Digital Manufacturing
From Traditional Factory to Connected Factory

Ing. Giuseppe Viglialoro - PMP
Cisco Systems – Manager Connected Industry & Energy Group - IoT Manufacturing
“Fabbrica Futuro” – Bologna, 14 March 2017
Digital Manufacturing Journey

Off-Line
- Factory Network
- Factory Security
- Factory Wireless

Connected Factory
- Analytics & Big Data
- Virtualization & Compute
- Connected Machines
- Factory Collaboration
- Location Services

Connected Enterprise
- Supply Chain Collaboration (SXP)
- Design Collaboration

Supply Chain Orchestration

- + 16% OEE
- + 23% NPI
- - 49% Defects
- - 48% Downtime
- - 35% Inventory
Where Are You Today? Where in 2020?

The Traditional Factory – The Purdue Model

Enterprise Zone
- Enterprise Network
- Site Business Planning and Logistics Network

Demilitarized Zone

Manufacturing Zone
- Site Manufacturing Operations and Control
- Area Supervisory Control
- Basic Control
- Process

Cell/Area Zone

Safety Zone
- Safety-Critical
Connected Factory Approach

TRADITIONAL FACTORY

- Separate Enterprise & Factory Networks
- Manufacturing Processes not Supported by IT Systems
- Proprietary Platforms

CONNECTED FACTORY

- Advanced Automation Through Improved Security & Data Virtualization
- Re-engineered Manufacturing Processes Utilizing Industrial Location & Collaboration
- Connected Supply Chain
Connected Factory Architecture

Advanced Automation

Enterprise (Levels 4-5)
- Enterprise Applications
- IDMZ Network
- Automation Security

Level 3.5
- iDMZ

Factories (Level 3)
- SCADA/MES Servers
- Data Mgmt. Servers
- Factory Network

Level 2.5
- Fog
- Distributed Applications

Floors (Levels 0-2)
- IE Switches
- HMI
- Controller
- Drive
- Distrib. I/O

Industrial Location

Cloud

- Enterprise Network
- Asset Management Applications
- Wi-Fi Network Applications
- Wireless Security

Unified Collaboration

- Collaboration Applications
- Unified Collaboration
- Advanced Automation

Advanced Automation
- Industrial Location
- Connected Factory Architecture
- Unified Collaboration

Smart Phones
- RFID Tags
- Video
- Laptops
- Phones
- Collaboration
- Video

Exciters

© 2015 Cisco and/or its affiliates. All rights reserved. Cisco Confidential
Connected Factory Reference Model

**Reduce Costs** (Optimize Operations)
- Production Automation
  - Predictive Maintenance
  - Connect AGVs
  - Secure Operations
  - Plant wide Security
  - Wireless Automation
- Product Enhancement
  - Predictive Maintenance
  - Digital Thread/Twin
  - Connect Equipment
  - Locate Equipment
  - Secure Operations
  - Device Security
  - Connecting the Unconnected

**Increase Revenues** (More Capabilities)
- Quality Control
  - Video Analytics
  - Quality Analytics
  - Locate Test Equipment
  - Video Expert
- Inventory Management
  - Supply Chain Management
  - Location Analytics
  - Locate Equipment
  - Locate Work in Process

**Meet Responsibilities** (Environmental, Safety, Regulatory)
- Workforce Enablement
  - Worker Training
  - Employee Communications
  - Customer Communications
  - Worker Safety
  - Worker Mobility
- Cost Management
  - Energy Management
  - Time & Motion Studies
  - Activity Based Costing

**Applications & Analytics**

- **Advanced Automation**
- **Industrial Location**
- **Unified Collaboration**
Advanced Automation Approach: Security

TRADITIONAL FACTORY

CONNECTED FACTORY

Secure Automation

<table>
<thead>
<tr>
<th>Segment Network</th>
<th>Secure Access</th>
<th>Identity &amp; Access</th>
<th>Threat &amp; Anomaly</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Industrial DMZ

Basic Security
Advanced Automation Architecture

**Challenge: Improve OEE**
- Improve automation network reliability & uptime
- Reduce costs through improved data visibility
- Protect the factory from external threats
- Drive Zero Down Time

**IoT Solution: 166% RoI**
- Implemented the CPwE architecture
- Implement robust security (Level 3.5 iDMZ, etc) for factory & enterprise network separation.
- Data Virtualization (Level 2.5 Fog, etc) to support distributed applications for predictive maintenance
Big Data and Analytics at FANUC

- Data Collection
- Edge Compute
- Predictive Analytics
- Proactive Part Replacement

Watch Video
Industrial Location Approach

TRADITIONAL FACTORY

CONNECTED FACTORY

Enhanced Process

<table>
<thead>
<tr>
<th>Material Management</th>
<th>Asset Management</th>
<th>People Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Floor Wireless</td>
<td>Plant Floor Wireless</td>
<td></td>
</tr>
</tbody>
</table>

Advanced Automation  Industrial Location  Unified Collaboration
Industrial Location Architecture

- **Challenge: WIP Handling**
  - Reduce scrap due to lost carriers & material handling inefficiencies
  - Locate WIP anywhere on the plant floor
  - Optimize labor utilization by reducing indirect labor
  - Platform that can be extended to additional material/asset & people location use cases

- **IoT Solution: 20% Loss Reduction**
  - High density Wi-Fi for location accuracy & industrial process support
  - RTLS solution including a single pane of glass for business applications
  - Location-based analytics
**Challenge**

Long Tire Assembly Search Times by Operators
Increased Cycle Times, Decreased Labor
Optimization, and Noncompliance with
Production Schedules. High Scrap Rate
Associated with Lost Carriers.

**Solution**

Implement LBS Solution to Track All Carriers in
Real-time Using T2 Tags and Cisco Unified Wi-Fi
network

Allow Material Handlers/Truckers and Managers
to Search for Component by ID, Tread Number,
Material Code (FIFO)

**Business Outcomes**

Continuous Real-time Visibility Across Entire Plant

20% Reduction of Breaker Component Tire Loss

Increase in tire machine utilization ensuring
increased production and overall equipment
efficiency (OEE)
Unified Collaboration Approach

TRADITIONAL FACTORY

CONNECTED FACTORY

Process Integration

Voice & Data  Video  Wearables

Plant Floor Collaboration

Consulting with Off-Site Machine Expert
**Unified Collaboration Architecture**

- **Challenge: Workforce Efficiency**
  - Implement High Performance Work Teams (HPWT) methods
  - Real-time OEE visibility across the plant-floor
  - Improve worker efficiency through plant-floor collaboration
  - Utilize collaboration platform for customer visits

- **IoT Solution: 90% Labor Utilization**
  - Collaboration platform that includes unified voice, video & messaging
  - Multi-function digital displays to support plant operations & visits
  - Integrate collaboration platform with MRP & MES Systems

---

© 2015 Cisco and/or its affiliates. All rights reserved. Cisco Confidential
Human Connectivity & The Future of Work

Efficient
Secure
Connected
Flexible

Efficient
Connected
Secure
Flexible
Thank you.

gviglial@cisco.com