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Submission

As a follow up to

Intervention by

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before the

Fourth Meeting for Empowered Technology Group (ETG)

Technology Advisory Group (TAG)

at PSA's Conference Hall

On matters

of

National Importance relating to Science, Technology, Innovation and R&D

'Securing and Architecting India's Digital Infrastructure'

1. BACKGROUND

A number of issues covering telecom and IT sector are shared covering policy changes that should take place in the department of telecom and other sectors like home, defence, railways, PSUs and others that make use of communication infrastructure. It is in the background of Make in India, Preferred Market Access, Domestic Design Led players, imports from China, market access not available, licensed service providers again do not buy Indian designed products though they match quality and prices, absence of national standards for telecom equipment, spectrum availability only through licensed players and they are not willing or asking prices which no one can afford, direct spectrum for private 5G networks not available directly from Government, incentives to licensed service providers in the form of reduced outgo to digital Nidhi fund supporting their buy from domestic stakeholders.

Procurement support is not a favour to startups, but a critical requirement to secure India's networks

"Technology Sovereignty: A Policy Framework for India" pitch is being made for high-impact, actionable roadmap to transition India from a services nation to a strategically autonomous "Product Nation".

Suggestion includes creation of an Inter-Ministerial Task Force to draft a unified Cabinet Note on "Securing and Architecting India's Digital Infrastructure"

2. Executive Summary: The Strategic Shift

India must transition from a technology consumer and services nation to a strategically autonomous **"Product Nation."** Securing India's digital infrastructure is no longer just an economic goal; it is a critical national security imperative.

2.1 Core Policy Issues & Market Distortions

2.1.1 The Procurement Paradox

- **Flawed Incentives:** Current regulatory frameworks do not incentivize the LSPs to deploy the domestic products.
- **The "Favor" Misconception:** Government and PSU procurement support is often treated as startup charity rather than a critical network security strategy, in spite of the fact that domestic OEMs have to match the price of L1 under the public procurement.

2.1.2 The Spectrum Bottleneck

- **Monopolised Access:** Spectrum is locked behind LSPs who either refuse to share or demand financially unviable prices.
- **Private 5G Stagnation:** The absence of direct spectrum allocation from the government halts private captive networks. Deployment of Captive private networks can unlock a new market to domestic OEMs .

It is a Rs. 10,000 Crore untapped national market and if successful can provide Global lead as India has 10+ players in 5G Radio and or Core and 77 Use Cases with multiple Consortium based players are listed in Annexure 1.

[Briefing-Paper -5G Consortium-based-Live-Trial-deployment-in-Delhi.docx](#)

Link above may be seen. Capability was established through live 5 G trails done in BSNL(MTNL's) Network in NCR using BSNL's 700 MHz Spectrum. In general coverage is available was within 1+ KMs range of the tower. In all cases, BSNL has provided its Spectrum along with Towers, power supply, infrastructure support for

housing of equipment. Other 5G equipment and add on equipment is brought in by VoICE consortium partners in each live 5G trial on their own with no financial support from BSNL or DoT or any other organisation. Voice, Data and Video calls are supported in the trial runs by following”.

- 1.VVDN CDoT, BSNL Chanakyapuri, Delhi
- 2 Lekha Wireless with Niral Networks’ Core , BSNL Minto Road
- 3 Galore Networks, BSNL, Rajendra Nagar
- 4.Tejas & TCS at Nehru Place

Based on successful trials a Revenue Share Model resulted in Galore and Lekha Wireless winning BSNL’s NCR Tender on 5G covering 2900 sites with 74% Revenue to BSNL. Before end of 2026, commercial deployment will start in Delhi NCR.

Now It is extended to Mumbai, Hyderabad, Pune and 3 more major cities in BSNL again on Revenue share.

Annexure 1 provides a list of 77 5G Private Network Use Cases where VoICE players in Consortium mode have capability to implement.

Just visualise, if Spectrum sharing is on favourable terms, actual competitive 5G deployment at remotest locations and also 5G Private Enterprise Networks could be possible. There are only 5 Global 5G players (Nokia, Ericsson, Samsung, Huawei, ZTE. This can jump from 5 to 15 if Market Access options are made available.

There are bands like 3700 to 4200 MHz band where 50 MHz allocation can be done, 5Mz on secondary usage basis can be done in mines and other industry 4.0 use cases using say 5KMs beyond railway lines and multiple players can use the spectrum on sharing basis without affecting the Licensed service providers.

- **Missing Guidelines:** Clear, commercially favourable spectrum leasing rules for telcos are completely absent.

2.1.3 Security & Sovereignty Deficits

- **The China Threat:** Ongoing reliance on Chinese imports creates massive vulnerabilities, as detailed in the DG China Study. White labelled imports still continue irrespective of the Government efforts.

<http://voiceofindiancomm.com/assets/pdf/case-study-on-telecom-imports-from-china.pdf>

Study results of almost 200 pages with actual import data with details in above link, were made available to Government.

There are multiple domestic players who can meet the domestic requirements covering around 100 items. Annex 2 carries the details. Tens of thousands Crores exports can be substituted by Indian domestic telecom industry.

- **Standardisation Void:** India lacks robust national standards for telecom equipment, allowing suboptimal or high-risk foreign hardware to enter networks. National Telecom Standards: **Establish a mandatory national framework for telecom equipment standards to ensure interoperability, security, and baseline quality.**
- **Incentivize Local Procurement:** Incentivize licensed service providers to procure a fixed percentage of domestically designed and manufactured equipment when quality and pricing match global standards.

3. Actionable Policy Recommendations & Solutions

3.1 Spectrum Liberalisation & Private 5G

- **Direct Allocation:** Allow private entities to obtain spectrum directly from DoT for captive, non-commercial 5G networks.

- **Leasing Framework:** Issue immediate spectrum leasing guidelines fixing reasonable price caps on telcos to prevent market gouging.

3.2 Financial & Procurement Re-engineering

- **Digital Nidhi Fund Incentives:** Reduce the Universal Service Obligation (USO) / Digital Nidhi Fund outgo for LSPs that meet strict quotas for Indian-designed products.
- **PPP-MII implementation:** Stricter implementation of Preferred Market Access (PMA) rules across DoT, Home, Defence, Railways, and PSUs and limitations on the exemptions granted regularly
- **Mandatory Indigenous Quotas:** Require all critical infrastructure ministries to source a baseline percentage of hardware from the Tiger Product List.

3.3 Standards & Security Architecture

- **National Telecom Standards:** Establish a mandatory Indian cryptographic and hardware standard for all communication equipment.
- **Zero-Trust Import Restrictions:** Use the DG China Study findings to enforce stricter exclusions on high-risk foreign vendors.
- **Leverage Line of credit projects to promote domestic design led manufactured products in the partner countries:** Govt. of India provides concessional credit to some countries to deploy infrastructure. This policy should lay down a plan to leverage India's experience on rural connectivity, deploying 4G/5G solutions using indigenous technology in Line of credit projects. It can help to showcase the "Make in India" at an international level.

3.4 R&D Support

- **R&D expenditure is very critical for domestic industry.** There should be a policy to incentivize R&D for IPR and patent creations thorough various measures, such as Capex subsidy. Eligible Expenditure should include Manpower Cost, Capital Investment, Software Ips & Licenses and Field Trials
- **TTDF should support R&D** of items which can be manufactured in large volumes and exported (For example Switches and DWDM for data centre deployment)
- **Design led PLI Scheme should be extended and add value addition-based incentive:** The tenure of PLI scheme has already lapsed and for DLI it will lapse in March 2027.
- PLI was good scheme to promote finished equipment manufacturing, however India should go one step further and **incentivize local value addition** through some scheme.
- DoT should **launch scheme to incentivize value addition especially electromechanical components.** It will help bring the supply chain in India.

4.. Cross-Sectoral Infrastructure Integration

Policy briefing addressing telecom issues in cross sector infrastructure integration:

4.1 Defence & Home Ministries (Internal Security)

- **China Import Ban:** Institute a strict, zero-tolerance ban on telecom, IT, and drone hardware or components originating from China to protect national security. Interests and restrict import of white labelled imports by taking strong measures.
- **Domestic Drone Infrastructure:** Mandate the use of Indian-designed secure communication links and localized software for all defense and law enforcement drone fleets.
- **Preferred Market Access (PMA):** Restrict sensitive border and internal security communication contracts exclusively to verified domestic design-led players.
- Cross-utilization of the Tiger Product List for mission-critical operations
- Secure, encrypted tactical radios and surveillance backhaul

4.2 Railways & Public Sector Undertakings (PSUs)

- **Procurement Overhaul:** Update tendering rules to eliminate legacy technical criteria that subtly disqualify domestic design-led startups and OEMs.
- **PMA Compliance:** Enforce strict accountability and penalties for PSUs that bypass Make in India mandates in favour of foreign communication infrastructure.
- **Dedicated Operational Networks:** Allocate dedicated, secure wireless spectrum for critical utility operations (railway signalling, smart grids) independent of commercial TSPs.
- **Secondary usage of 5G spectrum** 5 Kms beyond railway tracks using Indian design

4.3 Strengthen in PPP-MII Policy

- The **Class-I list of products** may be discussed with domestic industry and may be **revised and augmented every year**.
- In addition to Class 1 product list, another set of class say “**Class – 0**” **should be introduced for complex products where we have huge dependency on imports** and currently, we don’t have 3 or more domestic manufacturers meeting Local value addition of Class 1.
- We should **support such domestic manufacturers in terms of market access** who have achieved desired additional local value:
 - For the central Govt procurement covered under DPIIT PPP order, mandate that 50% of the procurement is reserved for Class-0 manufacturers.
 - Promote procurement of Class-0 products with other Govt licensees which are TSP or ISP of India. It can start with smaller percentage, say 10% and should progressively increase year after year.
 - Purchase preference for these suppliers should be increased from 20% to 40% for projects divisible in nature.

4.4 Cross-Sectoral Ecosystem (Make in India & IT)

- **Reciprocal Market Access:** Impose strict trade barriers or retaliatory tariffs on equipment from countries that block Indian telecom and IT products from entering their domestic markets.

- **Design-Led Incentives:** Expand the Product Linked Incentive (PLI) scheme to offer higher financial rewards for intellectual property (IP) created domestically, rather than just local assembly.

4.5 Mandate use of Government Digital infra (BharatNet, BSNL, Railways etc.,)

- **Utilisation of Digital infra:** mandate use of Government digital infra by Public Sector Undertakings, Central & State Government offices, Municipal Corporations and its offices, Schools, Colleges, Hospitals, etc.,
- **Digital / Smart Villages:** establish digital / Smart intelligent villages by leveraging Government's digital infra + make in India hardware & software in Consortium mode.

VOICE along with DoT had organised a Workshop on 5G intelligent Villages on 10th July 2024 along with DoT. This led for first Smart Intelligent Village at Satnavari on 24 August 2025 and Samridh Gram at Guna in March 2026 Samridh Gram has won a WSIS Award in this week itself).

voiceofindiancomm.com/assets/pdf/A-Workshop-on-Designing-5G-Intelligent-Villages1.pdf

Satnavari Consortium based implementation, first Global implementation based on ITU-T-Y.4218 Recommendation, is with 25 VOICE players in CONSORTIUM mode and got global attention from UK, EU, USA, ITU and VOICE on the strength of this implementation has MoUs with TSDSI, CDoT, UK India Future Technology Initiatives, IIT Gandhinagar and some more are in pipeline like Bharat 6G Alliance.

- Digital Bharat Nidhi should be utilised for this purpose since this initiative has power to transformation rural communities, leading to increase in rural and thus national GDP.

4.6 Visualise 'Fully Indian Designed Drones' with no China chips, subsystems and components/ sub-components. It is achievable in 18 months' time with CONSORTIUM based approach.

A Consortium from VOICE & ISPIRT based initiative is heading towards part success for a Fully Indian Designed Drones with no China control/ parts/chips.

Drone is split into 98 subsystems, components/ and sub-components under categorization of drone subsystems, including flight control, propulsion, energy, airframes, communication systems, payloads, ground control systems, launch and recovery systems. Subsystems include flight processing, positioning sensors, location guidance, propulsion motors, power electronics, batteries, hybrid fuel systems, jet engines, and reciprocating engines.

Almost 84 out of 98 are either already available or can be ready in 6 to 12 months and/ or can be done with RDI funding support.

Already 19 domestic design led players participated in a meeting on 4th July 2026 at Noida and next are meeting in Bengaluru on 25th July 2026 which can be attended by PSA's officials also.

But present RDI Scheme does not support CONSORTIUM and policy correction is required. Any technology transfer will bring in at least 2/3-year-old technology. Future proof technology can be done within the country. For example, Low Orbit Satellite constellation can be a new option and issues of line of sight can be avoided.

4.7 Product design

Product design should be recognised as system-level ownership of the product, including architecture, hardware, firmware, software, cybersecurity, source code and upgradeability, rather than being limited to component design alone. Such recognition will help build true domestic technology capability and prevent assembly from being misclassified as deep value addition.

4.8 Infrastructure Issues

Passive infra gets secondary treatment and considered to remain as the cheapest within the gamut of Telecom Infra, notwithstanding the importance of safety through life cycle, scalability-readiness, refined engineering and innovations, skyline aesthetics, environmental sustainability, professional work practices Research in and Utilization of Alternative Structural Materials in achieving weight-to-strength advantage and beauty of structural architecture (example carbon fibre and nanotechnology), Reduction in Logistics and related transportation issues, Promoting Multi-Utility Applications and many such gains that shall set aside India's projection as being a Highly Progressive, Technology Driven, Modern Country

4.9 Strategic Imperatives & Procurement Reform

4.9.1. Why the Sector is Crucial

Because it connects!

- **Industry Integration:** There are industry verticals and horizontals that need to be knitted at a platform level.
- **Ecosystem Entry:** Verified, certified, secure, innovative, and indigenous products need to enter the ecosystem seamlessly.
- **Sustained Traction:** These products require consistent attention and traction.

4.9.2. Tender Reform

Centralized Credentials: Profiles and credentials should be built in a central database to avoid repetition.

Value-Based Qualification: Qualification is more important than cost; prioritize this over L1 pricing for startups and innovators.

4.10 Insurance to absorb R&D and Operational Risks for Domestic Market Access Support

China leverages state-backed science and technology (sci-tech) insurance to absorb R&D and operational risks, shielding local players and systematically blocking foreign competitors from the domestic telecom market.

For Indian policymakers looking to augment the [DoT Design-Led Telecom PLI Scheme](#) or the MeitY Design Linked Incentive (DLI) Scheme, China's approach offers a structural blueprint. While India currently incentivizes output through capital subsidies and incremental sales rewards, China underwrites the *risk of failure*

The core mechanisms in China is summarized for a policy-level briefing.

1. Dual-Track Risk Mitigation Framework

China separates its insurance strategies by the maturation stage of the telecom stack to optimize fund utilization:

- **Hardware Components (Upstream R&D):** Targeted via "New Material & Core Component" Insurance. It absorbs up to 80% of losses resulting from trial batch failures, low wafer yields, or "tape-out" resets for advanced chips (e.g., GaN or high-frequency RF modules). This allows domestic fabless design houses to iterate rapidly without risking bankruptcy.
- **Macro Infrastructure (Downstream Deployment):** Governed by the "First-Set" Major Technical Equipment Insurance. When a state telecom carrier deploys unproven local hardware (e.g., 5G-Advanced base stations, optical switches), the state insurer covers up to 80% of financial liabilities arising from network blackouts, quality defects, or downtime.

2. The Premium Subsidy Engine (Market Activation)

To eliminate a carrier's natural hesitation to purchase unproven domestic hardware over reliable global alternatives (like Ericsson or Nokia), the Chinese central government subsidizes 70% to 80% of the insurance

premium directly. This effectively neutralizes the historical reliability advantage of foreign competitors by making local equipment entirely indemnified against failure by the state.

3. Comprehensive Legal and Operational Indemnity

- **Geopolitical & Intellectual Property Insulation:** Policies bundle IP litigation protection. If an international patent holder sues a domestic hardware vendor over Standard-Essential Patents (SEPs), the state-backed pool covers legal defense fees and fully indemnifies forced domestic-redesign costs.
- **Cybersecurity Bundling:** Liability pools are mandated for systems interfacing with critical infrastructure. By bundling data breach insurance directly into local public procurement bids (like smart city grids), foreign vendors who cannot access state-indemnified pools are systematically shut out).

Policy Recommendations for India

If the Department of Telecommunications (DoT) or MeitY intends to introduce a parallel financial framework to boost Indian players, the following modifications to existing policy are recommended:

1. **Introduce a "First-Set" Telecom Insurance Scheme:** Instead of relying solely on capital subsidies, India should partner with domestic insurers (like GIC Re or New India Assurance) to offer premium-subsidized operational liability insurance for domestic telecom service providers (like BSNL) when deploying homegrown 4G/5G technology stacks.
2. **Establish a Sovereign IP Defense Fund:** Protect Indian design-led startups from international patent litigation trolls by bundling IP defense insurance into the existing [Design Linked Incentive \(DLI\) scheme guidelines](#).
3. **Tie Insurance to Trusted Source Mandates:** Leverage India's existing "Trusted Telecom Portal" directives to establish strict source-code audits and BOM depth validation, making insurance subsidies exclusive to authentic domestic innovations rather than outsourced assembly lines.

5. Implementation Vehicle: The Cabinet Note

To turn these high-impact pitches into immediate administrative action, India requires a unified governance structure.

5.1 Inter-Ministerial Task Force (IMTF)

- **Leadership:**
- **Members**
- **Deliverable:** Draft a comprehensive, unified Cabinet Note titled "Securing and Architecting India's Digital Infrastructure."

5.2 Decisions Requested from Government: Actionable requests:

1. **Constitute the Inter-Ministerial Task Force.**
2. **Initiate a Cabinet Note on "Securing and Architecting India's Digital Infrastructure."**
3. **Notify a policy enabling direct or simplified access to spectrum for eligible private captive 5G networks and innovation use cases.**
4. **Issue spectrum leasing guidelines that are commercially viable and technology-neutral.**

5. Strengthen procurement policies by incorporating security, domestic design, lifecycle value, and innovation alongside price.
6. Operationalize incentives for licensed service providers to procure domestically designed telecom products, including calibrated reductions in Digital Nidhi obligations where appropriate.
7. Develop a National Trusted Telecom Standards and Certification Roadmap aligned with Indian requirements.
8. Launch flagship pilot deployments of indigenous telecom products across defence, railways, ports, airports, mining, utilities, smart cities, and public safety agencies.
9. Prepare a National Telecom Product and Technology Sovereignty Roadmap with defined milestones to 2035.
10. Establish an annual review mechanism to monitor implementation across ministries.

This approach allows a cohesive national strategy centered on technology sovereignty, trusted digital infrastructure, industrial competitiveness, and coordinated inter-ministerial action. It also provides a practical governance mechanism—a dedicated task force and Cabinet process—to translate policy recommendations into implementation.

ANNEX 1

Multiple Domestic Users who can support 5G Private Enterprise Networks (Rs. 10,000 Cr Annual Market)

1	2.1`	2.2	3	4	5
5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases
AI & AUTOMATION TOOLS	ARMED FORCES	ARMED FORCES	AUTOMATED VEHICLES	BANKING and FINANCIAL SERVICES	Bharatnet End to End Solutions
CIS	Arkin Labs	Niral	Astromer	Chipspirit Technologies	Cloud Photonix
Easiofy Solutions	BigCat Wireless	QNu Labs	Bharat Pi	Cosgrid	Cosgrid
EverestIMS	Chipspirit Technologies	Sensegiz Technologies	BigCat Wireless	dezynForge	GALORE
Innogle	Coral Telecom	Sensorise	DezynForge	EverestIMS	HFCL
ITECGAIN Solutions	Cosgrid	Signalchip Innovations	Dussat Global Technologies	Finaara Technologies	Infinity Labs
Nav Wireless Technologies	dezynForge	Signaltron Systems	Innominds	Indio Networks	Innominds
RASA Technologies	Dussat Global Technologies	SMPS ELECTRIC	Nav Wireless Technologies	Infinity Labs	Insta Solutions ICT
STL	EverestIMS	SPARSH	QNu Labs	Lepton	ITECGAIN Solutions
Syook	GALORE	STL	Sensorise	Nav Wireless Technologies	ITECGAIN Solutions
	Indio Networks	Superceuticals	Signalchip Innovations	QNu Labs	ITI Ltd
	ITECGAIN Solutions	Susan Future Technologies	Signaltron Systems	Sensorise	Lekha Wireless
	ITI Ltd	TCS	SMPS ELECTRIC	SPARSH	Lepton
	Lekha Wireless	Techphosis	SPARSH	XTEN Networks	Nav Wireless Technologies
	Lepton	Tidal Wave	STL		Niral
	Menthosa Solutions	Vasbeam			Sensorise
	LinkeZ Tech	VVDN			SMPS ELECTRIC
	Nav Wireless Technologies	XTEN Networks			SPARSH
					STL
					Superceuticals
					TCS
					TEJAS
					Tidal Wave
					VVDN
					XTEN Networks

6.1	6.2	7	8	9	10
5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases
BORDER AREA COMMUNICATION	BORDER AREA COMMUNICATION	BROADCAST NETWORKS	CAMPUS Cellular Blanket Coverage	CCTV Systems	Construction Sites
Astrome	Sensorise	Astrome	dezynForge	Insta ICT Solutions	Arkin Labs
Coral Telecom	Signalchip Innovations	BigCat Wireless	Dussat Global Technologies	ITI Ltd	Indio Networks
DezynForge	Signaltron Systems	EverestIMS	GALORE	Nirbhaya	Innominds
Dussat Global Technologies	SMPS ELECTRIC	ITI Ltd	HFCL	Sensorise	Lepton
GALORE	SPARSH	Lekha Wireless	Insta ICT Solutions	SPARSH	SPARSH
HFCL	STL	Lepton	ITECGAIN Solutions	STL	Sensorise
Innogle	Susan Future Technologies	Nav Wireless Technologies	ITI Ltd		Susan Future Technologies
ITECGAIN Solutions	TCS	QNu Labs	Lekha Wireless		
ITI Ltd	Techphosis	Signalchip Innovations	Lepton		
Lekha Wireless	TEJAS	Signaltron Systems	Niral		
Lepton	Tidal Wave	SMPS ELECTRIC	Priyaraja Electronics		
Nav Wireless Technologies	UTL	SPARSH	Sensorise		
Niral	VVDN	Tejas	Signalchip Innovations		
Pantherun Technologies			Signaltron Systems		
Priyaraja Electronics			SMPS ELECTRIC		
QNu Labs			SPARSH		
Resonous			STL		
			Susan Future Technologies		
			TCS		
			TEJAS		
			Tidal Wave		
			UTL		
			VVDN		

11	12	13	14	15	16
5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases
Controlled internet access for students	CROWD MANAGEMENT	DIGITAL TWIN	DISASTER MANAGEMENT	DRONE COMMUNICATION	DRONE Communication, MONITORING & INSPECTIONS
Astrome	Arkin Labs	Innogle	Arkin Labs	Arkin Labs	Arkin Labs
Cosgrid	Astrome	Lepton	Coral Telecom	Dussat Global Technologies	BigCat Wireless
Indio Networks	Coral Telecom	STL	Dussat Global Technologies	Insta ICT Solutions	Dussat Global Technologies
Insta ICT Solutions	Dussat Global Technologies	Susan Future Technologies	HFCL	Lekha Wireless	Innogle
ITECGAIN Solutions	Insta ICT Solutions	Syook	Indio Networks	Lepton	Insta ICT Solutions
ITI Ltd	ITECGAIN Solutions		Innogle	Nav Wireless Technologies	Lekha Wireless
Nav Wireless Technologies	Lepton		Innominds	Pantherun Technologies	Lepton
Sensorise	Menthosa Solutions		Lekha Wireless	QNu Labs	Menthosa Solutions
SPARSH	SPARSH		Menthosa Solutions	Sensorise	Nav Wireless Technologies
	STL		Lepton	Signalchip Innovations	Sensorise
	Susan Future Technologies		Mangalcare Systems	Signaltron Systems	Signalchip Innovations
			NAV Wireless Technologies	STL	Signaltron Systems
			SENSORISE	Susan Future Technologies	SPARSH
			Signalchip Innovations	Techphosis	STL
			Signaltron Systems	Vasbeam	Susan Future Technologies
			SPARSH		Techphosis
			STL		
			Superceuticals		
			Susan Future Technologies		
			Techphosis		
			TEJAS		
			UTL		
			VVDN		

17	18	19	20	21	22
5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases
EDGE COMPUTING	EDUCATION FACILITIES & 5G LABS	Encryption, Secured Networks	ENTERTAINMENT	Fleet tracking	Healthcare
BigCat Wireless	Astrome	Astrome	BigCat Wireless	Bharat Pi	BKK Aggregates
Cosgrid	CLTS	Chipspirit Technologies	Sensorise	Innominds	Dussat Global Technologies
Innominds	Coral Telecom	Cosgrid	SPARSH	Lepton	Easiofy Solutions
Insta ICT Solutions	Indio Networks	Indio Networks		Sensegiz Technologies	Insta ICT Solutions
ITECGAIN Solutions	Infinity Labs	Infinity Labs		Sensorise	Lepton
Niral Networks	Innominds	Insta ICT Solutions		SPARSH	Lynk AmbuPod
SPARSH	iSignal Research Labs	ITECGAIN Solutions		STL	Mangalcare Systems
STL	ITECGAIN Solutions	ITI Ltd		Syook	Sensorise
WiSig Networks	Lekha Wireless	Lekha Wireless			Superceuticals
XTEN Networks	Resonous	Nav Wireless Technologies			Syook
	SENSORISE	Pantherun Technologies			
	Signalchip Innovations	QNu Labs			
	Signaltron Systems	Scytale Alpha			
	SMPS ELECTRIC	Signalchip Innovations			
	SPARSH	Signaltron Systems			
	Techno learn	Skytale Alpha			
	Techphosis	SPARSH			
	XTEN Networks	STL			
		XTEN Networks			

23	24	25	26	27	28
5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases
INDOOR & Outdoor FARM MONITORING	Indoor and Outdoor High-Speed Network Access EDUCATION/ TOWNSHIPS/ SOCIETIES/ FACTORIES	Infrastructure Monitoring with IoT sensors	Intelligent Villages	Internet connectivity to legacy machines	Inventory management and capacity planning
BigCat Wireless	Astrome	Astrome	Arkin Labs	BigCat Wireless	Astrome
Innogle	Indio Networks	Chipspirit Technologies	Dussat Global Technologies	Indio Networks	EverestIMS
Insta ICT Solutions	Insta ICT Solutions	EverestIMS	ECIL	Insta ICT Solutions	Lepton
INVAS Technologies	ITECGAIN Solutions	Indio Networks	GALORE	Lekha Wireless	Linkez Tech
Lepton	ITI Ltd	Innogle	HFCL	Nav Wireless Technologies	Sensorise
Sensorise	Lekha Wireless	Innominds	Insta ICT Solutions	Techphosis	Signaltron Systems
SPARSH	Lepton	Insta ICT Solutions	IoTAS	XTEN Networks	SPARSH
STL	Sensorise	ITECGAIN Solutions	ITEGAIN Solutions		STL
Susan Future Technologies	Signalchip Innovations	ITI Ltd	ITI		
Syook	Signaltron Systems	Lekha Wireless	LEKHA WIRELESS		
Techphosis	SPARSH	Lepton	Lepton		
	STL	Sensegiz Technologies	Mangalcare Systems		
	Susan Future Technologies	Sensorise	Redmango Analytics		
	XTEN Networks	Signalchip Innovations	Resonous		
		Signaltron	Sensegiz Technologies		
		SMPS ELECTRIC	SENSORISE		
		SPARSH	Signaltron		
		STL	SMPS ELECTRIC		
		Susan Future Technologies	STL		
		Syook	Syook		
		XTEN Networks	TCIL		
			TCS		
			Techphosis		
			UTL		

29	30	31	32	33.1	33.2
5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases
IoT sensors to track classroom attendance, study room availability	LIVE VIEWS & BROADCASTING	Location tracking of life-saving Missions & equipment	Management of Hospital machines, drugs, supplies, and medical waste	MINING	MINING
Lekha Wireless	Insta ICT Solutions	Arkin Labs	BigCat Wireless	ArkinLabs	SPARSH
Sensegiz Technologies	Nav Wireless Technologies	Bharat Pi	Dussat Global Technologies	Coral Telecom	STL
SPARSH	SPARSH	Innogle	Mangalcare Systems	Galore	Susan Future Technologies
Syook	Susan Future Technologies	Innominds	Sensorise	IISM Dhanbad	Syook
		ITECGAIN Solutions	SPARSH	IIT Dhanbad (TEXMIN)	TechPhosis
		Lepton		Infinity Labs	Telelearn Flo Mobility
		Mangalcare Systems		IoTAS	Telemart
		Nav Wireless Technologies		ITECGAIN Solutions	VVDN
		Sensorise		ITI Ltd	
		Signalchip Innovations		Lekha Wireless	
		Signaltron Systems		Lepton	
		SPARSH		LivnSense	
		STL		Matrecom	
		Susan Future Technologies		Menthosa	
		Syook		NIRAL NETWORKS	
		Techphosis		Optimus Logic	
				Resonous	
				Sanchar Tele Systems	
				Sensegiz	
				Sensorise	
				Signalchip Innovations	
				Signaltron Systems	
				SMPS Electric Control	

34	35	36	37	38	39	40
5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases
NANO SATELLITES 5G IOT	NETWORK IN A 5G BOX	OCEAN & Water Ways communication	OIL AND GAS sector	POLICE COMMUNICATION NETWORKS	POWER Sector	Proactive & Preventive maintenance through IoT sensors
Astrome	Astrome	Innogle	Infinity Labs	Chipspirit Technologies	Arkin Labs	Indio Networks
Innominds	Coral Telecom	Lepton	Innogle	Coral Telecom	dezynForge	Innominds
Lekha Wireless	Dussat Global Technologies	Susan Future Technologies	Insta ICT Solutions	DezynForge	Indio Networks	Insta ICT Solutions
Susan Future Technologies	GALORE		ITECGAIN Solutions	Dussat Global Technologies	Infinity Labs	ITECGAIN Solutions
	Infinity Labs		Leakh Wireless	Infinity Labs	Insta ICT Solutions	Lepton
	Innominds		Lekha Wireless	Insta ICT Solutions	ITECGAIN Solutions	Sensegiz Technologies
	iSignal Research		Lepton	ITECGAIN Solutions	Lekha Wireless	SPARSH
	ITECGAIN Solutions		QNu Labs	Lekha Wireless	Lepton	STL
	Lekha Wireless		Resonous	Lepton	QNu Labs	Syook
	Linkez Tech		Sensorise	QNu Labs	Resonous	
	Nav Wireless Technologies		SMPS ELECTRIC	Resonous	Sensegiz Technologies	
	Niral		SPARSH	Sensegiz Technologies	Sensorise	
	Priyaraja Electronics		STL	Sensorise	SMPS ELECTRIC	
	Resonous		Susan Future Technologies	Signalchip Innovations	SPARSH	
	Signalchip Innovations		Syook	Signaltron Systems	STL	
	Signaltron Systems			SPARSH	Syook	
	TCS			STL		
	Techno learn			Susan Future Technologies		
	Techphosis			Techphosis		
	Tidal Wave			XTEN Networks		
	UTL					
	VVDN					
	WiSig Networks					

41	42	43	44	45	46	47
5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases
POWER Sector	Proactive & Preventive maintenance through IoT sensors	PUBLIC TRANSPORT	Quantum Communication	RAILWAYS 4G	RAILWAYS 5G	Real-time weather, traffic,safety updates to vehicles route
dezynForge	Indio Networks	Bharat Pi	Astrome	Coral Telecom	Astrome	Astrome
Indio Networks	Innominds	Insta ICT Solutions	dezynForge	Cosgrid	Coral Telecom	Lepton
Infinity Labs	Insta ICT Solutions	Lepton	Infinity Labs	EverestIMS	Cosgrid	Nav Wireless Technologies
ITECGAIN Solutions	ITECGAIN Solutions	Sensorise	ITECGAIN Solutions	Galore	EverestIMS	Sensegiz Technologies
Resonous	Lepton	SPARSH	QNu Labs	ITI Ltd	Galore	Sensorise
STL	Sensegiz Technologies	Susan Future Technologies		Lekha Wireless	Insta ICT Solutions	SPARSH
Sensorise	Signaltron Systems			Lepton	ITECGAIN Solutions	Susan Future Technologies
Tejas	SPARSH			Nav Wireless Technologies	ITI Ltd	
	SPARSH			Niral Networks	Lekha Wireless	
	STL			Resonous	Lepton	
	Susan Future Technologies			Resonous	Linkez Tech	
	Syook			Sensorise	Nav Wireless Technologies	
	WiSig Networks			Signalchip Innovations	Niral Networks	
				Signaltron Systems	Resonous	
				SMPS ELECTRIC	Sensorise	
				SPARSH	Signalchip Innovations	
				STL	Signaltron Systems	
				Superceuticals	SMPS ELECTRIC	
				TCS	SPARSH	
				Techphosis	STL	
				Tejas	Superceuticals	
				TidalWave	TCS	
				VVDN	Techphosis	
				WiSig	Tejas	
					TidalWave	
					Vasbeam	
					VVDN	
					WiSig Networks	

48	49	50	51	52	53	54	55
5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases
Research 6G	ROBOT Remote Controlling	Safe retrieval of stolen vehicles	Secure and controlled internet access for residents	Secure and reliable guest access	Secure cross-campus service for both staff and patients	Securely segment staff and students networks	SMART AGRICULTURE
Dussat Global Technologies	BigCat Wireless	Bharat Pi	Chipspirit Technologies	Indio Netwoprks	Indio Networks	Indio Networks	Dussat Global Technologies
Innogle	Dussat Global Technologies	Sensegiz Technologies	Indio Networks	Insta ICT Solutions	Insta ICT Solutions	QNu Labs	IARC
iSignal Research	Innominds	Sensorise	Insta ICT Solutions	Nav Wireless Technologies	Mangalcare Systems	XTEN Networks	Insta ICT Solutions
Lekha Wireless	Pantherun Technologies	Sparsh	QNu Labs	Sparsh	Nav Wireless Technologies		Invas Technologies
Nav Wireless Technologies	Sensorise		Sensegiz Technologies		Sparsh		Iotas
Resonous	SPARSH		Taqbit				ITECGAIN Solutions
Sensorise							Lepton
SMPS ELECTRIC							Sensegiz Technologies
Techphosis							Sensorise
Tejas							SMPS ELECTRIC
WiSig Networks							SPARSH
							STL
							Susan Future Technologies

56	57	58	59	60	61	62
5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases
Smart Aquaculture	Smart Animal Husbandary	Smart Battery & Power	SMART EDUCATION	SMART ENERGY	SMART FACTORIES	Smart Healthcare
IARC	IARC	Greenfield Energy	Astrome	Astrome	Astrome	Mangalcare System (Linkedcare Group)
Innogle	Insta ICT Solutions	Greenzo Energy	CLTS	Lepton	Chipspirit Technologies	Superceuticals
Iotas	Iotas	Sanvaru Technologies	Edufront	Priyaraja Electronics	Insta ICT Solutions	Sensorise
Invas Technologies	Sensegiz Technologies	Sensorise	Innogle	Sensorise	Linkez Tech	STL
Sensorise	Sensorise	SMPS ELECTRIC	ITI Ltd	SMPS ELECTRIC	Sensorise	Lepton
		UTL	ITECGAIN Solutions	SPARSH	SMPS ELECTRIC	
			Lepton	STL	SPARSH	
			Mangalcare Systems	UTL	STL	
			Priyaraja Electronics	XTEN Networks	Susan Future Technologies	
			PROBIT Education		XTEN Networks	
			Sensorise			
			SPARSH			
			Susan Future Technologies			
			Techno learn			
			UTL			

63	64	65	66	67	68	69	70
5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases
SMART HOMES	SMART LIGHTING	SMART HOMES	SMART METRO NETWORK	SMART RAILWAY NETWORK	SMART REFINERY	SMART STEEL PLANTS	SMART TOURISM
Astrome	Insta ICT Solutions	Insta ICT Solutions	Astrome	Astrome	Astrome	GALORE	Dussat Global
Insta ICT Solutions	ITECGAIN Solutions	Lepton	Coral Telecom	Coral Telecom	Chipspirit Technologies	INSTA ICT Solutions	Finaara
Nav Wireless Technologies	Nav Wireless Technologies	Nav Wireless Technologies	Finaara	Finaara	Insta ICT Solutions	ITECGAIN Solutions	INSTA ICT Solutions
Sensorise	Sensorise	Sensorise	Insta ICT Solutions	INSTA ICT Solutions	ITECGAIN Solutions	LEKHA WIRELESS	Lepton
Sensegiz Technologies	SMPS ELECTRIC	SPARSH	ITECGAIN SOLUTIONS	ITECGAIN Solutions	Lekha Wireless	Lekha Wireless	Sensegiz Technologies
SMPS ELECTRIC	SPARSH		Lekha Wireless	Lekha Wireless	Sensegiz Technologies	NIRAL	Sensorise
SPARSH	STL		Lepton	Lepton	Sensorise	Sensegiz Technologies	SPARSH
			Pantherun Technologies	Pantherun Technologies	SMPS ELECTRIC	Sensorise	
			Sensorise	Resonous	SPARSH	SMPS ELECTRIC	
			Signalchip Innovations	Sensorise	STL	SPARSH	
			Signaltron Systems	Signalchip Innovations	Susan Future Technologies	STL	
			SMPS ELECTRIC	Signaltron Systems	Techphosis	Techphosiis	
			SPARSH	SMPS ELECTRIC			
			STL	SPARSH			
			Techphosis	STL			
				Techphosiis			

71	72	73	74	75	76	77
5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases	5G Use Cases
SMART TRAFFIC MANAGEMENT	SMART TRANSPORTATION	Standardisation, Test Facilities	Time-stamping : Shipped Received Products	VEHICLE MOUNTED 5G COMMUNICATION NETWORK	Vehicle-to-vehicle communication	Video surveillance and traffic cameras
Lepton	Astrome	Sensorise	Sensorise	Bharat Pi	Bharat Pi	Dussat Global Technologies
Sensorise	INSTA Solutions ICT	SPARSH	SPARSH	Coral Telecom	Coral Telecom	Innominds
SMPS ELECTRIC	Lepton			Dussat Global Technologies	Dussat Global Technologies	Sensorise
SPARSH	Nav Wireless Technologies			Innogle	Innogle	SPARSH
STL	Pantherun Technologies			Innominds	Lekha Wireless	STL
Susan Future Technologies	Sensegiz Technologies			ITECGAIN Solutions	Lepton	Susan Future Technologies
	Sensorise			Lekha Wireless	NAV Wireless Technologies	Techphosiis
	SPARSH			Lepton	QNu Labs	
	STL			Nav Wireless Technologies	Sensorise	
	Susan Future Technologies			Sensorise		
				Signalchip Innovations		
				Signaltron Systems		
				SPARSH		
				SPARSH		
				STL		
				Techphosiis		

ANNEX 2

VoICE have strength to replace CHINESE and other MNC Imports and truly Atma Nirbhar Bharat is possible if MARKET ACCESS is provided. Licenses Service Providers can be compensated if they use domestic designed products and they can be compensated through reduction in their annual payments to Government

Telecommunication Products		
Product Category	Proposed sub-categories / details	Company details including website, contact details
1. Encryption/ UTM platforms (TDM and IP) (Unified threat management)	1.1 TDM	1. BEL 2. Infinity Labs Ltd. 3. ECIL 4. CDOT and its licensees 5. ITI 6. Quickheal (Seqrite), 7 Tejas Networks, 8. Nivetti Systems 9. Inventum Technologies
1. Encryption/ UTM platforms (TDM and IP) (Unified threat management)	1.2 IP	1. BEL 2. Infinity Labs Ltd. 3. CDOT and its licensees 4. ITI 5. Tejas Networks, 6. Inventum Technologies
2. IP/ MPLS Core routers/ Edge/Aggregation/ Enterprise Router	2.1 Enterprise class IP Edge, Aggregation & Core Routers for Data Centre / Head Quarter / Regional HQ / Branch	1. Nivetti 2. CDOT ToT: BEL BLR, ECIL, ITI BLR, BEL-KOT 3. Inventum Technologies 4. HFCL 5. Tejas Networks 6. Lavelle Networks 7. MRO Tek 8. United Telecom (UTL) 9. Infinity Labs 10. Niral
2. IP/ MPLS Core routers/ Edge/Aggregation/ Enterprise Router	2.2 Cell Site Router (CSR); Carrier class Aggregation / Core / Backbone Routers (<= 4.8 Tbps) including virtual routers	1. Tejas Networks 2. Nivetti Systems 3. CDOT ToT: BEL BLR , BEL KOT, ECIL, ITI BLR 4. HFCL 5. United Telecom (UTL) 6. Niral 7. Inventum
2. IP/ MPLS Core routers/ Edge/Aggregation/ Enterprise Router	2.3 Internet backbone Routers (with support for full internet routing table) or Backbone Super Core Router or Service Peering Router (> 4.8 Tbps); Carrier grade	1. Inventum 2. CDOT and its Licensees
2. IP/ MPLS Core routers/ Edge/Aggregation/ Enterprise Router	2.4 Carrier grade B-RAS	1. CDOT and its Licensees 2. Inventum Technologies 3. United Telecom (UTL)
2. IP/ MPLS Core routers/ Edge/Aggregation/ Enterprise Router	2.5 SD-WAN Routers (SDN Category) Home / Enterprise - Core / Branch routers (<= 1 Gbps)	1. Lavelle Networks 2. Nubewell 3. Arakya 4. Tejas Networks 5. Nivetti Systems 6. Indio Networks 7. Infinity Labs 8. Inventum Technologies 9. HFCL 10. United Telecom (UTL)
3. Managed Leased line Network equipment - N*64 Kbps	3.1 Managed Leased line Network equipment	1. Priamatel 2. Tejas Networks 3. ITI 4. CDOT and its Licensees
3. Managed Leased line Network equipment - N*64 Kbps	3.2. IP Diversity Splitter and Combiner, Network Accelerator	1. BEL 2. ITI
4. Ethernet Switches (L2 and L3)	4.1 L2/L3 – 1-100 GbE interface Switches (Metro and Enterprise) (stackable / standalones / modular switches), for Core / Distribution / Access Layers (including PoE/PoE+)	1. Tejas Networks 2. Nivetti Systems 3. CDOT ToT: BEL 4. Primatel 5. MRO Tek 6. HFCL 7. United Telecom (UTL)

4. Ethernet Switches (L2 and L3)	4.2 Layer L2/L3 <u>>100GbE</u> –Core Switches, Enterprise / Carrier grade	1. Tejas Networks 2. Nivetti Systems 3. CDOT ToT: BEL 4. Primatel 5. HFC 6. United Telecom (UTL)
4. Ethernet Switches (L2 and L3)	4.3 Industrial / Carrier Grade LAN 1, 10 GbE PoE/ PoE+/ Non-PoE Switches (Power over Ethernet)	1. Tejas Networks 2. Nivetti Systems 3. CDOT ToT: BEL 4. Sands India 5. MRO Tek 6. HFCL 7. Indio Networks 8. United Telecom (UTL) 9. VVDN Technologies
5. IP based Soft Switches, IMS, Unified Communication Systems	5.1 IP based Soft Switches, IMS, Unified Communication Systems: Enterprise class	1. Coral Telecom 2. Accord Communications 3. NXG (Nexge Technologies Ltd.) 4. Elcom Innovations 5. Matrix Comsec. 6. AstTech 7. CDOT ToT: BEL
5. IP based Soft Switches, IMS, Unified Communication Systems	5.2 IP based Soft Switches, IMS, Unified Communication Systems: Carrier class	1. Sterlite 2. NXG (Nexge Technologies Ltd.) 3. CDOT 4. BEL
6.1 Wireline PABXs / IP PBX	6.1 Wireline PABXs / IP PBX	1. Coral Telecom 2. Astech 3. Accord Communications 4. Matrix Comsec 5. Dialtronics 6. DSP Works
6.2 Media Gateways	6.2.1 Media Gateways: Enterprise class	1. Coral Telecom 2. Dialtronics Systems 3. Matrix Comsec 4. Sangoma 5. AstTech 6. Vihaas Design Technologies 7. Elcom Innovation 8. CDOT 9. BEL
6.2 Media Gateways	6.2.2 Media Gateways: Carrier Class	1. CDOT 2. BEL
7.1 CPE (including Wi-Fi Access points and Routers, Media Converters),	7.1.1 CPE (including Wi-Fi Access points and Routers	1. CDOT ToT: KAYNES 2. CDOT ToT: CYIENT 3. CDOT ECIL 4. CDOT ITI 5. HFCL 6. SandsIndia 7. Digisol 8. CDOT ToT: BEL 9.SCTPL 10. CDOT ToT: United Telecom (UTL) 11. HFCL 12. COMINT 13. Tarangg 12. Elcom 13. Agressive 14. CDOT ToT RCV 14. CDOT ToT: System Control 15. CDOT ToT: RCV 16. Primatel 17. Kenstel Networks 17. VVDN Technologies 18. Kirat Communication 19. Infinity Labs 20. WiSig
7.1 CPE (including Wi-Fi Access points and Routers, Media Converters),	7.1.2 Media converter	1. MATRIX COMSEC PVT. 2. Primatel 3. United Telecom (UTL) 4. MRO-Tek 5. CDOT 6. BEL 7. HFCL
7.1 CPE (including Wi-Fi Access points and Routers, Media Converters),	7.1.3 TDM over IP Converter	1. Matrix Comsec 2. Primatel 3. BEL 4. Dialtronics
7.2 2G/ 3G/ 4G LTE/5G Modems	7.2.1 2G/ 3G/ 4G LTE Modems	1. Matrix Comsec. 2. VVDN Technologies 3. CDOT 4. BEL 5. Indio Networks 6. United Telecom (UTL) 7. Makers Village Cavli Wireless 8. Vista
7.2 2G/ 3G/ 4G LTE/5G Modems	7.2.2 5G Modems	1. WiSig 2. HFCL 3. VVDN Technologies
7.3 Leased-line Modems n* 2Mbps		1. Primatel 2. Tejas Networks 3. MRO Tek 4. CDOT 5. Sands India
7.4 NFV/ SDN CPE	All configurations of Cloud / Software Routers and Switches with SDN Controllers	1. Nubewell 2. Lavelle Networks 3. Tejas Networks 4. MRO Tech 5. Vilankini 6. Nivetti Systems 7. CDOT 8. Infinity Labs 9. Inventum Labs 10.United Telecom (UTL) 11. VVDN Technologies

8. Set-Top Boxes	8.1 SD Set-Top Boxes (Standard Definition)	HFCL
8. Set-Top Boxes	8.2 HD Set-Top Boxes (High Definition) & Hybrid (RF and Ethernet tuners) Set Top Boxes and Android Set Top Boxes	1. CDOT 2. My Box Tech 3. United Telecom (UTL) 4. Catvision 5. Exza Infosystem 6. Valankani Group 9. MCBS
9.1 SDH/ NG-SDH	9.1 SDH/ NG-SDH (STM 1/4/16/64)	1. CDOT 2. FIBCOM 3. Primatel 4. Tejas Networks 5. ITI
9.2 Carrier Ethernet/MPLS- TP/ Packet Optical Transport equipment/ PTN systems	9.2 Carrier Ethernet/MPLS- TP/ Packet Optical Transport equipment/ PTN (with or without OTN interfaces) systems	1. CDOT 2. FIBCOM 3. Primatel 4. Tejas Networks 5. United Telecom (UTL)
10. DWDM/ CWDM systems	10.1 CWDM (Nx100G, Nx10G)	1. Tejas Networks 2. United Telecom (UTL) 3. Fibcom
10. DWDM/ CWDM systems	10.2 DWDM (Nx10G, Nx100G+ Channels) with Mux/De MUX with Transponder / Muxponder; ROADM (Reconfigurable Optical Add Drop Multiplexer), Passive DWDM MUX/DeMUX	1. Tejas Networks 2. United Telecom (UTL) 3. CDOT 4. Fibcom
11.1 GPON equipment (including ONT and OLT)	11.1 GPON/XGPON equipment (including ONU, ONT and OLT)	1. CDOT ToT: BEL 2. CDOT ToT: KAYNES 3. CDOT ToT: CYIENT 4. CDOT ToT: ITI 5. Tejas Networks 6. CDOT ToT: United Telecom (UTL) Technologies Ltd. 7. Alphion 8. Kenstel Networks 8. STCPL 9. HFCL 10. VMC 11. VVDN Technologies
11.2 XGS-PON,	11.2 XGS-PON (10G DS – 10G US) (including ONU, ONT and OLT)	1. CDOT ToT: BEL 2. CDOT ToT: KAYNES 3. CDOT ToT: CYIENT 4. CDOT ToT: ITI 5. CDOT ToT: United Telecom (UTL) 6. Tejas Networks 7. Alphion
11.3 NG-PON2	11.3 NG-PON2 (40G DS – 10G US) (including ONU, ONT and OLT)	1. Tejas Networks 2. CDOT (HFCL Cyient ITI) 3. United Telecom (UTL)
12.1 SDH/ PDH Cross Connects	12.1 SDH/ PDH Cross Connects (STM : 1/4/16/64; E1/E3/DS3; Ethernet interfaces)	1. CDOT 2. FIBCOM 3. Primatel 4. Tejas Networks 5. United Telecom (UTL)
12.2 Optical/ OTN Cross-connects	12.2.1 OTN Cross-connects	1. CDOT 2. FIBCOM 3. Primatel 4. Tejas Networks 5. United Telecom (UTL) 6. Sterlite
13.1 Small size 2 G GSM based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB	13.1.1 Macro 2G BTS	1. VNL 2. HFCL 3. Fibcom 4. CDOT

13.1 Small size 2 G GSM based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB	13.1.2 Micro 2G BTS	1. VNL 2. CDOT 3. ITI 4. HFCL
13.1 Small size 2 G GSM based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB	13.1.3 Pico 2G BTS	1. 2. HFCL 3. Fibcom 3. VNL
13.1 Small size 2 G GSM based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB	13.1.4 Femto 2G BTS	1. Fibcom 2. HFCL Limited
13.1 Small size 2 G GSM based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB	13.1.5 2G NIB Small cell	1. VNL 2. FIBCOM 3. HFCL
13.1 Small size 2 G GSM based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB	13.1.6 BSC/ MSC Enterprise class	1. HFCL 2. Fibcom
13.2 Small size 3 G based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB, C-RAN BBU and RRH	13.2.1 Macro 3G BTS	1. Signaltron 2. Signaltron 3. Fibcom

13.2 Small size 3 G based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB, C-RAN BBU and RRH	13.2.3 Pico 3G BTS	1. Signaltron 2. Signaltron 3. Fibcom
13.2 Small size 3 G based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB, C-RAN BBU and RRH	13.2.4 Femto 3G BTS	1. Signaltron 2. Signaltron 3. Fibcom
14.1 2G GSM based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB, C-RAN BBU and RRH	14.1.2 Micro 2G BTS	1. CDOT 2. ITI
15. Small Size LTE/ LTE-R Based Mobile Systems, with its various derivatives including rural & disaster communications, Macro & Micro eNodeB, Small Cells, EPC, NIB C-RAN BBU and RRH , LTE/ LTE-R/ LTE Advanced based broadband wireless access systems (eNodeB, gNB, EPC, etc.) in all standard LTE bands in the country	15.1. Macro eNode B, Category 2, TEC ENB GR (TDD/FDD)	1. CDOT 2. Tejas Networks 3. Lekha Wireless 4. Resonous Technologies 5. VNL 6. Signalchip 7. Signaltron 8. VNL 9. HFCL 10. VVDN 11. Galore Networks 12. Cienra 13. Vista 14. Alif Semiconductor (Mymo)

15. Small Size LTE/ LTE-R Based Mobile Systems, with its various derivatives including rural & disaster communications, Macro & Micro eNodeB, Small Cells, EPC, NIB C-RAN BBU and RRH , LTE/ LTE-R/ LTE Advanced based broadband wireless access systems (eNodeB, gNB, EPC, etc.) in all standard LTE bands in the country	15.2 Micro eNodeB, Category 2, TEC ENB GR (TDD/FDD)	1. CDOT 2. Tejas Networks 3. Lekha Wireless 4. Resonous Technologies 5. VNL 6. Sooktha 7. Signalchip 8. Signaltron 9. HFCL 10. Galore Networks 11. Cientra 12. Alif Semiconductor (Mymo)
15.3 Pico eNodeB, Category 2, TEC ENB GR (TDD/FDD)	15.3 Pico eNodeB, Category 2, TEC ENB GR (TDD/FDD)	1. CDOT 2. Lekha Wireless 3. Resonous Technologies 4. Sooktha 5. VNL 6. HFCL 7. SIGNALTRON 8. SIGNALCHIP 9. Airtel 10. JIO 11. Alif Semiconductor (Mymo)
15.4 EPC (Enterprise class)	15.4 EPC (Enterprise class)	1. TCS 2. TechMahindra 3. Tejas Networks 4. VNL 5. HCL 6. Resonous Technologies 7. Galore Network 8. Sooktha 9. galore Technologies 10. HFCL
15.5 4G NIB Small cell	15.5 4G NIB Small cell	1. CDOT 2. Tejas Networks 3. Lekha Wireless 4. Resonous Technologies 5. Sookhta 6. SIGNALCHIP 7. SIGNALTRON 8. VNL 9. HFCL 10. Galore Networks
16.1 LTE/ LTE-R Based Mobile Systems, with its various derivatives including rural & disaster communications, Macro & Micro eNode B, Small Cells, EPC, NIB C-RAN BBU and RRH, LTE/ LTE-R/ LTE Advanced/ based broadband wireless access systems (eNodeB, EPC etc.) in all standard LTE bands in the country	16.1.1. Wide Area eNode B, Category 1, TEC ENB GR (TDD/FDD)	1. CDOT 2. Tejas Networks 3. Lekha Wireless 4. SIGNALCHIP 5. SIGNALTRON 6. Galore Networks 7. United Telecom (UTL) 8. ITI 9. Alif Semiconductor (Mymo)

16.1 LTE/ LTE-R Based Mobile Systems, with its various derivatives including rural & disaster communications, Macro & Micro eNode B, Small Cells, EPC, NIB C-RAN BBU and RRH, LTE/ LTE-R/ LTE Advanced/ based broadband wireless access systems (eNodeB, EPC etc.) in all standard LTE bands in the country	16.1.2. Medium range eNodeB, Category 1, TEC ENB GR (TDD/FDD)	1. CDOT 2. Tejas Networks 3. Lekha Wireless 4. SIGNALCHIP 5. SIGNALTRON 6. Galore Networks 7. United Telecom (UTL) 8. Alif Semiconductor (Mymo)
16.1 LTE/ LTE-R Based Mobile Systems, with its various derivatives including rural & disaster communications, Macro & Micro eNode B, Small Cells, EPC, NIB C-RAN BBU and RRH, LTE/ LTE-R/ LTE Advanced/ based broadband wireless access systems (eNodeB, EPC etc.) in all standard LTE bands in the country	16.1.3 Local area eNodeB, Category 1, TEC ENB GR (TDD/FDD)	1. United Telecom (UTL) 2. Tejas Networks 3. Lekha Wireless 4. SIGNALCHIP 5. SIGNALTRON 6. Galore Networks 7. Alif Semiconductor (Mymo)
16.1 LTE/ LTE-R Based Mobile Systems, with its various derivatives including rural & disaster communications, Macro & Micro eNode B, Small Cells, EPC, NIB C-RAN BBU and RRH, LTE/ LTE-R/ LTE Advanced/ based broadband wireless access systems (eNodeB, EPC etc.) in all standard LTE bands in the country	16.1.4 EPC (Carrier class) (TEC EPC GR)	1. Tejas Networks 2. TechM 3. CDOT 4. Galore Networks 5. United Telecom (UTL) 6. Alif Semiconductor (Mymo)
16.2 5G Based broadband wireless infrastructure systems including gNodeB, 5G Core	16.2.1 5G gNodeB (Base Station) including CRAN or DRAN or VRAN based architecture	1. CDOT 2. Tejas Networks 3. Sterlite 4. JIO 5. Wisig 6. SIGNALCHIP 7. SIGNALTRON 8. SOOKHTA 9. LEKHA WIRELESS 10. Saankhya Wireless 11. VVDN 12. United Telecom (UTL) 13. BigCat Wireless 14. Galore Networks 15. HFCL 16. Alif Semiconductor (Mymo) 17. TCS

16.2 5G Based broadband wireless infrastructure systems including gNodeB, 5G Core	16.2.2 5GC (Packet Core) - Carrier Class	1. TCS 2. TechMahindra 3. HCL 4. JIO 5. Galore Networks 6. United Telecom (UTL) 7. IITB 8. Valles Marineris 9. Elcom 10. WiSig
16.2 5G Based broadband wireless infrastructure systems including gNodeB, 5G Core	16.2.3 5GC (Packet Core) - Enterprise Class	1. TechM 2. United Telecom (UTL) 3. Sooktha 4. Galore Networks 5. WiSig 6. Niral 7. TCS
17. Wi-Fi based broadband wireless access systems indoor & Outdoor (Including Access Point, Aggregation Block, Core Block)	17.1 Indoor AP (802.11 ac MIMO, 2.4 & 5 GHz bands)	1. MAKSAT Technologies 2. Tejas Networks 3. Inventum Technologies 4. Frog Cellsat 5. HFCL 6. Kenstel 7. Kirat Communications 8. SandsIndia 9. United Telecom (UTL) Technologies 10. Digisol 11. CDOT ToT: BEL 12. CDOT ToT: ITI 13. CDOT ToT: System Control 14. CDOT ToT: RCV 15. VVDN Technologies 16. CDOT ToT: KAYNES 17. CDOT ToT: CYIENT 18. United Telecom (UTL) 19. HFCL 20. Kenstel 21. VVDN Technologies 22. Indio Networks 23. Inventum Technologies
17. Wi-Fi based broadband wireless access systems indoor & Outdoor (Including Access Point, Aggregation Block, Core Block)	17.2 Indoor AP (802.11 ac MIMO, 2.4 & 5 GHz bands)	1. Tejas Networks 2. United Telecom (UTL) 3. CDOT 4. ITI 5. BEL 6. Cyient 7. KAYNES 8. Aggressive 9. ELCOM 10. Kirat Communications 11. VVDN Technologies 12. Indio Networks 13. Inventum Technologies 14. Kenstel Networks 15. HFCL
17.3 Outdoor AP (802.11ac - MIMO 2.4 and 5 GHz bands - IP67 Rated	17.3 Outdoor AP (802.11ac - MIMO 2.4 and 5 GHz bands - IP67 Rated	1. VNL 2. Kenstel Networks 3. Tejas Networks 4. VNL 5. Inventum Technologies 6. HFCL 7. United Telecom (UTL) 8. BEL 9. CDOT 10. Kirat Communications 11. CYIENT 12. ECIL 14. ITI 15. SCTSPL 16. COMINT 16. TARANGG 17. ELCOM 18, KAYNES 19. AGGRESSIVE 20. KENSTEL 21. Indiop Networks 22. VVDN Technologies
17.4 Outdoor AP (802.11n/b/g - MIMO 2.4 and 5 GHz bands - IP67 rated	17.4 Outdoor AP (802.11 n/b/g - MIMO 2.4 and 5 GHz bands - IP67 rated	1. VNL 2. CDOT 3. Inventum Technologies 4. CYIENT 5. Kenstel 6. HFCL 7. Tejas Networks 8. VVDN Technologies 8. Indio Networks 9. HFCL
17 A. Wi-Fi Access Controller (with interoperaility and multi vendor AP support)	17.A.1 Type 1: <= 2000 AP support	1. KENSTEL NETWORKS 2. HFCL 3. Tejas Networks 4. CDOT 5. VVDN Technologies 6. Inventum Technologies 7. Indio Networks
17 A. Wi-Fi Access Controller (with interoperaility and multi vendor AP support)	17.A.2 Type 2: >2000 AP support	1. KENSTEL NETWORKS 2. HFCL 3. CDOT 4. Inventum Technologies 5. Indio Networks 6. VVDN Technologies 7. Tejas Networks

17 B. AAA block(Authentication, Authorization & Accounting)	17.B.1 Enterprise grade AAA Block (Radius)	1. INDIO Networks 2. Sterlite
17 B. AAA block(Authentication, Authorization & Accounting)	17.B.2 Carrier grade AAA block (Radius/Diameter)	1. INDIO Networks 2. Sterlite
18. Radio systems (IP/ Hybrid), Mobile Front haul BBU and RRH (CPRI, eCPRI, FlexE, RoE, NGFI)	18.1 Radio systems (IP/ Hybrid), Mobile Front haul BBU and RRH (CPRI, eCPRI, FlexE, RoE, NGFI) (<24 GHz band))	1. HFCL 2. Shyam Telecom 3. BEL 4. ECIL 5. Frog Cellcast
18. Radio systems (IP/ Hybrid), Mobile Front haul BBU and RRH (CPRI, eCPRI, FlexE, RoE, NGFI)	18.1 Radio systems (IP/ Hybrid), Mobile Front haul BBU and RRH (CPRI, eCPRI, FlexE, RoE, NGFI) (<24 GHz band))	1. VNL 2. HFCL 3. CDOT 4. Saankhya Labs 5. Data Patterns 6. VVDN Technologies 7. Kenstel Networks 8. BigCat Wireless
18. Radio systems (IP/ Hybrid), Mobile Front haul BBU and RRH (CPRI, eCPRI, FlexE, RoE, NGFI)	18.2 Radio systems (IP/ Hybrid), Mobile - Front / Mid / Back haul BBU and RRH (CPRI, eCPRI, FlexE, RoE, NGFI) (52-71 GHz)	1. KENSTEL NETWORKS 2. MMRFIC 3. United Telecom (UTL)
18. Radio systems (IP/ Hybrid), Mobile Front haul BBU and RRH (CPRI, eCPRI, FlexE, RoE, NGFI)	18.4 Radio systems (IP/ Hybrid), Mobile - Front / Mid / Back haul BBU and RRH (CPRI, eCPRI, FlexE, RoE, NGFI) (71-90 GHz))	1. Astrome Technologies (Multiple Point-to-Point E-band Radio) 2. United Telecom (UTL)
19. Software Defined Radio, Cognitive Radio systems (all bands)	Ruggedised handheld, Ruggedised or non-ruggedised vehicle mounts, P2P OR P2MP or Mobile adhoc topology, Licensed /Unlicensed band operation	1. BEL 2. Saankhya Labs 3. Rolta 4. HFCL 5. Sanctum 6. Lekha Wireless 7. CYIENT 8. Makers Village Triaxon Technologies 9. BigCat Wireless 10. Data Patterns
20. Repeaters (RF/RF-over-Optical), IBS and Distributed Antenna systems (indoor / outdoor) including Active & Passive Accessories	20. Repeaters (RF/RF-over-Optical), IBS and Distributed Antenna systems (indoor / outdoor) including Active & Passive Accessories	1. Kavveri Telecom 2. Vensurwaves 3. Alif Semiconductor (Mymo) 4. BEL 5. Shyam Telecom 6. VNL 7. United Telecom (UTL) 8. United Telecom (UTL) 9. Kenstel Networks
21. Satellite based systems		
21.1 VSAT Systems	21.1.1 VSAT Terminals Static, Transportable, On the Move (including IP Modem, BUC & LNB, Accelerator, along with antenna and accessories etc.) C, L, S, Ku/Ka bands	1. Astrome Technologies (C,ku, Ka) 2. Saankhya Labs (All) 3. BEL (S, C, Ku) 4. Astra (All) 5. Alpha (All) 6. Essel Shyam 7. HFCL 8. Data Patterns 9. Decibel 10. MCBS
21.1 VSAT Systems	21.1.2 SCPC (All bands up to 45 Mbps)	1. Astrome Technologies (C, Ku - 45 Mbps; Ka - 100 Mbps) 2. Saankhya Labs (C,L, S, Ku, Ka - 45 Mbps) 3. BEL (S, C, Ku 45 Mbps) 4. Alpha (All Bands 45 Mbps) 5. Astra (All Bands 45 Mbps)

21.1 VSAT Systems	21.1.3 MF TDMA (DVB RCS, DVB RCS II)	1. Astrome (C, Ku - 45 Mbps; Ka - 100 Mbps) 2. Saankhya (C,L, S, Ku, Ka - 45 Mbps) 3. Alpha (All Bands 45 Mbps) 4. BEL (S, C, Ku 100 Mbps) 5. Astra (All Bands 45 Mbps)
21.1 VSAT Systems	21.1.4 VSAT Hub Equipment (including SSPA, LNA, Mod / De Mod), U/D Converter, Accelerator, NMS S/W, RF-Fibre converter, Antenna and accessories etc.) C, L, S, Ku, Ka Bands	1. Astrome Technologies (C,ku, Ka) 2.Saankhya Labs (All) 3. BEL (S, C, Ku) 4. Astra (All) 5. Alpha Design (All) 6. MCBS
21.1 VSAT Systems	21.1.5 VSAT Terminals Shipborne (including Modem/BUC & LNB, Accelerator) along with antenna and accessories C, L, S, Ku, Ka Bands	1. Astrome Technologies (C,ku, Ka) 2. BEL (C, Ku) 3. BigCat Wireless 4. MCBS 5. Saankhya Labs (L, S)
21.1 VSAT Systems	21.1.6 VSAT Terminals Airborne (including Modem/BUC & LNB, Accelerator) along with antenna and accessories C, L, S, Ku, Ka Bands	1. Astrome Technologies (C,ku, Ka) 2. Astra (All) 3. MCBS
21.2 VSAT terminal Subsystem - IDUs	21.2.1 SCPC	1. Astrome Technologies 2. Saankhya Labs 3. BEL 4. Alpha 5.MCBS
21.2 VSAT terminal Subsystem - IDUs	21.2.2 MF TDMA (Mesh) (DVB RCS, DVB RCS II)	1. Saankhya Labs 2. Astrome Technologies 3. BEL 4. AD 5. MCBS
21.2 VSAT terminal Subsystem - IDUs	21.2.3 MF TDMA (Star) (DVB RCS, DVB RCS II)	1. Saankhya Labs 2. Astrome Technologies 3. BEL 4. AD 5. MCBS
21.3 VSAT Terminal Subsystem - ODUs	21.3.1 BUC	1. Astra 2. AD 3. BEL 4. MCBS
21.3 VSAT Terminal Subsystem - ODUs	21.3.2 LNB	1. Astra 2. MCBS
21.3 VSAT Terminal Subsystem - ODUs	21.3.3 Antenna	1. Astra 2. AD 3. BEL 4. Astrome Technologies 5. MCBS
21.4 VSAT Hub Subsystems	SSPA RF U / D Conv Mod / De Mod LNA Accelerator NMS S/W RF to Fibre Converter Antenna and accessories etc.	1. Astrome Technologies (C,ku, Ka) - Mod / Demod, Antenna, (NMS), U/D Convertor 2. Saankhya Labs (All) - Mod / Demod, Accelerators, NMS 3. BEL (S, C, Ku) - Accelerator, Antenna, NMS, (Mod/ Demod) 4. Astra (All): Mod / De Mod, Accelerator, RFTs, (NMS S/W), Antenna, U/D Convertor, LNA (Ku) 5. Alpha Design (All): Mod / De Mod, RFTs, NMS S/W, Antenna 6. MCBS
21.5. Disaster Communication Systems etc., including backpack satellite products	C,Ka, Ku, L, S Bands	1. Saankhya Labs 2. HW Design Labs 3. Astrome Technologies 4. CDOT 5. MCBS
21.5. Disaster Communication Systems etc., including backpack satellite products	TEC GR (TEC / TS TP / TX / PVT -01/01/JAN - 11) for Portable Terminals Voice and Data (2 Mbps UL)	1. BEL (Ku - 2 Mbps), (S - 9.6 Kbps) 2. Astra (S - 9.6 Kbps) 3. Saankhya Labs (S) - support upto 2 Mbps 4. Alpha Design (C, Ku: 2 Mbps) - TEC GR 5. Aristrome Technologies (Ku - 2 Mbps)

21.6. Satellite based IoT Systems including location, resources tracking	Bands (L, S and Ku, Ka bands)	1. Skylo Tech 2. Astrome Technologies 3. Saankhya Labs
21.7.1 Two way MSS Data Terminals (Satellite Receivers with location data)	Satellite IoT devices for various applications position tracking, messaging etc.	1. BEL -S Band 2. Saankhya Labs S Band (L Band under development)) 3. Alpha Digital(S Band) 4. Astra (Sband) 5. WiwaNet (S Band) 6. Accord Software & Systems 7. Astrome Technologies 8. VVDN Technologies
21.7.2 One Way Receivers (Satellite Transmitters & Receivers)	Half-duplex and full-duplex modems, VSAT Modems, Mobile Satellite Service (MSS) terminals, Satellite Phones (L band & S-band), Satellite IoT devices	1. Astrome Technologies 2. Data Patterns 3. Saankhya Labs 4. BEL 5. Alpha ((S band) 6. Astra (S Band) 7. WiwaNet (S Band)
21.7.3 Hub side Baseband Equipment & Software	Including Mod / De Mod) , Accelerator, NMS S/W etc., based on open standards	1. Astrome Technologies'2. Saankhya Labs 3. BEL 4. Astra 5. Alpha 6. MCBS
21.7.3 Hub side Baseband Equipment & Software	Satellite Broadcast receivers, IP receive only terminals, Portable messaging terminals, Location reporting terminals	1. Saankhya Labs 2. Avantel 3. BEL
21.8 Other satellite equipment	Burst & Continuous Modems/Demodems, TDM & Burst Modulators, Hub-NMS Software, IP Encryptors	1. Saankhya Labs 2. Avantel 3. BEL
21.5 Satellite Phones	Both Voice and Data (up to 9.6 Kbps)	1. BEL (S Band) 9.6 Kbps 2. Saankhya Labs (S Band) 9.6 Kbps 3. Astra (S Band) 4.8 Kbps 4. Alpha (S Band) 9.6 Kbps
	Both Voice and Data (> 9.6 Kbps)	Linked to the satellite infra of Inmarsat.
22. Copper access systems (DSL/ DSLAM), high-speed xDSL (G.fast)	22. Copper access systems (DSL/ DSLAM), high-speed xDSL (G.fast)	1. CDOT 2. Pulse Communications Systems 3. Nomus 4. MRO tek 5. United Telecom (UTL)
23. Telecom Network Management systems (NMS) with its various derivatives including Operation Support System (OSS), Billing Support System (BSS), Trouble Ticketing System (TTS)	23.1 Carrier class	1. CDOT 2. CYIENT DLM 3. Nivetti Systems 4. NMSWorks Software 5. Tejas Networks 6. Sterlite 7. Coral 8. Redisys 9. United Telecom (UTL) 10. Minadarray System 11. Everest IMS Technologies 12. Fibcom 13. VVDN Technologies 14. Galore Networks 15. Coral Telecom
23. Telecom Network Management systems (NMS) with its various derivatives	23.2Enterprise Class	1.NMSWorks Software 2.Mindarray Systems 3.EverestIMS Technologies 4. Matrix Comsec 5. Nivetti Systems 6. Fibcom 7. CDOT 8. Galore Networks 9. Coral Telecom 10. Tejas Networks 11. Inventum Technologies 12. United Telecom (UTL) 13. Galore Networks 14. VVDN Technologies
24. Telecom OSS with its various derivatives	24.2 Service Fulfilment system	1. NMSWorks Software 2. Mindarray Systems 3. EverestIMS Technologies 4. Inventum Technologies 5. Galore Technologies
24. Telecom OSS with its various derivatives	24.3 Inventory Management	1. NMSWorks Software 2. Mindarray Systems 3. EverestIMS Technologies 4. Inventum Technologies 5. Galore Technologies

24. Telecom OSS with its various derivatives	24.4 Geographical Information System (GIS)	1. NMSWorks Software 2. Lepton Software Export & Research 3. NMS Works Software 4. BEL 5. Galore Technologies
25. Security and Surveillance Communication Systems (video and sensors based) including Perimeter Security Systems	25. Security and Surveillance Communication Systems (video and sensors based) including Perimeter Security Systems	1. VNL (Perimeter sensors) 2. HFCL ((Perimeter sensors) 3. BEL (Thermal cameras) 4. Samriddhi Automations 5. CP Plus 6. Matrix Comsec. 7. Zelotic 8. Videonetics 9. Sparsh Technologies 10. Cron Systems 11. Matrix Comsec 12. Makers Village Tranzmeo 13. Saankhya Labs 14. VVDN Technologies 15. MCBS 16. Lekha Wireless
25. Security and Surveillance Communication Systems (video and sensors based) including Perimeter Security Systems	25.1 Dual Sensor PTZ Camera	1. BEL 2. MCBS 3. Samriddhi Automations 4. VVDN Technologies
25. Security and Surveillance Communication Systems (video and sensors based) including Perimeter Security Systems	25.2 M2M Remote Management Portal	1. Sensorise Digital Services 2. MCBS
25. Security and Surveillance Communication Systems (video and sensors based) including Perimeter Security Systems	25.2 Aerial Security System using autonomous RPA	1. PDRL 2. MCBS
26.1 Optical Fibre	Optical Fibre; Single Mode / Multimode	1. Sterlite 2. Birla Furukawa Fiber Optics Limited 3. Finolex cables limited 4. HFCL 5. Teracom Limited 6. HTL
26. 2. Optical Fibre Cable	26.2.1 Overhead	1. Sterlite 2. Birla Furukawa Fiber Optics 3. Finolex Cables 4. HFCL 5. Teracom Limited 6. Aksh Optical 7. Paramount Cable 8. E-Systemizer 9. Adhishwar Telenetworks 10. HTL 11. Polycab India 12. Pratap Digital Communications 13. Pranav Enterprises 14. Universal Cables 15. Vindhya Telelinks 16. Villet Communications 17. ITI. 18. Makers Village Tranzmeo IT solutions
26. 2. Optical Fibre Cable	26.2.2 Underground	1. ITI 2. Many from 26.2.1
26. 2. Optical Fibre Cable	26.2.3 Submarine	Many from 26.2.1
26. 2. Optical Fibre Cable	26.2.4 Accessories	Many players

27. Telecom Power System (Including Solar Power)	27.1 UPS, Power Plant, Invertor (Including Solar Power) 0.5-1500 KVA	1. Vikram Solar 2. Waaree Solar 3. Goldi Green Technologies Pvt.. 4. Tata Power Solar Systems 5. Loom Solar 6. Moser Baer Solar 7. XL Energy 8. Solar Semiconductor 9. Emmvee Photovoltaics 10. Navitas Green Solutions 11. Saatvik Green Energy 12. Panchavakra Power 13. Invendis Technologies India 14. VNL 15. Exide Industries 16. Amara Raja Batteries Ltd 17. Luminous Power Technologies 18. HBL Power Systems 19. Su-Kam Power Systems 20. Base Corporation 21. Okaya Power 22. Southern Batteries 23. True Power International 24. Evolute Solutions 25. Greenvision Technologies 26. Artheon Electronics 27. United Telecom (UTL) 28. CDOT 29. BEL 30. VNL 31. ITI
27. Telecom Power System (Including Solar Power)	27.2 Power Plant: (Modular)	1. BEL 2. United Telecom (UTL) 3. ITI
28. Telecom Batteries (Lead Acid & Li-ion)	28.1 Telecom Batteries (Lead Acid) 250-5000 AH (Including VRLA)	1. Exide 2. Amarraja
28. Telecom Batteries (Lead Acid & Li-ion)	28.2 Li-Ion Batteries	1. United Telecom (UTL) 2. BEL
29. IP audio phones / IP video Phones / Analog adaptor	29. IP audio phones / IP video Phones / Analog adaptor	1. Coral Telecom 2. Kenstel Communications 3. Pulse Communications Systems 4. Matrix Comsec 5. Elcom Innovation Ltd. 6. CDOT 7. Matrix Comsec 8. BEL 9. Coral Telecom
30. SDN Software Controllers, NVF and CNF software	30. SDN Software Controllers, NVF and CNF software	1. Inventum Technologies 2. Nivetti Systems 3. IIT Chennai 4. DRDO CARE 5. Tejas Networks 6. Lavelle Networks 7. Cosgrid 8. Nubewell 9. Sanctum 10. United Telecom (UTL) 11. Nivetti Systems 12. CDOT 13. Saankya Labs 14. WiSig
31. Services from Telecom Cloud infrastructure/ Telecom Data centers	31.1 Spine Switches (10G/25G/50G/100G interfaces)	1. Yotta 2. CtrlS 3. NetMagic 4. Bharati Airtel 5. ESDS 6. NxtGen 7. Sify 8. TCL 9. RailTel 10. Jio 11. NIC 12. Nivetti Systems 12. CDOT 13. Saankhya Labs 14. ITI
31. Services from Telecom Cloud infrastructure/ Telecom Data centers	31.2 Top of Rack Switches (10G/25G/50G/100G interfaces)	1. CDOT 2. Nivetti Systems 3. ITI
32. 2 way Analog/ Digital radio including Walkie-Talkie & Mobile Radio	32. 2 way Analog/ Digital radio including Walkie-Talkie & Mobile Radio	1. TalkPro 2. Trucom 3. BEL 4. Sanchar Communications System 5. VNL 6. DSP Works
33. Batteries of 2 way Analog/ Digital radio including Walkie-Talkie	33. Batteries of 2 way Analog/ Digital radio including Walkie-Talkie	1. Eon Electric Ltd 2. Future Hi-Tech Batteries 3. Sanchar Communications Systems 4. BEL

34. Optical Fibre Monitoring System	34.1 OTDR - RTU Single / Multi Fibre;	1. Sterlite 2. Birla Furukawa Fiber Optics 3. Finolex Cables 4. HFCL 5. Inventum Technologies 6. Nivetti Systems 7. CDOT 8. BITCOM TECH 9. NMSWorks Software 10. Andig Systems
34. Optical Fibre Monitoring System	34.2 Remote Fibre Monitoring & Testing System (Software)	1. NMSWorks Software 2. CDOT
35. M2M/ IOT Subsystems including NB IoT in different verticals	35.1 M2M/ IOT Subsystems including NB IoT in different verticals	1. Azoi (Health Technology) 2. Coeey (Healthcare) 3. Car IQ (Automobile Analytics) 4. Altiux (Smart Homes) 5. Enterrox (Cloud and Big Data) 6. Wireless Controls 7. Uncanny Vision (Embedded System) 8. Light Metrics (Connected Trucks) 9. Things Cloud (Smart Energy) 10. SAAR Microsystems Industrial IoT (Connected Devices) 11. Mango Man (Smart TV) 12. Knowledge Lense (Big Data) 13. PluggX Lab (Smart Homes) 14. RHL Vision (Robotics) 15. Transpose India (Traffic Data Analytics) 16. Algo Engines (Smart Electricity) 17. Machine Pulse (Big Data and Analytics) 18. Mobilloitte Sensors (IoT ExSmart Wearable) 19. Inventrom (Cloud Platform) 20. Altizon (Smart Manufacturing) 21. Entrib (Industrial IoT) 22. Maven System (Smart Metering) 23. Senz IT (Digital Documentation) 24. UBER Diagnostics (Medical) 25. WiSIG 26. DSP works 27. Sensorize 28. VNL 29. ELGEN (smart lighting) 30. Green IP Core (water sensors) 31. Lefe9 systems 32. Asimov Robotics 33. Brain Wired (livestock monitoring) 34. Cavalier Wireless (Cellular IOT modules) 35. Enspark Systems (Home automation) 36. Fayette innovation (wearable devices) 37. Nimo technologies (wearable devices) 38. Nyokas Technologies (intelligent textile systems) 39. VaughnFrayr Luminaires (smart lighting) 40. wioopikings (hardware IoT modules) 41. Sookhta 42. GreenPCore 43. DSP Works (Lora, Sensors, Utility Metering, Indus IOT, Home Automat.) 44. EIGEN Technologies (Smart Light, Energy, Metering) 45. CDOT 46. Sensorise Digital Services (M2M connectivity and Lifecycle management) 46. Mannash 47. EverestIMS Technologies 48. Galore Networks 49. Makers Villagr Cavli Wireless 50. Frogcellsat 51. Dyotis 52. Enmovil 53. WiSig 54. VVDN Technologies 55. Nimble Vision
35. M2M/ IOT Subsystems including NB IoT in different verticals	35.2 Customer Feedback Device, Portal and Analytics	1. Eigen Technologies (SENSEnuts) + Many from 35.1 above
35. M2M/ IOT Subsystems including NB IoT in different verticals	35.3 M2M Security Client & Platform	1. Eigen Technologies (SENSEnuts) + Many from 35.1 above
35. M2M/ IOT Subsystems including NB IoT in different verticals	35.4 M2M Remote Management Portal	1. Eigen Technologies (SENSEnuts) + Many from 35.1 above

35. M2M/ IOT Subsystems including NB IoT in different verticals	35.4 Multi-Protocol IoT Gateway	1. Eigen Technologies (SENSEnats) 2. Enmovil 3. Many more from 35.1 above
35. M2M/ IOT Subsystems including NB IoT in different verticals	35.5 Multi-Protocol IoT Headend	1. Eigen Technologies (SENSEnats) + Many from 35.1 above
35. M2M/ IOT Subsystems including NB IoT in different verticals	35.6 Vehicle Tracking and Alarms Management	1. SenseGiz 2. Many more from 35.1 above
36. Gateways: GSM, VOIP, Signalling,	Enterprise GSM, VoIP	1. Dialtronics 2. Matrix Comsec 3. Inventum Technologies 4. Tejas Networks 5. Nivetti Systems 6. Frog Cellsat 7. Dialtronics 8. CDOT 9. BEL 10. Coral Telecom
37. Remote Piloted Aircrafts (RPA) as defined by Bureau of Civil Aviation (Drones / UAVs)	37.1.1 nano: less than or equal to 250g;	1. Makers Village-Ai Aerial Dynamics 2. MCBS
37. Remote Piloted Aircrafts (RPA) as defined by Bureau of Civil Aviation (Drones / UAVs)	37.1.2 micro: greater than 250g and less than or equal to 2g;	1. PDRL 2. Makers Village-Ai Aerial Dynamics 3. MCBS
37. Remote Piloted Aircrafts (RPA) as defined by Bureau of Civil Aviation (Drones / UAVs)	37.1.3 small: greater than 2kg and less than or equal to 25kg;	1. PDRL 2. MCBS
37. Remote Piloted Aircrafts (RPA) as defined by Bureau of Civil Aviation (Drones / UAVs)	37.1.3 small: greater than 2kg and less than or equal to 25kg;	1. Makers Village-Ai Aerial Dynamics 2. MCBS
37. Remote Piloted Aircrafts (RPA) as defined by Bureau of Civil Aviation (Drones / UAVs)	37.1.3 small: greater than 2kg and less than or equal to 25kg;	1. UAVE Limited 2. Makers Village-Ai Aerial Dynamics

37. Remote Piloted Aircrafts (RPA) as defined by Bureau of Civil Aviation (Drones / UAVs)	37.1.4 medium: greater than 25kg and less than or equal to 150kg; and	1. UAVE Limited 2. Makers Village-Ai Aerial Dynamics
37. Remote Piloted Aircrafts (RPA) as defined by Bureau of Civil Aviation (Drones / UAVs)	37.1.5 large: greater than 150kg.	1. UAVE Limited 2. Makers Village-Ai Aerial Dynamics
38. Camera including long range camera, IP camera & Recorders, Night vision cameras	Including Web camera /IP camera /Thermal camera /Dome camera /Bullet camera /Indoor & Outdoor camera /Smart, voice integrated cameras	1. VNL 2. Sparsh 3. VVDN Technologies 4. Smriddhi Automations 5. Sansap Technology 6. Matrix Comsec 7. Fibcom 8. BEL 9. HW Design Labs (OPC) 10. Radio Product Companies 11. Accord Software 12. VVDN Technologies 13. MCBS 14. CP Plus 15. ENMOVIL
39. Telecom Billing Support System (BSS) with all its derivatives	39. Telecom Billing Support System (BSS) with all its derivatives	1.NMSWorks Software 2.Sterlite Ltd. 3. Alepo Technologies 4. Inventum Technologies 5. CDOT
40. Video Conferencing Applications	40. Video Conferencing Applications	1. Coral telecom 2. Dbaux Technologies 3. CDOT 4. IIT Roorkee 5. MeitY companies under hackathon 6. BEL 7. VVDN Technologie 8. MCBS
41 Terrestrial Communication	41.1 Troposcatter antennas	1. KENSTEL NETWORKS 2. Frogcellsat
41 Terrestrial Communication	41.1 Line of Sight (LoS) antennas (Pt-Pt & Pt-Multi Pt)	1. Astrome Technologies 3. Data Patterns 4. United Telecom (UTL) 5. VVDN Technologies 6. Lekha Wireless
42 Satellite Communication- Ground/ Earth Station Antennas	42 Satellite Communication- Ground/ Earth Station Antennas	1. Astrome Technologies 2. BigCat Wireless
43. Lawful Logging Platform - IPFIX, Syslog, CG-NAT, NAT logs, etc.	43. Lawful Logging Platform - IPFIX, Syslog, CG-NAT, NAT logs, etc.	1. Inventum Technologies (Innovative Solution)
44. CAP based Early Warning Platform for Disaster situations	44. CAP based Early Warning Platform for Disaster situations	CDOT (Innovative Solution)
45. Cloud Computing	45. Deployment of Private Cloud	1. BEL 2. VVDN Technologies
46. GNSS based Time Servers (including navIC) NTP. IEEE 1588/PTP for Time Synchronisation and Standalone GNSS receiver for location information	46. GNSS based Time Servers (including navIC) NTP. IEEE 1588/PTP for Time Synchronisation and Standalone GNSS receiver for location information	Accord Software (Innovation at Global level)

47. Conditional Access System for Broadcast networks	47. Conditional Access System for Broadcast networks	CDOT (Innovative Solution)
48. Embedded Transaction Device	48. Point of Sale Device	BEL (Innovative Solution)
49. Digital Rights Management (DRM)	49. Digital Rights Management (DRM)	CDOT (Innovative Solution)
50. USB based security device	50. PKI Token	1. BEL 2. SNS Solutions
51. Light-Fidelity (Li-Fi) Technology based Access points and receiver for Short-range Indoor Communication	51. Indigenous prototype development for Indoor bi-directional communication based on Li-Fi technology with maximum data rate support	BEL (Innovative Solution)
52. Secure Chat and Call Platform	52. Secure Chat and Call Platform	CDOT (Innovative Solution)
53. Quantum Key Distribution (QKD)	53. Quantum Key Distribution (QKD)	1. CDOT 2. DRDO 3. QNU labs are also working on QKD)
54. Time Reference Server	54. G3I Based NTP/PTP Time Reference Server	BEL (Innovative Solution)
55. DMR (Digital Mobile Radio in UHF & VHF band)	55. DMR (Digital Mobile Radio in UHF & VHF band)	BEL (Innovative Solution)
56. AAA & TACACS appliances for smart cities	56. AAA & TACACS appliances for smart cities	1. Inventum Technologies (Innovative Solution)
57. U1 optical amplifier	57. C band+ L band optical amplifier	1. United Telecom (UTL) 2. MCBS
58. 5G Channel Recorder and Spectrum Analyzer	58. 5G Channel Recorder and Spectrum Analyzer	BigCat Wireless (Innovative Solution)
59. Pre-fab shelter for BTS/Exchanges	59. Pre-fab shelter for BTS/Exchanges	1. PRIMA TELECOM LTD 2. Kenstel Networks
60. 5G Core Testing Tool	60. 5G Core Testing Tool	Cientra (Innovative Solution)
61. 5G NAS STACK	61. 5G NAS STACK deployment on IOT Devices make them 5G Capable	WiSig (Innovation at Global level)
62. 5G Edge networking platform	62. Cloud-native 5G Edge networking platform for Enterprises	WiSig (Innovation at Global level)
63. 5G Satcom	63. 5G Satcom	WiSig (Innovation at Global level)
64. Integrated back haul 5g relay systems	64. Integrated back haul 5g relay systems	WiSig (Innovation at Global level)
65. mm Wave Systems	65. mm Wave Systems	1. WiSig 2. Astrome Technologies
66. Mobile Phone for Broadcast Signals	66. Mobile Phone for Broadcast Signals	Saankya Labs (Indian innovation for global innovation)
67. NB-IoT Geo Satellite Systems	67. NB-IoT Geo Satellite Systems	WiSig (Innovation at Global level)
68. NB-IoT Skylo Hub	68. NB-IoT Skylo Hub	WiSig (Innovation at Global level)

69 Home Automation based on Wi-Fi or sub-GHz solutions including sensors, remotes	Solutions for home, enterprise, office automation, other applications of IoT modules with secure cloud access	1. DSPWorks 2. Life9 System 3. NS Electrosecure 4. Vighanharta Technologies
70 IoT Modules	Wi-Fi, LoRa, 802.15.4g, NBIoT based modules that are used with various applications in sectors of power, automotive, home, enterprise	1. DSPWorks 2. Life9 System
71. Towers / Masts / Poles	71.1. Portable Footing-based Towers / Masts for 4G/5G 71.2. Skid-based Towers / Masts for 4G/5G 71.3. Cell on Wheels (COWs) for 4G/5G 71.4. Rooftop Towers / Masts for 4G/5G 71.5. Poles for 5G 71.6. OFC Junction Chambers & Manholes	1. Kotkar Energy Dynamics 2. Salasar Technologies 3. Precision Electronics
72. 5G Based Mobile Systems	72.1 Macro RU	1. VVDN technologies 2. HFCL 3. Sterlite 4. Tejas Networks 5. Saankya Labs
72. 5G Based Mobile Systems	72.2 Indoor RU	1. VVDN technologies 2. HFCL 3. Sterlite 4. Tejas Networks 5. Saankya Labs
73. 5G CPE	73. 5G CPE	1. VVDN technologies 2. HFCL 3. Sterlite 4. Tejas Networks 5. Saankya Labs
74. Over-the-Air Technology	74.1 Over-the-Air Technology (SIM & Device Management)	1. Mannash (Innovation at Global level) with Right to Use award to Airtel
74. Over-the-Air Technology	74.2 On Demand SIM Activation (White Labelled SIM Card)	1. Mannash (Innovation at Global level) with Right to Use award to Airtel
74. Over-the-Air Technology	74.3 SIM Based Roaming Steering, Mobile ID, Quality of Service, Emergency/Presidential Alerts	1. Mannash (Innovation at Global level) with Right to Use award to Airtel
75. Drone Communication	74. Drone Communication	Botlab Dynamics, Start-up by IIT-D team and many Startups have known capabilities (Botlab Dynamics demonstrated through 1000 Drones in Beating retreat function)
76. SCADA System for Telecom Networks	75. Infrastructure Monitoring System (Software and Hardware (RTU) deployed for monitoring & controlling Telecom Infra like Tower Sites, Point of Presence (POPs), Submarine Cable Landing Stations (CLS), etc from a Central Location.)	1. NMSWorks Software (Innovation at Global level) 2. Sensorise
77. Cyber Threat Detection, Visibility and Forensics	76.1 Flow based Threat Detection using AI/ML 76.2 Firewalls	1. Nivetti Systems 2. Gajshield
78. Unified Communications and IP Telephony	77. IP PBX	1. Matrix Comsec 2. Coral Telecom
79. Customer Premises Media Gateways	78. Customer Premises Media Gateways	1. Matrix Comsec 2. Coral Telecom
80. VoIP and SIP Phones (User Terminals Phones)	79. VoIP and SIP Phones	1. Matrix Comsec 2. Coral Telecom

81. Power Line Communication Carrier Equipment	80. PLCC Switches	1. Matrix Comsec 2. HFCL
82. Secured OTP System to avoid frauds	82.1 Secured OTP System to avoid frauds (Software in SIM and Server)	1. Mannash (Innovation at Global level) with Right to Use award to Airtel
82. Secured OTP System to avoid frauds	82.2 Non OTP Based Secure authentication	1. Mannash (Innovation at Global level) with Right to Use award to Airtel
83. SIM Applets for Subscription Management & Control	Card Operating Systems and Apps	Sensorise & Others
84. Remote management platforms for SIM, Subscription and Device enablement	Remote Management	Sensorise & Others
85. Position Velocity and Time Data and Alarms Management	IoT Data Management	Sensorise & Others
86. Remote Device Management & Data Acquisition	Common Service Layer Platforms	Sensorise & Others
87. IoT Based Customer Feedback Devices	IoT Device	Sensorise & Others
88. IoT based SCADA Devices	IoT Device	Sensorise & Others
89. Secure Element based Identity and Encryption Systems	IoT Security	Sensorise & Others
90 IP TV	90 IP TV	MCBS and others
91. Mesh network of Hardware, Cloud, analytics and Software	91. Mesh network of Hardware, Cloud, analytics and Software	SenseGiz (Global Innovation)
92. Distributed Unit (DU)	92. ORAN7.2x/ support 4G/ 5G/ NB-Iot	1. Saankya Labs + Other 5G players
93. Portable RAN Framework	93. Portable RAN framework for DU to make it hardware agnostic	1. Saankya Labs + Other 5G players