

# DSS MAX FAMILY



### **INTRODUCTING THE C-DOT DSS MAX FAMILY**

Total Solutions For Wide Area Telecommunication

The C-DOT Digital Switching System Main Automatic Exchange (DSS MAX) is a family of

The C-DOT digital switching systems that offers total switching solution for national telecom networks. The C-DOT DSS MAX products have the proven ability to serve as local, toll, transit and Integrated Local-cum-Transit(ILT) switches. The in-built support for SS7 enables the C-DOT MAX to function as integrated Signal Transfer Point (STP) and integrated Service Switching Point (SSP). The switch also supports ISDN and V5 interfaces. Starting from a switch that supports a few hundred lines for rural applications to the 40,000- line switch for central office applications, the modular architecture of the C-DOT DSS MAX is capable of serving the needs of the entire range of customers.





#### State-of -the -art Hardware and Software Technology

The C-DOT DSS MAX design employs state-of the art hardware and software concepts. CAD-VLSI and ASIC design techniques are used during hardware development. Latest design and simulation tools are employed to realise hardware modules in minimum time with minimum iterations. The 32-bit microprocessors and dynamic memory modules are used to realise the control complexes, whereas high performance message switches are employed to achieve high speed inter-processor message communication. Use of state-of-the-art components not only avoids component obsolescence while providing benefits of better technology advancements such as better integration and a compact, robust and reliable design at reduced cost-but also ensures long-term cost benefits.

Modern software engineering and quality assurance practices are followed during software development. CASE tools and automated testing and simulation are some of the techniques used to deliver quality software.

A standard programming language (C) and operating system (UNIX) are used along with a proprietary real-time OS (CDOS), optimised for the C-DOT DSS MAX applications. The generic nature of software across different products and applications ensures uniformity in feature implementation and upgradation.





#### **Flexible Architecture**

The flexible architecture of the C-DOT DSS MAX results from a loosely coupled network approach. This allows new functionalities to be added without requiring any change in the existing hardware. The inter-processor communication is message-based, and well-defined interfaces exist between various software subsystems.

The C-DOT DSS MAX system design is highly fault-tolerant. For redundancy, all the controllers, message switches and power supply units are duplicated or have N+X redundancy for load sharing. This flexible architecture, together with widespread redundancy, ensures high system availability.

#### **Modular Packaging**

The modular architecture of the C-DOT DSS MAX ensures costeffectiveness and protection of investment as the demand in a service area grows. It is possible to begin small in a potentially high growth area and to increase the exchange capacity later, simply by adding more modules to the existing exchange. The C-DOT DSS MAX product packaging utilizes standard cabinets, frames and cards. Due to minimum cabling required across cabinets and high level of connectorisation, the C-DOT DSS MAX products can be installed quickly and easily.





#### **Evolutionary Approach**

The C-DOT DSS MAX design follows an evolutionary approach in order to:

- introduce new services to the users
- meet service requirements of the network operators
- take advantage of the technological advancements taking place in telecom
- provide value additions
- provide cost-effective incremental capacity expansion.





The integration of CCS7 and network synchronisation capabilities in the C-DOT DSS MAX are examples of such an approach to meet the requirements of the network operators. The switch also provides Service Switching Point (SSP) functionality for Intelligent Network (IN) services, Integrated Services Digital Network (ISDN) services, and V5.1/V5.2 interfaces for the access network.

New functionalities are implemented in additional subsystems, which interwork with other functional subsystems present both in the existing and the new switches. As a result, the switches installed in the field in the 1980s are upgradable with new features and services.





#### **Reliability**

The C-DOT DSS MAX products meet the high reliability requirements of a modern digital switching system. Strict quality control measures are adhered to right from the component procurement stage up to the final system delivery. Quality components are chosen to ensure low fault rate under extreme environmental conditions. The quality system consists of manual and automated inspections during various stages of manufacture. Quality software delivery is ensured by well defined software engineering practices at every development stage. Automated feature testing and detailed validation is carried out before propagating any new software link or bug fixes to the field.

#### **Large Installation Base**

The appropriateness of the C-DOT DSS MAX products at all levels of the national telecom network is borne out by the fact that a large number of rural, ILT, toll and urban exchanges from C-DOT are installed in the Indian telecom network. Today, the C-DOT DSS MAX exchanges cover as much as over 30% of the total installed base in the country.





#### **Repair and Test Facilities**

C-DOT has established regional repair centres for card repairs all over India for ensuring low MTTR and, consequently, low inventory requirements and investments.

The customer support cells at Delhi and Bangalore are manned by C-DOT staff and operate 24 hours a day for monitoring the fault handling process. The cell also provides support for exchange dimensioning, equipment planning and engineering the system to the site-specific needs.

#### Single Base Module Exchange

A Single Base Module (SBM) stand-alone exchange can be deployed for rural local switch applications to service up to 1,500 subscribers. In the smallest configuration, a single cabinet (with four Terminal Units, a Service Unit, and a Control Unit) with two Input-Output Processors (IOP) and an Alarm Display Panel (ADP) can serve about 424 subscribers without any concentration with adequate trunk connectivity. By adding two more Line Module cabinets, equipped with only subscriber line cards in all the six frames, the switch can support up to 1500 lines with 4:1 concentration.



The switch in this configuration, can handle up to 244E traffic and 14,500 BHCA.





To suit the needs of the rural environment, CMOS components are used. The use of CMOS technology ensures low power consumption and allows the system to work in a partially controlled environment. Also, a high level of connectorisation and minimal inter-frame cabling allows quick installation of the system.

A stand-alone SBM exchange can be converted into a Remote Switching Unit (RSU), which can be parented to a MAX Multi Base Module (MBM) configuration by changing only two cards in the system and removing the IOPs. The RSU can serve up to 2000 subscribers.

The network operator can process the billing data at the exchange itself with the help of an extensive set of tools available with the switch, or, as an alternative, the billing and traffic information can be transferred over a dial-up line for centralised processing. The exchange can also be configured to support operator positions for subscriber assistance.



#### THE C-DOT DSS IN NETWORK APPLICATION



#### Main Automatic Exchange

The C-DOT DSS MAX in its largest configuration consists of 32 Base Modules (BM), which are interconnected via a Central Module (CM) using the T-S-T architecture. Of these, up to 16 BMs can be remotely located as RSUs. The Input-Output Module (IOM), consisting of two Input-Output Processors (IOP), serves as the front-end processor which provides man-machine interface and supports SCSI compatible secondary storage devices.

In this configuration, the system supports 40,000 subscribers in 4:1 concentration along with 6,000 trunks. In a trunk office application, up to 14,500 trunks can be provided. Each BM supports a maximum of 2,000 subscribers or 450 trunks. The switch can handle 8,00,000 BHCA and about 7,800E traffic.

The system has built-in network synchronisation capability and the exchange clock conforms to ITU-T G. 182 specifications. The synchronisation is based on the master-slave principle.





#### **Remote Switching Unit**

As mentioned earlier, the BMs of the C-DOT DSS MAX can be remotely located to serve as the Remote Switching Units, which can even work in non-airconditioned environment. Each RSU is connected to the host exchange by digital links using 2 Mbps, 30-channel PCM trunks. Up to 16 PCM trunks between the RSU and the host exchange can be configured depending upon the traffic.

The RSU in a stand-alone mode supports local switching. In this mode, metering data of all the local subscribers is stored in the RSU and is sent to the host exchange whenever the digital link between the RSU and the main exchange is restored. Any loss of revenue, therefore, is avoided during the standalone mode of operation. Any type of line and trunk can be terminated on RSU as on any other colocated BM.



#### **Remote Line Concentrator**

Remote Line Concentrator (RLC) provides the second level of remoting and works in non-airconditioned environment. It is connected to the main switch or RSU with standard V5.2 signalling interface over two E1 links. RLC supports maximum of either 120 PSTN/56 ISDN BRA or any combination of PSTN & ISDN BRA subscribers. It provides front-end connectivity ringing and 16 KHz metering pulse on all subscriber ports.

#### **Integrated Services Digital Network**

The Integrated Services Digital Network (ISDN) is the next logical step in the evolution of any Public Switched Telephone Network (PSTN). With the possibility of voice, data, text and image transfer over ISDN lines, many new applications and services can be provided without any need of dedicated networks. C-DOT DSS MAX can support a whole range of supplementary services. These include Calling Line Identification Presentation (CLIP), Advice of Charge (AOC) Multiple Subscriber Number (MSN), Closed User Group (CUG), and many more.





C-DOT DSS MAX facilitates a cost-effective introduction of ISDN capabilities where initial demand is likely to be low and scattered. The basic growth unit of ISDN implementation in the C-DOT DSS MAX is the ISDN Terminal Unit (ISTU) which contains Basic Rate Iterface (BRI) and Primary Rate Interface (PRI) cards. The PRI card has been designed to either work as a PRI subscriber interface or as a digital trunk card in the CAS/CCS mode of signalling in order to ensure optimum usage of 2 Mbps digital interfaces in the absence of any appreciable demand for a PRI. The ISTU can be concentrated with a PSTN subscriber Terminal Unit to achieve configurability as per demand.

The ISDN Customer Premises Equipment (CPE) developed by C-DOT are compact and have low power consumption. The Network termination (NT310) terminates 2-wire loop at the customer's premises, and provides a standard 4 wire S interface to the ISDN terminals. Low-cost Terminal Adaptor (TA210) for connecting telephone and G3 fax, and PC Adaptor & (PA 300, PA 300+ and PP 300) are also available. The PC Adaptors are specifically targetted towards internet users.



#### **Integrated IN Solution**

C-DOT offers complete and cost-effective Intelligent Network (IN) solution comprising Service Control Point (SCP), Service Management Point (SMP) and Service Switching Point (SSP) with integrated Intelligent Peripheral (IP). It has adopted the evolutionary path as defined by ITUT/ETSI and has successfully implemented Capability Set One (CS-I). Development of IN services conforming to CAMEL for mobile subscribers and further Capability Sets (CS-2,CS-3, etc.) is in progress. This would lead to the development of long-term IN architecture for the converged networks of the future.

The C-DOT DSS MAX switching systems have been enriched with the service switching functionality to allow them to function as SSPs. The SCP and SMP have been developed indigenously using standard computing platforms. Since the SCP and SSP implementation in the C-DOT DSS MAX adheres to the ITU-T/ETSI and Indian National standards, it can interface with SSPs and SCPs from multiple vendors.







C-DOT has successfully installed its IN systems in the Indian networks, comprising six SCPs/SMPs and over 175 SSPs. These system serve over six million prepaid users.



#### **Support for Wireless in Local Loop**

Wireless in Local Loop (WLL) is fast emerging as the preferred option for quick deployment of local loop in dense urban as well as rural networks.

The C-DOT DSS MAX supports ETSI standard V5.1/V5.2 interfaces to Access Networks (AN) for costeffective and flexible provisioning of wireless access in existing as well as new switch installations. The radio access equipment can be from different vendors due to open AN interfaces.



#### SYSTEM FEATURES

- T-S-T Architecture
- Non-blocking Switching Network up to 16,000 terminations
- Concentration up to 4:1

#### Signalling Capabilities

#### • Subscriber Signalling

- Decadic pulse dialling
- DTMF dialling
- PABX with DID
- 16 KHz pulses for subscribers' home meters and payphones

#### • Inter-exchange Signalling

- Line Signalling
- Loop disconnect
- E&M
- Digital R2 (DR2-CASI/2/3)

#### • Register Signalling

- Decadic
- Modified R2(national versions)
- ITU-T R2 and semi-compelled R2

#### • Common Channel Signalling No. 7

- MTP
- ISUP
- SCCP
- TCAP
- IN Protocol
  - ETSI Core INAP
- ISDN Access Signalling
  - Q.931

#### - Q.921

#### • Access Network Signalling

- V5.1 as per ETS 300 324-1
- V5.2 as per ETS 300 347-1 & ITU-T G.965

#### Subscriber Line Interfaces

- Ordinary lines
- Ordinary coin box lines
- CCB STD (STD PCO) lines
- Subscribers' private meter
- PABX lines

#### ISDN Interfaces

- BRI
- PRI

#### Access Network Interfaces

- V5.2, EI interfaces
  - V5.1 EI Interfaces
- Trunk Interfaces
  - Analog Trunks
    - Two -way trunk
    - E&M two-wire
    - E&M four-wire
  - Digital Trunks
    - 30 channel PCM trunk

#### Routing Capabilities

- 2,048 routes supported
- 64 categories possible for routing the incoming trunk calls
- Different treatment possible for level I call on a particular route
- Up to 7 alternate routing choices available
- Time-dependent routing supported
- Depth of analysis up to 12 digits for a route







#### Charging Capabilities

- ISUP charging
- Periodic pulses can be received from TAX
- Multi-metering supported (i.e. multiple units for one pulse)
- Subscribers of RSUs can have different charging from other subscribers any given direction
- Different charging possible for CCB subscribers from other subscribers
- Detailed billing records for all STD/ISD calls
- Bearer service based charging for ISDN services
- V5.X interface category based charging
- · Detailed records for local calls on demand
- Charging based on distance and time and type of day
- 64 charging categories possible
- · 8 different tariff classes possible with a day
- 8 different types of days possible within a year

#### \* Traffic measurement Capabilities

- Measurements available on
  - Lines
  - Trunks
  - Signalling links
  - Signalling routesets
  - Routes
  - Hunt groups
  - Subscriber initiated features
  - Switching network
  - Service circuits
  - Exchange performance
  - Daily reports
- Per port traffic data available for lines and trunks
- Detailed call records available on demand

#### Exchange Maintenance Capabilities

- Duplicated control cards, power supply units and tones
- Automatic switchover and recovery in case of single fault
- Automatic alarm reporting
- Line and trunk status display
- Automatic self diagnostics
- Remote supervision via supervisory tones
- Overload control

#### Line, Trunk, Service Circuit and Signalling Link Testing

- Line Testing
  - Metallic access to each line
  - Open /closed loop tests i,e.
  - Exchange side/outside plant tests (codec/signalling)
  - (เป็นอยู่/ วิเมาในแก่ยุ
- Trunk Testing
  - Synchronization card tests
  - Controller card tests
  - System tests (signalling, FAS, MFAS)
  - Loopback Tests
- Service Circuit Tests
  - Loopback tests on MF/ DTMF circuits
  - Loopback tests on tone circuits
- Signalling Link Tests



#### SUBSCRIBER SERVICES

#### Basic Subscriber Services

- PABX lines with DID facility
- payphones
- Information tones and recorded announcements
- Emergency calls
- Service quality observation

#### Rapid Call Set-up Services

- Hotline with time-out and directory number
- Hotline without time-out to specified directory number

#### Call Booking Services

- Semi-automatic alarm
- Automatic alarm

#### Call Restriction Services

- Service restriction in outgoing direction: subscriber controlled
- Incoming call barring
- Intrusion barring : subscriber and administration controlled

#### Conference Calls

- Three-party service
- Six-party service

#### Absent Subscriber Services

- Transfer to recorded announcement
- Follow me
- Call forwarding
- Tranfer to service operator

#### Call Completion Services

- Diversion on busy
  - to a selected number
  - to a hunt group
- Call waiting
- Priority subscriber
- Trunk offer
- Call queuing
  - Subscriber controlled
  - Administration controlled
- Mannual hold

#### Call Charge Services

- Charging Information Services
  - Subscriber's private meter
  - Detailed billing (printed record on
  - duration and charge of calls)
- Charging Debiting Services
  - Coin collection box lines: local and
  - STD/ISD lines
  - Non-metered lines (free-calls)
- PABX Services
  - PABX line hunting
  - Direct Inward Dialling (DID)







#### ISDN Services

- Bearer Services
  - Speech
  - 3.1 KHz audio
  - 64 Kbps unrestricted
- Supplementary Services
  - Number Identification services
  - MCID
  - DDI
  - MSN
  - SUB
  - CLIP/CLIR/CLIRO
  - COLP/ COLR /COLRO
  - Call Completion Services
  - CT
  - CFB
  - CFNR
  - CFU
  - LH
  - CW
  - CH
  - CQ
  - Call Completion Services
  - CNF
  - 3PTY
  - Charging Services
  - AOC-E
  - AOC-S
  - REV

- Miscellaneous Services
  - UUS
  - OCB - ICB
  - 100
  - ALM

#### IN Services

- Pre-paid Calling Card
- Freephone
- Premium Rate
- Televoting (Mass Calling)
- Universal Access Number

#### Miscellaneous Services

- Malicious call identification
- Dialling by equipment by eitherparty
- · Both party clear



#### **TECHNICAL SPECIFICATIONS SUMMARY**

#### Applications

- Local/Tandem /STP /SSP
- Integrated Local-cum -Tandem
- Trunk Automatic Exchange
- Group Dialling Centre
- Integrated STP
- Integrated SSP

#### Traffic Capacity

• MAX-XL: 8,00,000 BHCA, 7,808 E

#### Termination Capacity

- SBM RAX: 1,500 subscriber line and 128 trunks; or 450 trunks only
- IMAX-XL: 40,000 subscriber lines and 6,000 trunks; or 14,500 trunks only

#### Access Networks Interfaces

- V5.1 Interfaces
  - SBM: 5 V5.2 interfaces; 10 EI links; 3,072 subscribers
  - MBM (per BM) : 7 V5.2 interfaces; 14 EI links; 3072 subscribers

- V5.2 Interfaces
  - SBM: 5 V5.2 interfaces; 10 EI links; 3,072 subscribers
  - MBM (per BM) : 7 V5.2 interfaces; 14 EI links; 3072 subscribers

#### Environmental and Physical Aspects

- Pre-installation period
  - Temperature:-50 C to +60 c
  - Relative Huminity:up to 100%
- Operating Conditions
  - Temperature: 17 C to 25 C
  - Relative Humidity 45 % to 65 %









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