



ESG-NetCOP

Network Configuration,
Optimisation and
Planning Tool

ATM Transport Network
Planning

Layered Approach to Network Planning

The ATM module of ESG-NetCOP introduces the ATM layer as the transport layer of the UMTS network. With this module, ESG-NetCOP supports an orthogonal layered approach which allows integrated planning of both the logical layer (client layer) and the data link layer (server layer).

Between the client layer and the server layer, the fundamental information to be exchanged consists of traffic requirements (demands) between pairs of nodes.

Each UMTS node (e.g. NodeB, RNC, 3G-MSC, 3G-SGSN, Media Gateway) has an integrated ATM switch. Furthermore, the ATM topology may be based on or extended with stand-

alone ATM switches. ESG-NetCOP also supports the modelling of an ATM backbone through the use of so-called ATM gates. The ATM backbone is then treated like a "black box" part of the ATM network.

The traffic requirements are passed to the ATM layer as traffic demands per application type, with an associated required bandwidth. It is possible to manually add demands to this demand table and thus to model additional traffic that needs to be carried within the ATM layer.

Planning Objectives

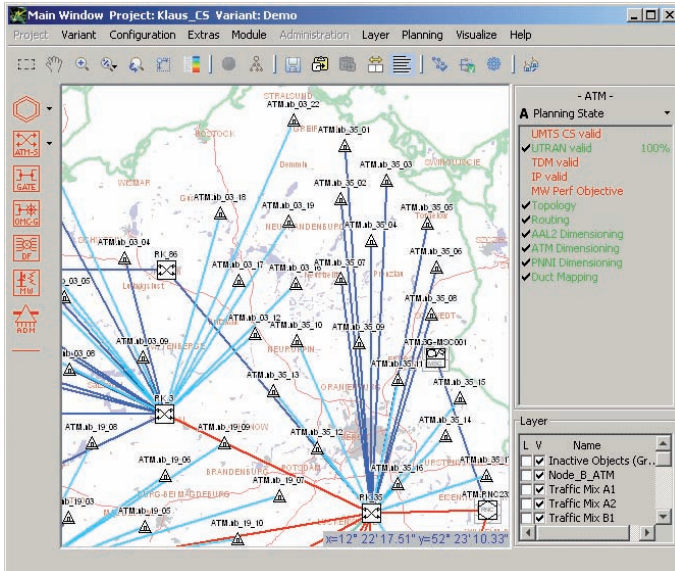
Configuration of the ATM layer is a significant and time-consuming task, in particular within the UTRAN. On average, each Node-B requires 5 to 10 different PVCs to be set up (varies

with different vendors). This can easily reach up to several thousands of PVCs for an UTRAN network, whose configuration needs to be adjusted frequently as demand grows. The ATM module relieves the operator of the burden of configuring these PVCs manually.

Another important issue is the cost of the transport network, in particular in the case that resources are shared between 2G (BSS/TDM) and 3G (UTRAN/ATM) equipment, either in the form of fractional ATM or CES. This issue is addressed by algorithms to optimise the network topology with regard to cost and to dimension links with regard to the requested QoS.

HIGHLIGHTS

- ▶ Automatic configuration of PVCs/SPVCs to be established for the given traffic demands
- ▶ Creation of a cost-efficient network topology
- ▶ Automatic placement of access concentrators (hubs)
- ▶ Routing of VCs and VPs through the network
- ▶ Assignment of identifiers (VCI, VPI, AAL2PathID, etc.)
- ▶ Provisioning of ATM equipment
- ▶ Simulation of PNNI routing



Geographical presentation of an UMTS/ATM layer

ATM Originating Demand Table of Node: Worms NodeB

Source	Destination	Connection Type	Head End	Demand Type	Interface	AAL Level	# VC	VC	Service Category	MCR, SCR Rx [cells/s]	MCR, SCR Tx [cells/s]	PCR Rx [cells/s]	PCR Tx [cells/s]
1	Worms NodeB	GiesSEN RNC	SPVC	Destination	AAL2SIG	Sub	AAL5	11	HYBR	0.0	0.0	150.0	150.0
2	Worms NodeB	GiesSEN RNC	SPVC	Destination	AAL2UP	Sub	AAL2	11	HYBR	0.0	0.0	3928.0	3928.0
3	Worms NodeB	GiesSEN RNC	SPVC	Destination	CMBAP	Sub	AAL5	11	HYBR	0.0	0.0	150.0	150.0
4	Worms NodeB	GiesSEN RNC	SPVC	Destination	DWBAP	Sub	AAL5	11	HYBR	0.0	0.0	150.0	150.0
5	Worms NodeB	GiesSEN RNC	SPVC	Destination	DWM	Sub	AAL5	11	HYBR	0.0	0.0	4490.0	4490.0

VC (of selected Demand Type):

ID	Connection Type	Src	Dest	AAL2 Path ID	Service Category	MCR, SCR Rx [cells/s]	MCR, SCR Tx [cells/s]	PCR Rx [cells/s]	PCR Tx [cells/s]	Route complete
1	16 PVC	Worms NodeB	151 Frankfurt1		HYBR	0.0	0.0	150.0	150.0	true
2	17 SPVC	151 Frankfurt1	1A1 GiesSEN1		HYBR	0.0	0.0	150.0	150.0	true
3	18 PVC	1A1 GiesSEN1	GiesSEN RNC		HYBR	0.0	0.0	150.0	150.0	true

Route (Link Level):

Src	Egress Port	Dest	Ingress Port	Link Type	Network Interface Type	Adapted Service Category	Original Service Category	IMA Group ID	VP1	VC1
1	Worms NodeB	Default S...	151 Frankfurt1	Default S...	E1	LINE	CBR	HYBR	0	40
1	151 Frankfurt1	Default S...	152 Frankfurt2	Default S...	E1	PNNI	HYBR	HYBR	-1	-1
1	152 Frankfurt2	Default S...	154 Frankfurt4	Default S...	E1	PNNI	HYBR	HYBR	-1	-1
1	154 Frankfurt4	Default S...	1A1 GiesSEN1	Default S...	STM-1	PNNI	HYBR	HYBR	-1	-1
1	1A1 GiesSEN1	Default S...	GiesSEN RNC	Default S...	STM-1	LINE	CBR	HYBR	0	32

Demand table with demand routing information

ATM Planning and Configuration

The ATM module of ESG-NetCOP can model, plan and configure an ATM network. Both initial planning and the extension of an already existing ATM network based on changed demands and a modified topology is supported.

The ATM topology and the demand routing can be given as input or, automatically calculated. Algorithms support e.g. a cost-optimised placement of ATM switches as access concentrators within the lub interface. The tool dimensions all ATM connections (transmission links) and configures all VPs and VCs required to carry the demands present in the demand table.

The capabilities of ATM nodes are defined through equipment releases. The highly detailed modelling allows a variety of parameters to be specified, including

- ▶ Identifier ranges for VPs and VCs, differentiated for the supported traffic types (user data, signalling, O&M, etc.),
- ▶ Cross connect capability and switching level (VP or VC switching),
- ▶ Limits concerning the switching capability (number of VCs, VPs, and VCs per VP),
- ▶ Simulation of SPVC/SPVP routing inside a PNNI backbone network.

Moreover, IMA (Inverse Multiplexing ATM) is supported and CES (Circuit Emulation Service) can be modelled for transmitting GSM demands via ATM.

Provisioning

The output of the ATM module can be forwarded to an Operation and Maintenance Centre (OMC) in order to directly configure the ATM network. The following information is handled: all transmitted demands with source and destination nodes, the links (E1s, STM-1s, etc.) and their assignment to logical ports of ATM switches, the assignment of the demands to VCs, the assignment of the VCs to VPs, the assignment of VPs to links, ATM switching tables, admin weights of ports, etc.

Benefits

- ▶ Effective support of ATM mass provisioning tasks
- ▶ Optimisation of network cost across layers
- ▶ Capacity planning, taking into account shared resources between TDM and ATM
- ▶ Layered approach to network planning, perfectly suited for UMTS/ATM