

Supporting Document 3.3

Technical Specification of Optical Access Network

1) Scope

This Specification describes characteristics of an Optical Access Network (OAN) with the capability of transporting various services between the user-network interface and the Service node interface.

The OAN described in this Specification should provide a flexible upgrade to meet future customer requirements, in particular in the area of the Optical Distribution Network (ODN). The ODN considered is based on the point-to-multipoint tree and branch option.

2) Features OAN

- | | |
|-----------------------------------|---|
| 2.1) Multi Service Platform: | Supports a variety of service including PSTN, Payphone, PABX, analog leased-lines, ISDN BRI and PRI, high speed digital data, CATV, xDSL, etc.. |
| 2.2) Open interface: | 2- wire analog, V5.1 and V5.2 interconnection with local exchange. |
| 2.3) Modular architecture: | The system shall be scalable |
| 2.4) Flexible network topologies: | It shall support point to point, add/drop, or self-healing ring network architecture |
| 2.5) Loop Testing Capacity: | It shall allow testing of subscriber loop and shall be integrate with existing test head and test control system |
| 2.6) Flexible Deployment: | The system shall have indoor and outdoor cabinets |
| 2.6) Network Management System: | It shall provide the ability to manage the entire network from one or more central locations. |

3 General specification

3.1 General Requirement

General framework of functional access network shall comply with ITU-T G.902

The optical access network (OAN) under consideration shall satisfy ITU-T G.983
The Bidder shall use two-fiber system as per

3.2 Design Requirement

3.2.2) The following operational requirements shall be met:

- a) Operational life > 15 years
- b) High reliability
- c) Rapid installation and Commissioning

- d) Field maintenance by module replacement
- e) Requirement only for standard test equipment

3.2.2) On-board power with each card is preferable.

3.2.3) Cards shall identify themselves automatically to the system and be fully operational at the time of installation.

3.2.4) The system shall support any service in any slot

3.2.5) In the event of a power supply failure the system shall restart automatically when the power supply is restored.

3.3 Labelling and Documentation

3.3.1) All equipment supplied shall be labelled and sign written in the English language.

3.3.2) All such markings shall be readily visible without displacing any component or cabling.

3.3.3) All documentation shall be supplied in English language

3.3.4) The bidder shall provide documentation related to the installation operation and First - level & Second-level maintenance of any proposed equipment.

3.4 Equipment Spares and Test Instruments.

3.4.1) The bidder shall include in the proposal a quantity of equipment spares for five years operation of the system.

3.4.2) The bidder shall give price escalation formula for future supplies of spares applicable for the life time of the equipment.

3.4.3) Test instruments necessary for the effective maintenance of the system shall be proposed.

3.5 Reliability

3.5.1) The bidder shall state the MTBF (in years) and MTTR for the equipment offered.

3.5.2) The bidder shall provide written testimonials from 3 users of the equipment offered.

3.5.3) Supply record showing quantities delivered and the respective operator /country shall be submitted for the offered type of equipment.

3.5.4) The bidder shall present ISO Quality standard certificate.

3.6 Maintenance

3.6.1 Serviceability

The cables shall be connected with connectors. The supplier shall deliver all needed connectors in sufficient quantity as integral parts of the equipment.

The plug - in units shall be accessible without removing the board from the body of the unit.

3.6.2 Measuring Facilities

The equipment shall have the following measuring facilities;

- Measurement of output pulses
- Measurement of the feeding voltages
- Measurement of clock frequencies

The equipment shall be supplied with extension cards, and test cords. These items shall be indicated in the financial offer.

3.6.3 Alarms

The alarm equipment of the rack side shall give the following alarms

- Prompt maintenance alarm
- Deferred maintenance alarm
- Service alarm

3.7 Services

3.7.1) The bidder shall provide details of local training courses to be held at ETC's premises indicating the type of personnel and course content.

3.7.2) The bidder shall provide installation and test services on supervisory basis utilising ONU with all required capacities. The number of supervisors shall be indicated.

3.7.3) The cost of services shall be given separately from the equipment price for supervision, the cost shall be given per person per day.

3.7.4) The type of after-sales service to be provided shall be indicated. Information shall be provided for in country warranty and service support or the nearest service dealer support to the purchaser.

4 Optical Line Terminal (OLT)

4.1 General

4.1.1) The Optical Line Terminal (OLT) provides an optical interface towards the Optical Distribution Network (ODN) and provides at least one network interface on the Service network side of the OAN

4.1.2) The bidder shall specify the maximum number of ONU to be connected from a single OLT

- 4.1.3) The signaling protocol between OLT and ONU shall be V5.2
- 4.1.4) The maximum logical reach limit shall be specified by the bidder
- 4.1.5) The maximum and minimum allowed optical attenuation of ODN shall be specified by the bidder.

4.2 **Mechanical Construction**

- 4.2.1) OLT shall be standard 19" rack mounted type. The framework of the rack shall be only mechanical support for smaller independently wired building blocks. Closed racks shall be offered. Open 19" supporting structures are not acceptable. A color photograph of the shelves installed in a rack shall be provided.
- 4.2.2) The shelves and shelf stacks shall be wired for their maximum capacity. If there is space for additional systems at the rack side, it shall be arranged in such a way that any additional wiring required by an eventual extension can be carried out easily.
- 4.2.3) The equipment racks will be secured to the supporting structure of the station both at the top and at the bottom of the rack. The top of the rack will be fastened with screws to iron bars. The bottom of the rack will be fastened to the floor.
- 4.2.4) The rack sides shall be provided with an earthing screw fitting to the cable lug of 16mm copper wire rope.
- 4.2.5) The equipment shall be cooled by means of natural air circulation.

4.3 **Service Network interface (SNI)**

- 4.3.1) The system shall provide access to a service node, a network element that provides access to various switched and/or permanent telecommunication services. In case of switched services, the service is providing access call and connection control signalling, and access connection and resource handling
- 4.3.2) The following service interfaces shall be supported by the system.
 - 4.3.2.1) VF 2 wire analog interface to Local Exchange as per ITU-G.713
 - 4.3.2.2) 2W/4W leased lines conforming to ITU-TG.712, G.713 G.
 - 4.3.2.2) Payphones with 16 KHz metering pulse and polarity reversal
 - 4.3.2.3) V 5.1/V5.2 digital interface to local exchange as per ITU G.964 and G.965
 - 4.3.2.4) 2B+D ISDN basic rate and 30B+D primary rate
 - 4.3.2.5) E1 interface, ITU-T G703

- 4.3.2.6) 64kbs synchronous and Nx64kbs ($1 < N < 31$) synchronous super-rate data access interface with V.35/G.703 interface.
 - 4.3.2.7) Asynchronous sub-rate with speed from 1,200bps to 115.2kbps with RS-232 / V.24/ V.35
 - 4.3.2.8) The bidder shall state Broadband and IP Services Supported.
- 4.4. **Digital Multiplex and ODN interface**
- 4.4.1) The Multiplex equipment shall conform to the latest ITU-T and ETSI SDH standards.
 - 4.4.2) The HDB3 interfaces at 2 Mbit/s shall satisfy the ITU-T Recommendation G.703. The E1 line impedance shall be 75 ohms unbalanced with a tolerance of $\pm 5\%$.
 - 4.4.3) The control of jitter and wander shall be in accordance with ITU-T Recommendation G.823.
 - 4.4.4) Optical interfaces shall be in accordance with ITU-T Recommendation G.957, and the equipment shall provide the facility for automatic shut down of the laser source in the event of a fault such as fiber or optical connector breakage.
 - 4.4.5) The optical loss budget shall be given and a fiber distribution frame to connect the optical line terminal equipment to the optical fiber cable shall be provided per tables 13.1B and 13.1F of the section Route Data and General Information.
 - 4.4.6) The Q - interface and associated protocols for transmission equipment in the telecommunications management network (TMN) shall be in accordance with ITU-T Recommendation G.773.
 - 4.4.7) The network node interface shall comply with the ITU-T Recommendation G.707 (1996 or later).
 - 4.4.8) Structures of recommendations on multiplexing equipment for the SDH hierarchy shall be in accordance with ITU-T Recommendation G.781.
 - 4.4.9) The general characteristics of the SDH multiplexing equipment shall satisfy the ITU-T Recommendation G. 782.
 - 4.4.10) Characteristics of the SDH multiplexing equipment functional block shall comply with the ITU-T Recommendation G.783.
 - 4.4.11) The equipment shall be equipped to provide a 1+1 card protection for STM-1 optical interface, 34 M tributary unit and a 1: N protection for 2M tributary units.
 - 4.4.12) The time elapsed between failure detection and completion of protection switching shall be indicated.
 - 4.4.13) It shall be possible to add/drop any VC-12 across the entire STM-1 payload.
 - 4.4.14) Local and remote loopback shall be possible at STM-1 and 2 Mb/s tributary level.

- 4.4.15) Front access shall be provided for both electrical & optical interfaces.
- 4.4.16) The capacity of the multiplex equipment shall be for the capacity described in Separate terminal block or strips for connection of signals is necessary.
- 4.4.17)** The terminal block provided to facilitate termination and patching of cables shall correspond to the maximum capacity requirement of each system.
- 4.4.18)** Each distribution frame shall be provided with holders for supporting jumpers. The digital distribution frame (DDF) shall provide connections from the Service node to OLT, ONU to user node and vice versa. Distribution frame shall be offered for all terminal and drop/insert location. If there is a difference between the full capacity of the system and the current equipped capacity the DDF shall be equipped for full capacity of the system. Coaxial jumpers and connectors shall be provided accordingly to connect the OLT to a switching equipment via the DDF.

4.4.19) Synchronization

- 4.4.19.1) For optimum performance each network element in the SDH network should be timed from a single Primary Reference Clock source.
- 4.4.19.2) The synchronization interface shall be as specified in ITU-T Recommendation G.703 #10.
- 4.4.19.3) At least three different modes of synchronization reference shall be configurable including external timing, free running and internal timing with holdover mode. A synchronization status message shall be supported to indicate the timing quality.
- 4.4.19.4)** It shall be possible to prioritise the selection of the working reference signal from the range of sources that may be available at a specific site.
- 4.4.19.5)** If the currently used source fails, the next priority source shall be automatically selected with Holdover implemented as temporary measure during changeover.

5 Optical Network Unit (ONU)

5.1 General

- 5.1.1) The ONU provides an optical interface towards the ODN and implements the interfaces at the customer side of the OAN
- 5.1.2) Outdoor and indoor types of ONU shall be provided
- 5.1.3) The out door ONU shall be a strong weatherproof roadside cabinet, pole or wall mounted type housing the remote unit. The cabinet shall include cross-connect distribution frame. In the financial offer, prices shall be quoted (as an option) for all available types of housing which are not included in the basic offer. The remote unit cabinet shall be provided with over voltage and lightning protectors.
- 5.1.4) To avoid unauthorized opening, the remote unit shall be equipped with special locker. The opening tool shall be provided with the equipment.

- 5.1.5) If a call is between 2 customers attended by the same ONU, the system shall establish this call within the remote terminal and shall release the established trunk.

ODN interface of ONU shall be as stated in section 4.2

5.2 User Network Interface (UNI)

The following service interfaces shall be supported by the system.

- 5.2.1) 2 wire analog interface to Local Exchange as per ITU-G.713
 - 5.2.2) 2W/4W leased lines conforming to ITU-TG.712,G.713 G.
 - 5.2.3) Pay phones with 16 KHz metering pulse and polarity reversal
 - 5.2.4) 2B+D ISDN basic rate and 30B+D primary rate
 - 5.2.5) E1 interface, ITU-T G703
 - 5.2.6) 64kbs synchronous and Nx64kbs ($1 < N < 31$) synchronous super-rate data access interface.
 - 5.2.7) Asynchronous sub-rate with speed from 1,200bps to 115.2kbps
 - 5.2.8) The bidder shall state Broadband and IP Services Supported.
- 5.3) Power supply
- 5.3.1) ONU shall be locally powered from main commercial power., the mains AC50 Hz 220 \pm 44 Volts power unit shall be installed separately but in the same cabinet. It shall include fuses, circuit breakers, outlets for battery charger etc... The bidder shall provide a full list of such items. If fuses are used, at least 2 spare fuses shall be included for every site. A short circuit in any card shall not cause the power supply to trip.
 - 5.3.2) When mains power fails rechargeable batteries are to be used for the supply of ONU. The back-up time shall be at least 12 hours at 20⁰C. If different from 12 hours, the actual time shall be provided by the bidder. The battery shall be a sealed, maintenance free type with a life expectancy not less than 8 years.

6 Optical Distribution Network

6.1 ODN functional requirements

6.1.1) General

6.1.1 In general, the Optical Distribution Network (ODN) provides the optical transmission medium for the physical connection of the Optical Line Terminal (OLT) to the Optical Distribution Unit (ONUs).

The ODN consists of passive optical elements:

- single-mode optical fibres and cables;
- optical connectors;
- passive branching components;
- passive optical attenuators;
- splices, splice closure.

6.2 Single Mode Optical Fiber Cable

General

The single mode optical fiber cable herein after referred to as the "Cable" shall comply with the requirements of this specification and generally shall meet any latest relevant ITU-T Recommendations.

The main operating wavelength region of this fiber is around 1310 nm.

The cable shall be applied for overhead, duct, or direct buried installation.

The cable shall consist of 12 and 24 fibers.

The cable proposed shall be new and its life-time shall be at least 20 years without any significant deterioration. The calculation of fiber failure time shall be stated by the bidder.

6.2.1 Technical Characteristics for Fibers

The geometrical characteristics shall be in accordance with the ITU-T Rec. G.652 or the latest Recommendations.

6.2.1.1 Material Properties of the Fibers

The fiber shall be made from silica glasses, high grade silica compound or equivalent material.

6.2.1.2 Protective material nature

The primary protective coating shall be two layers of UV curable acrylate, UV curable urethane or equivalent material .

6.2.1.3 Removal of the primary coating for jointing preferably shall be achieved without the use of chemicals. A simple mechanical operating shall be sufficient to prepare the fiber for jointing.

6.2.1.4 The nominal value of the coating diameter shall be 250 μm .

6.2.2 Mode Field Diameter

The nominal value of the mode field diameter shall lie within the range 9 to 12 μm . The mode field diameter deviation shall be in the limits of $\pm 10\%$ of the nominal value.

6.4 Cladding Diameter

The nominal value of the cladding diameter shall be 125 μm . The cladding deviation shall be in the limits of $\pm 2.5\%$.

6.5 Mode Field Concentricity error

The mode field concentricity error at 1310 nm shall be less than 1 μm .

6.6 Cladding Non-circularity

The cladding non-circularity shall be less than 2%.

6.7 Refractive Index

The refractive index of core glass at 1310 nm shall be stated and the percentage of refraction factor shall be stated by the bidder.

6.8 1550 nm loss performance

The fiber may be used at wavelength of exceeding 1550nm. The 1.0 dB maximum loss shall apply at the maximum wavelength of anticipated use (which could be less than or equal to 1580nm).

6.9 Attenuation

6.9.1 The maximum attenuation at the 1310 nm wavelength shall be less than 0.3 dB/Km. The maximum attenuation in the wavelength range 1525 to 1575 nm is no more than 0.05 dB/Km greater than the attenuation at the 1550nm.

6.9.2 The maximum value of the total dispersion shall be 18 ps/nm Km at the 1550 nm wavelength region.

6.10 Minimum Bending Radius of Fiber

The minimum allowable bending radius of the fibers shall be less than 40 mm.

6.11 The Effect of Temperature to Fiber Attenuation

The difference of maximum and minimum attenuation values of any cabled fiber shall not exceed 0.1 dB/Km in the temperature range 0°C to 60°C in normal operation conditions in the wavelength of 1310 nm. The operating temperature shall be -10°C to +70°C and the installation temperature shall be -10°C to +60°C.

6.12 Mechanical Characteristics

The fiber shall handle 8N force for the time of 1second. If the time is extended or shortened the load will vary correspondingly.

After installation the cable has to withstand mechanical and climatic constraints especially:

- Tensile force due to elongation and contraction caused by temperature changes and wind effects.
- Vibrations generated by wind
- Lightning strikes
- Bird attacks
- Intensive short time heating

6.13 Technical Characteristics For Cables

6.13.1 Minimum Bending Radius of Cable

The minimum allowable bending radius of the cable shall be less than 20 times the external diameter of the cable during handling or installation, and 10 times when fixed.

6.13.2 Lightning Protection

The lightning protection methods that conform to ITU-T Rec. K 25, shall be stated by the bidder.

6.13.3 Cable core

The core, which, at least, consist of the strength member, loose tubes, fibers, plastic tape wrapping, fillers (if necessary) and filling compound, shall be entirely non-metallic.

6.13.4 The strength member

The strength member shall be made from non-metallic material and located centrally.

6.13.5 Loose Tube Buffer

The fiber shall be surrounded by a non-hygroscopic loose tube buffer. The buffer tube material shall be stated by the bidder.

6.13.6 Fiber Identification

Positive identification of each fiber shall be provided by continuous coloring of the secondary fiber coating. The coloring shall be stable during the lifetime of the cable. The color coding for fibers in cable construction shall be stated by the bidder.

6.13.7 Fiber units

The standard cylindrical group or core designs shall conform to the specified in the Technical Requirement section. Positive identification of each fiber units shall be specified by the bidder.

6.13.8 Filling Compound

The cable core shall be filled with a filling compound in order to prevent the ingress of water longitudinally and radially. The filling compound shall be non-hygroscopic. The compound shall be neutral in color, non odorous, non-toxic and dermatological safe. It shall be homogeneous, uniformly mixed and contain a suitable antioxidant. The filling compound shall be easily removed from the fiber by wipings. The drop point of which shall be at least 70°C.

6.13.9 Moisture barrier:

6.13.9.1 The cable core shall be completely covered with a plastic coated aluminium tape applied longitudinally with a minimum overlap of not less than 6 mm. For small diameter cables the overlap shall not be less than 20% of the moisture barrier circumference.

6.13.9.2. The polyethylene part of the sheath shall adhere completely to the protective polymer coating of the aluminium tape and the sheath shall be applied to fit closely to the protected core of the cable.

6.13.9.3. Aluminium tape:

6.13.9.3.1 The thickness of the aluminium tape without the polymer coating shall be (0.2 ± 0.025) mm

6.13.9.3.2. The thickness of the protective polymer coating on both side of the aluminium tape shall be not less than 30 micro meter.

6.13.9.3.3 All Joints of the aluminium tape shall have good mechanical strength and electrical continuity and allow the specified cable diameter sheath thickness requirement to be met.

6.13.9.3.4 Polyethylene Sheath (Cable Jacket)

The sheath shall consist of tough weather resistant and low-density polyethylene compound containing a minimum of 2.5% by weight carbon black which shall meet international standards.

6.14. Support Strand (only for aerial cable)

The aerial cable shall be supported by metallic strand, in a figure eight geometry.

The bidder shall provide full details of

- Span lengths
- Sags
- Tensile strength of aerial cables that limit the elongation
- Size and weight of cable

6.14.1 A patented steel wire galvanized shall be used for support which is composed of 7 strands of 0.9mm diameter wire. If different the bidder shall state and describe the type used.

6.14.2 The minimum breaking strength of the steel wires shall be not less than 625Kg.

6.14.3 The minimum weight of galvanization required for 7x0.9 mm shall be 212gm/m².

6.14.4 Cable Sheath

The cable sheath shall be made of black high density polyethylene to offer maximum protection in hostile environment. The minimum thickness of the sheath shall be 1.5 mm.

The cable sheath and the steel wire shall be connected to form figure of '8' cross section.

6.15 Armouring (only for armoured cable):

6.15.1. The armouring consists of two galvanized soft steel tape with a nominal thickness of 0.3 mm to be applied over a bedding consisting of two helically applied PE tape.

6.15.2 The weight of the zinc coating on each side of the steel shall have a minimum of 250 gm/m².

6.15.3 Before armouring a wrapping of suitable tape shall be applied for bedding layer.

6.15.4 Over the steel tapes armouring sufficient flooding compound shall be applied so that voids and air spaces between the outer jacket and armour will be sealed.

6.15.5 The two tapes shall be laid in one helix in the same direction over a bedding so that the outer tape is almost central over the gap left by the inner tape.

6.15.6 The outer tape shall overlap the inner tape on both side by at least 20% of the tape width.

6.15.7 The minimum tensile strength of the steel tape shall be 350 N/mm².

6.16 Outer jacket (Only for armoured cables):

16.1 The jacket for the armoured cable shall consist of a tough weather resistant, high stress-crack resistant of low density polyethylene which shall be in accordance with ASTM D 1248 type 1, class C,cat. 5.

16.2 The nominal thickness of the outer covering shall be as follows:

Nominal \geq 2 mm

Average \geq 1.9 mm

Minimum \geq 1.8 mm

6.16.3 The average thickness at any cross-section and the minimum spot thickness at any point shall not be less than, respectively of, 90% and 75% of the specified thickness.

6.16.4 The sheath shall withstand a spark test voltage at least 8 KVr. m.s. or 12 KVd.c.

6.13 Identification Marker

Each cable shall have the following information clearly marked on the outermost sheath at approximately 20 meters intervals.

- a) Name of Manufacturer
- b) Type and size of cable
- c) Laser symbol

The length number shall be marked at regular intervals of one meter along the outer sheath (jacket) of the completed cable. " ETC" shall be applied just at the half point between the numbers to be marked. The colour to these markings shall preferably be white.

Delivery:

The cable ends shall be well sealed to prevent moisture ingress and securely tied and well protected during transportation.

The ends of the cable should be available for test without uncoiling the cable.

The standard drum length for each type of the cable to be supplied shall be stated by the bidder.

Maximum drum diameter allowed is 2.60 m and maximum width (including bolts) is 1.35 m.

The drum should indelibly be marked with:

- a) Factory name
- b) Drum number
- c) Cable type and length
- d) Gross weight and net weight
- e) Each flange shall be marked by an arrow applied to show the direction of winding.

6.6 Splicing:

Splicing shall be done easily and firmly.

Full details of the materials used e.g. closures, splice protectors, special tools required etc. shall be provided and sufficient spare shall be quoted for the purpose of maintenance.

The splicing machine to be provided shall be of the fusion splicer type and shall have the following characteristics:

The splicer shall be suitable for all common single mode and multimode fibers (standard and dispersion shifted).

Splice loss for identical standard single mode fiber shall be < 0.05 dB.

The splice process shall be fully automatic.

Video image evaluation for fusion process control and splice loss estimation shall be provided.

The splicer shall provide end face quality inspection and detection of contamination.

The splicer shall be operated from a nominal mains supply of 220 Vac/50 Hz and from a rechargeable battery integrated in the splicer. The capacity of the battery when fully charged shall be given in number of splice processes.

10 Operating temperature of the splicer shall be 0°C to 45°C.

12 A splicer case shall be provided for the fusion splicer and accessories to protect them during transport and operation.

Passive Optical Network components

- 1) The transmission characteristics of Optical splitter and optical attenuator shall be as per ITU-T G671E
- 2) Midsection closure shall be mechanical type and shall have splice organizer. The capacity of splice organizer shall be specified by the bidder.
- 3) All the connectors shall be FC/PC type

7 Network Management system (NMS)

The Bidder shall propose local and centralized Network Management system suitable and appropriate for the attached channel plan.

The centralized NMS shall use telecommunication management networks (TMN) with architecture as defined by ITU-T and set out in the Recommendations for the M.3000 series.

It shall be possible to control/monitor all central office terminals in a given switching center and the corresponding remote terminals from a single management unit.

The management system to be proposed shall be PC based operating preferably under Microsoft Windows.

The proposed hardware shall be fully described indicating the memory & hard disk capacity, the type of CPU and the speed and other relevant items.

The software shall be menu driven for ease of operation.

System configuration display and Alarm & performance monitoring shall be possible both for the central office terminal and the remote terminal.

Each alarm shall issue an indication to the management system with full description of the alarm.

The system shall generate accurate & reliable alarm information.

All network elements shall be managed by the NMS.

Total Management capability shall be available from both the local and central network management station.

Management of the system shall be in accordance with ITU -T Rec. G.784.

The Q interface and associated protocols shall be in accordance with ITU –T Recommendation G.773.

A block diagram, which shows the NMS (Network level and Element level) and the network elements shall be given.

The network must continue to function normally in the event that the NMS fails. The bidder shall state any impact that an NMS failure would have on the operation of the network.

All hardware and software network management components should be included in the offer. Details of hardware specification should be provided.

In conformity with appropriate ITU-T recommendations, the following management functions shall be provided.

ODN Testing

The management system shall be capable of measuring ODN parameters. The parameters to be tested shall be provided by the bidder.

Line Testing

The management system shall be capable of measuring capacitance and leakage of the line, External Voltage ac/dc on the line, Noise and Voice frequency. The bidder shall clearly indicate which measurements can be performed and which not. The tests should not interfere with subscriber traffic.

Fault Management

Alarm processing (e.g. AIS) to localize defective equipment in the OAN. Fault diagnosis at the module level (e.g. localization of the defective module).

Configuration Management

Defining and saving the configuration data; this can be input and queried from the NMS.

Performance Management

Calculation of the quality parameters as per ITU-T recommendation G.826. Setting of performance monitoring points and measuring periods shall be possible.

Security Management

Administration of the access rights for various user classes using passwords.