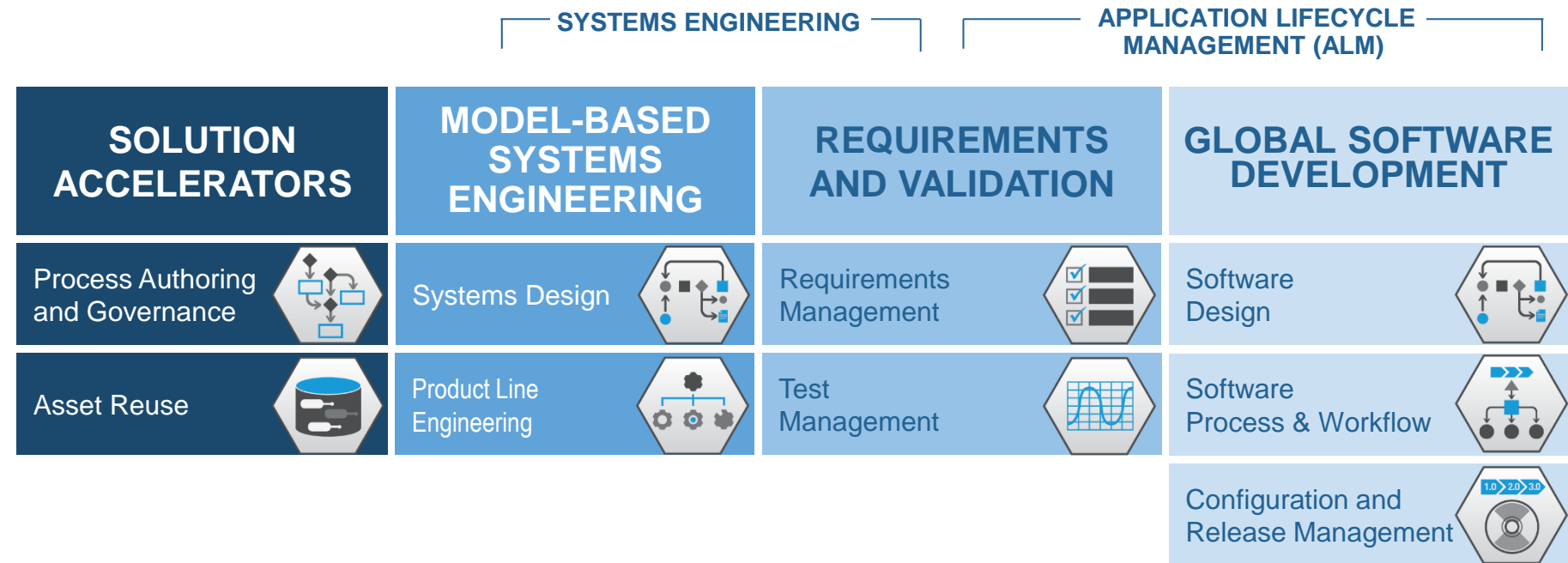


- The PTC Integrity Product Family
- 2015 Launch
- Software and the Digital Twin
- The Road Ahead



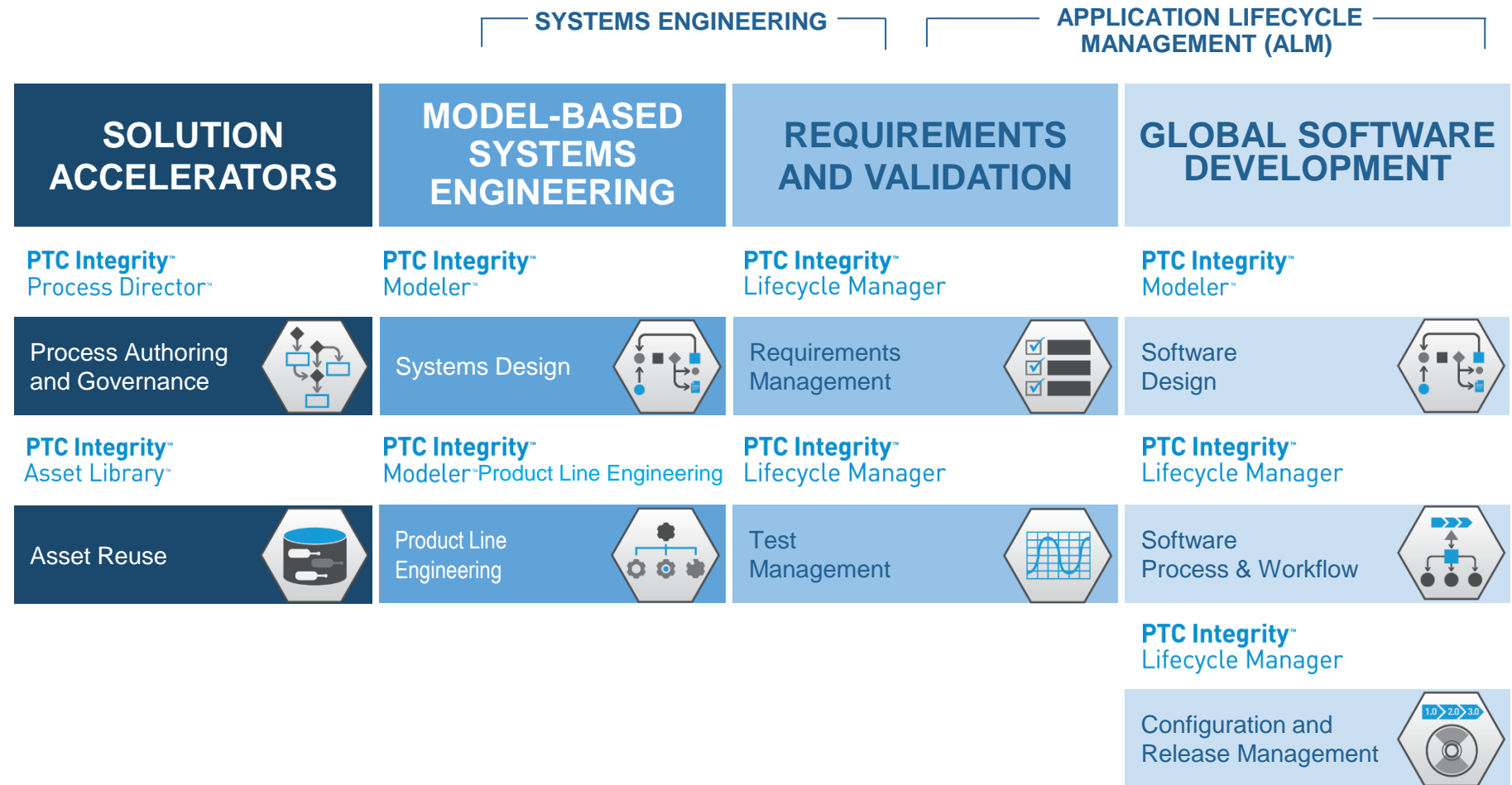
A family of **software and systems engineering** products that accelerate **product innovation.**

PTC Integrity enables a holistic software and systems engineering approach by improving collaboration, automation and reuse across teams and disciplines.



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PTC Integrity enables a holistic software and systems engineering approach by improving collaboration, automation and reuse across teams and disciplines.



Requirements and Validation

80%

Reduction in time spent on ISO 26262 compliance

“To succeed in increasingly fierce global competition, we needed to introduce tools that further increase our software quality and development efficiency.”

– Yoshihiro Miyazaki, Hitachi



Model-Based Systems Engineering

30%

Expected reduction in integration & test effort

“PTC modeling technology significantly improved quality and reduced effort through-out the design lifecycle.”

– Marco Ferrogallini, Alstom Transport



Software Development

4X

Gain in software development productivity

“With the PTC Integrity Lifecycle Manager platform I see activity in real time...which helps us develop a better product.”

– Eric DePaul, Senior Principle Systems Engineer, Hologic



Process Authoring & Governance

5X

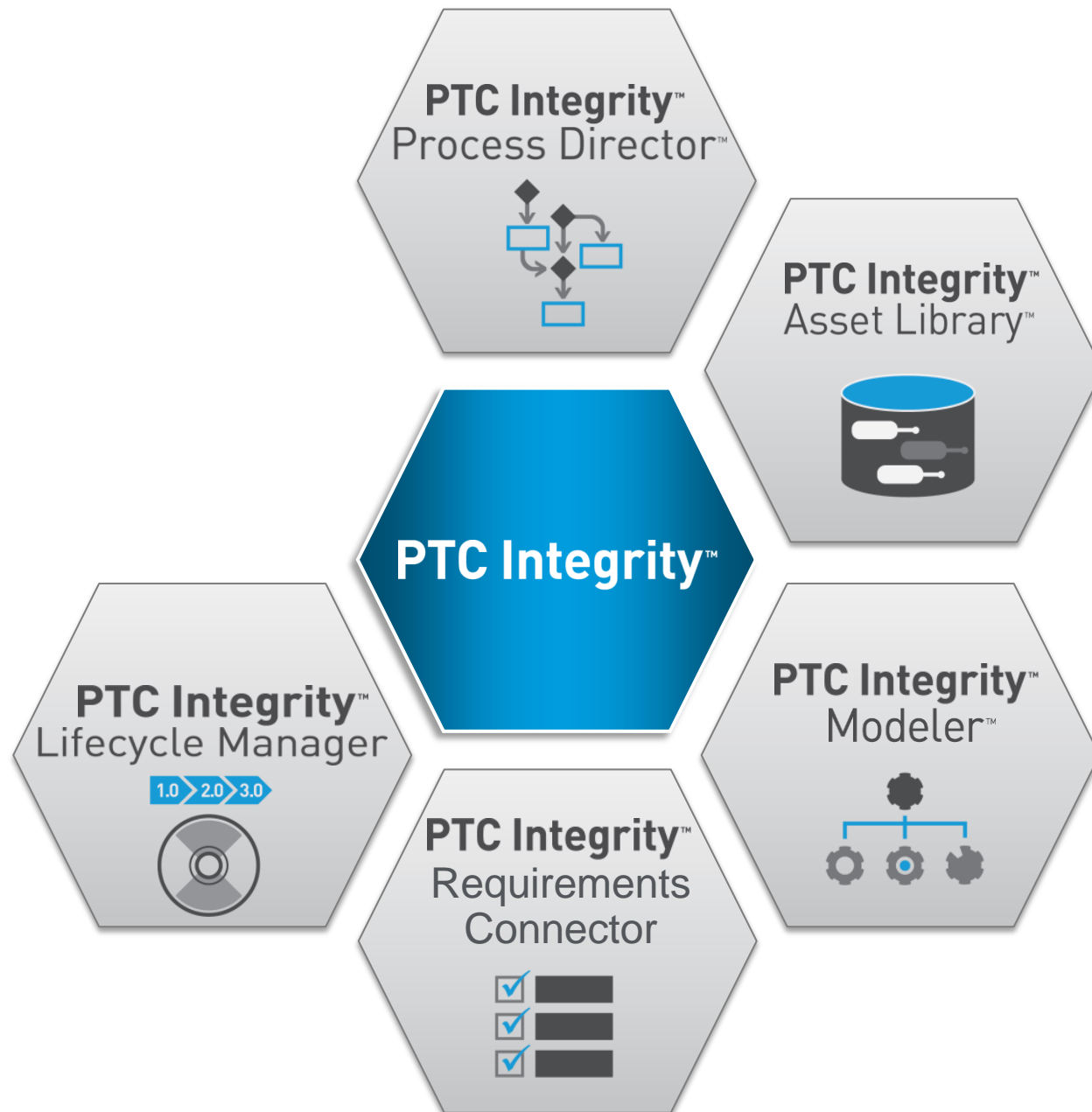
More efficient process authoring

“PTC Integrity Process Director makes it easier for our systems engineers to do things right the first time.”

– Nicolas Gueit, Development Methods Unit Manager, SAFRAN



PTC Releases Industry-First Capabilities to Transform Software and Systems Engineering in the IoT Era



Capture best practices as you type with **Natural Language Diagramming** in Integrity Process Director



Design higher quality, more profitable product lines with **Variable Parameters for Product Line Engineering** in PTC Integrity Modeler

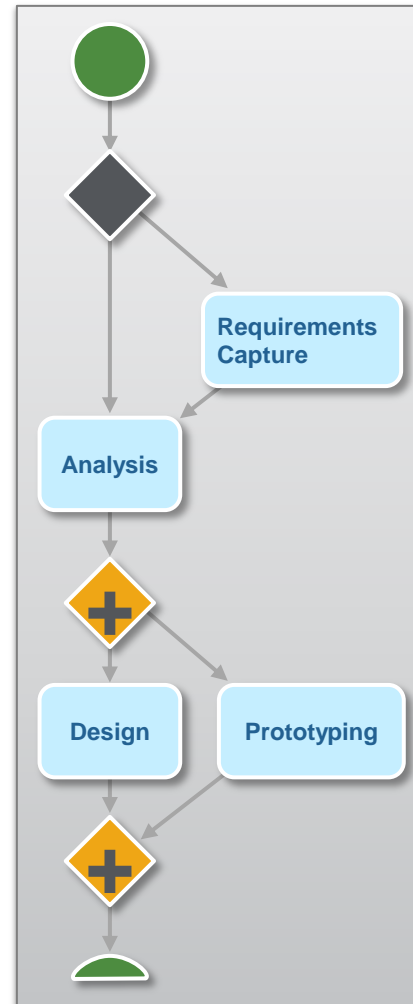


Speed IoT systems design with **Drag-and-Drop Web Service Cataloging and Reuse** in PTC Integrity Asset Library

Establish, measure and improve your organization's operational, engineering and development processes.

Natural Language Diagramming

- Capture best practices as you type
- Reduce barriers to process modeling
- Speed process documentation
- Accelerate process engineering workshops



Process – high level definition

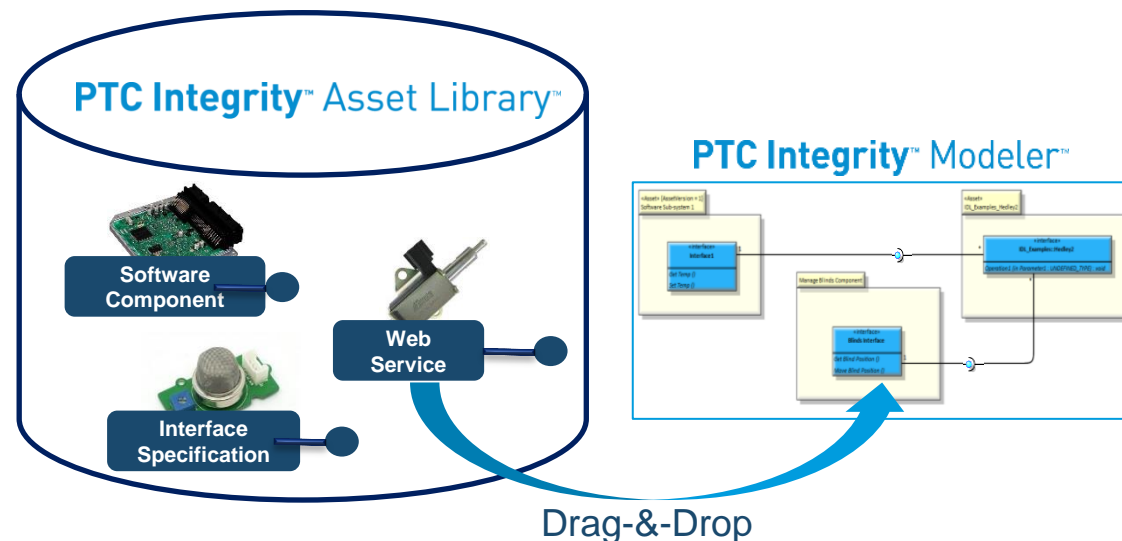
Requirements capture ? If no ToR Analysis
(
Design
Prototyping
(
Cod

- **Expanded Business Process Modeling Notation (BPMN)**
 - Make your process executable with any BPMN-compliant process engine
- **Visual Meta Modeling**
 - Graphically design process templates
 - Meta-model export and import
- **Mobile Web Ready**
 - Access from smartphones and tablets
- **Predecessor Steps**
 - Design complex process loop-backs
 - Map to real world process definition

Intuitive Asset Cataloging, Management and Reuse

Drag-and-drop Web service cataloging and reuse

- Auto-document and reuse Web Services
- Easily design Internet of Things (IoT) systems from a palette of reusable services
- Make reuse practical and time-saving



- **Open Services for Lifecycle Collaboration (OSLC) Extensibility**

- Catalog, publish, search and reuse assets of any OSLC-compliant lifecycle tool
- Drag-&-drop modular SoS design with PTC Integrity Modeler

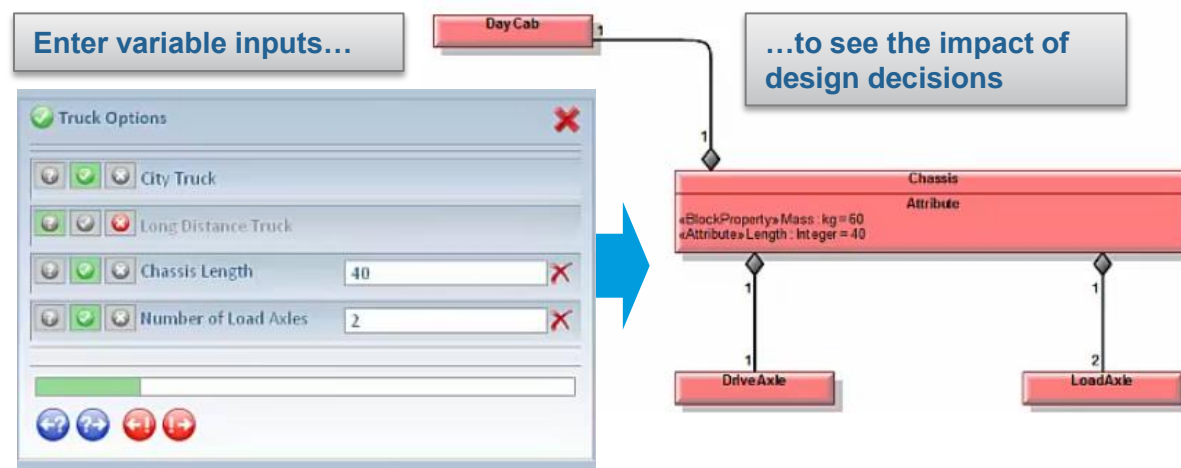
- **Pure::Variants Integration**

- Publish & Reuse Variable Assets
- Extend into Model-based Product Line Engineering

Design before you build with standards-based systems, software and product line modeling.

Variable Parameters for Product Line Engineering

- Fully explore and articulate real-world choices in product lines and variants
 - Inclusion/exclusion; attribute values; multiplicity; calculated variables
- Improve model quality by specifying and enforcing design constraints
- Build in design intelligence with pass-through values and powerful scripting

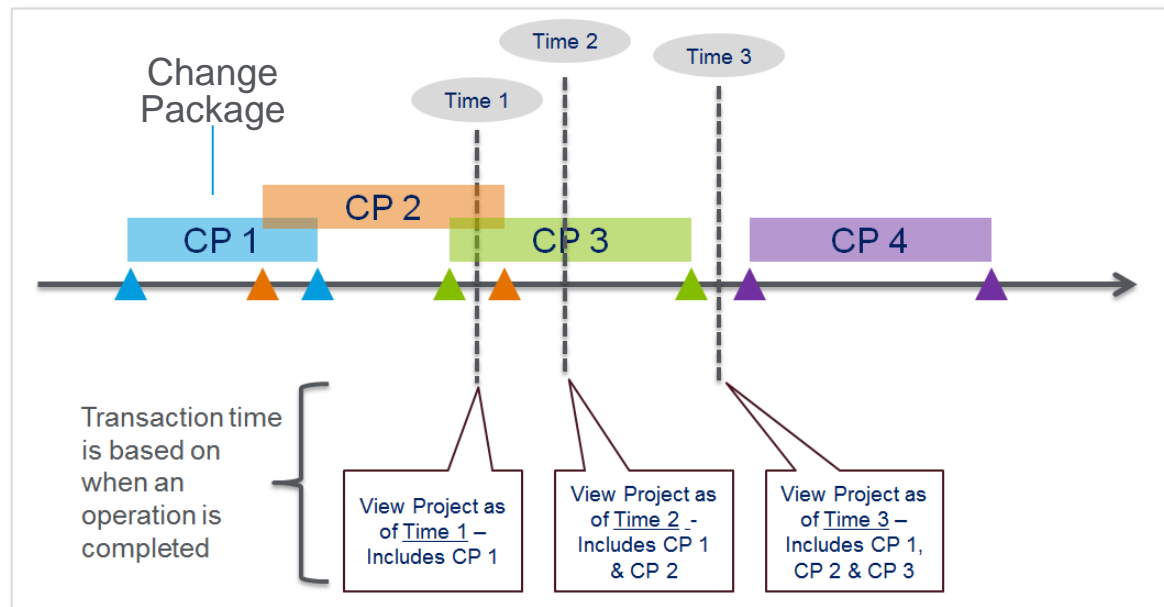


- **PTC Integrity Lifecycle Manager Requirements Synchronization**
 - Bi-directional import and synchronization
 - Full lifecycle traceability across requirements and models
- **UI Simplification**
 - Create custom UI's for role-based access to menu items
 - Reduce time-to-value; lower barriers to adoption
- **Web Model Viewer**
 - Live Model Browsing on the Web
 - Enhance access and collaboration

Accelerate product innovation through software while addressing predictability, quality and development cost challenges.

Time-based SCM milestones

- Support continuous integration processes to speed software delivery cycles
- Capture historical baselines across all artifacts
- Enhance developer productivity



- **Repository Management**

- Evolve repository location of artifacts with logical needs

- **Navigate Document and Content Genealogy**

- Facilitate “where used” for requirements, tests and other document contexts
- Report on requirement and test case evolution

- **Productivity Tools**

- Speed adoption and migration from Open Source offerings
- Improve individual developer productivity

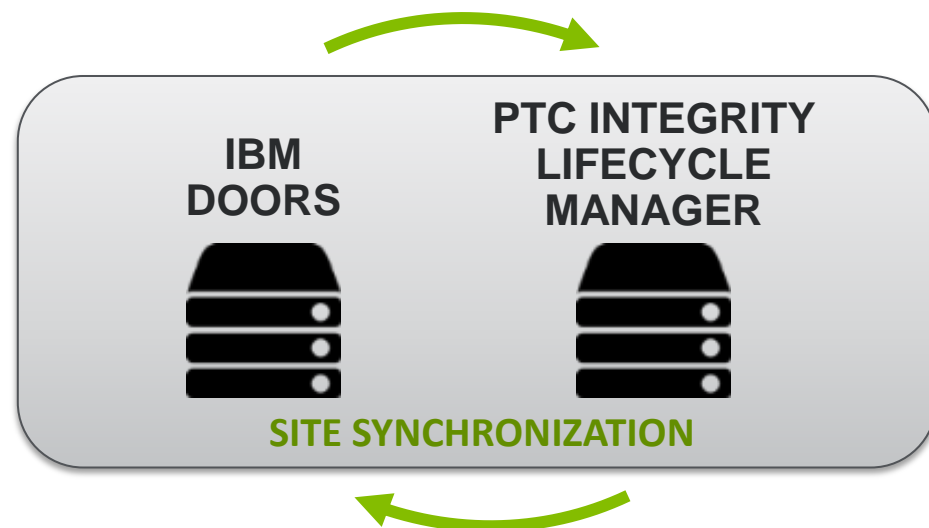
- **Improved Scalability and Performance**

- Checkpointing large code structures
- Relationship storage
- Code differencing
- Document manipulation

Deliver requirements interchange across applications and organizations.

PTC Integrity Lifecycle Manager Support

- Exchange requirements with Integrity Lifecycle Manager (ILM), IBM DOORS and other ReqIF-compliant applications
- Share high-fidelity requirements information across vendor boundaries
- Include rich text, images, OLE objects, and relationships



- **Automated Baseline Creation**
 - Manage requirements over time
 - Meet compliance reporting needs
- **ReqIF support**
 - Standardized exchange format with any requirements application
- **Increase performance**
 - Faster export/import; 64-bit support
- **Flexible mapping**
 - Configurable to support variety of attributes and requirements
- **Direct integration with IBM DOORS**
 - Compatible with 8.1 to 8.3 & 9.1 to 9.6

“We need greater...”

“IoT Innovation”

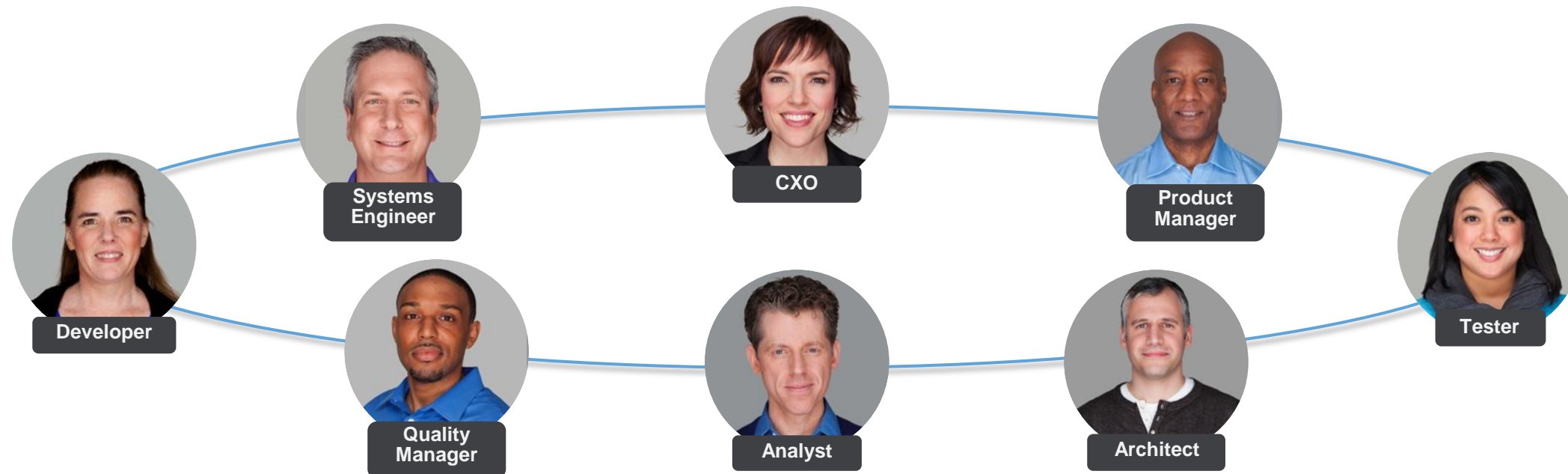
- “We need to move from preparation to action.”
- “We need to balance innovation with rigor for safety-critical products.”

“Simplicity”

- “We want to help teams focus at the right level of abstraction for the task at hand.”
- “We want to make it easy to do the right thing with integrated process guidance and workflow.”

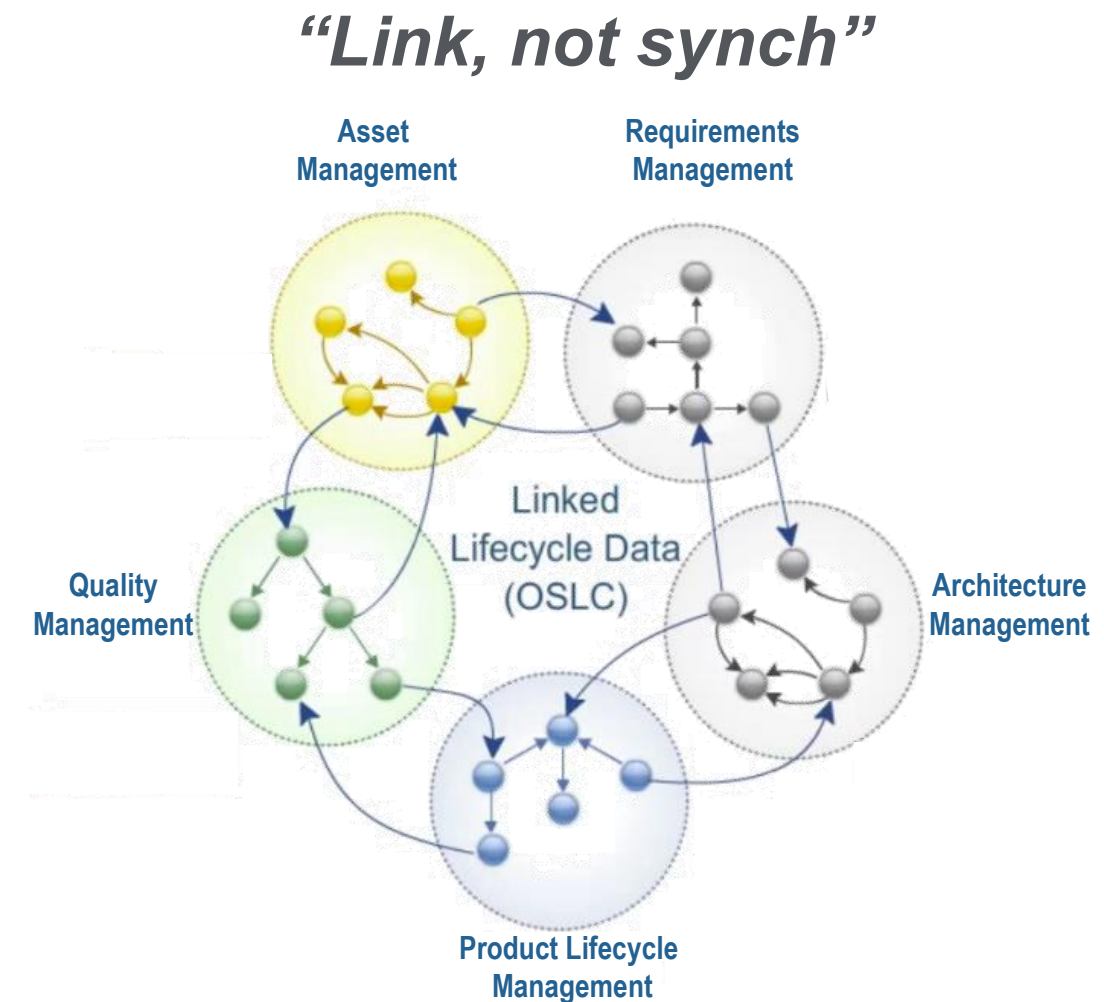
“Interoperability”

- “We want to protect our technology investments by aligning with industry standards.”
- “We want the flexibility to share lifecycle data with heterogeneous tools.”



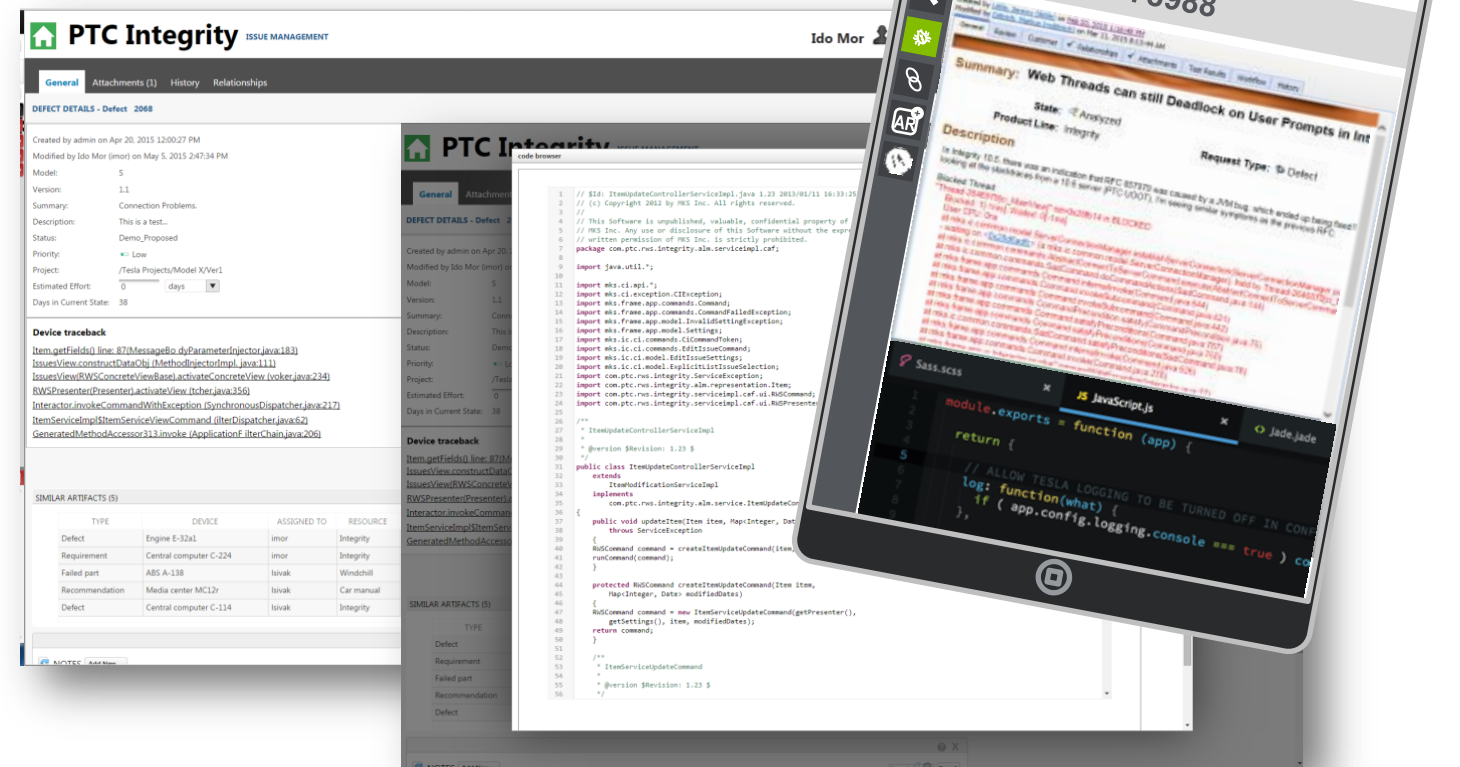
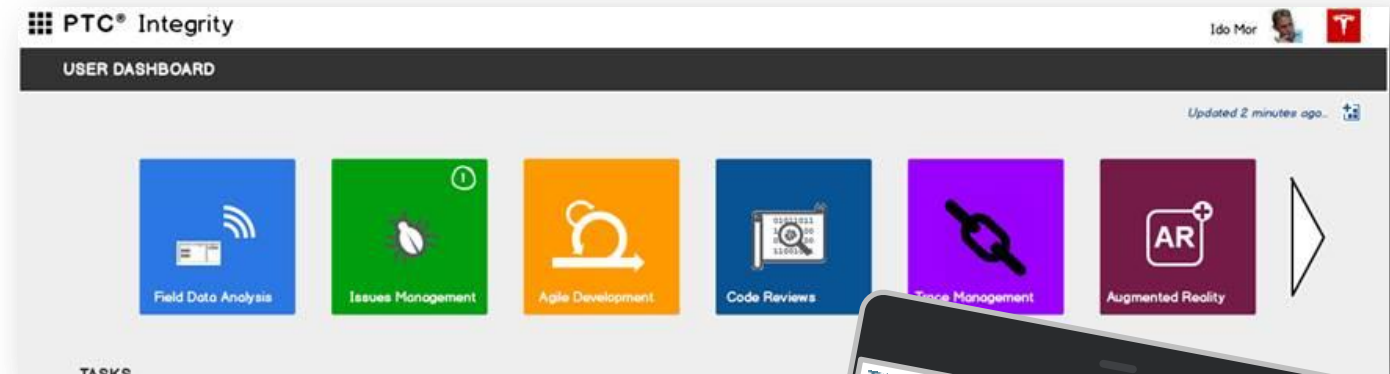
PTC will utilize OSLC as a foundational layer to satisfy key customer use cases – extended as needed to deliver more robust interoperability.

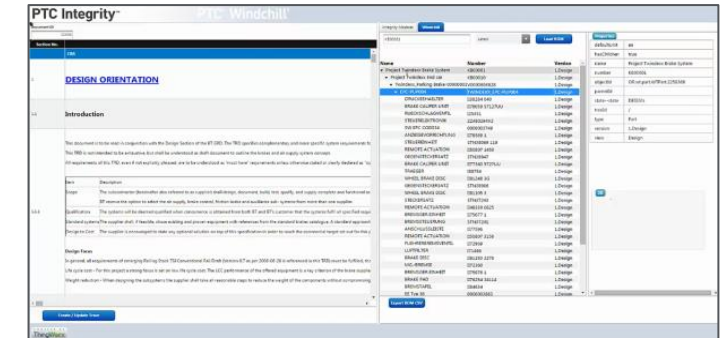
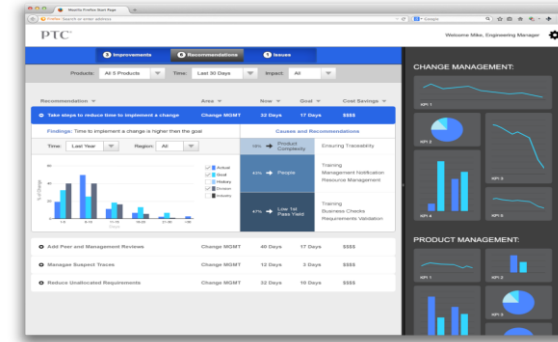
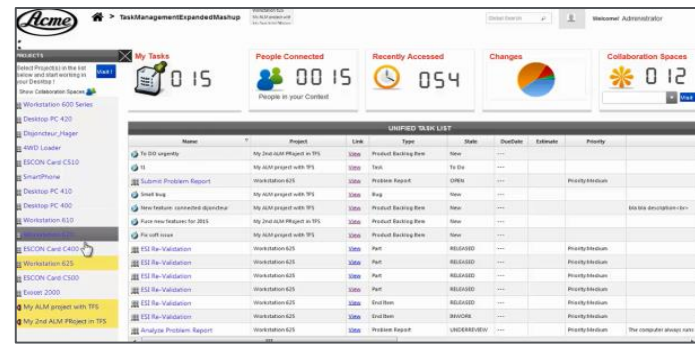
- **Standards-based**
 - Extends the value of ALM investments
 - RESTful Web Services architecture
 - PTC co-chairs OSLC Core group – ensuring our customers' needs are represented
- **Designed for maintainability**
 - Source application owns both data and UX
 - No data transformations, replication or synchronization
- **Open / extensible**
 - Enables use cases for cross-vendor interoperability
 - Supports N:N relationships – ideal for selective data sharing across supply chain



Enabler # 2: Task-based, Role Appropriate Apps

- Efficiency and ease-of-use
 - Only show information and features relevant to the task at hand
- Empower users
 - Provide capabilities that help users be decision-oriented and productivity-focused
- Enhance collaboration
 - Provide easy communication and social sharing
- Enable recognition instead of recollection
 - Provide features, visual aids, and data that match real-world processes





- **CONNECT** Engineering with the connected product in support of Closed Loop Lifecycle Management
- **ENABLE** composite PTC solutions further through ThingWorx based Task Based applications
- **EMBRACE** a marketplace for third party packaged and built applications

TASK BASED APPS

ALM – PLM Application Framework

Resource Provider Catalog

ALM Domain Model

PLM Domain Model



Application Enablement Platform

Web Services
Asynchronous Messaging

Windchill Extension for ThingWorx
REST / OSLC Services
Info*Engine
Asynchronous Messaging

REST / OSLC Services
Asynchronous Messaging

3rd Party

PTC Windchill PDMLink

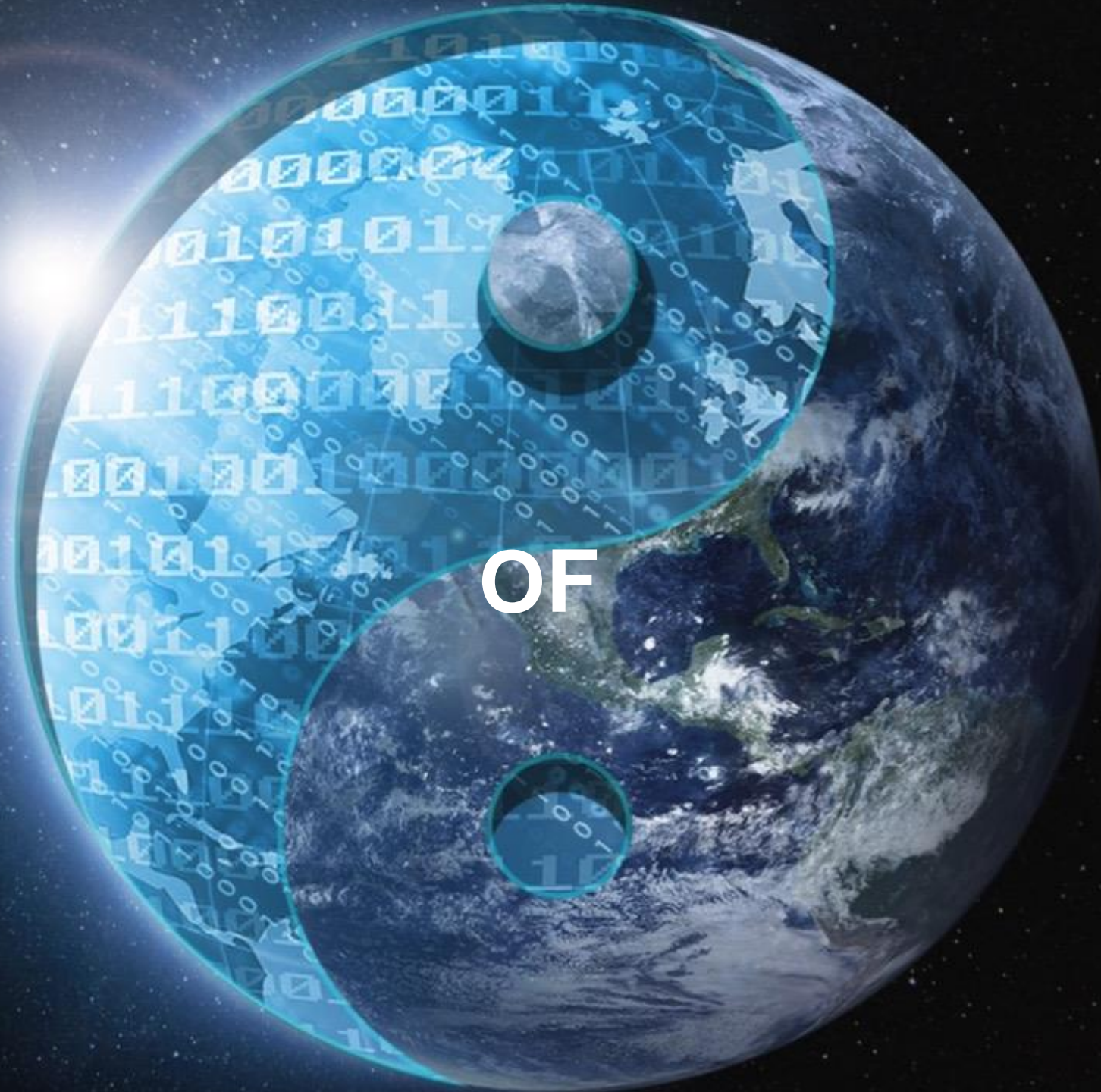
PTC Integrity
Family



INTERNET
Digital World

OF

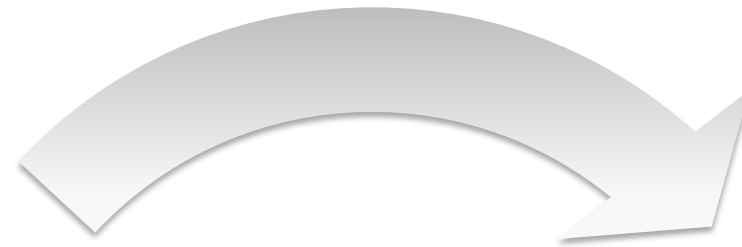
THINGS
Real World



Produce and manage Smart, Connected Products



Digital Product Definition



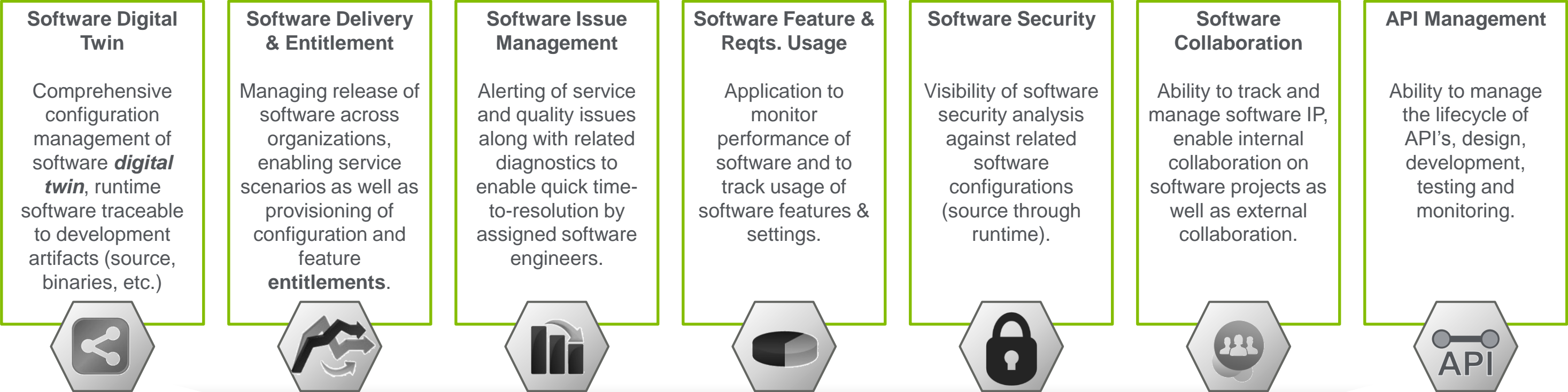
Digital Twin



Real World Product



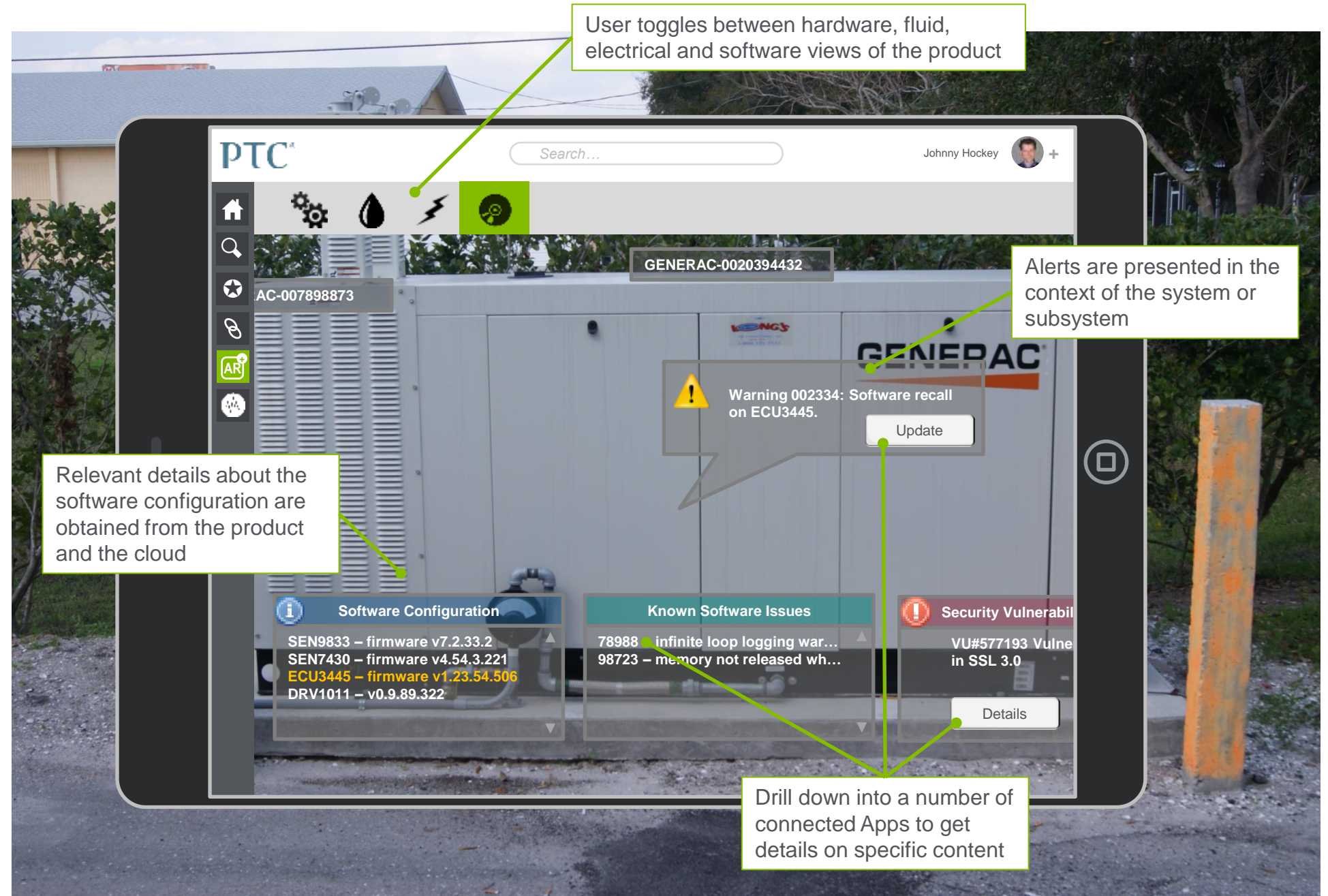
Leverage Smart, Connected Product data to improve products



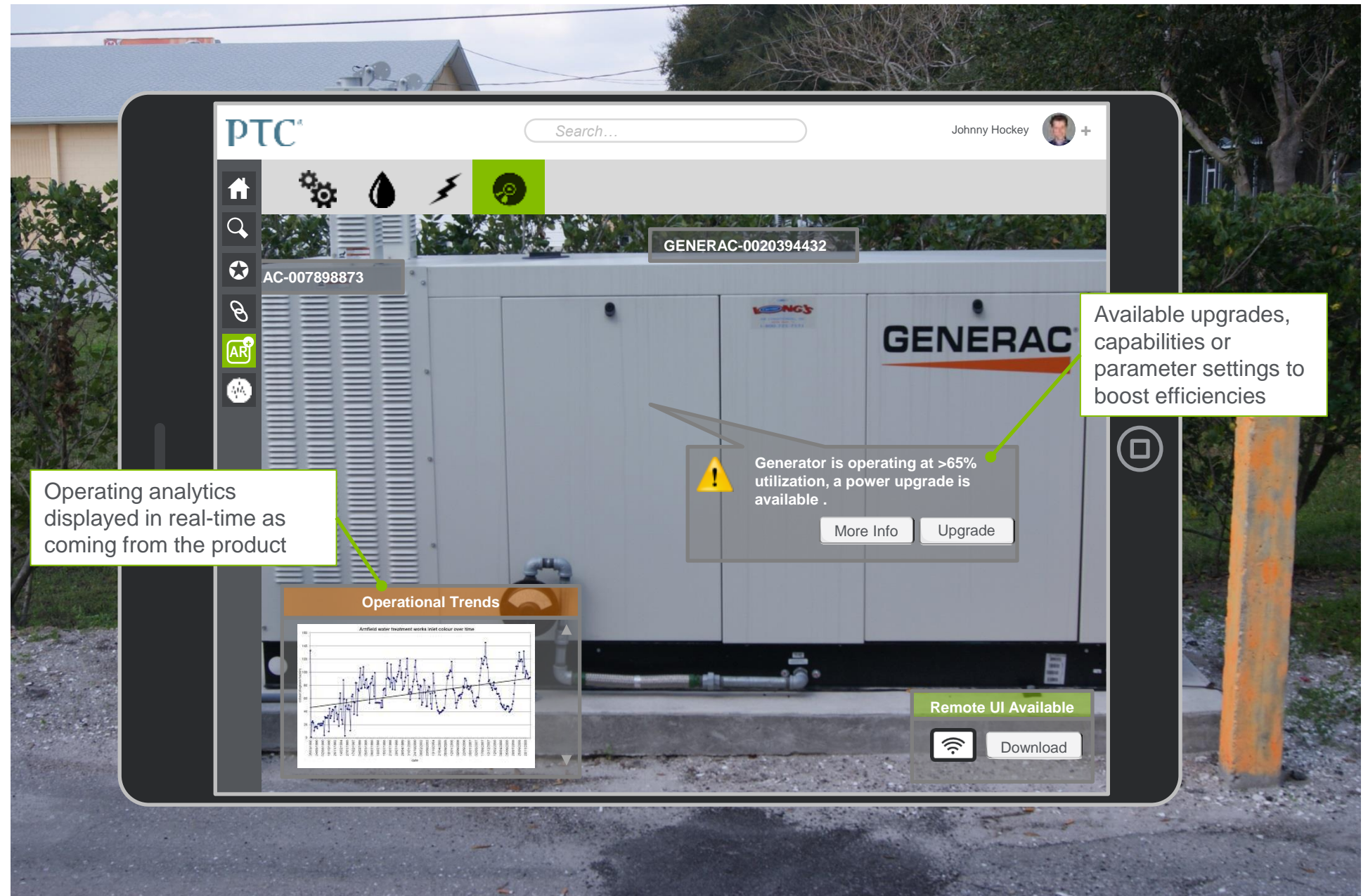
<p>Internet of Things ThingWorx</p> <p>Connectivity Marketplace</p> <p>Device Cloud Composer</p> <p>Application Enablement Converge</p>	<p>CAD PTC® Creo®</p>
<p>Predictive Analytics for Big Data COLDLIGHT</p>	<p>PLM PTC® Windchill®</p>
<p>Augmented Reality* Digital Twin*</p>	<p>ALM PTC Integrity™</p>
	<p>SLM PTC® Servigistics®</p>

* Beta

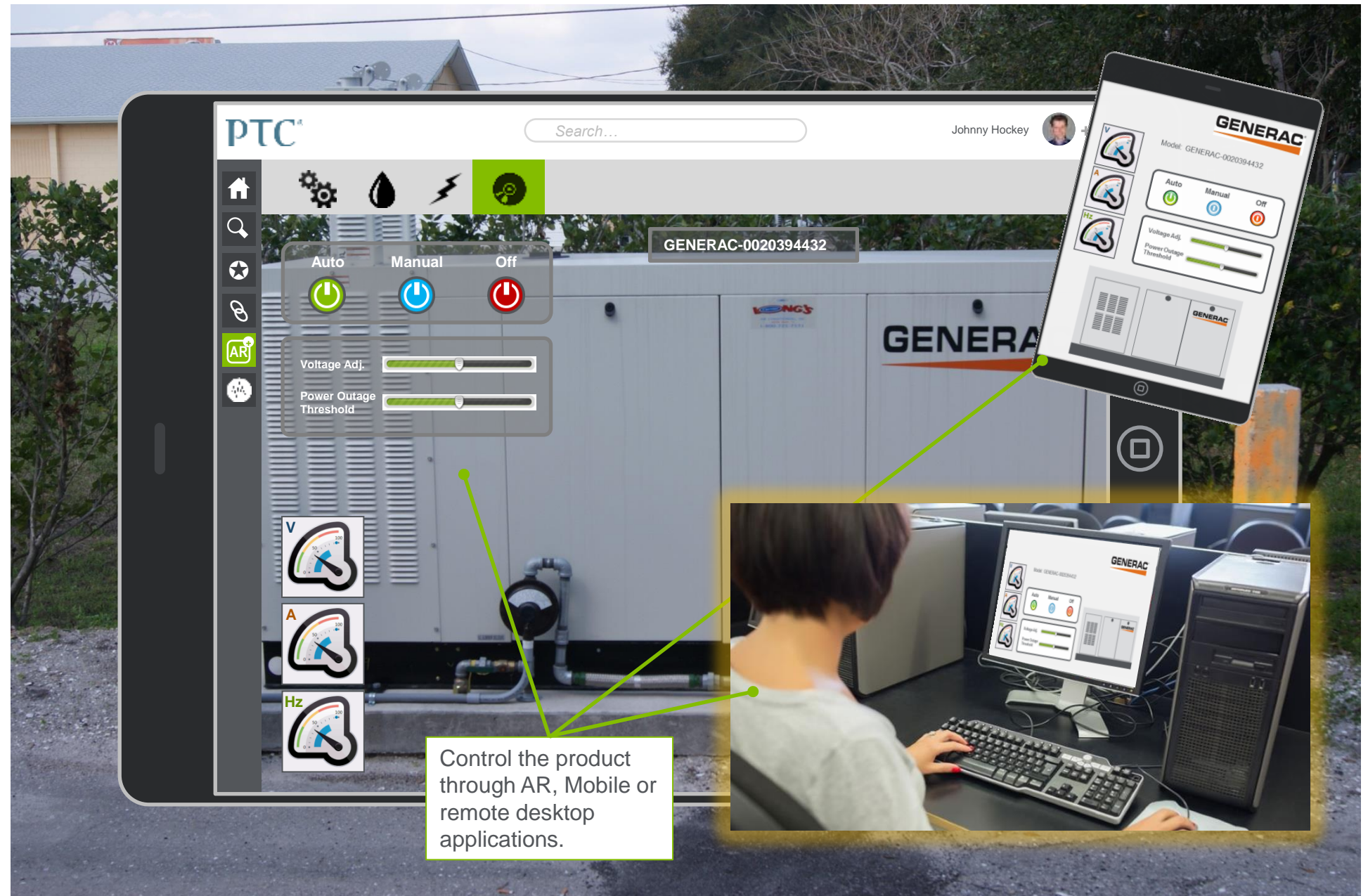
- Product is identified (QR, Barcode, Serial Number, etc.)
 - As manufactured, or latest as maintained, Software configuration obtained from the product cloud.
- Product publishes software configuration to App
- Differences highlighted to the user
 - Software updates that are available
 - Known issues against existing configuration
 - Critical security vulnerabilities
- Opportunity presented to:
 - Learn more about findings
 - Update software OTA



- Operational data streamed from the product
- Data compared with engineering norms in the product cloud
- Optional software updates to improve product performance are presented
 - Learn more about findings
 - Update software OTA – May require new licensing terms (and hence new revenue opportunities for vendor)
- Access to role-based control app(s) to tune and manipulate the product



- Remote access Apps generated or created by the manufacturer are presented to the user
 - May be several relevant for different users or roles (operator, junior service tech, master service tech, OEM)
- App SDK enables AR, Mobile or Desktop user interfaces.
- Product is connected such that access does not have to be “on site”

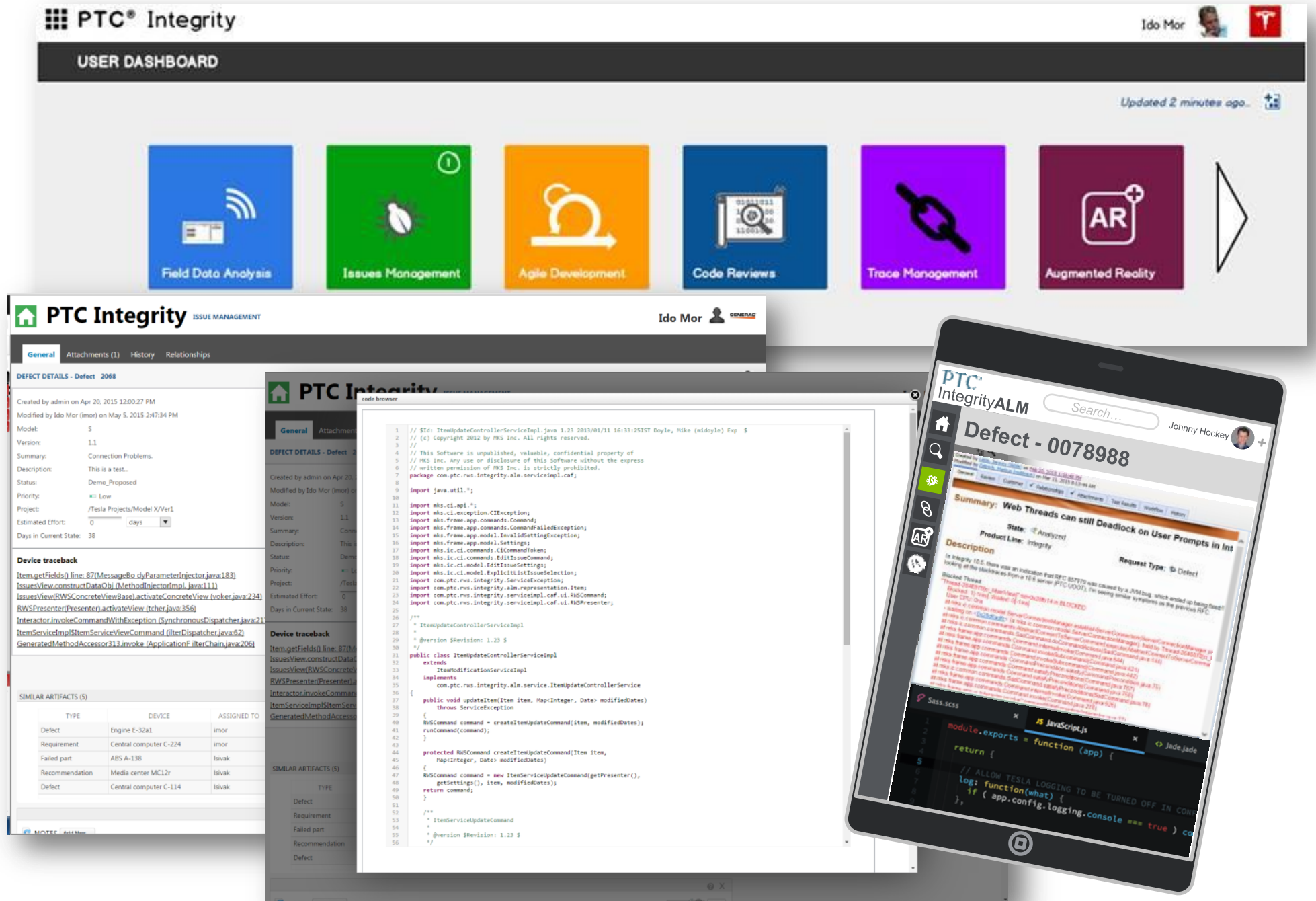


Control the product through AR, Mobile or remote desktop applications.

Consistent Task-based Mobile & Thin Desktop Experience

For all core, smart & connected apps...

- Application is Focused on a Task
- Applications can be bundled into a Collection and have a Homepage
- Applications shall support contextual navigation (e.g. drilldown or view object in context of another app)
- Applications should be customizable / extensible
 - 3rd party apps can be deployed alongside provided applications
 - Contextual navigation can be made accessible to 3rd party apps
- Links in apps should support rich hyperlinking (link expansion, e.g. Slack / OSLC)



Strategy and Vision

SMART

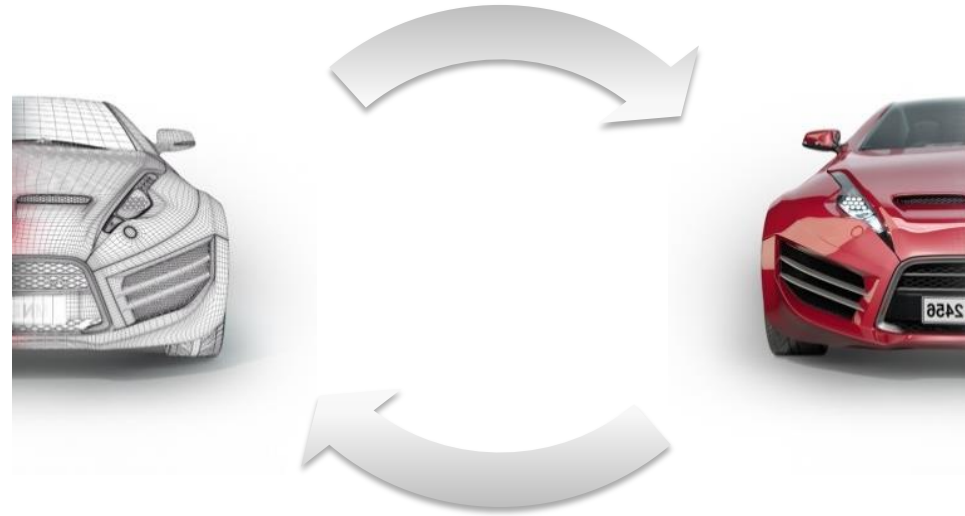
Software intensive products with high rates of change, personalization and criticality to overall customer experience.

For the Software Engineer

- Enable process agility and lean software development
- Support diverse tool chain interoperability
- Design & auto-generate complex device software

For the Systems Engineer

- Architect variability early
- Coordinate HW/SW design change
- Model and validate HW/SW dependencies and interfaces



CONNECTED

Capabilities delivered across device, cloud and environment supported by closed-loop engineering and service feedback process from inception to retirement.

For the Software Engineer

- Enable late stage and OTA updates
- Facilitate feature utilization and software entitlement models
- CBD & SOA modeling

For the Systems Engineer

- Provide context based usage feedback
- Design and validate complex Systems of Systems

PRODUCT

Highly complex systems with many independent components engineered and released across different development teams, disciplines and organizations.

For the Software Engineer

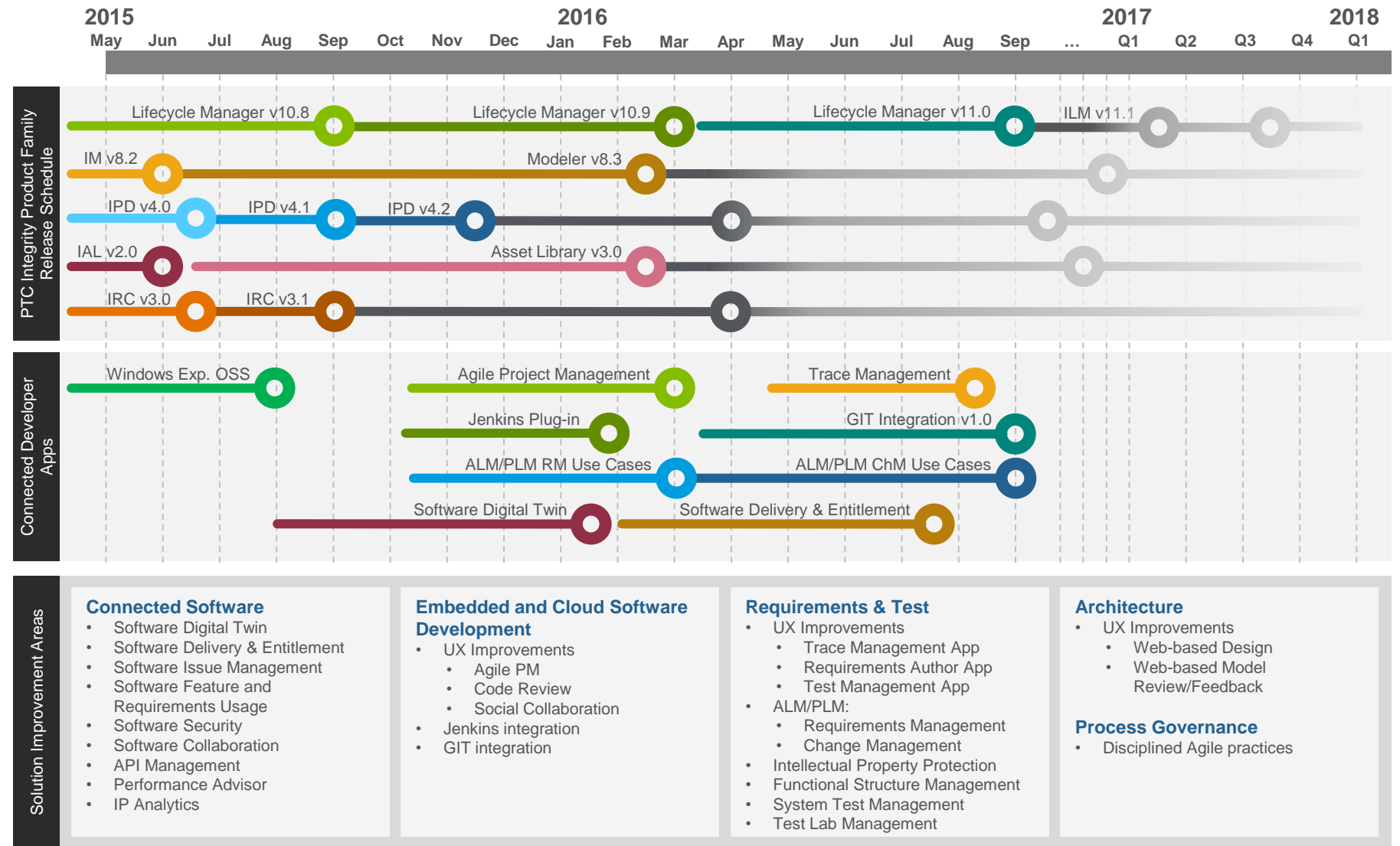
- Provide continuous integration and delivery models
- Enable and manage software product lines

For the Systems Engineer

- Design and communicate allocation of functions to disciplines
- Manage HW/SW and on-device/cloud compatibility
- Model and validate system and product line behaviors
- Support innovation through rapid evaluation of alternatives

Technology Roadmap

- Regular cadence of platform releases
 - Scalability, Performance, Reliability
 - Interoperability
- Expanding set of task-based Apps addressing the needs of the systems and software engineers
 - Intuitive Simplicity without Sacrifice
 - Productivity and Efficiency
- Innovation within connected systems and software development
 - Supporting both core ALM and IoT



Advanced registration is strongly suggested, but not required.*

Tuesday, June 9 Training Seminars

10:00 a.m. – 12:00 p.m.	SysML Modeling with PTC Integrity Modeler <i>Matthew C. Hause, PTC</i>
1:00 p.m. – 3:00 p.m.	Requirements Engineering with PTC Integrity Lifecycle Manager <i>Sheilah Fournier, PTC</i>
4:00 p.m. – 6:00 p.m.	Create and Automate Any Process with PTC Integrity Process Director <i>Jonathan Archer, PTC</i>

Wednesday, June 10 Training Seminars

7:45 a.m. – 9:45 a.m.	SysML Modeling with PTC Integrity Modeler Matthew C. Hause, PTC
10:00 a.m. – 12:00 p.m.	Requirements Engineering with PTC Integrity Lifecycle Manager Sheilah Fournier, PTC

* Each session has room for 24 attendees to sit and share 12 computers. Anyone above the 24 cap will be an observer.

PTC[®] Live Global