

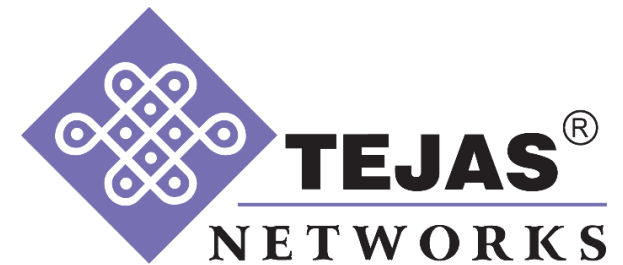


Satellite IoT

Presented by

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Associate Vice President – Satcom

19th Dec 2024



Agenda

- About Satellite IOT
- Sat-IoT Key Components
- Sat-IoT Communication Satellites
- Sat-IoT Applications
- Sat-IoT Real Life deployment, Case Study
- Q&A

About Satellite IOT

- Integration of satellite networks and IoT devices to enable seamless connectivity and data exchange.
- “Smart” Devices to “IOT Devices” (NB-IoT and Broadband)
- Communication satellites
 - LEO <Lower latency, closer proximity, ideal for IoT>
 - MEO <Moderate latency>
 - GEO <Larger coverage area, but higher latency>
- Non-Standard to Standardization
 - Proprietary Waveforms
 - 4G/5G NTN with advancement of 3GPP Standards

Satellite IOT - Key Components

- IoT Devices: Terminals, Sensors and Trackers installed on machinery, vehicles or in the any other outer environment
- Satellites: Low Earth Orbit (LEO) or Medium earth Orbit (MEO) or Geostationary Orbit (GEO) satellites act as the communication link.
- Ground Stations: Facilities that receive and process the data sent by satellites.
- Cloud/Analytics Platforms: Data is stored, analyzed and visualized for actionable insights.

Satellite IOT - Communication Satellites

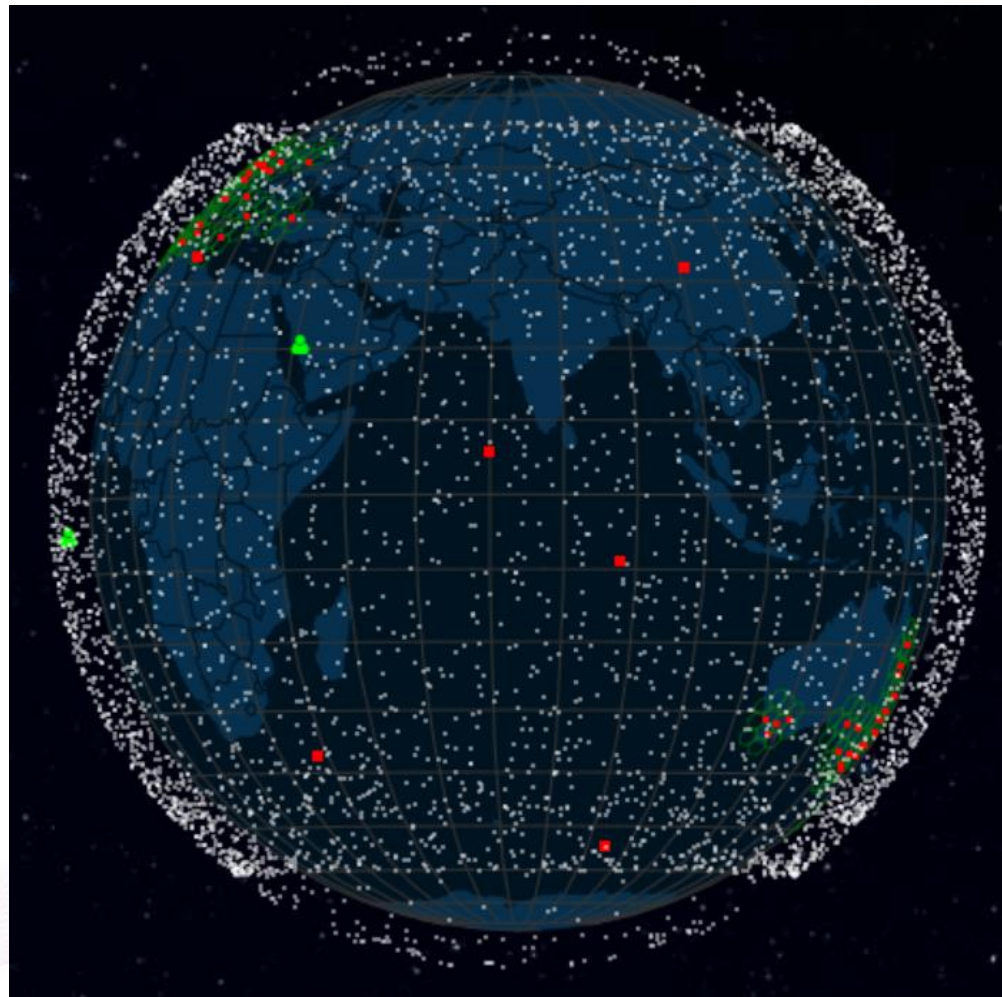
- Space Segment
- Ground Segment



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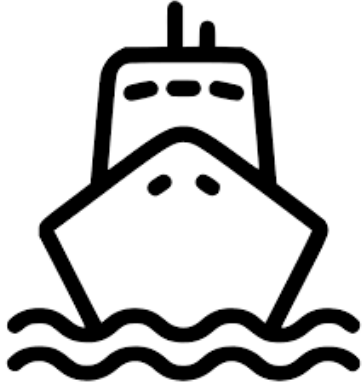
Satellite IOT - Communication Satellites

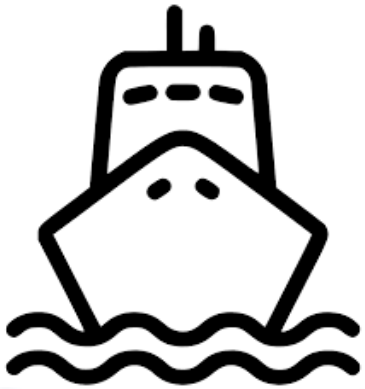
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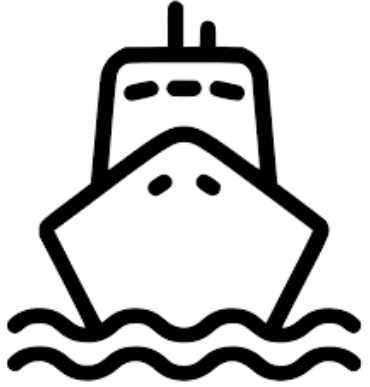
Satellite IOT - Applications





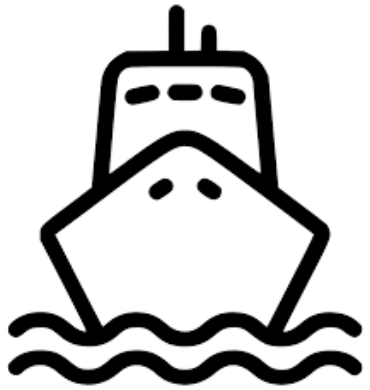
- Maritime Industry

- Tracking ships, containers and fishing fleets using GPS + satellite uplink
- Monitoring oceanic weather conditions
- Provide safety and security
- Technologies such as Bluetooth, WiFi, with a Satellite communication over S/L/Ku/Ka Bands



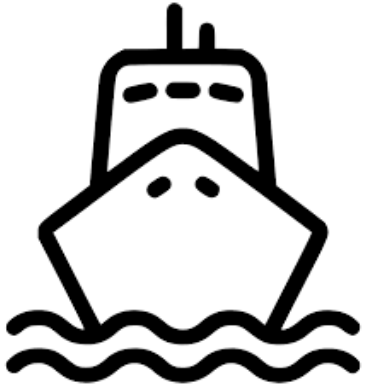
- **Agriculture**

- Smart farming with sensors for soil moisture, crop health, livestock tracking
- Technologies such as LoRA, ZigBee, etc with a Satellite Backhaul are popular to be used in such applications



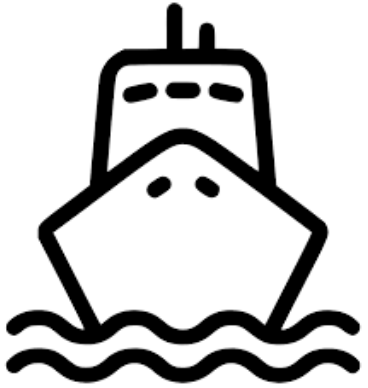
- Oil & Gas

- Monitoring pipelines, remote drilling sites and leak detection
- Technologies such as LoRA, SOS and positioning requirements, with a Satellite communication are used in such applications



- Utilities

- Managing power grids, remote solar farms, and water systems
- Technologies such as LoRA, ZigBee, etc with a Satellite Backhaul are popular to be used in such applications

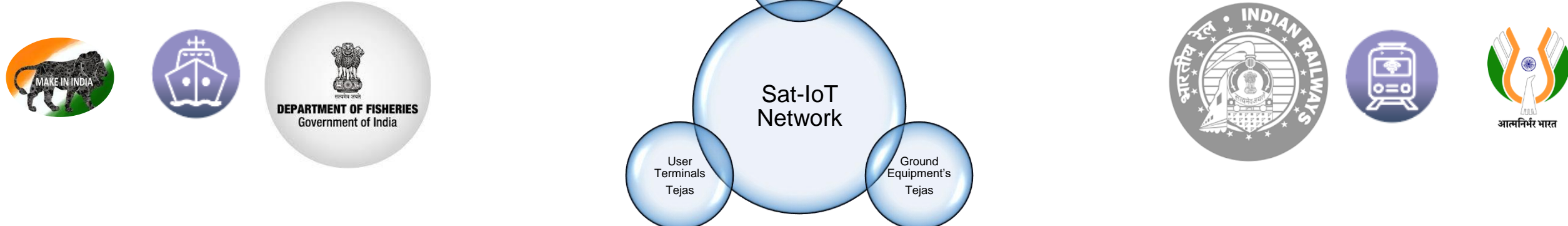


- Automotive

- FOTA and SOTA
- Connected car ecosystem
- Technologies such as OTA over Broadcast networks with Satellite Backhaul are used in such applications

Satellite IOT - Real Life Deployment, Case Study

Deploying largest Sat-IoT Network
End-to-End Satcom Solutions



Hub -
Baseband



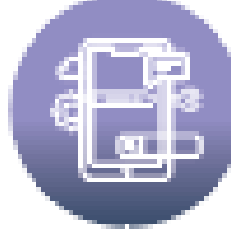
Network Management
Software



Indigenous SDR
Chipsets



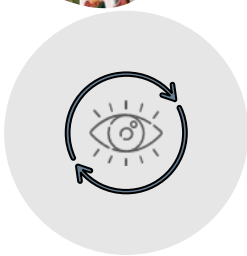
Remote User
Terminals



End User
Application

Sat-IoT Network for Dept of Fisheries, GoI

Why Vessel Tracking is Required ..



National Security

Hostile neighbors, history of terror attacks, better border vigilance & safeguarding of interests in Exclusive Economic Zone



Fishermen Safety

- Life safety, SOS, Aid in Search & rescue missions
- Weather info, International boundary alerts, Messaging



Maritime Vigilance

- Identification, Tracking, monitoring of fishing vessels.
- Better co-ordination amongst maritime security agencies



Enhance Productivity

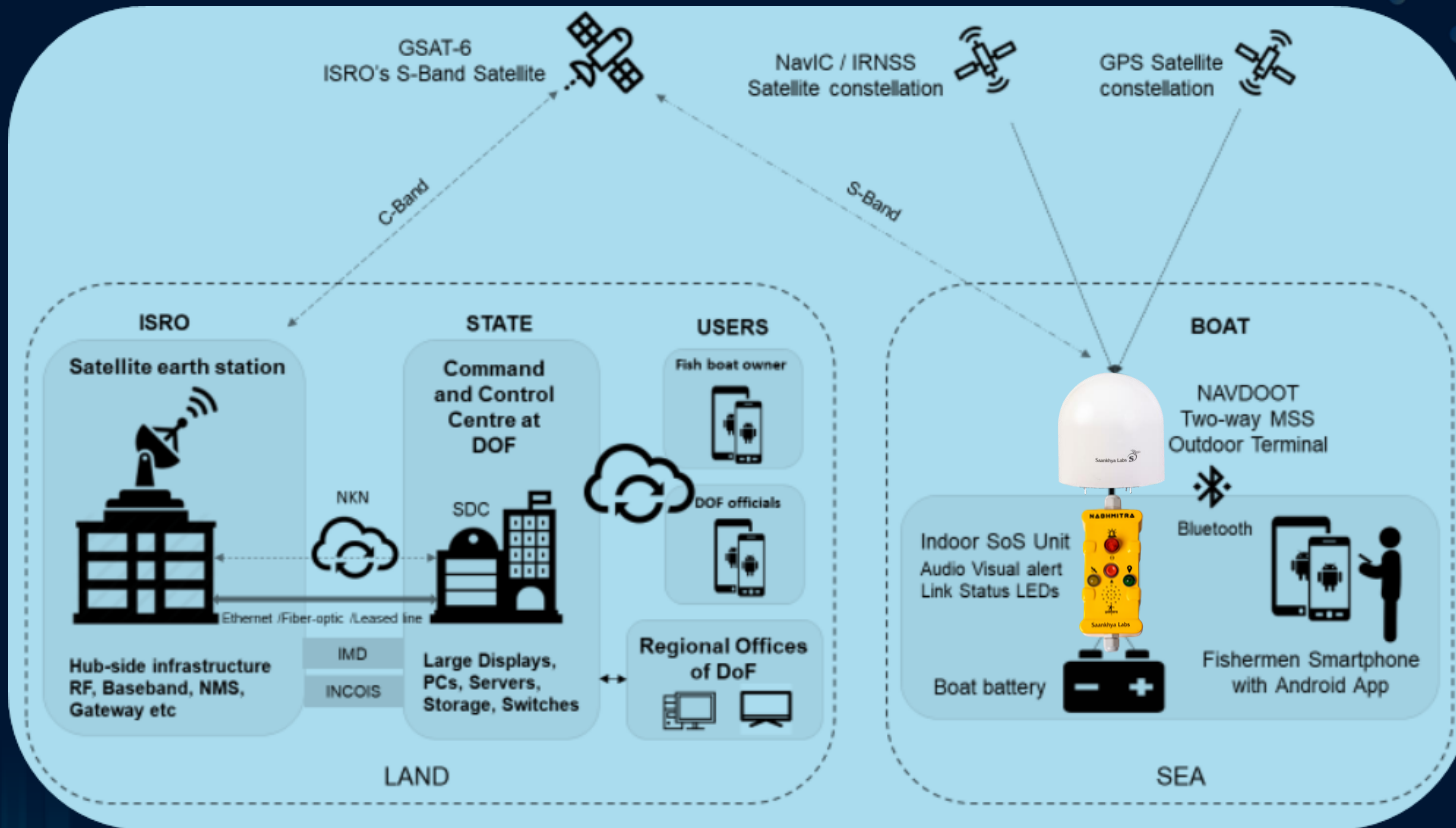
- Access to modern technology, PFZ info,
- 2-way messaging, quicker monetization, reduce idle time, minimize losses



Fiscal Efficiency

- Better utilization of govt. subsidies & state resources.
- Digitization of boat, crew & trip records

The Satellite IOT Network



ISRO

Satellite, Bandwidth, Earth station / Hub-infrastructure support

Statutory & VTS unit approvals, Interfacing with State DoF, Technical assistance
Facilitate data from IMD, INCOIS



Command & Control room for DoF

Centralized command & control for monitoring, geofencing, SoS, weather alerts and administration



Navdoot – VTS terminals & SoS Unit

Two-way MSS terminals with integrated battery, Bluetooth and Indoor SoS Unit with audio-visual alert



Hardware (IT) - Hub UserNMS

Broadband connectivity, Servers, Storage, Switches etc at state data centre or DoF premises



Software - Hub UserNMS

Application software for Tracking, Monitoring & Administration of deep-sea fishing vessels



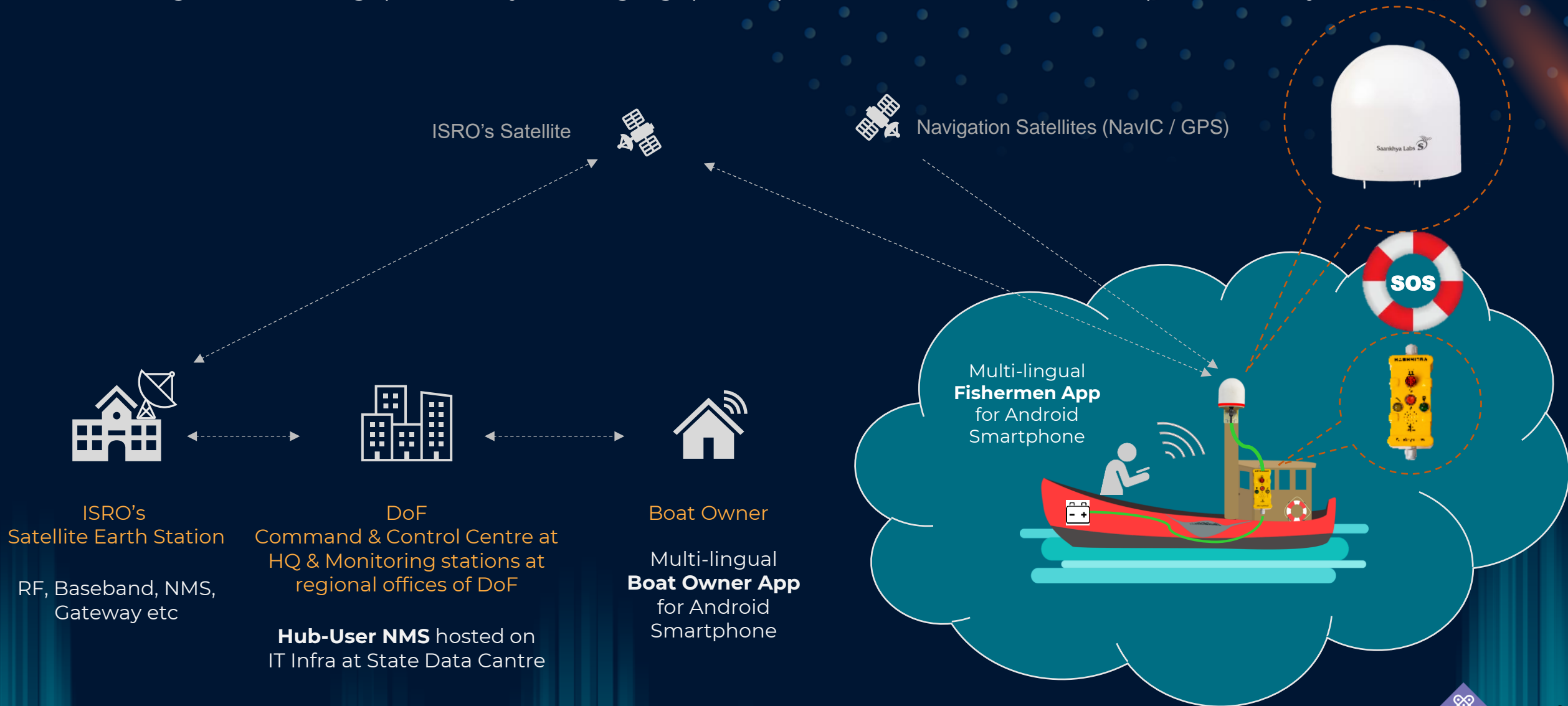
End-user Mobile App

Multi-lingual Android APP for fishermen, fish boat owners and DoF officials.

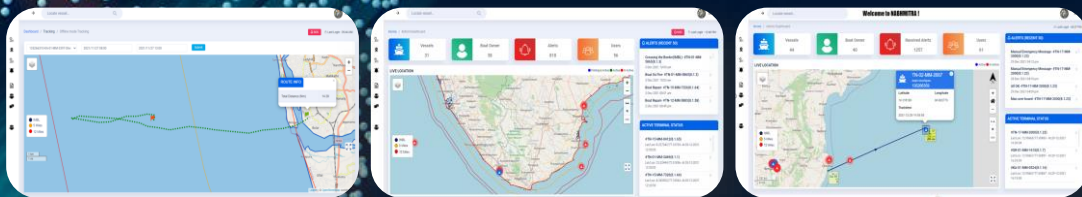
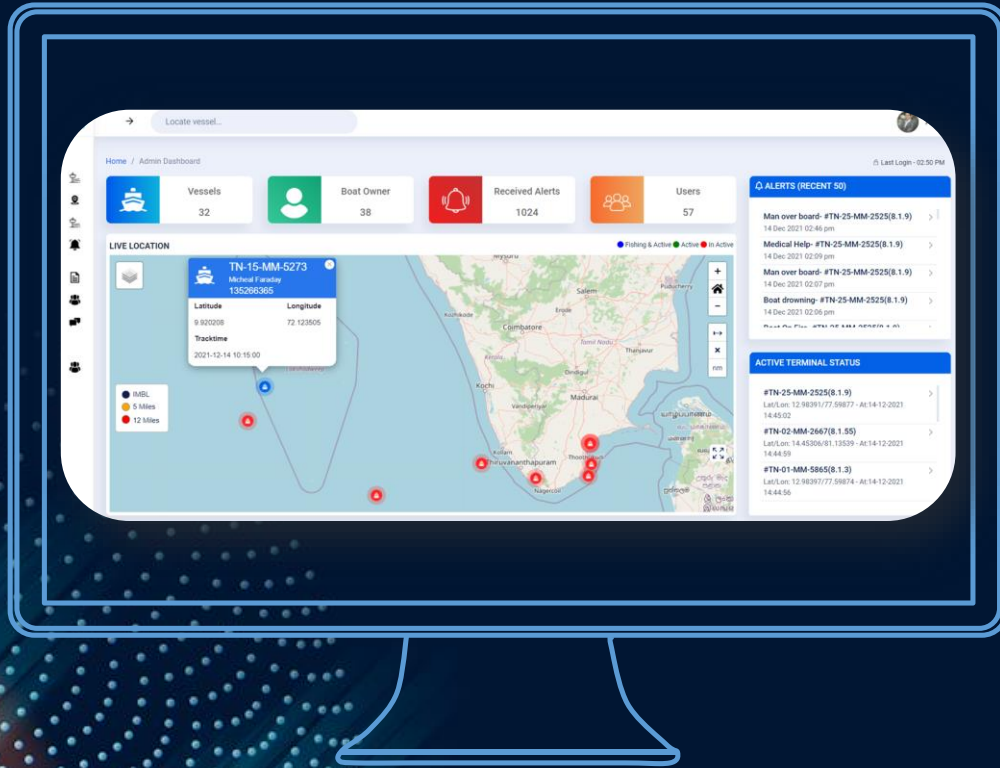


Two way MSS Network for Vessel Tracking & Fishermen Safety

Tracking & Monitoring | Two-way Messaging | SoS | Weather alerts & PFZ info | Productivity

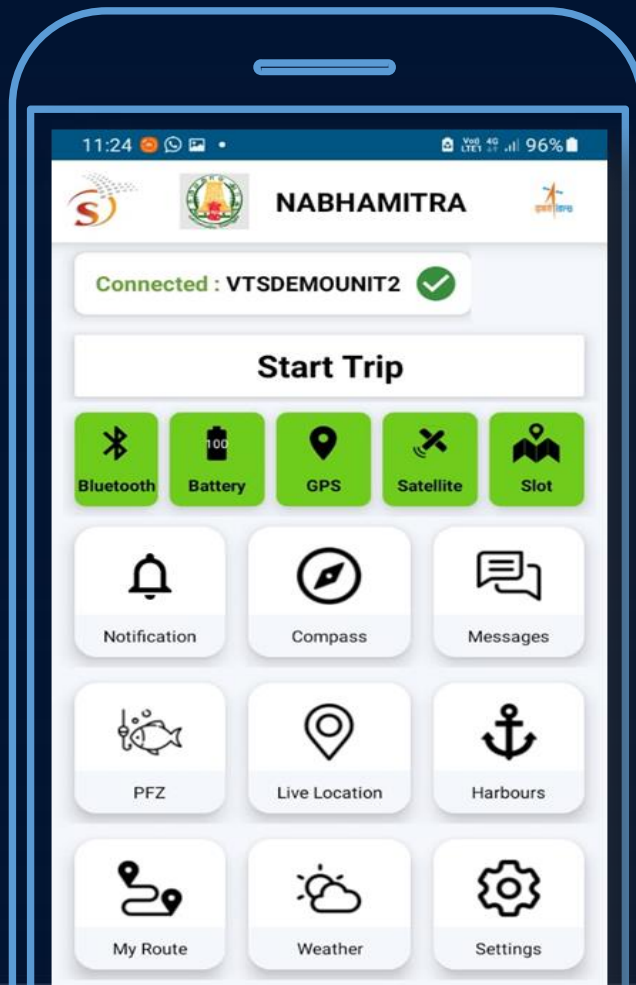
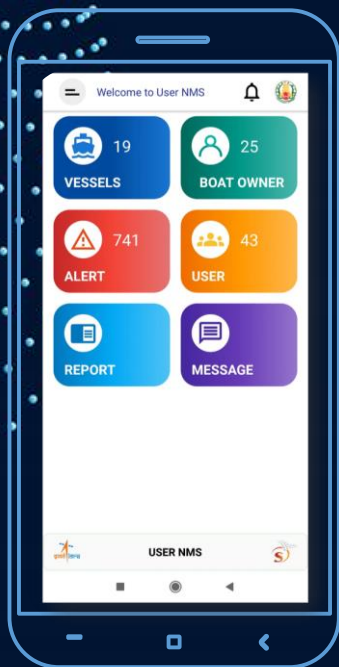


Command and Control Center



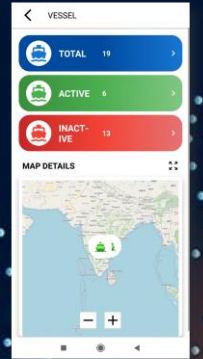
- **Tracking** NavIC / GPS tracking & periodic location reporting
- **Monitoring** SoS, violation alerts, individual boat / cluster-based monitoring, overfishing
- **Control** Demarcation of international /state boundaries, Geo-fencing, environmental & permit enforcements
- **Surveillance** Assist coastal security agencies in identification, tracking, protection of eco-fragile zones & border surveillance
- **Fishermen Safety** Two-way messaging, SoS, Search & rescue, Weather alerts, Warnings & path to safety
- **Messaging** Broadcast message from control room One-to-one and One-to-many, PFZ data (INCOIS) and weather info (IMD)
- **Administration** Centralized digitization of boat, crew & trip records. Offline analysis of violations, distance calculation, subsidies and penalties for violation, daily, weekly, monthly reports,

User Applications



Dept official App

- Vessel tracking & monitoring
- Total / Active vessel list
- Alerts, Cluster tracking
- Geofence, Messaging
- Trip report



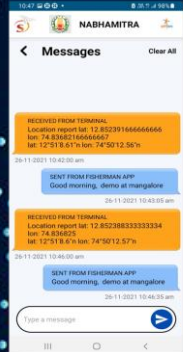
Fishermen App

- Multi-lingual app
- SoS, 2-Way Messaging
- Weather alert
- Path to safety, nearest shore
- Trip report



Fish boat owner App

- Tracking
- 2-Way Messaging
- Trip report
- Crew details entry



Sat-IoT Network for Indian Railways, Go!

- ❖ Deployed on 2600+ Indian Locomotives for for real time tracking and monitoring of trains – RTI project
- ❖ Supports two-way messaging, improves operational efficiencies, and helps in SoS situations
- ❖ Ability to receive and transmit data from multiple sensors
- ❖ Improved safety by superior diagnostics & remote management of assets
- ❖ Can be enhanced to support multiple interfaces

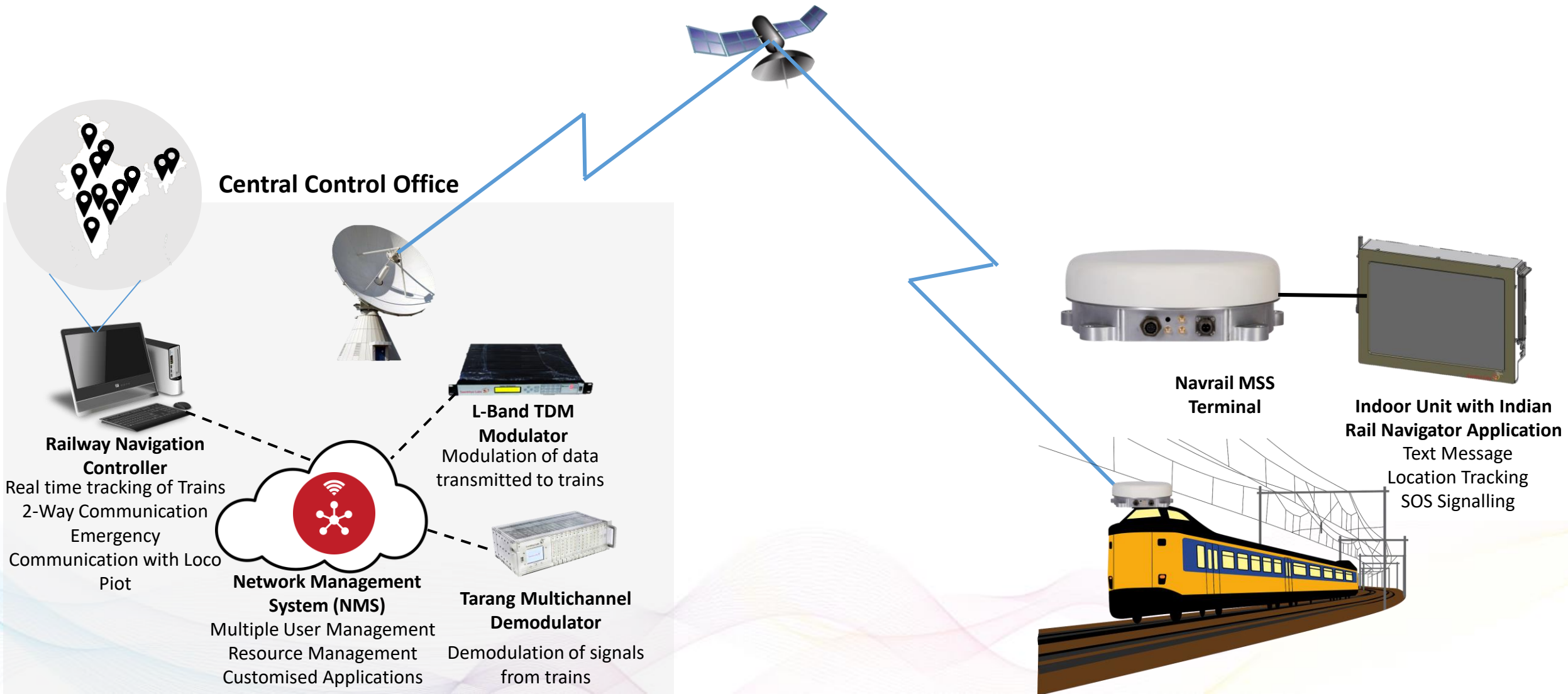
Heritage

Saankhya Labs supplied the hub-baseband equipment and Satcom modems for a first of its kind MSS network whereby over **2700** plus Indian Railways locomotives are reporting its location live on near real time basis. The network is in operation for about 2 years now.



Forward Channel	
Frequency Band	2560-2590 MHz
Data Rate	32 kbps scalable to 512 kbps
Return Channel	
Frequency Band	2670-2690 MHz
Channel Spacing	10 kHz
Data Rate	1.2/2.4/4.8/9.6 kbps in Burst Transmission
Transmit Power	+36dBm EIRP
Form Factor	
Dimensions	203 mm x 156 mm x 105 mm
Interface	Ethernet
Casing	IP 67 compliant

Network Architecture

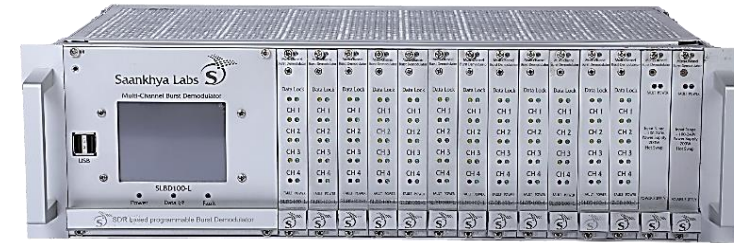


Sat-IoT Hubside Equipment

- ❖ SDR based Multi-Channel Burst Demodulator and Modulator for MSS network
- ❖ Supports a variety of standard and custom waveforms by way of software change
- ❖ L-Band input with 10/100 ethernet interface for control and seamless data transfer to NMS
- ❖ Up to 48 Channels in a 3RU 19" rack mountable form factor with dual redundant power supply
- ❖ Easy to configure web-based application utility

Heritage

Saankhya Labs has supplied hub-baseband equipment for Indian Railways Real Time Train Information network. Over **2700** trains are currently operational on the network.






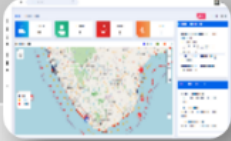



Input Frequency	
Frequency Range	950-2150 MHz
Frequency Tuning Step	1 kHz
Frequency Acquisition Range	± 5 kHz
Input Parameters	
I/P Level Range	-45 to -70 dBm
I/P Impedance	50 Ω
I/P Return Loss	>18 dB
I/P Spectrum Selection	Normal, Inverted
Coding	
Data rate	Selectable 1200bps, 2400bps, 2700bps & 4800bps
Modulation	BPSK, QPSK
FEC	Viterbi, Rate 1/2

Satcom Portfolio - A glance

Tejas Networks (acquired Saankhya Labs in Sept 2024) is the trusted technology partner of **ISRO** (Space Applications Centre (SAC)) and have delivered and deployed a host of indigenous solutions for strategic applications over the last decade

A summary of Tejas Networks Satcom offerings (non-exhaustive list)

Vessel Tacking	Satphone as Add-on device	MSS Modems for Railways	Hub-baseband equipment	Broadcast receiver	User NMS platform	Application software
						
VTS for Coastal security & fishermen safety	Companion device for Android Smartphone	MSS Modems for Real time tracking of Trains (RTIS – Phase I)	Hub-baseband equipment for RTIS Project	Portable, low-power Sat receiver for Smart devices	Developed & hosted the NMS platform for VTS	Android Application software for VTS, Satphone & receiver
Commissioned a VTS network in Tamil Nadu ~ 3K boats ➤ 50K boats in progress	Supplied to ISRO for strategic users ➤ Can be customized to other L/S Band	2700+ Trains in operation, BEL was SI partner ➤ Phase –III opportunity under discussion	Indian Railways RTIS is running on Saankhya's hub-equipment ➤ Customizable for Sat-IoT applications	Supplied to ISRO for strategic use ➤ Can be customized to other L/S Band	The VTS network is live in Tamil Nadu state ➤ IT infra installed & commissioned by Saankhya at SDC	➤ Multi-lingual Android app enables the user to send & receive messages via the Smartphone connected to Satcom terminal over Bluetooth

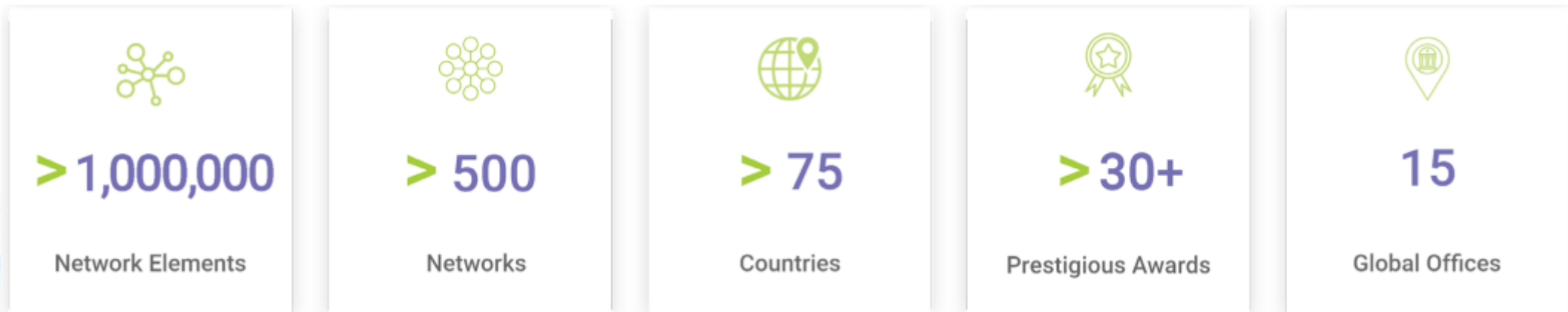
About Tejas Networks

Tejas Networks is a global broadband, optical and wireless networking company, with a focus on technology, innovation and R&D. Tejas' carrier-class products are used by telecom service providers, utilities, government, and defence networks in 75+ countries.

Tejas has an extensive portfolio of leading-edge telecom products for building end-to-end telecom networks based on the latest technologies and global standards with IPR ownership. Tejas Networks is a part of the Tata Group, with Panatone Finvest Ltd. (a subsidiary of Tata Sons Pvt. Ltd.) being the majority shareholder.

With a focus on deep technology and R&D, Tejas has a rich portfolio of patents and has shipped more than 900,000 systems across the globe. Tejas is ranked #1 in India's Optical Aggregation Market and stands among top ten players globally*.

Tejas Networks is currently the Sole supplier of 4G/5G RAN equipment for one of the largest mobile networks in the world!



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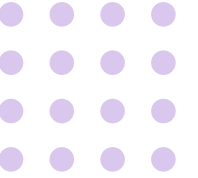
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Thank you

Q&A

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