Systems 2020
Strategic Initiative Overview

Kristen Baldwin

ODDR&E/Systems Engineering

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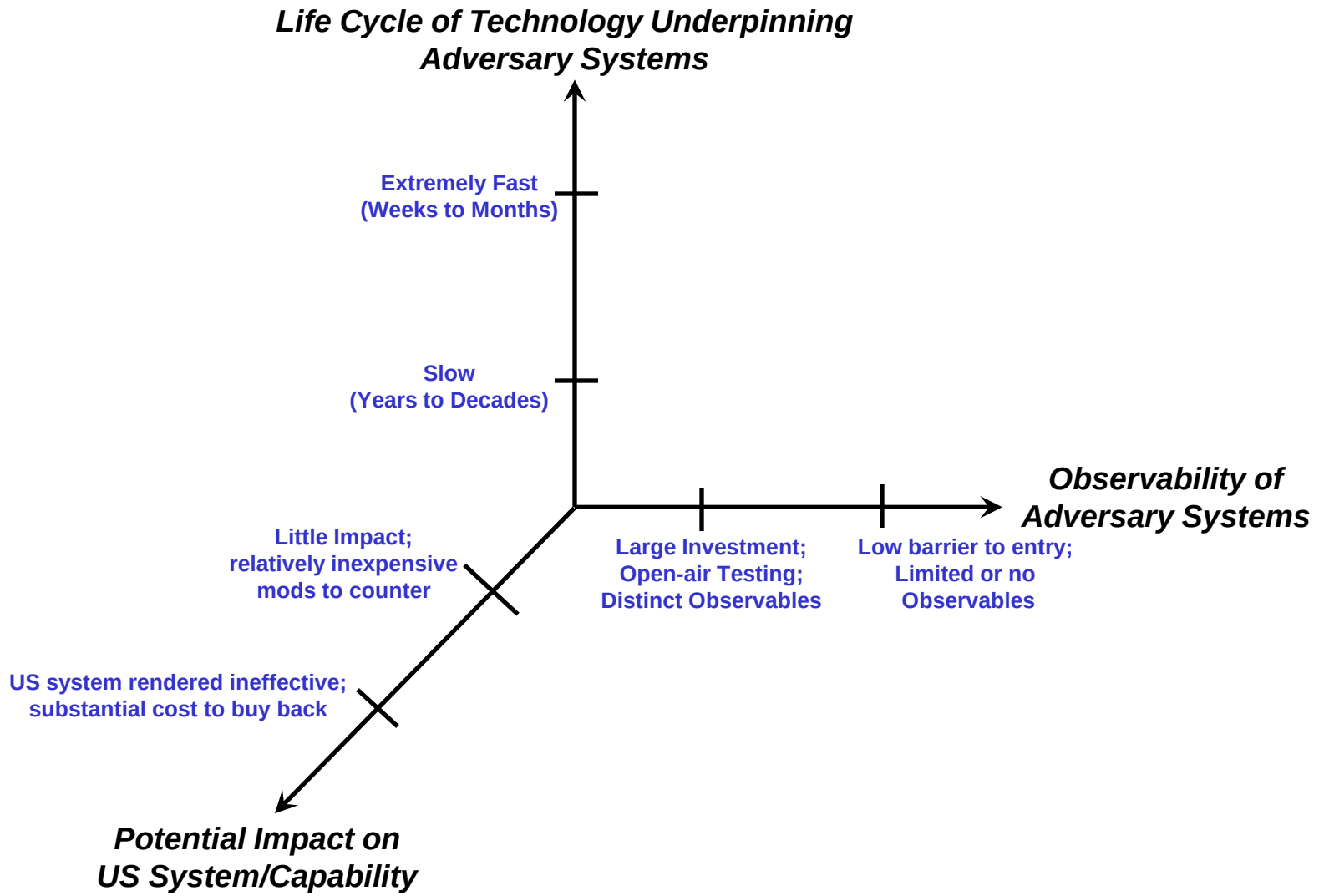
Need for Systems 2020

- **Adversary can use commercial technologies and new tactics to rapidly alter the threat to US forces**
  - Increasing uncertainty in future Defense missions & environments
- **DoD engineering, and business processes not structured for adaptability**
  - Sequential, single step progression from fixed requirements
  - Individually designed, monolithic systems
  - Vulnerabilities from global supply chain
- **New research, tools, pilot efforts needed to determine best methods for building adaptable defense systems**

The Urgency of Anticipation, Flexibility and Rapid Adaptability



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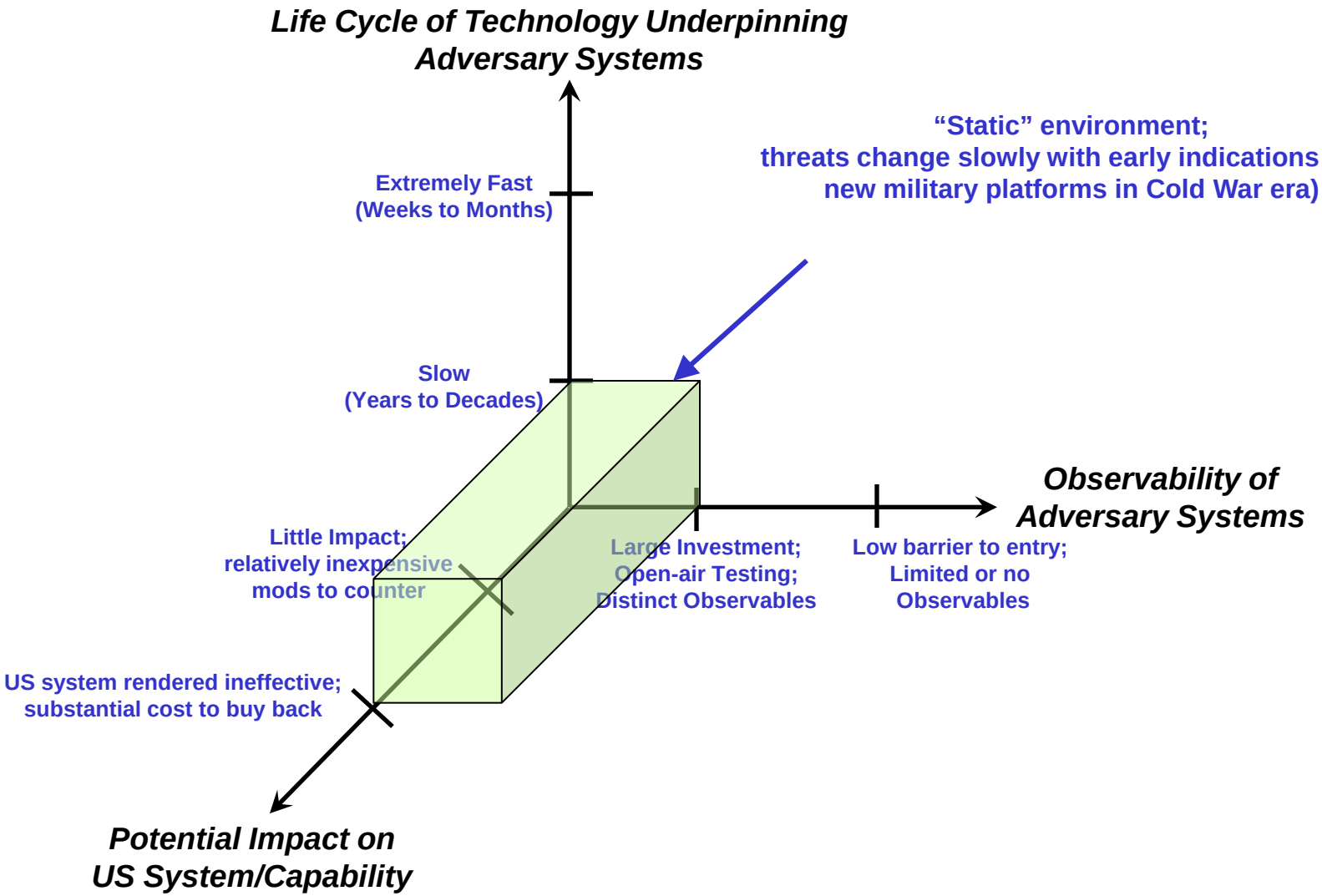

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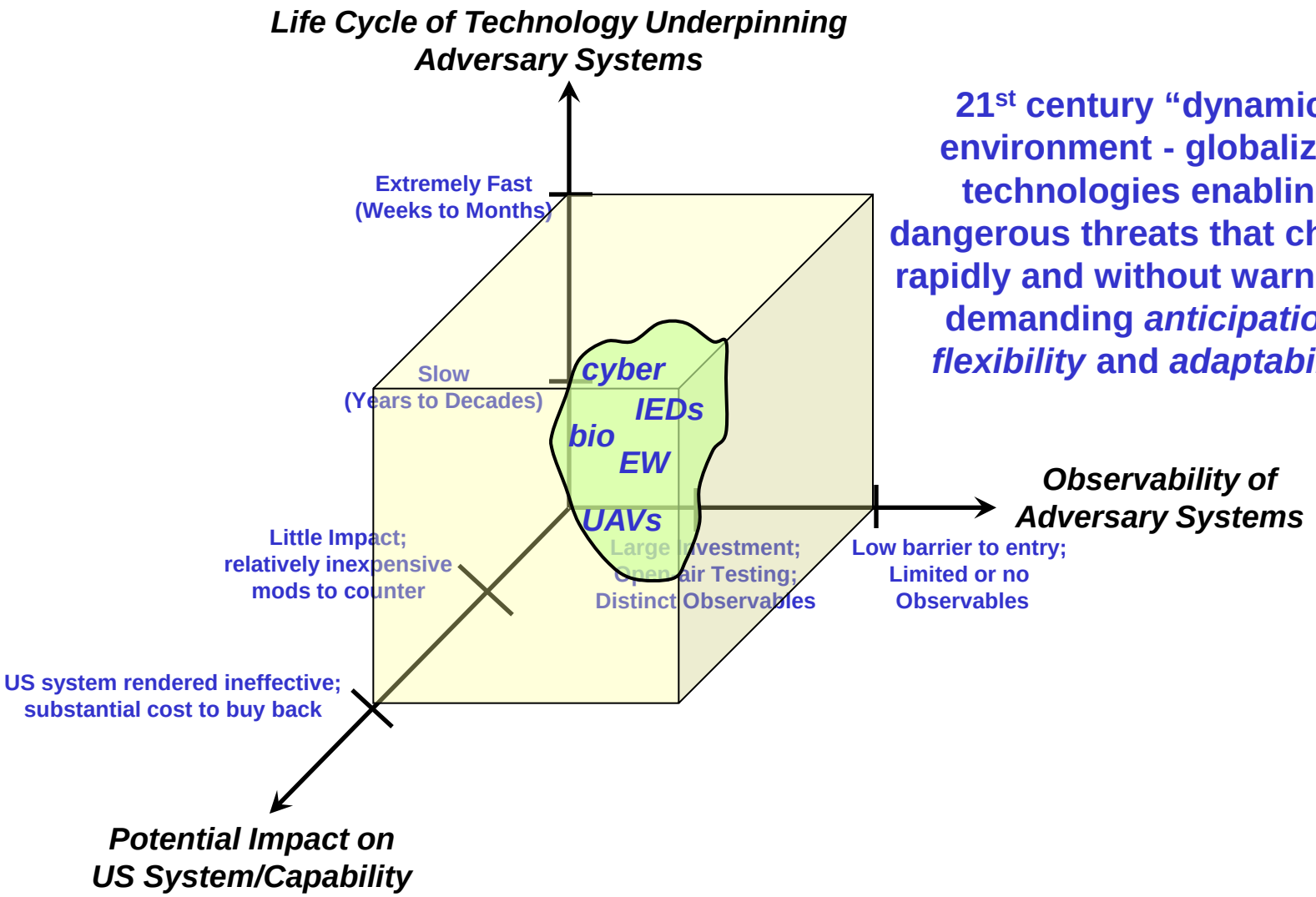
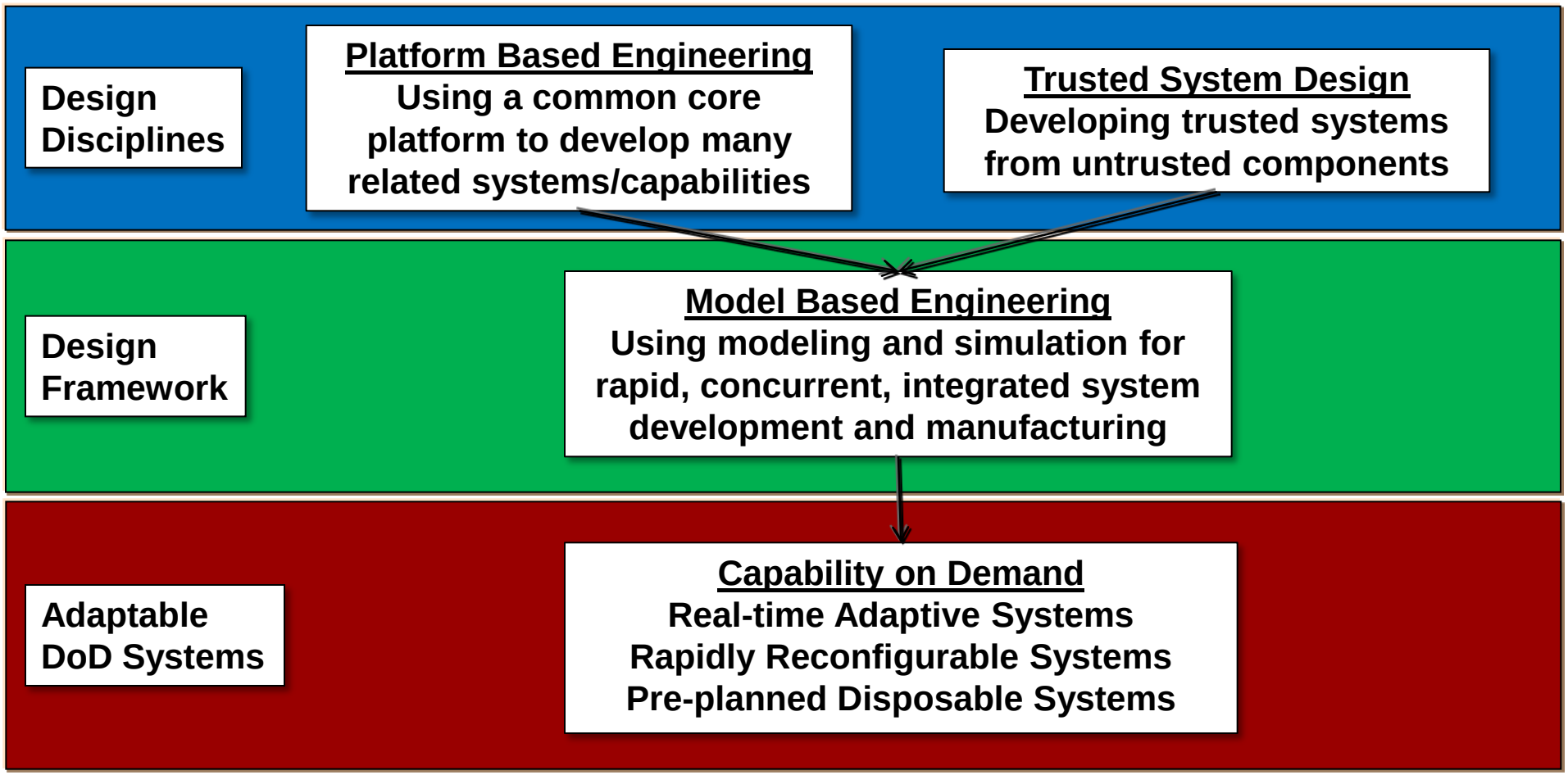


21st century "dynamic" environment - globalized technologies enabling dangerous threats that change rapidly and without warning… demanding *anticipation*, *flexibility* and *adaptability*

Systems 2020
Designing DoD Systems for Adaptability



Systems 2020 Scope

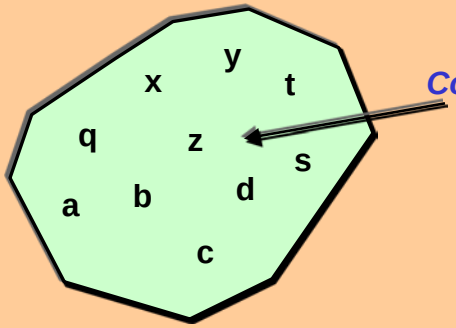
- **Systems 2020 technologies could apply to many domains**
  - Platform Based Engineering (PBE), Model Based Engineering (MBE), Trusted Systems Design (TSD) are relevant to microelectronics, software, enduring defense platforms
- **Focus of Systems 2020 is on system engineering disciplines and frameworks to build adaptable defense systems**
- **Significant business process challenges in addition to technical challenges**
  - e.g., Challenging the requirements community to avoid specifying a fixed point solution, enforcing open architectures
  - Primary S-2020 focus is on the technical challenges

Faster delivery of adaptable systems that are trusted, assured, reliable and interoperable

Platform-Based Engineering and Trusted Systems Design Disciplines

Notional Defense System

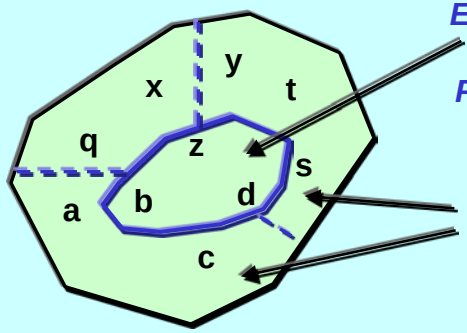
Today
Point design to address fixed, static requirements



Monolithic, Complex, Rigid Design

Threat and mission changes require extensive re-work or start from scratch
- **Expensive, slow to field**

PBE
Inherently adaptable design to address dynamic, uncertain requirements

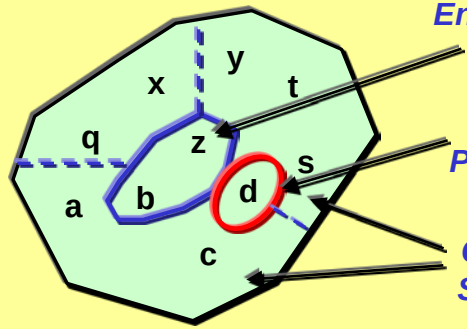


Enduring Core Platform

Rapidly Changeable Subsystems

Core platform capable of rapidly accommodating threat and mission changes
- **Well-defined architectures, interfaces allow a variety of systems configurations**

PBE + TSD
Inherently adaptable and robust design to address dynamic, uncertain requirements



Enduring Core Platform

Trust Partitioning

Rapidly Changeable Subsystems

Additional partitioning of untrusted components and subsystems
- **Allow rapid response to trust violation**

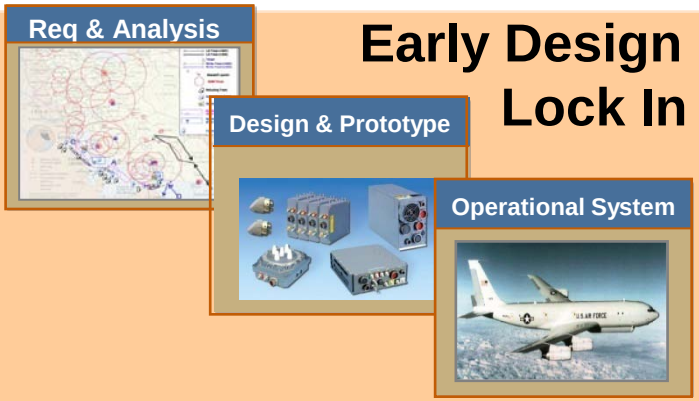
x, y, z, etc – subsystems and/or components

Model Based Engineering Framework
Designing for Adaptability

Today

Model selected critical subsystems

Lots of design – physical prototypes



Early Design Lock In

- Design decisions and interactions captured on paper, lost in personnel turnover.
- Lack of iterative concept design environment.
- Manual integration across product design seams.
- Custom manufacturing solutions.

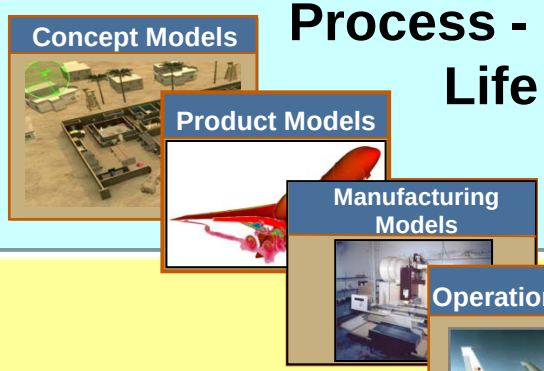
Stage 1

Segmented Virtual:

Concept Modeling

Product Modeling

Model Driven Manufacturing



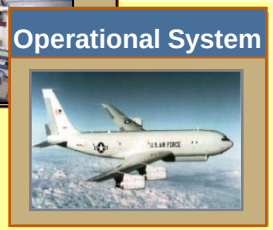
Iterative/ Adaptive Process - Entire Life Cycle

- Emergence of open virtual design environment, interoperable tools and design data/artifacts.
- Early analysis of PBE and TSD system trades in concept, product, manufacturing models.

Stage 2

Fully Integrated Process Flow:

System Concept, Design, Build, Field, Adapt



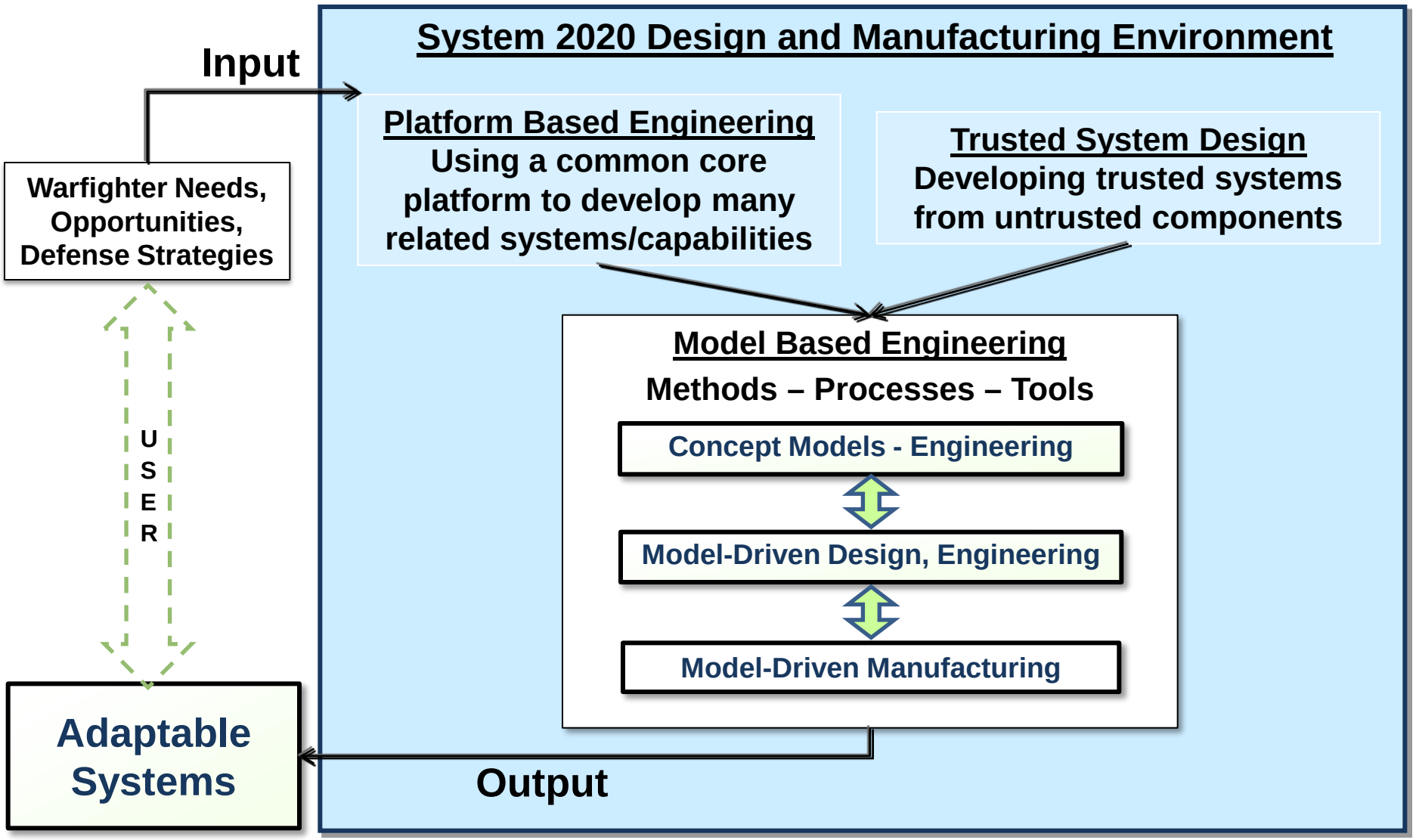
Adaptive Transparent Systems

- Robust end-to-end open multi-scale design environment, tools, data, patterns & virtual/physical verification.
- Support full system PBE & TSD trades, responding to dynamic threats & trust scenarios.

Trusted Systems Design

- **Designing trusted systems using components or subsystems of unknown or suspect trustworthiness**
  - Desire to leverage commercial technologies to provide enhanced warfighting capability, however…
  - Current patchwork of defensive methods are not adequate for using commercial technologies from across the globe
- **Use Platform Based Engineering tools, techniques to design the system to address trust**
  - Suspect components are isolated, not part of the enduring core
- **Research gaps identified in three key areas:**
  - Architectures to make systems less transparent to the attacker
  - Methods, models for implementing trusted system design throughout system lifecycle
  - Trustworthiness assessment tools and methodologies

System 2020 Workflow to Achieve Adaptable Systems



We are seeking input on key technical gaps and opportunities to shape research projects and pilots

Systems Engineering Gaps and Critical Needs

Summer 2010 Studies
Identified deficiencies and gaps in systems engineering

SE Research Center S-2020 Study

Booz Allen Hamilton S-2020 Study

BOOZ ALLEN HAMILTON
Systems-2020 Study

Final Report
Booz Allen Hamilton

8/16/2010

Gaps

- Need for a conceptual design environment
- Lack of tools to integrate system modeling capabilities across domains
- Lack of open, virtual, realistic environment for validation, testing and manufacturing

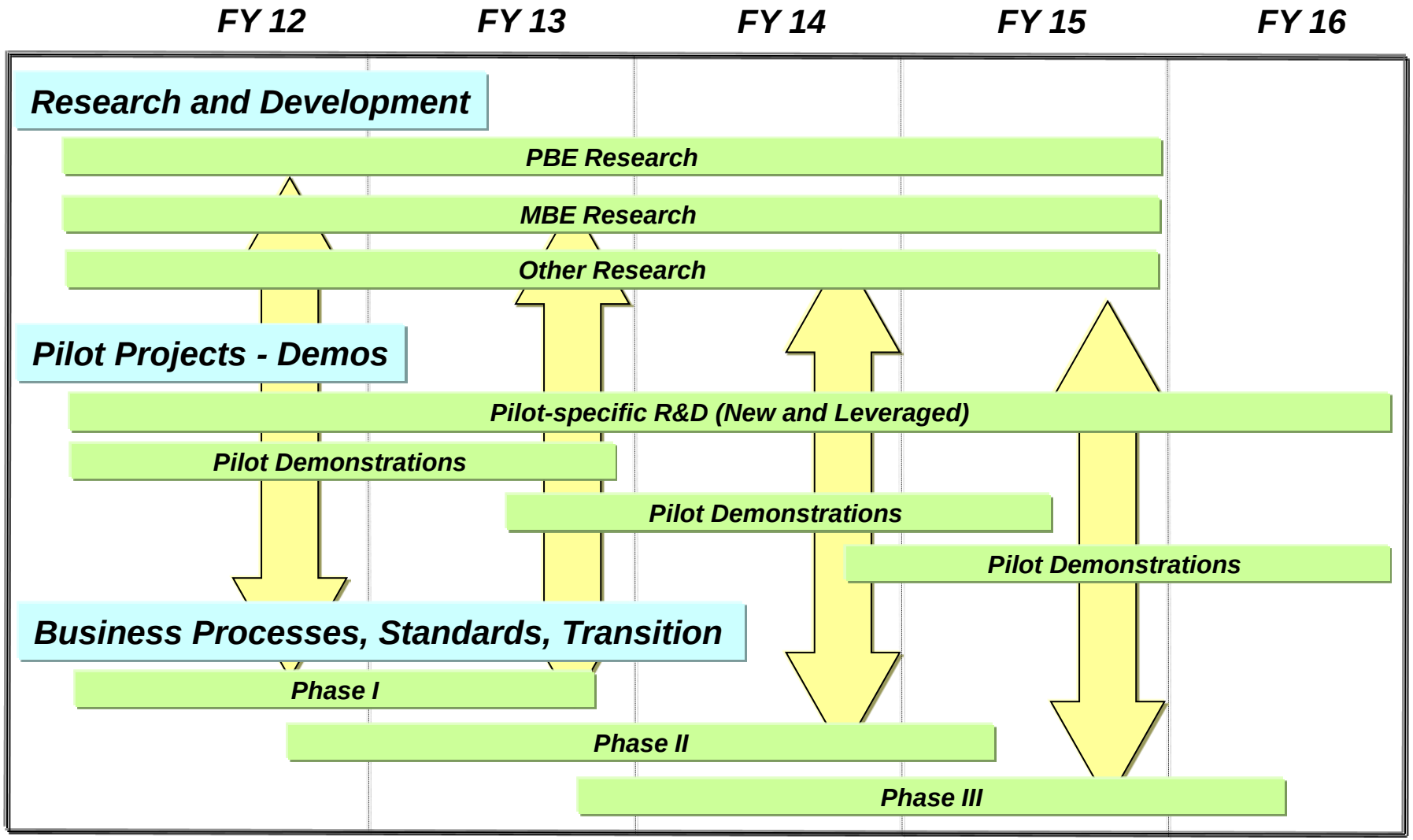
Lead to Critical Needs

An integrated framework for concept, design and analysis of systems

- Accomodates custom and commercial tools based on open architectures and standards
- Common conceptual environment and design tools for seamless interoperability
- Capabilities to verify system integrity, promote modularity and re-use, and design for trust
- Enhanced multi-scale Mod/Sim tools that support cross domain testing

Analysis of these reports
categorized gaps into 3 areas

Overview of S-2020 Path Ahead

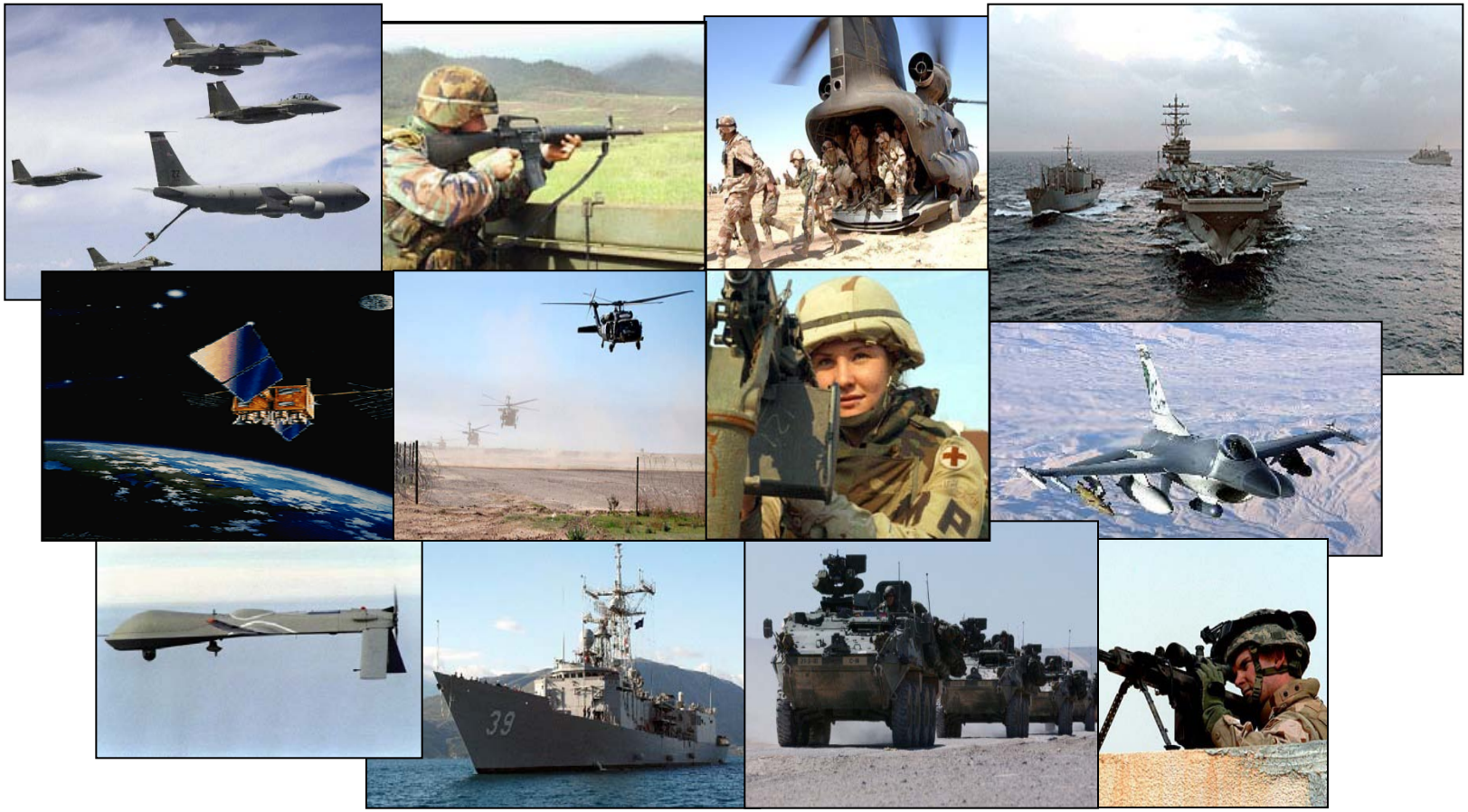


Summary

- **DDR&E's Systems 2020 initiative develops the design disciplines and framework to build adaptable Defense systems**
- **Program consists of research, pilot projects and transition efforts to advance key technologies**
  - Platform Based Engineering, Model Based Engineering, Trusted Systems Design
  - Rapidly reconfigurable systems
- **Execution performed through partnership with Services, Government, Industry, Academia**

We look forward to broad community engagement

Systems Engineering: Critical to Program Success



Innovation, Speed, and Agility

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