L&T Construction
Smart World & Communication

creating smart **infrastructure**

The Indian
CONSTRUCTION GIANT

L&T Construction, India's largest construction organization and ranked among the world's top 30 contractors, has been over the past seven decades transforming cityscapes and landscapes with structures of immense size and grandeur. The company's capabilities span the entire gamut of construction - civil, mechanical, electrical and instrumentation engineering - and its services extend to all core sector industries and infrastructure projects.

Several of the country's prized landmarks - edifices, structures, airports, industrial projects, flyovers, viaducts, water and power infrastructure projects carry L&T's signature of excellence in construction. Today, more and more structures beyond India's boundaries are standing tall, thanks to L&T Construction.

L&T Construction straddles seven related businesses:

- Buildings & Factories
- Transportation Infrastructure
- Heavy Civil Infrastructure
- Power Transmission & Distribution
- Water & Effluent Treatment
- Smart World & Communication
- Renewable Energy

Eighty years of
UNDISPUTED LEADERSHIP

Larsen & Toubro is a major Indian multinational in technology, engineering, construction, manufacturing and financial services, with global operations. Its products and systems are marketed in over 30 countries worldwide. A strong, customer-focused approach and the constant quest for top-class quality have enabled L&T to attain and sustain leadership in its major lines of business for over eighty years.

- Construction
- Heavy Engineering
- Hydrocarbon Engineering
- Power
- Metallurgical & Material Handling
- Ship Building
- Infrastructure Concession
- Realty
- Electrical & Automation
- Construction & Mining Machinery
- Valves
- Infotech
- Technology Services
- Financial Services

Building landmarks, setting benchmarks*

- **11** International Airports
- **400+** High Rise Towers
- **40** Institutions & Public Spaces
- **70000+** Apartment Units
- **85+** Manufacturing Facilities
- **22000+** Hospital Beds
- **5 lakh +** km of Water & Waste Water Networks
- **7200** MLD of Water & Waste Water Treatment Plants
- **7.3 lakh** Hectares of Land Being Irrigated
- **805** Substations
- **36900 ckm** of Transmission Lines
- **1.5 lakh+** km of Distribution Lines

- **156263** Habitations Electrified
- **120** Towns Power Quality Enhanced
- **2.5+** GW Portfolio of Solar Plants
- **344** km of Metro Rail Corridors
- **19.5** km of Monorail Corridors
- **22600** Lane km of Highways
- **12.08 million** Sq. m. of Runways
- **8315** MW of Hydro Power Projects
- **8080** MW of Nuclear Power Projects
- **5075** tkm of Railway Track Laying
- **17906** tkm of Railway Electrification
- **245** Signalling & Telecom Installation in Stations
- India's Largest City Surveillance Project: **6000** cameras at **1500** locations at Mumbai

GETTING SMARTER FOR A SMART WORLD

Increasingly, the world is seeking smarter, secure, more intelligent solutions and optimized utilization of resources to enhance quality of life which has led to the rise of smart cities and advanced security solutions and communication infrastructure in several advanced economies.

India is also rapidly gearing up to create smart infrastructure that will soon be the backbone of the economy. With the mandate to build smart cities at the top of the Government's priority list, this area is abound with huge opportunities in the near future. The potential business opportunities are in the areas of city surveillance, intelligent traffic management systems, transport & logistics, OFC cabling, communication network including backbone (GOFNMS, DWDMS, IPMPLS etc.), telecom infrastructure, BMS, smart grids, smart governance & education and smart city development. The need is to effectively tap the specific requirements of a wide range of customers including Central and State governments, railways, airports, seaports, expressways, defence, transport & logistics providers, telecommunication service providers, IT companies and residential building/city developers in a focused manner.

From L&T's perspective, the good news is that these resulting opportunities can be tapped by various businesses within the L&T Group. With a successful track-record complemented by domain knowledge across business verticals, L&T is well positioned to be a key Master Systems Integrator (MSI) for smart city projects. The Smart World & Communication Business Unit (SW&C BU) in L&T Construction leads all business initiatives in this realm and collaborates with L&T Infotech, L&T Electrical & Automation Independent Company and L&T Technology Services to provide end-to-end solutions to customers under the following segments:

SMART SECURITY SOLUTIONS

With safety and security being an imperative for modern life, L&T offers a whole spectrum of sustainable and scalable systems in security solutions for city surveillance systems, Intelligent Traffic Management Systems (ITMS), Border Security Systems, Security and Management Systems.

SMART COMMUNICATION NETWORK AND TELECOM INFRASTRUCTURE

For a more secure and smarter world, a robust communication network is an essential. L&T offers end-to-end solutions for a range of requirements covering wired & wireless networks including OFC, IP-based DWDM Communication Network, GSM services, Wi-Fi, Fixed Broad Band.

SMART INFRASTRUCTURE

L&T offers a reliable whole spectrum of smart infrastructure, which covers Smart buildings, Smart Energy, Smart Transportation and logistics, Emergency Response Systems, ICT Solutions, Smart Parking, Waste Management, etc. L&T Construction has executed many projects that include most of the subsystems of Smart City offerings like CCTV Systems, VMS, Video analytics and the like.

THE L&T ADVANTAGE

for complete spectrum of solutions

- Global expertise
- Project management
- Master systems integration
- State-of-the-art IT capabilities
- Software, analytical & mobility
- Hardware services
- Strategic partnerships

SMART SYSTEMS INTEGRATION FOR IMPROVED QUALITY OF LIFE & SUSTAINABILITY

SECURITY SOLUTIONS

SMART CITIES

COMMUNICATION

Water Management Systems

Smart Grid

Smart Lighting

Building Management Systems

Transport Management Systems

Public Safety Management Systems

Smart Infrastructure

Smart Waste Management

Utility Management Systems

Government & Agency Administration

Reusable Energy

Smart Digital Connectivity

Citizen-centric Apps

IoT OFFERINGS

Command and Control Centre at Mumbai

With the help of IoT, smart elements are generating data that can be used for analytics, to inform government bodies about prevailing conditions, to help citizens to know their surroundings, to ensure their safety and make cities a better place to live. L&T's core strength lies in offering a whole spectrum of sustainable and scalable IoT offerings for security solutions, City Surveillance, Intelligent Traffic Management System, Border Security System, Security and Management Systems for Critical Infrastructure across ports, airports, metros, IT parks and public buildings.

Several of these systems have been executed by L&T Construction in various projects across the country. Recently, L&T Construction commissioned India's largest city surveillance project comprising 6000 cameras at over 1500 locations at Mumbai City.

Other prestigious city surveillance projects executed include City Surveillance & Intelligent Traffic Management Systems for three cities in Gujarat – Ahmedabad, Gandhinagar and Vadodara, Smart City Operation Centers across Vizag and Hyderabad. Another unique project was to facilitate better surveillance and management of critical infrastructure at Sabarmati Jail in Gujarat.

A pilot smart-city in the campus incorporating features like surveillance, access control systems, video analytics and emergency response systems has been set up at the 27-acre campus of L&T Construction in Chennai.

City Surveillance

L&T has proven its expertise in providing state-of-the-art systems for city surveillance and its core strength lies in the extensive use of technology in exciting new applications like video management systems, video and audio analytics, picture intelligence units and Geographical Information Systems (GIS).

Comprehensive 'concept-to-commissioning' offerings include:

- Surveillance Equipment
- Network
- Data Centers
- Application Portfolio
- Command / Viewing Centers
- Picture Intelligence Units
- Vehicle Tracking Systems
- Emergency Call Box (ECB)
- Meteorological Systems (MET)
- Flood Level Monitoring Systems
- Public Announcements
- Collaborative Monitoring
- Help Desk and Facility Management Services
- E-portal services for citizen friendly services

Smart Transport & Logistics

Smart cities demand on-call emergency response systems that incorporate modern technologies such as Computer Aided Dispatch (CAD), Geographical Information Systems (GIS), Automated Vehicle Location Systems and Computer Telephony Integration to provide uniform and prompt response to citizens during emergencies.

L&T's end-to-end offerings include:

- Call Centers
- Contact Center Components
- CAD Applications
- Fleet Management
- Vehicle Tracking Systems
- Automated Vehicle Locator
- Passenger Information System
- Public Address System
- Smart transport Mobile Application
- Electronic ticketing Machine
- Panic button

L&T has partnered with leading global solution providers to provide world class solutions for the transportation sector including rail, bus and airports.

Transport & Logistics integrated with Dial 100
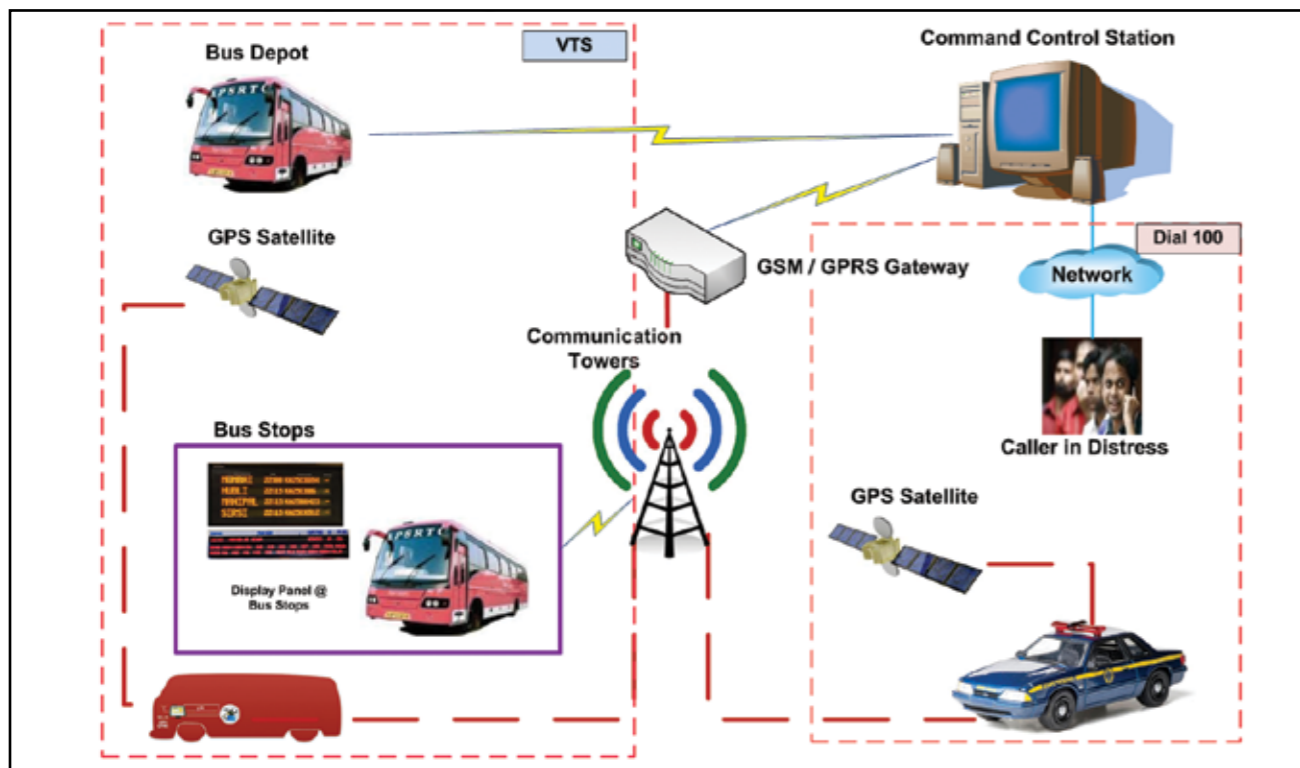
Solid Waste Management

L&T offers customized solutions for Solid Waste Management (SWM) through the installation and integration of communication technologies like RFID, GPS that ensure that entire segregation and waste management process is effectively carried out and monitored.

Offerings include:

- Non-intrusive Camera based Intelligent Bin Monitoring
- Automated Vehicle Locator Management System
- RFID based Bin Management System
- Weight & Volume Sensor Management System
- Mobile GPS based Staff Attendance Management System
- Real time management of missed garbage collection points
- Integration of dumping ground and transfer station facilities
- Handle Citizen Grievance

Lighting cities the smart way

In a world that is increasingly driven through smart infrastructure, efficient power management is not a luxury but a necessity as it forms the lifeline to sustainable governance. L&T has proven expertise in making several cities glow smartly with intelligent lighting systems equipped with sensors that provide real-time updates to the city administrators to optimize power management.

Comprehensive 'concept-to-commissioning' offers include:

- Smart light fixtures (LED based with motion and Ambient Light sensors)
- Street light smart controller for automated lighting and sensing unit
- Real-time status of street lighting
- Monitoring and Operating System for lighting
- Managing an independent unit of street light in terms of fault detection, replacement, etc.
- Panic button

Intelligent Parking Management System

The explosion in the quantum of vehicular traffic has made driving difficult and parking a nightmare! Finding a parking spot is stressful especially at crowded malls or supermarkets or auditoriums. L&T is radically changing this paradigm through state-of-the-art Intelligent Parking Management System that provides a range of parking information real time data both to city administrators and citizens to considerably ease the rigors of vehicle management.

Comprehensive system features include:

- Parking sensors
- Wireless sensor networks module
- Embedded web-server
- Central web-server
- Boom barrier and digital display Unit
- Enhanced parking security
- Data analytics

Enabling pan city Wi-Fi Hotspots

A key component in smart infrastructure are the Wi-Fi Hotspots that enable interconnectivity for the general public while enhancing public safety by updating relevant information on a timely basis. L&T specializes in creating smart Wi-Fi zones that bring a range of advantages to the users such as availability of better internet connectivity, reliability along with the option of integrating the zones with ICT devices to facilitate seamless administration of smart infrastructure utilities.

Comprehensive system features include:

- Parking sensors
- Wireless sensor networks module
- Embedded web-server
- Central web-server
- Boom barrier and digital display Unit
- Enhanced parking security
- Data analytics

Keeping tabs on the environment

With rising pollution levels in cities, citizens are concerned about the quality of air they breathe while the government needs actionable data to track and tackle polluters. L&T's customized environmental sensors provide a range of smart answers to forewarn citizens about various weather parameters while also mapping healthy and unhealthy zones for city administrators to initiate sustainable schemes.

L&T's end-to-end offerings include:

- Installation of wireless environment sensors

- Establishment of central systems to receive information from sensors

- Setting up of the driver's mobile devices Installation of digital display units

Internet ready Interactive kiosks

L&T specializes in creating customized internet ready interactive kiosk for sharing specific information across domains covering green buildings, public safety, transportation, green energy, water supply systems, emergency response systems and solutions for better governance.

Key turnkey offerings include:

- Kiosk terminal management
- Kiosk services management
- Kiosk partner management portal
- Services interface
- Service data exchange standards
- City Kiosk data adaptation management
- Message and communication

Smart Critical Infrastructure

L&T's comprehensive smart technology offerings for critical infrastructure covering nuclear power plants, metros, IT parks and airports straddle:

- Surveillance Equipment
- Access Control Systems
- Intrusion Detection Systems - Perimeter/Pipeline
- Public Address Systems
- Integrated Command Control Centres
- Video Management Systems
- Video Analytics
- Network Infrastructure
- Specialized Solutions
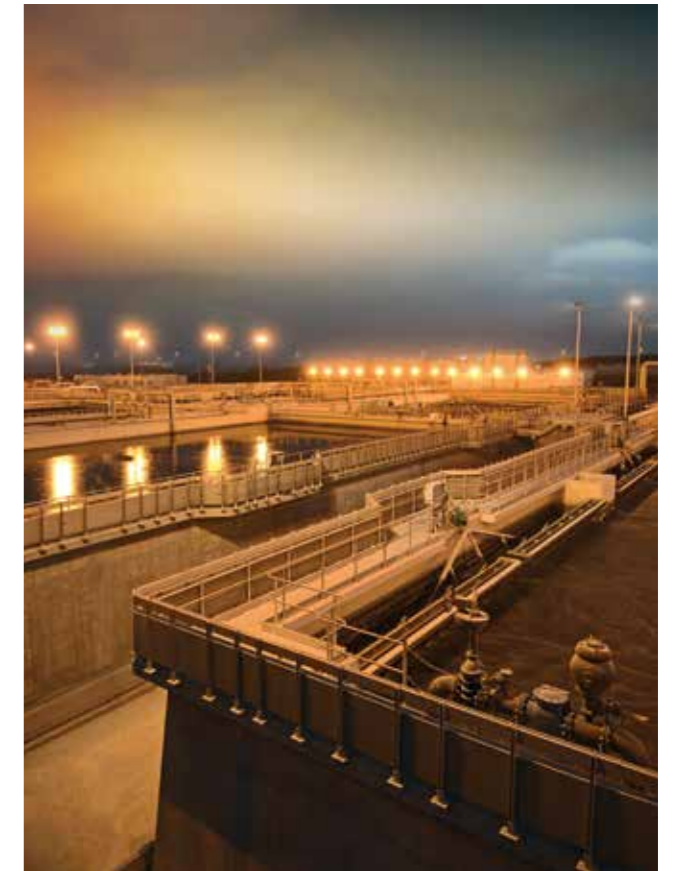- Public WiFi
- Information Displays
- Tetra Communications
- ELV and Special Systems

A state-of-the-art command and control centre
at Mumbai International Airport

Smart Water Solutions

A key contributor towards the critical cause of water sustainability, L&T is a market leader in offering 'concept-to-commissioning' services for creating world-class water infrastructure in the areas of:

- Water transmission, treatment, distribution and management
- Municipal used water collection, treatment and reuse
- Industrial water treatment to achieve ultra-pure water
- Industrial effluent treatment and zero liquid discharge / recycle
- Desalination Plants - sea water / brackish water
- 'Unaccounted for Water' projects to monitor the water loss
- Advanced Metering Infrastructure
- SCADA - water supply monitoring and distribution
- Mobile applications for real time metering information for citizen
- Visualization platforms/ dashboards for authorities to monitor the status of the overall infrastructure

Sewage treatment plant at Doha

SMART ENERGY
Providing comprehensive solutions from 'Concept to Commissioning'

Balancing generation and demand, new business models

Load management and peak avoidance

Reliability through automatic outage prevention and restoration

Efficient generation, transmission, distribution and consumption

Full transparency on distribution level and automated loss prevention

Generation
Transmission HV
Distribution MV

EXISTING SYSTEM

THE FUTURE

Smart Energy

L&T offers customized solutions from concept to commissioning for micro grids that are integrated energy system networks consisting of distributed generation sources (like solar, micro-wind turbines, fossil fuels and biomass), energy storage and advanced control systems for distribution. Solutions are offered after careful analysis of source and load controls to operate as a single autonomous grid either in parallel or exclusive island set-ups from the existing utility power grid.

L&T's smart grid solutions include smart meters, digital sensors, advanced communication networks, sophisticated analytics, sub-station monitoring for power utilities and predictive analytics to enhance distribution efficiencies. L&T SWC is currently implementing Advanced Metering Infrastructure (AMI) Solution for 5-million Smart Electricity Meters with GPRS-based Communication Module for Haryana and Uttar Pradesh.

Advanced Metering Infrastructure (AMI) Solution offerings:

- Installation of GPRS and SIM Card enabled Smart Meters
- Head End System & Meter Data Management System
- Mobile App and Web Portal for Customer
- Database management & Analytics
- Cloud services
- Integration with existing IT applications of Power Distribution Utilities

SMART COMMUNICATION NETWORK AND TELECOM INFRASTRUCTURE

For a more secure and smarter world, a robust communication network and telecom infrastructure is an imperative. L&T Construction has the capability to provide end to end solutions for a range of requirements covering Wired & Wireless Networks including OFC; IP-based DWDM Communication Network; GSM services; Wi-Fi; Fixed Broad Band; Satellite and Microwave RF Links; ICT / Data Centre Infrastructure; Multimedia Services & Gateways.

L&T Construction has considerable experience in laying more than 20,000 km of underground optical fiber cabling across the length and breadth of the country including the installation of more than 10,000 km of optical ground wire (OPGW) hot line stringing on transmission line towers. It is currently executing 17,500 km of OFC networks as part of the NFS roll out in the southern and western regions of India. The BU has an excellent track record of installing telecom towers and other associated works on a turnkey basis. The Communication segment has already proven its expertise in providing state-of-the-art IT & communication systems for airports, metros, power plants and factories including the ongoing TETRA communication system for Delhi Metro, Dubai Concourse 4 Special Airport Systems Package and AFNET.

Fiber Deployment & Management Systems

Fiber Optic is the emerging technology to meet the growing bandwidth of demand and reliability of network. With the thrust on better uptime and SLA, operators need to have a real time system for maintaining the health and availability of the fiber network. L&T offers specialized turnkey GIS-based network management solutions for a complete view of the Network on the GIS corridor and tools for real time monitoring, detection and restoration of faults as well as updating of ISP and OSP data to meet time-bound SLA for the network.

Comprehensive offerings include:

- Deployment of Fiber Optic Network
- Fiber Distribution Management Systems
- Network Testing & Monitoring
- Intrusion Detection Systems
- GIS-based Optical Fiber Network Management Systems (GOFNMS)

GSM/Satellite/Microwave Radio Networks

L&T offers a spectrum of solutions for wireless technologies covering satellite communication, terrestrial communication through microwaves and global systems.
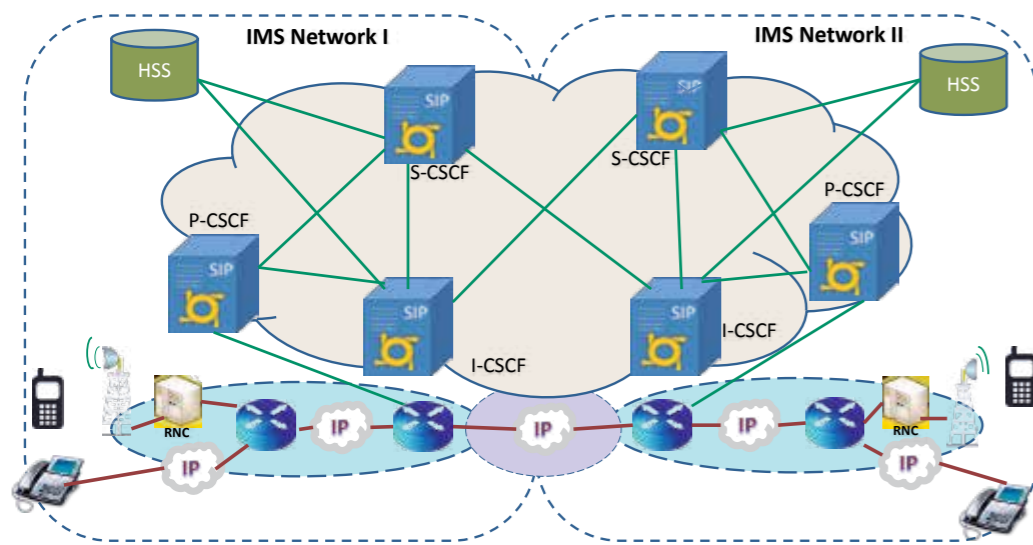
Turnkey offerings include:

- Satellite Communication Network with hub and remote stations
- Transportable Satellite Communication (TST) stations
- Ground based / Roof Top Towers, Poles
- Radio Network, IDU and ODU, frequency/space diversity

IP-MPLS/NGN Network

L&T, in collaboration with various OEMs, offers integrated time-bound multi-location network implementation for IP/MPLS networks to enable guaranteed network latency, quality of service flexibility in network deployment and improved routing system scalability.
Offerings include:
• Deployment of Converged IP/MPLS Backbone
• Datacenter Switching Network
• NOC / DR NOC

Fixed/Wireless Broadband Access Networks

Over the years, the demand for Wi-Fi and similar other wireless technologies have risen in terms of coverage, capacity, performance, quality, and manageability allowing service providers to establish wireless mesh networks. L&T is equipped to provide customized solutions that can be scaled-up based on a customer's utility. Solutions offered include:
• Campus based Wi-Fi services
• City Wi-Fi networks
• Public Wi-Fi hot spots

Optical Transport Solutions

Optical Transport Technologies enable high speed multimedia applications with utilization of fiber capacity as emerging solutions. L&T offers end-to-end system integration solutions in this domain covering:

• Optical Transport Network (OTN) equipment
• Dense Wavelength Division Multiplexing (DWDM) solutions
• Gigabit Passive Optical Network (GPON)
• SONET/SDH Based Network solutions
• Automatic Optical Switching Layers
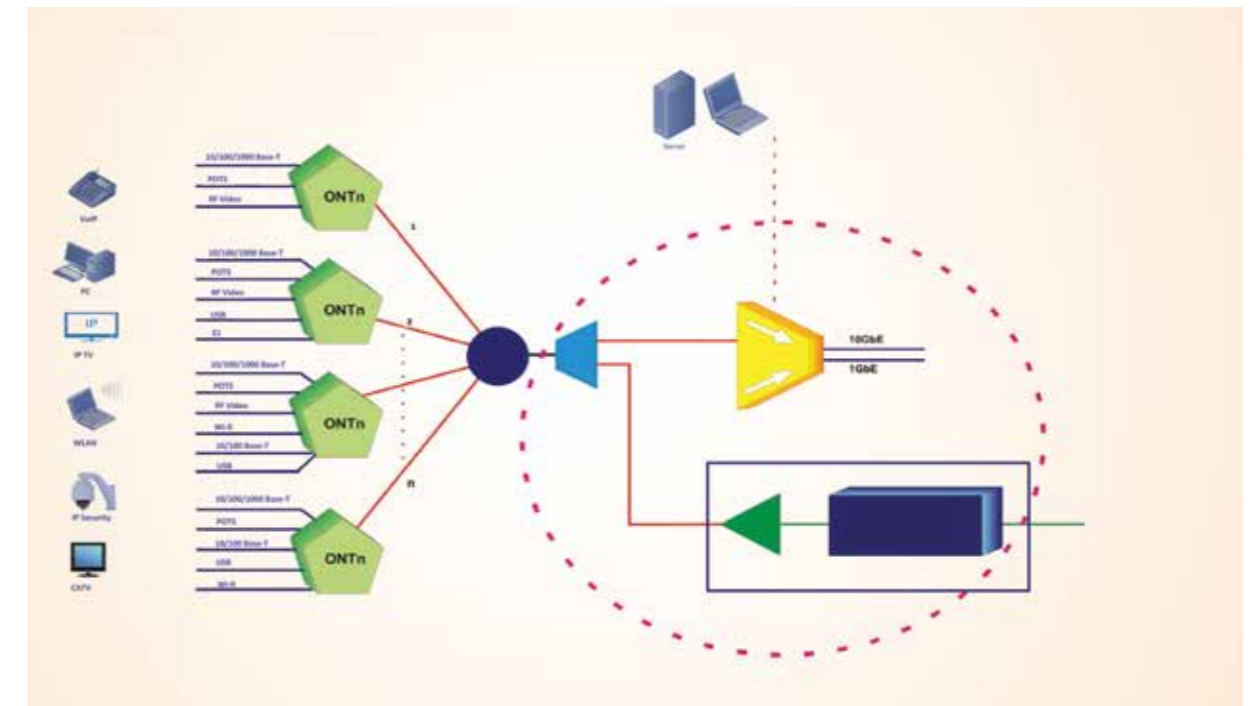
Gigabit Passive Optical Network

GPON (Gigabit Passive Optical Network): G.984 extends the earlier G.983 Broadband; PON (BPON) standard by increasing both the downstream and upstream bandwidth, providing a more bandwidth-efficient encapsulation method using GPON encapsulation method (GEM), making the transport more packet based, providing a more scalable management method using ONT Management Control Interface (OMCI) and improving on the encryption and Forward Error Control (FEC) methods.

L&T offers end to end system integration solutions in this domain covering:

• Optical Line Terminal
• Optical Network Terminal
• Splitter
• Element Management System
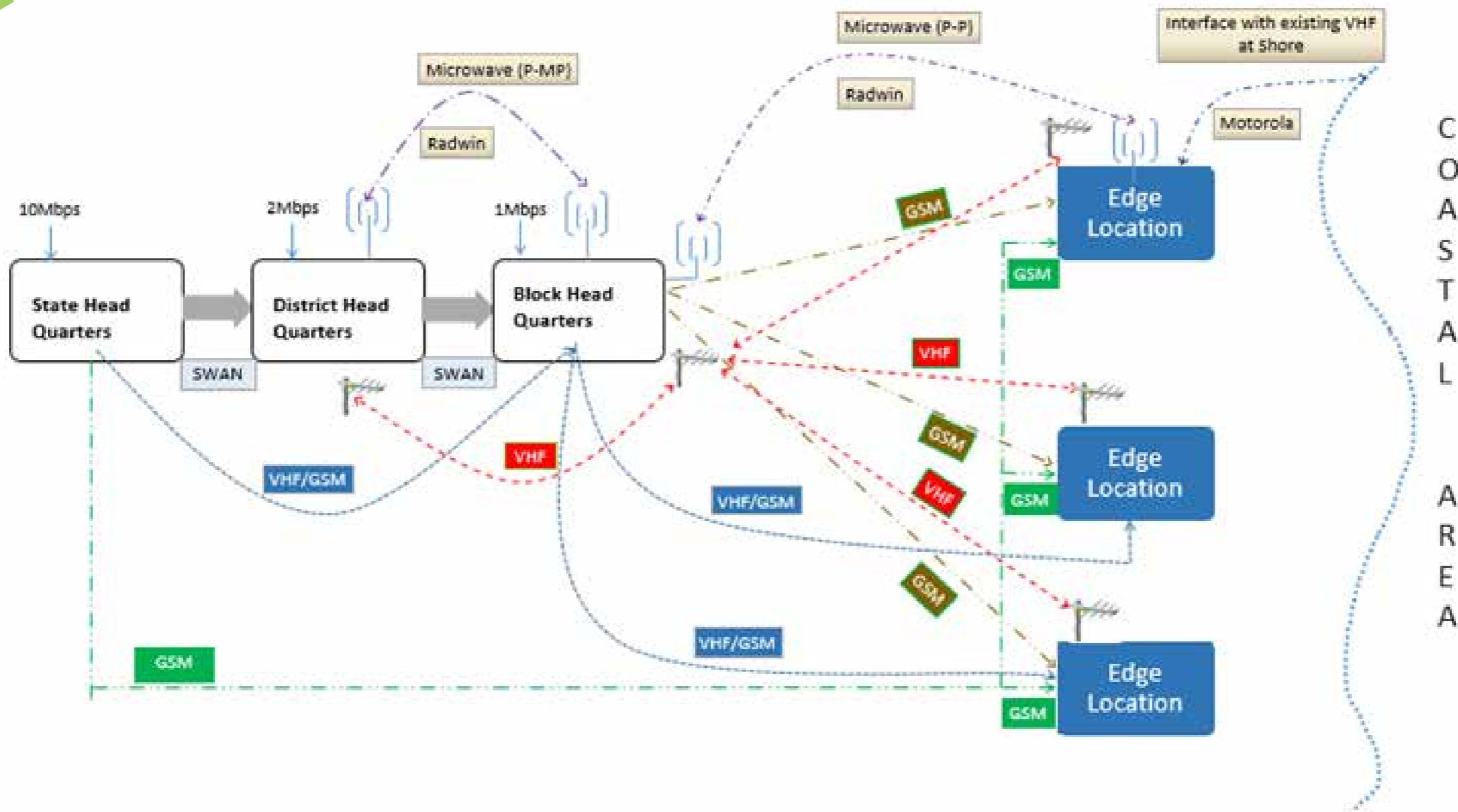• Solar Photo Voltaic (SPV)
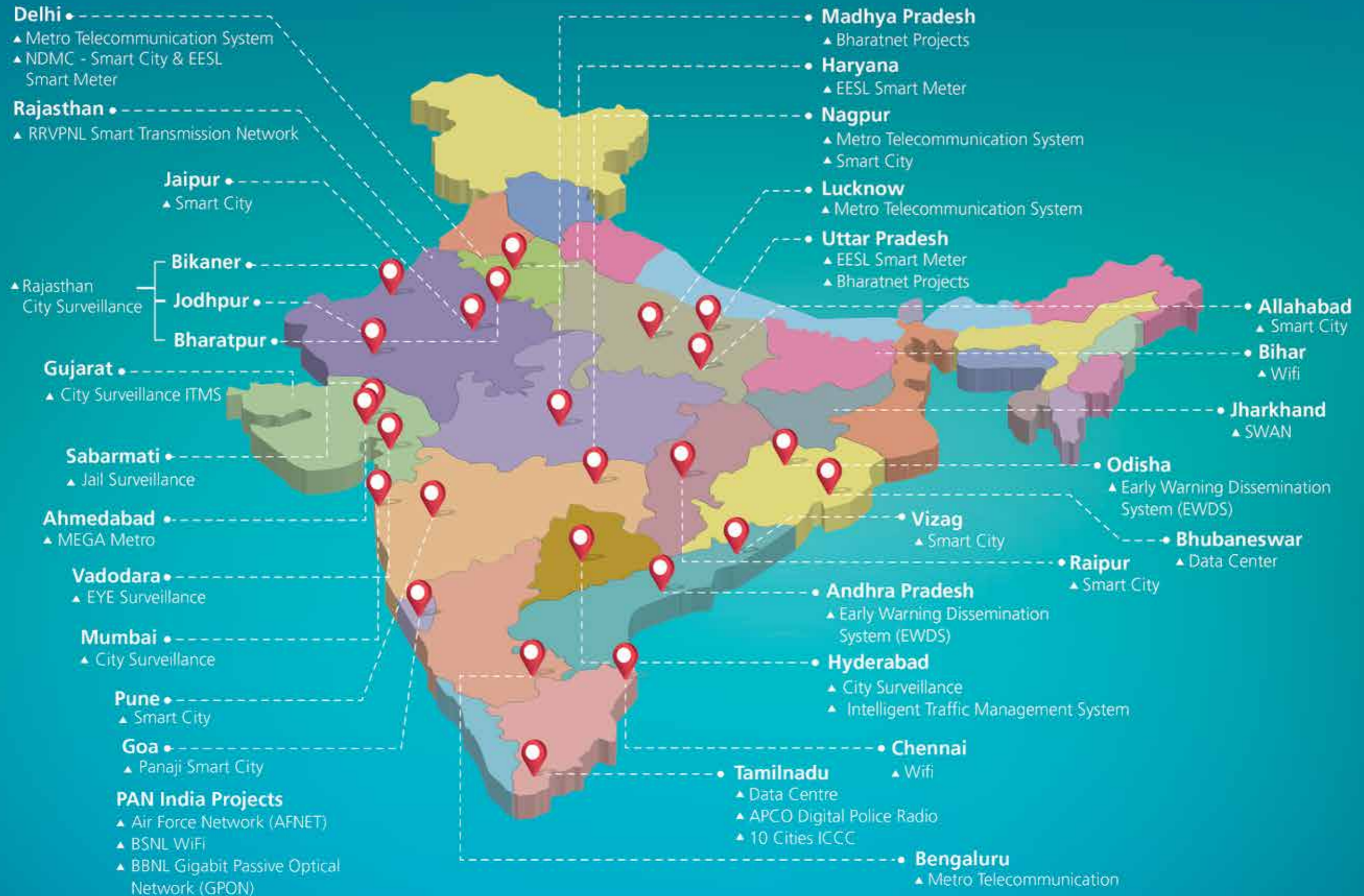
Early Warning Dissemination System

Early Warning Dissemination System (EWDS) is a state of the art alerting solution that can disseminate critical & urgent information to people present in a specific region during the time of disaster or possible events that can threaten their lives. It is envisaged that last mile connectivity will be achieved by equipping different technologies at State, District and Block operation centers, Fish Landing Centers (FLC's) so that the warnings about impending cyclones can be disseminated to coastal communities of cities effectively.

L&T has proven expertise in provinding state-of-the-art solutions for EWDS covering:

• Satellite Based Mobile Data Voice Terminal
• Universal Comminication Interface
• Bandwith and Internet
• Digital Mobile Radio System
• Alert Tower Siren System

BUILDING INDIA'S SMART INFRASTRUCTURE - THE L&T WAY

Delhi
- Metro Telecommunication System
- NDMC - Smart City & EESL Smart Meter

Rajasthan
- RRVPNL Smart Transmission Network

Jaipur
- Smart City

Bikaner
Jodhpur
Bharatpur
- Rajasthan City Surveillance

Gujarat
- City Surveillance ITMS

Sabarmati
- Jail Surveillance

Ahmedabad
- MEGA Metro

Vadodara
- EYE Surveillance

Mumbai
- City Surveillance

Pune
- Smart City

Goa
- Panaji Smart City

PAN India Projects
- Air Force Network (AFNET)
- BSNL WiFi
- BBNL Gigabit Passive Optical Network (GPON)

Madhya Pradesh
- Bharatnet Projects

Haryana
- EESL Smart Meter

Nagpur
- Metro Telecommunication System
- Smart City

Lucknow
- Metro Telecommunication System

Uttar Pradesh
- EESL Smart Meter
- Bharatnet Projects

Allahabad
- Smart City

Bihar
- Wifi

Jharkhand
- SWAN

Odisha
- Early Warning Dissemination System (EWDS)

Bhubaneswar
- Data Center

Vizag
- Smart City

Raipur
- Smart City

Andhra Pradesh
- Early Warning Dissemination System (EWDS)

Hyderabad
- City Surveillance
- Intelligent Traffic Management System

Chennai
- Wifi

Tamilnadu
- Data Centre
- APCO Digital Police Radio
- 10 Cities ICCC

Bengaluru
- Metro Telecommunication

Track record of smart infrastructure projects

Command and Control Center

With an experience of having established some of the largest and most sophisticated command and control centres across the country, L&T offers the advantage of integrating world class solutions for proactive analysis and enables precise decision support for the city administrator in day-to-day and emergency situaions.

City Operation Center, Nagpur

Accelerating a digital future

The cloud is becoming a technology paradigm that enables a platform to access a pool of resources to create a coherent environment to run the applications over the internet. A cloud solution offers several features like higher agility for organizations, multitenancy, resource pooling, on-demand self-service, broad network access, rapid elasticity, etc. L&T offers cloud solutions to process and store huge quantum of data across geographical locations. Raipur Smart city, Allahabad smart city and the like have witnessed the floating of the cloud based solutions, which has enriched its effectiveness.

Smart Buildings

Smart buildings employ communication and automation technologies to integrate various building subsystems, which typically operate in silos otherwise. These sub-systems including HVAC, Lighting, Fire Protection, Access Control Systems, Surveillance, Smart Meters, Water, UPS, Elevators, etc. share information to optimize the performance of the building.
A smart building is in sync with smart grids which enables it to optimize its energy requirements.

With an experience spanning over 500 buildings including high-rise towers, hospitals, commercials complexes, IT Parks and factories, L&T is the largest building construction company in India. In addition, L&T has also invested in creating a unique Building and Energy Management System – iBEMS which integrates several technologies to provide measurable benefits to customers in addition to providing a solid base towards getting certifications like LEED. iBEMS provides event-based data retrieval for real time data access (data analytics, reports, 3D visualization) along with historic data support and has a user-friendly interface.

Cognizant's Signature Campus at KITS Sholinganallur in Chennai

STATE-OF-THE-ART IT CAPABILITIES

STANDARD OPERATION PROCEDURES	UNIFIED COMM.	KPI MONITORING	MOBILITY
GIS INTEGRATION	INCIDENT CORRELATION	GEO SPATIAL ASSET MAPPING	MULTI-AGENCY COLLABORATION & UID
VIDEO FEEDS/ALERTS	RULE ENGINE	BI/REPORTING & ANALYTICS	INTEGRATION BUS
CORRELATION ALERTS	RDBMS	SOCIAL MEDIA ANALYTICS	SMS/EMAIL GATEWAY & HELPDESK

SERVICES

SAFETY	TRANSPORT	GOVERNANCE	WATER	ENERGY	BUILDING	HEALTH	EDUCATION	ENVIRONMENT

SOLUTIONS

SAFETY	TRANSPORT	GOVERNANCE	WATER	ENERGY	BUILDING	HEALTH	EDUCATION	ENVIRONMENT
VMS	Traffic Management	Remote Service Centres	Water Treatment	Smart Grid	Remote Home Control System	Integrated Health Record System	Integrated Student Safety Management	Weather Tracking
Emergency System	Car Parking System	Citizen Service Center	Water Distribution	Smart Meter	Intelligent Building	Point Of Care Planning	Content Management System	Carbon Dashboards
Identity Management	Toll/Fine Payment	City Dashboard	Leakage Management	Leakage Management	Management System	Telemedicine System	Unified Communications	Pollution Monitoring
Cyber Security	Vehicle Tracking	City Administration	Weather Tracking	Distribution Management	Asset & Maintenance Management	Hospital/ Doctor Management	Video Conferencing/ Broadcast Facilities	Solid Waste Management
Building Security	Travel Planner	Citizen Portal	Reservoir Management	Smart Lighting	Smart Home Apps	AFRMS		GIS wave Monitoring System
	Citizen/Police App	Citizen App		Alternate Energy				
	Road Maintenance							

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Smart World & Communication