

# The Private LTE & 5G Network Ecosystem: 2023 – 2030 – Opportunities, Challenges, Strategies, Industry Verticals & Forecasts

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## Abstracts

Historically a niche segment of the wider cellular communications industry, private cellular networks – also referred to as NPNs (Non-Public Networks) in 3GPP terminology – have rapidly gained popularity in recent years due to privacy, security, reliability and performance advantages over public mobile networks and competing wireless technologies as well as their potential to replace hardwired connections with non-obstructive wireless links. With the 3GPP-led standardization of features such as MCX (Mission-Critical PTT, Video & Data), URLLC (Ultra-Reliable, Low-Latency Communications), TSC (Time-Sensitive Communications), SNPNs (Standalone NPNs), PNI-NPNs (Public Network-Integrated NPNs) and network slicing, private networks based on LTE and 5G technologies have gained recognition as an all-inclusive connectivity platform for critical communications, Industry 4.0 and enterprise transformation-related applications. Traditionally, these sectors have been dominated by LMR (Land Mobile Radio), Wi-Fi, industrial Ethernet, fiber and other disparate networks.

The liberalization of spectrum is another factor that is accelerating the adoption of private LTE and 5G networks. National regulators across the globe have released or are in the process of granting access to shared and local area licensed spectrum. Examples include but are not limited to the three-tiered CBRS (Citizens Broadband Radio Service) spectrum sharing scheme in the United States, Canada's planned NCL (Non-Competitive Local) licensing framework, United Kingdom's shared and local access licensing model, Germany's 3.7-3.8 GHz and 28 GHz licenses for 5G campus networks, France's vertical spectrum and sub-letting arrangements, Netherlands' geographically restricted mid-band spectrum assignments, Finland's 2.3 GHz and 26 GHz licenses for local 4G/5G networks, Sweden's 3.7 GHz and 26 GHz permits, Norway's regulation of

local networks in the 3.8-4.2 GHz band, Poland's spectrum assignment for local government units and enterprises, Bahrain's private 5G network licenses, Japan's 4.6-4.9 GHz and 28 GHz local 5G network licenses, South Korea's e-Um 5G allocations in the 4.7 GHz and 28 GHz bands, Taiwan's provision of 4.8-4.9 GHz spectrum for private 5G networks, Hong Kong's LWBS (Localized Wireless Broadband System) licenses, Australia's apparatus licensing approach, India's CNPN (Captive Non-Public Network) leasing framework and Brazil's SLP (Private Limited Service) licenses. Even China – where mobile operators have been at the forefront of initial private 5G installations – has started allocating private 5G spectrum licenses directly to end user organizations. Vast swaths of globally and regionally harmonized license-exempt spectrum are also available worldwide that can be used for the operation of unlicensed LTE and 5G NR-U equipment for private networks. In addition, dedicated national spectrum in sub-1 GHz and higher frequencies has been allocated for specific critical communications-related applications in many countries.

LTE and 5G-based private cellular networks come in many different shapes and sizes, including isolated end-to-end NPNs in industrial and enterprise settings, local RAN equipment for targeted cellular coverage, dedicated on-premise core network functions, virtual sliced private networks, secure MVNO (Mobile Virtual Network Operator) platforms for critical communications, and wide area networks for application scenarios such as PPDR (Public Protection & Disaster Relief) broadband, smart utility grids, railway communications and A2G (Air-to-Ground) connectivity. However, it is important to note that equipment suppliers, system integrators, private network specialists, mobile operators and other ecosystem players have slightly different perceptions as to what exactly constitutes a private cellular network. While there is near universal consensus that private LTE and 5G networks refer to purpose-built cellular communications systems intended for the exclusive use of vertical industries and enterprises, some industry participants extend this definition to also include other market segments – for example, 3GPP-based community and residential broadband networks deployed by non-traditional service providers. Another closely related segment is multi-operator or shared neutral host infrastructure, which may be employed to support NPN services in specific scenarios.

Despite the somewhat differing views on market definition, one thing is clear – private LTE and 5G networks are continuing their upward trajectory with deployments targeting a multitude of use cases across various industries, ranging from localized wireless systems for dedicated connectivity in factories, warehouses, mines, power plants, substations, offshore wind farms, oil and gas facilities, construction sites, maritime ports, airports, hospitals, office buildings and university campuses to regional and

nationwide sub-1 GHz private wireless broadband networks for utilities, FRMCS (Future Railway Mobile Communication System)-ready networks for train-to-ground communications, and hybrid government-commercial public safety LTE networks, as well as rapidly deployable systems such as the German Armed Forces' ZNV (Deployable Cellular Networks) solution, Hsinchu City Fire Department's satellite-backhauled portable 5G network for emergency communications and BBC's (British Broadcasting Corporation) temporary private 5G network used during King Charles' coronation. Custom-built cellular networks have also been implemented in locations as remote as Antarctica and there are even plans for installations on the moon's surface and outer space.

SNS Telecom & IT estimates that global spending on private LTE and 5G network infrastructure for vertical industries will grow at a CAGR of approximately 18% between 2023 and 2026, eventually accounting for more than \$6.4 Billion by the end of 2026. As much as 40% of these investments – nearly \$2.8 Billion – will be directed towards the build-out of standalone private 5G networks that will become the predominant wireless communications medium to support the ongoing Industry 4.0 revolution for the digitization and automation of manufacturing and process industries. This unprecedented level of growth is likely to transform private LTE and 5G networks into an almost parallel equipment ecosystem to public mobile operator infrastructure in terms of market size by the late 2020s.

The “Private LTE & 5G Network Ecosystem: 2023 – 2030 – Opportunities, Challenges, Strategies, Industry Verticals & Forecasts” report presents an in-depth assessment of the private LTE and 5G network ecosystem, including the value chain, market drivers, barriers to uptake, enabling technologies, operational and business models, vertical industries, application scenarios, key trends, future roadmap, standardization, spectrum availability and allocation, regulatory landscape, case studies, ecosystem player profiles and strategies. The report also presents global and regional market size forecasts from 2023 till 2030. The forecasts cover three infrastructure submarkets, two technology generations, four spectrum licensing models, 15 vertical industries and five regional markets.

The report comes with an associated Excel datasheet suite covering quantitative data from all numeric forecasts presented in the report, as well as a database of over 6,000 global private LTE/5G engagements – as of Q2'2023.

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- 3.7.13 Network Intelligence & Automation
  - 3.7.13.1 AI (Artificial Intelligence)
  - 3.7.13.2 Machine & Deep Learning
  - 3.7.13.3 Big Data & Advanced Analytics
  - 3.7.13.4 SON (Self-Organizing Networks)
  - 3.7.13.5 Intelligent Control, Management & Orchestration
  - 3.7.13.6 Support for Network Intelligence & Automation in 3GPP Standards

## **CHAPTER 4: KEY VERTICAL INDUSTRIES & APPLICATIONS**

- 4.1 Cross-Sector & Enterprise Application Capabilities
  - 4.1.1 Mobile Broadband
  - 4.1.2 FWA (Fixed Wireless Access)
  - 4.1.3 Voice & Messaging Services
  - 4.1.4 High-Definition Video Transmission
  - 4.1.5 Telepresence & Video Conferencing
  - 4.1.6 Multimedia Broadcasting & Multicasting
  - 4.1.7 IoT (Internet of Things) Networking
  - 4.1.8 Wireless Connectivity for Wearables
  - 4.1.9 Untethered AR/VR/MR (Augmented, Virtual & Mixed Reality)
  - 4.1.10 Real-Time Holographic Projections
  - 4.1.11 Tactile Internet & Haptic Feedback
  - 4.1.12 Precise Positioning & Tracking
  - 4.1.13 Industrial Automation
  - 4.1.14 Remote Control of Machines
  - 4.1.15 Connected Mobile Robotics
  - 4.1.16 Unmanned & Autonomous Vehicles
  - 4.1.17 BVLOS (Beyond Visual Line-of-Sight) Operation of Drones
  - 4.1.18 Data-Driven Analytics & Insights
  - 4.1.19 Sensor-Equipped Digital Twins
  - 4.1.20 Predictive Maintenance of Assets
- 4.2 Vertical Industries & Specific Application Scenarios
  - 4.2.1 Agriculture
    - 4.2.1.1 Intelligent Monitoring of Crop, Soil & Weather Conditions
    - 4.2.1.2 IoT & Advanced Analytics-Driven Yield Optimization
    - 4.2.1.3 Sensor-Based Smart Irrigation Control Systems
    - 4.2.1.4 Real-Time Tracking & Geofencing in Farms
    - 4.2.1.5 Livestock & Aquaculture Health Management
    - 4.2.1.6 Video-Based Remote Veterinary Inspections

- 4.2.1.7 Unmanned Autonomous Tractors & Farm Vehicles
- 4.2.1.8 Robots for Planting, Weeding & Harvesting
- 4.2.1.9 5G-Equipped Agricultural Drones
- 4.2.1.10 Connected Greenhouses & Vertical Farms
- 4.2.2 Aviation
  - 4.2.2.1 Inflight Connectivity for Passengers & Cabin Crew
  - 4.2.2.2 Connected Airports for Enhanced Traveler & Visitor Experience
  - 4.2.2.3 Coordination of Ground Support Equipment, Vehicles & Personnel
  - 4.2.2.4 ATM (Air Traffic Management) for Drones & Urban Air Mobility Vehicles
  - 4.2.2.5 Wireless Upload of EFB (Electronic Flight Bag) & IFE (In-Flight Entertainment) Updates
  - 4.2.2.6 Aircraft Data Offload for Operational & Maintenance Purposes
  - 4.2.2.7 Video Surveillance of Airport Surface & Terminal Areas
  - 4.2.2.8 5G-Enabled Remote Inspection & Repair of Aircraft
  - 4.2.2.9 Navigation, Weather & Other IoT Sensors
  - 4.2.2.10 Smart Baggage Handling
  - 4.2.2.11 Asset Awareness & Tracking
  - 4.2.2.12 Passenger Flow & Resource Management
  - 4.2.2.13 Automation of Check-In & Boarding Procedures
  - 4.2.2.14 Intelligent Airport Service Robots
- 4.2.3 Broadcasting
  - 4.2.3.1 3GPP-Based PMSE (Program Making & Special Events)
  - 4.2.3.2 Live AV (Audio-Visual) Media Production Using NPNs
  - 4.2.3.3 Private 5G-Enabled Production in Remote Locations
  - 4.2.3.4 Network Slicing for Contribution Feeds
  - 4.2.3.5 Wire-Free Cameras & Microphones
  - 4.2.3.6 Multicast & Broadcast Content Distribution
- 4.2.4 Construction
  - 4.2.4.1 Wireless Connectivity for Construction Sites & Field Offices
  - 4.2.4.2 Instantaneous Access to Business-Critical Applications
  - 4.2.4.3 5G-Based Remote Control of Heavy Machinery
  - 4.2.4.4 Autonomous Mobile Robots for Construction
  - 4.2.4.5 IoT Sensor-Driven Maintenance of Equipment
  - 4.2.4.6 Video Surveillance & Analytics for Site Security
  - 4.2.4.7 Real-Time Visibility of Personnel, Assets & Materials
  - 4.2.4.8 Aerial Surveying & Monitoring of Construction Sites
- 4.2.5 Education
  - 4.2.5.1 Remote & Distance Learning Services
  - 4.2.5.2 Mobile Access to Academic Resources



- 4.2.5.3 5G-Connected Smart Classrooms
- 4.2.5.4 Automation of Administrative Tasks
- 4.2.5.5 Personalized & Engaging Learning
- 4.2.5.6 AR/VR-Based Immersive Lessons
- 4.2.5.7 5G-Enabled Virtual Field Trips
- 4.2.5.8 Educational Telepresence Robots
- 4.2.6 Forestry
  - 4.2.6.1 Wireless Connectivity for Forestry Operations & Recreation
  - 4.2.6.2 5G-Facilitated Teleoperation of Forestry Equipment
  - 4.2.6.3 Autonomous Harvesting & Milling Machinery
  - 4.2.6.4 Real-Time Tracking of Equipment, Vehicles & Personnel
  - 4.2.6.5 Cellular IoT Sensors for Biological & Environmental Monitoring
  - 4.2.6.6 Wireless Cameras for Wildlife Observation, Conservation & Security
  - 4.2.6.7 Early Wildfire Detection & Containment Systems
  - 4.2.6.8 Drones for Search & Rescue Operations
- 4.2.7 Healthcare
  - 4.2.7.1 5G-Connected Smart Hospitals & Healthcare Facilities
  - 4.2.7.2 Wireless Transmission of Medical Imagery & Rich Datasets
  - 4.2.7.3 Real-Time Monitoring of Patients in Acute & Intensive Care
  - 4.2.7.4 Telehealth Video Consultations for Visual Assessment
  - 4.2.7.5 Connectivity for AI-Based Healthcare Applications
  - 4.2.7.6 AR Systems for Complex Medical Procedures
  - 4.2.7.7 Remote-Controlled Surgery & Examination
  - 4.2.7.8 Assisted Living & Rehabilitation Robotics
  - 4.2.7.9 Immersive VR-Based Medical & Surgical Training
  - 4.2.7.10 Connected Ambulances for EMS (Emergency Medical Services)
- 4.2.8 Manufacturing
  - 4.2.8.1 Untethered Connectivity for Production & Process Automation
  - 4.2.8.2 Wireless Motion Control & C2C (Control-to-Control) Communications
  - 4.2.8.3 Cellular-Equipped Mobile Control Panels
  - 4.2.8.4 Mobile Robots & AGVs (Automated Guided Vehicles)
  - 4.2.8.5 Autonomous Forklifts & Warehouse Robotics
  - 4.2.8.6 AR-Facilitated Factory Floor Operations
  - 4.2.8.7 Machine Vision-Based Quality Inspection
  - 4.2.8.8 Closed-Loop Process Control
  - 4.2.8.9 Process & Environmental Monitoring
  - 4.2.8.10 Precise Indoor Positioning for Asset Management
  - 4.2.8.11 Remote Access & Maintenance of Equipment
- 4.2.9 Military

- 4.2.9.1 5G-Based Tactical Battlefield Communications
- 4.2.9.2 Smart Military Bases & Command Posts
- 4.2.9.3 ISR (Intelligence, Surveillance & Reconnaissance)
- 4.2.9.4 Command & Control of Weapon Systems
- 4.2.9.5 Remote Operation of Robotics & Unmanned Assets
- 4.2.9.6 AR HUD (Heads-Up Display) Systems
- 4.2.9.7 Wireless VR/MR-Based Military Training
- 4.2.9.8 Perimeter Security & Force Protection
- 4.2.10 Mining
  - 4.2.10.1 Safety-Critical Communications in Remote Mining Environments
  - 4.2.10.2 Wireless Control of Drilling, Excavation & Related Equipment
  - 4.2.10.3 Automated Loading, Haulage & Train Operations
  - 4.2.10.4 Video-Based Monitoring of Personnel & Assets
  - 4.2.10.5 Underground Positioning & Geofencing
  - 4.2.10.6 Smart Ventilation & Water Management
  - 4.2.10.7 Real-Time Operational Intelligence
  - 4.2.10.8 AR & VR for Mining Operations
- 4.2.11 Oil & Gas
  - 4.2.11.1 Wireless Connectivity for Remote Exploration & Production Sites
  - 4.2.11.2 Critical Voice & Data-Based Mobile Workforce Communications
  - 4.2.11.3 Push-to-Video & Telepresence Conferencing for Field Operations
  - 4.2.11.4 Cellular-Equipped Surveillance Cameras for Situational Awareness
  - 4.2.11.5 IoT Sensor-Enabled Remote Monitoring & Automation of Processes
  - 4.2.11.6 SCADA (Supervisory Control & Data Acquisition) Communications
  - 4.2.11.7 Location Services for Worker Safety & Asset Tracking
  - 4.2.11.8 AR Smart Helmets for Hands-Free Remote Assistance
  - 4.2.11.9 Predictive Maintenance of Oil & Gas Facilities
  - 4.2.11.10 Mobile Robots for Safety Hazard Inspections
- 4.2.12 Ports & Maritime Transport
  - 4.2.12.1 Critical Communications for Port Workers
  - 4.2.12.2 Automation of Port & Terminal Operations
  - 4.2.12.3 5G-Connected AGVs for Container Transport
  - 4.2.12.4 Remote-Controlled Cranes & Terminal Tractors
  - 4.2.12.5 Video Analytics for Operational Purposes
  - 4.2.12.6 Environmental & Condition Monitoring
  - 4.2.12.7 Port Traffic Management & Control
  - 4.2.12.8 AR & VR Applications for Port Digitization
  - 4.2.12.9 Unmanned Aerial Inspections of Port Facilities
  - 4.2.12.10 Private Cellular-Enabled Maritime Communications

- 4.2.12.11 Wireless Ship-to-Shore Connectivity in Nearshore Waters
- 4.2.12.12 5G-Facilitated Remote Steering of Unmanned Vessels
- 4.2.13 Public Safety
  - 4.2.13.1 Mission-Critical PTT Voice Communications
  - 4.2.13.2 Real-Time Video & High-Resolution Imagery
  - 4.2.13.3 Messaging, File Transfer & Presence Services
  - 4.2.13.4 Secure & Seamless Mobile Broadband Access
  - 4.2.13.5 Location-Based Services & Enhanced Mapping
  - 4.2.13.6 Multimedia CAD (Computer-Aided Dispatch)
  - 4.2.13.7 Massive-Scale Video Surveillance & Analytics
  - 4.2.13.8 Smart Glasses & AR Headgear for First Responders
  - 4.2.13.9 5G-Equipped Police, Firefighting & Rescue Robots
  - 4.2.13.10 5G MBS/5MBS in High-Density Environments
  - 4.2.13.11 Sidelink-Based Direct Mode Communications
- 4.2.14 Railways
  - 4.2.14.1 FRMCS (Future Railway Mobile Communication System)
  - 4.2.14.2 Train-to-Ground & Train-to-Train Connectivity
  - 4.2.14.3 Wireless Intra-Train Communications
  - 4.2.14.4 Rail Operations-Critical Voice, Data & Video Services
  - 4.2.14.5 ATO (Automatic Train Operation) & Traffic Management
  - 4.2.14.6 Video Surveillance for Operational Safety & Security
  - 4.2.14.7 Smart Maintenance of Railway Infrastructure
  - 4.2.14.8 Intelligent Management of Logistics Facilities
  - 4.2.14.9 Onboard Broadband Internet Access
  - 4.2.14.10 PIS (Passenger Information Systems)
  - 4.2.14.11 Smart Rail & Metro Station Services
- 4.2.15 Utilities
  - 4.2.15.1 Multi-Service FANs (Field Area Networks)
  - 4.2.15.2 Critical Applications for Field Workforce Communications
  - 4.2.15.3 AMI (Advanced Metering Infrastructure)
  - 4.2.15.4 DA (Distribution Automation) Systems
  - 4.2.15.5 Microgrid & DER (Distributed Energy Resource) Integration
  - 4.2.15.6 5G-Enabled VPPs (Virtual Power Plants)
  - 4.2.15.7 Low-Latency SCADA Applications for Utilities
  - 4.2.15.8 Teleprotection of Transmission & Distribution Grids
  - 4.2.15.9 Video Monitoring for Critical Infrastructure Protection
  - 4.2.15.10 Sensor-Based Detection of Water & Gas Leaks
  - 4.2.15.11 AR Information Overlays for Repairs & Maintenance
  - 4.2.15.12 Drone & Robot-Assisted Inspections of Utility Assets

- 4.2.15.13 Local Wireless Connectivity for Remote & Offshore Facilities
- 4.2.16 Other Verticals

## **CHAPTER 5: SPECTRUM AVAILABILITY, ALLOCATION & USAGE**

### 5.1 National & Local Area Licensed Spectrum

#### 5.1.1 Low-Band (Sub-1 GHz)

- 5.1.1.1 200 – 400 MHz
- 5.1.1.2 410 & 450 MHz
- 5.1.1.3 600 MHz
- 5.1.1.4 700 MHz
- 5.1.1.5 800 MHz
- 5.1.1.6 900 MHz

#### 5.1.2 Mid-Band (1 – 6 GHz)

- 5.1.2.1 1.4 GHz
- 5.1.2.2 1.6 GHz
- 5.1.2.3 1.8 GHz
- 5.1.2.4 1.9 GHz
- 5.1.2.5 2.1 GHz
- 5.1.2.6 2.3 GHz
- 5.1.2.7 2.4 GHz
- 5.1.2.8 2.5 GHz
- 5.1.2.9 2.6 GHz
- 5.1.2.10 3.3 – 3.8 GHz
- 5.1.2.11 3.8 – 4.2 GHz
- 5.1.2.12 4.6 – 4.9 GHz
- 5.1.2.13 Other Bands

#### 5.1.3 High-Band mmWave (Millimeter Wave)

- 5.1.3.1 26 GHz
- 5.1.3.2 28 GHz
- 5.1.3.3 37 GHz
- 5.1.3.4 Other Bands

### 5.2 License-Exempt (Unlicensed) Spectrum

- 5.2.1 Sub-1 GHz Bands (470 – 790/800/900 MHz)
- 5.2.2 1.8 GHz DECT Guard Band
- 5.2.3 1.9 GHz sXGP Band
- 5.2.4 2.4 GHz (2,400 – 2,483.5 MHz)
- 5.2.5 3.5 GHz CBRS GAA Tier (3,550 – 3,700 MHz)
- 5.2.6 5 GHz (5,150 – 5,925 MHz)

5.2.7 6 GHz (5,925 – 7,125 MHz)

5.2.8 60 GHz (57 – 71 GHz)

5.2.9 Other Bands

5.3 North America

5.3.1 United States

5.3.2 Canada

5.4 Asia Pacific

5.4.1 Australia

5.4.2 New Zealand

5.4.3 China

5.4.4 Hong Kong

5.4.5 Taiwan

5.4.6 Japan

5.4.7 South Korea

5.4.8 Singapore

5.4.9 Malaysia

5.4.10 Indonesia

5.4.11 Philippines

5.4.12 Thailand

5.4.13 Vietnam

5.4.14 Laos

5.4.15 Myanmar

5.4.16 India

5.4.17 Pakistan

5.4.18 Rest of Asia Pacific

5.5 Europe

5.5.1 United Kingdom

5.5.1.1 Great Britain

5.5.1.2 Northern Ireland

5.5.2 Republic of Ireland

5.5.3 France

5.5.4 Germany

5.5.5 Belgium

5.5.6 Netherlands

5.5.7 Switzerland

5.5.8 Austria

5.5.9 Italy

5.5.10 Spain

5.5.11 Portugal

- 5.5.12 Sweden
- 5.5.13 Norway
- 5.5.14 Denmark
- 5.5.15 Finland
- 5.5.16 Estonia
- 5.5.17 Czech Republic
- 5.5.18 Poland
- 5.5.19 Ukraine
- 5.5.20 Turkiye
- 5.5.21 Greece
- 5.5.22 Bulgaria
- 5.5.23 Romania
- 5.5.24 Hungary
- 5.5.25 Slovenia
- 5.5.26 Croatia
- 5.5.27 Russia
- 5.5.28 Belarus
- 5.5.29 Rest of Europe
- 5.6 Middle East & Africa
  - 5.6.1 Saudi Arabia
  - 5.6.2 United Arab Emirates
  - 5.6.3 Qatar
  - 5.6.4 Oman
  - 5.6.5 Bahrain
  - 5.6.6 Kuwait
  - 5.6.7 Jordan
  - 5.6.8 Israel
  - 5.6.9 Egypt
  - 5.6.10 Algeria
  - 5.6.11 Morocco
  - 5.6.12 Tunisia
  - 5.6.13 South Africa
  - 5.6.14 Botswana
  - 5.6.15 Zambia
  - 5.6.16 Kenya
  - 5.6.17 Ethiopia
  - 5.6.18 Angola
  - 5.6.19 Republic of the Congo
  - 5.6.20 Gabon



- 5.6.21 Nigeria
- 5.6.22 Ghana
- 5.6.23 Senegal
- 5.6.24 Rest of the Middle East & Africa
- 5.7 Latin & Central America
  - 5.7.1 Brazil
  - 5.7.2 Mexico
  - 5.7.3 Argentina
  - 5.7.4 Colombia
  - 5.7.5 Chile
  - 5.7.6 Peru
  - 5.7.7 Ecuador
  - 5.7.8 Bolivia
  - 5.7.9 Dominican Republic
  - 5.7.10 Barbados
  - 5.7.11 Trinidad & Tobago
  - 5.7.12 Suriname
  - 5.7.13 Rest of Latin & Central America

## **CHAPTER 6: STANDARDIZATION, REGULATORY & COLLABORATIVE INITIATIVES**

- 6.1 3GPP (Third Generation Partnership Project)
  - 6.1.1 Releases 11-14: 3GPP-Based Critical Communications Features
  - 6.1.2 Release 15: 5G eMBB, Network Slicing, Improvements for MTC/IoT & MCX Extensions
  - 6.1.3 Release 16: 3GPP Support for NPNs, 5G URLLC, TSN, NR-U & Vertical Application Enablers
  - 6.1.4 Release 17: NPN Enhancements, Edge Computing, TSC, Expansion of IIoT Features, RedCap & NTN Connectivity
  - 6.1.5 Release 18: 5G-Advanced, Further NPN Refinements, DetNet, Intelligent Automation, Spectrum Flexibility & XR Services
  - 6.1.6 Releases 19, 20, 21 & Beyond: Succession From 5G-Advanced to the 6G Evolution
- 6.2 450 MHz Alliance
  - 6.2.1 Promoting 3GPP Technologies in the 380 – 470 MHz Frequency Range
- 6.3 5G-ACIA (5G Alliance for Connected Industries and Automation)
  - 6.3.1 Maximizing the Applicability of 5G Technology in the Industrial Domain
- 6.4 5GAIA (5G Applications Industry Array)

- 6.4.1 Advancing the Development of China's 5G Applications Industry
- 6.5 5G Campus Network Alliance
  - 6.5.1 Supporting the Market Development of 5G Campus Networks in Germany
- 6.6 5GDNA (5G Deterministic Networking Alliance)
  - 6.6.1 Industry Collaboration & Promotion of 5GDN (5G Deterministic Networking)
- 6.7 5GFF (5G Future Forum)
  - 6.7.1 Accelerating the Delivery of 5G MEC (Multi-Access Edge Computing) Solutions
- 6.8 5G Forum (South Korea)
  - 6.8.1 Expanding Convergence Between 5G Technology & Vertical Industries
- 6.9 5G Health Association
  - 6.9.1 Interfacing 5G-Based Connectivity & Healthcare Applications
- 6.10 5G-MAG (5G Media Action Group)
  - 6.10.1 5G-Based NPNs in Media Production
- 6.11 5GMF (Fifth Generation Mobile Communication Promotion Forum, Japan)
  - 6.11.1 Initiatives Related to Local 5G Networks in Japan
- 6.12 5GSA (5G Slicing Association)
  - 6.12.1 Addressing Vertical Industry Requirements for 5G Network Slicing
- 6.13 6G-IA (6G Smart Networks and Services Industry Association)
  - 6.13.1 Private 5G-Related Projects & Activities
- 6.14 AGURRE (Association of Major Users of Operational Radio Networks, France)
  - 6.14.1 Spectrum Access, Regulatory Framework & Industrial Ecosystem for Private Mobile Networks
- 6.15 APCO (Association of Public-Safety Communications Officials) International
  - 6.15.1 Public Safety LTE/5G-Related Advocacy Efforts
- 6.16 ATIS (Alliance for Telecommunications Industry Solutions)
  - 6.16.1 Deployment & Operational Requirements of 5G-Based NPNs
  - 6.16.2 Shared HNI & IBN Administration for CBRS Spectrum
  - 6.16.3 Other Private LTE & 5G-Related Initiatives
- 6.17 BTG (Dutch Association of Large-Scale ICT & Telecommunications Users)
  - 6.17.1 KMBG (Dutch Critical Mobile Broadband Users) Expert Group
- 6.18 B-TrunC (Broadband Trunking Communication) Industry Alliance
  - 6.18.1 B-TrunC Standard for LTE-Based Critical Communications
- 6.19 CAMET (China Association of Metros)
  - 6.19.1 Adoption of 3GPP Networks for Urban Rail Transit Systems
- 6.20 CEPT (European Conference of Postal and Telecommunications Administrations)
  - 6.20.1 Common Spectrum Policies for Local 4G/5G, PPDR Broadband & FRMCS
- 6.21 DSA (Dynamic Spectrum Alliance)
  - 6.21.1 Promoting Unlicensed & Dynamic Access to Spectrum
- 6.22 Electricity Canada (Canadian Electricity Association)

- 6.22.1 PVNO & Dedicated Spectrum for Smart Grid Communications
- 6.23 ENTELEC (Energy Telecommunications and Electrical Association)
  - 6.23.1 Policy Advocacy & Other Private LTE/5G-Related Activities
- 6.24 EPRI (Electric Power Research Institute)
  - 6.24.1 Research & Guidelines in Support of 3GPP-Based Utility Communications
- 6.25 ERA (European Union Agency for Railways)
  - 6.25.1 Evolution of Railway Radio Communication Project
- 6.26 ETSI (European Telecommunications Standards Institute)
  - 6.26.1 Technical Specifications for FRMCS, PPDR Broadband, MCX & TETRA-3GPP Interworking
  - 6.26.2 Other Work Relevant to Private LTE & 5G Networks
- 6.27 EU-Rail (Europe's Rail Joint Undertaking)
  - 6.27.1 FRMCS-Related Research & Innovation Activities
- 6.28 EUTC (European Utilities Telecom Council)
  - 6.28.1 Addressing LTE & 5G-Related Requirements for European Utilities
- 6.29 EUWENA (European Users of Enterprise Wireless Networks Association)
  - 6.29.1 Catalyzing the Wider Adoption of 3GPP-Based Private Networks
- 6.30 EWA (Enterprise Wireless Alliance)
  - 6.30.1 Supporting the Private Wireless Industry in the United States
- 6.31 free5GC
  - 6.31.1 Open-Source 5GC Software
- 6.32 GSA (Global Mobile Suppliers Association)
  - 6.32.1 Advocacy for Private Mobile Networks
- 6.33 GSMA (GSM Association)
  - 6.33.1 Guidelines for 5G Private & Dedicated Networks
- 6.34 GUTMA (Global UTM Association)
  - 6.34.1 ACJA (Aerial Connectivity Joint Activity) Initiative
- 6.35 ITU (International Telecommunication Union)
  - 6.35.1 International & Regional Harmonization of LTE/5G Spectrum
  - 6.35.2 Defining the Role of IMT-2020 to Support Vertical Applications
- 6.36 JOTS (Joint Operators Technical Specification) Forum
  - 6.36.1 NHIB (Neutral Host In-Building) Specification
- 6.37 JRC (Joint Radio Company)
  - 6.37.1 Supporting LTE/5G-Based Smart Grid Initiatives
- 6.38 KRRRI (Korea Railroad Research Institute)
  - 6.38.1 Functional Testing & Certification of LTE-R (LTE-Based Railway Communications)
- 6.39 LF (Linux Foundation)
  - 6.39.1 Magma Mobile Core Software Platform

- 6.39.2 LF Networking's 5G Super Blueprint
- 6.39.3 LF Edge's Akraino Private LTE/5G ICN (Integrated Cloud-Native) Blueprint
- 6.39.4 Other Projects Relevant to Private LTE & 5G Networks
- 6.40 MFA (MulteFire Alliance)
  - 6.40.1 Uni5G Technology Blueprints for Private 5G Networks
  - 6.40.2 Network Identifier Program Supporting Private & Neutral Host Networks
  - 6.40.3 MulteFire Specifications: LTE Operation in Unlicensed Spectrum
  - 6.40.4 Certification Program for MulteFire Equipment
  - 6.40.5 MulteFire OSU (Online Sign-Up) System
- 6.41 NGA (Next G Alliance)
  - 6.41.1 Building the Foundation for North American Leadership in 6G
- 6.42 NGMN (Next-Generation Mobile Networks) Alliance
  - 6.42.1 Work Related to Private 5G & Network Slicing
- 6.43 NSC (National Spectrum Consortium)
  - 6.43.1 Enhancing Spectrum Superiority & 5G Capabilities for Federal Users
- 6.44 OCP (Open Compute Project) Foundation
  - 6.44.1 Initiatives Aimed at Open Designs for Telco Hardware
- 6.45 one6G Association
  - 6.45.1 Driving 6G Innovation & Development Across Vertical Industries
- 6.46 ONF (Open Networking Foundation)
  - 6.46.1 Aether Private 5G Connected Edge Platform
  - 6.46.2 SD-RAN, SD-Core, OMEC & Other Relevant Projects
- 6.47 OnGo Alliance
  - 6.47.1 Promoting 4G & 5G OnGo Wireless Network Technology
  - 6.47.2 Technical Specifications & Guidelines for 4G/5G-Based CBRS Networks
  - 6.47.3 Product Certification Program Supporting Multi-Vendor Interoperability
- 6.48 OPC Foundation
  - 6.48.1 OPC UA (Unified Architecture) Over 5G for Industry 4.0 Applications
- 6.49 Open RAN Policy Coalition
  - 6.49.1 Promoting Policies to Drive the Adoption of Open RAN
- 6.50 Open5GCore
  - 6.50.1 Vendor-Independent 5GC Implementation
- 6.51 Open5GS & NextEPC
  - 6.51.1 Open-Source 5GC & EPC Software
- 6.52 OpenInfra (Open Infrastructure) Foundation
  - 6.52.1 StarlingX Software Stack for Ultra-Low Latency Edge Applications
  - 6.52.2 OpenStack Cloud Software & Other Projects
- 6.53 O-RAN Alliance
  - 6.53.1 O-RAN Architecture Specifications

- 6.53.2 O-RAN SC (Software Community)
- 6.53.3 Testing & Integration Support
- 6.54 OSA (OpenAirInterface Software Alliance)
  - 6.54.1 OAI (OpenAirInterface) 5G RAN, Core & MOSAIC5G Projects
- 6.55 PIA (PSBN Innovation Alliance)
  - 6.55.1 PSBN (Public Safety Broadband Network) Governance in Canada's Ontario Province
- 6.56 PMeV (German Professional Mobile Radio Association)
  - 6.56.1 Professional Broadband & 5G Campus Network-Related Activities
- 6.57 PSBTA (Public Safety Broadband Technology Association)
  - 6.57.1 Public Safety LTE/5G-Related Activities
- 6.58 PSCE (Public Safety Communication Europe)
  - 6.58.1 Public Safety Broadband-Related Standardization Activities
  - 6.58.2 BroadX Projects: Pan-European Interoperable Mobile Broadband System for Public Safety
- 6.59 Safe-Net Forum
  - 6.59.1 Technical & Policy Guidance for 3GPP-Based Critical Communications Networks
- 6.60 SCF (Small Cell Forum)
  - 6.60.1 Reference Blueprints for Private 5G Networks
  - 6.60.2 Neutral Hosting, Edge Computing & Other Relevant Work
- 6.61 Seamless Air Alliance
  - 6.61.1 Leading Global Standards for Inflight Connectivity
- 6.62 SimpleRAN
  - 6.62.1 Ensuring Interoperability & Transparency in the vRAN Ecosystem
- 6.63 srsRAN Project
  - 6.63.1 Open-Source 4G & 5G Software Suites
- 6.64 TCA (Trusted Connectivity Alliance)
  - 6.64.1 5G SIM/eSIM Recommendations for Private Networks
- 6.65 TCCA (The Critical Communications Association)
  - 6.65.1 CCBG (Critical Communications Broadband Group)
  - 6.65.2 BIG (Broadband Industry Group)
  - 6.65.3 SCADA, Smart Grid & IoT Group
  - 6.65.4 Future Technologies Group
- 6.66 techUK
  - 6.66.1 SPF (Spectrum Policy Forum)
- 6.67 TIA (Telecommunications Industry Association)
  - 6.67.1 Defining Requirements for LMR-3GPP Interworking & Critical Broadband Capabilities



- 6.68 TIP (Telecom Infra Project)
  - 6.68.1 5G Private Networks Solution Group
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  - 6.68.4 Other Relevant Product & Solution Groups
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- 6.70 U.S. NIST (National Institute of Standards and Technology)
  - 6.70.1 Public Safety Broadband & 5G-Related R&D Initiatives
- 6.71 U.S. NPSTC (National Public Safety Telecommunications Council)
  - 6.71.1 Leadership for LMR-3GPP Interworking & Public Safety Broadband Communications
- 6.72 U.S. NTIA (National Telecommunications and Information Administration)
  - 6.72.1 Wireless Innovation & Supply Chain Security
- 6.73 UBBA (Utility Broadband Alliance)
  - 6.73.1 Championing the Advancement of Private Broadband Networks for Utilities
- 6.74 UIC (International Union of Railways)
  - 6.74.1 FRMCS Program for the Replacement of GSM-R Networks
- 6.75 UK5G Innovation Network
  - 6.75.1 Promoting Private 5G Adoption Projects, Testbeds & Trials
- 6.76 UNIFE (The European Rail Supply Industry Association)
  - 6.76.1 UNITEL Committee: Development & Implementation of FRMCS
- 6.77 UTC (Utilities Technology Council)
  - 6.77.1 Private LTE & 5G-Related Advocacy, Technology Development & Policy Efforts
- 6.78 UTCAL (Utilities Telecom & Technology Council America Latina)
  - 6.78.1 Promoting Private LTE & 5G Networks for Latin American Utilities
- 6.79 VDMA (German Mechanical and Plant Engineering Association)
  - 6.79.1 Guidelines for 5G in Mechanical & Plant Engineering
- 6.80 WBA (Wireless Broadband Alliance)
  - 6.80.1 5G & Wi-Fi Convergence in Private 5G Networks
  - 6.80.2 OpenRoaming for Private LTE/5G
- 6.81 WhiteSpace Alliance
  - 6.81.1 Promoting the Use of 3GPP, IEEE & IETF Standards for TVWS Spectrum
- 6.82 WInnForum (Wireless Innovation Forum)
  - 6.82.1 CBRS Standards for the Implementation of FCC Rulemaking
  - 6.82.2 6 GHz Unlicensed Sharing & Other Committees
- 6.83 XGP (eXtended Global Platform) Forum
  - 6.83.1 Development & Promotion of the sXGP Unlicensed LTE Service



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  - 8.90.3 Integrators & Suppliers
  - 8.90.4 Deployment Summary
- 8.91 U.S. Army: Expanding Military Communications Capabilities With 5G Technology
  - 8.91.1 Operational Model
  - 8.91.2 Spectrum Type
  - 8.91.3 Integrators & Suppliers
  - 8.91.4 Deployment Summary
- 8.92 U.S. Marine Corps: Private 5G for Smart Warehousing & Expeditionary Base Operations
  - 8.92.1 Operational Model
  - 8.92.2 Spectrum Type
  - 8.92.3 Integrators & Suppliers
  - 8.92.4 Deployment Summary
- 8.93 UKD (University Hospital of Dusseldorf): Improving Patient Care & Saving Lives With 5G Campus Network
  - 8.93.1 Operational Model
  - 8.93.2 Spectrum Type
  - 8.93.3 Integrators & Suppliers
  - 8.93.4 Deployment Summary
- 8.94 UN (United Nations): Dedicated Cellular Networks for Peacekeeping Missions
  - 8.94.1 Operational Model
  - 8.94.2 Spectrum Type
  - 8.94.3 Integrators & Suppliers
  - 8.94.4 Deployment Summary
- 8.95 Vale: Private Wireless Networks for Iron Ore Mining & Transport Operations
  - 8.95.1 Operational Model
  - 8.95.2 Spectrum Type
  - 8.95.3 Integrators & Suppliers
  - 8.95.4 Deployment Summary
- 8.96 VIRVE 2.0: Finland's Nationwide Mission-Critical Broadband Service
  - 8.96.1 Operational Model
  - 8.96.2 Spectrum Type

- 8.96.3 Integrators & Suppliers
- 8.96.4 Deployment Summary
- 8.97 VIT (Virginia International Terminals): Private 5G Network for Port Of Virginia Container Terminal
  - 8.97.1 Operational Model
  - 8.97.2 Spectrum Type
  - 8.97.3 Integrators & Suppliers
  - 8.97.4 Deployment Summary
- 8.98 X Shore: Empowering Electric Boat Manufacturing With Private 5G Network
  - 8.98.1 Operational Model
  - 8.98.2 Spectrum Type
  - 8.98.3 Integrators & Suppliers
  - 8.98.4 Deployment Summary
- 8.99 Xcel Energy: 900 MHz Private LTE Network for Electric & Gas Utility Operations
  - 8.99.1 Operational Model
  - 8.99.2 Spectrum Type
  - 8.99.3 Integrators & Suppliers
  - 8.99.4 Deployment Summary
- 8.100 Yumeshima Container Terminal: Local 5G Network for the Digital Transformation of Port Facilities
  - 8.100.1 Operational Model
  - 8.100.2 Spectrum Type
  - 8.100.3 Integrators & Suppliers
  - 8.100.4 Deployment Summary

## **CHAPTER 9: KEY ECOSYSTEM PLAYERS**

- 9.1 10T Tech
- 9.2 1NCE
- 9.3 1oT
- 9.4 3D-P (Epiroc)
- 9.5 450connect
- 9.6 4K Solutions
- 9.7 4RF
- 9.8 6Harmonics/6WiLInk
- 9.9 6WIND
- 9.10 7P (Seven Principles)
- 9.11 A Beep/Diga-Talk+
- 9.12 A1 Telekom Austria Group



- 9.13 A10 Networks
- 9.14 A5G Networks
- 9.15 AAEON Technology (ASUS – ASUSTeK Computer)
- 9.16 Aarna Networks
- 9.17 ABB
- 9.18 ABEL Mobilfunk
- 9.19 ABiT Corporation
- 9.20 ABS
- 9.21 Abside Networks
- 9.22 Accedian
- 9.23 AccelerComm
- 9.24 Accelink Technologies
- 9.25 Accelleran
- 9.26 Accenture
- 9.27 Access Spectrum
- 9.28 Accton Technology Corporation
- 9.29 Accuver (InnoWireless)
- 9.30 ACE Technologies
- 9.31 AceAxis
- 9.32 AceTel (Ace Solutions)
- 9.33 Achronix Semiconductor Corporation
- 9.34 ACOME
- 9.35 Actelis Networks
- 9.36 Action Technologies (Shenzhen Action Technologies)
- 9.37 Actiontec Electronics
- 9.38 Active911
- 9.39 Actus Networks
- 9.40 Adax
- 9.41 Adcor Magnet Systems
- 9.42 ADI (Analog Devices, Inc.)
- 9.43 ADLINK Technology
- 9.44 ADRF (Advanced RF Technologies)
- 9.45 ADT
- 9.46 Adtran
- 9.47 ADVA
- 9.48 Advanced Energy Industries
- 9.49 AdvanceTec Industries
- 9.50 Advantech
- 9.51 Advantech Wireless Technologies (Baylin Technologies)

- 9.52 Aegex Technologies
- 9.53 Aerial Applications
- 9.54 Aeris
- 9.55 Aerostar International
- 9.56 Aethertek
- 9.57 Affarii Technologies
- 9.58 Affirmed Networks (Microsoft Corporation)
- 9.59 AFL Global
- 9.60 AFRY
- 9.61 Agile (Agile Interoperable Solutions)
- 9.62 AGIS (Advanced Ground Information Systems)
- 9.63 AGM Mobile
- 9.64 AH NET (MVM NET)
- 9.65 AI-LINK
- 9.66 AINA Wireless
- 9.67 Airbus/SLC (Secure Land Communications)
- 9.68 Airfide Networks
- 9.69 Airgain
- 9.70 AirHop Communications
- 9.71 Airlinq
- 9.72 Airspan Networks
- 9.73 Airtower Networks
- 9.74 Airwavz Solutions
- 9.75 AIS (Advanced Info Service)
- 9.76 AiVader
- 9.77 Akamai Technologies
- 9.78 Akoustis Technologies
- 9.79 Alaxala Networks Corporation (Fortinet)
- 9.80 ALBEDO Telecom
- 9.81 albis-elcon (JET – United Electronic Technology)
- 9.82 Alcadis
- 9.83 Alea (Leonardo)
- 9.84 Alef (Alef Edge)
- 9.85 Alepo
- 9.86 Alibaba Group
- 9.87 Aliniant
- 9.88 Allbesmart
- 9.89 Allen Vanguard Wireless
- 9.90 Allerio

- 9.91 Allied Telesis
- 9.92 Allot
- 9.93 Alpha Networks
- 9.94 Alpha Wireless
- 9.95 Alsatis Reseaux
- 9.96 Alstom
- 9.97 Altaeros
- 9.98 Altair Semiconductor (Sony Semiconductor Israel)
- 9.99 ALTAN Redes
- 9.100 Altice Group
- 9.101 AltioStar (Rakuten Symphony)
- 9.102 ALVIS (Argentina)
- 9.103 AM Telecom
- 9.104 Amantya Technologies
- 9.105 Amarisoft
- 9.106 Amazon/AWS (Amazon Web Services)
- 9.107 Ambra Solutions-ECOTEL
- 9.108 AMD (Advanced Micro Devices)
- 9.109 Amdocs
- 9.110 America Movil
- 9.111 American Tower Corporation
- 9.112 AMI (American Megatrends International)
- 9.113 AMIT Wireless
- 9.114 Ampere Computing
- 9.115 Amphenol Corporation
- 9.116 Ampleon
- 9.117 Amtele Communication
- 9.118 Andesat
- 9.119 ANDRO Computational Solutions
- 9.120 Anktion (Fujian) Technology
- 9.121 Anokiwave
- 9.122 Anritsu
- 9.123 ANS – Advanced Network Services (Charge Enterprises)
- 9.124 Antenna Company
- 9.125 Anterix
- 9.126 Antna Antenna Technology
- 9.127 Aorotech
- 9.128 Apple
- 9.129 APRESIA Systems

- 9.130 APSTAR (APT Satellite Company)
- 9.131 APT (Asia Pacific Telecom)
- 9.132 aql
- 9.133 Aquila (Suzhou Aquila Solutions)
- 9.134 Aqura Technologies (Telstra Purple)
- 9.135 Arabsat
- 9.136 Arcadyan Technology Corporation (Compal Electronics)
- 9.137 Archos
- 9.138 Arete M
- 9.139 Argela
- 9.140 ArgoNET
- 9.141 Aria Networks
- 9.142 Arista Networks
- 9.143 Arkessa (Wireless Logic Group)
- 9.144 Arm
- 9.145 Armour Communications
- 9.146 Arqit Quantum
- 9.147 ArrayComm (Chengdu ArrayComm Wireless Technologies)
- 9.148 Arrcus
- 9.149 Artemis Networks
- 9.150 Artiza Networks
- 9.151 Aruba (HPE – Hewlett Packard Enterprise)
- 9.152 Arukona
- 9.153 Asavie
- 9.154 ASELSAN
- 9.155 AsiaInfo Technologies
- 9.156 AsiaSat (Asia Satellite Telecommunications Company)
- 9.157 Askey Computer Corporation (ASUS – ASUSTeK Computer)
- 9.158 ASOCS
- 9.159 Aspire Technology (NEC Corporation)
- 9.160 ASR Microelectronics
- 9.161 Assured Wireless Corporation (Nextivity)
- 9.162 AST SpaceMobile
- 9.163 ASTELLA (Astella Technologies)
- 9.164 ASTRI (Hong Kong Applied Science and Technology Research Institute)
- 9.165 ASUS (ASUSTeK Computer)
- 9.166 Asylon
- 9.167 AT&T
- 9.168 ATDI

- 9.169 ATEL (Asiatelco Technologies)
- 9.170 Atel Antennas
- 9.171 Atesio
- 9.172 Athonet (HPE – Hewlett Packard Enterprise)
- 9.173 ATL – A Test Lab (Eurofins E&E – Electrical and Electronics)
- 9.174 Atlas Telecom
- 9.175 ATN International
- 9.176 Atos
- 9.177 Atrinet
- 9.178 Attabotics
- 9.179 AttoCore
- 9.180 Auden Techno
- 9.181 Auray Technology (Auden Techno)
- 9.182 Aurora Insight
- 9.183 Avanti Communications
- 9.184 Avari Wireless
- 9.185 AVI
- 9.186 Aviat Networks
- 9.187 Avidyne Corporation
- 9.188 AVIWEST (Haivision)
- 9.189 AVM
- 9.190 AW2S – Advanced Wireless Solutions and Services (SERMA Group)
- 9.191 AWTG
- 9.192 Axell Wireless
- 9.193 AXESS Networks (HISPASAT)
- 9.194 Axians (VINCI Energies)
- 9.195 Axiata Group
- 9.196 Axione
- 9.197 Axis Communications
- 9.198 Axon
- 9.199 Axtel
- 9.200 Axxcelera Broadband Wireless (Axxcss Wireless Solutions)
- 9.201 Axxcss Wireless Solutions
- 9.202 Azcom Technology
- 9.203 Azetti Networks
- 9.204 B+B SmartWorx (Advantech)
- 9.205 BAE Systems
- 9.206 BAI Communications/Boldyn Networks
- 9.207 Baicells

- 9.208 Ball Aerospace
- 9.209 Ballast Networks
- 9.210 BandRich
- 9.211 BandwidthX
- 9.212 Barrett Communications (Motorola Solutions)
- 9.213 BATS Wireless (Broadband Antenna Tracking Systems)
- 9.214 BAYFU (Bayerische Funknetz)
- 9.215 Baylin Technologies
- 9.216 BBB (BB Backbone Corporation)
- 9.217 BBK Electronics
- 9.218 BCDVideo
- 9.219 Beam Semiconductor
- 9.220 Beamlink
- 9.221 BearCom
- 9.222 BEC Technologies
- 9.223 becon
- 9.224 Beeper Communications
- 9.225 Beijer Electronics Group
- 9.226 Belden
- 9.227 BelFone
- 9.228 Bell Canada
- 9.229 Bellantenna
- 9.230 Benetel
- 9.231 BesoVideo
- 9.232 Betacom
- 9.233 Bharti Airtel
- 9.234 BHE (Bonn Hungary Electronics)
- 9.235 BICS (Proximus)
- 9.236 Billion Electric
- 9.237 BinnenBereik (NOVEC)
- 9.238 Bird Technologies
- 9.239 BISDN (Berlin Institute for Software Defined Networks)
- 9.240 Bittium
- 9.241 BK Technologies
- 9.242 Black & Veatch
- 9.243 Black Box
- 9.244 BlackBerry
- 9.245 Blackned
- 9.246 BLiNQ Networks (CCI – Communication Components Inc.)



- 9.247 Blu Wireless
- 9.248 Blue Arcus Technologies
- 9.249 Blue Danube Systems (NEC Corporation)
- 9.250 Blue Wireless
- 9.251 Bluebird
- 9.252 Blueforce Development Corporation
- 9.253 BLUnet Schweiz (Axp0 WZ-Systems)
- 9.254 Boeing/Aurora Flight Sciences
- 9.255 Boelink (Shanghai Boelink Communication Technology)
- 9.256 Boingo Wireless (DigitalBridge Group)
- 9.257 Bombardier
- 9.258 Booz Allen Hamilton
- 9.259 Boston Dynamics
- 9.260 Bouygues Telecom
- 9.261 Boxchip
- 9.262 Branch Communications
- 9.263 BravoCom
- 9.264 Bredengen
- 9.265 Broadcom
- 9.266 BroadForward
- 9.267 Broadmobi – Shanghai Broadmobi Communication Technology (Wutong Group)
- 9.268 Broadpeak
- 9.269 Broadtech
- 9.270 BSNL (Bharat Sanchar Nigam Limited)
- 9.271 BT Group
- 9.272 BTI Wireless
- 9.273 Bullitt Mobile
- 9.274 Bumicom Telecommunicatie
- 9.275 Bureau Veritas/7Layers
- 9.276 BVSystems (Berkeley Varitronics Systems)
- 9.277 BWT (BlueWaveTel)
- 9.278 BYD
- 9.279 B-Yond
- 9.280 C Spire
- 9.281 C Squared Systems
- 9.282 CableFree (Wireless Excellence)
- 9.283 CableLabs
- 9.284 CACI International/LGS Innovations
- 9.285 Cadence Design Systems

- 9.286 CalAmp
- 9.287 CalChip Connect
- 9.288 Caliber Public Safety
- 9.289 Calix
- 9.290 Calnex Solutions
- 9.291 Caltta Technologies
- 9.292 Cambium Networks
- 9.293 Cambridge Consultants (Capgemini Invent)
- 9.294 CampusGenius
- 9.295 Canoga Perkins
- 9.296 Canonical
- 9.297 Capgemini Engineering
- 9.298 CapX Nederland
- 9.299 Carbyne
- 9.300 Carlson Wireless Technologies
- 9.301 Casa Systems
- 9.302 CASIC (China Aerospace Science and Industry Corporation)
- 9.303 Casio Computer Company
- 9.304 Castor Marine
- 9.305 Catalyst Communications Technologies
- 9.306 Cavli Wireless
- 9.307 CBNG (Cambridge Broadband Networks Group)
- 9.308 CCI (Communication Components Inc.)
- 9.309 CCN (Cirrus Core Networks)
- 9.310 CCww (Communications Consultants Worldwide)
- 9.311 Cegeka
- 9.312 CeLa Link Corporation
- 9.313 Celfinet (Cyient)
- 9.314 CellAntenna Corporation
- 9.315 Cellcomm Solutions
- 9.316 Cellient
- 9.317 Celling 5G
- 9.318 CellMax Technologies (Rosenberger)
- 9.319 Cellnex Telecom
- 9.320 CellOnyx
- 9.321 Cellwize (Qualcomm)
- 9.322 cellXica
- 9.323 cellXion
- 9.324 Celona

- 9.325 CelPlan Technologies
- 9.326 Centerline Communications
- 9.327 CENTRA Technology
- 9.328 CentralSquare Technologies
- 9.329 Ceragon Networks
- 9.330 Cerillion
- 9.331 CertusNet
- 9.332 CETC (China Electronics Technology Group Corporation)
- 9.333 CEVA
- 9.334 CGI
- 9.335 Challenge Networks (Vocus)
- 9.336 Charter Communications
- 9.337 Cheerzing (Xiamen Cheerzing IoT Technology)
- 9.338 Chelton
- 9.339 Chemring Technology Solutions
- 9.340 Chengdu NTS
- 9.341 China All Access
- 9.342 China Mobile
- 9.343 China Satcom (China Satellite Communications)
- 9.344 China Telecom
- 9.345 China Unicom
- 9.346 Chunghwa Telecom
- 9.347 Cibicom
- 9.348 CICT – China Information and Communication Technology Group (China Xinke Group)
- 9.349 Ciena Corporation
- 9.350 CIG (Cambridge Industries Group)
- 9.351 CIO (Connected IO)
- 9.352 Cirpack
- 9.353 Cisco Systems
- 9.354 Citymesh (Cegeka/DIGI Communications)
- 9.355 CitySwitch
- 9.356 CKH IOD (CK Hutchison)
- 9.357 Clavister
- 9.358 Clever Logic
- 9.359 CloudMinds
- 9.360 CMIoT (China Mobile IoT)
- 9.361 Cobham
- 9.362 COCUS

- 9.363 Codan Communications
- 9.364 Codium Networks
- 9.365 Cogisys
- 9.366 Cognizant
- 9.367 Cohere Technologies
- 9.368 Coherent Logix
- 9.369 Coiler Corporation
- 9.370 Collinear Networks (EOS – Electro Optic Systems)
- 9.371 Collins Aerospace (Raytheon Technologies Corporation)
- 9.372 Colt Technology Services
- 9.373 Com4 (Wireless Logic Group)
- 9.374 Comander (ANDRA)
- 9.375 Comarch
- 9.376 Comba Telecom
- 9.377 Combain Mobile
- 9.378 Comcast Corporation
- 9.379 Comcores
- 9.380 Comfone
- 9.381 COMLAB
- 9.382 CommAgility (E-Space)
- 9.383 CommandWear Systems
- 9.384 Commnet Wireless (ATN International)
- 9.385 Comms365
- 9.386 CommScope
- 9.387 Compal Electronics
- 9.388 Comprod
- 9.389 Comptek Technologies (Aero Wireless Group)
- 9.390 Comrod Communication Group
- 9.391 COMSovereign
- 9.392 Comtech Telecommunications Corporation
- 9.393 Comtest Wireless
- 9.394 Comtrend Corporation
- 9.395 Comviva (Tech Mahindra)
- 9.396 CONET Technologies
- 9.397 CONEXIO Corporation
- 9.398 CONGIV (ROBUR Industry Service Group)
- 9.399 Connect Tech
- 9.400 Connect44 Group
- 9.401 Connectivity Wireless Solutions (M/C Partners)

- 9.402 Contela
- 9.403 Continual
- 9.404 Coolpad
- 9.405 CopaSAT
- 9.406 coreNOC
- 9.407 Cornerstone (CTIL)
- 9.408 Cornet Technology
- 9.409 Corning
- 9.410 Cortina Access
- 9.411 Cosemi Technologies
- 9.412 COSMOTE (OTE Group)
- 9.413 Council Rock
- 9.414 Coweaver
- 9.415 Cox Communications
- 9.416 Cradlepoint (Ericsson)
- 9.417 Creanord
- 9.418 CrisisGo
- 9.419 CROSSCALL
- 9.420 Crown Castle International Corporation
- 9.421 CRSC (China Railway Signal & Communication Corporation)/CASCO Signal
- 9.422 CS Corporation
- 9.423 CSG Systems International
- 9.424 CTG (Celestia Technologies Group)
- 9.425 CTS (Communication Technology Services)
- 9.426 CTS Corporation
- 9.427 Cubic Corporation
- 9.428 Cubic Telecom
- 9.429 Cumucore
- 9.430 Custom MMIC
- 9.431 CybertelBridge
- 9.432 Cyient
- 9.433 Cyrus Technology
- 9.434 D2 Technologies
- 9.435 DAEL Group
- 9.436 Daeyoun System Company
- 9.437 Dahua Technology
- 9.438 Dali Wireless
- 9.439 DAMM Cellular Systems
- 9.440 DATACOM

- 9.441 DataSoft
- 9.442 DBcom
- 9.443 DeepSig
- 9.444 Dejero Labs
- 9.445 DEKRA
- 9.446 Dell Technologies
- 9.447 Delta Electronics
- 9.448 DENGYO (Nihon Dengyo Kosaku)
- 9.449 Dense Air (SIP – Sidewalk Infrastructure Partners)
- 9.450 DGS (Digital Global Systems)
- 9.451 Dialogic
- 9.452 Diamond Communications
- 9.453 Digi International
- 9.454 DigiCert
- 9.455 Digita (DigitalBridge Group)
- 9.456 Digital Ally
- 9.457 Digital Enhancement
- 9.458 DigitalBridge Group
- 9.459 DigitalRoute
- 9.460 Digitata
- 9.461 DigitGate (Nanjing DigitGate Communication Technology)
- 9.462 Dimeter
- 9.463 DISH Network Corporation
- 9.464 DKK (Denki Kogyo)
- 9.465 D-Link Corporation
- 9.466 DMI
- 9.467 Doogee
- 9.468 Doosan Corporation
- 9.469 DragonWave-X (COMSovereign)
- 9.470 Drakontas
- 9.471 DriveNets
- 9.472 Drone Aviation (COMSovereign)
- 9.473 DroneSense
- 9.474 Druid Software
- 9.475 DSBJ (Suzhou Dongshan Precision Manufacturing)
- 9.476 DT (Deutsche Telekom)
- 9.477 DTAC (Total Access Communication)
- 9.478 du (EITC – Emirates Integrated Telecommunications Company)
- 9.479 Duons



- 9.480 Durabook (Twinhead International Corporation)
- 9.481 Duubee
- 9.482 DZS
- 9.483 Eahison Communication
- 9.484 EANTC
- 9.485 Eastcom (Eastern Communications)
- 9.486 Easycom (Shenzhen Easycom Electronics)
- 9.487 E-Band Communications (Axxcss Wireless Solutions)
- 9.488 e-BO Enterprises
- 9.489 ECE (European Communications Engineering)
- 9.490 EchoStar Corporation
- 9.491 Ecom Instruments (Pepperl+Fuchs)
- 9.492 Ecrio
- 9.493 Edgecore Networks (Accton Technology Corporation)
- 9.494 EdgeQ
- 9.495 Edgybees
- 9.496 edotco Group (Axiata Group)
- 9.497 EDX Wireless
- 9.498 Edzcom (Cellnex Telecom)
- 9.499 Effnet
- 9.500 Eigencomm
- 9.501 eino
- 9.502 EION Wireless
- 9.503 Eir (Eircom)
- 9.504 Ekinops
- 9.505 Elbit Systems
- 9.506 Elefante Group
- 9.507 E-Lins Technology
- 9.508 Elisa
- 9.509 Elisa Polystar
- 9.510 Elistair
- 9.511 Elsight
- 9.512 Elta Systems (IAI – Israel Aerospace Industries)
- 9.513 Eltex
- 9.514 ELUON Corporation
- 9.515 ELVA-1
- 9.516 Emblasoft
- 9.517 Embraer
- 9.518 Embratel

- 9.519 Emerson
- 9.520 EMnify
- 9.521 EMS (Electronic Media Services)
- 9.522 Encore Networks
- 9.523 Endress+Hauser
- 9.524 Enea
- 9.525 ENENSYS Technologies
- 9.526 Energizer Mobile (Avenir Telecom)
- 9.527 EnerSys
- 9.528 Entropia
- 9.529 Entropy Solution
- 9.530 Eoptolink Technology
- 9.531 Epiroc
- 9.532 Equiendo
- 9.533 Eravant (SAGE Millimeter)
- 9.534 Ericsson
- 9.535 Errigal
- 9.536 Eseye
- 9.537 Esharah Etisalat Security Solutions
- 9.538 E-Space
- 9.539 Estalky (K-Mobile Technology)
- 9.540 ETELM
- 9.541 eTera (Sinotech R&D Group)
- 9.542 Ethernity Networks
- 9.543 Etherstack
- 9.544 Etisalat Group (e&)
- 9.545 ETRI (Electronics & Telecommunications Research Institute, South Korea)
- 9.546 Etteplan
- 9.547 EUCAST
- 9.548 Eurofins E&E (Electrical and Electronics)
- 9.549 Eurotech
- 9.550 Eutelsat Communications
- 9.551 Eventide Communications
- 9.552 Exacom
- 9.553 Exaware
- 9.554 Excelerate Technology
- 9.555 EXFO
- 9.556 Exium
- 9.557 Expandium

- 9.558 Expeto
- 9.559 ExteNet Systems (DigitalBridge Group)
- 9.560 Extreme Networks
- 9.561 EY (Ernst & Young)
- 9.562 Eyecom Telecommunications Group
- 9.563 EZcon Network
- 9.564 F2G (Far-Together) Solutions
- 9.565 F5
- 9.566 Fairspectrum
- 9.567 Fairwaves
- 9.568 Faraday Technology Corporation
- 9.569 Fastback Networks (COMSovereign)
- 9.570 FCNT (Fujitsu Connected Technologies)-JEMS (Japan EM Solutions)
- 9.571 Federal Engineering
- 9.572 Federated Wireless
- 9.573 Fenix Group
- 9.574 Festo
- 9.575 FET (Far EastTone Telecommunications)
- 9.576 FIBERSTAMP
- 9.577 Fibocom
- 9.578 Fibrolan
- 9.579 Filtronic
- 9.580 Fingu (Wuhan Fingu Electronic Technology)
- 9.581 Fiplex Communications (Honeywell International)
- 9.582 Firecell
- 9.583 Fivecomm
- 9.584 Flash Networks
- 9.585 Flash Private Mobile Networks
- 9.586 Fleet Complete
- 9.587 Flex
- 9.588 Flex Logix Technologies
- 9.589 Flightcell International
- 9.590 FLIR Systems
- 9.591 floLIVE
- 9.592 Flymotion
- 9.593 FMBE (FMB Engineering)
- 9.594 Forsk
- 9.595 Fortinet
- 9.596 Fortress Solutions

- 9.597 Four-Faith Communication Technology
- 9.598 Foxconn (Hon Hai Technology Group)
- 9.599 Franklin Wireless
- 9.600 Fraunhofer FOKUS (Institute for Open Communication Systems)
- 9.601 Fraunhofer HHI (Heinrich Hertz Institute)
- 9.602 Fraunhofer IIS (Institute for Integrated Circuits)
- 9.603 Fraunhofer IPT (Institute for Production Technology)
- 9.604 FreedomFi
- 9.605 Freeway
- 9.606 Frequentis
- 9.607 Freshwave Group (DigitalBridge Group)
- 9.608 Frog Cellsat
- 9.609 FRTek
- 9.610 FSG (Field Solutions Group)
- 9.611 FTS – Formula Telecom Solutions (Magic Software Group)
- 9.612 Fujikura
- 9.613 Fujitsu
- 9.614 Funk-Electronic Piciorgros
- 9.615 Funkwerk
- 9.616 Furukawa Electric
- 9.617 Furuno Electric
- 9.618 Future Technologies Venture
- 9.619 G REIGNS (HTC Corporation)
- 9.620 G+D (Giesecke+Devrient)
- 9.621 G3 Global
- 9.622 Galtronics (Baylin Technologies)
- 9.623 Gamma Nu
- 9.624 Gapwaves
- 9.625 Garderos
- 9.626 Gazprom Space Systems
- 9.627 GCT Semiconductor
- 9.628 GD (General Devices)
- 9.629 GE (General Electric)
- 9.630 Gemtek Technology
- 9.631 General Dynamics
- 9.632 Genesis Group
- 9.633 GENEViSiO (QNAP Systems)
- 9.634 Genew Technologies
- 9.635 Genmix Technology

- 9.636 GenXComm
- 9.637 Geotab
- 9.638 GeoTraq
- 9.639 Getac Technology Corporation
- 9.640 Gewei (Wuhan Gewei Electronic Technology)
- 9.641 GF (GlobalFoundries)
- 9.642 GIGABYTE Technology
- 9.643 Gigalane
- 9.644 GIGALIGHT
- 9.645 Gigamon
- 9.646 GigaTera Communications (KMW)
- 9.647 GigSky
- 9.648 Gilat Satellite Networks
- 9.649 GL Communications
- 9.650 Global Telecom
- 9.651 Globalgig
- 9.652 Globalstar
- 9.653 Globe Telecom
- 9.654 GNConnect (Greenet)
- 9.655 Gogo Business Aviation
- 9.656 Goodman Telecom Services
- 9.657 Goodmill Systems
- 9.658 Google (Alphabet)
- 9.659 Goosetown Communications
- 9.660 Gore (W. L. Gore & Associates)
- 9.661 GosuncnWelink Technology (Gosuncn Group)
- 9.662 Granite Telecommunications
- 9.663 Grape One (Sumitomo Corporation)
- 9.664 Green Communications
- 9.665 Green Packet
- 9.666 GreenPalm (Hangzhou GreenPalm Technology)
- 9.667 GrenTech
- 9.668 GridGears
- 9.669 Groundhog Technologies
- 9.670 GroupTalk
- 9.671 GS Lab (Great Software Laboratory)
- 9.672 GSI (GS Instech)/GST (GS Teletech)
- 9.673 Guavus (Thales)
- 9.674 Guerrilla RF

- 9.675 HAAS Alert
- 9.676 Haier
- 9.677 Haivision
- 9.678 Halys
- 9.679 Hancom MDS
- 9.680 Handheld Group
- 9.681 Handsfree Group
- 9.682 Hansen Technologies
- 9.683 Hanswell
- 9.684 Hanwha Techwin
- 9.685 HAPSMobile
- 9.686 Harbor Max
- 9.687 HARMAN DTS (Digital Transformation Solutions)
- 9.688 HARTING
- 9.689 Harvilon (Shenzhen Harvilon Technology)
- 9.690 Hawk Networks (Althea)
- 9.691 Haystax Technology (Fishtech Group/Cyderes)
- 9.692 HBFEC (Hebei Far East Communication System Engineering)
- 9.693 HCL Technologies
- 9.694 Helios (Fujian Helios Technologies)
- 9.695 Hengxin (Jiangsu Hengxin Technology)
- 9.696 Henkel
- 9.697 Herystorm (Guangzhou Herystorm Technology)
- 9.698 Hexagon
- 9.699 Hexagon Communication (Suzhou Hexagon Communication Technologies)
- 9.700 HFCL
- 9.701 HFR Networks
- 9.702 HG Genuine (HGTECH – Huagong Technology)
- 9.703 Highstreet Technologies
- 9.704 Hikvision (Hangzhou Hikvision Digital Technology)
- 9.705 Hilinks Technology
- 9.706 HipLink Software
- 9.707 Hisense
- 9.708 HiSilicon Technologies (Huawei)
- 9.709 HISPASAT
- 9.710 Hitachi
- 9.711 HKT (PCCW)
- 9.712 HKTech (Howking Tech)
- 9.713 HLS (HARD-LINE Solutions)

- 9.714 HMD Global
- 9.715 HMF (Hytera Mobilfunk)
- 9.716 HMS Networks
- 9.717 Hoimyung ICT
- 9.718 Hologram
- 9.719 Honeywell International
- 9.720 Hongdian Corporation
- 9.721 HONOR
- 9.722 Hoverfly Technologies
- 9.723 HP
- 9.724 HPE (Hewlett Packard Enterprise)
- 9.725 HQT (Shenzhen HQT Science and Technology)
- 9.726 HSC (Hughes Systique Corporation)
- 9.727 HTC Corporation
- 9.728 Huahuan (Beijing Huahuan Electronics)
- 9.729 Huaptec
- 9.730 Huawei
- 9.731 HUBER+SUHNER
- 9.732 HUCOM Wireless
- 9.733 Hughes Network Systems (EchoStar Corporation)
- 9.734 HXI (Renaissance Electronics & Communications)
- 9.735 Hypha (Wireless Innovation)
- 9.736 Hytec Inter
- 9.737 Hytera Communications
- 9.738 i.safe MOBILE
- 9.739 i2i Systems
- 9.740 iBASIS (Tofane Global)
- 9.741 IBM
- 9.742 IBO Technology Company
- 9.743 iBwave Solutions
- 9.744 iCana (Foxconn – Hon Hai Technology Group)
- 9.745 Ice Norway (Lyse)
- 9.746 Icom
- 9.747 Iconec
- 9.748 iConNext
- 9.749 iDAQS
- 9.750 IDEMIA
- 9.751 IDY Corporation
- 9.752 IFLY Electronics



9.753 ifm  
9.754 IJ (Internet Initiative Japan)  
9.755 II-VI  
9.756 IM Technology  
9.757 Imec  
9.758 IMPTT  
9.759 InCoax Networks  
9.760 Indra  
9.761 iNET (Infrastructure Networks)  
9.762 INEX Microtechnology  
9.763 Infineon Technologies  
9.764 Infinera  
9.765 InfiNet Wireless  
9.766 Infinite Electronics  
9.767 Infomark Corporation  
9.768 Infosys  
9.769 Infovista  
9.770 InHand Networks  
9.771 Inmanta  
9.772 Inmarsat  
9.773 Innertron  
9.774 InnoGence Technology (TROY Information)  
9.775 InnoLight Technology  
9.776 Innonet  
9.777 Innovile  
9.778 InnoWireless  
9.779 Inrico Technologies  
9.780 Inseego Corporation  
9.781 Inspur  
9.782 Insta Group  
9.783 Instant Connect  
9.784 INSYS icom (INSYS Microelectronics)  
9.785 Intec E&C  
9.786 Intel Corporation  
9.787 Intelbras  
9.788 Intelliport Solutions  
9.789 Intelsat  
9.790 Intenna Systems  
9.791 InterDigital

- 9.792 INTERLEV
- 9.793 Interop Technologies
- 9.794 InterTalk Critical Information Systems
- 9.795 Intracom Telecom
- 9.796 Intrado Corporation
- 9.797 Intrepid Networks
- 9.798 Inventec Corporation
- 9.799 INWIT (Infrastrutture Wireless Italiane)
- 9.800 IoT4Net
- 9.801 IoTAS (IoT & Approval Solutions)
- 9.802 IP Infusion (ACCESS CO.)
- 9.803 IPAGEON
- 9.804 IPITEK (Integrated Photonics Technology)
- 9.805 IPLOOK Technologies
- 9.806 iPosi
- 9.807 Iradio Electronics
- 9.808 Iridium Communications
- 9.809 ISCO International
- 9.810 IS-Wireless
- 9.811 Italtel
- 9.812 ITCEN
- 9.813 ITRI (Industrial Technology Research Institute, Taiwan)
- 9.814 Itron
- 9.815 IWT (Innovative Wireless Technologies)
- 9.816 Jabil
- 9.817 JACS Solutions
- 9.818 JATONTEC (Jaton Technology)
- 9.819 JCI (Japan Communications Inc.)
- 9.820 JET Connectivity
- 9.821 Jezetek (Sichuan Jiuzhou Electric Group)
- 9.822 Jiaxun Feihong (Beijing Jiaxun Feihong Electrical)
- 9.823 Jinan USR IoT Technology (Mokuai/Wenheng)
- 9.824 JIT (JI Technology)
- 9.825 JMA Wireless
- 9.826 Johnson Controls
- 9.827 JOUAV
- 9.828 JPC Connectivity
- 9.829 JPS Interoperability Solutions
- 9.830 JQL Technologies

- 9.831 JRC (Japan Radio Company)
- 9.832 JSC Ingenium
- 9.833 JT IoT
- 9.834 Juniper Networks
- 9.835 Junkosha
- 9.836 Juvare
- 9.837 JVCKENWOOD Corporation
- 9.838 Kacific Broadband Satellites
- 9.839 Kaelus
- 9.840 Kaifa (Shenzen Kaifa Technology)
- 9.841 Kajeet
- 9.842 Kalmar (Cargotec)
- 9.843 Kaloom
- 9.844 Kalray
- 9.845 Katela Networks
- 9.846 KBR
- 9.847 KBT (Kenbotong Technology)
- 9.848 KDDI Corporation
- 9.849 Key Bridge Wireless
- 9.850 Keysight Technologies
- 9.851 Kiana Analytics
- 9.852 Kigen
- 9.853 Kindroid – Shanghai Jinzhuo Technology (Kyland Technology)
- 9.854 Kirisun Communications
- 9.855 Kisan Telecom
- 9.856 KLA Laboratories
- 9.857 Klas Telecom
- 9.858 Klein Electronics
- 9.859 Kleos
- 9.860 KMW
- 9.861 Knightscope
- 9.862 Komatsu
- 9.863 Konecranes
- 9.864 Kontron
- 9.865 KORE Wireless
- 9.866 KPN
- 9.867 KT Corporation
- 9.868 Kudelski Group
- 9.869 KUKA

9.870 Kumu Networks  
9.871 K-Won/Hunter Technology  
9.872 Kyland Technology  
9.873 Kymeta Corporation  
9.874 Kyndryl  
9.875 Kyocera Corporation  
9.876 Kyrio (CableLabs)  
9.877 KZ TECH (KZ Broadband Technologies)  
9.878 L3Harris Technologies  
9.879 Laird Connectivity  
9.880 Landis+Gyr  
9.881 Landmark Dividend (DigitalBridge Group)  
9.882 Lanner Electronics  
9.883 Lantronix  
9.884 Lattice Semiconductor  
9.885 LCR Embedded Systems  
9.886 Leenos Corporation  
9.887 Leidos  
9.888 Lekha Wireless Solutions  
9.889 Lemko Corporation  
9.890 Lenovo  
9.891 Leonardo  
9.892 Lextrum (COMSovereign)  
9.893 LG Corporation  
9.894 LG Uplus  
9.895 Lierda Science & Technology Group  
9.896 Lifecycle Software  
9.897 Ligado Networks  
9.898 Lightron  
9.899 Lime Microsystems  
9.900 Lindsay Broadband  
9.901 Linkem  
9.902 Linksys  
9.903 Linx Technologies  
9.904 LIONS Technology  
9.905 Lisheng Fujian Communications  
9.906 LITE-ON Technology Corporation  
9.907 LitePoint (Teradyne)  
9.908 LiveU

- 9.909 Lociva
- 9.910 Lockheed Martin Corporation
- 9.911 Logicalis (Datatec)
- 9.912 LogicTree IT Solutions
- 9.913 Longsung Technology (Sunsea AIoT Technology)
- 9.914 Lookout
- 9.915 LS Mtron
- 9.916 LS telcom
- 9.917 LTTS (L&T Technology Services)
- 9.918 Luceor
- 9.919 Lumen Technologies
- 9.920 Lumentum
- 9.921 Lumineye
- 9.922 LuxCarta
- 9.923 Luxoft (DXC Technology)
- 9.924 Lyfo
- 9.925 Lynk Global
- 9.926 M1
- 9.927 m3connect
- 9.928 M4PS (Mobility 4 Public Safety)
- 9.929 MACOM
- 9.930 Magnaquest Technologies
- 9.931 Maipu Communication Technology
- 9.932 Maja Systems
- 9.933 MantisNet
- 9.934 MarchNet
- 9.935 Marlink
- 9.936 Marquistech
- 9.937 Martin UAV
- 9.938 Marubeni Corporation
- 9.939 Marubun Corporation
- 9.940 Marvell Technology
- 9.941 MASMOVIL
- 9.942 Mathworks
- 9.943 Matrix Electronica/Webdyn (Flexitron Group)
- 9.944 MATRIXX Software
- 9.945 MatSing
- 9.946 Maven Wireless
- 9.947 Mavenir

- 9.948 MaxComm
- 9.949 Maxis
- 9.950 MaxLinear
- 9.951 MC Technologies
- 9.952 MCP (Mission Critical Partners)
- 9.953 MCS Benelux
- 9.954 MD (MICRODRIVE)
- 9.955 Mdex (Wireless Logic Group)
- 9.956 MEASAT Satellite Systems
- 9.957 MECSware
- 9.958 Media Broadcast (freenet Group)
- 9.959 MediaTek
- 9.960 Meeami Technologies
- 9.961 MegaChips Corporation
- 9.962 MegaFon
- 9.963 Meglab (Epiroc)
- 9.964 MeiG Smart Technology
- 9.965 Meizu
- 9.966 Mentura Group
- 9.967 MER Group
- 9.968 Meta
- 9.969 Metanoia Communications
- 9.970 Metaswitch Networks (Microsoft Corporation)
- 9.971 Metawave Corporation
- 9.972 Metismake
- 9.973 MetTel
- 9.974 MHD (Muhan Digital)
- 9.975 MIC Nordic
- 9.976 MICAS-RF (MICAS Shenzhen Telecommunication)
- 9.977 MiCOM Labs
- 9.978 Micran
- 9.979 Microamp Solutions
- 9.980 Microchip Technology
- 9.981 Microlab (RF Industries)
- 9.982 MicroNova
- 9.983 Microsoft Corporation
- 9.984 Microwave Networks
- 9.985 MikroTik
- 9.986 Mikwave (Guangdong Mikwave Communication Tech)

- 9.987 Milesight
- 9.988 Milestone Systems
- 9.989 Miliwave
- 9.990 MiMOMax
- 9.991 MIPS
- 9.992 MiTAC Computing Technology Corporation
- 9.993 MitraStar Technology (Unizyx Holding Corporation)
- 9.994 MITRE Corporation
- 9.995 Mitsubishi Electric Corporation
- 9.996 MKI (Mitsui Knowledge Industry)
- 9.997 MOBI (Mobi Antenna Technologies)
- 9.998 Mobile Mark
- 9.999 Mobile Tornado
- 9.1000 Mobile Viewpoint
- 9.1001 MobileDemand
- 9.1002 MobileIron
- 9.1003 MobileTek (Shanghai Mobiletek Communication)
- 9.1004 Mobileum
- 9.1005 Mobilicom
- 9.1006 Mobilitie (BAI Communications)
- 9.1007 Mobiveil
- 9.1008 Modular Mining Systems (Komatsu)
- 9.1009 Molex
- 9.1010 Monogoto
- 9.1011 Morningcore Technology (CICT – China Information and Communication Technology Group)
- 9.1012 Morningstar Corporation
- 9.1013 Moseley Associates (Axxcss Wireless Solutions)
- 9.1014 MosoLabs (Sercomm Corporation)
- 9.1015 Motive Infrastructure Solutions
- 9.1016 Motorola Mobility (Lenovo)
- 9.1017 Motorola Solutions
- 9.1018 Mott MacDonald
- 9.1019 Movandi
- 9.1020 Moxa
- 9.1021 MP Antenna
- 9.1022 MRK Media
- 9.1023 MRT Technology (Suzhou)
- 9.1024 MSB (M S Benbow & Associates)



- 9.1025 MST Global – Mine Site Technologies (Komatsu)
- 9.1026 MTI (Microelectronics Technology Inc.)
- 9.1027 MTI Wireless Edge
- 9.1028 MTN Group
- 9.1029 MTS (Mobile TeleSystems)
- 9.1030 MUGLER
- 9.1031 MultiTech (Multi-Tech Systems)
- 9.1032 Murata Manufacturing
- 9.1033 Mushroom Networks
- 9.1034 Mutualink
- 9.1035 MVI Group
- 9.1036 MYCOM OSI
- 9.1037 Mynaric
- 9.1038 MYT Electronics
- 9.1039 N.A.T.
- 9.1040 Nable Communications
- 9.1041 NanoSemi (MaxLinear)
- 9.1042 Napatech
- 9.1043 Nash Technologies
- 9.1044 Nearby Computing
- 9.1045 NEC Corporation
- 9.1046 Nemergent Solutions
- 9.1047 Nemko
- 9.1048 Neolink Communications Technology
- 9.1049 NeoPlane
- 9.1050 Neoway Technology
- 9.1051 Neptune Communications
- 9.1052 Neragon Networks
- 9.1053 Net AI
- 9.1054 Netas
- 9.1055 NETBEE (NET-Automation)
- 9.1056 NetCity (GEOS Telecom/GEOS Holding)
- 9.1057 Netcracker Technology (NEC Corporation)
- 9.1058 NetFoundry
- 9.1059 Netgear
- 9.1060 NetModule (Belden)
- 9.1061 Netmore Group
- 9.1062 NETSCOUT Systems
- 9.1063 Netsia (Argela)

- 9.1064 Netvision Telecom
- 9.1065 Neutral Wireless
- 9.1066 Neutron Technologies
- 9.1067 New H3C Technologies (Tsinghua Unigroup)
- 9.1068 New Postcom Equipment
- 9.1069 NewEdge Signal Solutions
- 9.1070 NEXCOM International
- 9.1071 Nexign
- 9.1072 Nexpring
- 9.1073 Nextivity
- 9.1074 NextNav
- 9.1075 NextWave
- 9.1076 Nextworks
- 9.1077 ng4T
- 9.1078 NGK Group (NGK Insulators)
- 9.1079 ng-voice
- 9.1080 NI (National Instruments)
- 9.1081 NICE
- 9.1082 NimbeLink
- 9.1083 Niral Networks
- 9.1084 Nitto Denko Corporation
- 9.1085 NKG (New Kinpo Group)
- 9.1086 Node-H
- 9.1087 Nokia
- 9.1088 Nomad Digital (Alstom)
- 9.1089 Nordic Semiconductor
- 9.1090 Northrop Grumman Corporation
- 9.1091 NOTION Information Technology
- 9.1092 Nova Labs (Helium)
- 9.1093 NOVEC
- 9.1094 NOVELSAT
- 9.1095 NRB (Network Research Belgium)
- 9.1096 NS Solutions Corporation
- 9.1097 Nsight
- 9.1098 NT (National Telecom)
- 9.1099 NTMore (Network Technology More)
- 9.1100 NTT DoCoMo
- 9.1101 NTT Group
- 9.1102 Nubia Technology (ZTE)

9.1103 NuRAN Wireless  
9.1104 Nurlink Technology  
9.1105 NVIDIA Corporation  
9.1106 NXP Semiconductors  
9.1107 Oasis Smart SIM  
9.1108 Ocado Technology  
9.1109 Oceus Networks  
9.1110 Octasic  
9.1111 O-Cubes  
9.1112 ODN (Orbital Data Network)  
9.1113 OE Solutions  
9.1114 OFS Fitel (Furukawa Electric)  
9.1115 OKI Electric Industry  
9.1116 Omnispace  
9.1117 Omnitele  
9.1118 Omnitron Systems  
9.1119 Omnitronics  
9.1120 One2many (Everbridge)  
9.1121 OneLayer  
9.1122 OnePlus (BBK Electronics)  
9.1123 OneSimCard  
9.1124 OneWeb  
9.1125 Onomondo  
9.1126 Ontix  
9.1127 Onwave  
9.1128 Ooredoo  
9.1129 Opanga Networks  
9.1130 Open Valley  
9.1131 Opencode Systems  
9.1132 Openet (Amdocs)  
9.1133 OPPO (BBK Electronics)  
9.1134 O'Prueba Technology  
9.1135 OPTAGE  
9.1136 OptConnect  
9.1137 Optical Zonu Corporation  
9.1138 Opticoms  
9.1139 Option  
9.1140 Optiva  
9.1141 OQ Technology

9.1142 Oracle Communications  
9.1143 Orange  
9.1144 ORBCOMM  
9.1145 Ori Industries  
9.1146 Orion Labs  
9.1147 Oscilloquartz (Adtran)  
9.1148 OV (Manx Telecom)  
9.1149 OVHcloud  
9.1150 P.I. Works  
9.1151 PacStar (Pacific Star Communications)  
9.1152 Padtec  
9.1153 Palo Alto Networks  
9.1154 Panasonic Connect  
9.1155 Panda Electronics  
9.1156 PanOptis  
9.1157 Panorama Antennas  
9.1158 Parallel Wireless  
9.1159 Parsec Technologies  
9.1160 Particle  
9.1161 PASTech  
9.1162 Patrocinium Systems  
9.1163 Patton  
9.1164 Pavlov Media  
9.1165 PCS Technologies  
9.1166 PCTEL  
9.1167 PCTEST Lab (PCTEST Engineering Laboratory)  
9.1168 Peatalk Corporation  
9.1169 Pegatron Corporation  
9.1170 Pei Tel Communications  
9.1171 Pelion  
9.1172 Penguin Solutions (SGH – SMART Global Holdings)  
9.1173 Pente Networks  
9.1174 Pentonet  
9.1175 Peplink (Plover Bay Technologies)  
9.1176 Pepperl+Fuchs  
9.1177 Pepro  
9.1178 Peraso  
9.1179 Peraton Labs  
9.1180 Percepto

- 9.1181 Perle Systems
- 9.1182 PGE Systemy (PGE – Polish Energy Group)
- 9.1183 Pharrowtech
- 9.1184 Phirst Technologies/xCraft Enterprises
- 9.1185 Phluido
- 9.1186 Phoenix Contact
- 9.1187 Phytium Technology (Tianjin Phytium Information Technology)
- 9.1188 PHYTunes
- 9.1189 Picocom
- 9.1190 Pierson Wireless
- 9.1191 Pivot Technology Services
- 9.1192 Pivotal Commware
- 9.1193 Pivotel Group
- 9.1194 Pivotone
- 9.1195 Pixavi (BARTEC)
- 9.1196 PK Solutions
- 9.1197 Platform9
- 9.1198 Pletronics
- 9.1199 Plextek
- 9.1200 Plintron
- 9.1201 Plus (Polkomtel)
- 9.1202 POCSTARS
- 9.1203 Pod Group (G+D – Giesecke+Devrient)
- 9.1204 Polaris Networks (Motorola Solutions)
- 9.1205 Polaris Wireless
- 9.1206 Pollen Mobile
- 9.1207 Positron Access Solutions
- 9.1208 Potevio (CETC – China Electronics Technology Group Corporation)
- 9.1209 PPC (Power Plus Communications)
- 9.1210 PPC Broadband (Belden)
- 9.1211 Precision OT (Optical Transceivers)
- 9.1212 PRESCOM
- 9.1213 PrioCom
- 9.1214 Proef
- 9.1215 Proptivity
- 9.1216 Proscend Communications
- 9.1217 PROSE Technologies (Rosenberger)
- 9.1218 PROTEI
- 9.1219 Proxim Wireless Corporation (SRA Holdings)

- 9.1220 Proximus
- 9.1221 Pryme Radio Products
- 9.1222 pSemi Corporation (Murata Manufacturing)
- 9.1223 PT INTI (PT Industri Telekomunikasi Indonesia)
- 9.1224 PT LEN Industri
- 9.1225 PTC
- 9.1226 PTI (Persistent Telecom Inc.)
- 9.1227 Publicis Sapient
- 9.1228 Puloli
- 9.1229 Pulsara
- 9.1230 Pulse Electronics (YAGEO Corporation)
- 9.1231 Pycom
- 9.1232 PySENSE
- 9.1233 QCT (Quanta Cloud Technology)
- 9.1234 Qinetiq
- 9.1235 Qorvo
- 9.1236 QuadGen Wireless Solutions
- 9.1237 Qualcomm
- 9.1238 Quanta Computer
- 9.1239 Quantum Wireless
- 9.1240 Qucell Networks (InnoWireless)
- 9.1241 Quectel Wireless Solutions
- 9.1242 Quintel (Cirtek Holdings Philippines Corporation)
- 9.1243 Qulsar
- 9.1244 Quortus (CradlePoint)
- 9.1245 Qwake Technologies
- 9.1246 Qwilt
- 9.1247 R Systems (Computaris International)
- 9.1248 R3 Solutions
- 9.1249 RACOM (Czech Republic)
- 9.1250 RACOM Corporation
- 9.1251 RAD
- 9.1252 RADCOM
- 9.1253 Radiall
- 9.1254 Radio Gigabit
- 9.1255 Radio IP Software
- 9.1256 RadioMobile
- 9.1257 Radisys (Reliance Industries)
- 9.1258 RADTONICS

- 9.1259 Radware
- 9.1260 RADWIN
- 9.1261 Rafael Advanced Defense Systems
- 9.1262 Raisecom
- 9.1263 Rajant Corporation
- 9.1264 Rakon
- 9.1265 Rakuten Symphony
- 9.1266 RAKwireless
- 9.1267 Range Networks (AMN – Africa Mobile Networks)
- 9.1268 Ranger Systems
- 9.1269 Ranplan Wireless
- 9.1270 Rapid.Space (Nexedi)
- 9.1271 RapidDeploy
- 9.1272 RapidSOS
- 9.1273 Rapidtek Technologies
- 9.1274 Rave Mobile Safety
- 9.1275 Raycap
- 9.1276 Raytheon Technologies Corporation
- 9.1277 RCS Telecommunications
- 9.1278 RCT (Remote Control Technologies)
- 9.1279 Ready Wireless
- 9.1280 Realme (BBK Electronics)
- 9.1281 Red Hat (IBM)
- 9.1282 Red Lion Controls (Spectris)
- 9.1283 RED Technologies
- 9.1284 REDCOM Laboratories
- 9.1285 RedZinc
- 9.1286 Reliance Jio Infocomm (Jio Platforms)
- 9.1287 REMEC Broadband Wireless Networks (Bridgewave Communications/SAGE SatCom)
- 9.1288 Renesas Electronics Corporation
- 9.1289 REPLY
- 9.1290 Rescue
- 9.1291 Responder Corp
- 9.1292 RF Connect
- 9.1293 RF DSP
- 9.1294 RF Industries
- 9.1295 RF MORECOM
- 9.1296 RF Window



- 9.1297 RF-Comm
- 9.1298 RFHIC Corporation
- 9.1299 RFI Technology Solutions
- 9.1300 RFS (Radio Frequency Systems)
- 9.1301 RFTech
- 9.1302 Ribbon Communications
- 9.1303 Ricon Mobile
- 9.1304 RigNet (Viasat Energy Services)
- 9.1305 RIMEDO Labs
- 9.1306 Rivada Networks
- 9.1307 Rivada Space Networks
- 9.1308 RKTPL (RK Telesystem Private Limited)
- 9.1309 Robert Bosch
- 9.1310 Robin.io (Rakuten Symphony)
- 9.1311 Robustel
- 9.1312 Rogers Communications
- 9.1313 Rogers Corporation
- 9.1314 Rohde & Schwarz
- 9.1315 Rohill
- 9.1316 Rolling Wireless (Fibocom)
- 9.1317 Rolloos (FMJ Group)
- 9.1318 Rosenberger
- 9.1319 Royole Corporation
- 9.1320 RSCC (Russian Satellite Communications Company)
- 9.1321 RSConnect
- 9.1322 RTX A/S
- 9.1323 RTx Technology
- 9.1324 RugGear
- 9.1325 RuggON Corporation
- 9.1326 Ruijie Networks
- 9.1327 RunEL
- 9.1328 Rushmere Technology
- 9.1329 S&T Iskratel (Kontron)
- 9.1330 Saab
- 9.1331 Saankhya Labs (Tejas Networks)
- 9.1332 SABIC
- 9.1333 SAC Wireless (Nokia)
- 9.1334 SAE IT-Systems (LACROIX Group)
- 9.1335 SAF Tehnika

- 9.1336 Safe-Com Wireless
- 9.1337 SafeMobile
- 9.1338 Safran
- 9.1339 Sagemcom
- 9.1340 SageRAN (Guangzhou SageRAN Technology)
- 9.1341 Saguna Networks (COMSovereign)
- 9.1342 SAI Technology
- 9.1343 SAIC (Science Applications International Corporation)
- 9.1344 Samji Electronics
- 9.1345 Samsung
- 9.1346 SAMWON FA
- 9.1347 Samyoung Celetra
- 9.1348 Sandvik
- 9.1349 Sandvine
- 9.1350 Sanechips Technology (ZTE)
- 9.1351 Sanjole
- 9.1352 San-tron
- 9.1353 Sanxing (Ningbo Sanxing Smart Electric)
- 9.1354 Sasken Technologies
- 9.1355 SaskTel
- 9.1356 Sateliot
- 9.1357 SatixFy
- 9.1358 Saviah Technologies
- 9.1359 Savox Communications
- 9.1360 SBA Communications
- 9.1361 Sceye
- 9.1362 Schneider Electric
- 9.1363 SEA – Systems Engineering & Assessment (Cohort)
- 9.1364 Seamless Waves
- 9.1365 Sectra Communications
- 9.1366 Secured Communications
- 9.1367 SecureG
- 9.1368 Select Spectrum
- 9.1369 SEMPRES
- 9.1370 Semtech Corporation
- 9.1371 Senko Advanced Components
- 9.1372 Sensorview
- 9.1373 Senstar Corporation
- 9.1374 Sensus (Xylem)

- 9.1375 Sentient Energy (Koch Engineered Solutions)
- 9.1376 Sentinel Camera Systems
- 9.1377 Seong Ji Industrial
- 9.1378 SEONTECH
- 9.1379 Seowon Intech
- 9.1380 Sepura
- 9.1381 Sequans Communications
- 9.1382 Sercomm Corporation
- 9.1383 SES
- 9.1384 SETUP Protokolltester
- 9.1385 SGS
- 9.1386 Shannon Wireless (Zhejiang Shannon Communication Technology)
- 9.1387 Shared Access
- 9.1388 Sharp Corporation (Foxconn – Hon Hai Technology Group)
- 9.1389 Shenglu (Guangdong Shenglu Telecommunication)
- 9.1390 Shenzhen CXD Science & Technology
- 9.1391 Shenzhen Recoda Technologies
- 9.1392 SIAE Microelettronica
- 9.1393 SICK
- 9.1394 Siemens
- 9.1395 Sierra Wireless (Semtech Corporation)
- 9.1396 Sigma Wireless
- 9.1397 Signal Information & Communication Corporation
- 9.1398 Signalchip
- 9.1399 Signalwing
- 9.1400 Siklu
- 9.1401 Silicom Connectivity Solutions
- 9.1402 Silicom SAS (France)
- 9.1403 SIMCom Wireless Solutions (Sunsea AIoT Technology)
- 9.1404 Simnovus
- 9.1405 Simoco Wireless Solutions
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