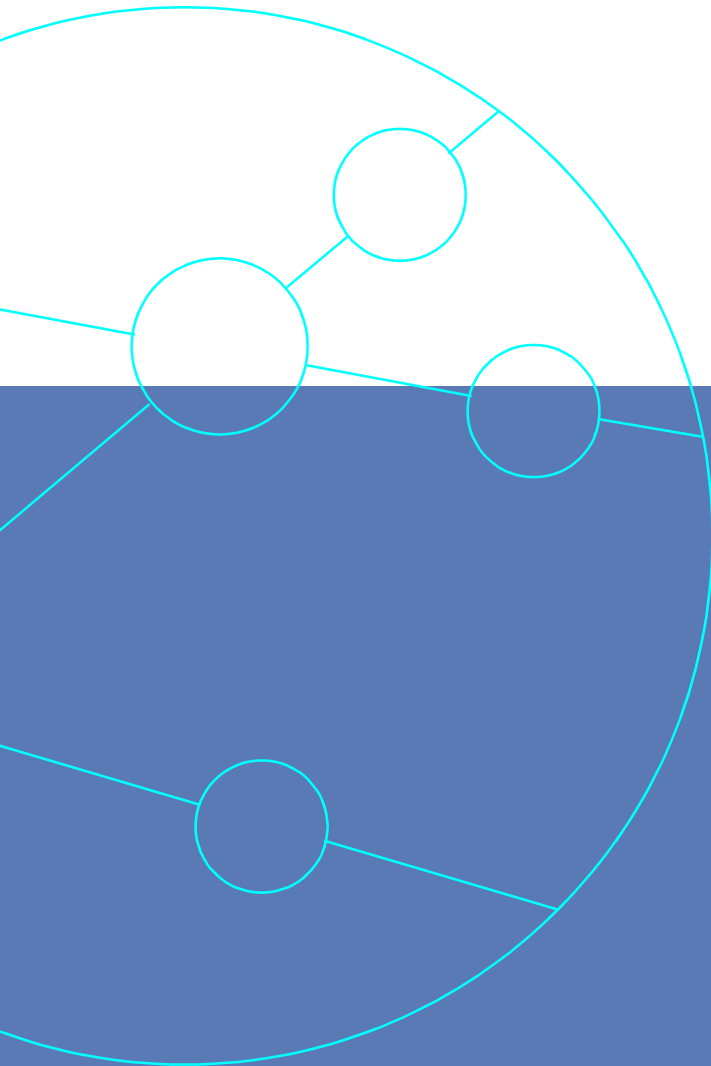


3G/UMTS Network Testing

The mobile phone network evolution to 3G/UMTS is designed to provide broadband data connections over the air interface to the user. Expectations are high that the new Content Applications that become possible over these broadband connections will change the way we live and work. The use of ATM within the network is a key difference between 2/2.5G network and the new 3G architecture. Efficient and reliable operation of the ATM transmission network will be vital for the delivery of high value services to mobile users.

Application Note ANFORTE 10



Testing the World's Digital Networks

TrendCommunications

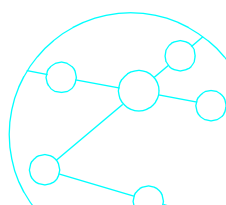
INSTALLATION AND MAINTENANCE TESTING

The mobile phone network evolution to 3G/UMTS is designed to provide broadband data connections over the air interface to the user. Expectations are high that the new Content Applications that become possible over these broadband connections will change the way we live and work. The use of ATM within the network is a key difference between 2/2.5G network and the new 3G architecture. Efficient and reliable operation of the ATM transmission network will be vital for the delivery of high value services to mobile users.

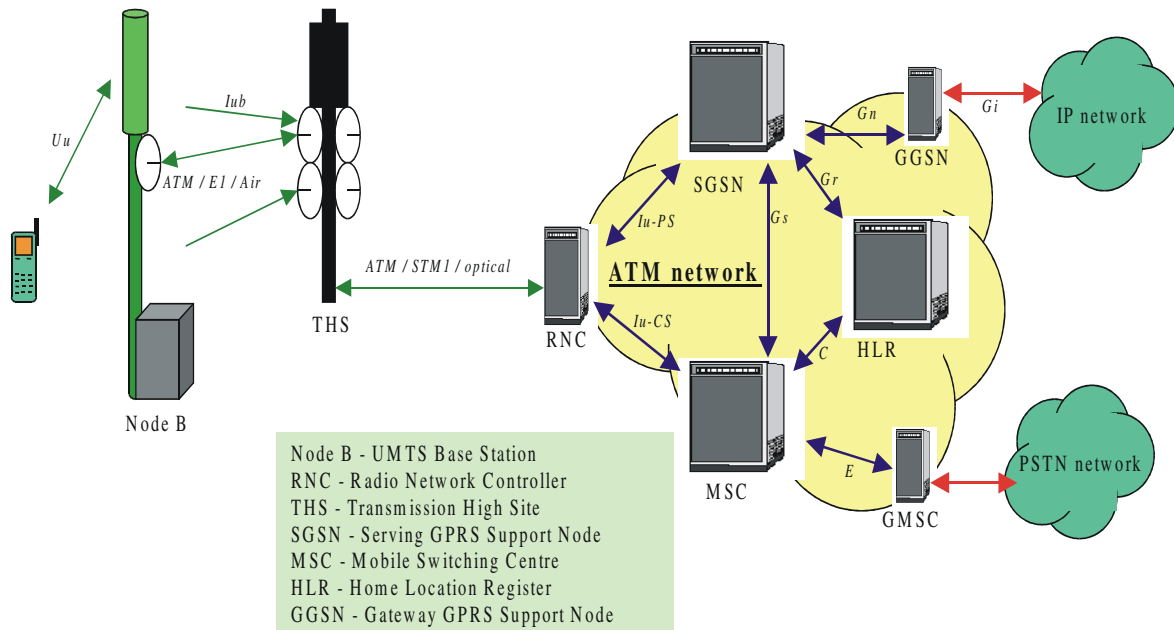
For Network Operators the challenges are daunting:

- Installation of a new network infrastructure
- Migration from 2/2.5G to 3G
- Managing Broadband data connections over the air interface
- Application bandwidth demands that cannot be forecast
- Bandwidth usage that will be unpredictable

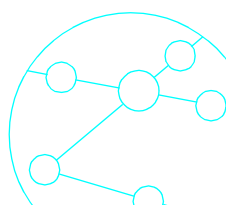
The architecture of 3G/UMTS is radically different from the GSM network, but the mechanisms for installing and maintaining the network will be similar. The use of ATM cells on the 3G/UMTS network provides a mechanism for sharing all the available bandwidth to any application, and over a variety of physical links - E1, nxE1, STM1 etc. The advantage from the ATM protocol is that the bandwidth can be allocated to applications as required either permanently or dynamically. The provision and management of application bandwidth is critical for successful delivery of network signalling, voice calls and data flows.



What needs to be tested?



Engineering teams that are responsible for managing the installation and maintenance of the transmission network will need new tools that provide the necessary test capability and are easy to use with familiar techniques. The standard tool for the GSM network has been an E1 Bit Error Rate Tester, with GSM protocol monitor capabilities. The ATM protocol is used widely within the 3G/UMTS network and will demand additional capability in test tools because the shared bandwidth nature of ATM introduces new configuration issues. Test equipment to be used on the 3G/UMTS network should be easy to use so that a minimum of time is spent training to use the equipment and provide relevant new test procedures for proving the reliability of the ATM transmission layer.



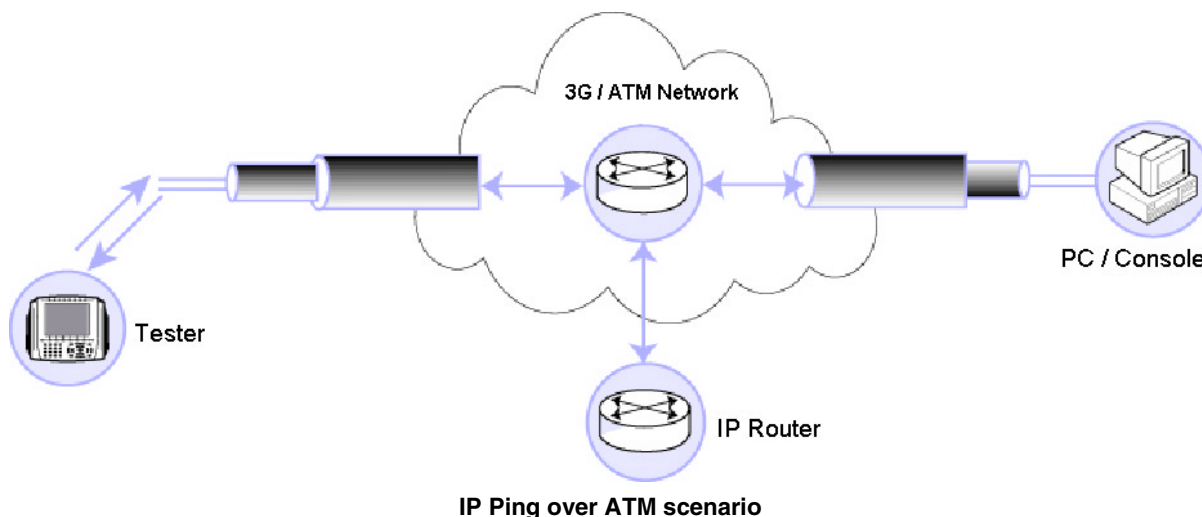
Test Strategies

The field testing requirements for 3G can be broken down into a number of categories, as indicated below.

Network interconnections e.g. RNC to MSC

The network connections that link the 3G/UMTS infrastructure together will all use an ATM transmission layer, with a variety of physical media such as E1 and STM1. An SDH ring network will also be used as a core network operating at STM 4 or STM16 data rates. The network operator will want to test the paths across the network to ensure that they are reliable and routed correctly. The test procedures that can be used are familiar and easy to learn, but adapted because of the use of ATM transmission layer:

1. Physical Frame/Alarms Test
2. Physical layer Bit Error Rate Test
3. ATM Bit Error Rate Test - using a typical VCC bandwidth profile, or 100% of link capability
4. QoS (O.191) measurement - measures VCC performance including Round Trip Delay
5. IP Ping over ATM - transmit or respond test through network or to 3G equipment



Equipment connections e.g. Node B

UMTS equipment such as Node B or RNC will be pre-configured before installation in the field. The field testing task will be to confirm that the equipment is operating correctly. It is convenient to ensure that the test procedures are easy to use and can be completed quickly. The important tests are:

1. VCC traffic scanning
2. OAM loopback
3. IP Ping over ATM

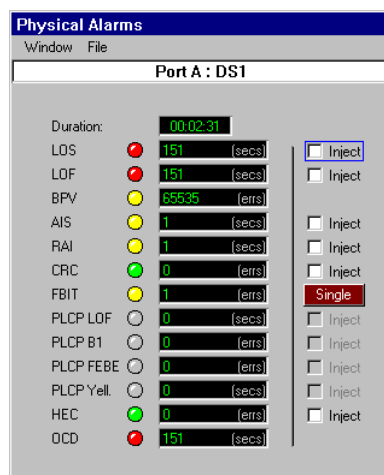
Network monitoring e.g. RNC

In-service monitoring of the network requires a capability for bi-directional connection of the tester at monitor points, or using fibre splitters. This allows normal operation of the network and with full test visibility of traffic to and from the network.

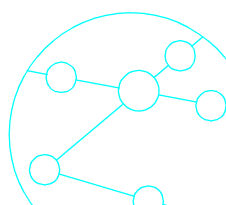
1. VCC traffic scanning
2. OAM monitoring
3. VCC Traffic Policing
4. 3G/IP protocol decoding

Example test application on Aurora Forte

Physical Frame/Alarms



- Proves network connection is live and error free
- Proves ATM layer is active



ATM VCC Traffic Scanning

Rx Summary						
Window	File					
Circuit	AAL ID	Average	Total Cells	Peak	CLP=0	CLP=1
4095.65535 [A]	AAL1	5012	6683	5012	6675	8
4095.65534 [A]	AAL5	1358	1811	1358	1795	16
4095.65533 [A]	AAL0	2058	2745	2058	2734	11
4095.65532 [A]	AAL1	1764	2353	1764	2342	11
4095.65531 [A]	AAL0	1737	2317	1737	2317	0
4095.65530 [A]	AAL1	5726	7635	5726	7627	8
4095.65529 [A]	AAL2	4562	6083	4562	6069	14
4095.65528 [A]	AAL0	6529	8706	6529	8703	3
4095.65527 [A]	AAL2	4891	6522	4891	6520	2
4095.65526 [A]	AAL1	1830	2440	1830	2428	12
4095.65525 [A]	AAL0	4544	6059	4544	6050	9
4095.65524 [A]	AAL5	6396	8528	6396	8515	13
4095.65523 [A]	AAL5	427	570	427	568	2
4095.65522 [A]	AAL2	3501	4669	3501	4668	1

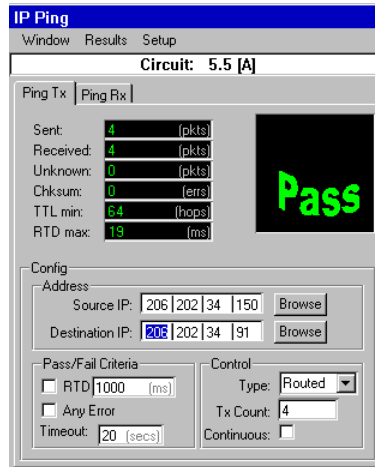
20 Circuits Maximum: 50000 Average: 5012

- Learn active VCCs
- Display real time data rate

ATM BERT

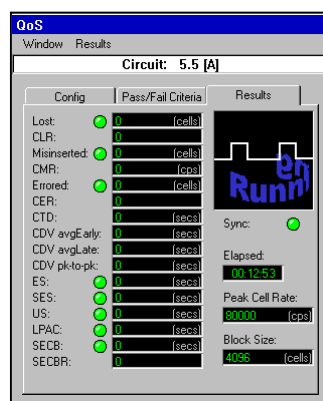
- Proves VCC routing
- Proves VCC bandwidth settings
- Proves VCC reliability

IP Ping over ATM

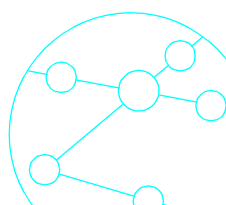


- Ping Transmit and Respond tests
- Proves VCC route
- Proves IP connection
- Proves IP address settings

Quality of Service (O.191)



- Measures key ATM performance parameters
- Round Trip Delay of ATM cells (CTD)



Aurora Forte

Aurora Forte is an ATM handheld tester with the key features of being multi-interface with a graphical user interface and providing physical, ATM and IP layer test routines. File Management System allows test results and configurations to be copied to/from a PC using the testers Ethernet port.

- Portable, battery powered, handheld unit, rugged design
 - Large high resolution colour display
 - Graphical ICON based window applications for easy operation of tests
 - Interfaces - combined E1 + E3, combined DS1 + DS3, ATM25,
 - OC3/STM1 (Single mode, Multi mode, G703, CAT5)
 - Bi-directional monitoring
 - Pass / Fail parameters for fast analysis of test results
 - Physical Frame and Alarm monitoring & Injection
 - Physical BERT for E1, E3, DS1, DS3
 - ATM VCC real time Traffic Scanning - up to 1024 VCC
 - ATM cellstream transmission - up to 256 VCC
 - ATM BERT
 - Quality of Service (O.191) measurement
 - Traffic Policing - to monitor and enforce a committed service level agreement
 - F4 and F5 OAM testing of ATM fault management layer (AIS, RDI, CC, Loopback), real time and trace history OAM cell capture with English language decode
 - IP ping over ATM - transmit and respond tests
 - SVC UNI 3.0, 3.1, 4.0 support with comprehensive Information Element editing
 - Management of results and configuration files via PC on Ethernet interface for simple operation
 - Software upgrades available from Trend Communications website, with download to tester via Ethernet port
- Aurora Forte is subject to an ongoing development program with continuous addition of new features - call for more information.



TrendCommunications

Trend Communications Ltd
Knaves Beech Estate
Loudwater, High Wycombe
Bucks HP10 9QZ UK
www.trendcomms.com
info@trendcomms.com

Trend Communications SL
Pujades, 60
08005 Barcelona
(Spain)

International: +44 1628 524977
España:..... 93 300 3313
Deutschland: 089 32 30 09 11
US: 256 461 0790

UK:..... 01628 524977
France: 01 69 35 54 70
India:..... 22 8597 463/4