Improve Flexibility & Efficiency

Chatchai Wajakiet / Chee Hoe Lee
Agenda

1. Manufacturing and Enterprise Network Convergence

2. Rockwell Automation and Cisco Collaboration

3. Solution for Manufacturing Flexibility and Efficiency
Convergence: The Perpetual Trend

Manufacturing Plantwide Systems

Business Enterprise Systems

Suppliers

Supply Chain Integration

Customer Demand

Flexible Manufacturing

Lower Total Cost of Ownership | Faster Time to Market | Better Asset Optimization | Broader Risk Management
Business Agility
Competitive Advantage

Technology Convergence
Network Convergence
Organizational Convergence
Cultural Convergence
Wide Ethernet Deployment
Increasing Business Pressures

Business Model Innovation
What is Manufacturing and Enterprise Network Convergence?

Shared Domain

IT Domain

Controls Domain

PEOPLE TECHNOLOGY PROCESSES & INNOVATION
Industries—Manufacturing

Common Enterprise and IT Functions, Unique Manufacturing and Automation Functions
The Solution

Combining Our Expertise to Address the Network Convergence of IT and Manufacturing
Leading global provider of industrial automation control and information solutions

- Annual Sales (FY09): $4.3 billion
- World Headquarters: Milwaukee, Wisconsin, USA
- Trading Symbol: ROK
- Employees: 19,000+
- Serving customers in 80+ countries
Asia Pacific Fact Sheet

- Asia Pacific includes Greater China, India, South Pacific, South East Asia, Korea & Japan
- 3,500+ employees
- Over 80 sales/support locations
- 3 manufacturing and R&D centers
  - Singapore, Shanghai China, Giheung (Korea)
- 1 software development center
  - Dalian (China)
- 4 OEM application development centers
  - Shenzhen (China), Shanghai (China), Bangalore (India), Singapore
- 6 solutions engineering centers
  - Shanghai (China), New Dehli (India), Seoul (Korea), Tokoyo (Japan), Singapore, Sydney (Australia)
- 3 competency centers
  - Singapore, Shanghai (China), Bangalore (India)
Industries and Customers We Serve

**Consumer Packaged Goods**
(Blended Beverage, HPC)
- P & G/Gillette
- Kimberley Clark
- 3M
- Dupont
- Colgate Palmolive
- PZ Cussons
- Avery Dennison
- Clorox
- Recite Beckinser
- L'oreal
- Dow Chemicals
- Henkel
- Akzo Nobel
- Amore Pacific
- Kang Na Hsiung Enterprise Co. Ltd
- General Mills Inc.
- Kraft
- McCains
- MasterFoods
- Nestle
- Narla
- Coca-Cola
- Cadbury's
- PepsiCo
- Anheuser Busch
- General Mills Inc.
- Grupo Bimbo
- InBev
- Unilever
- Mengniu Dairy
- Bright Dairy
- CRB
- Wahaha
- Guangxi Sugar
- Sanlu Dairy
- Strong Food
- Heineken
- United Breweries Limited
- ITC Food
- Universal Robina Corporation (URC)
- National Dairy Development Board (NDBB)

**Automotive**
- GM
- Ford
- Toyota
- Volkswagen
- Daimler
- Chrysler
- PSA Peugeot
- Citroen
- Arvinmeritor
- Autoliv
- BMW
- Delphi
- Denso
- Faurecia
- FIAT
- Honda
- Johnson Controls
- LEAR
- General Motors
- Toyota
- Nissan
- Hyundai
- Daimler Chrysler
- Ford/Mazda
- Magna
- PSA Peugeot
- Citron
- Arvinmeritor
- Autoliv
- BMW
- Delphi
- Denso
- Faurecia
- FIAT
- Honda
- Johnson Controls
- LEAR

**Tire**
- Bridgestone
- Goodyear
- Michelin
- Kumho Tire
- Hankook Tire
- Nexen Tire
- Trelleborg
- Apollo
- Pirelli
- GITI
- ARB
- Trelleborg

**Life Sciences**
- Abbott Laboratories
- Bristol-Myers Squibb
- GlaxoSmithKline
- Pfizer
- Sanofi Aventis
- Wyeth
- Roche
- TEVA
- Lonza
- Merck
- Cipla
- Baxter
- Boeing
- United Breweries Limited
- Becton Dickinson
- Genentech
- Sandoz
- Wockhardt
- Ranbaxy
- Abbott Laboratories
- Bristol-Myers Squibb
- GlaxoSmithKline
- Pfizer
- Sanofi Aventis
- Wyeth
- Roche
- TEVA
- Lonza
- Merck
- Cipla
- Baxter
- Boeing
- United Breweries Limited
- Becton Dickinson
- Genentech
- Sandoz
- Wockhardt
- Ranbaxy

**Power & Infrastructure**
(Oil & Gas, W/W, Power, Mass Transit, Airports, Metals, Mining and Cement)
- Chevron-Unocal
- BP
- Exxonmobil
- Conoco Phillips
- CNPC
- CNOOC
- Sinopec
- Meridian Energy
- Genesys Energy
- MHI
- NTPC
- Reliance Power
- Bhushan steel
- Hindalco
- Hindustan Zinc
- KEPCO
- BP
- Exxonmobil
- Conoco Phillips
- CNPC
- CNOOC
- Sinopec
- Meridian Energy
- Genesys Energy
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- Genesys Energy
- MHI
- NTPC
- Reliance Power
- Bhushan Steel
- Hindalco
- Hindustan Zinc
Rockwell Automation
Deep Industrial Manufacturing, Application & Control Expertise
Dedicated to Open Solutions … Developer of Control and Information Protocol (CIP)
Recent Actions
Established premier industrial partnering program: Encompass™ – 1990’s
Founding Member – ODVA
Customer Innovation Council with Cisco – 09/06, 9/07

Cisco
Broad Enterprise-wide Communications Expertise
Dedicated to Open Solutions … Champion of the Internet Protocol (IP)
Recent Actions
Joined Rockwell Automation Encompass™ Program - 2003
Joined ODVA Board – 2005
Customer Innovation Council with Rockwell Automation – 09/06, 9/07

• Shared Vision – *Network Convergence*
• Complementary Technology Roadmaps
• Product Collaboration
• Unified Reference Architecture
• Coordinating Education and Service Offerings
Bringing Together Critical Knowledge and Leadership & Shared Vision

Enterprise Networks
- IT Domain
- Gigabit Backbones
- Self-Defending Networks

Cultural & Technology Convergence

Automation Networks
- EtherNet/IP
- Real-Time Performance
- Environmental / Form Factory
- Safety
- Legacy Migration
- "IT Compatible"

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Integrated Architecture - Enabling Convergence

Manufacturing & Enterprise System Convergence

Critical Plant Assets
Manufacturing Network Convergence

Traditional

- Control Network Gateway
- PC Based Controller
- Motors, Drives, Actuators
- Sensors and other Input/Output Devices

Corporate Network
- Back-Office Mainframes and Servers (ERP, MES, CAPP, PDM, etc.)
- Office Applications, Internetworking, Data Servers, Storage
- Office Applications, Internetworking, Data Servers, Storage
- Robotics
- Motors, Drives, Actuators

Standard Ethernet

- Control Network Gateway
- Human Machine Interface (HMI)
- PC Based Controller
- Motors, Drives, Actuators
- Sensors and other Input/Output Devices
- Corporate Network

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## Cultural and Organizational Convergence

### Security Policies

<table>
<thead>
<tr>
<th></th>
<th>IT Network</th>
<th>Controls Network</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Priorities</strong></td>
<td>Confidentiality</td>
<td>Availability</td>
</tr>
<tr>
<td></td>
<td>Integrity</td>
<td>Integrity</td>
</tr>
<tr>
<td></td>
<td>Availability</td>
<td>Confidentiality</td>
</tr>
<tr>
<td><strong>Types of Data Traffic</strong></td>
<td>Converged Network of Data, Voice and Video</td>
<td>Application Specific Data</td>
</tr>
<tr>
<td><strong>Access Control</strong></td>
<td>Strict Network Authentication and Access Policies</td>
<td>Strict Physical Access</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Simple Network Device Access</td>
</tr>
<tr>
<td><strong>Implications of a Device Failure</strong></td>
<td>Continues to Operate</td>
<td>Could Stop Operation</td>
</tr>
<tr>
<td><strong>Threat Protection</strong></td>
<td>Shut Down Access to Detected Threat</td>
<td>Potentially Keep Operating with a Detected Threat</td>
</tr>
<tr>
<td><strong>Upgrades</strong></td>
<td>ASAP During Uptime</td>
<td>Scheduled During Downtime</td>
</tr>
</tbody>
</table>
Cisco and Rockwell Automation Initiatives

Common Technology View
Support use of open, unmodified standards, with intelligent networking features in automation networks

Collaborating on Reference Architectures
Detailed design and implementation guidance and best practices for a converged network architecture

People and Process Optimization
Develop process and design guidelines, facilitate training and dialogue with IT and Manufacturing
A Sample of the Current State of Convergence

Technological Convergence

Network Convergence

Organizational Convergence

Cultural Convergence

Source: Customer Innovation Council © 2007 Cisco and Rockwell Automation
Rockwell Automation Stratix 8000™ managed switch line with Cisco Technology
Reference Architectures
Education Series

http://www.ab.com/networks/architectures.html
Cultural Convergence – Common Tools

Device Manager

Command Line Interface

Cisco Network Assistant

FactoryTalk View, Faceplates

RSLogix, Add-on Profile

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Industrial Infrastructure Portfolio

- **Stratix 8000™ - Modular Managed with Cisco Technology**
  - Integrates the enterprise and manufacturing environments
  - IT Friendly - Cisco operating system, feature set and user interface
  - Engineer Friendly – RSLogix 5000 configuration, Logix tags and FactoryTalk View faceplates

- **Stratix 6000™ - Fixed Managed**
  - Optimized for the Plant Floor
  - Engineer Friendly – RSLogix 5000 configuration, Logix tags and FactoryTalk View faceplates

- **Embedded switch technology**
  - Switch technology embedded in Rockwell Automation and 3rd party products
  - Enables high speed ring and linear topologies

- **Stratix 2000™ - Unmanaged**
  - IP20 and IP67 versions
  - No configuration required

- **Physical Media**
  - cables
  - connectors
  - cordsets

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Reference Architectures for Manufacturing

• Design guidance
  – Best practices and recommendations
  – Methodology
  – Documented configuration settings
  – Developed against tested and validated architectures

• “Future-ready” network foundation
Reference Architectures for Manufacturing

• Technology
  – IEEE – standard/unmodified Ethernet
  – Future - Wireless & PTP (1588)
  – IETF - standard Internet Protocol (IP)
  – ODVA - Common Industrial Protocol (CIP)
  – ISA 100 – Wireless (Future)
  – NIST – National Institute of Standards and Technology

• Manufacturing
  – ISA 99 - Manufacturing and Control Systems Security
  – ISA 95 - Enterprise-Control System Integration
  – Purdue Reference Model

Built on Standards
### Manufacturing Framework

<table>
<thead>
<tr>
<th>Enterprise Zone</th>
<th>Enterprise Network</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Business Planning and Logistics Network</td>
<td>Level 4</td>
<td></td>
</tr>
</tbody>
</table>

| Demilitarized Zone (DMZ)         | Site Manufacturing Operations and Control | Level 3 |

<table>
<thead>
<tr>
<th>Manufacturing Zone</th>
<th>Site Manufacturing Operations and Control</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell/Area Zone</td>
<td>Area Supervisory Control</td>
<td>Level 2</td>
</tr>
<tr>
<td></td>
<td>Basic Control</td>
<td>Level 1</td>
</tr>
<tr>
<td></td>
<td>Process</td>
<td>Level 0</td>
</tr>
</tbody>
</table>

| Safety Zone                      | Safety-Critical                            |         |

- Enterprise zone for IT networks
- DMZ as a buffer zone to securely share data and services
- Manufacturing zone where critical production floor systems exist
- Cell/area zone where devices and controllers reside
- Safety zone for safety devices
- Levels from ISA SP95 and Purdue Reference Model
- Zones from ISA SP99
No Direct Traffic Flow from Enterprise to Manufacturing Zone
• Comprehensive Security Model for Defense in Depth - Security is **not** a bolt-on component
• Segment Manufacturing floor from Enterprise with a Demilitarized zone
• Defense in Depth
  – Defending the edge
  – Protecting the interior
  – Guarding the endpoints
  – Physical Security
• Design Secure Remote/Guest Access
• RA Network & Security Services

**Security Services Must Not Compromise Operations of the Control Zone or I/O Traffic**