



The Challenges of Applying Service Orientation to the U.S. Army's Live Training Software Product Line

Jeremy Lanman, Ph.D.
U.S. Army PEO STRI
12350 Research Parkway
Orlando, FL 32826
+1 407 384 5307
Jeremy.Lanman@us.army.mil

Rowland Darbin
Jorge Rivera
General Dynamics
12001 Research Parkway, Suite 500,
Orlando, FL 32826
+1 407 275 4820
Rowland.Darbin@gdc4s.com
jorge.rivera@gdc4s.com

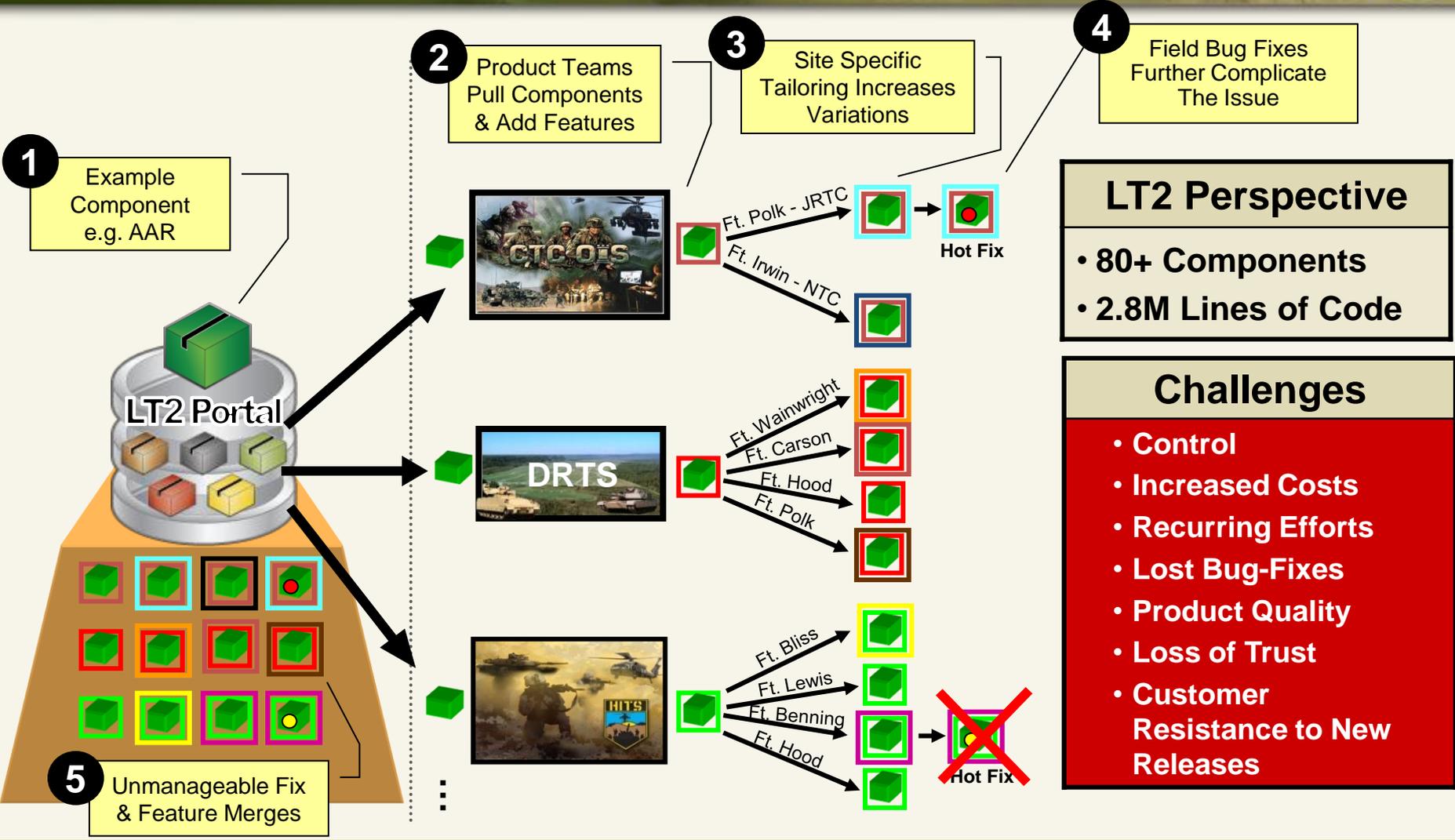
Paul Clements, Ph.D.
Charles Krueger, Ph.D.
BigLever Software
10500 Laurel Hill Cove
Austin, Texas 78730 USA
+1 512 426 2227
pclements@biglever.com
ckrueger@biglever.com



GENERAL DYNAMICS
C4 Systems



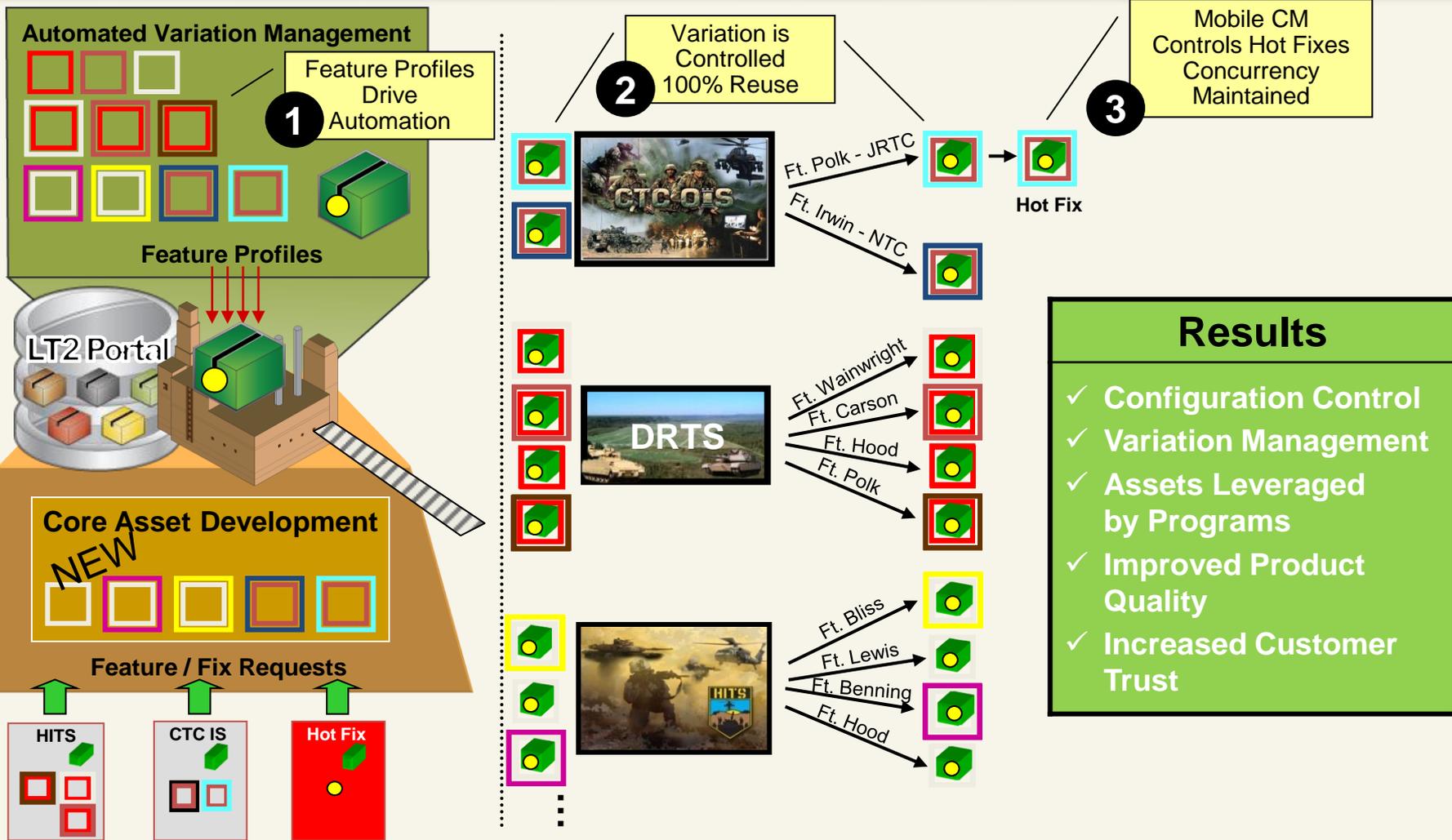
1st Generation SPL Management Component Reuse



Reuse Results in Complex CM Branching and Merging



2nd Generation LT2 Product line Management



To Date Over \$350M Cost Avoidance



- Increase ROI for LT2
 - Needs of LT2 users are changing
 - Army is moving toward Cloud and Mobile-based technologies
- Training as a Service (TaaS)
 - “Always On” training capabilities
- Align development and technology with customer goals

Apply SOA design principles to meet strategic goals



Design Principle	Benefit to Training Community
Standardized Service Contracts	<u>Easier</u> to integrate services developed by others
Service Composability	Create <u>new capabilities</u> from reusable services
Service Loose Coupling	<u>Easier</u> to deploy new capabilities (less dependencies)
Service Abstraction	<u>Easier</u> to reuse services (supports loose coupling)
Service Reusability	<u>Reduces</u> redundant implementations of same service logic
Service Autonomy	<u>Improved</u> Reliability, Availability and Maintainability (RAM)
Service Statelessness	<u>Improved</u> availability/scalability, supports composability
Service Discoverability	<u>Easier</u> to find services developed by others

Strategic Goals

Increased Federation

Increased Intrinsic Interoperability

Increased Vendor Diversification

Increased Business and Technology Domain Alignment

Strategic Benefits

Increased ROI

Increased Organizational Agility

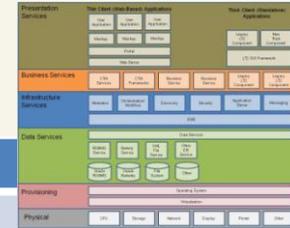
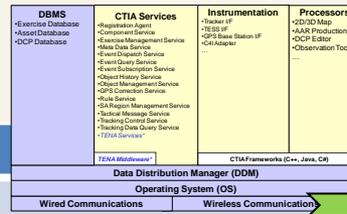
Reduced IT Burden



Common Training Instrumentation Architecture CTIA



Using loosely coupled, well defined services that address the business goals of the system. Services are composed into orchestrations that change to meet the future needs of the live training community.



Capability	CTIA Current	CTIA 4
Architecture	Monolithic Middleware	Scalable Service Oriented
Composability	Plug-and-Play Components	Composable Services
Service Interface	Dedicated IDL APIs	Reusable Service Contract
Usability	Thick Applications	Mobile Enabled Web Clients
Reusability	Component Level	Service Level
Business Logic	Static; Tightly Coupled to Components	Composition driven; Defined by Consumer
Integration	Static	Composable
Configuration Management	Single, Monolithic Release	Individual Services
Governance	Component Agreement	Service Contract & Service Agreement
Backwards Compatibility	Dependent on Middleware; Compile-time only	Service Mediation
Testing	Unit / Component / System	Service / System, Automation, Coverage

Aligning technology to business goals – Leveraging SOA methodology



Challenges to adopting SOA

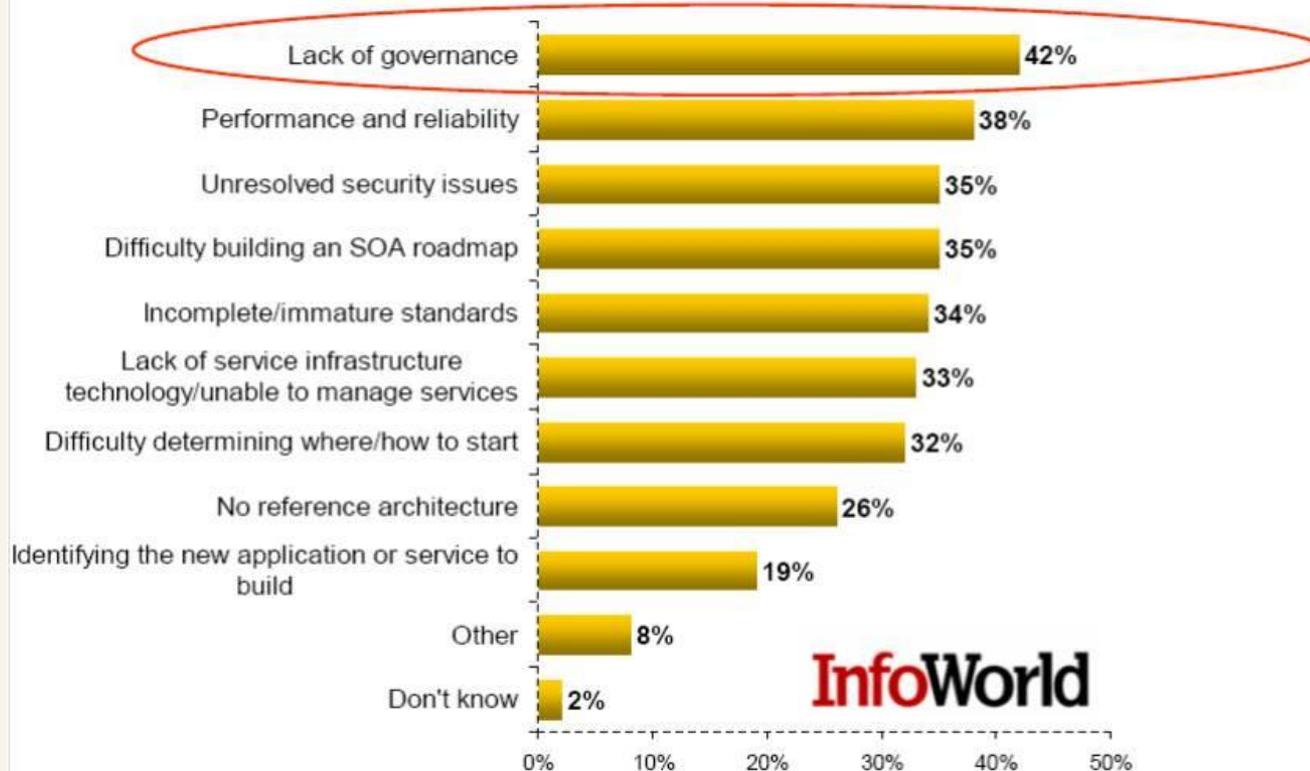


- Ensuring reuse
 - How do we meet current capabilities in a SOA environment
 - Define autonomous services
- Business process
 - CITA doesn't follow archetypal service orchestrations
 - Phases of system use changes active service inventory
- Deployment / Cycle Time
 - Periods of high use with no change
 - Moving to cloud for always on capability
- Security
 - Changing interfaces is expensive
 - System boundaries are not flexible
- Technical Concerns
 - TPMs and performance constraints

Challenges managing a SOA Architecture



Factors that inhibit SOA adoption

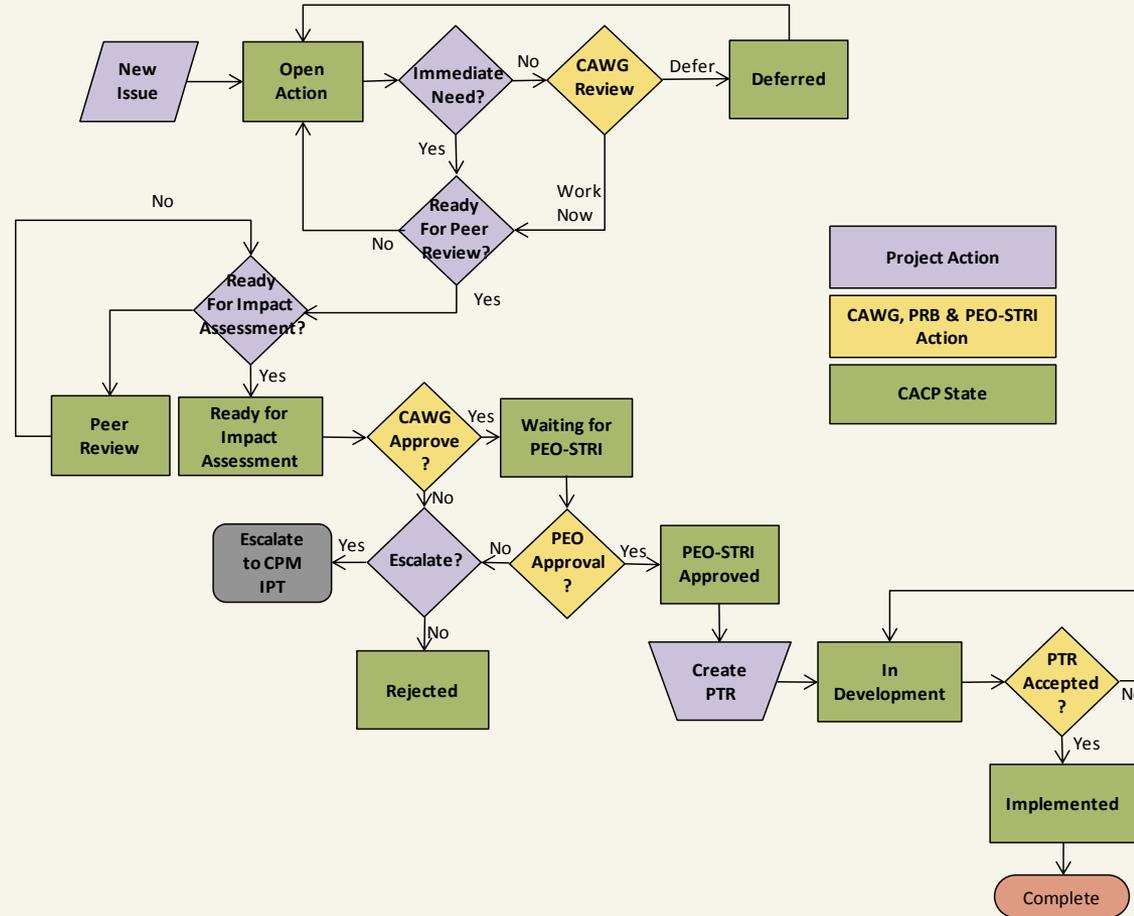


Source: InfoWorld Research Report: SOA July 2006

Lack of governance is the number one reason for SOA failure in organizations

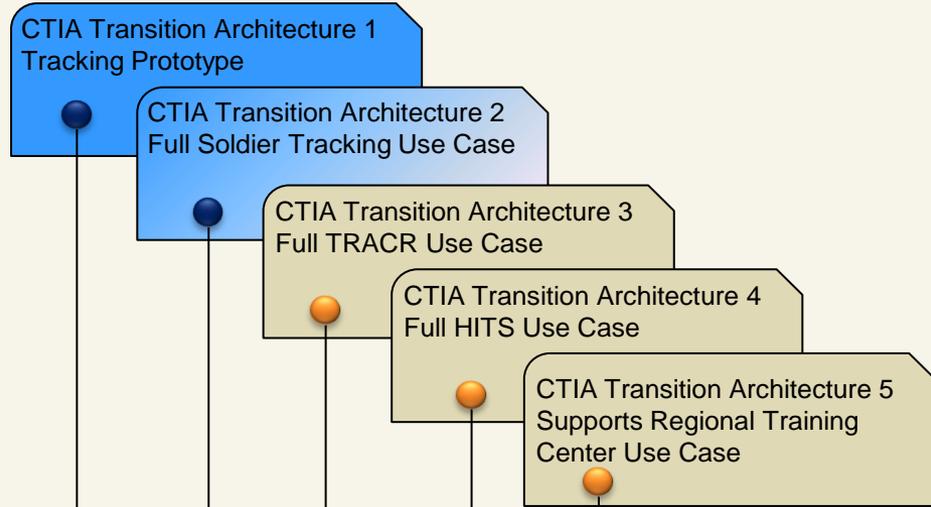
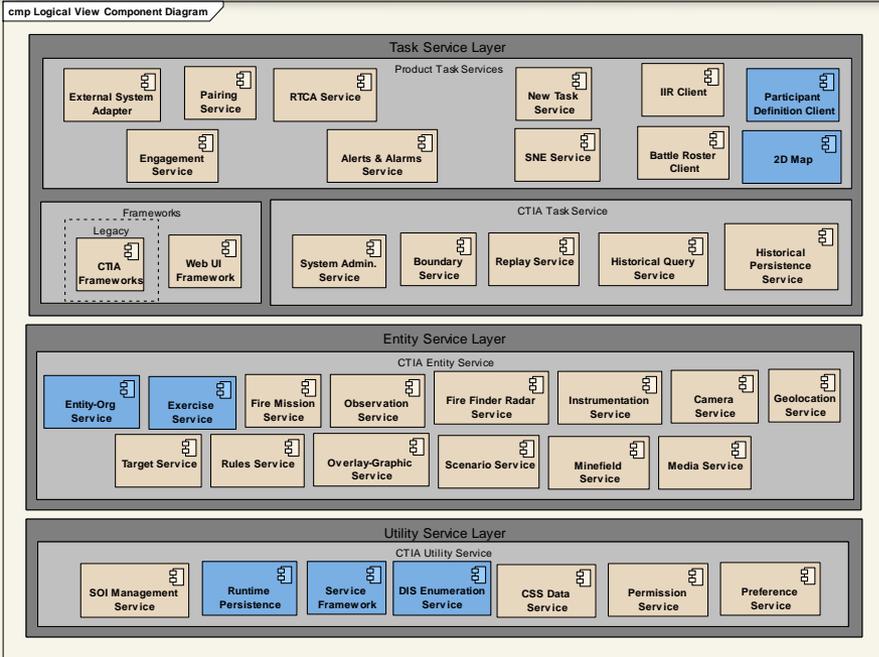
Managing your SOA in a Product Line

- Re-using existing Product Line processes
 - Variation management
 - Common baseline
- Using LT2 Portal for Service Inventory and static discovery
- Community approves changes

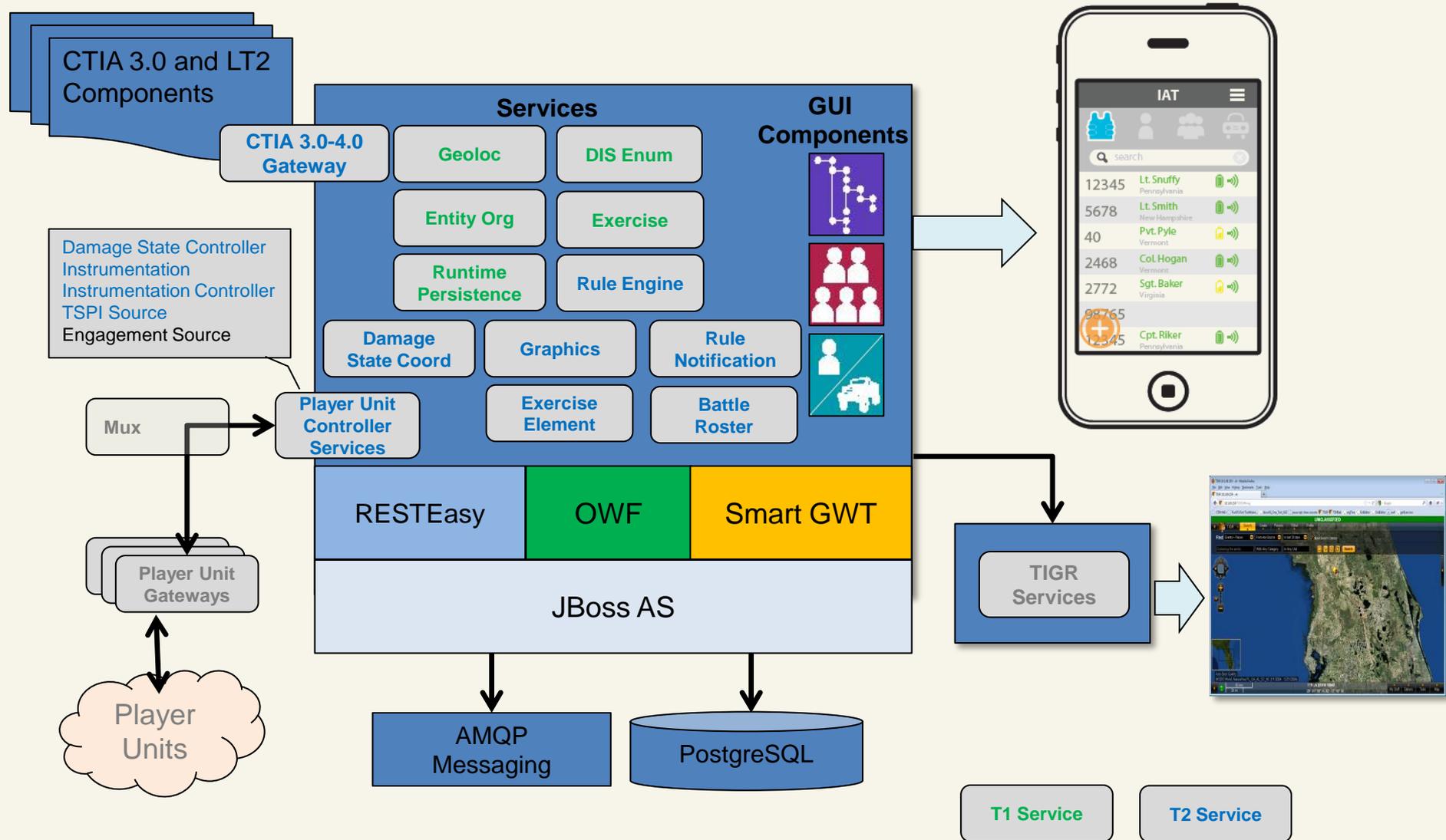


Product line governance process didn't change due to SOA

Product alignment development strategy



Current Transition Architecture



Conclusions

- LT2 is a proven and mature product line with over \$350M in cost savings already realized
- An established software product line aligns with SOA migration
- Major barriers to managing SOA are already solved in a software product line
- Supports product needs and technology evolution

