Connecting capabilities to an innovative Systems Engineering solution

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**Strength and Reach**

**FINANCIAL STRENGTH**
- Total Revenue ($ millions)
- Total non-GAAP operating profits* ($ millions)
- % = YOY growth

**FOCUSED ON MANUFACTURING**
- FY 2013 revenue by vertical
  - Industrial Products: 30%
  - Federal, Aerospace & Defense: 18%
  - Electronics & High Tech: 18%
  - Automotive: 12%
  - Retail & Consumer: 8%
  - Other: 10%
  - Life Sciences: 4%

**GLOBAL FOOTPRINT**
- FY 2013 revenue by region
  - Americas: 41%
  - Europe: 37%
  - AP: 22%

**ORGANIZATIONAL STRENGTH**
- 6,000+ employees
- 2,000+ employees in R&D
- 1,360+ service professionals

**STRONG MARKET PRESENCE**
- 27,000+ active customers
- 1,456,000+ active PTC Windchill Seats
- 1,931,000+ total active Seats

**STRONG COMMUNITY SUPPORT**
- 750+ partners
- 10 million students participating in PTC Global Academic Program
- 150+ sponsored FIRST® Teams
  *(For Inspiration and Recognition of Science & Technology)*
Transforming How Products are Created and Serviced

Our Current System of Market Leading Software Applications

- **CAD**: Create and analyze conceptual and detailed designs, perform engineering calculations.
- **PLM**: Evolve the complete definition of a product over its entire life.
- **SCM**: Manage components and suppliers, measure and manage compliance, and analyze product cost.
- **ALM**: Manage product requirements, system models, software configurations, test plans and defects.
- **Extended PLM**: Plan, manage, deliver and analyze service information, parts and warranty throughout the service lifecycle.

**Revenue Breakdown**

- CAD is ~41% of PTC Revenue
- Extended PLM is ~47% of PTC Revenue
- SLM is ~12% of PTC Revenue
PTC System of Solutions

SUPPLY CHAIN AND MANUFACTURING

- PTC Global Software Development
- PTC Component and Supplier Management
- PTC UDI
- PTC Materials Compliance
- PTC Manufacturing Process Management
- PTC Retail PLM
- PTC Technical Information

PTC Project Management
PTC Global Product Development
PTC Multi-CAD Design
PTC 3D Design

PTC Global Platforms
PTC Global Quality
PTC Enterprise Validation and Review
PTC System Requirements and Validation
PTC Service Network Management
PTC Service Depot Management
PTC Service Parts Pricing
PTC Field Service Management

Product Advantage
Service Advantage

PTC Field Service Management
PTC Warranty and Contract Management
PTC Service Parts Management
PTC Service Knowledge Management
PTC Service Parts Information
PTC Global Platforms
PTC Global Quality
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Product Advantage

Service Advantage

PTC Global Software Development
PTC Component and Supplier Management
PTC UDI
PTC Materials Compliance
PTC Manufacturing Process Management
PTC Retail PLM
PTC Technical Information

PTC Project Management
PTC Global Product Development
PTC Multi-CAD Design
PTC 3D Design

PTC Global Platforms
PTC Global Quality
PTC Enterprise Validation and Review
PTC System Requirements and Validation

PTC Service Network
PTC Service Depot
PTC Service Parts Pricing
PTC Field Service Management

SERVICE EXECUTION

PTC Warranty and Contract Management
PTC Service Parts Management
PTC Service Knowledge Management
PTC Service Parts Information

8
How Products Are Transforming: Automobile Example

Physical

Smart

Smart, Connected
Major Forces of Transformation in Manufacturing Sector

- Digitization
- Regulation
- Connectivity
- Servitization
- Globalization
- Personalization
- Software-intensive products

External forces are reshaping the manufacturing landscape.

Products are evolving to be smart, connected and global.

Value is fundamentally shifting from product to service.

When combined, these forces will transform the industry.
These Major Forces Have Driven PTC’s Evolution

- **Digitization**
- **Globalization & Personalization**
- **Regulation**
- **Software Intensive Products**
- **Servitization**
- **Connectivity**
- **System Complexity**

**1988**
- **CAD**

**1998**
- **PLM**
- **Product Lifecycle Mgmt** Windchill Acquisition

**2008**
- **SCM**
- **Supply Chain Planning** Synapsis Acquisition

**2011**
- **ALM**
- **Application Lifecycle Mgmt** MKS Acquisition

**2012**
- **SLM**
- **Service Lifecycle Mgmt** Multiple Acquisitions

**2014**
- **MBSE**
- **Complex Products** Atego Acquisition

**2014**
- **IoT**
- **Connected Products** ThingWorx Acquisition

**2014**
- **System Complexity**

**2014**
- **ThingWorx Acquisition**

**2014**
- **Complex Products**

**2014**
- **Connected Products**

**2014**
- **Core Innovation**

**2014**
- **MBSE**

**2014**
- **ALM**

**2014**
- **CAD**

**2014**
- **Digitization**

**2014**
- **Globalization & Personalization**

**2014**
- **Software Intensive Products**

**2014**
- **Servitization**

**2014**
- **Connectivity**

**2014**
- **System Complexity**
MBSE in Context

Simplified view on Systems Engineering

• **System Requirements**
  – Elicitation
  – Engineering
  – Management

• **System Architecture**
  – Requirements
  – Functional
  – Logical
  – Technical

• **System Test**
  – Specification
  – Planning & Execution
  – Results Management
Understand the context of the system

• **Context Requirements**
  – Constraints
  – Stakeholders
  – Trends

• **Context Architecture**
  – Interactions
  – Dependencies
  – Tech Constraints
  – „System of Systems“

• **Test in Context**
De-compose and Integrate consistently

- **Component Requirements**
  - Derive
  - Refine

- **Component Design**
  - Consistent with System Architecture
  - Model-based for simulation

- **Component Test**
  - Ensure that Implementation matches specification
  - Back-to-back testing based on sim results
MBSE in Context → Systems Engineering

Requires Interoperability and Traceability

Horizontal Traceability

Seamless Integration

Consistent Decomposition
Product & CAD Structure
Systems Engineering
Key solution areas to address Engineering Challenges

**Engineering Challenges**

1. **Model-Based Systems Engineering**
   - Formalize use of modeling to support system requirements, design, analysis, verification and validation activities throughout product lifecycle.

2. **System Requirements and Validation**
   - Continuously evaluate systems and sub-systems against requirements throughout product lifecycle.

3. **X-Discipline Coordination**
   - Improve communication and coordination across disciplines (Mechanical, Electrical, Software) to identify and mitigate risks early.

4. **Product Line Engineering (System Modularity and Reuse)**
   - Architect new products to maximize component reuse and apply variability with decreased costs and time.

- Ensuring customer needs are met
- Reducing and mitigating risks
- Providing holistic view throughout lifecycle
- Increasing reuse/Supporting variants
- Understanding trade-offs
Solution areas in an open and integrated SE Environment

Model-Based Systems Engineering

X-Discipline Coordination

System Requirements and Validation

Product Line Engineering (System Modularity and Reuse)
Globalization Challenges require Interoperability

Distributed Design Collaboration

Secure, Globally Accessible data

Global Manufacturing & Supply Chain

Global Joint Ventures

U.S. R&D Center

European Design Center

Asian Manufacturing
Collaboration Challenges drive Interoperability

Needs from multi-discipline development organizations – example car-makers

- Specific development tools
- Different suppliers
- Adapted development processes
- Tailored information models
- Different work methodologies
Conventional Solution Approach

Cross-Discipline Applications

PLM
- Change Mgmt
- Product Structure
- Option and Variant
- Doc Mgmt

ALM
- Change Mgmt
- Requirements
- Test/Verification
- Traceability
- Impact Analysis
- Option and Variant
- Source

Sys Arch
- Sys Modeling
- Functions
- Interfaces
- Variability

Point Integrations over integration platform or direct
Customer Reality Pushes Conventional Approach to its limits

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Significant N:N Solution Dependency Constraints
Possible Strategy Leveraging OSLC

Connect capabilities on demand

PLM
- Change Mgmt
- Product Structure
- Option and Variant
- Doc Mgmt
- CAD Mgmt
- Visualization
- Config Management
- Workflow
- Reporting
- Security / Access Control
- Admin

ESB
- Process Orchestration
- OSLC Interoperability

SE Area
- Change Mgmt
- Requirements
- Test/Verification
- Traceability
- Impact Analysis
- Option and Variant
- Config Management
- Reporting
- Security / Access Control
- Admin
- Sys Arch
- Sys Modeling
- Functions
- Interfaces
- Variability
- Document Generation
- IMP/EXP

OSLC
- Mdl/ Sim
- Auth
- Other
- Ext. SCM
- Eclipse
- Git
Goal: Support Multi-Divisional Systems Engineering

Multiple Tools, Solutions and Organizational Considerations

Top Level System Engineering

System Engineering solution operated across business units

Division A

Division B

Division C

ALM

PLM

ALM

Competitive PLM

ALM

Competitive ALM

3rd Party Tools / Solutions

Customer Business Systems

Integrated

Integrated

Integrated

Competitive Solution
Technical Approach: PTC’s Enterprise Platform

A Platform that is Open, Flexible, Engaging and Dependable

- **User and Task Focus**
- **Rest enabled Clients**
- **Canonical Representation**

**Application Portal**

- **3rd party Applications**
- **ERP Systems**
- **MES Systems**

**Customer IT Domain**

**PTC Service Bus**

- **Message Brokers**
- **Integration Patterns & Application Adapters**
- **Transformation & Routing Rules**
- **Service Registry & Repository**

**PTC Enterprise Shared Services**

- **User/Group**
- **Object Linking**
- **Search & Indexing**
- **Vaulting & Content**
- **Workflow & BPM**
- **BI & Analytic Reporting**
- **Archive**
- **Publishing & Visualization**

**PTC Products**

- **Atego Modeler / Artisan Studio**
- **PTC Integrity**
- **PTC Windchill**
- **Service Center**
- **Relex**

**PTC Solution Manager**

**PTC System Monitor**

Forward Looking Information Subject to Change without Notice
Federal, modular solution infrastructure

- “PTC Service Bus“ connectivity layer
- Solution modules by PTC or other vendors
- External tools and repositories
- Flexible linking and navigation
Sustainable Systems Engineering Environment

- "PTC Service Bus" connectivity layer
- Solution-modules by PTC or other vendors
- External tools and repositories
- Flexible linking and