

**Expression of Interest  
For  
“Shortlisting Firms  
for  
upcoming Invitation To Bid (ITB)  
for Empanelment as C-DOT  
Business Partners”**

No: C-DOT/EOI/MKTG/2021-22/01 date: 16-JUL-2021

**Centre for Development of Telematics  
Telecom Technology Centre of Govt. of India**

**Delhi Office: C-DOT Campus, Mehrauli, New Delhi -110030**

**Bengaluru Office: Electronic City, Phase 1, Hosur Road, Bengaluru-560100**





## 1. Background Information

Centre for Development of Telematics (C-DOT), Telecom R&D Centre of Department of Telecommunications, Ministry of Communications, Govt. of India, has diverse product portfolio spanning a wide range of Telecom Technologies that include Switching & Routing, Optical Communication, Wireless and Cellular Communication, Telecom Network Security, M2M/IOT, Network Management Systems and other Telecom software applications. Details of C-DOT technologies/products are listed at **Annexure-H<sup>#</sup>**.

# Technologies/Products listed in **Annexure -H** are indicative and not exhaustive, and may be revised by C-DOT at any point of time during engagement.

## 2. Objective of EOI

The objective of this EOI is to shortlist suitable Firms\* in relation to the upcoming Invitation To Bid (ITB) for empanelment as C-DOT Business Partners. Such Firms, shortlisted through this EOI process, shall be invited to submit their response against the upcoming ITB. The firms selected through the ITB process shall become Business Partners of C-DOT with the execution of a formal Empanelment agreement.

Subsequent to empanelment, appropriate Teaming Agreement/Project Agreement or both shall be signed between C-DOT and Empaneled Business Partner for each specific opportunity/project of Clients.

Role of empaneled Business Partners is to maximize participation of C-DOT products in forthcoming tenders/ business opportunities. In order to enable empaneled business partners to propose and deploy C-DOT products against Client requirements, C-DOT shall assist them through timely provision of technical documentations, detailed data sheets, installation & operation manual, testing and validation reports, product prototype for field trial/Proof of concept, technical training, marketing assistance, compliances/ undertakings/Client testimonials, certifications and other bid related documentation.





### 3. Modes of Engagement

In Client Projects/Tenders, Empaneled Business Partners shall be engaged in one of following modes (depending on tender eligibility conditions):

- i. As Lead Bidder/Prime Contractor, where C-DOT shall act as OEM/Sub-Contractor for its scope & deliverables.
- ii. As OEM/Sub-Contractor in Tender for third party deliverables, where C-DOT shall act as Lead Bidder/Prime Contractor for whole solution being proposed.

### 4. Desirable Expertise/Credentials of Empaneled Business Partner

Through the upcoming ITB, C-DOT aims to select Business Partners who have specialization/expertise in following areas:

- i. Architecting whole end-to-end solution as per Client/tender requirement,
- ii. Site Survey, Preparing Detailed Requirements/ or Engineering document, preparing a complete a proposal/quotation/bid, meeting the Client requirement, by integrating C-DOT products along with other off-the-shelf components/products,
- iii. Overall Project Management, Supply, installation, configuration, integration, commissioning, testing, training, operation, maintenance, Cyber security audit and support of Telecom Networks and related solutions, as desired by the Client.
- iv. Making Commercial tie-ups for supply and support of deliverables supplied by C-DOT ToT Partners (on preferential basis) , other OEMs, Solution and Service Providers.
- v. Having proven credentials of satisfactory prior work experience for similar Clients' projects/tender works.

### 5. Criteria for Shortlisting the Firms

Criteria for shortlisting the firms for next stage evaluation i.e. ITB, shall be based on parameters including, but not limited to: prior work experience, proven credentials, project management capabilities, prior tie ups/agreements with OEMs for off-the-shelf products/software, necessary skills and expertise of Solution Architect Team Personnel, and requisite Financial Strength.





## 6. Guideline for preparation of response to this EOI

Applicants are requested to follow the below guidelines while preparing their responses to EOI.

- i. The EOI proposal along with the requisite documents to be submitted in soft copy (email id mentioned above) .pdf form in the format given in **Annexure – A** (scanned in 100 dpi with black and white option), citing the name of C-DOT product of interest. Any EOI not found responsive to the details mentioned in this document may be rejected. C-DOT shall short-list the Organization/Firm based on an assessment of the submitted information.
- ii. The EOI proposal to be addressed to: The Head – Marketing, Centre for Development of Telematics (C-DOT) C-DOT Campus, Mehrauli, New Delhi-110030, Email: [kjonwal@cdot.in](mailto:kjonwal@cdot.in) ph 9953884308. Interested firms to forward their Expression of Interest (EOI) including relevant documentation by email (max. 4.5 MB per email message with no limit on number of messages) with Subject line of “EOI proposal for C-DOT/EOI/MKTG/2021-22/01 date: 16-JUL-2021”.
- iii. Technical Presentation: Subsequent to submission of proposals, the Evaluation Committee of C-DOT may ask the intending partner to give a detailed technical presentation, covering following points:
  - a. Types/Technologies of telecom products/solutions/technologies undertaken by the intending business partner.
  - b. Knowledge, skills, expertise of intending business partner pertaining to products/solutions/ technologies, for which proposal is submitted.
  - c. Certificates, Achievements, awards won, etc.
  - d. Plan/methodology for rendering the services and support from thirty party vendors/OEMs.
  - e. Capability and willingness of the intending business partner for marketing, proposing, and deploying C-DOT's products/solutions/ technologies.
- iv. Amendment to EOI Documents:
  - a. At any time prior to the deadline for submission of proposals, C-DOT may, for any reason of its own initiative, modify the EOI document.
  - b. The amendments to the EOI documents, if any, will be notified by release of corrigendum notice on C-DOT website. The intending partner to take into account any corrigendum published on C-DOT website regarding the EOI document before submitting their proposals.
  - c. C-DOT at its discretion may extend the deadline for the submission of proposals if it







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thinks necessary to do so or if the proposal document undergoes changes during the submission period, in order to give prospective partner time to take into consideration the amendments while preparing their proposals.

- d. C-DOT reserves the right to amend any terms & conditions of the EOI or cancel the entire EOI without assigning any reasons therefor.

*[Signature]*  
16/07/2021





**Annexure – A**

**Cover Letter**

(on Firm's Letterhead)

To

Date: \_\_\_\_\_

The Head - Marketing

Centre for Development of Telematics (C-DOT)

C-DOT Campus, Mehrauli, New Delhi-110030

Subject: Submission of EOI to be short listed in relation to the upcoming Invitation To Bid (ITB) for  
Empanelment as C-DOT Business Partners

Dear Sir,

Having read EOI document bearing the reference number **C-DOT/EOI/MKTG/2021-22/01, dated 16-JUL-2021** released by C-DOT, we, the undersigned, hereby acknowledge the receipt of the same and offer to empanel our organization as a Business Partner in conformity with the said EOI.

If our offer is accepted, we undertake to abide by all the terms and conditions mentioned in the said EOI and intends to participate in the subsequent exercise (of ITB) in case of being shortlisted.

We hereby declare that all the information and supporting documents furnished as a part of our response to the said EOI, are true to the best of our knowledge. We understand that in case any discrepancy is found in the information submitted by us, our EOI is liable to be rejected.

Please find enclosed herewith the below listed documents, as required.

1. Authorization Letter as per **Annexure - B**.
2. Organization Details, as follows  
General Details (**Annexure - C**)  
Work Experience and Credentials of Organization (**Annexure - D**)  
Financial Data of Organization (**Annexure - E**)
3. Declaration for Near Relation (**Annexure - F**)
4. Declaration for Non-Blacklisting by PSU/Govt agency in the past 3 years (**Annexure - G**)
5. Clause by clause compliance of EOI with supporting documents, wherever asked in EOI

Signature of the Competent Authority (with date)

(full name)

(designation)





Firm's official Seal

**Annexure -B**

**Authorization Letter**

**Reference: EOI No. C-DOT/EOI/MKTG/2021-22/01, dated 16-JUL-2021**

Date:

To

The Head - Marketing

Centre for Development of Telematics (C-DOT)

C-DOT Campus, Mehrauli, New Delhi-110030

Dear Sir,

We, M/s \_\_\_\_\_ (Name of the intending business partner firm) having registered office at \_\_\_\_\_ (address of the intending business partner) herewith submit our proposal against the aforementioned EOI document.

Mr./Ms. \_\_\_\_\_ (Name and designation of the signatory), whose signature is appended below, is authorized to sign and submit the proposal documents on behalf of \_\_\_\_\_ (Name of the intending business partner) against said EOI.

Specimen Signature: \_\_\_\_\_

The undersigned is authorized to issue such authorization on behalf of us.

For M/s \_\_\_\_\_ (Name of the prospective partner)

Signature and company seal

Name

Designation

Email

Mobile No.





## Annexure – C

### General Details of Organization

Reference: EOI No. C-DOT/EOI/MKTG/2021-22/01, dated 16-JUL-2021

Sr.	Information heading	Details
1	Name of Company/Firm (Please attach Certificate of Incorporation/Registration with Partnership Deed/Memorandum and Article of Association)	
2	Name, designation, e-mail and mobile number of contact person (* in format given below)	
3	Address of Head Office/Registered Office	
4	Details of Regional Offices, Branch Offices, if any	
5	Total number of Technical employees (B.Tech/M.Tech/MS/PhD) on roll	
6	Nature of Primary Business/Area of Expertise	
7	List/ Details of telecom products, technologies or services (recently dealing with)	
8	List of Clients, presently engaged with (please attach a list)	
9	Names of Principal Manufacturer/OEM for which you are partner/Authorized Dealer	
10	Organizational Chart (please attach in separate document)	
11	Awards won year-wise	
12	Any other relevant information (Quality assurance certificates, any certificate highlighting the capabilities of organization)	
13	Litigation and arbitration history in past 5 years, if any (in brief)	





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14. DETAILS OF SINGLE POINT OF CONTACT OF FIRM

First Name		Last Name	
Designation			
Company Name			
Official Address for Correspondence			
Contact Number (Office Landline)			
Mobile Number			
Official Email ID			
GST No.(s) (State wise) of Company/Firm			
PAN/TAN No. of Firm			





## Annexure – D

### Work Experience and Credentials of the Organization

Reference: EOI No. C-DOT/EOI/MKTG/2021-22/01, dated 16-JUL-2021

Experience of organization in implementation of solutions involving products/ solutions/ technologies, similar to C-DOT products listed at **Annexure H**

Sr. No.	Description of assignments/projects during last Five (05) years <sup>#</sup>	Vertical/ Area of Work**	Sector Government/Private/Foreign	Order Value in INR (enclose copy of each of the order)	Mention the name of Client/Organization (enclose completion certificates)
1.					
2.					
--					

Decision of the Evaluating Committee of C-DOT, in ascertaining “similar nature”, will be final.

\* Attach work orders, statement of completed scope & certificates specifying “satisfactory completion” along with Reference Details on the applicant’s letter head with contact details for reference. (PO/Work orders from Central Govt./State Govt./PSUs/Municipal Corporations/other Govt. bodies in India would be given preferences)

\*\*in Vertical/Area of Work, mention one or more of following domain: (i) Wireless and Cellular communication, (ii) Switching & Routing, (iii) Optical Communication, (iv) Telecom Network Security, (v) M2M/IOT, (vi) Telecom Software/ Telecom Management Software, (vii) Other Telecom related Hardware/ Software/ Services.

# Purchase Orders placed on the Company/Firm within the past five years proving relevant experience in supplying Telecom Networking Solution matching to existing product portfolio of C-DOT , listed at **Annexure -H**. Response should clearly indicate the type of items and technical specifications, contract amount, quantities, and customers contact details as references may be sought.





**Annexure – E**

**Financial Data of the Organization**

**Reference: EOI No. C-DOT/EOI/MKTG/2021-22/01, dated 16-JUL-2021**

Financial Data of the Organization					
S.No.	Financial Year	Overall annual Turnover (in INR)	Annual Net Profit (in INR)	Annual turnover from only Telecom Projects rendered in India (in INR)	Whether profitable Yes/No
1.	2020 – 21				
2.	2019 – 20				
3.	2018- 19				

Supported with

1. Audited financial statements for the last three years (Consolidated Balance Sheet, Profit & Loss, and Cash Flow statements).
2. Proof of Credit Availability: A Letter from a Recognized Commercial Bank specifically stating credit availability of the company
3. Copy of Income Tax Return for last 3 years

Signature of the Applicant/Authorized Signatory

(Full name of the Applicant/Authorized Signatory)

Stamp & Date





**Annexure-F**

**RELATIONSHIP CERTIFICATE**

**Reference: EoI No. C-DOT/EOI/MKTG/2021-22/01, dated 16-JUL-2021**

Date:

To

The Head - Marketing

Centre for Development of Telematics (C-DOT)

C-DOT Campus, Mehrauli, New Delhi-110030

It is certified that I/We, the undersigned/or Board of Director/Top Management, do not have relationship with any of the employees working at Centre for Development of Telematics (C-DOT).

The above statement is true, and is submitted against the above referred EOI.

Date: \_\_\_\_\_

(Signature)

Name of the Company/Firm





**Annexure-G**

**NON- BLACKLISTING CERTIFICATE**

**Reference: EOI No. C-DOT/EOI/MKTG/2021-22/01, dated 16-JUL-2021**

Date:

To

The Head - Marketing

Centre for Development of Telematics (C-DOT)

C-DOT Campus, Mehrauli, New Delhi-110030

This is to testify you that our Firm/Company/Organization <provide Name of the Firm/Company/Organization> intends to submit a EOI proposal in response to the above referred EOI for intending to be shortlisted for ITB for empanelment as Business Partner of C-DOT.

In accordance with the above we declare that:

- We are not involved in any major litigation that may have any impact affecting or compromising the delivery of services as required under this EOI
- We are not blacklisted by any Central/ State Government/ agency of Central/ State Government of India or Public Sector Undertaking/ any Regulatory Authorities in India or any other country in the world for any kind of fraudulent activities.

Sincerely,

[For and on behalf of Name of the Company/Firm]

Name

Title

Signature





ANNEXURE- H

*आत्मनिर्भरता की ओर*  
***Towards Self-reliance***



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**CENTRE FOR DEVELOPMENT OF TELEMATICS**



**Product Catalogue**



## Our Vision

- C-DOT to become world class Telecom Technology development centre.

## Our Mission

- To Design and develop state-of-the-art technologies, products and solutions.
- To meet the telecom needs of India, especially those of national importance in strategic and rural sectors.

Centre for Development of Telematics (C-DOT), a premier Telecom Technology Development Centre of Government of India was founded in August 1984 to meet technology needs of the country. It has state of the art CMMI Level 5 certified research centres at Delhi & Bangalore.

C-DOT, India's premier telecommunications R&D centre, has been a pioneer and a nation builder. Committed to provide a wide range of indigenously developed, cost-effective, state-of-the-art total telecom solutions, it has come a long way since its inception. Starting from the mission of providing dial tone to the Indian masses, C-DOT has developed solutions in practically all areas of Telecom viz. Switching, Transmission, Optical, Wireless, Satellite communications, Next Generation Network, Voice over IP Solutions and Telecom Software Solutions.



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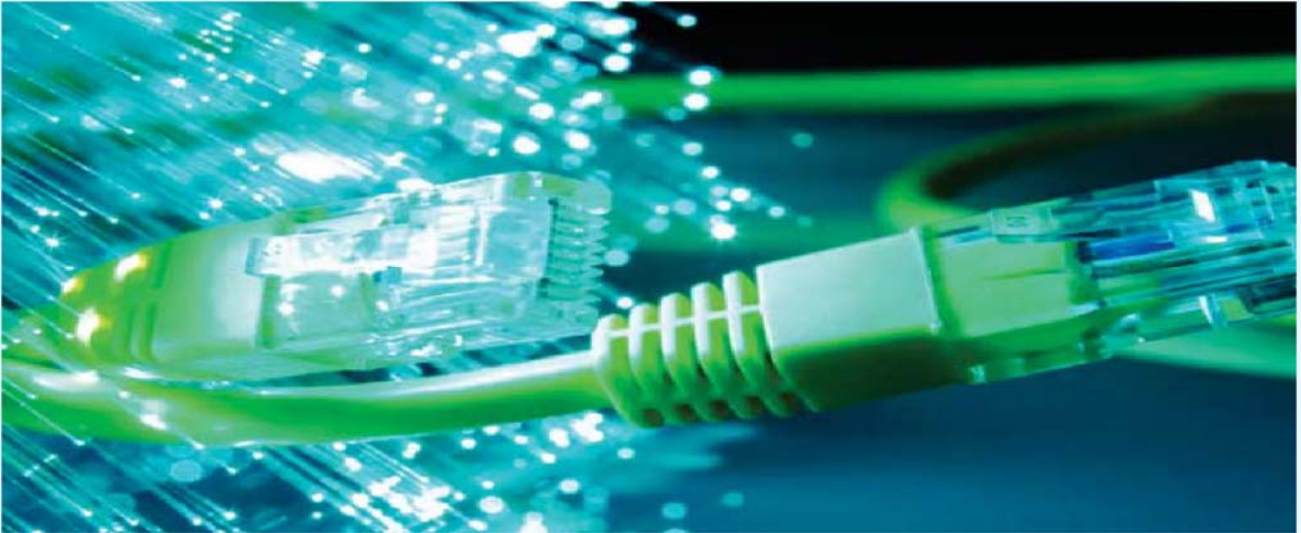
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# Optical Products



With increasing data loads, internet traffic and quantity, traditional broadband connections will soon become a substantial limitation. Therefore, fiber optic broadband connections become a mainstream media of high-speed transmission. Optical fiber uses light instead of electricity, to carry signal. While copper cables are capable of handling high bandwidth, they can only do so at a short distance. The biggest advantage of fiber broadband based optical technology-based connectivity is the consistency of carrying fast data over long distances.

Keeping this in view, C-DOT has developed range of Optical products for Access Networks & Core Networks. Products for Access Networks (GPON & XGS-PON) and Core Networks (DWDM & POTP) are detailed in the following pages.

***The availability of seamless broadband connectivity across the country plays a pivotal role in improving the nation's governance, enhancing business performance, providing sustainable job growth, which ultimately also determines the economic development of our semi-urban, rural and small towns.***



# Optical Access Network – GPON

Broadband has become a critical infrastructure for the advancement in education, health, public safety, research, economic diversification and public services. Broadband services and its related offering should be fast enough to support available applications that enable sufficient access to information, communication, education, healthcare, business, entertainment, social connectivity & interaction. GPON offers best solution that will address the access bandwidth growth in the foreseeable future for providing true triple play services of Voice, Video and Data.

GPON is an excellent choice for small to medium businesses that require voice, Internet access, and VPN services to be provided at low cost. GPON bandwidth is high enough and has the SLA features, to allow business-class services to be provided on the same infrastructure as residential services, eliminating the requirement for overbuilt infrastructures. GPON is seen as the technology of choice to deliver FTTH services; by the service providers because it can provide higher bandwidth, better Quality of Service (QoS) and enhanced scalability when compared to other PON technologies. GPON technology will continue to dominate worldwide as the best choice for providing high speed broadband and other triple play services to the end customer.

C-DOT has launched Gigabit Passive Optical Network – GPON, a Fiber to the home - FTTH Application, completely with indigenous state of the art technology. This is a complete end to end GPON solution from the central office to the customer premises. With C-DOT's GPON, India proudly joins the elite group of advanced countries in offering FTTH solutions to the customers. Various flavours of customer premise equipments are available which satisfy the requirements of Fibre to the Home, Business or multi-dwelling units.

C-DOT's GPON system is perfect for government offices, universities, hospitals as well as business parks, malls, and industrial centers due to its ability to efficiently serve large numbers of users over a defined area. Hospitals, clinics, and specialty clinics can use high speed links through GPON technology for sharing of patient records, including radiological image data.

So, with the use of C-DOT's advanced, robust and cutting edge GPON products, users can enjoy variety of services such as:

- High Speed Internet Access
- Transparent LAN Service
- Broadcast Video
- IPTV
- Security and surveillance
- Video on demand
- IP Telephony (VoIP)
- On line gaming
- E-education
- E-medicine

And all this can be achieved through a single optical fiber coming to the customers place.



## GPON OLT

OLT (Optical Line Termination) is the central office equipment of the GPON system and provides the Service Node Interface for the system. These OLTs support 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. These also support 1:1 protection for PON ports towards ONTs (Optical Network Termination) at customer or user premises. OLTs can support up to 128 ONTs per PON port which can be 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 can be done through LCT/EMS.

## GPON ONT

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 Tops. 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 all the services i.e., Voice, Video and Data to the users. These 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 a special 'Dying Gasp' feature so that in case of ONT becoming "un-reachable" from OLT, administrator can know that this is because of power failure at ONT or due to cut in optical fiber connected to that ONT. These have Transmit Power 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.

### Common Interfaces/ Features in ONTs are

- **Ethernet interface:** Support of IEEE 802.3, 802.3u, 802.1x
- **WiFi interface:** Standard IEEE 802.11b, 802.11g, 802.11n with 2.400-5GHz, OBW= 40MHz, auto channel selection with Antenna MIMO 2x2, 5dBi supporting 30 concurrent users
- **POTS interface:** Standard SIP (RFC3261), ITU-T G.729/G.722/G.711a/G.711 VoIP function, Support for Caller ID, Call waiting, Call holding, Call forwarding
- **Security:** Supported with NAT and SPI Firewall MAC/IP/Packet/Application/URL Filtering
- All the ONTs support Web GUI configuration and can be remotely Configured & Managed via LCT/EMS connected at OLT. Firmware upgrade via Web-based/TFTP is also supported.

These are designed to work in non-AC environment, are cost effective, power efficient and work on 12V DC supply.





### TEC Certification

C-DOT has secured TEC certification for:







- **OLTs:** Office OLT2, MiniOLT 8P and GPON OLT chassis 48/96 port
- **ONTs:** ONT15, ONT17A, ONT18 and ONT24





The Optical products portfolio includes various Network Elements as detailed below:

Sl.No.	Product Name	Main Features	Use Cases
1.	GPON OLT 	Chassis based GPON OLT with support of 48/96P is a big OLT product. It can serve up-to 12000 number of users. Provides 1:1 PON protection and meets ITU-T G.984.x recommendation. It has 06 numbers of configurable 1G/10G Ethernet (each with 1:1 protection) interfaces towards the network side connectivity.	The OLT has been designed to cater to the requirements of Broadband services / bandwidth for a residential colony or entire district, very large office campus or large business hub.
2.	4P MiniOLT (Office OLT2) 	Office OLT2 is smallest OLT among the range of CDOT OLT products. It has the provision to terminate 04 PON interfaces (or 2 PON interfaces with 1:1 protection) towards PON side. and 04 numbers of 1G Electrical Ethernet interfaces towards network side. It works on -48VDC supply or through AC/DC Adapter.	The OLT is capable of serving small offices or campus and residential complexes where the number of users is less than 500 for Internet, Voice and Video services (Broadband Services).
3.	4P MiniOLT (Office OLT3) 	Office OLT3 is smallest OLT among the range of CDOT OLT products. It has the provision to terminate 04 PON interfaces (or 2 PON interfaces with 1:1 protection) towards PON side. and 04 numbers of 1G Electrical Ethernet interfaces towards network side. It works on +12V DC supply or through AC/DC Adapter.	The OLT is capable of serving small offices or campus and residential complexes where the number of users is less than 500 for Internet, Voice and Video services (Broadband Services).
4.	8P MiniOLT 	8P Mini OLT is a standalone small OLT product. It is single card system which is housed in a 1U box, which can be inserted in 19 inches wide rack and can also be placed on table. It has the provision to terminate 8 PON interfaces (or 04 PON interfaces with 1:1 protection) towards PON side and 2 numbers of 10G and 4 numbers of 1G Ethernet interfaces towards network side. The OLT can work on -48V DC or can be fed through AC/DC adapter.	The OLT will meet the requirements of a residential premises or business centre for Internet, Voice and Video services (Broadband Services). The Box is capable to serve up to 1000 users.



Sl.No.	Product Name	Main Features	Use Cases
5.	ONT15 	This is named as Titli ONT which has One PON Port, Two 10/100/1000 Base-T Ports, Two RJ-11 Voice Ports, One USB Port (Only for Charging)	Small ONT will meet the requirement of individual office desk.
6.	ONT17 	Two PON Ports for Ring Topology, Five 10/100/1000 Base-T Ports, Two RJ-11 Voice Ports, Two USB Ports and 802.11 b/g/n Wi-Fi Interface	Meeting the optical path redundancy for high availability.
7.	ONT17A 	The ONT provides following interfaces: One PON Port, Four 10/100/1000 Base-T Ports, Two RJ-11 Voice Ports, Two USB Ports and 802.11 b/g/n Wi-Fi Interface	ONT is designed to fulfil the requirement of Broadband Services provided through large service providers.
8.	ONT18 	One PON Port, Five 10/100/1000 Base-T Ports, Two RJ-11 Voice Ports, Two USB Ports, 802.11 b/g/n Wi-Fi Interface and One RF Video Port	Along with broadband services, Cable TV services can be deployed through ONT.
9.	ONT24 	One PON Port, Four 10/100/1000 Base-T Ports, Two RJ-11 Voice Ports and 802.11 b/g/n Wi-Fi Interface	Home users for Broadband services at affordable device cost.
10.	GPON EMS	GPON EMS (Element Management System) is the solution to manage network of GPON Networks and capable of service provisioning, network monitoring, fault reporting and authorized user control access. Ems has Web based GUI access which has well-defined user-friendly modules managing the GPON network.	Centralized managed / monitoring system for GPON network.
11.	XGS-PON OLT 	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	high speed internet, Voice calls, IPTV, HD Video streaming, high speed Wi-Fi services to the customers.



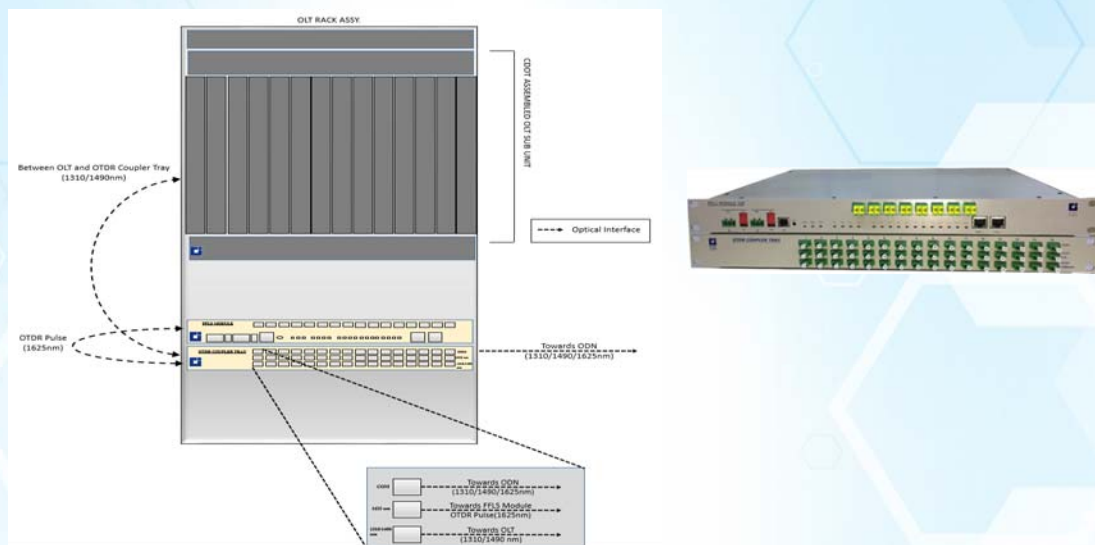
Sl.No.	Product Name	Main Features	Use Cases
		network. Both Class N1 (29dB) and Class N2 (31dB) Optics can be used depending upon requirements. Data travelling between OLT and ONT is completely secure with AES encryption.	
12.	XGS-PON ONT 	These ONTs support Uplink Speed of 10 Gbps (@1270nm) & Downlink Speed also of 10 Gbps (@1577nm).  ONT has 5x1 Gbps and one 10 Gbps optical Ethernet port, Two VoIP ports, Two IEEE 802.11n Wi-Fi interfaces and Two USB 3.0 ports.	All above services with higher bandwidth requirements. Can connect small business hub/centre, institutions with high-speed connectivity.
13.	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.	All above services with requirements of optical path redundancy for high availability of services.
14.	XGS-PON EMS	XGS-PON EMS (Element Management System) is the solution to manage network of GPON Networks and capable of service provisioning, network monitoring, fault reporting and authorized user control access. Ems has Web based GUI access which has well-defined user-friendly modules managing the GPON network.	Centralized managed / monitoring system for XGS-PON network.
15.	NMS	NMS Solution is highly available and scalable based on server load and the number of equipments. C-DOT's NMS is user friendly and has well-defined modules for the operations and management of the entire network including CPE level equipment. The management system provides multiple modules including provisioning, monitoring, reporting, network health etc.	To manage Network of different domain networks / multi-technology GPON Networks.



## GPON FFLS

C-DOT Fiber Fault Localization System (FFLS) detects and locates fiber fault (fibre cut or removal of connector) along with its overlay of fault location (latitude, longitude, with fiber details) on GIS Map (private or public) taking satellite imagery as background.

FFLS for a specific fibre-based technology, utilizes deployed network (Central Office (CO) and Customer Premise Equipment (CPE) as topological nodes along with its NMS), 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 with other optical communication technologies.



## System Features

- FFLS Server can handle multiple COs e.g., OLTs per NMS and it can detect multiple faults simultaneously.
- It works on ALWAYS ON mode and minimum time to localize fault is 2 min.
- It does Periodic Monitoring of PON Health.
- By using this system, the fault can be located with details like: Lat/Lon with location-based service, Fiber section, Duct/cable or fiber details of fault location, Distance from C.O. and/or fault mapping on background Satellite Imagery.
- Accuracy for fault location depends on accuracy of GIS Map and accuracy of OTDR Module.





For more details about this product, scan QR Code



# Optical Core Network - Dense Wavelength Division Multiplexing System (DWDM)

*Dense Wavelength Division Multiplexing (DWDM) is a revolutionary technology, with Point-to-Point DWDM systems representing the first phase in the evolution of Optical Transport Networking. Needless to say, TDM technology is no longer being able to keep pace with the emerging ultra-broadband data backbone demands and also laying new fiber is expensive, particularly for long routes, let alone its high installation time. In this scenario, DWDM provides the most cost-effective way to expand the capacity.*

Sl.No.	Product Name	Main Features	Use Cases
1.	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 Kms span without regeneration.	Long Distance Transport network /Core Network, Metro Ring, Storage Area Networks, ESCON (Enterprise Systems Connection) and FICON (Fiber Connection)  Offered Configurations: Linear Network Point to Point Closed / Hubbed Ring Mesh Network
2	1.6T POTP System 	POTP, Packet Optical Transport network, has OTN switching capability of 1.6Tbs traffic in multiple directions. The system supports 8 wavelengths of 100G on line side interface and transported over DWDM layer. Other side, Client's interface of various protocol such as	Long Distance Transport network /Core Network, Metro Ring, Storage Area Networks, ESCON (Enterprise Systems Connection) and FICON (Fiber Connection)



Sl.No.	Product Name	Main Features	Use Cases
		SDH, Ethernet, OTN, Fiber Channel etc. This provides traffic switching across the wavelengths resulting effective utilization of available transport capacity among different nodes connected through POTP/DWDM network.	



*For more details about this product, scan QR Code*



# Switching Products – Routers

*The exponential growth of Internet traffic has caused new developments in IP/MPLS router technology. The need for the offering of value-added IP services ranging from QoS-based internet access to real-time triple play services like IP telephony, social media, ecommerce, video conferencing and IPTV has resulted in a demand for multi-service routers with better switching performance.*

## CRAT-100 / CRDT-100 Router

C-DOT'S CRAT-100/CRDT-100 Router is a Next generation product, built to address challenges faced by service providers at the core and edge of the network.

It can be used as a high speed L3 switch in Data Centre solutions. It is reliable and is IP/MPLS network fail-safe due to the Non-Stop Forwarding and other value-added features.



### Product features

**Form Factor:**

**Interfaces:**

**Switching fabric capacity:**

**Management port:**

**Power Supply:**

- 1 U high, 19" rack mountable pizza-box packing
- 48 Ethernet interfaces which can be configured as either 1Gbps or 10Gbps each
- 960 Gbps non-blocking
- 10/100/1000 Mbps out of band Management Ethernet port
- Dual Redundant Power supply, 220V AC or –48V DC

### Certifications

EAL-3 Certified, Ipv6 Ready Logo Certified



For more details about this product, scan QR Code



# CRTR-210 Router

The CRTR-210 is a secure router product, built to address challenges faced by medium and large enterprise solutions. It supports features which together make IP/MPLS network fail-safe and reliable for NGN services and applications. The system has a switching fabric and backplane capacity of up to 80 Gbps.



The CRTR-210 Router Software is known as C-DOT Router OS (CROS) and is a modular, reliable, high performance carrier class network operating system used across routing, switching and security platforms. The software architecture is modular, scalable and supports separate control and data/forwarding plane to ensure high availability. The management plane is isolated from control plane and data plane. EAL-3 certification is under progress.

## Product Features

- Modular, reliable and high-performance IP/MPLS Router Solution
- State of the art security features (MACSec at line rate and hardware accelerated IPSec features)
- Provision for incorporating third party modules for enhanced features

## Interfaces Supported

- 4 X RJ-45 10/100/1000Base-T Electrical
- 24 X 1G SFP Ports
  - 1000Base- LX/SX/LH/ZX
  - 10/100/1000Base-T Electrical SFP
- Option for
  - 2 X 10-Gig SR/LR/ER/ZR
  - E1 Interface (Through SFP based adapter/ inter-working device)
  - V.35 Interface (through external adapter)



*For more details about this product, scan QR Code*



# Branch Router-10

C-DOT BRTR-10 is a high-performance Branch Router which addresses the requirements of small offices and business units, typically having different types of LAN/WAN interfaces.

## Product Features

- It is based on a versatile hardware designed to support various kinds of features and protocols required in an IP network. On the WAN side, the router provides support for V.35, legacy E1 TDM (G.703/G.704), E1 (EoPDH), as well as Gigabit Ethernet electrical/optical interfaces.
- On the LAN side, it provides support for Fast Ethernet interfaces/Gigabit Ethernet interfaces. Support for Ethernet packets over V.35 interface is also provided. IP data packets are extracted and encapsulated in PPP/HDLC frames before transmitting on V.35 serial WAN interface and vice-versa.

## Network Interfaces

- 08 x 10/100/1000Base-T Ethernet over Copper Transceivers
- 02 x 1G Ethernet over Optical Fiber (SFP)
- 08 x Fast Ethernet Ports [08 x 10/100BASE-TX Ethernet]
- 8 x E1 Ports
- 01 x V.35 interface
- 01 x Console port with RS-232



*For more details about this product, scan QR Code*



# Switching Products - L2 / L3 & V.35 Adaptor

## CSX-10

CSX-10 is an Access Switch in the C-DOT's portfolio of Switches. Features of this Switch are detailed below:

### L2 Features

- 802.1Q VLAN
- RSTP/MSTP, LLDP/LLDP-MED
- Link Aggregation
- Port/Flow Mirroring
- DHCP snooping, DHCP relay
- PoE/PoE+

### L3 & QoS Features

- Static Routing
- IGMP/MLD Snooping
- DSCP, 802.1p based QoS
- QoS Classifier, Policer, Shaper
- WRED

### Security and Management Features

- IEEE 802.1x, MAC-based authentication
- MAC limiting
- RADIUS/TACACS+
- ACL, Storm Control, IP Source Guard
- CLI/SNMP/Web-based GUI RMON, Syslog

### Interfaces Supported

8X1G copper ports + 2X1G optical uplinks interfaces with single AC power supply.



*For more details about this product, scan QR Code*



# CSX-100

CSX-100 is a Mobile and Wireless Backhaul Access switch for LANs. This switch can be used for providing connectivity between RAN and 4G core network. Can be used as a Layer-2 access switch for setting up LAN and can also be used as an aggregation switch. Currently in the strategic network of DRDO, SDCN network of MTNL, MAX-NG network of BSNL & TEC.



## Switch Variants

- 24X1G + 4X1/10G with redundant power supply
- 24X1G copper ports + 2X10G with single AC power supply
- 24X1G optical ports + 2X10G with single AC power supply

## Interfaces Supported

1G and 10G Ethernet interfaces in multiple variants

## Certifications

- EAL certification is under progress
- EMI/EMC certified from STQC



For more details about this product, scan QR Code



# CSX-200

CSX-200 is a core switch for small networks for connecting access networks. This switch can also be used as a fully managed L2/L3 switch for enterprise networks.



## Switch Variants

- 16X1G Optical + 8X1G copper + 4X10G uplinks with single power supply
- 48X1G Copper + 4X10G uplinks with single power supply
- 48X1G Copper with PoE+ + 4X1/10G uplinks with dual power supply with MACSec on uplinks
- 44X1G optical + 4X1/10G uplinks with dual power supply with MACSec on uplinks

## Interfaces Supported

1G and 10G Ethernet interfaces in multiple variants.



*For more details about this product, scan QR Code*

# V.35 Adaptor

C-DOT's V.35 adaptor (CADV-3501) is designed to receive data packets over electrical Ethernet interface (full duplex, 10/100 Mbps with auto negotiation). It extracts IP Data packets and encapsulates them in PPP/HDLC frames before transmitting on V.35 serial WAN interface and vice-versa. Provides Dual independent V.35 to Fast Ethernet adaptor in a single box.

## Product Features

- IP packets on PPP over V.35 serial WAN links
- Data rate upto 2 Mbps
- Operates as DTE mode on V.35 interface
- Operates on incoming DCE clock
- Management port for CLI/SNMP for configuration, performance statistics and status monitoring
- Fault propagation between V.35 and Ethernet interfaces
- Bit Error Rate (BER) detection and reporting
- Link statistics
- Remote software upgrade
- Automatic restart on Power failure/restoration
- Link status LEDs
- Diagnostics

## Interfaces Supported

- Fast Ethernet Data Ports
- Management Port
- V.35 serial DTE Ports



*For more details about this product, scan QR Code*



# Satellite Hub Baseband System

Satellite Hub system provides voice and message services between different types of satellite terminals and between satellite terminals and external PSTN user.

CDOT's Satellite Hub Baseband system is a part overall Hub system providing baseband functionality with IF input/output and interfacing with external RF Modules. Satellite Hub Baseband system of 8 chassis integrated with customer modules including RF units is operational in the field. The Hub Baseband system consists of the following functional blocks:

- Modem Stack consisting of Modulator and Demodulator units
- IF Units
- Terrestrial Gateway Unit
- Network Signaling Controller & Server Access Unit
- Switch Fabric

## Product features

- Multi-channel burst Modulator and demodulator
- BPSK, QPSK and OQPSK
- Common hardware for all types of modulators and demodulators and software configurable
- Symbol rates from 1.2 Ksps to 150 Ksps
- FEC encoding and Pulse shaping
- 70 MHz IF input/output
- Frequency offset correction up to +/-7Khz
- Monitoring, command and control
- Control, traffic and signaling data on different planes

## Interfaces Supported

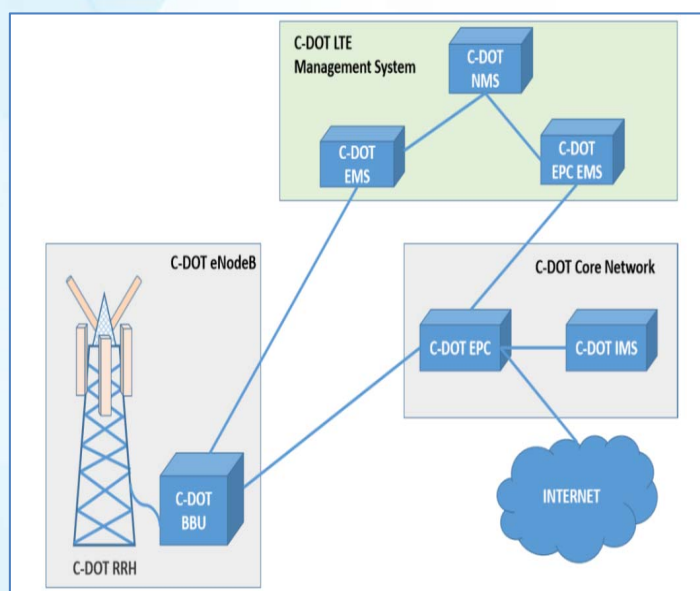
Input/output IF Connector	SMA
Input IF Level	-20dBm to -60dBm
Input IF Frequency	70+/-18 MHz
Output IF Level	0 dBm to -20 dBm
Output IF Frequency	70+/-25 MHz



For more details about this product, scan QR Code

# C-DOT 4G Solution

C-DOT 4G solution provides a complete end-to-end carrier grade solution targeted at operators of 4G networks. It consists of Radio Access Network (RAN) - consisting of macro-class eNodeB, Core – consisting of C-DOT Enhanced Packet Core (EPC) and C-DOT IP Multimedia System (IMS). The management subsystem consists of C-DOT RAN Element Management System (EMS), C-DOT EPC Element Management System and C-DOT Network Management System (NMS).



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



*For more details about this product, scan QR Code*

# 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**

C-DOT EPC comprises of the following network entities:

- The Mobility Management Entity (C-DOT MME), the Home Subscriber Server (HSS), the Serving Gateway (S-GW), the Packet Data Network Gateway (P-GW) and the Policy and Charging Control Entity (PCRF).
- Simplified Network Topology with well-defined 3GPP interfaces
- Scalable architecture
- Voice services through IMS
- Support for Integration and handovers with 3GPP and Non-3GPP access networks
- Centralized Policy and Charging Support
- High Availability support for EPC nodes
- SNMP based EMS for FCAPS management

## **Interfaces Supported**

### **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 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 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, TS32.251
- Sgi interface towards packet data network as per TS 29.061
- S2a, S2b interfaces towards ePDG and TWAG as per TS 23.402



### **C-DOT PCRF**

- Gx towards P-GW as per TS 23.203, TS 29.212
- Rx towards AF as per TS 29.213, TS29.214
- Sy towards OCS as per TS 29.219 S9 towards V-PCRF as per TS 29.21

### **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



*For more details about this product, scan QR Code*

# Wi-Fi Products

## Wireless Access Point (WAP)

C-DOT Wireless Access Point (WAP) is a cost effective, high speed, exceptionally reliable, modular and effective wireless solution for outdoor use cases such as Public Wi-Fi Hotspots.

### Product Features

- The Access Point complies with IEEE 802.11ac standard and is backward compatible to IEEE 802.11 a/b/g/n standards. The AP supports concurrent operation in dual band 2.4 GHz & 5 GHz. It supports 2x2 MIMO and 20, 40 & 80 MHz channel bandwidths.
- Supports Mesh configuration for reducing the necessity of line-of-sight requirement Configuration & control either through local web GUI or C-DOT Controller/EMS/NMS IP67 Compliant and suitable for all weather condition

### Interfaces Supported

- PM-WANI Complied & Standalone mode AP interface
- Electrical 10/100/1000Mbps with autoneg
- Optical interface thru SFP
- PoE Support
- IEEE 802.11a, 802.11b, 802.11g, 802.11n & 802.11ac Wi-Fi Interface

### Certifications

- EMI/EMC as per TEC/SD/DD/EMC-221/05/OCT-16



For more details about this product, scan QR Code



# Enterprise Wi-Fi (EAP)

The Enterprise Access Point (EAP) is a high-performance, power efficient and cost-effective wireless access-point used for Enterprise applications.

## Product Features

- Highly integrated System-on-Chip (SoC) design supports 2x2, 802.11ac and operates in Dual Band Dual Concurrent (DBDC) ISM bands of 2.4GHz & 5GHz
- Supports Mesh standard for reducing the necessity of line-of-sight requirement
- Configuration & control either through local web GUI or C-DOT Controller/EMS/NMS
- IP67 Compliant and suitable for all weather conditions

## Interfaces Supported

- WAN Port- 1x Ethernet Port – Gig bit auto-sensing
- 4 LAN Interfaces
- PoE Support
- Up to 3 Wi-Fi radios support
- IEEE 802.11a, 802.11b, 802.11g, 802.11n & 802.11ac standards
- Support for USB3.0



*For more details about this product, scan QR Code*

# WANI Accessibility Unit (WAYU)

## PM-WANI Compliant Access Point

C-DOT has designed WANI Accessibility Unit (WAYU), a miniPDO (Public Data Office) on similar lines of PCO (Public Call Office) to offer data services on Wi-Fi to end users. The C-DOT miniPDO is an efficient, low powered and cost effective indigenously designed miniature version of C-DOT Public Data Office. It is designed to meet the growing demand of Wi-Fi hotspots in our country.



It works in two modes: Standalone PDO & PDO compliant to WANI Framework. Users can purchase vouchers from PDO operator (in Standalone mode) or through WANI compliant APP and get connected to the Internet as per the purchased plans. With the help of C-DOT miniPDO, a VLE (Village Level Entrepreneur) can easily setup a Wi-Fi infrastructure at any place where Ethernet backhaul is available and start selling vouchers to its customers.

### Product Features

- PM-WANI compliant indoor access point
- It works in two modes: Standalone PDO & PDO compliant to WANI Framework
- Compact device requiring less space
- Consumes less power
- Powered by a 5V adapter
- Can be powered by power bank with USB to 2mm DC connector
- Power cuts will not affect service

### Interfaces Supported

- Radio as per IEEE 802.11 b/g/n 2.4 Ghz (20/40 MHz bandwidth)
- Electrical 10/100 Mbps with Autoneg
- Power 12V DC jack-in
- PM-WANI Compliant: Yes



For more details about this product, scan QR Code



# Long Range Wi-Fi

The C-DOT long range Wi-Fi 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.

## Product Features

- Dual power feed ensuring reliability of system
- Supports operator sharing as system supports 3 radio interfaces, with different radios assigned for different operators
- Power feeding from C-DOT Green power source, which works using solar power
- Uses POE (Power Over Ethernet) thus saving the cost of running a separate power cable to terminal
- Uses spectrum sensing to choose from channel with minimum interference
- Uses Orthogonal Frequency Division Multiplexing (OFDM) technique for high spectral efficiency
- Encryption on per link basis
- Supports direct optical interface for GPON connectivity
- GPS enabled for tracking and monitoring purposes
- Support to hardened proprietary encryption for defense and standard Encryption for civilian applications
- IP67 compliant; thus, suitable for all weather conditions
- Long distance Back haul
- Point to Multi Point with three Grid antenna
- Relay/Repeater with Grid antenna
- Mesh topology for hilly/NLOS terrains

## Interfaces Supported

- Electrical 10/100/1000Mbps with Autoneg
- Optical interface thru SFP
- PoE Support
- IEEE 802.11a, 802.11b, 802.11g, 802.11n Wi-Fi Interface

## Certifications

- EMI/EMC as per TEC/SD/DD/EMC-221/05/OCT-16
- QM 333 as per SD: QM-333 March 2020
- Safety as per IS 13252 & 10437 (IEC 60950-1 & IEC 60215)
- Technology Approval (TA) from TEC-NEW DELHI



For more details about this product, scan QR Code

# Solar Wi-Fi

Frequent power cuts are an ailing problem of rural and semi urban India. Using diesel generators is not only costly; it also increases Carbon foot print of the country. C-DOT Solar Wi-Fi Solution is an ideal solution for this situation, providing cost-effective broadband services to urban, semi urban, rural and unconnected areas. It is ideally suited for creating hot spots in / around rural schools/ panchayats etc. It can also be used as backhaul link for Wi-Fi hot spots, cellular base stations and base station controllers, ATMs, Banks etc.

## Product Features

- Ruggedized Solution for areas not having reliable Grid power supply
- Unique design capable to operate in all types of Indian environmental conditions, complying to IP67 standards
- Operates in 2.4 GHz and 5.8GHz License exempt bands thereby reducing operational expenditure (OPEX)
- Supports operator sharing, thus reducing capital expenditure (CAPEX)
- Power feed from solar powered C-DOT Green power source
- Dual power feed for providing uninterrupted service
- Uses spectrum sensing to choose from channel with minimum interference and thereby optimizing transmitted power
- Control and management through C-DOT EMS and NMS

## Interfaces Supported

- Electrical 10/100/1000Mbps with Autoneg
- Optical interface thru SFP
- PoE Support
- Radio as per IEEE 802.11a, 802.11b, 802.11g, 802.11n Wi-Fi Interface

## Certifications

- EMI/EMC as per TEC/SD/DD/EMC-221/05/OCT-16
- QM 333 as per SD: QM-333 March 2020
- Safety as per IS 13252 & 10437 (IEC 60950-1 & IEC 60215)
- Technology Approval (TA) from TEC-NEW DELHI



For more details about this product, scan QR Code



# Wi-Fi 6 (TEJ)

TEJ - C-DOT's Wi-Fi 6 Access point is indigenously designed and developed product suitable for both indoor/outdoor and urban/rural requirements such as schools, Enterprise, offices, Smart City, Railways stations, malls, stadiums, Industry 4.0 and rural areas etc. It is suitable for Point to Point and multi point configuration in rural areas and hotspot configuration in dense urban areas.



## Product Features

- Wi-Fi 6 or IEEE 802.11ax is the best in class and latest standard for Wi-Fi technology. The standard is focused on improving 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, 5 GHz and 6GHz.
- 4 times more throughput than 802.11 AC in dense & congested environments
- More Bandwidth on a Wider 160MHz Channel
- Connect to More Devices Simultaneously
- Minimize Wi-Fi Conflicts with Neighbor
- Reduce Power Consumption with Target Wake Time

## Interfaces Supported

- Electrical 10/100/1000Mbps - 4 nos with Autoneg
- Electrical 2.5 Gbps with PoE Support
- Optical 2.5Gbps interface thru SFP
- IEEE 802.11a, 802.11b, 802.11g, 802.11n & 802.11ax Wi-Fi Interface



*For more details about this product, scan QR Code*

# PM-WANI Framework

The PM-WANI framework envisages provision of Broadband through Public Wi-Fi Hotspot providers. The importance of PM-WANI framework is to facilitate ease of doing business and encourage local shops and small establishments to become Wi-Fi providers. This service will be especially useful in rural areas where Public Wi-Fi Hotspots are also being created under BharatNet. Proliferation of Public Wi-Fi Hotspots will lead to increased employment for small and micro entrepreneurs, and provide them with an additional source of income. The telecom and internet service providers will also benefit due to the sale of bandwidth to PDOs.

## **Product Features**

The potential user who wants to access Broadband through Public Wi-Fi 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. The PM-WANI framework consists of elements such as:

### **Public Data Office (PDO)**

The Public Data Office will establish, maintain, and operate PM-WANI compliant Wi-Fi Access Points and provide last-mile connectivity to deliver Broadband services to subscribers by procuring internet bandwidth from telecom service providers and/ or internet service providers.

### **Public Data Office Aggregator (PDOA)**

The Public Data Office Aggregator will provide aggregation services such as authorization and accounting to PDOs, thereby facilitating PDOs in providing services to the end consumer.

### **App Provider**

The App Provider will develop an application to register users and discover and display PM-WANI compliant Wi-Fi hotspots in the proximity for accessing the internet service and also authenticate the potential Broadband users.

### **Central Registry**

The Central Registry will maintain the details of App Providers, PDOAs, and PDOs. It is currently maintained by the Centre for Development of Telematics (C-DOT).



*For more details about this product, scan QR Code*



# Green Telecom Solutions

*Unreliable electrical grid supply is one of the biggest challenges faced by the rapidly growing telecom industry in India. Today on an average, 70 percent (mostly located in rural areas) of the Telecom equipment installations face electrical outages, in excess of 8 hours per day.*

## Green Power Supply Systems (12V Variant)

C-DOT has developed the following variants of Green Power Supply Systems (GPSS) that can source the power from solar panels and in turn provide uninterrupted power to the telecom equipment. These can power 12V low power products requiring battery backup, viz. C-DOT's ONT, Gyansetu, Solar WiFi, Street Lights, etc.



**Indoor, 75W/125W,  
Integrated Battery,  
12V@3A Load**



**Indoor, 75W/125W,  
External Battery,  
12V@5A/10A Load**



**IP65 Outdoor,  
75W/125W,  
Integrated Battery,  
12V@3A Load**



**Indoor, 250W/300W,  
External Battery,  
12V@5A/10A Load**

### Product features

- Designed as per TEC/GR/TX/HPS-001/01/MAR-17

### Interfaces supported

- Ethernet Interface (SNMP & Secure HTTP web monitoring and configuration)
- Optional PoE for low power telecom devices
- USB host interface

### Certifications

- ELCINA-EFY awards - Certificate of Merit in "Research and Development" for the year 2014-15.
- AEGIS Graham Bell Award in "Green Telecom" for the year 2018.



For more details about this product, scan QR Code

# Green Power Supply Systems (48V Variant)

C-DOT has developed the following variants of Green Power Supply Systems (GPSS) that can source the power from solar panels and in turn provide uninterrupted power to the telecom equipment. These can power 48V telecom equipments such as Mini BTS, Mobile Towers, and C-DOT telecom products such as SG-RAN, C-Sat-Fi, MAX-NG, 4G-RAN, eNodeB, etc.



**Indoor, 2KW, External  
Battery 48V@15A Load**



**Indoor, 5KW, External  
Battery 48V@20A Load**

## **Product features**

- 2KW GPSS designed as per TEC/GR/TX/SPV-003/03.MAR.2011
- 5KW GPSS designed as per TEC/GR/TX/HPS-001/01/MAR-17

## **Interfaces supported**

- Ethernet Interface (SNMP & Secure HTTP web monitoring and configuration)

## **Certifications**

- ELCINA-EFY awards – 2nd Prize in "Research and Development (Large Category)" for the year 2018-19.



*For more details about this product, scan QR Code*



# Bridging the Urban-Rural Gap



*Internet has been perhaps the most outstanding innovation in the field of communication in the history of mankind. There is a huge amount of information available on the Internet. Unfortunately, the rural population of India is not able to benefit from the available technology because of various limiting factors including illiteracy.*

## GyanSetu

C-DOT's GYANSETU system tries to bridge this gap by providing advanced yet simplified applications that can interact with the rural population, in a way comfortable to them so as to extract the required information from the internet. The possible services are e-governance, e-market, e-services (ticket booking), e-education, etc.

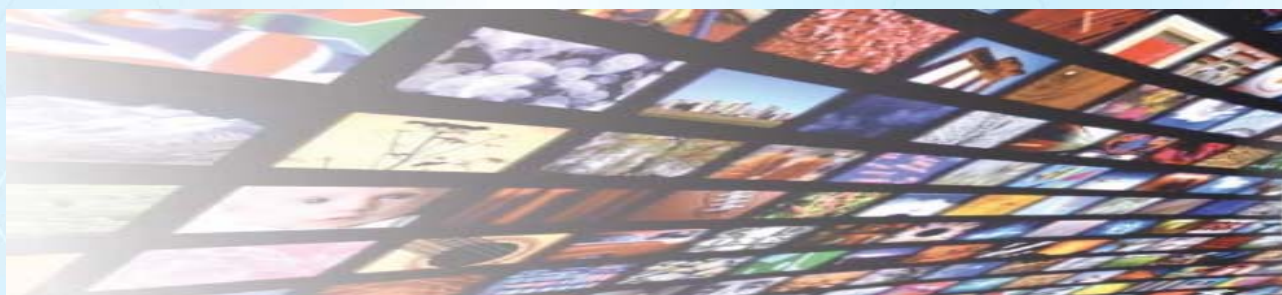
### Product Features

- Interacts with the user with its own GUI
- Extracts the information from third party servers
- No change required in third party servers
- User specific additional services can be added Site specific customization is supported



For more details about this product, scan QR Code

# Broadcasting Segment



## Cable Hybrid STB (CB100)

C-DOT has developed Cable STB and state of the art Conditional Access System for Broadcast Network. C-DOT's STB / CAS along with other Network Subsystems are the most profound innovations which are true enablers towards Government of India's flagship programs such as "Make in India" and "Digital India". These products and solutions from C-DOT also provide an effective impetus to "Startup India" and "Skill India" initiatives.



### Product Features

- RF Input: Fully compliance to DVB-C
- Platform: Efficient CPU, MPEG-1/2, H.264 decoder
- Audio/Video: Stereo L&R (RCA Type), CVBS (RCA Type), HDMI 1.4a
- Smart card: ISO7816-3 compliant (Supports Card less CAS also)
- Communication Interfaces: USB 2.0 HS, IR Remote, and Network Interfaces
- Power: 12V @1.5A Max
- LED Indicators: Power, IR Remote Sensing and Standby
- In-house flexible Middleware and UI
- Hybrid capability (RF+IP)
- Secure Boot
- Supports C-DOT CAS
- 2-layer PCB design
- Software upgrade via USB or Over the Cable
- PVR Support
- 7-day Electronic Programming Guide
- Regulatory Compliance: IS 13252 Safety Standard (CiSTB) UL V-0 for Bare PCB
- ROHS



For more details about this product, scan QR Code



# DTH Hybrid STB (DT100)

C-DOT has developed DTH STB and state of the art Conditional Access System for Broadcast Network. C-DOT's STB / CAS along with other Network Subsystems are the most profound innovations which are true enablers towards Government of India's flagship programs such as "Make in India" and "Digital India".

These products and solutions from C-DOT also provide an effective impetus to "Startup India" and "Skill India" initiatives.



## Product Features

- RF Input: Fully compliance to DVB-S/S2
- Platform: Efficient CPU, MPEG-1/2, H.264 decoder
- Audio/Video: Stereo L&R (RCA Type), CVBS (RCA Type), HDMI 1.4a
- Smart card: ISO7816-3 compliant (Supports Cardless CAS also)
- DVB-CI and CI+ slot
- Communication Interfaces: USB 2.0 HS, IR Remote, and Network Interfaces
- Power: 12V @1.5A Max
- LED Indicators: Power, IR Remote Sensing and Standby
- In-house flexible Middleware and UI
- Hybrid capability (RF+IP)
- Secure Boot
- Supports C-DOT CAS
- 2-layer PCB design
- Software upgrade via USB or OTA.
- PVR Support
- 7-day Electronic Programming Guide
- Regulatory Compliance: UL V-0 for Bare PCB
- ROHS



For more details about this product, scan QR Code

# OTT STB

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.

## Product Features

- Support upto 4K resolution
- High bandwidth network interface support
- Support for many Apps
- Android 7.1 (Nougat)
- Fan less system
- IR support
- Sleek packaging - available in two different colours (Black & White)
- Low power consumption - 6 Watts (Approx)
- Supports HDMI and CVBS and AV
- 2X USB 2.0 & MicroSD slot DRM support



*For more details about this product, scan QR Code*



# CAS (Conditional Access System)

C-DOT has developed state of the art Conditional Access System for Broadcast Network. C-DOT's STB / CAS along with other Network Subsystems are the most profound innovations which are true enablers towards Government of India's flagship programs such as "Make in India" and "Digital India". These products and solutions from C-DOT also provide an effective impetus to "Startup India" and "Skill India" initiatives.'

## Product Features

- DVB Simulcrypt (ETSI TS 103197) compliant. Hence, can co-exist with other CAS with ease
- Periodic Key refreshment feature
- Advanced High Security through Hardware enabled features
- Additional security using mobile OTP feature
- Highly efficient bandwidth management while passing info from Headend to Receiver
- Smart Card based and Cardless (both variants)
- Supports finger printing
- Supports DVB-C and DVB-S/S2
- Highly scalable
- End to End solution with basic SMS (Subscriber Management System)
- MailBox feature
- STB blacklisting feature
- Dynamic Channel & Package allocation
- Subscription alert information
- With C-DOT's own middleware enables to provide necessary support from holistic point of view

## Certifications

- NIST CAVP certified



*For more details about this product, scan QR Code*

# Software Applications

## CSMP Framework

C-DOT CSMP (Customization Service Management Platform) Framework 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.

### *Deployments*

BharatNet NMS is based on C-DOT CSMP framework which is deployed pan India to monitor/manage 2.5 Lakh Gram Panchayats and is operational in the Network.



# Features of CSMP Framework

## Dashboard

Dashboard is a solution presenting the network information of equipments status whether UP or DOWN. The reasons for equipment being Down, tickets being raised and tracking of those tickets in state-of-the-art charts and reports, with trend analysis. Dashboard applications can be customized to provide a wide range of useful managerial information to any domain e.g., Enterprise, IT and Telecom, BFSI, etc.



## CDR-SM

C-DOT as an OEM offers a Subscriber Management system which allows subscriber facilities to be managed from a centralized location for C-DOT Public Switch Telephone Network (PSTN) switches. This solution gives unified view of the subscriber facilities by hiding the technology specific details of the underlying switch.

## Inventory Management System

C-DOT Inventory Management System is a future ready active, centralized inventory solution that addresses key challenges in the telecom space. It allows you to discover, map and inventory your entire network, while providing high-quality network automation tools and a bird's eye view of your entire network. The CDOT Inventory Management System is based on TMF e-ToM standards.

## IPNMS

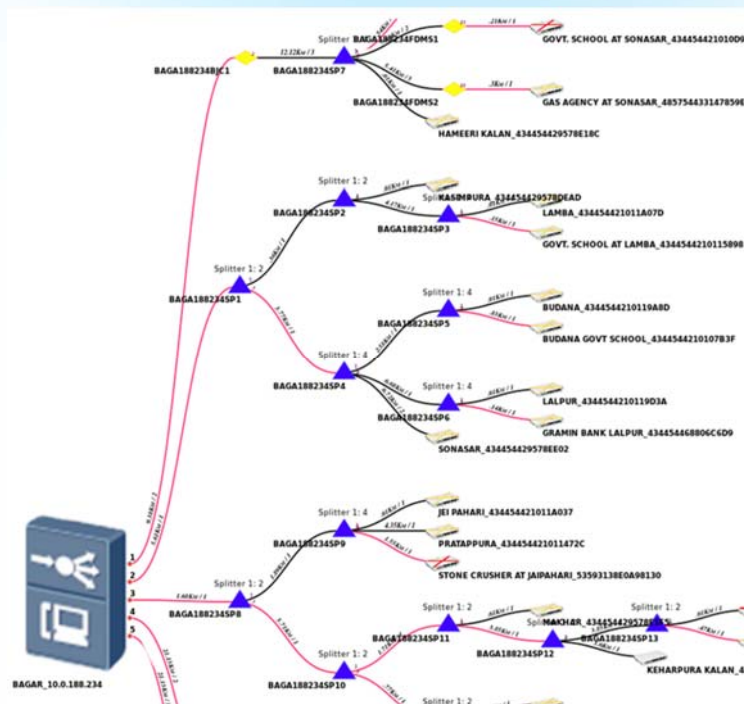
IPNMS helps to manage and monitor any IP based network ensuring smooth and error free operations of the network. Product is highly scalable from small enterprise IP network to geographically wide (national level) IP network and can be used in any sector which requires monitoring of their IP networks.

## Messenger

Messenger is a product that effectively and instantaneously sends network faults and performance conditions as and when they occur to network operators/concerned persons via various communication channels so that corrective measures can be taken and network effectiveness is restored.

## Fiber Management

Fiber Management system is an application 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. Fiber Management system is also used to Configure End to End Fibers (OLT to ONT) along with configuration of passive elements and represent them in graphical display for ease of management at operators end. It also does root cause analysis for identifying probable segment's fault. Operator can configure required fiber details using this application.



## Fault Management System

C-DOT Fault Management system is an IT system for managing network failures. This state-of-the-art tool quickly identifies, isolates, diagnoses and resolves all critical network issues that are affecting the network performance. This will ensure that the services are up and running all the time leading to customer satisfaction. C-DOT Fault Management System is based on TMF e-ToM standards and is useful for all telecom technologies like Optical, IP, MPLS, wireless etc.

## Network Services Management System

Network Services Management System provides a centralized monitoring and management framework for the telecom network services provided by TSPs to their B2B and B2C customers. It provides a generic framework where in telecom network services can be modelled/designed and configured for services of access networks, core networks and backbone networks.

## Performance Management System

C-DOT Performance Management system is aimed at a wider audience, from small LANs, SMBs (Small to Medium Business) and to large corporations. The software focuses strongly on monitoring the performance of infrastructure and services.

## Telecom Asset Management System

C-DOT TAMS (Telecom Asset Management System) is an application to manage 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.



### ***Trouble Ticketing System***

C-DOT Trouble Ticketing System is an ITIL compliant docket management system that provides mechanism for raising tickets on Network Faults, QoS Faults and SLA Violations in the system. The system tracks and manages the life cycle of all the dockets / tickets for faster resolution and restoration of the faulty conditions in the network.

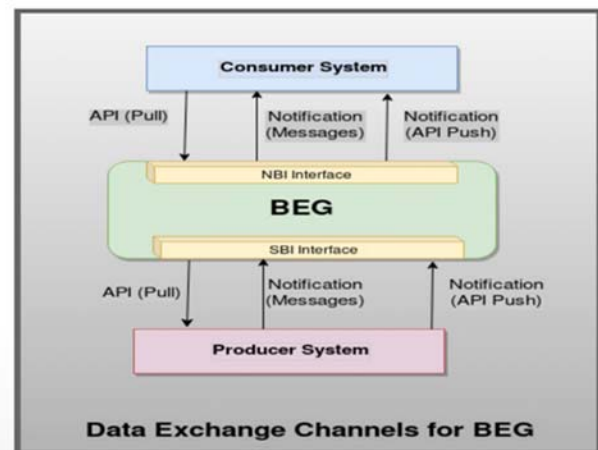
### ***Business Enterprise Bus***

C-DOT 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.

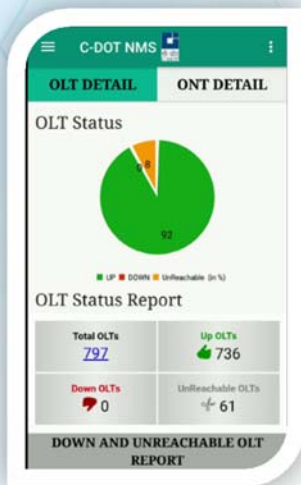
### **BEG Interfacing with system**



For more details about this product, scan QR Code

# CNMS - Mobile App

CNMS Mobile App is a Mobile Application which is a light weight NMS solution and a smarter solution to reduce the CAPEX and OPEX of the network. It provides the field operator, the network view on the mobile. The Mobile App also helps the field operators to view all the pending tickets immediately after the ticket creation and enables them to act swiftly to rectify the issue. This will reduce the Operational delays and help in faster restoration of faults to keep the MTBR lower.



It provides a bird's eye view of the network status to the higher management with complete drilldown features. The higher management will be able to get the required status faster along with the failure reasons, if any.

This Mobile App can be developed for any application pertaining to any domain.

## Product features

- Live Managerial Data Dashboards
  - Location hierarchy wise details
  - Appropriate Drill down reports
  - Graphical representation of Network Status
- Faster resolution of O&M issues by Field Operators (Trouble Tickets)
  - List of pending tickets against the user
  - List of pending tickets against the sub-ordinate
  - Modify the ticket as Resolved with appropriate comments
  - List of GPs affected because of Fiber-Cut
  - Provision to associate a reason for OLT Unreachable tickets
  - Provision to forward the ticket to NOC
- Secured Role Based Access
- Concurrent Logins and Sessions across Mobile and Desktop application

## Interfaces supported

The Mobile-App is available for both Android and iOS platforms. This APP is available in google play store to download as an evaluation copy.



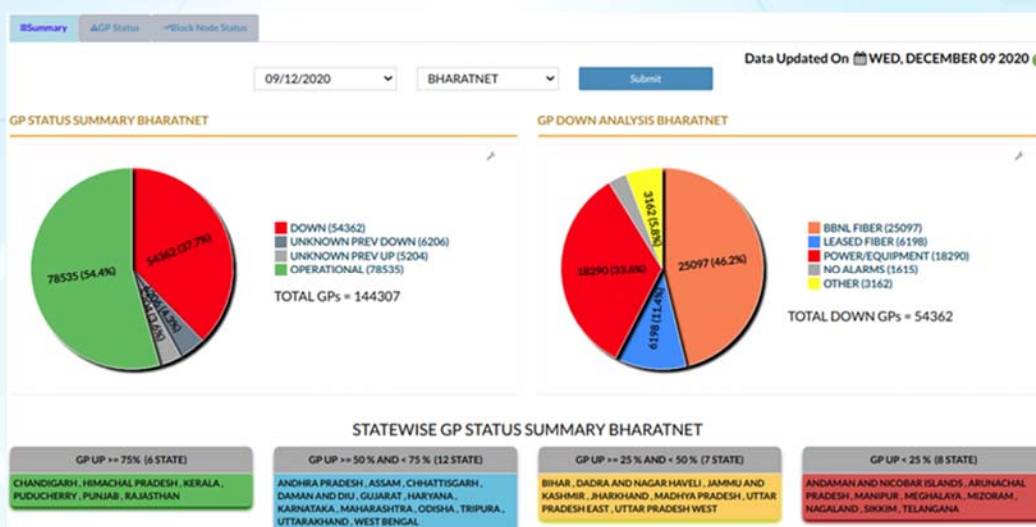
For more details about this product, scan QR Code



# Unified Network Management System

C-DOT 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 equipments and can monitor from a few to lakhs of equipments 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.



## Product features

- Application is accessible over web, using user authentication and authorization.
- It shows equipment Status, reasons for equipment being down, bandwidth utilization by way of state-of-the-art charts and reports.
- Trend charts help to analyze the performance of the equipment over weeks and months.

## Interfaces supported

RESTful Web Services



For more details about this product, scan QR Code

# Common Alerting Protocol (CAP)

CAP compliant Public Alert System is a state of art 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, thus, saving precious lives and livelihoods and making India disaster resilient.

- It provides an integrated platform for forecasting agencies, disaster management authorities and dissemination medias for seamless information exchange and targeted public alerting in vernacular languages.
- It automates the process of alerting targeted public about impending disaster situations so that a disaster alert is triggered at right time and to the right people which enables people and authorities better prepared for the disaster.
- It overcomes the limitations of existing early warning system by geo-fencing intelligence for targeted, real time alert dissemination over multiple media.

## Product Features

- CAP compliant Public Alert System implements ITU-T x.1303 Common Alerting protocol for consistent, real time emergency alert information exchange among all stakeholders.
- Geo-intelligent functionalities and analytics for effectively select target area for disaster alerting
- It integrates for Forecasting Agencies like India Meteorological Department (IMD), Central Water Commission (CWC), Indian National Centre for Ocean Information Services (INCOIS), Forest Survey of India (FSI), Defence Geoinformatics Research Establishment (DGRE), and Disaster Management Authorities (SDMAs, DDMAs) to create and disseminate disaster Alerts to public
- The System facilitates near real time Alert's dissemination over multiple medias by integrating various dissemination agencies in a seamless manner like TSPs for SMS and Cell Broadcast, Radio Broadcasters, TH and Cable TV broadcasters, Railways Integrated Passenger Information System (IPIS), Coastal Siren Management Systems.
- Cross Platform Mobile App for targeted disaster alerting and weather forecasting
- Alert dissemination over social media (Facebook, Twitter), Browser Notification, RSS Feed, Google Alerts
- Integration with GAGAN and NavIC Messaging Services to cater the areas where terrestrial communication is not available or is disrupted
- National Disaster Warning Public Portal is a GIS based portal where general public can see all the current live warnings present all over the country and can subscribe to Browser Notifications and RSS Feed.
- It supports Vernacular languages to ensure understandability of critical disaster alerts among local population as India is a linguistically diverse country where the language changes every 100 km.
- Supports High Priority Messaging to First Responders and voice notification tone to cater to visually impaired persons and addressing during odd hours.
- It uses Multilevel Secure authentication and Trusted Device Mechanism to prevent any unauthorized access and has its own Connectivity Monitoring System and NOC Dashboards to monitor the entire platform to ensure high availability and security.
- Notification Engine for sending multi-channel notifications associated with various events to different users based on their roles and organizations.



## Interfaces Supported

CAP Early Warning Platform Enterprise Edition ensures all factors related to performance, availability, scalability, and security required for a mission critical disaster early warning application.

- Interfaces for all major Alert Generating Agencies of India namely IMD, CWC, INCOIS, DGRE, FSI.
- Interfaces for 36 State and UTs level Disaster Management Authority as Alert Authorization agencies.
- Integration with TSPs (Airtel, BSNL, MTNL, Reliance Jio, Vi) in an automated, secure interface enabled with multilingual support for the purpose of early warning messages.
- RSS feed and browser notification interface to access alerts/ updates from the system in a standardized format.
- Interfaces for various Alert Dissemination Agencies like
  - Radio Broadcasters
  - Television DTH Operators, Cable Operators
  - Indian Railways (for Station level Public Addressing System)
  - Social media platforms like Facebook, Twitter
  - Satellite message broadcasters (like Airport Authority of India for GAGAN and ISRO for NavIC)
- CAP NMS interface for Administrator for round the clock monitoring of network node's pre-emptive fault detection and notification performance and QoS

## Certifications

- Common Alerting Protocol ITU-T 1303.X Recommendation
- TEC SR v1.1 for Integrated Disaster Management System Using Common Alerting Protocol (IDMS)
- Security audit clearance certificate from CERT-IN (Indian Computer Emergency Response Team)
- Patent Filed - System for Geo-targeted Emergency Alerting through Analog Radio Broadcast (Application No. – 202041041216, India)



*For more details about this product, scan QR Code*

# Samvad

C-DOT has developed an easy-to-use application in the form of “SAMVAD” an Android and iOS App to provide Secure Call & Chat for sharing of text, image, audio and video files.

The users will benefit from the availability of data on their mobiles anytime, anywhere, while still enjoying the privileges of a secure and self-hosted network.



## Advantages

- Stay connected with your contacts through secured chat and voice communication
- Search a fellow member
- 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
- User status
- Sharing of images, video, PDF, text, audio files, contacts, location
- Message received and read indication to senders
- Integration of user organization's contact database
- Management of contacts and groups
- Broadcast list
- Very useful for messaging within an organisation
- Sharing media from external apps using Samvad
- Filtered News
- Delete Account
- User verification with OTP

## Technical Specifications

- Supported Android API level 15 or above
- Supported version of iOS 8 and above



For more details about this product, scan QR Code



# VCDOT Meetings

VCDOT Meetings is a secure web conferencing solution. User can organize (host) his/her own video conference and join video conference hosted by other users by simply clicking on a web-link. VCDOT Meetings is an indigenous secure solution with all the servers are placed within the Indian territory. It is customizable and scalable solution equipped with all the latest features available in other Video Conferencing application.

## 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 MoM, Breakout Rooms, Real Time Polling, Multi-Level Screen Sharing, Multi User Whiteboard, Meeting Scheduling.



### 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)



For more details about this product, scan QR Code

# Tower Monitoring System (TMS)

TMS can facilitate tamper proof monitoring of Powering Sources (Grid Supply, DG, Battery backup) of any Mobile Tower installed at a remote place. Using the power status information,

- Call drop can be reduced. Proper monitoring of the availability of power supply at tower will help in timely switching to DG or battery in the absence of mains grid. This will reduce the duration of non-operationality of mobile tower and thus reducing the call drop in that area.
- Diesel consumption can be checked with the help of the statistics of the duration for which the tower was powered through DG.
- Carbon footprint and carbon credit can be measured
- Pollution level can be measured based on the duration for which the DG was in use.
- Statistics of the duration for which the battery was used can help in fault tracking and replacement of battery on time.
- Alternate renewable source can be explored to replace the DG

## Product Features

- AC voltage sensing for sensing the presence of AC power input
- DC voltage sensing to sense the battery input
- Communication module (GSM/GPRS/LTE) for sending data to the server
- Microprocessor unit for data processing and interfacing with other modules

## Interfaces Supported

- Terminal connector interface for 3-phases of AC supply
- Terminal connector interface for battery supply
- GSM/GPRS/LTE antenna
- Power ON/OFF Switch

## Certifications

- oneM2M standard compliant system
- Patent Filed - GIS Based Centralized Carbon Footprint Monitoring System and Method Thereof; Application No. – 201611008699, India



*For more details about this product, scan QR Code*



# IP Multimedia Core N/W Subsystem (IMS)

C-DOT's IP Multimedia Core Network Subsystem (IMS) solution is a complete package for delivery of converged Voice and Data services. C-DOT IMS is an integrated, modular and expandable software product which provides a highly scalable, carrier grade solution and flexibility of services. It is a multi-protocol solution with intelligent routing, call control functionality and configurability targeted for converged market applications.

## ***High Availability***

The CDOT IMS solution employs mechanisms to ensure that all voice calls, data calls and call charge records are maintained if there is a system failure. This ensures that active voice and data calls in the system are not lost due to any single point of failure. This high availability functionality is supported by the dual on-line, hot standby system architecture.

## ***Automatic Recovery***

The solution automatically restarts any process that fails due to a software error and endeavors to maintain call-charging information across such a failure. Standard restoration procedures as per 3GPP specifications are used.

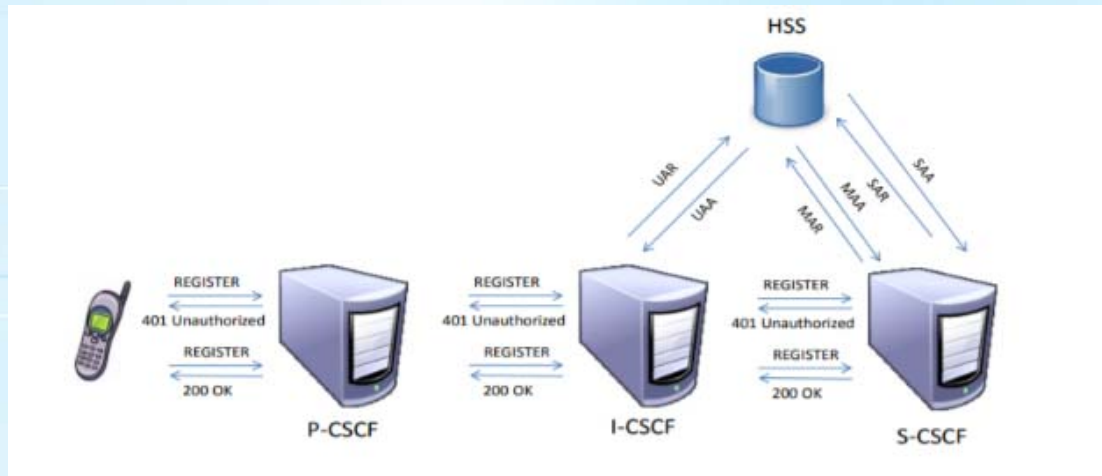
## ***Hardware Support***

All software products run on ATCA chassis.

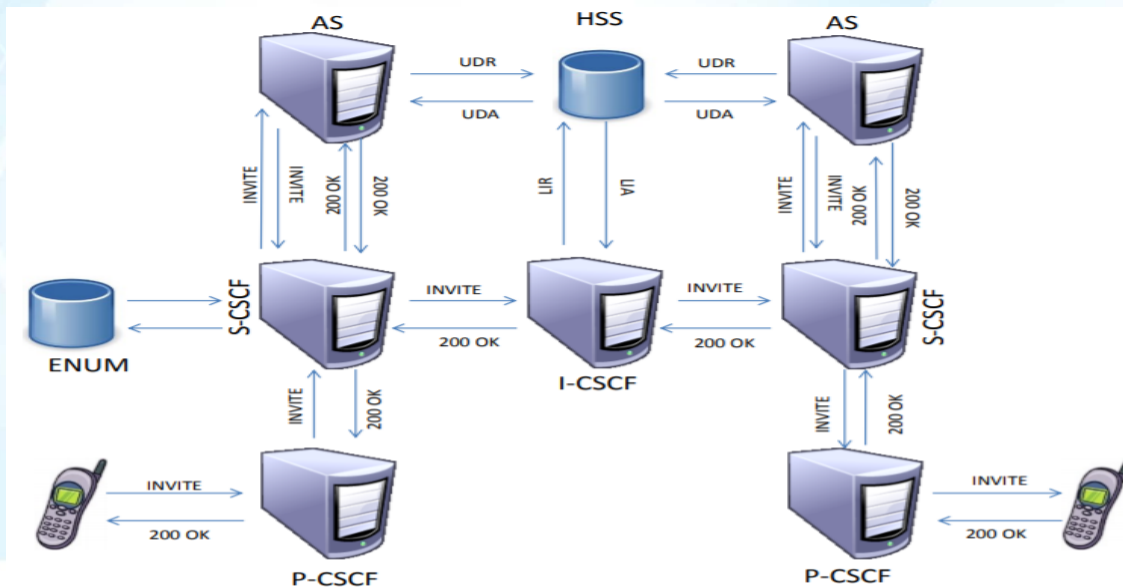
## ***Product Features***

- Subscriber Registration
- Routing and Call Control
- Online and offline charging
- Network Topology Hiding
- Support for IPv4 and IPv6
- Network Address Translation (NAT) traversal

## Registration Flow Diagram



## Intra Network Call Flow Diagram



For more details about this product, scan QR Code



# 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.



 <b>COVID-19 Saavdhyaan System</b>	 <b>COVID Quarantine Alert System (CQAS)</b>	 <b>Mobile Subscriber Migration</b>
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.



*For more details about this product, scan QR Code*



# Geo-Intelligence based Solution

The Geo-Intelligence based Solution solves the problem of Digitization of any kind of network asset, centralized GIS Data collection of the assets in the remote rural areas as well as urban areas in a standard and unified format. Helps in Processing and managing large scale GIS network coverage map of TSPs, identifying dark spots for ensuring universal coverage of mobile network.

## Product Features

- Cost efficient Web GIS tool to Digitize/ Update / Correct any kind of network asset in the line point, polygon format.
- Data will be created remotely, no need to visit the place to digitize the asset
- Ensure Security and integrity of the data as it will not be shared by anybody else
- Processing and managing large scale GIS data of TSP Coverage Map
  - Visualization of Coverage of 2G, 3G and 4G technology with different signal strength
  - Partition of signal strength in Good, Partial and No Coverage with color coding
  - View and compare data as well as voice Coverage
  - Regulatory to monitor the QoS of TSP
- Provide Services like WMS, WFS, WCS, WPS to consume the GIS data
- User Friendly, easily used with a minimal training
- Only requires a PC with internet connectivity to use the application

## Interfaces Supported

Geo-Intelligence based solution has well defined interfaces for

- Network Management System (NMS)
- Fiber Management System (FMS)
- Fiber Fault Localization System (FFLS)

## Certifications

- OGC Complaint data format
- ITU-T G.984 recommendation



*For more details about this product, scan QR Code*

# LoRaWAN Gateway

LoRa/LoRaWAN gateway functions as a concentrator/aggregator for LoRa/LoRaWAN end-devices and bridges the end-devices with the LoRa/LoRaWAN network server and the corresponding application servers.

It can not only cater to sensor nodes deployed over several km while prolonging their battery-life using low power mode but can also be used to control actuating devices for wide area control such as in Smart Street Light and Smart Agriculture. Further, LoRa/LoRaWAN gateway provides a means for alternative emergency communication in areas where traditional cellular networks are non-existent or disrupted due to disasters and can also act as an enabler for disaster alert delivery to individuals with LoRa/LoRaWAN receivers.

## Product Features

- Long range wireless technology LoRa
- 15Km Line of Sight
- 3~5Km urban environment
- Supports global open standard LoRaWAN protocol
- Class A, Class B and Class C end-device support
- Operates in unlicensed 865-867MHz band
- 8 channels for simultaneous reception of data from multiple sensors
- Integrated GPS for gateway synchronization and beaconing
- Supports encrypted data exchange between end-devices and gateway
- Supports adaptive data rate modes
- Capacity to serve thousands of end-devices.
- LoRa and oneM2M inter-working functionality
- Connects to LoRaWAN network server, oneM2M CSE or custom server at back-end

## Interfaces Supported

### Front-end

- LoRaWAN end-devices: Class A, B and C
- LoRa end-devices

### Back-end

- LoRaWAN network server
- oneM2M CSE
- Server with custom protocol

## Certifications

- oneM2M complaint
- LoRaWAN protocol compliant
- Indian Patent filed for “A System for Enabling Voice Communication over Long-Range Using LoRa Modulation in Indian Disaster Scenario”, Application Number: 201911003585



For more details about this product, scan QR Code



# Tele-PlanNet Solution

Tele-PlanNet is a geo-intelligent telecom network planner solution for setting up a new telecom infrastructure while utilizing as much of existing infrastructure as possible. It automates the entire process of visualization, plan generation and the preparation of construction documents and work orders. The combined GIS and interactive user interface optimize the customer's workflow, wherein all the relevant network objects are taken into account.

## **Product Features**

- Backhaul and Access Network planning with reduced CAPEX & OPEX
- Electronic equipment optimization
- Plan for Greenfield and Legacy networks
- OGC Compliant GIS Mapping and other interfaces
- Asset and Fiber Management
- Designed as per ITU-T Recommendation
- Supports Network Planning for different technologies
- Cost effective and secure

## **Interfaces Supported**

- Tele-PlanNet has well defined interfaces for
- Network Management System (NMS)
- Fiber Management System (FMS)
- Fiber Fault Localization System (FFLS)

## **Certifications**

Patent granted for FTTP System for Passive Optical Network for Minimizing Fiber Laying by Utilizing Existing Laid Fiber; Application No. 01008/DEL/2012, India



*For more details about this product, scan QR Code*

# Security Solutions



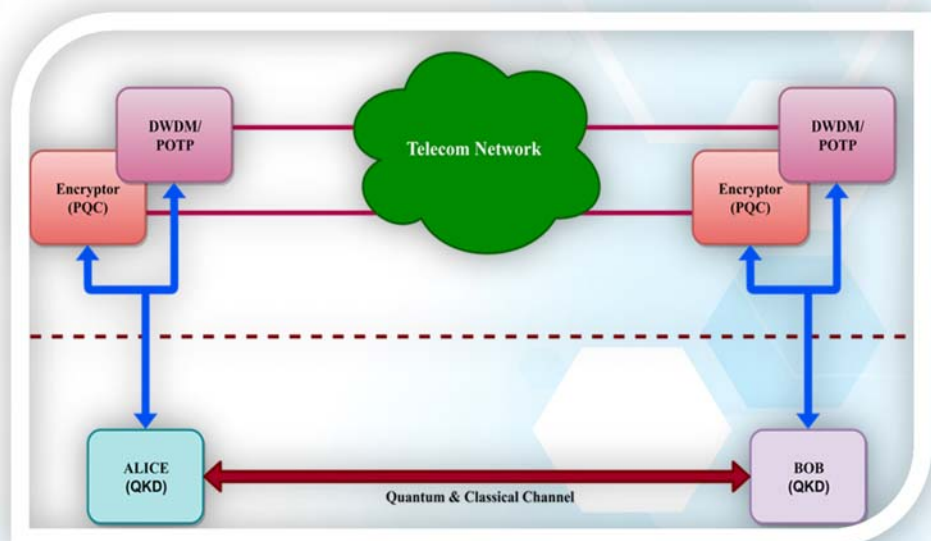
## Quantum Key Distribution System

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 fool proof security in data transmission.

### Product Features

QKD systems are required to ensure Information Theoretic security (i.e., security even if eavesdropper has access to infinite computational power) in communication networks, even from an adversary having infinite computational power (or access to Quantum Computers). With the rapid advancement in quantum computing and in the area of quantum algorithms (which can run over quantum computers), the traditional methods of securing the communication, widely in use now, are no longer secure from an adversary having access to quantum computers.





This is primarily because of the fact that the algorithms employed in present day methods (like Diffie Hellman Key Exchange) are based on assumptions that it is virtually impossible, even for the most advanced conventional classical computers, to carry out certain mathematical functions (like prime factorization of a very large integer) in a reasonable amount of time. However, this assumption is no longer valid with quantum computers, which can potentially carry out these operations very quickly (like Shor's algorithm for prime factorization).

QKD solution consists of "Alice" and "Bob" 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.



*For more details about this product, scan QR Code*

# Compact Encryption Module (CEM)

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. CEM is a future proof product that supports Quantum-safe public-key algorithms that are under process of NIST standardization.

Security, of classical public-key schemes relies on some of the hard mathematical problems like integer factorization, discrete logarithm and elliptic-curve discrete logarithm. Security experts are predicting that these hard problems shall easily be solved on a sufficiently powerful quantum computer using quantum algorithms in coming years. C-DoT's Compact Encryption Module is a future proof product that supports Quantum-safe public-key algorithms that are under process of NIST standardization.

## 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 NewHope, Classic McEliece, CRYSTALS-KYBER etc.
- Support for integration with any QKD system for key loading through RS232 serial interface
- Support of Hybrid key exchange using one classical and one Quantum-safe key exchange algorithm

## 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)



*For more details about this product, scan QR Code*



# Secure & Dedicated Communication Network (SDCN)

C-DOT has designed a secure, robust, dedicated network called SDCN for the exclusive use of various government departments in Delhi, independent of the existing public and private communication network infrastructure. This network will provide secure VoIP connectivity with the help of indigenous state-of-the-art equipments.

All the Network Elements in the Secure IP cloud have been designed and developed by C-DOT, and the end-devices are secure VoIP phones with Biometric (finger print based) authentication.

## ***Product Features***

SDCN has an all-IP network supporting voice and multimedia services and encryption at different levels, for signaling as well as media. Salient features of the network are:

- End-to-end dedicated and fully secure captive network with protection against unauthorized access and network threats, isolated from other networks
- Exclusive media, using dark fibers with last mile using ADSL2+ on copper Secure VoIP phones with encryption at customer premises Robust and resilient network with disaster recovery support

## ***Interfaces Supported***

The customer premises equipment can only be used after proper authentication.



*For more details about this product, scan QR Code*

# 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/Smart phones that are expensive in the market, reselling of stolen handsets has become lucrative for thieves.*

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://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 website
- Through TSP's specified customer outlets
- 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. The IMEI database in the CEIR includes the following lists:

- White – for devices that are allowed to register in the cellular network
- Black – for devices that are prohibited to register in the cellular network
- Grey – for devices in intermediate status (when it is not yet defined in which of the lists - black or white - the device should be placed)



For more details about this product, scan QR Code



# IoT / M2M Solutions

Today's IoT solutions are Vertical Centric and thus tightly coupled and not interoperable. The real value of these IoT ecosystem comes from interoperability and sharing of data amongst various divergent applications. Billions of devices (Sensors, actuators, gateways, etc.) are going to be installed in order to make our cities, villages and industries smarter. A standards-based approach is necessary in order to deliver cost effective IoT/M2M solutions.

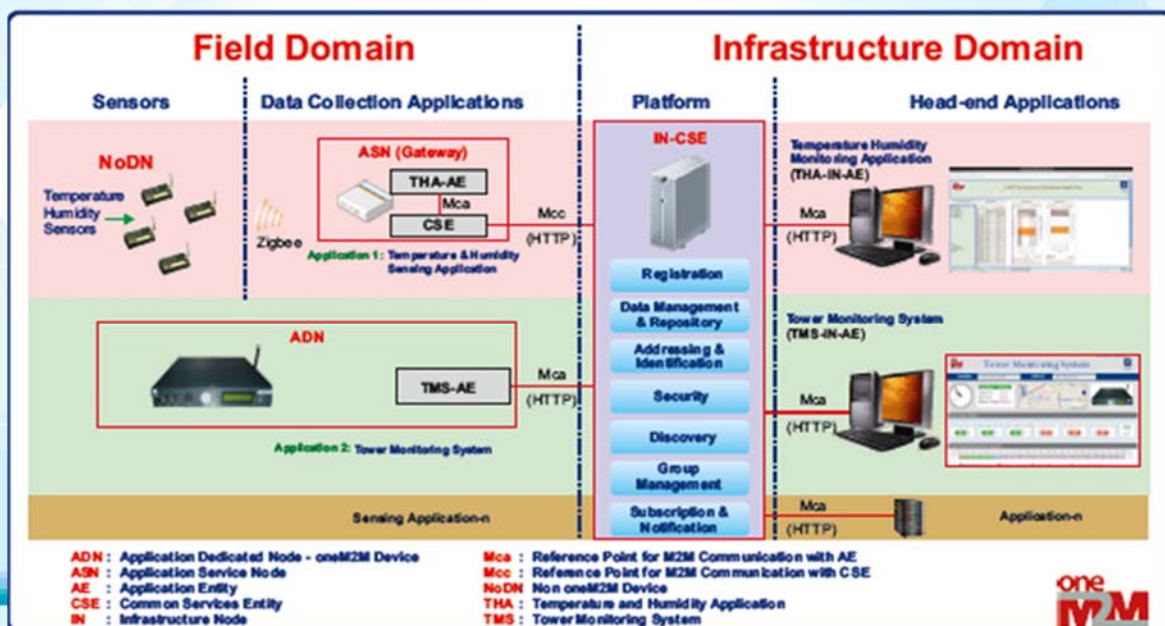
**CCSP - CDOT's Common Service Platform** – A oneM2M based software platform offers a standard based approach to develop and deploy solutions in IoT/M2M. CCSP provides the horizontal Common Service Layer for the IoT applications of various domains. CCSP can support multiple industry-specific use cases on the same horizontal platform. CCSP sits between applications and data processing & communication H/W.

CCSP enables the development of standardized applications with ease, thereby significantly reducing the application development time and deployment lifecycle. CCSP is agnostic to the underlying hardware, Operating Systems or connectivity technologies.

## C-DOT M2M Platform – CCSP offers

- **Infrastructure Node – IN:** A software platform 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.
- **Application Service Node - ASN (Gateway):** Contains Application and Common Service Layer
- **Middle Node – MN (Gateway):** Contains Common Service Layer
- **Application Dedicated Node – ADN:** Contains Application only

**M2M Application Solution:** Asset tracking application, HVAC control and monitoring, Vehicle and visitor management application



## Product Features

- Supports 12 Common Service Functions (CSFs)
  - Registration, (Data, device, Application Registry and authentication)
  - Security (Security Enrolment, Access Control Mechanism, PSK, Certificate)
  - Group Management (Group related requests and bulk operations)
  - Subscription & Notification (Data subscription, events, notifications, polling channel)
  - Transaction Management
  - Device Management
  - Service Charging and Accounting
  - Discovery
  - Location
  - Application and Software Management
  - Data management and Repository
  - Semantics
- CRUD- N , RESTful resource-oriented APIs
- XML & JSON data format support

## Supports Advanced functionalities like

○ Flex Container	○ Service Subscriber
○ Time Series	○ Service Provider Restrictions
○ Field Device Configuration	○ Announcement across oneM2M Nodes
○ 3GPP Interworking for Non IP Data Delivery	○ Device Management over LWM2M & TR069

## Interfaces Supported

- 3GPP T8 interface supported,
- oneM2M Mca, Mcc interfaces supported over HTTPs, CoAPs and MQTT

## Certifications

- Successful Interoperability testing of CCSP at oneM2M interoperability events held at South Korea, Japan, Taiwan with various international organizations
- Successful ETSI Conformance testing of IN-CCSP and MN



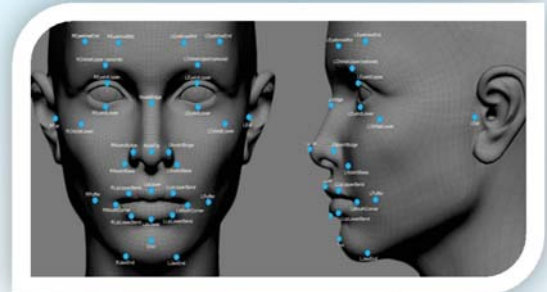
For more details about this product, scan QR Code



# AI / ML Solutions







## Face Recognition Tool

Face recognition systems are built on the idea that each person has a particular face structure, and using the facial symmetry, computerized face-matching is possible. Facial recognition is a way of recognizing a human face through technology. A facial recognition system uses biometrics to map facial features from a photograph or video. It compares the information with a database of known faces to find a match.



### Product Features

- Face Detection - Detects Human Face in Image/Video
- Pre-processing
  - Face Crop Normalization to Account
  - For Variations in Light, Background, Pose, Expression
- Face Recognition
  - Recognize Human Face

Expression Agnostic	Low Resolution	Profile Face
 sanjay gupta  0.422 ajay kumar  0.135 navin  0.057	 ajay kumar  0.223 Unknown  0.117 validation1  0.090	 ajay kumar  0.261 validation1  0.093 ashish gupta  0.076
 sanjay gupta  0.538 anvaya  0.114 alav kumari  0.062	 arun bediya  0.207 ashish gupta  0.126 sunil kotwal  0.085	 neeta  0.581 lata  0.134 ashish gupta  0.026
Occlusion Aware	Shadow Compensation	Disguise Aware

### Technical Specifications

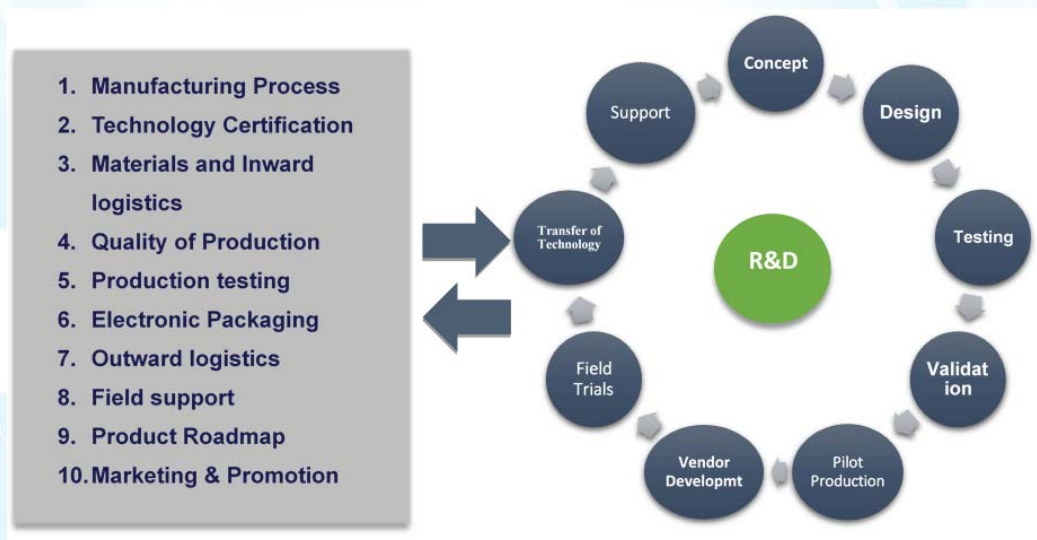
- Employing Deep Learning Techniques
- Learning from Single Training Image of Each Class
- Camera Perspective Transformation
- Image Normalization
- Illumination Models for Environmental Changes

# Transfer of Technology (ToT)



The Transfer of Technology (ToT) philosophy of C-DOT aims at a high rate of success in the technology dissemination process. It aims at educating the recipients of various technologies not only on the infrastructural requirements and requisite know-how for production, but also at providing the licensed manufacturers with vital details about sources and specifications for the capital equipment and components.

## R&D to Mass Manufacturing through ToT





## **Tot Process**

The ToT process assumes two distinct forms depending upon the mode of ToT agreed upon.

- **Direct ToT**

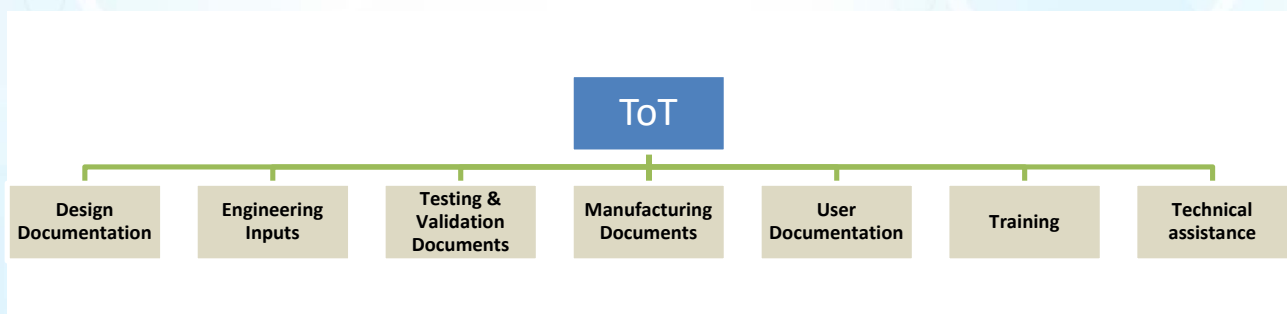
Subsequent to the signing of the agreement, C-DOT provides first level of training, following which the recipients set up their manufacturing infrastructure. Based on the technical assistance available from C-DOT, the recipients fabricate the production model and offer it to C-DOT for quality evaluation. The manufacturer, on acceptance, gets the type approval for bulk production.

- **Turnkey Projects**

C-DOT also has the capability to setup manufacturing facilities for its products on a turnkey basis. This approach expedites the setting up of manufacturing infrastructure and of bulk production by the manufacturer. After the setting up of the requisite infrastructure, the production model is offered by C-DOT for acceptance on behalf of the manufacturer. Once this is successfully achieved, C-DOT gradually withdraws its support and the manufacturer takes independent control of the operations.

## **Overview of the TOT Package**

The ToT package consists of Design Documentation, Engineering Inputs, Testing & Validation Documents, Manufacturing Documents and User Documentation, besides providing training and technical assistance. Recipients of the technology have the option to commence production with integration and testing of the finished systems, Semi Knocked Down (SKD) assembly or Completely Knocked Down (CKD) kits.



## **Design Documentation**

The information regarding the product details is given through system architecture documents and card/unit/module level documents, comprising:

- General Description • Block Diagrams • Circuit Description • Circuit Schematics • Timing Diagrams • Connector Pin Assignments • Assembly Diagrams • Components Lists • Master Patterns • Gerber

## **Engineering Inputs**

The engineering inputs comprise:

- Routing Diagram • Back Panel Wiring • Inter rack Wiring • Inter-module Wiring • Mechanical Packaging • General Assembly • System Engineering • Site Engineering

## ***Testing and Validation Documents***

Information regarding the testing and validation is provided through documents covering:

- Tester Documents • Test Procedures • Submodule / System Integration Procedures and Testing • Cards / Unit / Module & their Testing & Validation Procedures

## ***Manufacturing Documents***

C-DOT provides a detailed feasibility report for different production capacities targeted by the recipients. The topics covered include:

- Capital Goods / Specifications / Sources of Supply • Component Ordering Information • Manufacturing Process Diagram • Packaging Details

## ***Quality Control Documents***

To ensure the manufacture of high-quality products, C-DOT adheres to the following steps in various stages of its production process:

- Batch Acceptance and Sampling Plans • Inwards Goods Inspection Procedures • Quality Plans • Workmanship Standards • Fault Classifications • Factory Inspection Procedures • Acceptance Test Procedures

## ***User Documentation***

- Overview Documents • Product Specifications • Configuration Documents • Software Related Documents • Administration Documents • Installation Documents • Maintenance Documents • Planning Documents • Despatch Details





### ***Training***

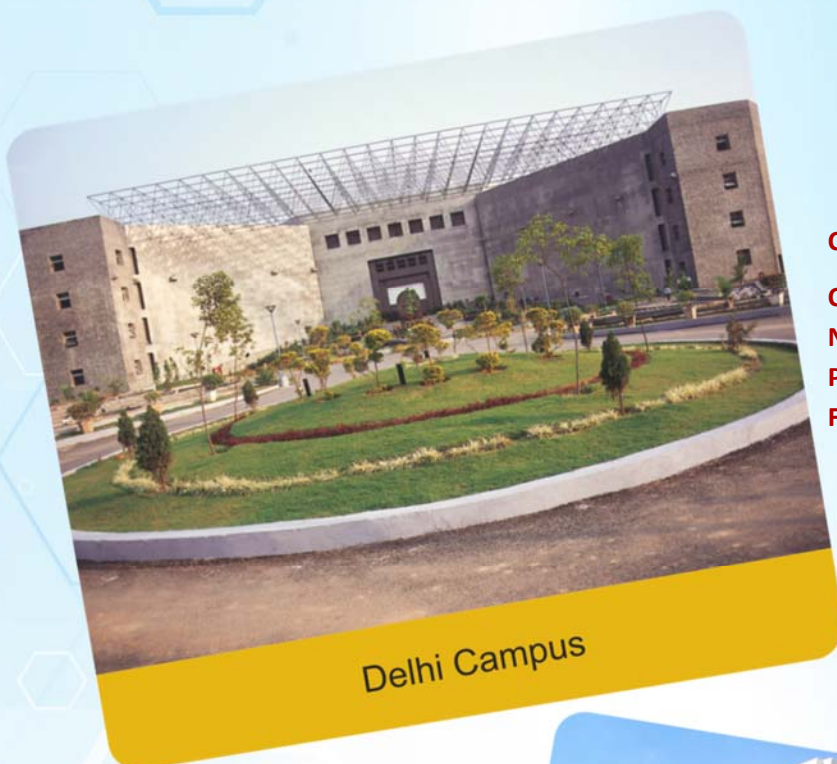
TOT provides adequate hardware and software training to the engineers of the licensees essentially comprising of class room lectures with hands-on training given in phases, for easy absorption of the product and manufacturing technology.

### ***Technical Assistance***

Technical Assistance from C-DOT experts including usage of C-DOT production facility is made available during the establishment of production infrastructure, prototype fabrication, testing, fabrication of testers, system integration and validation phases. Support during tender submissions & vendor negotiations.

### ***C-DOT's Capabilities & Strengths***

- Unparalleled Telecom Knowledge and Consultancy
- Expert on Telecommunication
- State of the art R&D Infrastructure
- Young, Talented and Dynamic Professionals
- Wide portfolio of Technologies, Products and Solutions
- Proven Design Concepts & Methodologies
- In-house Pilot Production Plant
- Proven Technology Transfer Methodology
- Excellent Support throughout the life time of the Solutions
- Quality Management System



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Bengaluru Campus



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