Diamond Software Product Family®
Product Centered Organization (PCO)

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BAE Systems

Hudson, NH

Agenda

- Background of our organization

- Motivation for creating a software product family

- Path to creation

- Current status

- Lessons Learned

Project Diamond

BAE Systems Overview

- A global company engaged in the development, delivery and support of advanced defense and aerospace systems in the air, on land and at sea
- 3rd largest global defense company
- 5th largest US defense company
- 97,500 employees
- Customers in over 100 countries
- Annual sales exceed $23 billion

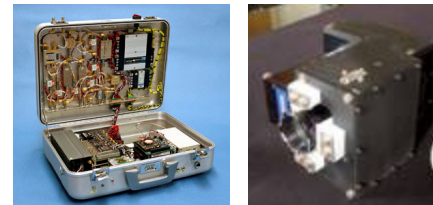# Information Dominance Systems (IDS) - NH

BAE SYSTEMS

- Our systems provide:
  - Signal acquisition
  - Signal recognition
  - Direction finding
  - Digital signal processing
  - Threat analysis
  - Jamming
- Platforms
  - Airborne
    - (manned and unmanned)
  - Naval
  - Ground

Signal Intelligence
Situation Awareness

C-130 Compass Call

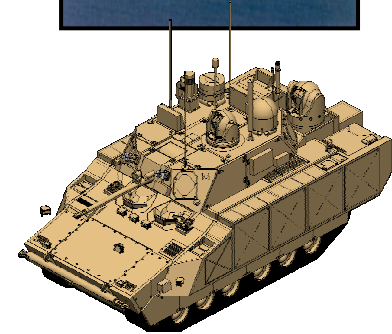SIGINT, MASINT Sensors
& Mission Payloads
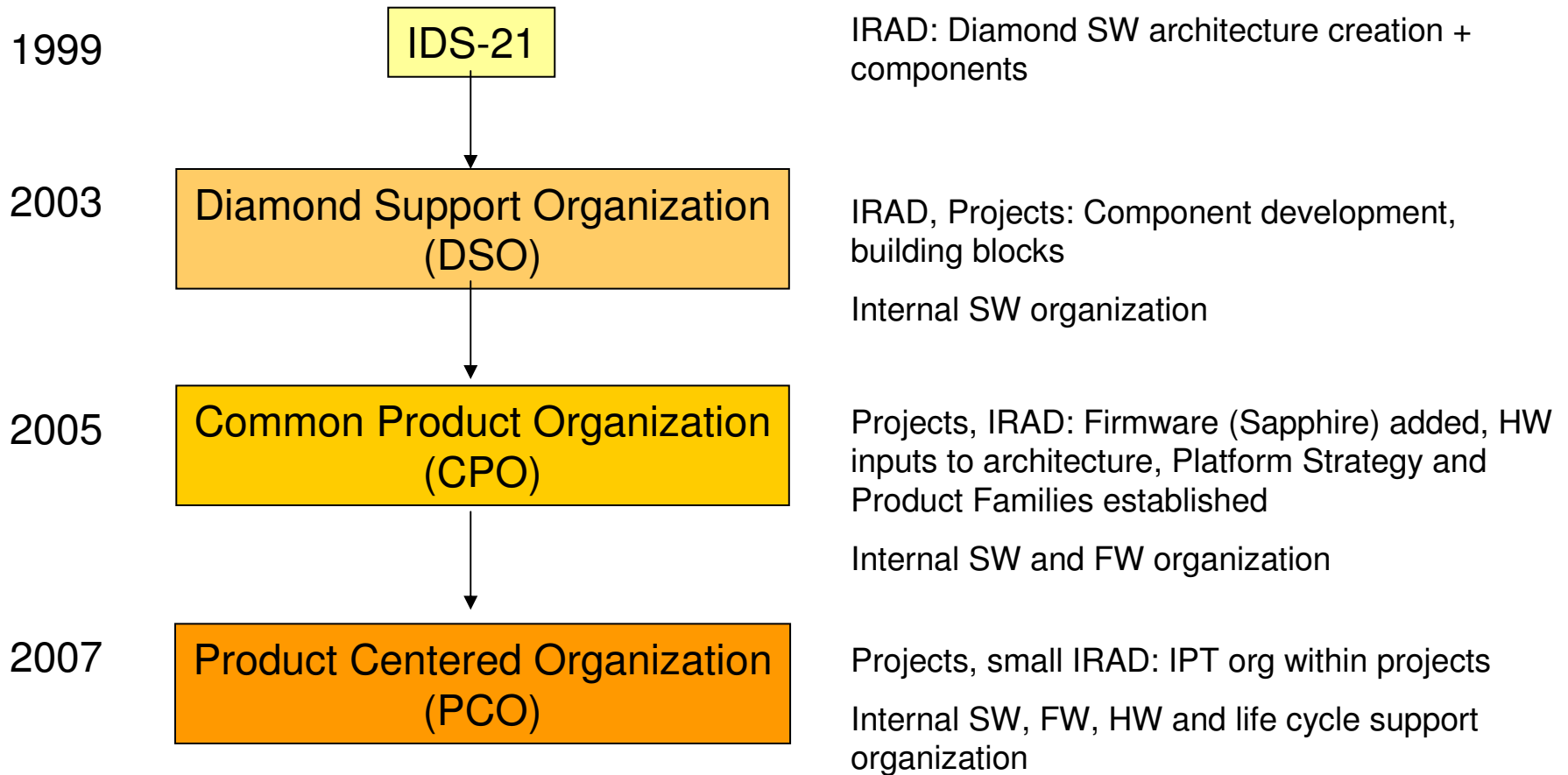
First Responder
Technology

Army Customers

- Airborne Reconnaissance Low (ARL)

- FCS Emitter Mapping Systems (EMS)

- Tactical SIGINT Platform (TSP)

- DCREW (counter IED)

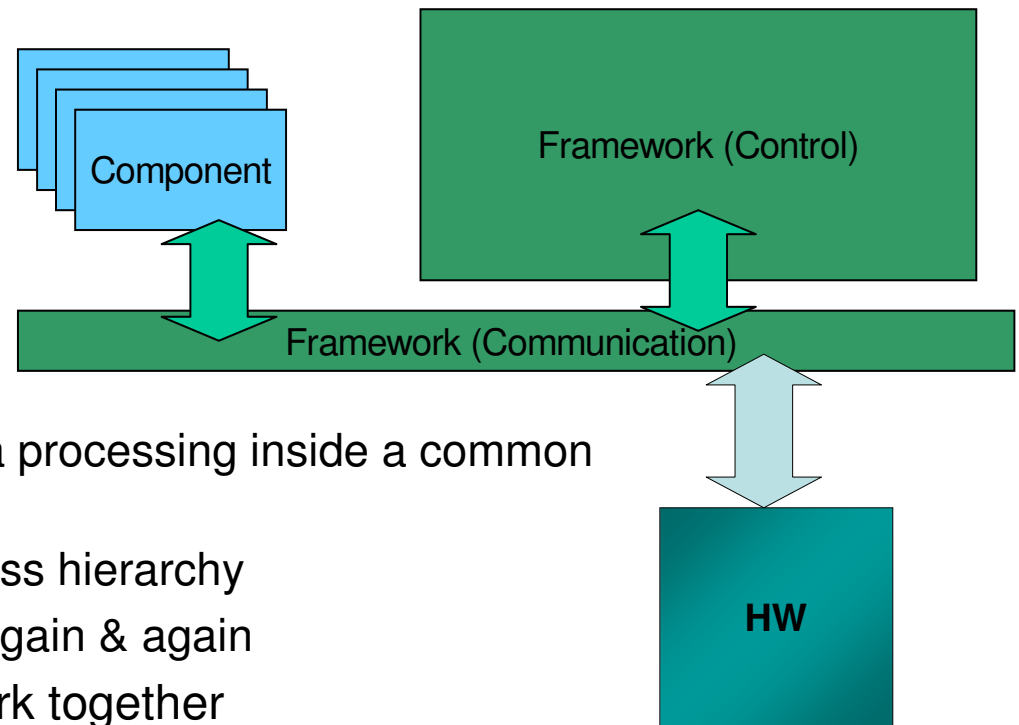# Historical Background

1999   IDS-21   IRAD: Diamond SW architecture creation + components

2003   Diamond Support Organization (DSO)

IRAD, Projects: Component development, building blocks

Internal SW organization

2005   Common Product Organization (CPO)

Projects, IRAD: Firmware (Sapphire) added, HW inputs to architecture, Platform Strategy and Product Families established

Internal SW and FW organization

2007   Product Centered Organization (PCO)

Projects, small IRAD: IPT org within projects

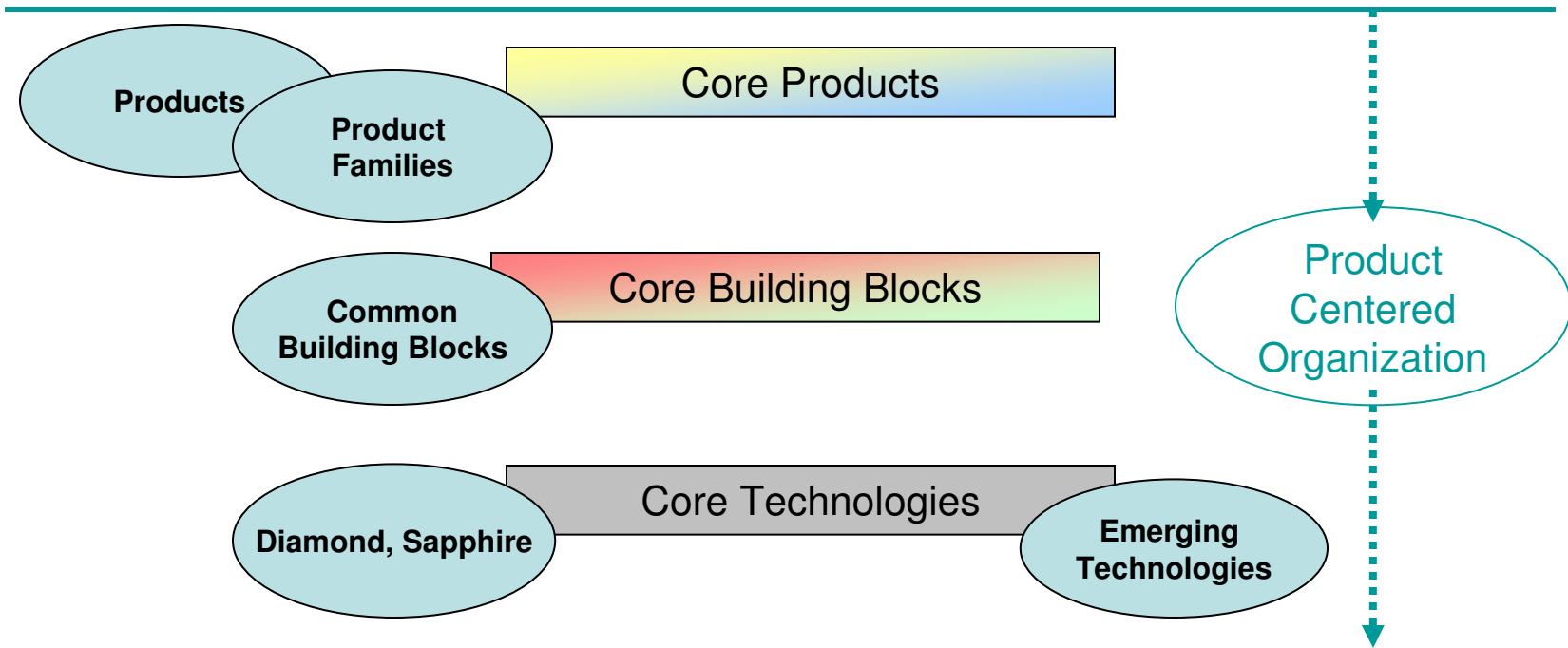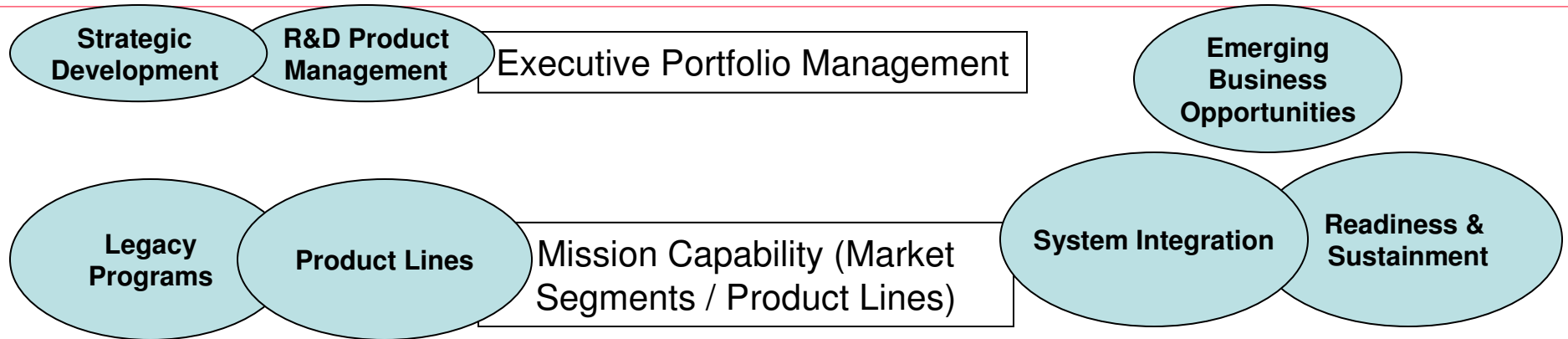Internal SW, FW, HW and life cycle support organization

What is the Diamond Software Product Family?®

- A framework providing an organized environment for running collection of objects
- Its tools let the developer construct components that "play" by the framework's rules of engagement

- Components "do the work"
  - Encapsulates the signal and data processing inside a common (extensible) interface
  - Reuse by inheritance through class hierarchy
  - Build it once, test it once, use it again & again
- Frameworks make components work together
  - Provides a common upgradable run-time infrastructure for components (platform independent communication, error handling, OS services, vector math libraries, …)
  - Provides a common set of base classes for component developers (inherent reuse)
  - Framework will run on a variety of common operating systems

Conceptual Organization – "Power Tower"

BAE SYSTEMS

Strategic Development **R&D Product Management** Executive Portfolio Management **Emerging Business Opportunities**

Legacy Programs **Product Lines** Mission Capability (Market Segments / Product Lines) **System Integration** **Readiness & Sustainment**

Products **Product Families** Core Products

Core Building Blocks **Common Building Blocks**

Product Centered Organization

Diamond, Sapphire Core Technologies **Emerging Technologies**
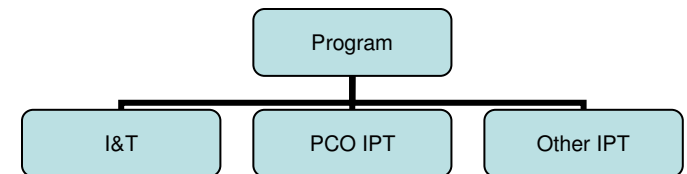
PCO Objectives

- Refresh and extend our <u>Core Technologies</u>

  – Diamond, Sapphire

- Expand our <u>component libraries</u>

- Continue reducing non-recurring costs

- Reduce recurring costs

- Coordinate, maintain and execute the <u>product roadmaps</u> essential to support the IDS product lines

PCO Principal Responsibilities

a) Development of SW and HW design/manufacture, ensuring maximum potential for reuse

b) Integration & Test through subsystem/product level

    a) Includes tech insertion and life cycle support

c) Maintain cost/schedule/technical merit of product

d) Led by Integrated Product Team (IPT) that is part of overall project

    a) responsible to all projects using this product

e) Bid future efforts that will utilize common products

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              ┌──────────┐
              │ Program  │
              └────┬─────┘
      ┌────────────┼────────────┐
┌─────────┐  ┌─────────┐  ┌──────────┐
│   I&T   │  │ PCO IPT │  │ Other IPT│
└─────────┘  └─────────┘  └──────────┘
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IDS PCO Benefits

Note: width of each project not necessarily to scale

- "Old" way: Program A: $$$$$

Z

- Program B: $$$$

X	Y	Z

- Program C: $$$

X	Y	Z

- Program D: $$

X	Y	Z
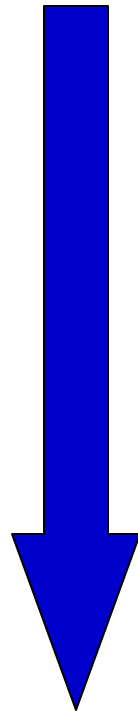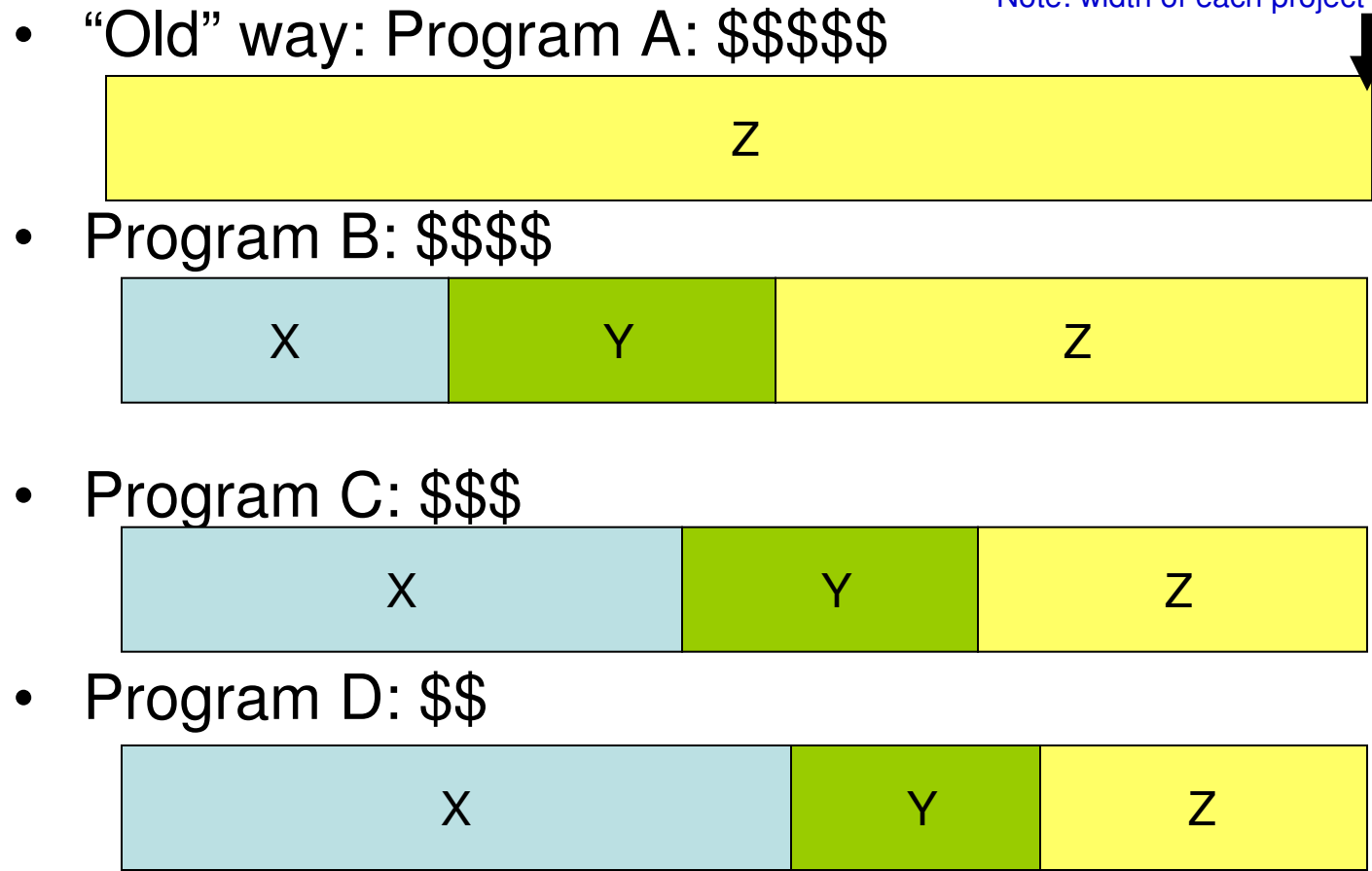
X = Direct Reuse from PCO Library
Y = New Elements to be Added to the Library
Z = Project Specific Effort

As PCO matures

Day to Day Decisions

- How to guarantee that software improvements foster strong future reuse?

  – Classic struggle: program interest vs. business interest

- Need for strong design engineering that promotes flexible future use

- Can two or more programs share a common software release?

- What is the best use of internal research and development funds (IRAD)?

- How to deal with differing security classification levels of deliverable software?

Lessons Learned

- It's much easier to create a product platform with initial IRAD funds than with committed project funds

- A successful common product family requires strong leadership and support from upper management

- Our chief architect (and his technical leads) must keep careful eye on actual week to week development of various projects
  - The sheep will wander…

- Don't be shy about analyzing the financial costs/benefits

Questions/Comments