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IT Data collection, Analysis and Benchmarking
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Software Data Collection: Supporting Defensible Estimates

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Goals of the presentation

- ✓**G1.** What are the requirements for a successful data collection project?
- ✓**G2.** How do consistency and automation create success?
- ✓**G3.** What do you need to know to know to be successful with software data collection?

Outline

Who - PEO STRI Overview

Why – Affordability and budgetary impact of estimates done without historical data

How – Cost Analytics Implementation for better Data Collection

"WHEN AND WHERE"

Army Training Inventory

- 335,000 training devices located at over 600 sites worldwide
- Sustained by 7,000 people
- Valued at $3.9B

Headquartered in Orlando, FL

- Redstone Arsenal, AL
- Fort Bliss, TX
- Fort Huachuca, AZ.

Field OPS operates 24/7 around the world

- "the sun never sets on their support"

1618 contracts valued at more than $21.9 billion

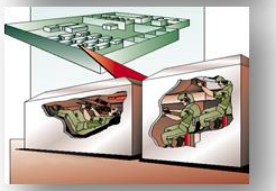
HQ Orlando, FL; Redstone Arsenal, AL; Fort Bliss, TX; Fort Huachuca, AZ.

Joint Forces: Army, Navy, Marine Corps, Air Force and SOCOM.

WHY SIMULATION?

Simulation Is Safe, Saves Time, Money, Fuel and the Environment

- Safety – less training injuries
- Minor Fuel Needs
- No Ammo Required
- Limits Environmental Impact
  - Air Pollution
  - Noise Pollution
  - Terrain Damage
- Inexpensive to Operate



Simulation Enhances Live Training

Approved for public release; distribution is unlimited.

Project Overview

The Situation: No Data.

- No process in place to collect data
- No official requirement to collect data
- No authoritative database with project data to support estimation.
- Estimates presented to ODASA-CE are asked, "Where is the supporting data?"

The Problem: ODASA CE adds a cost "plus up" (growth factor) from 30% to 60% for software cost estimates that are not informed by actual data from the past.

The Implications: Program(s) become unaffordable.

- Less budget available for other PEO STRI programs
- Less scope for the program being estimated (OneSAF)
- Contractors perform to budget available

Project Overview

The Need

Significantly reduce growth factors in software cost. (PEO STRI)

A repeatable process for collecting the data required to defend estimates to oversight organization(s)

The Payoff

Improved AFFORDABILITY of software-intensive programs.

More delivered CAPABILITY; eliminate arbitrary growth factors.

Decreased CYCLE TIME to develop software cost estimates enabling more analysis

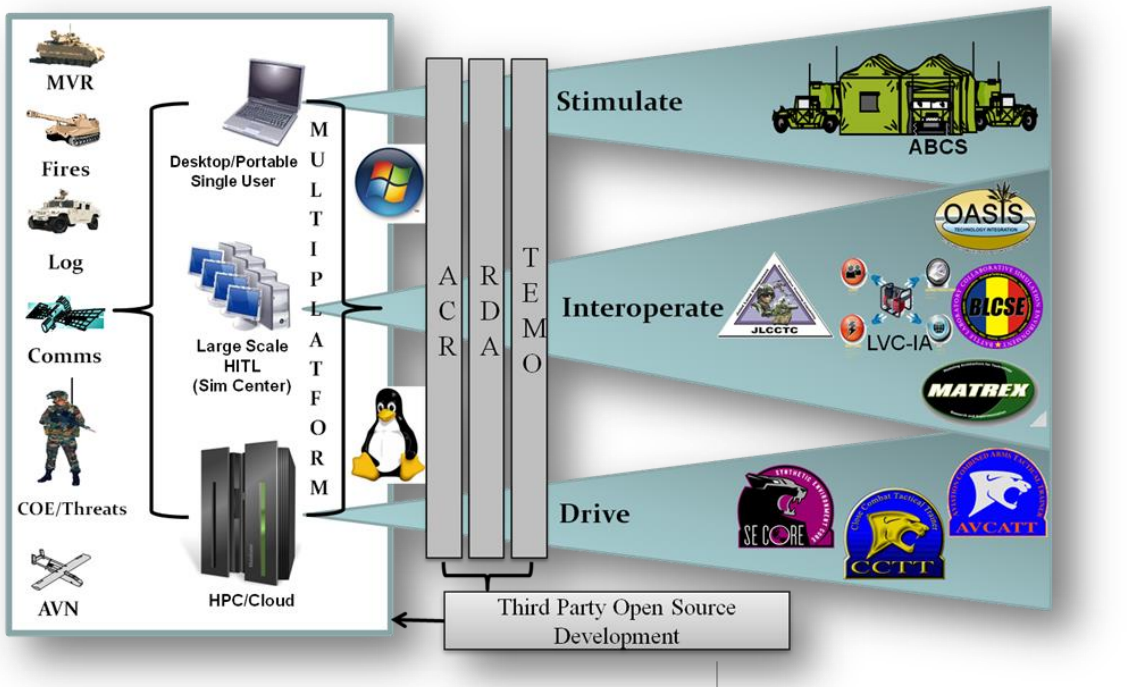
DEFENDABLE and CREDIBLE software cost estimates

Improved organizational ability to defend estimates

Better foundation for cost management

What Is OneSAF?

OneSAF is a "composable," next generation computer generated forces simulation that represents a full range of operations, systems, and control processes from an individual combatant and platform to brigade level



OneSAF Characteristics

One large, complex, open source development program

Two contractors

- A - Exclusively Capability development
- B - Primarily integration and some capability development

Design Complexity

- Huge amount of reused code
- Multiple languages per single capability
- Open source system with allied government handovers
- Agile development environment – 10 week sprints

Strategy Guidelines and Assumptions

Minimize the impact to the government program office

Minimize the impact to the contractors

Ensure **repeatability** in the process

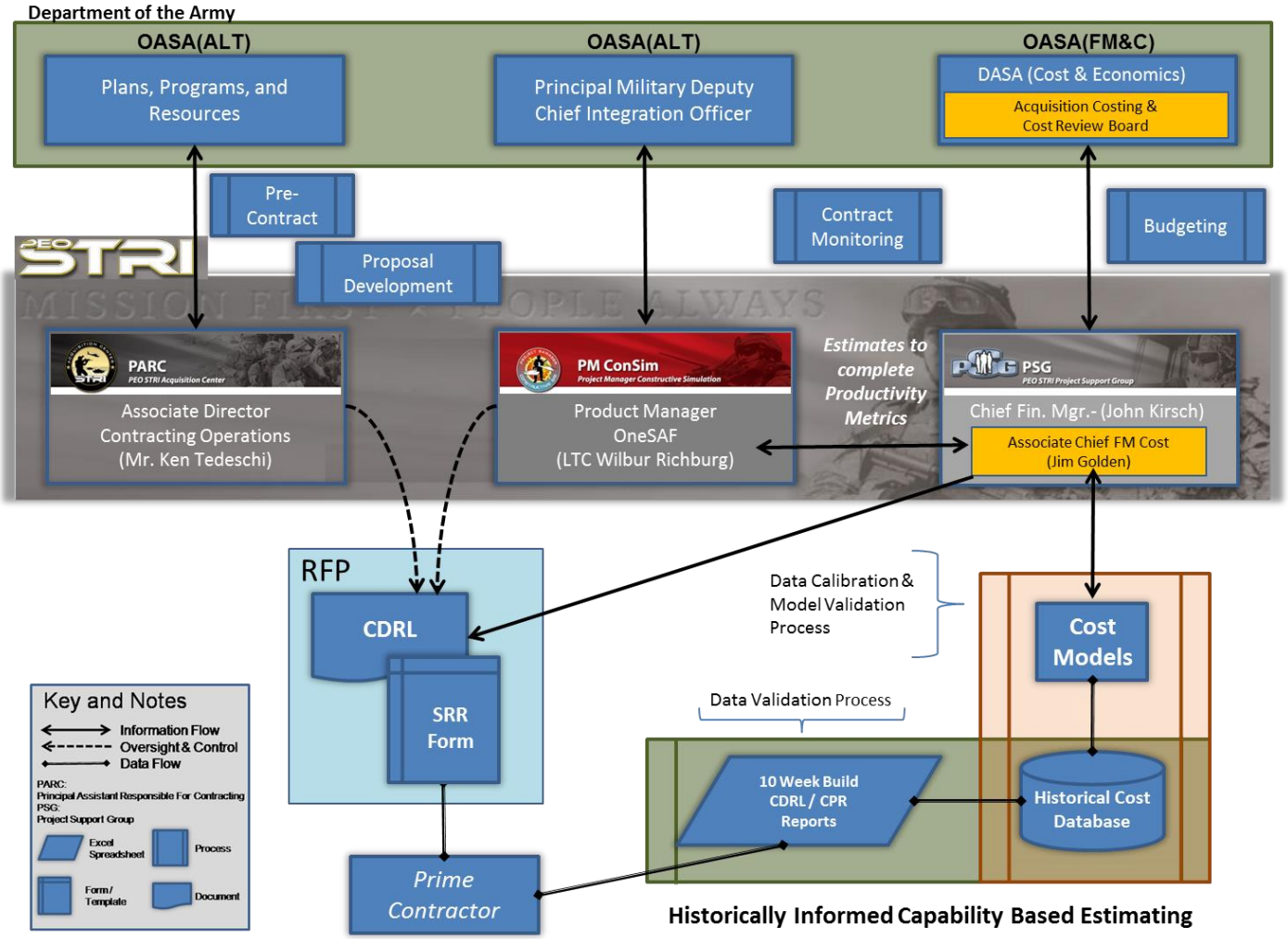
Ensure **consistency** of the data

Ensure the data collected is **not** in a **proprietary format**

Future estimates will be developed with TruePlanning, but could be with other solutions.

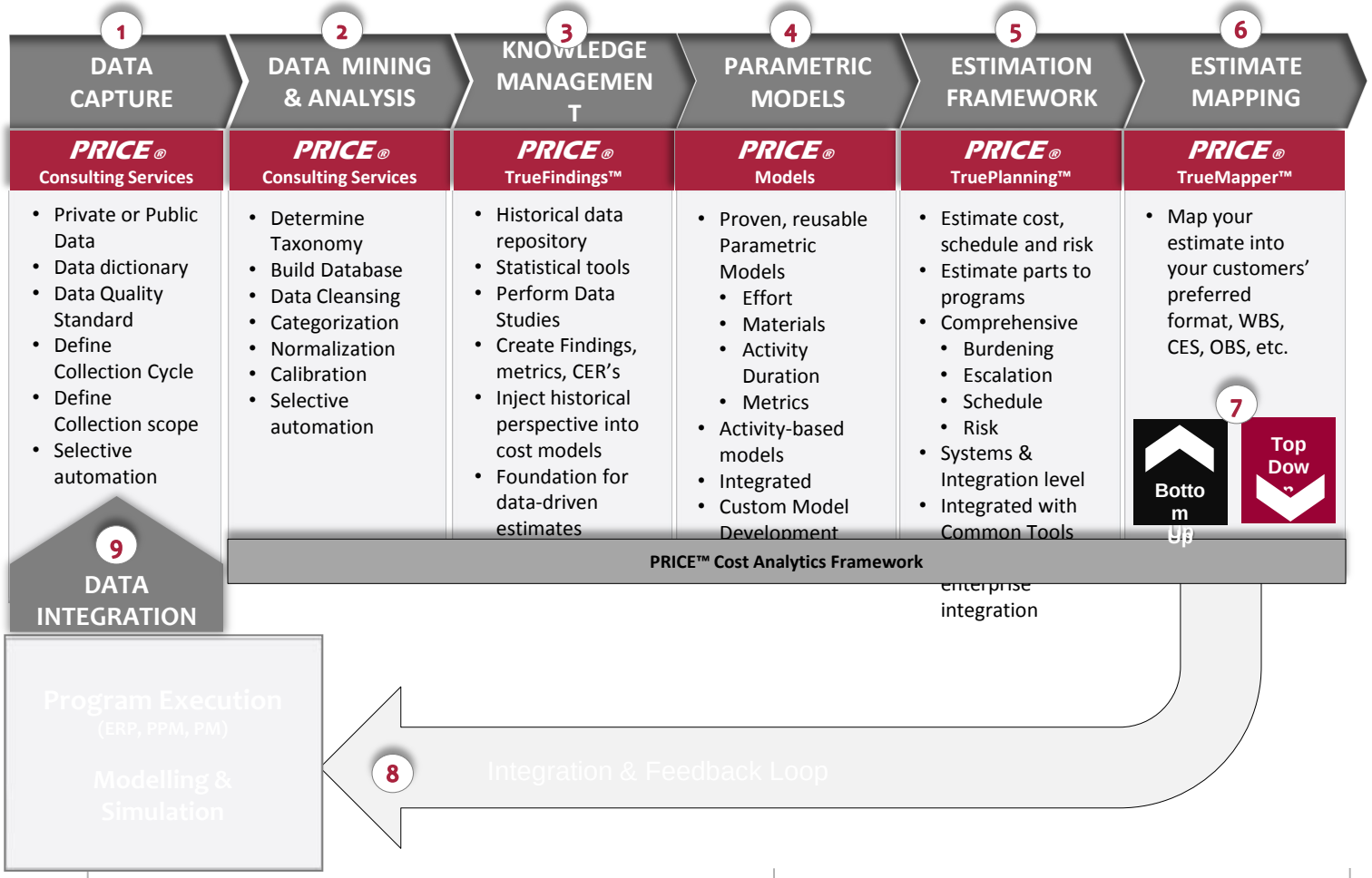
Don't design a "point solution." The solution should be in large part re-usable across programs, PEO's and/or Departments.

The Strategy



THE SOLUTION.

PRICE® Cost Analytics -> Data-Driven Estimation



Data Capture - Overview

- Integrated Product Team (IPT) developed
  - PRICE, Vendor A, Vendor B, PEO STRI, PM CONSIM
  - Process of growth and trust
  - Excellent collaboration
- Data Item Dictionary (DID)
  - What data to collect
  - How often to collect it
  - A clear understanding of the data and potential uses
  - How to align project specific data to more general categories (across multiple contractors)
- Software Resource Report (SRR) – Commended by DASA-CE
- Requirement added to Contract Deliverable Requirements List (CDRL) making data collection a contractor requirement

Data Capture - Overview

- Semi-automated Excel Workbook
  - Skill hours (Resource Effort) from the contractor reporting system
  - Provided to the program office by contractors and summarized into consolidated report
- USC CodeCount®
  - SLOC count based on logical lines of code as defined by the University of Southern California (USC) Code Counting Tool
  - Code counts are automated using the USC Code Counting Tool and a PRICE Systems provided Excel-based Companion App
- Collection of the appropriate amount of data necessary to provide defendable cost estimates based on historical data
- Identify and validate the collection process
  - DRAFT SRR presented to IPT and **worked together** to minimize impact and maximize quality

Data Capture – Software Resources Report

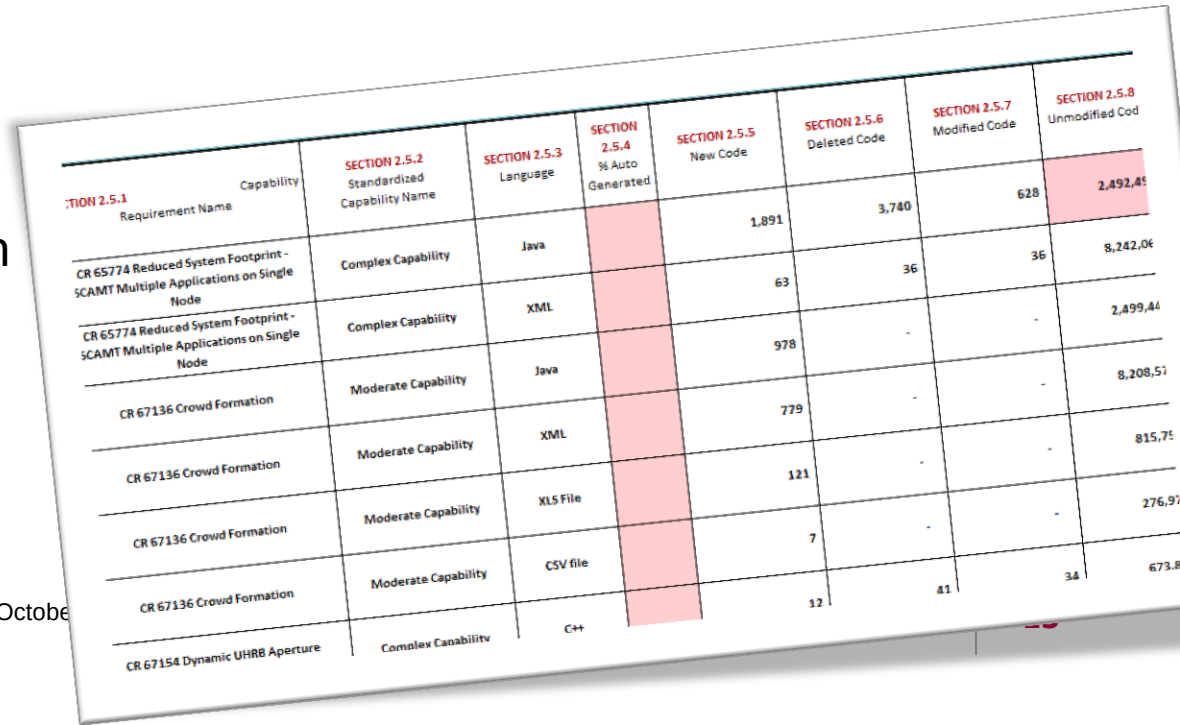
Software Resources Report developed to integrate and aligned with output of code counting tool and automate activity & resource mapping processes

Global Inputs (Program & Organization)

- 1.1.Release context and development organization
- 1.2 Product Release and Development Description
- 1.3 Activity and Resource Mapping
- 1.4 POC Information

Build Report Template

- 2.1 Build ID Information
- 2.2 Product Build Description
- 2.3 Development Resources
- 2.4 Requirement Reporting
- 2.5 Product Size Reporting
- 2.6 POC Information



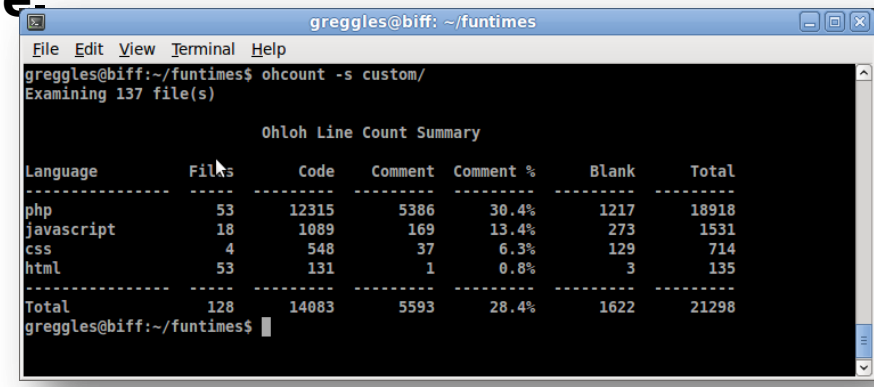
Requirement Name	Capability	SECTION 2.5.2 Standardized Capability Name	SECTION 2.5.3 Language	SECTION 2.5.4 % Auto Generated	SECTION 2.5.5 New Code	SECTION 2.5.6 Deleted Code	SECTION 2.5.7 Modified Code	SECTION 2.5.8 Unmodified Cod
CR 65774 Reduced System Footprint - SCAMT Multiple Applications on Single Node		Complex Capability	Java		1,891	3,740	628	2,492,49
CR 65774 Reduced System Footprint - SCAMT Multiple Applications on Single Node		Complex Capability	XML		63	36	36	8,242,06
CR 67136 Crowd Formation		Moderate Capability	Java		978	-	-	2,499,44
CR 67136 Crowd Formation		Moderate Capability	XML		779	-	-	8,208,57
CR 67136 Crowd Formation		Moderate Capability	XLS File		121	-	-	815,75
CR 67136 Crowd Formation		Moderate Capability	CSV file		7	-	-	276,97
CR 67154 Dynamic UHRB Aperture		Complex Capability	C++		12	41	34	673,8

Data Capture - Automation

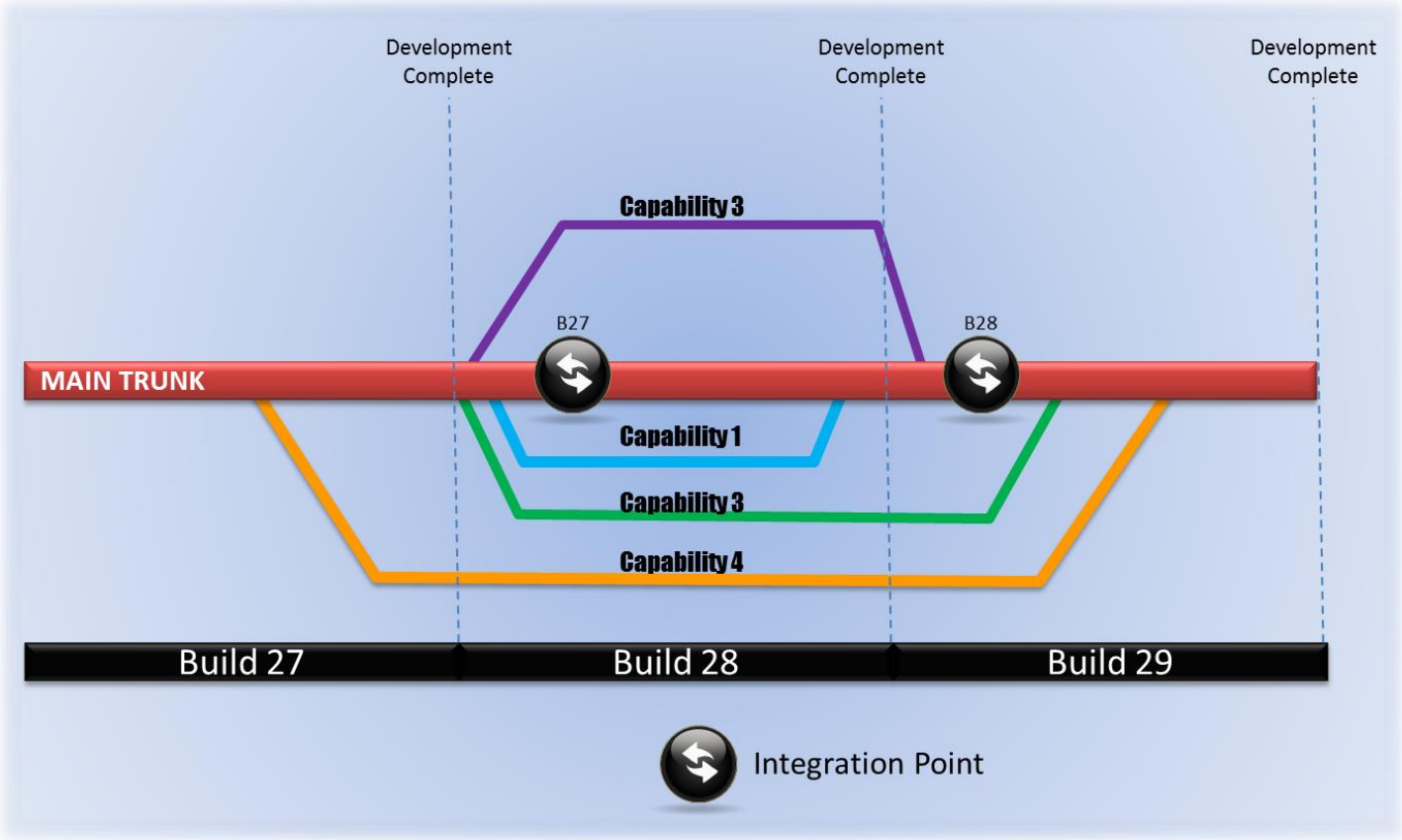
Creation of **automated** code counting solution by wrapping USC's Code Counting tool with Excel

Unified Code Count (UCC)

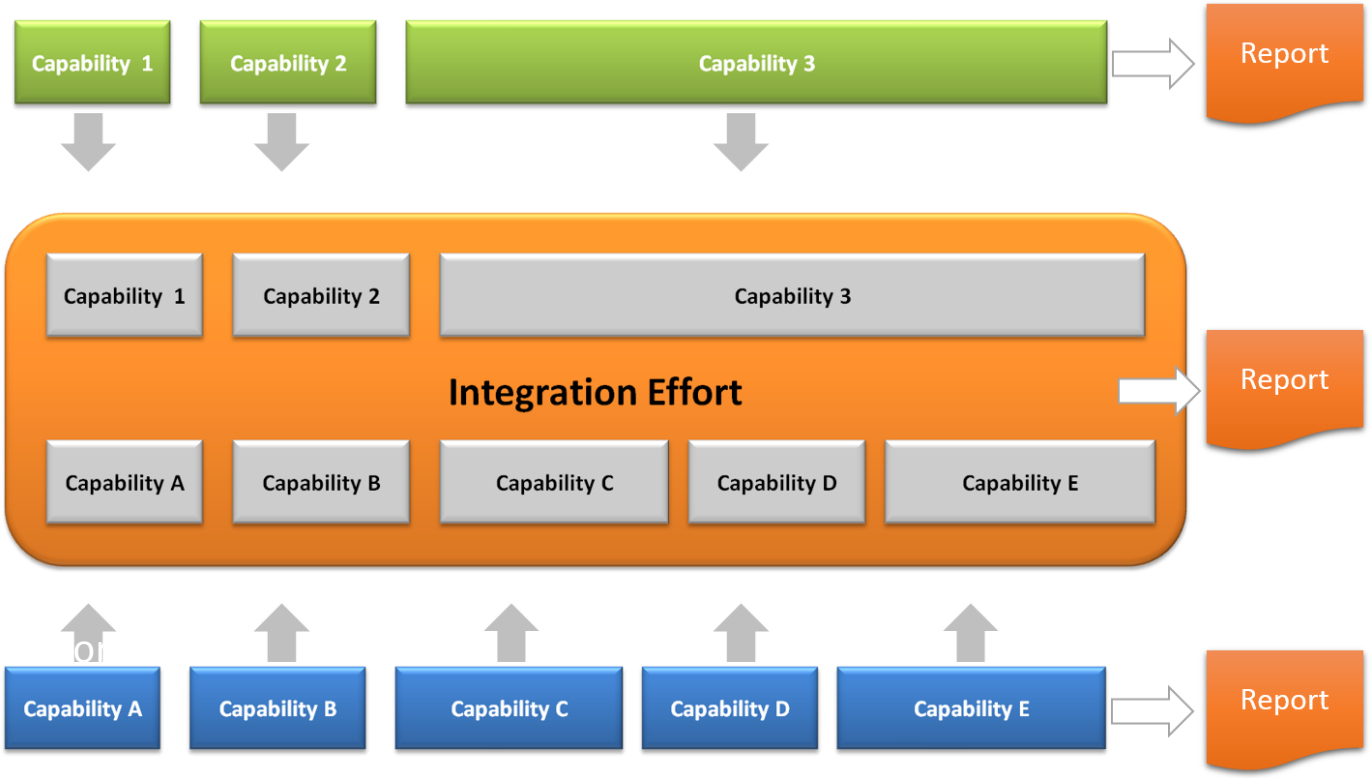
- Free code counting tool developed by University of Southern California Center for Software Excellence (USC-CSE)
- Implements popular code counting standards
- Supports over 21 software languages and performs source differencing
- **Key to identify new, deleted, modified and reused code base by capability by language.**



OneSAF Complexity Creates Challenges



Reporting Strategy for Maximum Benefit



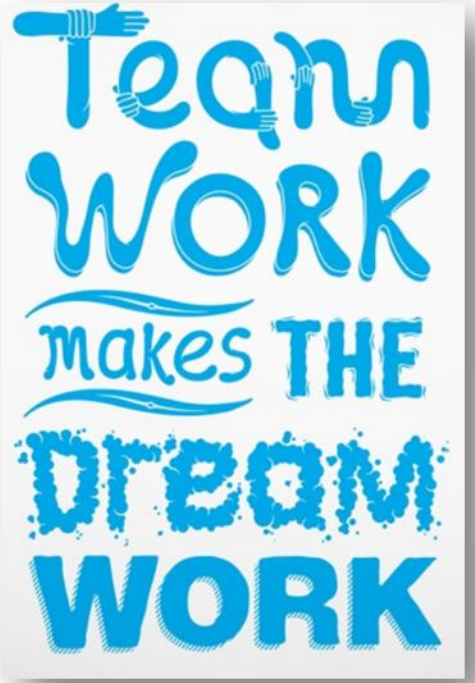
Data Mining & Analysis

- Taxonomy included metadata to align with PRICE® Software Model
  - Program attributes
  - Organization attributes
  - Development team attributes
- Development Effort captured by Activity and Resource
- Normalization guidelines developed & applied
- Calibration Companion helps
  - Automate some of the normalization and calibration of the data
  - Ensure consistency in the process
  - Organizational Productivity
  - Functional Complexity by capability by language
- Clear and concise documentation of the cost research process ensures that the process is transferrable and repeatable.

Data Collection - Lessons Learned

Entire team needs to understand motivation for data collection

- Team building and relationship creation are extremely important to successful data collection
- Alleviate contractor concern about being 'measured' or misuse of data
- Facilitate determination of data collection targets
- Need buy in from the data collectors



Data Collection - Lessons Learned

Automation is key to success

- Creates consistency
- Creates efficiency
- Reduces impact on contractors
- Promotes harmony
- Only means to handle such large code counts / bases
- Facilitates normalization and enforces normalization guidelines

Data Collection - Lessons Learned

Communication, teamwork and building trust are paramount

Transparency builds Trust

(Entire team needs to understand motivation for data collection)

Trust enhances Communication

(Alleviate contractor concern about being 'measured' or misuse of data)

Communication allows Flexibility

(Negotiation of what can be collected)

Flexibility allows Consensus

(Facilitate determination of data collection targets)

Consensus provides opportunity to move forward

(Need buy-in from the data collectors)

Business Impact

Qualitative Benefits:

Efficiency – faster cycle time to gather data and estimate costs

Compliance – valid, defensible software cost estimates compliant with ODASA-CE requirements for calibration and validation

Quality – standardized methodology across PEO STRI domains keeps the level of estimates at the highest quality possible based on local historical data

Credibility – PRICE® brings 40 years of credibility to the table and TruePlanning® generates defensible estimates based on historical data mined in-house

Accuracy – improved accuracy of cost estimates and funding requests

Improved contractor software data collection process

Business Impact

Quantitative Benefits:

- Program cost savings of over $90M indicated by pilot
  - Across six years – life cycle usually full operational capability +20
  - Using only a 15% reduction in growth factor – actual reduction higher
  - Pilot looked at only eight software-intensive programs
- Cost savings on program life cycle costs significantly reduced
- Cost savings can be reinvested in new technology and to reduce funding requests
- Revenue generation increases as PEO STRI lowers cost to take on more work
- Effective measurement of the productivity of software development efforts supports creation and defensibility of future pricing/cost estimates.

Q&A SESSION

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