



सी-डॉट
C-DOT

Connecting **India** to the Future

Driving Innovation Through Technology

PRODUCT BOOKLET



Centre for Development of Telematics (C-DOT)
Telecom Technology Centre of Government of India



Digital India
Power To Empower

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OVERVIEW

Centre for Development of Telematics (C-DOT) , established in 1984 as an autonomous R&D centre of the Department Of Telecommunications, Ministry of Communications, Government of India has been widely known for its monumental role in ushering in the indigenous Telecom revolution in the nation. With its world class research labs equipped with the state-of-the-art infrastructure and a pool of the brightest engineers from the top institutes of the nation, C-DOT has been strongly committed to fulfilling the overarching objectives of national development through its targeted research initiatives addressing the specific connectivity needs of our diverse country. C-DOT's technologies aim at augmenting the broadband infrastructure of the nation and addressing the typical requirements pertaining to rural, security and strategic applications. C-DOT's diverse product portfolio spanning a wide array of technologies that include switching & routing, optical communication, wireless communication, 4G LTE, 5G, network security, advanced encryption techniques and Post-Quantum Cryptography based solutions, network management, M2M/IOT, AI, and a host of other telecom software applications is a manifestation of its unrelenting desire to capture the unexplored dimensions of the vast Telecom firmament.

C-DOT's indigenously designed exchanges, popularly called RAX and MAX that are still propelling the rural networks with the persistent upgrades to facilitate the provisioning of the latest IP-based services in an economically viable and effective manner.

C-DOT designed an early warning platform based on ITU's Common Alerting Protocol (CAP) for effective disaster management has been widely used by National and State Disaster Management authorities for dissemination of alerts and other useful information to the masses on all available media during emergencies like floods, cyclones and Covid pandemic.

C-DOT's GPON solution is fueling the backbone of BharatNet, the prestigious nationwide optical fibre based network connecting 2.5 lakh Gram Panchayats in the nation with high-speed broadband. C-DOT's XGS-PON is ideally suited to fulfilling the ever increasing demand of bandwidth emanating from the new dimensions of user applications like Work from Home, IPTV, HD Video Streaming, Online Gaming and host of other cloud- based services. C-DOT's high-capacity DWDM system has been designed to drive the core of Telecom networks in an optimally effective manner.

C-DOT's indigenously designed and developed network elements like Routers, Switches, etc. are a testimony to our prowess in building Next Generation Networks for "Smart Cities" and "Digital India". C-DOT has a wide suite of indigenous Wi-Fi solutions that are slated to play an increasingly pivotal role in the creation of PM-WANI Wi-Fi hotspots across the country.

C-DOT has also been developing indigenous solutions for strengthening communication networks for defence & strategic establishments. C-DOT has been actively involved in various projects of national importance that aim to augment the security of our national networks against cyber threats. C-DOT has developed Samvad, a mobile based unified secure chat & call platform and a Video-conferencing solution that are being used by the officers of various Government departments.

C-DOT is a proud member of the global oneM2M initiative and successfully demonstrated the interoperability of its M2M/IoT solutions on the platform. C-DOT has been focused on creating an inter-operable indigenous M2M/IoT ecosystem comprising of start-ups, industry, academia and R&D to boost innovation and growth in this new dimension.

C-DOT reiterates its commitment towards catalyzing the indigenous Telecom design, development & manufacturing for fulfilling the vision of "**Atmanirbhar Bharat**"

Foreword



C-DOT is a premier R&D organisation of the Government of India. As a torch-bearer of indigenous telecom research and development, it is committed to the cause of nation- building with the development of relevant products. C-DOT has undertaken more than three decades of relentless R&D efforts in the indigenous design, development and production of telecom technologies especially suited to the Indian landscape. With a pool of around 1000 brilliant and committed manpower, it has been at the technology forefront and significantly contributed to the digitization of the Indian Telecom Network.

It gives me immense pleasure to introduce C-DOT's efforts of R&D resulting in to an impressive product line, in the form of this product booklet. C-DOT has a vast product portfolio covering areas like 4G/5G, Wi-Fi, Disaster management, Cyber Security, Secured Quantum Communications, Artificial intelligence, Computer vision, Optical Access and Transport, Network management Solutions, Next Gen Switching and Routing and many more. This booklet provides a brief overview of these products, their applicability, benefits, technical specifications, conformances etc. across all key areas of technology mentioned above. I am sure this will help to provide perspective to CDOT's product line.

I am hopeful that this product booklet will be helpful for our existing and prospective customers, members of telecom industry, academia, Govt Institutions, Startups and other research bodies by providing them relevant information about all our products. We also aim to continuously innovate and expand our offerings through R&D collaboration with Domestic Startups, industry and academia to make India self-reliant in telecom technologies. This booklet will also prove to be a good source for prospective partners to understand C-DoT products, identify gaps and come up with a proposal for collaborative R&D and product development.

We look forward to your valuable feedback so that we could improve our products to meet the fast changing requirements.

Dr Rajkumar Upadhyay,
Chief Executive Officer



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C-DOT

OPTICAL PRODUCTS

GPON OPTICAL ACCESS PLATFORM

CDOT OLT5X | OFFICE-OLT | 8P MiniOLT | 16P MiniOLT

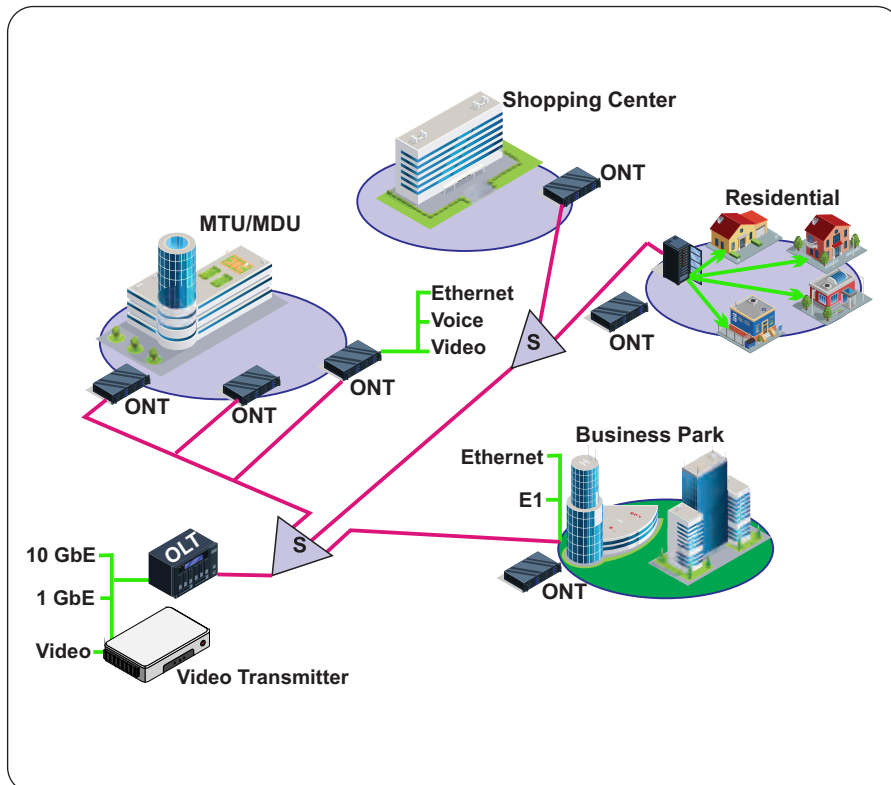
PRODUCT OVERVIEW

OLT (Optical Line Termination) is the central office equipment of the GPON system which works in point to multi point architecture and provides the Service Node Interface in the access network. The OLT supports data rate of 2.5 Gbps in downstream direction (i.e., OLT to ONT) at 1490nm and data rate of 1.25 Gbps in upstream direction at 1310nm. The OLT also supports 1:1 protection for PON ports towards ONTs (Optical Network Termination) at customer or user premises. OLT can serve up to 128 ONTs per fiber up to 20 Kms apart depending on optical budget available in the distribution network. Both Class B+(28dB) and Class C+(32dB) Optics can be used depending upon requirements. Data travelling between OLT and ONT is completely secure with AES encryption. Each OLT supports all the Ethernet layer-2 features. Entire



GPON system i.e., OLTs and ONTs can be synchronized through network clock. Management of the entire GPON system is done through LCT/EMS.

APPLICATION



BENEFITS

- Standalone GPON solution
- 4, 8, 16 or 48/96 GPON ports
- Compact 1U/19" design
- Up to 12,048 Broadband users
- High speed 2.5 / 1.25 Gbps
- Guaranteed QoS and SLA
- Fully featured with Layer 2 protocols
- Secured communications: isolation, encryption, ACL
- Redundant AC and DC power supplies @ low power consumption
- Ease of operation and complete equipment management
- Complete range of ONTs offering including 11ac and CATV
- Applications: local ISP with Triple-play services, Enterprises, hospitalities, Industries, Institutions, Commercial Complexes etc.

GPON OLTs

OLT SPECIFICATIONS

Attribute	CDOT OLT5X	Office OLT	8P MiniOLT	16 Port Mini OLT
Product				
System Capacity	Max. split ratio: 128 Backplane BW: 124 Gbps Mac table: 64K	Max. split ratio: 128 Backplane BW: 4 Gbps Mac table: 32K	Max. split ratio: 128 Backplane BW: 26 Gbps Mac table: 64K	Max. split ratio: 128 Backplane BW: 62 Gbps Mac table: 64K
Interfaces	GPON : 48/96 ports Uplink: 6x 1G/10G SFP/SFP+ 2 GbE RJ45 ports,	GPON: 4 ports Uplink: 4xGbE RJ45 ports	GPON: 8 ports Uplink: 4xGbE SFP, 2 GbE RJ45 ports, 2 x 10GbE SFP+ ports	GPON: 16 ports Uplink: 6xGbE 1G/10G SFP/SFP+ 2xGbE RJ45 ports,
Standards	ITU-T G.984/G.988 IEEE 802.1Q, VLAN IEEE 802.1ad, Double Tag IEEE 802.3ad physical link dynamic aggregation (LACP) Ethernet-II	ITU-T G.984/G.988 IEEE 802.1Q, VLAN IEEE 802.1ad, Double Tag IEEE 802.3ad physical link dynamic aggregation (LACP) Ethernet-II	ITU-T G.984/G.988 IEEE 802.1Q, VLAN IEEE 802.1ad, Double Tag IEEE 802.1w, RSTP IEEE 802.3ad physical link dynamic aggregation (LACP) Ethernet-II	ITU-T G.984/G.988 IEEE 802.1Q, VLAN IEEE 802.1ad, Double Tag IEEE 802.3ad physical link dynamic aggregation (LACP) Ethernet-II
Attribute of the PON interface	The transmission rate with downlink 2.5Gbps / Uplink 1.25Gbps Class B+ and class C+ GPON Module Security: ONU authentication mechanism			
QoS	IEEE 802.3x flow control (full duplex) IEEE 802.1p, CoS WRR, SP queue schedule Limiting the uplink/downlink rate based on each ONU DBA and SLA"			
VLAN	Port-Based VLAN, QinQ and flexible QinQ			
Multicast	L2 Multicast, IGMP			

OLT SPECIFICATION








Attribute	CDOT OLT5X	Office OLT	8P MiniOLT	16 Port Mini OLT
Reliability	Type B and Type C PON protection, SNI protection 1:1			
Network Security	Per port user limiting Port isolation Packet storm control Protocol-based ACL access control function Transmission data encryption on the PON interface			
Configuration Management	"SNMP, Telnet TFTP, FTP, RSYNC for software upgrade Debug Output			
Physical characteristics	It is housed in a 19" wide and 24" high shelf	277mm (Length) x 160.6 mm (Width) x 57 mm (Height)	471.5 mm (Length) x 287mm(width)x44 mm (Height)	471.5 mm (Length) x 287mm(width)x44 mm (Height)
Environment	Operating temperature: 0°C to 55°C Hygrometry: 10-85% non-condensing	Operating temperature: 0°C to 55°C Hygrometry: 10-85% non-condensing	Operating temperature: 0°C to 55°C Hygrometry: 10-85% non-condensing	Operating temperature: 0°C to 55°C Hygrometry: 10-85% non-condensing
Power Supply	-48 V DC input with two independent power supply modules and can work in standalone mode.	Two power feeds, AC: 100-240 Vac, 50-60 Hz, 80 W	Two power feeds, AC: 100-240 Vac, 50-60 Hz, 80 W	Two power slots, AC: 100-240 Vac, 50-60 Hz, 160 W

GPON ONTs

GPON ONT is the network termination equipment in GPON network which is located at the user premises. These are small box type units which can be Wall Mountable as well as Table Top. C-DOT's ONTs are compliant with ITU-T G.984 & TEC GR: GR/TX/PON-001/03.MAR.2017.

These compact, sleek and user-friendly units provide triple play services i.e., Voice, Video and Data to the users. ONTs support Uplink Speed of 1.244 Gbps (@1310nm) & Downlink Speed of 2.488 Gbps (@1490nm). Data travelling between OLT and ONTs is completely secure through Configurable AES (Downstream) and FEC (Downstream and Upstream). ONTs have 'Dying Gasp' feature to distinguish ONT down status at OLT based on ONT power down or optical fiber cut between OLT and ONT. The ONT has Optical Transmit Power in the range of 0.5 to 5.0 dBm and have receiver Sensitivity from -28 dBm to -8 dBm. ONTs have LEDs indication for Power/PON/Internet/LAN/WiFi/LOS/POTS.

ONT SPESIFICATIONS

Attribute	ONT 17	ONT 17A	ONT 18	ONT 23	ONT 24	ONT 27	ONT 23A
							
PON Port	2	1	1	1	1	1	1
Ethernet 10/100/1000	4	4	4	1	4	2	1
Ethernet 10/100	-	-	-	1	-	-	1
WiFi	802.11 b/g/n	802.11 b/g/n	802.11 b/g/n	802.11 b/g/n	802.11 b/g/n	802.11b/g/n +802.11 ac 2.4GHz 150 Mbps 5GHZ 800 Mbps	802.11b/g/n
VoIP	2xFXS	2xFXS	2xFXS	None	2xFXS	1xFXS	1xFXS
CATV	NA	NA	Yes	NA	NA	NA	NA
USB	2	2	2	None	2	1	None
Router	Bridge and router						
Fibre	SC/ APC						
PON Interface	Downlink 2.5Gbps/Uplink 1.25Gbps - Rx: 1490nm/Tx: 1310nm Distance: 20Km Sensitivity: -27dbm Security: ONT authentication mechanism						

ONT SPESIFICATIONS

Attribute	ONT 17	ONT 17A	ONT 18	ONT 23	ONT 24	ONT 27	ONT 23A
Standards	ITU-T G.984/988 IEEE 802.1Q IEEE 802.1ad & q-in-1 double VLAN						
VLAN	Port based VLAN Service based VLAN						
Multicast	IGMP-Snooping MLD-Snooping						
QoS	IEEE 802.3x flow control IEEE 802.1p, CoS 8 priority queue per port Rate limit						
Reliability	Dying-gasp						
Security	Per port MAC address limitation Port storm control						
Management	CLI, Web, Telnet and OMCI Software upgrade through TFTP , web and OMCI						
Power Supply	12 Vdc external adapter						
Power Consumption	17W	16W	18W	6W	14W	12W	10W
Dimension WxDxH mm	220 mm X 156 mm X 48.6 mm	220 mm X 156 mm X 48.6 mm	220 mm X 156 mm X 48.6 mm	155.7 mm X 106.6 mm X 33.2 mm	180 mm X 140 mm X 44.1 mm	160 mm X 145 mm X 37.7 mm	155.7 mm X 106.6 mm X 33.2 mm
Operating Tempeture	-5 TO 55°C						

XGS-PON OPTICAL ACCESS PLATFORM

CDOT XGS-PON OLT | XGS-MiniOLT | NGN-PON OLT

PRODUCT OVERVIEW

XGS-PON provides 10 Gbps symmetric data transmission capability over the fibre network. It is defined by ITU-T recommendations G.9807 and can coexist with legacy GPON technology on the same fibre as the wavelengths used in XGS-PON i.e., 1577/1270 nm for downstream and upstream respectively are outside the spectrum allocated for legacy PON.

OLTs can support up to 256 ONTs per PON port which can be 20 Kms apart depending on optical budget available in distribution network. Both Class N1 (29dB) and Class N2 (31dB) Optics can be used depending upon requirements. Data travelling between OLT and ONT is completely secure with AES encryption.



XGS-PON ONT

XGS-PON ONT is the network termination equipment in GPON network which is located at the user premises. These are small box type units which can be Wall Mountable as well as Table Top. C-DOT's ONTs are compliant with ITU-T G.984 & TEC GR: GR/TX/PON-001/03.MAR.2017.

These compact, sleek and user-friendly units provide triple play services i.e., Voice, Video and Data to the users. ONTs support Uplink Speed of 10 Gbps (@1270nm) & Downlink Speed of 10 Gbps (@1577nm). Data travelling between OLT and ONTs is completely secure through Configurable AES (Downstream) and FEC (Downstream and Upstream). ONTs have 'Dying Gasp' feature to distinguish ONT down status at OLT based on ONT power down or optical fiber cut between OLT and ONT.

XGS-PON ONT R




XGS-Ring-ONT has two XGS-PON ports, five numbers of Gigabit Ethernet ports, 10G optical Ethernet port, two VoIP ports, two IEEE 802.11n Wi-Fi interfaces and two USB 3.0 ports

BENIFITS

- **Standalone GPON solution**
- **48 XG-PON ports**
- **Compact 1U/19" design**
- **Up to 12,048 Broadband users**
- **High speed 10 / 10 Gbps**
- **Guaranteed QoS and SLA**
- **Fully featured with Layer 2 protocols**
- **Secured communications: isolation, encryption, ACL**
- **Redundant AC and DC power supplies @ low power consumption**
- **Ease of operation and complete equipment management**
- **Complete range of ONTs offering including 11ac and CATV**
- **Applications: local ISP with Triple-Play services, Enterprises, Hospitalities, Industries, Institutions, Commercial Complexes etc.**

XGS-PON OLTs

OLT SPECIFICATIONS

Attribute	XGS-PON OLT	XGS MiniOLT	NGPON2 OLT
			
System Capacity	Max. split ratio: 256 Backplane BW: 124 Gbps Mac table: 64K	Max. split ratio: 256 Backplane BW: 60 Gbps Mac table: 64K	Max. split ratio: 256 Backplane BW: 124 Gbps Mac table: 64K
Interfaces	XGPON: 48 ports Uplink :6x GbE 1G/10G SFP/SFP+ 2 GbE RJ45 ports	XGPON: 48 ports Uplink :6x GbE 1G/10G SFP/SFP+	NGPON2: 12 ports Uplink :6x GbE 1G/10G SFP/SFP+ 2 GbE RJ45 ports
Standards	ITU-T G.984/G.988 IEEE 802.1Q, VLAN IEEE 802.1ad, Double Tag IEEE 802.3ad physical link dynamic aggregation (LACP) Ethernet-II	ITU-T G.984/G.988 IEEE 802.1Q, VLAN IEEE 802.1ad, Double Tag IEEE 802.1w, RSTP IEEE 802.3ad physical link dynamic aggregation (LACP)	ITU-T G.984/G.988 IEEE 802.1Q, VLAN IEEE 802.1ad, Double Tag IEEE 802.3ad physical link dynamic aggregation (LACP) Ethernet-II
Attribute of the PON interface	"The transmission rate with downlink 10Gbps / Uplink 10Gbps Class B+ and class C+ GPON Module Security: ONU authentication mechanism"	"The transmission rate with downlink 10Gbps / Uplink 10Gbps Class B+ and class C+ GPON Module Security: ONU authentication mechanism"	"The transmission rate with downlink 10Gbps / Uplink 10Gbps Class B+ and class C+ GPON Module Security: ONU authentication mechanism"
QoS	IEEE 802.3x flow control (full duplex) IEEE 802.1p, CoS WRR, SP queue schedule Limiting the uplink/downlink rate based on each ONU DBA and SLA"		
VLAN	Port-Based VLAN, QinQ and flexible QinQ		
Multicast	L2 Multicast, IGMP		
Reliability	Type B and Type C PON protection, SNI protection 1:1		
Network Security	Per port user limiting Port isolation Packet storm control Protocol-based ACL access control function Transmission data encryption on the PON interface		
Configuration Management	"SNMP, Telnet, TFTP, FTP, RSYNC for software upgrade, Debug Output"		
Physical characteristics	It is housed in a 19" wide and 24U high shelf.	It is housed in a 19" wide and 1U high shelf.	It is housed in a 19" wide and 24U high shelf.
Environment	It conforms to QM333 'B2' category specifications.	It conforms to QM333 'B2' category specifications.	It conforms to QM333 'B2' category specifications.
Power supply	Two power feeds AC: 100-240 Vac, 50-60 Hz, 80 W	Two power feeds, AC: 100-240 Vac, 50-60 Hz, 80 W	Two power slots, AC: 100-240 Vac, 50-60 Hz, 160 W

XGS-PON ONTs

ONT SPECIFICATIONS

Attribute	XGS PON ONT	XGS PON ONT R	NGPON2 ONT
			
Ethernet 10G SFP	1	1	1
Ethernet 10/100/1000	5	5	5
WiFi	802.11 b/g/n + 802.11 ac	802.11 b/g/n + 802.11 ac	802.11 b/g/n + 802.11 ac
VoIP	2xFXS	2xFXS	2xFXS
CATV	NA	NA	Yes
USB	2 USB 3.0	2 USB 3.0	2 USB 3.0
Router	Bridge and router		
Fibre	SC/UPC		
PON Interface	Downlink 10Gbps/Uplink 10Gbps - Rx: 1577nm/Tx: 1270nm Distance: 20Km Sensitivity: -28dbm Security: ONT authentication mechanism	Downlink 10Gbps/Uplink 10Gbps - Rx: 1577nm/Tx: 1270nm Distance: 20Km Sensitivity: -28dbm Security: ONT authentication mechanism	Downlink 10Gbps/Uplink 10Gbps - Rx: 1596.34, 1597.19, 1598.04, 1598.89 nm (Tunable)/Tx: 1532.68, 1533.47, 1534.25, 1535.04 nm (Tunable) Distance: 20Km Sensitivity: -28dbm Security: ONT authentication mechanism
Standards	ITU-T G.9807.1/G.988 IEEE 802.1Q IEEE 802.1ad & q-in-1 double vlan	ITU-T G.9807.1/G.988 IEEE 802.1Q IEEE 802.1ad & q-in-1 double vlan	ITU-T G.987.x/G.988 IEEE 802.1Q IEEE 802.1ad & q-in-1 double vlan
VLAN	Port based VLAN Service based VLAN		
Multicast	IGMP-Snooping		
QoS	IEEE 802.3x flow control IEEE 802.1p, CoS		
Reliability	Dying gasp	Type R	Dying gasp
Security	Per port MAC address limitation Port storm control		

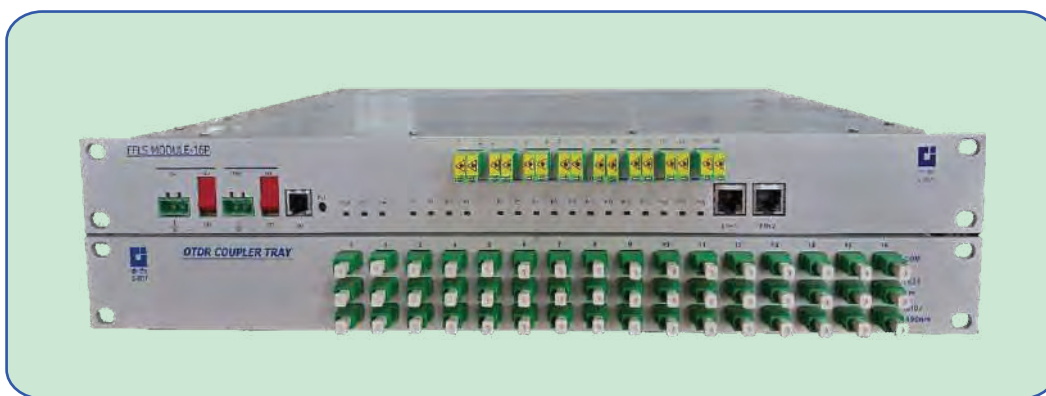
ONT SPECIFICATIONS

Attribute	XGS PON ONT	XGS PON ONT R	NGPON2 ONT
Management	CLI, Web, Telnet and OMCI		
Power Supply	12 V DC external adapter		
Power Consumption	17.7 W	19.5 W	19 W
Dimensions WxDxH mm	260 mm x 177 mm x 48.6 mm	260 mm x 177 mm x 48.6 mm	260 mm x 177 mm x 48.6 mm
Operating temperature	-5 to 55°C		

Fiber Fault Localization System (FFLS)

C-DOT FFLS (Fiber Fault Localization System) integrates with optical transport network to provide in-service monitoring of the network, it detects and locates fiber fault (fiber cut or removal of connector) along with its overlay of fault location (lat., long. with fiber details) on GIS Map (private or public) taking satellite imagery as background.

FFLS for a specific fiber based technology, utilizes deployed network (Central Office (CO) and Customer Premise Equipment (CPE) as topological nodes along with its NMS (Network Management System)), considering technology specific parameters e.g. link budget and ranging along with its physical coverage. Currently FFLS has been tested on C-DOT GPON; however it can be customized to work with any-vendor GPON solution.



System Features

- FFLS Server can handle multiple COs (Central Offices) e.g. OLTs (Optical Line Terminals) per NMS and it can detect multiple faults simultaneously.
- Works for Point to Point and Point to Multipoint networks.
- Typical time to localize fault is 2 min.
- Works on ALWAYS ON mode and does periodic monitoring of PON health.
- Fault location accuracy can be improve with highly accurate GIS map.
- Web based Centralized system which uses NMS to fetch relevant information for fault detection.
- SMS, Email to user through NMS.

CDOT 100G DWDM and 1.6T POTP SYSTEM

100G DWDM System

100G DWDM system is a client agnostic OTN based transport network system and caters to multiple clients like SDH, Ethernet, Fiber Channel, OTN etc. the system is used for transmitting data from different sources over the same fiber optic link at the same time whereby each data channel is carried on its own unique wavelength. It is the de-facto choice for Telecom Service Providers for both metro and long-haul core networks to address the unprecedented demands for high bandwidth. System comprises of Terminal Equipment, ROADM (Re-Configurable Optical Add Drop Multiplexer), In-Line Optical Amplifiers to cover the transport distance of data traffic up to 640 Km span without regeneration.



Benefits

- 80 Channels with 50Ghz Spacing
- Supports long haul & very long haul applications
- Optical pre-emphasis and athermal optical multiplexing/de-multiplexing
- Up to 80 channels Add/Drop
- Alien wavelength supported
- Control Plane based advanced protection and restoration scheme
- Forward error correction at the 100G line-side supported
- In-service upgradation from TE to ROADM
- A user-friendly Local Management Interface (LMI) for operation, administration and maintenanc.
- Simple Network Management Protocol (SNMP) based Element Management System (EMS)

- Standard protections for Linear, Ring and Mesh Topologies
- Simple Network Management Protocol (SNMP) based Element Management System (EMS)
- Standard protections for Linear, Ring and Mesh Topologies

1.6T POTP SYSTEM



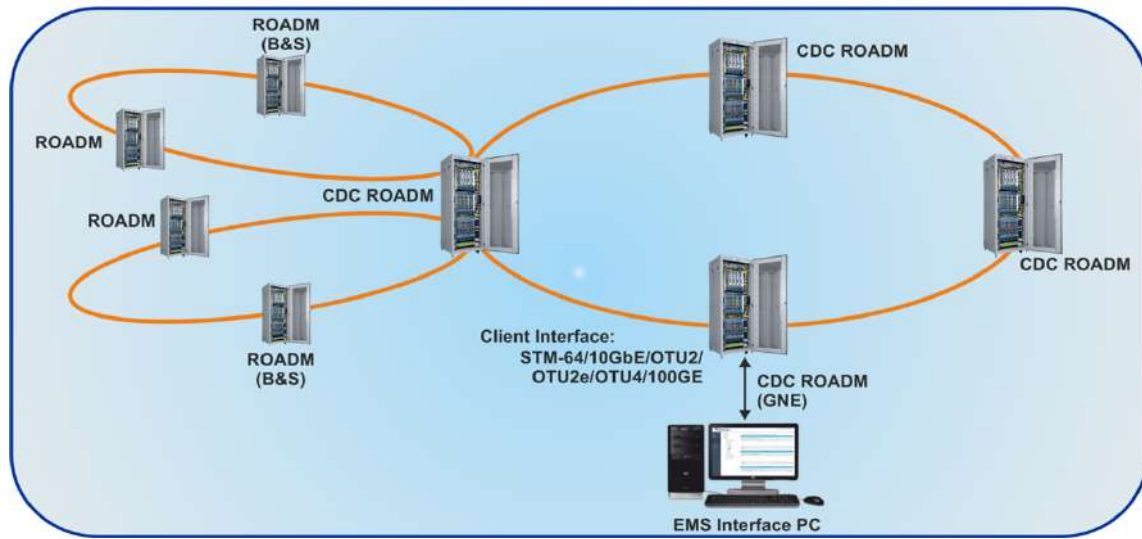
POTP, Packet Optical Transport network, has OTN switching capability of 1.6Tbs The system supports 8 wavelengths of 100G on line side interface and supports 80x10G clients of Ethernet, OTN, Fibre Channel, SDH/SONET etc. This provides traffic switching across all the wavelengths resulting effective utilization of available transport capacity among different nodes connected through POTP/DWDM network.

Benefits

- Simple Network Management Protocol (SNMP) based Element Management System (EMS)
- Standard protections for Linear, Ring and Mesh Topologies
- Active/Passive Controller card redundancy
- Intelligent GMPLS based Control plane
- SNC-I,N,S Protected Client in 1:R, 1+1+R and 1+1 Mode

APPLICATION

TYPICAL APPLICATION CONFIGURATION



System Specification

System	DWDM	POTP
System Capacity	Up to 80 channels of 10G/100G capacity each	1.6T OTN cross-connect
Interfaces	OTU2 (Tri-FEC) 10GE LAN OC-192/STM-64 FC-800, FC-1200 and CBR OTU4, 100GE, OC-3/STM-1 OC-12/STM-4 OC-48 / STM-16 OTU1	OTU4 (Tri-FEC) OTU2 10GE LAN OC-192/STM-64 FC-800, FC-1200
VLAN	Not Applicable	Port Based
Fault Management	There is provision for detection, collection, validation and reporting of all the alarms in the system. The alarms are reported to LCT at the corresponding Node as well as to the EMS.	
Reliability	DWDM Line Protection in Optical multiplexed section DWDM Line Protection BEFORE Optical multiplexed section Client 1+1 Protection Client 1+1 Protection with Dual Client interface	Client 1+1 Protection Client 1+1 Protection with Dual Client interface
Physical characteristics	Rack: 600mm(W) x 600 mm(D) x 2250mm(H) Sub-Rack: 482.60 (W) x 546.30 (D) x 663.90 (H) mm	Rack: 800mm (W) x 800mm (D) x 2337mm (H) Sub Rack: 590mm (W) x 507.2mm (D) x 663.9mm (H)
Standards	ITU-T Rec. G.652D ITU-T Rec. G.655 ITU-T Rec. G.662 ITU-T Rec. G671 ITU-T Rec. G681 ITU-T Rec. G.692 ITU-T Rec. G.707 ITU-T Rec. G709 ITU-T Rec. G798 ITU-T Rec. G805 ITU-T Rec. G.823	

CDOT 100G DWDM and 1.6T POTP SYSTEM

System Specification

	Parameter	Range	Units
Attribute of DWDM / POTP channel interface	Nominal Bit rate	127.156 (OTU4)	Gbps
	Modulation Type	DP-QPSK	
	Mean launched power range	-15 to +2	dBm
	Central Frequency	193.1	Thz
	Transmit Wavelength Range as per ITU Grid	1529.55 -1560.01	nm
	Receiver Sensitivity	-18	dBm
	Receiver Type	PIN	
	Receiver Overload power	0	dBm
	Receiver wavelength range	1529-1565	nm
	Receiver Reflectance	<= -27	dB
	DGD Tolerance	15	ps
	Configuration Management	"SNMP, Telnet, TFTP, FTP, RSYNC for software upgrade Debug Output"	
Environment	Operating temperature: 0°C to 55°C Hygrometry: 10-85% non-condensing		
Power Supply	- 48 V DC input with two independent power supply modules and can work in stand-alone mode. Two power feeds, redundant and hot-swappable Nominal power supply : - 48V DC Input power supply range : - 40V DC to -60V DC The D.C. voltage in the equipment has protection against overvoltage/under voltage and short circuit.		
Optical Connectors Interface	All optical connectors will be LC/UPC & LC/APC type.		
ASON Features	Platinum Service Gold Service Silver Service Bronze Service		



सी-डॉट
C-DOT

ROUTERS & SWITCHES

C-DOT Routers

CDOT BRTR-10 | CRTR-210 | CRAT-100 | CTX-2000

PRODUCT OVERVIEW

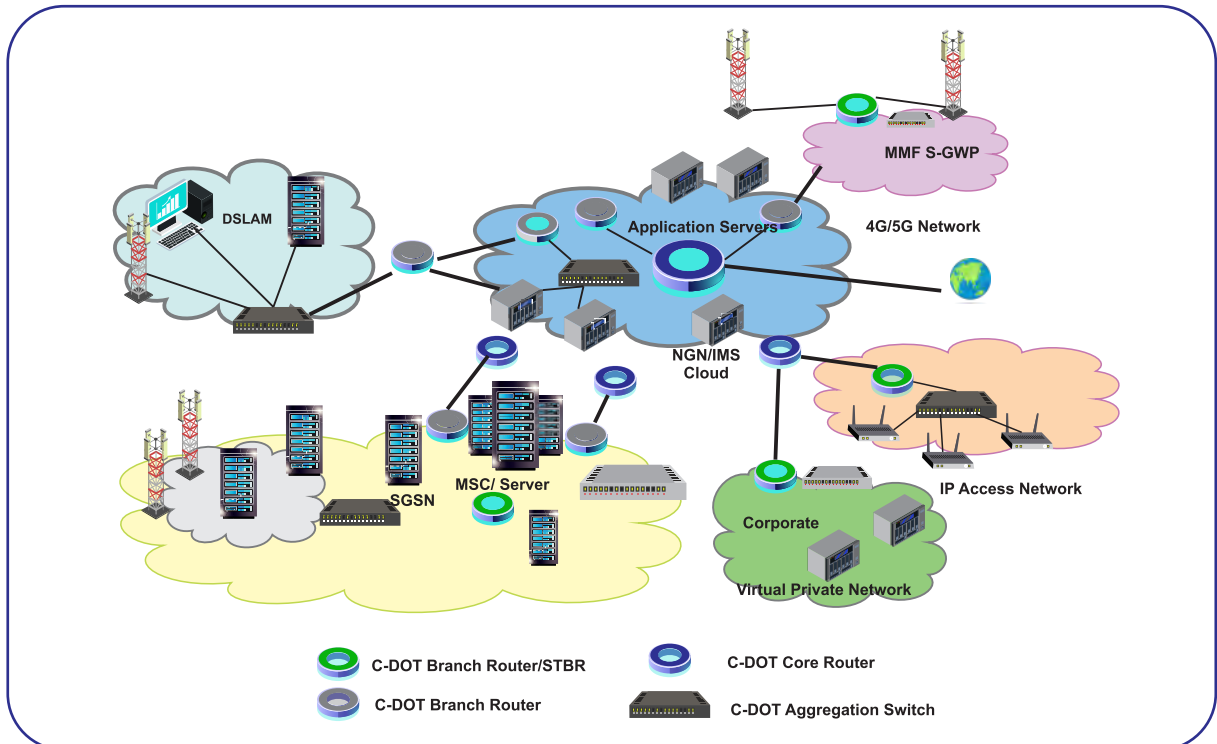
C-DOT's next generation routing products are built to address challenges faced by users and service providers at the customer edge, providers edge and core networks. These products provide backbone for carrying voice, data and video traffic through IP network. They offer enhanced performance and port density to support multiple services in a 1-U chassis form-factor. The products are cost-effective, feature-rich and power-efficient, providing low to very high packet throughput, thus reducing the total cost of ownership. These products supports Ethernet Small Form Factor Pluggable (SFP) optical/ electrical interfaces for network connectivity. Some of the products in the family support Multi-Protocol Label Switching (MPLS) and VPN Technology for provisioning of various services. Moreover, both IPv4 and IPv6 Protocols are supported in these







systems. System configuration and management is supported through Command Line Interface and EMS/NMS through SNMP or NetConf protocols.

These products also support other value added features, which together make IP/MPLS network fail-safe and reliable for 4G/5G/IMS services and applications.

APPLICATION



C-DOT ROUTER SPECIFICATIONS

Attributes	Branch Router (BRTR - 10)	Secure Router (CRTR-210)	Terabit Router (CRAT-100/CRDT-100)	Core Router (CTX-2000)
				
System Capacity	Throughput: 10 Gbps	Throughput: 56 Gbps	Throughput: 960 Gbps	Throughput: 6.4 Tbps
Interfaces	1G Optical/Electrical: 2 ports (SFP based) 10/100/1000 Mbps GbE : 8 ports E1 (GFP) : 8 ports E1 (TDM) : 8 ports V.35 : 1 port	1G Optical/Electrical: 24 ports (SFP based) 1000/100/10 Mbps Electrical (RJ45) : 4 ports	1G/10G Electrical/Optical: 48 ports (SFP based)	100 Gbps : 32 ports OR 40 Gbps: 32 ports OR 10G/25Gbps : 128 ports (using break-out cables)
Layer 3 protocols	IPv4 IPv6 OSPF RIP BGP ISIS VRRP	IPv4 IPv6 VRF OSPFv2/v3 RIP/RIP-ng BGPv4/MP-BGP ISIS PIM-DM/SM/SSM IGMP/MLD MPLS LDP MPLS L3VPN VRRP PBR	IPv4 IPv6 VRF OSPFv2/v3 RIP/RIP-ng BGPv4/MP-BGP ISIS PIM-DM/SM/SSM IGMP/MLD IGMP/MLD Snooping MPLS LDP MPLS L3VPN VPWS RSVP-TE VRRP PBR GRE	IPv4 IPv6 VRF OSPFv2/v3 RIP/RIP-ng BGPv4/MP-BGP ISIS PIM-DM/SM/SSM IGMP/MLD IGMP/MLD Snooping MPLS LDP MPLS L3VPN RSVP-TE BFD VRRP PBR GRE EVPN-VxLAN
Layer 2 Protocols	VLAN STP/RSTP/MSTP	VLAN STP/RSTP/MSTP LLDP LAG MVRP DHCP server/Relay	VLAN STP/RSTP/MSTP LLDP LAG MC-LAG	VLAN STP/RSTP/MSTP LLDP LAG MC-LAG Voice VLAN DHCP Server/Relay DNS Resolver
Security	ACL Authentication Rate-Limiting Ipssec NAT	ACL Protocol Authentication Storm Control CoPP BPDU/Root guard Ipssec MACSec DHCP snooping/DAI IP Source Guard 802.1x, Port Security DoS/DDoS protection NAT	ACL Protocol Authentication Storm Control CoPP BPDU/Root guard DHCP Snooping/DAI/IP Source Guard	ACL Protocol Authentication Storm Control CoPP BPDU/Root guard DHCP Snooping/DAI/IP Source Guard

C-DOT ROUTER SPECIFICATIONS

Attributes	Branch Router (BRTR - 10)	Secure Router (CRTR-210)	Terabit Router (CRAT-100/CRDT-100)	Core Router (CTX-2000)
Redundancy	LAG VRRP ECMP Dual redundant power supply LAG	VRRP ECMP Dual redundant power supply LAG	MC-LAG VRRP ECMP Dual redundant power supply LAG	MC-LAG VRRP ECMP Dual redundant power supply
Management	In-band Out of Band SNMP v1/v2/v3 CLI EMS/NMS SSH, SFTP, SCP AAA	In-band Out of Band SNMP v1/v2/v3 NetConf Openflow CLI EMS/NMS SSH, SFTP, SCP AAA	In-band Out of Band SNMP v1/v2/v3 NetConf CLI EMS/NMS SSH, SFTP, SCP AAA ZTP	In-band Out of Band SNMP v1/v2/v3 NetConf CLI EMS/NMS SSH, SFTP, SCP AAA ZTP
QoS Feature		802.1p DiffServ SP/WRR Scheduling WRED 8 queues per port	802.1p DiffServ SP/WRR Scheduling WRED 8 queues per port	802.1p DiffServ ETS/ECN/WRED SP/WRR Scheduling 8 queues per port
Monitoring	S-Flow Port Mirroring	S-Flow Port Mirroring IP SLA Monitoring (TWAMP)	Port Mirroring RMON Syslog	S-Flow Port/VLAN/Flow Mirroring RMON Syslog
Physical characteristics (Length x Width x Height)	483 mm x 305 mm x 44.5 mm	650 mm x 482.6 mm) x 44.5 mm	595 mm x 446 mm x 44.5 mm	595 mm x 428mm x 44 mm
Environment	Operating Temperature: 10°C to 35°C Humidity: 10-85% non-condensing	Operating Temperature: 0°C to 35°C Humidity: 10-85% non-condensing	Operating Temperature: 5°C to 35°C Humidity: 10-85% non-condensing	Operating Temperature: 0°C to 40°C Humidity: 10-85% non-condensing
Power supply	-48 V DC 220V AC	220V AC	-48 V DC 220V AC	220V AC

CDOT SWITCHES

CDOT CSX-100 | CAGG-24E | CAGG-240 | M System

Product Overview

C-DOT Aggregator/ Managed Layer 2 switch, a next generation switching product, built to address the challenges faced by service providers which provides unmatched level of service edge and carrier ethernet networking features with wire speed performance. The service aware architecture is designed to map data traffic to services, with individual services offering MEF complaint features like classification, policing, scheduling & traffic shaping for providing network based on Provider Bridge (PB), Provider Backbone Bridge (PBB/Customer Backbone Switch) and Provider Backbone Bridge with Traffic Engineering (PBB-TE).

C-DOT CSX-100 Series of Aggregator is a layer-2/layer-3 managed switch supporting optical or electrical interfaces for interconnecting servers, clients, RAS, routers and other devices used in the internet or intranet. It combines the power of modular architecture with the flexibility of the packet processing engine.

The C-DOT Aggregator can handle traffic with up to 24X1Gb ports and up to four 1/10Gb ports for trunking/ cascading. It has an inbuilt CPU which acts as a Carrier Ethernet switch with all the security and configuration features needed in a L2/L3 switch. CLI and GUI interfaces are available for configuration and monitoring along with an LED-based status display

Applications




- Network Interface Devices targeting Corporate Office locations and Cell site, RAS & other devices.
- Carrier Ethernet Access & Aggregation Switch
- Wireless backhaul targeting cell sites.
- Data Center Switch

Benefits

- Upto 88Gbps Switch
- Configurable Optical/ Electrical ports
- Compact 1U/19" design
- Featured with Layer 2 and Layer 3 protocols
- QoS and ACL
- Redundant AC and DC power in CSX-100
- Ease of operation and complete equipment management
- Interworking with any commercial Switch
- Applications: Local ISP with Triple-Play services, Aggregation Network, Data Centres, Customer Edge Network



C-DOT SWITCH SPECIFICATIONS

Attributes	Ethernet Switch (CSX-100)	Ethernet Switch (CAGG-24E)	Optical Switch (CAGG-24O)
			
System Capacity	Throughput: 88 Gbps	Throughput: 52 Gbps	Throughput: 52 Gbps
Interfaces	1G Electrical: 24 ports 1/10G Optical: 4 ports (SFP based) 1G Electrical dedicated Management port: 1 Serial console :1	1G Ethernet electrical interface in Full Duplex mode: 24 10G Gigabit Ethernet optical (SFP+) uplink ports: 2 1G Electrical dedicated Management port: 1 Serial console :1	1G Ethernet Optical interface in Full Duplex mode: 24 10G Gigabit Ethernet optical (SFP+) uplink ports: 2 1G Electrical dedicated Management port: 1 Serial console :1
Carrier Ethernet	Can act as a Provider Bridge (PB) switch Can act as a Provider Backbone Bridge (PBB) switch/ Customer Backbone Switch 4K MAC-in-MAC encapsulations PBB-TE switch - includes all PBB features with 4K Ethernet Switched Paths (ESPs) and 512 hardware protected ESPs OAM hardware for 4K service points, 512 paths, 32 ports Software for OAM and protection switching Layer 1 Synchronous Ethernet Layer 2 IEEE 1588 time stamping hardware ELINE, ELAN and ETREE MEF services Performance Monitoring Traffic Policing based on EIR, CIR, MBS	Can act as Provider Bridge (PB) switch with 32K MACs and 4K VLANs. Can act as Provider Backbone Bridge (PBB)/Customer backbone switch. [16K B-MACs & 4K B-VLANs (Backbone MACs/Backbone VLANS, 16K C-MACs, 4K VLANs (customer MACs/customer Edge VLANs), 4K MAC-in-MAC encapsulations] PBB-TE (with 4K Ethernet switched Paths (ESP) & 512 hardware protected ESPs]. Performance monitoring & OAM hardware for 4K service points, 512 paths, 32 ports.	Can act as Provider Bridge (PB) switch with 32K MACs and 4K VLANs. Can act as Provider Backbone Bridge (PBB)/Customer backbone switch. [16K B-MACs & 4K B-VLANs (Backbone MACs/Backbone VLANS, 16K C-MACs, 4K VLANs (customer MACs/customer Edge VLANs), 4K MAC-in-MAC encapsulations] PBB-TE (with 4K Ethernet switched Paths (ESP) & 512 hardware protected ESPs]. Performance monitoring & OAM hardware for 4K service points, 512 paths, 32 ports.
Layer 3 protocols	Static Routing DSCP based QoS, Translation and Classification Supported 32K Layer 2 Multicast Groups supporting up to 1K port masks 1K IPv4 Multicast Groups. Security 32K IPv4/IPv6 Multicast Groups Internet Group Management Protocol version 2 and version 3(IGMPv2/v3) support Internet Group Management Protocol version 3 (IGMPv3) support SDN Enabled Multicast Listener Discovery (MLD) version 1 and version 2 support IGMP Snooping MLD Snooping VRRP	Static Routing. Supports DHCP snooping & relay functions IGMP(v2, v3) MLD(v1, v2) Snooping ARP inspection GRE	Static Routing. Supports DHCP snooping & relay functions IGMP(v2, v3) MLD(v1, v2) Snooping ARP inspection GRE

C-DOT SWITCH SPECIFICATIONS

Attributes	Ethernet Switch (CSX-100)	Ethernet Switch (CAGG-24E)	Optical Switch (CAGG-24O)
Layer 2 protocols	<p>802.1Q VLAN switch Push/Pop/Translate upto two VLAN tags on ingress and/or egress Policing with leaky bucket storm control and protection from broadcast, flooding and multicast Loop Protection Spanning Tree Protocol Rapid Spanning Tree Protocol (RSTP) support Multiple Spanning Tree Protocol (MSTP) support Multiple Registration Protocol (MRP) Multiple VLAN Registration Protocol (MVRP) VLAN Learning Independent VLAN Learning (IVL) Shared VLAN Learning (SVL) Hardware and Software based Learning 512 TCAM-based QoS, VLAN and Security Profile Classification Entries Voice VLAN VLAN Translation VLAN Trunking</p>	<p>Supports standard IEEE 802.1D STP, IEEE802.1s Rapid STP for faster convergence, IEEE 802.1s Multiple STP. 802.1Q VLAN switch with 32K MACs & 4K VLANs. Push/Pop/Translate up to 2 VLAN tags on ingress and/or egress. VLAN can be MAC based, protocol based and IP subnet based. VLAN Learning: Independent VLAN Learning (IVL) and Shared VLAN Learning (SVL). Hardware and Software based Learning.512 TCAM based QoS, VLAN and Security profile classification entries. Voice VLAN</p>	<p>Supports standard IEEE 802.1D STP, IEEE802.1s Rapid STP for faster convergence, IEEE 802.1s Multiple STP. 802.1Q VLAN switch with 32K MACs & 4K VLANs. Push/pop/translate up to 2 VLAN tags on ingress and/or egress. VLAN can be MAC based, protocol based and IP subnet based. VLAN learning: Independent VLAN learning (IVL) and Shared VLAN learning (SVL). Hardware and Software based Learning.512 TCAM based QoS, VLAN and Security profile classification entries. Voice VLAN.</p>
Security	<p>Network Access Server (NAS) Port-based IEEE 802.1X Single and multiple IEEE 802.1X MAC-based authentication Port based VLAN and QoS assignment MACSEC (802.1AE) on uplink ports Guest VLAN RADIUS authentication and accounting ü MAC address limit TACACS+ Web and CLI Authentication Authorization (15 user levels) ACLs for filtering, policing, and port copy IP source guard ü IP MAC binding IP MAC binding dynamic to static</p>	<p>Network Access Server (NAS) ACL for filtering policing and port copy Port-based IEEE 802.1x Single and multiple IEEE 802.1x, MAC based authentication Guest VLAN, VLAN & QoS assignment RADIUS account MAC address limit Web and CLI authentication Authorization (15 user levels) IP source guard IP MAC binding & IP MAC binding dynamic to static.</p>	<p>Network Access Server (NAS) ACL for filtering policing and port copy Port-based IEEE 802.1x Single and multiple IEEE 802.1x, MAC based authentication Guest VLAN, VLAN & QoS assignment RADIUS account MAC address limit Web and CLI authentication Authorization (15 user levels) IP source guard IP MAC binding & IP MAC binding dynamic to static.</p>
Redundancy	<p>LAG VRRP Dual redundant AC power supply</p>	<p>LAG</p>	<p>LAG</p>

C-DOT SWITCH SPECIFICATIONS

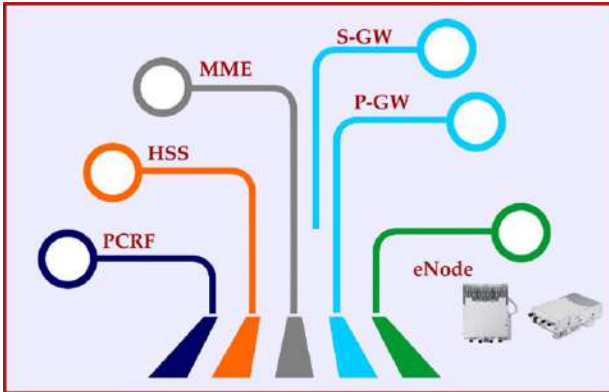
Attributes	Ethernet Switch (CSX-100)	Ethernet Switch (CAGG-24E)	Optical Switch (CAGG-24O)
Management	<p>HTTP Server CLI – console port and Telnet Management access filtering HTTPS SSH TFTP IPv6 Management System/Syslog Software Upload through Web SNMP v1, v2c, v3 Agent RMON IEEE 802.10AB-2005 Link Layer Discovery – LLDP and LLDP-MED Discovery filtering, CDP DNS client, Proxy DHCP server, Client Daylight savings Configuration download and upload: XML format Multiple SNMP trap destinations Software up gradation through CLI/GUI interface Status LEDs for LAN-WAN ports, Board-up and Power Status Monitoring of Power Supplies Fan Status Monitoring Adaptive Fan Control Configuration Rollback</p>	<p>Secure Management access via CLI, Telnet, GUI or MIB through serial console, SSH, HTTP server, SNMPv3 respectively. Management access filtering HTTPS. Software upload through web. DNS client /Proxy. IPv6 Management. IEEE 802.10AB LLDP (Link Layer Discovery Protocol) & LLDP-MED (Media Endpoint Discovery) with discovery filtering. Loop detection/restore to default. Daylight savings</p>	<p>Secure management access via CLI, telnet, GUI or MIB through serial console, SSH, HTTP server, SNMPv3 respectively. Management access filtering HTTPS. Software upload through web. DNS client /Proxy. IPv6 Management. IEEE 802.10AB LLDP (Link Layer Discovery Protocol) & LLDP-MED (Media Endpoint Discovery) with discovery filtering. Loop detection/restore to default. Daylight savings.</p>
QoS Features	<p>Traffic classes (8 active priorities) Port default priority User priority Input priority mapping QoS control list (QCL mode) Storm Policing Weighted Random Early Detection (WRED) Policers: port, service, queue, and global/ACL Port and queue egress shaper</p>	<p>802.1p Traffic classes (8 active priorities). Policers: port, service3, queue and global/ACL. Port and queue egress shaper. Port default priority. User Priority. Input Priority mapping. Storm Policing. Weighted Random Early Detection (WRED).</p>	<p>802.1p Traffic classes (8 active priorities). Policers: port, service3, queue and global/ACL. Port and queue egress shaper. Port default priority. User Priority. Input Priority mapping. Storm Policing. Weighted Random Early Detection (WRED).</p>
Monitoring	<p>Port Mirroring/Flow Mirroring. RMON Sflow</p>	<p>Port Mirroring/Flow Mirroring. RMON Sflow.</p>	<p>Port Mirroring/Flow Mirroring. RMON Sflow.</p>
Physical characteristics	<p>1U high system and can be mounted on a standard 19" rack mount.</p>	<p>1U high system and can be mounted on a standard 19" rack mount.</p>	<p>1U high system and can be mounted on a standard 19" rack mount.</p>
Environment	<p>Operating Temperature: +5° C to 33° C (+/-2 ℃) Storage Temperature: 0° C to 45° C (+/-2 °C) Damp Heat: RH: 80% minimum, Temp +43 °C (+/-2 °C)</p>	<p>Temperature: Operating (0° C to +50° C) Storage (-10° C to +70° C). Humidity: Operating (10% to 95%)</p>	<p>Temperature: Operating (0° C to +50° C) Storage (-10° C to +70° C). Humidity: Operating (10% to 95%)</p>
Power Supply	<p>220V AC</p>	<p>220V AC</p>	<p>220V AC</p>



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C-DOT LTE SOLUTION

CDOT LTE Solutions



- 3GPP Release 14 compliant
- Long Term Support with Future Upgradability to Release 16 and future advanced features
- Scalable Architecture
- Distributed RAN Architecture: Indoor Baseband Unit (BBU) and Outdoor Remote Radio Head (RRH)
- * MME: Mobility Management Entity; * HSS: Home Subscriber Server ;*S-GW: Serving Gateway ; *P-GW: Packet Data Network Gateway ;*PCRF: Policy and Charging Rules Function

LTE for Cellular Operators



- Support for integration and handovers with 3GPP and Non-3GPP acce networks, having infrastructure Agnostic architecture
- 5G Ready with massive machine-type communications (mMTC), ultra reliable low-latency communications (URLLC), vehicle to everything (V2X), service-based and Network Slicing architecture..
- Support for communication requirements of Smart Grid, Smart Rail, Smart City, Smart Home and other use case of IOT, M2M, D2D, Industry OIT, AR, VR & XR user experience.

LTE for Railways



- Wireless cellular communication at highspeed mobility more than 350 Kmph
- Bearer for train control/ collision avoidance communication and QoS management of MCX Services
- Low Latency Communication for Real Time Train Monitoring

LTE for Defence



- Greater Situational Awareness
- High Security and Reliable performance
- Mission Critical Operations
- Easily Deployable and Portable Solution for UAV, UGV

LTE for Public Safety



- Quick & Effective Coordination among various agencies
- Isolated E-UTRAN Operation for Public Safety (IOPS)
- Quick Dissemination of Public Warning (Interworking Networks)

Secure & Reliable Delivery of real-time video, high-resolution imagery, multimedia messaging, mobile office/field data applications, location services and mapping, Device to Device Communication, SON and unmanned asset control

4G Evolved Packet Core

C-DOT EPC is a standards-based, packet only core network with a simplified and modular architecture, providing support for and mobility between multiple heterogeneous access networks including (E-UTRAN and LTE Advanced air interface), 3GPP legacy systems (for example GERAN or UTRAN) but also non-3GPP systems (for example WiMAX or cdma2000, Wi-Fi).

Product Features

- Simplified Network Topology with well-defined 3GPP interfaces
- Scalable architecture and High Availability support for EPC nodes
- Voice services through IMS
- Support for Integration and handovers with 3GPP and Non-3GPP access networks
- Centralized Policy and Charging Support
- SNMP based EMS for FCAPS management

C-DOT EPC comprises of the following network entities

C-DOT Mobility Management Entity (MME)

- S6a with HSS as per 3GPP TS 29.272
- S1-C-DOT MME with E-UTRAN as per 3GPP TS 36.412 and TS 36.413
- S10 with other C-DOT MME as per 3GPP TS 29.274
- S11 interface with SGW via GTP v2 as per 3GPP TS 29.274 Sgs, Sv interfaces with MSC

C-DOT HSS/HLR

- S6a interface with C-DOT MME as per TS 29.272
- SWx interface with AAA server as per TS 29.273
- MAP protocol support as per TS 29.002

C-DOT Serving Gateway (SGW)

- S5/S8 Interface towards PGW as per TS 29.274.
- S11 Interface towards C-DOT MME as per TS 29.274.
- Gz Interface towards OFCS as per TS 32.240, TS 32.295

C-DOT PCRF

- Gx towards P-GW as per TS 23.203, TS 29.212
- Rx towards AF as per TS 29.213, TS 29.214
- Sy towards OCS as per TS 29.219 S9 towards V-PCRF as per TS 29.21

C-DOT PDN Gateway (PGW)

- S5/S8 interface towards SGW as per TS 29.274 Gx interface towards PCRF as per TS 23.203.
- Gy towards OCS and Gz towards OFCS as per TS 32.240, TS 32.299, TS 32.251
- Sgi interface towards packet data network as per TS 29.061
- S2a, S2b interfaces towards ePDG and TWAG as per TS 23.402

4G Radio Access Network Equipment

C-DOT 4G solution provides a complete end-to-end carrier grade solution targeted at operators of 4G networks. C-DOT RAN technology provides for carrier-grade Macro-class eNodeB, Radio Access Network (RAN) Element Management System (EMS), and Network Management System for the RAN subsystem. C-DOT has complete expertise and control of the hardware and software components used to build the RAN technology and hence will be able to provide long-term support. The indigenous technology will help build a trust-worthy network.

Product Features

- 3GPP Release-10 compliant (Upgradeable to Release 14.)
- Carrier-grade 3 sector Macro class solution
- Scalable Module and Software Defined Radio (SDR) platform-based solution
- Indoor Baseband Unit (BBU) and Outdoor Remote Radio Head (RRH)
- Supports both TDD and FDD Mode of operation
- FDD Bandwidth options: 1.4/3/5/10/15/20 MHz
- TDD Bandwidth options: 5/10/15/20 MHz
- Supports 384 Active and 1000 Connected User Equipment (UE) across 3 sectors.
- Supports 2x2, 4x4 MIMO in Downlink
- Multiple models of RRH
- 20W 4T4R: Band-3 (1800MHz), Band-40 (2300MHz), Band-41 (2500MHz)
- 40W 4T4R: Band-1 (2100MHz), Band-41 (2500MHz), Band-3 (1800MHz), Band-5 (850MHz), Band-8 (900MHz)
- Can be managed through Elements Management System (EMS) and Network Management System (NMS) using open standards-based TR-069 protocol
- Supports QoS requirements for various data, video and voice services
- Minus 48V DC power supply
- The BBU supports two 10Gbps and one 1Gbps links for backhauling
- Supports CPRI 4.2 optical interface between BBU and RRH
- 2 Component Carrier (CC) Intra-band contiguous and non-contiguous Downlink Carrier Aggregation supported
- Supports Transmission Modes: Transmit Diversity, Open Loop and Closed Loop Spatial Multiplexing



सी-डॉट
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SECURITY SOLUTIONS

QUANTUM KEY DISTRIBUTION SYSTEM

Securing

Data Communication Channel
USING QUANTUM MECHANICS

Quantum Key Distribution (QKD) is emerging as an important area to ensure secure communication between two parties using a cryptographic protocol involving components of quantum mechanics. It enables two parties to produce a shared random secret key known only to them, which can then be used to encrypt and decrypt messages to ensure full proof security in data transmission.

For

Government & Strategic Sectors, TSPs, BFSI,
Healthcare Organisations, Powergrid Infrastructure



Secure

Independent of eavesdropper's computational power



Vigilant

Capable to detect any eavesdropping



Atmanirbhar

Completely designed and developed in India

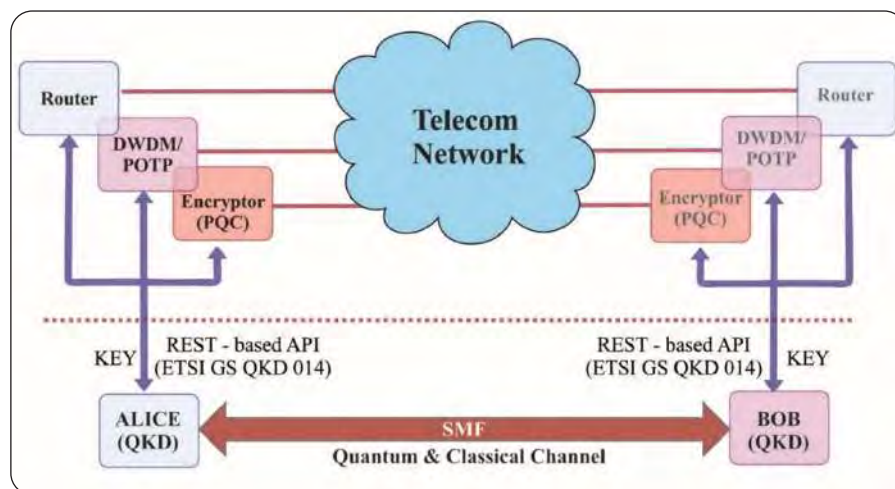
Quantum Key Distribution System

Traditional methods of key distribution for encrypting data use public key cryptography, based on complex mathematical one-way functions. These one-way functions are easy to calculate in one direction, but require much more time (of the order of few thousand years) to reverse them, by conventional computers. As an example, it is very easy for a conventional computer to calculate the product of two large prime numbers but it is virtually impossible to obtain prime factors of a very large integer. However, the rapid advancement in Quantum Computing threatens this very basic assumption and makes the present method of key distribution susceptible to eavesdropping, as the mathematical problems on which today's public key cryptography is based can be solved in a very small time by the use of quantum computers. Although a sufficiently capable quantum computer is still sometime away, but today encrypted data can be intercepted, stored and decrypted by future quantum computers. It is therefore necessary to reconsider the methods required to distribute cryptographic keys safely.

Unlike traditional cryptographic techniques (where security is based on unproven mathematical assumptions), the security of quantum cryptography is based on the laws of physics. The security of quantum key distribution depends on the fundamental principles of nature on which infinite computational power, new attack algorithms and the arrival of quantum computers will not matter. Information is encoded in quantum states or Q-bits by quantum communication. Q-bits cannot be cloned or measured without including detectable anomalies.

Thus, an important feature of the quantum key distribution is that two communicating users can find out whether a third party has tried to gain knowledge of the key, and in that case, the key distribution can be aborted. The feature of QKD is that any intervention or tampering in quantum channel will get detected and leads to destruction of key.

QKD solution consists of "Alice" (QKD Transmitter) and "BOB" (QKD Receiver) nodes which are connected to each other through a Quantum Channel and Classical Channel, both implemented using Single Mode Optical Fibers. The following figure shows typical deployment scenario of QKD solution.



The secured keys are provided to other Network Elements (like Encryptor, Router, DWDM – Dense Wavelength Division Multiplexing equipment, POTP – Packet Optical Transport Platform etc.) over a standardized interface. In the figure, Post-Quantum-Cryptography (PQC) refers to the new upcoming cryptography techniques that can be used to protect future communication systems from the threat of Quantum Computers. This is an alternate approach to address the threat posed by the advancement in Quantum Computing and both QKD and PQC can be combined to offer maximum security. NIST (National Institute of Standards & Technology), USA is in the process of standardizing the Post-Quantum Cryptographic algorithms.

C-DOT has its own in-house developed PQC encryptor which can be used as shown in the figure above for enhanced security requirements.

It has become imperative both for government and industries to be prepared to develop and deploy these emerging and disruptive technologies in order to secure critical communication infrastructure, financial transactions, strategic & defense networks etc.

System Features

- Any intervention or tempering in quantum channel will get detected and leads to destruction of the key at both Alice and Bob Nodes.
- Supports DPS (Differential Phase Shift) and COW (Coherent One Way) protocols.
- Hardware-based (FPGA) key processing for high key distribution rate
- True/Quantum Random Number Generator (TRNG/QRNG) in both Alice & Bob nodes
- Performance monitoring and Alarm generation for errors
- Provide Variable Key Length on request
- RESTful API for Key distribution
- Key exchange through Ethernet & USB interfaces
- Supports > 100 Km Single Mode Fiber (SMF) for the Quantum Channel
- Support Local Management Interface (LMI)
- Compact & Standard 19" Rack mountable
- Graphical User Interface (GUI) to control and operate the CDOT-QKD solution

SPECIFICATIONS

S.N.	Specification Description	Value
1	Secure Key Rate	>2Kbps for DPS PROTOCOL >1Kbps for COW PROTOCOL
2	QBER	<5%
3	Key transfer Interface	USB/Ethernet
4	Quantum Wavelength	C-Band @ITU-T DWDM grid
5	Quantum Channel Loss (Max)	16dB for DPS PROTOCOL 18 dB for COW PROTOCOL
6	Operating Temperature	10 to 30 °C
7	Detector Type	Single Photon Avalanche Detector
8	Power Supply	220VAC@50Hz
9	Maximum Power Consumption	250W (ALICE) 250W (BOB)
10	Mechanical Dimension	19inch Rack mountable



Compact Encryption Module (CEM)

With Quantum Safe-Features



Solution for Secure Communication in Era of Quantum Computers

C-DoT's Compact Encryption Module (CEM) is both Network (IP) layer and Data-link layer-based solution for encryption of data over LAN and Internet. It supports standard public-key and secret-key algorithms. CEM can perform encryption and authentication operations independent of application-level protocols, thus making it reliable for any application.

For

Government & Strategic Sectors, TSPs, BFSI, Healthcare Organisations, Powergrid Infrastructure



Quantum Safe

Using state-of-the-art inbuilt post Quantum cryptography algorithms



Segments

Government & Strategic Sectors, TSPs, BFSI, Healthcare Organisations, Powergrid Infrastructure



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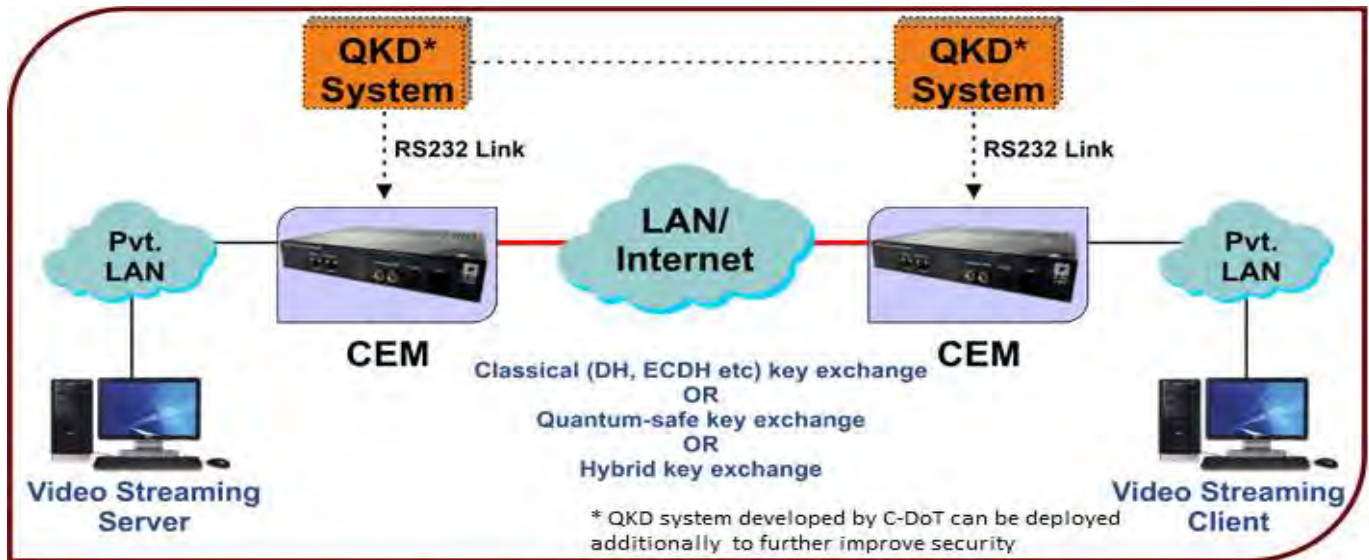
Completely designed and developed in India

Product Features

- Support of both Internet Key exchange and Physical key loading
- Support of standard encryption algorithms like AES128, AES256 etc.
- Custom or proprietary encryption algorithms can also be supported
- Support of Layer 2 and Layer 3 encryption both
- Support of Quantum-safe key exchange algorithms like Classic McEliece, CRYSTALS-KYBER, NewHope etc.
- Support for integration with any Quantum Key Distribution (QKD) System for key loading through RS232 serial interface
- Supports Hybrid key exchange using one classical and one Quantum-safe key exchange algorithm

Use Case Scenario

The following figure depicts a use case scenario for C-DOT's Product Compact Encryption Module (CEM) to connect Private Local Area Networks (LANs) of collaborating offices to Internet.



- a) L3 security using IPsec with Classical or PQC or Hybrid key exchange
- b) Integration with QKD system through RS232 interface for key loading

Interfaces Supported

- Two 1G interfaces (one CIPHER and one PLAIN)
- One USB interface
- One RS232 interface

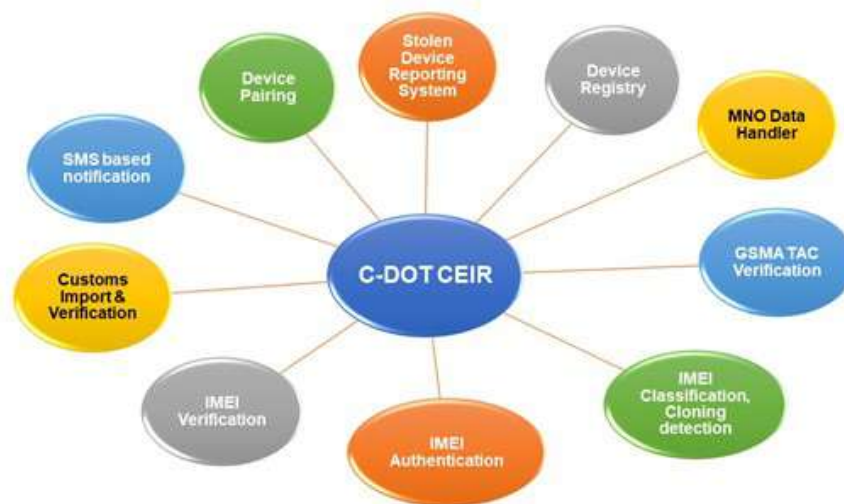
Certifications

- Common Criteria (CC) EAL3 Evaluation/certification (in-progress)

Central Equipment Identity Register (CEIR)

The mobile handset has become a valuable item particularly in terms of the personal data/information stored in it. With this comes issues like increasing theft cases of mobile phones, cloning of IMEI and availability of illegal & non-genuine mobile handsets. Added to this, the onset of new technologies such as 3G/4G/5G Smart phones that are expensive in the market, reselling of stolen handsets has become lucrative for thieves. C-DOT CEIR is the world's most advanced software solution for authentication of mobile devices in the country network, capable of including IoT devices. It provides a single, unified access point for the extensive feature set for implementing service logic, active triggering, reporting, alarming and more.

With an aim to curtail the counterfeit mobile phone market and discourage mobile phone theft, protect consumer interest and facilitate law enforcement authorities for lawful interception, Department of Telecommunications launched Central Equipment Identity Registry (CEIR) <https://www.ceir.gov.in>, indigenously developed by Centre for Development of Telematics (C-DOT) that connects to the IMEI database of all the mobile Operators. CEIR acts as a central system for all network Operators to share black listed mobile devices so that devices blacklisted in one network will not work on other networks even if the Subscriber Identity Module (SIM) card in the device is changed.



Product features

If a user's mobile has been lost/stolen, the first step taken should be to block the IMEI of the user's phone. The user can block the phone's IMEI by any one of the following means:

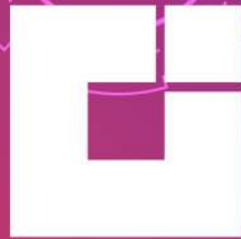
- Through a form submitted on the CEIR web-portal, Stolen Device Reporting System (SDRS)
- Through State Police

After the successful submission of blocking request, the user's phone is blocked within 24 hours. After the phone has been blocked, it cannot be used on any network across India. If any person tries to use SIM on the lost/stolen mobile device, traceability report will be provided to the local police through which lost/stolen was reported. User will also be notified regarding the availability of traceability.

Other than the Stolen Device Reporting System (SDRS) feature of CEIR, following are the major features -

1. Convenient for all stakeholders, especially for the consumers

2. Flexible/Configurable to adapt the national regulations and policy decisions
3. Provides tools (Know Your Mobile) for users to check device validity even before purchase
4. Online/offline Device analysis, identification and cloning detection
5. Amnesty to existing non-compliant or illegal devices – configurable as per national requirement.
6. Device Authentication System
7. Indian Counterfeited Device Restriction (ICDR) to discourage import of duplicate/cloned mobile devices to the country.
8. Daily /regular latest TAC data updation from GSMA.
9. Mobile Device Registry.
10. Configurable SMS notification.
11. Fault management and alarm display provisions.



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WIFI SOLUTIONS

C-DOT Wi-Fi Access Points

WAYU | WAP | EAP | OUTDOOR AND INDOOR DOA/WGR | XAP

Product Overview

C-DOT Wi-Fi Solution is an ideal solution for providing cost-effective broadband services to urban, semi-urban, rural and unconnected areas. It is ideally suited for creating hotspots in/around rural schools/Gram-panchayats etc. It can also be used as backhaul link for Wi-Fi hotspots with long-distance Wi-Fi which enables the signal to reach to longer distance.

Thus, this solution is ideal for increasing the penetration of broadband services in difficult and inaccessible terrains (e.g., hilly areas, dense vegetation, islands, unconnected villages, disaster sites, border areas, cellular base stations and base station controllers, ATMs, Banks etc.)

Also, C-DOT has a range of PM-WANI Compliant Access points which suit the requirement of PM-WANI scheme.

C-DOT's Wi-Fi 6 Access Points is the best in class and latest standard for Wi-Fi Technology. These products improve Wi-Fi performance in dense and crowded environments and can provide 4x (four times) increase in the data throughput and support very low latency AR/VR scenarios. Wi-Fi 6 technology is very suitable to provide efficient access network to meet 5G indoor hotspot use cases and dense urban requirements using unlicensed band spectrum in 2.4 GHz and 5 GHz.

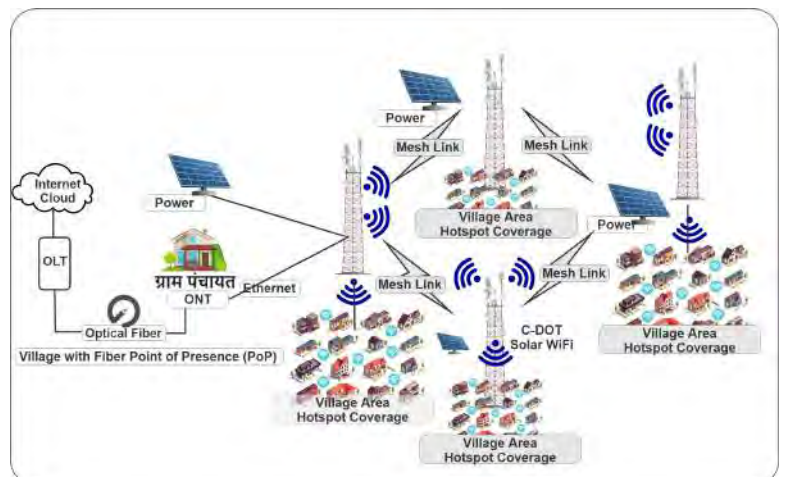
Benefits

- Support Latest Wi-Fi standard IEEE 802.11 a/b/g/n/ac/ax variants
- Multiple radio support suitable for Hotspot / Point-to-point and Point to Multipoint deployment
- Dual power feed with Green Power supply system ensuing reliability of system.
- Uses spectrum sensing to choose channel with minimum interference
- IP67 compliant; thus, suitable for all weather conditions for outdoor applications
- Supports hardened proprietary encryption for defense and standard encryption for civilian application
- Uses Orthogonal Frequency Division Multiplexing (OFDM) technique for high spectral efficiency
- Ease of operation and complete equipment management
- Table top, Wall Mount, Ceiling mount models and IP 67 pole mountable models available
- Some of the products in this family are TEC Certified as per latest GR.

Application

Wi-Fi Point to Point Solution

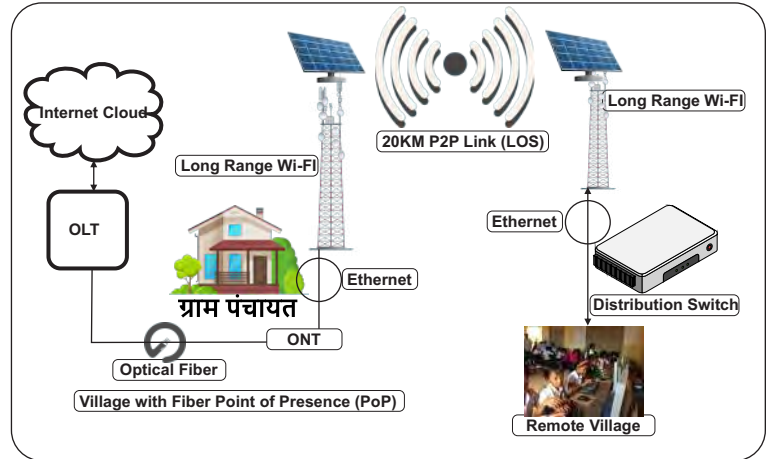
- Ideal for horizontal extension of broadband services in difficult and inaccessible terrains
- Help in connecting unconnected villages.
- Connect offices with different branches with in a distance of 5-7 Km to have common network at both places.








Application

Wi-Fi in Hotspot Deployment

- Ideal for the large area like big size village/locality with single backhaul
- Mesh topology provides link redundancy for reliable service



C-DOT Wi-Fi SPECIFICATIONS

Attributes	WAYU (C-DOT Wi-Fi 4 Access Point)	WAP (C-DOT Wi-Fi 5 Access Point)	WGR/DOA (C-DOT Wi-Fi 5 Access Point)	Saranga (C-DOT Wi-Fi 5 Access Point)	TEJ (C-DOT Wi-Fi 6 Access Point)
					
Standard	IEEE 802.11 a/b/g/n	IEEE 802.11 a/b/g/n/ac	IEEE 802.11 a/b/g/n/ac	IEEE 802.11 a/b/g/n/ac	IEEE 802.11 a/b/g/n/ac/ax
PM-WANI Compliance	Yes	Yes	Yes	Yes	Yes
VLAN/ QoS/ Encryption/ Authentication/ Other standards	802.11e/ WMM	802.1Q VLAN/802.11e/WMM /802.1x/802.11i/802.11s/WDS	802.1Q VLAN/802.11e/WMM /802.1x/802.11i/802.11s/WDS	802.1Q VLAN/802.11e/WMM /802.1x/802.11i/802.11s/WDS	802.1Q VLAN/802.11e/WMM /802.1x/802.11i/802.11s/WDS
Mode	Bridge, Router	Bridge, Router	Bridge, Router	Bridge, Router	Bridge, Router
Operating Frequency	2.4GHz	2.4GHz and 5GHz	2.4GHz and 5GHz	2.4GHz and 5GHz	2.4GHz and 5GHz
Radio	1 Wi-Fi Radios (on the board) Single Band 2.4GHz operation	2 Wi-Fi Radios (on the board) Dual Band (2.4GHz and 5GHz) concurrent operation	2 Wi-Fi Radios (on the board) Dual Band (2.4GHz and 5GHz) concurrent operation	3 Wi-Fi Radios (2 Radios on the board and 1 optional PCIe radio module) Dual Band (2.4GHz and 5GHz) concurrent operation	3 Wi-Fi Radios (2 Radios on the board and 1 optional PCIe radio module) Dual Band (2.4GHz and 5GHz) concurrent operation
Channel Width	20/40 MHz	20/40/80 MHz	20/40/80 MHz	20/40/80 MHz	20/40/80/160/80+80 MHz

C-DOT Wi-Fi SPECIFICATIONS

Attributes	WAYU (C-DOT Wi-Fi 4 Access Point)	WAP (C-DOT Wi-Fi 5 Access Point)	WGR/DOA (C-DOT Wi-Fi 5 Access Point)	Saranga (C-DOT Wi-Fi 5 Access Point)	TEJ (C-DOT Wi-Fi 6 Access Point)
MIMO	1x1	2x2 till 80MHz channel for 5 GHz	2x2 till 80MHz channel bandwidth for 5 GHz	2x2 till 80MHz channel bandwidth for 5 GHz	4x4 till 80MHz channel bandwidth 2x2 for 160MHz and 80+80 MHz channel bandwidth
Channel Width	20/40 MHz	20/40/80/ MHz	20/40/80 MHz	20/40/80 MHz	20/40/80/160 MHz
Clients	30	128	128	256	256
Operating Power	Max: 6 W Input Voltage Range: 5V / 1.5 A	Max: 10W Input Voltage Range: 10V to 60 V DC	Max: 10W Input Voltage Range: 15V to 55V DC	Max: 15W Input Voltage Range: 15V to 55V DC	Max: 18W Input Voltage Range: 10V to 60V DC
Power Source	2mm DC Jack, Passive POE injection 5V Max	PoE (802.3 af/at)/ Passive PoE	PoE (802.3 af/at)/ Passive PoE	PoE (802.3 af/at)/ Passive PoE	PoE (802.3 bt)/ Passive PoE
WAN Port	100 Mbps Ethernet	1x Ethernet, Giga bit auto-sensing	1x Ethernet, Giga bit auto-sensing	1x 1G Ethernet, auto-sensing	1x 2.5G Ethernet, auto-sensing 1x 2.5G Optical SFP+ (Optional)
Deployment Scenario	Indoor Hotspot, Outdoor Hotspot	Outdoor Hotspot, Indoor Hotspot, Point to Point, Point to Multipoint, MESH	Outdoor Hotspot, Indoor Hotspot, Point to Point, Point to Multipoint, MESH,	Outdoor Hotspot, Indoor Hotspot, Point to Point, Point to Multipoint, MESH, WDS	Outdoor Hotspot, Indoor Hotspot, Point to Point, Point to Multipoint, MESH, WDS
Max Tx Power	20 dBm	28 dBm *2.4 Ghz radio - 27 dBm/ 5GH3 Radio - 23dBm	23 dBm	2.4G radio: 23dBm, 5G radio: 20 dBm	30 dBm
Management	Data and syslog capture for audit and analysis	FCAPS C-DOT EMS (SNMP based), C-DOT WAC Power failure Alarm to NMS. Data and syslog capture for audit and analysis	TIP Controller C-DOT EMS Data and syslog capture for audit and analysis	TIP Controller C-DOT EMS Data and syslog capture for audit and analysis	TIP Controller C-DOT EMS Data and syslog capture for audit and analysis
Roaming	NA	Yes	NA	Yes	IEEE 802.11 r
Authentication Support	NA	RADIUS protocol supported for external AAA server	RADIUS protocol supported for external AAA server	RADIUS protocol supported for external AAA server	RADIUS protocol supported for external AAA server
Encryption Support	NA	TKIP (WPA), AES-CCMP (WPA2)	WPA 2	TKIP (WPA), AES-CCMP (WPA2)	TKIP (WPA), AES-CCMP (WPA2), WPA3
Mesh	NA	Mesh Supported	Mesh Supported	Wi-Fi SON and Easy Mesh	Wi-Fi SON (AP steering, Band Steering) and Easy Mesh
RF Management	NA	DFS, Dynamic Channel Selection for Interference Mitigation (DCS-IM)	DFS, Dynamic Channel Selection for Interference Mitigation (DCS-IM)	DFS, Dynamic Channel Selection for Interference Mitigation (DCS-IM)	DFS, Dynamic Channel Selection for Interference Mitigation (DCS-IM), BSS color, Airtime fairness (ATF)

C-DOT Wi-Fi SPECIFICATIONS

Attributes	Solar Wi-Fi (C-DOT Wi-Fi 4/5 Access Point)	Long Range Wi-Fi (C-DOT Wi-Fi 4/5 Access Point)	WAYU (C-DOT Wi-Fi 4 Access Point)	WAP (C-DOT Wi-Fi 5 Access Point)	Saranga (C-DOT Wi-Fi 5 Access Point)	TEJ (C-DOT Wi-Fi 6 Access Point)
Visual Indication	NA	NA	Available 4 LEDs (Power, LAN ports, WAN port, Wi-Fi Status)	NA	Available in Indoor unit 10 LEDs (Power, LAN ports, WAN port, Wi-Fi Status)	Available in Indoor unit 11 LEDs (Power, LAN ports, WAN ports: Ethernet and Optical, Wi-Fi Status)
Deployment Scenario	Outdoor Hotspot	Outdoor Point to Point, Point to Multipoint	Indoor Hotspot, Outdoor Hotspot	Outdoor Hotspot, Indoor Hotspot, Point to Point, Point to Multipoint, MESH	Outdoor Hotspot, Indoor Hotspot, Point to Point, Point to Multipoint, MESH, WDS	Outdoor Hotspot, Indoor Hotspot, Point to Point, Point to Multipoint, MESH, WDS
Max Tx Power	28 dBm	28 dBm	20 dBm	28 dBm	2.4G radio: 23dBm, 5G radio: 20 dBm	30 dBm
Housing/Mounting	IP65/67, Pole mount, Lightning and Overvoltage Protection Withstand high speed winds/thunderstorms	IP65/67, Pole mount, Lightning and Overvoltage Protection Withstand high speed winds/thunderstorms	Indoor Deployment/Table -top, IP65 Outdoor pole mount.	Ip67, Pole mount, Lightning and Overvoltage Protection Withstand high speed winds/thunderstorms	Ip67, Pole mount, Lightning and Overvoltage Protection Withstand high speed winds/thunderstorms	Ip67, Pole mount, Lightning and Overvoltage Protection Withstand high speed winds/thunderstorms
Operating condition	Temp: -20°C to +55°C Humidity: 10 to 95% non-condensing	Temp: -20°C to +55°C Humidity: 10 to 95% non-condensing	Temp: -20°C to +55°C Humidity: 10 to 95% non-condensing	Temp: -20°C to +55°C Humidity: 10 to 95% non-condensing	Temp: -20°C to +55°C Humidity: 10 to 95% non-condensing	Temp: -20°C to +55°C Humidity: 10 to 95% non-condensing
Management	FCAPS C-DOT EMS (SNMP based), Data and syslog capture for audit and analysis	FCAPS C-DOT EMS (SNMP based), Data and syslog capture for audit and analysis	Data and syslog capture for audit and analysis	FCAPS C-DOT EMS (SNMP based), C-DOT WAC Power failure Alarm to NMS.Data and syslog capture for audit and analysis	TIP Controller C-DOT EMS Data and syslog capture for audit and analysis	TIP Controller C-DOT EMS Data and syslog capture for audit and analysis
Roaming Feature	NA	NA	NA	Yes	Yes	IEEE 802.11 r
Remote upgrade	Yes	Yes	Yes	Yes	Yes	Yes
GUI	Yes	Yes	Yes	Yes	Yes	Yes
Authentication Support	RADIUS protocol supported for external AAA server	NA	NA	RADIUS protocol supported for external AAA server	RADIUS protocol supported for external AAA server	RADIUS protocol supported for external AAA server
Encryption Support	WPA	TKIP (WPA), AES-CCMP (WPA2)	NA	TKIP (WPA), AES-CCMP (WPA2)	TKIP (WPA), AES-CCMP (WPA2)	TKIP (WPA), AES-CCMP (WPA2), WPA3

C-DOT Wi-Fi SPECIFICATIONS

Attributes	Solar Wi-Fi (C-DOT Wi-Fi 4/5 Access Point)	Long Range Wi-Fi (C-DOT Wi-Fi 4/5 Access Point)	WAYU (C-DOT Wi-Fi 4 Access Point)	WAP (C-DOT Wi-Fi 5 Access Point)	Saranga (C-DOT Wi-Fi 5 Access Point)	TEJ (C-DOT Wi-Fi 6 Access Point)
Mesh	NA	NA	NA	Mesh Supported	Wi-Fi SON and Easy Mesh	Wi-Fi SON (AP steering, Band Steering) and Easy Mesh
RF Management	DFS, Dynamic Channel Selection for Interference Mitigation (DCS-IM)	DFS, Dynamic Channel Selection for Interference Mitigation (DCS-IM)	NA	DFS, Dynamic Channel Selection for Interference Mitigation (DCS-IM)	DFS, Dynamic Channel Selection for Interference Mitigation (DCS-IM)	DFS, Dynamic Channel Selection for Interference Mitigation (DCS-IM), BSS color, Airtime fairness (ATF)
Antenna	Outdoor: Omni/Patch/Sector or	Outdoor Grid	Omni	Internal Omni	Indoor: 3dBi Omni Outdoor: Internal Omni	Indoor: 3dBi Omni Outdoor: Internal Omni
Antenna Connector Type (Optional)	N (F)	N (F)	Reverse SMA (F)	NA	Metal Indoor Unit: Reverse SMA (F) Outdoor Unit: N (F)	Metal Indoor Unit: Reverse SMA (F) Plastic Indoor Unit: Fixed 3dBi Antenna with UFL connector Outdoor Unit: N (F)
Antenna Type supported (Optional)	Patch Panel Omni Sector	Grid	Omni	Patch Panel Omni Sector Grid	Patch Panel Omni Sector Grid	Patch Panel Omni Sector Grid
External Interface	NA	NA	NA	NA	USB: USB 3.0 Support	USB: USB 3.0 Support

PM-WANI Framework

Government of India scheme for provision of Broadband through Public Wi-Fi Hotspot providers

User will need to download the relevant App, get authenticated, and thereafter access Broadband at any Public Wi-Fi Hotspot. When the user reaches a Public Wi-Fi Hotspot, the App on the mobile phone will show various available networks. The user can then choose the Public Wi-Fi network of choice, pay an amount – either online or through voucher – and use the network till the balance is exhausted.

C-DOT's Offering for PM-WANI

WANI Compliant Wi-Fi Access Points

C-DOT's Low-cost Access Point (WAP): Wi-Fi connectivity upto 100 m radius



This is suitable for outdoor deployment

WAYU: Wi-Fi connectivity upto 40 m radius



This solution is targeted for small enterprises e.g. Kirana shops, panwallahs, PDS shops etc.

WANI Compliant Android APP called C-WANI

APP providers may get it customised as per their requirement and graphics

C-DOT Wi Fi Product suite is WANI compliant and interoperable with other PDOAs and APP providers

C-DOT's Platform as a service (PaaS) for PDOAs

For Authorization. Accounting, Voucher management and payment gateway. security logs

C-DOT has been entrusted with the development and maintenance of Central Registry for the rollout of PM-WANI.

C-DOT has all the requisite element for PM-WANI framework and provides one stop solution to all prospective operators of this mammoth nationwide network.



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**BROADCASTING
SEGMENT**

C-DOT CONDITIONAL ACCESS SYSTEM (C-CAS®)

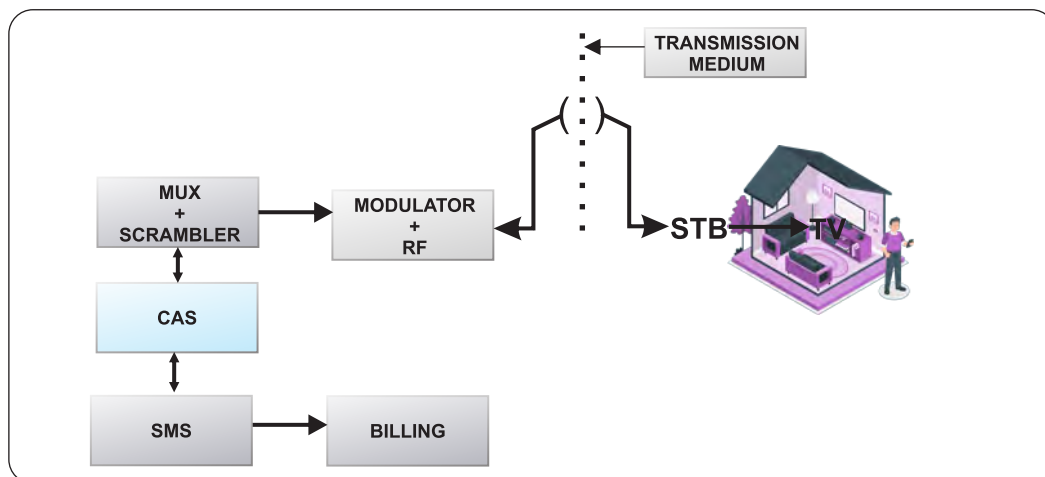
C-DOT BROADCAST & CONVERGED NETWORK SOLUTIONS

Product Overview

CAS is the most important sub-system in the Broadcasting Value chain responsible for allowing access of the contents to the legitimate users. C-DOT has developed a state of the art Conditional Access System for the Broadcast network. C-DOT CAS boosts the STB manufacturing and enables the STB manufacturers of the country towards sustainable "Make in India" initiative and provides impetus towards "AtmaNirbhar Bharat" in the true spirit of it by propelling innovations in this segment.



Application



Benefits

- DVB Simulcrypt (ETSI TS 103197) compliant. Hence, can co-exist with other CAS with ease
- Advanced High Security through Hardware enabled features
- Additional security using mobile OTP feature
- Highly efficient bandwidth management .
- Smart Card based and Cardless (both variants)
- Supports fingerprinting
- Supports DVB-C and DVB-S/S2
- End to End solution with Subscriber Management System (SMS)
- STB blacklisting feature
- Highly scalable
- Dynamic Channel & Package allocation
- Subscription alert information
- With C-DOT's own reference middleware
- NIST CAVP certified

SUBSCRIBER MANAGEMENT SYSTEM (SMS)

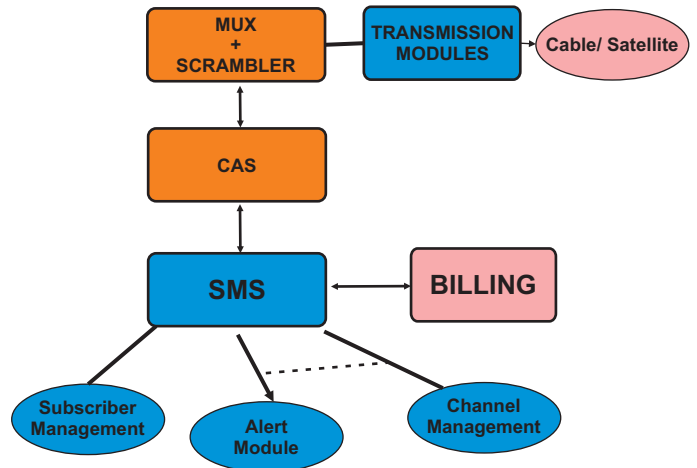
Product Overview

SMS is a user interface portal for managing all the subscribers and STBs in a given network. It acts as the control and management interface for any Conditional access system to perform all the CAS operations and manage their subscribers and network.

Benefits

- Role based Access control with multiple users
- Subscribers management
- CAS management
- STB management
- Subscription management
- Payments and Billing
- Alerts and notifications
- Reports generation
- Activity logs

Application

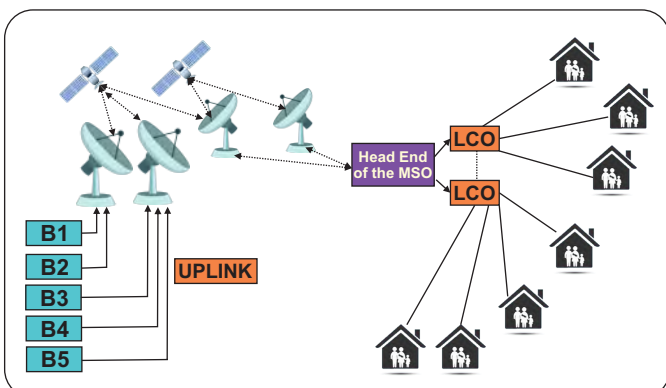


CABLE HYBRID STB (CB100)

Product Overview

This Cable Hybrid STB is customer premise equipment which has been designed to receive the RF signals over coaxial cable (DVB-C) and decode the same into Video and Audio signals playable on TV through HDMI or AV Interfaces. It can be configured/ customized for the cable operator's network.

Application



Benefits

- RF Input: Fully compliant to DVB-C
- Audio/Video: Stereo, High Definition, MPEG2/MPEG4
- Smart card: ISO7816-3 compliant (Supports Card less CAS also)
- Communication Interfaces: USB 2.0 HS, IR Remote, and Network Interfaces
- Hybrid capability (RF+IP)
- Software upgrade via USB or Over the Cable
- PVR support using USB
- Low Power Consumption : 8 Watts (approx.)
- Input Power: 12V DC @1.5A Max

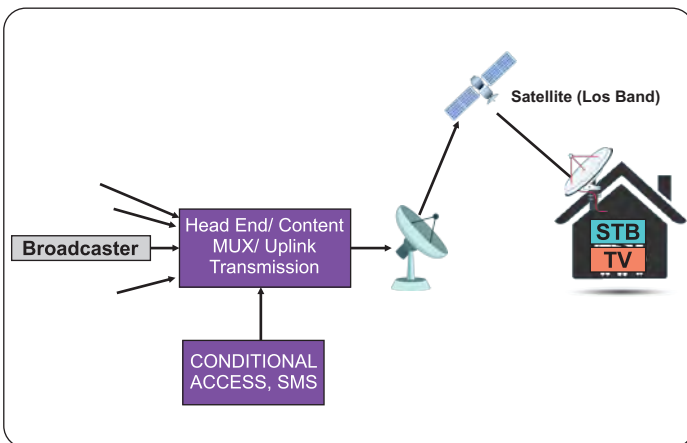
DTH HYBRID STB (DT100)

Product Overview

This DTH Hybrid STB is customer premise equipment which has been designed to receive the Satellite (DVB-S/S2) RF signals and decode the same into Video and Audio signals playable on TV through HDMI or AV Interfaces. This can be used for reception of DoorDarshan contents as well as can be configured for PayTV content reception. This also has advanced features and attributes to offer additional facilities to the end users.



Application



Benefits

- RF Input: Fully compliant to DVB-S/S2
- Audio/Video: Stereo L&R (RCA Type), CVBS (RCA Type), HDMI 1.4a, S/PDIF
- Supports Card less CAS
- Communication Interfaces: USB 2.0 HS, IR Remote, and Network Interfaces, 5-Keypad on front panel for PWR, CH+/- and VOL+/-
- Hybrid capability (RF+IP)
- Software upgrade via USB or OTA
- PVR support using USB
- Low Power Consumption : 8 Watts (approx.)
- Input Power: 12V DC @1.5A Max

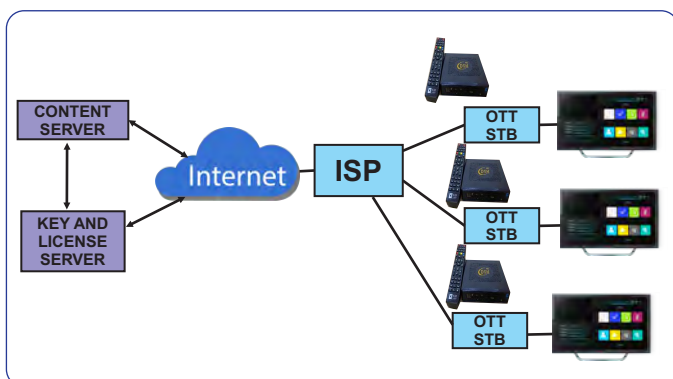
OTT SET TOP BOX

Product Overview

With proliferation of Broadband in the country, there is a very high demand for 2K/4K resolution intelligent OTT STB. The OTT STB will be functioning as a converged service delivery platform catering to entertainment as well as e-services



Application



Benefits

- Support upto 4K resolution
- High bandwidth network interface support
- Support for many Apps
- Runs on Android OS (AOSP)
- Supports Wi-Fi 802.11 a/b/g/n/ac and, WPA, WPA2 protected access
- Supports Bluetooth v4.2 and v4.0, compatible with v2.1
- Low Power Consumption : 6-7 Watts (approx.)
- Input Power: 12V DC @1.5A Max

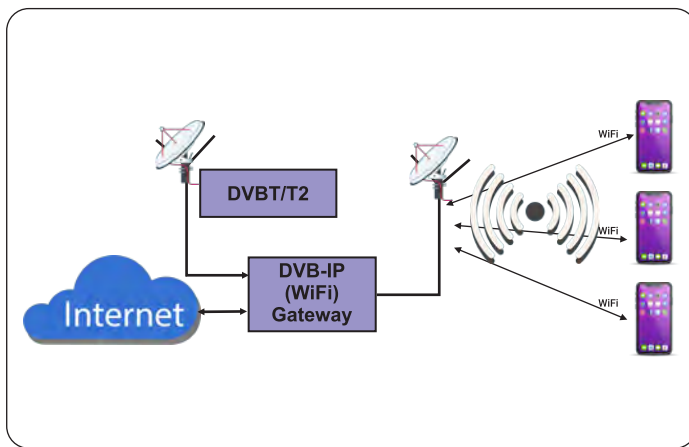
DVB-IP (WiFi) Gateway

Product Overview

Towards the delivery of infotainment content while on move, this product enables the reception of DVB-T/T2 signals and streams the same to users' mobiles using Wi-Fi without need for a broadband backhaul. This solution can be widely used for moving cars for reception of digital Terrestrial signals.



Application



Benefits

- Receives DVB-T/T2 signals
- Support as Wi-Fi Access point in 802.11 b/g/n modes.
- Supports Gigabit Ethernet Interface
- Supports streaming over Wi-Fi/ Ethernet
- Supports Android OS (AOSP)
- 2X USB 2.0
- Low power consumption - 7 Watts (Approx.)
- Input Power: 12V DC @1.5A Max



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**SOFTWARE
APPLICATIONS**

C-DOT's Network Management Solution

Product Overview

C-DOT offers a comprehensive suite of Network Management Solution (NMS) for telecom networks to centrally monitor, manage and configure complex networks with lakhs of network elements. C-DOT's NMS is a full featured scalable, reliable, flexible state-of-the-art solution which can be customized as per network requirements. The solution supports wireline, wireless, satellite and optical technologies being fully compliant to industry standards.

C-DOT's NMS is based on the C-DOT's CSMP (Customization Service Management Platform) Framework which is an indigenous next generation solution for Telecom/Internet Service Providers. It has a core engine readily available for product development based on ITU-T TMN model. This highly reduces the development and delivery cycle. It helps to deliver cost effective and timely NMS/OSS end to end solutions to TSPs/ISPs. This is an award winning, (CSMP framework Patent filed) indigenous framework for NMS product development.

CSMP has three major components

- **Application Framework (CSMP-AF)** - CSMP-AF is a common Framework to deliver user interface, supports all latest frameworks like BootStrap, NodeJS etc.
- **Mediation Framework (CSMP-MF)** - CSMP-MF Supports multiple industry standard Interfaces/Protocols like SNMP, NetConf, TR069, CORBA, RESTFul / SOAP web services etc.
- **Multi-Database support** - Database Manager supports databases namely Oracle, MySQL, PostGRE SQL and Db2.

CSMP Framework can be used in management software development requiring

- Catchy GUI applications development
- Tasks scheduling and automated management
- Southbound interfacing

Interfaces Supported

- SNMP, NetConf, TR069, CORBA, RESTFul / SOAP web services etc.

C-DOT NMS offers full conformity to the ISO model for Network Management called FCAP and beyond..

Applications / Use Cases

BharatNet Network Management Solution

C-DOT's BharatNet Network Management Solution, based on C-DOT CSMP framework, is a successfully deployed PAN India NMS Solution for the government's esteemed BharatNet Project. It is operational and monitors/manages the Network elements deployed across 2.5 Lakh Gram Panchayats from a Central Network Operations Centre.

Telecom Asset Management

C-DOT TAMS (Telecom Asset Management) is a generic solution which manages any type of telecom equipment life cycle i.e from their purchase to disposal. It manages the end-to-end life cycle management process from procuring physical assets through Purchase Order to installing & commissioning, verification, re-location, Operation & maintenance, AMC, repair/scrap.

Fiber Management

Fiber Management is an application specific to optical technologies; to efficiently manage and monitor fiber links, joints, splitters in optical networks. It has features for configuring, provisioning, fault monitoring and reporting on fibers. It raises tickets on fibre faults/alarms.

Trouble Ticket Management

This application provide docket generation, automatic escalation & media notification for service/network/fiber/QoS & SLA alarms. Ticket modification via emails & SMS.

C-DOT Messenger

C-DOT Messenger is an application to instantaneously send network faults, performance reports and threshold crossover alerts to network personnel via various communication channels. C-DOT Messenger helps to meet the industry requirement of instant resolution of network related problems like alarms and other performance critical issues.

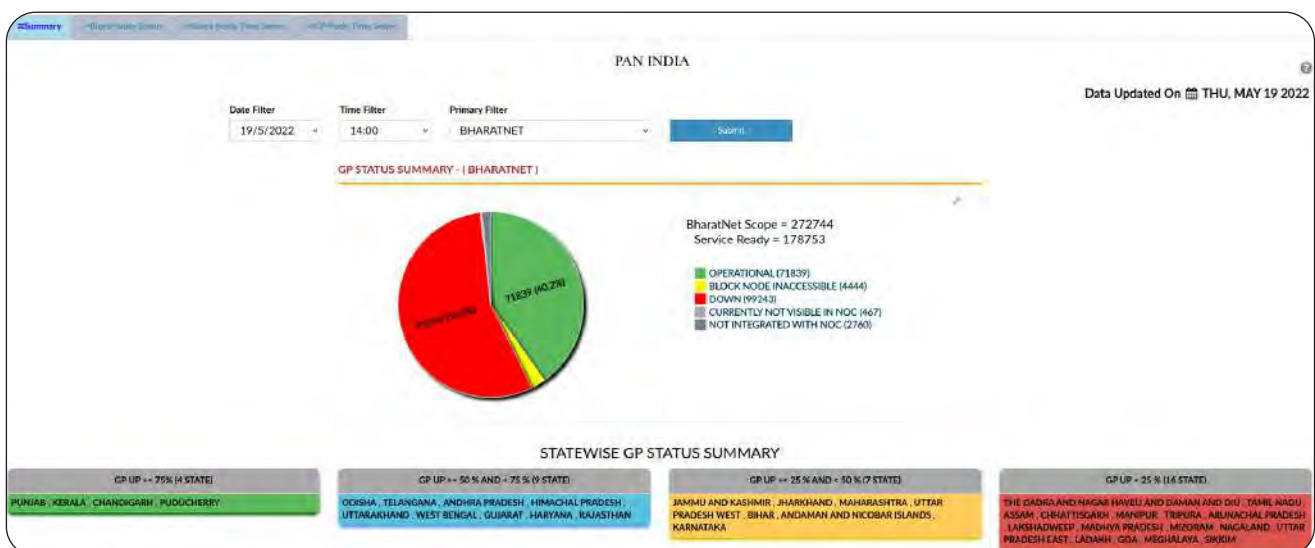
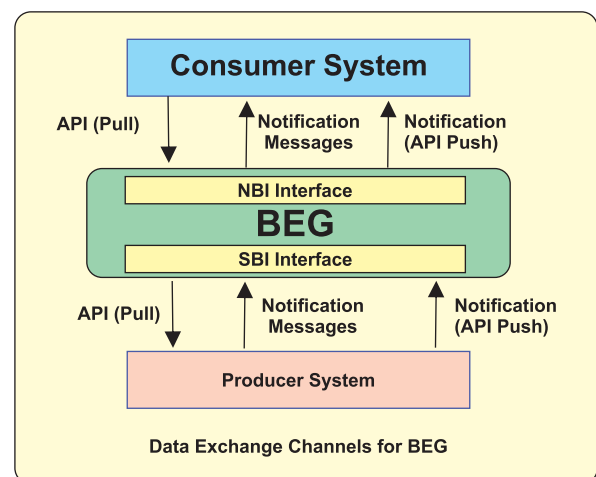
IPNMS

IPNMS is a generic application which helps to manage and monitor any IP based network ensuring smooth and error free operations of the network. Product is highly scalable from small enterprise IP network to geographically wide (national level) IP network and can be used in any sector which requires monitoring of their IP networks.

Business Enterprise Bus

C-DOT's Business Enterprise Bus is an application to provide a central access point for managing enterprise APIs, providing a mediator between internal and external services, systems and devices. It gives an abstraction layer for the O&M data which simplifies and facilitates interaction and integration of systems for business processes. Business Exchange Gateway (BEG) is an abstraction layer which simplifies and facilitates interaction and integration of systems for business processes. It absorbs the changes and provides conversion and generic modelling of data exchanged between systems. The data producer can extend available APIs as per its syntax, semantics and processes. The consumer system gets data as per their requirements of O&M and map it to their own user interface. It can also cater to business logic which an enterprise wants to bring in during data exchange insulating both its NMS and third-party systems from integration issues.

BEG interfacing with system



Unified Network Management Solution

C-DOT's UNMS (Unified NMS) presents a high-level view of the entire network across different geographical locations. It supports and can be customized for multi technology & multi-vendor network management for an enterprise like TSP/ISP (GPON, FTTH, MPLS, Satellite, Radio, 4G and Wi-Fi technologies). UNMS also monitors the status of Broadband Services, thereby enabling the customer, a single window to monitor and manage the complete network efficiently and effectively.

The UNMS solution is scalable based on the number of equipment and can monitor from a few to lakhs of equipment based on the customer's needs. The UNMS collects data from the Business Exchange Gateway via industry defined standard interfaces and provides a bird's eye view of the customer network. It depicts equipment Status, reasons for equipment being down, bandwidth utilization by way of state-of-the-art charts and reports. Trend charts are available to analyze the performance of the equipment over weeks and months. Application is accessible over web, using user authentication and authorization.

Mobile App for NMS

C-DOT offers to provide a customized Mobile App for its NMS Applications as per customer requirements. Mobile Application is a light weight NMS solution and a smarter option to reduce the CAPEX and OPEX of the network. It provides a bird's eye view of the network status to the person on move with complete drilldown features. The Mobile-Apps can be developed for both Android and iOS platforms.



Key Benefits

- Cost effective and Comprehensive management for large and complex networks
- Policy-based configuration of the network infrastructure
- Supports Northbound Interface allowing easy data handling and providing direct access to network information for further processing in other systems and applications
- Efficient System providing decentralized approach with a comprehensive view of the network, regardless of its size and complexity
- Convenient remote network management



CAP-Integrated Public Alert System (CAP-IPAS)



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**Indigenous early
warning system for saving
lives and livelihoods
during disasters**

For
Disaster Management Authorities



Market Leadership

One among few countries
who have deployed
such system



Proven

More than **3.5 Billion**
warnings and
advisories delivered
so far



One Nation, One System

Multiple warning sources
integrated with multiple warning
dissemination media



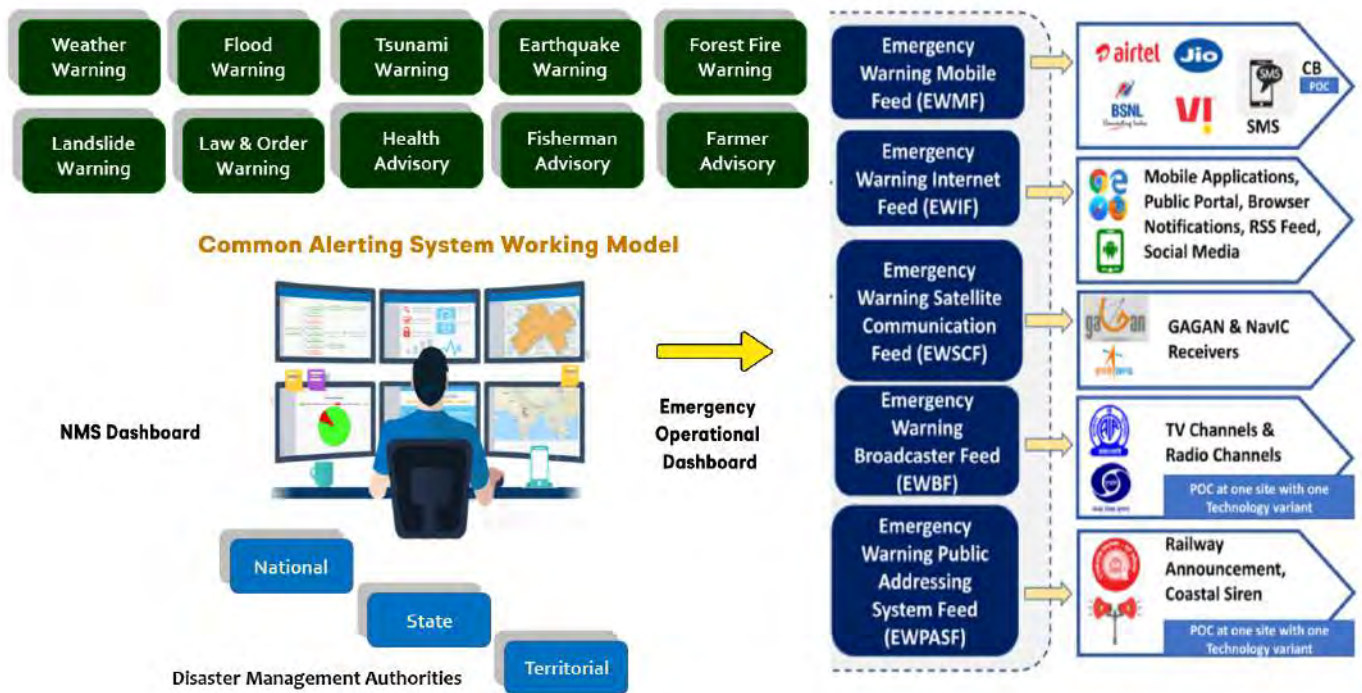
Atmanirbhar

Made-in-India
for the
Mankind

CAP- Integrated Public Alert System (CAP-IPAS)

For Disaster Alert Dissemination to Citizens of Targeted Area

Multi-purpose, multi-channel platform for targeted alerting to the people; before, during and after incidents like Cyclone, Tsunami, Flood, pandemic and any other natural and man-made disasters in Indian vernacular languages, and to achieve a substantial reduction of disaster risk and losses in lives, livelihoods and health in line with the UN's Sendai framework guidelines for disaster risk reduction thus making India disaster resilient.



Besides sending SMS alerts, the system will send out messages through FM radio, television, railway announcement, Indian satellites, social media, browser engines, mobile apps etc. to the population falling under the affected area, chosen on map by disaster management authorities. It will override FM radio content, TV channel content, railway announcements to broadcast the emergency message in vernacular languages.

The pan-India implementation of CAP integrated alert system project will bring all major alert generating agencies of India, including Indian Meteorological Department, Central Water Commission, Indian National Centre for Ocean Information Services, Snow and Avalanche Study Establishment, state and UT level Disaster management authorities on a centralized platform.

Use case

Used for dissemination of weather forecasting during **Holy Amarnath Yatra** 2018, 2019, by Kerala SDMA for issuing advisory to flood affected people during **Kerala floods** in 2018.

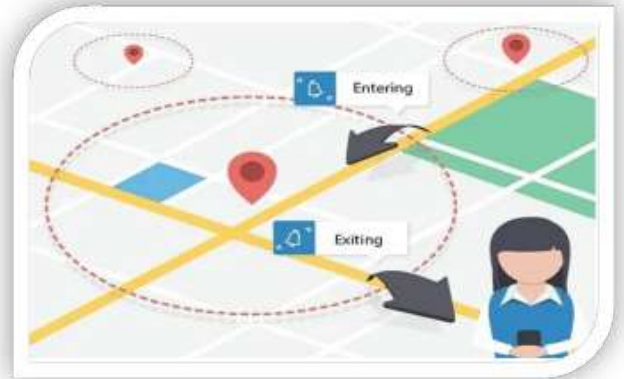
This system was also used widely for **Amphan, Nisarga, Nivar, Burevi** and recently for **Yaas and Tauktae** cyclones

During **COVID pandemic**, a modified version of the system called COVID SAVDHAAN for disseminating Covid-related information in targeted areas, in containment zones or even in wider areas was heavily utilised by 26 states and union territories for Covid, related information, disseminating more than 3.5 Billion messages.

Covid19 Quarantine Alert System (CQAS)

The Covid19 Quarantine Alert System (CQAS) is designed for detecting the quarantine Geo-fence breaches. CQAS collects phone data, including the device's location, on a common secure platform and alerts the local agencies in case of a violation by COVID patients under watch or in isolation.

The DoT, Government of India along with C-DOT and Telecom service providers (TSPs) designed an indigenous and comprehensive system titled Covid19 Quarantine Alert System (CQAS) for detecting the quarantine Geo-fence breaches. The entire project has been conceptualized and implemented with existing resources, without incurring any additional cost. C-DOT has provided application server, application environment, connectivity with stakeholders, application for collection near real time locations of the quarantined subscribers.



The software application automatically triggers an email or SMS if any identified Corona positive person moves away for their quarantine location.



COVID-19 Saavdhaan System	COVID Quarantine Alert System (CQAS)	Mobile Subscriber Migration
SMS messages(Hindi/ English/ Tamil/ Telugu/ Malayalam/ Marathi) are sent to a targeted geographical area identified by State Govts	Auto Email / SMS sent to State Govt. agency, if identified Corona +ve or quarantined person, moves away from his quarantined mobile tower area	Mobile Phone tower dump data of pre and post lockdown has been analyzed to get the details of movement of migrants from their present location
Around 16.5 Cr SMS sent	Andhra Pradesh, Delhi, Haryana, Madhya Pradesh, Meghalaya, Chhattisgarh, Maharashtra, Nagaland, Karnataka, Punjab, Rajasthan, Telangana, Bihar and West Bengal	Active support has been provided to Bihar government in respect of movements made from Metros to Bihar and their present location in various districts of Bihar
	Quarantine Alert sent to 3.45 Lakh Mobiles	Similar request have been received from Odisha, Karnataka, Gujarat and Maharashtra government

The Ministry of Electronics and Information Technology has encouraged State government agencies to use the CQAS. A Standard Operating Procedure (SOP) for location-based monitoring of potential cases from the telecom network data has been established. The system would send triggers to the identified monitoring agencies for any potential violations from the quarantined location, subject to network availability and triangulation limitations.

The CQAS creates a virtual-boundary, commonly known as geo-fence, around the quarantine premises for the targets received from the State governments. Such targets are duly approved by the Home Secretary of the State under Section 5(2) of Indian Telegraph Act 1885.

The real time location is fetched from the telecom networks, analyzed by CQAS in its Big Data Analytics engine, following which the periodic alerts related to geo-fence breaches are generated and sent to the state administration and district authorities. C-DOT's CQAS application is used to fetch near real time location from all TSPs like Airtel, VIL, RJIO and BSNL

Product Features

- Identification of geo-spatial location of stranded labours / migrants for helping respective states government to provide assistance.
- Management of institutional quarantine of immigrants in respective states.
- Real time feed for close monitoring of repeated geo-fence offenders at highest level through NDMA GIS portal
- The CQAS prepares a list of mobile numbers, segregates them on the basis of telecom service providers, and the location data provided by the telecom companies is run on the application to create geo-fencing.
- The location information is received periodically over a secure network for the authorized cases with “due protection of the data received”.
- The System triggers e-mails and SMS alerts to an authorized government agency if a person has jumped quarantine or escaped from isolation, based on the person’s mobile phone’s cell tower location.
- The “geo-fencing” is accurate by up to 300 m.

Interfaces Supported

CQAS application interfaces with various TSPs like JIO/AIRTEL/VODAFONE/BSNL to get the location data in bulk.

Certifications

Award: Best Emergency Response System for 2020 by CISO MAG Summit 2020.

Samvad

- A customizable unified secure Chat & Call platform.
- An easy to use application offers rich bouquet of useful features that can be readily customized to meet various specific requirements.
- Ensure secure availability of data on user mobiles anytime, anywhere, with the privileges of a secure and self-hosted network.
- Deployed in various government departments and strategic agencies.



Advantages

- Stay connected with your contacts through secured chat, voice and video communication
- Send instant messages secured by multiple levels of encryption
- Multiple modes to verify the authenticity of the remote peer
- Initiate Secure Voice Call with other members, over Public Network

Product Features

- One-to-one Group messaging, Calling - Useful for messaging within an organization
- User status, User verification with OTP, Delete Account
- Wide-ranging admin & management features
- Sharing of images, video, PDF, text, audio files, contacts, location
- Message received and read indication to senders
- Integration of user organization's contact database
- Broadcast list, Filtered News, Sharing media from external apps using Samvad

Technical Specifications

- Supports Android API level 15 or above
- Supports iOS 8 and above

Certifications

- STQC, Ministry of Electronics & IT, Government of India

VCDOT Meetings









- Enabling virtual communication in most secure and effective manner.
- A secure web based video conferencing solution where User can organize (host) their own video conference and join video conference hosted by other users by simply clicking on a web-link.
- An indigenous secure solution with all the servers placed within the Indian Territory.
- A customizable and scalable solution equipped with all the latest features.
- Deployed in various government departments & strategic agencies.



Product Features

In addition to features available in other VC applications, VCDOT Meetings offers features like Public Private Chat, HD Video Conferencing, Upload Presentations, Live Minutes of Meeting, Breakout Rooms, Real Time Polling, Multi-Level Screen Sharing, Multi-User Whiteboard, Meeting Scheduling, etc..

Expressive Features

 Public/Private Chat	 HD Videoconferencing	 Upload Presentations	 Live MoM
 Breakout Rooms	 Real Time Polling	 Multi Level Screen Sharing	 Multi User Whiteboard

Highlights of the VCDOT Meetings

Secure & Indigenous
 Robust & User Friendly
 Customizable & Scalable
 Equipped with all the Latest Features
 Servers are placed within the Indian territory
 Host sessions or join others using a simple web-link

Interfaces Supported

VCDOT Meetings supports Windows, Linux, iOS, Android operating systems installed on Mobiles, Tablets, Laptops and Desktops.

Certifications

C3i Certification by IIT Kanpur, SSL Certificate issued by Global Sign (GlobalSign OVSSL CA-2018)



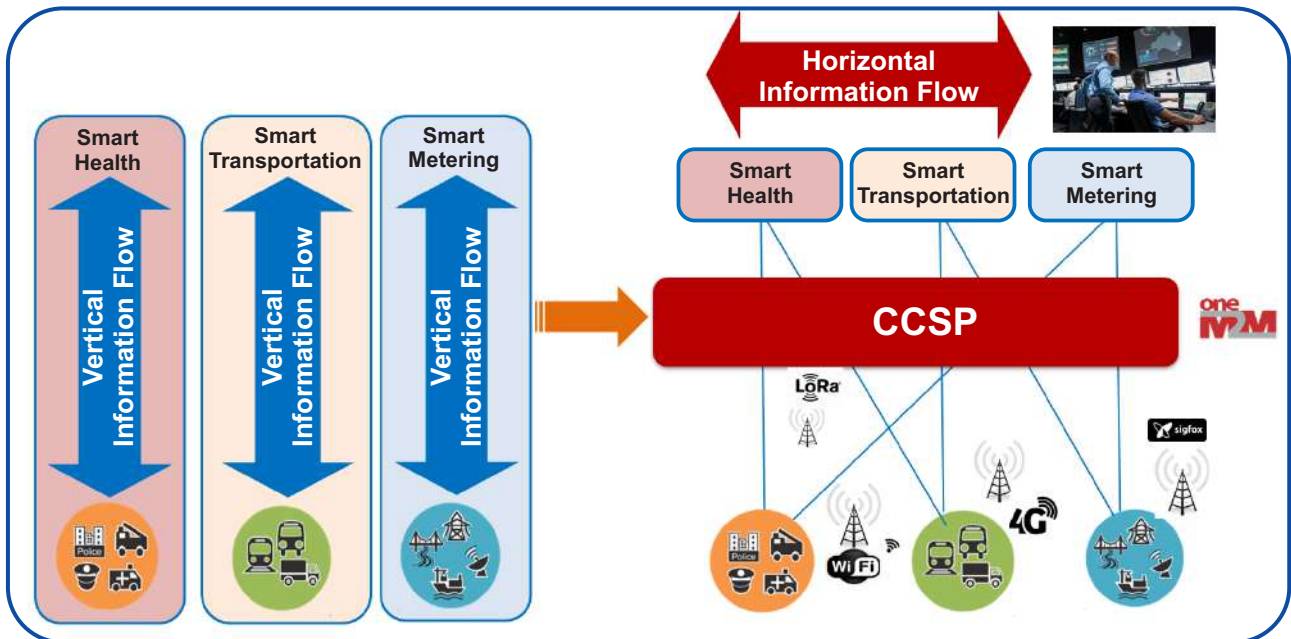
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IoT/ M2M SOLUTION

C-DOT Common Service Platform (CCSP) for IoT/M2M Communication

The Interoperability enabler for IoT/M2M based on oneM2M Release3 Standards

oneM2M is a global standards initiative for Machine to Machine (M2M) communications and the Internet of Things (IoT). Eight of the world's leading ICT standard development organisations (SDOs) and 6 Global forums and over 200 companies from industrial sector are part of oneM2M. oneM2M addresses the need for a common M2M Service Layer that can be readily embedded within various hardware and software and relied upon to connect the myriad of devices in the field with M2M application servers worldwide.



Infrastructure Domain Node

- **IN - Infrastructure Node** - A oneM2M node to make M2M devices/applications i.e. data producers and consumers, to communicate with each other in a secure and efficient manner on a horizontal Common Service Layer.

Field Domain Node

- MN - Middle Node (Gateway) - Contains oneM2M Common Service Layer.
- ASN - Application Service Node (Gateway/Device)- Contains oneM2M Application and Common Service Layer for Edge Computing.
- ADN - Application Dedicated Node - Contains oneM2M Applications only.

CCSP Solution Set

- **CCSP for the Infrastructure domain node** : IN – CCSP
- **CCSP for field domain nodes** : ASN – CCSP and MN – CCSP
- **Resource tree viewer tool.**
- **CA Server**
- **M2M Application Solution:** Smart Living, Smart Street Light, Smart Vehicle and Visitor Management, Feedback Applications

- Interoperability
- Security
- Flexibility
- Reduced Dependence of Application on device vendors
- Scalability

CCSP Testing

- CCSP has been successfully tested for Interoperability at oneM2M Interop test events held at South Korea, Taiwan and Japan.
- Successfully tested for oneM2M Conformance with ETSI.

oneM2M has been adopted as the National Standard for IoT/M2M by DOT

Features and Benefits of CCSP

- Authenticated & Authorised devices only can connect CCSP based IoT network.
- Provides functions that M2M applications across different industry segments commonly need.
- Functions are exposed via CRUD - (Create, Retrieve, Update, Delete) operations.
- RESTful APIs.
- XML and JSON data format support.
- HTTP COAP and MQTT support.
- Docker based and Kubernetes Cluster based IN-CCSP solution.
- Reports
- Service Subscription Management
- Registration

Common Services in C-DOT IN-CCSP

- Security
- Location
- Service charging and Accounting
- Data Management and Repository
- Discovery
- Semantics
- Group Management
- Subscription and Notification
- Device Management (LWM2M, TR069)
- Transaction Management
- 3GPP Interworking



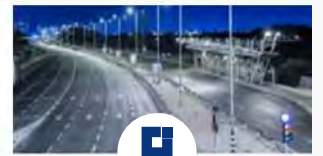
Canteen Feedback C-DOT

Live Poll of Canteen Food Quality based on user's feedback



Smart Living C-DOT

Live temperature and humidity data using sensors and data analysis



Smart Street Light (6LoWPAN) C-DOT

Live Status and Group Management of Street Lights using mobile application



Smart Vehicle and Visitor Management System C-DOT

Smart Vehicle Management System to distinguish between authorized persons and visitors.

Lower CAPEX

- Lower complexity of the M2M solution development thus reduces development cost & time.
- Standardized protocols & APIs which reduces application development cost.
- Standards based development ensures easy interfacing thus reduces integration cost.
- Use of oneM2M Service Layer simplifies testing and interworking of components (device/server side).
- Reduces the deployment cost.

Lower OPEX

- Devices may differ in their access technologies (ZigBee, Bluetooth, M-bus, Zwave etc.) and their data models. Any new device having any access technology can be integrated.
- Same service layer for different verticals - Reduces cost of operation.



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ARTIFICIAL INTELLEGENGE

Artificial Intelligence Products

Years of Research and Development by C-DOT in Artificial Intelligence has resulted into many sustainable business solutions in computer vision and NLP, such as person tracking, face recognition, object detection, intrusion detection, moving object detection, pose estimation, speech analytics, chatbot, cyber security, augmented and virtual reality among many others. Following state-of-the-art products are ready for commercial deployment, while others can be customized as per client's specific requirement.

C-DOT Intelligent Attendance System (CIAS)



Salient Features

- Facial Recognition and Verification System
- A Low cost edge device
- Low Shot Recognition
- Auto directions for users to adjust face in ROI
- Image quality assessment
- Facial alignment for better results
- Automatic Mask Detection
- Face Spoofing Detection (Mobile Images/Videos or Physical Printouts)
- Auto Prompt For Mask Removal
- Attendance Intimation with Staff Details

C-DOT Mask Detection System (CMASK)

Salient Features

- Detection & Reporting of Masked/ Non-Masked Person information to concerned authority
- Low cost CPU based solution
- Customized for Indian crowd faces
- Image pre-processing techniques used (deblurring & denoising of scenes) to improve the quality of images for better results
- Person Tracking across the frames to improve accuracy
- Detection of improper wearing of mask
- Environment agnostic algorithm; works both in Indoor & Outdoor environments accurately.
- Alarms in the form of email notification may be sent to the concerned authority to take action as per official policy on non-compliance.
- AI/ ML based social distance monitoring



DL/ML Based Text Analytics

Committed to building Deep Learning based Text-data Analytical Solutions for Indian domain, Searchstar is a short-text based Social Media Analytics tool that collects, stores, analyses data from multiple social media sites and presents extracted information in user friendly dashboards.

Data Collection: Twitter, You-Tube, Linked-In

Analytical Engines:

- 3-class **Sentiment Classification** (+ve, -ve, neutral)
- 7-class **Emotion Analysis** (Joy, Surprise, Anger, Disgust, Fear, Sad, Other)
- 3-class **Gender Prediction** (Male, Female, Other)
- 17-class **Named Entity Recognition** (Person, Location, Organization, Technology, Equipment, Event, Religion, Social Issues, Date, Number, Percentage, Money, Sport, Disease, Drug, Disaster, Entertainment)
- **Topic Modeling** (k content clusters, where k=5)
- **User-Retweeter Network** Using Graph Algorithms
- **Statistical Analysis** Based Inferences



Key Characteristics

- OS Agnostic, Browser-based solution
- Collects live and archive data
- Real-time analysis of Collected Data
- Deep Learning/Machine Learning based in-house built specialized models
- Separate data-sets for Hindi and English
- Data collected from Indian domain in specialized areas of **National Security, Social Issues and Disaster Management** ***

*** Trained on specialized datasets, TextAnalytic models built in-house give higher accuracies than solutions available otherwise on generic data or models.

Dashboards : General Metrics, Sentiment, Gender, Location, Hashtag, User-Mentions, WordClouds, User- Retweeter Network, Following/Followers, NER-Person, Organization,...,Technology, Disaster; and many more.



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C-DOT

Centre for Development of Telematics (C-DOT)

Telecom Technology Centre of Government of India

C-DOT Delhi Campus

Mehrauli New Delhi- 110030

Phone: +91 11 2659 8262/ 2680 2856

C-DOT Bangaluru Campus

Electronic City Phase I, Bangaluru - 560100

Phone: +91 80 2852 0050

email: mktg@cdot.in web: www.cdot.in