"Ethernet Industrial. Fundamentos y Aplicaciones"
Cisco Connected Manufacturing.
The Network is the Platform for Responsive Manufacturing

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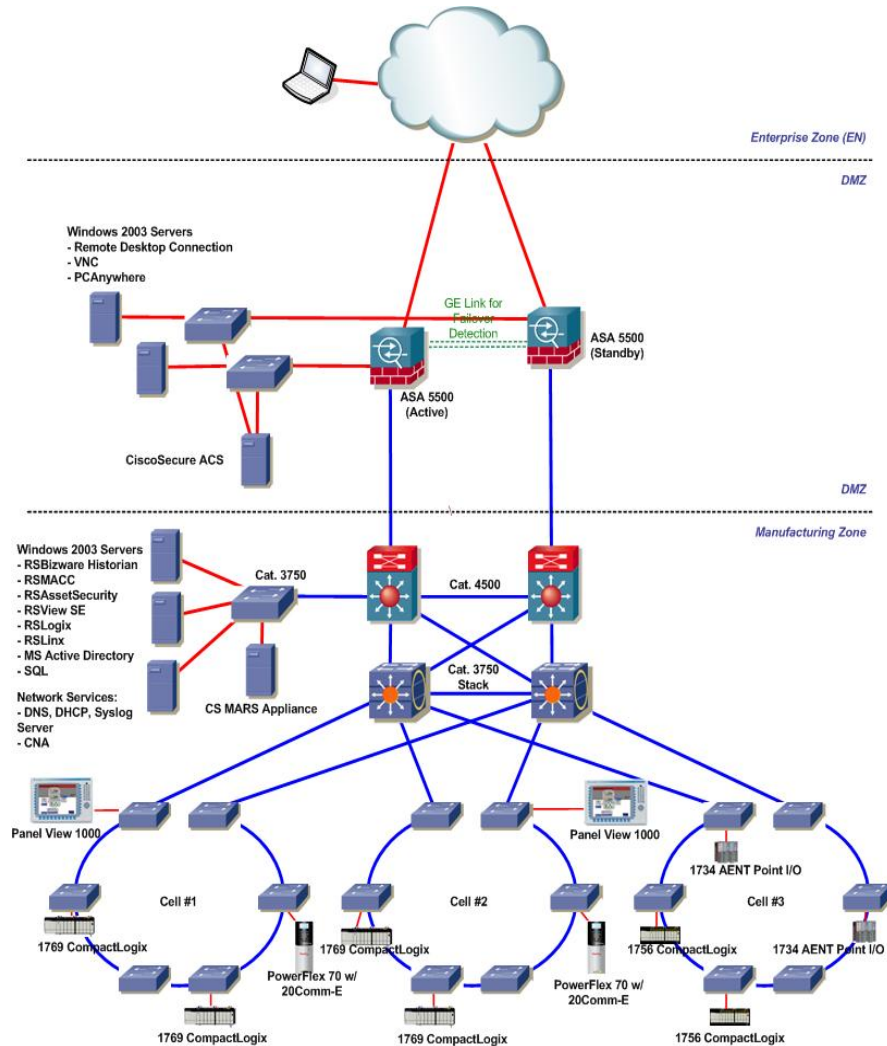
Vigo 15 Enero 2010

Agenda

- Introduction to IE

- Market trends for Manufacturing

- Solutions

- Case Studies

Industrial Ethernet: Key Trends

- Industrial Ethernet Switch market is maturing

    More configurations and compliance specifications required

- Customers moving past basic connectivity to application-specific features

    Management supporting Mfg protocols (CIP, Profinet, etc)

    High-precision timing (IEEE 1588)

- Ease-of-use is a must-have

    Easy deployment and management

    Equipment replacement by a technician who is not trained in switching

    Redundancy

    High Availability Networks

Ethernet-to-the-Factory Architecture

Factory Floor Optimized

Enterprise Network	
Demilitarized Zone (DMZ)	**Separation between Control & Enterprise Networks**
Manufacturing Zone	**Interconnection between Cell Zones, Server Farms, and DMZ**
Cell Zone	**Network Connection for PLCs, HMIs, I/Os, & Drives**

IE Market - Update

30%
Compound Annual Growth Rate
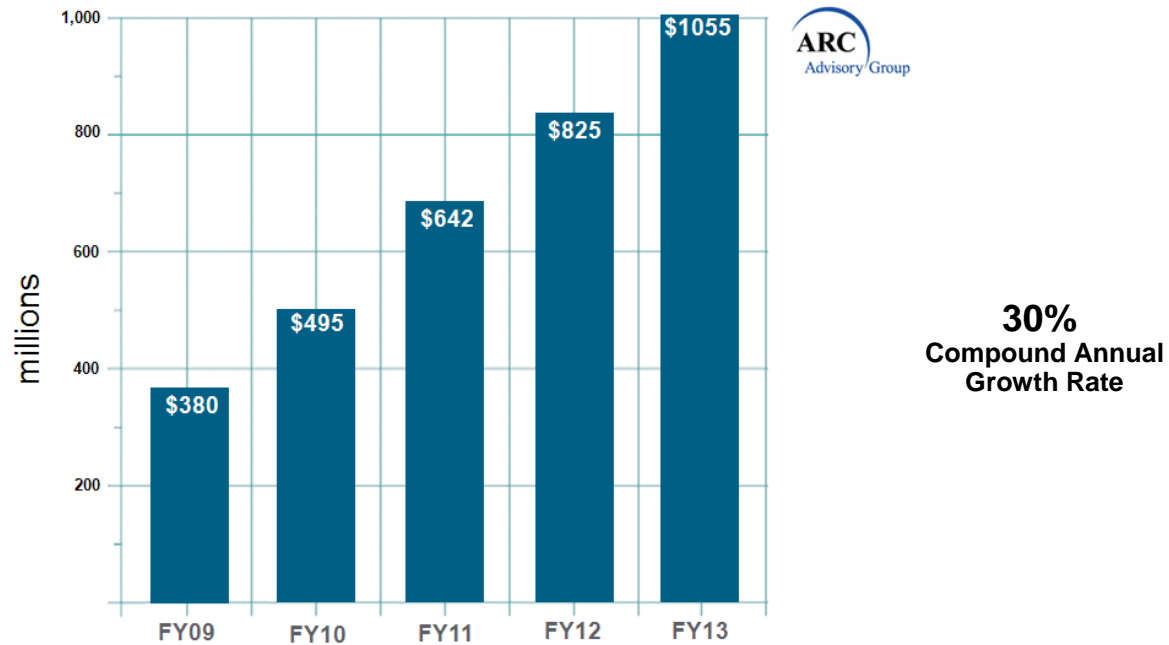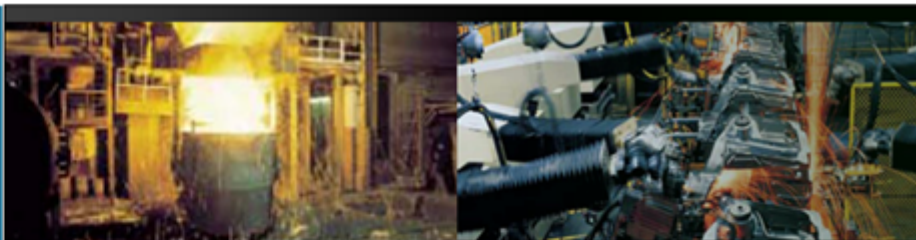
Industrial Ethernet TAM

Source: ARC 2007 report adjusted for macro-economic conditions in 2009

- **Strong market for all industrial automation equipment**
- **No. of Ethernet devices continue to expand**
- **Ethernet is the clear successor to current device networks**

Industrial Ethernet Markets (Top Verticals)

- Industrial Automation
- Intelligent Transportation Systems
- Energy

IE Market Opportunity – Industrial Automation (70%), ITS (20%), Energy/Utilities (10%)

In today's global manufacturing market, staying connected is staying ahead.

Today's Challenges are Global

The goals of manufacturers remain the same, but the challenges are magnified and complicated by an extended value chain that includes global suppliers and customers:

- Fragmentation of the value chain

- Regulatory mandates

- Growing risks to the supply chain

- More quickly evolving customer requirements

Be More Responsive

Cisco Connected Manufacturing solutions allow you to be more competitive and responsive as you:

- Increase the rate of innovation in research and development

- Enable your supply chain to adapt to changing markets

- Improve the efficiency and flexibility of production processes

- Enhance customer intimacy in sales and service functions

Speed Product Development

- Integrate communications with business processes

- Incorporate customer needs into product designs

- Accelerate delivery of information for improved collaboration
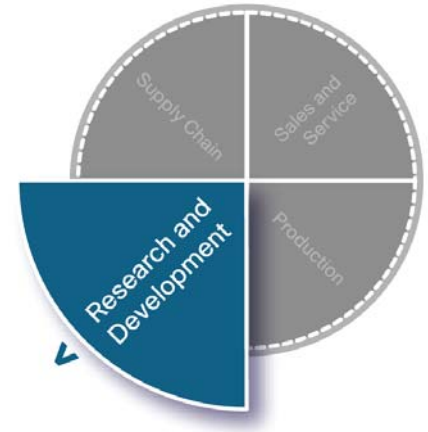
Improve Time to Market

- Communicate and collaborate with global design centers and partners

- Securely share information from multiple functions and view project status in real time

- Make simultaneous design changes, sharing data with suppliers and partners

- Enable remote testing to reduce costs
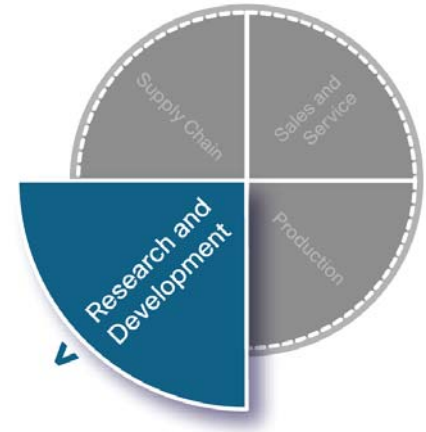
Adapt to Changing Markets

- Securely extend access, visibility, and data integration to the whole supply chain

- Use voice, video, and data to improve communication between suppliers, partners, and plants

- Make better business decisions with increased process visibility

- Quickly and easily inform partners about new products, technologies, and services

Increase Productivity

- Minimize inventory shortages by viewing customer orders and monitoring supply

- Improve event response with rapid response to factory floor exceptions, plus faster resolution of tool downtime and production issues

- Funnel product issues and manufacturing problems into R&D

- Make better business decisions based on real-time data
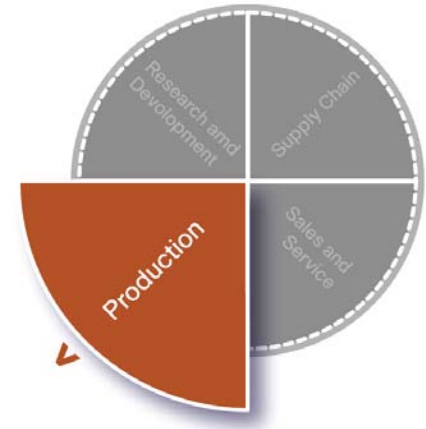
Enhance Safety and Compliance

- Improve safety with better emergency communications and video monitoring

- Protect critical network functions with full security

- Meet regulatory compliance demands
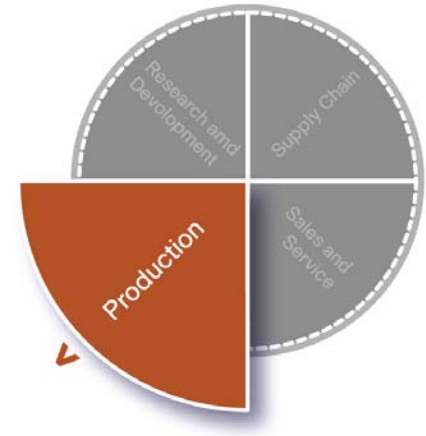
Improve Customer Relationships

- Identify the right products and features to satisfy customers and maximize ROI

- Increase customer satisfaction with improved responsiveness to customer orders, problems, product issues, and service requests

- View real-time parts and inventory availability to respond immediately to customer queries
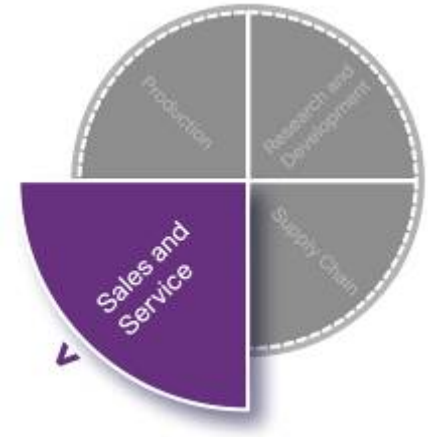
Communicate More Efficiently

- Leverage subject matter experts throughout the world

- Quickly and easily train remote sales and services teams

- Extend your sales force with more efficient communications to channel partners and distributors
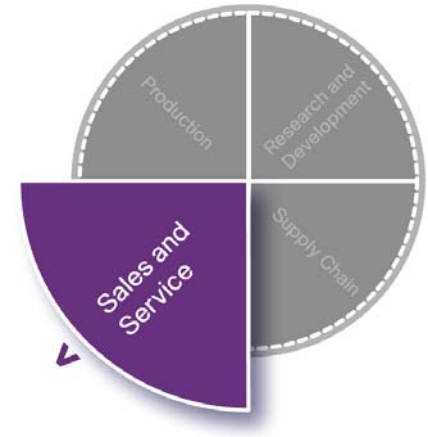
The Network is the Platform for Responsive Manufacturing

- Extend access, visibility, and knowledge across your value chain

- Communicate and collaborate across globally distributed teams

- Securely integrate communications and information into business workflows

- Enable flexibility throughout the value chain

Solutions

Ethernet-to-the-Factory Architecture

Factory Floor Optimized

Enterprise Network

Demilitarized Zone (DMZ) — Separation between Control & Enterprise Networks

Manufacturing Zone — Interconnection between Cell Zones, Server Farms, and DMZ

Cell Zone — Network Connection for PLCs, HMIs, I/Os, & Drives

IE 3000 Series Switches

- **Optimized for the factory floor**
  - Rugged design
  - Support for Common Industrial Protocol (CIP)
  - Support for Precision Time Protocol (PTP) via IEEE 1588

- **Secure**
  - Port Security
  - User based Authentication
  - Secure CIP

- **Easy to use**
  - Plug and play setup / Smart ports and custom macros for Industrial applications
  - Integrates into current industrial management applications
  - "Zero-Config" replacement via the IE SwapDrive

- **Standards Based**
  - IEEE, CIP, ODVA

Industrial Ethernet Switch 4/8 port base switch

- **4 & 8-port base switch** (10/100BaseT)

  2 dual purpose uplink ports
  - 10/100/1000BaseT or SFP
  - Mutually exclusive

  Dimensions
  - 5.75" W x 5.75" H x 4" D

- **Expandable to include additional:**
  - 16 10/100BaseT ports
  - 8 100FX ports

- **Power input:**
  - 24V/48V DC
  - Expandable to support AC & extended DC

- **Industrial SFPs supported:**
  - 100FX / 1000 SX / 100LX / 1000LX / 1000ZX

Expansion Modules

- **8-port copper module** (10/100BaseT)

- **8-port fiber module** (100FX)

    Expansion options:
    - Two 8-port 10/100BaseT modules
    - One 8-port 100FX module
    - One 8-port 10/100BaseT module and one 8-port 100FX module

    Dimensions:
    - 3.5" W x 5.75 H x 4" D

- **Snap on power transformer module**

    Power module inputs:
    - 100-220 VAC
    - 90-300 VDC

    Dimensions:
    - 2" W x 5.75" H x 4" D

Cisco IE 3000 Hardware Features

Ruggedized

Feature	Description
Mounting	DIN-Rail, Wall-Mount and Rack-Mount (19" rack converter provided)
Temperature	-40C to 75C
Relative Humidity	5% - 95% Condensing
Shock	15g (Operational), 30g (Non-Operational)
Surge Protection	4 kV (line to earth) / 2 kV (line to line)
Alarms	Dual 24V alarm relays, normally open
Memory	Removable Compact Flash
Real Time Ethernet	IEEE 1588 (PTP Boundary Clock)
Fiber Connectors	LC
Intrusion Protection rating	IP20 (Protection against dust, (solids greater than 12mm), No protection against water)
Power input	24V/48V DC

Basic IE Features

Feature	Why
VLAN / VLAN Trunking	Segment broadcast traffic
DHCP (client)	IP Address Assignment
SNMP (v3)	Management
IGMP / IGMP snooping (with querier)	Manage multicast traffic in producer-consumer model
Broadcast & Multicast rate limiting	Eliminate network disruptions due to traffic bursts
Spanning Tree Protocol	Remove loops in the network
Rapid Spanning Tree Protocol (RSTP)	Quick Network recovery after a link failure
Port Mirroring	Troubleshooting
Port Security	Restrict # devices allowed on a switch port

Advanced IE Features

Feature	Why
Quality of Service, Access Control Lists Layers 1-4	Prioritize critical data traffic, Support Quality of Service and Security Profiles
DHCP Server	Assign IP addresses to devices
TFTP Server	Store config files for devices
SSH / HTTPS / Telnet access	Management
802.1x w/ guest & dynamic VLAN assignment	Authentication and Access restriction (Security)
Network Access Control (NAC)	Virus Protection
DHCP Persistence	DHCP server offers the same IP address to the devices
Resilient Ethernet Protocol (REP)	Segment Protocol, 50 nodes and 50ms convergence

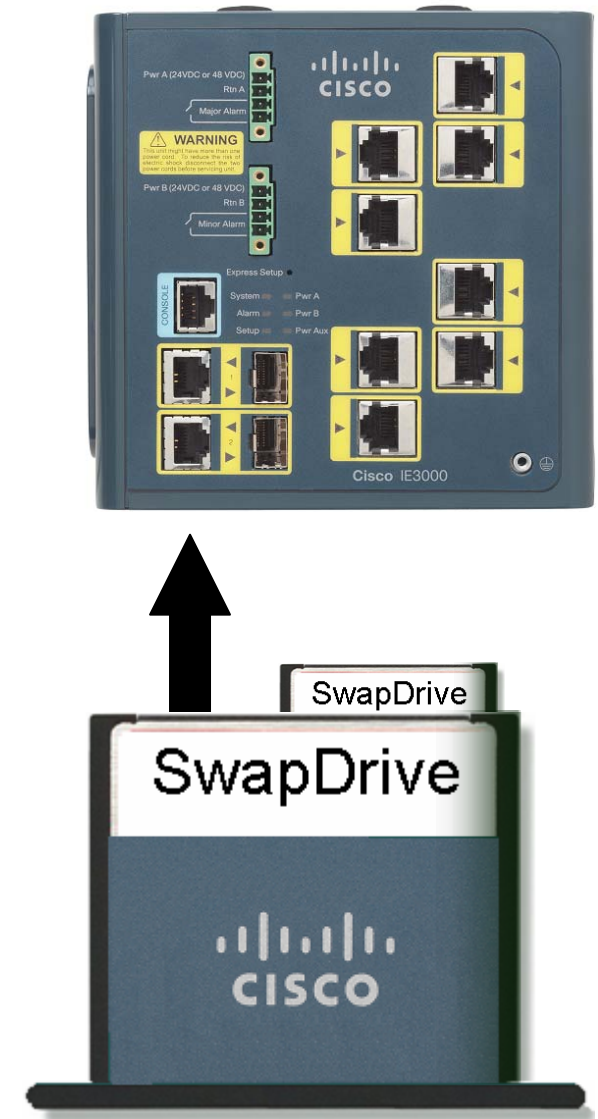# IE SwapDrive - "Zero-Config" Replacement

Easy to Use

- **What is "Zero-config" replacement?**
  - Simple switch replacement in case of a failure
  - No IT expertise required
  - IE SwapDrive ensures fast recovery

- **Files stored on the SwapDrive compact flash**
  - IOS Image – (tar, html) – 2 sets
  - Config text
  - VLAN dat
  - Other device configs

This solves a key business issue in the IE market

Cisco IE 3000 Software Features

Factory Floor Optimized

Catalyst 2960 LAN Base Image +

Feature	Description
CIP	A peer-to-peer application layer protocol suite, shared by industrial networks such as DeviceNet, ControlNet and EtherNet/IP.
PROFINET IO	Exchange data, alarms and diagnostics information with the PROFINET automation controllers and IO devices
PTP	PTP Software module for time synchronization
Industrial Automation Smartport Templates	Optimized Smartport profiles for industrial automation devices.
DHCP Persistence	DHCP server offers the same IP address to the devices
Resilient Ethernet Protocol (REP)	Segment Protocol, 50 nodes and 50ms ring convergence

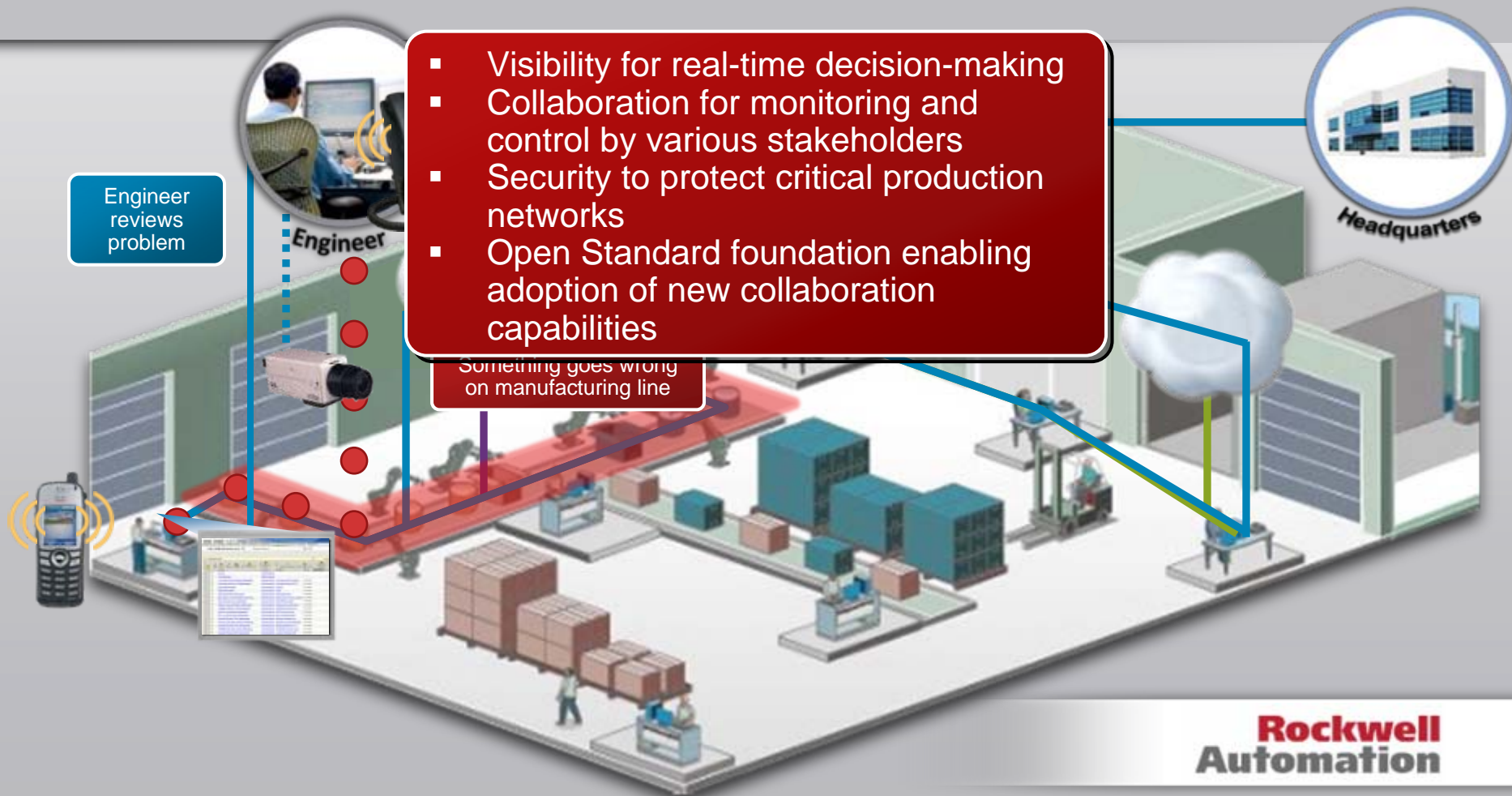# IEEE 1588 – Precision time protocol

Standards Based

Master Clock

- **Precision time protocol (PTP)**
  - Real-time synchronization in a distributed system

- **Needed in environments with high performance industrial applications**
  - e.g. motion control requires sub-micro second accuracy and precision
  - All devices synchronize their clocks to within 1 microsecond or less
  - The high-precision activity is scheduled (ex: all systems stop at time=x
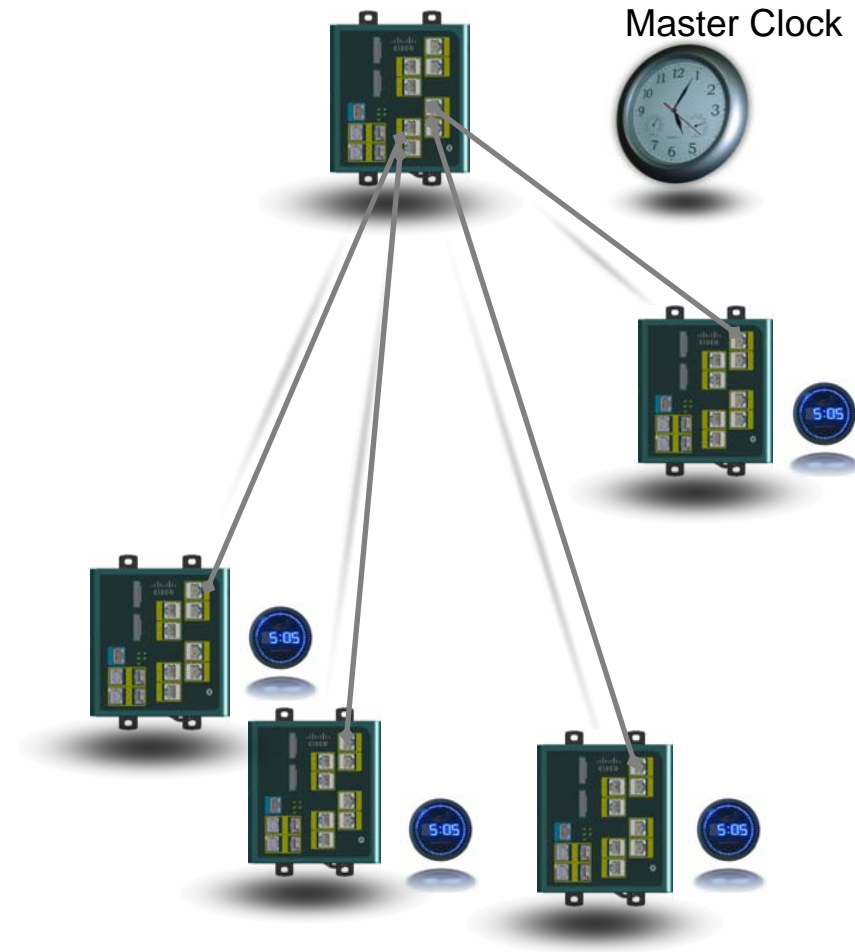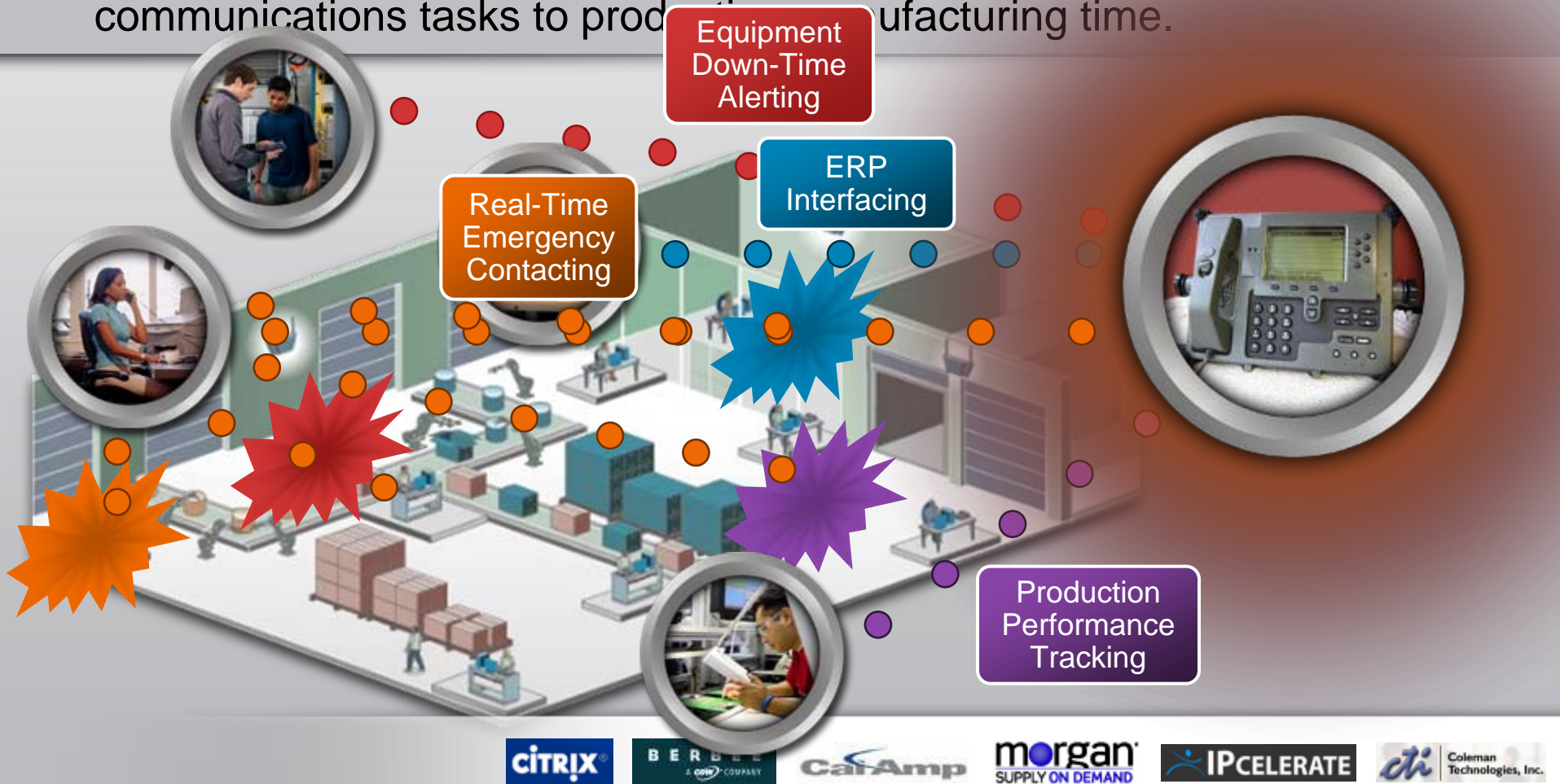
Ethernet to the Factory

Securely connects the factory to the corporate network, improving the efficiency and flexibility of production operations, all in a highly secure environment.

- Visibility for real-time decision-making
- Collaboration for monitoring and control by various stakeholders
- Security to protect critical production networks
- Open Standard foundation enabling adoption of new collaboration capabilities

Engineer reviews problem

Engineer

Something goes wrong on manufacturing line

Headquarters

Rockwell Automation

Connected Factory Floor

Unleashes hidden productivity and transforms performance improvement initiatives like Lean by leveraging advanced communications and enhances worker throughput by converting routine and tedious data and communications tasks to productive manufacturing time.

Equipment Down-Time Alerting

ERP Interfacing

Real-Time Emergency Contacting

Production Performance Tracking

Plant Voice over Wireless LAN

Improved productivity through quicker responses to disturbances and avoidance of work stoppages of up to 50 percent using Voice over Wireless LAN technology.

Problem with Flow Rate

Engineer

Manufacturing Location-Based Services

Provides complete visibility into the plant and supply chain using standard Wi-Fi wireless networks to accurately locate assets, people, and inventory.

Production Manager

MAC: 000CCC732F74

Alert sent to tech on floor

Parts about to go missing

AeroScout

Industrial Wireless Video Surveillance

Improves the efficiency and safety of manufacturing environments through wireless video monitoring, eliminating the need for staff to physically collect recordings, even in extremely hazardous environments.

Video of intrusion sent over secure mesh network
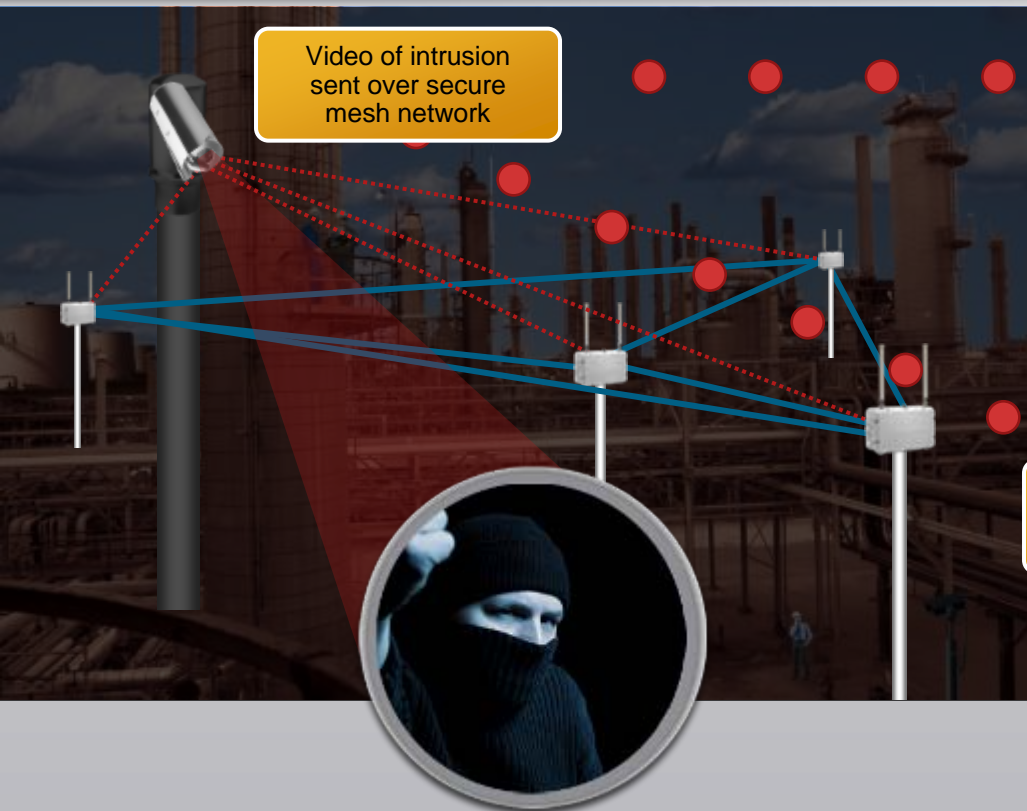
Control room and grounds security view video & take action

PELCO

Warehouse UC Voice Picking

Provides an open-standards, affordable warehouse voice solution to increase order accuracy, reduce redundant labor steps, and improve the work environment.
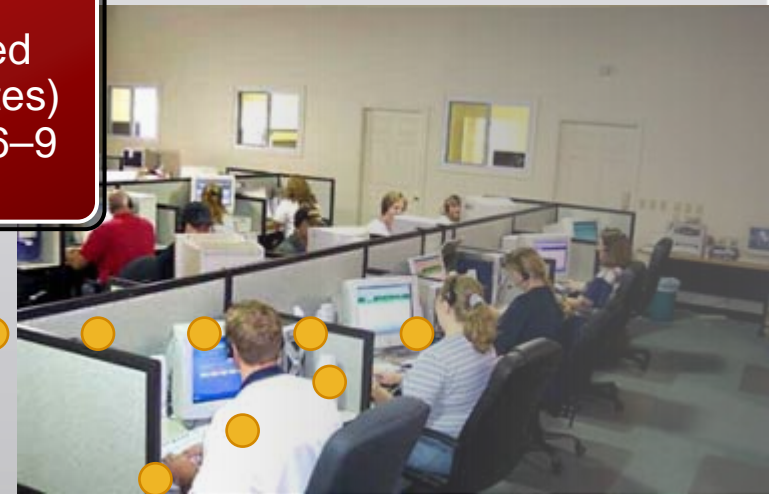
Manufacturer Warehouse

Manufacturer Call Center

- Increased order accuracy to >99.8%
- Delivery time reduced 80% (60 to 10 minutes)
- Measurable ROI in 6–9 months

to speech

Warehouse Worker

Distributor orders product

Distributor

Dàtria®

Distributed Manufacturing

Provides secure visibility and rich collaboration between multiple plant locations, enterprises, and partners to improve the speed and effectiveness of business decisions.

Contract Manufacturer

Network Detects "Component Failure" and sends alert

- Real-time data visibility across supply chain
- Rich, contextual, real-time collaboration
- Leverage existing systems and infrastructure

Secure data from CM to SAP MII

Quality Engineer

Production Manager contacts supplier through MII

Supplier acknowledges order over phone

Production Manager

New Supplier

SAP

Collaborative Research and Development

Provides manufacturing designers and engineers with real-time collaboration which accelerates time to market, improves the quality of collaboration, gains efficiency through reduced travel, all in a secure environment.
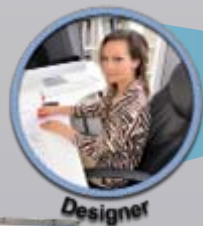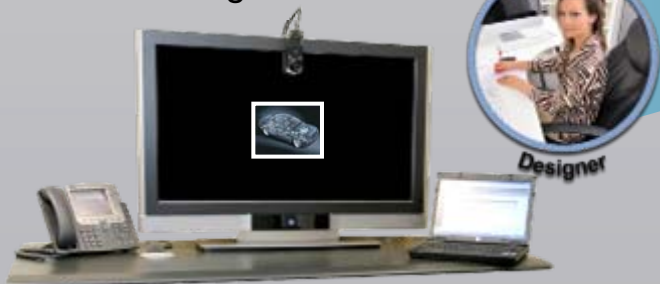
Main Design Center TelePresense

Supply Partner TelePresense

Engineer

Partner
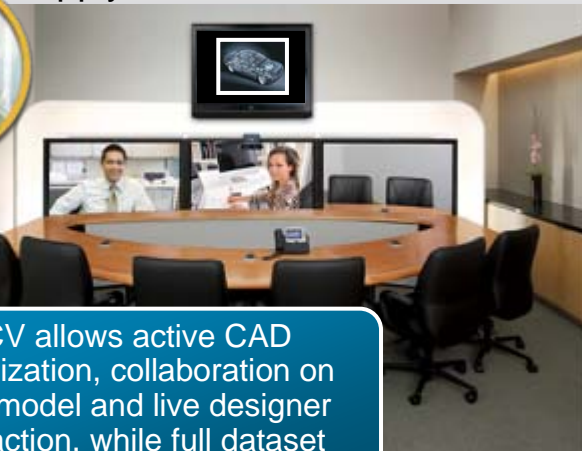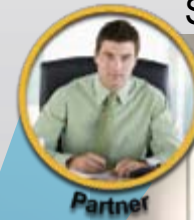
DCV allows active CAD virtualization, collaboration on CAD model and live designer interaction, while full dataset remains secure

Remote Design Center

Data Center

Designer

IBM

Collaborative Engineering Change

Optimizes design changes for manufacturers through faster, more collaborative processes that reduce cycle time, minimize data errors, connect appropriate skill sets, and provide a recorded audit trail.

9 am EST:
Designer writes change description

PLM converts text to speech and calls Engineer

Designer

- Engineer receives call
- Access design data on PDA
- Review proposed design change

Engineer

Web conference of approvers are contacted

- Team reviews change to 3D design and suggest improvements
- Team collaborates on changes until satisfied
- Team reviews and approves final design
- **Design change approved—1 pm EST**

PTC

Manufacturing Application Networking

Transforms the Manufacturing data center, reduces hardware at the sales offices, and improves application performance, enabling increased efficiencies and faster deployment of local sales and service offices.

Data Center

Manufacturer Sales Office

Headquarters

Workstation

Cisco ACE Server Load Balancing
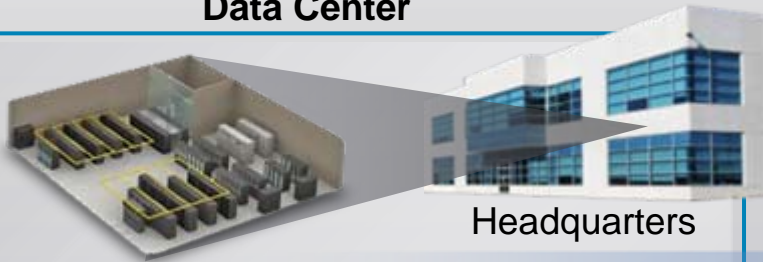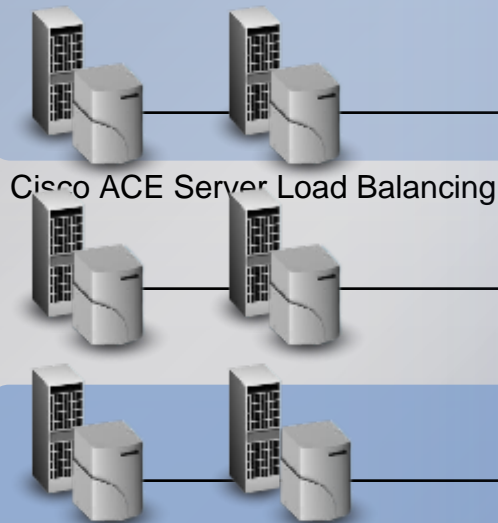
WAN

Eliminates Servers in the Branch

Case Studies

Case Study: Toyota Technical Center Asia Pacific
Increased R&D Collaboration

- **Challenge**

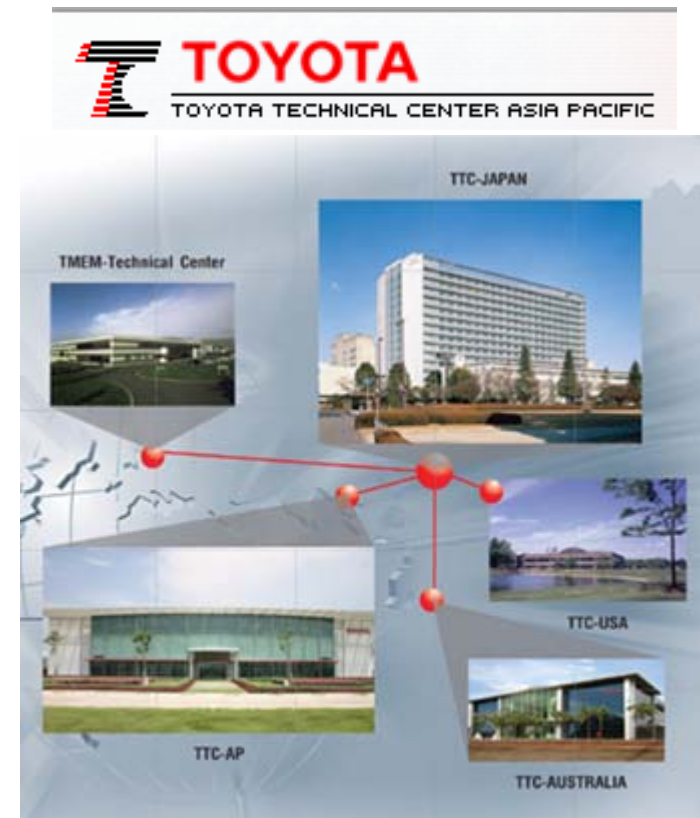 Facilitate collaboration from dispersed locations

- **Solution**

  Unified Communications: Voice, Video and Web Conferencing

  High performance converged network

- **Benefit**

  Improved collaboration between regional engineers

  Resulting in higher quality automotive spare parts designs

Case Study: Lawrence Berkeley Labs
Increased R&D Collaboration

- ## Challenge

  Facilitate collaboration from dispersed locations

- ## Solution

  Integrated voice, Web, and videoconferencing

- ## Benefit

  Advance projects more quickly through frequent and effective collaboration

Berkeley Lab
LAWRENCE BERKELEY NATIONAL LABORATORY

About 60% of manufacturing industry executives believe ad hoc conferencing can shorten development times by 1 or more days*

* Source: Forrester Consulting: Unified Communications Delivers Global Benefits, Se

Case Study: Adept Technology
Supply Chain Visibility

- **Business Challenges**

  - Position company for growth by increasing operational efficiency

  - Maintain excellent customer service while reducing costs

- **Cisco Solutions**

  - Cisco Connected Supply Chain solution: routers, firewalls, IP Communications, and security products

  - Cisco Integrated services routers at Adept manufacturing facilities, service depots, and vendor locations throughout the supply chain

- **Business Value**

  - Supply chain visibility supports more efficient, less expensive service operations

Case Study: Boeing
Improving Visibility

- **Challenges**

  Misplaced toolkits, machinery, parts and WIP inventory

  Costs as much as $1 million per incident

- **Solution**

  Cisco's Unified Wireless LAN Infrastructure

  Location capabilities and Wi-Fi asset tags

- **Benefits**

  Locate tagged assets instantly

  Reduces delays in the production

  Reduce government fines

Case Study: Petrom
Cost Savings and Easy Expansion

- **Challenges**

    Older IT infrastructure

    3,600 users across eight locations

    Growth—15,000 users in five years

- **Solution**

    Unified communications system

    Connected Factory Floor

- **Benefits**

    Leveraged existing infrastructure

    Built systems for easy expansion

    100% elimination of inter-site calling costs

Case Study: Festo AG
Increased Productivity and Security

- **Challenges**

  Separate networks across 250 locations

  Supporting 23,000 different products

  Production environment in need of optimization

- **Solution**

  Cisco Ethernet to the Factory Solution

- **Benefits**

  100% uptime over last 12 months

  Effective management of security threats

  360 degree view of operations

  Enhanced manufacturing, sales, customer service and IT processes

FESTO

Case Study: Maher Terminals
Operations and Safety

Challenge

- Incompatible devices for communication

Solution

- Cisco IPICS—IP Integrated Communication System

Benefits

- Cost-effective connection to any device at any time
- Crisis management availability

Case Study: Grainger
Increase Customer Responsiveness

- ## Key business challenge

    How to leverage local presence with central enterprise resources to drive sales, improve customer experience
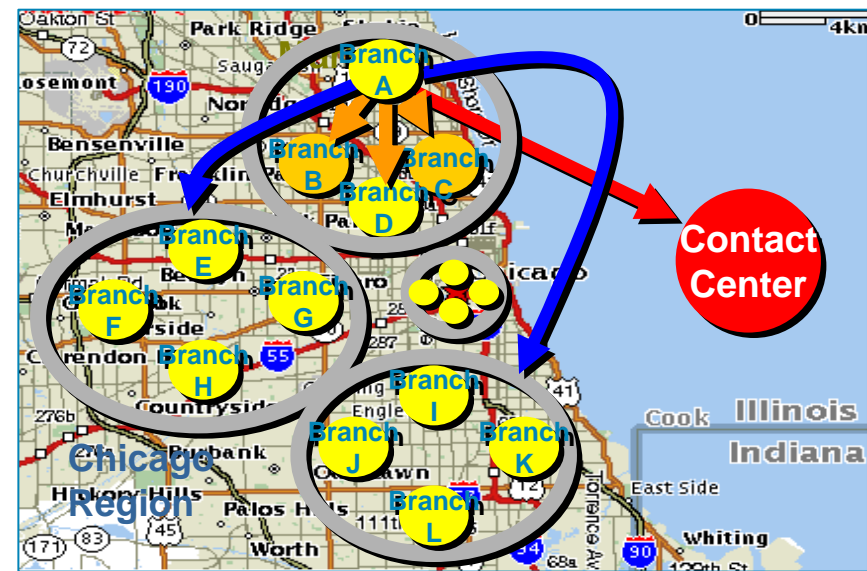
- ## Solution

    Integrating branch and enterprise resources through a converged network

- ## Result

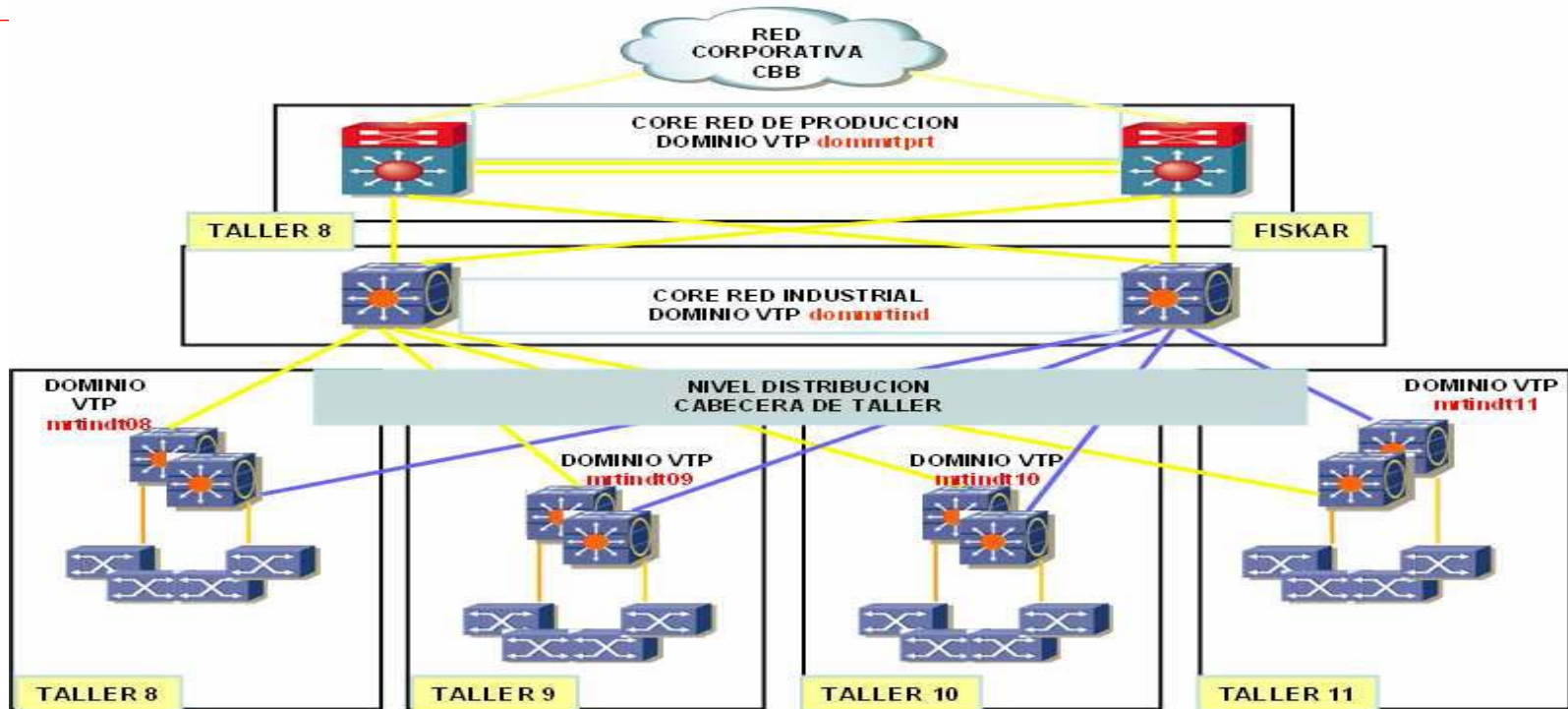   Shorter hold time for customers

    Local touch

    Increased annual sales by $60M

¿Qué es la Red Ethernet Industrial en SEAT?

Total clientes conectados: **200** (igual que la suma de las anteriores redes)
Total capacidad electrónica (puertos de red disponibles): **696**
Total capacidad infraestructura pasiva (armarios, fibras, etc) :27 armarios aprox. 2.100 clientes

Manufacturing Case Studies

slides available

- Advanced Micro Devices http://newsroom.cisco.com/dlls/global/asiapac/news/2007/pr_03-26.html

- POSCO http://newsroom.cisco.com/dlls/global/asiapac/news/2007/pr_12-04.html?sid=BAC-JsSynd

- Petrom* http://newsroom.cisco.com/dlls/2006/prod_012606.html

- Diamond Aircraft* http://www.cisco.com/web/strategy/docs/manufacturing/Diamond_Aircraft.pdf

- Toyota Technical Center* http://www.cisco.com/web/strategy/docs/manufacturing/cisco_toyota06.pdf

- VTech http://newsroom.cisco.com/dlls/2006/prod_111406g.html

- Lehman & Voss http://www.cisco.com/web/strategy/docs/manufacturing/lehmann_voss_cs.pdf

- Boeing* http://www.cisco.com/web/strategy/docs/manufacturing/network_world.pdf

- Festo* http://www.cisco.com/web/strategy/docs/manufacturing/cisco_festo06.pdf

- Kichler Lighting http://www.cisco.com/en/US/netsol/ns641/networking_solutions_customer_profile0900aecd8067ef79.html (VoD)

- Intel http://www.cisco.com/web/strategy/docs/Intel_CCS_0125a.pdf

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