msn

00000000

CS MSRN



SRI

1 SRI

TAS SS7 MAP HLR

SRI

1. SRI MSRN - MSRN

- MSISDN GMSC IMSI MSRN
- MSRN: 61412345678

2. IMSI + VLR - CS PRN

- MSISDN GMSC IMSI MSC/VLR
- CS MSRN

3. IMSI VLR - CS IMS/PS

- MSISDN GMSC IMSI
- IMS/4G CS

4. - SRI

- `msrn`
- `msrn`

2. **PRN** - `msrn`

SRI IMSI + VLR MSRN TAS VLR PRN MSRN

VLR MSRN TAS MSRN

PRN MSRN 61412345678

`msrn`

SS7 MAP MSRN MT

`msrn`

- `E.164` +
- "61412345678"
- CS
- MT HLR

MSRN mt_dialplan.xml

MSRN MT

1. **MSRN:** `msrn`
2. `msrn`:
 - `msrn`: 10
 - `msrn`: `msrn`
3. **MSRN:** CS MSRN
 - `ignore_early_media=ring_ready`
 - `msrn`: AMR/PCMA/PCMU
 - `msrn`: `sofia/gateway/CS_Gateway/+$msrn`
4. `msrn`: `msrn`

□□□□□□□□

```
<extension name="Route-to-CS-MSRN" continue="false">
  <condition field="msrn" expression="^\(\\d+\)$">
    <!-- □□□□ -->
    <action application="set" data="progress_timeout=10" />
    <action application="set" data="bridge_answer_timeout=${no_reply_

    <!-- □□□ MSRN □□ CS □□ -->
    <action application="bridge"
      data="
{ignore_early_media=ring_ready,absolute_codec_string='AMR,PCMA,PCMU',
/>

    <!-- □□□□□□□□/□□□□ -->
    <action application="bridge"
      data="sofia/internal/${call_forward_not_reachable_destination}@
    </condition>
  </extension>
```

□□□

1. **MSRN** □□□□ - □□□□□□□□□□
2. □□□ **CS** □□ - MSRN □□ 2G/3G □□□□□□ VoLTE/IMS □□
3. **MT** □□□□□□□□ - MSRN □□□□□ IMS □□□□□□
4. □□□□□□□□ - □□ MSRN □□□□□□□□□□□□□□□□
5. **HLR** □□□ **Sh** - HLR □ MSRN □□□ Sh □□□□□

□□

□□□ TAS □□□□□ SS7 MAP □□□

□□□□□

- **enabled:** □□□ `true` □□□ SS7 MAP □□
- **http_map_server_url_base:** □□ SS7 MAP □□□ URL□□
□□ `"http://10.1.1.100:5001"` □
- **gmsc:** SRI/PRN □□□□□ MSC □□□□□□ `"61400000000"` □

- **timeout_ms:** 5000

SS7 MAP

SS7 MAP

TAS Sh HSS SS7 MAP
HLR HLR

SS7 MAP

SS7 MAP

SS7 MAP	SS7 MAP	SS7 MAP
CFU	call_forward_all_destination	SS7 MAP
CFB	call_forward_not_reachable_destination	SS7 MAP
CFNRy	call_forward_not_reachable_destination	SS7 MAP
CFNRc	call_forward_not_reachable_destination	SS7 MAP/

SS7 MAP

1. Sh HSS

HSS

TAS Sh HSS

SS7 MAP

- `call_forward_all_destination`: CFU `"61412345678"`
- `call_forward_not_reachable_destination`: CFB/CFNRy/CFNRc `"61487654321"`
- `no_reply_timer`: CFNRy `"20"`

2. SS7 MAP HLR

HLR HSS USSD/MMI *21*

TAS SS7 MAP HLR

HLR

- `forwarded_to_number`: `"61412345678"`
- `reason`:
- `notification flags`:

- `call_forward_all_destination`
- `call_forward_not_reachable_destination`

HLR Sh

TAS MT

1. Sh HSS
2. SS7 MAP HLR
3. HLR Sh

USSD HSS

MT

名前	タイプ	値	説明
call_forward_all_destination	整数	"61412345678"	CFU 宛先番号
call_forward_not_reachable_destination	整数	"61487654321"	CFB/CFN 宛先番号
no_reply_timer	整数	"20"	CFNRy タイマー

設定

- 宛先番号を "none" に設定
- 宛先番号を正規表現 `^(?!none$).*` で指定し、"none" に設定

mt_dialplan.xml の設定

1. CFU (Call Forwarding Unconditional)

以下は、CFU を有効にするための設定例です。

以下は、sofia/gateway/ExternalSIPGateway を PSTN 宛先として設定する例です。

設定

```

<extension name="Check-Call-Forward-All">
  <condition field="{call_forward_all_destination}" expression="^(?!
    <action application="log" data="INFO [redacted] ${call_forward

    <!-- [redacted] History-Info [redacted] -->
    <action application="set" data="sip_h_History-Info=<sip:${destina

    <!-- [redacted] ID [redacted] -->
    <action application="set" data="sip_call_id=${sip_call_id};CALL_F

    <!-- [redacted] -->
    <action application="bridge"
      data="{absolute_codec_string='AMR-
WB,AMR,PCMA,PCMU',originate_retries=1,originate_timeout=60}sofia/gate
  />
  </condition>
</extension>

```

[redacted]

- [redacted] [redacted]
- [redacted] ;CALL_FORWARD_UNCONDITIONAL [redacted] ID [redacted]
- [redacted] History-Info [redacted]
- [redacted] 61412345678 [redacted] CFU [redacted] 61487654321 - [redacted]

[redacted] 2 [redacted]/[redacted]

[redacted]

[redacted]

```

<!-- MSRN  IMS ... -->
<action application="log" data="INFO MSRN - MSRN" />

<!-- History-Info ... -->
<action application="set" data="sip_h_History-Info=<sip:${destination

<!-- ... -->
<action application="bridge"
  data="
{absolute_codec_string='AMR,PCMU,PCMA',originate_timeout=65}sofia/gat
/>

```

MSRN

- MSRN 61412345678 CFNRy MSRN 61487654321
- MSRN
- 20 MSRNno_reply_timer
- MSRN 61487654321 MSRN History-Info

History-Info

History-Info SIP

```

<action application="set" data="sip_h_History-Info=
<sip:${destination_number}@${ims_domain}>;index=1.1" />

```

MSRN

- MSRN \${destination_number}
- MSRN
- MSRN

MSRN

```

<extension name="Voicemail Route" continue="false">
  <condition field="{tas_destination_number}"
expression="^(555121|555122)$">
  <!-- History Info -->
  <action application="set"
data="history_info_value={sip_i_history_info}"/>
  <action application="log" data="DEBUG {history_info_value}" />

  <!-- -->
  <action application="voicemail" data="default default
{history_info_value}"/>
</condition>
</extension>

```

History Info

- History Info field 555121 | 555122
- History-Info application
- History-Info data
- History-Info application

Configuration

1. **none** - `^(?!none$).*` none
2. **History-Info** - application
3. **continue_on_fail** - application
4. **CLI** - ID
5. - application

ID (CLI)

TAS (CLI) application

CLI 設定

設定項目の CLI コマンド

項目名	説明	設定値
<code>msisdn</code>	電話番号 +	"61412345678"
<code>effective_caller_id_number</code>	発信元番号	"+61412345678" 〇 "anonymous"
<code>effective_caller_id_name</code>	発信元名前	"+61412345678" 〇 "anonymous"
<code>origination_caller_id_number</code>	発信元 CLI	"+61412345678"
<code>caller_id_number</code>	FreeSWITCH CLI 発信元番号	"+61412345678"
<code>sip_from_user</code>	SIP From 発信元番号	"0412345678" 〇 "+61412345678"
<code>cli_withheld</code>	発信元番号非表示	"true" 〇 "false" 〇〇〇 〇〇
<code>origination_privacy</code>	発信元番号非表示	"hide_number"

CLI 設定コマンド/例

設定

TAS 設定項目の CLI コマンド

1. 発信元番号非表示

発信元番号非表示の ID

設定

- *67 - 匿名
- #31# - GSM 匿名
- 1831 - 匿名

TAS 匿名 CLI cli_withheld "true"

*67555 1234 - *67 5551234 CLI

2. From 匿名

(UE) SIP From "anonymous"

TAS Caller-Orig-Caller-ID-Name "anonymous"
cli_withheld "true"

3. SIP 匿名

S-CSCF SIP INVITE Privacy: id

cli_withheld CLI


```

<extension name="Outgoing-Call-CLI-National" continue="true">
  <condition field="{msisdn}" expression="^61(.*)$">
    <action application="log" data="CLI $1" />
    <action application="set"
data="effective_caller_id_number=$1"/> <!-- 0412345678 -->
    <action application="set" data="effective_caller_id_name=$1"/>
    <action application="set" data="sip_from_user=$1"/>
    <action application="set" data="sip_cid_type=pid"/>
  </condition>
</extension>

```

□□□□

- □□□□ ^61(.*)\$ □□□□ 61 □□□□
- □□: msisdn="61412345678" → □□: \$1="412345678" □ "0412345678"
- □□□□□□□□□□□□□□ CLI

□□□□□□

□□□□□□□□□□□□ E.164 □□□□ CLI□□□ + □□□

□□□□□□□□

```

<extension name="Outgoing-Call-CLI-International" continue="true">
  <condition field="{tas_destination_number}"
expression="^61(.*)$">
    <action application="log" data="□□□□□□" />

    <!-- □□□□□□□□□□□□□□ -->
    <anti-action application="log" data="□□□□□□ CLI" />
    <anti-action application="set"
data="effective_caller_id_number=+{msisdn}"/> <!-- +61412345678
-->
    <anti-action application="set"
data="effective_caller_id_name=+{msisdn}"/>
    <anti-action application="set"
data="sip_from_user=+{msisdn}"/>
    <anti-action application="set" data="sip_cid_type=pid"/>
  </condition>
</extension>

```


- SIP P-Asserted-Identity
- IMS ID
- IMS

Configuration

Configuration for SIP P-Asserted-Identity

Configuration for IMS

```
<action application="set" data="sip_copy_multipart=false"/>
<action application="set" data="sip_copy_custom_headers=false"/>
<action application="unset" data="sip_h_P-Internal-Correlation-ID"/>
<action application="unset" data="sip_h_P-Access-Network-Info"/>
<!-- Configuration -->
```

Steps

- Configuration
- Configuration
- Configuration
- SIP

Configuration

- ID
- Configuration
- P
- Configuration

CLI

1. CLI `continue="true"` - CLI
2. `sip_cid_type=pid` - IMS
3. CLI `*67` `#31#`

4. 設定 - CLI
5. 設定 -
6. 設定 - CLI

設定

TAS の FreeSWITCH の `bridge` を IMS と PSTN を

設定

SIP の TAS の SIP を

```
<gateway name="CS_Gateway">
  <param name="proxy" value="10.1.1.100:5060"/>
  <param name="register" value="false"/>
  <param name="caller-id-in-from" value="true"/>
  <param name="extension-in-contact" value="true"/>
</gateway>
```

設定

設定

```
<action application="bridge"
  data="sofia/gateway/GATEWAY_NAME/DESTINATION_NUMBER" />
```

```
<action application="bridge" data="
{param1=value1,param2=value2}sofia/gateway/GATEWAY_NAME/DESTINATION_M
/>
```

GATEWAY_NAME IMS_Core PSTN_Primary
International_Gateway

absolute_codec_string -

```
<action application="bridge" data="
{absolute_codec_string='AMR,PCMA,PCMU'}sofia/gateway/IMS_Gateway/+$n
/>
```

1. **AMR** -
2. **PCMA** G.711 a-law -
3. **PCMU** G.711 μ-law -

priv/templates/mt_dialplan.xml:80 mo_dialplan.xml:124
mo_dialplan.xml:202

originate_timeout -

```
<action application="set" data="originate_timeout=60"/>
<action application="bridge" data="
{originate_timeout=60}sofia/gateway/CS_Gateway/+$msisdn" />
```

progress_timeout - 180/183

```
<action application="set" data="progress_timeout=10" />
```

bridge_answer_timeout - 200 OK

```
<action application="set" data="bridge_answer_timeout=${no_reply_timer}" />
```

leg_progress_timeout -

```
<action application="set" data="leg_progress_timeout=${no_reply_timer}" />
```

priv/templates/mt_dialplan.xml:73-76

```
<action application="set" data="progress_timeout=10" />
<!-- INVITE 200 OK -->
<action application="set" data="bridge_answer_timeout=${no_reply_timer}" />
<action application="set" data="leg_progress_timeout=${no_reply_timer}" />
```

bridge_answer_timeout 20-30

originate_retries -

```
<action application="bridge" data="{originate_retries=1}sofia/gateway/CS_Gateway/${msisdn}" />
```

continue_on_fail -

```
<action application="set" data="continue_on_fail=true" />
<action application="bridge" data="
{continue_on_fail=true}sofia/gateway/CS_Gateway/${msisdn}" />
<!-- 0000000000000000 -->
<action application="log" data="INFO 0000 - 00000000" />
```

hangup_after_bridge - B-leg 000000 A-leg

```
<action application="set" data="hangup_after_bridge=true"/>
```

000000

ignore_early_media - 0000000000

```
<action application="set" data="ignore_early_media=ring_ready" />
<action application="bridge" data="
{ignore_early_media=ring_ready}sofia/gateway/CS_Gateway/${msisdn}"
/>
```

000

- **ring_ready** - 0000000000000000
- **true** - 00000000
- **false** 0000 - 00000000000000

00000 **ring_ready** - 0000000000000000000000

00000 **priv/templates/mt_dialplan.xml:78-79**

```
<action application="set" data="ignore_early_media=ring_ready" />
<action application="bridge" data="
{ignore_early_media=ring_ready,...}sofia/gateway/CS_Gateway/${msrn}"
/>
```

On-net 0 **Off-net** 000000


```

<extension name="Route-to-IMS-Sub" continue="false">
  <condition field="destination_number" expression="^(.*)$">
    <action application="set" data="continue_on_fail=true" />
    <action application="set" data="hangup_after_bridge=true"/>
    <action application="set" data="progress_timeout=10" />

    <!-- INVITE 200 OK  -->
    <action application="set" data="bridge_answer_timeout=${no_reply_t
    <action application="set" data="leg_progress_timeout=${no_reply_t

    <!-- IMS S-CSCF  -->
    <action application="set" data="ignore_early_media=ring_ready" />
    <action application="set" data="sip_cid_type=pid" />

    <action application="bridge"
      data="{absolute_codec_string='AMR-
WB,AMR,PCMA,PCMU',ignore_early_media=ring_ready,continue_on_fail=true
/>

    <!--  -->
    <action application="log" data="INFO  -  " />
    <action application="set" data="sip_h_History-Info=<sip:${destina
    <action application="set" data="sip_h_Diversion=<sip:${destinatio

    <!--  -->
    <action application="bridge"
      data="{absolute_codec_string='AMR-WB,AMR,PCMU,PCMA',originate_t
    </condition>
  </extension>

```

□□□□

- □□□ □{msisdn}@□{ims_domain}□□□□
5551234567@ims.mnc380.mcc313.3gppnetwork.org□
- IMS □□□S-CSCF/I-CSCF□□□□□□□□□□
- ignore_early_media=ring_ready □□□□□□□□□□
- □□□□□□□□□□□□□□□□
- □□ History-Info □ Diversion □□□□□□□□□□

□□ 2□□□□ MSRN□CS □□□□

CS

priv/templates/mt_dialplan.xml:67-80

```

<extension name="Route-to-CS-MSRN" continue="false">
  <condition field="msrn" expression="^\d+$">
    <action application="set" data="continue_on_fail=true" />
    <action application="set" data="hangup_after_bridge=true"/>
    <action application="set" data="progress_timeout=10" />
    <action application="set" data="bridge_answer_timeout=${no_reply_
    <action application="set" data="leg_progress_timeout=${no_reply_t

    <!-- MSRN -->
    <action application="set" data="ignore_early_media=ring_ready" />
    <action application="set" data="sip_cid_type=pid" />
    <action application="bridge"
      data="
{ignore_early_media=ring_ready,absolute_codec_string='AMR,PCMA,PCMU',
/>
  </condition>
</extension>

```

3 On-Net MO MT TAS

TAS MT MT

TAS MT

-
-
- MSRN
-
- CDR

MO TAS MT

```

<extension name="On-Net-Route">
  <condition field="{on_net_status}" expression="true">
    <action application="log" data="DEBUG On-Net MO - TAS" />

    <!-- TAS -->
    <action application="set" data="sip_copy_multipart=false"/>
    <action application="set" data="sip_h_Request-Disposition=no-fork

    <!-- TAS MT -->
    <action application="bridge"
      data="{absolute_codec_string='AMR-
WB,AMR,PCMA,PCMU',originate_retries=1,originate_timeout=60,sip_invite
/>
    <action application="hangup" data="" />
  </condition>
</extension>

```

配置

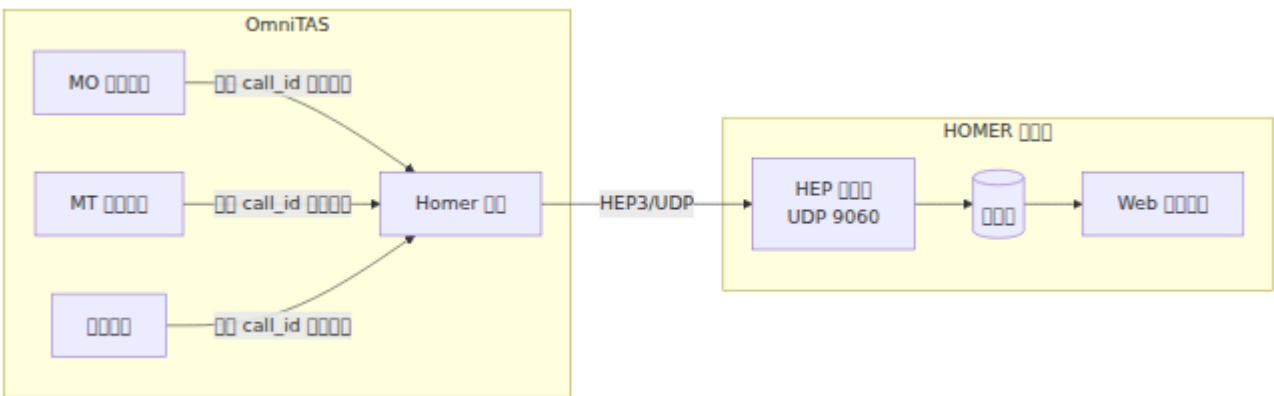
- MO** 配置 A 配置 B
- 配置 **On-Net** TAS 配置 `{on_net_status}`
- 配置 **TAS**
 - 配置 TAS IP
 - 配置 ID
- MT** TAS 配置 MT 配置 `mt_dialplan.xml`
 - 配置

HOMER

OmniTAS SIP Call-ID

□□

OmniTAS UDP HEP3 Homer HOMER SIP Call-ID SIP



□□□□

- OmniTAS SIP Call-ID
- Homer PubSub
- call_id
- HEP3 100 HEP3
- HOMER Call-ID SIP

□□

homer_server config/runtime.exs

```

config :tas,
  homer_server: %{
    host: "10.179.2.136",
    port: 9060,
    auth_key: nil,
    capture_id: 2001
  }

```

□□

□□	□□	□ □	□□	□□
host	□□ □	□	-	HOMER □□ IP □□□□□□
port	□□	□	9060	HEP □□ UDP □□
auth_key	□□ □	□	nil	□□ HEP □□□□□□□□□□□□□□□□ heplify-server □□□□ authkey □□
capture_id	□□	□	2001	□□□□□□□□ HOMER □□□□□□□□□□□□

□□ HOMER □□

□□□ HOMER □□□□□□

- □□□□ homer_server □□□□
- □□□□□□

□□□□Homer □□□□□□□□□□□□□□□□

HOMER □□□□□□

HOMER □□□□□□□ heplify-server□□□□ UDP □□□□ HEP □□□□

heplify-server

heplify-server.toml

```
HEPAddr = "0.0.0.0:9060"
```

OmniTAS 100 heplify-server logs_capture HOMER

B2BUA (X-CID)

OmniTAS B2BUA SIP Call-ID HOMER X-CID

1. TAS MO original_call_id UE A-leg SIP Call-ID
2. MO sip_h_X-CID=\${original_call_id} B-leg INVITE
3. MT INVITE \${sip_h_X-CID}
4. B-leg INVITE UE Call-ID X-CID

```
UE INVITE (Call-ID: abc@ue)
-> S-CSCF -> TAS (MO)
-> B-leg INVITE (Call-ID: fs-123, X-CID: abc@ue) <-
-> TAS (MT)
-> B-leg INVITE (Call-ID: fs-456, X-CID: abc@ue) <- MT
-> S-CSCF ->
```

Call-ID abc@ue fs-123 fs-456 HOMER

XXXXXXXXXX

X-CID XXXXX XXXXXXXXXXXXXXXX set XXXX sip_copy_custom_headers=false XXXX
set XXXX XXXX sip_h_ XXXX

MO XXXXXXXXXXXXXXXX

```
<action application="bridge" data="{sip_h_X-
CID=${original_call_id},...}sofia/internal/${tas_destination_number}@
/>
```

MO XXXXXXXXXXXXXXXX

```
<action application="bridge" data="{sip_h_X-
CID=${original_call_id},...}sofia/gateway/trunk/${tas_destination_num
/>
```

MT XXXXXXXXXXXXXXXX -- XXXX **MO** XXXXXXXX **X-CID** XXXX

```
<action application="bridge" data="{sip_h_X-CID=${sip_h_X-
CID},...}sofia/internal/${tas_destination_number}@${domain}" />
```

heplify-server XXXX

HOMER heplify-server XXXXXXXXXXXXXXXX X-CID XXXX

```
AlegIDs = ["X-CID"]
CustomHeader = ["X-CID"]
SIPHeader =
["callid","callid_aleg","method","ruri_user","from_user","to_user","v
```

- **AlegIDs** XXXX heplify-server XXXX X-CID XXXX A-leg Call-ID XXXXXXXXXXXXXXXX **callid_aleg** XXXX
- **CustomHeader** XXXX X-CID XXXX data_header JSON XXXXXXXX
- **SIPHeader** XXXX **callid_aleg** XXXX HOMER XXXXXXXXXXXXXXXX

XXXX heplify-server.toml XXXXXXXX **systemctl restart heplify-server**

□□□□

□□ **Call-ID** □□

OmniTAS □□□□□□◆◆□□ Call-ID □□□□□□□□□□

- **MO** □□□□□□□□□□□□□□□□
- **MT** □□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□

□□□□

□□□ HOMER □□□□□□

□□	□□
□□ ID	□□□□□□□ SIP Call-ID
□□□	□□□□□□□□
□□	□□□□□□□□□□□□□□□□□□
□□	□□□□□□□
□ IP	OmniTAS □□□ IP □□
□□ ID	□□□□□□□□□□

HOMER □□□□□□

□□□□□□□□HOMER □□□□□□□□

```
[info] 61400123456 <61400654321> MO
[debug] 61400123456
[info] OCS: 120
[debug] hangup_case = none
```

SIP INVITE 200 OK BYE HOMER

HEP3

OmniTAS HOMER HEP3 Kamailio siptrace

□□□□□□

□ ID	□□	□□
0x0001	IP □□	□□□ 2□IPv4□
0x0002	IP □□	□□□ 17□UDP□
0x0003	□ IPv4	OmniTAS □□□□□
0x0004	□□ IPv4	HOMER □□□□□
0x0007	□□□	0□□□□□□□□
0x0008	□□□□	□□□ HEP □□
0x0009	□□□□	Unix □□□□
0x000A	□□□□□	□□□□
0x000B	□□□□	100□□□□
0x000C	□□ ID	□□□ capture_id
0x0011	□□ ID	SIP Call-ID
0x000F	□□□□	□□□□
0x000E	□□□□	□□□□□

□□□□

□□□□□□ **HOMER** □

□□□□□□□□□□ HOMER □□□□□□□

1. `Call-ID` `SIP Call-ID`
2. `HOMER logs_capture`

`HOMER`

OmniTAS

`HEP`

```
[warning] HEP Homer: <reason>
```

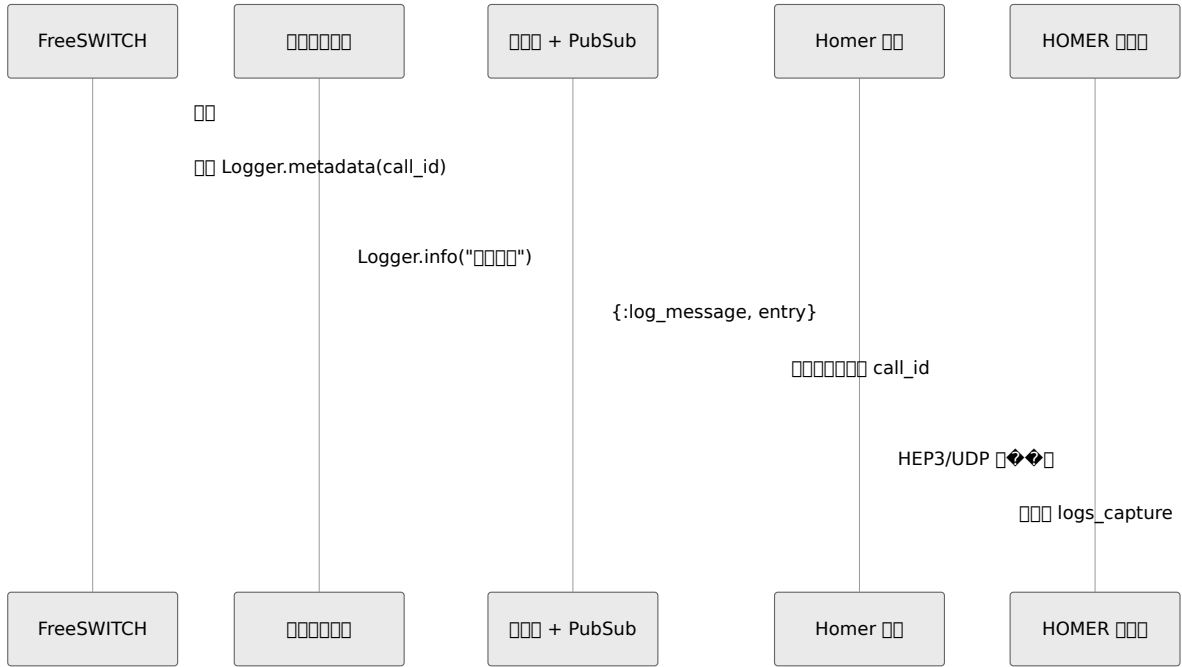
heplify-server

`heplify-server` `Prometheus`

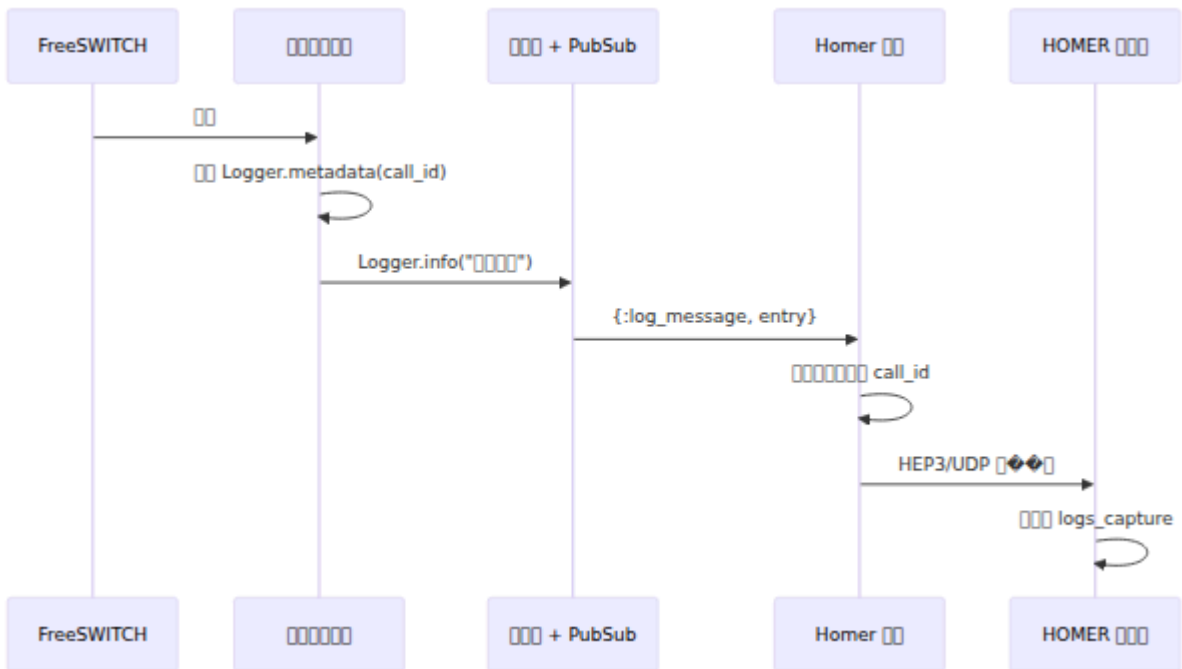
- `heplify_packets_total{type="log"}` -
- `heplify_packets_dropped_total` -

□□□□

□□□□



□□□





- HOMER ☐☐ - ☐☐ VoIP/RTC ☐☐☐☐
- HEP ☐☐☐☐ - HEP/EEP ☐☐☐☐
- heplify-server - HEP ☐☐☐☐



IMS Prometheus



- IMS
- 9090 - IMS
 - IMS
 - IMS
 - IMS
 - IMS
 - IMS
 - IMS
 - IMS
 - IMS
 - Sofia IMS
 - IMS
- 8080 - TAS
 - IMS
 - Diameter IMS
 - IMS
 - IMS OCS
 - IMS
 - IMS
 - IMS
 - IMS
 - Erlang Mnesia IMS
 - Erlang VM IMS
 - Erlang VM IMS
 - Erlang VM IMS
 - Erlang VM IMS MSACC
 - Erlang VM IMS

- 9093 - `esl`
 - RTP - `esl`
 - RTP - `esl`
 - RTP - `esl`
 - RTP - `esl`
 - RTCP
- Go
- `esl`
- Prometheus HTTP
- `esl`
- `esl`
- `esl`
- `esl`
- Grafana
- `esl`
- `esl`
- `esl`
- `esl`

esl

esl	esl	esl	esl
9090	<code>/metrics</code>	<code>esl</code>	9090 →
8080	<code>/metrics</code>	TAS Diameter HLR OCS Erlang VM	8080 →
9093	<code>/esl? module=default</code>	RTP/RTCP	9093 →

9090 -

freeswitch_bridged_calls	9090	
freeswitch_detailed_bridged_calls	9090	
freeswitch_current_calls	9090	
freeswitch_detailed_calls	9090	
freeswitch_current_channels	9090	
freeswitch_current_sessions	9090	
freeswitch_current_sessions_peak	9090	
freeswitch_current_sessions_peak_last_5min	9090	
freeswitch_sessions_total	9090	
freeswitch_current_sps	9090	
freeswitch_current_sps_peak	9090	
freeswitch_current_sps_peak_last_5min	9090	
freeswitch_max_sessions	9090	
freeswitch_max_sps	9090	

配置参数

配置项	类型	描述
<code>freeswitch_current_idle_cpu</code>	9090	当前CPU空闲百分比
<code>freeswitch_min_idle_cpu</code>	9090	最低CPU空闲百分比
<code>freeswitch_uptime_seconds</code>	9090	运行时间(秒)
<code>freeswitch_time_synced</code>	9090	时间同步状态 1=同步 0=不同步

内存

配置项	类型	描述
<code>freeswitch_memory_arena</code>	9090	mmapped malloc arena
<code>freeswitch_memory_ordblks</code>	9090	ordblks
<code>freeswitch_memory_smblocks</code>	9090	fastbin
<code>freeswitch_memory_hblocks</code>	9090	hblocks
<code>freeswitch_memory_hblkhd</code>	9090	hblkhd
<code>freeswitch_memory_usmblocks</code>	9090	usmblocks
<code>freeswitch_memory_fsmblocks</code>	9090	fastbins
<code>freeswitch_memory_uordblks</code>	9090	uordblks
<code>freeswitch_memory_fordblks</code>	9090	fordblks
<code>freeswitch_memory_keepcost</code>	9090	keepcost

Codec

Codec	Port	Options
freeswitch_codec_status	9090	key name type=1

Codec List

- G.711 alaw/ulaw
- PROXY PASS-THROUGH
- PROXY VIDEO PASS-THROUGH
- RAW Signed Linear (16 bit)
- Speex
- VP8/VP9 Video
- AMR variants
- B64
- G.723.1, G.729, G.722, G.726 variants
- OPUS
- MP3
- ADPCM, GSM, LPC-10

Endpoint

Endpoint	Port	Options
freeswitch_endpoint_status	9090	key name type=1

Endpoint List

- error, group, pickup, user (mod_dptools)
- loopback, null (mod_loopback)
- rtc (mod_rtc)

- rtp, sofia (mod_sofia)
- modem (mod_spandsp)

配置

配置项	值	说明
freeswitch_load_module	9090	加载模块1=加载0=模块名module

模块

- mod_sofia (SIP)
- mod_conference, mod_conference_ims
- mod_opus, mod_g729, mod_amr, ...
- mod_event_socket
- mod_dptools
- mod_python3
- mod_rtc
- ...

注册

配置项	端口	说明
freeswitch_registrations	9090	注册
freeswitch_registration_details	9090	注册详情: expires, hostname, network_ip, network_port, network_proto, realm, reg_user, token, url

Sofia□□□□

□□□□	□□	□□
freeswitch_sofia_gateway_status	9090	□□□□□□□□context, name, profile, proxy, scheme, status (UP/DOWN)
freeswitch_sofia_gateway_call_in	9090	□□□□□□□□□□
freeswitch_sofia_gateway_call_out	9090	□□□□□□□□□□
freeswitch_sofia_gateway_failed_call_in	9090	□□□□□□□□
freeswitch_sofia_gateway_failed_call_out	9090	□□□□□□□□
freeswitch_sofia_gateway_ping	9090	□□□□ping□□□□Unix □□□
freeswitch_sofia_gateway_pingtime	9090	□□□□ping□□□□□□
freeswitch_sofia_gateway_pingfreq	9090	ping□□□□□□
freeswitch_sofia_gateway_pingcount	9090	□□□ping□□
freeswitch_sofia_gateway_pingmin	9090	□□□□□ping□□
freeswitch_sofia_gateway_pingmax	9090	□□□□□ping□□

Diameter□□□□

□□□□	□□	□□
<code>diameter_peer_state</code>	8080	Diameter □□□□□□ □1=□□□□0=□□□□□□□□ peer_host, peer_realm, application
<code>diameter_requests_total</code>	8080	Diameter □□□□□□□□□□ □□
<code>diameter_responses_total</code>	8080	Diameter □□□□□□□□□□ □□
<code>diameter_response_duration_milliseconds</code>	8080	Diameter □□□□□□□□□□ □□□□□□□□

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○○○○	○○	○○
hlr_lookups_total	8080	HLR○○○○○○○○○○○○○○
hlr_data_duration_milliseconds	8080	HLR○○○○○○○○○○○○○○○○ ○○○
subscriber_data_lookups_total	8080	○○○○○○○○○○○○○○○○○○
subscriber_data_duration_milliseconds	8080	Sh○○○○○○○○○○○○○○○○○○ ○○○○○
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	○○○○○○○○○○○○○○○○

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□□□□	□□	□□
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	□□□□□□□□□□ □□□□□□□□□□

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event_socket_connected	8080	□□□□□□□□□□1=□□□□0=□□ □□□□□□connection_type
event_socket_reconnections_total	8080	□□□□□□□□□□□□□□□□ □□□□□□connection_type, result
event_socket_commands_total	8080	□□□□□□□□□□□□□□□□□□ □□command_type, result
event_socket_command_timeouts_total	8080	□□□□□□□□□□□□□□□□□□ □□command_type

options

- `uuid_setvar`, `uuid_dump`, `uuid_kill`, `uuid_transfer`
- `uuid_set_media_stats`
- `sched_hangup`, `sched_transfer`
- `vm_boxcount`
- `status`, `echo`, `show`, `sofia`

args

- `success`: `int`
- `timeout`: `int`
- `error`: `int`

return

name	type	description
<code>feature_invocations_total</code>	<code>8080</code>	TAS <code>feature_invocations_total</code> , <code>call_type</code> , <code>result</code>
<code>feature_data_source_total</code>	<code>8080</code>	<code>feature_data_source_total</code> , <code>feature</code> , <code>source</code>

enums

- `call_forward_all` - `int`
- `call_forward_not_reachable` - `int`
- `call_forward_no_reply` - `int`
- `call_barring` - `enum` OCS
- `cli_withheld` - CLI `enum`

enums `mo`, `mt`

enums `sh_interface`, `hlr`, `config_fallback`

enums `success`, `error`, `skipped`

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sms_trigger_attempts_total	8080	□□□□□□□□□□□□□□□□□□ trigger_type, result
sms_trigger_errors_total	8080	□□□◆◆◆□□□□□□□□□□□□□□□□ trigger_type, error_stage
smsc_requests_total	8080	SMSC HTTP□□□□□□□□□□□□□□□□ message_type, result

□□□□□ voicemail_deposit, voicemail_clear

□□□□□ vm_boxcount, template_render, smsc_request

□□□□□ notification, mwi

□□□□□ success, error

Erlang Mnesia

名前	型	説明
<code>erlang_mnesia_held_locks</code>	8080	保持中のロック
<code>erlang_mnesia_lock_queue</code>	8080	ロック待ちのキュー
<code>erlang_mnesia_transaction_participants</code>	8080	トランザクション参加者
<code>erlang_mnesia_transaction_coordinators</code>	8080	トランザクション調整者
<code>erlang_mnesia_failed_transactions</code>	8080	失敗したトランザクションのリスト リスト
<code>erlang_mnesia_committed_transactions</code>	8080	コミットされたトランザクション
<code>erlang_mnesia_logged_transactions</code>	8080	ログされたトランザクション
<code>erlang_mnesia_restarted_transactions</code>	8080	再実行されたトランザクション
<code>erlang_mnesia_memory_usage_bytes</code>	8080	Mnesiaのメモリ使用量 バイト
<code>erlang_mnesia_tablewise_memory_usage_bytes</code>	8080	Mnesiaのテーブルごとのメモリ使用量 バイトtable
<code>erlang_mnesia_tablewise_size</code>	8080	テーブルごとのサイズtable

Erlang VM

名前	単位	説明
<code>erlang_vm_memory_atom_bytes_total</code>	8080	Atom memory usage [used/free]
<code>erlang_vm_memory_bytes_total</code>	8080	VM memory kind [system/processes]
<code>erlang_vm_memory_dets_tables</code>	8080	DETS tables
<code>erlang_vm_memory_ets_tables</code>	8080	ETS tables
<code>erlang_vm_memory_processes_bytes_total</code>	8080	Process memory usage [used/free]
<code>erlang_vm_memory_system_bytes_total</code>	8080	System memory usage [atom/binary/code/ets/]

Erlang VM

VM Statistics	Unit	Value
<code>erlang_vm_statistics_bytes_output_total</code>	Bytes	8080
<code>erlang_vm_statistics_bytes_received_total</code>	Bytes	8080
<code>erlang_vm_statistics_context_switches</code>	Count	8080
<code>erlang_vm_statistics_dirty_cpu_run_queue_length</code>	Count	8080
<code>erlang_vm_statistics_dirty_io_run_queue_length</code>	Count	8080
<code>erlang_vm_statistics_garbage_collection_number_of_gcs</code>	Count	8080

名称	单位	类型
		计数 计数
<code>erlang_vm_statistics_garbage_collection_bytes_reclaimed</code>	8080	计数 计数 计数 计数 计数
<code>erlang_vm_statistics_garbage_collection_words_reclaimed</code>	8080	计数 计数 计数 计数 计数
<code>erlang_vm_statistics_reductions_total</code>	8080	计数 计数 计数 计数
<code>erlang_vm_statistics_run_queues_length</code>	8080	计数 计数 计数
<code>erlang_vm_statistics_runtime_milliseconds</code>	8080	计数 计数 计数 计数 计数 计数
<code>erlang_vm_statistics_wallclock_time_milliseconds</code>	8080	计数 计数 计数 计数

Erlang VM

名前	デフォルト値	説明
<code>erlang_vm_dirty_cpu_schedulers</code>	8080	CPUスケジューラ
<code>erlang_vm_dirty_cpu_schedulers_online</code>	8080	オンラインCPUスケジューラ
<code>erlang_vm_dirty_io_schedulers</code>	8080	I/Oスケジューラ
<code>erlang_vm_ets_limit</code>	8080	ETSテーブルの最大数
<code>erlang_vm_logical_processors</code>	8080	論理的プロセッサの数
<code>erlang_vm_logical_processors_available</code>	8080	利用可能な論理的プロセッサの数
<code>erlang_vm_logical_processors_online</code>	8080	オンライン論理的プロセッサの数
<code>erlang_vm_port_count</code>	8080	ポートの数
<code>erlang_vm_port_limit</code>	8080	ポートの最大数
<code>erlang_vm_process_count</code>	8080	プロセスの数
<code>erlang_vm_process_limit</code>	8080	プロセスの最大数
<code>erlang_vm_schedulers</code>	8080	スケジューラ
<code>erlang_vm_schedulers_online</code>	8080	オンラインスケジューラ
<code>erlang_vm_smp_support</code>	8080	SMPサポートの有無 (1:サポートあり, 0:サポートなし)
<code>erlang_vm_threads</code>	8080	スレッドの数 (0:無制限)
<code>erlang_vm_thread_pool_size</code>	8080	スレッドプールサイズ

名前	値	説明
<code>erlang_vm_time_correction</code>	8080	1から0までの範囲
<code>erlang_vm_wordsize_bytes</code>	8080	Erlangのワードサイズ
<code>erlang_vm_atom_count</code>	8080	アトム数の制限
<code>erlang_vm_atom_limit</code>	8080	アトム数の制限

Erlang VMのMSAC

型名, id

項目名	単位	説明
erlang_vm_msacc_aux_seconds_total	8080	補助的な処理に消費された時間
erlang_vm_msacc_check_io_seconds_total	8080	IOチェックに消費された時間
erlang_vm_msacc_emulator_seconds_total	8080	Erlangの仮想マシンに消費された時間
erlang_vm_msacc_gc_seconds_total	8080	ガベージコレクションに消費された時間
erlang_vm_msacc_other_seconds_total	8080	その他の処理に消費された時間
erlang_vm_msacc_port_seconds_total	8080	ポート操作に消費された時間
erlang_vm_msacc_sleep_seconds_total	8080	スリープに消費された時間
erlang_vm_msacc_alloc_seconds_total	8080	メモリ割り当てに消費された時間
erlang_vm_msacc_bif_seconds_total	8080	BIFsの実行に消費された時間
erlang_vm_msacc_busy_wait_seconds_total	8080	バジーウェイトに消費された時間
erlang_vm_msacc_ets_seconds_total	8080	ETSとBIFsの操作に消費された時間
erlang_vm_msacc_gc_full_seconds_total	8080	フルGCに消費された時間
erlang_vm_msacc_nif_seconds_total	8080	NIFsの実行に消費された時間
erlang_vm_msacc_send_seconds_total	8080	送信に消費された時間
erlang_vm_msacc_timers_seconds_total	8080	タイマーに消費された時間

Erlang VM

alloc, instance_no, kind, usage

name	pid	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

name	pid	usage
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 -

項目名	値	単位
rtp_audio_in_raw_bytes_total	9093	バイト
rtp_audio_out_raw_bytes_total	9093	バイト
rtp_audio_in_media_bytes_total	9093	バイト
rtp_audio_out_media_bytes_total	9093	バイト

RTPパケット - パケット数

項目名	値	単位
rtp_audio_in_packets_total	9093	パケット
rtp_audio_out_packets_total	9093	パケット
rtp_audio_in_media_packets_total	9093	パケット
rtp_audio_out_media_packets_total	9093	パケット
rtp_audio_in_skip_packets_total	9093	パケット
rtp_audio_out_skip_packets_total	9093	パケット

RTPパケット - パケット数

項目名	単位	説明
rtp_audio_in_jitter_packets_total	9093	合計のジッターパケット数
rtp_audio_in_dtmf_packets_total	9093	合計のDTMFパケット数
rtp_audio_out_dtmf_packets_total	9093	合計のDTMFパケット数
rtp_audio_in_cng_packets_total	9093	合計のCNGパケット数
rtp_audio_out_cng_packets_total	9093	合計のCNGパケット数
rtp_audio_in_flush_packets_total	9093	合計のフラッシュパケット数

RTP - 統計項目

項目名	単位	説明
rtp_audio_in_jitter_buffer_bytes_max	9093	最大のジッターバッファバイト数
rtp_audio_in_jitter_seconds_min	9093	最小のジッター秒数
rtp_audio_in_jitter_seconds_max	9093	最大のジッター秒数
rtp_audio_in_jitter_loss_rate	9093	ジッター損失率
rtp_audio_in_jitter_burst_rate	9093	ジッターバースト率
rtp_audio_in_mean_interval_seconds	9093	平均ジッター間隔秒数
rtp_audio_in_flaw_total	9093	合計のフラウパケット数
rtp_audio_in_quality_percent	9093	品質率 (0-100%)
rtp_audio_in_quality_mos	9093	平均モーションスコア (1-5)

RTCP

名前	値	単位
rtcp_audio_bytes_total	9093	RTCP
rtcp_audio_packets_total	9093	RTCP

Go

變數名	類型	說明
<code>go_goroutines</code>	9090	goroutine 的數量
<code>go_threads</code>	9090	正在執行的 goroutine 數量
<code>go_info</code>	9090	Go 的各種資訊
<code>go_gc_duration_seconds</code>	9090	垃圾回收的總時間
<code>go_memstats_alloc_bytes</code>	9090	堆棧的總大小
<code>go_memstats_alloc_bytes_total</code>	9090	堆棧的總大小 (包含已釋放)
<code>go_memstats_heap_alloc_bytes</code>	9090	堆棧的總大小
<code>go_memstats_heap_idle_bytes</code>	9090	堆棧的閒置大小
<code>go_memstats_heap_inuse_bytes</code>	9090	堆棧的已使用大小
<code>go_memstats_heap_objects</code>	9090	堆棧的物件數量
<code>go_memstats_heap_released_bytes</code>	9090	堆棧的已釋放大小
<code>go_memstats_heap_sys_bytes</code>	9090	堆棧的系統大小
<code>go_memstats_sys_bytes</code>	9090	堆棧的系統大小

进程

名称	类型	描述
<code>process_cpu_seconds_total</code>	9090	进程消耗的CPU时间
<code>process_max_fds</code>	9090	进程打开的文件描述符的最大数量
<code>process_open_fds</code>	9090	进程当前打开的文件描述符数量
<code>process_resident_memory_bytes</code>	9090	进程的常驻内存大小
<code>process_virtual_memory_bytes</code>	9090	进程的虚拟内存大小
<code>process_virtual_memory_max_bytes</code>	9090	进程的虚拟内存最大限制
<code>process_start_time_seconds</code>	9090	进程在Unix时间戳下的启动时间

Prometheus HTTP

名称	类型	描述
<code>promhttp_metric_handler_requests_in_flight</code>	9090	当前正在处理的HTTP请求数
<code>promhttp_metric_handler_requests_total</code>	9090	处理的HTTP请求总数

↑ 进程

指标

- gauge:** `current_calls`, `cpu_idle`
- counter:** `sessions_total`, `failed_scrapes`

- **summary:** `gc_duration_seconds`
-

↑ `gc`

`gc`

Prometheus

```
scrape_configs:  
  - job_name: 'ims_as_system'  
    static_configs:  
      - targets: ['localhost:9090']  
  
  - job_name: 'ims_as_engine'  
    static_configs:  
      - targets: ['localhost:8080']  
    metrics_path: '/metrics'  
  
  - job_name: 'ims_as_media'  
    static_configs:  
      - targets: ['localhost:9093']  
    metrics_path: '/esl'  
    params:  
      module: ['default']
```

↑ `gc`

`gc`

`gc`

- `9090`
- `9093`
- `TAS 8080`

□□□□

□□□□□□

```
freeswitch_current_calls
```

□□□□□

```
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 95th

```
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

```
erlang_vm_memory_bytes_total
```

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

```
erlang_vm_statistics_run_queues_length
```

ETS

```
erlang_vm_memory_ets_tables
```

HTTP

```
histogram_quantile(0.5,  
http_dialplan_request_duration_milliseconds)
```

↑

Grafana

Grafana Prometheus

1

- active_calls

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

2

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

3

- HLR
- OCS
- Diameter

4

- `rtp_audio_in_quality_mos`
- `rtp_audio_in_quality_percent`
-
-

5

- Erlang VM
- Erlang VM
- ETS
-
-

6

-

- 0000
- 0000000000
- Mnesia0000

000000

0000000000

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

P950000000000⚡⚡⚡

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

Diameter0000

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

0000 - 00**MOS**

```
avg(rtp_audio_in_quality_mos)
```

↑ 0000

00000

00000000000000

0000 - 000000

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

Diameter[redacted]

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

[redacted]

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

[redacted]

[redacted]Diameter[redacted]

```

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:
    summary: "OCS"
    description: "{{ $value | humanizePercentage }}"

```



```

alert: HighCallRejectionRate
expr: |
    rate(call_rejections_total[5m]) /
    rate(call_attempts_total[5m]) > 0.05
for: 5m
labels:
    severity: high
annotations:
    summary: ""5%"
    description: "{{ $value | humanizePercentage }}"

```

##

```
alert: PoorMediaQuality
expr: avg(rtp_audio_in_quality_mos) < 3.5
for: 3m
labels:
  severity: high
annotations:
  summary: "Audio quality is poor"
  description: "Average MOS is {{ $value }}"
```

Audio quality is poor

Average MOS is 3.2

```
alert: HighMemoryUsage
expr: |
  erlang_vm_memory_bytes_total{kind="processes"} /
  (erlang_vm_process_limit * 1000000) > 0.8
for: 10m
labels:
  severity: warning
annotations:
  summary: "Erlang VM memory usage is high"
  description: "Memory usage is {{ $value | humanizePercentage }}"
```

Erlang VM memory usage is high

```
alert: HighSchedulerRunQueue
expr: erlang_vm_statistics_run_queues_length > 10
for: 5m
labels:
  severity: warning
annotations:
  summary: "Scheduler run queue is high"
  description: "Run queue length is {{ $value }}"
```

Mnesia is high

```
alert: MnesiaTransactionFailures
expr: rate(erlang_mnesia_failed_transactions[5m]) > 1
for: 5m
labels:
  severity: warning
annotations:
  summary: "Mnesia"
  description: "{{ $value }}"
```

↑

1.

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

2.

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

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

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

3. Histogram

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

Context

- HSS, HLR, OCS
-
-
-

Queries

1. Call Rejections

1. Call Rejections

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

2. Authorization Decisions

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

3. Diameter Peer State

```
diameter_peer_state
```

4. Event Socket Connected

```
event_socket_connected
```

□□□□□□

□□□□□

1. □□□□□□

```
rate(call_attempts_total[5m])
active_calls
```

2. □□**Erlang VM**□□□

```
erlang_vm_process_count
erlang_vm_statistics_run_queues_length
erlang_vm_memory_bytes_total
```

3. □□□□□□□

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

□□□□□□□□

□□□□□

1. □□**MOS**□□□

```
rtp_audio_in_quality_mos
rtp_audio_in_quality_percent
```

2. □□□□□

```
rtp_audio_in_jitter_seconds_max
rtp_audio_in_jitter_loss_rate
```

3. □□□□□□□□

```
rtp_audio_in_skip_packets_total
rtp_audio_in_flaw_total
```

4. 网络性能

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

↑ 网络

网络

网络性能

网络P95

- HTTP网络延迟200-500ms
- 网络抖动Sh网络延迟50-150ms
- HLR网络延迟100-300ms
- OCS网络延迟100-250ms
- Diameter网络延迟50-200ms
- 网络丢包率网络延迟10-50ms

网络

- 网络丢包率>95%
- 网络抖动率>99%
- HLR网络延迟>98%
- OCS网络延迟>99%网络延迟
- Diameter网络延迟>99.9%

网络

- MOS网络延迟>4.0

- 呼叫成功率 > 80%
- 呼叫时延 < 30ms
- 呼叫失败率 < 1%

呼叫质量

- Erlang 利用率 < 50% 空闲
- Erlang 利用率 < 70% 空闲
- 呼叫阻塞率 < 5
- ETS 大小 < 1000

呼叫速率

呼叫速率限制

- 呼叫速率 500-1000 呼叫/秒
- 呼叫速率 20-50 CPS
- 呼叫速率 10,000-50,000

呼叫速率限制

- 呼叫成功率 70% 以上
- Erlang 利用率 70% 以上
- P95 延迟 < 10ms
- 呼叫失败率 < 10

↑ 呼叫

呼叫质量

呼叫速率

1. 呼叫速率限制

- 呼叫速率限制

- 時間単位で集計されたメトリクス
- 時間単位で集計されたKPI

2. 時間単位で集計されたメトリクス

- 時間単位で集計されたメトリクス
- 時間単位で集計されたメトリクス
- 時間単位で集計されたメトリクス

3. 時間単位で集計されたKPI

- 時間単位で集計されたKPI
- 時間単位で集計されたKPI
- 時間単位で集計されたKPI

4. 時間単位で集計されたKPI

- 時間単位で集計されたKPI
- 時間単位で集計されたKPI
- 時間単位で集計されたKPI

まとめ

1. 時間単位で集計されたメトリクス

```
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. 時間単位で集計されたKPI

3. 時間単位で集計されたKPI

- `count by` [5m]
- `count by` [1h]
- `count by` [1d]

□□□□

□□□□□□ Prometheus □□□□□

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

□□□□□□

- □□□□□□□□□□□□□□□□□□□□ ID□
- □□□□□
- | 1000□□□□□□□□

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- □□□□□□□□□□□□□□□□
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- □□□□□□□□□□□

↑ □□□□

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:AC	☐☐☐☐	247	5	☐	00	
:AD	☐☐☐	376	6-9	☐	00	
:AE	☐☐☐	971	9	0	00	
:AF	☐☐☐	93	9	0	00	
:AG	☐☐☐☐☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐☐☐
:AI	☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐☐☐
:AL	☐☐☐☐☐	355	9	0	00	
:AM	☐☐☐☐	374	8	0	00	
:AO	☐☐☐	244	9	☐	00	
:AR	☐☐☐	54	10	0	00	
:AS	☐☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐☐☐
:AT	☐☐☐	43	10-13	0	00	
:AU	☐☐☐☐	61	9	0	0011	
:AW	☐☐☐	297	7	☐	00	
:AX	☐☐☐☐	358	9-10	0	00	☐☐☐☐☐
:AZ	☐☐☐☐	994	9	0	00	
:BA	☐☐☐☐☐☐☐☐☐☐☐☐	387	8	0	00	
:BB	☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐☐☐

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:BD	☐☐☐☐	880	10	0	00	
:BE	☐☐☐	32	8-9	0	00	
:BF	☐☐☐☐☐	226	8	☐	00	
:BG	☐☐☐☐	359	9	0	00	
:BH	☐☐	973	8	☐	00	
:BI	☐☐☐	257	8	☐	00	
:BJ	☐☐	229	8	☐	00	
:BL	☐☐☐☐☐	590	9	0	00	
:BM	☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐
:BN	☐☐	673	7	☐	00	
:BO	☐☐☐☐	591	8	☐	00	
:BQ	☐☐☐/☐☐☐☐☐☐/☐☐	599	7	☐	00	
:BR	☐☐	55	10-11	0	00	
:BS	☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐
:BT	☐☐	975	8	☐	00	
:BV	☐☐☐	47	8	☐	00	☐☐☐☐☐
:BW	☐☐☐☐	267	8	☐	00	
:BY	☐☐☐☐	375	9	8	810	

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:BZ	☐☐☐	501	7	☐	00	
:CA	☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐
:CC	☐☐☐☐☐	61	9	0	0011	☐☐☐☐☐☐☐
:CD	☐☐☐☐☐☐☐	243	9	0	00	
:CF	☐☐☐☐☐	236	8	☐	00	
:CG	☐☐☐☐☐	242	9	☐	00	
:CH	☐☐	41	9	0	00	
:CI	☐☐☐☐	225	10	☐	00	
:CK	☐☐☐☐	682	5	☐	00	
:CL	☐☐	56	9	0	00	
:CM	☐☐☐	237	9	☐	00	
:CN	☐☐	86	11	☐	00	
:CO	☐☐☐☐	57	10	0	00	
:CR	☐☐☐☐☐	506	8	☐	00	
:CU	☐☐	53	8	0	119	
:CV	☐☐☐	238	7	☐	00	
:CW	☐☐☐	599	7-8	☐	00	
:CX	☐☐☐	61	9	0	0011	☐☐☐☐☐☐☐

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:CY	☐☐☐☐	357	8	☐	00	
:CZ	☐☐☐☐☐☐	420	9	☐	00	
:DE	☐☐	49	10-12	0	00	
:DJ	☐☐☐	253	8	☐	00	
:DK	☐☐	45	8	☐	00	
:DM	☐☐☐☐	1	10	📞📞📞	011	NANP☐☐☐☐☐☐
:DO	☐☐☐☐☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐
:DZ	☐☐☐☐☐☐	213	9	0	00	
:EC	☐☐☐☐	593	9	0	00	
:EE	☐☐☐☐	372	7-8	☐	00	
:EG	☐☐	20	10	0	00	
:EH	☐☐☐☐	212	9	0	00	☐☐☐☐☐☐
:ER	☐☐☐☐☐☐	291	7	0	00	
:ES	☐☐☐	34	9	☐	00	
:ET	☐☐☐☐☐☐	251	9	0	00	
:FI	☐☐	358	9-10	0	00	
:FJ	☐☐	679	7	☐	00	
:FK	☐☐☐☐☐☐	500	5	☐	00	

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:FM	☐☐☐☐☐☐	691	7	☐	011	
:FO	☐☐☐☐	298	6	☐	00	
:FR	☐☐	33	9	0	00	
:GA	☐☐	241	7	☐	00	
:GB	☐☐	44	10	0	00	
:GD	☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐
:GE	☐☐☐☐	995	9	0	00	
:GF	☐☐☐☐☐☐	594	9	0	00	
:GG	☐☐☐☐	44	10	0	00	☐☐☐☐☐☐
:GH	☐☐	233	9	0	00	
:GI	☐☐☐☐	350	8	☐	00	
:GL	☐☐☐☐	299	6	☐	00	
:GM	☐☐☐☐	220	7	☐	00	
:GN	☐☐☐☐	224	9	☐	00	
:GP	☐☐☐☐☐☐	590	9	0	00	
:GQ	☐☐☐☐☐☐	240	9	☐	00	
:GR	☐☐	30	10	☐	00	
:GS	☐☐☐☐☐☐	500	5	☐	00	☐☐☐☐☐☐☐☐

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:GT	☐☐☐☐	502	8	☐	00	
:GU	☐☐	1	10	☐	011	NANP☐☐☐☐☐☐
:GW	☐☐☐☐☐☐	245	7	☐	00	
:GY	☐☐☐	592	7	☐	001	
:HK	☐☐	852	8	☐	001	
:HM	☐☐☐☐☐☐☐☐☐☐☐☐	61	9	0	0011	☐☐☐☐☐☐☐☐
:HN	☐☐☐☐	504	8	☐	00	
:HR	☐☐☐☐	385	9	0	00	
:HT	☐☐	509	8	☐	00	
:HU	☐☐☐	36	9	06	00	
:ID	☐☐☐☐☐☐	62	10-12	0	001	
:IE	☐☐☐	353	9	0	00	
:IL	☐☐☐	972	9	0	00	
:IM	☐☐☐	44	10	0	00	☐☐☐☐☐
:IN	☐☐	91	10	0	00	
:IO	☐☐☐☐☐☐☐☐	246	7	☐	00	
:IQ	☐☐☐	964	10	0	00	
:IR	☐☐	98	10	0	00	

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:IS	☐☐	354	7	☐	00	
:IT	☐☐☐	39	9-10	☐	00	☐☐☐☐☐☐☐☐ 0
:JE	☐☐☐	44	10	0	00	☐☐☐☐☐
:JM	☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐☐
:JO	☐☐	962	9	0	00	
:JP	☐☐	81	10	0	010	
:KE	☐☐☐	254	9	0	000	
:KG	☐☐☐☐☐☐	996	9	0	00	
:KH	☐☐☐	855	8-9	0	001	
:KI	☐☐☐☐	686	5	☐	00	
:KM	☐☐☐	269	7	☐	00	
:KN	☐☐☐☐☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐☐☐
:KP	☐☐	850	10	0	00	
:KR	☐☐	82	9-10	0	001	
:KW	☐☐☐	965	8	☐	00	
:KY	☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐☐☐
:KZ	☐☐☐☐☐☐	7	10	8	810	
:LA	☐☐	856	10	0	00	

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:LB	☐☐☐	961	8	0	00	
:LC	☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐
:LI	☐☐☐☐☐	423	7	☐	00	
:LK	☐☐☐☐	94	9	0	00	
:LR	☐☐☐☐	231	7-9	☐	00	
:LS	☐☐☐	266	8	☐	00	
:LT	☐☐☐	370	8	8	00	
:LU	☐☐☐	352	9	☐	00	
:LV	☐☐☐☐	371	8	☐	00	
:LY	☐☐☐	218	9	0	00	
:MA	☐☐🇲🇦🇲🇦🇲🇦	212	9	0	00	
:MC	☐☐☐	377	8-9	☐	00	
:MD	☐☐☐☐	373	8	0	00	
:ME	☐☐	382	8	0	00	
:MF	☐☐☐	590	9	0	00	
:MG	☐☐☐☐☐	261	9	0	00	
:MH	☐☐☐☐☐	692	7	☐	011	
:MK	☐☐☐☐	389	8	0	00	

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:ML	☐☐	223	8	☐	00	
:MM	☐☐	95	8-10	0	00	
:MN	☐☐	976	8	☐	001	
:MO	☐☐	853	8	☐	00	
:MP	☐☐☐☐☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐☐☐
:MQ	☐☐☐☐	596	9	0	00	
:MR	☐☐☐☐☐	222	8	☐	00	
:MS	☐☐☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐☐☐
:MT	☐☐☐	356	8	☐	00	
:MU	☐☐☐☐	230	8	☐	00	
:MV	☐☐☐☐	960	7	☐	00	
:MW	☐☐☐	265	9	0	00	
:MX	☐☐☐	52	10	☐	00	
:MY	☐☐☐☐	60	9-10	0	00	
:MZ	☐☐☐☐	258	9	☐	00	
:NA	☐☐☐☐	264	9	0	00	
:NC	☐☐☐☐☐☐☐☐	687	6	☐	00	
:NE	☐☐☐	227	8	☐	00	

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:NF	☐☐☐☐	672	5-6	☐	00	
:NG	☐☐☐☐	234	10	0	009	
:NI	☐☐☐☐	505	8	☐	00	
:NL	☐☐	31	9	0	00	
:NO	☐☐	47	8	☐	00	
:NP	☐☐☐	977	10	0	00	
:NR	☐☐	674	7	☐	00	
:NU	☐☐	683	4	☐	00	
:NZ	☐☐☐	64	8-9	0	00	
:OM	☐☐	968	8	☐	00	
:PA	☐☐☐	507	8	☐	00	
:PE	☐☐	51	9	0	00	
:PF	☐☐☐☐☐☐☐☐	689	8	☐	00	
:PG	☐☐☐☐☐☐☐☐	675	8	☐	05	
:PH	☐☐☐	63	10	0	00	
:PK	☐☐☐☐	92	10	0	00	
:PL	☐☐	48	9	☐	00	
:PM	☐☐☐☐☐☐☐☐	508	6	☐	00	

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:PN	☐☐☐☐☐☐	64	8-9	0	00	☐☐☐☐☐☐
:PR	☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐
:PS	☐☐☐☐	970	9	0	00	
:PT	☐☐☐	351	9	☐	00	
:PW	☐☐	680	7	☐	011	
:PY	☐☐☐	595	9	0	00	
:QA	☐☐☐	974	8	☐	00	
:RE	☐☐☐	262	9	0	00	
:RO	☐☐☐☐	40	9	0	00	
:RS	☐☐☐☐	381	9	0	00	
:RU	☐☐☐	7	10	8	810	
:RW	☐☐☐	250	9	0	00	
:SA	☐☐☐☐☐☐	966	9	0	00	
:SB	☐☐☐☐☐☐	677	5-7	☐	00	
:SC	☐☐☐	248	7	☐	00	
:SD	☐☐	249	9	0	00	
:SE	☐☐	46	9	0	00	
:SG	☐☐☐	65	8	☐	001	

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:SH	☐☐☐☐	290	4-5	☐	00	
:SI	☐☐☐☐☐	386	8	0	00	
:SJ	☐☐☐☐☐	47	8	☐	00	☐☐☐☐☐
:SK	☐☐☐☐	421	9	0	00	
:SL	☐☐☐☐	232	8	0	00	
:SM	☐☐☐☐	378	10	☐	00	
:SN	☐☐☐☐	221	9	☐	00	
:SO	☐☐☐	252	8	☐	00	
:SR	☐☐☐	597	7	☐	00	
:SS	☐☐☐	211	9	0	00	
:ST	☐☐☐☐☐☐☐☐☐	239	7	☐	00	
:SV	☐☐☐☐	503	8	☐	00	
:SX	☐☐☐☐☐	1721	7	☐	00	
:SY	☐☐☐	963	9	0	00	
:SZ	☐☐☐☐	268	8	☐	00	
:TC	☐☐☐☐☐☐☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐
:TD	☐☐	235	8	☐	00	
:TG	☐☐	228	8	☐	00	

☐☐	☐☐/☐☐	E.164 ☐☐	☐☐☐☐	☐☐	IDD	☐☐
:TH	☐☐	66	9	0	001	
:TJ	☐☐☐☐☐☐	992	9	☐	810	
:TK	☐☐☐	690	4	☐	00	
:TL	☐☐☐	670	7-8	☐	00	
:TM	☐☐☐☐☐☐	993	8	8	810	
:TN	☐☐☐	216	8	☐	00	
:TO	☐☐	676	5-7	☐	00	
:TR	☐☐☐	90	10	0	00	
:TT	☐☐☐☐☐☐☐☐☐☐	1	10	☐	011	NANP☐☐☐☐☐☐☐☐
:TV	☐☐☐	688	5	☐	00	
:TW	☐☐	886	9	0	002	
:TZ	☐☐☐☐	255	9	0	00	
:UA	☐☐☐	380	9	0	00	
:UG	☐☐☐	256	9	0	00	
:US	☐☐	1	10	☐	011	NANP ☐☐☐☐
:UY	☐☐☐	598	8	0	00	
:UZ	☐☐☐☐☐☐☐☐	998	9	☐	810	
:VA	☐☐☐	39	9-10	☐	00	☐☐☐☐☐☐☐☐

000 *67555123456
 00 1000 *67 → 555123456
 00 2000 → 155512345600000000

2. SIP 0000

0000000000

000 61403123456;npdi;rn=+61400000000
 00 1000 ;npdi;rn=... → 61403123456
 00 2000 → 61403123456

3. 00000000

0000000000 +000000

000 +61 (403) 123-456
 00 100000 → +61403123456
 00 2000 → 61403123456

0000000000

00	0	00
destination_number	E.164 0 0	0000000000
tas_destination_number	E.164 0 0	0 destination_number 00000000 000000
effective_caller_id_number	E.164 0 0	0000000000MO 000

□□□□□□□□□□

□□□□□□□□□□

```
config :tas, number_translate: %{country_code: :XX} # □□
```

□□□ { :error, "□□□□□□□□" } - □□□□□

□□□□□□□□□□

```
□□□ "abc123"□□□□□□□□
□□ 1□□□□□□□ → "123"
□□ 2□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□
```

□□□□□ □□□□□□□□ E.164 □□□□□□□□□□

□□□□□□□□

Web UI □□□□□ (/translate)□

1. □□□□□□□□□□ (/translate)
2. □□□□□□□□□□□□□□
3. □□□□□□□□□□□□
4. □□□□□□□□ E.164 □□
5. □□□□□□□□□□

□□□□□□□□

- □□□□ → E.164
- □□□□ (ONSN) → E.164
- □□□□ (+CC) → E.164
- □□ CLI □□□□□□ → □□□□□□
- □□□□□□□□□□□□□□□□ → □□□□ E.164

UNALLOCATED_NUMBER

UNALLOCATED_NUMBER "UNALLOCATED_NUMBER"

1. UNALLOCATED_NUMBER

- UNALLOCATED_NUMBER /translate UNALLOCATED_NUMBER
- UNALLOCATED_NUMBER E.164 UNALLOCATED_NUMBER
- UNALLOCATED_NUMBER UNALLOCATED_NUMBER

2. UNALLOCATED_NUMBER Sh UNALLOCATED_NUMBER

- UNALLOCATED_NUMBER Sh UNALLOCATED_NUMBER
- UNALLOCATED_NUMBER /sh_test UNALLOCATED_NUMBER
- UNALLOCATED_NUMBER MSISDN UNALLOCATED_NUMBER

3. UNALLOCATED_NUMBER

- UNALLOCATED_NUMBER destination_number UNALLOCATED_NUMBER
- UNALLOCATED_NUMBER UNALLOCATED_NUMBER

UNALLOCATED_NUMBER

```
# UNALLOCATED_NUMBER
config :tas, number_translate: %{
  country_code: :AU,
  localAreaCode: "617" # UNALLOCATED_NUMBER
}
```

```
# UNALLOCATED_NUMBER12345678 UNALLOCATED_NUMBER
# UNALLOCATED_NUMBER6161712345678 UNALLOCATED_NUMBER - UNALLOCATED_NUMBER
# UNALLOCATED_NUMBER UNALLOCATED_NUMBER localAreaCode
```

UNALLOCATED_NUMBER

UNALLOCATED_NUMBER

- UNALLOCATED_NUMBER +61403123456 UNALLOCATED_NUMBER 61403123456 → UNALLOCATED_NUMBER
- UNALLOCATED_NUMBER 0403123456 UNALLOCATED_NUMBER country_code UNALLOCATED_NUMBER → UNALLOCATED_NUMBER

MO 及 MT 詳解

MT 詳解

- 接收端號碼
- 接收端號碼 SIP 號碼
- 接收端號碼 Sh 號碼

MO 詳解

- 接收端號碼
- 接收端號碼
- 接收端號碼 Sh 號碼
- 接收端號碼/CDR

詳解

1. 接收端號碼

- 接收端 `country_code` 接收端號碼
- 接收端號碼

2. 接收端號碼

- `localAreaCode` 接收端號碼
- 接收端號碼

3. 接收端號碼

- 接收端號碼
- 接收端 0NSN 號碼
- 接收端 +CC 號碼
- 接收端號碼

4. 接收端號碼

- 接收端 "接收端號碼" 號碼
- 接收端號碼

- 00 E.164 00000000

5. 00000000

- 00000000
- 0 /translate 00000000
- 000000000000

OmniTAS (OCS) 介紹

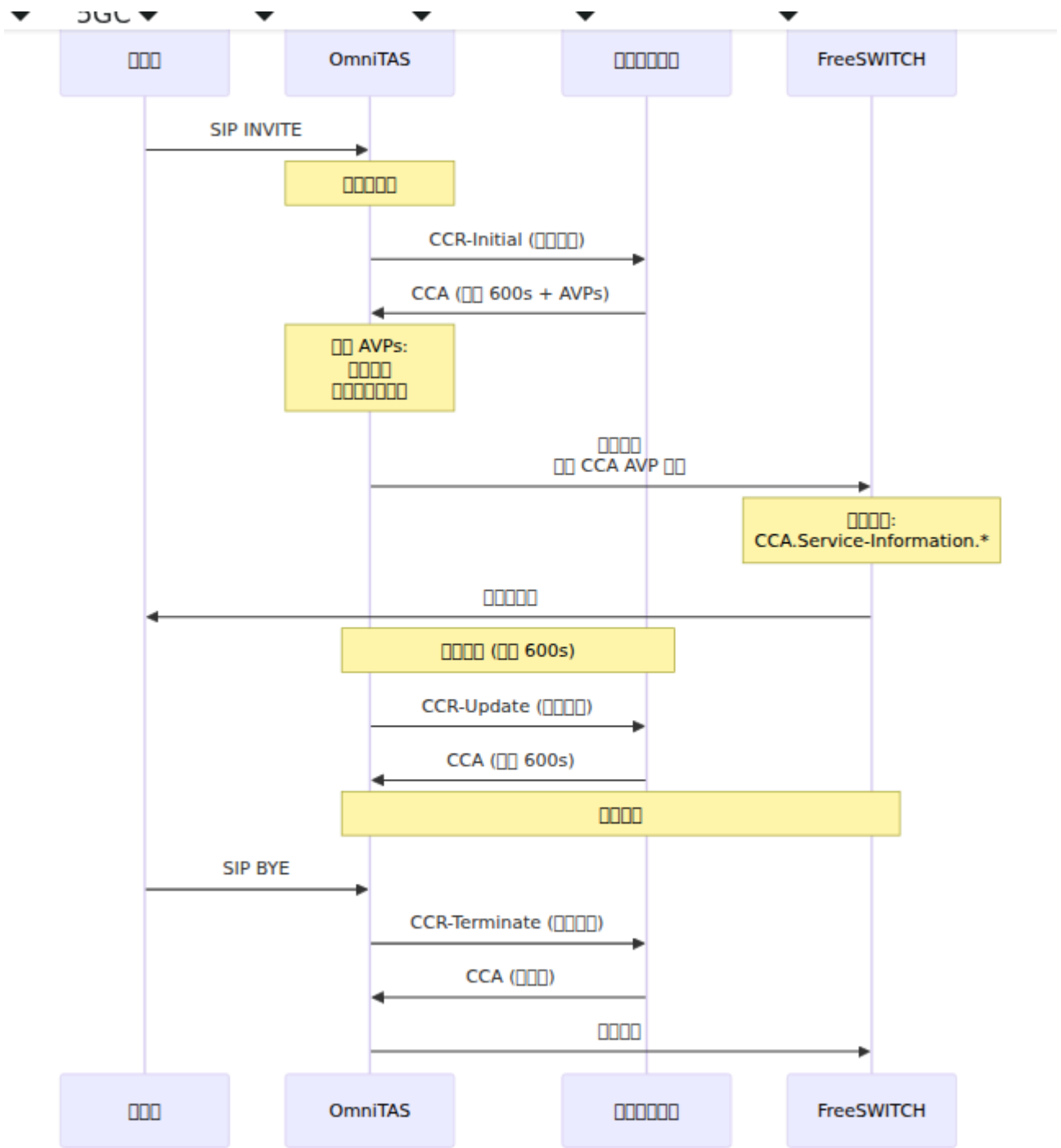
OmniTAS 透過 Diameter Ro 與 OmniTAS AVP 與 FreeSWITCH 連接

目錄

- 介紹
- 系統架構
- AVP 定義
- 設定
- FreeSWITCH 設定
- Diameter 設定
- 測試
- 問題
- FreeSWITCH 問題
- AVP 問題

簡介

OmniTAS 符合 3GPP TS 32.299 的 Diameter Ro 與 OmniTAS AVP 與 FreeSWITCH 連接



CCRs

CCRs (CCR):

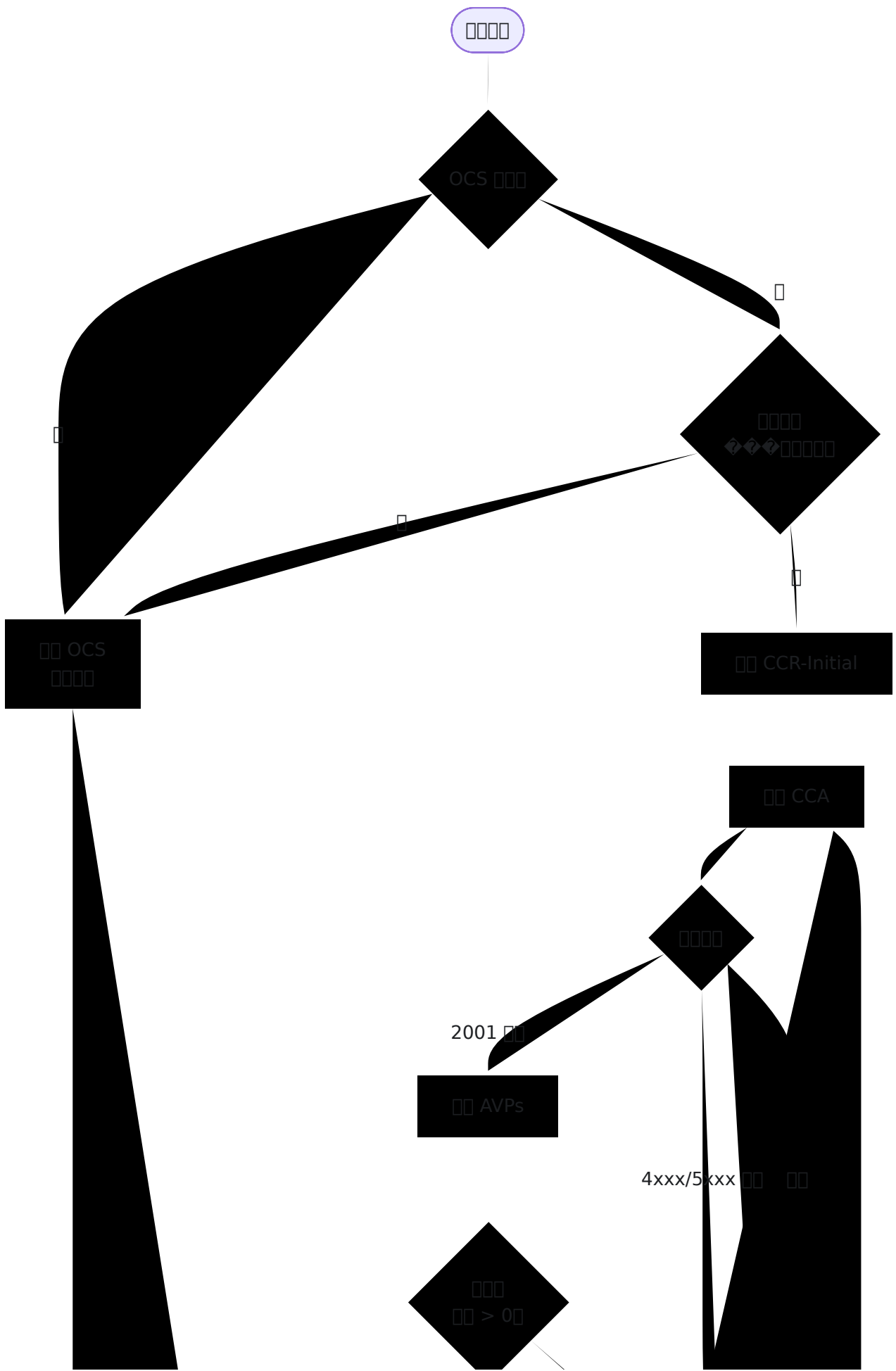
- **CCR-Initial (1):** [Description]
- **CCR-Update (2):** [Description]
- **CCR-Terminate (3):** [Description]

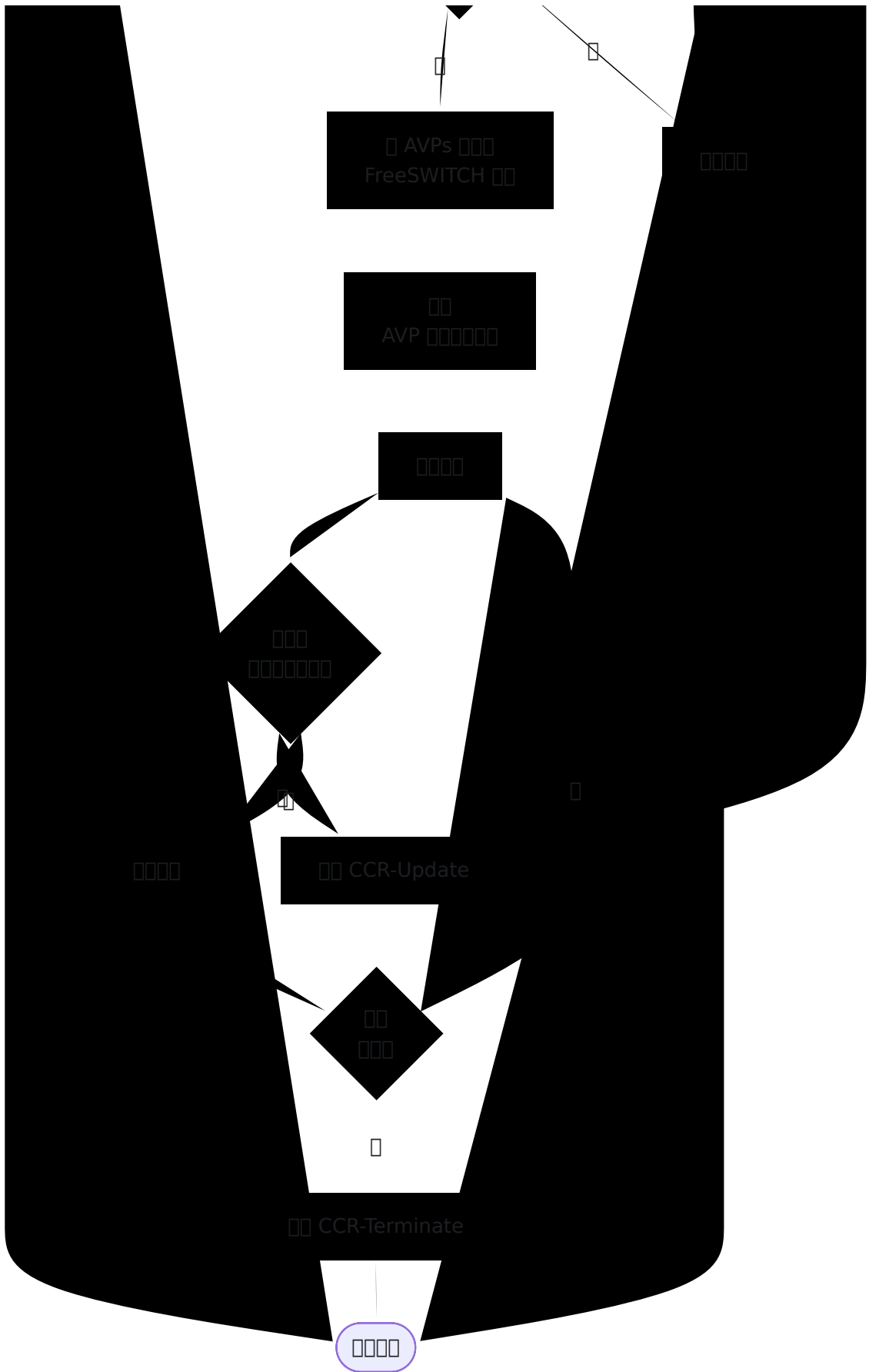
CCAs (CCA):

- 00000000000000000000000000000000
- 000000000 AVPs 000000000000000000
- 00000000000000000000000000000000

□□□□□□

□□□□□□





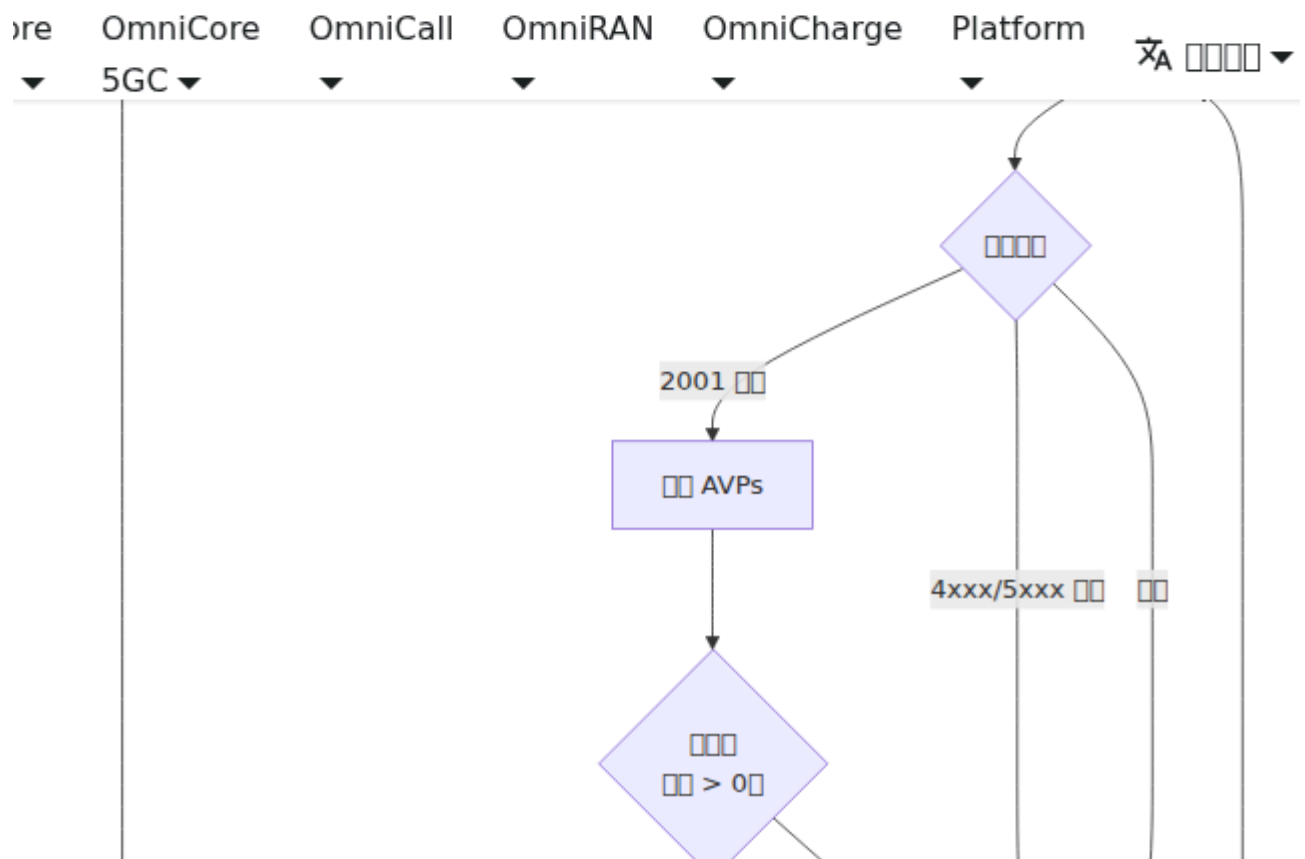
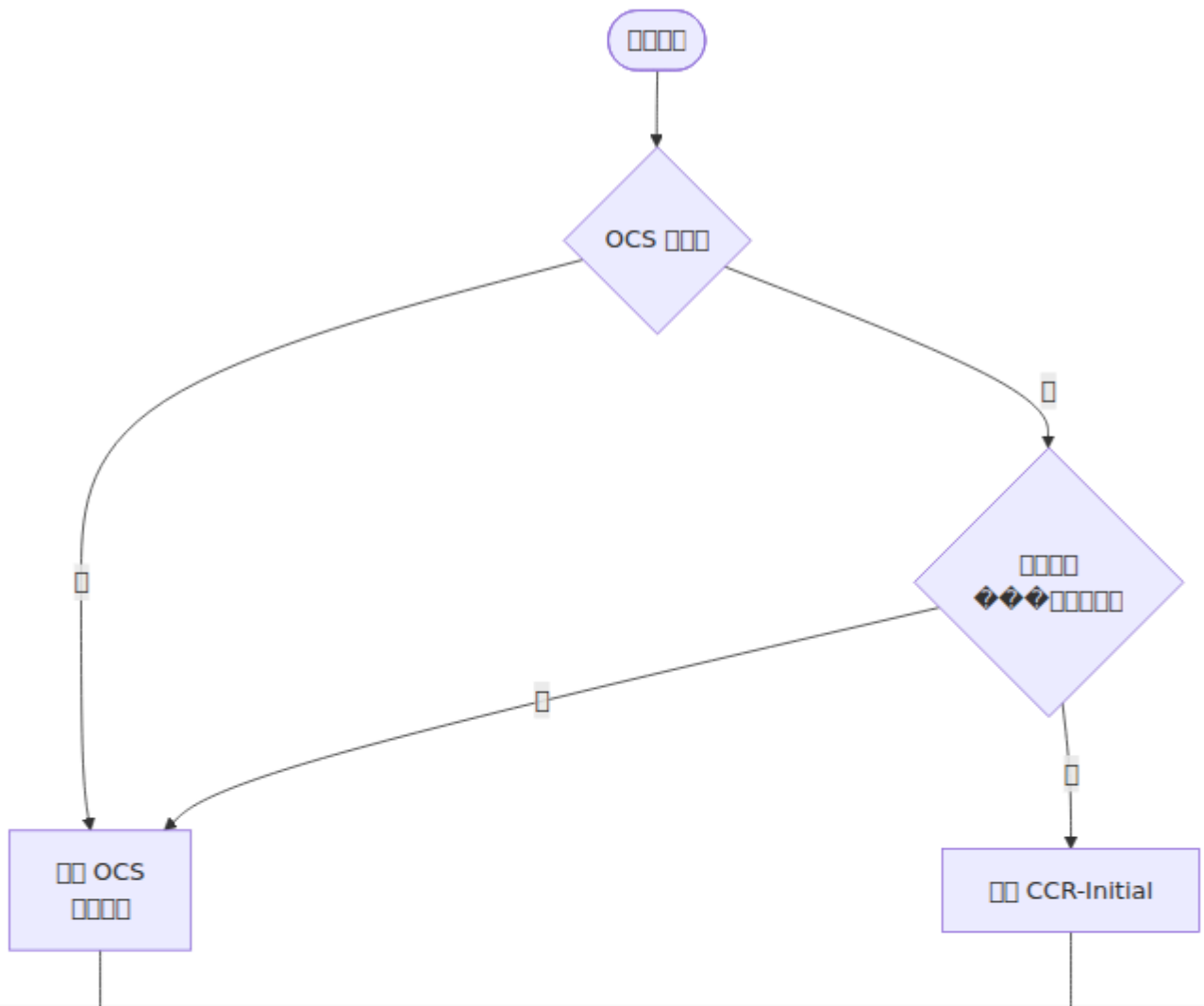
□□□□□□

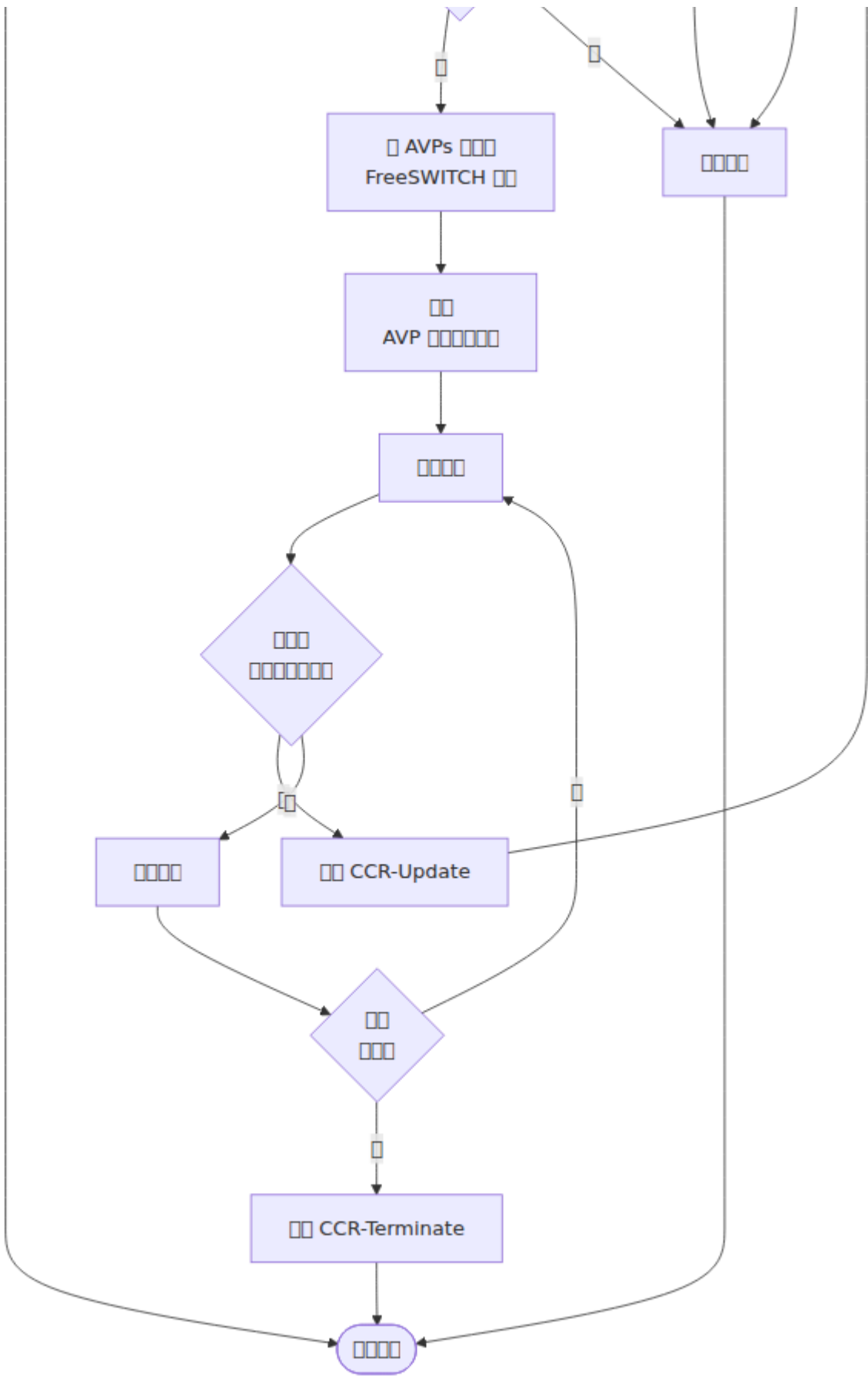
OmniTAS 00000000000000000000000000000000

0000000000

0 schedule_hangup_auth 0000OmniTAS 00000 FreeSWITCH 000000000000000000
0000000 CCR-Update 00000000000000 00000000

□□□□





□□□□

OmniTAS 00000000 00 00 CCR-Update 00000000000000000000

ccr_update_buffer_seconds 0000002 000

000000

- **T+0s:** 00000OCS 00 10s0000000 T+10s

- **T+8s:** CCR-U 10s - 2s
- **T+8.1s:** OCS 10s T+18.1s 10s
- **T+16.1s:** CCR-U
- **T+16.2s:** OCS 10s T+26.2s
- OCS

```
[OCS HANGUP RESCHEDULE] UUID <uuid> <id> - 10s
[SCHED TRANSFER] 10s credit_exhausted <uuid>
[OCS HANGUP RESCHEDULE] <id> (UUID: <uuid>)
```

schedule_hangup_auth + credit_exhaustion_announcement

OmniTAS

```
config :tas, :online_charging,
  schedule_hangup_auth: true,
  credit_exhaustion_announcement: nil
```

→ sched_hangup -

```
config :tas, :online_charging,
  schedule_hangup_auth: true,
  credit_exhaustion_announcement:
    "${base_dir}/sounds/en/us/callie/misc/8000/credit_exhausted.wav"
```

→ sched_transfer - credit_exhausted

1. OmniTAS tas_call_reason=credit_exhausted

2. 當 credit_exhausted 時 ims_as 會

3. 當

- FreeSWITCH 在 A-leg 時 credit_exhausted
- 在 B-leg 時 BYE
- 在 A-leg 時
-

-
- B-leg
- CCR-T
- FreeSWITCH 在 `{base_dir}` 時

CCR-Update

當 OCS 在 CCR-Update 時 OmniTAS

OCS

CCR-Update

CCA

OCS

N
N > 0

0

4012

CREDIT_LIMIT_REACHED

4010

SERVICE_DENIED

+N

credit_exhausted

OUTGOING_CALL_BARRED



□□□□□□□□

OCS □□	□□	□□
<code>{:ok, 0}</code> (□□)	□□□□ □□	□□□□□□□□□□ - □□□□□□
<code>{:error, 4012}</code> (CREDIT_LIMIT_REACHED)	□□□□□ □□	□□□□□4012 CREDIT_LIMIT_REACHED□ - □□□□ □□□
<code>{:error, 4010}</code> (END_USER_SERVICE_DENIED)	□□□□□ □□	□□□□□4010 END_USER_SERVICE_DENIED□ - □□□□□□
<code>{:error, reason}</code> (□□□□)	□□□□□ CCR □ □□□□□ □□□□□	□□□ CCR □□□□□ <reason> - □ □□□
<code>{:ok, N}</code> □□ N > 0	□□□□□ □□□ +N □	□□□ CCA □□ Ns□□□□ (N- buffer)s □□□□□□ CCR-U

□□□: □□□□□□□□ □□ □□□□□□□□□□ OCS □ T+8s □□□□□□□□□□□□□□ T+10s□□□□ T+8s □□□□□□
□□□□□□□□□□□□□□

□□□□□□□□□□□□□□

```
T+0s:   []
T+0.1s: OCS [] 10s → [] T+10.1s
T+8s:   [] CCR-U[] = 2s
T+8.1s: OCS [] 0 [] → [] credit_exhausted []
T+8.2s: []
T+10s:  []
```

[]

```
[warning] [] - []
[warning] [] <id> (UUID: <uuid>)[]
[info] []: "${base_dir}/sounds/..."
[info] []: ...
[info] [] <uuid> [] tas_call_reason=credit_exhausted
[info] []: uuid_transfer <uuid> credit_exhausted XML
ims_as
```

[]

OmniTAS []

1. [] (schedule_hangup_auth):

- []/[]
- [] CCR-U []
- [] CCR-U
- []

2. []:

- [] OCS [] CCR-U []
- []
- []
- [] Diameter []

[] credit_exhaustion_announcement []

AVP 配置

概要

OmniTAS 環境 (AVPs) FreeSWITCH 環境 OCS 環境

AVP 種類:

- UTF8String, Unsigned32, Integer32
- AVPs
- AVPs (3GPP)

AVPs CCA:

```
CCA.<AVP-番号>.<番号-AVP-番号>.<番号-AVP-番号> = ""
```

AVP 種類

AVP (3GPP)

AVP (AVP 番号 873, ID 10415) IMS 環境

OCS 種類:

```
IMS-番号  
├── IMS-番号  
│   ├── 番号: "1408"  
│   └── 番号: 6  
└── 番号: "NickTest"
```

FreeSWITCH 種類:

```
CCA.Service-Information.Carrier-Select-Routing-Information =
"1408"
CCA.Service-Information.Alternate-Charged-Party-Address =
"NickTest"
```

#####: #####

```
<action application="log" data="INFO ##: ${CCA.Service-
Information.Carrier-Select-Routing-Information}"/>
```

uuid_dump ##: ## FreeSWITCH ##### ESL ##### `variable_`

```
variable_CCA.Service-Information.Carrier-Select-Routing-
Information: 1408
variable_CCA.Service-Information.Alternate-Charged-Party-Address:
NickTest
```

##: FreeSWITCH #####

AVP

#####

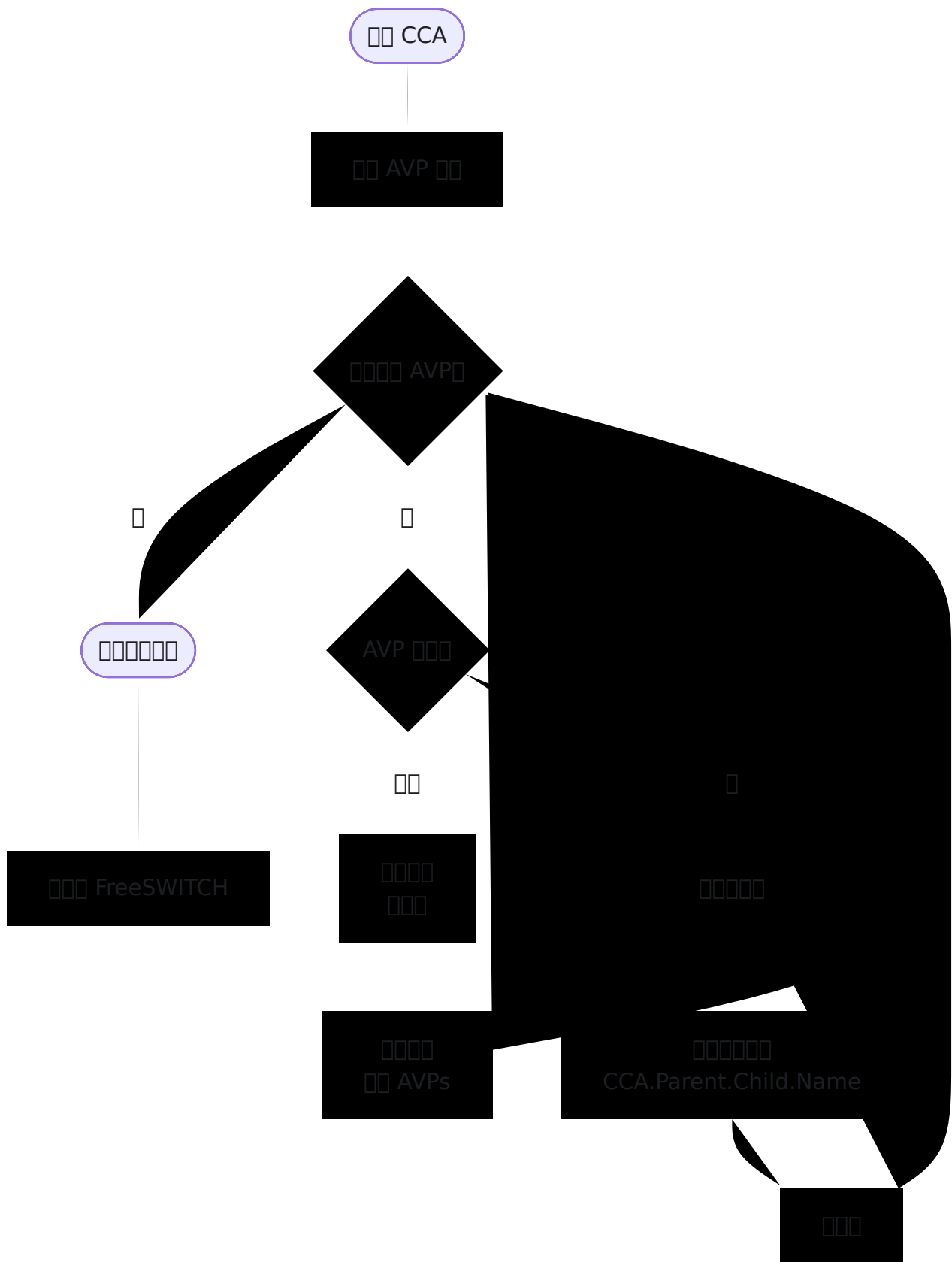
OCS ##:

```
#####
└─ CC-##: 600
```

##:

```
allocated_time = 600
```

AVP 架构图



AVP:

1. AVPs
2. AVPs
3. AVPs AVPs
4. AVPs

OCS CCA :

```

( )
├── IMS- ( )
│   ├── : 6
│   ├── : 1
│   ├── : "tel:+313380000000670"
│   └── ( )
│       ├── SIP- : "2026-01-24T22:40:18Z"
│       └── SIP- : "2026-01-24T22:40:18Z"
└── IN- ( )
    └── : "24724741234"
  
```

FreeSWITCH :

```

CCA.Service-Information.IMS-Information.Node-Functionality = "6"
CCA.Service-Information.IMS-Information.Role-Of-Node = "1"
CCA.Service-Information.IMS-Information.Calling-Party-Address =
"tel:+313380000000670"
CCA.Service-Information.IMS-Information.Time-Stamps.SIP-Request-
Timestamp = "2026-01-24T22:40:18Z"
CCA.Service-Information.IMS-Information.Time-Stamps.SIP-Response-
Timestamp = "2026-01-24T22:40:18Z"
CCA.Service-Information.IN-Information.Real-Called-Number =
"24724741234"
  
```

□□

□□□□□□

□□	□ □	□ □	□□	□□
<code>enabled</code>	□ □ □	□	<code>false</code>	□□□□□□□□□□ <code>false</code> □ OCS □□□
<code>periodic_ccr_time_seconds</code>	□ □	□	<code>60</code>	□□□□□□ CCR-Update □□□□□□□□ <code>schedule_h</code> □□□□□□□□□□□□□□□□□□ □□□□□□□□
<code>ccr_update_buffer_seconds</code>	□ □	□	<code>2</code>	□□□ CCR-Update □□□□ □□□□□□□□ OmniTAS □ (<code>allocated_time - b</code> CCR-U□□□□□□□□□□□□□□
<code>schedule_hangup_auth</code>	□ □ □	□	<code>false</code>	□□□□□□□□□□□□□□□□/□□□ □□□□□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□□ <code>allocated_time</code> □□ Fr □□□□□□□□□□□□□□□□□□ <code>credit_exhaustion_a</code> □□□□□□
<code>credit_exhaustion_announcement</code>	□ □ □	□	<code>nil</code>	□□□□□□□□□□□□□□□□□□ <code>schedule_hangup_auth</code> □□ □□ □□□□□□□□□□□□□□ <code>schedule_hangup_auth</code> □□□□□□□□□□□□□□□□□□ F □□□ "□{base_dir}/sou □□ <code>nil</code> □□□□□□□□□□□□□□

Field	Origin	Destination	Host	Realm
skipped_regex	[]	[]	[]	OCS Diameter Regex: "^911\$" and "^000\$"

Diameter Fields

Field	Origin	Destination	Host	Realm
origin_host	[]	[]	-	OmniTAS Diameter (FQDN) Diameter Host: "tas01.epc.mnc123.mcc456.3gppnetv"
origin_realm	[]	[]	-	OmniTAS Diameter Host: "epc.mnc123.mcc456.3gppnetwork.o"
destination_realm	[]	[]	-	OCS Diameter
destination_host	[]	[]	nil	OCS Diameter nil destination_realm

配置

```
config :tas, :online_charging,  
  # 是否启用  
  enabled: true,  
  
  # 每 60 秒更新 CCR-Update  
  periodic_ccr_time_seconds: 60,  
  
  # 是否启用  
  schedule_hangup_auth: true,  
  
  # 信用耗尽公告  
  credit_exhaustion_announcement: "ivr/ivr-  
account_balance_low.wav",  
  
  # 跳过 OCS  
  skipped_regex: [  
    "^911$",      # 紧急呼叫  
    "^000$",     # 国际长途  
    "^\\*86$"    # 国际漫游  
  ]  
  
config :tas, :diameter,  
  # 配置  
  origin_host: "tas01.epc.mnc380.mcc313.3gppnetwork.org",  
  origin_realm: "epc.mnc380.mcc313.3gppnetwork.org",  
  
  # OCS 配置  
  destination_realm: "epc.mnc380.mcc313.3gppnetwork.org",  
  destination_host: nil # 不指定主机
```

配置

配置

- 配置 `skipped_regex` 配置
- 配置 OCS 配置
- 配置 CCR-Initial 配置 `destination_realm` 配置 OCS
- 配置 CCA 配置 AVPs

5. AVPs FreeSWITCH AVP
6. allocated_time AVP
7. periodic_ccr_time_seconds CCR-Update
8. schedule_hangup_auth
9. CCR-Terminate

- OCS:
- : periodic_ccr_time_seconds 30s
- : schedule_hangup_auth credit_exhaustion_announcement
- : skipped_regex

FreeSWITCH

AVP

CCA AVP FreeSWITCH

```

<extension name="Route_with_OCS_Data">
  <condition field="destination_number" expression="^(.+)$">

    <!-- OCS OCS OCS OCS -->
    <action application="log"
      data="INFO OCS: ${CCA.Service-Information.Carrier-
Select-Routing-Information}"/>

    <!-- OCS OCS OCS -->
    <action application="log"
      data="INFO OCS: ${CCA.Service-Information.Alternate-
Charged-Party-Address}"/>

    <!-- OCS -->
    <action application="log"
      data="INFO OCS: ${allocated_time} "/>

    <!-- OCS OCS OCS -->
    <action application="set"
      data="carrier_code=${CCA.Service-Information.Carrier-
Select-Routing-Information}"/>
    <action application="bridge"

data="sofia/external/$1@carrier-${carrier_code}.sip.example.com"/>

  </condition>
</extension>

```

○○○○○

○○:

- ○○○ FreeSWITCH ○○○ ○○ ○○
- ○○○○○○○○○○○
- ○○○○○○○○○○○

○○:

- ○○○○○○○○○○○○○○○
- ○○○○○/○○○○○○

- 設定ファイルの修正

設定

1. OCS 設定

OCS 設定

```
<extension name="Carrier_Selection">
  <condition field="{CCA.Service-Information.Carrier-Select-
Routing-Information}" expression="^(.+)$">
    <action application="bridge"
data="sofia/external/${destination_number}@carrier-$1.example.com"/>
  </condition>

  <!-- コメントアウト -->
  <condition field="{CCA.Service-Information.Carrier-Select-
Routing-Information}" expression="^$">
    <action application="bridge"
data="sofia/external/${destination_number}@default-
carrier.example.com"/>
  </condition>
</extension>
```

設定: OCS 設定 AVP 設定 "1408" FreeSWITCH 設定 carrier-1408.example.com

2. 設定

OCS 設定

```

<extension name="Alternate_Billing">
  <condition field="{CCA.Service-Information.Alternate-Charged-Party-Address}" expression="^(.+)$">

    <!-- CDR -->
    <action application="set"
      data="billed_party=$1"/>
    <action application="export"
      data="billed_party=$1"/>

    <!-- SIP -->
    <action application="set"
      data="sip_h_X-Billed-Party=$1"/>

    <action application="bridge"

data="sofia/external/${destination_number}@trunk.example.com"/>
  </condition>
</extension>

```

AVP "NickTest" CDR SIP

3. SIP

SIP

```

<extension name="Credit_Warnings">
  <condition field="destination_number" expression="^(.+)$">

    <!-- 30 seconds -->
    <action application="set"
      data="warning_time=${expr(${allocated_time} - 30)}/>

    <action application="sched_hangup"
      data="+${allocated_time} ALLOTTED_TIMEOUT"/>

    <action application="sched_broadcast"
      data="+${warning_time} playback::ivr/ivr-
account_balance_low.wav"/>

    <action application="bridge"
      data="sofia/external/$1@trunk.example.com"/>
  </condition>
</extension>

```

Example: OCS `allocated_time` 30 seconds

Diameter

CCR-Initial (1)

AVPs:

AVP	길이	타입	비고
Session-Id	263	UTF8String	원시호스트명 <origin_host>; 타임스탬프 <timestamp>; 랜덤값 <random>
Auth-Application-Id	258	Unsigned32	4 Diameter 프로토콜 RFC 4006
Service-Context-Id	461	UTF8String	"000.000.12.32260@3gpp.org" IMS 프로토콜 TS 32.299
CC-Request-Type	416	타입	1 (INITIAL_REQUEST)
CC-Request-Number	415	Unsigned32	1
Subscription-Id	443	타입	MSISDN IMSI
Requested-Service-Unit	437	타입	
Service-Information	873	타입	IMS 프로토콜

CCR-I:

```

Session-Id: "tas01.example.org;1769294418268;8a078232"
Auth-Application-Id: 4
CC-Request-Type: 1 (INITIAL_REQUEST)
CC-Request-Number: 1
Subscription-Id:
  - Subscription-ID-Type: 0 (END_USER_E164)
    Subscription-ID-Data: "313380000000670"
Requested-Service-Unit:
  - CC-Time: 0 (000000)
Service-Information:
  - IMS-Information:
    - Calling-Party-Address: "tel:+313380000000670"
    - Called-Party-Address: "tel:+24724741234"
    - Node-Functionality: 6 (AS)

```

CCA (000000)

00 OCS 000000000000000000

00000 AVPs:

AVP	00	00	00
Result-Code	268	Unsigned32	2001 0000000000000000 000000
Granted-Service-Unit	431	00	0000000000000000
Service-Information	873	00	000000000000000000

00 CCA 0 AVPs:

CCR-Terminate (0000 3)

000000000000000000000000

00 AVPs:

- CC-Request-Type: 3 (TERMINATION_REQUEST)
- Used-Service-Unit: 00000000
- Termination-Cause: 00000000

0000

00	00	00	OmniTAS 00
2001	DIAMETER_SUCCESS	000 0	00 AVPs000000
4010	DIAMETER_END_USER_SERVICE_DENIED	000 000 00	00000000 CALL_REJECTED
4012	DIAMETER_CREDIT_LIMIT_REACHED	000 0	00000000 OUTGOING_CALL_BAR
5003	DIAMETER_AUTHORIZATION_REJECTED	OCS 000 0	0000000000
5xxx	000000	OCS 000 000 0	0000000000

00: RFC 6733 §7.1 0 3GPP TS 32.299



Diameter 过滤器

过滤器: `diameter_requests_total` 指标: 速率 指标: 每秒钟 Diameter 消息 数量:

- `application` - Diameter 应用: `ro` (漫游)
- `command` - 命令: `ccr`
- `status` - 状态: `success`, `error`, `timeout`

查询:

```
# CCR 速率
sum(rate(diameter_requests_total{application="ro",command="ccr",status="t
[5m]))
  / sum(rate(diameter_requests_total{application="ro",command="ccr"}[
[5m]))

# CCR 错误率
rate(diameter_requests_total{application="ro",command="ccr",status="t
[5m])
```

Diameter 过滤器

过滤器: `diameter_responses_total` 指标: 速率 指标: 每秒钟 Diameter 消息 数量:

- `application` - `ro`
- `command` - `ccr`
- `result_code` - Diameter 结果码 (2001, 4012, ...)

查询:

```
# 平均値を計算
sum by (result_code)
(rate(diameter_responses_total{application="ro"}[5m]))

# 4012エラーの割合 (4012)
rate(diameter_responses_total{application="ro",result_code="4012"}
[5m])
```

OCS 監視

メトリック: `ocs_authorizations_total` ユニットの単位: OCS 承認の総数

- `result` - `success`, `nocredit`, `timeout`, `error`
- `skipped` - `true` (スキップされた) `false` (スキップされなかった)

例:

```
# 成功した承認の割合を計算
sum(rate(ocs_authorizations_total{result="success",skipped="false"}
[5m]))
/ sum(rate(ocs_authorizations_total{skipped="false"}[5m]))

# 4012エラーの割合
rate(ocs_authorizations_total{result="nocredit"}[5m])
```

Diameter 監視

メトリック: `diameter_request_duration_seconds` ユニットの単位: Diameter リクエストの総数

- `application` - `ro`
- `command` - `ccr`
- `status` - `success`, `error`, `timeout`

例:

```

# CCR 95
histogram_quantile(0.95,

sum(rate(diameter_request_duration_seconds_bucket{application="ro"}
[5m])) by (le)
)

#
avg(rate(diameter_request_duration_seconds_sum{application="ro"}
[5m]))
  by (status)
/
avg(rate(diameter_request_duration_seconds_count{application="ro"}
[5m]))
  by (status)

```

□□□□

FreeSWITCH □□□□ AVP □□

□□:

- FreeSWITCH □□□□□□ □□ ``${CCA.Service-Information.*}`` □□
- □□□□□□□□□□

□❓❓❓□□:

1. OCS □ CCA □□□□□□□□ AVPs
2. AVP □□□□□□□□□□
3. □□□□□□ FreeSWITCH □□

□□□□:

1. □□ **OCS** □□□□ **AVPs**

□□ OmniTAS □□□□ CCA □□□□

```
[debug] []: {:diameter_packet, ...}
[debug] [] AVP []: %{
  "CCA.Service-Information.Carrier-Select-Routing-Information"
=> "1408",
  "CCA.Service-Information.Alternate-Charged-Party-Address" =>
  "NickTest"
}
```

[] "[] AVP []" [] %{} [] OCS [] AVPs[]

2. [] **AVP** []

[][]

```
[warning] []: {...}
```

[][] AVP [] Diameter []

3. [] **FreeSWITCH** []

[] FreeSWITCH [] ESL []

```
freeswitch> uuid_dump <call-uuid>
```

[][] variable_ [] CCA. []

```
variable_CCA.Service-Information.Carrier-Select-Routing-
Information: 1408
variable_CCA.Service-Information.Alternate-Charged-Party-
Address: NickTest
variable_CCA.Auth-Application-Id: 4
variable_CCA.Result-Code: 2001
```

[][]: FreeSWITCH []

```
<action application="log" data="消息: ${CCA.Service-Information.Carrier-Select-Routing-Information}"/>
```

消息 "unhandled"

消息:

- 消息: [warning] 消息: :unhandled
- 消息 CCA 消息 (消息 2001) 消息
- 消息 OCS 消息

消息:

- CCA 消息
- 消息 AVPs 消息
- AVP 消息

消息:

消息

消息: 消息

- 消息 AVP 消息 7
- 消息 AVP 消息 []

消息: 消息

- 消息 AVP 消息
- 消息 AVP 消息

消息

- 消息 CCA 消息
- 消息 AVPs 消息 Diameter 消息
- 消息 2001

OCS 配置

配置:

- CCR 配置
- 配置: [debug] 配置: {:error, :timeout}
- 5 配置 CCA

配置:

- OCS/DRA 配置
- 配置 Diameter 配置 (3868)
- destination_realm 配置 destination_host 配置
- OCS 配置

配置:

1. 配置

配置 OCS 配置 TCP 配置

```
telnet ocs.example.com 3868
```

配置

2. 配置 Diameter 配置

配置 destination_realm 配置 OCS 配置

```
config :tas, :diameter,  
  destination_realm: "epc.mnc380.mcc313.3gppnetwork.org" # 配置  
OCS 配置
```

3. 配置 OCS 配置

配置 OCS 配置 CCR 配置 OCS 配置

- 配置 OmniTAS 配置 origin_host 配置 OCS 配置

- OCS 與 OmniTAS 的 ID
- ID 與 OCS 的 ID

安裝步驟

1. 安裝

- 安裝
- `allocated_time` 設定
- `schedule_hangup_auth` 設定

2. 設定

- FreeSWITCH 設定
- `schedule_hangup_auth` 設定為 `false`
- 設定

3. 測試

1. 測試

測試 `schedule_hangup_auth`

```
config :tas, :online_charging,
  schedule_hangup_auth: true
```

2. 測試 FreeSWITCH ESL

測試 OmniTAS 與 FreeSWITCH 的 ID

```
[debug] : {:ok, "+0K"}
```

測試 FreeSWITCH 的 ID

3. 測試

測試 UUID 與 ID

```
[debug] 000000000000600 00
```

000000 UUID0000000000000000

000000000000 OCS

00:

- 0000 (911, 000) 0000 OCS 00
- 00 skipped_regex 0000000000
- 000000

0000:

- 000000000000
- 0000000000
- 000000000000

0000:

1. 0000000000

000000000000

```
Regex.compile("^911$") # 0000 {:ok, ~r/^911$/}
```

000000

- 00000000 ^911\$ 0000 911
- 000000 * 000000000000 *

2. 00000000

00000000000000000000

```
[debug] 00000000 "911" 0000000000000000...
```

正则表达式 "+1911" 匹配 "^911\$" 正则表达式

3. 正则表达式

```
config :tas, :online_charging,  
  skipped_regex: [  
    "^911$",           # 正则表达式  
    "^000$",           # 正则表达式  
    "^112$",           # 正则表达式  
    "\\*86$",          # 正则表达式  
    "^1?800\d{7}$"     # 正则表达式  
  ]
```

正则表达式

3GPP 正则表达式

正则表达式	正则表达式	正则表达式
TS 32.299	Diameter 正则表达式	§6.3 (Ro 正则表达式), §7.2 (AVP 正则表达式)
TS 32.240	正则表达式	§5 (正则表达式)
TS 29.229	Cx 正则表达式 Dx 正则表达式	正则表达式 AVP 正则表达式 IMS 正则表达式

IETF RFCs

RFC	正则表达式	正则表达式
RFC 6733	Diameter 正则表达式	§3 (正则表达式), §7 (正则表达式)
RFC 4006	Diameter 正则表达式	§8 (正则表达式)

AVP 属性

OCs 属性 AVPs

AVP 属性	属性	属性 ID	属性	属性
Session-Id	263	0	UTF8String	属性
Auth-Application-Id	258	0	Unsigned32	Diameter 属性 ID (4 CC)
CC-Request-Type	416	0	属性	1=属性2=属性3=属性
CC-Request-Number	415	0	Unsigned32	属性
Result-Code	268	0	Unsigned32	属性 (2001=属性)
Granted-Service-Unit	431	0	属性	属性
CC-Time	420	0	Unsigned32	属性
Service-Information	873	10415	属性	3GPP 属性
IMS-Information	876	10415	属性	IMS 属性
Carrier-Select-Routing-Information	2023	10415	UTF8String	属性
Alternate-Charged-Party-Address	1280	10415	UTF8String	属性

属性 ID 10415 = 3GPP

FreeSWITCH 属性

属性 AVP 属性 FreeSWITCH 属性

項目名	項目	値
<code>{allocated_time}</code>	セッション時間 / CC-時間	600
<code>{CCA.Session-Id}</code>	Session-Id AVP	omni-as01.epc...;1769299669873;
<code>{CCA.Result-Code}</code>	Result-Code AVP	2001
<code>{CCA.Auth-Application-Id}</code>	Auth-Application-Id AVP	4
<code>{CCA.CC-Request-Type}</code>	CC-Request-Type AVP	1
<code>{CCA.CC-Request-Number}</code>	CC-Request-Number AVP	1
<code>{CCA.CC-Time}</code>	CC-時間 AVP セッション時間	600
<code>{CCA.Origin-Host}</code>	Origin-Host AVP	ocs01.epc.mnc380.mcc313.3gppnet
<code>{CCA.Origin-Realm}</code>	Origin-Realm AVP	epc.mnc380.mcc313.3gppnetwork.c
<code>{CCA.Service-Information.Carrier-}</code>	Service-Information → Carrier-	1408

属性名	属性値	属性タイプ
Select-Routing-Information}	Select-Routing-Information	
`\${CCA.Service-Information.Alternate-Charged-Party-Address}`	Service-Information → Alternate-Charged-Party-Address	NickTest

属性:

- CCA AVPs 属性 CCA.
- AVPs 属性 CCA.Parent.Child
- 属性
- `uuid_dump` 属性 `variable_` 属性

属性 `uuid_dump` 属性:

```
variable_allocated_time: 600
variable_CCA.Service-Information.Carrier-Select-Routing-Information: 1408
variable_CCA.Service-Information.Alternate-Charged-Party-Address: NickTest
variable_CCA.Result-Code: 2001
```

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- □ **README** - □□□□□□□□
- □ □□□□ - □□□□□□□□
- □ □□□□ - Prometheus□□□□□□

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- □ **HLR**□□□□□□ - HLR□□□□□□□□□□□□
- □ **IMS**□□□□□□ - □□□□□□□□
- □ □□□□□□□ - □□□□□□□□□□

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- □ □□□□□□□ - □□□□□□□□□□□□
- □ **Sh**□□ - □□□□□□□□
- □ □□□□ - OCS□□
- □ □□□□ - □□□□□□□□
- □ □□□□ - □□□□□□□□

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- □ **SS7 MAP** - HLR/MAP□□
- ⚙️ □□□□ - □□□□□□□□□□
- □ **HOMER**□□ - SIP□□□□□□□□

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□□□□□□ OmniTAS □□□□□□□□□□□□□□□□□□

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- □□□□□
- □□□□□□□ CDR□
- □□□□□□
- IMS□□□□□
- □□□□
- Diameter□□□□
- □□□□□
- □□□□□
- □□□□□
- HLR/MAP□□
- □□□□

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□□□□□□□□□□ Sofia SIP□□□□□□□□ IMS□□□□□□□□□□□□

□□□ □□□□□□□□□□ `/subscribers`

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- □□□□□ □□□□□□□□□□□□□□□□
- □□□□□ □□□□□□□□□□□□□□□□□
 - 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

- 100
-
- - " " "
 - /
 - /
 - localStorage
 - "X / Y" "
- - ▲ ▼
 -
 - 1
- -
 - /
 -
 -
 -
- CDR

- 0000000000/0000000000
- 00000000000000
- 0000000000
- 000000000000=00000=00000=0000
- 00UUID0A-leg0B-leg0
- 0000000000
- 00000000000000000000
- 00000000000
 - 0 000 NORMAL_CLEARING
 - 0 000 000000
 - 0 000 00000
- 0000 00000000000000
- 0000000 0000000000000000

00000

1. 000000

- 000000001000CDR00000 start_stamp 000000
- 000000000000
- 00 000 / 0000 00000000
- 00000000000000000000

2. 000000

- 0000000 "0" 00
- 00000000000000
- 00/00000000000/0000
- 00 "00" 0000 "000" 0000000
- 00000000000000
- 00000000000000

3. 000000

- 0000000000000000
- 00000000000▼0

- 0000000000▲
- 0000000000
- 0000000000

4. 000000

- 0 "00" 0000000000
- 00000000000000000000
- 0000000000 caller_id_number destination_number uuid caller_id_name hangup_cause
- 00 "00" 0000

5. 0000000000

- 00 "0000" 0 "0000" 00000000
- 0000000000000000
- 0000000000
- 00 "00" 0000

6. 0000000000

- 0 "0000000000" 0000000000
 - 0000
 - 0000
 - 000
 - 000
- 0 "000000" 0000000
- 00 "00" 0000

7. 0000000

- 0000000000000000
 - 0000 + 0000 + 0000000000000000
- 00000000000000000000
- 00 "0000" 000000000000

8. 00000000

- CDR
-
-
-
-

CDR

- caller_id_number
- destination_number
- uuid
- caller_id_name
- hangup_cause

1.

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

2.

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

3. /

- 条件 `!term` を指定する
- 条件 条件 条件 条件
- SQL 条件 `NOT LIKE '%term%'` 条件 `AND`
- 条件 `!NORMAL` 条件 `"NORMAL"` 条件

4. 条件/条件

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

5. 条件 AND

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

条件

```

条件 CDR
条件 !
- 条件/条件 → 条件
- SQL field1 LIKE '%term%' OR field2 LIKE '%term%' OR ...

条件 !
- 条件/条件 → 条件
- SQL field1 NOT LIKE '%term%' AND field2 NOT LIKE '%term%'
AND ...

条件 AND 条件
- 条件
- 条件 → 条件
- SQL (term1_conditions) AND (term2_conditions) AND ...

```

条件

SQL	MySQL	Oracle
61480	61480	61480 61480 '61480' 61480 '61480'
"911"	"911"	"911" "911"
!NORMAL_CLEARING	NOT NORMAL_CLEARING	NOT NORMAL_CLEARING "NORMAL_CLEARING" NOT NORMAL_CLEARING
!"NORMAL_CLEARING"	NOT "NORMAL_CLEARING"	NOT "NORMAL_CLEARING" NOT
"911" AND "12345"	"911" AND "12345"	"911" AND "12345" ="12345" "911"
!NORMAL AND 61480	NOT "NORMAL" AND 61480	NOT "61480" AND NOT
!"ANSWER" AND !NORMAL	NOT "ANSWER" AND NOT "NORMAL"	NOT "NORMAL" AND NOT
61480 AND !NORMAL_CLEARING	"61480" AND NOT "NORMAL_CLEARING"	"61480" AND NOT

SQL

- 61480123456 - 61480123456
- "911" - "911"
- !NORMAL_CLEARING - NOT NORMAL_CLEARING
- "61480123456" AND !NORMAL - "61480123456" AND NOT NORMAL
- !test AND !demo - NOT test AND NOT demo
- 61480 AND !"ANSWER" AND !CANCEL - 61480 AND NOT "ANSWER" AND NOT CANCEL

SQL

CDR 数据库 TAS CDR SQLite 数据库

数据库 数据库 数据库 数据库 数据库 数据库

CDR 数据库

数据库 CDR 数据库 数据库 数据库 数据库 数据库 数据库 数据库 数据库 数据库 数据库

CDR 数据库 数据库 数据库 数据库 数据库 数据库 数据库 数据库 数据库 数据库 **CDR** 数据库 数据库 数据库 数据库

- CSV 数据库
- JSON 数据库 API 数据库
- XML
- 数据库
- 数据库

数据库 数据库 数据库 数据库 数据库 数据库 CDR 数据库

数据库

- 数据库 数据库 UUID 数据库 数据库 数据库
- 数据库 数据库 数据库 数据库
- 数据库 数据库 数据库 数据库
- 数据库 数据库 "911" 数据库 数据库
- 数据库 数据库 数据库 数据库 数据库
- 数据库 数据库 数据库 数据库 数据库
- 数据库 数据库 数据库 数据库 数据库
- 数据库 数据库 数据库 **!NORMAL_CLEARING** 数据库 数据库
- 数据库 数据库 数据库 数据库 数据库

数据库

数据库

数据库 `config/runtime.exs` 数据库 `cdrs_field_list` 数据库 LiveView 数据库 数据库 CDR 数据库

数据库

```


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

```

□□□

- □□□□ `cdrs_field_list` □□□□□□□□□□ CDR □□
- □□□□ `cdrs_field_list` □□□□□□□□□□ □□□□□□□□□□□□□□
- □□□□□□□□□□ CDR □□□□□□□□□□□□
- □□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□

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- □□□□□□□□□□□□□□□□□□
- □□□□□□□□□□
- □□□□□  □□□□□□□□
- □□□□□□□□□□□□□□

□□□□□

```

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

```

□□□ □□□□□ `CDR` □□□□□□□□□□ "□" □□□□□□□ - □□□□□□□□□□□□□□□□□□□□

SQL Injection

SQL Injection

1. SQL Injection
2. SQL Injection
3. SQL Injection
4. SQL Injection

SQL Injection

1. SQL AND
2. SQL Injection
3. SQL Injection
4. SQL Injection

SQL Injection

1. SQL Injection
2. SQL Injection UUID
3. SQL Injection
4. SQL AND OR

SQL

- SQL Injection
- SQL Injection + SQL + SQL Injection
- SQL Injection ? ? ?
- SQL Injection / SQL Injection
- SQL Injection
- SQL Injection
- SQL Injection - SQL Injection
- SQL Injection
- SQL Injection
 - SQL Injection "911"
 - SQL ! SQL !NORMAL_CLEARING
 - SQL AND SQL "61480" AND !NORMAL

- 0000 0000000000000000 - 000000000000
-

00000000

00000000000000000000000000000000

0000 0000000000 /calls

00

- 000000 00000000000000
 - 000000 0000000000000000
 - **UUID** 0000 00A-leg 00B-leg 000000
-

IMS 000000

IMS 0000000000 3GPP IMS 0000 RFC 4579 RFC 4575 TS 24.147 0000000000

0000 0000000000 /conference

0000 0000 **IMS** 0000000000 00000000

00

- 000000 0000000000000000
- 0000000000
 - 00000000
 - 000000000000
 - 00000000
 - 00000000
 - 000000000000 MNC/MCC 00000000
- 000000 00000000000000
 - 00ID SIP URI
 - 0000000000
 - 0000000000

- 呼叫失败原因

 - 呼叫失败原因
 - 呼叫失败原因
 - 呼叫失败原因

- 呼叫失败原因

 - 呼叫失败原因
 - 呼叫失败原因
 - 呼叫失败原因

- 呼叫失败原因 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**

- **RFC 4579** SIP OPTIONS - 拡張オプション
 - **RFC 4575** SIP OPTIONS 拡張オプション
 - **RFC 5239** SIP OPTIONS 拡張オプション
-

概要

TAS SIP / 拡張オプション

拡張オプション /gw

概要

- 拡張オプション
- 拡張オプション
- **Ping** SIP OPTIONS ping 拡張オプション
- 拡張オプション

概要

- SIP
 - Ping SIP OPTIONS
 - 拡張オプション
 - 拡張オプション
 - 拡張オプション/拡張オプション
 - ping 拡張オプション
-

Diameter

Diameter Sh Ro

拡張オプション /diameter

概要

- 拡張オプション

- 00000000000000000000
- 00000000
- 000000000000

5. 00/0000

- 00 "00" 0000000000000000
- "000" 0000000000
- 000000000000000000000000
- 00 "00" 0000000000000000

6. 000000

- 00 "00" 000000000000000000
- 00TAS000000000000
- 000000000000

7. 00000000

- 0000 00HH:MM:SS.0000000000
- 000000 00TAS000000000000000000
- 000000 0000000000000000 [ERROR]00[INFO] 00
- 00/00 0000000000000000
- 0000 000000000000

00000000

項目	種別	説明	備考
項目	種別	説明	備考FreeSWITCH
項目	種別	説明	備考
項目	種別	説明	備考
項目	種別	説明	備考
項目	種別	説明	備考
項目	種別	説明	備考
項目	種別	説明	備考Diameter
項目	種別	説明	備考

項目

- 説明
- 説明
- 説明ID
- 説明
- 説明TASDiameter/Sh/Ro
- 説明TASFreeSWITCH
- 説明
- 説明

項目

- 説明 + 説明 + 説明
 - 説明 説明="TAS説明" + 説明="説明" + 説明="Diameter" → 説明Diameter説明
- 説明
- 説明説明 - 説明
- 説明説明 - 説明

- 電話番号をデータベースに格納する
- 電話番号をデータベースから取得する
- 電話番号のフォーマットを管理する
- 電話番号の検索を高速化する
- **UUID** を ID/UUID として使用する
- 電話番号に "911" や "000" を追加する

データベース

- データベースに 500 以上のレコードを格納する
- データベースに 1000 以上のレコードを格納する
- データベースの検索を高速化する
- データベースのバックアップ/復元を行う
- データベースの接続を `:elixir` や `:freeswitch` にする
- データベースの接続を `:elixir` にする
- **PubSub** を Elixir の Phoenix PubSub を使用する
- **FreeSWITCH** のデータベースに `ES` を使用する

データベース

データベースに `OpenCellID` を格納する

データベースに `/cell_towers` を格納する

- 000000 0000000000/00000000
- 000000
 - 0MCC0000000000
 - 0MNC0000000000
 - 000000GSM0UMTS0LTE000
 - 00000000
- 000000
 - 000000
 - 000000OpenCellID000000
 - 00000000
- 00000 000ID00000000

00

- 00000000
- 00000000000000
- 000000
- 00000000
- 00000000

000

000000OpenCellID<https://opencellid.org/>00000000000000000000000000000000

000000

00000000000000000000000000000000

000 0000000000 /simulator

00000 000 HLR0000000000

00

- 00000000 00MO0MT000000
- 000000

- 認證服務
- IP 認證服務 SBC/CSCF
- 認證服務
- OCS 認證服務
- 認證服務
 - 認證服務
 - Sh/HLR 認證
 - OCS 認證
 - SS7 MAP 認證服務
 - 認證服務 XML
- 認證服務 認證服務

認證

- 認證服務
- 認證服務
- 認證服務
- 認證服務
- OCS/HLR 認證
- 認證服務

HLR/MAP 認證

SS7 MAP 認證服務 SRI 認證服務 PRN 認證

認證 認證 `/hlr`

認證 認證 **HLR** 認證

認證

- **SRI** 認證 認證
- **PRN** 認證 認證
- 認證 認證 MAP 認證
- 認證 認證 MSRN 認證 MSC 認證

- 000000 0000MAP000000

00

- 00HLR00
- 0000000000
- 0000000000000000
- 00MAP00000
- 0000000000

OCS00

000000OCS00Diameter Ro0000000000000000CCR00000

000 0000000000 /ocs_test

00

- 000**CCR**000 00INITIAL0UPDATE0TERMINATION0EVENT00
- 000000 000000000ID0000000000000000
- 00000000 00SMS0000000000000000000000
- 000000 000000MO000000MT0000
- 000000 000000000000000000000000
- 000000 000000CCA000000000000000

00000

1. 0000000000

- **MSISDN** 61400123456
- **MSISDN** 61400987654
- sms call
 - SMS EVENT_REQUEST 4
 - INITIAL_REQUEST 1
- out MO in MT

2. CCR

- CCR
 - 1 – INITIAL_REQUEST -
 - 2 – UPDATE_REQUEST -
 - 3 – TERMINATION_REQUEST -
 - 4 – EVENT_REQUEST - SMS
- 1

3. ID

- ID
- "ID" ID
- ID
 - INITIAL_REQUEST 1 1
 - UPDATE_REQUEST 2 2 3 4...
 - TERMINATION_REQUEST 3 N+1

4. OCS

- OCS
-

5. CCR

- "CCR"
- CCA AVP
-
-

- **OCS** 프로세스는 Diameter Ro 프로세스이다
- 프로세스는 프로세스들 사이에서
- 프로세스들 간의 프로세스들 사이의 INITIAL → UPDATE → TERMINATION
- 프로세스는 프로세스들 사이에서
- 프로세스는 프로세스들 사이에서 OCS
- 프로세스는 프로세스들 AVP 프로세스 OCS
- 프로세스는 프로세스들 OCS
- 프로세스는 프로세스들

프로세스

- 프로세스 ID 프로세스들
- 프로세스 OCS 프로세스들
- 프로세스 UPDATE 프로세스들
- 프로세스 TERMINATION 프로세스들
- 프로세스 프로세스들 UPDATE 프로세스들

Sh 프로세스

프로세스 Diameter Sh 프로세스들 UDR 프로세스들 HSS 프로세스들

프로세스 프로세스들 /sh_test

프로세스

- 프로세스는 프로세스 20 프로세스들
- 프로세스 HSS 프로세스들 HSS 프로세스들 Diameter Sh

- 00000000 000000XML00000000AVP
- 000000 00HSS000000000000ID
- 000000 00000Diameter000000000000

00000

1. 00000000

- 000000 00000IMS00000
- 0000 sip:61400123456@ims.mncXXX.mccXXX.3gppnetwork.org
- 000000 tel:+61400123456 00

2. 00000000 000000000000000000

- **RepositoryData (0)** 000000000000
- **IMSPublicIdentity (10)** 00000000
- **IMSUserState (11)** 00000
- **S-CSCFName (12)** 0000S-CSCF
- **InitialFilterCriteria (13)** 00000000iFC0000
- **LocationInformation (14)** 00000000
- **ChargingInformation (16)** P-000000
- **MSISDN (17)** 00000
- **IMSI (32)** 000000000000
- **IMSPrivateUserIdentity (33)** 00000000
- 000000...

3. 00000000

- 00 "00SH00" 00UDR00
- 000000000000000000UDA0000
- 000000000000XML00000000iFC00
- 000000000000HSS00

00

- 00000000 00000000HSS00000
- **iFC**0000 0000000000000000

- IMS-CSCF
- P-IMS
- **HSS** Diameter Sh
- IMS-CSCF
- IMS-CSCF HSS
- IMS-CSCF

IM

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

IM

IMS-CSCF

IMS-CSCF /translate

IM

- IMS-CSCF
- IMS-CSCF
- IMS-CSCF

- 000000 00000000000000
- 000000 000000000000000000

0000

1. 000000

- 000000 000000000000 AU US NZ
 - 0000 config/runtime.exs 0000000000
 - 000000 AU :AU au
- 000000 00000000
 - 0000 +61400111222 0400111222 61400111222
- 0000 00000000000000000000
 - 0000 originate route emergency

2. 000000

- 0000000000
- 000000000000
- 0000 "00" 000000
- 000000000000

3. 000000

- 0000 0000000000000000
- 0000 0000000000000000
- 000000000000 000000Elixir0000000000

00

- 0000000000 0000000000000000
- 000000 00E.16400000000000
- 0000000000 00000000000000
- 0000000000 0000000000000000
- 00000000 000000000000000000
- 00000000 000000000000000000
- 00000000 000000000000000000
- 00000000 00MO0MT0000000000

- 00000000 0000000000000000

00

- 00000000 0400111222 00000000 +61400111222 0
- 00000000 000 112 00000000
- 00000000000000000000 MO MT 0000
- 00000000000000000000
- 000000000000 - 00000000
- 0000000000000000000000

00000000

00000000000000000000

000 0000000000 /voicemail

00

- 000000000000 0000000000000000
- 00000000 000000000000000000
- 000000 000000 UUID 0000000000000000
- 000000 000000000000
- 000000 00000000000000000000
- 000000 0000000000000000

0000

1. 0000000000

- 音源 데이터를 가져오는 방법
- 音源 데이터를 저장하는 방법
- 音源 데이터를 재생하는 방법
- 音源 데이터를 삭제하는 방법

2. 音源 데이터

- 音源 데이터를 가져오는 방법 "▶" 버튼
- 音源 데이터를 저장하는 방법
- WAV, MP3, OGG
- "음원" 데이터베이스

3. 音원 데이터

- "음원" 데이터베이스
- 데이터베이스
- 데이터베이스

4. 音원 데이터

- "음원" 데이터베이스
- 데이터베이스

데이터베이스

데이터베이스

- 데이터베이스
- **UUID** 데이터베이스
- 데이터베이스 데이터베이스/데이터
- 데이터베이스 데이터베이스
- 데이터베이스 데이터베이스
- 데이터베이스 데이터베이스

데이터

- 데이터베이스 데이터베이스
- 데이터베이스 데이터베이스

- 000000 000000000000000000
- 0000000000 000000000000000000
- 000000 0000000000000000
- 000000 00000000000000

00

- 0000000000000000000000
- 0000000000000000000000
- 000000000000 "0000000000"
- 0000000 HTML50000 - 000000000000
- 000000000000000000

TTS0000

0000000000000000TTS0000000000

000 0000000000 /prompts

00

- 00000000 0000TTS000000000000
- 000000 0000000000000000
- 000000 0000000000000000000000
- 00000000 00000000000000
- 000000 0000000000000000

- 如何選擇合適的音頻格式
- 如何選擇合適的音頻編碼器

如何選擇

1. 音頻格式

- 音頻格式 TTS 引擎支持 alloy nova shimmer
- 音頻格式 wav mp3 opus
- 音頻格式 TTS 引擎支持

2. 音頻編碼器

- 音頻編碼器
- 音頻編碼器
- 音頻編碼器 " " 音頻編碼器 "
- 音頻編碼器 /KiB/MiB 音頻編碼器
- 音頻編碼器

3. 音頻格式

- 音頻格式
 - 音頻格式
- 音頻格式
 - 音頻格式
 - 音頻格式

4. 音頻編碼器

- ▶ 音頻編碼器
- 音頻編碼器
 - 音頻編碼器
 - 音頻編碼器

5. 音頻格式

- 音頻 "▶ 音頻" 音頻
- 音頻編碼器
- 音頻 "音頻" 音頻

📄

📄📄📄📄📄📄📄📄

```
config :tas, :prompts,  
  voice: "nova",  
  response_format: "wav",  
  instructions: "📄📄📄📄📄",  
  recordings: [  
    %{path: "/sounds/en/us/callie/voicemail/vm-enter_id.wav",  
      text: "📄📄📄📄ID📄📄📄"},  
    # ... 📄📄  
  ]
```

📄

- 📄📄📄 📄📄📄📄📄📄📄
- 📄📄📄 📄📄📄TTS📄📄📄📄📄📄
- 📄📄📄 📄📄📄📄📄📄📄
- 📄📄📄 📄📄📄📄📄wav → mp3📄📄📄📄
- 📄📄📄 📄📄📄📄📄📄📄📄
- 📄TTS📄 📄📄📄📄📄📄
- 📄📄📄📄 📄📄📄📄📄📄📄
- 📄📄📄 📄📄📄📄📄📄📄

📄

- 📄 "📄📄" 📄📄📄 - 📄📄📄📄📄
 - 📄📄📄📄📄📄📄📄 "📄📄📄"
 - 📄 "📄📄" 📄📄📄📄📄📄
 - 📄📄📄📄📄📄
 - 📄📄📄📄📄wav📄📄📄📄📄📄📄📄
 - 📄📄📄📄📄TTS📄📄📄📄
 - 📄📄📄📄📄📄📄📄📄 - 📄📄📄
 - 📄📄📄FreeSWITCH📄📄📄📄📄
-

XML

FreeSWITCH XML

`/routing`

- `priv/templates/` XML
-
- XML
 -
 -
 - /
 -
- XML
-
- 600px

1.

- `.xml`
-
-

2.

- XML
- XML
- XML

3. XML

- XML `<extension>` `<condition>`
- `name=` `field=`
- `"public"` `"destination_number"`
- XML `<!-- ... -->`

•

- XML
- XML
- XML
- XML
- XML
- XML
- XML

•

- TAS `priv/templates/`
- `.xml`
- XML
- XML
- XML
- XML
- XML
- `/logs`

•

- `priv/templates/`
- FreeSWITCH XML
- `.xml`
- XML

- 000000 000000000000000000000000
 - 00000000 600px0000000000000000
-

ESL000000

0000000000FreeSWITCH00000000ESL00000

000 0000000000 /command

00

- 000000 0000ESL/FreeSWITCH API00
- 000000 0000000000
- 000000 000000000000000000001000000
- 00000000 00000000000000
- 000000 00000000000000
- 00000000 00000000000000000000“00”

00000

1. 000000

- 00000000ESL00
- 0000
 - status - 00FreeSWITCH00
 - show channels - 00000000
 - uuid_dump <uuid> - 000000000000

- `sofia status` - SIP 狀態
- `reloadxml` - 重新載入 XML 檔案
- `version` - FreeSWITCH 版本


2. 顯示

- 顯示 "ID" 欄位
- 顯示 "ID" 欄位 "ID..."
- 顯示 "ID" 欄位

3. 顯示

- 顯示 "ID" 欄位
- 顯示 "ID" 欄位
- 顯示 "ID" 欄位
- 顯示 "ID" 欄位 600px
- 顯示 "ID" 欄位

4. 顯示

- 顯示 "ID" 欄位  欄位
- 顯示 "ID" 欄位
- 顯示 "ID" 欄位 10 欄位
- 顯示 "ID" 欄位
- 顯示 "ID" 欄位

顯示

コマンド	説明	返り値
<code>status</code>	FreeSWITCHの状態を確認	FreeSWITCHの状態
<code>show channels</code>	現在のチャンネルを確認	チャンネルID "0" など
<code>show calls</code>	現在の呼び出しを確認	呼び出しID
<code>uuid_dump <uuid></code>	指定されたUUIDの情報を取得	UUIDのリスト
<code>uuid_kill <uuid></code>	指定されたUUIDの呼び出しを強制終了	"+OK" など
<code>sofia status</code>	SIPの状態を確認	SIPの状態
<code>sofia status profile <name></code>	指定されたプロファイルの状態を確認	プロファイル名
<code>reloadxml</code>	XML設定を再読み込み	"+OK" など
<code>version</code>	FreeSWITCHのバージョンを確認	バージョン番号
<code>global_getvar <var></code>	グローバル変数の値を取得	変数の値
<code>api help</code>	APIコマンドのヘルプを表示	ヘルプメッセージ

注意

- `uuid_dump` コマンドは、UUIDのリストを返す
- `status`、`show calls` コマンドは、FreeSWITCHの状態を確認する
- **SIP**の状態を確認するには、`sofia status` コマンドを使用する
- XML設定を再読み込みするには、`reloadxml` コマンドを使用する
- 指定されたUUIDの呼び出しを強制終了するには、`uuid_kill` コマンドを使用する
- ヘルプメッセージは、`api help` コマンドで取得できる

TTS

OpenAI TTS

OpenAI TTS (TTS)

README

API

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

API

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

API

API

API `playback` API

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

```
config :tas,  
  ...  
  prompts: %{\br/>    voice: "alloy",  
    instructions: "Speak with a prim, British accent.",  
    response_format: "wav",  
    recordings: [  
      %{\br/>        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"  
      },  
      %{\br/>        text: "The destination you have called is unable to be  
reached",  
        path:  
"/sounds/en/us/callie/misc/8000/unable_to_be_reached.wav"  
      },  
      %{\br/>        text: "Your call is being transferred to emergency  
services",  
        path:  
"/sounds/en/us/callie/misc/8000/emergency_services_transfer.wav"  
      }  
    ]  
  }  
}
```

Sh

Sh

Sh Diameter HSS/Repository

Sh

Sh

- [README](#) -
- [Diameter](#) - Diameter
- [Sh](#) - Sh

Sh

- [Sh](#) - Sh
- [MMTel-Config](#) - MMTel-Config
- [SS7 MAP](#) - HLR Sh

Sh

- [Ro](#) - Ro Diameter
- [Sh](#) - Sh

Sh

- [Sh](#) - Sh

Sh

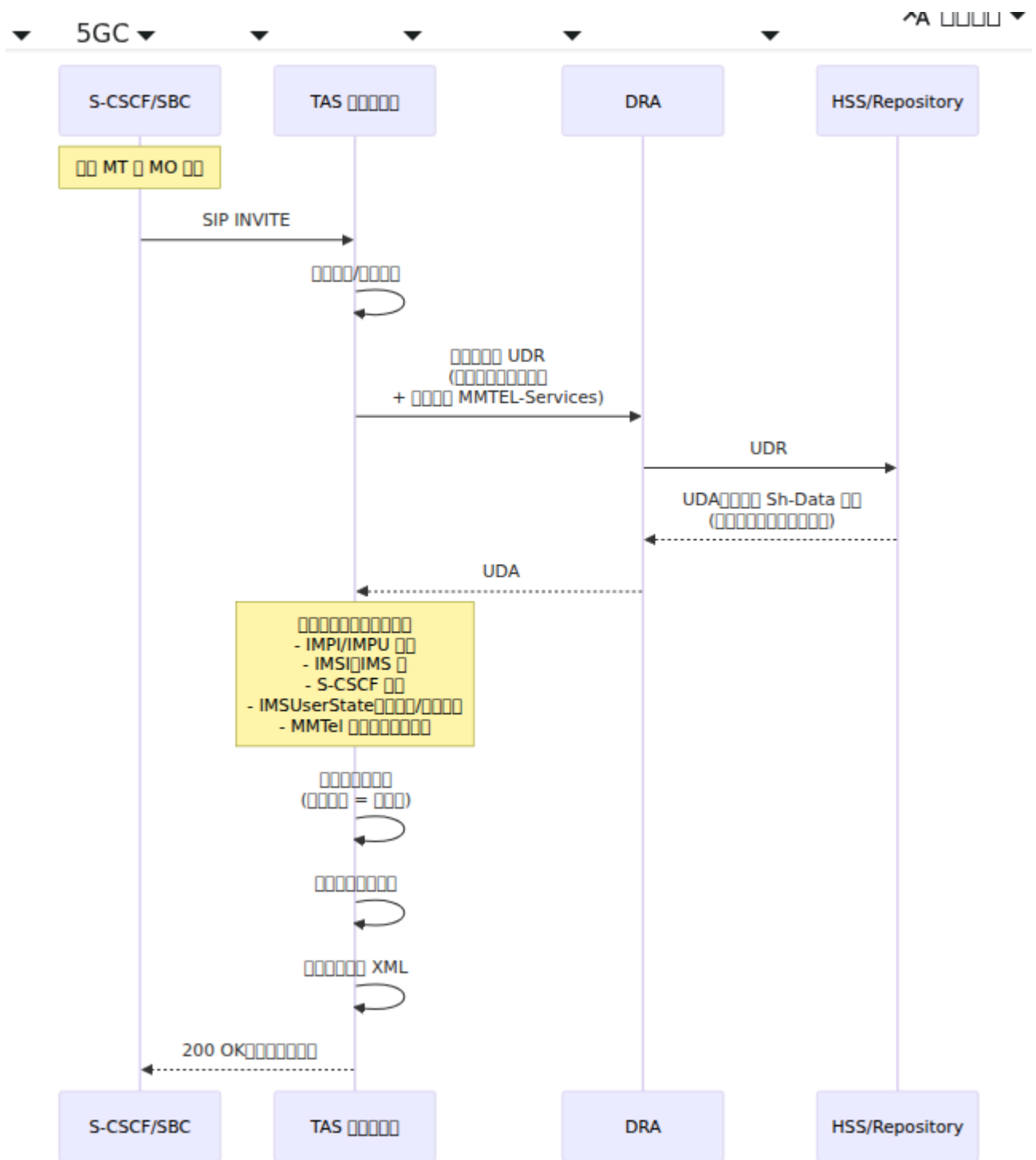
Sh HSS/Repository MMTel

Sh

Sh 3GPP Diameter TAS HSS/Repository

- IMS IMPI/IMPU
- MMTel-Config
-
- S-CSCF

Sh



Sh

- **MT** MO
- **MO** MT
- MMTEL-Services

TAS UDR MO MT UDR —

UDR Notif-Eff

3GPP TS 29.328 §6.1.1.1 AS HSS Notif-Eff Supported-Features AVP UDR Data-Reference AVP HSS UDA User-Data-Sh <Sh-Data> TAS — Sh

TS 29.328 7.6.1

Ref		TAS
0	RepositoryData Service-Indication = "MMTEL-Services"	call_forward_all_destination call_forward_not_reachable_destination no_reply_timer
10	IMSPublicIdentity	ims_public_identity msisdn
11	IMSUserState	ims_user_state TS 29.328 §7.6.3
12	SCSCFName	scscf_address scscf_domain
13	InitialFilterCriteria	TAS
14	LocationInformation	location_rat_type location_mme_name location_vplmn_id location_age_seconds
15	UserState	user_state TS 29.328 §7.6.7
17	MSISDN	IMPU
32	IMSI	imsi
33	IMSPrivateUserIdentity	ims_private_identity ims_domain

TAS Sh

UDAP

UDAP — Sh-Data

[debug] +614xxxxxxx (Data-Ref [0, 10, 11, 12, 13, 14, 15, 17, 32, 33], SI="MMTEL-Services"): 4453

```
<?xml version="1.0" encoding="UTF-8"?>
<Sh-Data>
  <RepositoryData></RepositoryData>
  <PublicIdentifiers>
    <IMSPublicIdentity>sip:+614xxxxxxx@ims.mnc001.mcc999.3gppnetwork
    <IMSPublicIdentity>tel:+614xxxxxxx</IMSPublicIdentity>
  </PublicIdentifiers>
  <ShIMSData>
    <IMSUserState>1</IMSUserState>
  </ShIMSData>
  <ShIMSData>
    <SCSCFName>sip:scscf01.ims.mnc001.mcc999.3gppnetwork.org:5060</SC
  </ShIMSData>
  <IMSSubscription>
    <PrivateID>9999990000xxxxx@ims.mnc001.mcc999.3gppnetwork.org</Pri
    <ServiceProfile>
      ... InitialFilterCriteria ...
    </ServiceProfile>
  </IMSSubscription>
  <ShIMSData>
    <LocationInformation>
      <RAT-Type>eutran</RAT-Type>
      <MMENAME>mme01.epc.mnc001.mcc999.3gppnetwork.org</MMENAME>
      <VPLMNIId>999001</VPLMNIId>
      <AgeOfLocationInformation>NNNN</AgeOfLocationInformation>
    </LocationInformation>
  </ShIMSData>
  <IMSPrivateUserIdentity>9999990000xxxxx@ims.mnc001.mcc999.3gppnetwork
</Sh-Data>
```

UDAP

TAS XML `<SCSCFName>` `<IMSPublicIdentity>` `<CallForwardUnconditional>` `<CallForwardNoReplyTimer>` `not-reachable` `cp:rule`

HSS

Sh

TAS UDR `Notif-Eff` TAS `<Sh-Data>`

1. IMS

- IMPI** `<IMSPublicIdentity>` `{IMSI}@{IMS-domain}` TAS @ IMSI IMS
- IMPU** `<IMSPublicIdentity>` `sip:+{MSISDN}@{IMS-domain}` MSISDN + `msisdn`

2. S-CSCF

- S-CSCF `<SCSCFName>` 12MT INVITE S-CSCF IMS
- TS 29.328 D XML `SCSCFName` "S-CSCF"

3. MMTel

- `<RepositoryData>` `Service-Indication = "MMTEL-Services"`
- CFA**
 - CFB**
 - CFNRy** `<CallForwardNoReplyTimer>`
 - CFNRc** MMTel-Services `not-reachable` `<cp:rule>`

MMTel-Config

MMTel-Config HSS Service-Indication = "MMTEL-Services" UDR 0 AVP complete-communication-diversion cp:rule busy noanswer unregistered unreachable <NoReplyTimer> MMTel

TAS MMTel

- **CDIV** unreachable call_forward_not_reachable_destination <NoReplyTimer> no_reply_timer
- **OIP** ID
- **TIP**

Sh

Sh

項目	説明
ims_private_identity	IMPI
ims_public_identity	IMPU
msisdn	IMPU□□□□
imsi	IMPI□□□□
ims_domain	IMPI/IMPU
scscf_address	SCSCFName
scscf_domain	SCSCFName□□□□
call_forward_all_destination	MMTel CDIV
call_forward_not_reachable_destination	MMTel CDIV
no_reply_timer	MMTel CDIV
ims_user_state	IMSUserState□□□□□ 11□

□□	□□
user_state	UserState□□□□ 15□
location_rat_type	LocationInformation/RAT-Type
location_mme_name	LocationInformation/MMENAME
location_vplmn_id	LocationInformation/VPLMNid
location_age_seconds	LocationInformation/AgeOfLoca

Sh 配置

TAS 配置

- Sh 配置 **MMTel-Config** — 配置
- 配置 **SS7 MAP** 和 **HLR** — 配置 SS7 MAP 和 Sh 的 MT 配置
- 配置 — 配置 Sh 的 HLR 配置 — 配置 `runtime.exs` 中的 `config :tas` 配置 — `call_forward_not_reachable_destination` 和 `default_no_reply_timer`

Sh 配置

配置

- 配置 **HSS** 配置
 - HSS 配置 `Experimental-Result-Code 5001` `DIAMETER_ERROR_USER_UNKNOWN`
 - TAS 配置
 - `hangup_case` 配置 `"UNALLOCATED_NUMBER"`
 - 配置 SIP 配置
- HSS** 配置 / 配置
 - Sh 配置 `5000ms` 配置 `runtime.exs` 中的 Diameter `request_timeout`
 - 配置
 - 配置 `1` 配置
- HSS** 配置 **UDR**
 - HSS 配置 HSS
 - TAS 配置 `10002` — 配置
 - HSS 配置 `Notif-Eff` 配置 TAS 配置 `TS 29.328 §6.1.1.1` 配置

XML Schema

UDR Result-Code: 2001 <Sh-Data> TAS IMS Public Identity

XML Element	Value
<SCSCFName> 12	scscf_address scscf_domain "none"
<IMSPrivateUserIdentity> 33	ims_private_identity imsi ims_domain
<CallForwardUnconditional> MMTel RepositoryData	call_forward_all_destination "none"
not-reachable/<cp:rule> MMTel RepositoryData	call_forward_not_reachable_destination Tas.Config.call_forward_not_reachable_de
<CallForwardNoReplyTimer> MMTel RepositoryData	no_reply_timer Tas.Config.default_no_reply_timer()
<RepositoryData>	MMTel
<IMSUserState> <LocationInformation> <InitialFilterCriteria>	

<IMSPublicIdentity> {error, :sh_parse_failed} 1 "IMS Public Identity Error"

TAS HSS Notif-Eff IMSPublicIdentity MSISDN SCSCFName HSS MMTel

Sh

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

# Sh P95
histogram_quantile(0.95,
  rate(subscriber_data_duration_milliseconds_bucket[5m]))

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

- P95 > 100ms HSS
- > 5% HSS
- > 20% HSS

1. Web UI Diameter /diameter
2. Web UI Sh /sh_test
3. " " "
4. HSS/Repository TAS
5. subscriber_data_lookups_total

Sh

Web UI Sh /sh_test

1. /sh_test
2. MSISDN +614xxxxxxxx
3. " Sh"
4.
 - IMPI/IMPU

- S-CSCF []
- MMTEL []
- []

[][][]

- [] HSS []
- []
- [] IMS [] S-CSCF []
- [] HSS []

SS7 MAP / Gateway- MSC

📄 [README](#)

📄 HLR 📄 SS7 MAP 📄 MSRN 📄

📄 📄 📄

📄 📄 📄

- 📄 [README](#) - 📄
- 📄 [README](#) - SS7 MAP 📄 `ss7_map` 📄
- 📄 [README](#) - 📄 HLR/MAP 📄

📄 📄 📄 📄

- 📄 [README](#) - 📄 MSRN 📄 `forwarded_to_number`
- ⚙️ [README](#) - 📄 HLR 📄 Sh/MMTel 📄
- 📄 [README](#) - Sh 📄 MAP 📄
- 📄 [README](#) - HLR 📄

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- 📄 [README](#) - 📄 HLR/MAP 📄
- 📄 [README](#) - HLR/MAP 📄

Gateway-MSC

TAS 📄 HLR 📄 MSRN 📄 MSC 📄 2G/3G 📄 📄 📄 📄

msrn forwarded_to_number

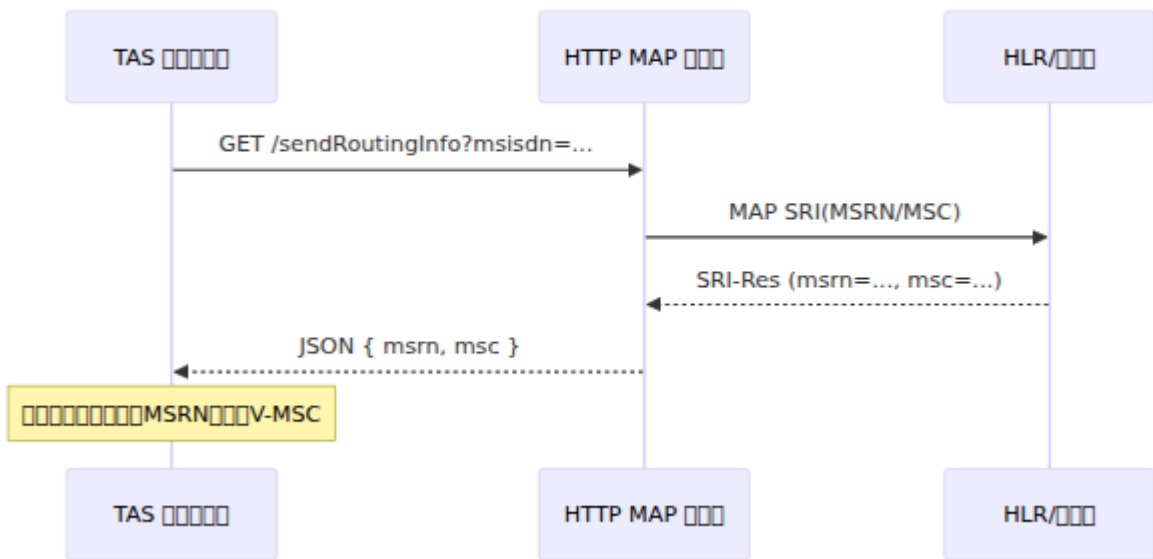
- enabled - SS7 MAP
- http_map_server_url_base - MAP HTTP API URL
- gmsc - SRI/PRN MSC
- timeout_ms - MAP HTTP 5000

```

config :tas,
  ...
  ss7_map: %{
    enabled: true,
    http_map_server_url_base: "http://10.5.1.216:8080",
    gmsc: "55512411506",
    timeout_ms: 5000 # 5000ms
  },

```

SS7 MAP



TAS SRI

1. SRI - SRI PRN msrn
2. 2G/3G - VLR PRN V-MSC MSRN
3. -

msrn tas_destination_number PRN

目录

1. 简介

本仓库提供CLI工具，用于配置和测试

2. 安装

2.1 安装

- [README](#) - 快速入门
- [安装](#) - 安装CLI工具
- [使用](#) - 使用指南

2.2 测试

- [测试](#) - 测试脚本
- [Sh 脚本](#) - MMTel-Config
- [SS7 MAP](#) - HLR 脚本
- [CLI 工具](#) - CLI 工具

2.3 部署

- [部署](#) - OCS 部署
- [部署](#) - 部署/测试脚本

2.4 其他

- [其他](#) - 其他脚本
 - [其他](#) - 其他脚本
-

📞📞📞📞📞📞 / 📞 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"]
 - 📞📞 📞📞📞📞 📞📞📞📞📞📞📞📞

□□□ **ID** □□□□□□□□

TAS □□□□□□□□ ID□CLI □□□□□□□□□□□□□□ □□□□□□□□□□ `cli_withheld` □□□□□□□□□□ "true"□

Call ID 000000

MO 0000
000: *67555123456
00: 00
<sip:+61403123456@domain>

000000

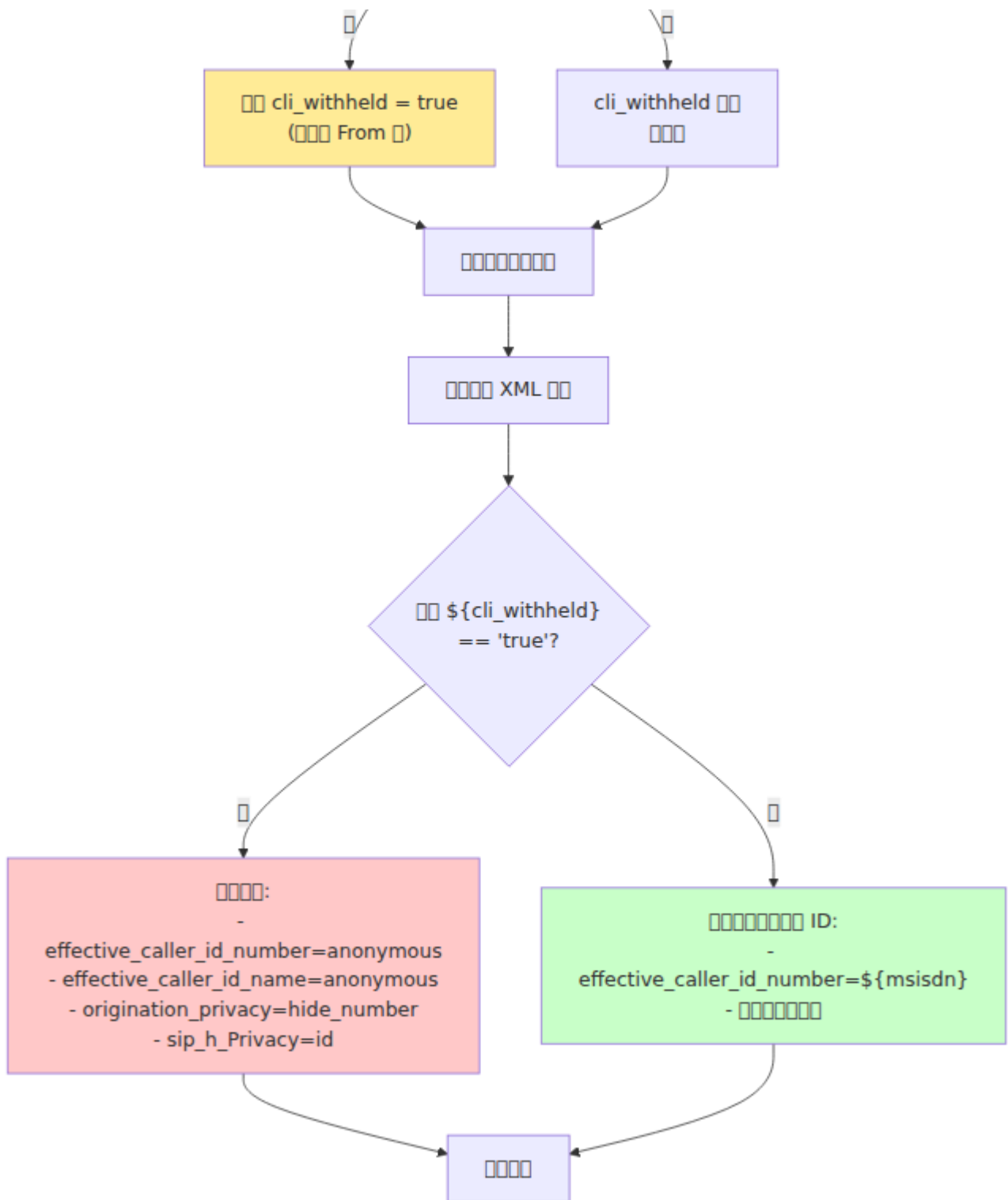
0000
blocked_cli_prefix 00?
(*67, #31#, 00)

Core OmniCore OmniCall OmniRAN OmniCharge Platform ⌵ 0000 ⌵

0000000000
*67555123456 →
555123456

00 cli_withheld = true
(000000)

SIP From 00
00 'anonymous' 00



1

blocked_cli_prefix

1. *67555123456
2. 55123456
3. cli_withheld "true"
- 4.

□□□□

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

□□ **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

Field	Value	Condition	Description
<code>cli_withheld</code>	<code>"true"</code> / <code>"false"</code>	<code>cli_withheld</code>	From CLI
<code>tas_destination_number</code>	<code>555123456</code>	<code>tas_destination_number</code>	Destination number
<code>destination_number</code>	<code>tas_destination_number</code>	<code>destination_number</code>	Final destination number

`cli_withheld="true"`

項目	値	説明
effective_caller_id_number	"anonymous"	匿名発信
effective_caller_id_name	"anonymous"	匿名発信
origination_privacy	"hide_number"	発信元 SIP 番号
sip_h_Privacy	"id"	SIP 番号 RFC 3323
sip_h_P-Asserted-Identity	匿名発信	匿名発信 P-Asserted-Identity

匿名発信

```

<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  ID:
${msisdn}"/>
    <anti-action application="set"
data="effective_caller_id_number=${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>

```

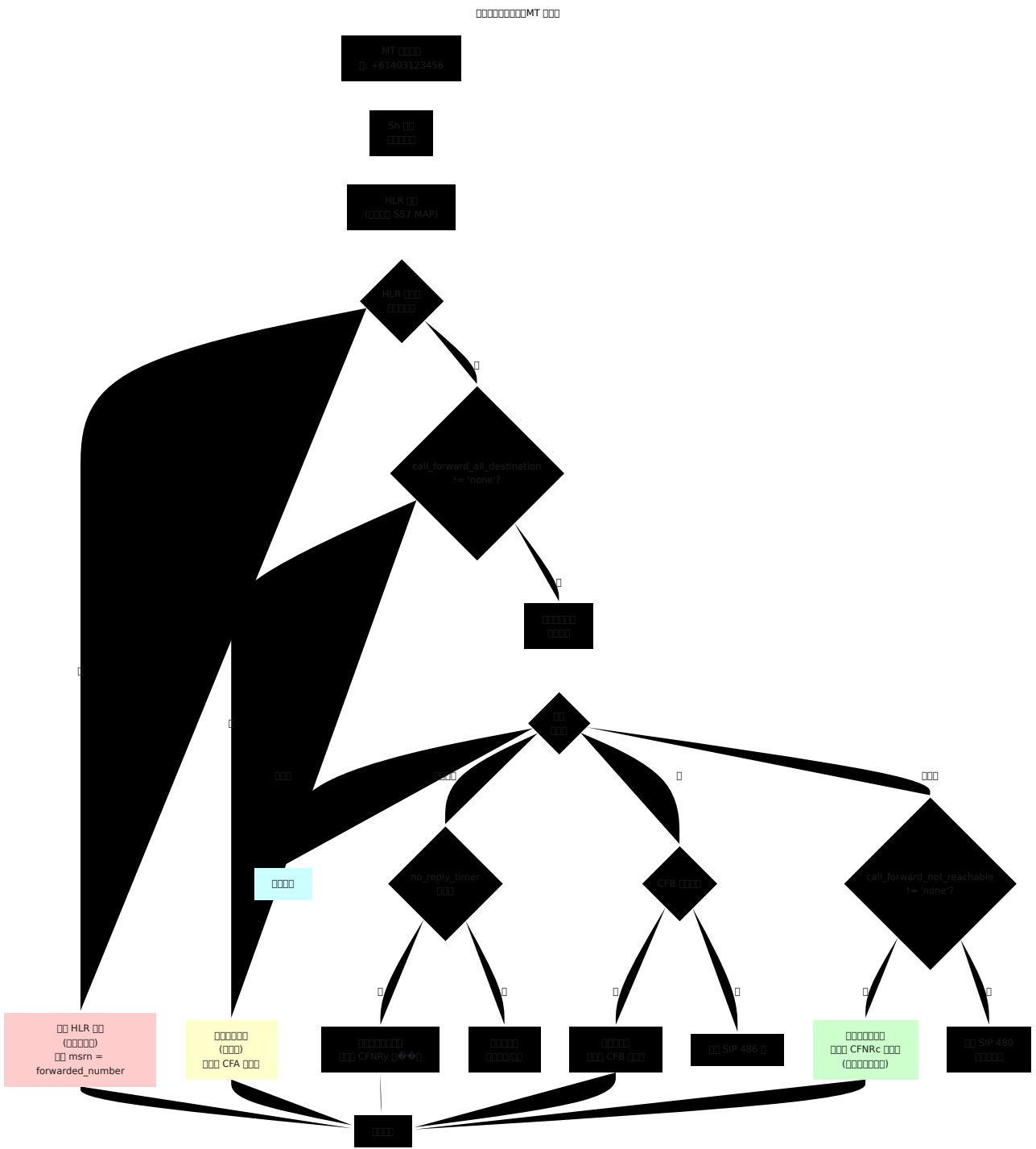
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- □□□□□□□□□□□□□□ SIP □□□□□□
- □□□□□□□□□□□□□□□□□□□□□□□□□□

- cli_withheld 是否 "true" 或 "false"
- 是否/否 CLI 是否 XML 格式
- 是否
- 是否 MO

是否

是否 CDIV 是否 TAS 是否



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

項目

- **HLR** 項目 項目/項目
- **MMTel-Config** 項目 IMS 項目
- 項目 項目

項目

項目	種別	値	単位
call_forward_all_destination	Sh/MMTel なし	"none"	"61403555123"
call_forward_not_reachable_destination	Sh/MMTel なし	"2222"	"2222"
no_reply_timer	Sh/MMTel なし	30	30
msrn	HLR MT	"61400123456"	"61400123456"
tas_destination_number	なし	"2222"	"2222"

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```

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

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

```

HLR

config/runtime.exs HLR

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

- HSS MMTel-Config
- Sh
-

1. Sh

- Web UI /sh_test
- MMTel-Config CDIV
- call_forward_all_destination

2.

-
- call_forward_all_destination != "none"
- tas_destination_number

3. HLR SS7 MAP

- Web UI /hlr
- HLR Sh
- msrn

4.

- call_forward_not_reachable_destination
- default_no_reply_timer

- MMTel-Config

```

<!-- -->
<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>

```

-
- `no_reply_timer`
-

```

INFO 61403555123
INFO 2222
INFO

```

□□□□

- □□□□□□□□□□
- □□□□□□□□
- □□□□□□□□□□

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- 📄 **TTS** 📄📄 - 📄📄📄📄📄

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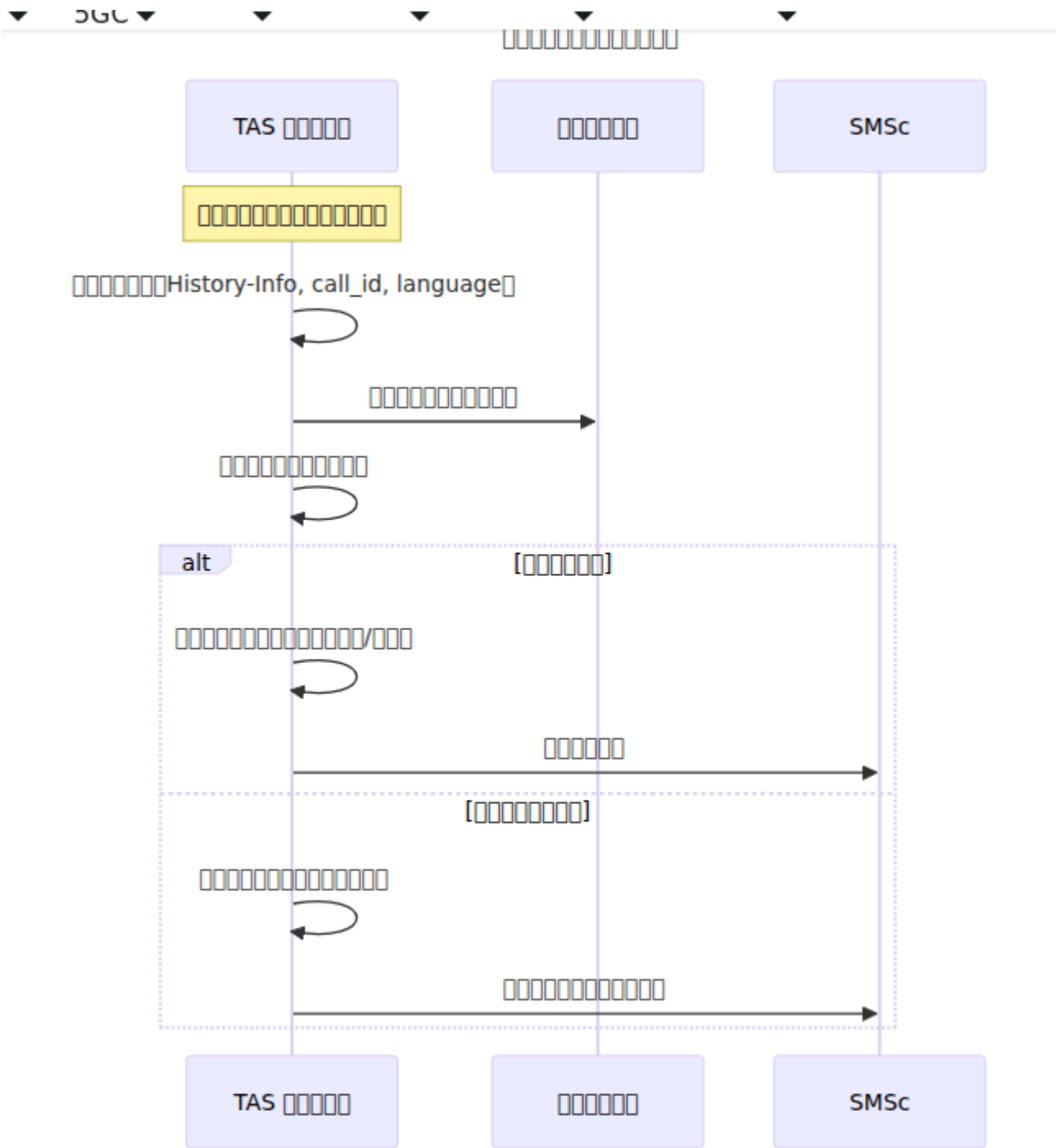
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bridge

```

<action application="log"
  data="INFO Failed to bridge Call - Routing to Call Forward No-Ans
<action application="set"
  data="sip_h_History-Info=<sip:${destination_number}@${ims_domain}
<action application="set" data="sip_call_id=${sip_call_id};CALL_FOF
<action application="log" data="DEBUG Called Voicemail Deposit Numk
<action application="set" data="default_language=fr"/>
<action application="answer" />
<action application="sleep" data="500"/>
<!-- TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS -->
<action application="set"
data='vm_post_body=mailbox=${msisdn}&caller=${effective_caller_id_num
  <action application="set" data='api_hangup_hook=curl http://localhc
type application/x-www-form-urlencoded post ${vm_post_body}'/>
  <action application="voicemail" data="default default ${msisdn}'/>

```

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```

<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"/>
    <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>

```

❓❓ TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS MWI TAS TAS

TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS TAS

```

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
      URL
      smsc_api_key: "nicktestkey123", #SMSc
      API
      source_msisdn: "2222" #
    }
  },
  #
  voicemail_notification_text: %{
    not_left:
      "1 <%= caller %> <%= day %>/<%= month %>
      <%= hour %>:<%= minute %>",
    single_voicemail:
      "<%= caller %> <%= day %>/<%= month %>
      <%= hour %>:<%= minute %> 2222",
    multiple_voicemails:
      "<%= message_count %> 2222"
  }
}

```

