

Raytheon
An RTX Business

BEYOND THE BLUEPRINT: SCALING THE NEXT GENERATION OF DIGITAL ENGINEERING

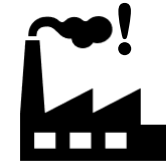
Bret Lowell, VP Digital Technology

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Our Burning Platform = Production: Double it! Triple it!

THE WALL STREET JOURNAL.

Pentagon Pushes to Double Missile Production Military leaders are urging defense contractors to increase assembly of 12 critical weapons



RESPONSIBLE STATECRAFT



Our industrial base isn't keeping up with the pace of weapons transfers to Ukraine and Israel

THE WALL STREET JOURNAL.

[in 12 days of conflict], Thaad operators burned through nearly a quarter of interceptors ever purchased by Pentagon



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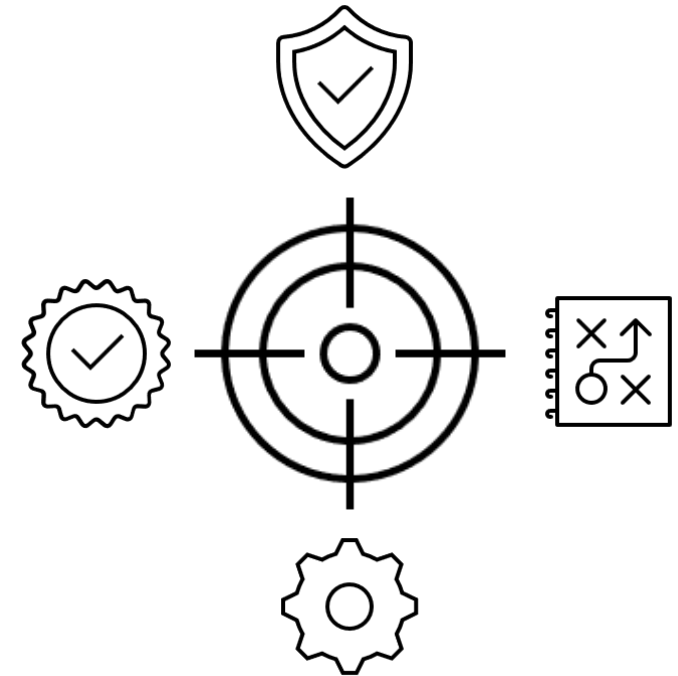


United States typically expended more than 5,000 long-range missiles in three weeks of major conflict

This isn't hypothetical, this is happening, right now

Cultivating an agile, innovation-first culture

- **Start** with Culture
 - Build a foundation of Trust and Openness
 - Empower the team with clear Roles & Responsibilities
 - Who is Responsible, Accountable, Consulted and Informed
 - Change behaviors by modeling the run rules
 - Coach your staff ('bad' news is just news; no surprises)
- Do the **hard** stuff Right
 - Tools can't 'establish' a culture that doesn't exist
 - Use the Best tools to improve collaboration
 - Tools don't 'know' anything and can't do the hard work
 - Use Tools to make the hard work easier

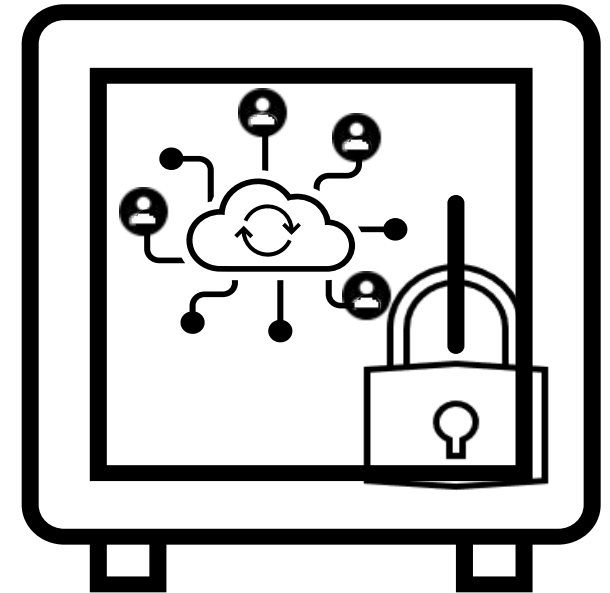


“Culture eats strategy for breakfast” – Peter Drucker

End-to-end Product Lifecycle Management (PLM) via secure cloud + edge platforms

Real-time collaboration, *cross-functional*, *cross-supply-base* collaboration

Key Theme	Tangible Benefit
Product & Production definition: Digital Thread / Twin	Accelerated Development: <ul style="list-style-type: none">• Model Based Systems Engineering (MBSE)• Model Based Design, Manufacturing & Inspection (MBDMI)• Connected xBOM
Design Collaboration	Early Supplier Collaboration <ul style="list-style-type: none">• Accelerated Delivery• Reduced rework / defects
Design Optimization	Design for X (ex: APQP) <ul style="list-style-type: none">• Improved Cost, Quality, and Processes• Enforced standards• Alternate Parts / Part Reuse
Data & Product Integration	End to End Change Management: <ul style="list-style-type: none">• As-Designed / As-Built / As-Maintained• Reduced Volatility• Flawless Configuration Management• Meaningful Metrics and Key Performance Indicators (KPI)s



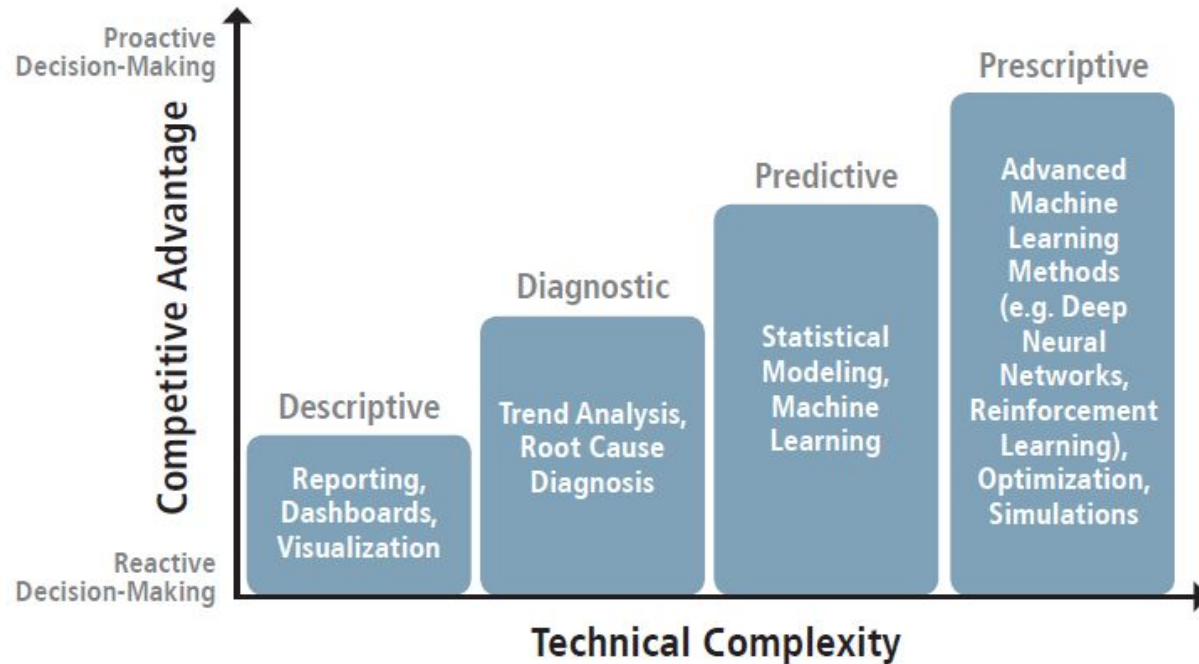
Reduce risk via virtual prototyping, virtual validation and early end-to-end integration

- Digital Twins in the Wild Real World
 - Ex: Raytheon’s “Missile Kit” modeling, simulation and analysis
 - COTS & custom parts, systems & assemblies
 - Validated models from real world test data
 - Proven physics models and computational fluid dynamics
 - Emulating hardware, processes, systems & environments
 - High-fidelity Physics based, threat environment models
 - Detailed control loop modeling for guidance and control
 - Simulations so accurate, most flight tests no longer needed
- Requires High Performance Computing (HPC)
 - Scalable, parallel processing (GPUs, SLURM, CUDA)
 - On-premises to maximize performance and flexibility



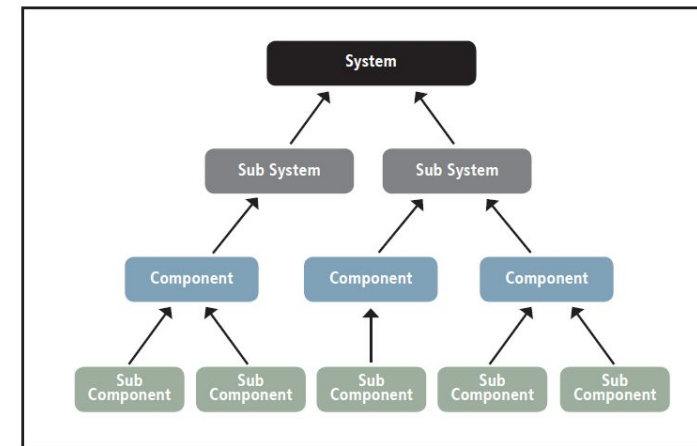
Hyper-Accurate Digital Prototyping: design, build, integrate and test in the “cloud”

Leverage the power of AI to accelerate production



Artificial Intelligence: revealing the unseen

- Descriptive: quickly identify, visualize and mitigate
- Diagnostic: identify root causes of defects, turn backs, time wasters, bottlenecks, & swirl
- Predictive: proactively reprioritize operations
- Prescriptive:
 - Maintenance at the exact right time
 - Optimize throughput and yield



Finding defects late is expensive

Predicting downstream defects *early* saves money

Diagnostic & predictive analytics powered AI accelerate production

Large & Complex Systems: it's what we do at Raytheon



Advanced Products & Solutions



Advanced Technology



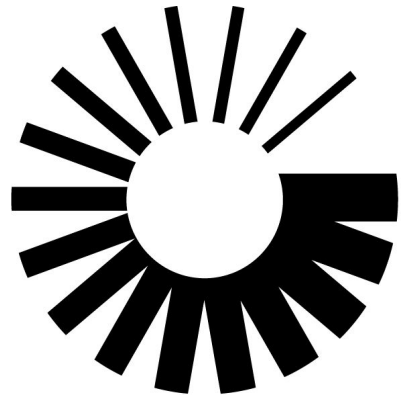
Air & Space Defense Systems



Land & Air Defense Systems



Naval Power



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