Azmoon Keyfiat Co.

ULC-1000AN MSAN

Multi-Service Access Network System

System Description
Version 3.2
2012

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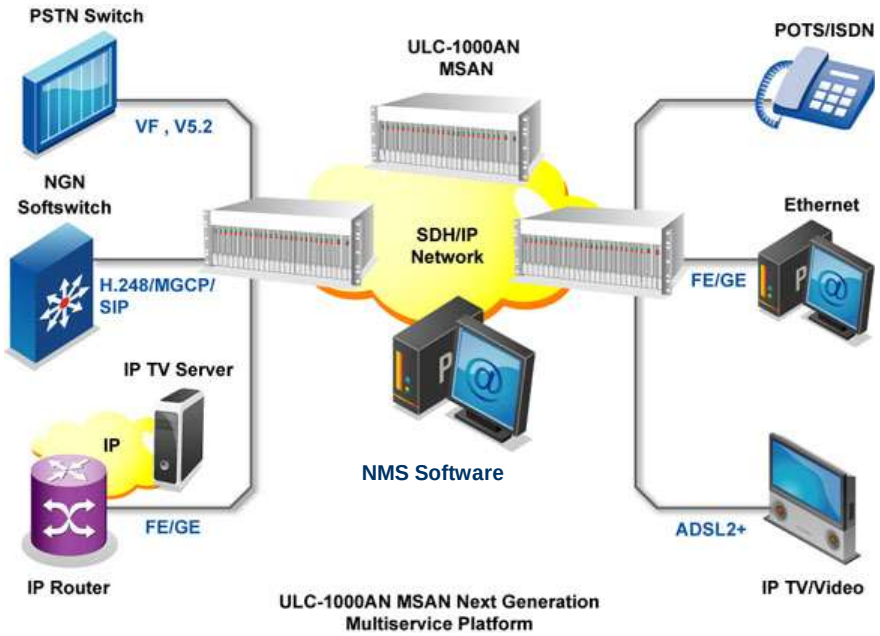
1. Introduction

The ULC-1000AN MSAN System enables service providers to successfully evolve to full service access networks in a very cost-effective, practical, and flexible manner. The ULC-1000AN MSAN System achieves these goals in a variety of ways. It has been designed for low-cost deployment in a wide range of applications. Its integrated apability of supporting xDSL services simplifies planning for data and digital video services. These xDSL services are cost-effectively provided as an overlay to existing telephony networks or as a part of a new, combined narrowband and xDSL services system.
The ULC-1000AN MSAN System allows deployment of fiber deeper into the network and offers simplified operations in any of its configurations. It is built on a new access interface platform that will support a multitude of access configurations including fiber in the loop, remote modules and a fixed wireless network.
The ULC-1000AN Multi-Service Access Network System provides narrowband switch services, leased line services, broadband and VoIP services in a single platform. Through the advanced flexible system architecture, it economically performs the following functions:

- Universal Digital Loop Carrier (UDLC)
- V5 based Integrated Digital Loop Carrier (IDLC)
- Digital Access Cross Connect (DAC)
- Channel Bank (CB)
- Optical Add-Drop Multiplexer (ADM)
- Digital Subscriber Line Access Multiplexer (DSLAM)
- NGN VoIP Access Gateway (AG)
- NGN VoIP Trunk Gateway (TG)



2. System Features and Benefits

Advantages and benefits for the ULC-1000AN MSAN System:

Competitively priced telephony deployment for first installations and for later network extensions in case of increasing needs for additional lines

Service-independent access solution by means of a common platform for all services

Broadband services, narrowband service & transmission system in a universal shelf.

Same NMS for broadband, narrowband & transmission

Flexible system configuration to different NE, such as DLC, E1 Channel bank, DAC, DSLAM, VoIP Access Gateway, STM-1/4 transmission, etc.

Supports variety interfaces cards for POTS, ISDN, Asyn/Sync. Data, xDSL, and SHDSL from a single system

Integrated high performance Layer 2 data switching unit for easy manipulate data package

Easy upgrade to advanced IP-based Next Generation Network

Transport of narrowband services and broadband services via an integrated transport system

Different network interfaces for different network

Economic utilization of different types of broadband network interfaces

Architectural flexibility by a modular structure

Space-efficient through a high-density packaging

Conformance with V5.2 standards, H.248 Megaco, and MGCP VoIP standards

Configurations for indoor or outdoor applications

ULC-1000AN MSAN Management Interface

Built-in transmission for fiber (SDH, PDH, GE/FE optical), or use external transmission system

The Management Interface, executed on a PC as Windows based software to make operation, administration, maintenance, and provisioning (OAM&P) procedures easier and to reduce sources of error is used for managing narrowband and broadband services. It includes:

Craft Interface (CIT): The CIT is used to provision narrowband and broadband services and to monitor alarms and events on a single NE.

Network Maintenance Manager: The Network Maintenance Manager is used to monitor alarms over multiple NEs.

Comprehensive NMS Software

High reliability via robust software and optional redundancy in hardware for common units

Supports duplex mode operation for the CPU, PSU, V5P and Transceiver Unit

Supports STM-1/STM-4 transmission protection in point-to-point or ring network

Supports V5.2 multi-E1 loading sharing and protection protocol

High MTBF for 5 years and long life span for 10 years

Complete access network solutions supporting synchronous digital hierarchy (SDH) and plesiochronous digital hierarchy (PDH) transmission equipment

The ULC-1000AN MSAN System supports one COT up to 31 remote terminal(RT) via built-in optical transmission system in tree, star, ring or linear topology as well as RT-only applications

Scalable system capacity from small to large

Outdoor cabinet housing for outdoor environment application

Pre-cabled for ease installation

Separate rooms for electrical equipment, MDF cabling and batteries

Internal cooling by a fan unit or heat exchanger

Powering by AC mains and backup by batteries

Different cabinet size for different capacity

Perfectly Built-in Line Test Function to detect malfunction cause of subscriber/subscriber line that connected on the RT side. Able to test from the Network Management Function on COT side.

TDM over IP capability to bridge between TDM network & IP network

3. Applications and services

The ULC-1000AN MSAN System includes configurations for the following applications:

Central office-site applications (CO), co-located with the local exchange (LE), indoor application

Remote applications:

1. Remote indoor applications

Switch consolidation

Extension of service area

2. Remote outdoor application

Applications with optical fiber for remote access to Remote Terminal via Optical point-to-point, self-healing ring, star or linear topologies

The ULC-1000AN MSAN System supports narrowband and broadband xDSL Services.

3.1 Narrowband Services

The narrowband services are traditional POTS and analog services, V5 switched services, and non-switched services. The following narrowband services are supported.

3.1.1 Traditional POTS and Analog Services

POTS (customer-specific POTS with different features) for example pulse metering and reverse battery.

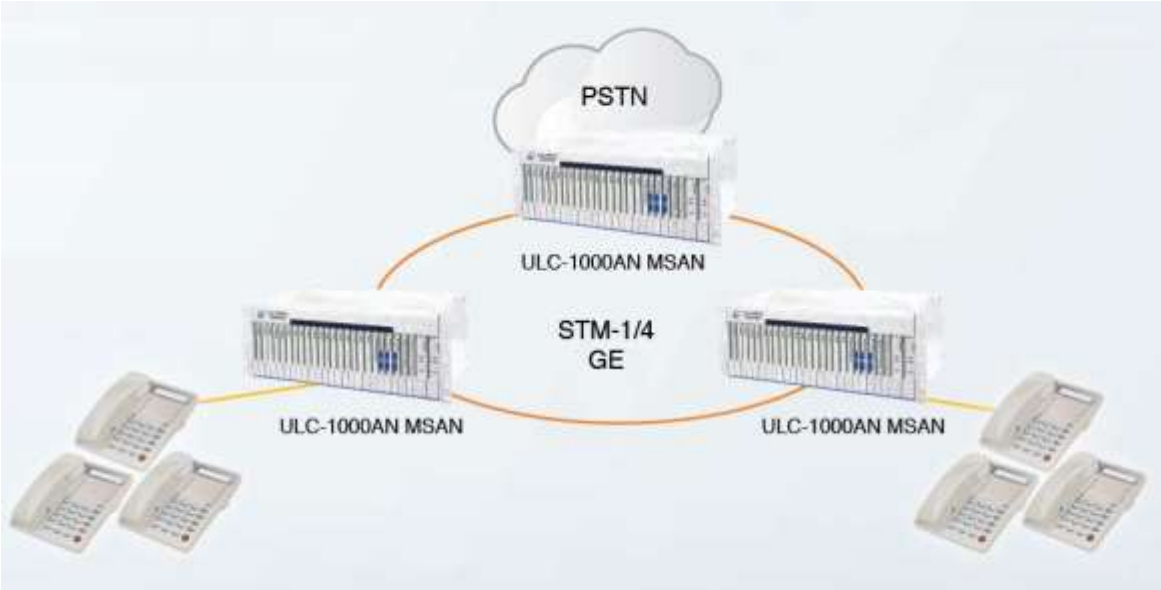
3.1.2 V5.2 Switched Services

On the subscriber side the following services are supported: POTS (customer-specific POTS with different features; for example pulse metering, reverse battery).

ISDN BRA: dial-up connection, 2 x 64-kbps transmission capability for voice and data (two B-channels) and 16-kbps transmission capability for signaling and data (D-channel).

ISDN PRA: Transmission capability up to 30 B-channels (30 × 64 kbps) and one D-channel (64 kbps).

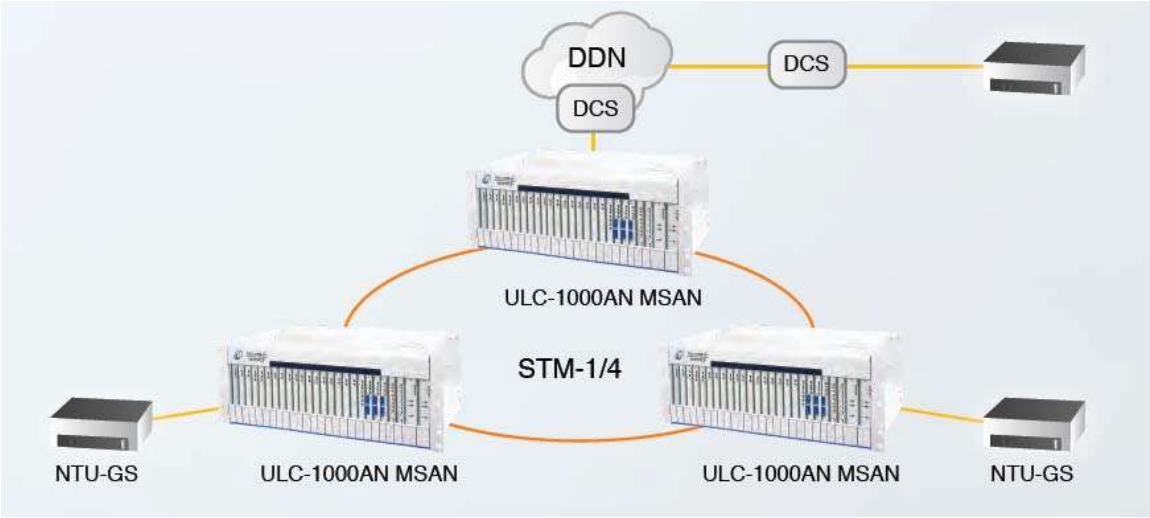
On the network side the following services are included: V5.2 switched services, up to 16 E1 per V5 group.



3.1.3 Analog and Data Leased Line

On the subscriber side the following services are included:

- Analog leased lines (ALLs), Transmission only, 2/4-wire E&M
- Digital leased lines (DLLs) with or without managed NTUs
- Two kinds of G.SHDSL nx64 kbps leased line services
- A digital leased line via interfaces according to ITU V.35
- A digital data network (DDN) leased line via interfaces according to G.703.
- 2 Mbps leased line services via interfaces according to G.703.



3.2 Broadband xDSL services

The following xDSL services are supported using service-independent IP and/or ATM technology:
Multi-ADSL consists of the Splitter Unit (POTS Filter) which can be configured the software to support the ADSL, ADSL2, and ADSL2+, and can support the xDSL standard shown below:

ITU-T G.922.1 – Asymmetrical Digital Subscriber Line (ADSL) transceiver (G.DMT) annex A (Upstream 800 Kbps, Downstream 8 Mbps)

ITU-T G.992.2 – Asymmetrical Digital Subscriber Line (ADSL) transceiver (G.LITE) annex A (Upstream 512 Kbps, Downstream 1.5 Mbps)

ITU-T G.992.3 – Asymmetrical Digital Subscriber Line (ADSL2) transceiver 2 annex A (Upstream 1 Mbps, Downstream 12 Mbps)

ITU-T G.992.3 Annex M

ITU-T G.992.5 – Asymmetrical Digital Subscriber Line (ADSL2+) transceiver 2+ annex A (Upstream 1 Mbps, Downstream 24 Mbps)

ITU-T G.992.5 Annex M

ITU-T G.994.1 Handshake procedure for Digital Subscriber Line (DSL) transceiver

ITU-T G.997.1 Physical layer management for Digital Subscriber Line (DSL) transceiver

Single-pair high bit-rate digital subscriber line (SHDSL) service with equal transmission rates for both the upstream and the downstream direction based on use of the TC-PAM line coding scheme.
The ULC-1000AN MSAN System is transparent for the end user protocol. The interface to the subscriber and the end user protocol depend only on the used CPE.
The ULC-1000AN MSAN System supports several CPEs with different interfaces.

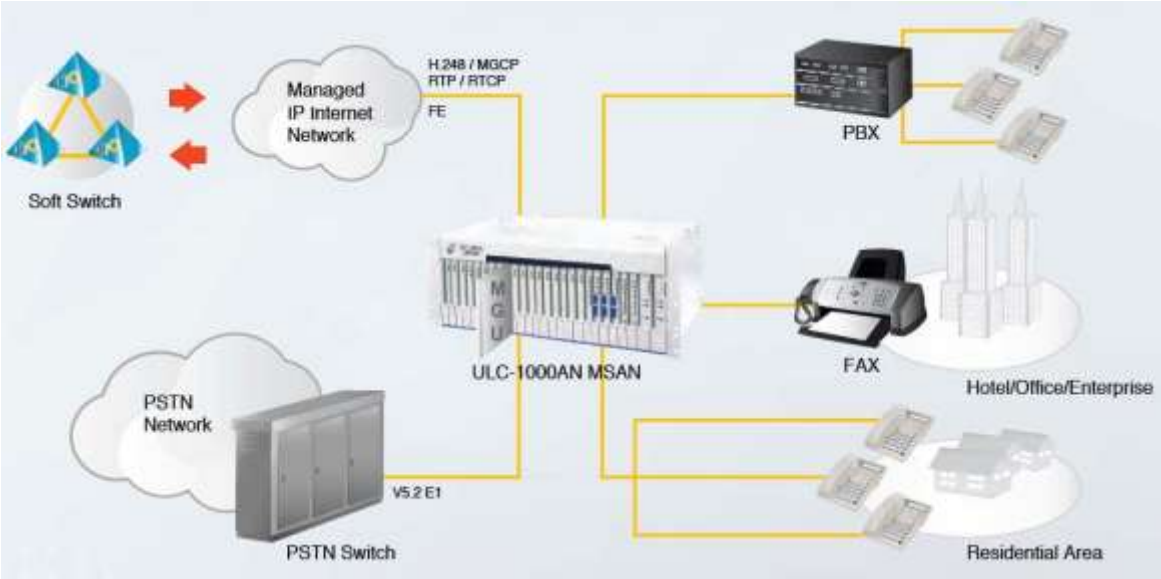
3.3 Services in Next Generation Network

3.3.1 VoIP Services

The ULC-1000AN MSAN provides VoIP voice access Service with the Soft switch platform. Its expansible capacity enables service operators to provide extensive local and long-haul calls on IP-Based Next Generation Network, and flexibly enables fast and convenient service deployment.

The ULC-1000AN MSAN System supports VoIP services for Soft switch according to ITU-T H.248 Megaco, MGCP and ETSI TISPAN standard as below:

Voice codec G.711, G.723.1, G.729ab
Voice control protocol H.248, MECAGO, Transparent SIP Protocol
Voice Packet Transfer Protocol RTP, RTCP, RTP/UDP/IP Encapsulation.
Transparent CLIP/CLIR
Real-time fax relay (T.38)
Echo cancellation (G.168)
Fax detection
Fax and modem pass through
DTMF Detection and relay (RFC 2833)
Transparent Voice activity detection (Silence suppression and comfort noise Generation)
Support Voice quality of Service (QoS) features, including IP Precedence (TOS), IP DiffServe or RSVP.



3.3.2 Layer 2 Data Switch Function

Support Spanning Tree working as IEEE802.1d and IEEE802.1w standard.
Support VLAN tagging to divide customer group as standard of IEEE802.1q
Support Link Aggregate as standard of IEEE802.3ad
Have ability for Quality of Service (QoS) to put data order as important and able to do Class-of-Service (CoS) Prioritization for divide data group upon to the importance of IEEE802.1p standard at least.
Support IP Multicast with IGMP (Internet Group Protocol) Snooping (v1/v2)
Support PPPoE working from the user
Support Transparent SIP Protocol and H.323 Protocol working with those advanced VoIP and Layer 2 data switch function, ULC-1000AN MSAN have ability to support services as Voice over DSL (VoDSL) Service, Virtual Private Network (VPN) Service, Video on Demand (VOD), VLAN (Virtual LAN), Voice over IP and Multi-Media service, Internet Protocol (IP) service, IP TV Broadcasting, and LAN-to-LAN service.

Broadband Application - Virtual Private Network Service

4. Housing Configuration

Depending on the application, different types of housing to install ULC-1000AN configurations are available:

DC-powered 19” Standard Rack

ULC-1000AN MSAN equipment shelf could be mounted in 19” standard rack (Indoor Cabinet) for indoor application. One 42U height rack could contain up to 8 equipment shelves (one main shelf + seven expansion shelves) for up to 1000 subscribers. Equip with DC power distribution panel, Fuse and Alarm panel.

Indoor Cabinet

42U

28U

Outdoor Cabinet

Azmoon Keyfiat outdoor cabinets have various dimensions and different capacities and its components are as follows:

- Metallic cabinet frame with dimensions proportional to its capacity.
- MDF unit equipped to two kinds of terminal NC and NO with extended to 1:2 or more
- Place of battery (4x12v)
- Rectifier charger 48v that it feeds from single phase and it's switching type.
- 19 inch rack that it's used to fix sub rack systems
- ODF-OCDF for fusion place of fiber optic and for setup fiber optic.
- Air conditioner system proportional different capacity cabinet (active cooling for high capacity ONUs and passive cooling for small size ONUs).

Mechanical specifications for ONUs :

1- Material: Iron
2- Coloration : head sealed paint
3- Color number :7032
4- For high capacity outdoors : protection class of the inner shell is IP65
5- For small size outdoors : protection class of the inner shell is IP55
6- Designed with Anti-earthquake safety function and compliant with FCC68.302 and ETSI300019 ;
7- Relative humidity 5% ~ 95% ;
8- Operating temperature : -30c ~ +55c
9- In High capacity Outdoor cabinets are Active cooling box with Rotary compressor 1200 BTU.
   In Small capacity Outdoor cabinets are passive cooling box with Heat exchanger units or fan units.
10- Power Input: 220 v/ 50 Hz ~ 60 Hz
11- Ac counter place
11- 12 core ODF-OCDF
12- 1 to 2 central to subscriber MDF

This outdoor cabinet configuration could be installed in outdoor environment for remote application. Different types and sizes of outdoor cabinet are available. Outdoor cabinet integrate the ULC-1000AN MASN equipment with customer-specific accessories, such as AC/DC rectifier, backup batteries, MDF and cooling system inside one enclosed housing.

Outdoor Cabinet

ONU-600~1000

ONU+

ONU-240

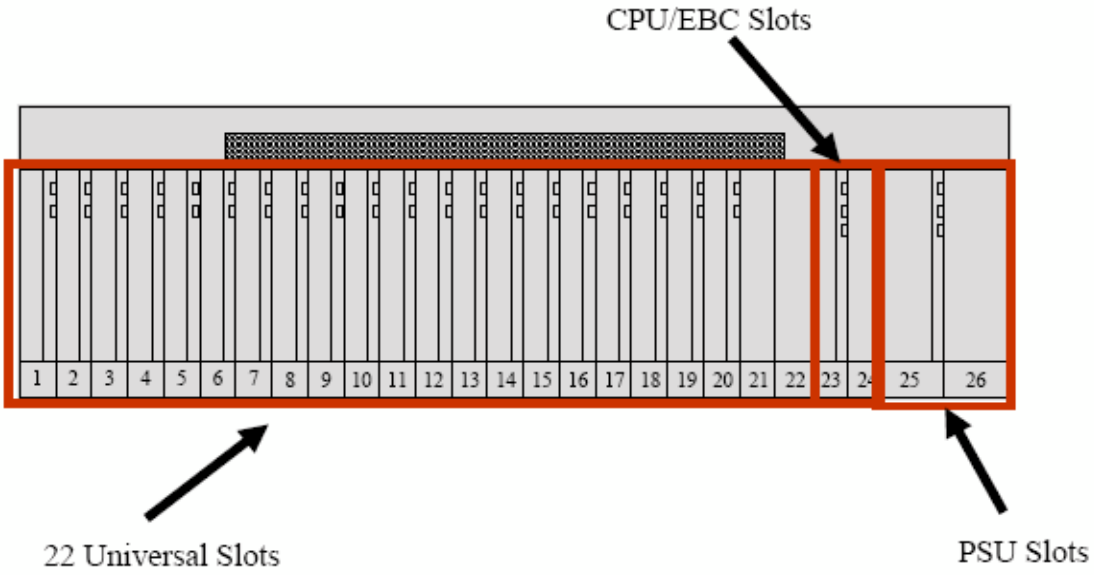
ONU-120

Mini ONU-60

5. Shelves and Components

The ULC-1000AN equipment shelf (CBA) is a metallic shelf to contain application cards.
Shelf Dimensions (H x D x W): 176 mm x 385 mm x 435 mm

Each shelf consists of 26 slots:
™Slots No.1~22 for Service/Function/Transceiver Units
™ Slots No. 23~24 for Central Processor Unit
™ Slots No. 25~26 for Power Supply Unit



6. System Units

The following components are used or can be used in the ULC-1000AN MSAN Equipment Shelf:

6.1 Common Control Units

Power Supply Unit (PSU)

One or two PSU cards per shelf at the most left hand side of 25th and 26th slots. Local Power Supply Unit (L-PSU): is used at COT side or the terminal doesn't require ringing generator. Support 1+1 redundancy optionally.
Remote Power Supply Unit (R-PSU): is used at RT side, a ringing generator is built-in for telephone ringing. Support 1+1 redundancy optionally.

Central Processor Unit (CPU)

One or two CPU cards per system or subsystem at the main shelf, it is located at the left hand side of 23th and 24th slots. CPU is used to control the terminal system, communication all application packs internally and provide management interface to EMS. Support 1+1 redundancy optionally.

Expansion Bank Control Unit (EBC)

One or two EBC cards per expansion CBA shelf and be located at the left hand side of 23th and 24th slots. EBC is used to control the application packs in the expansion shelf

and communicate with CPU. Each EBC links to an ELU card at the main shelf via a multi-mode fiber (EBF). Support 1+1 redundancy optionally.
The universal slots from 1st to 22nd in the equipment shelf can be equipped with any of kind of functional units, transceiver units, narrow band service units, broadband service units, etc.

6.2 Functional Unit

Expansion Link Unit (ELU)

Links to an EBC via multi-mode fiber (EBF), transfer the messages between CPU and EBC. This unit should be located at main shelf of a multi-shelves terminal system. Support 1+1 redundancy optionally.

Expansion Link Unit-2 (ELU2)

Links to another ELU2 via optical fiber (ELF), transfer the messages between subsystems. This unit should be located at subsystem main shelf of a multi-subsystem terminal system.

Metallic Test Unit-Subscriber (MTU or MTU-S)

MTU or MTU-S unit support complete Line Test Function to check damage cause of lease that is connected on RT side, and able to test from Network
Management Function and Local Craft Terminal (LCT) on COT side. MTU or MTU-S able to check and display the testing subscriber line value as below:
DC Voltage of R-T, R-G and T-G
AC Voltage of R-T, R-G and T-G
Capacitance of R-T, R-G and T-G
Insulation resistance of R-T, R-G and T-G
Loop resistance

For xDSL service, following values could be tested by xDSL line unit at remote terminal (RT) and display the data to EMS.
Down Link speed for xDSL (for Broadband service)
Up Link speed for xDSL (for Broadband service)
MTU/MTU-S should be located at each main shelf of subsystem main shelf, and use MTU-cable daisy chain to other expansion shelves

V5 Protocol Unit (V5P)

Co-work with E1V5 unit and process V5.2 Protocol with V5 switch. The primary V5P unit should be located at the 22nd slot of the main shelf.
Support 1+1 redundancy optionally.

Media Gateway Unit (MGU)

Process VoIP Access Gateway Protocol, ITU-T H.248 Megaco and interface to the VoIP network. It should be located the main shelf.

Timing Generation Unit (TGU)

Generates 2Mb/s timing clock signal and be used by other equipment at the same location. It should be located the main shelf.

ISDN Clock Unit (ISDN CLK)

It is used to synchronous with ISDN switch for ISDN services, if no other digital interface available for timing synchronization between COT and ISDN switch.

Layer 2 Date Switch Unit (GE-SW)

An integrated Layer 2 Date Switch Unit in system to support advanced data operation features, such as VLAN, VPN, IGMP, etc.. Eight 100/1000Base Ethernet ports per unit, two of them could be configured as 1000Base Ethernet optical interface by plug-in SFP module. Two types of GE-SW with different switch capacity, 8 Gbps and 12 Gbps.

Bus Adapt Unit (ADP)

It is a signal bridge unit between TDM bus and high speed SDH bus on the CBA backplane. It should work with STM1-XCVR2, STM1-XCVR2E and STM4-XCVR2E.

Ethernet to V.35 Conversion Unit (EV35)

It converts Ethernet interface signal to a V.35 interface, a four port hub also be contained.

6.3 Transceiver Unit

Transceiver Unit allocated in primary shelf to link COT (or RT) with RT, has redundancy option. Following types of transceiver unit are available for different application:

6.3.1 Optical Transceiver Unit

Fiber Optical Transceiver Unit (FO-XCVR)

STM-1 Transceiver Unit (STM1-XCVR)

STM-1 Transceiver Unit-E, (STM1-XCVRE), STM-1 transceiver unit with 2 Ethernet ports

STM-1 Transceiver Unit-2, (STM1-XCVR2), full rate STM-1 transceiver unit

STM-1 Transceiver Unit-2E, (STM1-XCVR2E), full rate STM-1 transceiver unit with 2 Ethernet ports

STM-4 Transceiver Unit-2E, (STM4-XCVR2E), full rate STM-4 transceiver unit with 2 Ethernet ports. One VC-4 is used to transport TDM traffic and other three VC-4s are used to transport Ethernet package data.

Dual STM-4 Transceiver Unit, (STM4D-XCVR), dual STM-4 ports and full rate transceiver unit.

All of these optical transceiver units could be equipped with customer specific optical module for different transmission distance, short haul, long haul and extra long haul.

6.3.2 Electrical Transceiver Unit

- E1 Transceiver Unit (E1X-XCVR)
- Dual E1 Transceiver Unit (E1DX-XCVR)
- Tri-E1 Transceiver Unit (E1TX-XCVR2)
- Quad E1 Transceiver Unit (E1QX-XCVR2)
- E3 Transceiver Unit (E3X-XCVR)

Those E1/E3 transceiver units could be interface to existing SDH/PDH transmission network. An impedance converter panel, TCF-16 is available to adapt the E1 impedance between 120 ohm and 75 ohm as customer specific.

- E1X-XCVR (G.703 E1 Transceiver Unit)
- G.SHDSL E1 Transceiver Unit (E1GS-XCVR), uses G.SHDSL technology and twist-pair as the transmission media, suit for low capacity and lack of fiber application.

6.4 Analog Subscriber Channel Unit

ULC-1000AN MSAN supports variety types of analog subscriber channel unit as below:

LI-POTS: 6 channels of FXO with reverse battery
LI-APOT: 6 channels of FXO with reverse battery and 12/16 kHz metering function
RI-POTS: 6 channels of FXS with reverse battery
RI-APOT: 6 channels of FXS with reverse battery and 12/16 kHz metering function
E&M6: 6 channels of 2/4-wire E&M Type V
L-MPI/R-MPI: 6 channels of Magneto Phone Interface
DID: 6 channels of Direct Inward Dialing voice
HL-POTS: 6 channels of Hot line voice

6.5 Narrowband Data Channel Unit

ULC-1000AN MSAN supports variety types of narrow band data channel unit as below:

ADSU: 2 channels of asynchronous data or 1 channel of synchronous channel, data rate from 600 bps to 64 kbps with V.24, V.28 or V.35 interface
CO-64: 3 channels of G.703 Co-directional 64 kbps
IDL-128: 6 channels of IDSL, link with NTU-128 at customer site to support 64 or 128 kbps with V.35 interface
L-ISDN/R-ISDN: 6 channels of ISDN BRI U-interface at COT side or RT side
N64: 1 channel of Nx64 kbps with V.35 interface
N64GS: 2 channels of Nx64 kbps with G.SHDSL interface, link with NTU-200 at customer site V.35, E1 or Ethernet interface
DLAN: 2-LAN/1-WAN 10/100BaseT Ethernet channel unit, to provide up to 8 Mbps Ethernet end-to-end leased line services
E1X: 1 channel of framed E1 unit
E1AX: 1 channel of asynchronous E1 unit
E1DX: 2 channels of framed/unframed E1 unit
E1TX2: 3 channels of framed/unframed E1 unit
E1QX: 4 channels of framed E1 unit
E1QX2: 4 channels of framed/unframed E1 unit
(All those E1 channel units could support ISDN PRA service)
E1V5: 1 channel of V5 E1 unit, link to V5 switch

6.6 Broadband Subscriber Line Unit

ULC-1000AN MSAN supports variety types of broadband subscriber line unit as below:

ATU-C: 4 channels of ADSL line unit, with or without on-board POTS splitters
ATU-C8: 8 channels of multi-ADSL line unit, with on-board POTS splitters

ATU-C16: 16 channels of multi-ADSL line unit, without on-board POTS splitters
STU-C: 4 channels of SHDSL line unit.
IMA4: 4 E1 IMA channel

6.7 Broadband Network Interface Unit

ULC-1000AN MSAN supports variety types of broadband network interface unit as below:

ATMU-IMA4: 4 E1 IMA interface to ATM switch
ATMU-IMA8: 8 E1 IMA interface to ATM switch
ATMU-STM1: ATM-based STM-1 optical interface to ATM switch
ATMU-LAN: 100BaseT Ethernet interface to IP Network, support IP-based DSLAM application
ATMU-GE: 1000BaseT Ethernet interface to IP Network, support IP-based DSLAM application

6.8 Network Terminating Unit

The network terminating units (NTUs) are customer site equipment used by the customers. They work with corresponding data channel units in the ULC-1000AN. NTU-128 works with IDL-128. NTU-200GS works with N64-GS. To terminate other typical of digital services, the customer can use NTU equipment from other vendors, such as E1 CSU/DSU to terminate E1 line.

NTU-128: Terminating IDSL interface to support 64 or 128 kbps data rate with V.35 interface
NTU-128S: Terminating IDSL interface to support subrate data rate with V.24, V.28 interface
NTU-200GS: Terminating G.SHDSL interface to support Nx64 kbps data rate with V.35, E1 or Ethernet interface
NTU-200GS E1: Terminating G.SHDSL interface to support 2.048Mbps data rate with G.703 E1 interface

6.9 Supporting Unit

Additional unit or panel may be used to completed system application as below:

TCF-16: 16-port of E1 impedance converter panel, convert E1 line impedance between 120 ohms (twist-pair wire wrap type) and 75 ohms (BNC type), mounted in 19” standard rack with 1 U height
FAA: Fuse and alarm panel
ODF: Optical Distribution Frame
DDF: E1 Distribution Frame
Fan unit
Heat exchanger: Equipped in outdoor cabinet optionally
AC/DC rectifier for AC-powered remote application
Outdoor cabinet

7. Interfaces of ULC-1000AN MSAN System

The ULC-1000AN MSAN System provides different interfaces for narrowband services and for xDSL services.

7.1 Interfaces for Narrowband Services

The following types of interfaces are used for handling narrowband services:

On the Network Side

2-wire analog POTS line
2/4-wire analog E&M
E1 interface for Leased line services
V5.2 interfaces with line concentration according to ETS 300 347
100BaseT Ethernet H.248 Megaco

On the Subscriber Side

POTS
ISDN BRA
ISDN PRA
2/4-wire analog E&M leased line
Asynchronous and synchronous data
IDSL 64 or 128 kbps digital leased line via interfaces according to ITU V.35
SHDSL Nx64 kbps digital leased line via interfaces according to ITU V.35, G.703
Unstructured 2 Mbps leased line via interfaces according to ITU G.703

7.2 Interfaces for Broadband Services

The following types of interfaces are used for handling broadband services:

On the Network Side

E1 IMA
ATM based STM-1 optical
100BaseT Ethernet
1000BaseT Ethernet
1000Base-SX/LX/LH/LZ optical Ethernet (with GE-SW card)

On the Subscriber Side

ADSL (lite and Gdm)
ADSL2
ADSL2+
SHDSL
E1 IMA

7.3 Synchronization Interfaces

For recovering timing the following sources can be used:

Physical E1 links
Transmission interface from STM-1/4 trucking

Station clock from an external synchronization equipment delivering a synchronization signal to the clock interface connected at the shelf connection panel.
While no external timing sources available, system will use it's internal clock as the system timing.

7.4 OAM&P Interfaces

- CIT port (EIA-232C interface) for line command message protocol
- Via a D-type connector on the faceplate of the main shelf can be connected. This interface is typically used during initial installation and other maintenance related activities
- 10BaseT Ethernet interface for SNMP protocol based on TCP/IP via a RJ-45 connector in the main shelf connection panel
- Remote operations channel (ROC) within the transmission interface between COT and RT. It lets the operation could operate the remote terminal from local terminal.
- Alarm interfaces
- The CPU supports six alarm closure inputs to indicate an external fault.
- Light emitting diodes (LEDs) located on the faceplate of the packs can be used as local alarm interfaces.

8. Network Topologies and System Capacity

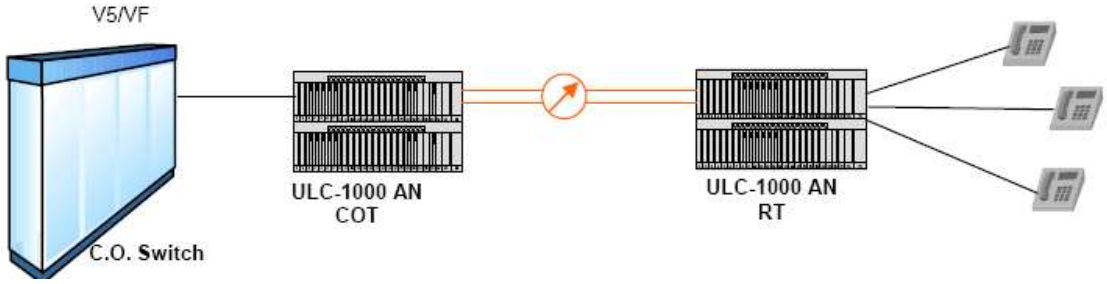
8.1 Network Topologies

A complete ULC-1000AN access network normally includes a terminal located at central office, named as Central Office Terminal (COT), and it will connect to several of terminals located at remote sites, named as Remote Terminal (RTs). The COT and RTs form an access network with different types of network topologies. The ULC-1000AN can support the following network topologies:

Point-to-point
Star
Multi-point add/drop
Tree
Self-healing ring
Or, mix of above network configuration

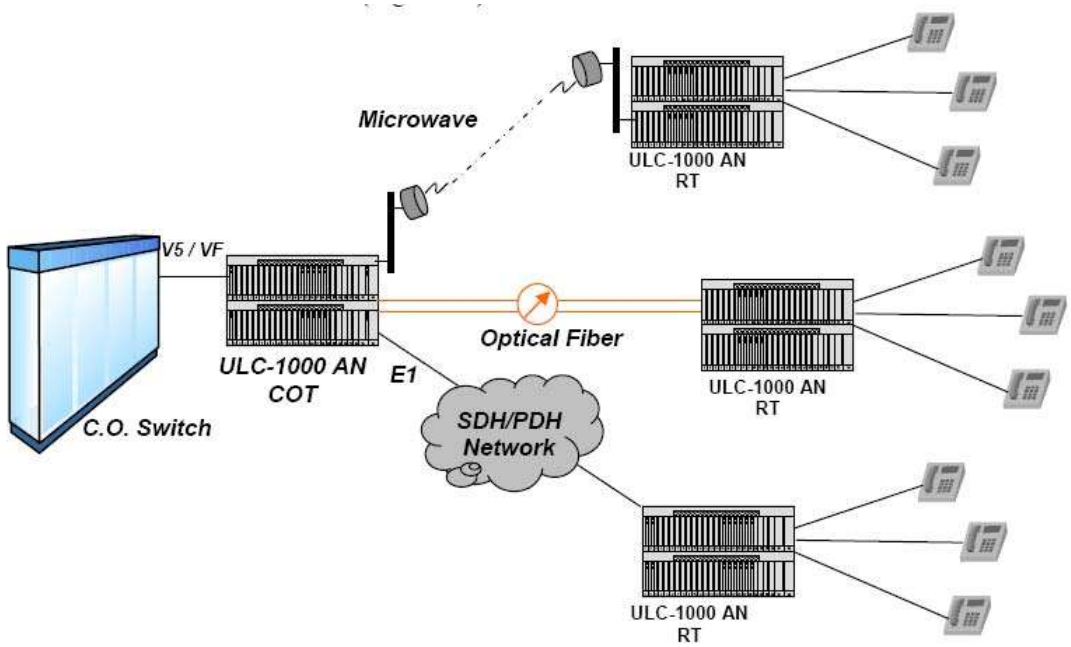
8.1.1 Point to Point Network Configuration

Figure below shows the universal point-to-point configuration. The COT is located at the same site with the CO switch. The interface to the exchange can be either 2-wire analog or V5.2 E1 link. Various subscriber services are provided from the RT, which is located at remote site. In addition to fiber, the transmission media between COT and RT, copper (G.SHDSL) or microwave based on E1 signals are also supported.



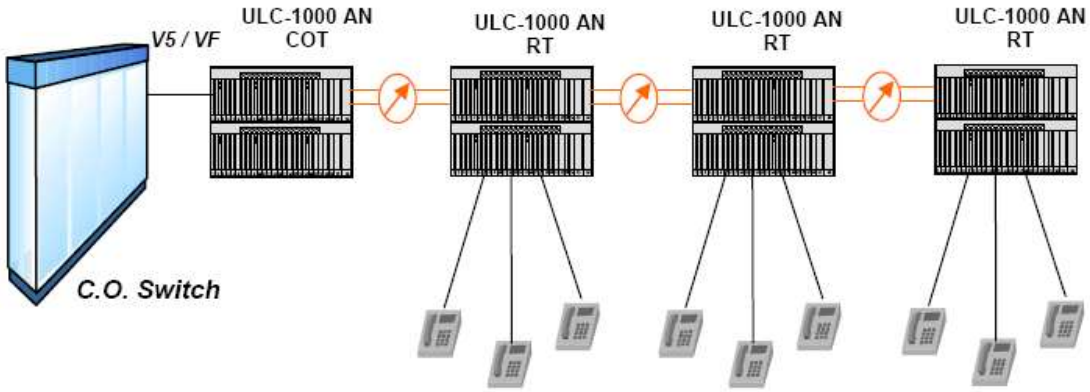
8.1.2 Star Network Configuration

A single COT can be connected to several of RTs. Up to 4 directions could be homed to a COT.



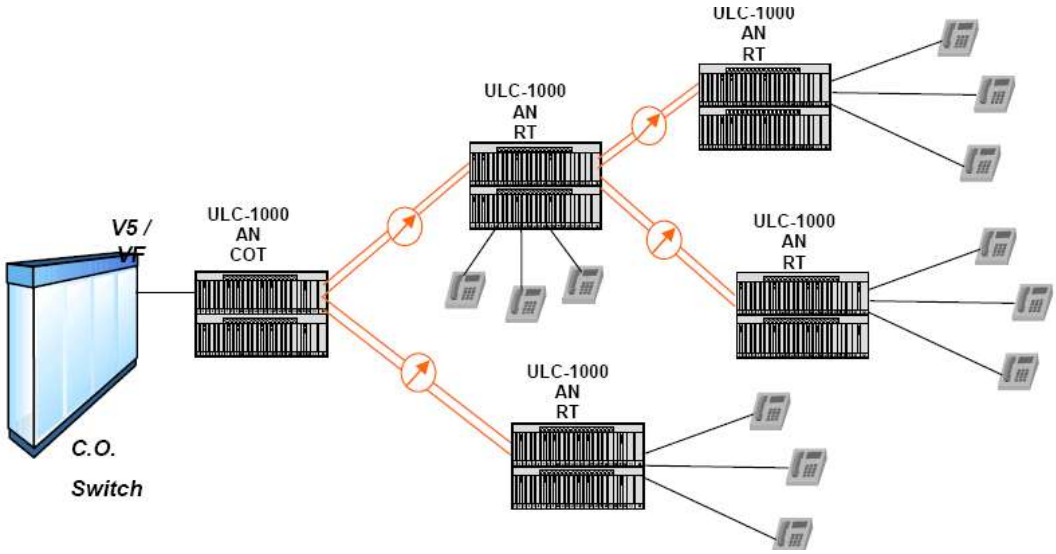
8.1.3 Multi-point Add/Drop Network Configuration

Several of RTs can be connected in a linear add/drop topology. Each RT provides services for nearby subscribers. This configuration is provided for applications where transport protection is not a major concern and low cost deployment is the major issue. Up to four RTs can be chained to a COT.



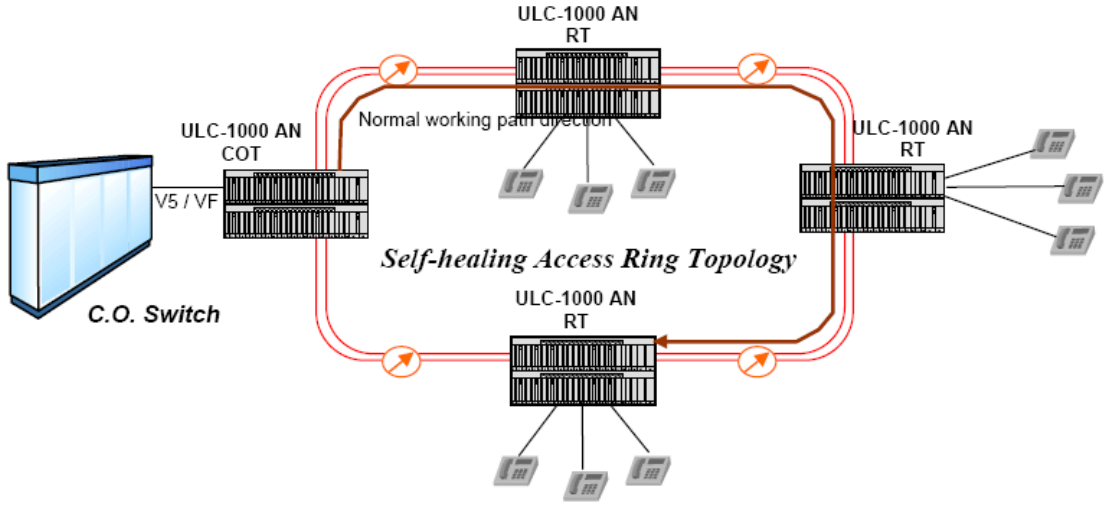
8.1.4 Tree Network Configuration

The linear drop and star topologies can be mixed together to form a tree network to serve sparsely distributed subscribers. Up to eight RTs can be homed to a COT.

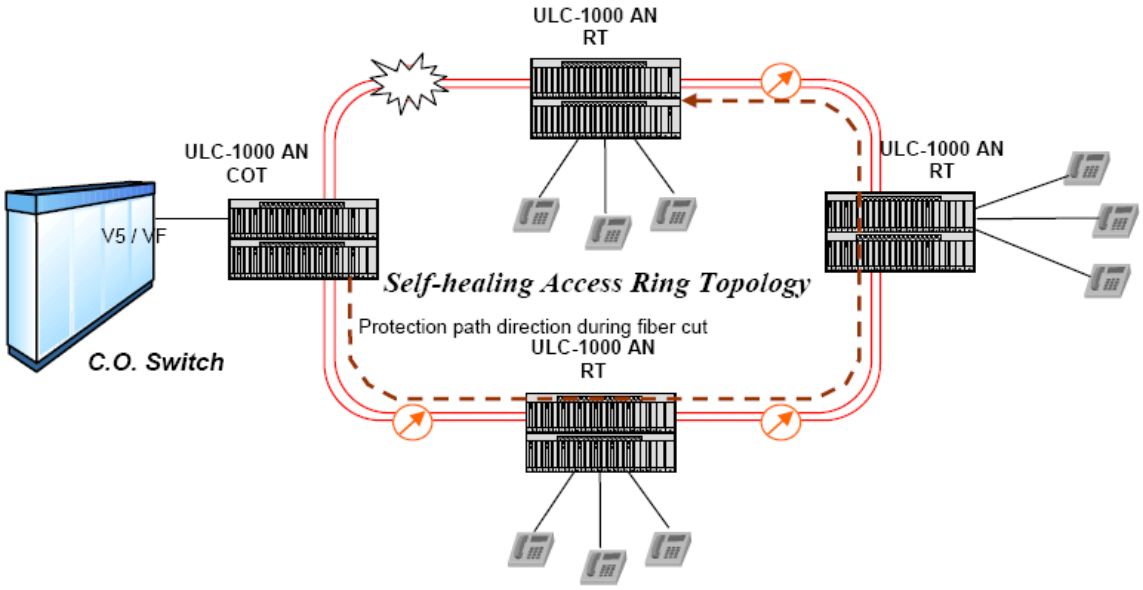


8.1.5 Self-healing Ring Configuration

ULC-1000AN can be configured in a self-healing ring topology to provide traffic restoration capability in case of a transmission link is failed, such as a fiber cut. An example is given below for a ring topology using built-in fiber transceiver unit. In ring topology, up to sixteen RT nodes can be “ringed” to a COT.



Normal working path direction



Protection path direction during fiber cut

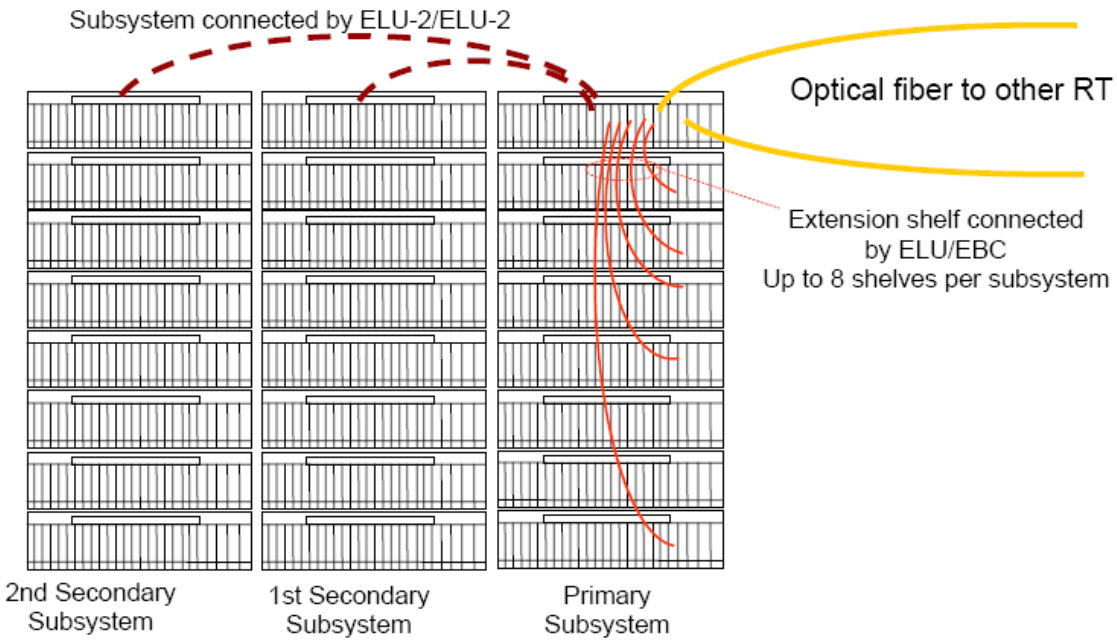
8.2 System Capacity

ULC-1000AN capacity could be scalable from small to large. The smallest system terminal may just only contain one CBA equipment shelf and support up to 120 POTS lines with PSU, CPU and transceiver unit.

The system could be expanded by additional expansion CBA shelves. The first shelf of a terminal system is also known as the main shelf which contains CPU unit, transceiver unit and other common units. An expansion shelf links to the main shelf by ELU/EBC units via an EBF multi-mode fiber. Up to seven expansive CBA shelves could link to a main shelf to about 960 POTS lines.

After seven expansion shelves had been link to a main shelf, the terminal capacity still can be expanded by another subsystem which contains other eight shelves. ELU2 units are used to link the primary subsystem and other subsystems, those subsystems share the same bandwidth of transmission fiber.

One large terminal could contain more than four subsystems. Total capacity of a large terminal could up to 2000 POTS lines without concentration.

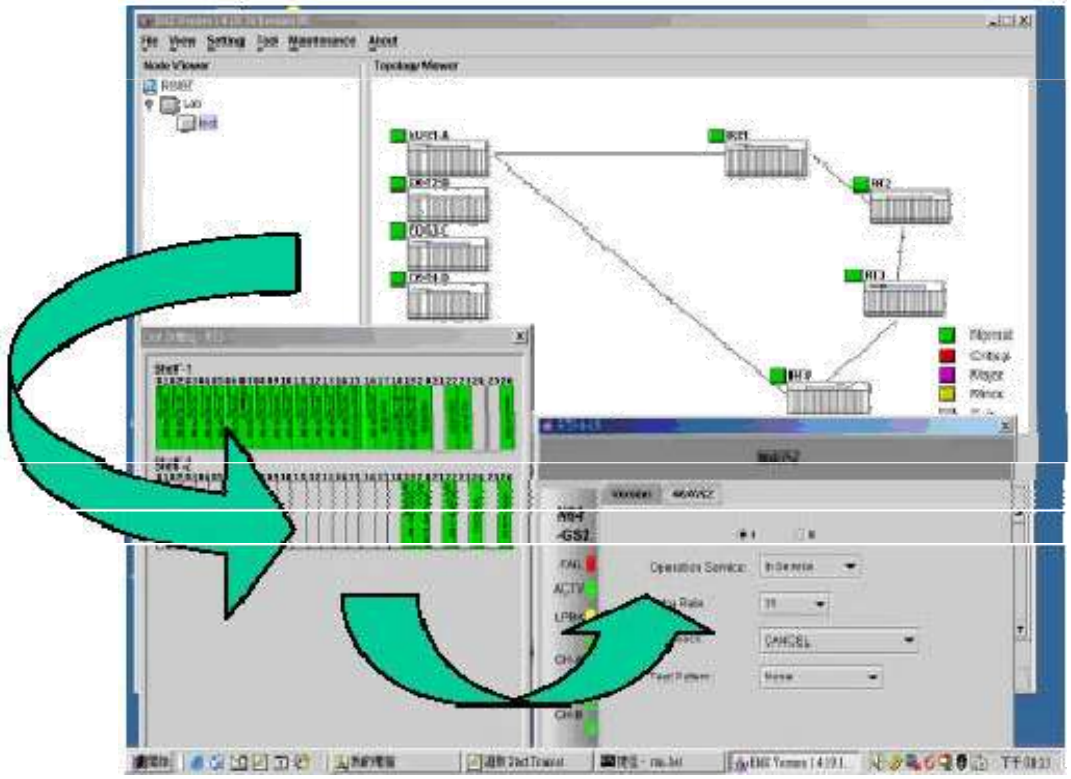


9. Network Element Management Tools

Azmoon Technologies provides software for the initial system turn-up as well as for the central and regional management scenarios based on the standard Telecommunication Management Network (TMN) models by supporting the tasks of the International Standardization Organization) (ISO) functional areas.

The following software tools are used for Operations, Administration, Maintenance, and Provisioning (OAM&P) actions and tasks of the ULC-1000AN MSAN System:

- Craft Interface Terminal (CIT), it could manage one access network element that means one COT with the connected RTs at a time.
- NMS Software, it could be is used to monitor the whole access network over multiple NEs. The EMS can manage hundreds of network elements (NE) at a time.



ULC-1000 MSAN NMS Software

10. Operations, Administration, Maintenance, Provisioning

The OAM&P management actions are as follows:

Configuration Management
Fault Management
Performance Management
Security Management.

The NMS Software provides the following main characteristics/functions:

Support of all ULC-1000AN MSAN Systems features (telephony and data)
Equipment overview
Telephony and data service provisioning
Common alarm handling for all network elements (NEs)
Test management
Data performance monitoring
Report, log, backup and restore functions
Southbound interfaces:

- SNMP NE access via UDP/IP for data agents based on DCN

User security handling (user profiles, NE domains)
Online help
Multi user access
Northbound interfaces (Option)

Configuration Management

The configuration management supports the complete range of graphical functions to provision and maintain ULC-1000AN MSAN. Network topologies, shelf views and self-explaining menus are navigating the operator to configure the following services:

Telephony

POTS
ISDN BRA
ISDN PRA
Structured leased line services (64 kbps or Nx64 kbps leased lines)
Unstructured leased line services.

Data

IP/ATM virtual paths
IP/ATM virtual channel connections carried over ADSL/SDSL/SHDSL lines.
Inventory management
Equipment provisioning and maintenance (subshelves, packs, ports)
Telephony and data service provisioning
Clock synchronization
System/equipment/service status
NE database backup and restore
System date/time synchronization

Fault Management

The fault management supports the operator in detecting, displaying, localizing and logging any faults occurring in the managed network.

Handling of alarm severity (critical, major, minor)
Receiving of autonomous alarm messages
Retrieving of alarms per NE
Retrieving of alarm and event logs from NE
Filters to display pre-selected alarm types only.

Performance Management

The performance management provides facilities for retrieving, storing as logs and printing the logs of the NE performance data to ensure the quality of service.

Security Management

The security management functions control the access to the EMS and to the managed NEs. The following main functionalities are offered:

EMS user administration
EMS user security profile
No additional NE login for current EMS user
EMS access via login name and password
Inactivity user session time-out.

11. General Specification

Hardware

Shelf Dimensions (H x D x W)
CBA-C Front Access Shelf:
230 mm x 310 mm x 435 mm
CBA-A/C Rear Access Shelf:
176 mm x 385 mm x 435 mm
Power Supply
VDC: -42V to -72V
VAC: 100V to 240V
Power Consumption: max.75Watt per shelf
Operating Requirements
Temperature
Operating: 0 ~ 65 oC
Short-term Operating: 0 ~ 70 oC
Storage: -15 ~ 65 oC
Relative Humidity
5% to 95% (non-condensing)
Standards and compliances
CE, EN61000-4-5
EN55022 ClassA / CISPR 22

Interface and Protocol

Management
SNMP Manageable
CIT through RS-232 console
In-band management
Out of Band Management
ATM Support
Up to 8 PVCs per port
F4/F5 OAM loopback
RFC 2684 bridged and routed modes
RFC 2516 PPPoE
VOIP Protocol
MGCP
MEGACO (H.248)
SIP (transparent mode and terminating mode)
Subscriber Interface
POTS, Payphone, E&M, ITO
V.11, V.24, V.28, V.35
IEEE 802.3 Ethernet
ADSL/ADSL2/ADSL2+, G.SHDSL
Network Interface
Voice Frequency
V5.2 E1, ITU-T G.703/G.704 E1
ATM STM-1, E1 IMA
100-BaseT Ethernet
1000-BaseT/X Ethernet
H.248/IP/Ethernet
Transmission Interface
ITU-T G.703/G.704 E1
STM-1, STM-4
Gigabit Ethernet
G.SHDSL
Switching and Service
L2 switching
Up to 8K MAC address learning
Ethernet CoS per IEEE 803.1p
STP/RSTP
Link Aggregation per IEEE 802.3ad
VLAN
Support 4K VLAN
VLAN Tagging pass-through
Multicast
Support 512 Multicast Groups forwarding
Support IGMP Snooping v2/v3
QoS Classification
Support IEEE 802.1p 4 priority queues, traffic classification, and rate limiting
Service Access Control
MAC address filtering
PPPoE, DHCP, and Bridge Over ATM
DHCP relay agent with option 82

Appendix A V5 Protocol in ULC-1000AN MSAN

The V5 protocol stack provides ITU-T V5.2 call processing, link control protocol functions (layer 2) and layer 1 functions with alarm detections. The functions of V5 protocol is provided in a V5P board which is directly attached to the TDM bus. The system provides up to 16 E1 interfaces for V5.2 applications.

Figure below shows the V5.2 system interface between ULC-1000AN and V5 switch. Table 1 shows the functions of V5.1/V5.2. Since V5.2 are more advance and popular than V5.1, ULC-1000AN supports V5.2 only.

V5.2 is a message-oriented protocol that supports complex feature operation unavailable with earlier bit and tone-oriented schemes like CAS and MFC-R2.
V5.2 supports CLASS features like caller ID and distinctive ringing, pulse metering, Centrex, drop, hold, conference, transfer, etc. It also provides a method for transporting ISDN D-channel messages and for allowing a rich maintenance and provisioning capability.

When the LE offers a V5.2 interface, the connection to the RT is digital and no analog-to-digital (A/D) conversion is required before the RI-POTS interface at the RT sites. This results in better voice quality, lower distortion and noise, and better voice-band data speeds. The access network equipment costs are lower than with a 2-wire LE since there are no analog line equipment costs at the COT. Migration the access network from 2-wire VF to V5.2, the POTS interface units is replaced by V5 equipment at COT terminal. At RT side, no need to be changed.

In ULC-1000AN system, backup V5.2's C-channel is implemented, which can recover from any single V5 E1 failure and bypasses the damaged E1s with dynamic channel allocation capability and load sharing to all V5 E1 links. A failure in one of the V5 E1 links does not result in a number of subscribers out of service. The system simply detects the failed E1 and reassigns the active customer to the remaining operational E1 links.

For access network applications, traffic concentration is used to achieve greater sharing of the transmission bandwidth to the RT, thereby reducing the overall network cost on a per-subscriber basis.

Expected peak traffic levels and acceptable blocking probability determine the allowable concentration rations. For PSTN networks, concentration rations of up to 8:1 can be used. The RT using V5.2 interface can concentrate multiple subscribers onto the available transmission timeslots. New subscribers can be added without expansion on transmission capacity as long as the blocking probability is acceptable. The ULC-1000AN dynamically achieves any concentration ratio based on the actual ratio of subscribers to available transmission timeslots. The service provider can simply configure the system by installing the E1 links required to best serve the subscribers.

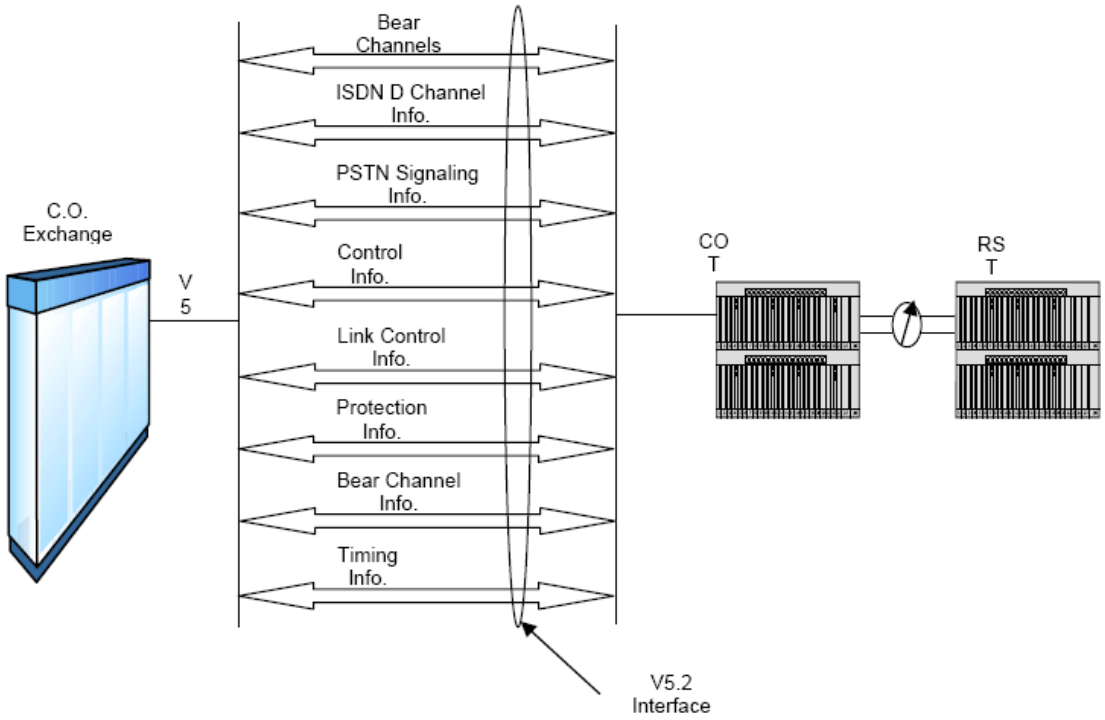


Table 1 Comparison Table of V5.1 and V5.2

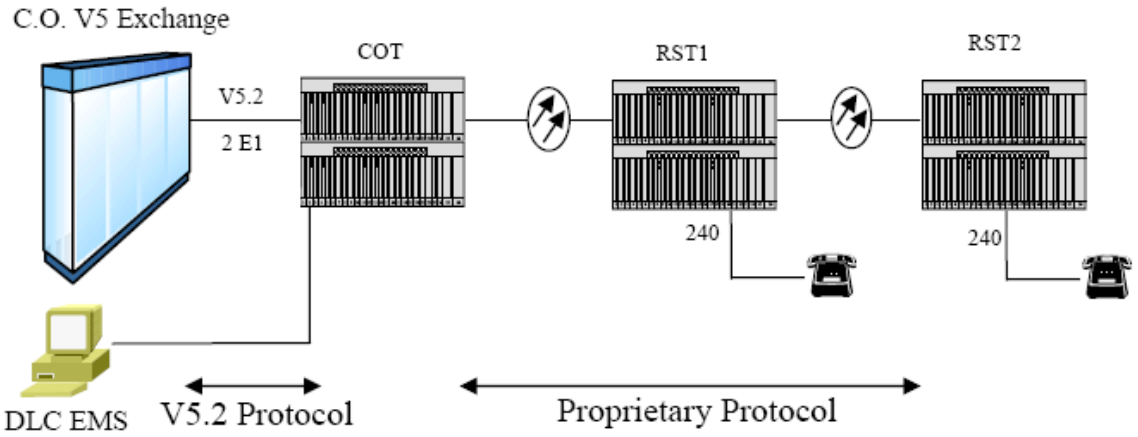
Function / Feature	**V5.1**	**V5.2**
ITU Standard	G.964	G.965
Number of E1	1	1-16
Services Supported	PSTN	PSTN
Concentration	NO	YES
C-channel	YES (1~3)	YES (1~3)
Control Protocol	YES	YES
Link Control Protocol	NO	YES
PSTN Signaling Protocol	YES	YES
ISDN D-channel Signaling and Data	Frame relayed in C-channel	Frame relayed in C-channel
BCC Control	NO	YES
Protection Protocol	NO	YES
Semi Permanent Line	YES	YES

The V5.2 protocol in ULC-1000AN is processed in the V5 Protocol unit (V5P). The V5P unit can be located either in COT or RT. When V5P is located in COT, the POTS/ISDN services are provided from RTs. When V5P is located in an RT, the same RT can also provide POTS/ISDN services. This is typically used when external transmission equipment is used and transmission links already established. The V5.2 E1 links are directly available at an RT from the external transmission equipment.

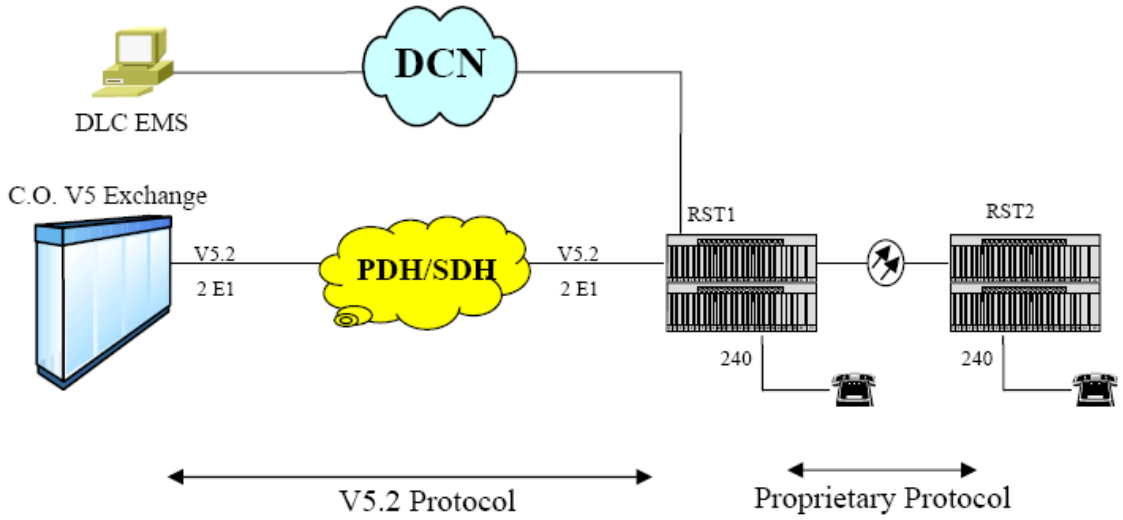
In V5 implementation, each subscriber is assigned an "AN port number". The AN port number is known to both ULC-1000AN and the LE. The ULC-1000AN also has an internal mapping between the AN port number and the ports physical location. When service is requested for a port, the LE assigns a time slot in one of the E1 links to that port and transmits that information in the V5.2 BCC protocol. After ULC-1000AN receives this information, the time slot in the E1 link is mapped to the corresponding physical port location.

Figure below shows an example with V5.2 protocol processed at the COT. The V5.2 sends call processing information to the COT over the V5.2 link. The COT converts this information to proprietary form and distributes related call processing information to all RTs. The network management system at the central office links to the NMI card at COT for network management of ULC-1000AN. If both RT1 and RT2 are equipped with 240 POTS interface, and 8:1 concentration ratio is used, 2E1 links are enough for the V5.2 interface.

Also in the other page shows an example with V5.2 processor (V5P) at RT1. Transmission network, such as an SDH/PDH, is used to link V5.2 E1 between the LE and RT1. The V5P at RT1 handles V5.2 protocol. The network management information is sent to the NMS over a data communication network (DCN). The call processing information is distributed from RT1 to RT2 over an internal proprietary protocol.



ULC-1000AN V5.2 Function-V5 Processing at COT



ULC-1000AN V5.2 Function - V5 Processing at RT 1