## HISTORY

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>DATE</th>
<th>DESCRIPTION</th>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>31 May 2017</td>
<td>Initial version of the proposal for internal discussion.</td>
<td>Harald Welte</td>
</tr>
<tr>
<td>1.0</td>
<td>November 2020</td>
<td>Update with changes on what was actually implemented in recent years; change from future to past tense.</td>
<td>Harald Welte</td>
</tr>
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# 1 Introduction

This document serves as a paper to illustrate the different configurations of OsmoBSC in terms of integration with BTSs and MSCs.

The document was created ahead of the 2017 development cycle which included the death of the NITB, i.e. the move away from OsmoNITB to having OsmoBSC in all configurations, whether with a proprietary/external MSC or with OsmoMSC.

Particular attention is spent on the user plane, including aspects such as

- user plane transport address handling
- use of MGCP (Media Gateway Control Protocol)
- the (required) evolution of osmo-bsc_mgcp
- not loosing classic TDM (E1/T1) BTS support when moving from OsmoNITB to split OsmoBSC + OsmoMSC setup

## 2 Overview

### 2.1 Classic GSM RAN with E1 based Abis and E1 A

This is how GSM was originally specified when it was introduced: E1/T1 circuits on all interfaces, no IP anywhere.

This configuration was actually never supported by OpenBSC, as E1 support was always only on the Abis side (OpenBSC, OsmoNITB and today OsmoBSC).

We never supported A interface over E1. It could be done if there was a need.

<table>
<thead>
<tr>
<th>MS</th>
<th>E1 BTS</th>
<th>OsmoBSC</th>
<th>TRAU</th>
<th>MSC</th>
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![Diagram](image-url)


## 2.2 OsmoBSC 2010-2017: IPA-style A over SCCPlite

This configuration was introduced as early as 2010 in OpenBSC. It allowed the use of IP based BTSs (ip.access nanoBTS as well as all the OsmoBTS supported BTS models) in combination with third-party MSCs implementing a pre-standard, proprietary way of transporting the A interface over IP at a time where the 3GPP specifications only allowed classic TDM transport.

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### Diagram Description:

- **DTAP CC SETUP**
- **DTAP CC CALL PROCEEDING**
- **IPA CRCX**
- **IPA CRCX ACK**
- **IPA MDCX**
- **IPA MDCX ACK**
- **RTP Audio**
- **Um Audio (unidirectional)**
- **Um Audio (bidirectional)**
- **DTAP CC ALERTING**
- **DTAP CC CONNECT**
- **DTAP CC CONNECT ACK**
- **DTAP CC RELEASE**
- **DTAP CC RELEASE COMPL**
- **MGCP CRCX 1@mgw OK**
- **MGCP MDCX 1@mgw OK**
- **MGCP MDCX 1@mgw (recvonly)**
- **MGCP MDCX 1@mgw (sndrecv)**
- **MGCP MDCX (sndrecv)**
- **MGCP DLCX 1@mgw OK**
- **MGCP DLCX 1@mgw (recvonly)**
- **MGCP DLCX 1@mgw (sndrecv)**
- **MGCP DLCX 1@mgw OK**

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**Notes:**

- We assume a SDCCH is already established.
- Why?

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2.3 OsmoBSC 2017+: 3GPP AoIP + Abis/IP

Release 7 of 3GPP included an official specification on how an interoperable A-over-IP (AoIP) interface shall look like. As more modern MSCs at operators tend to favor implementing 3GPP AoIP rather than the proprietary SCCPlite based A interface, it became necessary for OsmoBSC to support this. At the same time, for compatibility reasons, the classic SCCPlite support is kept in OsmoBSC as a configuration option.
2.4 OsmoBSC 2020+: 3GPP AoIP + Abis/E1

Since OsmoNITB was deprecated in 2017, and OsmoBSC only supported Abis/IP, we temporarily lost the ability to use classic E1 based BTSs. In 2020, we re-introduced and re-tested the support of Abis/E1.

For the control plane of Abis (RSL, OML) the E1 support via libosmo-abis never really ceased to exist. But for the user plane,
E1 support had to be introduced to osmo-mgw, and osmo-bsc needed to be taught how to configure E1 endpoints at the MGW. The related call flow for such setups looks like this:

We assume a SDCCH is already established

- **DTAP CC SETUP**
  - **RSL CHAN ACT**
    - **RSL CHAN ACT ACK**
  - **MGCP CRCX ts1/ss2@mgw (MSC:4000)**
  - **MGCP CRCX ts1/ss2@mgw OK (MGW:3000)**

- **BSSAP ASSIGN REQ (3GPP AoIP MSC:4000)**
  - **Bind arbitrary local port (4000)**
  - **Bind to MGW-local RTP Port (3000)**
  - **Connect to MSC:4000**
  - **MGCP CRCX ts1/ss2@mgw OK (MGW:3000)**
  - **BSSAP ASSIGN CMPL (3GPP AoIP MGW:3000)**

- **Connect remote RTP to MGW addr from ASSIGN CMPL**
  - **RTP Audio MGW:3000 MSC:4000**

- **TRAU Frame Audio (E1 TS1 SS2)**
  - **DTAP CC ALERTING**
  - **DTAP CC CONNECT**
  - **DTAP CC CONNECT ACK**
  - **Voice Call in Progress**
  - **DTAP CC DISCONNECT**

- **DTAP CC RELEASE**
  - **DTAP CC RELEASE CMPL**
  - **BSSMAP CLEAR CMD**
  - **BSSMAP CLEAR CMPL**
  - **SCCP DL6D**
  - **SCCP RLCD**
  - **MGCP DLCX ts1/ss2@mgw**
  - **Release MSC-facing local RTP port**
  - **MGCP DLCX ts1/ss2@mgw OK**

- **SCCP RLSD**