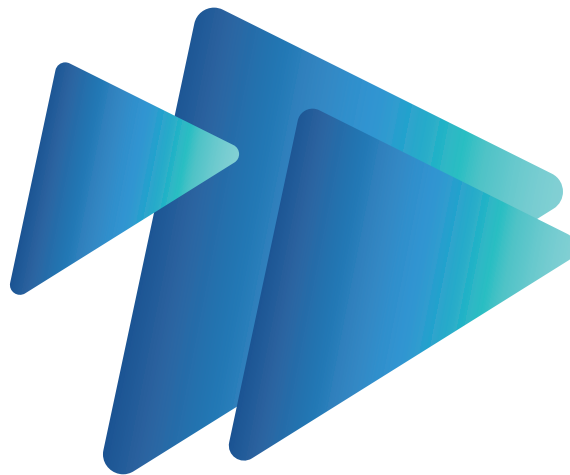5G • Innovation
Transformation

A New Generation
of Intelligent
Communication Solutions

PEGATRON 5G ▷

Navigate The Future Faster

Smart Manufacturing & Digital Resilience

PEGATRON's 5G network solution is designed for private network use cases and compliant with 3GPP and O-RAN standards by using Intel® x86 based servers. Designed to work at or near the edge where data is acquired. Lightweight and built for easy portability from one campus to the next. Built-in PEGATRON RAN software and OAM (Operations, Administration and Maintenance) system for management with GUI interfaces. Offering customized services to provide API for edge compute application integration.

Navigate the Future Faster

Integrated and Rapid Deployable Private 5G Network

PEGATRON Portable II Private 5G Network Solution

PEGATRON private 5G network solution contains 5G-SA O-RAN based gNodeB plus 5G core system. PEGATRON's 5G solutions are cloud-native platforms running on Intel® FlexRAN™ technology to provide the maximum computing power in a highly reliable mobile private network system. Network Function Virtualization Infrastructure (NFVI) in O-RAN based cloud, provides enhanced high availability, flexible, fast, and customizable services. The backhaul external network can be connected to leased lines by ISPs or orbital satellites for internet connection so it's quick and easily to setup a 5G private network to provide on demand broadband network anywhere. Based on your use case, applications can cover digital transformation for smart factories, public transportation, public safety, mission critical IT systems, corporate data security, and digital resilience.

PEGATRON Private 5G Network Solution overview

Industry Milestone
PEGATRON O-RAN solution meets the standards defined by O-RAN, either in E2E or security certification. This could be an important milestone in terms of industry adaptation of PEGATRON O-RAN solution.

Solution Ready
End-to-End test evaluates different perspectives of PEGATRON O-RAN solution, including validation of various real use cases, such as smart factory, smart transportation, and digital resilience.

Openness
PEGATRON O-RAN solution is adaptable, open, and certified for use within existing private network systems.

Safety Adaptation
PEGATRON O-RAN solution has security assurance and attack mitigation which correctly handles the issue without interrupting the services and affecting performance.

PEGATRON 5G Network Solutions

O-RAN / Edge Computing / 5G Core

Edge Compute Application

AI Analytics	Azure IoT Edge	AR / VR	AOI	AMR

Northbound Interface (RESTful)

Operations, Administration, and Maintenance (OAM)

RAN Intelligent Controller (RIC) Non-Real Time

Network Slicing

O-RU (Low-PHY / RF)

RAN Intelligent Controller (RIC) Near-Real Time

- Intel FlexRAN High-PHY
- O-DU (PDCP / RLC / MAC)
- O-CU (RRC / SDAP)

NFVI Platform

5G Core

AMF	AUSF
UDM	SMF
UDR	PCF
UPF	

2T2R

Radio Unit (Sub-6G)

4T4R

Function Split Option 7.2

CU (Central Unit) DU (Distributed Unit)

Local UPF (User Plane Function)

5GC (Standalone 5G Core)

xHaul Switch

MEC (Mulit-Access Edge Computing)

- 3rd party applications
- 5G Core Solution Partner
- Pegatron 5G RAN Stack
- Pegatron Customized API

| Manufacturing	Disaster Relief	Entertainment	Transportation	Maritime	Education

OAM

OAM (Operations, Administration, and Maintenance)

- Provide Northbound APIs for E2E OAM NMS support
- Supports FCAPS management function
- Support for Auto-Provisioning
- Provide Web GUI interface
- Support 5GC management
- Support Network Topology detection
- Support Single Sign-On
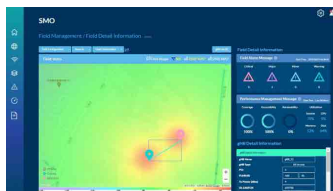
SMO

SMO (Service Management, and Orchestration)

- Support Multiple DNNs
- Support NETCONF, RESTful and CLI interface
- H/W offload for traffic/steering with rApp/xApp

PAX54-5G

PAX36-5G

5G CPE / PAX54 5G (White) & PAX36 5G (Black)

- Qualcomm SDX62 (3GPP Rel.16) or MediaTek T750 (3GPP Rel.15) solution
- Support both LTE and 5G NR (Sub-6GHz)
- WiFi6 AX5400 (2.4G 2x2 + 5G/160MHz 4x4) or AX3600 (2.4G 4x4 + 5G/80MHz 4x4)
- Two GE ports (PAX54) and One 2.5GE + Two GE ports (PAX36)
- Dual WAN connectivity for 4G/5G cellular or wire GE
- MMCX connectors for external 5G/LTE antenna extension options (PAX54)
- Dimension & color: 105mm x 110mm x 221mm / White (PAX54) or Black (PAX36)

PD160-5G

NURA

5G USB Dongle / PD160-5G

- Qualcomm SDX62 5G NR Modem
- 5G NR Sub 6 SA and NSA Mode, Global Bands
- 3GPP Rel.16, NSA & SA Sub-6GHz Network Slicing
- De-attachable USB cable for different USB type connector
- Two USB ports for USB power passthrough
- Dimension & color : 42mm x 93mm x 20mm / Black

5G 4K Camera / NURA

- Qualcomm Snapdragon X55 Multimode 5G Modem
- Sigmastar SAV536G Edge AI Camera Platform
- Dual Cores Cortex A7@1.2GHz, 1 TOPs NPU
- Sony IMX415 1/2.8" 4K UHD STARVIS sensor
- Multiple exposure / digital overlap HDR
- 3GPP Rel. 15, NSA/SA operation, Sub-6GHz and mmWave
- Dimension: 72.5mm(W) x 123.5mm(D) x 73mm(H)

4T4R

2T2R

O-RU (Radio Unit) / 4T4R & 2T2R

- 3GPP Rel.15
- Functional Split: Option 7.2
- 5G New Radio Stand Alone Mode, TDD Mode.
- Band Support: N78, N79, N48, Up to 100MHz, 30KHz
- Modulation:
    - Downlink: 256/64/16 QAM and QPSK
    - Uplink: 64/32/16 QAM and QPSK
- 24dBm per Antenna Chain
- Model 1: 4T4R, Model 2: 2T2R

VIRGO

X-Haul Switch / VIRGO

- 12 x 1/10/25G＋2 x 40G/100G Ports
- Support Precision Timing and Synchronization (IEEE1588v2 & SyncE) and IEEE 802.1CM Profile B Frame Preemption.
- High availability in redundant design: 1+1 PSU Module, and 4+1 Fan Tray
- Short depth 250mm chassis design for small space cabinet deployment
- All front access IO
- Extended Operation temperature: -40°~65°

ARIES

X-Haul Switch / ARIES

- 12 x 1G＋6 x 10/25G Ports
- Precision Timing and Synchronization (IEEE1588v2 & SyncE)
- Support TSN IEEE 802.1CM Profile B Frame Preemption
- High availability in redundant design: 1+1 PSU Module, and 2+1 Fan Tray
- Short depth 250mm chassis design for small space cabinet deployment
- All front access IO
- Extended Operation temperature: -40°~65°

RAMONE

UPF (User Plane Function) / RAMONE

- Virtualized, Highly Integrated, Cloud Native Solution
- Highly scalable: enable to deploy multi-instance on cloud platform
- Support four roles defined in 3GPP standard PSA, I-UPF, UL-CL or BP, Multi-Roles
- Management interface to integrate with customers' operations
- Max. Throughput depends on SmartNIC throughput (10Gbps/25Gbps/100Gbps)
- PDU session capacity: 10K
- Packet latency: <50 us
- 1+1 Redundancy
- Dimension: 438mm(W) x 430mm(D) x 43mm(H)

RAMONE

O-CU (Centralized Unit) & O-DU (Distributed Unit) / RAMONE

- Intel Xeon-D single processor (SoC) solution
- Integrated FEC Accelerator, GNSS DPLL module
- Built-in QAT engine to compress and encrypt data
- Short depth chassis design (430mm) for small space cabinet deployment
- All front access IO
- Wide Operation temperature: -5°~55°
- Dimension: 438mm(W) x 430mm(D) x 43mm(H)

ELLINGTON

MEC (Multi-access Edge Computing) / ELLINGTON

- Dual 4th Gen Intel® Xeon® Scalable Processor
- High Memory (up to 32 x DIMM DDR5) and I/O for IaaS
- Intel Persistent Memory support to achieve High IOPS
- Support Ultra-fast All-Flash (PCIe5.0) or Hybrid Storage (SSD + HDD) Configurations
- Install up to 2 x Dual-Slot GPU card for AI Deep Learning
- Built-in Hardware Security (TPM2.0 & Optional for PRF3.0)

LUIGI

MEC (Multi-access Edge Computing) / LUIGI

- AMD EPYC Genoa 2P Solution for each node, up to 168 Cores/per node
- CPU TDP up to 290W
- All front-access I/O, and hot swappable drawer design for each node, easy to maintenance
- Shared redundant power supplies provides better power efficiency
- Modularized Lego Brick Like design and optional for GPU node and Storage node

PEGATRON 5G One Box Solution

5G Portable — Portable, Integrated, Easy Setup

- Pegatron 5G O-RAN CU, DU, 5GC and Management System
- Max. Cell up to 4, Total Active User up to 256

Functional Split	Option 7.2
Band Support	FR1: n78, n79, n48
Modulation	256QAM(DL), 64QAM(UL)
Ant. MIMO	4T4R DL: 4Layers, UL: 2Layers
Profile	DL Centric 7:3, 4:1
	UL Centric 2:3
Timing Source	Support IEEE 1588 PTPv2, ITU-T G.8275.1 profile
OAM	System Configuration
	UE management with list usage & QoS profile
	Network Slicing Management
	Northbound interface for higher level management
Dimension	540mm(W) x 590mm(D) x 120mm(H)

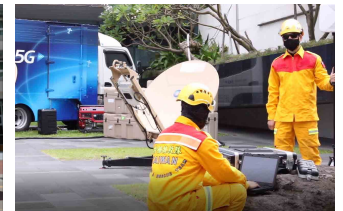## 5G Portable II — Optimized for 5G Edge

- Pegatron 5G O-RAN CU, DU and Management System
- Max. Cell up to 4, Total Active User up to 256
- Support Microsoft Azure 5G Private Core
- Wide temperature, -5°C ~ 55°C, for Edge Deployment

|	
Functional Split	Option 7.2
Band Support	FR1: n78, n79, n48
Modulation	256QAM(DL), 64QAM(UL)
Ant. MIMO	4T4R DL: 4Layers, UL: 2Layers
Profile	DL Centric 7:3, 4:1
	UL Centric 2:3
Timing Source	Support IEEE 1588 PTPv2, ITU-T G.8275.1 profile
OAM	System Configuration
	UE management with list usage & QoS profile
	Network Slicing Management
	Northbound interface for higher level management
GPU Support (Optional)	NVIDIA L4
MEC support (Optional)	Support Azure IoT Edge, Azure Vision on Edge
	Support PEGA Cambrian Edge Vision AI
Dimension	540mm(W) x 590mm(D) x 20mm(H)

5G Digital Resilience

A highly reliable mobile 5G base station using orbital satellites as a backhaul to create a digital relief network connecting to the Internet and to global data centers in case of disaster scenarios such as hurricanes, tornadoes, mass fires, earthquakes, or mass flooding.

This digital resilient 5G private network can also be used for remote mining, oil/gas platforms, energy farms, and remote factories.

Pegatron & Microsoft 5G Satcom solution

Serviced Industries

- Disaster Relief
- Remote Mining
- Oil/Gas Rig Platforms
- Energy Farms
- Remote Factories
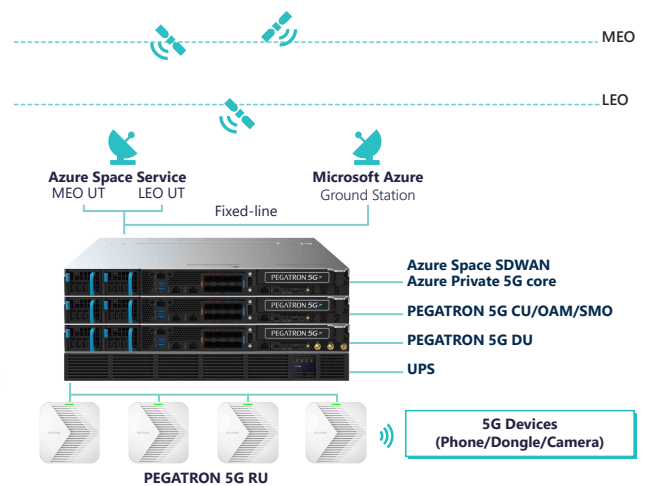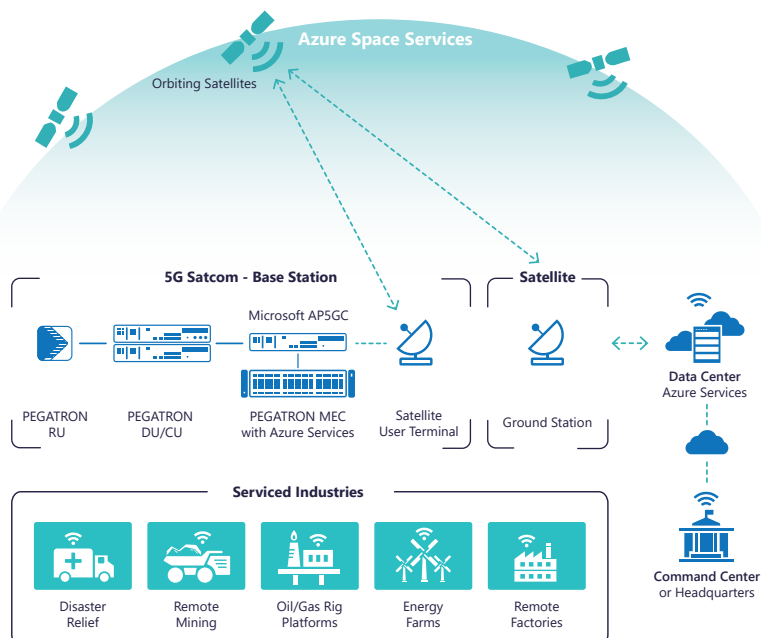
5G Portable & 5G Portable II

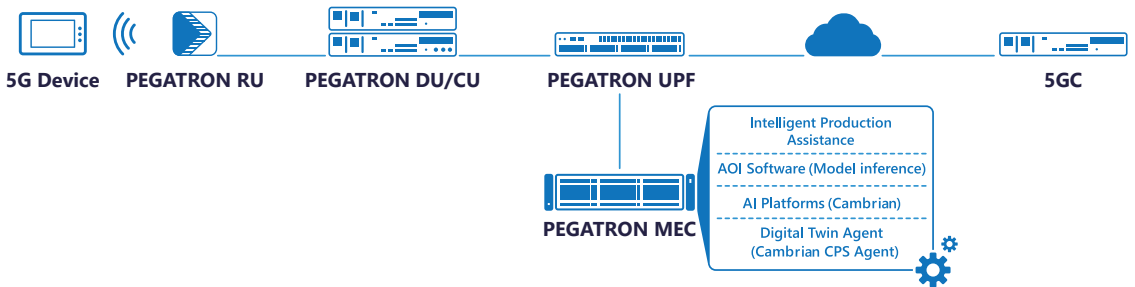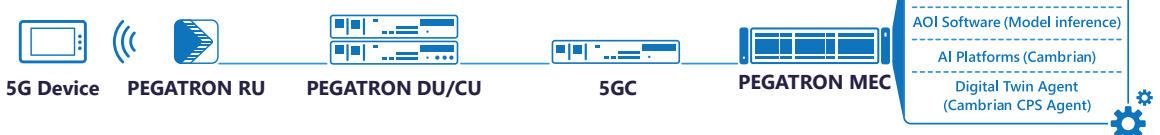|	
Resilient Network	• Support multiple orbital satellite communications (MEO and LEO)
	• SDWAN – automatically switch between satellite or fixed line networks
Light-weight	• On-premise Azure Private 5G Core
	• Highly integrated 5G O-RAN base station
	• Compact and wide temperature edge servers
Extendable	• Azure Cloud 5G Management
	• Azure Private 5G Core (20~500+ UEs)
	• Stackable PEGA 5G O-RAN to extend more RU (2~16+)

5G Smart Manufacturing

1 Assembly Monitoring
Use camera to capture workers' assembly actions to ensure SOP compliance and analyze assembly time and assembly results to ensure production capacity. Video streams are sent to MEC through 5G to do video analytics.

2 AOI Defect Detection
Provide real-time defect detection through deploying AI models on MEC server and continuous imaging from production line to do automated optical inspection on PCBAs and DUT.

3 Rapid Deployment
5G can efficiently and flexibly deploy smart factory applications; and software-independent implementation is efficient for changing production lines.

4 AMR / Automated Logistics System
Multiple factory AMRs coordinate using 5G and perform required jobs at exactly the right time while continuously adapting to changing site conditions and traffic.

5 Production Line Real-time Dashboard
Provide an IoT platform to collect big data from the factory shop floor, and provide intuitive visualization dashboard for production KPI, and provide anomaly alert to reduce response time and improve decision making.

6 AR/MR Remote Collaboration
5G can give users immersive experiences and remote collaboration with real-time low latency in-context information, guided instruction, and interact with system with Augmented Reality and Mixed Reality technologies.

7 Real-Time Surveillance
Video from IP cameras are transmitted to the MEC server using 5G is known as environmental surveillance; or applications like face and object recognition can be utilized through PEGA Vision AI.

8 Immersive Digital Twins
Real word physical entities in cyber space Cambrian digital twin provides simulation, real-time synchronization, remote control, event playback and production line optimization. It allows you to control the entire factory both in the physical world and Metaverse.

AR/VR Remote Collaboration

Defect and SOP AI Inspection

AI Security Check

Rapid Deployment

Cloud 5GC

5G Device — PEGATRON RU — PEGATRON DU/CU — PEGATRON UPF — 5GC

PEGATRON MEC
- Intelligent Production Assistance
- AOI Software (Model inference)
- AI Platforms (Cambrian)
- Digital Twin Agent (Cambrian CPS Agent)

On-Premise 5GC

5G Device — PEGATRON RU — PEGATRON DU/CU — 5GC — PEGATRON MEC
- Intelligent Production Assistance
- AOI Software (Model inference)
- AI Platforms (Cambrian)
- Digital Twin Agent (Cambrian CPS Agent)

Clean Network

We are committed to providing our customers with high-quality, reliable, and secure 5G O-RAN equipment, while upholding the principles of The Clean Network and maintaining a trusted and secure supply chain. To ensure that our equipment is secure and trustworthy, we maintain a secure supply chain that includes rigorous testing, verification, and certification processes. We work closely with our vendors to ensure that their products meet the highest security standards and comply with international regulations. We are proud to integrate a wide range of 5G O-RAN components from top vendors in the industry, including Microsoft, Intel, Radisys, WindRiver.

Zero Trust Architecture

Follow NIST-SP 800-207 principle to protect resources, secure data network connection and grant access. For example,

1. Building severs with TPM, authorizing connection through CA, digital signatures, and secure software download.
2. Use software-defined networking to establish network micro-segmentation to avoid the horizontal spread of attacks, and use the sandbox mechanism to allow software to run independently.
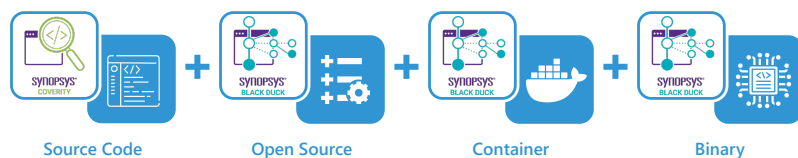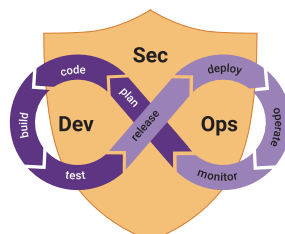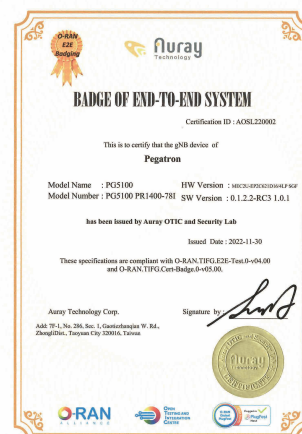
Security by Design

Based on the requirements in NTIA, O-RAN, GSMA and TIP, automated processes from R&D to production by using GitLab along with security test tools such as Coverity and Blackduck to achieve DevSecOps and implemented product development, lifecycle management process, and effective risk management in response to possible threats.

- Perform Source Code, Docker Image, 3rd Party Firmware/Binary Code scanning.
- Identify & Trace the Open Source's Security & License Issues.
- Generate and manage SBOM.
- Check Cloud-Native platform vulnerabilities and security configuration.

Use threat modeling tools and refer to ENISA 5G Cybersecurity standards to analyze possible risks faced by the 5G environment, and make corrections and preventions.

Accreditation of OTIC Lab

1. **PlugFest 2021, 2022**

   Passed 3GPP SCAS testing (Security Assurance Specification, e.g. TS33.511, TS33.117) during O-RAN PlugFest in the OTIC Lab.

2. **2022 E2E Badging**

   - O-RAN specified End-to-end tests
     - Functional Tests
     - Performance Tests
     - Load and Stress Tests

   - DoS and blind exploitation types of security tests
     - gNB Security Assurance Specification
     - DoS and Fuzzing Security Test
     - O-Cloud Resource Exhaustion Security Test

Overview of 5G O-RAN Security Testing

PEGA 5G Self Security Test
Software Develop, Open Source & Cloud Native (K8S)

| Source Code | Open Source | Container | Binary |

3GPP Specification Security Test

| TS 33.117 General Security Assurance Requirements | TS 33.511 Security Assurance Specification for gNB Network Product Class | TS 33.513 Security Assurance Specification; User Plane Function |

PEGATRON 5G

About PEGATRON Corporation

PEGATRON was founded on January 1, 2008. With abundant product development experience and vertically integrated manufacturing, we are committed to providing clients with innovative design, systematic production and manufacturing service in order to comprehensively and efficiently satisfy all of our customers' needs. PEGATRON features a solid R&D team, friendly, fast service quality as well as a high degree of employee cohesion. Furthermore, we have combined EMS and ODM industries to become an emerging Design and Manufacturing Service (DMS) company. Consequently, we are able to offer industry-leading, state-of-the-art products and profitable business opportunities for our partners.

PEGATRON Authorized Partner

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https://5G.pegatroncorp.com

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