

## Asynchronous Transfer Mode

C-DOT has designed an ATM (Asynchronous Transfer Mode) technology based broadband switching system. The solution consists of an ATM switch for use in the backbone network and an NIU (Network Interface Unit) for use in the access network. The ATM switch provides the ATM interfaces for connecting the ATM devices to it and offers voice and data services to them. The NIU provides the non-ATM interfaces for connecting the non-ATM devices over the ATM backbone. The switching capacity of an ATM switch is 5 Gbps and the solution is scalable and fault-tolerant.

The solution is compliant to ITU-T, ATM Forum and IETF standards.

### SPECIFICATIONS OF C-DOT CAX 16 R1 ATM SWITCHING SYSTEM

- Capacity: 16 x 16 STM-1 ports with 4K VCs per port
- Throughput: 2.4 Gbps
- Interfaces supported:
  - ATM Interface at NNI - STM-1 G.957-L1.1 optical interface as per ITU-T recommendation 1.432, G.957 and G.707
  - ATM Interface at UNI - STM-1 G.957-L-1.1 optical interface as per ITU-T recommendation 1.432, G.957 and G.707
  - E1 ATM full duplex lines over twisted pair cable as per ITU-T recommendation G.703, G.704, G.804 and I.432
- Signalling Supported
  - Types of connections and calls supported
    - ◆ Point to point
    - ◆ Point to multipoint
  - Call Control capabilities supported  
The user can negotiate QOS parameters at the call set up time
  - NNI Signalling  
The following protocols are supported at the NNI:
    - ◆ SAAL as per ITU-T Q.2100, 2110
    - ◆ SAAL SSCF for NNI as per ITU-T Q.2140
    - ◆ SAAL management as per ITU-T Q.2144
    - ◆ ATM forum P-NNI 1.0
  - UNI Signalling  
The following protocols are supported at the UNI:
    - ◆ AAL5 as per ITU-T recommendation 1.363
    - ◆ SAAL as per ITU-T Q.2100, 2110
    - ◆ ITU-T Q.2931 for SVC
    - ◆ ATM Forum UNI 3.1/4.0
    - ◆ Q.2971 for Point to Multipoint call
- Connection Types Supported by the Switch
  - Unicast : Point to point bi-directional symmetrical or asymmetrical connections
  - Multicast : Point to multipoint unidirectional connections
- Redundancy
  - Redundancy is provided in Power, Switch & Control Plane
- Traffic Management
  - The switch supports traffic policing, prioritisation and congestion management as per ITU-T recommendation I.371
- Service Bit Rate categories
  - The following bit rates and associated QOS requirements are supported as per 1.356
  - Constant Bit Rate (CBR)
  - Variable Bit Rate – Real Time (VBR-RT)
  - Variable Bit Rate – Non Real Time (VBR-NRT)
- Network Synchronisation
  - Synchronised network clock is provided by an external network synchronization equipment over G.703/10 (120 ohm) interface.
- Clock recovery and Timing sources
  - Source of timing signal is programmable and can be from any type of network interfaces (STM-1)
- OAM Support
  - The switch supports B-ISDN operation and maintenance principles and functions as defined in ITU-T recommendation 1.610
- Numbering Plan
  - The Switch supports numbering plan as per ATM Forum AESA format and ITU-T recommendation E.164
- Maintenance Features
  - Diagnostics
    - ◆ Diagnostic tests are provided at the card and system level
    - ◆ The insertion and the diagnostic test of individual card does not interrupt the working of the system
    - ◆ Start up diagnostics check the system integrity memory and perform equipment configuration checks
    - ◆ In case of system failures proper trace is maintained (in log files) for later analysis
- Alarm Monitoring
  - The hardware alarm monitoring is provided at the card and system level
- Loopbacks
  - Loopback facility is provided on the interface cards for maintenance purposes.
- Management
  - Node Management
  - The switch is manageable both locally and from Network Health Monitoring System. The node management features include:
    - ◆ Configuration of parameters like node name, node address etc.
    - ◆ Configuration of connections
    - ◆ Alarm monitoring
    - ◆ Diagnostics
    - ◆ Statistical Information
- Network Management
  - The ATM switches in the ATM network are manageable from a Network Health Monitoring System (NHMS). The network management capabilities include:
    - ◆ Remote node configuration
    - ◆ Diagnostics

- ◆ Alarms
- ◆ Link and path management
- The network management system works from a Linux based workstation with GUI for easy management
- Power Supply
  - The equipment requires – 48V DC for its operation : However, the equipment can operate from –44V DC to 60V DC
- Mechanical features
  - The system has a modular physical architecture
  - It is easily accessible for cabling, connections and for insertion and replacement of modules
  - The mechanical design prevents insertion of wrong modules or insertion of the modules in a wrong way (eg. Upside down)
- Physical dimensions
  - All the circuit cards are of the same dimension (415 mm (Height) x 285 mm (Depth) x 2.4 mm (Thickness)
  - The card frame dimension is 419 mm (Height) x 554 mm (Width) x 295 mm (Depth)
  - The Cabinet dimension is 1450 mm (Height) x 696 mm (Width) x 611 mm (Depth)

## SPECIFICATIONS OF C-DOT NETWORK INTERFACE UNIT (NIU)

- Interfaces supported by the NIU
  - Access Interface
 

There are two types of Access Cards NDI and NAI

    - ◆ NDI - The interface card NDI will have the following functions:
      - + 2 ports of RS422 SDLC Input/Output links
      - + 4 ports of RS232C / 422 Serial Digital Asynchronous Input/Output links
      - + 4 channels of DC Voltage sensor inputs
      - + 2 channels of AC Voltage sensor inputs
      - + 4 channels of Contact closure outputs
      - + 2 channels of Log Speed pulses at TTL / Potential free outputs with programmable sector values of 100 / 200/ 400 pulses per nautical mile
    - ◆ NAI - The interface card NAI will have the following functions:
      - + 1 channel of Synchro / Resolver input to 16 bit parallel digital converter
      - + 1 channel of 16 bit parallel digital to Resolver / Synchro converter
      - + 1 channel of MIL1553B interface
  - High power portions of the design (like power amplifiers) and transformers shall be physically located outside NAI card and would be developed by BEL.
  - Network Interface - STM-1 G.957-L-1.1 optical interface as per ITU-T recommendation 1.432, G.957 and G.707
- Redundancy
  - Redundancy is provided in Power and Control Plane
- Maintenance Features
  - Diagnostic tests are provided at the card level and system level

- The insertion and the diagnostic test of individual card does not interrupt the working of the system
- Start up diagnostics check the system integrity, memory and perform equipment configuration checks
- In case of system failures proper trace is maintained (in log files) for later analysis
- Alarm Monitoring
  - The hardware alarm monitoring is provided at the card and system level
- Node Management
  - The NIU is manageable both locally and from a Network Health Monitoring System (NHMS)
  - The node management features include:
    - ◆ Configuration of parameters like node identity , node address etc.
    - ◆ Alarm monitoring
    - ◆ Diagnostics
    - ◆ Statistical Information
- Network Management
  - The NIUs connected to the ATM switches are manageable from a Network Health Monitoring System.
  - The network management features include:
    - ◆ Remote node configuration
    - ◆ Configuration of connections
    - ◆ Alarm monitoring
    - ◆ Diagnostics
    - ◆ Link and Path management
  - The network health monitoring system works from a linux based workstation with GUI for easy management
- Power Supply
  - The equipment requires –48V DC for its operation. However, the equipment can operate from –44V DC to –60V DC
- Mechanical Features
  - The system has modular physical architecture. It is easily accessible for cabling connections and insertion and replacement of modules. The mechanical design prevents insertion of wrong modules or insertion of the modules in a wrong way (e.g. upside down)
- Physical Dimensions
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## MAJOR FEATURES OF THE SYSTEM

- **Duplex Redundancy of Network Health Monitoring System (NHMS)**
- **Network Time-of-day Synchronization**
- **Physical Layer Protection Switching**
- **ATM Layer Protection Switching**
- **Flash Programming from Local Management System**
- **SNMP based Network Management**

