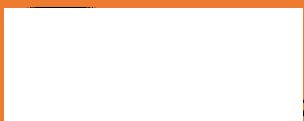




February 14 – 15, 2017

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AGILE CoP
Sandia National Laboratories



Our EVM Adventure

February 15, 2017

Jeff Brooks and Colt Stout
Project Managers
Sandia National Laboratories



History



- SNL was tasked to identify a way to use the current process in place to calculate Earned Value metrics on a project that was already in execution phase
- Our project is \$30M-\$40M per year over 5+ years

Problem Statement



- Does the Agile project management approach, based on current management processes, demonstrate compliance with the intent of EIS-748, Electronic Industries Alliance, guidelines?
- Can this be implemented for “*Our Project*” with our current set of Agile Metrics during execution without massive reorganization?

Assumptions



- Assumptions:
 - All financial data is maintained in Oracle ERP system
 - All work scope with ATP (authorization to proceed) is maintained in Rally.
 - Rally is an Agile application for lifecycle management.
 - Project utilizes SAFe Agile processes

PARCA – has a guide



AGILE AND EARNED VALUE MANAGEMENT: A PROGRAM MANAGER'S DESK GUIDE

JOHN S. MCGREGOR

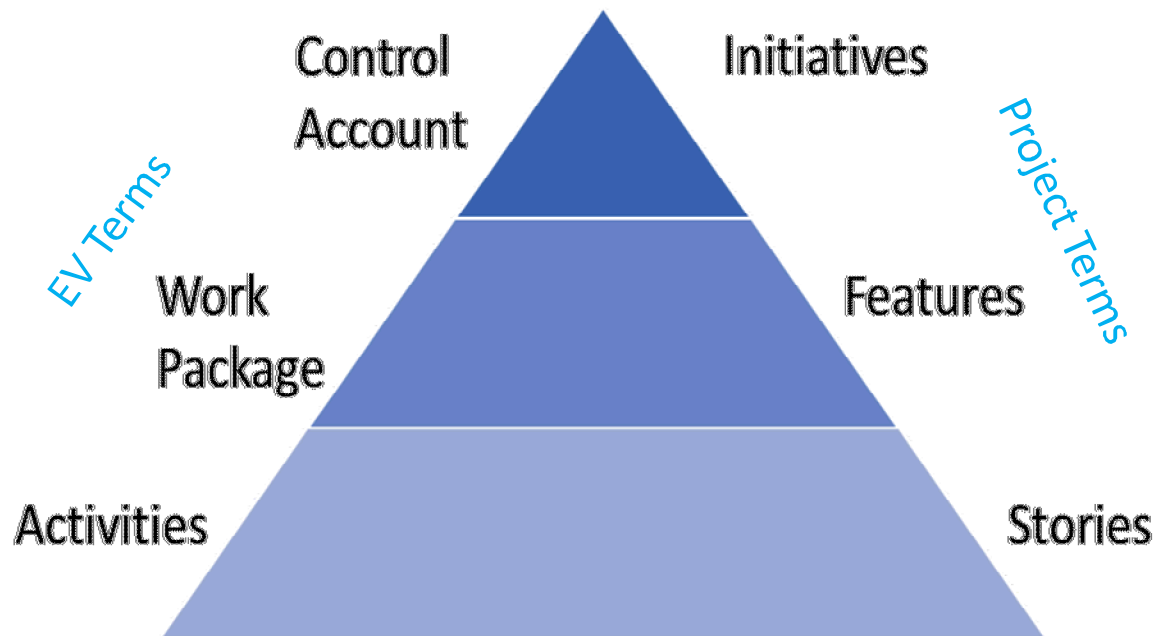
Deputy Director, Earned Value Management
Performance Assessments and Root Cause Analyses



AGILE Overview / Terminology – Work Scope



Each piece of work scope has a unique ID # and ties to the hierarchal structure, demonstrated below.



Mission Value Thread

Large, cross-ART, customer-facing encapsulation of work scope to realize a significant business or mission value

decomposed into

Initiative (i.e. Epics)

Work scope for an ART to realize a deliverable, demonstrable part of an MVT

decomposed into

Feature

Deliverable, demonstrable portions of an Initiative for one Component that are developed within a SPIN

decomposed into

Story

Work scope for a portion of a Feature that a single development team can complete in one Sprint

AGILE Overview / Terminology



- Each SPIN* is a 3 month period aligned to financial quarters
 - SPIN planning is rolling wave planning for the next 3 months.
 - Initiatives are carefully controlled and do not change without customer direction and approval.
 - Features and user stories are planned in each rolling wave planning session (i.e. SPIN planning).

FY	2016											
SPIN	SPIN 3			SPIN 4			SPIN 5			SPIN 6		
Month	OCT '15	NOV '15	DEC '15	JAN '16	FEB '16	MAR '16	APR '16	MAY '16	JUN '16	JUL '16	AUG '16	SEP '16

SPINs are planned for the entire project

AGILE Overview / Terminology – Estimation



Studies show humans are good at *Relative Estimation*. When you put two rocks in front of us, we can tell quite easily which rock is bigger.



- SNL has a defined process for estimating all work. Work is categorized into 5 defined sizes: XS,S,M,L,XL.
- Each size has a defined point system to allow estimation and tracking.

Where we struggle is with telling you precisely how big it actually is (estimating absolutely).

5 Earned Value Guidelines



- **Our Project Meets or Tailors Approaches to:**
 - #1 - Organization
 - #2 - Planning and Budgeting
 - #3 - Accounting Considerations
 - #4 - Analysis and Management Reporting
 - #5 - Revision and Data Maintenance

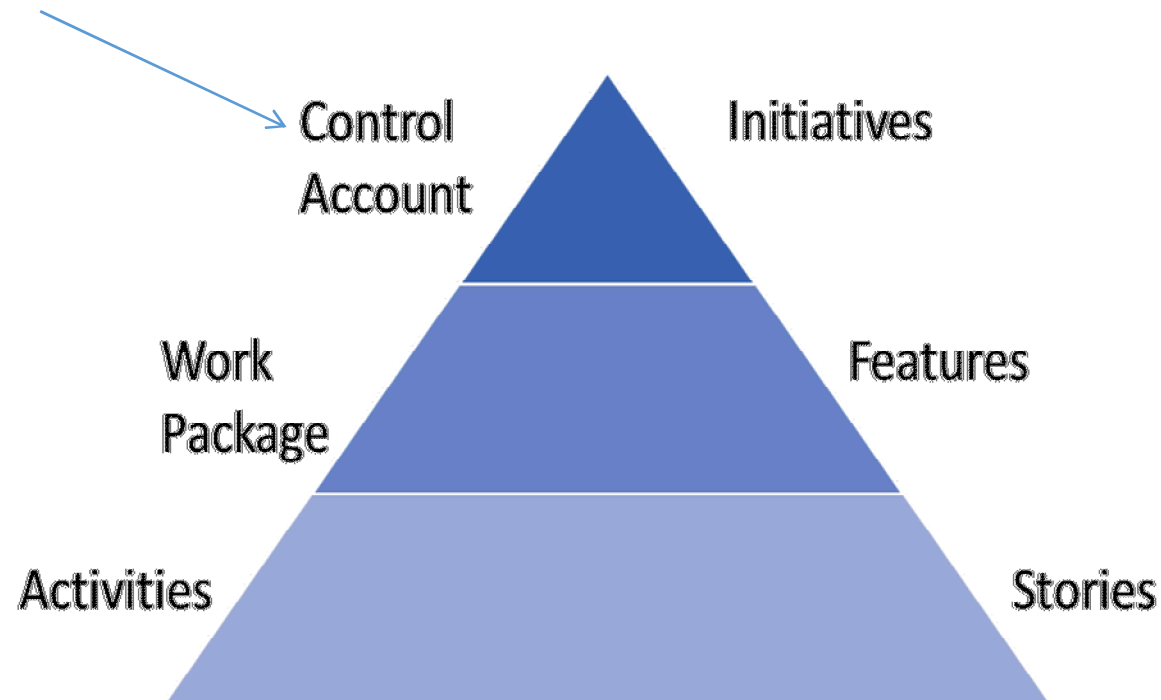
#1 Organization - Work



WBS Structure

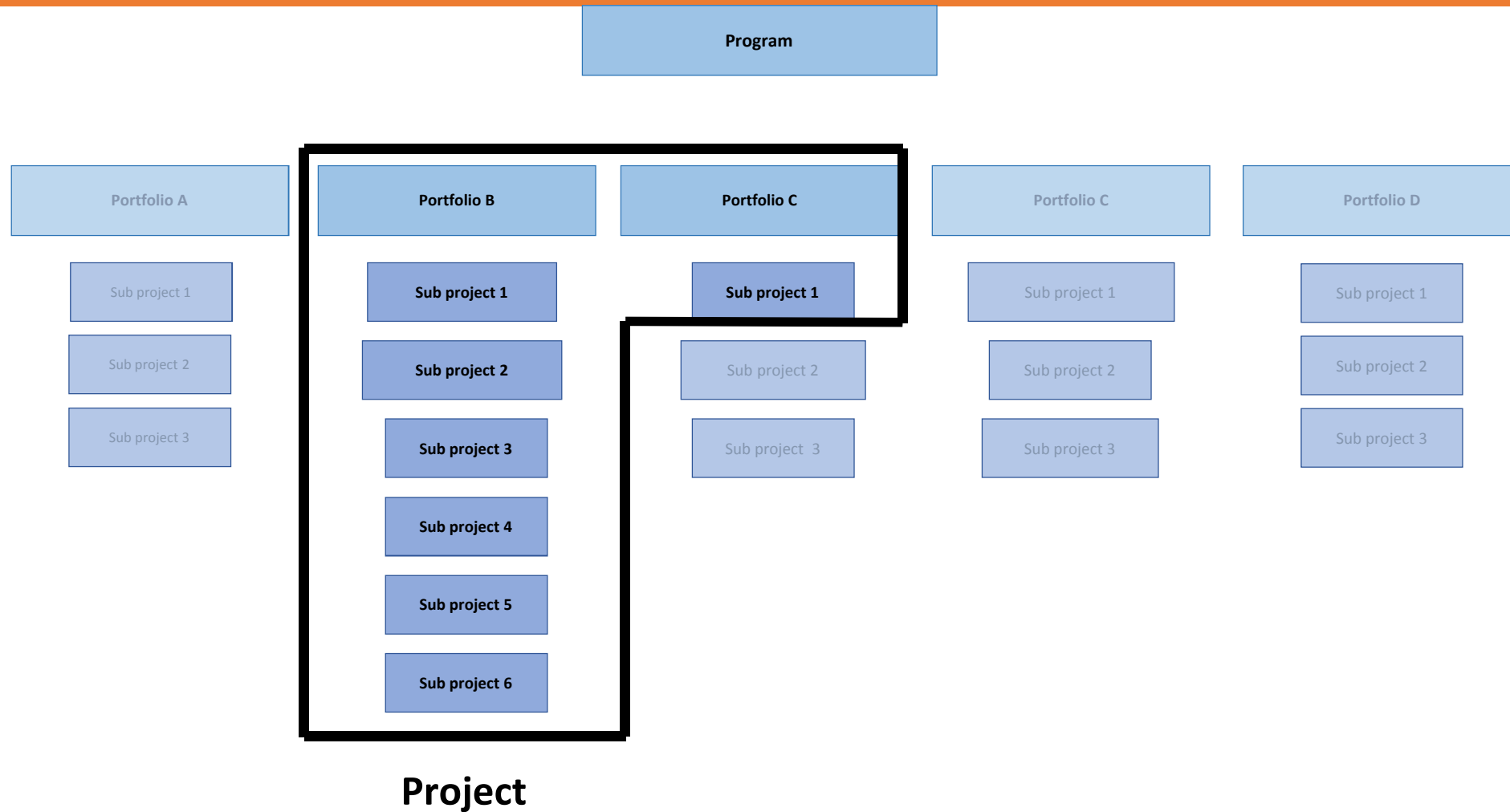
- All initiatives are planned for the project.
- All scope items in the definitive for the project are captured in the initiatives.
- Initiatives are not part of the rolling wave planning process (SPIN).

114 Initiatives



Note: Cost Definitive Estimate had 90 top-level tasks and 779 detailed tasks that are captured in the 114 initiatives.

#1 - Organization - SNL OBS Structure



#1 - Organization – Costs



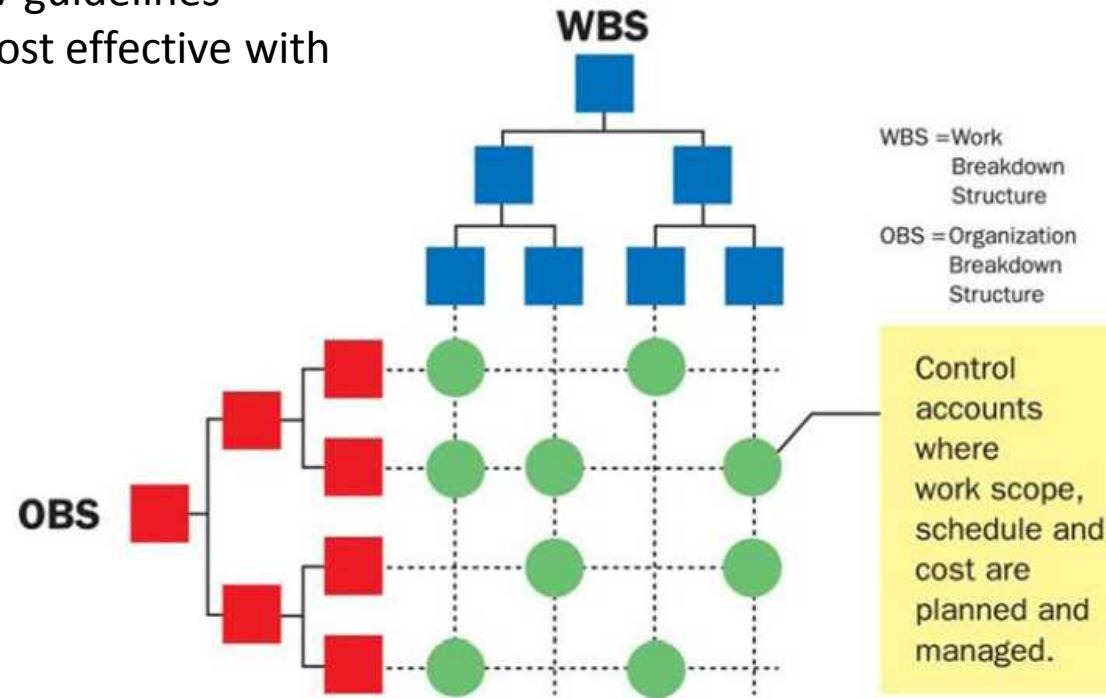
All costs are captured in SNL's financial system

Portfolio	Sub-Project	EAC (Actuals +Forecast)	Baseline -MR	Var
A				
B		\$ 14,075.00	\$ 14,175.00	\$ 100.00
	1	\$ 4,000.00	\$ 4,050.00	\$ 50.00
	2	\$ 1,075.00	\$ 1,050.00	\$ (25.00)
	3	\$ 3,000.00	\$ 3,000.00	\$ -
	4	\$ 6,000.00	\$ 6,075.00	\$ 75.00

#1 - Organization – Mapping OBS to WBS



This is an exemption to EV guidelines because it would not be cost effective with current processes



Agile promotes cross functional teams which makes it cost prohibitive for us to map WBS to OBS.

#1 - Organization – WBS



Costs and work both have a breakdown structure that overlap at the top level

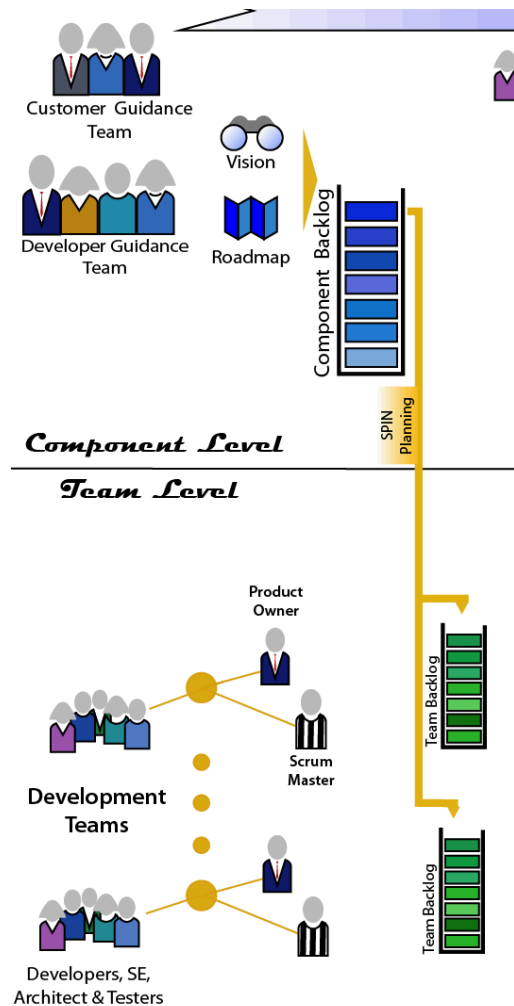
		WBS				
		level 1	level 2	level 3	level 4	Name
		01				Project
Costs			01.01			Core Costs
				01.01.01		Portfolio
					01.01.01.01	Project Name
Work			01.02			Initiative 1
				01.02.01		Feature 1
					01.02.01.01	Story 1
			01.03			Initiative 2
				01.03.01		Feature 2
					01.03.01.01	Story 2

#2 - Planning and Budgeting



Work Planning and Completion

#2 - Planning and Budgeting – Business Rhythm



- Two day, program level, interactive, face-to-face planning event
 - Aligns development with customer objectives
 - Identifies dependencies and fosters cross-team coordination
- All work is ranked. *Higher* ranked items must complete before *lower* ranked items subject to maximum allowed **Work In Process**.
- Teams break features into stories and populate team backlogs
 - Timing and interdependencies can be resolved in real-time
- Team objectives, which include stretch objectives, roll up into objectives for that SPIN
- **All data is documented in Rally**

#2 - Planning and Budgeting – Business Rhythm



- Assigning Work
 - PMT meets **weekly** to rank and clarify Initiatives and Features for upcoming SPINs; Chief Product Owner maintains ranking in Rally with customer input and concurrence.
 - Documented working agreements between Product Owners and developers require highest ranked stories be worked first; status of stories in progress is checked **daily** at stand-ups.
- Accepting Work
 - Working software and tests are demonstrated to **Product Owners** before **stories** are Accepted each **sprint**
 - Working software and tests are demonstrated to the **Chief Product Owner and Customers** before **Initiatives** are Accepted each **SPIN**
 - Chief Product Owner does a review at the end of the SPIN to give an update on actual work versus planned work
 - All results are documented and briefed

#2 - Planning and Budgeting



Budget and Expenditures

#2 - Planning and Budgeting – Business Rhythm



- **Budget**
 - Baseline budget for the project was in the definitive cost estimate
 - Management Reserve is in a separate account and is only used according to established process
 - The Baseline budget is in SNL's financial system and follows a configuration management plan
 - A budget forecast is also tracked in SNL's financial system
 - Current year Budgets are planned down to individual people and captured in SNL's financial system
- **Expenditures**
 - All Expenditures are captured in SNL's financial system
 - Monthly analysis is done and there is a documented process to update budget forecasts based on past actuals
- All information is reported monthly to Customer at PMR

#3 - Accounting Considerations



- SNL financial structure will meet EV requirements
 - SNL financials are CAS & GASB compliant
 - All financial data is stored in Oracle ERP system

#4 - Management and Analysis

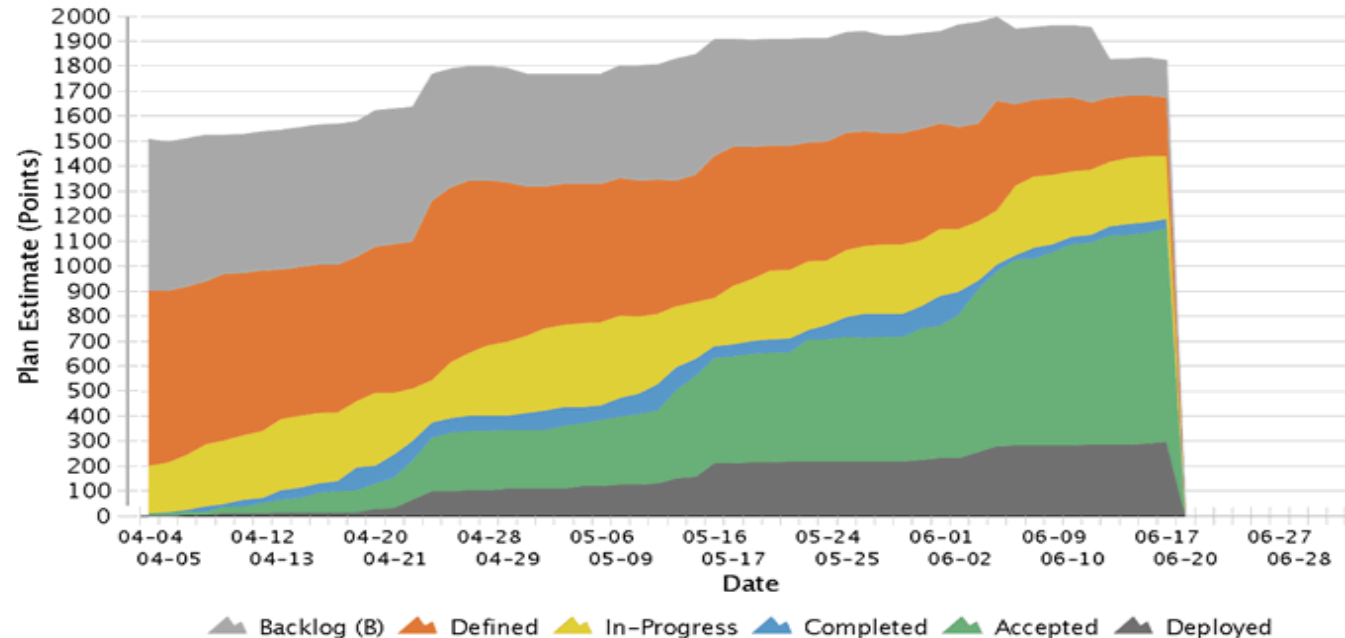


- Monthly Program Management Reviews (PMR) to Customer include Financial Baseline and Actual Costs
- Bi-monthly PMRs add additional items
 - Scheduled Baseline and Actual Work performed
 - Projection of when all Initiatives will be completed
- EV Prototype not being presented but could be reported at PMRs
 - EV data can be reported on the quarterly SPIN cycle and possibly on a monthly basis

#4 - Management and Analysis – Tracking



Release Cumulative Flow Diagram



End of SPIN data
generated by Rally
reported at PMR

- Shows progress of all stories within a SPIN
- Cumulative effort of all teams
- Similar charts are available for all levels of the team hierarchy

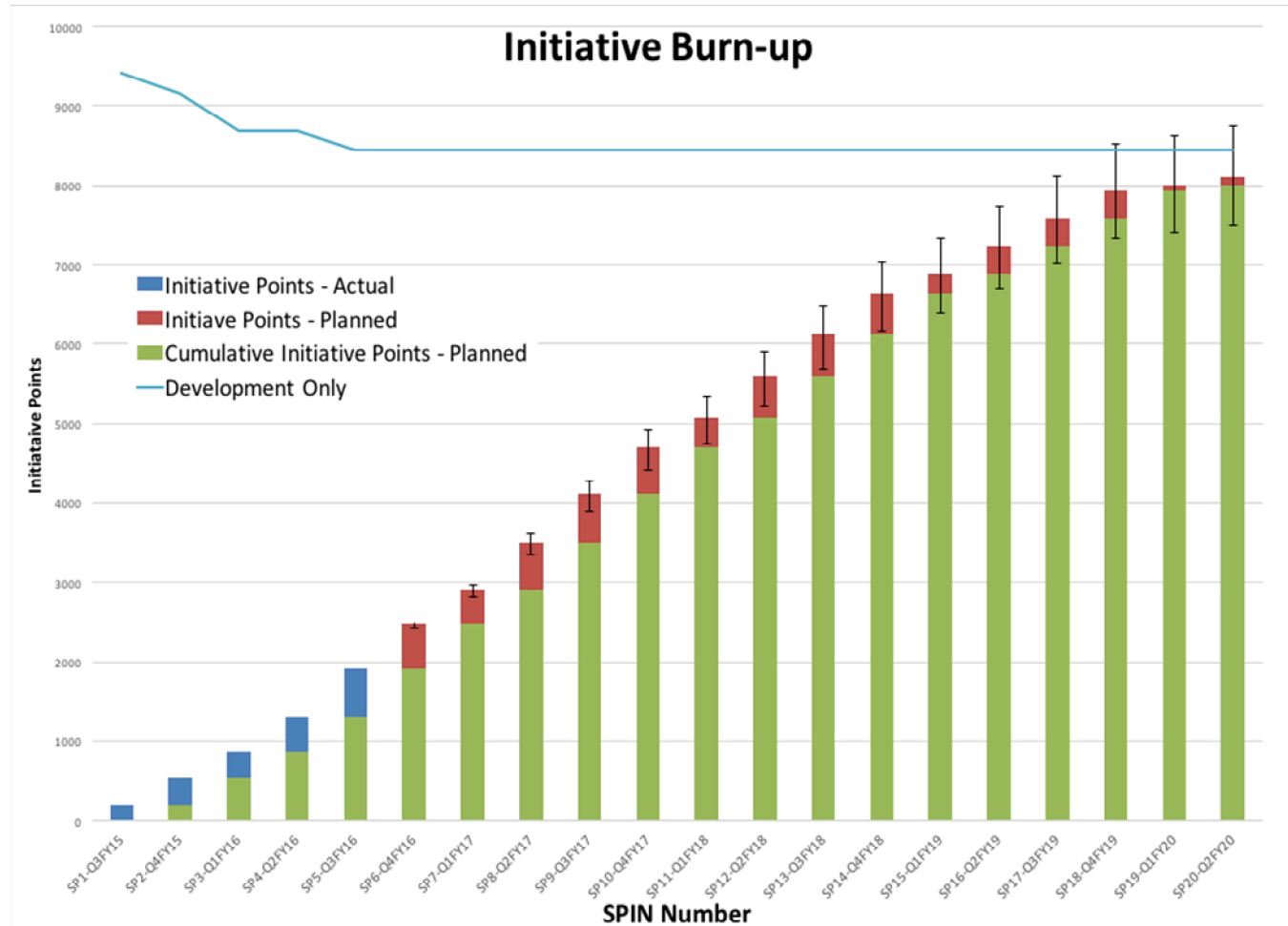
#4 - Management and Analysis – Projecting



- Requirements to forecast completion:
 - Project has all initiatives relative sized for the entire project.
 - Project maps all stories to features to initiatives.
 - The project tracks completeness of initiatives.
 - All work is tracked in Rally.

Forward project how many Initiative Points can be accomplished each SPIN (based on available budget) and predict when the program will complete all the initiatives

#4 - Management and Analysis – Projecting



Presented at
PMR

Milestones can
be added

Error Bars
currently
indicate
available
Management
Reserve to
provide “*What
If*” analyses

#4 - Management and Analysis – EV Calcs



The prototype has data manually entered and all EV calculations are completed in excel

Time	1	2	3	Total
	SPIN 1	SPIN 2	SPIN 3	
Financial				
EAC per spin				
actual costs				
\$ EAC variance per spin (underplan)				
\$ % EAC var. per spin				
Rally Schedule				
Actual Story Points (Track)				
schedule EAC Predicted Story Points				
Actual ASP - Cum Flow Diagram				
point EAC variance per spin (underplan)				
Point % EAAC var. per spin				

Financial and schedule analysis are presented in PMR to Customer. EV calculations are not reported but could be presented at PMRs.

Time	1	2	3	Total
	SPIN 1	SPIN 2	SPIN 3	
Financial				
EAC per spin				
actual costs				
\$ EAC variance per spin (underplan)				
\$ % EAC var. per spin				
Rally Schedule				
Actual Story Points (Track)				
schedule EAC Predicted Story Points				
Actual ASP - Cum Flow Diagram				
point EAC variance per spin (underplan)				
Point % EAAC var. per spin				
work per dollar				
planned \$\$ per point				
actual \$\$ per point				
average point per spin				
EVM				
basic calculations				
PV	= (F7)			\$ -
EV (% total point EAC var. * Total EAC)	= (F7*F24)+F7			\$ -
EV = the authorized budget for work actually completed. Called BCWP				
AC	= (F8)			\$ -
AC = the costs actually incurred in completing the work actually achieved. Called ACWP				
calculating variance and index values				
SV = (EV-PV)				
pos is good a neg number is bad				
\$2,191 K behind what we should have achieved by now				
CV = (EV-AC)				
pos is good a neg number is bad				
The work that we have actually achieved cost us \$102K more than expected				
SPI = EV/PV				
above 1 good below 1 bad				
only achieving 92% of the amount of work that we should have done				
CPI = EV/AC				
above 1 good below 1 bad				
spending money 1.00 effectively as planned				

Baseline vs Actuals data

PV, EV, AC calculations



#4 - Management and Analysis – EV Calcs



SV, CV, SPI, CPI calculations

calculating variance and index values				
SV = (EV-PV)				\$ (2,191.15)
pos is good a neg number is bad				
\$2,191 K behind what we should have achieved by now				
CV = (EV-AC)				\$ 102.33
pos is good a neg number is bad				
The work that we have actually achieved cost us \$102K more than expected				
SPI = EV/PV				0.921161826
above 1 good below 1 bad				
only achieving 92% of the amount of work that we should have done				
CPI = EV/AC				1.004013132
above 1 good below 1 bad				
spending money 1.00 effectively as planned				

#5 - Data Maintenance and Revision



Maintenance

- All schedule data is stored in Rally (version controlled, access controlled, automated)
- All financial data is stored in Oracle ERP system (version controlled, access controlled, automated)

Revision

- Original scope, schedule, and budget baseline is in the Definitive
- The Project follow a Baseline Change Request (BCR) process to document any changes to budget, scope, or schedule

Quality

- Software demos (with accompanying tests) are completed to ensure product meets specifications

#5 - Data Maintenance and Revision



When is done “done”

- V&V documented and tracked
- End-to-end demonstrations at the end of SPINs
- Robust acceptance criteria documented in initiatives
- Automated test reports and regression suites

- ... All Agile Best Practices!

Currently Helping Us Manage Our Project



- Burn up charts help senior management at Sandia and our customer's organization understand if we have enough budget to meet scope and time commitments
- Trending over time to determine if we are gaining or losing ground
 - Quickly see weekly, monthly, annual patterns
- Explore *what-if* scenarios to determine how changes to budget, timelines, or scope will impact the project
 - Very useful to give quick turnaround answers to possible budget cuts, scope changes, timeline shifts

Lessons Learned



- Training with your customers/sponsors/users
- Acknowledge that “.COM” and “.GOV” can be different and make changes
- Generate useful artifacts and share them with everyone (i.e. Transparency)
- Start with something simple, and grow the capability

Next Steps



- Evaluating opportunities to track at lower level
 - "Is the Juice worth the Squeeze?"
 - Team and component level insights
 - Tracking and identification of overhead people and activities
- Fully automated report generation across Rally and Oracle

Best Practices



- Plan out the entire project
 - Where is the end and how do we get there?
 - Use relative sizing and continually refine the estimates
 - Identify dependencies and track them in your tool
 - Visibly show the *cut line*
- Line up financial and PI boundaries
- Automate, Automate, Automate
- Kaizen
- Pick mature tools and learn them

Conclusion



- Identify what helps **you** manage your project and collect just enough data to generate the appropriate artifacts
- Write down what you are doing so you can defend it to others
- Start small and grow your processes

Back up





Next: Agile EVMS Handbook



Agile EVMS Handbook

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February 14 – 15, 2017

Agenda

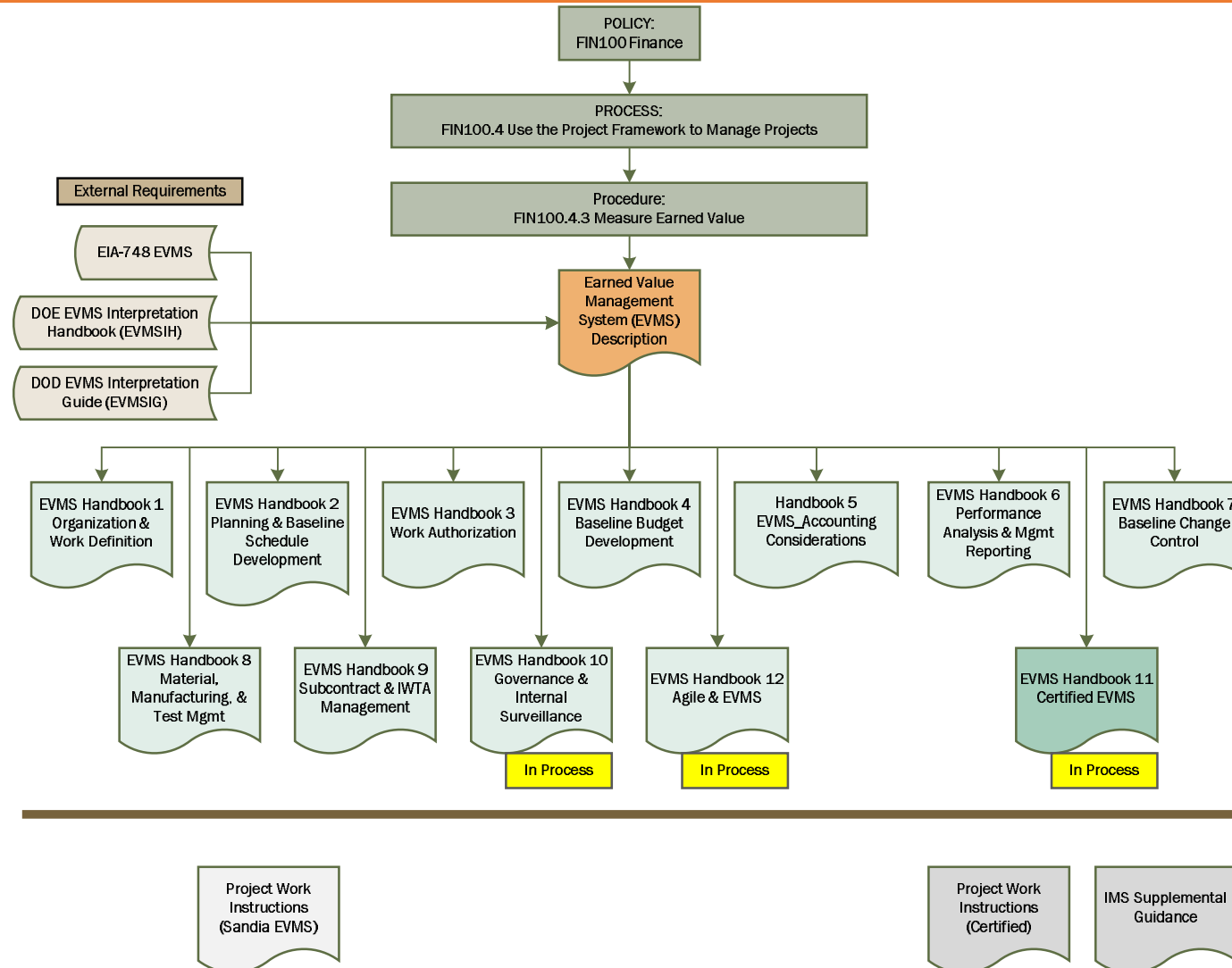


- Corporate EVMS Documentation
- EVMS Handbook 12 – Agile and EVMS
 - Status
 - Major Components
 - Work Definition
 - Planning & Scheduling
 - Budgeting
 - Accounting
 - Analysis and Management Reporting
 - Change Management



Corporate EVMS Documentation

Corporate EVMS Documentation



Objectives



- Standardization and consistency of EVMS processes across Sandia
- Corporate sponsored EVMS tool suite
 - Primavera and MS Project – Scheduling
 - Cobra – EVMS Engine
- Address inconsistent direction from customers



EVMS Handbook 12 Agile and EVMS

Why?



- Establish standard process for implementing EVMS on Agile projects consistent with industry best practices
- Ensure that implementation of EVMS on Agile projects does not impede project flexibility

Agile EVMS Handbook - Status



- Released to Agile SMEs for review and comment – 1/13/17
 - Comments received 1/20/17
- Release to EV SMEs for review and comment – 2/24/17
- Comments incorporated – 3/30/17
- Release Agile EVMS Handbook – 4/7/17

Agile EVMS Handbook - Resources



- National Defense Industrial Association (NDIA) Integrated Program Management Division (IMPD) *An Industry Practice Guide for Agile on Earned Value Management Programs*
 - Released March 2016 by Agile Subgroup
 - V2 to be released March 2017
- DoD Performance Assessments and Root Cause Analyses (PARCA) *Agile and Earned Value Management: A Program Manager's Desk Guide*

Key Assumptions



- Basic understanding of key EV and Agile terminology
- Project controls staff will take lead in EVMS implementation on Agile Projects

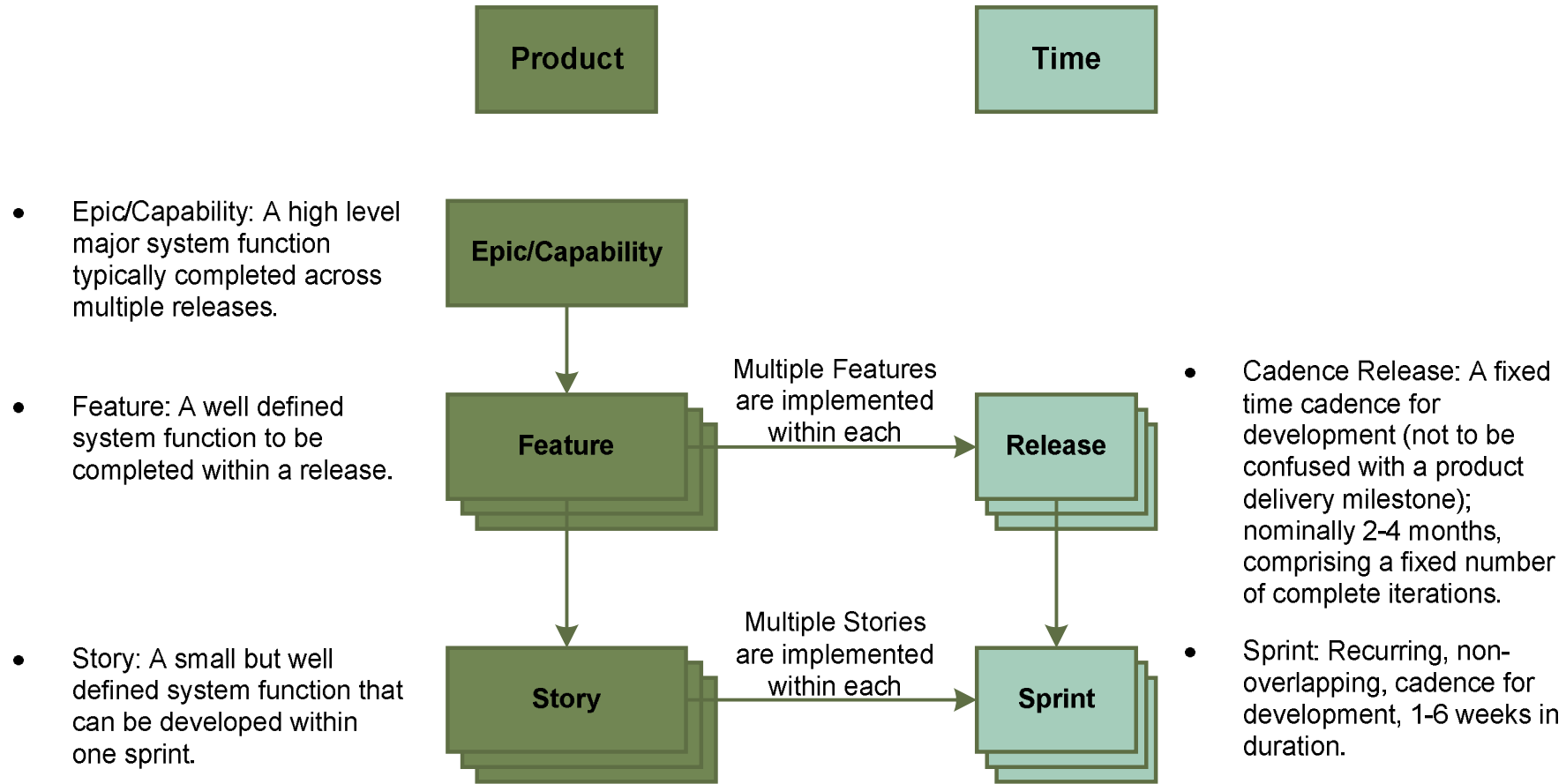
Handbook Structure



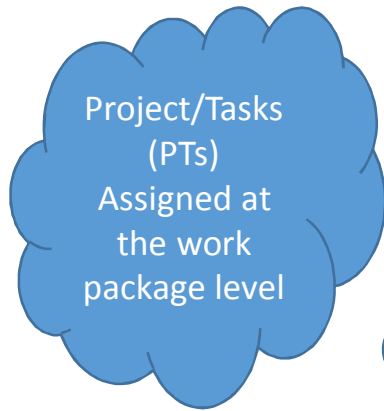
- Requirements and Responsibilities
- EVMS Process Areas
 - Work Definition
 - Planning and Scheduling
 - Work Authorization
 - Budget Development
 - Accounting Considerations
 - Analysis and Management Reporting
 - Change Management
- Work Instruction Requirements
- Definitions



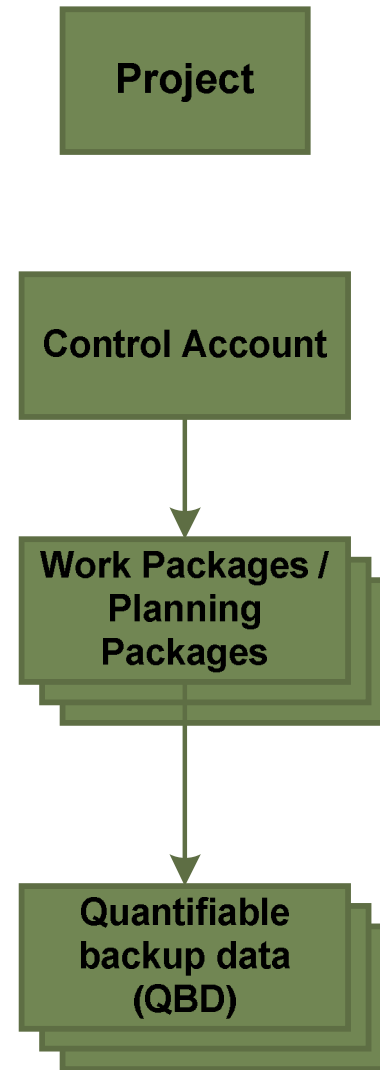
Integration: Agile Hierarchy



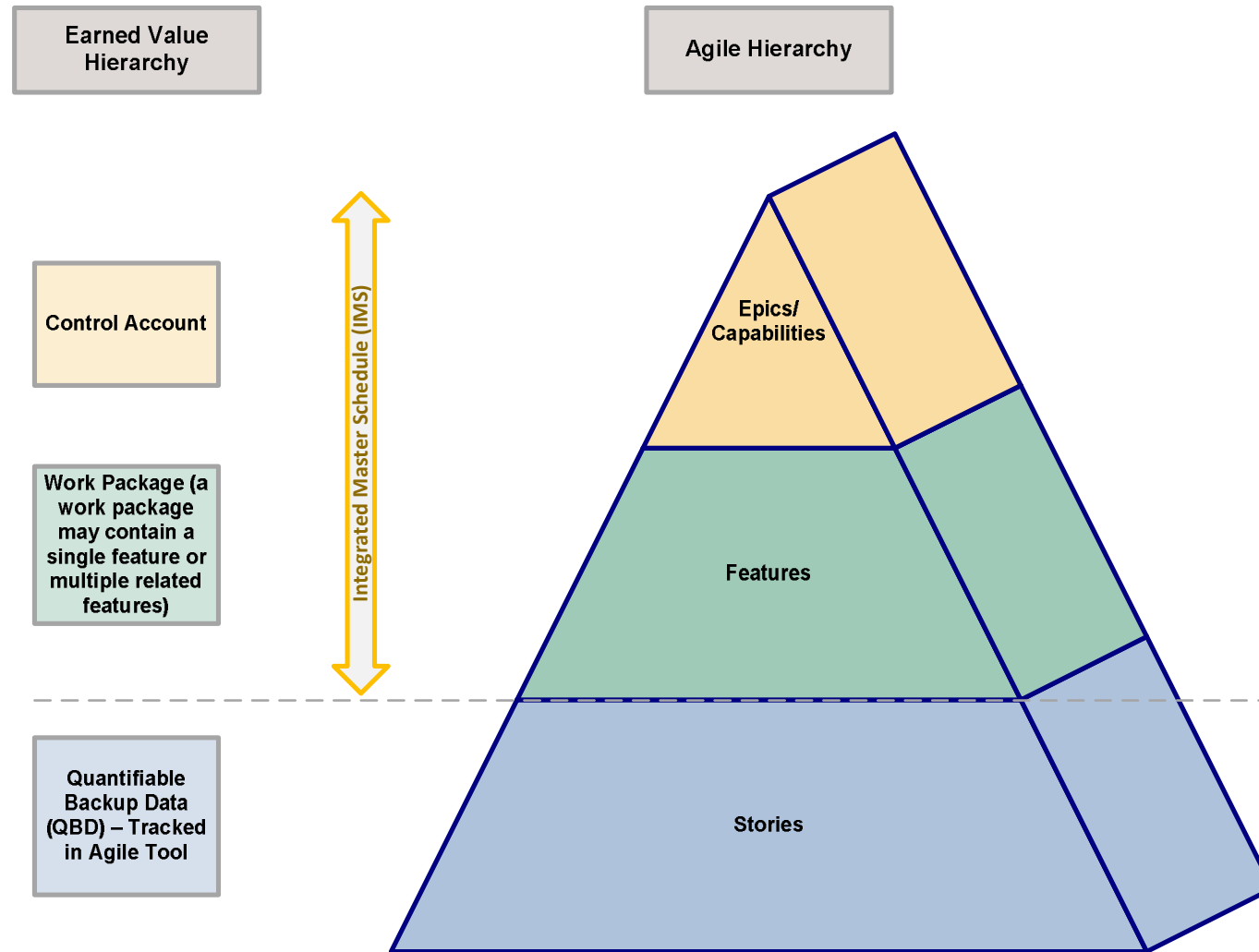
Integration: Earned Value Hierarchy



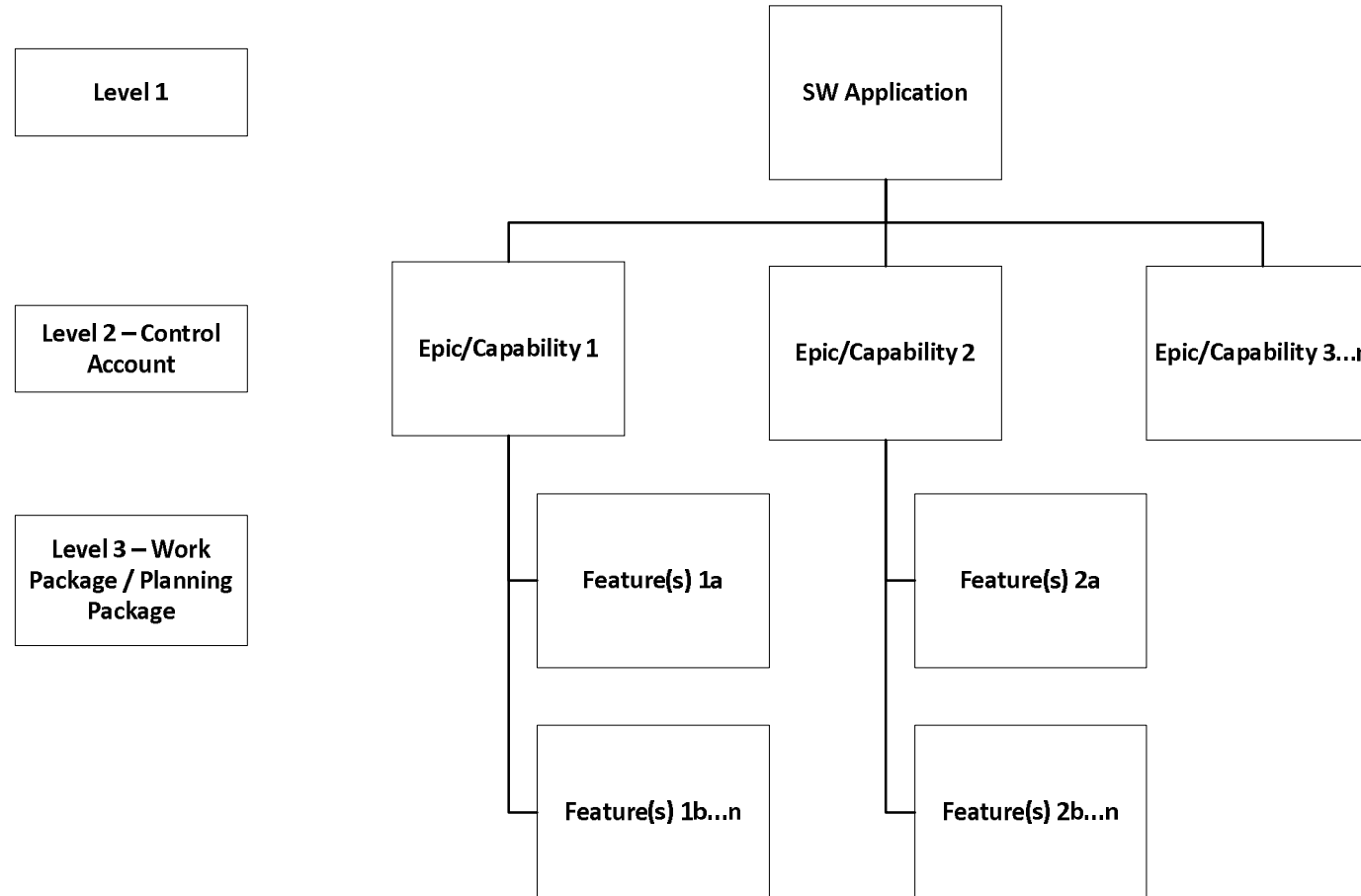
- Control Account: Integrates budget, scope, and schedule for single WBS element assigned to a single organizational unit (OBS) – development team
- Work package: Near term work scope, schedule, and budget
- Planning package: Far term work scope, schedule, budget
- QBD: Objective measures of performance to assess performance within the work package



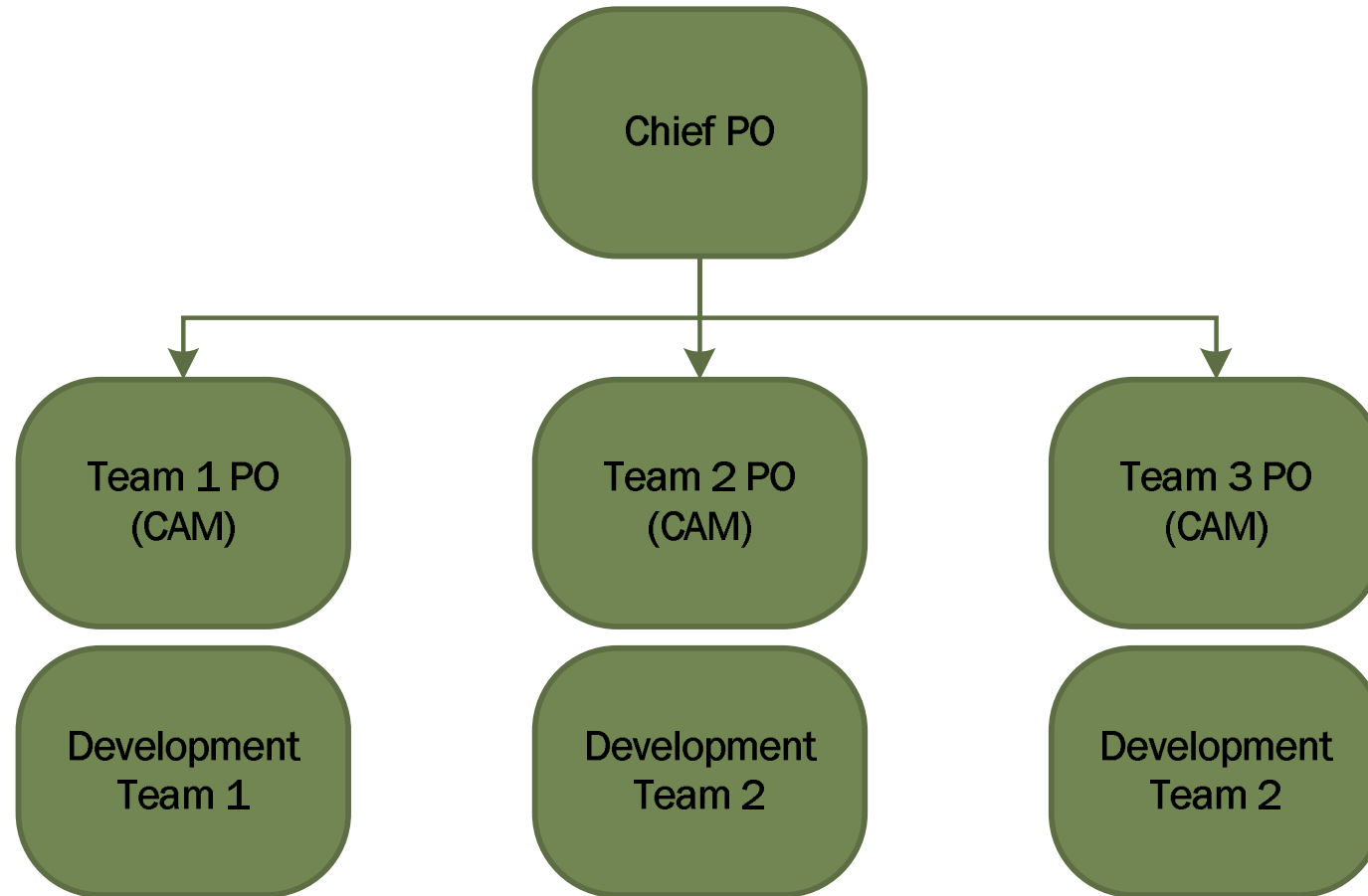
Integrated Hierarchies



Work Definition: Agile Work Breakdown Structure (WBS)



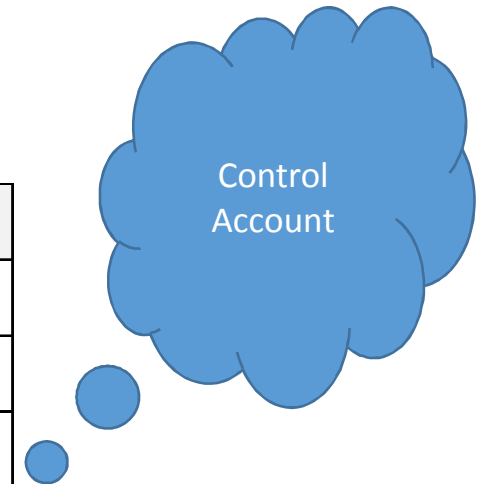
Work Definition: Agile Organization Breakdown Structure (OBS)



Work Definition: Control Accounts



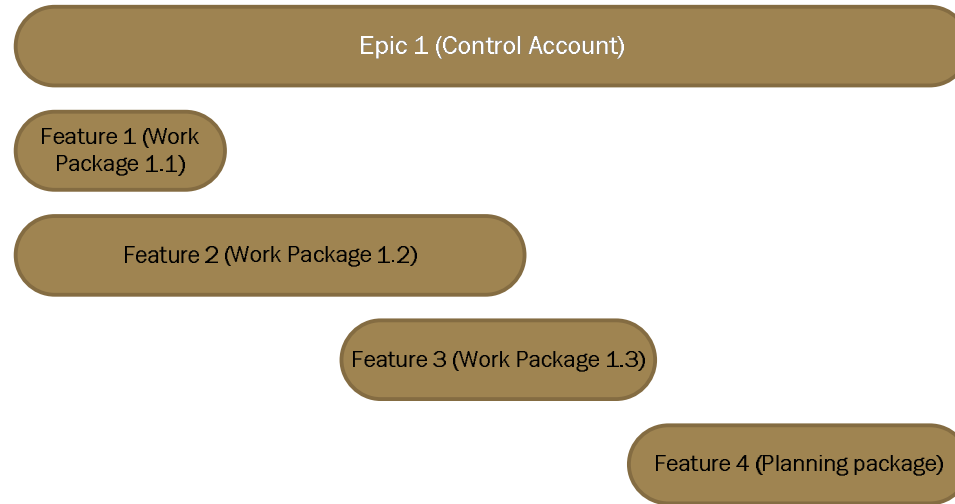
Responsibility Assignment Matrix (RAM)			
	Team 1	Team 2	Team 3
Epic/Capability 1		\$200,000	
Epic/Capability 2	\$500,000		
Epic/Capability 3			\$350,000



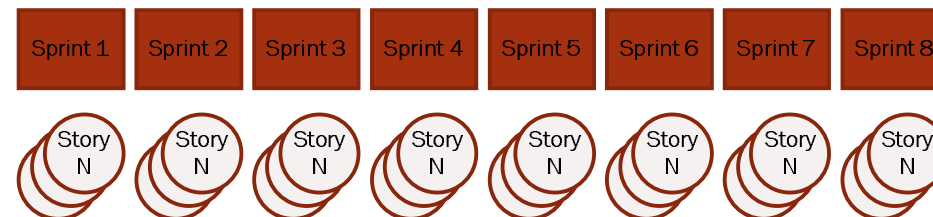
Planning & Scheduling: Integrated Master Schedule (IMS)



IMS (EV)



Agile



Planning & Scheduling: Agile IMS



- Work must be scheduled for entire duration of project
- Relationships between Features (work packages and planning packages) must be established for Critical Path development
- Work package durations may (will) be longer
- More activities will run concurrently
 - Start to start vs Finish to start relationships

Budget Development



- Use size and productivity estimates along with staffing plans to develop time phased budget baseline

Accounting



- One for one relationship between P/T and Feature (work package)
 - Not unique to Agile but new to Sandia

Analysis & Management Reporting



- Claiming earned value (EV)
 - EV based on story points
 - To apply earned value, story points must be normalized during the initial Release and Sprint planning
- Earned value techniques (EVT)
 - 50/50
 - 0/100
 - % complete

Analysis & Management Reporting



- Variance analysis
 - Ensure that variance information generated by the EVMS engine is consistent with information provided by the Agile tool
- Estimates at completion (EAC)
 - Utilize Remaining Effort Hours as basis for EAC
- Use standard EV reports in conjunction with Agile reports

Change Management



- Streamline and document change process
- Freeze period
 - Standard Sprint duration
- Changes to Stories not under formal change control – if they are maintained in the Agile tool and not in the IMS
- Rolling wave planning is consistent with the Release Planning cycle
- Productivity improvements will be reflected in updates to the estimate at completion – not updates to the budget
- Changes to project scope such as addition or deletion of capabilities/features will require a formal change

Conclusion



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