Applying IBM Continuous Engineering for AUTOSAR R4.0.3

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1. KPIT Technologies introduction – Product Engineering Solutions & Products Overview

2. Business and Technical Challenges, Current Ways for Addressing Them

3. Solution Approach - Key Elements from IBM Continuous Engineering

4. Overall Project Benefits
**KPIT Corporate Overview**

**Engineering & IT solutions:**
- Automotive
- Manufacturing
- Energy & Utilities

**Global reach**
- 11 Development centers
- 34 Offices in 16 Countries

**Relevant in our focused areas**
- 85 Automotive OEMs & Tier1s
- 50+ Manufacturing companies as long standing clients
- 150+ Global Clients

**Investing in Technology, Partnerships and Consortiums**
- 60+ Patents filed in less than 5 years
- 6% of Revenues invested in R&D of Automotive Business
- Winners of 9 Innovation Awards in last 4 years

**Key Statistics**
- USD revenues
  - $489 Mn FY’15
- Employees globally
  - 10,000+
- Employees representing over 25 Nations

**Investment in Technology**
- 6% of Revenues invested in R&D of Automotive Business

**Innovation Awards**
- Winners of 9 Innovation Awards in last 4 years
Industry focus bringing thought leadership to our customers

Industry specialization

- Automotive & Transportation
- Manufacturing
- Energy & Utilities

Engineering Thought Leadership

- REVOLO - Hybrid Solution for Everyone
- On-Bus ITS* Solution for bringing modern technology to buses
- In2Soft Diagnostic Tools
- Functional Safety Tool
- CMMI
- AUTOSAR

Deep Technology Expertise

- ePLM (PLM, ALM, SLM)
- SAP
- Oracle
- Product Engineering services
- Products & Platforms
- Infrastructure Management Services
- Enterprise solutions
# Product Engineering - Solutions

Leverage our deep expertise across Automotive Subsystems

## AUTOSAR & In Vehicle Networks
- AUTOSAR Strategy
- AUTOSAR Integration
- MCAL & Boot loader
- Migration Solutions
- OEM Specific Customization

## Engineering Design
- Powertrain – Exhaust & Filtration
- Powertrain – Engine Transmission
- Powertrain – Fuel Systems
- Interior/Exterior - Seating
- Interior/Exterior – Door Trims, Steering, Cockpit

## Instrument Clusters
- Cluster Infotainment Hybrids
- Reconfigurable Clusters
- Migration Solutions
- Cluster Platform Management
- Automated Validation Solutions

## Body Electronics
- Power Window & Door Control Module
- Auto HVAC
- Power Management Module
- Body Control Module
- Smart Mirrors & Wipers

## Functional Safety
**ISO 26262**
- Safety Process Consulting
- Safety Process Tailoring
- Functional Safety Engineering & Analysis
- Safety Assessment & Qualification
- Customization of medini™ analyze

## Powertrain
- Model Based Development
- Software Re-architecture
- Systems & Control Engineering
- AUTOSAR & Functional Safety Compliance

## Chassis, Safety and Driver Assistance
- Night Vision With Pedestrian Detection
- Adaptive Cruise Control
- Driver Status Monitoring
- Forward Collision Warning
- Traffic/Road Sign Recognition

## Infotainment
- On-Board
- Connectivity
- Enterprise Mobility
- Business IT

## Vehicle Diagnostics
- Diagnostic Design & Specification Solution
- Aftersales Solution
- Diagnostic Consultancy Services
- Software Development & Validation Services
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Automotive OEM’s & Tier1 suppliers alike are faced with satisfying **strict guidelines and standards** to meet the **highest levels of safety and quality**. The AUTOSAR (AUTomotive Open System ARchitecture) standard is an approach by the industry to address the growing complexity.

- Consolidation of sub-systems
- Geography specific customization
- Traceability throughout product development lifecycle
- Variability configuration
- Process and standards compliance

**Development environment complexity**

- **Global platforms**
- **Localization**
- **Driver Safety**
- **Green Energy**
- **Connected**

**Tool Integration** across life-cycle activities

- **Discrete** Project Management and governance of processes
- **Limited** Code re-usability
- **Multi** location development
- **Variation Management** in product release
- **Difficulties** in propagating fixes across variants
AUTOSAR – Typical Configuration Challenges

Composition
- Port Mapping of Software Component

System To Software
- Data Element to Signal Mapping

ECU
- Runnable to Task Mapping

ECU
- BSW Stack configuration

RESPONSIBILITY

TIER-1

TIER-2
AUTOSAR – Typical Configuration Challenges

Port Mapping of Software Component

SYSTEM EXTRACT

ECU1

ECU2

ECU3

SWC1

SWC2

SWC3

P  R

P  R

P  R

P  R

P  R

P  R

P  R

P  R

P  R

P  R

P  R

Provider Port

Receiver Port

OEM

TIER-1

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AUTOSAR Configuration

- ECU1
- ECU2
- System Configuration Description
- OEM
- ECU Extract
- TIER-1
- ECU Configuration Specification
- ECU Configuration Description
Since, **too many disparate tools** are involved in the AUTOSAR Platform software development process - **Managing interactions/Integration** between them is complex.
Now Being Addressed by the IBM Rational Software Solution

- IBM Rational CLM (DNG, RTC and RQM)
- Design Manager
- Rhapsody Developer
- Rational Test-Real Time

Solution Components

- ISO26262 (DOORS Template)
- Configuration and Variants Management (CM and SCM)
- Verification & Validation
- Modeling
- End-to-End Traceability and Visibility
- Auto SPICE (customized Process template)

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Variant Management

Effectively managing SW variants and implementing late provisioning of SW

Master Component Repository

Product Quality Dashboard

Build Tool

< KPIT Proprietary Build Tool>

BUILD N101

Calculate Dependency for components from master set

Vehicle Program N701 <Model 1>

Vehicle Program N702 <Model 1>

Vehicle Program N721 <Model 2>

Build Recipe
Global Configuration Management
Variant Management

![Diagram showing variant management process with baselines and stream updates over time]

- **Main**
- **ECU 1 Variant**
- **Time**

- **Baselines**
- **Stream updates**
Customer (Tier-1 /CUST-A) requested 4 Modules with minor changes.

Tier-1/CUST-A requirement has been fulfilled and we have created a common baseline for all projects area called it GC

Stream for further Development

OS_COMMON Streams related to particular tool

Base line created from stream once it satisfy the requirement

AUTOSAR OS module
Stream Management Continued

Another customer (CUST-B) come to us with their requirement of some module and their requirement are almost 80% same what we done for CUST-A.

We created stream from the base line of GC for each application like R2 for requirement etc.

Implemented stream as per the requirement of customer and created base line

Baseline shows that customer requirement has been fulfilled

In such case - We have an advantages that, our 80% requirement which already covered for CUST-A customer, know we can save our efforts working further on that stream.

Merging this baselines we can have a deliverable product

Now this base line of individual application we can leave as it is or we can make Global Configuration of it
Stream Management

Requirement
- AutosarR

Models
- AutosarD

Impl.
- AutosarC

Test
- AutosarT

CUST-A
- R1
- R1B
- D1
- D1B
- C1
- C1B
- T1
- T1B

Baseline

CUST-B
- R2
- R2B
- D2
- D2B
- C2
- C2B
- T2
- T2B

GC1

GC2
Global Configurations for AUTOSAR Development
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Solution Benefits for the AUTOSAR Team

IBM’s Continuous Lifecycle Management tool chain helps to achieve key business imperatives across product engineering cycle through –

- End-to-end traceability
- Superior collaboration platform with real-time insight
- Achieved deterministic variants management system
- Overall quality improvement and responsiveness for our K-SAR customers
### KPIT Contacts

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Phone number – (+1) 248-894-4900 |
Thank You!
Technical features in basic software

**Multi Core support** - AUTOSAR OS specification has been enhanced for better multi core support

**Ethernet** - Legal requirements for Diagnostics interface, Replacement for MOST

**Partial Networking** - Overall Mode Management for all network participants, Efficient Energy management

**Functional Safety** - Legal requirement to use state of the art processes Features for controlled failure rate, Software reuse to reduce assessment cost

**Security features** – Secure communication to & from vehicle, Onboard secure storage
KPIT ePLM SBU highlights

✓ Global EPLM practice with strong capability to act locally while leveraging global strengths developed through decade long Engineering and IT lineage across focused verticals

✓ >200 PLM & ALM Consultants across US, Europe, APAC and India, supported by a 3500 strong product engineering solutions & services team

✓ 3 ePLM specific development centers across US, Germany and India

✓ Strong Strategic Partnerships with PTC( Product Development+Service), Oracle and Siemens

✓ Known for Consulting, Platform based Products, Material Compliance, PLM-ERP Connector, AMS Services and ALM Solutions

✓ Onsite, Near Shore and Offshore models for customers in US, EU & APAC for Lean operations
The lifecycle management trends & initiatives that we follow:

**NEW PRODUCT DEVELOPMENT**
Integrate people, processes & technology to rapidly bring customer driven innovations to market

**CAPTURE INTELLECTUAL ASSETS**
Capture and reuse product & process knowledge to improve productivity and optimize investments

**DESIGN ANYWHERE/BUILD ANYWHERE**
Organize, manage & secure critical product & processes data to leverage information across enterprise

**MANUFACTURING EXCELLENCE**
Increase manufacturing flexibility & performance by integrating product & process design with production

**REDUCTION OF IT COMPLEXITY**
Consolidation, harmonization and refreshment of PLM IT Landscape

**EXTENDED ENTERPRISE**
Connect all value chain members, including partners, suppliers and customers, to optimize product returns

**COMPLIANCE & SUSTAINABILITY**
Manage processes & records to ensure adherence to government, industry & international regulations

**COMMONIZATION & REUSE**
Maximize reuse of products & processes with common development platforms & manufacturing operations

**SYSTEMS ENGINEERING/ ALM / IoT**
Design & evaluate complex products that include mechanical, electrical, software, sensors, and internet/mobility elements

**MERGERS & ACQUISITIONS**
Transforming business and IT to a future operating model with respect to all dimensions
Aligning to these trends, KPIT has categorized its ePLM offerings in 6 broad categories.

We take a consultative approach unifying our strengths of industry business process expertise, engineering thought leadership & IT technology.

1. EcoSystem Modernization
   - Identify/implement a modern xLM system
   - Consolidate systems onto minimum platforms
   - Ensure continuous systems performance and application relevance

2. Value Harvesting
   - Maximize use of your existing xLM systems
   - Review and refresh capabilities
   - Proactively manage Organizational Change

3. Closed-Loop Traceability
   - Develop full process coverage
   - Design systems to trace from Requirements > Development > Testing > Change > Requirements

4. Product Complexity Management
   - Automate Configure-To-Order / Engineer-To-Order Business Processes
   - Develop Product Variant Management / Product Line Engineering systems

5. Engineering life cycle management
   - Simulation led Product engineering services (MEDS)
   - ALM led Embedded software development
   - Diagnostics led Service life cycle management (SLM)

6. Compliance management
   - Material & Regulatory compliance
   - Enable Industry Standards Compliance such as SPICE, ISO-26262 and AUTOSAR (Auto)
   - Provide Embedded Software Development
Some of our value assets and differentiators..

Extensive data migration capabilities
Predictable PLM Data Migration and Consolidation

**Legend 10™**
- Multi-threaded, High-Capacity Integrated Data Loading Technology
- Direct PLM and Authoring Application Integration
- Comprehensive Reporting and Validation

**Profiler**
- Ensure Data Compliance and Cleanliness
- Rapid CAD Data Analysis Leveraging Native CAD APIs
- Customer Defined Cleanliness Rules

Application Development
Proprietary tools and technology that improve usability and adoption of your PLM investment

**Tech Notes**
Increase the usefulness, quality, and consistency of your technical notes with our Siemens Teamcenter add-on

**Legend Attribute Manager™**
Provide tighter MCAD/ECAD administrative control.

iLink™ – The PLM Adaptor for ERP
Seamless ERP to PLM Integration

**PLM**
- Parts Master
- Manufacturers’ Parts
- Bill of Materials
- Change Orders
- Product Quality Records

**Non-Conformances & Customer Product Issues**
- Order Ship Holes / Releases
- EC Implementation Dates
- ECO
- Order Mgmt
- Quality
- CRM

**ERP**
- Item Master
- Item Branch
- Purchasing
- Bill of Material

AKOYA™
KPIT’s patented technology methods for parts and supplier related decisions

**Strategic Sourcing**
- Balance and rationalize each supplier portfolio to ensure the best part mix at the right price
- Eliminate low quality, over priced, low volume or single source suppliers

Average 16% savings identified per category 4% savings on contract after 1st year
Our engagement models are aligned to the strategic & operational needs of our customers

**Definition**

**Consulting**

Services offered to help clients with short-term high impact needs, specifically deliverables to decision makers & corporate executives.

**Attributes**

- Thought leadership in Business & Engineering Process, Advisory, Technology neutral, Industry best practices, Objective deliverables, 1-3 month engagements

**Key Offerings**

- Assessments
- Strategy & Roadmap
- System Evaluation & Selection
- Process Design & Optimization
- Business Case & ROI
- Organizational Change Management

**Extended support**

Services delivered in Onsite-offshore manner, where primary driver is scale & skills at lowered costs.

Utilization of assets, global re-usability, cost optimization, automation, process excellence, T&M based OR subscription based

- Staff Augmentation
- Sub-Contract
- Managed Services

**Project Based**

Services where KPIT is accountable for the entire Program / Project

Managed services, Project/Program based deliverables, Fixed price driven. PMO Included

- Implementations
- Integrations
- Migrations
- Upgrades
- Application Development
- Learning & Adoption
- System Performance Assessment
- Analytics

**Products**

Productized Offerings


- iLink
- TechNotes
- KLARITY