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Private 5G | Igniting the Industrial Revolution

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Network Transformation: Fundamental to 5G

Traditional Networks
- Custom Proprietary Hardware-defined

Modern, Cloud-Ready
- NFV + SDN Orchestration
- Software-defined Open Platforms Virtualized Containers

Next-Generation Networks
- Analytics Cloud Native
- Network Slicing & Private Networks
- Analytics Core to Edge Visual Cloud

Cloud to Edge-Native Transformation Brings
- Intelligence where it’s needed
- Flexibility and agility
- Single, scalable architecture
- New use cases and services

Open Consortia & Platform SW
- O-RAN ALLIANCE
- ONAP
- ONF
- TELECOM INFRA PROJECT
- Red Hat
- Open Source MANO
- ONAP
- NFV
- OpenVINO
- OPC
- Kubernetes

Open Frameworks Bring
- Efforts led by key CoSPs & Cloud providers
- Reference implementations that accelerate development
- Ecosystem opportunities for verticals and private 5G
Societal Shifts Will Drive Enterprises Toward an Edge-Native SW + AI Strategy

- Labor Shortages and Supply Chain Bottlenecks
- Rapid Evolution of Remote and Hybrid Work
- Rising Privacy Concerns & Patchwork Regulations
- Digitization & Automation of Physical Infrastructure with Edge Native SW & AI
- Distributed Access, Security & Networking at the Edge For Low Latency Worker Access
- Cost effective, Privacy Preserving Data Processing & Storage at the Edge
# Leading Industrial Use Cases

<table>
<thead>
<tr>
<th>Potential Use Case</th>
<th>Example Application</th>
<th>Comms &amp; Compute Requirement</th>
<th>Edge to Cloud</th>
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</thead>
<tbody>
<tr>
<td>Guided and Autonomous Vehicles (AGV, AMR)</td>
<td>Material Handling in indoor and outdoor warehouses and factory floors, Collaborating Robots</td>
<td><strong>Comms</strong>: Mobility, Seamless handover, and Reliability</td>
<td>• ERP/Warehouse mgmt. Integration</td>
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<td><strong>Compute</strong>: Centralized control of AGV swarms, on-device sensor fusion, native 5G precise locationing</td>
<td>• On-prem AGV fleet management</td>
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<td>Visual Quality Inspection</td>
<td>Incoming, In-line, Outgoing inspection; ML based <em>Predictive Quality</em> Inspection to optimize production</td>
<td><strong>Comms</strong>: High and consistent data throughput</td>
<td>• ML Model training using data across global production lines</td>
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<td><strong>Compute</strong>: Real time distributed inferencing, product and process data contextualization</td>
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<td>Augmented Reality (AR)</td>
<td>Connected Worker, Remote equipment &amp; facility maintenance, Worker training</td>
<td><strong>Comms</strong>: High and consistent data throughput</td>
<td>• Equipment Supplier remote maintenance capability</td>
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<td><strong>Compute</strong>: Rendition and augmentation at distributed edge</td>
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<td>Wireless Sensor Networks</td>
<td>Building automation and Remote operation command center applications</td>
<td><strong>Comms</strong>: Reliably support massive number of end devices/sensors</td>
<td>• Local versus facility wide operation decisions</td>
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<td><strong>Compute</strong>: Sensor Fusion, Aggregation, distributed analytics</td>
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Use Case Example: Japan Waste Treatment Site

Smart Waste Management Factory Use Cases
- Remote control/driving of tractor/backhoe in the recycling plant
- AI Camera for safety protocol adherence monitoring (safety helmet detection, human detection during operations)
- Real-time digital twin of tractor/backhoe

Private Network
- Enables real-time low latency connectivity
- Real time decision making via data collection & analysis

Edge Compute
- Ability to stream real time videos from edge node leveraging 5G connectivity with large bandwidth and low latency
Use Case Example: Vision-Based Factory Workloads

Manufacturing Workload Optimization
- AMR fleet management
- Virtual PLC consolidation
- Asset health maintenance

Use Case Priority
- Worker Safety: Keep out zoning
- Vision-based workloads
- AMR utilization, status, and real-time location

Private Network
- Seamless AMR mobility in and out of factory site

Cloud Connectivity
- Edge to cloud function
Use Case Example: Aerospace Manufacturing

Existing Workstream Improvement:
- “Instant Work Area” creation
  - Floor changes daily
- Safety: Human and machine
  - Worker safety
  - Maintenance detection
  - AGV fleet management

New Workstream Enablement
- Mobile maintenance
  - Remote vendors
- Mass data consumption
  - 1TB per hour of data
  - 8 hours using traditional connectivity
- Inventory management/tool tracking
  - Vending machines vet credentials, location, time in/out

Private Network
- 300K square feet interior space
Thank You