What is GSM TRAU?

TRAU = Transcoding and Rate Adaption Unit

A single TRAU channel handles one speech or CSD call:
16 kbit/s or 8 kbit/s on Abis/Ater side, 64 kbit/s on A interface

In Nokia and Siemens BSS implementations, the bank of TRAUs topologically sits between the BSC and the MSC:

MSC <-- A i/f --> TRAU <-- Ater i/f --> BSC <-- Abis i/f --> BTS

We all know what A and Abis interfaces are, but what is Ater?

Ater (Nokia term) or Asub (Siemens term) is the i/f between BSC and TRAU: same 16 kbit/s or 8 kbit/s format as on Abis, but with CIC channels matching those of the A interface. BSC then acts as a switch on 16 kbit/s or 8 kbit/s channels, from Abis to Ater.

The TRAU expands each 16 kbit/s or 8 kbit/s channel to 64 kbit/s - hence the number of E1 circuits required on A i/f is 4 or 8 times more than Ater/Asub! Colocating the TRAU bank with the MSC dramatically reduces leased line costs. :)

Terminology: TRAU vs TCSM

Does the term TRAU refer to a single speech or CSD channel handler, or to the whole transcoding rack that sits between MSC and BSC racks?

Nokia's interpretation: TRAU is one call channel handler, whereas the big rack full of TRAUs needs a new name. They called it TCSM:

Transcoder and Submultiplexer

Siemens, OTOH, used the term TRAU to mean the whole big rack, equivalent of TCSM in Nokia universe.

Nokia TCSM had 3 generations; the one I chose to hack on is TCSM2: the middle of the three. The design is from late 1990s.

Why TCSM2, why not original TCSME or final TCSM3i? And why Nokia and not Siemens or Ericsson?

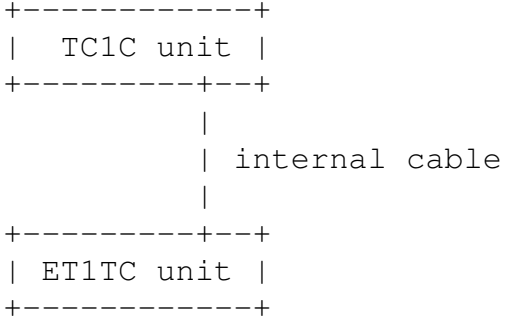
Answer: Nokia TCSM2 is the only TRAU for which I could find enough documentation to take the plunge of buying hardware parts and trying my luck!

Nokia TCSM2 architecture

Back In The Day: a "proper" TCSM2 rack is 1.8 m tall, 0.8 m wide and 0.5 m deep: too big for most hobbyists, including yours truly. :)

Let’s look at the units inside that rack, to get a smaller configuration:

The original/official rack holds 8 TC1C chassis and 4 ET1TC chassis; a hobbyist can get away with this minimal config:



Nokia TCSM2 architecture (continued)

A single "unit" of TCSM2:

* Consists of one TC1C chassis with cards inside, plus one-half (!) of an ET1TC chassis (min 1, max 4 ET2A/ET2E units in that ET1TC);

* Handles exactly one E1 (or T1) on Ater interface to the BSC;

* Min 1, max 7 E1 (or T1) A i/f circuits toward the MSC;

* Is a single self-contained entity for logical/software/config purposes, with its own top-level control CPU.

Beyond passives (chassis, backplanes, cables) and power supplies, this single "unit" of TCSM2 consists of:

* One TRCO card, sits in TC1C chassis, is the head master of the system.

* Min 2, max 14 transcoder (TR12/TR16) cards: this is where the DSPs are!

* Min 1, max 4 ET2A (2xT1) or ET2E (2xE1) "exchange terminal" modules.

What I seek to accomplish

Putting together the absolute minimal config: 1x TRCO, 2x TR16, 1x ET2E.

Two E1 circuits in total, on one ET2E module: one A E1 and one Ater E1.

Connect both E1s to a server in my lab, an x86 "desktop" box with a Digium TE405P PCI card (4x T1/E1).

How am I going to operate the TRAU with neither a BSC nor an MSC in the picture?

TRAUs are officially part of the BSS, and Nokia concurred: in a "proper" setup, each TCSM2 unit receives config & control from the BSC via a dedicated LAPD channel on Ater – a proprietary protocol. :(

But for "test purposes", Nokia allowed TCSM2 to be configured and controlled via a local RS-232 port (plain ASCII terminal) when the BSC link is down!

Once TCSM2 is configured (BSC LAPD or local RS-232), subsequent operation is "automagical": whenever TRAU-UL frames appear on a given sub-timeslot on Ater, the corresponding TRAU channel comes to life, selecting the right codec based on TRAU-UL frame type – nice! :)

Hardware show time!

End of slides portion of the presentation, beginning the fun part: looking at the hardware. :)

This presentation is to be given from the "hw lab" room that holds my ESD-safe workstation; webcam is to be pointed up-close at various hardware components so we can all get a good look.

Components to be examined (visual reverse eng):

* TRCO card
* TR16-S card
* TC1C chassis and backplane

Planned next steps

Try powering TC1C box by itself, with no exchange terminal connected:
may or may not do anything interesting, as in allowing us to play with
configuration settings.

Connecting -48 VDC power: either find connectors that mate with the original,
or solder hack wires into the adjacent holes.

ET2E module (2xE1) and the ET1TC chassis to hold it remain to be acquired.

The cable that connects TC1C and ET1TC backplanes (thereby connecting TRCO to
ET2E) will need to be either located on the surplus market or made anew;
DIN 41612 3-row connectors.

Finally, the E1 interfaces coming out of ET2E will present yet another
pain point...

Which ET2E version should I buy?

There is a version with coaxial E1 interfaces (said to be 75 ohm), and a version with more conventional "balanced" (twisted pair) E1 interfaces, said to be 120 ohm.

... but the "balanced" version brings out 2xE1 on another weird 3x16 DIN 41612 connector instead of T1-style RJ-48C jacks! I looked up the needed connector at Digi-Key - cost-prohibitive MOQ. :(

So what do I do:

1) Get the "balanced" version of ET2E and go on a wild goose chase looking for a mating connector part,

or

2) Get the coaxial version and go on a wild goose chase looking for a converter from coaxial E1 to the traditional kind one can plug into a Digium card?

Adventure to be continued...