Prometheus □□□□□□□

□□

OmniTAS □ Prometheus □□□□□□□

□□□□□

- 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 □

□□□

```
# □□□□□□□□
diameter_peer_state == 0
```

□□□□□

- □□□□□□□□□□ 1 □□

□□□□□□□□

1. HTTP □□□□

`http_dialplan_request_duration_milliseconds`

□□□ Histogram
□□□ `call_type` (mt, mo, emergency, unknown)
□□□ □□□ **HTTP** □□□□□□ □□□□□ HTTP □□□□□□□□□□

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

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

# □□ MT □ MO □□
histogram_quantile(0.95,

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

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

□□□□□

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

□□□

- □□□□□□□□□□□□ □□□□□
- □□□□P50: 100-500ms, P95: 500-2000ms, P99: 1000-3000ms
- □□□□□□□□□□Sh + HLR + OCS + □□□
- □□□□□□□□□□□□□□□□□□□□subscriber_data, hlr_data, ocs_authorization□
- □□□□□100ms□□□□□□□□□ 5000ms□□□□□□/□□□

□□□□□

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

2. □□□□□□□□

`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 □□□□
rate(subscriber_data_lookups_total[5m])

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

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

□□□□□

- □□□ > 5% - HSS □□□□
- □□□ > 20% - □□ HSS □□

2. HLR □□□□

`hlr_data_duration_milliseconds`

□□□ Histogram
□□□ `result` (success, error)
□□□ □□ SS7 MAP □□ HLR □□□□□□□

□□□

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

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

□□□□□

- P95 > 500ms - SS7 MAP □□□□
- P95 > 2000ms - □□ SS7 MAP □□

`hlr_lookups_total`

□□□ Counter
□□□ `result_type` (msrn, forwarding, error, unknown)
□□□ □□□□□□□□ HLR □□

□□□

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

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

# □□□□□□□□□
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
```

□□□□□

- □□□ > 5% - OCS □□□□
- □□□ < 95% - OCS □□□□□□

□□□

- □□□□□□□□□□□/□□□□
- □□□□□□□ OCS □□
- □□□□□□□□□□□□□□

4. □□□□□□

`call_param_errors_total`

□□□ Counter
□□□ `error_type` (parse_failed, missing_required_params)
□□□ □□□□□□□□

□□□

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

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

□□□□

- □□□ > 0 - □□□□□□□□□□□□□□
- □□ > □□□ 1% - □□□

`authorization_decisions_total`

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

□□□

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

# MT □□□
rate(authorization_decisions_total{disposition="mt"}[5m])

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

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

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

□□□□

- □□□ > 1% - □□□□□□□□□□
- □□□□□□□□□ - □□□□□□□
- MT/MO □□□□□□□ - □□□□

□□

- MT/MO □□□□□□□□
- □□□□□□□□□□□□□□
- □□□□□□□□□□

`freeswitch_variable_set_duration_milliseconds`

□□ Histogram
□□ `batch_size` (1, 5, 10, 25, 50, 100)
□□ □□□□□□□□□□□□□□

□□

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

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

□□□□□

- P95 > 100ms - □□□□□□□□
- □□□□ - □□□□□□□□□

5. □□□□□□

`dialplan_module_duration_milliseconds`

□□□ Histogram
□□□ `module` (MT, MO, Emergency, CallParams, □), `call_type`
□□□ □□□□□□□□□□□□□

□□□

```
# □□□□□□□□□
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])
)
```

□□□□□

- □□□□ P95 > 500ms - □□□□
- □□□□□□□□□ - □□□□□□□

□□□

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

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)
□□□ □□□□□□□

□□□

```
# □□□□□□□
active_calls

# □□□□□□□□□□
active_calls by (call_type)

# □□□□□□□□□□□□□□□□
max_over_time(active_calls[1h])
```

□□□□□

- □□□□ > □□ - □□
- □□□□ = 0 □□□□□□□ - □□□□

7. □□□□

`call_simulations_total`

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

□□□

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

# □□□□□□
rate(call_simulations_total[5m]) by (call_type)
```

□□□

- □□□□□□□□□□□□
- □□□□□□
- □□□□□□□□□□

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

□□□□□

- □□□□□□□□□

10. □□□□□□

`tracked_registrations`

□□□ Gauge
□□□ □□□□□ SIP □□□□□□□ FreeSWITCH Sofia □□□□□□
□□□□□ □ 10 □

□□□

- □□□□□□□□□□□□FreeSWITCH □□□□□

`tracked_call_sessions`

□□□ Gauge
□□□ □□□ ETS □□□□□□□□□□
□□□□□ □ 10 □

11. HTTP □□□□

`http_requests_total`

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

□□□

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

□□□□□

- HTTP 5xx □□□ > 10%

12. □□□□□□

`call_rejections_total`

□□□ 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/□ - □□□□

13. □□□□□□□□□

`event_socket_connected`

□□□ Gauge
□□□ `connection_type` (main, log_listener)
□□□ □□□□□□□□□ (1=connected, 0=disconnected)
□□□□□ □□□□□□□□□□□

□□□

```
# □□□□□□□□□□
event_socket_connected
```

□□□□□

- □□□□□□ 30 □

`event_socket_reconnections_total`

□□□ Counter
□□□ `connection_type` (main, log_listener), `result` (attempting, success, failed)
□□□ □□□□□□□□□□□□

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□□□

- □□□□

- □□□□□
- Sh □□
- HLR □□
- OCS □□

□□□□

□□□ **1**□□□□□□□

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

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

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

□□□ **2**□□□□

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

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

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

□□□ **3**□□□□

```
# 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
```

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Diameter □□□□□

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

□ Diameter □□

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

OCS □□□□

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

SS7 MAP □□□□

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

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

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

HTTP □□□□

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

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□□□□□□□□□□ "unknown"

□□□

- □□□□□□□ `call_type="unknown"` □□□ `mt`, `mo` □ `emergency`
- □□□□□□□□□□□□□□

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1. □□□□□□□□□ "HTTP □□□□□□□" □□ - □□□□□□□□□□□□□□□
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1. □□ `http_dialplan_request_duration_milliseconds` P95 - □□□□□
2. □□□□□□□□□□□□□□□
   - □□ `subscriber_data_duration_milliseconds` □□□ Sh □□
   - □□ `hlr_data_duration_milliseconds` □□□ HLR □□
   - □□ `ocs_authorization_duration_milliseconds` □□□ OCS □□

- □□ `dialplan_module_duration_milliseconds` □□□□□□□□□□□□

3. □□□□□ `call_type="unknown"` - □□□□□□□□□□□□
4. □□ MT □ MO □□□□□□□□
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1. □□ `call_attempts_total{result="rejected"}` □□
2. □□ `subscriber_data_lookups_total{result="error"}` □□□ Sh □□
3. □□ `hlr_lookups_total{result_type="error"}` □□□ HLR □□
4. □□ `ocs_authorization_attempts_total{result="error"}` □□□ OCS □□
5. □□ `authorization_decisions_total{disposition="unauthorized"}` □□□□□ □□

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1. □□□□□□ `active_calls` □
2. □□ `call_attempts_total` □□
3. □□□□□□□□□□□□□□□□
4. □□ MT □ MO □□
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1. □□ `hlr_lookups_total{result_type="msrn"}` □□

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

□□□□□ □□ HLR □□□□□

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

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

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- `call_attempts_total` □□□□
- `active_calls` □□□□
- P95 □□□□□□
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- □□□□□□□□P95 □□□□
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3. □□□□□□□ → □□□ ID □□□□□□□□□
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□□□ Prometheus □□□□□□□□□□□□□□□□□ `prometheus.yml` □□

```yaml
scrape_configs:
  - job_name: 'omnitas'
    static_configs:
      - targets: ['<tas-ip>:9094']
    metrics_path: '/metrics'
    scrape_interval: 10s
```

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- □□□□□□ □□□□□□□□□□ Diameter/OCS □□□□
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HLR □□□□□□□□ - □□□□

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5. □□ MSRN □□□□□□□□□□□□□□ MSRN □□□□
6. □□□□ MSRN□□□□□□□ LTE/VoLTE□□□□ MSRN□

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1. □□ HLR □□□□
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7. □□□HLR □□□□□□□ Sh/HSS □□

□□ **HLR** □□□

□□□ □□ SS7 MAP □□□□□□□□□

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1. □□ HLR □□□□
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3. □□ "□□ HLR □□"
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6. □□□□□
   - "SS7 MAP □□□" - □□□□
   - "□□" - □□□□□ HLR
   - "□□ VLR □□" - □□□□□□□□

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HLR □□□□□□□□□□□□□□□□

- MSRN □□□□□□□□□
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   - □□ MO □□□□□□□□□□□
   - □□□□□□□□□ "urn:service:sos" □□□□

3. □ **IP** □□

   - SIP □□□□ IP □□
   - □□□ `allowed_sbc_source_ips` □□□ MT□□ `allowed_cscf_ips` □□□ MO□□
   - □□□□□□□□MT □ MO□

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   - □□ OCS □□□□□□□□□□□□□□□□□□□
   - □□ HLR □□□□□ SS7 MAP □□□□□□□□□

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8. □□ HLR □□□□□□□□ MSRN □□□
9. □□□□□□□□□□ `hangup_case`
10. □□ `hangup_case` □ "UNALLOCATED_NUMBER"□□□□□□
11. □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

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10. □□□□□□□□□□ `allocated_time` □ `hangup_case`
11. □□ `hangup_case` □ "OUTGOING_CALL_BARRED"□OCS □□□□□

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4. □□□□□ IP□□□□□□□ IP □□□
5. □□ "□□□□"
6. □□□□□□□□□□ "□□ (SOS)"
7. □□ `hangup_case` □ "none"□□□□□□□□□□
8. □□ OCS □ HLR □□□□□
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□□ **Sh** □ **HLR** □□

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

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- □□□□□□□□□□ SS7 MAP □□□□□ HLR
- □□□□□□□□□□□□ OCS
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API

`POST /simulator/echo_call`

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`destination`	`string`	□□□□ MSISDN□□□□□□□□□□□□/□□□□□□□□□□ `+` □□□
`source`	`string`	□□□□□□□ ID □ MSISDN□□□□□□□ `+` □□□

```
curl -k -X POST https://<tas>:8444/simulator/echo_call \
  -H 'content-type: application/json' \
  -d '{"destination":"99988037866","source":"61400000001"}'
```

□□□□□ `bgapi` □□□□□□□□□□

```
{
  "ok": true,
  "command": "bgapi originate
{tas_call_reason=echo_test,ignore_early_media=true,origination_caller
&echo",
  "result": "+OK Job-UUID: <uuid>"
}
```

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□□□□□ FreeSWITCH `originate`□□□□□

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□□□□□□ Prometheus □□□□□

- □□□□□□□ HLR □□□□ `hlr_lookups_total`
- □□□□□□ `call_simulations_total{call_type, source}`
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    - □□□□ HLR □□□□□
    - □□ SS7 MAP □□
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- □□ OCS □ HLR □□

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HLR □□□□

□□□□ "**SS7 MAP □□□**"

- □□ `config/runtime.exs` □□ `ss7_map.enabled`
- □□□□□□□□□□□□□□

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- □□ SS7 MAP □□□□□□□
- □□□ HLR □□□□□□
- □□□□□□□ `ss7_map.timeout_ms`

□□□□ "□□ **VLR** □□"

- □□□□□□□ HLR □□□□
- □□□□□□□□□□□□□□□
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□□□□□ "□□ **Sh** □□"

- □□□□ HSS □□□
- HSS □□□□

- □□ `diameter.sh_application` □□

□□□□□ "□ **IP** □□□"

- IP □□ `allowed_sbc_source_ips` □ `allowed_cscf_ips` □
- □□ "□□□□" □□□□□ IP □□□

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- □□□□□□□□□□Sh/HLR/OCS □□□□□

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IMS □□□□□□□□□□ 3GPP IMS □□□□□RFC 4579□RFC 4575□TS 24.147□□□□□□□□□□□□□□□□□□□□ IMS □□□□□□□□□□□□□□/□□□□□□

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IMS □□□□□□ OmniTAS □□□□□□□□□□□□

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IMS □□□□□□

TAS □□□ TS 24.147 □ RFC 4579 □□□□ 3GPP □□□□□□□

Parse error on line 17: ... IMS □□□□□] Factory[□□□□
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'

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□□□□□□ (RFC 4579 □□□□)

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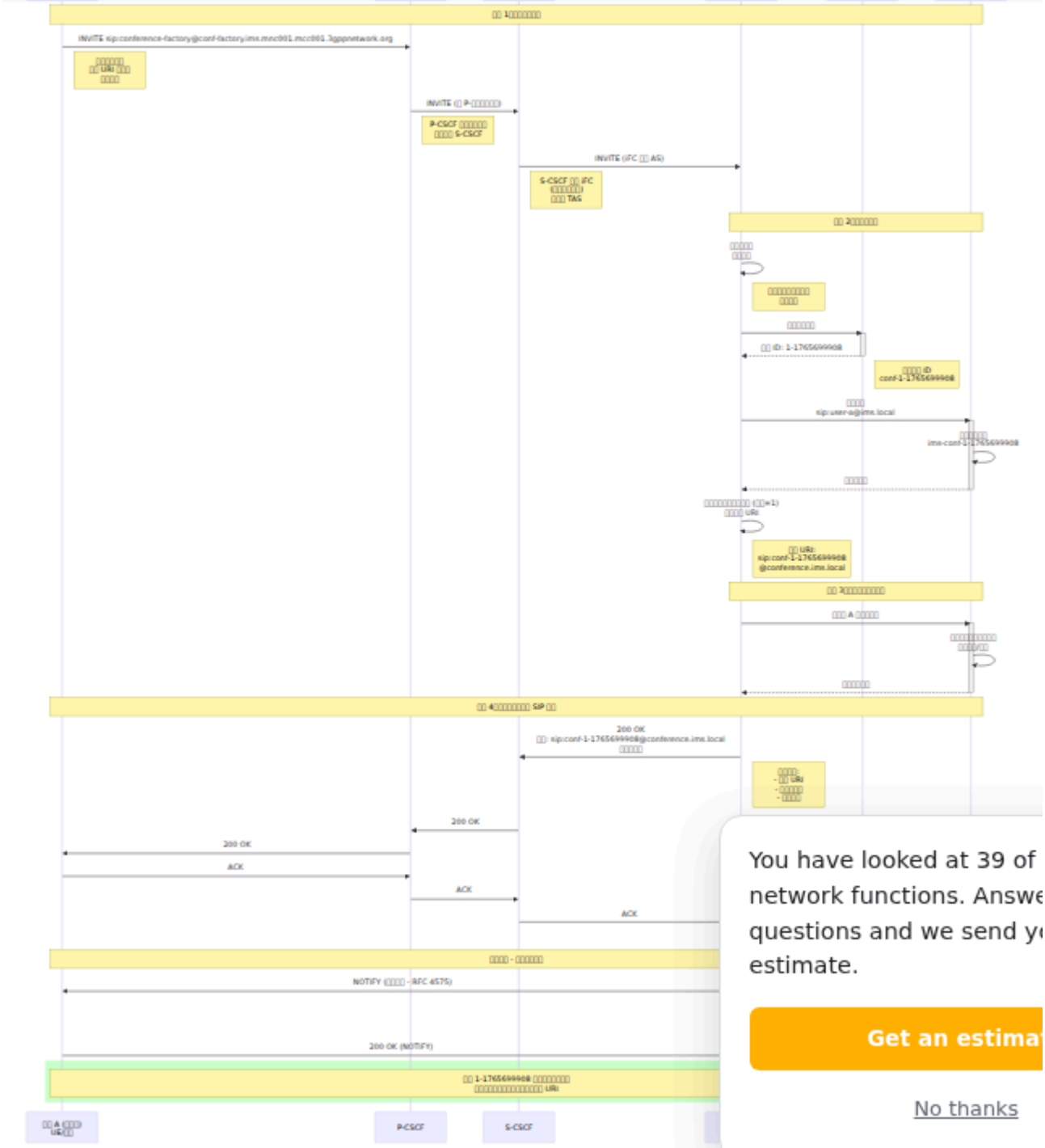

You have looked at 39 of
network functions. Answe
questions and we send y
estimate.

Get an estima

No thanks

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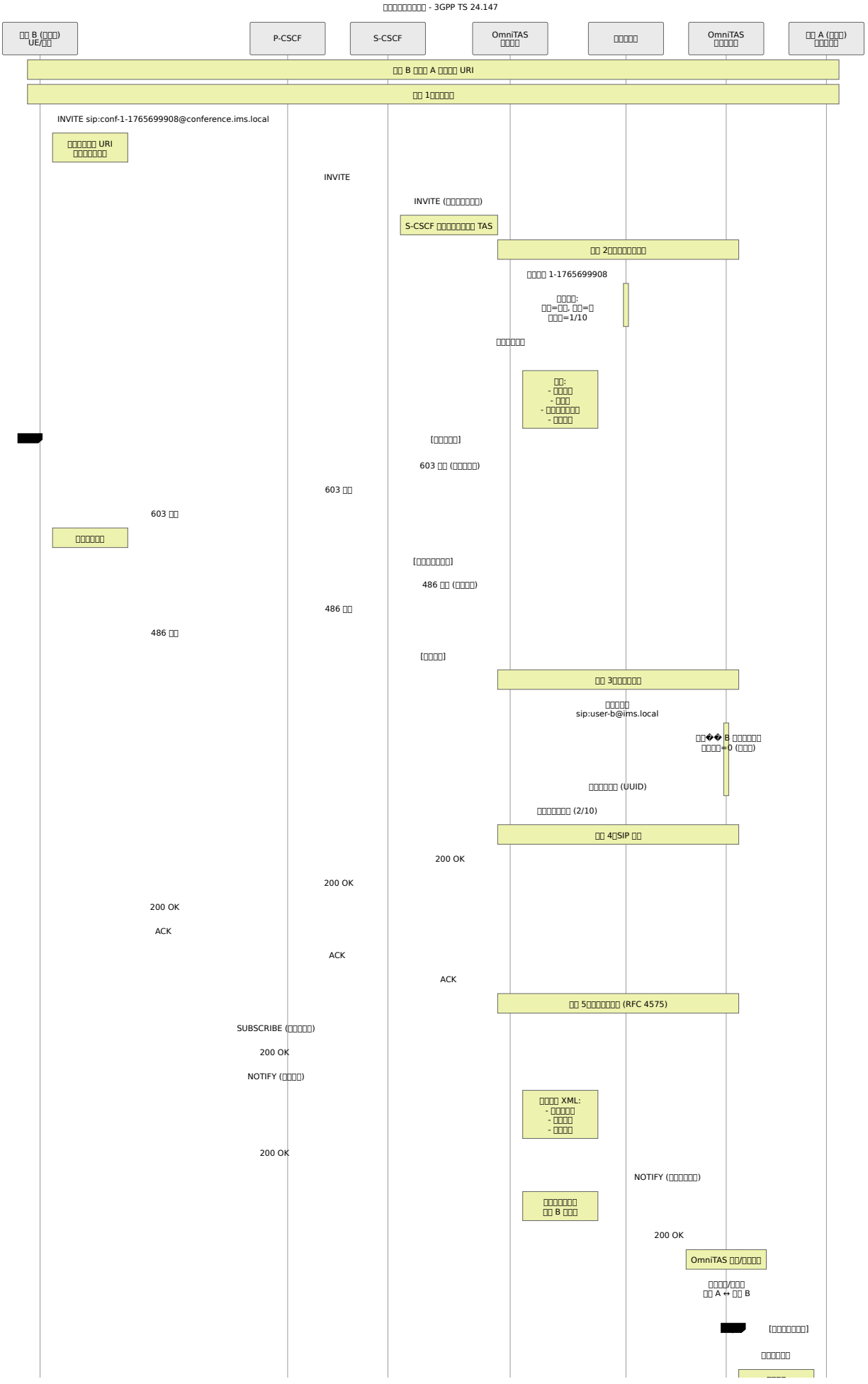
□□□□□□□□□□□□ - 3GPP TS 24.147
□□ B (□□□)
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INVITE sip:conf-1-1765699908@conference.ims.local
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S-CSCF □□□□□□□□□ TAS
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603 □□ (□□□□□)
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sip:user-b@ims.local
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SUBSCRIBE (□□□□□)
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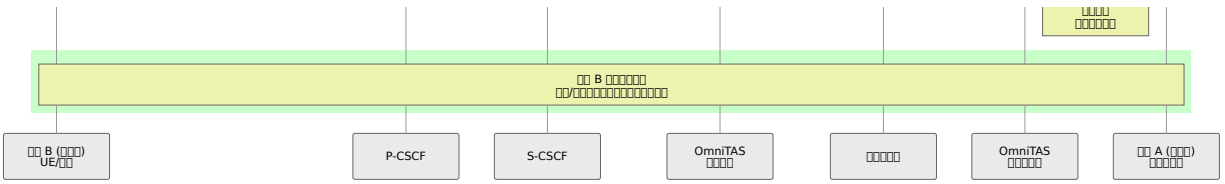

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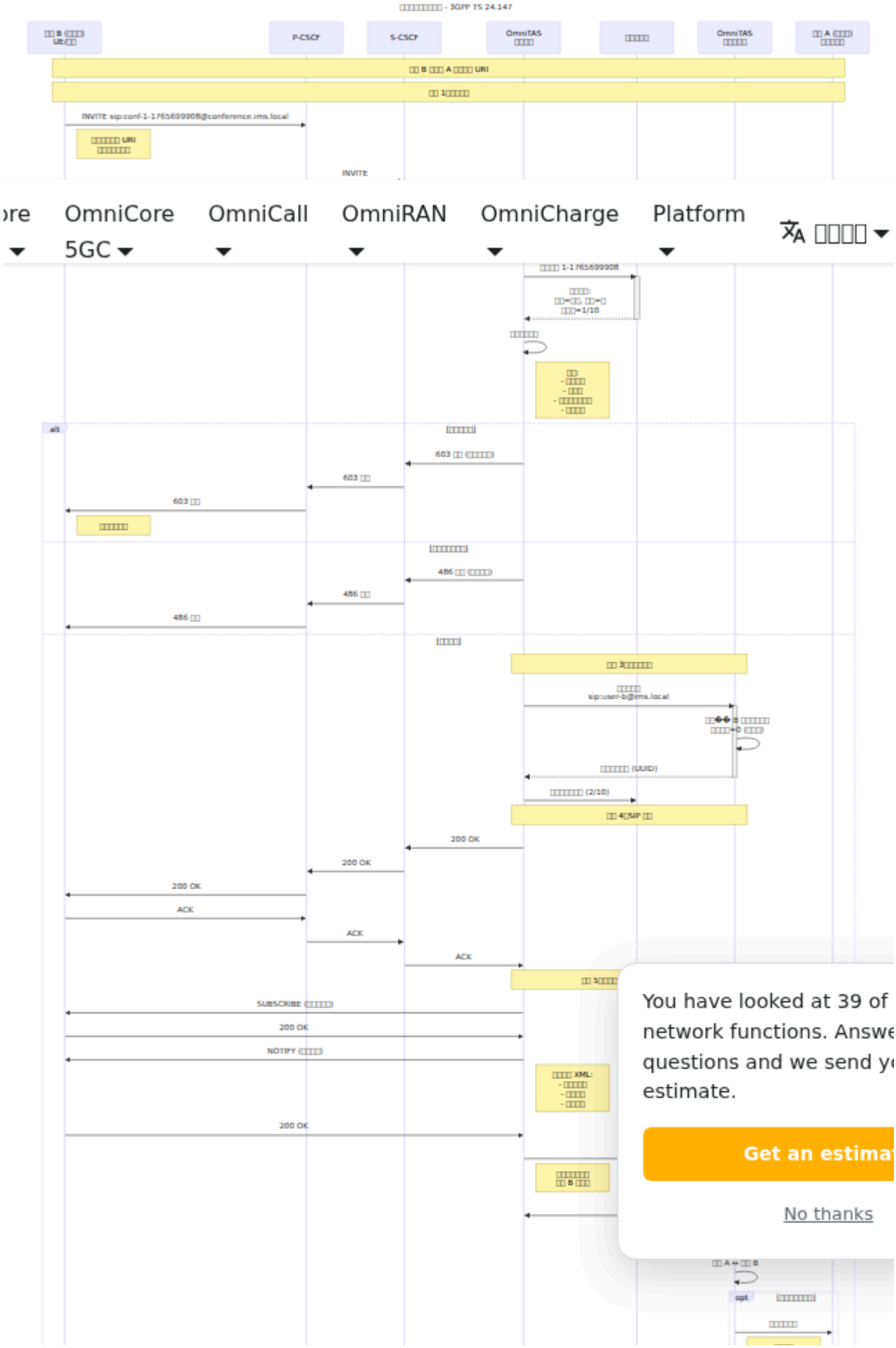
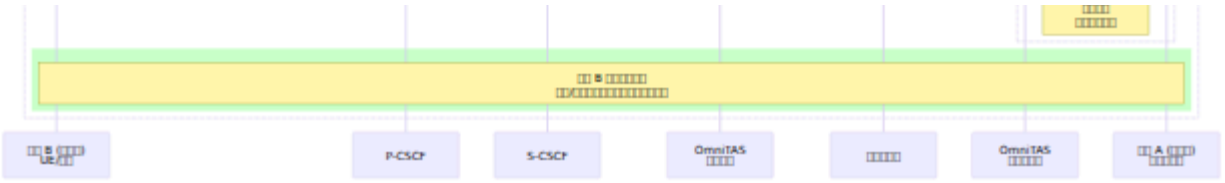


You have looked at 39 of
network functions. Answe
questions and we send y
estimate.

Get an estima

No thanks



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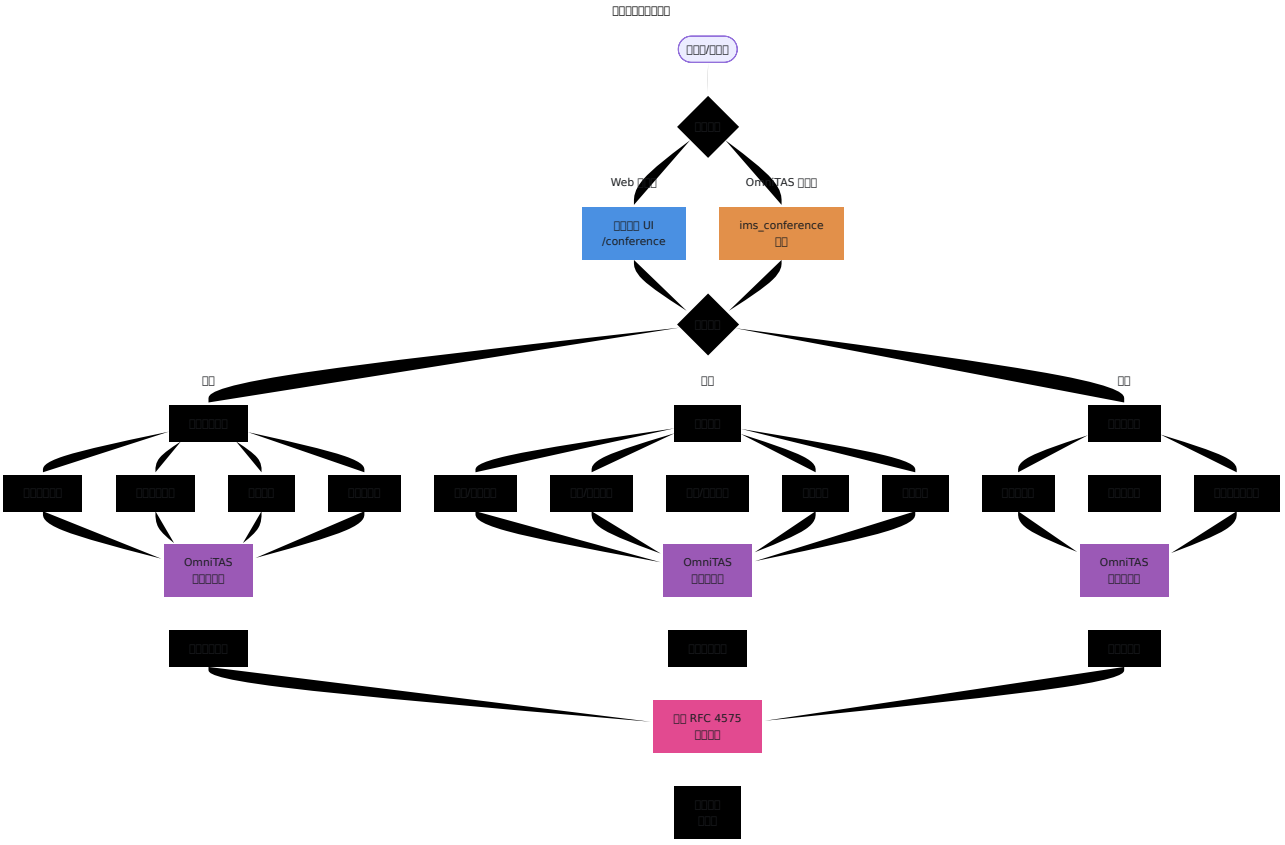
□□ Web UI □ OmniTAS □□□□□□□□□□



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Web □□

□□□ `/conference` □□□□□□□□□□“□□”□□□□□□□□□□□

OmniTAS □□□

□□ `ims_conference` □□□ OmniTAS □□□□□□□□□□□□

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Web □□□□□□□□ IMS □□□□□□□□□□□□

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OmniTAS □□□□□

□□□□□□□□□□□□□ OmniTAS □□□□□□ `ims_conference` □□□□□□

□□□□

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

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list

□□□□□□ IMS □□□

```
omnitas@server> ims_conference list
IMS □□□
□□ ID        □□ URI                          □□□ □□□
=====================================================================
1-1765699908         sip:conf-1-1765699908@conference.ims.local 3
12025550151

□□□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
  □□□: 12025550151
  □□: 1
  □□□: 3/10 (□□: 2)
  □□: □□
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□□□□
  - sip:1235;phone-
context=ims.mnc001.mcc001.3gppnetwork.org@ims.mnc001.mcc001.3gppnetwo
(342d50e0-9f67-4cc5-9179-4acae6f65f34)
      □□: 3, □□: 0, □□: □
  - sip:1235;phone-
context=ims.mnc001.mcc001.3gppnetwork.org@ims.mnc001.mcc001.3gppnetwo
(bd98ca37-64fd-4618-b2db-aaba108c73e2)
      □□: 3, □□: 0, □□: □
  - 12025550151 (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.mnc001.mcc001.3gppnetwork.org
  MNC/MCC□001/001
  □□□□□□3GPP-E-UTRAN-FDD
  □□□□□□□□□□10
  □□□□□□□□
  □□□□□□□□□□
  □□□□□□□□
  □□□□□□=□□□□□=□□□□□=□
```

create

□□□□□□□□□

□□□□ `ims_conference create <creator_uri>`

```
omnitas@server> ims_conference create sip:12025550151@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:12025550152@ims.local
□□□□ sip:12025550152@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.mnc001.mcc001.3gppnetwork.org@ims.mnc001.mcc001.3gppnetwo
  - 12025550151
```

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□□□□

- **0**□□□□
- **1**□□□
- **2**□□□□
- **3**□□□□

□□□□□

- **0**□□□□
- **1**□□□□
- **2**□□□□
- **3**□□□□
- **4**□□□□
- **5**□□□□

□□□□□

- **0**□□□□□□
- **1**□□□□/□□□

□□

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□□□

1. □□□□□□□□□ (`/conference`)
2. □□□□□□□□□□□□□□□□□
3. □□□□□□□□□□□□□□□
4. □□□□□□□□□□□

CLI □□□□□

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

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□□□

1. □□□□□□□□□□ ID
2. □□ `ims_conference info <conf_id>` □□□□□□
3. □□□□□□□□□□□□□□□□□
4. □□□□□□□□□□□□□□□
5. □□□□□□□□□□□□□□□□□□
6. □□ OmniTAS □□□□□ SIP □□□□□□□

□□□□□

- □□□□□□ `ims_conference unlock <conf_id>`
- □□□□□□□□□ default_max_participants □□
- □□□□□□□ SIP □□□□□□□□□

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1. □□□□□□□□□□
2. □□□□□□□□□□□□□□□
   ```
   ims_conference video <conf_id> off
   ```
3. □□□□□□□□□
4. □□□□□□□□□□□□

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1. □□□□ ID □□□□□□□□ UUID
2. □□□□□□□
   ```
   ims_conference remove <conf_id> <participant_uuid>
   ```
3. □□□□□□□□□□□□□□□□
   ```
   ims_conference lock <conf_id>
   ```
4. □□□□□□□□□□□□□□□□
   ```
   ims_conference add <conf_id> <sip_uri>
   ```

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□□□

1. □□□□ ID
2. □□□□□
   ```
   ims_conference record <conf_id> start
   ```
3. □□□□□□□□□□□□□□□□□□□□ `info` □□□□□□□□
4. □□□□□□□□□
   ```
   ims_conference record <conf_id> stop
   ```
5. □□□□□□□ OmniTAS □□□□□

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1. □□□□□□□□□□□
   ```
   ims_conference announce <conf_id> "□□□□□□□□□"
   ```
2. □□□□□□□□□□□
3. □□□□□
   ```
   ims_conference destroy <conf_id>
   ```
4. □□□□□□□□□□□□□

□ IMS □□□□□

□□□□□□

1. □□□□□□□ URI □□ SIP INVITE
2. IMS □□□□□□□□□
3. □□□□□□□□□□□□□

4. □□□□ ID □ URI
5. □□□□□□□□□□□□□
6. □□□□□□□□□□□□□□□□□□□□□□□□□□□□
7. □□ URI □□□□□□□
8. □□□□□□□□□□□□□□□□ URI □□

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3GPP □□□

IMS □□□□□□□□□□□□□ 3GPP □□□

- **TS 24.147**□□□ IP □□□ (IM) □□□□ (CN) □□□□□□
- **RFC 4579**□□□□□□□□ (SIP) □□□□ - □□□□□□□□
- **RFC 4575**□□□□□□□□□□□□□□□□ (SIP) □□□
- **RFC 5239**□□□□□□□□□

□□□□□□

- **P-CSCF**□□□□□ UE □□□ SIP □□
- **S-CSCF**□□□□□□□□□□□□□□□
- **OmniTAS**□□□□□□□□□□□□□□□□□□□

- **HSS**□□□□□□□□□□□□□□

□□

□□□□□□□□□ OmniTAS □□□□□□□□

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- `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 □□□□
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- □□□□□□□/□□□
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□□□□□□□□□ □□□ metrics.md □□□□

- RTP/RTCP □□□□□□□□□ 9093□
- □□□□□□□□□□□□□ 9090□
- □□□ Erlang VM □□□□□ 9094□
- Prometheus □□□□

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- □□ OmniTAS □□□□□□□□□□□□□□
- □□□□□□□□□□
- □□□□□□□□□□□□□□
- □□ Omnitouch □□□□□□□ ID □□□□

ANSSI R226 □□□□□□

□□□□□□ □□□□□□□□□□□□□□□ R226-3 □ R226-7 □□□□□□ OmniTAS IMS □□□□□□□□□□ ANSSI R226 □□□□□□□□□□

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□□□□ R226 - □□□□□□□□□□□□□□

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1. □□□□□□□

1.1 □□□□□□□□□

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

□□□□□

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

□□□□□□

- □□□□ IMS S-CSCF □□ (SIP over TCP/UDP)
- □□□□ SBC/□□□□□ (SIP □□)

- **Diameter**□ Sh (□□□□), Ro (□□□□)
- **SS7**□ MAP □□□□□□ HLR/MSC □□
- **HTTP/HTTPS**□ □□□□□□ (SMS, TTS, MAP □□)

□□□□□□

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

1.2 □□□

TAS □□□ ETSI TS 103 221 □□□□ (X1, X2, X3)□TAS □□□□□□□□□□□□□□□□□□□□ X1 □□□ □□TAS □□ X2 □ 3GPP TS 33.128 xIRI □□□□ SIP □□□TAS □□ X3 □ RTP/IP □□□□□□□□□□□ □□□□□□□□□□□□□□□□□□□□□□□ □□□□ (X1/X2/X3)□

1.2.1 □□□□

SIP □□□□□

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

□□□□□□□□

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

- □□□□□□□ (□□□□□□□□□□)

□□□□□□□ **(SIPREC)**□

- □□ SIPREC □□□□□□□□□□
- □□□ SIP □□□□□□□□□□□□□□
- □□□□□□□□□□□
- □□□□□□ SIPREC □□□□□□□□□□□□
- □□□□□□ SIPREC □□□□□□□□□□□

1.2.2 □□□□□□□

□□□□□□

- □□ RTP □□□□□□□□ B2BUA
- RTP □□□□□□□□□
- □□□□□□□□□□□
- SDP □□□□□□□□□□□□□□□□□□

□□□□□□

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

1.2.3 □□□□

□□□□□□□□

- Web UI □□□□□□□□□□□□□□□
  - □□□□ (□□□□□□□□□□□□□)
  - □□/□□□□
  - □□□□□□
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- □□□□□□□□□ CDR □□□□
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  - □□/□□□□
  - □□□□ (□□□□□□□)
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- □□□□□□□
- □□□□□□□□□□□□□□□
  - IMS □□□□ URI
  - P-Access-Network-Info □ (□□□□)
  - IP □□□□□□□□
- □□□□□□□

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- □□□□□ (Prometheus □□)
- □□□□□□□□□
- Diameter □□□□
- □□□□□□□

□□□□□□□□□ □□□ metrics.md □□□□□□□□□□□□□□□□□□□□□□□

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- □□□□□□□□
- E.164 □□□□□□□□□□ (□□□□□□□)
- □□□□□□□ (PSAP □□)

1.3 □□□□

1.3.1 □□□□□□□

□□□□□□□

- Diameter TLS □□□□
- Web □□□ API □ HTTPS
- □□□□□□□ (□□□)

□□□□□

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

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- □□□□□□□□□□□□
- □□□□□□□
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1.3.2 □□□□□

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

□□□□□

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

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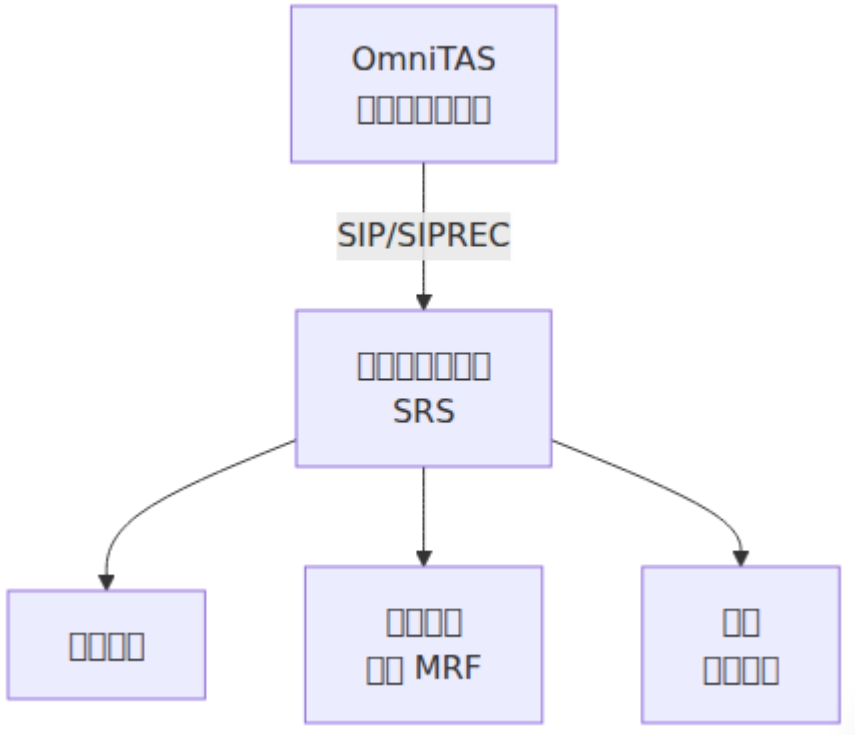
- □□□□□□□
- □□□□□□□□
- □□□□□ (□□□□□□□□)

1.4 □□□□□□□□□□

□□□□□□□□

1. SIPREC □□ (□□□□□□□ - RFC 7866)□



2. CDR □□□□□

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

3. □□□□□□□□□

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

4. API □□□

- □□□□□□□□ RESTful API
- □□□□□□□□□

- □□ CDR □□
- □□□□□□□

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

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- □□□□□□□□□□
- □□□□□□□□□□ (□□□□)

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2. □□□□□□□□□

2.1 □□□□□□□

OmniTAS IMS □□□□□□□□□□□□□□□□

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

□□□□ **(□□□□□□□□□)**□

□□ - TLS 1.3□

- TLS_AES_256_GCM_SHA384
- TLS_CHACHA20_POLY1305_SHA256
- TLS_AES_128_GCM_SHA256

□□ - TLS 1.2□

- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_RSA_WITH_CHACHA20_POLY1305_SHA256
- TLS_DHE_RSA_WITH_AES_256_GCM_SHA384
- TLS_DHE_RSA_WITH_AES_128_GCM_SHA256

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

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

□□□

- Web UI □ API □□□ HTTPS
- □□ TLS □ Diameter

2.3 □□□□□□

2.3.1 □□□□□

SQLite □□□

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

2.3.2 □□□□□□

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

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2.4 □□□□□□□□□

2.4.1 □□□□

□□□ SHA-512 □□
□□□

- □□□□□□ (128 □□□)
- 65,532 □□□□□ (□□□)

- □□□□□□□□□
- □□□□□□□□

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

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

2.4.2 SSH □□□□□□

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

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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 □□□□□ TCP □□ TLS
- □□□□□□□□

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

2.6 SIP □□□□

P-Asserted-Identity□

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- □□□□□□□
- □□□□□

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

2.7 □□□□□□□□□□

2.7.1 □□□□□□

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

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

2.7.2 □□□□□□

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- SIP □□□□□□ MD5 □□ (□□□□□□□□□)
- □□□□□□□□□ (□□□□)
- □□□□□□□ (□□□□/□□)

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2.8 □□□□□□□

2.8.1 □□□

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- RSA □□□□□OpenSSL □ (□□ FIPS 140-2 □□□□□)
- □□□□□□/dev/urandom (Linux □□ CSPRNG)
- □□□□□ RNG□□□□□

2.8.2 □□□□□□□

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- □□□□□□□□□ (0600)
- □□□□□□ PEM □□
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- □□□□□□□□□
- □□□□□□□ (□□□□□□)

2.8.3 □□□□

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

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- Diameter □□□□□□□□□□
- TLS □□ Diffie-Hellman □□□□
- □□□□□□□

2.9 □□□□□

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

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

2.10 □□□□□

2.10.1 □□□

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2.10.2 □□□□□

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

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3. □□□□□□□

3.1 □□□□□□□□□□

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- □□□□□□□□□□□□□□□□□□□□
- SIPREC □□□□□□□□□□□□□□□□□□
- CDR □□□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□□□

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- □□□□□□ (□□□□□□□)

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- □□□□□□□□□□

3.2 □□□□□□□

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- CDR □□□□□□ (□□ 90 □□□□□□ 1 □)
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- □□□□□□□ 1 □□
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- □□□□□□□□
- □□□ (□□□□□□)
- □□□□□□□□□

3.3 □□□□□

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- ETSI LI (□□□) □□□ (□□□□□□□□)
- SIPREC □ LI □□□
- X1, X2, X3 □□□ (□□□)

□□□□□

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

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4. □□□□□□□□□

4.1 □□□□

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- □□□□□□□ (ANSSI R226 □□)
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- □□□□□□□

4.2 □□□□

□□□□□

- □□□□□□□ (□ SIP, Diameter, HTTPS)
- □□□□□□□□□□
- IP □□□/□□□

4.3 □□□□

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- □□□□□□□□□
- □□ Diameter □□□□
- □□□□□□□ (SIEM □□)

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5. □□□□

5.1 □□□□

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- **README.md** □□□□□□□□□□□□□□
- **docs/deployment_guide.md** □□□□ (□□□)
- **docs/configuration.md** □□□□ (□□□)

5.2 □□□□

- □□□□□□□□ [□□□□□□□]
- □□□□□□□□ [□□□□□□□]
- □□□□□□□□ OpenSSL FIPS 140-2 □□□

5.3 □□□□

- **ANSSI R226** □□□□□ □□□
- □□□□□□□□□ □□□□□□□□□□□□□□□□

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6. □□□□

□□□/□□□□□□□

- □□□□□Omnitouch Network Services Pty Ltd
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- □□□□□□□□□
- □□□compliance@omnitouch.com.au

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- □□□compliance@omnitouch.com.au

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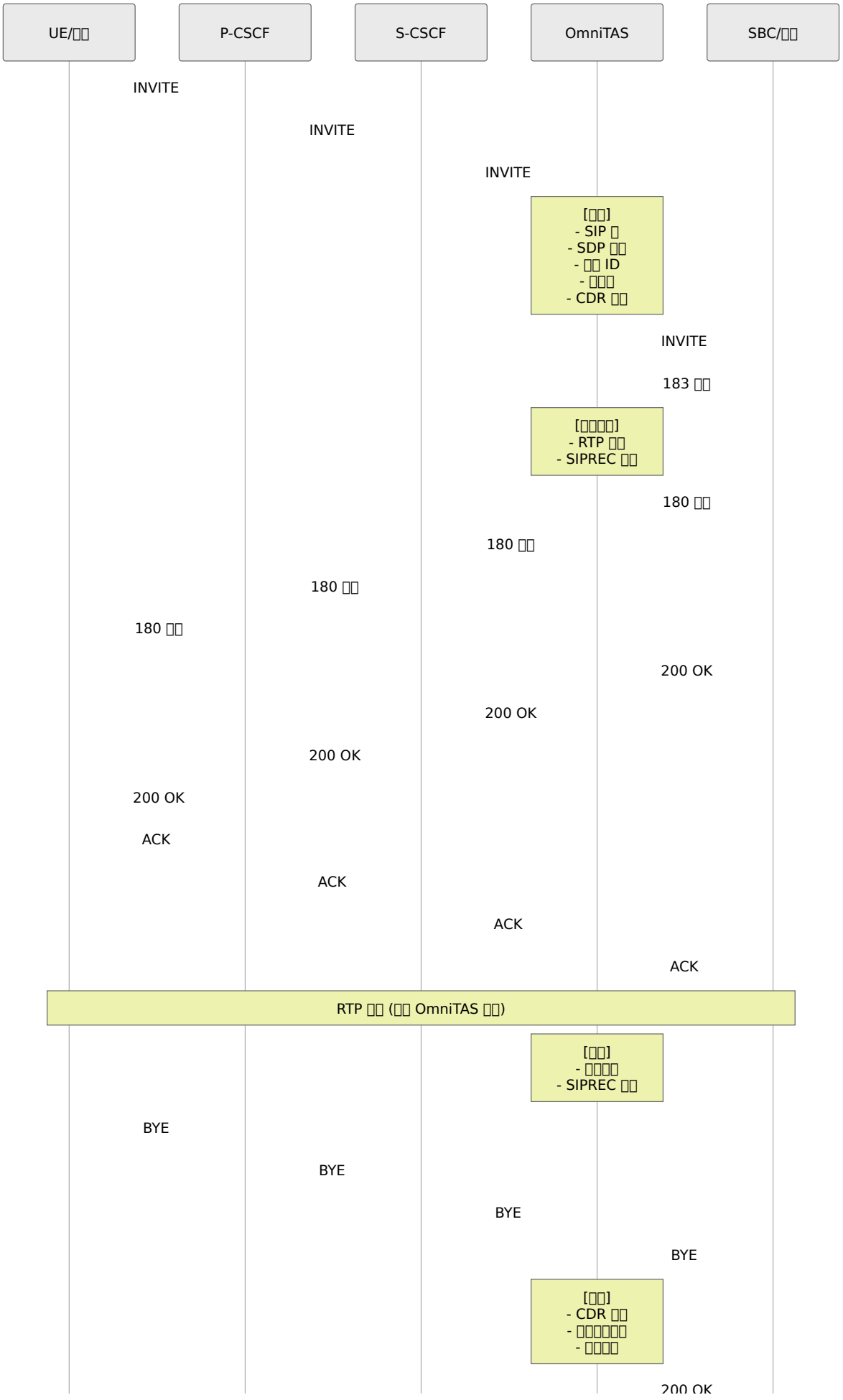
□□ A□SIP □□□□□

A.1 □□□□□□□□□□□□


UE/□□
P-CSCF
S-CSCF
OmniTAS
SBC/□□
INVITE
INVITE
INVITE
[□□]
- SIP □
- SDP □□
- □□ ID
- □□□
- CDR □□
INVITE
183 □□
[□□□□]
- RTP □□
- SIPREC □□
180 □□
180 □□
180 □□
180 □□
200 OK
200 OK
200 OK
200 OK
ACK
ACK
ACK
ACK
RTP □□ (□□ OmniTAS □□)
[□□]
- □□□□
- SIPREC □□
BYE
BYE
BYE
BYE
[□□]
- CDR □□
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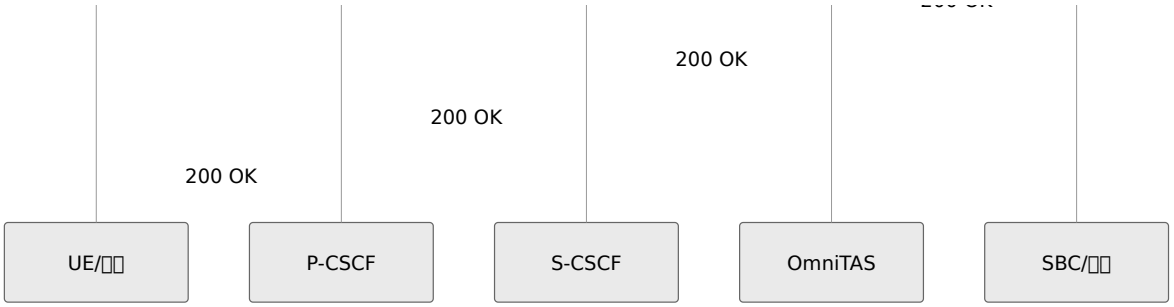
- □□□□
200 OK



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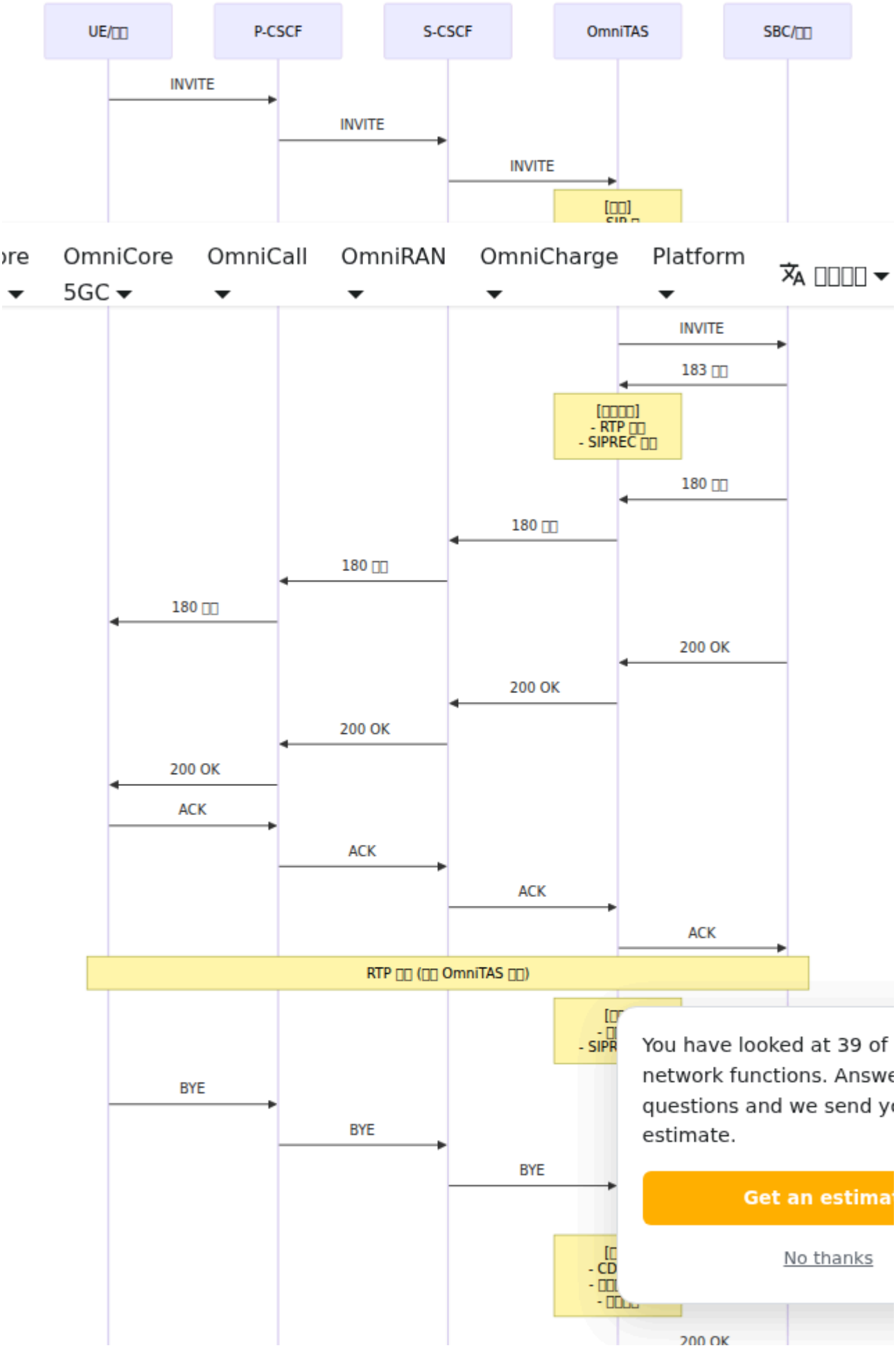
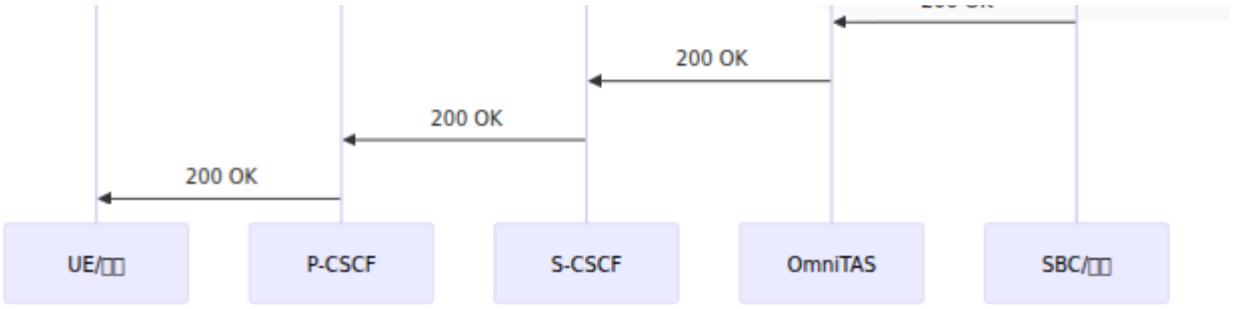
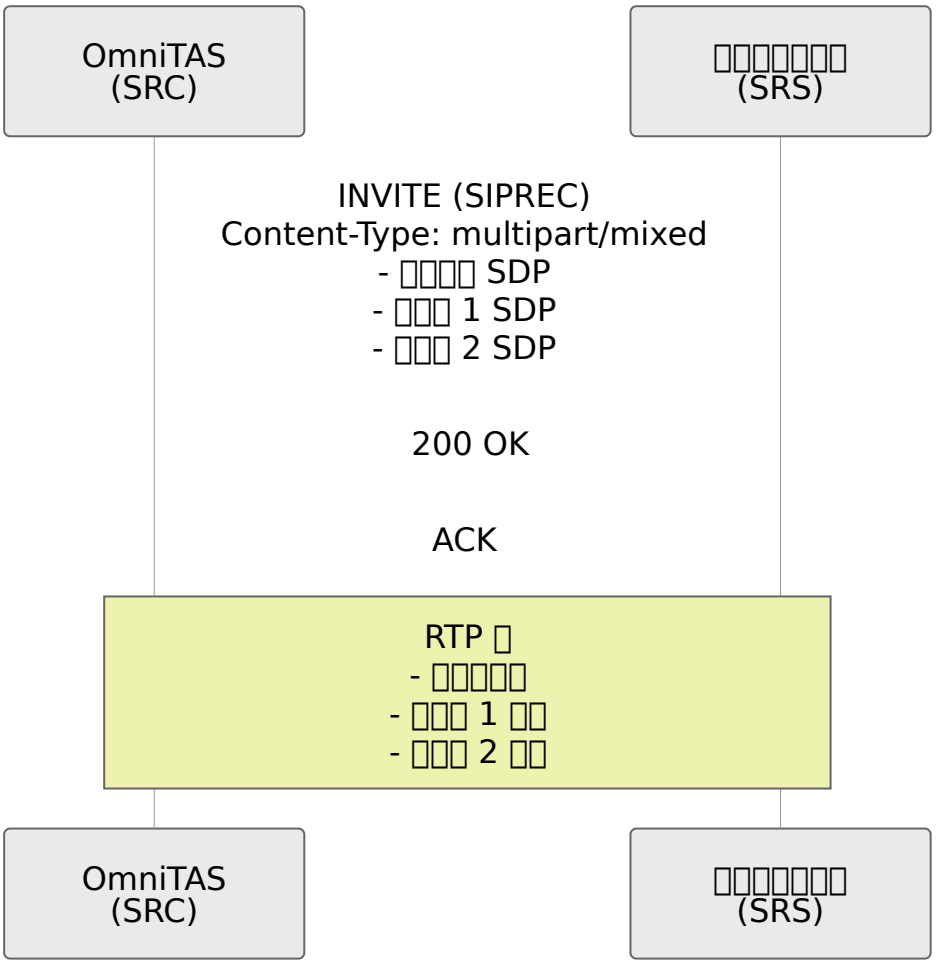
A.2 □□□□□□□□□□



You have looked at 39 of
network functions. Answe
questions and we send y
estimate.
Get an estima
No thanks



A.3 SIPREC □□□□□□



□□ B□CDR □□

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

B.1 □□□□□□□CDR□□

□□□□	□□	□□	□□□□□
`uuid`	TEXT	□□□□□□□	□□□
`caller_id_number`	TEXT	□□□□ (MSISDN)	□□□□□□□□□
`caller_id_name`	TEXT	□□□□□□□	□□□
`destination_number`	TEXT	□□□□	□□□□□□
`start_stamp`	DATETIME	□□□□□□	□□□□
`answer_stamp`	DATETIME	□□□□□□	□□□□□
`end_stamp`	DATETIME	□□□□□□	□□□□□□□
`duration`	INTEGER	□□□□□□□	□□□
`billsec`	INTEGER	□□□□□□□□□	□□□□□
`hangup_cause`	TEXT	□□□□□	□□□□□
`sip_hangup_disposition`	TEXT	SIP □□□	□□□□□
`network_addr`	TEXT	□□IP□□	□□□□
`sip_from_user`	TEXT	SIP From□□□□□	□□SIP□□
`sip_to_user`	TEXT	SIP To□□□□□	SIP□□
`sip_call_id`	TEXT	SIP Call-ID□□	**SIP**□□□

B.2 □□□□□CDR□□□□

□□□□□□□□□□

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

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

□□□□□□□□□**CSV**□

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

B.3 CDR□□

- □□□□□□□□□□□□□□□90□□1□□
- □□□□□□□□
- □□□□□□□□Web UI□`/cdr`□API
- □□□SQLite□□□□□□□□□CSV/JSON

□□C□SIPREC□□□□

SIPREC□□□□□□□□□□□□□OmniTAS□□□□□□□□□□□□□□



C.2 □□SIPREC□□

□□□□□□□□□□□□□□□

□□□□□

- □□□□□□ (caller_id_number)
- □□□□□□ (destination_number)
- SIP URI□□

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- □□□□□□□911□112□□
- □/□□□□□□□□□
- □□□□□□□□□

□□□□□

- □□□□□□□P-Access-Network-Info□□□
- IP□□□□

C.3 SIPREC□□□□

SIPREC□□□□□SRS□

□□□□□□

- □□□SIP□□□From□To□P-Asserted-Identity□
- Call-ID□□□□□□
- □□□□□□□□□□□□□□
- □□/□□□□

□□□□

- □□□1 RTP□□□□□□□
- □□□2 RTP□□□□□□□
- □□□□□□
- DTMF□□

C.4 □□□□□□□□

□□□□□□□□□□

- **X1**□□□ □□□□□□□□□□
- **X2**□□□ □□□□□□□IRI□ - □□□□□
- **X3**□□□ □□□□□CC□ - □□□□

OmniTAS□□□□□□□□□□SRC□□□□□□□□□□□IRI□CC□□□SRS□□□□□□□□□□

□□D□□□□□□□

D.1 □□□□

□□**TLS**□□□

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

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

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

# □□□□□□□□□□□CA□□□
```

□□□ SIP□□□/□IMS□□□TLS□SIP□□□□□□□TCP/UDP□

D.2 Web UI□HTTPS□□

API/Web□□□TLS□config/runtime.exs□□

```
config :api_ex,
  api: %{
    enable_tls: true,
    tls_cert_path: "priv/cert/server.crt",
    tls_key_path: "priv/cert/server.key",
    tls_versions: [:"tlsv1.2", :"tlsv1.3"],
    ciphers: [
      "ECDHE-RSA-AES256-GCM-SHA384",
      "ECDHE-RSA-AES128-GCM-SHA256",
      "TLS_AES_256_GCM_SHA384",
      "TLS_AES_128_GCM_SHA256"
    ]
  }
```

D.3 SIP□□

SIP□□□□□□□□□TCP/UDP□□□□□TLS□□□

FreeSWITCH SIP□□□□□

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

D.4 Diameter TLS□□

Diameter□□□TLS□

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

D.5 □□□□□

□□SQLCipher□SQLite□□□

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

□□□ □□□

D.6 □□□□□□

□□□□□□□SHA-512□□□□□□□□

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

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- **ANSSI**□ □□□□□□□□□□□□□
- **ETSI**□ □□□□□□□□□
- **3GPP**□ □□□□□□□□□□ - □□□□□□□□□
- **IETF**□ □□□□□□□□□ - □□□□□□□□

IMS□□□□

- **IMS**□ IP□□□□□□□ - □□□□□□□□□□IP□□□□
- **CSCF**□ □□□□□□□□□ - IMS□□□□SIP□□□
  - **P-CSCF**□ □□-CSCF - UE□□□□□□□□□SIP□□
  - **I-CSCF**□ □□-CSCF - □□□□□□□□□□
  - **S-CSCF**□ □□-CSCF - □□□□□□□□□□
- **HSS**□ □□□□□□□□ - □□□□□□
- **TAS**□ □□/□□□□□□□□ - □□□□□□□

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- **SIP**□ □□□□□□□□RFC 3261□ - □□/□□□□□□□□□□
- **SDP**□ □□□□□□□□RFC 4566□ - □□□□□□□
- **RTP**□ □□□□□□□□RFC 3550□ - □□□□□
- **RTCP**□ RTP□□□□ - RTP□□□□□
- **SRTP**□ □□RTP□RFC 3711□ - □□□□□
- **Diameter**□ □IMS□□□□AAA□□□□□□□□□□□□□
  - **Sh**□ □□□□□□□□□□Diameter□□
  - **Ro**□ □□□□□□□□Diameter□□
- **SIPREC**□ □□□□□□□□□□RFC 7866□ - □□□□□□□

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- **SBC**□ □□□□□□□□ - □□□□□□□□□□□□
- **MRF**□ □□□□□□□ - □□□□□□□□□□□□□□□□
- **UE**□ □□□□ - □□□□□□□□□□

- **PSAP**□ □□□□□□□□ - □□□□□□□□□
- **DRA**□ Diameter□□□□ - Diameter□□□□

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

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

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- **TLS**□ □□□□□□□RFC 5246□RFC 8446□ - □□□□
- **PFS**□ □□□□□□□ - □□□□□□□□□□□□□□□
- **SHA-512**□ □□□512□□□□□□□□
- **AES**□ □□□□□□□
- **RSA**□ Rivest-Shamir-Adleman - □□□□□□
- **ECDSA**□ □□□□□□□□□□□
- **PKI**□ □□□□□□□ - □□□□□□□
- **CA**□ □□□□□□□ - □□□□□□□
- **CRL**□ □□□□□□□

- **OCSP**□ □□□□□□□□□

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- **MAP**□ □□□□□□□ - SS7□□□□□□□□□
- **HLR**□ □□□□□□□ - □□□□□□□□□□□□
- **SS7**□ □□□□□7□ - □□□□□□□
- **NANP**□ □□□□□□□
- □□/□□**ID**□ □□□□□□□□□□□□□□□□□□□

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

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- **API**□ □□□□□□□□□ - □□□□
- **UI**□ □□□□ - □□Web□□□□□
- **RBAC**□ □□□□□□□□□□ - □□□□
- **UUID**□ □□□□□□□□ - □□□□

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□□□□□□ TAS □□□□□□□□□□□□□□

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

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- □ **Sh □□** - □ HSS/□□□□□□□□□□
- □ □□□□ **(Ro)** - OCS □□□□□□□
- □ **SS7 MAP** - □□□□□□□□□□ HLR □□
- □ □□□□ **(X1/X2/X3)** - ETSI TS 103 221 □□ (X1, X2, X3)

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

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

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- □ **HLR & □□□□□** - □□□□
- □ **ANSSI R226 □□□** - □□□□□□□□

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

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    - □□□□□ `"127.0.0.1"` (□□□□□)
    - □□□□□□□□ TAS □□□□□□□□□□□□□□□ localhost
    - □□□□□□□□□□□□□□□ IP
    - □□□ `"10.8.82.60"` □□□□□□□
- **`port`** (□□□□□□)□□□□□□□□□□ TCP □□
    - □□□□□ `8021`
    - □□□□□□□□□□□ 8021
    - □□□□□□□□□□□□□□□□□□□□□□□□
    - □□□ `8021`
- **`secret`** (□□□□□□□)□□□□□□□□□□□□□□□
    - □□□□□□□□□□□□□□□□□□□
    - □□□□□□□ ESL □□
    - □□□□□□ □□□□□□□□□□□□□□
    - □□□ `"cd463RZ8qMk9AHMMDGT3V"`

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- □□□□□□□□□□□□□□□□□□□□ `/calls` □□
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- □□□ `secret` □□□□□□□□□□□□□□□

- □□□□□□□□□□□□□□□□□□□□□□□□□□□□ TAS □□□
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- □□□□□□□□ □□ `secret` □□□□□□□□□□□□□
- □□□□□□ □□□□□□□□□□□□□□
- □□□□□□□□ □□ TAS □□□□□□□□□□□□□

□ IMSI MSISDN □□

□ IMSI MSISDN □□□□□□□□□□□□□□□□ SIM □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□TAS □□□□□□□ □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ □□□□□□□□□□□

□□□□□□ TAS □□□TAS □□ HSS □□□□□□□□□□□□□□□□□TAS □□ Sh □□ □□□□□□□HSS □□□□□□□□□□ □□□□ IMSI □□□□ `<IMSPrivateUserIdentity>`□TAS □□□□□□□□

- □□□□□□ - □ IMSI □□□□□□TAS □□□□□□□□□□ `Request-Disposition: no-fork`□□□□ S-CSCF □□□□□□□□
- □□□□□ - □□□□□□TAS □□ `Request-Disposition: no-fork` □□□□□□□□□□□□

□□□□□□□□□□□□□□□□□HSS□□□□□□□□□□□□□□□□ TAS □□□

□□□

- S-CSCF □□□□□□□□□□□□□□□□□□□□

□□□□□ `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"
  ]
```

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□□□□□□

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

Web □□□

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

□□□□□

□□□□□□□□□□ TLS □□□□□□ HTTPS □□□

1. □□□□□□□□□/□□□□□

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

2. □□□□□□

   - □□□□□□□□□□□□□□ (CA) □□□
   - □□□□□□□Let's Encrypt□□□□□□□□ CA
   - □□□□□□□□□□□□□□□□□□□□□□
   - □□□□□□□□□□□□`chmod 600`□□□□□□□□□

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- □□□□□□□ □□□□□□□□□□□□□□□□□□□□
- □□□□□□□□ □□ MSISDN □□□□□□□□□□
- □□□□□□ Diameter □□□□□□□□□□
- □□□□□□ □□□□□□□□□□□□□

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- □□□□□□□□□□□□□□□□ VPN □□
- □□□□□□□□ CA □□ TLS □□
- □□□□□□□□□□□□IP □□□□
- □□□□□□□□□□□□□□□□□□□□
- □□□□□□□□□□
- □□□ HTTPS - □□□□□□□ HTTP □□□□

□□□□□□□□

1. □□□□□□□

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

2. □□□□□□□□□□

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

3. □□□□□□□□□

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

□□□□□

- □□□□□ □□ `keyfile` □ `certfile` □□□□□□□□□□□□□
- □□□□□□□□ □□□□□□□□□□□□□□□□□ 443□□□□□□□□□
- □□□□ **UI**□ □□□□□□□□□□□□□□□□ HTTPS □□
- **SSL** □□□□□ □□□□□□□□□□□□□ PEM □□

API □□

TAS □□□□ REST API□□□□□□□□□□□□□□□□□□□□□□□□□□□□□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"`□□□□□□□□□□□□□□□□□□□
  - □□ IP□□□□□□□□□□□□□`"10.8.82.60"`□
  - □□□□ □□ API □□□□□□□□□□ `"127.0.0.1"`
- **`product_name`** (□□□)□API □□□□□□□□□
  - □□ API □□□□□□□
  - □□□`"OmniTAS"`□`"MyOperator-IMS"`
- **`title`** (□□□)□API □□□□□□□□□
  - □□□ OpenAPI/Swagger UI □□□
  - □□□`"API - OmniTAS"`□`"IMS □□□□□ API"`
- **`hostname`** (□□□)□□□□ API □□□□□□□

    - □□ OpenAPI □□□□□□□ URL
    - □□□□□□□□ API □□□□□
    - □□□ `"localhost"` □ `"api.operator.com"` □ `"10.8.82.60"`
- **`enable_tls`** (□□□)□□□□□□□ API □ TLS/HTTPS
    - `true` □□□ HTTPS □□ API□□□□□□□□□
    - `false` □□□ HTTP □□ API□□□□□□□/□□□
    - □□□□ □□□□□□□□□□□ `true`
- **`tls_cert_path`** (□□□)□TLS □□□□□□□□□PEM □□□
    - □ `enable_tls: true` □□□
    - □□□□ TAS □□□□□□□
    - □□□ `"priv/cert/server.crt"`
- **`tls_key_path`** (□□□)□TLS □□□□□□□□□PEM □□□
    - □ `enable_tls: true` □□□
    - □□□□ TAS □□□□□□□
    - □□□□ □□□□□□□□□□ `chmod 600` □
    - □□□ `"priv/cert/server.key"`

API □□□

REST API □□□□□□□□□□□□□□□

- □□□□□□□□□
- □□□□□□□ (CDR) □□
- □□□□□□□□□□
- Diameter □□□□□
- □□□□□□□□□□
- □□□□□□□
- □□□□

OpenAPI/Swagger □□□

API □□□□□ OpenAPI (Swagger) □□□

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

□□□□□

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

□□□□□

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

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

□□□□□□□

1. □□□ **API**□

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

2. □□ **API** □ **TLS**□

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

3. □□/□□□

```
listen_ip: "0.0.0.0"
enable_tls: false       # □□□□□□ HTTP
port: 9094              # □□□□□□
```

□□□□□□

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

□□□□ (X1/X2/X3)

TAS □□□□□□ IMS □□□ (POI)□TAS □□ ETSI TS 103 221 □□□□□□TAS □□□□□□□ (NE) □□□□□□□ □□□ (LEMF) □□ X1 □□□□□□□□TAS □□ X2 □□ SIP □□□TAS □□ X3 □□□□□□□□

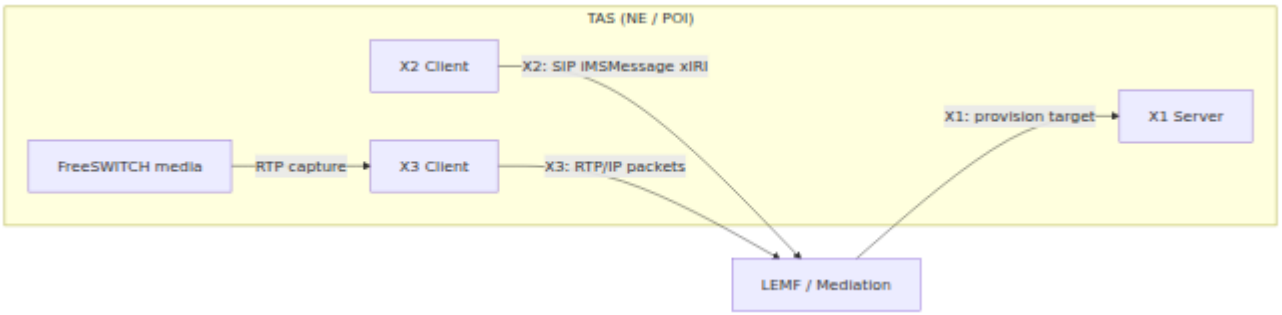
□□□□□

□□	□□	**TAS** □□	□□
X1	□□□□□□□□□□□□□□	□□□	□□ HTTPS □□□□□ TLS
X2	□□□□□□□□□□ (SIP □□□□□ TS 33.128 iMSMessage xIRI)	□□□	TCP□□□ TLS
X3	□□□□□□□ (□□□□□□□ RTP/IP □□□)	□□□	TCP□□□ TLS

□□□□□□

□□	□□
ETSI TS 103 221-1	□□□□□□□ X1 (□□)
ETSI TS 103 221-2	□□□□□□□ X2/X3 (□□)
3GPP TS 33.128	□□□□□□□□□□□□

□□



□□

□ `config :tas, :li` □□□□□□□□□□□□□ `config/runtime.exs` □□□□□□□□□□□□□□□□□□□□□□□□□□□□□ `enabled: true` □□□□□□□□□□□□□□□□□□□□□□□□□□□□

```
config :tas, :li,
  enabled: true,
  ne_identifier: "tas-poi-01",
  ne_ip: "198.51.100.60",
  media_iface: "eth0",
  tcpdump_path: "/usr/bin/tcpdump",
  x1: [
    enabled: true,
    port: 8443,
    tls: [
      certfile: "/etc/omnitas/li/x1-cert.pem",
      keyfile: "/etc/omnitas/li/x1-key.pem",
      cacertfile: "/etc/omnitas/li/lemf-ca.pem"
    ]
  ],
  x2: [enabled: true, address: "192.0.2.10", port: 12345, tls:
false],
  x3: [enabled: true, address: "192.0.2.10", port: 12346, tls:
false]
```

□□□□

□□	□□	□□	□□	□□
`enabled`	□□□	□	`false`	□□□□□ `false` □□□□□□□□□□□□
`ne_identifier`	□□□	□	`"tas-01"`	□□□□□□□□ (TS 103 221-2 □□ 18)□TAS □□□ X2 □ X3 □□□□□□□□□LEMF □□□□□□□□□□□ IP □□□□□□□□
`ne_ip`	□□□	□	`"0.0.0.0"`	□□□□□□ IP □□□TAS □ X2 □ X3 □□□□□□□□□
`media_iface`	□□□	□	`"eth0"`	□□ RTP □□□□□□□□□X3 □□□□□□□□□□□□
`tcpdump_path`	□□□	□	`"/usr/bin/tcpdump"`	`tcpdump` □□□□□□□X3 □□□□□□□ RTP □□□□□□ TAS □ □□□□□□□□□
`x1`	□□□□□	□	`[]`	X1 □□□□□□□□□□ X1 □□□
`x2`	□□□□□	□	`[]`	X2 □□□□□□□□□□ X2 □ X3 □□□

□□	□□	□□	□□	□□
`x3`	□□□□□□□	□	`[]`	X3 □□□□□□□□□□ X2 □ X3 □□□

X1 □□

TAS □□ X1 □□□□LEMF □□□□□□□□□□□□□TLS □□□□□ (TS 103 221-1 □□ 7.2.2.1)□□□□□□ `allow_insecure: true`□□□□□□□□□□□□□□□□□□

□□	□□	□□	□□	□□
`enabled`	□□□	□	`false`	□□ X1 □□□□
`port`	□□	□	`8443`	X1 □□□□ TCP □□□
`tls`	□□□□□	□	-	X1 □□□□ TLS □□□□□□ X1 TLS □□□
`allow_insecure`	□□□	□	`false`	□□□□ HTTP □□ X1 □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

X1 TLS □□

□□	□□	□□	□□	□□
`certfile`	□□□	□	-	□□□□□□□□□□□□ PEM □□□
`keyfile`	□□□	□	-	□□□□□□□□□□□□ PEM □□□
`cacertfile`	□□□	□	-	□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ TLS□□□□□□□□□□□ TLS□

X2 □ X3 □□

TAS □□ X2 □□□□ X3 □□□□X2 □□□□ SIP □□□□ TS 33.128 `iMSMessage` xIRI □□□□□X3 □□□□□□□□□□ RTP/IP □□□□□□□TS 33.128 □□ 7.12.6.3□IPv4 □□□□□□□ 5 □ IPv6 □□□ 6□□□□□□□□□□□□□□

□□	□□	□□	□□	□□
`enabled`	□□□	□	`false`	□□□□□□□
`address`	□□□	□	-	LEMF □□□ IP □□□□□□□□
`port`	□□	□	-	LEMF □□□ TCP □□□
`tls`	□□□□□□□□□□□	□	`false`	□□□ `true` □ TLS □□□□□□□□□□□□ TLS □□□□□□□ `false` □□□□□□ TCP□

□□□

□□□□□□□TAS □□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□ ANSSI R226 □□□□□□

SIP □□□□

Ansible □□□□□□□□□□□□ XML □□□□□□□□□ `Gateways` □□□□□□□□□□□□□□□□

CSCF □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ IP □□□□□□□□□□□/SBC□□ MT □□□□□□□□□□□□ CSCF□MO □□□□□□□□□□ `allowed_sbc_source_ips` □ `allowed_cscf_ips`□

□□ - □□□□□□□□ TAS □□□□□□□□ MO □□□□□□ MT □□□□□□□□□□ TAS IP □□□□□□□□□ IP □□□□

```
config :tas,
  allowed_sbc_source_ips: ["10.5.198.200", "203.0.113.36"],
  allowed_cscf_ips: ["10.8.3.34"],
```

□□ Web UI□□□□□□□□□□□□□□□□□□□□□

- SIP □□□□□□□□□□□□□□□
- SIP □□
- SIP □□□□□□□□□□□□
- □□□
- Ping □□□□□□ SIP OPTIONs □□□□□□□□□□ SIP OPTIONs□□
- □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
- □□□ / □□□ / □□□□□□□ / □□□□□□□
- □□ SIP OPTIONs ping □□□□□□□
- SIP OPTIONs ping □□
- □ **detail** □□□□□□□□□□

□□□□□□□

□□□ 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 REGISTER
- □□`true` | `false`
- □□□□□□□□□□□□□ `true`
- □□□□□□ IP □□□□□□□ `false`

□□□□

`username`

- SIP □□□□□
- □ REGISTER □□□□□□□□
- □□ `register="true"`□□□□□
- □□□`value="trunk_account_123"`

`password`

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

`realm`

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

`auth-username`

- □□□□□□□□□□□□□□□□ `username` □□□
- □□□□ - □□□□□□□□□ auth □ From □□□□□□□□□□
- □□□`value="auth_user_456"`

□□□□

`register-transport`

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

`register-proxy`

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

`retry-seconds`

- □□□□□□□□□□□□□
- □□□`30`
- □□□`5` □ `3600`
- □□□`value="30"`

`expire-seconds`

- □□□□□□□□□□□□□□
- □□□`3600`□1 □□□
- □□□□□□□□□□□□□
- □□□`value="1800"`□30 □□□

`caller-id-in-from`

- □ SIP From □□□□□□□□

- □□`true` | `false`
- `true`□From □□□□□□□□□□□□□□□□□□□□□□□□
- `false`□From □□□□□□□□□
- □□□ □□□□□□□□□□□□□ `true`
- □□□`value="true"`

□□□□

`ping`

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

`ping-max`

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

□□□□□□

`extension`

- □□□□□□□□□□□□□□□□□□
- □□□□ - □□□□□□□□□□□□
- □□□`value="+12125551234"`

`extension-in-contact`

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

`contact-params`

- □□□□□□□□ Contact □
- □□□□□□□□□□□□□
- □□□`value="line=1;isup=true"`

□□□□

`from-user`

- □□ From □□□□□□
- □□□□□□□□□□□□□□□□
- □□□`value="trunk_pilot"`

`from-domain`

- □□ From □□□□
- □□□□□□□□
- □□□`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"`

`codec-prefs`

- □□□□□□□□□□□□□
- □□□□□□□□□□□□□
- □□□`value="PCMU,PCMA,G729"`
- □□□□□□□`PCMU`□`PCMA`□`G729`□`AMR`□`AMR-WB`□`G722`□`OPUS`

`rtp-timeout-sec`

- □□ N □□□□□ RTP□□□□□□
- □□□`0`□□□
- □□□□□□□□
- □□□`value="120"`

`rtp-hold-timeout-sec`

- □□□□□□ RTP □□□□
- □□□`0`□□□
- □□□`value="1800"`□30 □□□

SIP □□□

`sip-port`

- □□□□□□□□ SIP □□
- □□□□□□□□□□

- □□□□
- □□□`value="5060"`

`rtp-ip`

- RTP □□□□□ IP □□
- □□□□□□□□ RTP IP
- □□□`value="10.0.0.5"`

`register-proxy-port`

- □□□□□□□
- □□□□□□□□□□□□□□□□
- □□□`value="5061"`

`contact-host`

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

`distinct-to`

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

`cid-type`

- □ Remote-Party-ID □ P-Asserted-Identity □□□□□□□□□
- □□`rpid` | `pid` | `none`
- `rpid`□Remote-Party-ID □
- `pid`□P-Asserted-Identity □
- □□□`value="pid"`

`extension-in-contact`

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

□□□□

`transport`□□□□□□□□□

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

□□ TLS □□□□□□□□ SIP □□□□□□□□□□□□□□□□

□□□□□□□□□□□□

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

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

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

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

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

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

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

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

□□□□□□□□□□

□□□□□□□□□ `sofia/gateway/name/destination` □□□□□□□□

```
<!-- □□□□□□□□ -->
<action application="bridge" data="sofia/gateway/primary_carrier/+121

<!-- □□□□□□□ -->
<action application="bridge" data="sofia/gateway/primary_carrier/${ta

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

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

□□□□□□□□□

□□□□□□□□

- □□ `username` □ `password` □□□□
- □□ `proxy` □□□□□□□
- □□ `register-transport` □□□□□□□□□□
- □□□□□□□□□□□□□□□□□

□□□□□□

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

□□□□□□□

- □□□□□□□□□ `ping` □□
- □□ `rtp-timeout-sec` □□□□□□□
- □□□□□□□□□□□□□□□□□
- □□□□□□□□□□

SBC □□□□□□□□□□

□□□□□□□□ □□□□□□□□□**SBC**□ □□□□□□□□□□

Sh □□□□□□□`sh_data_references`□

□□□□□ TAS □□□□□□□□□□□□ Sh `Data-Reference` □□□□□□□□□□`caller` = MO □□ `called` = MT □□□□□□□□□□TAS □□□□□□□□□□□□□□□□□□□□ HSS □□□□□□□□□□□□□□□□□□□□ `5012 UNABLE_TO_COMPLY` □ `5101 OPERATION_NOT_ALLOWED` □□□□□□□□□□□□□□ UDR □□□□

```
config :tas,
  # □□□□□□□□□□□□□□□□□□□□□□□□□□
  sh_data_references: [
    caller: [10, 16, 17, 32],
    called: [10, 16, 17, 32]
  ]

# ...□□□□□□□□□□□□□□□
config :tas, sh_data_references: [10, 16, 17, 32]
```

□□□□□□□□□□□□□□□□□□□□ UDR □□□□ ID □□□□□□`;mo` / `;mt`□□□□□□□□□□□□□□ **Sh □□** □□□□

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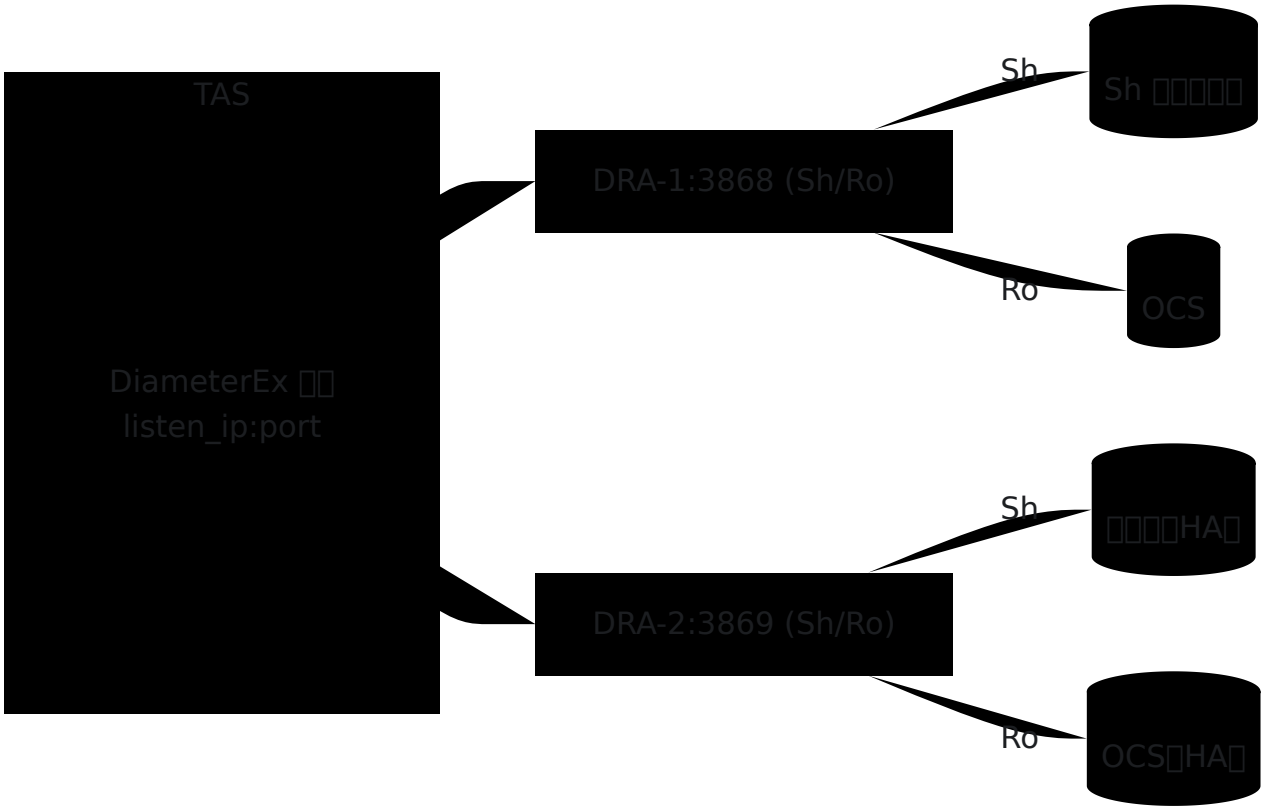
TAS
DiameterEx □□
listen_ip:port
DRA-1:3868 (Sh/Ro)
DRA-2:3869 (Sh/Ro)
Sh
Ro
Sh □□□□□
OCS
Sh
□□□□HA□
Ro
OCS□HA□

```
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,
        # □□□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,
        # □□□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
      }
    ]
  }
```

□□□□□□

□□□□□

- **`service_name`**□□□□□□□□□□□□□□□□□□□□
  - □□□`:omnitouch_tas`
  - □□□□□□□□□□
- **`listen_ip`**□□□□□□□□□□□□□□□□ IP □□

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

- □□ Vendor-Specific-Application-Id AVP

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`destination_realm` □□□□□□□□□□□□□□□ `Destination-Realm` AVP□□ AVP □□□□□□□□□□ □DRA□□□□□□□□□□□

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1. □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ `destination_realm`
2. □□□□□□□□□□□□□□□ `destination_realm`
3. □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ `realm` □

□□□□□□

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

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- □□□□□□□□□□ Sh □□ HSS □ Ro □□□□□□□ OCS □
- **DRA** □□□□ DRA □□□□□□□□□□□□□□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
- □□

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```
□□□□□□□□ destination_realm
  ↓ (□□□□□□)
□□ destination_realm
  ↓ (□□□□□□)
□□
```

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□□□□ Web UI □ **Diameter** □□□□□ Diameter □□□□□□□

□□□□□ Web UI □ **Sh** □□□□□□□□ `Sh` □□□□□□□ Sh □□□□□□□

FreeSWITCH □□□□□□

FreeSWITCH □□□□□□□□

- □□□□□□□□ `:info`□□□□□□□□□□□□□□□□□□□□□□□□□□□□

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XML □□□□□□□□□□□

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TAS □□□□□□□ XML □□□□□□□□□ XML □□□□□□□□ TAS □□□ □□□□□□□□□

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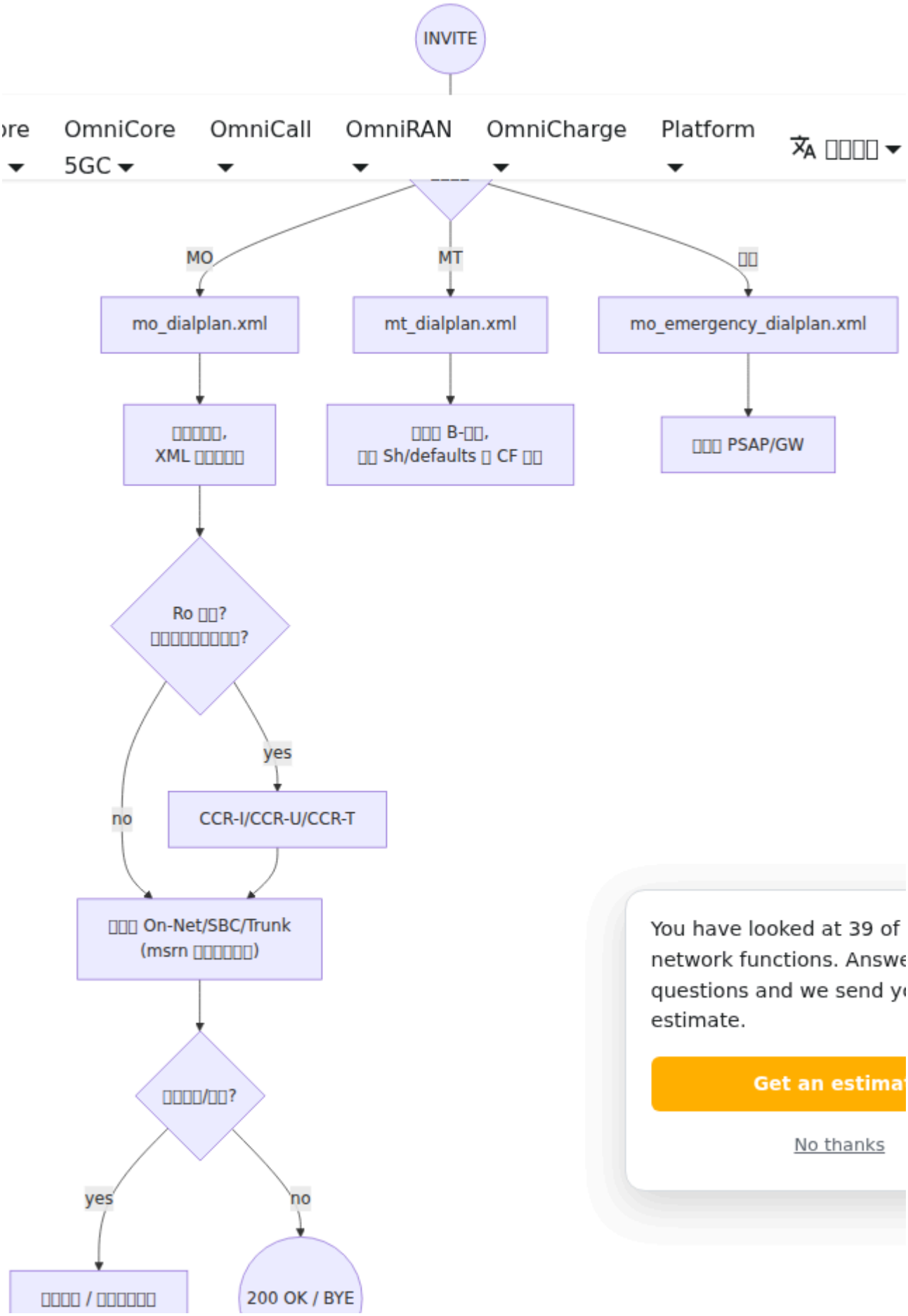

You have looked at 39 of
network functions. Answe
questions and we send y
estimate.

Get an estima

No thanks

FreeSWITCH XML □□□□□□

OmniTAS □□□ FreeSWITCH □□□□□ XML □□□□□□□□□□□□□□□□□□□□□□□□□□□□□

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```
<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>
```

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

□□□□□

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

□□□□□

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

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

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

continue="true" □□

□□□

```
<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"` □□□

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- □□□□□□□□□□□□□
- □□□□□□□□□□

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answer - □□□□□□□ 200 OK□

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

hangup - □□□□□□□□□

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

bridge - □□□□□□□□□□□□□

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

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

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

□□□□□□□□

set - □□□□□□□

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

unset - □□□□□□□

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

export - □□□□□□□□□ B-leg□□□□□□□

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

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playback - □□□□□□□

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

sleep - □□□□□□□□□

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

echo - □□□□□□□□□□□□□□□

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

conference - □□□□□□□□

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

□□□□□TAS ESL □□□□□

□□□□□ TAS □□ ESL □□□□□□□□□□□□ FreeSWITCH □ `voicemail` □□□□□□□□□□/□□/□□□□□□□ □□□□□□□□□□□□□ □□□□ □□□□□□□□□

```
<!-- □□□□□□□□□□□□□□□ -->
<action application="set" data="tas_vm_mode=deposit"/>
<action application="set" data="tas_vm_mailbox=${msisdn}"/>
<action application="set"
data="tas_vm_caller=${effective_caller_id_number}"/>
<action application="socket" data="127.0.0.1:8084 async full"/>

<!-- □□□□□□□□□□□ -->
<action application="set" data="tas_vm_mode=retrieve"/>
<action application="set" data="tas_vm_mailbox=${msisdn}"/>
<action application="socket" data="127.0.0.1:8084 async full"/>
```

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log - □□□□□□□

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

info - □□□□□□□□□□□□□□

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

□□□□

say - □□□□□□□□□□

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

send_dtmf - □□ DTMF □□

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

□□□□

□□□□□□□□

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

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```
<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"/>

    <!-- □□□□□□□□□□□□□□□□□TAS ESL □□□□□□□□□ voicemail.md□ -->
    <action application="log" data="INFO □□□□□□□□□□□□□"/>
    <action application="answer" data=""/>
    <action application="set" data="tas_vm_mode=deposit"/>
    <action application="set"
data="tas_vm_mailbox=${tas_destination_number}"/>
    <action application="set"
data="tas_vm_caller=${effective_caller_id_number}"/>
    <action application="socket" data="127.0.0.1:8084 async
full"/>
  </condition>
</extension>
```

□□□□□□□

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

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

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

- □□□□□□
  https://freeswitch.org/confluence/display/FREESWITCH/Channel+Variables

FreeSWITCH wiki □□□□□□

> □□□□□□□□□□ `:credit_exhausted` □□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□□

□□ CDR □□□□□□□□□□ CDR □□□□□□□□□□ □`cdr_sqlite` / `cdr_csv`□□□□□□□□□□□□□□ OmniCore ansible `applicationserver` □□□`cdr_sqlite.conf.xml` □□ + □□□□ `cdr` □□□ □□□□□□□□□□ A-leg□□□□□□□□□□□□□□□□□B-leg □□□ `bleg_uuid` □□□

□□□□

- `hangup_case` - "none"
- `ims_private_identity` - □□□□□□□
- `ims_public_identity` - □□□□□□□
- `msisdn` - □□□□□□□□□ +□
- `imsi` - □□□□□□□□ IMSI
- `ims_domain` - □□□□□□□□□

MT □□□□□□□□□

- `ims_private_identity` - □□□□□□□
- `ims_public_identity` - □□□□□□□
- `msisdn` - □□□□□□□□□ +□
- `msisdns` - □□□□□□□□□□□□□□□□□□□ +□□□□□□□□
- `imsi` - □□□□□□□□ IMSI
- `ims_domain` - □□□□□□□□□
- `call_forward_all_destination` - CFA □□□□ "none"
- `call_forward_not_reachable_destination` - CFNRc □□□
- `scscf_address` - S-CSCF □□□ "none"
- `scscf_domain` - S-CSCF □□ "none"
- `no_reply_timer` - □□□□□
- `hangup_case` - "none" □ "UNALLOCATED_NUMBER"
- `msrn` - □□ PRN □ MSRN□□□□□□□□□ SRI □□□□□□□□□□□□□□□□□□□□
- `tas_destination_number` - □□□□□□□□□□□ MSRN □□□□□□

MO □□□□□□□□□

- `hangup_case` - "none"□"OUTGOING_CALL_BARRED" □ "UNALLOCATED_NUMBER"

- `ims_private_identity` - □□□□□□□
- `ims_public_identity` - □□□□□□□
- `msisdn` - □□□□□□□□□ +□
- `msisdns` - □□□□□□□□□□□□□□□□□□□□ +□□□□□□□□
- `imsi` - □□□□□□□□ IMSI
- `ims_domain` - □□□□□□□□□
- `allocated_time` - OCS □□□□□□□□□□□□□□□□□
- `cli_withheld` - "true" □ "false" □□□
- `on_net_status` - "true" □ "false" □□□□□□□□□□□□□□□□□□□□□□□ Sh □□□□□
- `original_call_id` - □□ UE □□□ A-leg SIP Call-ID□□□□ B2BUA □□ HOMER X-CID □□□
- `msrn` - □□□□□□ MSRN□□□□□
- `tas_destination_number` - MSRN □□□□□□□□

□□□□□ OmniTAS □□□□□□

- `tas_zero_rate` - □□□ `"true"` □□□□□□□□□□□ □□□□□□

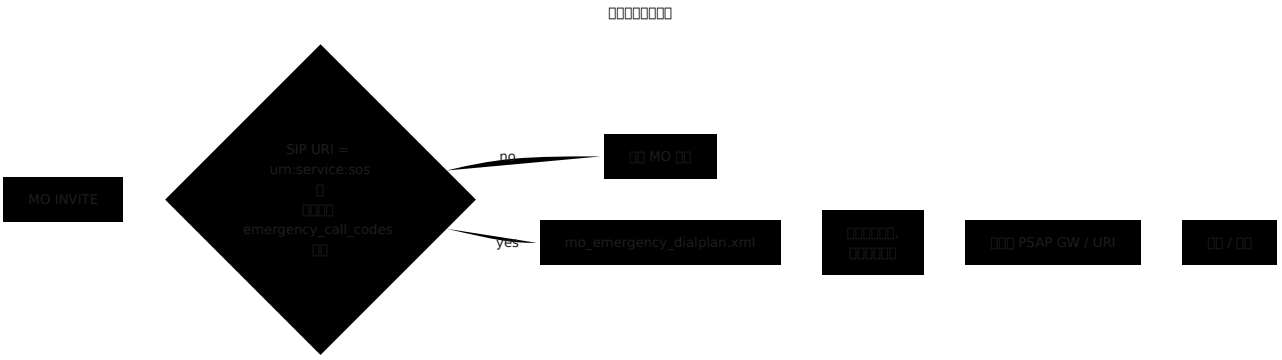
□□□□□

□□□□□□□□□□□□□□□□ `tas_zero_rate=true` □□□□□□□□

```
<extension name="Zero-Rated-Routes" continue="true">
  <condition field="${on_net_status}" expression="^true$"
break="never">
    <action application="set" data="tas_zero_rate=true"/>
  </condition>
  <condition field="${tas_destination_number}"
expression="^(1800|0800)" break="never">
    <action application="set" data="tas_zero_rate=true"/>
  </condition>
</extension>
```

□□□□□□□□□CCR-Initial □□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□ *□□□* □□ - □□□□□□□□□□□□□□□□□□□□



□□□□□□□□□

1. □□□□ TAS
2. □□□□□□□□□□□□□□□□□□□□
3. □□□□□□□□□□□
   - □□□□□□□□ `:emergency`
   - □□ `mo_emergency_dialplan.xml` □□
   - □□□□ OCS □□
   - □□□□□□ PSAP □□
4. □□□□□□□□□ `call_type: emergency`

□□□□□□□

□ `priv/templates/mo_emergency_dialplan.xml` □□□□□□□□□□□□□□□□□□□□

- □□□□□□□□□□□□□□□□□□□□□□□□□□□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 □□

□□□□

□□	□□
`name`	□□□□□ `ivr` □□□□□□□□□□□□□□
`greet-long`	□□□□□□□□□□□□□
`greet-short`	□□□□□□□□□□□□□
`timeout`	□□□□□□□□□
`max-failures`	□□□ `invalid` □□□□□□□□□□□
`max-timeouts`	□□□ `timeout` □□□□□□□□□□
`digit-len`	□□□□□□□□□

□□□□

□□□□ `action="menu-exec-app"` □□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□

□□ MO □□□□□□ TAS □□ MT □□□□□□□□□□□□□□□□□ MT □□□□□□□□□□□□□□□□□□□□□□□□□□□□ MSRN □□□□□□□□□□□□□□□□□

□□□□□ **MO** □□□ **MT**□

□□ **MT** □□□□□□□□□□□

- □□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□
- □□□□□□□□□ MSRN □□
- □□□□□□□□□□

□ **MT** □□□□□□□ TAS□□

- □□□□□□□□□□□□CFU□CFB□CFNRy□CFNRc□
- □□/□□□□□□□□□□
- CS □□□□□□ MSRN □□
- □□□□□□□□□□□
- □□□□□□□□□□□

□□

MO □□□□□□□□□□□□□□□□□□□□□□ TAS □□□□□□□□□□□□□□□□□□□ TAS □□□TAS □□□□□□□ MT □□□□□□□ `mt_dialplan.xml` □□□□□□□□

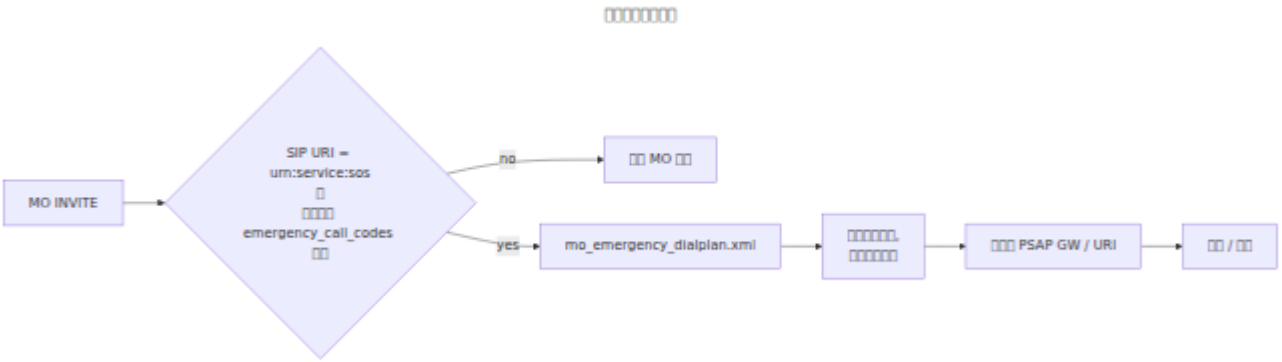
□□□□□□□□□□□

```
<extension name="On-Net-Route">
  <condition field="${on_net_status}" expression="true">
    <action application="log" data="DEBUG □□ 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` - □□□□□□

□□□□□



□□□□□

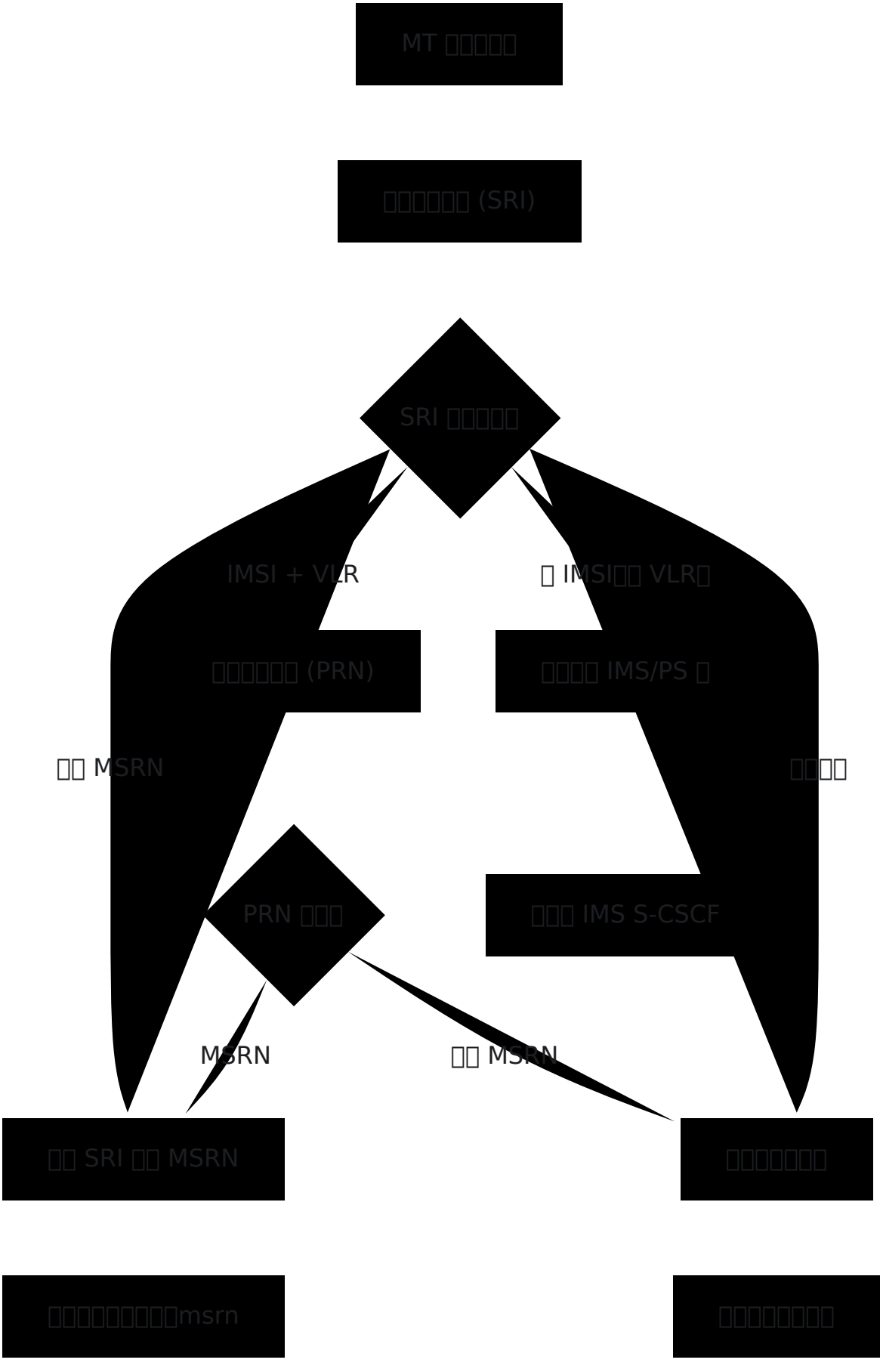
- TAS IP□□□□`10.179.3.60`□□□□□□ `allowed_sbc_source_ips` □□□□□
- □□□ TAS □□□□□□□□□□ MT □□

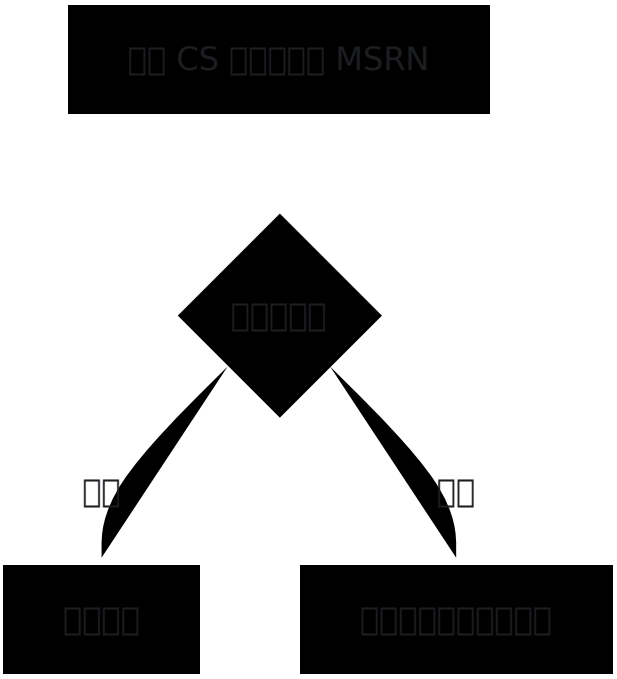
- □□□□□□□□TAS □□□□□□□□□□□□□□

MSRN □□ 2G/3G □□□□□□□□

□□□□ 2G/3G □□□□□□CS□□□□□□□□□□TAS □□□□□ MSRN□□□□□□□□□□□□□

□□□□□□ MT □□□ MSRN □□


MT □□□□□□
□□□□□□□□ (SRI)
SRI □□□□□□
IMSI + VLR
□ IMSI□□ VLR□
□□□□□□□□ (PRN)
□□□□□ IMS/PS □
□□ MSRN
□□□□
PRN □□□
□□□□ IMS S-CSCF
MSRN
□□ MSRN
□□ SRI □□ MSRN
□□□□□□□□□
□□□□□□□□□□□msrn
□□□□□□□□□□



□□□□

□ 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 □□□□□□□

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

□ **2** □□□□□□□□□ **(PRN) -** □□□□

□□ SRI □□ IMSI + VLR □□□ MSRN□TAS □□ VLR □□ PRN □□□□□ MSRN□

VLR □□□□□□□□□□□ MSRN□□□□□□□□ TAS□□ MSRN □□□□□□□□□□□□□□□□□

□□ **PRN** □□□ MSRN `61412345678`

□□□□□□□`msrn`

□□ TAS □□ SS7 MAP □□□ MSRN□□□ MSRN □□□□□□□□□□□MT □□□□□□□□□□□□□

□□□ `${msrn}`

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

□ mt_dialplan.xml □□□□ MSRN

MSRN □□□□ MT □□□□□□□□□□□□□□□□□□□□□□

□□□□□□□□

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

□□□□□□□□□□

```
<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_

    <!-- □□ CS □□□□□ MSRN -->
    <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 Documentation**□

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□□□□	□□	□□□□
□□□□□□□□ **(CFU)**	`call_forward_all_destination`	□□□□□□□□□□□□
□□□□□□ **(CFB)**	`call_forward_not_reachable_destination`	□□□□□□
□□□□□□□□ **(CFNRy)**	`call_forward_not_reachable_destination`	□□□□□□□□□□□
□□□□□□□□ **(CFNRc)**	`call_forward_not_reachable_destination`	□□□□□/□□

□□□□

1. Sh □□□HSS□

□□□□ □□□ HSS □□□□□□□□

TAS □□□□□□□□□□ Sh □□□ HSS □□□□□□□□□□□□□□□□□□□□/□□□□□

□□□□□□□□

- `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** □□□□□□

□□	□□	□□	□
`call_forward_all_destination`	□□□	`"61412345678"`	CFU □□□□
`call_forward_not_reachable_destination`	□□□	`"61487654321"`	CFB/CFN □□□
`no_reply_timer`	□□□	`"20"`	CFNRy □□

□□□□

- □□□□□□□`"none"`□□□□□
- □□□□□□□□□□□□□□ `^(?!none$).*` □□□□□□□□□ "none"

□ mt_dialplan.xml □□□□□□

□□ 1□□□□□□□□ (CFU)

□□□□□□□□□□□□□

```
<extension name="Check-Call-Forward-All">
  <condition field="${call_forward_all_destination}" expression="^(?!
    <action application="log" data="INFO □□□□□□□□□□□□□□□ ${call_forwarc

    <!-- □□□□□□□□□□□□□□□ -->
    <action application="set" data="sip_h_History-Info=<sip:${destina

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

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

□□□□

- □□□□□□□□□□□□□□□□□□□□□□□□
- □□ `;CALL_FORWARD_UNCONDITIONAL` □□□□ ID □□□□□
- □□ `History-Info` □□□□□□□□□□
- □□□□□ `61412345678` □ CFU □□□ `61487654321` - □□□□□□□□

□□ **2**□□□□□□□□/□□□

□□

□□□□□□□□□□

```
<!-- □□□□□ MSRN □ IMS □□□... -->
<action application="log" data="INFO Failed to bridge Call - Routing

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

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

□□□□□

- □□ `61412345678` □ CFNRy □□□□□□□□□□ `61487654321`
- □□□□□□□□□
- 20 □□□□□□no_reply_timer□
- □□□□□□ `61487654321`□□□□ History-Info □□□□□□□□□□

History-Info □

`History-Info` SIP □□□□□□□□

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

□□□

- □□□□□□□□□□ `${destination_number}`
- □□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□

```
<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 Called Voicemail Deposit
Number for ${history_info_value}" />

    <!-- □□□□□□□□□□□□□□□□□□□□□□□□□□
         (TAS ESL □□□□□□ voicemail.md) -->
    <action application="set" data="tas_vm_mode=deposit"/>
    <action application="set"
data="tas_vm_mailbox=${history_info_value}"/>
    <action application="set"
data="tas_vm_caller=${effective_caller_id_number}"/>
    <action application="socket" data="127.0.0.1:8084 async
full"/>
  </condition>
</extension>
```

□□□□□

- □□□□□□□□□□555121□555122□□□□□□
- □□□□□□□□□□□□□□History-Info □□□□□□□
- □□□□□□□ History-Info □□□□□□□□
- □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□

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

□□□□□□□□□□ IMSI □□□

□□□□□□TAS □□□□□□MT□□□□□□□□□□□□□ S-CSCF □□ `Request-Disposition: no-fork`□□□ S-CSCF □□□□□□□□□□□□□□□□

□□ □ **IMSI MSISDN** □□□□□□□□□□□□□□ SIM □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□TAS □□□□□□□□□□□□□□□□□□□□ `no-fork`□□□ S-CSCF □□□□□□□□□□□□□□□□□□□□

TAS □□□□

TAS □□ HSS □□□□□□□□□□□□□□□□□□□□TAS □□ Sh □□ □□□□□□□HSS □□□□□□□□□□□□ IMSI □□□□ `<IMSPrivateUserIdentity>`□TAS □□□□□□□□□□□□□□□□ IMSI □□□□□□□□ TAS □□□□□□□□□□□□□□□□ TAS □□□□□□□□□□□□□□□□ TAS □□□□□□□ □ IMSI MSISDN □□□

□□□□□□□□MT □□□ FreeSWITCH □□□□□ `tas_mt_allow_forking`□

- `tas_mt_allow_forking = "true"` - HSS □□□□□□□□□□□ IMSI□□ IMSI □□□□□□□□□□□□□□ `no-fork`□□□□□□□□□
- `tas_mt_allow_forking = "false"`□□□□ - HSS □□□□□□□□□□□□□□□ `Request-Disposition: no-fork`□□□□□□□□□□□□□□□

□□□□□□

`MT-Fork-Control` □□□ `mt_dialplan.xml` □□□□□□□□□□□□ `no-fork`□

```
<extension name="MT-Fork-Control" continue="true">
  <condition field="${tas_mt_allow_forking}"
expression="^(?!true$).*">
    <action application="set" data="sip_h_Request-Disposition=no-
fork"/>
  </condition>
</extension>
```

□□

- **S-CSCF** □□□□□□□□□□□□□□□□□□□ □□ S-CSCF □□□□□□□□□□□□□□□□□□□□

- □□□□□□□ HSS □□□□□□□□□□□□□□ MSISDN □□□□□□□□□□□□□□□□□□ HSS "□□□□□□□□□" □□□

□□□□□CLI□□□

TAS □□□□□□□□□□CLI□□□□□□□□□□□□□□□□□

□□	□□	□□
`msisdn`	□□□□□□□ +□	`"61412345678"`
`msisdns`	□□□□□□□□□□□□□□□□ +□□□ □□□□ CLI □□ □□□□□	`"61412345678,61412345679"`
`effective_caller_id_number`	□□□□□□□	`"+61412345678"` □ `"anonymous"`
`effective_caller_id_name`	□□□□□□□	`"+61412345678"` □ `"anonymous"`
`origination_caller_id_number`	□□□ CLI	`"+61412345678"`
`caller_id_number`	□□ FreeSWITCH CLI □□	`"+61412345678"`
`sip_from_user`	SIP From □□ □□□	`"0412345678"` □ `"+61412345678"`
`cli_withheld`	□□□	`"true"` □ `"false"`□□□□
`origination_privacy`	□□□	`"hide_number"`

CLI □□□□/□□□

□□□

TAS □□□□□□□ CLI □□□□□

1. □□□□□□□□□

□□□□□□□□□□□□□□□□□□□□ ID□

□□□□□

- `*67` - □□□□
- `#31#` - □□/GSM □□
- `1831` - □□□□

TAS □□□□□□□□□□□□□□□□□□□ CLI □□□□□□□□□□□□□□□ `cli_withheld` □□□□□□ `"true"`□

□□□ □□□□□ `*67555 1234` - □□□□□□□ `*67` □□□□□□□□□ `5551234`□CLI □□□□

2. From □□□□□

□□□□□UE□□ SIP From □□□□□□□□□□ "anonymous"□

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

3. SIP □□□

S-CSCF □□□ SIP INVITE □□□ `Privacy: id` □□□□□□□□□□□□□□

□□□□□□□

□□□□□□□ `cli_withheld` □□□□□□□□□□□□□ CLI □□□□□□□

□□□□□□□□□□

```
<extension name="Manage-Caller-ID" continue="true">
  <condition field="${cli_withheld}" expression="true">
    <!-- CLI □□□ - □□□□□ -->
    <action application="log" data="DEBUG CLI withheld detected"
/>
    <action application="set"
data="effective_caller_id_name=anonymous" />
    <action application="set"
data="effective_caller_id_number=anonymous" />
    <action application="set"
data="origination_caller_id_number=anonymous" />
    <action application="set"
data="origination_privacy=hide_number" />

    <!-- CLI □□□□ - □□□□ MSISDN -->
    <anti-action application="log" data="DEBUG CLI is normal (not
withheld)" />
    <anti-action application="set"
data="effective_caller_id_number=${msisdn}" />
  </condition>
</extension>
```

□□□ □□□□□ `continue="true"`□□□□□□□□ CLI□□□□□□□□□□□□□□□□

CLI □□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□ CLI □□□

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□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ CLI□

□□□□□□□□□□□□□□□□□□□□□

```
<extension name="Outgoing-Call-CLI-National" continue="true">
  <condition field="${msisdn}" expression="^61(.*)$">
    <action application="log" data="Setting source CLI to $1 for
national" />
    <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="Call is to national" />

    <!-- □□□□□□□□□□□□□□□□ -->
    <anti-action application="log" data="Setting source CLI for
international" />
    <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>
```

□□□□□

- □□□□□□□□□□□□□□□□□□□□□□□□□□□□□ `61`□
- `<anti-action>` □□□□□□□□□□□□□□□□
- □□□□□□□□ `+` □□□□□□□□□ E.164 □□

□□□□□ CLI □□

□□□□□□□□□□□□□□□□□□□

- □□□`effective_caller_id_number="+61412345678"`□□□ `:3` → □□□`"412345678"`
- □□□`effective_caller_id_number="+61412345678"`□□□ `:1` → □□□`"61412345678"`

□□□

- □□□□□□□□□ `+`□□□ `:1`
- □□□□□□□□□□□□□□□□□□□□□□□□□`+61` □□ `:3`□`+1` □□ `:2` □□

SIP P-Asserted-Identity (PAI)

`sip_cid_type=pid` □□□□□□ ID □□□□

```
<action application="set" data="sip_cid_type=pid"/>
```

□□□

- □□ SIP `P-Asserted-Identity` □□□□□□□□
- □□□□□□□□ ID □□
- IMS □□□□□

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```
<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"/>
<!-- □□□□□□□□□□□□□□□□□□□ -->
```

□□□

- □□□□□□□□□□□□□□□□
- □□□□□□□□□□□□
- □□□□□□□□□□
- □□ SIP □□□□

□□□□□□□□□

- □□□□/□□ ID
- □□□□□□□□□□□□□□□□□□
- □□□□□□□ P □
- □□□□□□□□□□□□□□

□□□□

1. □ **CLI** □□□□ `continue="true"` - □□□□ CLI □□□□□
2. □□ `sip_cid_type=pid` - □□ IMS □□□□
3. □□ **CLI** □□ - □□ `*67` □ `#31#` □□□□□□
4. □□□□□□□□ - □□□□□ CLI □□
5. □□□□□ - □□□□□□□□
6. □□□□□□ - □□□□□□□□□ CLI □□□□

□□□□

TAS □□ FreeSWITCH □ `bridge` □□□□□□□□□□□□□□□□IMS □□□PSTN □□□□□□□□□□□□□□□□□□

```
<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>
```

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□□□□□

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

□□□□

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

□□ `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/+${m
/>
```

□□□□□□□□□□□

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}" />
```

□□□ `${no_reply_timer}` □□□□□□□□□□ 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}" />
<!-- □□□□□□□□□□□□□□ -->
<action application="log" data="INFO Bridge failed - routing to
voicemail" />
```

`hangup_after_bridge` - □ B-leg □□□□□ A-leg□

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

□□□□□□

`ignore_early_media` - □□□□□□□□□

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

□□□

- `ring_ready` - □□□□□□□□□□□□□□□□□
- `true` - □□□□□□□□□
- `false`□□□□ - □□□□□□□□□□□□□□□

□□□□□ **`ring_ready`**□ - □□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□ `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}"
/>
```

□□□□□□□□□□□□□

```
<extension name="Route-to-IMS-Sub-Early-Media" continue="true">
  <condition field="${on_net_caller}" expression="true">
    <!-- □□□□□□ - □□ ring_ready -->
    <action application="log" data="INFO On-net caller
${effective_caller_id_number} - using
ignore_early_media=ring_ready"/>
    <action application="set"
data="ignore_early_media=ring_ready"/>

    <!-- □□□□□□□ - □□□□□□□ -->
    <anti-action application="log" data="INFO Off-net caller
${effective_caller_id_number} - setting instant ringback"/>
    <anti-action application="set" data="instant_ringback=true"/>
    <anti-action application="set" data="ringback=${fr-ring}"/>
    <anti-action application="set" data="transfer_ringback=${fr-
ring}"/>
  </condition>
</extension>
```

□□□ `${on_net_caller}` □□□□□□□

```
<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=${no_reply_
    <action application="set" data="leg_progress_timeout=${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 Failed to bridge Call - Rout
    <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.mnc001.mcc001.3gppnetwork.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□□□□□□MO □ MT □□ TAS□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□ TAS □□□□□□□ MT □□□□□□□□□□□□□□□□□□□□□□ MT □□□□□□□□ □□□□□□□□

□□□□□□□□□□

□□□□□□□ TAS□□□□□□□□□□□□ MT □□□□□□□□□

- □□□□□□□□□□□□□
- □□/□□□□□□□□□□□□□□□□
- □□□□□□□ MSRN □□□□□□
- □□□□□□□□□□□□□
- □□□□□□ CDR □□□□

□□□ MO □□□□□□□ MT □□□□□□ TAS□□□□□□□□□□□□□□□□□□□□

□□□□□□

```
<extension name="On-Net-Route">
  <condition field="${on_net_status}" expression="true">
    <action application="log" data="DEBUG On-Net MO call - Routing ba

    <!-- □□□□□□□□□□ -->
    <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>
```

□□□□□

1. **MO** □□□□□□□□ A □□□□□ B□□□□□□
2. □□□□□□□TAS □□ `${on_net_status}` □□□□□□□□□
3. □□□ **TAS**□□□□
   `sofia/internal/${tas_destination_number}@${sip_local_network_addr}`
   - □□ TAS □□□ IP □□□□□□
   - □□□□□□ ID □□□□
4. **MT** □□□TAS □□□□□□□ MT □□□□□□□ `mt_dialplan.xml`
   - □□□□□□□□□CFU□CFB□CFNRy□CFNRc□
   - □□□□□□□□ MSRN
   - □□□ IMS □□□□□□
5. □□□□□□□□□□□□□□□ MT □□

□□□□

- □□□ `${sip_local_network_addr}`□TAS IP □□□□□□`10.179.3.60`□
- □□□□ MT □□□□□□□□□□□□
- □□ `sip_invite_call_id` □□□□□□ ID □□□□□□□
- □□□□ MT □□□□□□□□□□□□□MSRN □□□□□□□□
- □□□□□□□□□□□□□□□□ CDR □□

- □□□□□□□□□□ MT □□□□□□□□□□
- TAS IP □□□ `allowed_sbc_source_ips` □□□□□

□□□ `${on_net_status}` □□□□□□□□□ TAS □□□□□□□□□ `"true"`□□□ MO □□□□□□□□□□□□□□ MSISDN □□□□□□□□□□□□□□□□□□□□□□

□□ **4**□□□□□□**MO** □ **PSTN**/□□□

□□□□□□ MO □□□□□□□□ PSTN□□□□□□□□□□□□

□□□□□□□ `sofia/gateway/ExternalSIPGateway` □ `sofia/gateway/PSTN_Gateway`

□□□□□□

```
<extension name="Outgoing-Call-Off-Net">
  <condition field="${tas_destination_number}" expression="^(.*)$">
    <action application="log" data="Sending call off-net" />

    <!-- □□□□□□□□□□□□ -->
    <action application="set" data="sip_copy_multipart=false"/>

    <!-- □□□□□□□□□□□□ CDR/□□ -->
    <action application="set" data='api_body=caller=${msisdn}&called=
    <action application="set" data='api_on_answer=curl http://localhc
${api_body}'/>
    <action application="set" data='api_body=caller=${msisdn}&called=
    <action application="set" data='api_hangup_hook=curl http://local
${api_body}'/>

    <!-- □□□□□□□ P-Asserted-Identity -->
    <action application="set" data="sip_h_Request-Disposition=no-fork
    <action application="set" data="sip_h_P-Asserted-Identity=<sip:${

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

    <!-- □□□□□ PSTN/□□□□ -->
    <action application="set" data="used_gateway=ExternalSIPGateway"/
    <action application="bridge"
      data="{absolute_codec_string='AMR-
WB,AMR,PCMA,PCMU',originate_retries=1,originate_timeout=60,sip_invite
/>

    <!-- □□□□□□□□□□□□□ -->
    <action application="answer" data="" />
    <action application="log" data="INFO Bridge failed with SIP code
    <action application="sleep" data="500"/>
    <action application="transfer" data="${last_bridge_proto_specific
  </condition>
</extension>
```

□□□□

- □□ `sofia/gateway/ExternalSIPGateway` □□□□□□
- □□□□□□□ `P-Asserted-Identity` □□□□□□□

- □□□□□□□□□ CDR/□□□□
- `continue_on_fail=true` □□□□□□
- □□□□□□□□ SIP □□□□□□□□□□
- `used_gateway` □□□□□□□/□□□□

□□□□□□□□

- `ExternalSIPGateway` - □□ PSTN □□/□□
- `BackupSIPGateway` - □□ PSTN □□□□□□□□□□
- `International_GW` - □□□□□□
- `Emergency_GW` - □□□□□□

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PSTN/□□	□□□□□□□	• PSTN □□ • □□□□□ • □□□□□□□
CS □□	□□□□□□	• 2G/3G □□ (MSRN) • CS □□□□
□□□	□□□□□□	• 911/112/000 □□ • PSAP □□
□□□□□	□□□□□□	• □□□□□ • □□□

□□□□□□□□□□□

1. □□□□□□□

   - `sofia/gateway/International_Gateway` - □□□□□□□□□□□□□□
   - `sofia/gateway/National_Gateway` - □□/□□□□
   - `sofia/gateway/Mobile_Gateway` - □□□□□□□
   - `sofia/gateway/Emergency_Gateway` - □□□□□911/112/000□

2. □□□□

   - `sofia/gateway/Provider_A_Primary` - □□□ A □□□□□□□□
   - `sofia/gateway/Provider_A_Backup` - □□□ A □□□□
   - `sofia/gateway/Provider_B` - □□□□□□□
   - `sofia/gateway/Transit_Provider` - □□/□□□□

3. □□□□□□

   - `sofia/gateway/APAC_Gateway` - □□□
   - `sofia/gateway/EMEA_Gateway` - □□/□□/□□
   - `sofia/gateway/Americas_Gateway` - □□/□□

4. □□□

- `sofia/gateway/Voice_Gateway` - □□□□□□□
- `sofia/gateway/SMS_Gateway` - □□ SIP □ SMS□□□□□□□
- `sofia/gateway/Wholesale_Gateway` - □□/□□□□□□
- `sofia/gateway/CS_Network_Gateway` - □□□□□2G/3G□□□

□□□□□□□□□

```
<profile name="external">
  <gateways>
    <!-- □□□□□ -->
    <gateway name="International_Primary">
      <param name="proxy" value="10.1.1.100:5060"/>
      <param name="register" value="false"/>
    </gateway>

    <!-- □□/□□□□□□ -->
    <gateway name="Domestic_Provider_A">
      <param name="proxy" value="10.1.2.100:5060"/>
      <param name="register" value="false"/>
    </gateway>

    <gateway name="Domestic_Provider_B">
      <param name="proxy" value="10.1.3.100:5060"/>
      <param name="register" value="false"/>
    </gateway>

    <!-- □□□□□ -->
    <gateway name="Emergency_PSAP">
      <param name="proxy" value="10.1.4.100:5060"/>
      <param name="register" value="false"/>
    </gateway>

    <!-- CS □□□□□□□□ MSRN □□□ -->
    <gateway name="CS_Network">
      <param name="proxy" value="10.1.5.100:5060"/>
      <param name="register" value="false"/>
    </gateway>
  </gateways>
</profile>
```

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□□□□□□□□□□□□□□□□□□□□□□□□□

```
<!-- □□□□□□□□□□□□□□□□ -->
<extension name="Route-International">
  <condition field="${tas_destination_number}"
expression="^(?!61).*$">
    <action application="bridge"
data="sofia/gateway/International_Primary/${tas_destination_number}"
/>
  </condition>
</extension>

<!-- □□□□□□□□□□□□□□□□ -->
<extension name="Route-Provider-A">
  <condition field="${tas_destination_number}"
expression="^614\d{8}$">
    <action application="bridge"
data="sofia/gateway/Domestic_Provider_A/${tas_destination_number}"
/>
  </condition>
</extension>

<!-- □□□□□□□□□□□ -->
<extension name="Route-With-Failover">
  <condition field="${tas_destination_number}" expression="^(.*)$">
    <action application="set" data="continue_on_fail=true"/>
    <action application="bridge"
data="sofia/gateway/Primary_Gateway/$1"/>
    <!-- □□□□□□□□□□□ -->
    <action application="bridge"
data="sofia/gateway/Backup_Gateway/$1"/>
  </condition>
</extension>
```

□□□□□□□□□□

- □□□□□□□□□□□□□□□□
- □□□□□□□□□□/□□□□
- □□□□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□SIP □□□□□□□□□□□□□

- □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□

□□□□□□ **MO □□**

```
□□□ A (MO) → TAS → sofia/internal/B@TAS_IP → TAS (MT □□) → IMS → □
□□ B
```

□□□□□□□ **MO □□**

```
□□□ A (MO) → TAS → sofia/gateway/ExternalSIPGateway/+123456789 →
PSTN
```

□□□**MT □□□ IMS □□□**

```
□□ → TAS (MT) → sofia/internal/msisdn@ims.domain → I-CSCF → S-CSCF
→ □□□
```

□□□**MT □□□ CFU □□□□□□**

```
□□ → TAS (MT) → □□□ CFU →
sofia/gateway/ExternalSIPGateway/+forwarding_number → PSTN
```

□□□**MT □□□ CS □□□□□**

```
□□ → TAS (MT) → □□□ MSRN → sofia/gateway/CS_Gateway/+msrn → CS □□
→ □□□
```

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```
<!-- □□ PSTN □□ -->
<gateway name="ExternalSIPGateway">
  <param name="proxy" value="10.1.1.100:5060"/>
  <param name="register" value="false"/>
  <param name="caller-id-in-from" value="true"/>
</gateway>

<!-- CS □□□□□□□□ MSRN □□□ -->
<gateway name="CS_Gateway">
  <param name="proxy" value="10.1.1.200:5060"/>
  <param name="register" value="false"/>
  <param name="caller-id-in-from" value="true"/>
</gateway>

<!-- □□□□□□□ -->
<gateway name="Emergency_GW">
  <param name="proxy" value="10.1.1.250:5060"/>
  <param name="register" value="false"/>
  <param name="caller-id-in-from" value="true"/>
</gateway>
```

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1. □□□□□□□□□ - □□ `absolute_codec_string` □□□□□□□□□□□□
2. □□□□ - □□□□ `progress_timeout` □ `bridge_answer_timeout`
3. □□□□ - □□ `continue_on_fail=true` □□□□□
4. □□□□ - □□□□□□□□□□□□□□□
5. □□□□□□□□□□ - `ring_ready` □□□□□□□
6. □□□□ - □□ `Request-Disposition: no-fork` □□□□□□□
7. □□□□□□□ - □□□□□□□□□□□□□□□□
8. □□□□□□□ - □□ `originate_retries` □□□□□□□

□□□□

□□ **FreeSWITCH** □□□□□

```
<action application="set" data="sip_trace=on"/>
<action application="info" data=""/>  <!-- □□□□□□□□□□□ -->
```

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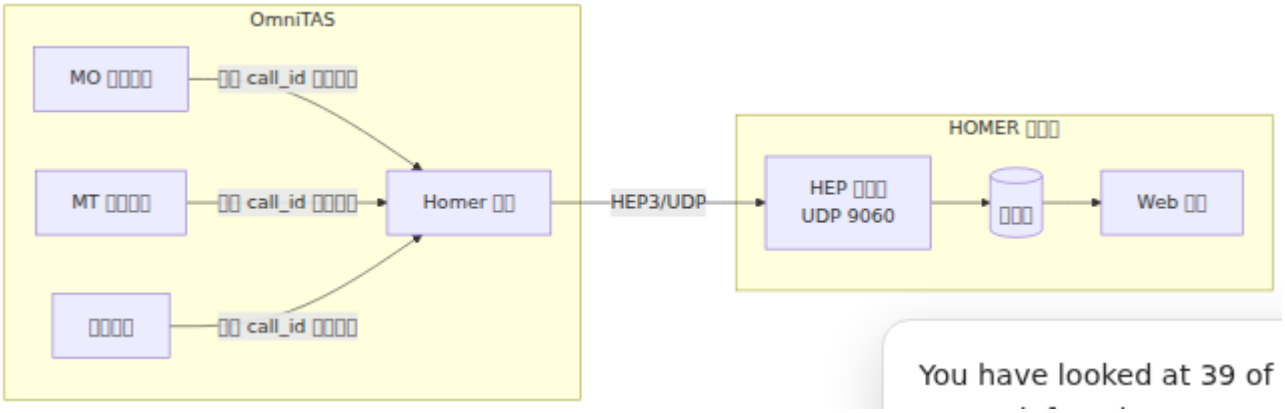
□□	□□	□□□□
□□□□	□□□□□□□□	□□ `absolute_codec_string`
□□□□□□□	□□□□□□	□□□□□□□
□□□□	`originate_timeout` □□	□□□□□□
□□□□□□□	□□□□□□□	□□ `ignore_early_media=ring_ready`
□□□□□□□□	`sip_cid_type` □□□	□□ `sip_cid_type=pid`

HOMER □□

□□□□□□□□□ HOMER □□□□□□□□□□□□□ SIP □□□□□□

□□

OmniTAS □□□□ UDP □□ HEP3□Homer □□□□□□□□□□□□□□□ HOMER □□□□□□ SIP Call-ID □□□□ SIP □□□□□□□□□□□□□□□□□□□□□□□□□□□□



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1. □□□□□□□□□□□□□□□□OmniTAS □□□□□□□□□□ SIP Call-ID
2. □□□□□Homer □□□□ PubSub □□□□□□
3. □□□□□□□□ `call_id` □□□□□□□
4. **HEP3** □□□□□□□□□ HEP3 □□□□□□□□□ 100□□□□
5. □□□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 UI □□□□□□□□□

□□ 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 □□□□□□□□□

□□□□□□

X-CID □□□□□ □□□□□□□□□□□□□ `set`□□□ `sip_copy_custom_headers=false` □□□□□ `set` □□□ `sip_h_` □□□

MO □□□□□□□□□□□□

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

MO □□□□□□□□□□□□

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

MT □□□□□□□□□□□-- □□□ MO □□□□□□ X-CID□

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

heplify-server □□

HOMER heplify-server □□□□□□□□□□ X-CID□

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

- `AlegIDs` □□ heplify-server □ X-CID □□□□ A-leg Call-ID□□□□□□□ `callid_aleg` □
- `CustomHeader` □□□ X-CID □□□□ data_header JSON □□□□□
- `SIPHeader` □□□□ `callid_aleg`□□□ HOMER □□□□□□□□□□

□□ heplify-server.toml □□□□□`systemctl restart heplify-server`

□□□□

□□ Call-ID □□

OmniTAS □□□□□□□□□ Call-ID □□□□□□□□□□□

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

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□□□ 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□□□□□ HEP3 SIP □□□□□

□□□□□□

□ 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	□□□□	□□□□□

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□□□□□□ HOMER □

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- HOMER □□□□□□□□□□□□□□□□
- □□□□□□ UDP □□□□□□ 9060
- heplify-server □□□□□□□ HEP
- □□□□ call_id □□□

□□□□□□

1. □□□□□□□□`nc -zvu <homer_host> 9060`
2. □□ heplify-server □□□□□□□`ss -ulnp | grep 9060`
3. □□ heplify-server □□□□□□□□□□□
4. □□ call_id □□□□□□ OmniTAS □□□□□□□□□□□□□□ `call_id=`□

□□□□

□□□heplify-server □□□□□□□□□

□□□□□□□

- OmniTAS □ heplify-server □□□ auth_key □□□
- □□□□□□□□□□□□□□□□□□□

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1. □□ heplify-server □□□□□□□□□□□□ OmniTAS □□ `auth_key: nil`
2. □□ heplify-server □□□□□□□□□□□□□□□□□□□□□□□□

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□□□□□□□□□ HOMER □□□□□□ SIP □□□□

□□□□□□□

- SIP □□□□□□□ Call-ID □□□□□□
- HOMER □□□□

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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` - □□□□□□□□□/□□□□□

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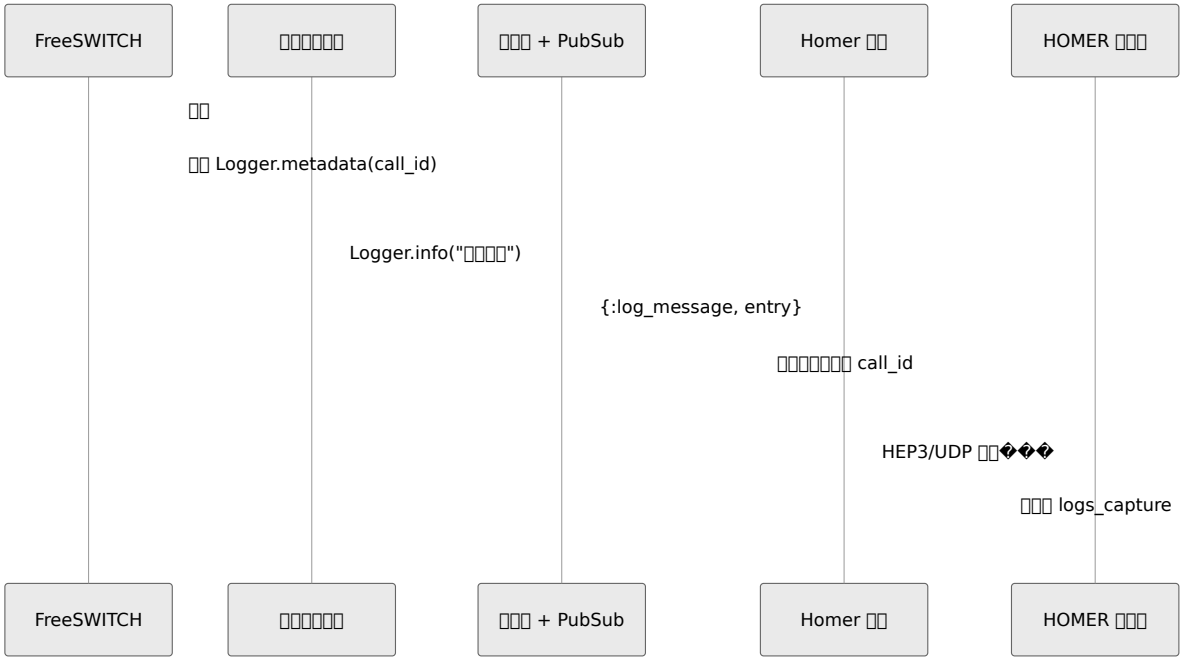
FreeSWITCH
□□□□□□□
□□□ + PubSub
Homer □□
HOMER □□□
□□
□□ Logger.metadata(call_id)
Logger.info("□□□□")
{:log_message, entry}
□□□□□□□ call_id
HEP3/UDP □□□
□□□ logs_capture
FreeSWITCH
□□□□□□□
□□□ + PubSub
Homer □□
HOMER □□□

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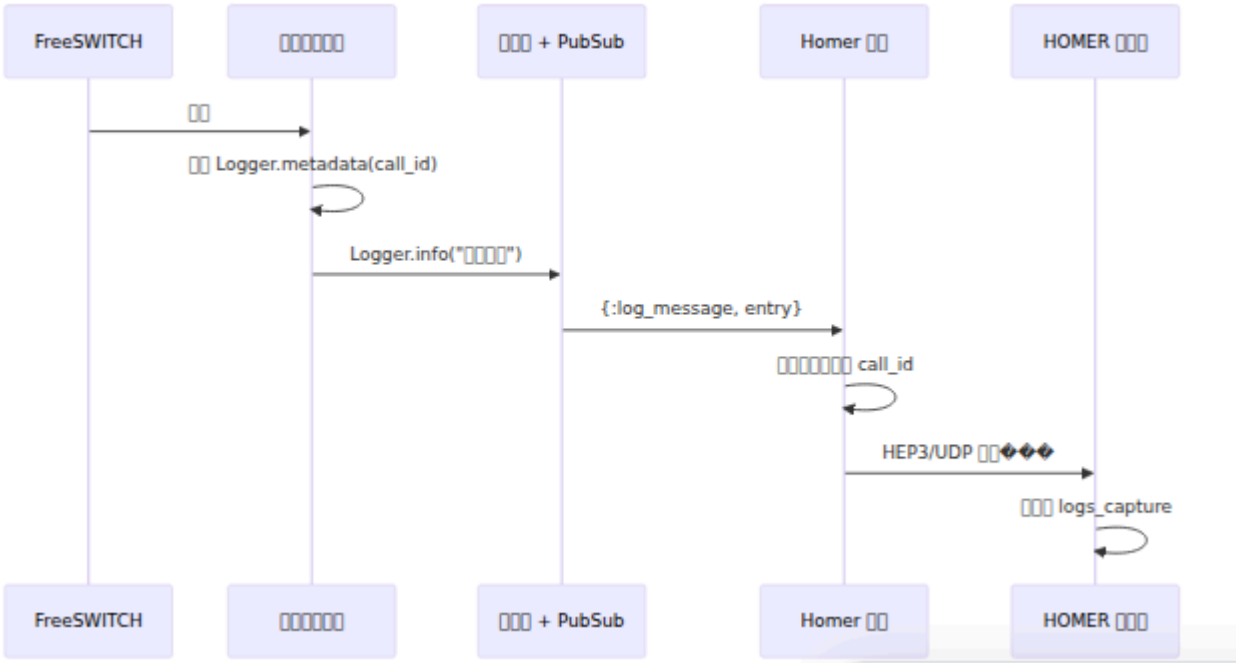
FreeSWITCH
□□□□□□□
□□□ + PubSub
Homer □□
HOMER □□□
□□
□□ Logger.metadata(call_id)
Logger.info("□□□□")
{:log_message, entry}
□□□□□□□ call_id
HEP3/UDP □□□
□□□ logs_capture
FreeSWITCH
□□□□□□□
□□□ + PubSub
Homer □□
HOMER □□□

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

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□□□□□□IMS□□□□□□□□□□□□Prometheus□□□

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  - Sofia□□□□
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- □□9094□TAS□□□□
  - □□□□□□
  - Diameter□□□□
  - □□□□□□
  - □□□□□□□OCS□□□
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  - Erlang Mnesia□��□□□
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  - Erlang VM□□□□
  - Erlang VM□□□□
  - Erlang VM□□□□□□MSACC□

    - Erlang VM□□□
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    - RTP□□□□□□□□□
    - RTP□□□□□□□□□□
    - RTP□□□□□□□□□□
    - RTCP□□
- Go□□□□□
- □□□□
- Prometheus HTTP□□
- □□□□
- □□
- □□□□
- □□□□
- Grafana□□□□□
- □□□□
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- □□□□

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9090	`/metrics`	□□□□□□□□□□□□□	���□ 9090 →
9094	`/metrics`	TAS□□□Diameter□HLR□OCS□ Erlang VM□□	□□9094 →
9093	`/esl?module=default`	RTP/RTCP□□□□□□□□□	□□9093 →

□□9090□□□□□

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`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	□□5□□□□□□□□□
`freeswitch_sessions_total`	9090	□□□□□□□□□□□□□□□□
`freeswitch_current_sps`	9090	□□□□□□□□
`freeswitch_current_sps_peak`	9090	□□□□□□□□□□□□□□
`freeswitch_current_sps_peak_last_5min`	9090	□□5□□□□□□□□□□□
`freeswitch_max_sessions`	9090	□□□□□□□□□
`freeswitch_max_sps`	9090	□□□□□□□□□□□

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`freeswitch_current_idle_cpu`	9090	□□CPU□□□□□
`freeswitch_min_idle_cpu`	9090	□□□□□CPU□□□□□
`freeswitch_uptime_seconds`	9090	□□□□□□□
`freeswitch_time_synced`	9090	□□□□□□□□□□□□□□□□□□□1=□□□0=□□□□

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`freeswitch_memory_arena`	9090	□□mmapped□□□malloc arena□
`freeswitch_memory_ordblks`	9090	□□□□□
`freeswitch_memory_smblks`	9090	□□□□□□□
`freeswitch_memory_hblks`	9090	□□□□□□
`freeswitch_memory_hblkhd`	9090	□□□□□□□□□
`freeswitch_memory_usmblks`	9090	□□□□□□□
`freeswitch_memory_fsmblks`	9090	□□□□□□□□□□□□
`freeswitch_memory_uordblks`	9090	□□□□□
`freeswitch_memory_fordblks`	9090	□□□□□
`freeswitch_memory_keepcost`	9090	□□□□□□□□

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`freeswitch_codec_status`	9090	□□□□□□□□□□□ikey□□□□□name□□□□□□□□□ type□□□□□□□□=1□□□□□□□□

□□□□□□□□□

- 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

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`freeswitch_endpoint_status`	9090	□□□□□□□□□ikey□□□□□name□□□□□□□ type□□□□□□=1□□□□□□

□□□□□□□□

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

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

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`freeswitch_load_module`	9090	□□□□□□□1=□□□□0=□□□□□□□□module

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

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`freeswitch_registrations`	9090	□□□□□□□
`freeswitch_registration_defails`	9090	□□□□□□□□□□□□expires, hostname, network_ip, network_port, network_proto, realm, reg_user, token, url

Sofia□□□□

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`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□□

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`freeswitch_up`	9090	□□□□□□□□□□□□1=□□□0=□□□
`freeswitch_exporter_total_scrapes`	9090	□□□□□□□□□□□□
`freeswitch_exporter_failed_scrapes`	9090	□□□□□□□□□□□□

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□□9094□TAS□□□□

□□Erlang VM□□□□□□

> □□□ `9094` □□□□□OmniTAS HTTP API□□□□□□□□□REST API□FreeSWITCH□□□ `fsapi_dialplan`/`fsapi_directory`□□□□□□ `runtime.exs`□□□ `config :tas, api_port: <port>`□□□□□□□□□□□FreeSWITCH□`xml_curl`□□URL□Prometheus□□□□□□□□□□□□□

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`call_simulations_total`	9094	□□□□□□□□□□□□□
`call_attempts_total`	9094	□□□□□□□□□□□□□
`call_rejections_total`	9094	□□□□□□□□□□□□□□□□□□□□
`call_param_errors_total`	9094	□□□□□□□□□□□□□□□□□□□
`active_calls`	9094	□□□□□□□□□□□□□□□□call_type (mo/mt/emergency)
`tracked_call_sessions`	9094	□□□ETS□□□□□□□□□□□

Diameter□□□□

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`diameter_peer_state`	9094	Diameter□□□□□□□□1=□□□0=□□□□□□□□peer_host, peer_realm, application□□10□□□□□□□□Ro□Sh□□□□
`diameter_requests_total`	9094	Diameter□□□□□□□□□□□□□□application, command
`diameter_responses_total`	9094	Diameter□□□□□□□□□□□□□□application, command, result_code
`diameter_response_duration_milliseconds`	9094	Diameter□□□□□□□□□□□□□□□□□□□□□□□application, command, result

`application` / **`command`**□□□□

application	command	□□
`ro`	`ccr_i`	Credit-Control-Request, INITIAL (□□□□)
`ro`	`ccr_u`	Credit-Control-Request, UPDATE (□□□□□□)
`ro`	`ccr_t`	Credit-Control-Request, TERMINATION (□□□□)
`sh`	`udr`	User-Data-Request

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hlr_lookups_total	9094	HLR□□□□□□□□□□
hlr_data_duration_milliseconds	9094	HLR□□□□□□□□□□□□□□□□□□□□□□□
subscriber_data_lookups_total	9094	□□□□□□□□□□□□□□□□□
subscriber_data_duration_milliseconds	9094	Sh□□□□□□□□□□□□□□□□□□□□□□□□□
ss7_map_operations_total	9094	SS7 MAP□□□□□□□□□□
ss7_map_http_duration_milliseconds	9094	SS7 MAP HTTP□□□□□□□□□□□□□□□□□□□
tracked_registrations	9094	□□□□□SIP□□□□

□□□□□□□OCS□□□

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`ocs_authorization_attempts_total`	9094	OCS□□□□□□□□□□□□
`ocs_authorization_duration_milliseconds`	9094	OCS□□□□□□□□□□□□□□□
`online_charging_events_total`	9094	□□□□□□□□□□□□□□□□□□□□ event_type, result
`authorization_decisions_total`	9094	□□□□□□□□□□□□
`ro_charging_quota_seconds`	9094	Ro□□□□□□□□□□□□□□□□□□□□□□ request_type (`ccr_i`/`ccr_u`/`ccr_t`), (`requested`/`granted`/

`online_charging_events_total`□□□

- **event_type:** `authorize`, `answer`, `reauth`, `hangup`, `credit_exhaustion_hangup`, `hangup_rescheduled`
- **result:** `success`, `nocredit`, `timeout`, `error`, `triggered`

`ro_charging_quota_seconds`: □□CCR□□□□□□□□

- `kind="requested"`: □CCR-I/CCR-U□□□□□□□□`Requested-Service-Unit` CC-Time□
- `kind="granted"`: OCS□CCA□□□□□□□□`Granted-Service-Unit` CC-Time□`0` = □□□□
- `kind="used"`: □CCR-T□□□□□□□□□□□`Used-Service-Unit` CC-Time□

□□`granted`□`used`□□□□□□□□□□□□□□□□□Ro□□□□□□□□□□□□□□□

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`http_requests_total`	9094	HTTP□□□□□□□□□□endpoint, status_code □□□□□
`http_dialplan_request_duration_milliseconds`	9094	HTTP□□□□□□□□□□□□□□□□□□□□□□□□
`dialplan_module_duration_milliseconds`	9094	□□□□□□□□□□□□□□□□□□□□□□□□□□□□
`freeswitch_variable_set_duration_milliseconds`	9094	□□□□□□□□□□□□□□□□□□□□□□□□

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`event_socket_connected`	9094	□□□□□□□□□□□1=□□□□0=□□□□□□□connection_type
`event_socket_reconnections_total`	9094	□□□□□□□□□□□□□□□□□□□□□□□□□□□connection_type, result
`event_socket_commands_total`	9094	□□□□□□□□□□□□□□□□□□□□□□□□□□command_type, result
`event_socket_command_timeouts_total`	9094	□□□□□□□□□□□□□□□□□□□□□□□□□□command_type

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

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- success: □□□□□□
- timeout: □□□□□□□□
- error: □□□□□□□□

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`feature_invocations_total`	9094	TAS□□□□□□□□□□□□□□□□□□feature, call_type, result
`feature_data_source_total`	9094	□□□□□□□□□□□□□□□□□□□□feature, source

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- `call_forward_all` - □□□□□□□□
- `call_forward_not_reachable` - □□□□□□□□□□□□□
- `call_forward_no_reply` - □□□□□□□□
- `call_barring` - □□OCS□□□□□□□□□□□
- `cli_withheld` - CLI□□/□□

□□□□□ `mo`, `mt`

□□□□ `sh_interface`, `hlr`, `config_fallback`

□□□□ `success`, `error`, `skipped`

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`sms_trigger_attempts_total`	9094	□□□□□□□□□□□□□□□□□□□□trigger_type, result
`sms_trigger_errors_total`	9094	□□□□□□□□□□□□□□□□□□□□trigger_type, error_stage
`smsc_requests_total`	9094	SMSC HTTP□□□□□□□□□□□□□□□□ message_type, result

□□□□□ `voicemail_deposit`, `voicemail_clear`

□□□□□ `vm_boxcount`, `template_render`, `smsc_request`

□□□□□ `notification`, `mwi`

□□□□ `success`, `error`

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□□□□□□TAS□□□□□□□□□□□ `config :tas, voicemail: %{cluster: ...}` □□□□□□□□□□□□□□□□□□□□TAS□□□□□□□□□□□□□□□□□□□

```
# □□□□□□□□□□□□
sum by (operation)
(rate(voicemail_cluster_fanout_errors_total[5m]))
```

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- □□□□ > 0□□□TAS□□□□□□□□□□□□□□□□□□□□

Erlang Mnesia□□□□□

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`erlang_mnesia_held_locks`	9094	□□□□□□
`erlang_mnesia_lock_queue`	9094	□□□□□□□□
`erlang_mnesia_transaction_participants`	9094	□□□□□□□
`erlang_mnesia_transaction_coordinators`	9094	□□□□□□□
`erlang_mnesia_failed_transactions`	9094	□□□□□□□□□□□□□□□□□□
`erlang_mnesia_committed_transactions`	9094	□□□□□□□□□□□□□
`erlang_mnesia_logged_transactions`	9094	□□□□□□□□□□□□□
`erlang_mnesia_restarted_transactions`	9094	□□□□□□□□□□□□□
`erlang_mnesia_memory_usage_bytes`	9094	□□mnesia□□□□□□□□
`erlang_mnesia_tablewise_memory_usage_bytes`	9094	□□mnesia□□□□□□□□□□□table
`erlang_mnesia_tablewise_size`	9094	□□□□□□□□□□table

Erlang VM□□□□

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`erlang_vm_memory_atom_bytes_total`	9094	□□□□□□□□□□□□□usage (used/free)
`erlang_vm_memory_bytes_total`	9094	□□□□□□□□□□kind (system/processes)
`erlang_vm_memory_dets_tables`	9094	DETS□□□□
`erlang_vm_memory_ets_tables`	9094	ETS□□□□
`erlang_vm_memory_processes_bytes_total`	9094	□□□□□□□□□□□□□usage (used/free)
`erlang_vm_memory_system_bytes_total`	9094	□□□□□□□□□□□□□□□□□□□usa (atom/binary/code/ets/d

Erlang VM□□□□

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`erlang_vm_statistics_bytes_output_total`	9094	□□□□□□□□□□□□□□□
`erlang_vm_statistics_bytes_received_total`	9094	□□□□□□□□□□□□□□□□□□□
`erlang_vm_statistics_context_switches`	9094	□□□□□□□□□□□□□□□□□□□□□□□□□□□
`erlang_vm_statistics_dirty_cpu_run_queue_length`	9094	□CPU□□□□□□□□□
`erlang_vm_statistics_dirty_io_run_queue_length`	9094	□IO□□□□□□□□□
`erlang_vm_statistics_garbage_collection_number_of_gcs`	9094	□□□□□□□

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		××× ×××
`erlang_vm_statistics_garbage_collection_bytes_reclaimed`	9094	××× ××× ××× ××× ×××
`erlang_vm_statistics_garbage_collection_words_reclaimed`	9094	××× ××× ××× ××× ××
`erlang_vm_statistics_reductions_total`	9094	××× ××× ×××
`erlang_vm_statistics_run_queues_length`	9094	××× ××× ×××
`erlang_vm_statistics_runtime_milliseconds`	9094	××× ××× ××× ×× ××× ××
`erlang_vm_statistics_wallclock_time_milliseconds`	9094	××× ××× ××× ×××

Erlang VM□□□□

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`erlang_vm_dirty_cpu_schedulers`	9094	□CPU□□□□□□□
`erlang_vm_dirty_cpu_schedulers_online`	9094	□□□□CPU□□□□□
`erlang_vm_dirty_io_schedulers`	9094	□I/O□□□□□□□
`erlang_vm_ets_limit`	9094	□□□□□ETS□□□
`erlang_vm_logical_processors`	9094	□□□□□□□□□□
`erlang_vm_logical_processors_available`	9094	□□□□□□□□□□
`erlang_vm_logical_processors_online`	9094	□□□□□□□□□□
`erlang_vm_port_count`	9094	□□□□□□□□□
`erlang_vm_port_limit`	9094	□□□□□□□□□
`erlang_vm_process_count`	9094	□□□□□□□□□
`erlang_vm_process_limit`	9094	□□□□□□□□□
`erlang_vm_schedulers`	9094	□□□□□□□
`erlang_vm_schedulers_online`	9094	□□□□□□□□
`erlang_vm_smp_support`	9094	□□□□□□□SMP□□1□□□□0
`erlang_vm_threads`	9094	□□□□□□□□□□□1□□□□0
`erlang_vm_thread_pool_size`	9094	□□□□□□□□□

□□□□	□□	□□
`erlang_vm_time_correction`	9094	□□□□□□□□□□1□□□□0
`erlang_vm_wordsize_bytes`	9094	Erlang□□□□□□□□
`erlang_vm_atom_count`	9094	□□□□□□□□□
`erlang_vm_atom_limit`	9094	□□□□□□□□□

Erlang VM□□□□□□MSACC□

□□□□□□□□□□□□□□□□□□type, id

□□□□	□□	□□
`erlang_vm_msacc_aux_seconds_total`	9094	□□□□□□□□□□□□□□□□
`erlang_vm_msacc_check_io_seconds_total`	9094	□□□I/O□□□□□□□□□□
`erlang_vm_msacc_emulator_seconds_total`	9094	□□Erlang□□□□□□□□□□
`erlang_vm_msacc_gc_seconds_total`	9094	□□□□□□□□□□□□□
`erlang_vm_msacc_other_seconds_total`	9094	□□□□□□□□□□□□□□□□□□□
`erlang_vm_msacc_port_seconds_total`	9094	□□□□□□□□□□□□□
`erlang_vm_msacc_sleep_seconds_total`	9094	□□□□□□□□□
`erlang_vm_msacc_alloc_seconds_total`	9094	□□□□□□□□□□□□□
`erlang_vm_msacc_bif_seconds_total`	9094	□BIFs□□□□□□□□□□□
`erlang_vm_msacc_busy_wait_seconds_total`	9094	□□□□□□□□□□□□
`erlang_vm_msacc_ets_seconds_total`	9094	□ETS BIFs□□□□□□□□□□
`erlang_vm_msacc_gc_full_seconds_total`	9094	□□□GC□□□□□□□□□□□
`erlang_vm_msacc_nif_seconds_total`	9094	□NIFs□□□□□□□□□□□
`erlang_vm_msacc_send_seconds_total`	9094	□□□□□□□□□□□□□
`erlang_vm_msacc_timers_seconds_total`	9094	□□□□□□□□□□□□□□

Erlang VM□□□

□□□□□□□□□□□□□□□□alloc, instance_no, kind, usage

□□□□	□□	□□
`erlang_vm_allocators`	9094	□□□□□□□□□carriers_size□□□□□blocks_size□□□□□□erts_alloc(3)□

□□□□□□□□ temp_alloc, sl_alloc, std_alloc, ll_alloc, eheap_alloc, ets_alloc, fix_alloc, literal_alloc, binary_alloc, driver_alloc

---

↑ □□□□

□□9093□□□□□□□□□□

□□□□□□□□□□□□□□□RTP/RTCP□□□□□□□□□□

□□□□	□□	□□
`freeswitch_info`	9093	□□□□□□□□version
`freeswitch_up`	9093	□□□□□1=□□□0=□□□□
`freeswitch_stack_bytes`	9093	□□□□□□□□
`freeswitch_session_total`	9093	□□□□
`freeswitch_session_active`	9093	□□□□□□
`freeswitch_session_limit`	9093	□□□□
`rtp_channel_info`	9093	RTP□□□□□□□□□□□□□□□□□

RTP□□□□□□□□□

□□□□	□□	□□
`rtp_audio_in_raw_bytes_total`	9093	□□□□□□□□□□□□□□□
`rtp_audio_out_raw_bytes_total`	9093	□□□□□□□□□□□□□□□
`rtp_audio_in_media_bytes_total`	9093	□□□□□□□□□□□□□□□□□□
`rtp_audio_out_media_bytes_total`	9093	□□□□□□□□□□□□□□□□□□

RTP□□□□□□□□□□

□□□□	□□	□□
`rtp_audio_in_packets_total`	9093	□□□□□□□□□
`rtp_audio_out_packets_total`	9093	□□□□□□□□□
`rtp_audio_in_media_packets_total`	9093	□□□□□□□□□□□
`rtp_audio_out_media_packets_total`	9093	□□□□□□□□□□□
`rtp_audio_in_skip_packets_total`	9093	□□□□□□□□□
`rtp_audio_out_skip_packets_total`	9093	□□□□□□□□□

RTP□□□□□□□□□□

□□□□	□□	□□
`rtp_audio_in_jitter_packets_total`	9093	□□□□□□□□□□□□
`rtp_audio_in_dtmf_packets_total`	9093	□□□DTMF□□□
`rtp_audio_out_dtmf_packets_total`	9093	□□□DTMF□□□
`rtp_audio_in_cng_packets_total`	9093	□□□□□□□□□□□□
`rtp_audio_out_cng_packets_total`	9093	□□□□□□□□□□□□
`rtp_audio_in_flush_packets_total`	9093	□□□□□□□□□□□□□□

RTP□□□□□□□□□□

□□□□	□□	□□
`rtp_audio_in_jitter_buffer_bytes_max`	9093	□□□□□□□□□□□□□□
`rtp_audio_in_jitter_seconds_min`	9093	□□□□□□□
`rtp_audio_in_jitter_seconds_max`	9093	□□□□□□□
`rtp_audio_in_jitter_loss_rate`	9093	□□□□□□□□□□□□□□□□□□
`rtp_audio_in_jitter_burst_rate`	9093	□□□□□□□□□□□□□□□□□□
`rtp_audio_in_mean_interval_seconds`	9093	□□□□□□□□□□□□
`rtp_audio_in_flaw_total`	9093	□□□□□□□□□□□□□□□□□□
`rtp_audio_in_quality_percent`	9093	□□□□□□□□□0-100□
`rtp_audio_in_quality_mos`	9093	□□□□□□□1-5□5□□□□

RTCP□□

□□□□	□□	□□
`rtcp_audio_bytes_total`	9093	□RTCP□□□
`rtcp_audio_packets_total`	9093	□RTCP□□□□

Go□□□□□

□□□□	□□	□□
`go_goroutines`	9090	□□□□□goroutine□□
`go_threads`	9090	□□□□□□□□□□□□
`go_info`	9090	□□Go□□□□□□□□□□□□
`go_gc_duration_seconds`	9090	□□□□□□□□□□□□□□□□□□□
`go_memstats_alloc_bytes`	9090	□□□□□□□□□□□□
`go_memstats_alloc_bytes_total`	9090	□□□□□□□□□□□□□
`go_memstats_heap_alloc_bytes`	9090	□□□□□□□□□□□□□
`go_memstats_heap_idle_bytes`	9090	□□□□□□□□□
`go_memstats_heap_inuse_bytes`	9090	□□□□□□□□□
`go_memstats_heap_objects`	9090	□□□□□□□□
`go_memstats_heap_released_bytes`	9090	□□□□□□□□□□□□□
`go_memstats_heap_sys_bytes`	9090	□□□□□□□□□□
`go_memstats_sys_bytes`	9090	□□□□□□□□□□

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□□□□	□□	□□
`process_cpu_seconds_total`	9090	□□□□□□□□□□CPU□□□□□□□□
`process_max_fds`	9090	□□□□□□□□□□□□
`process_open_fds`	9090	□□□□□□□□□□□□
`process_resident_memory_bytes`	9090	□□□□□□□□□□
`process_virtual_memory_bytes`	9090	□□□□□□□□□□
`process_virtual_memory_max_bytes`	9090	□□□□□□□□□□
`process_start_time_seconds`	9090	□Unix□□□□□□□□□□

Prometheus HTTP□□

□□□□	□□	□□
`promhttp_metric_handler_requests_in_flight`	9090	□□□□□□□□□□
`promhttp_metric_handler_requests_total`	9090	□HTTP□□□□□□□□□□□□□

↑ □□□□

□□□□

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

- **summary**: □□□□□□□□□□□□□□□□□□□□□□gc_duration_seconds□

↑ □□□□

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□□□□□□□□□□□□□□Prometheus□□□□□□□□□□□□□□

```
scrape_configs:
  - job_name: 'ims_as_system'
    static_configs:
      - targets: ['localhost:9090']

  - job_name: 'ims_as_engine'
    static_configs:
      - targets: ['localhost:9094']
    metrics_path: '/metrics'

  - job_name: 'ims_as_media'
    static_configs:
      - targets: ['localhost:9093']
    metrics_path: '/esl'
    params:
      module: ['default']
```

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- □□□□□□□□9090□
- □□□□□□□□□□9093□
- TAS□□□□□□□□9094□

□□□□

□□□□□□

```
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
```

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

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```
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□□□□□□95□□□□□

```
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])
```

□□□□□□**CCR**□□□□□□□□□□□□

```
sum by (command) (rate(diameter_requests_total{application="ro"}
[5m]))
```

□□□□□□□**CCR**□□□

```
sum by (command) (rate(diameter_responses_total{application="ro",
result_code!="2001"}[5m]))
```

Sh (UDR) P95□□

```
histogram_quantile(0.95,
rate(diameter_response_duration_milliseconds_bucket{application="sh"}
[5m]))
```

□��□□□□□□□□□□□□□□□□□

```
histogram_quantile(0.5,
rate(ro_charging_quota_seconds_bucket{request_type="ccr_i",
kind="granted"}[5m]))
```

□□□□□□□□□□□□□□□□

```
rate(ro_charging_quota_seconds_bucket{kind="granted", le="0"}[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])
```

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```
erlang_vm_statistics_run_queues_length
```

ETS□□□□

```
erlang_vm_memory_ets_tables
```

HTTP□□□□□□□□□□□□□□□□□□□

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

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Grafana□□□□□

□□□□□□□□Prometheus□□□□Grafana□□□□□

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□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**□□□□□□

- □□□□MOS□□□`rtp_audio_in_quality_mos`□
- □□□□□□□□`rtp_audio_in_quality_percent`□
- □□□□
- □□□□□□

□**5**□□□□□□

- Erlang VM□□□□
- Erlang VM□□□□□□
- ETS□□□
- □□□□□□□□□
- □□□□□

□**6**□□□□□□

- □□□□□□
- □□□□
- □□□□□□□□□
- Mnesia□□□□

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□□□□□□□□□

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

P95□□□□□□□□□□

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

Diameter□□□□

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

□□□□ - □□MOS□

```
avg(rtp_audio_in_quality_mos)
```

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□□□□ - □□□□□□□

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

Diameter□□□□□□

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

□□□□□□□□□□

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

□□□□□□

□Diameter□□□

```yaml
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□□□□□

```yaml
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 }}□□□□□□□□□"
```

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```yaml
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 }}□□□□□□"
```

□□□□□□□

```yaml
alert: PoorMediaQuality
expr: avg(rtp_audio_in_quality_mos) < 3.5
for: 3m
labels:
  severity: high
annotations:
  summary: "□□□□□□□□□□"
  description: "□□MOS□□□{{ $value }}"
```

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□□□□□□

```yaml
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□□□□□"
  description: "□□□□□{{ $value | humanizePercentage }}"
```

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```yaml
alert: HighSchedulerRunQueue
expr: erlang_vm_statistics_run_queues_length > 10
for: 5m
labels:
  severity: warning
annotations:
  summary: "□□□□□□□□□□"
  description: "□□□□□□□{{ $value }}"
```

Mnesia□□□□

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

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

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- □□□□□□□□HSS□HLR□OCS□
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```
sum by (reason) (rate(call_rejections_total[5m]))
```

2. □□□□□□□

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

3. □□**Diameter**□□□□□

```
diameter_peer_state
```

4. □□□□□□□□□□

```
event_socket_connected
```

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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])
```

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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. □□□□□□□

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

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□□□**P95**□□

- HTTP□□□□□□□□200-500ms
- □□□□□□□Sh□□□□50-150ms
- HLR□□□□□100-300ms
- OCS□□□100-250ms
- Diameter□□□50-200ms
- □□□□□□□□□□□□□□□10-50ms

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

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

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

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

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

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

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

2. □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

3. □□□□□□□□□□□

- □□□□□□`[5m]`
- □□□□□□`[1h]`
- □□□□□□`[1d]`

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□□□□□□□□Prometheus□□□□□

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

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- □□□□□□
- □□1000□□□□□□□□

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- □ □ **README** - □□□□□□□□
- □ □□□□ - □□□□□□□ (`number_translate`)
- □ □□□□ - □□□□□□□□□□□□□□

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- □ □□□□□□□ - □□□□□□□□□□□□□□□□□□□□□□□□□□□□
- □ **Sh** □□ - Sh □□□□□□□□□□□
- □ □□□□ - OCS □□□□□□□□□
- □ **SS7 MAP** - HLR □□□□□□□□□□□

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

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- **`country_code`**: □□□□□atom□□ ISO □□□□□□□□□`:AU`, `:US`, `:PF`□
- **`localAreaCode`**: □□□□□□□□□□□□

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TAS □□ **248** □□□□□□□ □□□□□□□□□□□□□□□□□□□□ ISO 3166-1 alpha-2 □□□

□□	□□/□□	**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	13 xx xx□6+ □□□□□ 1300/1800 xxx xxx□10+ □□ □□□□□ 61□□□□□ 6/10 □□□□ 190x □□□□□□□□
`:AW`	□□□	`297`	7	□	00	

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:AX	□□□□	358	9-10	0	00	□□□□□
:AZ	□□□□	994	9	0	00	
:BA	□□□□□□ □□□□	387	8	0	00	
:BB	□□□□	1	10	□	011	NANP□□□□□□
: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	

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: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	
: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	

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`: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	□□□□□□□
`: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	

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: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	
: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	

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: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	□□□□□□
: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	□□□□□□□□

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`: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	
`:IS`	□□	`354`	7	□	00	
`:IT`	□□□	`39`	9-10	□	00	□□□□□□□□□□ 0
`:JE`	□□□	`44`	10	0	00	□□□□□
`:JM`	□□□	`1`	10	□	011	NANP□□□□□□

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: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	
:LB	□□□	961	8	0	00	
:LC	□□□□	1	10	□	011	NANP□□□□□□

□□	□□/□□	E.164 □□	□□□□	□□	IDD	□□
: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	
:ML	□□	223	8	□	00	

□□	□□/□□	**E.164 □□**	□□□□	□□	**IDD**	□□
: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	

□□	□□/□□	**E.164 □□**	□□□□	□□	**IDD**	□□
:NE	□□□	227	8	□	00	
: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	

□□	□□/□□	E.164 □□	□□□□	□□	IDD	□□
:PK	□□□□	92	10	0	00	
:PL	□□	48	9	□	00	
:PM	□□□□□□□□	508	6	□	00	
: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	

□□	□□/□□	E.164 □□	□□□□	□□	IDD	□□
:SB	□□□□□	677	5-7	□	00	
:SC	□□□	248	7	□	00	
:SD	□□	249	9	0	00	
:SE	□□	46	9	0	00	
:SG	□□□	65	8	□	001	
: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	

□□	□□/□□	**E.164 □□**	□□□□	□□	**IDD**	□□
: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	
: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	

□□	□□/□□	E.164 □□	□□□□	□□	IDD	□□
: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	□□□□□□
:VC	□□□□□□□□□□	1	10	□	011	NANP□□□□□□
:VE	□□□□	58	10	0	00	
:VG	□□□□□□□	1	10	□	011	NANP□□□□□□
:VI	□□□□□□□	1	10	□	011	NANP□□□□□□
:VN	□□	84	9-10	0	00	
:VU	□□□□	678	5-7	□	00	

□□	□□/□□	**E.164 □□**	□□□□	□□	**IDD**	□□
`:WF`	□□□□□□□□	`681`	6	□	00	
`:WS`	□□□	`685`	5-7	□	0	
`:XK`	□□□	`383`	8	0	00	
`:YE`	□□	`967`	9	0	00	
`:YT`	□□□	`262`	9	0	00	□□□□□□
`:ZA`	□□	`27`	9	0	00	
`:ZM`	□□□	`260`	9	0	00	
`:ZW`	□□□□	`263`	9	0	00	

□□□□□□

1. CLI □□□□□□

□□□□□□□□□□□ CLI □□□□□

```
□□□  *67555123456
□□ 1□□□ *67 → 555123456
□□ 2□□□ → 1555123456□□□□□□□
```

2. SIP □□□□

□□□□□□□□□□□

```
□□□  61403123456;npdi;rn=+61400000000
□□ 1□□□ ;npdi;rn=... → 61403123456
□□ 2□□□ → 61403123456
```

3. □□□□□□□

□□□□□□□□□□□□□ +□□

```
□□□  +61 (403) 123-456
□□ 1□□□□□ → +61403123456
□□ 2□□□ → 61403123456
```

4. □□□□□□□□□□□□□□□□□

□□□□□ 13 □ 1300/1800 □□□□□□□□□□□□□□□□□

□□□□□□□□□□

□□□□□□□□□□□□

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

□□□ `{:error, "□□□□□□□□□"}` - □□□□□

□□□□□□□□□□□

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

□□□□□ □□□□□□□ E.164 □□□ HSS □□□□□□□□

□□□□□□

Web UI □□□□□ (`/translate`):

1. □□□□□□□□□ `/translate`
2. □□□□□□□□□□□□
3. □□□□□□□□□□□
4. □□□□□□ E.164 □□
5. □□□□□□□□□□□

□□□□□□□

- □□□□ → E.164
- □□□ (0NSN) → E.164
- □□□ (+CC) → E.164
- □□ CLI □□□□□ → □□□□
- □□□□□□□□□□□□□□□ → □□ E.164
- □□□□□□□□□□□□ 13/1300/1800□ → E.164

□□□□□□□□

□□□□□□□□□□ **"UNALLOCATED_NUMBER"**

1. □□□□□□□□□□□□
   - □□ `/translate` □□□□□□
   - □□□□□□□□□□□□ E.164 □□
   - □□□□□□□□□□□□□□
2. □□ **Sh** □□□
   - □□□□□□□□ Sh □□
   - □□ `/sh_test` □□□□□□□□
   - □□□□□□□□□□ MSISDN
3. □□□□□□□□□
   - □□□□□□ `destination_number` □
   - □□□□□□□□□□□□□□

□□□□□□□□□□□

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

# □□□ 12345678□8 □□□□□□
# □□□ 6161712345678□□□□ - □□□□
# □□□□□□□□□□□□□□ localAreaCode
```

□□□□□□□□□□□

□□□□□□□□□□□□□

- □ `+61403123456` □ `61403123456` → □□□
- □ `0403123456` □□□□ country_code □□□ → □□□□

MO 和 MT 的区别

MT（被叫）的处理流程：

- 接收来自运营商的呼入请求
- 根据被叫号码查找对应的 SIP 账户
- 通过预设的 Sh 接口查询用户状态

MO (主叫呼出) 流程:

- 接收来自用户的呼出请求
- 对主叫号码进行鉴权
- 通过预设的接口向 Sh
- 呼叫结束后，生成话单记录（CDR）

号码处理

1. 国际号码处理流程：
    - 检查 `country_code` 是否在允许列表中
    - 根据国家代码添加前缀
2. 国内号码处理流程：
    - `localAreaCode` 是否在允许的区号列表中
    - 根据区号添加前缀
3. 本地号码处理流程：
    - 检查号码长度
    - 如果0NSN 开头
    - 如果+CC 开头
    - 根据号码长度添加相应的前缀
4. 特殊号码处理：
    - 检查“特殊号码列表”中
    - 根据特殊规则处理

- □□ E.164 □□□□□□□□□

5. □□□□□□□□□:

- □□□□□□□□□□□
- □ `/translate` □□□□□□□□□□
- □□□□□□□□□□□□□

□□□□□□ (OCS) □□

OmniTAS □□□□□□□□□ Diameter Ro □□□□□□□□□□□□□□□□□□□□AVP □□□ FreeSWITCH □□□□□

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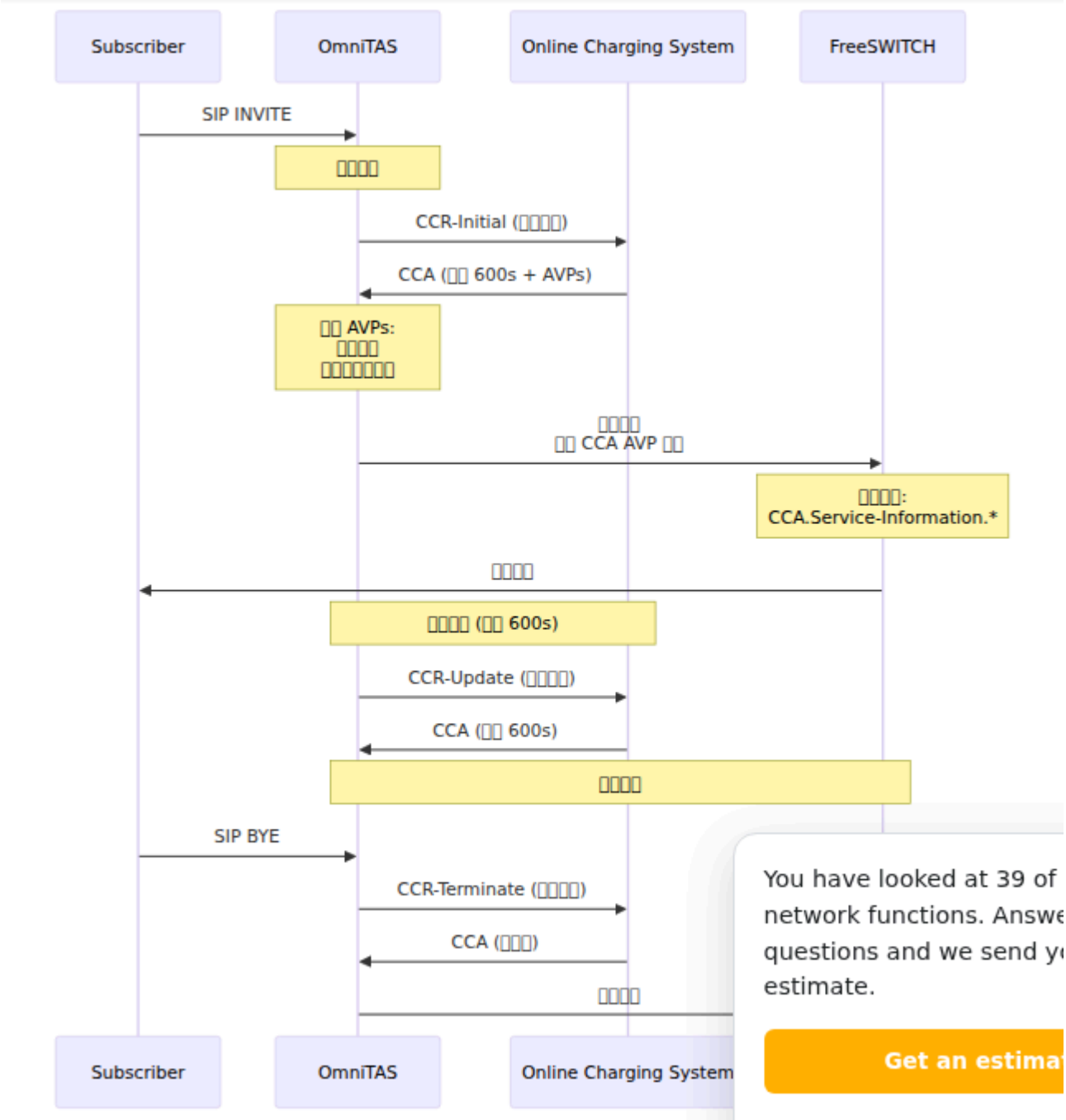
- □□□□
- □□□□□□□□□□□□
- □□□□□□□
- AVP □□□□□□□
- □□
- FreeSWITCH □□
- □□□□□□□
- Diameter □□
- □□
- □□□□
- □□
  - FreeSWITCH □□□□
  - AVP □□□□

□□□□

OmniTAS □□ 3GPP TS 32.299 □□ Diameter Ro □□□□□□□□□□□□□□□□□□□□



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□□□□□□□ (CCR):

- **CCR-Initial (□□ 1)**: □□□□□□□□□□□□□□□□□□□□
- **CCR-Update (□□ 2)**: □□□□□□□□□□□□□□□□□□□□□□□
- **CCR-Terminate (□□ 3)**: □□□□□□□□□□□□□□□□□□

□□□□□□□ (CCA):

- □□□□□□□□□□□□□□□□□□□□□□□□
- □□□□□□□□□ AVPs □□□□□□□□□□
- □□□□□□□□□□□□□□□□□□□□□□□□

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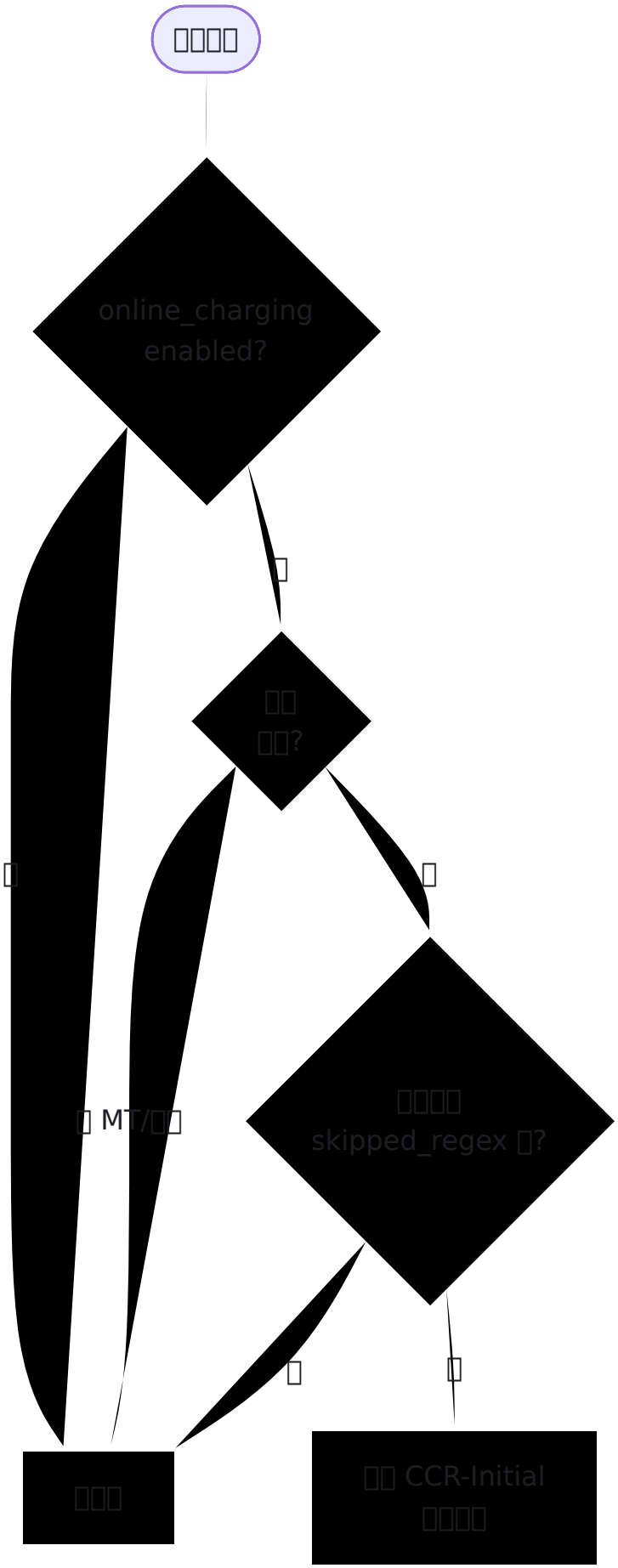
□□□□□□□□□□□□□□□□□□□□□□□□□□□□ Diameter CCRs□□□□□ OmniTAS □□□□□□□□□□ (MO) □□□□□□□□□□□

1. □□□□□□□: `online_charging.enabled` □ `true`□□□ `false` □□OmniTAS □□□□□□□□□ □□□□□□□□□□ OCS□
2. □□□□□□□□ **(MO)**: □□ MO □□□□□□□□□□□ **(MT)** □□□□□□□: MT □□□□□ OCS □□□□□□□□□□ □□□□□□□□□□
3. □□□□□□□□: □□□□□□□ `skipped_regex` □□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□OmniTAS □□□ **CCR-Initial** □□□□□□□ SIP Call-ID □□□□□□□□□□□□□□□□□**CCR-Update** □ **CCR-Terminate** □□□/□□□□□□□□□ □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□MT □□□ □□□□ B □□□□□□□□□□□□□□□ CCRs□


□□□□
online_charging
enabled?
□
□□
□□?
□
□
□ MT/□□
□□□□
skipped_regex □?
□
□
□□□
□□ CCR-Initial
□□□□



> □□: □□ OCS □□□□□□□□□□□□□□ □ □□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□□□□ CCR □□□ □□□□□□□□□□□ CCR □□□□□□□

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`skipped_regex` □□□□□□□□□□□ - □□□□□□□□ CCR-I□□□□□□□□□□□□□□□□□□□

CCR-T □□□□□□□□□□□□□ - □□□□`Cause-Code`□`Service-Information` - □□ OCS □□□□□□ □□□□□□ CDR□□□□□□□□□□□□ CCR-Initial □□□

> □□**:** □□□□□□ CCR-Update□OCS □□□□□□□□□□□ CCR-Initial □□□□□□□ CCR-Terminate □□□□□□□□□□□□□

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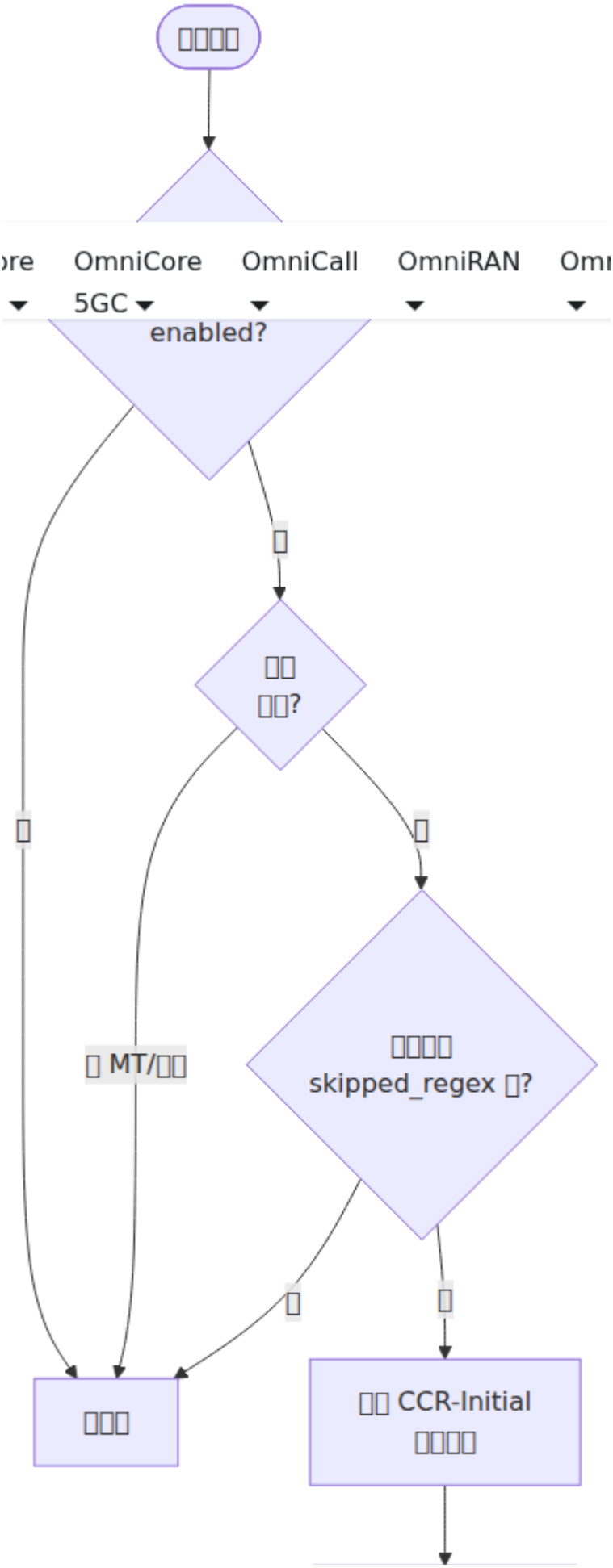
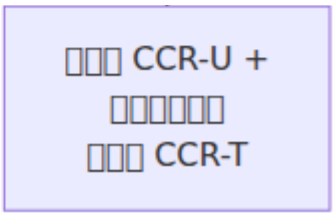
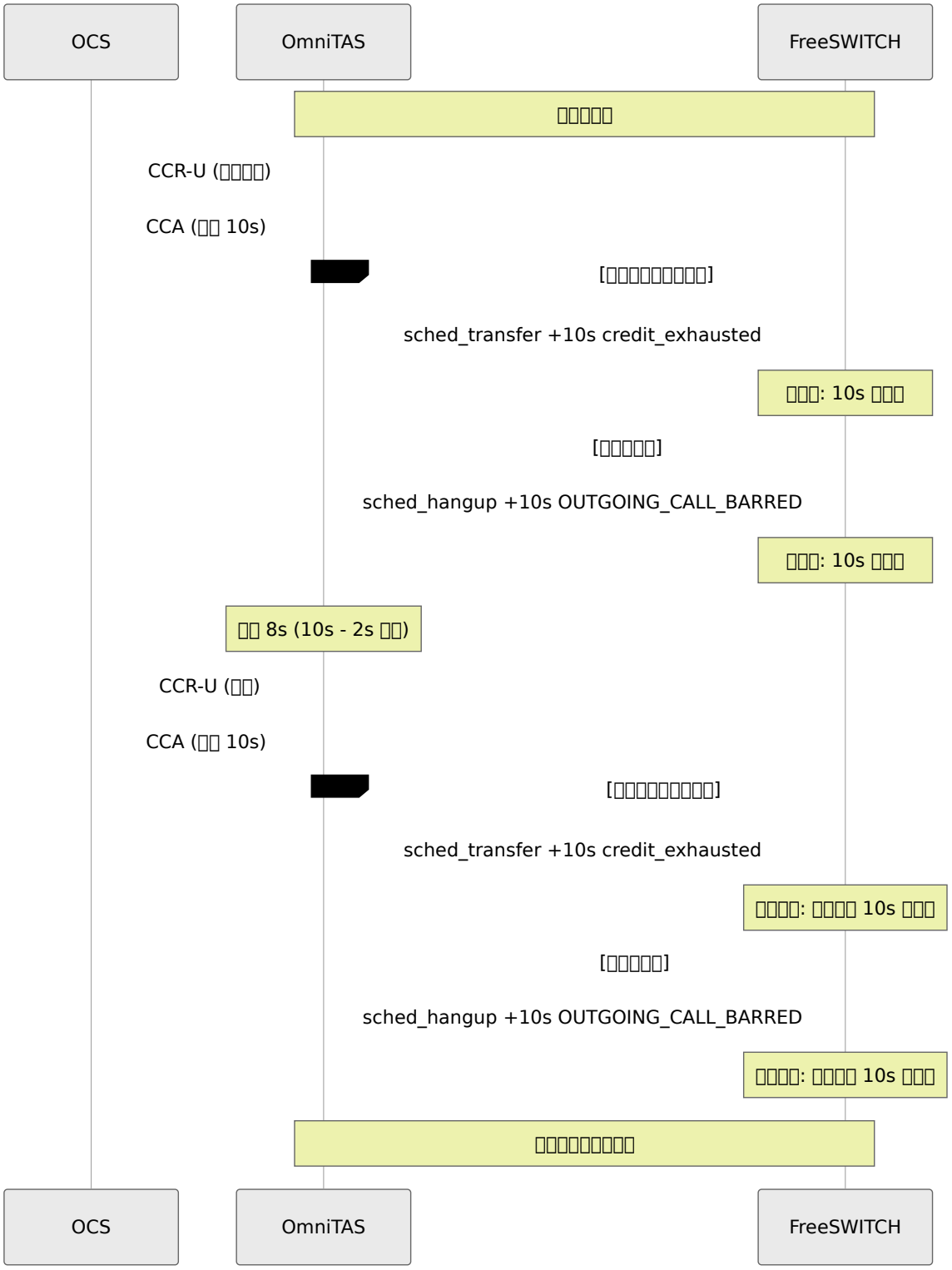

□□□□
ore
OmniCore
5GC
OmniCall
OmniRAN
Omı
enabled?
□
□□
□□?
□
□
□ MT/□□
□□□□
skipped_regex □?
□
□
□□□
□□ CCR-Initial
□□□□



□□□□□□□□□□

□□□□□□□□□□ □□ OCS □□□□□□ CCA□□□□□□ `2001`□□□□□□□□□□ □□□□□□□□□□ `4012` (DIAMETER_CREDIT_LIMIT_REACHED) □ `4010` (DIAMETER_END_USER_SERVICE_DENIED)□□OmniTAS □□□□□□□□□□□□□□□□□□□□ `OUTGOING_CALL_BARRED` □□□□□□□□□□□□□□□□□□□□

□□□□□



□□□□□

OmniTAS □□□□□□□□□□□□□ CCR-Update □□□□□□□□□□□□□

- **T+0s**: □□□□□OCS □□ 10s□□□□□□□ 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] □□□□ <id> □ UUID <uuid> - □□□□□□□□□□□□□□□
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. □□□□□ `ims_as` □□□□□□□□□ `credit_exhausted` □□
3. □□□□□□□□□
   - FreeSWITCH □ A □□□□□ credit_exhausted □□□□
   - □□□□□□□□B □□□□ BYE
   - □□□□□ A □□□□□□□
   - □□□□□□□□□

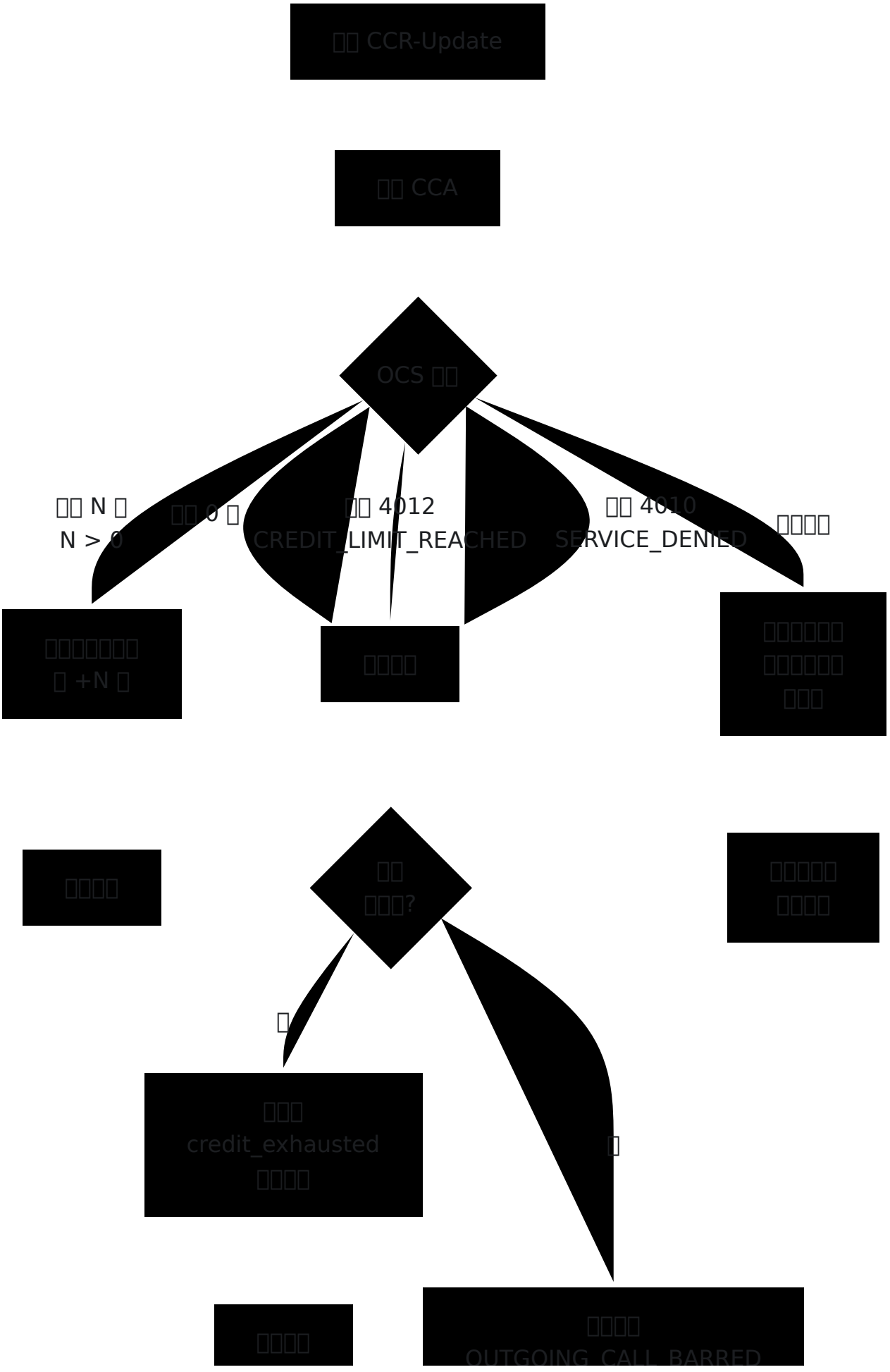
□□:

- □□□□□□□□□□□□□□□□□□□□
- B □□□□□□□□□□□□□□□□□
- CCR-T □□□□□□□□□□□
- □□□□: □□□□□ FreeSWITCH □□□□□□ `${base_dir}` □□□

CCR-Update □□□□□□□□□

□□ OCS □ CCR-Update □□ □□□□ □□□ □□□OmniTAS □□□□□□□□□□□□□□□□□□□□□□□□□□□

OCS □□□□□


□□ CCR-Update
□□ CCA
OCS □□
□□ N □
N > 0
□□ 0 □
□□ 4012
CREDIT_LIMIT_REACHED
□□ 4010
SERVICE_DENIED
□□□□
□□□□□□□□
□ +N □
□□□□
□□□□□□□
□□□□□□□
□□□
□□□□
□□
□□□?
□
□□□
credit_exhausted
□□□□
□
□□□□
□□□□
OUTGOING_CALL_BARRED



□□□□□□□□□

OCS □□	□□	□□
`{:ok, 0}` (□□)	□□□□□□ □□□	`□□□□□□□□□□□□ - □□□□□□□`
`{:error, 4012}` (CREDIT_LIMIT_REACHED)	□□□□□□ □□□	`□□□□□4012 CREDIT_LIMIT_REACHED□ - □□□ □□□`
`{:error, 4010}` (END_USER_SERVICE_DENIED)	□□□□□□ □□□	`□□□□□4010 END_USER_SERVICE_DENIED□ - □□□□□□□`
`{:error, reason}` (□□□□)	□□□□ CCR □ □□□□□□ □□□□□	`□□ CCR □□□□□ <reason> - □□ □□`
`{:ok, N}` □□ N > 0	□□□□□□ □□□ +N □	`□□ CCA □□ Ns□□□ (N-□□)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. □□□□□□:
   - □ CCR-U □□ OCS □□□□□□□
   - □□□□□□□
   - □□□□□□
   - □□□□□ Diameter □□□

□□□□□□□□ `credit_exhaustion_announcement` □□□□□□□□□□□□□□□□□□

AVP □□□□□□□

□□

OmniTAS □□□□□□□□□□□□□□□□□-□□ (AVPs)□□□□□□□□□□□□□□□ FreeSWITCH□□□□□□□□□□ □□□□ OCS □□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□ **AVP □□:**

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

□□□□□□□**:** AVPs □□□□□□□□□□□□□□□□□□□ `CCA`□

```
CCA.<AVP-Name>.<Nested-AVP-Name>.<Value-AVP-Name> = "value"
```

□□ AVP □□

□□□□ **AVP (3GPP)**

□□□□□□ AVP (AVP □□ 873, □□□ ID 10415) □□ IMS □□□□□□□□

□□ **OCS □□:**

```
Service-Information
  ├── IMS-Information
  │     ├── Carrier-Select-Routing-Information: "1408"
  │     └── Node-Functionality: 6
  └── Alternate-Charged-Party-Address: "NickTest"
```

□□ **FreeSWITCH □□:**

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

□□□□□□□□□: □□□□□□□□□□□□□□□□□□□□

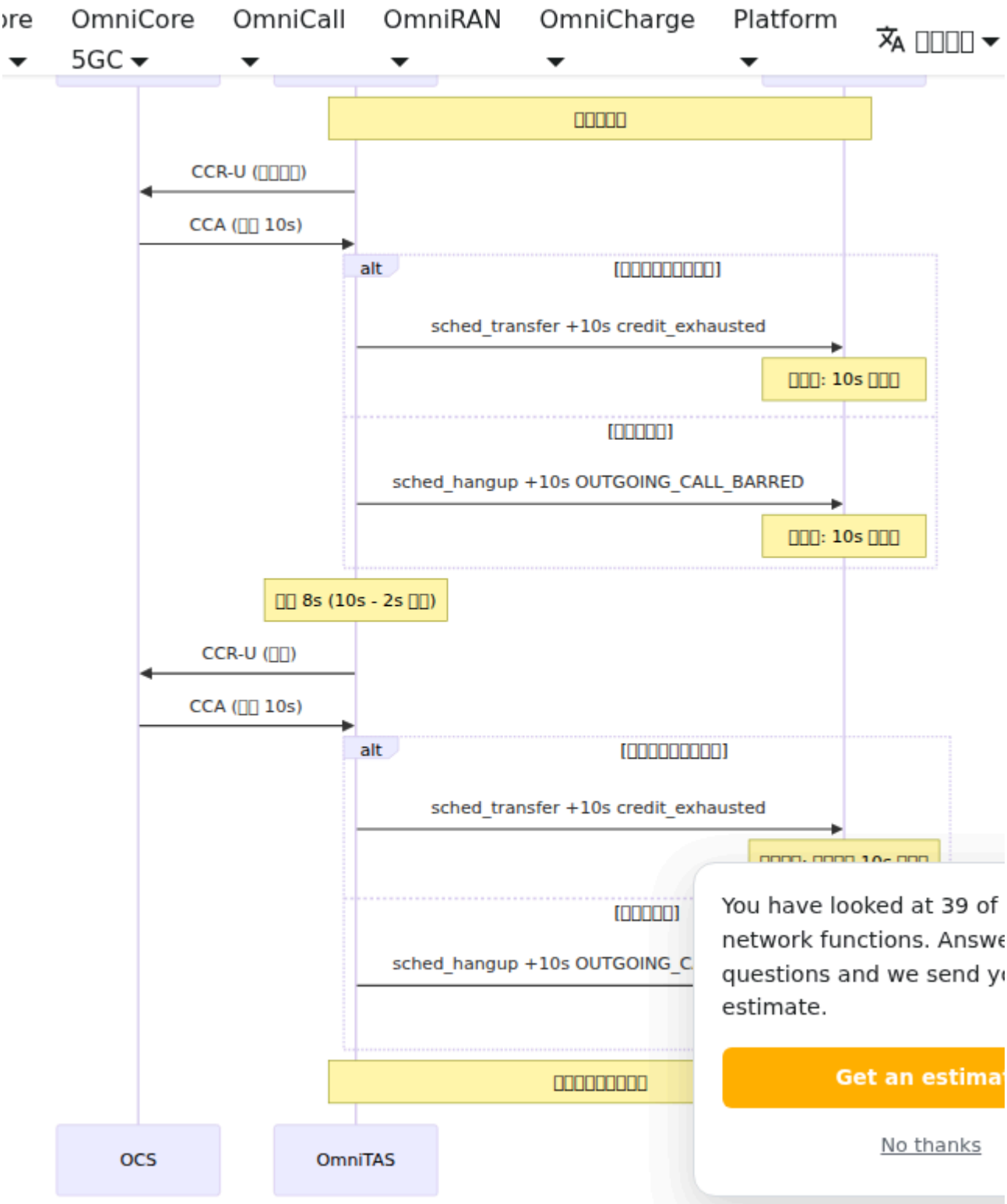
```
<action application="log" data="INFO □□□: ${CCA.Service-
Information.Carrier-Select-Routing-Information}"/>
```

□□ **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 □□□□



□□□□□

1. □□ **AVP** □□□□□□□□□□□□□□□□□□
2. □□ **AVP** □□□□□□□□□□□□□□□□
3. □□□□□□ **AVP** □□□□□□□ AVP □□

4. □□ **AVP** □□□□□□□□□□□□□

□□□□□□□

OCS CCA □□□

```
□□□□□ (□□)
  ├── IMS □□ (□□)
  │     ├── □□□□□□ 6
  │     ├── □□□□□□ 1
  │     ├── □□□□□□□ "tel:+313380000000670"
  │     └── □□□ (□□)
  │           ├── SIP □□□□□□□ "2026-01-24T22:40:18Z"
  │           └── SIP □□□□□□□ "2026-01-24T22:40:18Z"
  └── IN □□ (□□)
        └── □□□□□□□□ "15551234567"
```

□□□ **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 =
"15551234567"
```

□□

□□□□□□

□□	□□	□□	□□	□□
`enabled`	□□	□	`false`	□□□□□□□□□□ `false` □□ □□□□□□ CCR□□□□□ □□□
`requested_units_seconds`	□□	□	`0`	□□□□□□□□□□□□□□□□ CC `Requested-Service-U` □□□□□□□□ **// RSU**□AVP `Time`□□□ OCS □□□□□□□ □□ CGRateS OCS □□□□ □□□□□□□□□□□ □ □□□□ F □ OCS □□□□□ `CC-Time`
`report_and_reserve`	□□	□	`false`	3GPP SCUR □□□□□□□□□ `true` □□□□ CCR-□□□ C `Used-Service-Unit`□□ □ `CC-Time`□□□□□□□ `3G` `Reporting-Reason`□□□ `RATING_CONDITION_CH` □□□□□□ `QUOTA_EXHAUS` □□□ `FINAL (2)`□OCS □ □□□□□□□□□□□□□□□□□ `-` CCR-T □□□□□□□□□□□□□ □□□□□ `CC-Time` □□□□□
`service_identifier`	□□	□	`1`	□□ CCR □□□□□□□□□□□ `Identifier`□AVP 439□ `{Service-Context-Id Identifier}` □□□□□□□ □□□□□□□

□□	□□	□□	□□	□□
`periodic_ccr_time_seconds`	□□	□	`10`	□ OCS □□□□□□□□□CCR- □□□□□□□□□□□□□□□ CCI □□□□□□□□□□□□□□□□ □`allocated_time - ccr_update_buffer_s`
`ccr_update_buffer_seconds`	□□	□	`2`	□□□□□□□□□□□□□□□□□□□O `(allocated_time - b` □□ CCR-U□□□□□□□□□□□□ □□
`schedule_hangup_auth`	□□	□	`false`	□□□□□□□□□□□□□□□□□/□□□ OmniTAS □□□□ CCA □ `allocated_time` □□ Fr □□□□□□□□ CCR-U □□□□□□ `credit_exhaustion_a` □□□□□
`credit_exhaustion_announcement`	□□□	□	`nil`	□□□□□□□□□□□□□□□□□□ `schedule_hangup_aut` □ □□ □□□□□□□□□□□□□□□□ □□□□□□□□□□□□ FreeSWI □□`"${base_dir}/sour` □ `nil` □□□□□□□□□□□
`skipped_regex`	□□ [□ □ □]	□	`[]`	□ □□□□ □□□□□□□□□□□□□ OCS□□□□□□□□ CCR□□□ □□□□□□□□□□□□`"^911$"` □□□□□□□□□□□□□□□□□□□□□ `tas_zero_rate` □□ - □ □□□

Diameter □□□□

□□	□□	□□	□□	□□
`origin_host`	□□□□	□	-	OmniTAS Diameter □□□FQDN□□□□□□□□ D□□□□□ □□`"tas01.epc.mnc123.mcc456.3gppnetw`
`origin_realm`	□□□□	□	-	OmniTAS Diameter □□□□□□□□□□□□ □□`"epc.mnc123.mcc456.3gppnetwork.or`
`destination_realm`	□□□□	□	-	OCS Diameter □□□□□□□□□□□□□□□□□□□□
`destination_host`	□□□□	□	`nil`	□□□ OCS Diameter □□□□□ `nil` □□□□□□ `destination_realm` □□□□□□□□□□□□□□□□□□ C□□

□□□□

```
config :tas, :online_charging,
  # □□□
  enabled: true,

  # 0 = □ RSU□□ OCS □□□□□□□□□□ TAS / CGRateS □□□□
  # □□□□□□□□□□□□□□□ OCS □□□□□□
  requested_units_seconds: 0,

  # □□□□□□□□□□□□□
  service_identifier: 1,

  # □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
  periodic_ccr_time_seconds: 10,

  # □□□□□□□□□ 2 □□□□□□
  ccr_update_buffer_seconds: 2,

  # □□□□□□□□□□□□□
  schedule_hangup_auth: true,

  # □□□□□□□□□□□□□□□
  credit_exhaustion_announcement: "ivr/ivr-
account_balance_low.wav",

  # □□ OCS □□□□□□□□□□□□
  skipped_regex: [
    "^911$",      # □□□□□□
    "^000$",      # □□□□□□□□□
    "^\*86$"     # □□□□□□□
  ]

config :tas, :diameter,
  # □□□□
  origin_host: "tas01.epc.mnc001.mcc001.3gppnetwork.org",
  origin_realm: "epc.mnc001.mcc001.3gppnetwork.org",

  # OCS □□
  destination_realm: "epc.mnc001.mcc001.3gppnetwork.org",
  destination_host: nil  # □□□□□□□
```

□□□□□

□□□□□□□□□

1. □□□□□ `skipped_regex` □□□□□□
2. □□□□□□□□□ OCS□□□□□□□□□
3. □□□□□□CCR-□□□□□ OCS □ `destination_realm`
4. □□ CCA □□□□□□□□□□ AVP
5. AVP □□□ FreeSWITCH □□□□□□ AVP □□□
6. □□□□□□□`allocated_time` □ AVP □□□□
7. □□□□□□ `periodic_ccr_time_seconds` □□ CCR-□□
8. □□□□ `schedule_hangup_auth`□□□□□□□□□□□□
9. □□□□□□□ CCR-□□

□□□

- □□ **OCS**□□□□□□□□□□□□□□□□
- □□□□□□□ `periodic_ccr_time_seconds` □□□ 30 □□□□□□□□
- □□□□□□□□ `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 □□□□□□□□ -->
    <action application="log"
            data="INFO □□□□□: ${CCA.Service-Information.Carrier-
Select-Routing-Information}"/>

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

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

    <!-- □□□□□□□□□ -->
    <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 □□□□ □□ □□
- □□□□□□□□□□□□
- □□□□□□□□□□□□□□

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- □□□□□□□□□□□□□□
- □□□□/□□□□□□

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□□□□

1. □□ OCS □□□□□□□□□

□□ OCS □□□□□□□□□□□□□□□

```
<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>

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

□□□□□ OCS □□□□□ AVP □□□□□□□□ "1408"□FreeSWITCH □□□□□□□□□□□ `carrier-1408.example.com` □□□

2. □□□□□

□□ OCS □□□□□□□□□□□□□□□

```
<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>
```

□□□□□ OCS □□□□□□□□□□□□□□□□□□□□OmniTAS □ AVP □□□ "NickTest" □□□□□□□□□□□□□□□□ CDR □□□ SIP □□□□

3. □□□□□□□□□□□□

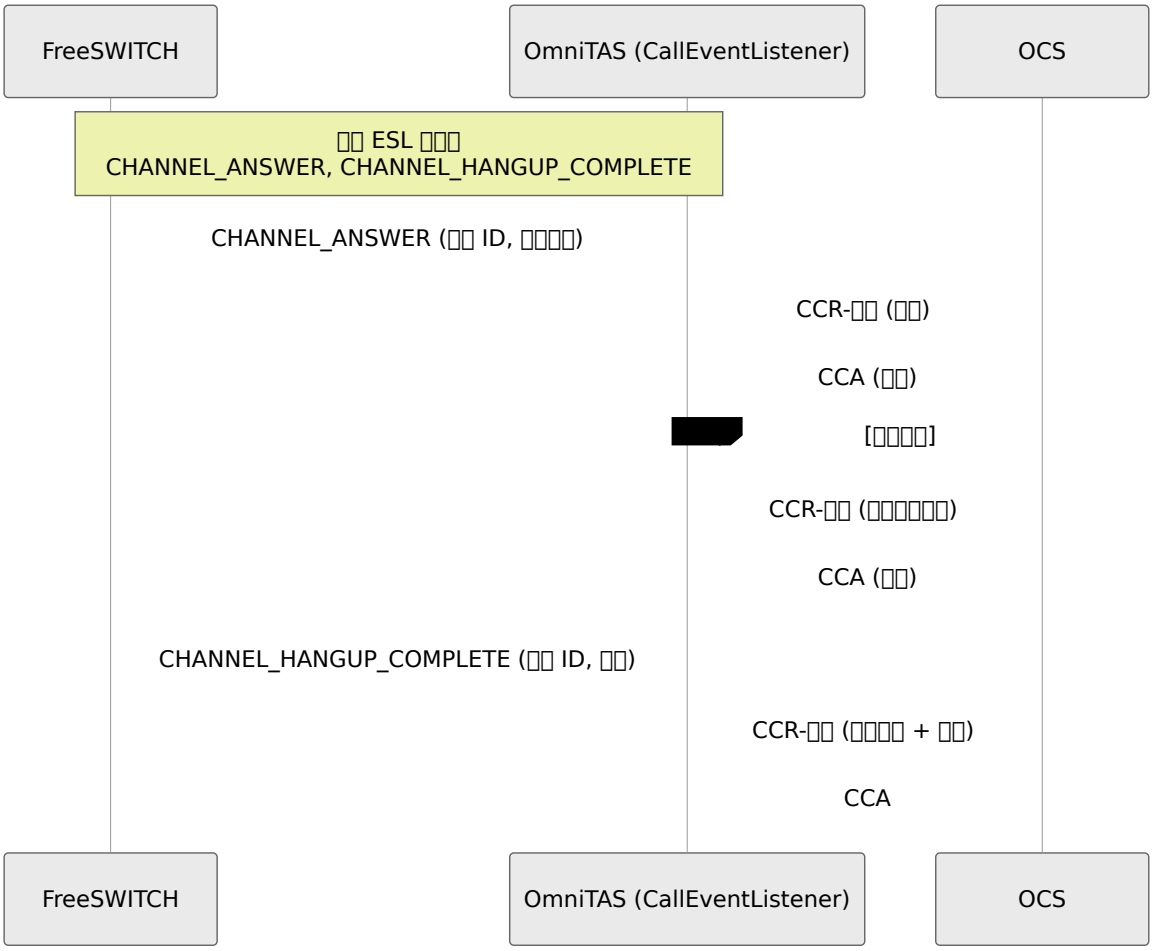
□□□□□□□□□□□□

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

    <!-- □□□□ 30 □□□□□ -->
    <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>
```

□□□□□ □□□□ OCS □ `allocated_time` □□□□□□□□□□□□□□□ 30 □□□□□□□□□

□□□□□□□

□ CCR-□□□□□□□□□OmniTAS □□□□□□□ □□□□□□□□□□□□□□□□ CCR-□□□□ □□□□□□□□□ CCR-□ □□□□□□□□□□ FreeSWITCH □□□□□□□□□ESL□□□□



□□□□□

- OmniTAS □□□□□ FreeSWITCH □□□□□ ESL □□□□□□ `CHANNEL_ANSWER` □ `CHANNEL_HANGUP_COMPLETE`□
- □ `CHANNEL_ANSWER` □□□□□ SIP □□ ID □□□□□□□□□□□□□□□□□□ CCR-□□□
- □ `CHANNEL_HANGUP_COMPLETE` □□□□□ SIP □□ ID □ FreeSWITCH □□□□□□□□□□□□□□□□□□□ CCR-□□□
- □□□□ SIP □□ ID □□□□□□□□□□□□□□□□□□□□□□MT □□□□ B □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ CCR □□□□
- □□□□□□□□□□ □□□□□□□□□□□□□□ `CHANNEL_ANSWER`□□□□□□□□□□□□□ ID□□□□□□□□□ CCR-□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ CCR-U □□□□□□□□□□
- □□□□□□□□□□ `BLIND_TRANSFER`/`ATTENDED_TRANSFER` □□□□□□□□□□ → CCR-□□□□□□□□□□□□□□□□□□□

`esl_notifications` □□□□□□□□□□□□□□□ `online_charging.enabled` □□□□□□□□□□□□□□□

AVP	□□	□□	□□
Session-Id	263	UTF8String	□□□□□□□□□□□□□□□□□□□□□□□□CCR-I/U/T □□□□□□□ SIP □□ ID □□□□□□□
Auth-Application-Id	258	Unsigned32	□□ RFC 4006 □ Diameter □□□□□□□□□□□ □ `4`
Service-Context-Id	461	UTF8String	□□ TS 32.299 □ IMS □□ `"000.000.12.32260@3gpp.org"`
CC-Request-Type	416	Enumerated	□ `1`□□INITIAL_REQUEST□
CC-Request-Number	415	Unsigned32	□□□□`0` □ **INITIAL_REQUEST**□□□□□□ □□□□□□□□ `1`□`2`□... RFC 4006 §8.2
Service-Identifier	439	Unsigned32	□□□□□□□□□□□□`service_identifier` □□□
Subscription-Id	443	□□	□□□ MSISDN □ IMSI
Requested-Service-Unit	437	□□	□□□□□`CC-Time` = `requested_units_seconds`
Service-Information	873	□□	IMS □□□□□□□□□□/□□□□□□□□□□□□□□

□□ CCR-I□

```
Session-Id: "tas01.example.org;1463927445;1744753804"
Auth-Application-Id: 4
CC-Request-Type: 1 (INITIAL_REQUEST)
CC-Request-Number: 0
Subscription-Id:
  - Subscription-ID-Type: 0 (END_USER_E164)
    Subscription-ID-Data: "313380000000670"
Multiple-Services-Credit-Control:
  - Service-Identifier: 1
    Requested-Service-Unit:
      - CC-Time: 300 (□□□□□)
Service-Information:
  - IMS-Information:
      - Role-Of-Node: 0 (ORIGINATING_ROLE)
      - Node-Functionality: 6 (AS)
      - Calling-Party-Address: "tel:+313380000000670"
      - Called-Party-Address: "tel:+15551234567"
```

> `Requested-Service-Unit` □□□□□□□□□□□□□OCS □□□□□□□□□□ CCA □ `Granted-Service-Unit` □□□□

CCA□□□□□□□□

□□ OCS □□□□□□□□□□□□□□□□□□□□

□□□□□ **AVP**□

AVP	□□	□□	□□
Result-Code	268	Unsigned32	`2001` □□□□□□□□□□□□□□□ □□□□□
Granted-Service-Unit	431	□□	□□□□□□□□□□□□□
Service-Information	873	□□	□□□□□□□□□□□□□□□□□□□□

□ **AVP** □□□ **CCA**□

```
Session-Id: "tas01.example.org;1769294418268;8a078232"
Result-Code: 2001 (DIAMETER_SUCCESS)
CC-Request-Type: 1
CC-Request-Number: 1
Granted-Service-Unit:
  - CC-Time: 600 (□□□ 10 □□)
Service-Information:
  - IMS-Information:
      - Carrier-Select-Routing-Information: "1408"
  - Alternate-Charged-Party-Address: "NickTest"
```

□□□□□

```
allocated_time = 600
CCA.Service-Information.Carrier-Select-Routing-Information =
"1408"
CCA.Service-Information.Alternate-Charged-Party-Address =
"NickTest"
```

CCR-□□□□□□□ 2□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□

- □□□□□□□□□ ESL □ `CHANNEL_ANSWER`□□`CC-Request-Number` = `1`□□ `SIP-Response-Timestamp` □□□□□□□□□
- □□□□□□□□□□□□□□□□□□ `allocated_time - ccr_update_buffer_seconds`□□□□□ □□□□□□□□ `periodic_ccr_time_seconds`□

□ **CCR-I** □□□□□□

- `CC-Request-Type`□`2`□UPDATE_REQUEST□
- `CC-Request-Number`□□□□□ `1`□□□□□□□□□□□□□□□□
- `Requested-Service-Unit`□□□□□□□ `requested_units_seconds`□
- □ CCR-□□□□□□□ `Session-Id`

> □□□□□□□ CCR-□□□□□□□`Used-Service-Unit`□□□□□□□□□ CCR-□□□□□□□□□

□□□□

□□	□□	□□	**OmniTAS □□**
2001	DIAMETER_SUCCESS	□□□ □□	□□ AVP□□□□□
4010	DIAMETER_END_USER_SERVICE_DENIED	□□□ □□□ □□	□□□□□□□ `CALL_REJECTED`
4012	DIAMETER_CREDIT_LIMIT_REACHED	□□□ □	□□□□□□□ `OUTGOING_CALL_BAR`
5003	DIAMETER_AUTHORIZATION_REJECTED	OCS □□□ □□	□□□□□□□ `CALL_REJECTED`
5xxx	□□□□□	OCS □□□ □□□ □	□□□□□□□□□

□□: RFC 6733 §7.1 □ 3GPP TS 32.299

□□

> □□□ docs/metrics.md □□□□□□□□□□□□□□□□□□□□□□□□□

Diameter □□ / □□□□

CCRs □□□□□□□ `command` □□□□□□□□□ CCR-Initial (□□), CCR-Update (□□□□□□) □ CCR-Terminate (□□) □□□□□□□ □□□□□□□□□□□□□□□□□□□□

□□: `diameter_requests_total` (□□□): □□□ Diameter □□ □□:
`diameter_responses_total` (□□□): □□□□ Diameter □□ □□:

`diameter_response_duration_milliseconds` (□□□): □□□□□□□

□□:

- `application` - `ro` (□□□□□) □ `sh` (□□□□□□)
- `command` - `ccr_i`, `ccr_u`, `ccr_t` (Ro) □ `udr` (Sh)
- `result_code` - (□□□) Diameter □□□□□: `2001`, `4012`, □; `0` = □□ / □□□□□□□□
- `result` - (□□□□□□) `success`, `nocredit`, `error`

□□□□□:

```
# □□□□□□□ CCR □□
sum by (command) (rate(diameter_requests_total{application="ro"}[5m]))

# CCR □□□□□□□□□□ (□□□□ 2001 □)
sum by (command) (rate(diameter_responses_total{application="ro",
result_code!="2001"}[5m]))

# □□□□□□□ (4012)
rate(diameter_responses_total{application="ro", result_code="4012"}
[5m])

# □□□□□□□□ 95 □□□ CCR □□
histogram_quantile(0.95,
  sum by (le, command)
(rate(diameter_response_duration_milliseconds_bucket{application="ro"
[5m]))
)
```

□□□□□□□□

□□: `ro_charging_quota_seconds` □□: □□□ □□: □□ CCR □□□□□□□□□□

```
# □□□□□□□□□□□□□□□□
histogram_quantile(0.5,
rate(ro_charging_quota_seconds_bucket{request_type="ccr_i",
kind="granted"}[5m]))

# □□□□□□□□□□□□□□□□
rate(ro_charging_quota_seconds_bucket{kind="granted", le="0"}[5m])

# □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
rate(ro_charging_quota_seconds_sum{kind="used"}[5m])
```

OCS □□□□□□□

□□: `ocs_authorization_attempts_total` (□□□) □□: `result` (`success`, `nocredit`, `timeout`, `error`), `skipped` (`true` □□□□□□□□□□□□□□□ `false`)

□□: `online_charging_events_total` (□□□): □□□□□□ □□: `event_type` (`authorize`, `answer`, `reauth`, `hangup`, `credit_exhaustion_hangup`, `hangup_rescheduled`), `result` (`success`, `nocredit`, `timeout`, `error`, `triggered`)

□□□□:

```
# □□□□□□□□□□□□□□□
sum(rate(ocs_authorization_attempts_total{result="success",
skipped="false"}[5m]))
  / sum(rate(ocs_authorization_attempts_total{skipped="false"}[5m]))

# □□□□□□□□□□□□□□□□
rate(online_charging_events_total{event_type="credit_exhaustion_hangu
[5m])
```

□□□□

AVP □□□ FreeSWITCH □□□□

□□:

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

□□□□□:

1. OCS □ CCA □□□□ Service-Information AVP
2. AVP □□□□□□□□□□
3. □□□□□□ FreeSWITCH □□

□□□□:

1. □□ **OCS** □□□□ **AVP**

   □□ OmniTAS □□□□ CCA □□:

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

   □□ "Parsed AVP variables" □□ `%{}` □□ OCS □□□□□□ AVP□

2. □□ **AVP** □□□□

   □□□□□□□□□:

   ```
   [warning] got back another type of reply: {...}
   ```

   □□□ 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 □□□□□

- Granted-Service-Unit AVP □□□□□
- □□□□□□□□□ AVP □□

□□□□□□□□□:

1. □□□□□□□ CCA □□□□□□
2. □□ AVP □□□□□□□□ Diameter □□
3. □□ Result-Code □□□ 2001

OCS □□□□□□□□□

□□:

- □□ CCR □□□□
- □□□□: `[debug] Got back response for authorize: {:error, :timeout}`
- □ 5 □□□□□ CCA

□□□□□:

- □ OCS/DRA □□□□□
- □□□□□ Diameter □□ (3868)
- □□□□ `destination_realm` □ `destination_host`
- OCS □□□□□□□□□

□□□□:

1. □□□□□□□

   □□□ OCS □ TCP □□:

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

   □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

2. □□ **Diameter** □□

   □□ `destination_realm` □□□ OCS □□□□:

```
config :tas, :diameter,
  destination_realm: "epc.mnc001.mcc001.3gppnetwork.org"  # □□□
OCS □□□□
```

3. □□ **OCS** □□

   □□ OCS □□□□□ CCR □□□□□ OCS □□□□□□□□□:

   - □□ OmniTAS □ `origin_host` □□□ OCS □□
   - □□ OCS □□□□□□□□□□ OmniTAS □□□
   - □□ Service-Context-Id □ Application-Id □□□ OCS □□□□

□□□□□□□□□

□□:

- □□□□□□□□□□□□
- □ `allocated_time` □□□□□□□□□
- `schedule_hangup_auth` □□□□□□□

□□□□□:

- FreeSWITCH □□□□□□□□
- `schedule_hangup_auth` □ `false`
- □□□□□□□□□

□□□□:

1. □□□□

   □□ `schedule_hangup_auth` □□□:

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

2. □□ **FreeSWITCH ESL** □□

□□ OmniTAS □□□□□ FreeSWITCH □□□□:

```
[debug] Schedule Hangup Response: {:ok, "+OK"}
```

□□□□□□□□□□□□□□□□ FreeSWITCH □□□□□□□□□

3. □□□□□□

□□□□ UUID □□□□□□□□□□□:

```
[debug] Setting Scheduled Hangup for call in 600 seconds
```

□□□□□ UUID□□□□□□□□□□□□□□

□□□□□□□□□□ OCS

□□:

- □□□□ (911, 000) □□□□ OCS □□
- □□ `skipped_regex` □□□□□□□□□
- □□□□□□

□□□□□:

- □□□□□□□□□□
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- □□□□□□□□□□

□□□□:

1. □□□□□□□□□

□□□□□□□□□:

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

□□□□:

- □□□□: □□ `^911$` □□□ `911`
- □□: □□ `\*` □□□□□□□□□□ `\*`

2. □□□□□□□

   □□□□□□□□□□□□□□□□□□:

   ```
   [debug] Checking if dialled number "911" matches skipped
   regex...
   ```

   □□□□□□□□ "+1911" □□□□ "^911$"□□□□□□□□

3. □□□□

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

□□

3GPP □□

□□	□□	□□□□
TS 32.299	Diameter □□□□	§6.3 (Ro □□), §7.2 (AVP □□)
TS 32.240	□□□□□□□□	§5 (□□□□)
TS 29.229	Cx □ Dx □□	IMS □□ Service-Information AVP □□

IETF RFC

RFC	□□	□□□□
RFC 6733	Diameter □□□□	§3 (□□□□), §7 (□□□□)
RFC 4006	Diameter □□□□□□	§8 (□□□□□□)

AVP □□□□

Vendor-ID `0` = IETF □□ (RFC 6733 / RFC 4006); Vendor-ID `10415` = 3GPP (TS 32.299).

□□□ CCR □□□□□□□□

□□ AVP OmniTAS □□□ Credit-Control-Request □□□□□□□□:

```
Credit-Control-Request (Command 272, App 4)
├─ Session-Id (263)
├─ Origin-Host (264)
├─ Origin-Realm (296)
├─ Destination-Realm (283)
├─ Destination-Host (293)                          [□□□□□]
├─ Auth-Application-Id (258)            = 4
├─ Service-Context-Id (461)             =
000.000.12.32260@3gpp.org
├─ CC-Request-Type (416)
├─ CC-Request-Number (415)
├─ Event-Timestamp (55)
├─ User-Name (1)                                   [□□□□□□□□□]
├─ Termination-Cause (295)                         [□ CCR-T]
├─ Subscription-Id (443)
│   ├─ Subscription-Id-Type (450)       = 0 (END_USER_E164)
│   └─ Subscription-Id-Data (444)       = □□□ MSISDN
├─ Multiple-Services-Credit-Control (456)
│   ├─ Service-Identifier (439)
│   ├─ Requested-Service-Unit (437)             [CCR-I, CCR-U]
│   │   └─ CC-Time (420)
│   └─ Used-Service-Unit (446)                  [CCR-T]
│       └─ CC-Time (420)
└─ Service-Information (873, v10415)
    ├─ IN-Information                             [□□□□□]
    │   └─ Real-Called-Number
    └─ IMS-Information (876, v10415)
        ├─ Role-Of-Node (829)           = 0 (ORIGINATING_ROLE)
        ├─ Node-Functionality (862)     = 6 (AS)
        ├─ User-Session-Id (830)        = SIP Call-ID
        ├─ Calling-Party-Address (831)
        ├─ Called-Party-Address (832)
        ├─ Requested-Party-Address (1251)
        ├─ Time-Stamps (833)
        │   ├─ SIP-Request-Timestamp (834)
        │   ├─ SIP-Request-Timestamp-Fraction (2301)
        │   ├─ SIP-Response-Timestamp (835)               [□□□□]
        │   └─ SIP-Response-Timestamp-Fraction (2302)     [□□□□]
        └─ Cause-Code (861)                       [CCR-T]
```

OmniTAS □□□ AVP (CCR)

In □□□□□□□□□□□ AVP: **I** = CCR-Initial, **U** = CCR-Update, **T** = CCR-Terminate.

AVP	□□	□□□	□□	In	□ / □□
Session-Id	263	0	UTF8String	I U T	□□□□□□□□□□ SIP Cal I/U/T □□□
Origin-Host	264	0	DiameterIdentity	I U T	OmniTAS Diameter (`origin_host`.`orig`
Origin-Realm	296	0	DiameterIdentity	I U T	`origin_realm`
Destination-Realm	283	0	DiameterIdentity	I U T	OCS □□
Destination-Host	293	0	DiameterIdentity	I U T	□□□□□□ OCS □□□□□
Auth-Application-Id	258	0	Unsigned32	I U T	`4` (Diameter □□□□□
Service-Context-Id	461	0	UTF8String	I U T	`000.000.12.32260@`
CC-Request-Type	416	0	Enumerated	I U T	`1`=□□, `2`=□□, `3`=□
CC-Request-Number	415	0	Unsigned32	I U T	□□□ `0`□□□□ `1`, `2`, …

AVP	□□	□□□	□□	In	□ / □□
Event-Timestamp	55	0	Time	IUT	□□□□□□□
User-Name	1	0	UTF8String	IUT	□□; □□□□□□□/IMSI □
Termination-Cause	295	0	Enumerated	T	`1` (DIAMETER_LOG
Subscription-Id	443	0	Grouped	IUT	□□□□□ (□□□)
→ Subscription-Id-Type	450	0	Enumerated	IUT	`0` (END_USER_E164
→ Subscription-Id-Data	444	0	UTF8String	IUT	□□□ MSISDN
Multiple-Services-Credit-Control	456	0	Grouped	IUT	□□□□□□ (□□□)
→ Service-Identifier	439	0	Unsigned32	IUT	`service_identifie` □)
→ Requested-Service-Unit	437	0	Grouped	IU	□□□□

AVP	□□	□□□	□□	In	□ / □□
→ → CC-Time	420	0	Unsigned32	I U	`requested_units_s`
→ Used-Service-Unit	446	0	Grouped	T	□□□□
→ → CC-Time	420	0	Unsigned32	T	□□□□□□□□□□
Service-Information	873	10415	Grouped	I U T	3GPP □□□□
→ IN-Information	-	10415	Grouped	I U T	□□□□□□□□□□□□□□□
→ → Real-Called-Number	-	10415	UTF8String	I U T	□□□□□□□□
→ IMS-Information	876	10415	Grouped	I U T	IMS □□□□
→ → Role-Of-Node	829	10415	Enumerated	I U T	`0` (ORIGINATING_R□ □□□□
→ → Node-Functionality	862	10415	Enumerated	I U T	`6` (AS)
→ → User-Session-Id	830	10415	UTF8String	I U T	SIP Call-ID (OCS □□□

AVP	□□	□□□	□□	In	□ / □□
→ → Calling-Party-Address	831	10415	UTF8String	IUT	`tel:+<calling MSI`
→ → Called-Party-Address	832	10415	UTF8String	IUT	`tel:+<called numb`
→ → Requested-Party-Address	1251	10415	UTF8String	IUT	`tel:+<called numb`
→ → Time-Stamps	833	10415	Grouped	IUT	SIP □□/□□□□
→ → → SIP-Request-Timestamp	834	10415	Time	IUT	INVITE □□□□□□
→ → → SIP-Request-Timestamp-Fraction	2301	10415	Unsigned32	IUT	INVITE □□□□□□
→ → → SIP-Response-Timestamp	835	10415	Time	UT	□□ (200 OK) □□: □□□
→ → → SIP-Response-Timestamp-Fraction	2302	10415	Unsigned32	UT	□□□□□□□□□□□□□□□

AVP	□□	□□□	□□	In	□ / □□
→ → Cause-Code	861	10415	Integer32	T	`0` □□□□ / `2` □□□□

> □□□ `-` □□□□□□□/□□□□□□□□□ `Service-Information` □; □□□ 3GPP □□□□□□□□ OmniTAS Diameter □□□□□□

□ OCS □□□ AVP (CCA)

AVP	□□	□□□	□□	□□
Result-Code	268	0	Unsigned32	`2001` = □□; □ □□□
Granted-Service-Unit	431	0	Grouped	□□□□
→ CC-Time	420	0	Unsigned32	□□□□ (`allocated_time`)□`0` ⇒ □□□ ⇒ □□/□□
Service-Information	873	10415	Grouped	OCS □□□□□□□□
→ Carrier-Select-Routing-Information	2023	10415	UTF8String	□□□□□□□□□□ FreeSWITCH □□□
→ Alternate-Charged-Party-Address	1280	10415	UTF8String	□□□□□□□□□□ FreeSWITCH □□□

□□□ CCA □□□□ `Service-Information` □ AVP □□□□□ FreeSWITCH □□□□□□□□ AVP □□ □□□□□ □ FreeSWITCH □□□□□

FreeSWITCH □□□□

□□□□□ AVP □□□□□ FreeSWITCH □□□□□□:

□□□□	□□	□□□
`${allocated_time}`	Granted-Service-Unit / CC-Time	`600`
`${CCA.Session-Id}`	Session-Id AVP	`omni-as01.epc...;1769299669873;`
`${CCA.Result-Code}`	Result-Code AVP	`2001`
`${CCA.Auth-Application-Id}`	Auth-Application-Id AVP	`4`
`${CCA.CC-Request-Type}`	CC-Request-Type AVP	`1`
`${CCA.CC-Request-Number}`	CC-Request-Number AVP	`1`
`${CCA.CC-Time}`	CC-Time AVP (□□□□)	`600`
`${CCA.Origin-Host}`	Origin-Host AVP	`ocs01.epc.mnc001.mcc001.3gppnet`
`${CCA.Origin-Realm}`	Origin-Realm AVP	`epc.mnc001.mcc001.3gppnetwork.o`

□□□□	□□	□□□
`${CCA.Service-Information.Carrier-Select-Routing-Information}`	Service-Information → Carrier-Select-Routing-Information	`1408`
`${CCA.Service-Information.Alternate-Charged-Party-Address}`	Service-Information → Alternate-Charged-Party-Address	`NickTest`

□□□□:

- □□ CCA AVP □□□□ `CCA.`
- □□ AVP □□□□□□: `CCA.Parent.Child`
- □□□□□□□□□□□□□□□□
- □ uuid_dump □□□□□ `variable_` □□□□

□□ **uuid_dump □□:**

```
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** - □□□□□□□□
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- □ **□□□□** - Prometheus□□□□□

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

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2. □□□□□

    - □□□□□□ "□" □□
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4. □□□□□

- □ "□□" □□□□□□□□□
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- □□□□□□□□□□ `caller_id_number`□`destination_number`□`uuid`□ `caller_id_name`□`hangup_cause`
- □□ "□□" □□□□

5. □□□□□□□□□

- □□ "□□□□" □ "□□□□" □□□□□□□□
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- SQL□ □□ `!= 'term'` □□□□□□□□□□□□ `AND`
- □□□ `!"NORMAL_CLEARING"` □□□□□□□□□□□ "NORMAL_CLEARING" □□□

5. □□□□□**AND**□

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

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    - □□□□ **□□□□□□/□□** □□□ → □□□□□□□□
    - SQL□ field1 LIKE '%term%' OR field2 LIKE '%term%' OR ...

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

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

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`"911"`	□□□□□□□□□□□□□□	□□□□□□□□□ "911" □□□
`!NORMAL_CLEARING`	□□□□□□□	□□□□□□□□□□ "NORMAL_CLEARING" □□□□□□□□□□
`!"NORMAL_CLEARING"`	□□□□	□□□□□□□□□□□ "NORMAL_CLEARING" □□
`"911" AND "12345"`	□□ "911" □□□ "12345"	□□□□□□□□□□□□□□□□□□□□□□□□="12345"□□□□□="911"□
`!NORMAL AND 61480`	□□□□ "NORMAL" □□□ "61480"	□□ "61480" □□□□□□
`!"ANSWER" AND !NORMAL`	□□□□ "ANSWER" □□□□□ "NORMAL"	□□□□□□□□□□□□□□□ "NORMAL" □□□
`61480 AND !NORMAL_CLEARING`	□□ "61480" □□□□□ "NORMAL_CLEARING"	□□ "61480" □□□□□

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- □□□□□ `61480 AND !"ANSWER" AND !CANCEL` - □□□□□□□□□□□□□□□□□

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

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

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  - □□ `!` □□□ `!NORMAL_CLEARING`
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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>       # □□□□
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- **RFC 4575**□SIP□□□□□□□□□□
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    - **RepositoryData (0)**□ □□□□□□□□□□
    - **IMSPublicIdentity (10)**□ □□□□□□
    - **IMSUserState (11)**□ □□□□
    - **S-CSCFName (12)**□ □□□S-CSCF
    - **InitialFilterCriteria (13)**□ □□□□□□iFC□□□
    - **LocationInformation (14)**□ □□□□□□
    - **ChargingInformation (16)**□ P-□□□□
    - **MSISDN (17)**□ □□□□
    - **IMSI (32)**□ □□□□□□□□
    - **IMSPrivateUserIdentity (33)**□ □□□□□□
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  response_format: "wav",
  instructions: "□□□□□□□□□□",
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    - □□□□□□□□□□□□□□□□ `name=`□`field=`
    - □□□□□□□□□□□□□ `"public"`□`"destination_number"`
    - □□□□□□□□XML□□ `<!-- ... -->`

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    - □□□
        - `status` - □□FreeSWITCH□□
        - `show channels` - □□□□□□
        - `uuid_dump <uuid>` - □□□□□□□□□
        - `sofia status` - □□SIP□□□□□□
        - `reloadxml` - □□□□XML□□□□
        - `version` - □□FreeSWITCH□□

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

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- □□□□□□□□□ □□ `reloadxml` □□□□□□
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- □□Sofia□□□□□□□□□□□□□□ `sofia status profile internal`
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□□□ Omnicore Ansible □□□□□□□□□ OmniTAS □□□

- □□□□□□□□ (`group_vars/tts.yml`) □□□□□□□□□□□□□□□□
- □□□□ (`scripts/generate_tts.py`) □□□□□□□ `mod_say` □□/□□□□□□□□□□□□□ □Azure□OpenAI □ ElevenLabs□□□□□□□/□□□□□□□□□ WAV □□□□□□□ `group_vars/recordings/` □□□
- `applicationserver` □□□ `recordings/` □□□ FreeSWITCH □□□□ (`/usr/local/freeswitch/sounds/`)□

□□□ Omnicore □□ (`docs/tts_recordings.md`) □□□□□□□□□□□□□□□□□

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- □□□□□ **API** □□□ TTS □□□□□□□□□□□□□□ Ansible ��□□□□□□ OmniTAS □□□□
- □□□□□□□ □□□ WAV □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
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OmniTAS □□ FreeSWITCH `say` □□□□□□□□□□□□□□□□□□□□ □□ □□ (`SHORT_DATE_TIME`)□□□□□□□“□□ 14:30”□“□□ …”□□

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□□□ XML □□□□□ OmniTAS □□ Sh □□□□□□□□□RepositoryData□□□□□□□□□□**3GPP TS 29.364 "IMS □□□□□□□AS□□□□□□□□□□ AS □□□□□"**□V18.0.0□2024-05□□□□□ ETSI TS 129 364□□□□□□ PDF □□□□□□□□□□□□□

□□□□□□□ — OmniTAS □ RepositoryData □□□□□□□□□□□□□□□□□□□□□ TS 29.328□HSS □□□□□ □ `ServiceData`□□

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□□	**TS 29.364 □□**	□□□	□□
`MMTelServices-root.xsd`	§4 / □□	`<MMTelServices>`	`MMTEL Servi`
`IMS-ODB-Information.xsd`	§10.2	`<OdbForImsOrientedServices>`	`IMS-O Infor`
`TS_129364_v18.0.0.pdf`	—	—	□□□□□

`MMTelServices-root.xsd` □□□□□□□□□□□□□ `xs:include`s □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□-*□□□□□□□□ — □□□ PDF □□□□□□□□□□□

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- **`<MMTelServices>`** — **TS 29.364**□□□ RepositoryData □□□ HSS □□□ AS □□□ **Sh** □□□□ □□□□□ `complete-*` □ `operator-*` □□□□□□□□ **OmniTAS** □ **Sh** □□□□□□□□□

HSS □□□□□□□

- `<simservs>` — ETSI TS 183 023 / 3GPP TS 24.623□**XCAP-over-Ut** □□□□□□□/UE □□□□□□□□ OmniSEP EntitlementServer □ Ut □□□□□□□□□□□□ `simservs` □□□□□□□□□□□□□□□□□□□□ `complete-*`/`operator-*` □□□

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□□□□□□□□□TS 29.364□

- `MMTEL-Services` — MMTel □□□□ (`<MMTelServices>`)
- `IMS-ODB-Information` — □□□□□□□□ (§10)
- `IMS-CAMEL-Services` — IMS CAMEL □□□□ (§11)

□□□□□□□□□□□□□□ `E911` / `PBX` / `Customer-Address` □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ — □□□□ TS 29.364 §10.1□

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TS 29.364 ODB □□□□ □□□□□□□□□□□□□□□ `<OdbForImsOrientedServices>`□□□□□□□OpenCloud Sentinel VoLTE / Omnitouch□□□□□□□□□□□□□□□□□□□□□□□□□□□□ `xmlns="odb.mmtel.omnitou.ch"` — □□□□□□□□□□□□□□□□□□□□ 3GPP □□□□□□□□

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- ⚙ **□□□□** - □□□□□□□□□□
- □ **SS7 MAP** - `call_forward_*` □□□ HLR □□

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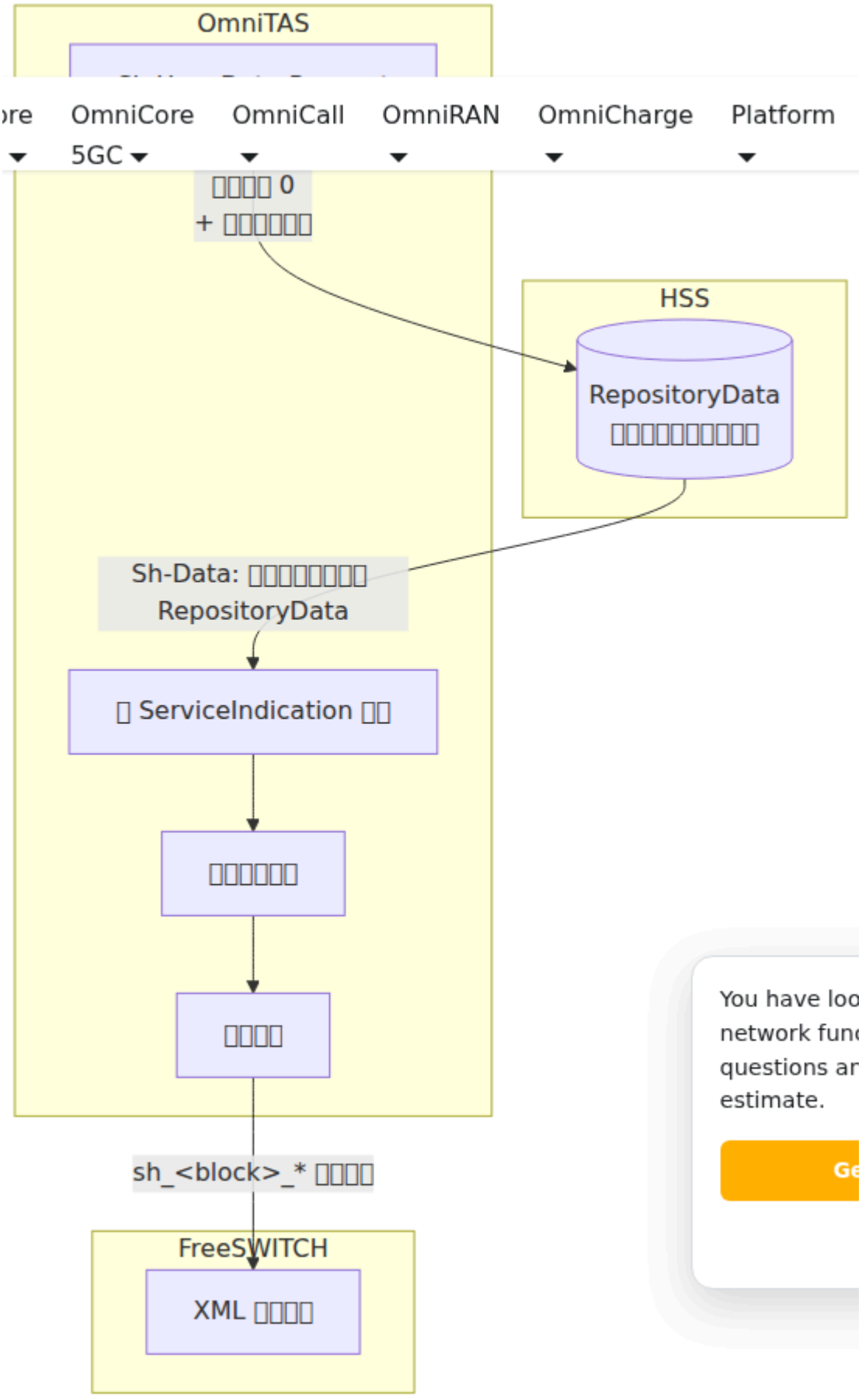
> □□□□□□□□□□□□□□□□ `call_forward_all_destination`□ `call_forward_not_reachable_destination` □ `no_reply_timer` □□ □ MMTel □□□□□□□□□ HLR/SS7□□ SS7 MAP□□□□□□□□□



OmniTAS □□□□□□□□□ Sh User-Data-Request□□□□□□□ `Data-Reference` □ `0` □□□□□ □□□ `Service-Indication`□HSS □□□□ `Sh-Data` □□□□□□□□□□□□□□□□□

`RepositoryData` □□□OmniTAS □ Service-Indication □□□□

□□□ RepositoryData □□□□□□□□□S-CSCF□□□□□□□□□ Sh □□□

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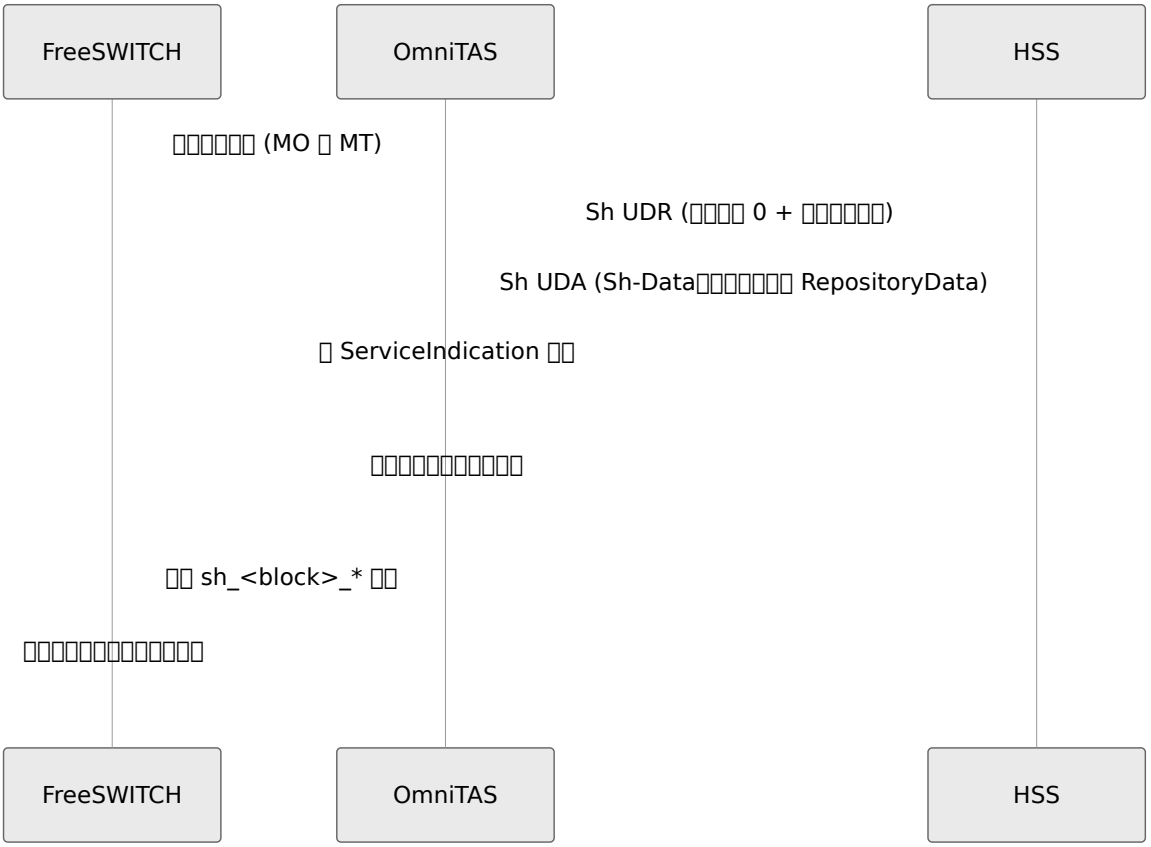

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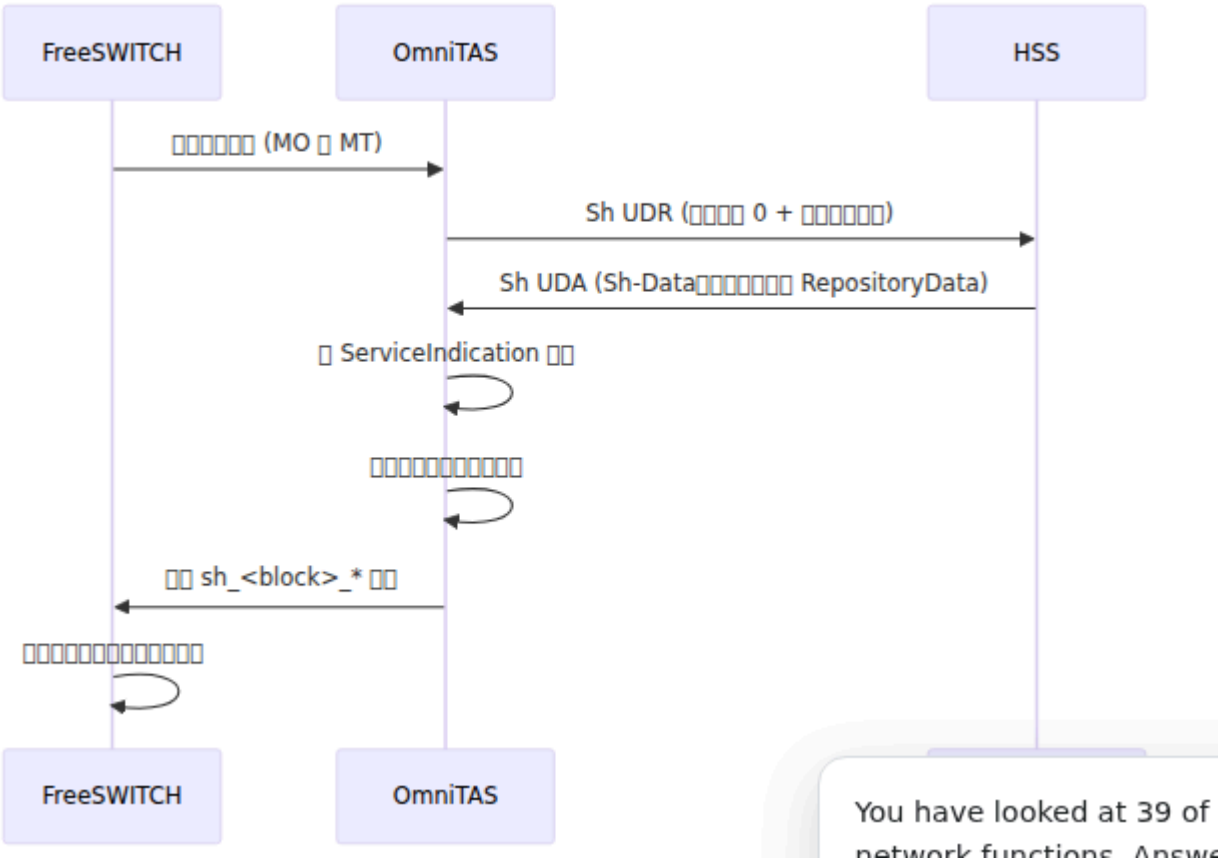
OmniTAS □□□□□□□□□□□□□□□□



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`sh_<block>_xml_b64`	□□ `ServiceData` XML□Base64 □□□□□□□□□□□□□□□□□□□□□□□□□□□□
`sh_<block>_<key>`	□□□□□□□□□□□□□□□□□□□□ `true`□□□□□□□□□□□□□□□ `sh_mmtel_services_busy_target`□
`sh_<block>_<key>_<attr>`	□□□□□□□□□□□□□□□□□ `sh_mmtel_services_communication_diversion_a`

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`sh_data_<key>`	□□□□□□□□□□□□□□□□□□□
`sh_data_<key>_<attr>`	□□□□□□
`sh_raw_xml_b64`	□□□□□□ `Sh-Data` □□□Base64 □□□

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- OmniTAS □□□□□□□□□□□ HSS □□□□□□□□□□□□
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- □□□□□ □ id/name □□□□□□□□□□ `true` □□□`<rule-deactivated/>` □□□ `<cp:rule id="noanswer">` □□□ `sh_<block>_noanswer_rule_deactivated=true`□□ `<no-answer/>` □□□□□□□ `sh_<block>_noanswer_no_answer=true`□

> □□□□□□□□ □ MMTel □□□□□□□`active` □□□□□ `true`□3GPP TS 24.623 §6.1□□ OmniTAS □□ **HSS** □□□□□ □□ `..._active` □□□□□□□□□□□□□□ true□□□□ false □□ □□□□□ = □□□□□□□□□□ false□□□□□□□□□□□□□□ □□ `^true$`□□□□□□□□□□□□□□□□□□□ □□□□□□□□□□□□□□ `xs:boolean`□□□ false □□ `false` □ `0` □□□□□`rule-deactivated` □□□□□□□□□□□□□□□□□ = □□□

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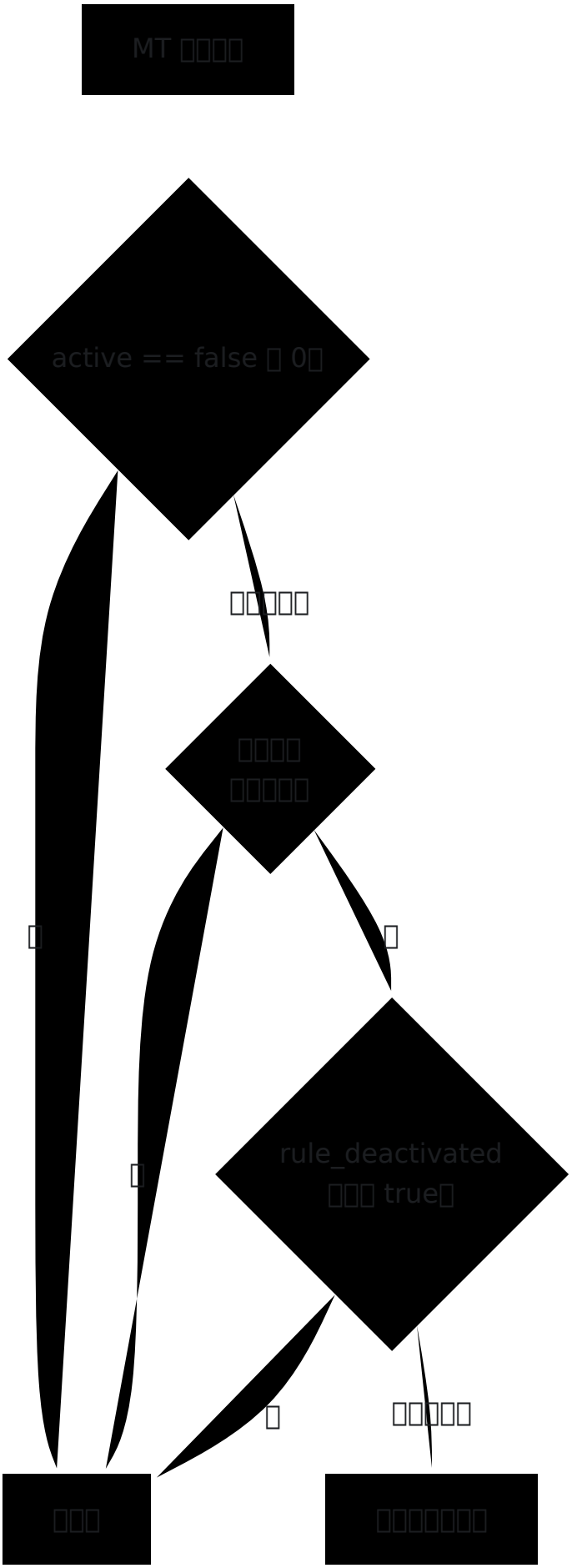
MT □□□□
active == false □ 0□
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```
<extension name="MMTel-CFB" continue="true">
  <!-- □□□□□□ false □ 0□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ -->
  <condition
field="${sh_mmtel_services_communication_diversion_active}"
expression="^(?!(false|0)$).*"/>
  <!-- □□□□□□□□□□□□□□□□□□□□□□□□□□□□ -->
  <condition field="${sh_mmtel_services_busy_rule_deactivated}"
expression="^(?!true$).*"/>
  <condition field="${sh_mmtel_services_busy_target}"
expression="^(?!$).+">
    <action application="log" data="INFO CFB to
${sh_mmtel_services_busy_target}"/>
  </condition>
</extension>
```

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□□□□□□□ HSS □□□ `ServiceData` □□□□□□ OmniTAS □□□□□□□□□□□□□ `docs/reference/mmtel-schemas/` □□

MMTEL-Services

MMTel □□□□□□□□□□ Sh □□ 3GPP TS 29.364 □□□ `MMTelServices` □□

```
<MMTelServices
xmlns="http://uri.etsi.org/ngn/params/xml/simservs/xcap"
               xmlns:cp="urn:ietf:params:xml:ns:common-policy">
  <complete-communication-diversion>
    <communication-diversion active="true">
      <NoReplyTimer>20</NoReplyTimer>
      <cp:ruleset>
        <cp:rule id="busy">
          <cp:conditions><busy/></cp:conditions>
          <cp:actions><forward-to>
<target>sip:+61400000001@ims.example.org</target></forward-to>
</cp:actions>
        </cp:rule>
      </cp:ruleset>
    </communication-diversion>
  </complete-communication-diversion>
  <complete-communication-barring>
    <operator-outgoing-communication-barring authorized="true"/>
  </complete-communication-barring>
</MMTelServices>
```

```
sh_mmtel_services_communication_diversion_active=true
sh_mmtel_services_NoReplyTimer=20
sh_mmtel_services_busy_target=sip:+61400000001@ims.example.org
sh_mmtel_services_busy_busy=true
sh_mmtel_services_operator_outgoing_communication_barring_authorized=
sh_mmtel_services_xml_b64=PE1NVGVsU2VydmljZXM+...
```

□□□□□`communication_diversion_active`□□□□□□□□□`busy_target`□□□□□□□□□□`busy_busy`□□□□□□□□□□□□□□□□ □□□□□□□□□

IMS-ODB-Information

□□□□□□□□□□□□□□□□ 3GPP TS 29.364 □ 10 □ □□□□ `OdbForImsOrientedServices` □□□□□□□□□□□□□□□□

```
<OdbForImsOrientedServices>
  <OdbForImsMultimediaTelephonyServices>
    <OutgoinBarring>1</OutgoinBarring>
    <IncomingBarring>1</IncomingBarring>
    <BarringOfRoaming>0</BarringOfRoaming>
  </OdbForImsMultimediaTelephonyServices>
</OdbForImsOrientedServices>
```

```
sh_ims_odb_information_OutgoinBarring=1
sh_ims_odb_information_IncomingBarring=1
sh_ims_odb_information_BarringOfRoaming=0
sh_ims_odb_information_xml_b64=PE9kYkZvckltc09yaWVudGVkU2VydmljZXM+..
```

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□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ `E911` □□□□□□□

```
<Address><Number>221B</Number><Street>Baker Street</Street>
<City>London</City></Address>
```

```
sh_e911_Number=221B
sh_e911_Street=Baker Street
sh_e911_City=London
sh_e911_xml_b64=PEFkZHJlc3M+...
```

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- □□□□□□□ **id** □ **name**□ OmniTAS □□□ `id` □ `name` □□□□□□□□□□□MMTel □□□□□□□□□□ □□□ `<cp:rule>` □□□□□□ `id`□□□□□□□□□□□□□□□□ `id` □ `name`□OmniTAS □□□□□□□□□□□ □□□□□□□□□□□□□ `id`□□□□□□□□□□□□□□□
- □□□□□□ **id**□ □□ `id="cfb"` □□□□□□□□ `sh_<block>_cfb_target`□□□□ `sh_<block>_busy_target`□□□□□□□□□□□□□□□

- □□□□□□□□□□□□□□ □□□□ false□□□□ `true`□□□□ □□□□□□□□□
- □□□□□□□□□□□□□□ □□□□□ id/name □□□□□□ `true` □□□□□□□□□□□□□□□□□□ `sh_<block>_xml_b64` □□□□□
- □□□□□□□□□ □□□□□□□□□□□□□□□□□□□□ `sh_<block>_xml_b64` □□□□□□□□

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`MMTEL-Services`	`MMTelServices`	MMTel □□□□ □□□□□□□□□□ □□□□□□	3GPP TS 29.364
`IMS-ODB-Information`	`OdbForImsOrientedServices`	□□□□□□□□	3GPP TS 29.364 §10
`IMS-CAMEL-Services`	`im-csi-information`	IMS CAMEL □□□□	3GPP TS 29.364 §11

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ODB □□

□□	□□	□□
`OutgoinBarring`	0	□□□□□□□□□□
`OutgoinBarring`	1	□□□□□□□□□□
`OutgoinBarring`	2	□□□□□□□□□□□□□□□□ PLMN □□
`OutgoinBarring`	3	□□□ PLMN □□□□□□□□□□□□□
`IncomingBarring`	0	□□□□□□□□□□
`IncomingBarring`	1	□□□ PLMN □□□□□□□□□□□□□

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TS 29.328	Sh □□□□□□□□□□
TS 29.329	□□ Diameter □□□ Sh □□
TS 29.364	IMS □□□□□□□□□□□□□□ AS □□□□
TS 24.623	□□ Ut □□□□□□□□□ XCAP
TS 24.604	□□□□□CDIV□
TS 22.041	□□□□□□□□□ODB□

Sh □□□□□□□□□□

□ □□□□□

Sh □□□□ Diameter □□□ HSS/Repository □□□□□□□□□□□

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- □ □ **README** - □□□□□□□□
- □ □□□□ - Diameter □□□□□
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- ⚙ □□□□ - □□□□□ MMTel-Config
- □ **SS7 MAP** - HLR □□□ Sh □□□□□

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- □ □□□□ - Ro □□□□□□ Diameter□
- □ □□□□ - Sh □□□□□□□□□

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Sh □□□□□□□□□□

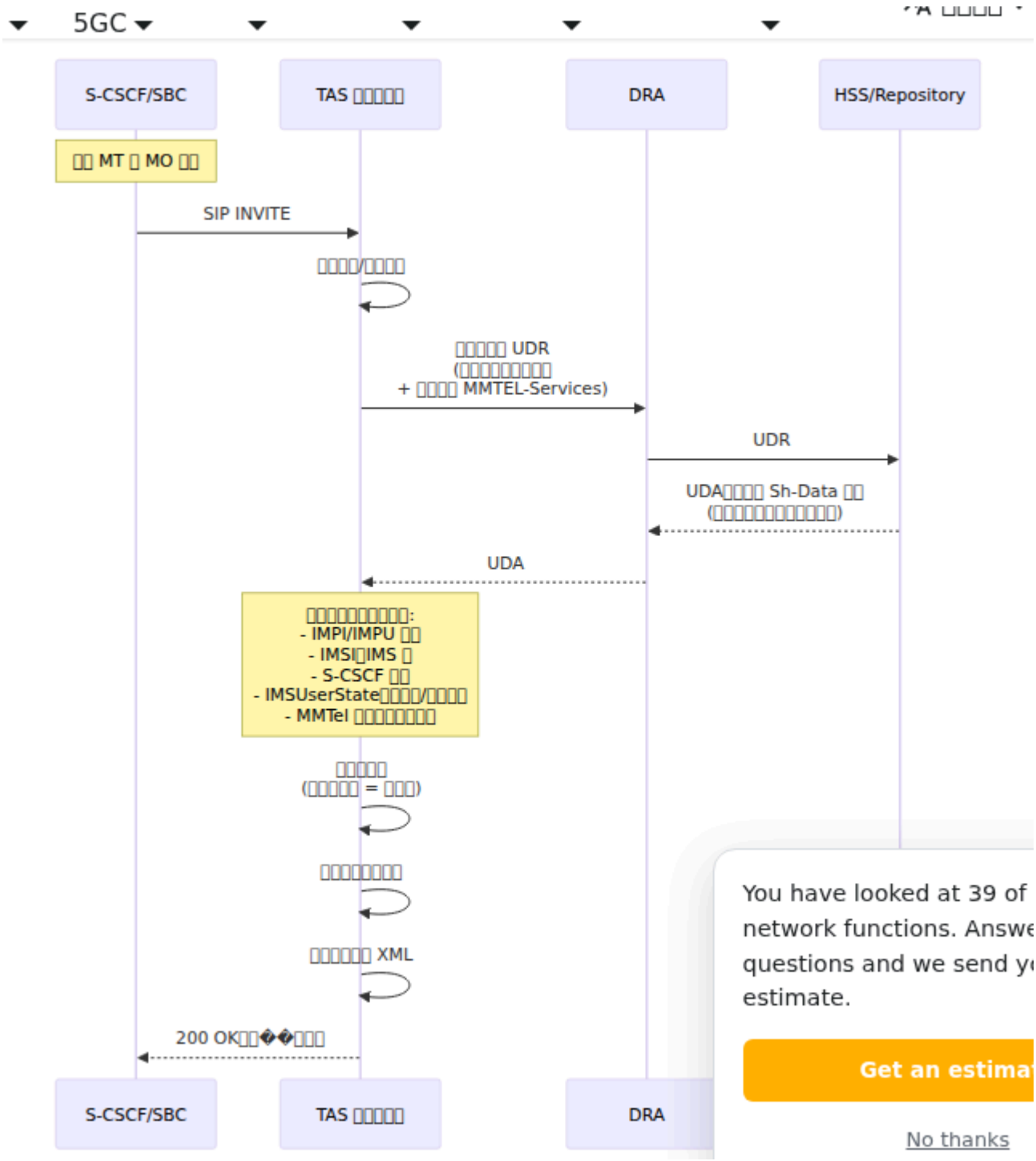
Sh □□□□□□□□□□□

□□□ Sh □□□

Sh □□□ 3GPP □□□□ Diameter □□□□□ TAS □ HSS/Repository□Repo□□□□□□□□□□□□

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

Sh □□□□□□□



Sh □□□□□□□

- **MT □□□** □□□□□□□□□□□□
- **MO □□□** □□□□□□□□□□□
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□□□□□ 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`□`IMS-ODB-Information`□	□□ `sh_<block>_*` □□□□□□□□□□□□
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`□□□□□□□

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□□ **UDA** □□□□□□□□

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```
[debug] □ +614xxxxxxxx □□□□□□□□□
        (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:+614xxxxxxxx@ims.mnc001.mcc999.3gppnetwork
    <IMSPublicIdentity>tel:+614xxxxxxxx</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>
      <VPLMNId>999001</VPLMNId>
      <AgeOfLocationInformation>NNNN</AgeOfLocationInformation>
    </LocationInformation>
  </ShIMSData>

<IMSPrivateUserIdentity>9999990000xxxxx@ims.mnc001.mcc999.3gppnetwork
</Sh-Data>
```

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□□□□/S-CSCF/□□□□□□□□□□□□□□□□ □□□□□□ □□□□□□□□□□□□□□□□□

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□□□□□□□□□□□□`sh_data_references`□

□□□□□□TAS □□□□ □□ □□□`[0, 10, 11, 12, 13, 14, 15, 17, 32, 33]` + `Service-Indication = "MMTEL-Services"`□□□□□□□□ □ MO□□□□□ MT□□□□□□□□□□ □□□ Sh □□□□□ HSS □□□□□□□

□□ HSS □□ □ □□□□□□□□ UDR □□ *//* □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ HSS □□□□□ □□□□□□

- `5012 DIAMETER_UNABLE_TO_COMPLY` □□ `LocationInformation`□14□/ `UserState`□15□□□□□□□□□□□□□□□□□□□□□□□□□□□□ □□□□□□
- `5101 DIAMETER_ERROR_OPERATION_NOT_ALLOWED` □□ AS □□□□□□□□□□□□ `RepositoryData`□0□□`IMSUserState`□11□□`SCSCFName`□12□□ `InitialFilterCriteria`□13□□`IMSPrivateUserIdentity`□33□□□

□□□ `:tas` □□□ **`sh_data_references`** □□□□□□ □□ □□□□□□□□□□ □□□□□□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□□□

```
# config/runtime.exs

# □□□□□□□□ = MO □□□□ = MT □□□□□
# □□□□□□□□□□□□□□□□□□□□
config :tas,
  sh_data_references: [
    caller: [10, 16, 17, 32],
    called: [10, 16, 17, 32]
  ]

# □□□□□□□□□□□□□□□□□
config :tas, sh_data_references: [10, 16, 17, 32]
```

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(□□□)	□□□□□□□□□□ □`@sh_data_references`□□
□□□□□ `[caller: [...], called: [...]]`	□□□□□□□□□□□□□□□□□□
□□□ `[10, 17, 32]`	□□□□□□□□□□□□

`Service-Indication = "MMTEL-Services"` □□□□□□ `RepositoryData`□0□□□□□□□□ □□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□□ `SCSCFName`□12□□ MMTel `RepositoryData` □0□□□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□

Session-Id □□□□□

□□ Sh UDR □ `Session-Id` □□ RFC 6733 §8.8 □□□□□“□□□”□□ 4 □ `;` □□□□□□□□□ □□□ □□□□□ HSS □□□□□□□□□□ MO □ MT □□□

```
example-dc01-
as01.epc.mnc001.mcc001.3gppnetwork.org;1781225439574;7468896e;mo
                                                    └ □□□ ┘ └ □□ ┘ └
□□
```

`mo` □□□□□□/□□□□□□`mt` □□□□□□□/□□□□□□□□□□□ □□□ + □□□□□□□□□□□□□□□□□□□□□□□□□□ □ `[a-z0-9_]`□□□□□□□□□ Session-Id □□□□□□□□□□□□ Web UI Sh □□□□□□□□□ 3 □□ Session-Id□

□ Sh □□□□□□□

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

1. IMS □□□

- **IMPI**□□□□□□□ □ `<IMSPrivateUserIdentity>` □□□□□□□□`{IMSI}@{IMS-domain}`□TAS □ `@` □□□□□□□□□ IMSI □ IMS □□

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

2. S-CSCF □□□

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

3. MMTel □□□□□□□□□□□□□

- □ `<RepositoryData>` □□□□□□ `Service-Indication = "MMTEL-Services"` □□□
- □□□□□□□□□□□CDIV □□□□□□OIP/OIR□ ICB/OCB □□□□□□□□/□□□□TAS □□□□□□□□□ □□□□□□□□□ `sh_mmtel_services_*` □□□□□□□□ □□□□□□□□□□□ Repository Data Blocks□□

□□□ MMTel-Config□

MMTel-Config □□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□ HSS □□□ `Service-Indication = "MMTEL-Services"` □□□□□□□□□□□□□□□□ □□□□□□ UDR □□□□□□□□□□□□□ 0 □□□□□□□ AVP□□□□ Sh□□□□□□ `<MMTelServices>` □□□□ **3GPP TS 29.364** □□□AS/HSS □□□□□□ □□□ UE □□□ `<simservs>` XCAP-over-Ut □□□□□□□□□□□□□□□ `complete-communication-diversion` □□□□□□□□□□ `cp:rule` □□□`busy`□`noanswer`□ `unregistered`□`notreachable`□□□□□□□□ `<NoReplyTimer>` □□□□□□□ MMTel □□□□□□□□ □□□□□□□□□□□□□□□□MMTelServices□ IMS-ODB-Information□□ `docs/reference/mmtel-schemas/` □□□□

TAS □□□ MMTel □□□□□□□□□□□□ RepositoryData □□□□□□□□□□□□ `sh_mmtel_services_*` □□□□□□□□ `sh_mmtel_services_xml_b64`□□□□□□□□□□□□□□□□□ □□□□□□□□ CDIV / OIP / TIP / □□□□□□□□□□ `call_forward_*` / `no_reply_timer` □□ □ □ □ MMTel□□□□□□ HLR/SS7 □□□□□□□□

□ Sh □□□□□□□□□□□

□□□□ Sh □□□□□□□□□□□□□

□□	□□
`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`	HLR/SS7 (`Tas.SS7Map`) □ `"none`
`call_forward_not_reachable_destination`	HLR/SS7 □□□□□□
`no_reply_timer`	□□ (`default_no_reply_timer`)
`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

Repository □□□

□□ Sh RepositoryData □□□□□ `MMTEL-Services`□`IMS-ODB-Information`□□□□□□□□□□□□□□□□□□□OmniTAS □□□□□□□□OmniTAS □□□□□□□□ Sh □□□□□□□□□□□□ `sh_<block>_*` □□□□□□□□□□□□□□□□□□□□ Base64 □□□□ `sh_<block>_xml_b64`□OmniTAS □□□□□□ `sh_data_*` □□□□□ `sh_raw_xml_b64`□

□□□ `call_forward_all_destination`□ `call_forward_not_reachable_destination` □ `no_reply_timer` □□□□□ MMTel□□□□□ HLR/SS7 □□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ **Repository □□□**□

□□□□Sh □□□□□□□□

□□□ `call_forward_*` / `no_reply_timer` □□□□□□□□□□□□□

1. □□ **SS7 MAP** □ **HLR** □□□□□ MT □□□□□□□/□□□□□□□□□□□□□□□□□□□□ `call_forward_all_destination` □□□□□□ `call_forward_not_reachable_destination`□□□□□ □□□□□□□□□ SS7 MAP□
2. □□□□□□□□ HLR □□□□□□□□□□□□ `runtime.exs` □□ `config :tas` □□ `call_forward_not_reachable_destination` □ `default_no_reply_timer`□

MMTel □□□□□□□ □ □□□□□□□□□□□□□□□ `sh_mmtel_services_*`□□□□□□□□□□□□□□□

□ Sh □□□□□□□□□□

□□□□□□□□□

1. □□□□ **HSS** □□□□
   - HSS □□ `Experimental-Result-Code 5001` □DIAMETER_ERROR_USER_UNKNOWN□
   - TAS □□□□□□□□□□□□
   - `hangup_case` □□□□□ `"UNALLOCATED_NUMBER"`
   - □□□□□□□□□□□□□□ SIP □□
2. **HSS** □□□□/□□□
   - Sh □□□□□□□□□5000ms□□□ Diameter `request_timeout` □ `runtime.exs` □□
   - □□□□□□□□□□
   - □□□□□□□□□□1□□□□□□□□□
3. **HSS** □□□□□□□□ **UDR**□
   - HSS □□□□□□□□□□□□□□□□□□□□□□□□ HSS□
   - □ TAS □□□□□□□□□□□□□1□□□2□□□□□□□□ □□□□□□□□□□
   - HSS □□□□ Notif-Eff □□□□□ TAS □□□□□□□□ TS 29.328 §6.1.1.1 □□□□□□□□

□□□□□□□□

□ UDR □□□□□`Result-Code: 2001`□□□□□ `<Sh-Data>` □□□ □□□□□□□□TAS □□ □□□□□□ □□□□□□□□□□□□□□□□□□□□

□□□□	□□
`<SCSCFName>`□□□□□ 12□	`scscf_address` □ `scscf_domain` □□□ `"none"`
`<IMSPrivateUserIdentity>` □□□□□ 33□	`ims_private_identity`□`imsi`□`ims_domain` □ □□ `"none"`
MMTel RepositoryData □□	□□□□□□ `sh_mmtel_services_*`□□ □□ `call_forward_*`□□□□ HLR/□□□□□□
MMTel RepositoryData □□	`call_forward_not_reachable_destination` / `no_reply_timer` □□□□□□□□□□ `call_forward_all_destination` □ `"none"`□□ □□ HLR □□
□□ `<RepositoryData>` `</RepositoryData>`	□□ MMTel □□□□□□□□□□□□
□/□□□ `<IMSUserState>`□ `<LocationInformation>`□ `<InitialFilterCriteria>`	□□□□□□□□□□□□□□□□□□□□□□□□

□□ □□□□□□□□□□□□□□ `<IMSPublicIdentity>` □□□□□□□□□□□□□□□□ `{:error, :sh_parse_failed}`□□□□□□□□□□□□ □□□□□□ 1 □□□□□□□□□□□□□□□□□□“□□□□□□□□□”□

□□□ TAS □□□ HSS □□□□□□□□□□ Notif-Eff □ HSS □□□□ IMSPublicIdentity□MSISDN □ SCSCFName□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□ 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 □□□□□□□□□

SRVCC□□□□□□□□□□□□□□

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TAS □□□□□□□□□□ VoLTE □□□□□□□□□□□□□□ LTE□PS□□□□ 2G/3G □□□□□□CS□□□□□□□ SIP □□□□□□

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- □ □ **README** - □□□□□□□□
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- □ □□□□ - □□□□□□□□□□□CLI □□
- □ **Sh** □□ - □□ HSS □□□□□

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SRVCC□3GPP TS 23.216□□□□□□□□UE□□□ LTE □□□□□□□□ 2G/3G CS □□□□□□□□□□TAS □□□ VoLTE □□□□□□□□□□□□□ UE □□□□□□□□□□□□□□□□□□□□□□□□□□TAS □□□□□□□□□ CS □□□□□□□□ LTE □□□□□□□□□□□□□□ TAS □ UE □□□□□□□□□□

□□□□ PS □ CS □□□□LTE □ CS□□□□ CS □ PS □□□□□□□□□□□□□

□□□□□PS □ CS□

1. eNB □□□ LTE □□□□□□□ MME □□ S1AP □□□□□

2. MME □ MSC-Server □□ Sv PS-to-CS □□□□□□□□ STN-SR□□□□□□ TAS □ E.164 □□□
3. MSC-Server □ STN-SR □□□□□□□ CS □□□MSC-Server □ SIP □ IMS □□□□□
4. CS □□□ SIP INVITE □□□□□ TAS□□□□ STN-SR □□□
5. TAS □□ STN-SR□□□□□□ MSISDN□□□□□□ VoLTE □□□□□□ SIP □□□□□
6. TAS □□□□□□□ CS □□□□□□ LTE □□□□

```
MSC-S ──INVITE sip:+9<MSISDN>──► TAS
        (C-MSISDN: <MSISDN>)
                                  │ strip prefix -> find active
session
        ◄──100 Trying──────────────┤
              TAS ──REFER──► Remote S-CSCF (Refer-To: CS MGW
endpoint)
                  ◄──202 Accepted──
                  ◄──NOTIFY (200 OK sipfrag)──  transfer succeeded
        ◄──200 OK──────────────────┤
              TAS ──BYE──► UE VoLTE access leg (teardown)
```

STN-SR □□□□

STN-SR□SRVCC □□□□□□□□ TAS □□□ E.164 □□□□□□□□□□□□TAS □ STN-SR □□□□□□□□□□□□□□□□□□□□□□□□□□□□ MSISDN □□□

```
STN-SR = <escape> + <prefix> + <MSISDN digits>
```

□□□□□ `9` □□□ `+61412345678`□STN-SR □ `+961412345678`□TAS □□□□□□□□□□□□□□□□□□□□ MSISDN□

```
+961412345678  --(strip "9")-->  +61412345678
```

□□□□□□□□□□

- □□□□□□□□□□□□□□□□□□□□□□□□□□□□ STN-SR□
- MSISDN □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

- □□□□□□□□□□ DID □□□□□□□□□□□

> STN-SR □□□□□□□□□□□□□□□□ PSTN □□□□□□□□□□□□□□□ DID □□□□□

□□

SRVCC □□□□□□□□□□□ `srvcc` □□□□ `enabled` □□ `true` □□□□□□□□□□□□ STN-SR □□□□ □□□□□□□□□□□

```
config :tas,
  ...
  srvcc: %{
    enabled: true,
    stn_sr_prefix: "9"
  },
  ...
```

□□□□□

□□	□□	□□	□□
`enabled`	boolean	□	□□ SRVCC □□□□□□□ `false` □□□□□□STN-SR □□□□□□□□□
`stn_sr_prefix`	string	□	□□ TAS STN-SR □□□□□□□□ `+` □ `00` □□□□□ □□□□ `"9"`□

□□□□ SRVCC □□□□□□□□□ `enabled` □ `true` □ `stn_sr_prefix` □□□□ SRVCC □□□□□□ □□□□□□□□□□□□□

TAS □□□□ STN-SR INVITE

□ INVITE □□□□□□□□□□□□□□□□□□□□□□□□□□□□ URI □□□□□ STN-SR □□□□□STN-SR INVITE □□□□□□□□□□□□□□□□ MT □□□

□□□□□□□□□□

1. □□□□□□□□□□ MSISDN□
2. □□□□□□ SRVCC □□□
3. □□□□□□□□□□□□□□□□ VoLTE □□□
4. □□ C-MSISDN □□□□□□□□□□□□□□□□□□□□□□ TS 24.237 □□□□□□□□□□□□□
5. □□ MSC-Server □ INVITE □□□□□□□□

□□□□□□□□

□□	**SIP** □□	□□
MSISDN □□□□□ VoLTE □□	404 Not Found	□□ MSC-Server □□□□□□□
□□□□□ SRVCC	480 Temporarily Unavailable	□□□□□□□□□
□□□□□ C-MSISDN □□□□□□□	480 Temporarily Unavailable	□□□□□□□□□□□□□
���□ URI □□□□□ STN-SR	484 Address Incomplete	□□□□□□□□

□□□□□□□□□□□□□□□□□□□□ VoLTE □□□□□□□□□□□□□□□□□□

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SRVCC □□□□□□□□□□□□□□TAS □□ □□□ □□□□□□□□□□□□□□□□□□□□STN-SR □□□□□□□□ Elixir □□ □□`Tas.Dialplan.Authorization` □□□□□ `stn_sr_prefix`□□□□□□□□ MT □□□□□□□□□□ □ STN-SR INVITE □□TAS □□□□□ SRVCC □□□□□□□□□ MT □□□

- `priv/templates/srvcc_transfer_dialplan.xml` □□□□ SRVCC □□□□□□□□□□□ □□□□□`srvcc_msisdn`□`srvcc_c_msisdn`□`srvcc_transferred_call_id`□ `srvcc_cs_target`□□□□□□□□ MSC-Server □ INVITE□□□□□□□□□□ CS □□□

□□□□

- **MME Sv** □□ □□ PS-to-CS □□ STN-SR □□□ MSC-Server□
- **HSS** □ S6a □□□□□□□□□□ STN-SR □ C-MSISDN□

3GPP □□

□□	□□
TS 23.216 §6.2	PS-to-CS SRVCC □□
TS 24.237	IMS □□□□□□SIP □□□□□
TS 29.280	Sv □□□MME □ MSC-Server□

SS7 MAP / Gateway-MSC □□

□ □□□□□

□□ HLR □□□□□ SS7 MAP □□ MSRN□□□□□□□□□□□□□□□

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- □ □ **README** - □□□□□□□□
- □ □□□□ - SS7 MAP □□ (`ss7_map` □□)
- □ □□□□ - □□□□□□ HLR/MAP □□

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- □ □□□□□□ - □□□□□□□□□□ MSRN □ forwarded_to_number
- ⚙ □□□□ - □□ HLR □□□□□□□□ Sh/MMTel□
- □ **Sh** □□ - Sh □ MAP □□□□□
- □ □□□□ - HLR □□□□□□□

□□□□□

- □ **HLR** □□□□□□ - □□ HLR/MAP □□
- □ □□□□ - HLR/MAP □□□□

Gateway-MSC □□

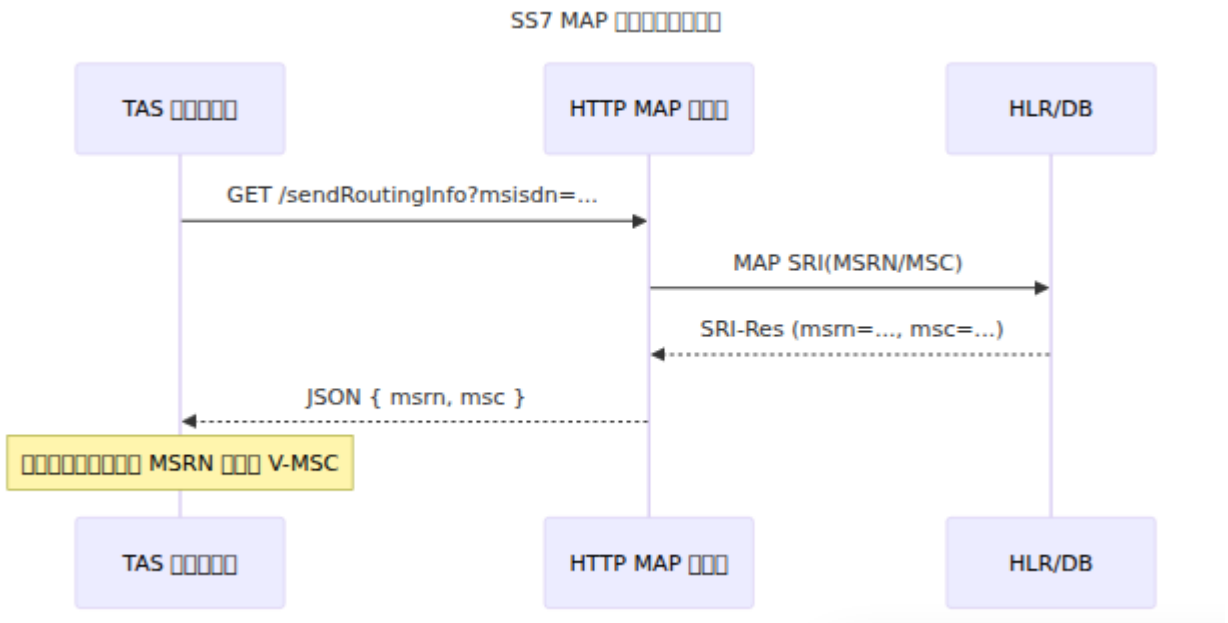
TAS □□□□ HLR □□□□□□□□MSRN□□ MSC□□□□□ 2G/3G □□□□□□□□□□□□□□□□□□□□

□□□□ `msrn` □ `forwarded_to_number` □□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□

- `enabled` - □□/□□ SS7 MAP □□
- `http_map_server_url_base` - MAP □□ HTTP API □□□ URL
- `gmsc` - □□ SRI/PRN □□□□□ MSC □□
- `timeout_ms` - MAP □□□ HTTP □□□□□□□□□□□□□□□5000□

```
config :tas,
  ...
  ss7_map: %{
    enabled: true,
    http_map_server_url_base: "http://10.5.1.216:8080",
    gmsc: "55512411506",
    timeout_ms: 5000  # □□□□□□□ 5000ms
  },
```



□□□ TAS □□ SRI□□□□□□□□□□□□□□□□□□□□□□□□□□□□

1. □□□□□□□ - □□ SRI □□□□□□□□□□□□□□□□ MSRN□□□□ PRN□□□□□□□□□□□ `msrn` □□□□□□□□□□
2. □□□**2G/3G**□ - □□□□□□□□□□VLR □□□□□□□□□□□□□□□□□□□□ PRN□□□□□□□□□□□□□□□□□□□□ V-MSC □ MSRN
3. □□ - □□□□□□□□□□□□□□□□□□□□

`msrn` □ `tas_destination_number` □□□□□□□□□□□□□□□□□□□□□□□□□□ PRN □□□□□□□□□□

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□ □□□□□

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- □ □ **README** - □□□□□□□□
- □ □□□□ - □□□□□□□□□□□□□□CLI □□□□□□□□□□□
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- □ **Sh □□** - □□□□□□□□ MMTel-Config
- □ **SS7 MAP** - □□ HLR □□□□□□□Sh □□□□□□□
- □ □□□□ - CLI □□□□□□□

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- □ □□□□ - □□□□□□□ OCS
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□□ CLI □□□□□□□□□□□□□□□□□□□□□□□□□□ Sh □□□ MMTel-Config □□□□□□□□□□□□□ / □□□□ □□□

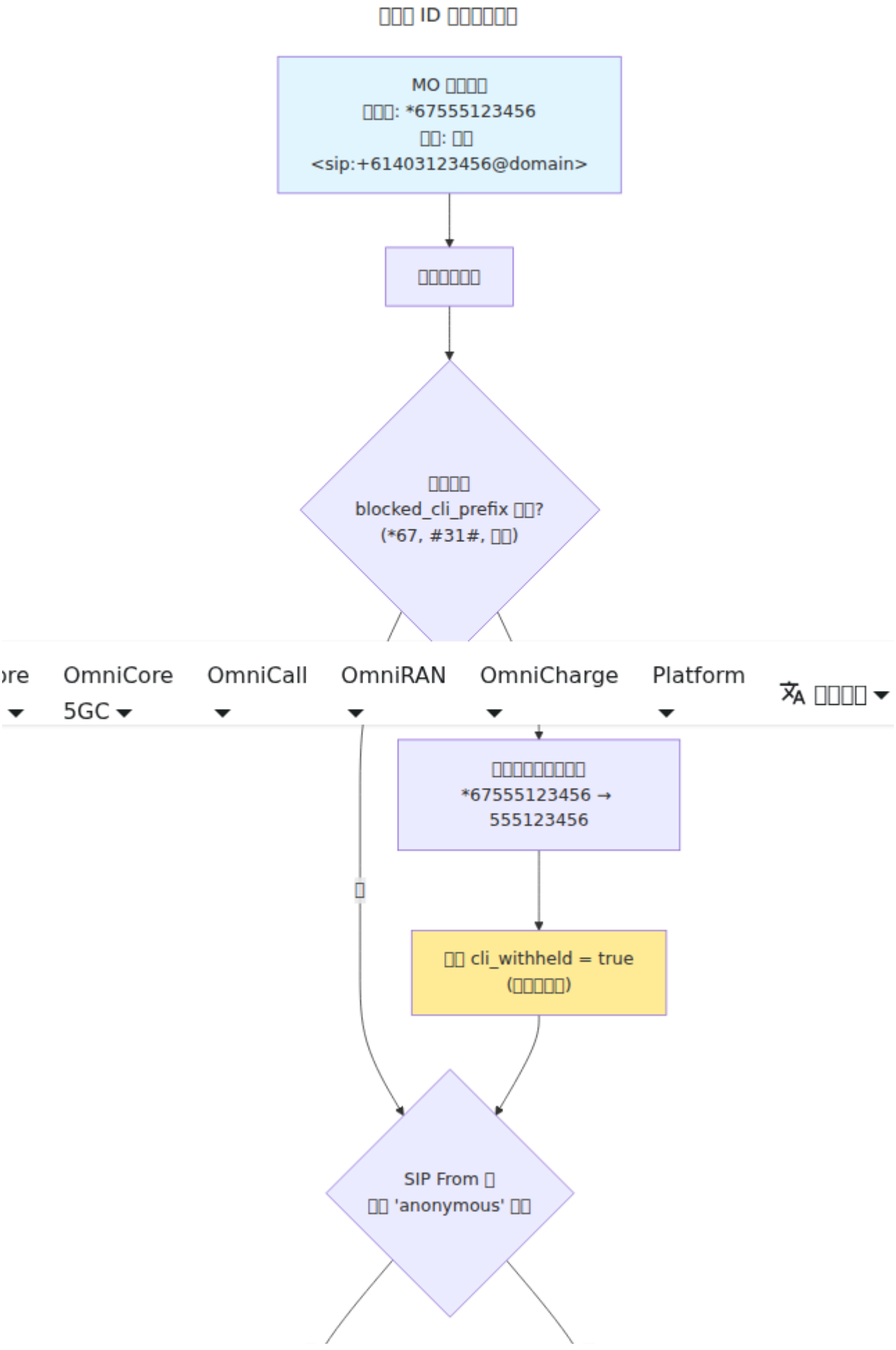
```
config :tas,
  ...
  blocked_cli_prefix: ["*67"],
  call_forward_not_reachable_destination: "2222",
  default_no_reply_timer: 30,
  emergency_call_codes: ["911", "912", "913", "sos"],
  ...
```

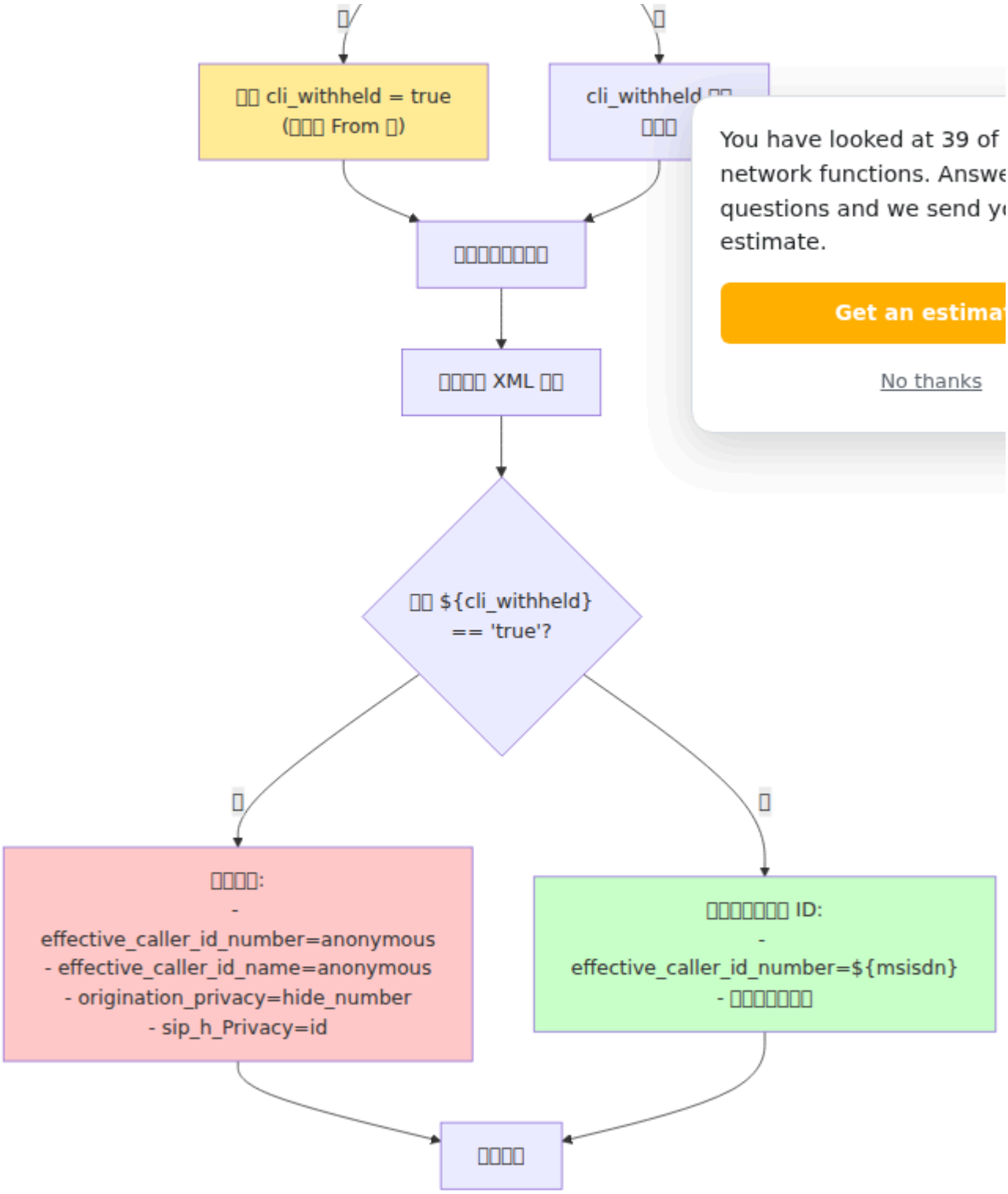
□□□□□

- **`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"□


□□□ ID □□□□□□□
MO □□□□
□□□: *67555123456
□□: □□
<sip:+61403123456@domain>
□□□□□□□
□□□□
blocked_cli_prefix □□?
(*67, #31#, □□)
ore
OmniCore
5GC
OmniCall
OmniRAN
OmniCharge
Platform
□□□□
□□□□□□□□□□
*67555123456 →
555123456
□
□□ cli_withheld = true
(□□□□□)
SIP From □
□□ 'anonymous' □□



□□ **1**□□□□□□□□□

□□□□□□□□ `blocked_cli_prefix` □□□□□□□□□□□□

1. □□□□□□□□□□□□□□□□□□□□□□□□□ `*67555123456`□
2. □□□□□□□□□ □□□□□□ `555123456`□
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 □□□□□□□□□□□□□□□□□□□

□□	□□	□	□□
`cli_withheld`	□□□	`"true"` □ `"false"`	□□□□□□□□□□ From □□□□ CLI □□
`tas_destination_number`	□□□	□□□□□	□□□□□□□□□□□□□□□□□□ `555123456`□
`destination_number`	□□□	□□□□□	□ `tas_destination_number` □□□□□□□□□□□

□□□□□□□□□□□□□□□□ **`cli_withheld="true"`** □□□

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□□	□□□	□□
`effective_caller_id_number`	`"anonymous"`	□□□□□□□□□□□
`effective_caller_id_name`	`"anonymous"`	□□□□□□□□□□□
`origination_privacy`	`"hide_number"`	□□□□□ SIP □□□□
`sip_h_Privacy`	`"id"`	SIP □□□□RFC 3323□
`sip_h_P-Asserted-Identity`	(□□□□□□)	□□□□□ P-Asserted-Identity □

□□□□□□□□□

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

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

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

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

    <!-- □□ cli_withheld □ false□□□□□□□□ -->
    <anti-action application="log" data="DEBUG □□□□□□□□ 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` □□□ □□□□`"true"` □ `"false"`□□□□□□□□
- □□□□ / □□ CLI □□□□□□□□□ XML □□□
- □□□
- □□□ MO□□□□□□□□□□□□□□□

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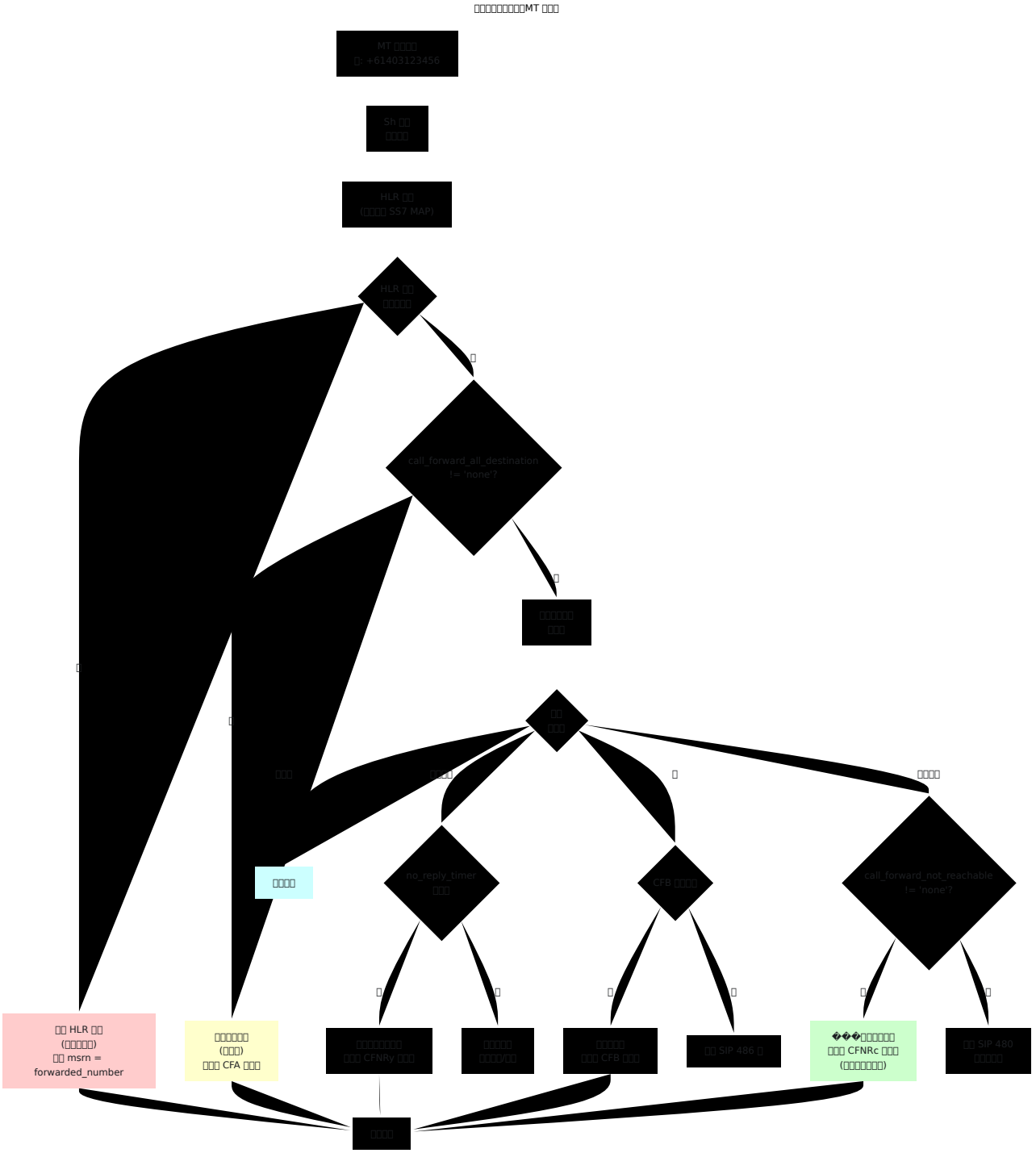
□□□□□□□□□□□□□□ CDIV□□□□□□□□□□□□□□□□□□□□□□□□TAS □□□□□□□□□□□□□□□□□□□□□□□□□□□



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1. □□□□□□□ (CFA) - □□□□□

- □□□ `call_forward_all_destination`
- □□□□□ □□□□□□□□□
- □□□□ □□□□□□□ HLR □□□□□
- □□□□□ □□□□□□□□□□□□□□□□□□□
- □□□ □□□□□□□□□□□□

2. □□□□□ (CFB)

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

3. □□□□□□□□ (CFNRy)

- □□□ `no_reply_timer`
- □□□□□ □□□□□□□□□□□□□□□
- □□□ □□□ 15-30 □
- □□□□□ □□□□□□□□□□□□

4. □□□□□□□ (CFNRc)

- □□□ `call_forward_not_reachable_destination`
- □□□□□ □□□□□□□□□□□□□□
- **SIP** □□□ 480 □□□□□
- □□□□□ □□□□□□□□□□□□□□
- □□□ □□□□ MMTel-Config□□□□□□□□

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

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

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□□	□□	□□	□□□
`call_forward_all_destination`	□□□	Sh/MMTel □ `"none"`	`"61403555123"`
`call_forward_not_reachable_destination`	□□□	Sh/MMTel □□□	`"2222"`
`no_reply_timer`	□	Sh/MMTel □□□	`30`
`msrn`	□□□	HLR□□ MT□	`"61400123456"`
`tas_destination_number`	□□□	□□□□	`"2222"`

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□□ **MT** □□□□□□□□□□

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

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

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

    <!-- □□□□□□□□ -->
    <action application="set"
data="forward_destination=${call_forward_not_reachable_destination}"/
    <action application="log" data="INFO □□□
${forward_destination}"/>
    <action application="answer"/>
    <!-- □□□ TAS ESL □□□□□□□□□□ voicemail.md -->
    <action application="set" data="tas_vm_mode=deposit"/>
    <action application="set" data="tas_vm_mailbox=${msisdn}"/>
    <action application="set"
data="tas_vm_caller=${effective_caller_id_number}"/>
    <action application="socket" data="127.0.0.1:8084 async full"/>
  </condition>
</extension>
```

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□ `config/runtime.exs` □□□□□□□□□□□□□

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

  # □□□□□□□□□ MMTel-Config □□□ CFNRy□□□
  default_no_reply_timer: 30  # □□ 30 □
```

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- □□□□□ HSS □□□□□□□□ MMTel-Config
- Sh □□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□

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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 □□□

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```
<!-- □□□□□□□ -->
<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>
```

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- □□□□□□□□□□□□□□□□
- □□□ `no_reply_timer` □□□□□□□□
- □□□□□□□□□□□□□□□□□□

□□□□□□□

```
INFO □□□□□□□□□□ 61403555123
INFO □□□ 2222
INFO □□□□□□□□□□□□
```

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□□□□□ XML □□□□□□□□□□□□□□□□□□□□

```
  <action application="log"
    data="INFO Failed to bridge Call - Routing to Call Forward No-
Answer Destination" />
  <action application="set"
    data="sip_h_History-Info=
<sip:${destination_number}@${ims_domain}>;index=1.1" />
  <action application="set"
data="sip_call_id=${sip_call_id};CALL_FORWARD_NO_ANSWER" />
  <action application="log" data="DEBUG Called Voicemail Deposit
Number for ${msisdn}" />
  <action application="set" data="default_language=fr"/>
  <action application="answer" />
  <action application="sleep" data="500"/>
  <!-- □□□□□ TAS □□□□ IVR□□□□□TAS □□□□□
       □□ mod_voicemail □□□□□□□ MWI□
       ip:port □□□ :tas voicemail.outbound_socket □ runtime.exs □□
□□ -->
  <action application="set" data="tas_vm_mode=deposit"/>
  <action application="set" data="tas_vm_mailbox=${msisdn}"/>
  <action application="set"
data="tas_vm_caller=${effective_caller_id_number}"/>
  <action application="socket" data="127.0.0.1:8084 async full"/>
```

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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" />
      <!-- □□□□□□ TAS □□□□□ IVR□□□□□□TAS □□□□□□
           □□□□/□□/□□□□□□□□□□ MWI□
           ip:port □□□□ :tas voicemail.outbound_socket □
runtime.exs □□□□□ -->
      <action application="set" data="tas_vm_mode=retrieve"/>
      <action application="set" data="tas_vm_mailbox=${msisdn}"/>
      <action application="socket" data="127.0.0.1:8084 async
full"/>
    </condition>
  </extension>
```

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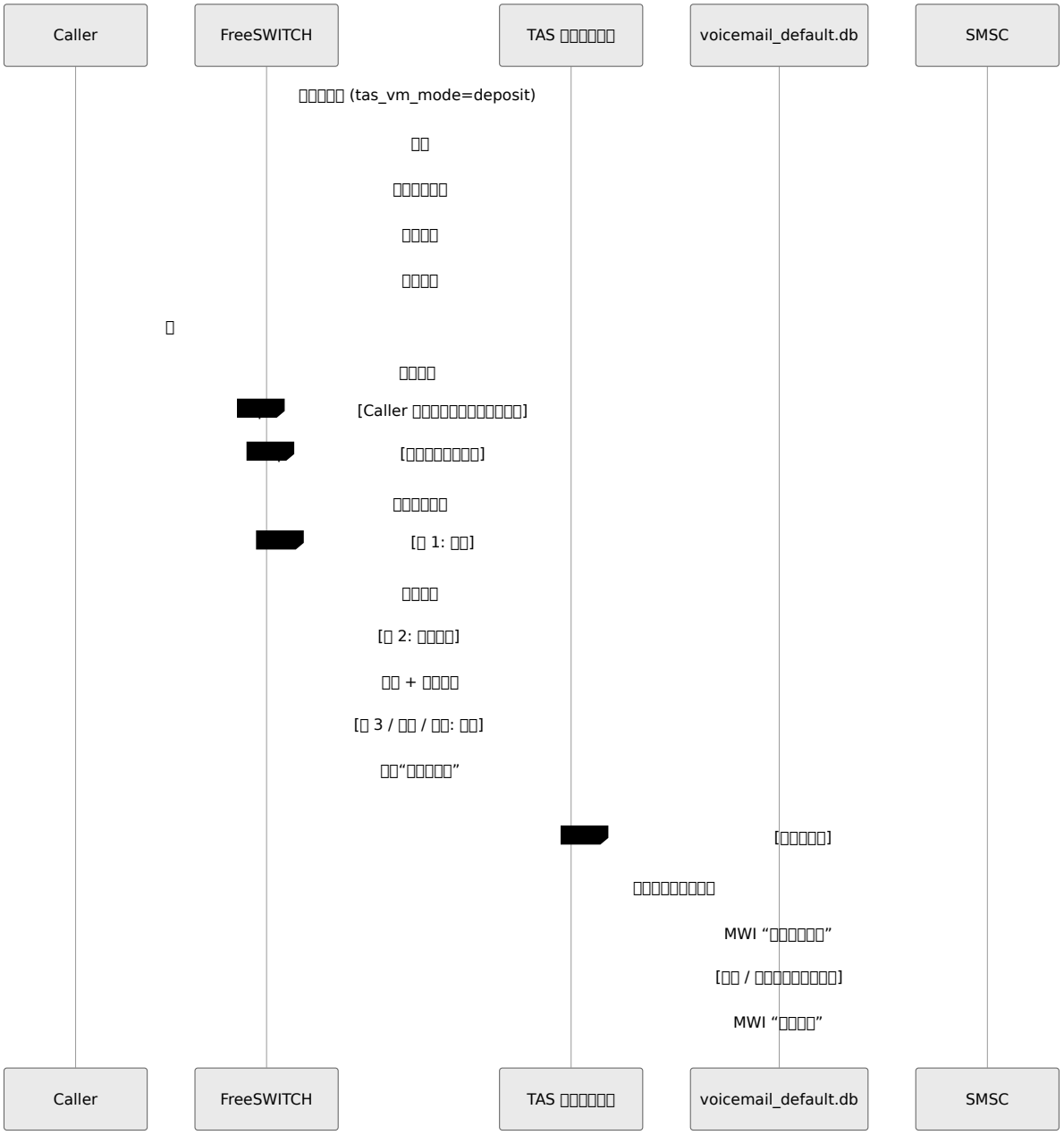

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3. □□□□□□`prompts.beep`□□

4. □□ □ `storage_dir`□□□□□□□#□□□□□□□□□□□□□□□□□□□□□□

5. □□□□□□`prompts.deposit_review_menu`□□□□□□□□□□□□□□□□□□□

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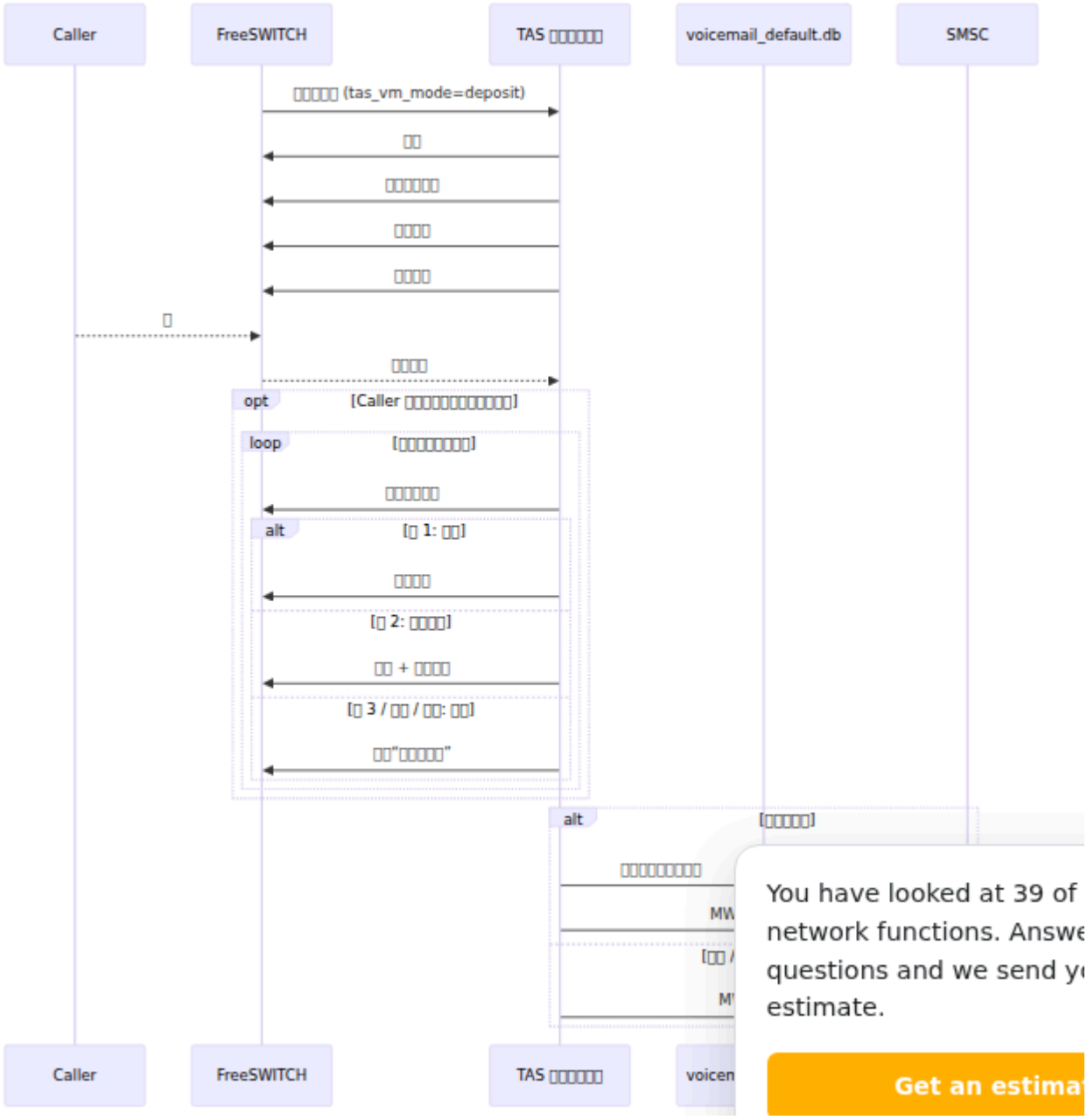
Caller
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voicemail_default.db
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□□□□□□□□□□□	□□	`voicemail_notification_text.multiple_voicemails`
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`caller`	□□	□□□□□/□□□□□□□□□□□□□
`day`	□□	□□□□□□□□□□□ `timezone` □□□
`month`	□□	□□□□□□□□□□ `timezone` □□□
`hour`	□□	□□□24□□□□□□□□□□ `timezone` □□□
`minute`	□□	□□□□□□□□□□□□ `timezone` □□□
`message_count`	`multiple_voicemails`	□□□□□□□□□□□□□□ □□ **1** □□□□

□□□□□□□VVM□

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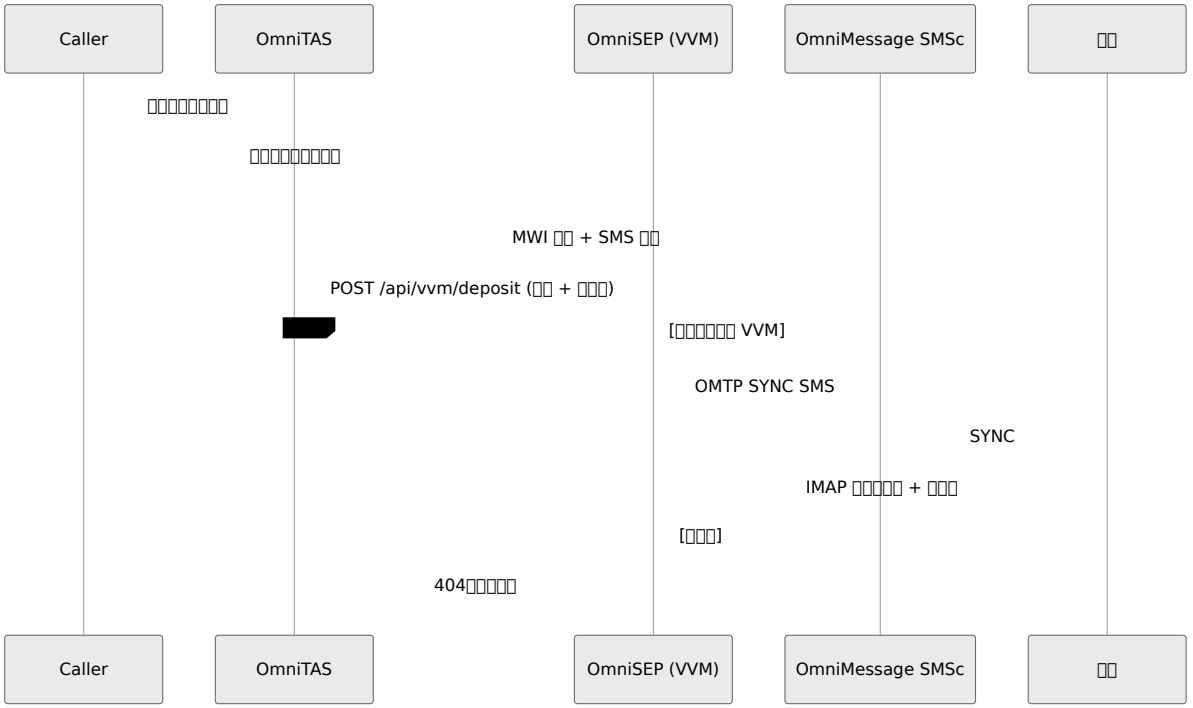
VVM □ MWI □ SMS □□□□ □□□□□□□□□□□□□OmniTAS □□□□ MWI ◆◆□□□□□ SMS□□□□□□□ □□ OmniSEP□□□□□□□□□□□□□□□□□□□□□□□□□□□□ MWI/SMS □□□

OmniSEP □□□□□□ VVM □□□□□□□□□□□□□□□□ OMTP □□□□□□□ VVM□□□□□ OmniSEP □□□□□□□ □□□□□□□□□□OmniSEP □□□ `404` □□□□□□□□□□MWI/SMS □□□□□□□□□□□□



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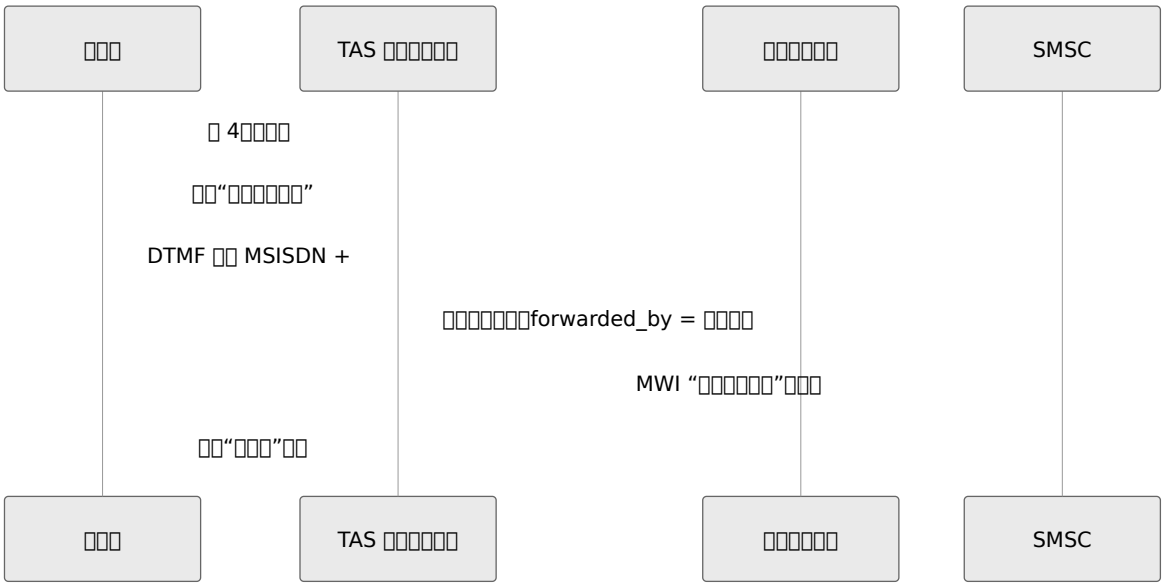

1. □□□□ `4` □□□□□`prompts.forward_enter_mailbox`□□□□□□□□□□ `#` □□□□□□□□□□ □□□□□□□□□ `:number_translate` □□□□□□□□□□□

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- □□□ **`:static`**□□□□□□□□□□□ `runtime.exs` □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ `self_id` □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□/□□□□□□□□□□□□□□□□□□□□□□□□
- **DNS**□ **`:dns`**□□□□□□□□□□□□ TAS □□□□ DNS □□□A/AAAA □□□□□□ TAS □□□□□□□□□□□□□□□□□□□ URL□□□□□□□□□□□□□□□□ DNS TTL □□□□□□□□□□□□□□□□□□□□

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`GET /api/voicemail/count?mailbox=<msisdn>`	□□□□□□□□□□□□□□
`GET /api/voicemail/all`	□□□□□□□□□□□□□□

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□□□□□□□□□□□ `:tas` □□□□□ `voicemail` □□□□□ `runtime.exs` □□

`outbound_socket`□`record` □ `menu` □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ `:tas, :prompts` □□□□□□□□□ □□□□□□□□□ `prompts` □□□□□□□□□□□□

```
config :tas,
  voicemail: %{
    timezone: "UTC",                                          # □□□□□□□□
□

    say_language: "fr",                                       # □□□□/□□
□□□□□
                                                              # □□□
default_language □□□□□□□□□
    storage_dir: "/usr/local/freeswitch/storage/voicemail", # □□□□
□□□

    # □□ - □□□□□□□□□□□□□□□□□
    # outbound_socket: %{listen_ip: "127.0.0.1", listen_port:
8084},
    # record: %{max_seconds: 120, silence_threshold: 200,
silence_seconds: 5, min_seconds: 2},
    # menu: %{tries: 3, timeout_ms: 5000, terminators: "#"},

    # FreeSWITCH □□□□□□□□□□□□□□□$${base_dir} □□□ ESL □□□□□
    # □□□□□ :tas, :prompts □□□□□□`beep` □□□□□□
    prompts: %{
      deposit_greeting:
"/usr/local/freeswitch/sounds/tas/vm/deposit_greeting.wav",
      deposit_review_menu:
"/usr/local/freeswitch/sounds/tas/vm/deposit_review_menu.wav",
      deposit_saved:
"/usr/local/freeswitch/sounds/tas/vm/deposit_saved.wav",
      beep: "tone_stream://%(500,0,800)",
      retrieve_received_at:
"/usr/local/freeswitch/sounds/tas/vm/received_at.wav",
      retrieve_menu:
"/usr/local/freeswitch/sounds/tas/vm/menu.wav",
      retrieve_no_messages:
"/usr/local/freeswitch/sounds/tas/vm/no_messages.wav",
      retrieve_deleted:
"/usr/local/freeswitch/sounds/tas/vm/deleted.wav",
      retrieve_saved:
"/usr/local/freeswitch/sounds/tas/vm/saved.wav",
      retrieve_goodbye:
"/usr/local/freeswitch/sounds/tas/vm/goodbye.wav",

      # □□□□□□□□ greetings.enabled □□□□
```

```
      retrieve_greeting_menu:
"/usr/local/freeswitch/sounds/tas/vm/greeting_menu.wav",
      greeting_record:
"/usr/local/freeswitch/sounds/tas/vm/greeting_record.wav",
      greeting_saved:
"/usr/local/freeswitch/sounds/tas/vm/greeting_saved.wav",

      # □□□□□□ forwarding.enabled □□□□□
      forward_enter_mailbox:
"/usr/local/freeswitch/sounds/tas/vm/forward_enter_mailbox.wav",
      forward_done:
"/usr/local/freeswitch/sounds/tas/vm/forward_done.wav",
      forward_invalid:
"/usr/local/freeswitch/sounds/tas/vm/forward_invalid.wav"
    },

    # □□ - □□□□□□□□□□□□□□□ IVR □□□□□ menu_key□□
    # force_first_time □□□□□□□□□□□□□□□□□□□□□□□□□□□□□
    # greetings: %{enabled: true, menu_key: "5", force_first_time:
false},

    # □□ - □□□□□□□□□□ 4□□□□□□□□□□□□□□□□
    # forwarding: %{enabled: true, menu_key: "4"},

    # □□ - □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
    # expiry: %{
    #   enabled: true,
    #   max_age_days: 30,          # □□□□□□□□□□□□
    #   read_max_age_days: 7,      # □□□□□□□□□□□□□
    #   sweep_interval_minutes: 60
    # },

    # □□ - □ TAS □□□□□□□□□□□□□□□□□□□□□□□□□
    # cluster: %{
    #   discovery: :static,        # :static□□□□□□□□ :dns□dns_name□
    #   self_id: "tas-a",
    #   nodes: [
    #     %{id: "tas-a", base_url: "https://10.8.82.60:9094"},
    #     %{id: "tas-b", base_url: "https://10.8.82.61:9094"}
    #   ],
    #   # discovery: :dns, dns_name: "omnitas-
vm.internal.example.com", scheme: "https", port: 9094,
    #   shared_secret: System.get_env("VM_CLUSTER_SECRET"),
    #   request_timeout_ms: 1500
```

```
    # },

    smsc: %{
      smsc_url: "https://10.80.14.219:8443",             # SMSc /
Omnimessage API □□ URL
      source_msisdn: "2222"                              # □□□□□□□□
□
    },

    # □□□□□□□□□□□□□□□□□□□□□ MWI □□
    voicemail_notification_text: %{
      not_left:
        "□□ 1 □□□ <%= caller %> □□□□□□□□□ <%= day %>/<%= month %>□
<%= hour %>:<%= minute %>",
      single_voicemail:
        "□□□□□□ <%= caller %> □□□□□□□□□ <%= day %>/<%= month %>□
<%= hour %>:<%= minute %>□□□□□□□□ 2222□",
      multiple_voicemails:
        "□□ <%= message_count %> □□□□□□□□□□□□□□□ 2222□"
    }
  }
```

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□□□□□□□□□□ `:tas` □ `vvm`□□□□□□□□□□□□ `enabled: false` □□□□□□ MWI/SMS □□□□ □□□□□□□□□□□□ □□□□□□□VVM□□

```
config :tas, :vvm, %{
  enabled: true,                                         # □□ VVM □
□
  deposit_url: "https://10.80.14.219:9014/api/vvm/deposit", #
OmniSEP □□□□
  timeout_ms: 5000                                       # □□□□
}
```

□□	□□	□□	□□	□□
`enabled`	□□□	□	`false`	□□□□□□□□□□□□□□□□□□□ `false` □□□□□□□□□□□□ OmniSEP□□□□□ MWI/SMS □□□
`deposit_url`	□□□	□ □□ □ □□	-	OmniSEP □□□□□□□□ URL□□□□ `https://<omnisep-host>:9014/api/vvm/deposit`□`9014` □ OmniSEP □ HTTP □□□
`timeout_ms`	□□	□	`5000`	□□ OmniSEP □□□□□□□□□□□□□□□□□□□□□

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□□	□□	□□	
`timezone`	□□□	□	`"E`
`outbound_socket.listen_ip`	□□□	□	`"1`
`outbound_socket.listen_port`	□□	□	`80`
`say_language`	□□□	□	`"e`
`storage_dir`	□□□	□	-
`record.max_seconds`	□□	□	`12`
`record.silence_threshold`	□□	□	`20`
`record.silence_seconds`	□□	□	`5`

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`record.min_seconds`	□□□	□	`2`
`menu.tries`	□□□	□	`3`
`menu.timeout_ms`	□□□	□	`50`
`menu.terminators`	□□□□	□	`"#`
`prompts.*`	□□□□	□	-
`smsc.smsc_url`	□□□□	□	-
`smsc.source_msisdn`	□□□□	□	-
`voicemail_notification_text.not_left`	□□□□	□	-
`voicemail_notification_text.single_voicemail`	□□□□	□	-

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`voicemail_notification_text.multiple_voicemails`	□□□	□	-
`voicemail_notification_text.cleared`	□□□	□	□□[
`greetings.enabled`	□□□	□	`fa`
`greetings.menu_key`	□□□	□	`"5`
`greetings.force_first_time`	□□□	□	`fa`
`forwarding.enabled`	□□□	□	`fa`
`forwarding.menu_key`	□□□	□	`"4`
`expiry.enabled`	□□□	□	`fa`
`expiry.max_age_days`	□□	□	-

□□	□□	□□	
`expiry.read_max_age_days`	□□□	□	□□[
`expiry.sweep_interval_minutes`	□□□	□	`60`
`cluster`	□□□	□	□□[
`cluster.discovery`	□□□	□□□□□□□□ `cluster`□	-
`cluster.self_id`	□□□□	□ □`:static`□	-
`cluster.nodes`	□□□□□□	□ □`:static`□	-
`cluster.dns_name`	□□□□□	□□`:dns`□	-
`cluster.scheme`	□□□□□	□□`:dns`□	`"h`
`cluster.port`	□□□□	□□`:dns`□	`90`

□□	□□	□□	
`cluster.shared_secret`	□□□	□□□□□□□ `cluster`□	-
`cluster.request_timeout_ms`	□□	□	15

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□□□□□□□□ `:tas, :prompts` □□□ □□□□□□□□□□□□□□/□□□□□□□ OpenAI TTS □□□□□□□□□□ □□□□□□□□□□□□□□□□□□ `voicemail.prompts` □□□□□□□□□□□□□□□ `/usr/local/freeswitch` □□□□□□□□□□□□□□□□

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`deposit_greeting`	□□□□□□□□□□□□□□□□□□
`beep`	□□□□□□□□□□□□□□□□□□□□□□□□□□□□ `tone_stream://` URI□□□ □ `tone_stream://%(500,0,800)`□□□□□□□□□□□□□
`retrieve_received_at`	□□□“□□□□□□□□□”□□□□□□□□□□□/□□□
`retrieve_menu`	□□□□□□□□“□□□□□□□□□ 1□□□□□□□□ 2□□□□□□□□ 3”□
`retrieve_no_messages`	□□□□□□□□□□
`retrieve_deleted`	□□□□□□□□□□□□
`retrieve_saved`	□□□□□□□□□□□□
`retrieve_goodbye`	□□□□□□□□□□□□
`retrieve_greeting_menu`	□□□□□□□□“□□□□”□□□□□ `greetings.enabled` □□□
`greeting_record`	□□□□□□□□□□□□ `greetings.enabled` □□□
`greeting_saved`	□□□□□□□□□□□□
`forward_enter_mailbox`	□□□□□□□□□ MSISDN□□□ `forwarding.enabled` □□□
`forward_done`	□□□□□□□□□□
`forward_invalid`	□□□□□□□□□□/□□□□□□□

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- □□□□ `socket` □□/□□□ `outbound_socket` □□□□
- □□□□□□□□□□□□
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1. □□□□□□□ `socket` □□□□□□ `outbound_socket` □□□ IP □□□□
2. □□ TAS □□□□□□□□□□□□□□□□□□□□
3. □□ FreeSWITCH □□□□ `listen_ip`:`listen_port`□

□□□□□□□□ UI □□□□

□□□□□□□□□□□□□ UI/REST API □□□ `vm_boxcount` □□ 0□

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- `mod_voicemail` □□□□□□□ `voicemail_msgs` □ / `vm_boxcount` □□□□
- □□□□ `record.min_seconds`□□□□□□□□□
- `storage_dir` □□□ FreeSWITCH □□□

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1. □□ `mod_voicemail` □ FreeSWITCH □□□□□□
2. □□□□□□□□ `record.min_seconds` □□□□
3. □□ `storage_dir` □□□

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- `prompts` □□□□□ FreeSWITCH □□□□□
- □□□ `$${base_dir}` □ `prompts` □□□□□□□□□ ESL □□□□

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1. □□□□ `prompts` □□ FreeSWITCH □□□□□□□□□□□□□□
2. □□□ `$${base_dir}` □□□□□□□□□□□□□□

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1. □□□□□ `cleared`□□□□□□□□□□
2. □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

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- □□ TAS □□□□□□□□□□□□□□□□□□□□□□□□□□□□ + □□□□
- `cluster.shared_secret` □□□□□□□□□□□□□□□□□□□□□□□□
- □□□□□□□□□□ `nodes` □□□□ `dns_name` □□□□□□□□□
- □□□□□ TAS □□□□□ HTTP □□□□□□

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1. □□□□□□□□□□□/□□□□□□□□□□□□□□
2. □□ `shared_secret` □□□□□□□□□□□□□□□□□□□□□□□□
3. □□□□□□□□□□□□□□□ HTTP □□□□□□

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- `greetings.enabled` □□□□
- □□□□□□