

The Architecture and Design of a Corporate Engineering Data Repository

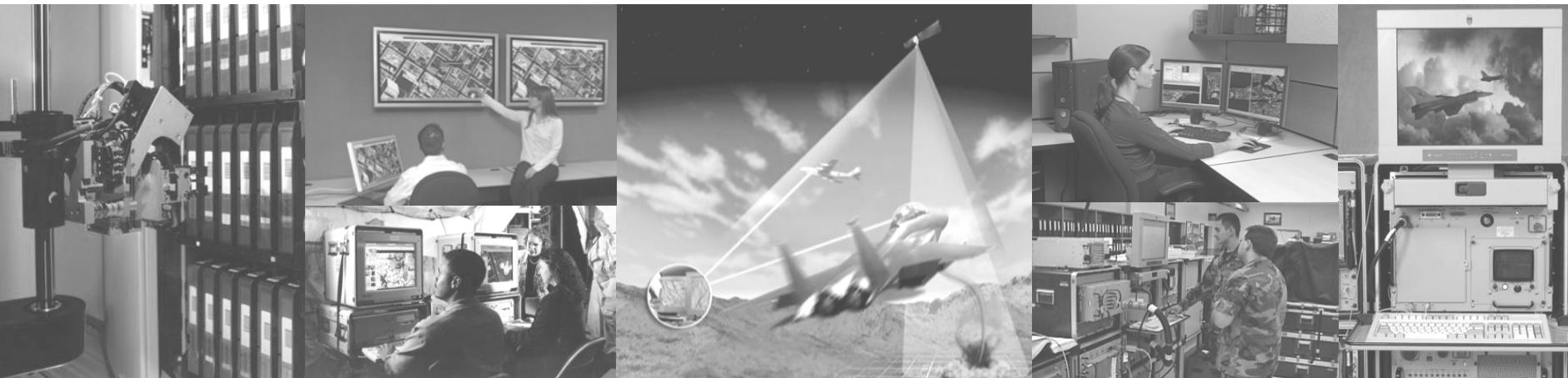
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Welcome to Rome!

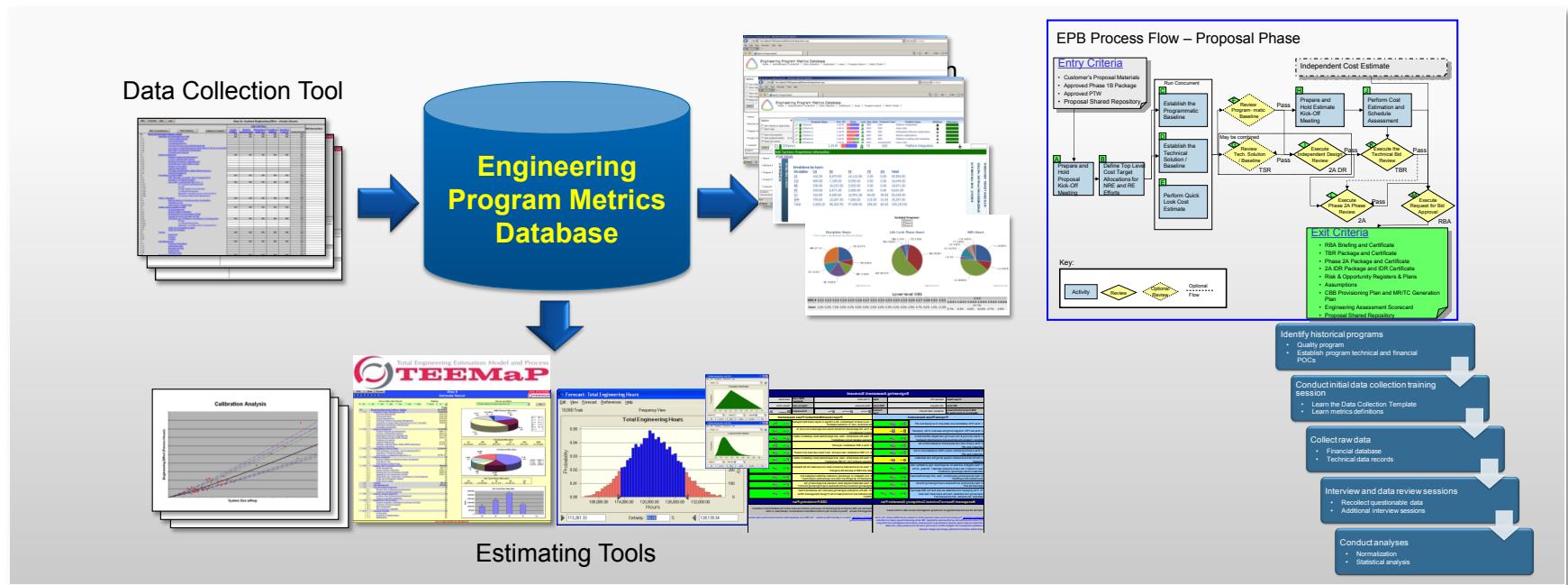


Outline

- What is the Engineering Data Repository?
- CONOPS
- Architectural and Design Considerations
- Use Interfaces
- Data Collection Process
- Lessons Learned

What's the Engineering Data Repository?

- A suite of tools, comprised of
 - Database of historical program data
 - Data query portal
 - Tools
 - Process assets
 - Training



What's in the Repository?

Historical Data:

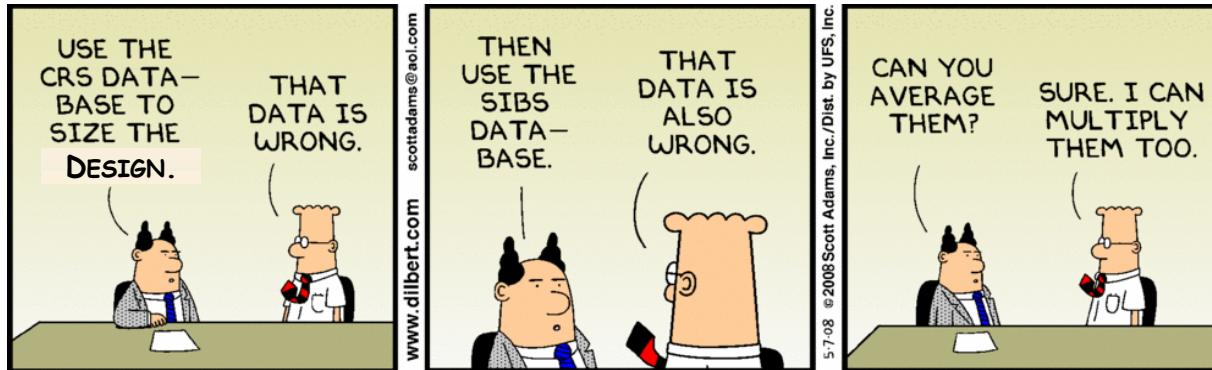
- Project metadata
 - Project and program level descriptions
 - Attributes and characteristics
- Engineering financial actuals
 - Actual (historical) efforts
 - Estimated (in-execution) efforts
- System-level design metrics, e.g.,
 - Requirements
 - Interfaces
 - Algorithms
 - System complexity factors
- Subsystem/component-level metrics, e.g.,
 - SLOC counts
 - SWaP
 - Drawing counts
 - Supportability

Tools and Processes:

- Data search and query interfaces
- Engineering (parametric) estimating tools
- Data collection and analysis tools
- Procedures, templates, checklists
- Training materials, videos
- References

What's Motivation?

- The dilemma we ran into in the past...

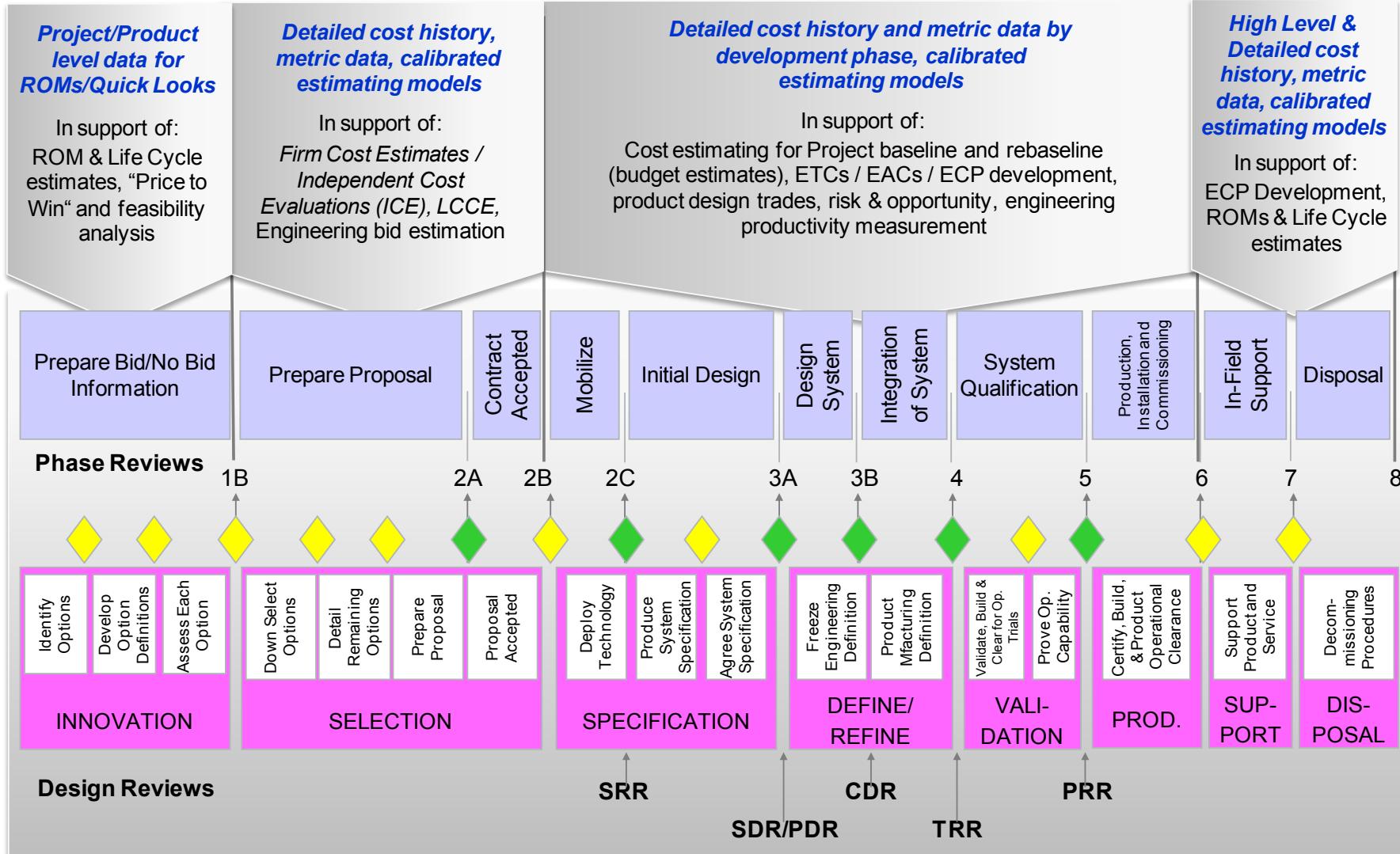


Adapted from Dilbert, © Scott Adams, Inc.

- Provide enterprise-wide, central and easy-to-use data store for all engineers
 - Consistent use of historical data in system design and business winning
 - Supporting entire project life cycle
 - Improved estimation accuracy, confidence and credibility
 - Save cost and reduce cycle time
 - Strategic competitive discriminator

Lifecycle Operational Data Needs

Use of historical data essential in system design and program execution



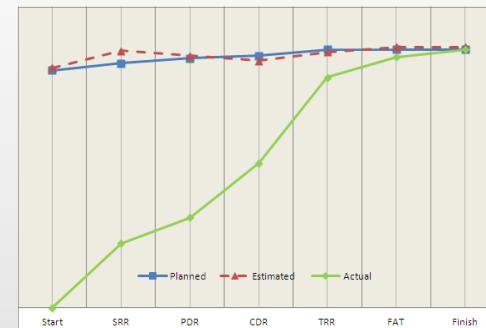
Three Interconnecting Logical Databases

Use Past Results to Predict Future Performance

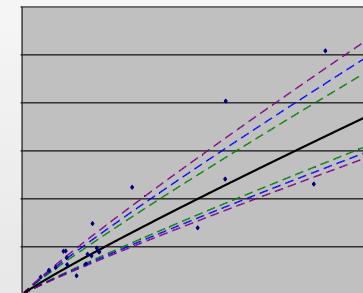
Engineering Estimates



Project Engineering EACs



Project Engineering Actuals



Project Bid / Proposal

Project Life Cycle

Time

Project Post Mortem

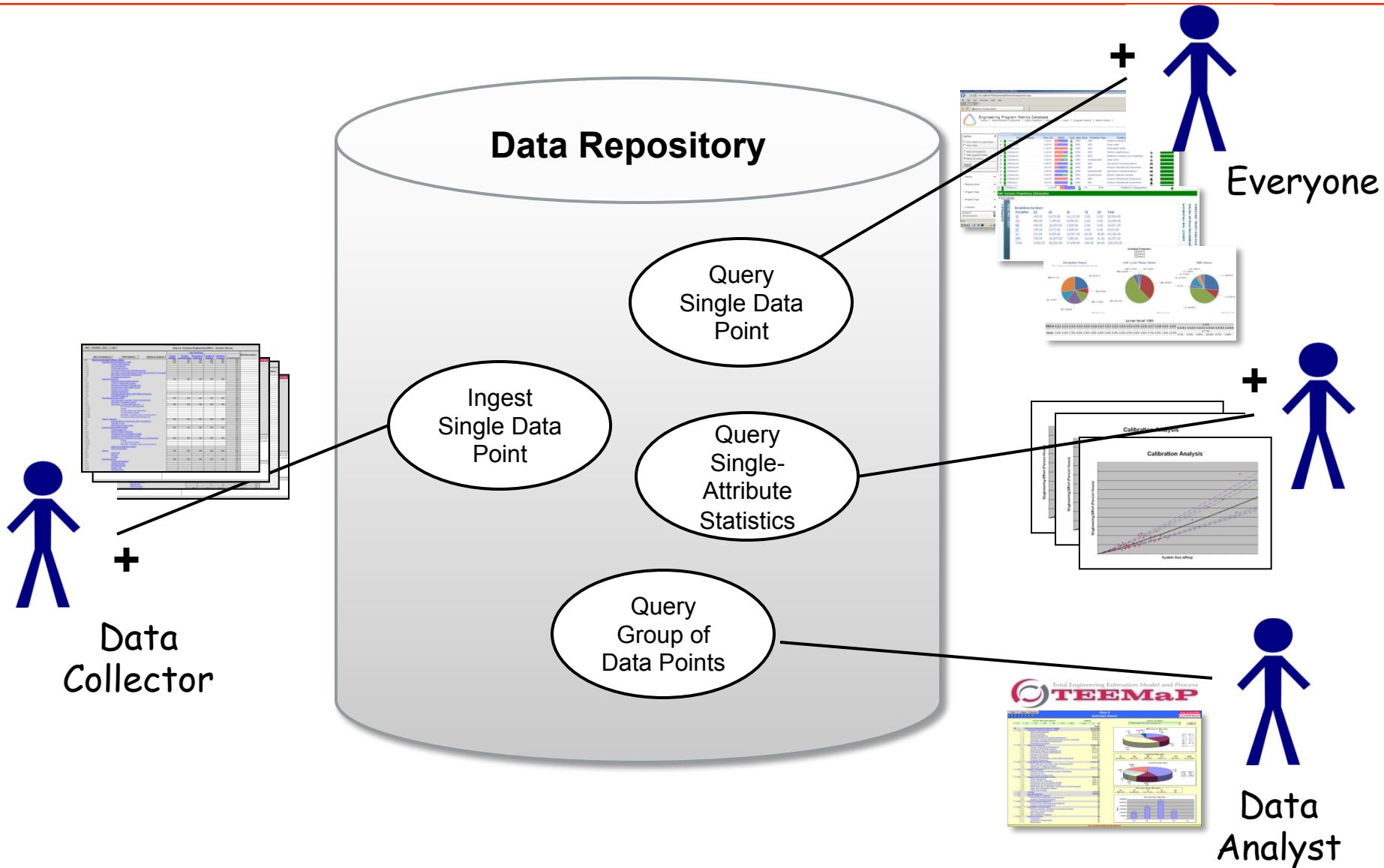


Business Capture

Program Execution

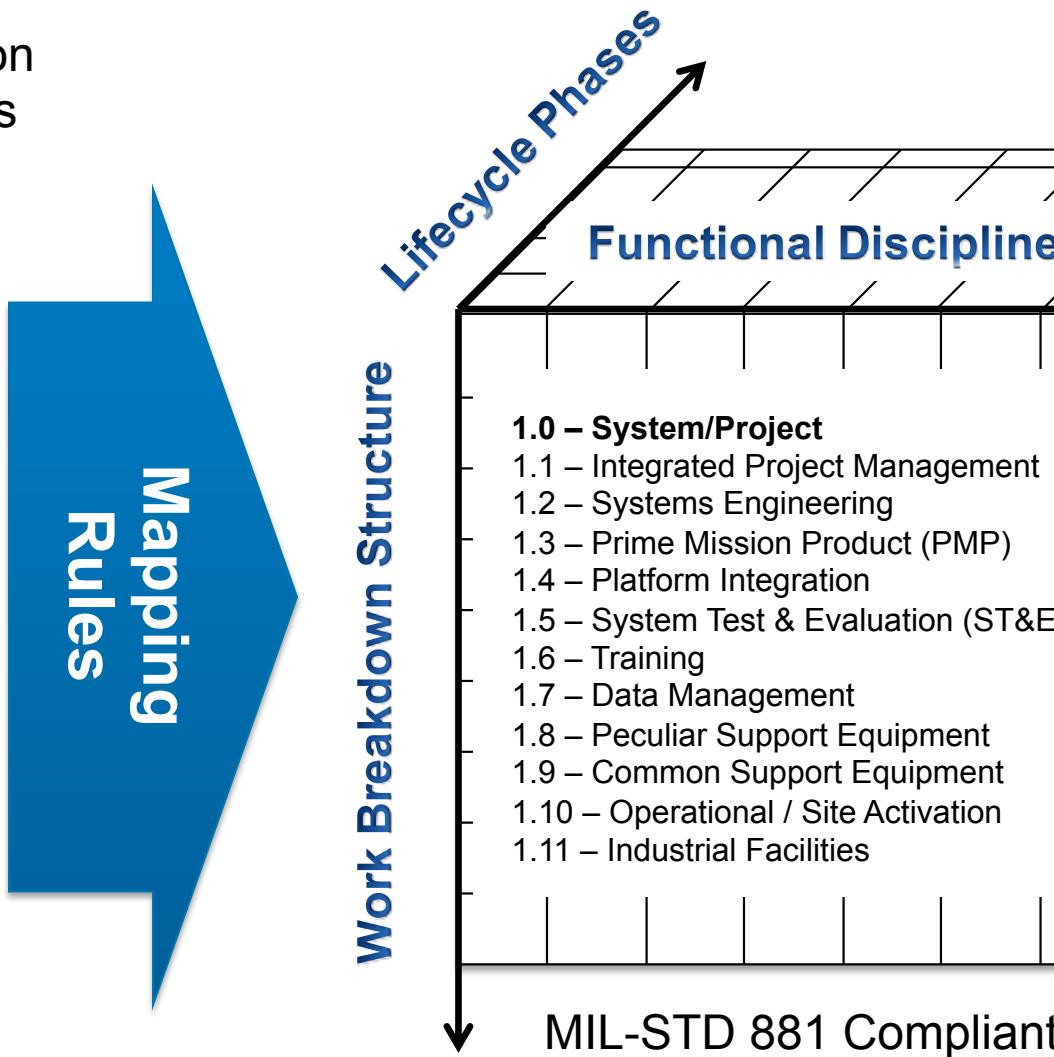
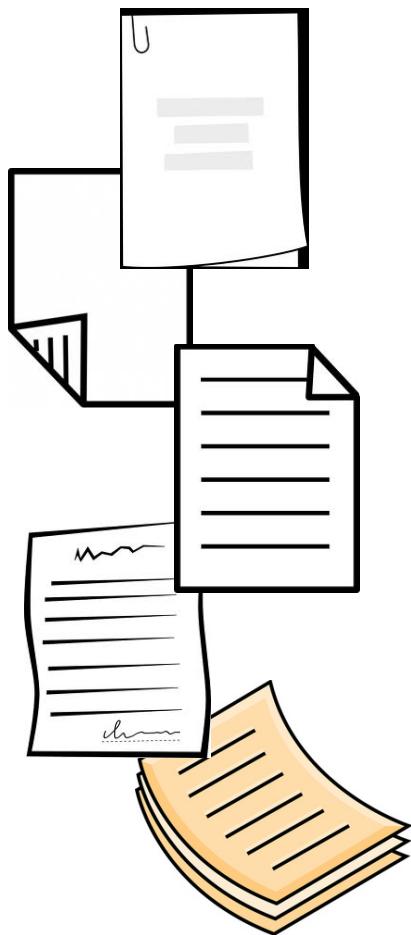
Process Improvement

Typical Use Cases

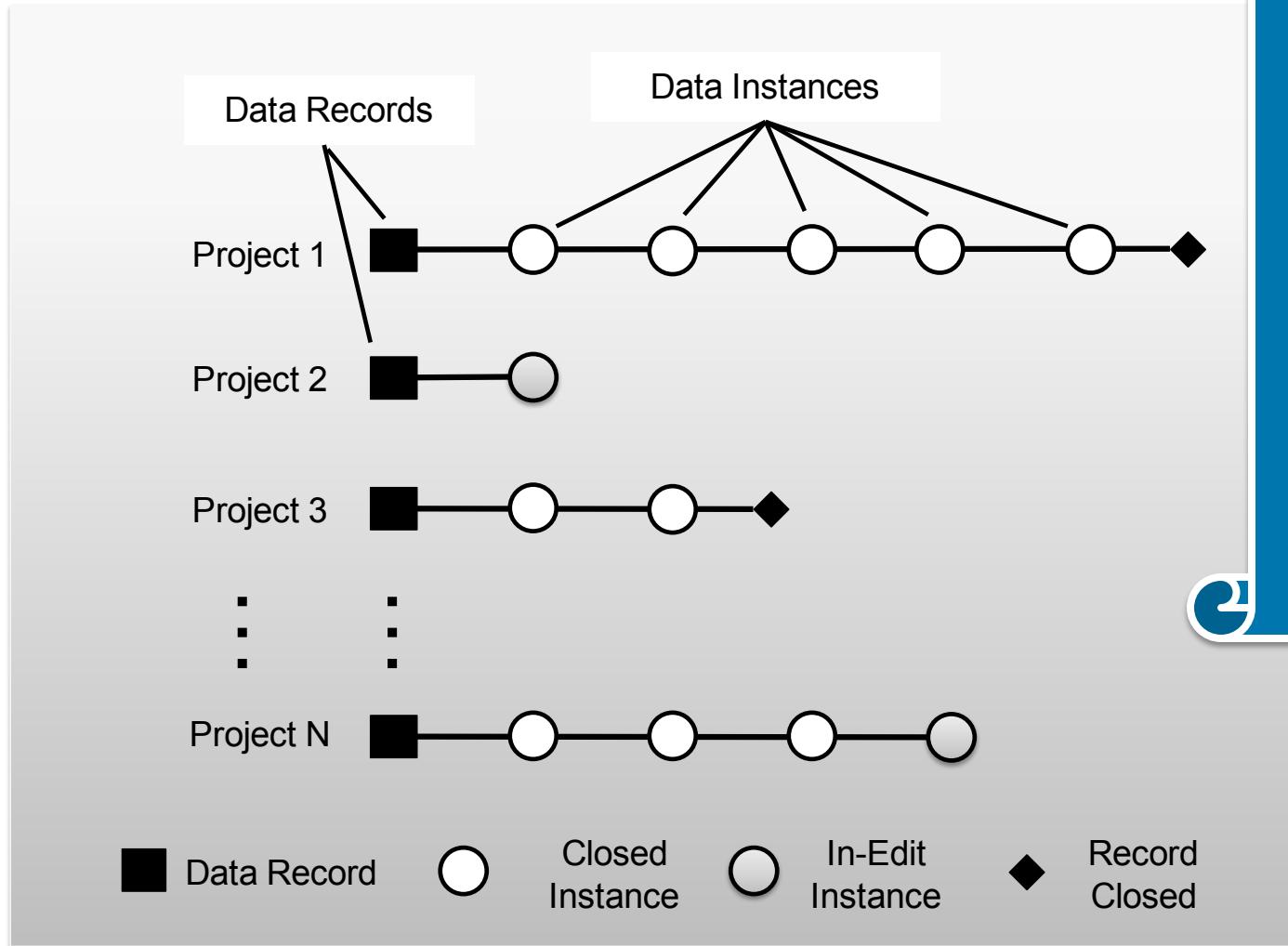


Cost Element Structure

Project/Organization
Specific Structures



Dynamic Data Structure Design

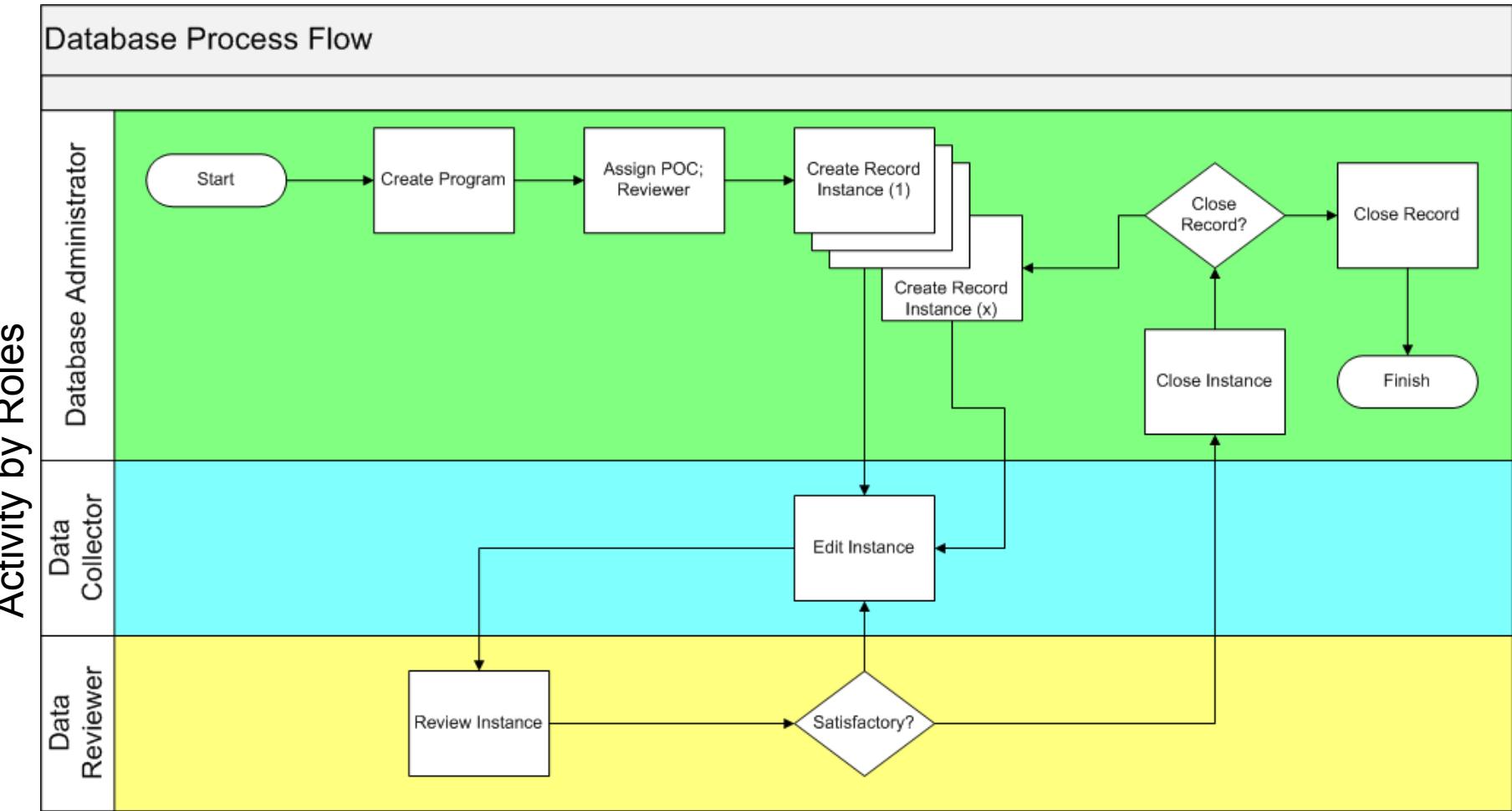


Dynamic linked lists used to support different data types and periodic collections throughout project and system life cycles

Database Workflow Supporting Collection of Multiple Data Instances of Same Program Data

BAE SYSTEMS

Built-in Data Ingestion and Review Functions to Support Role-based Interactions



Data Query Portal – Search by Program Attributes

Accessible from Corp. Intranet

Search Criteria

Search Relevance

Search Dashboard

Individual Selection

Engineering Program Metrics Database

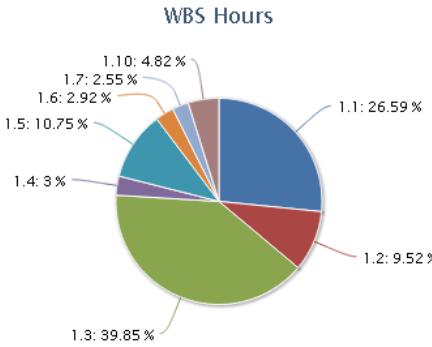
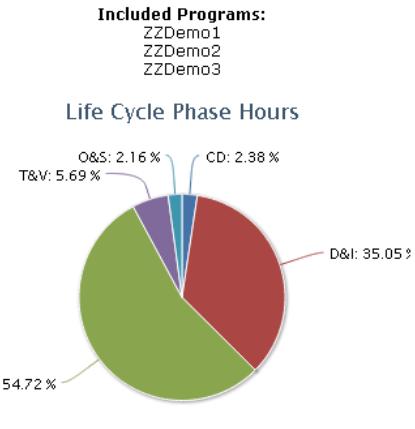
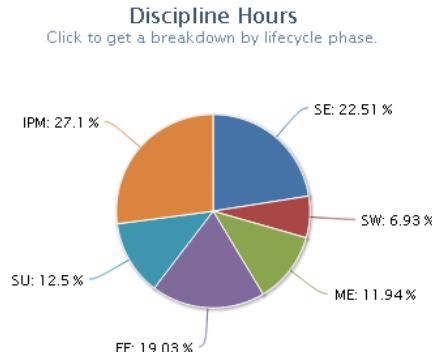
Programs

Program Name	Size (\$)	Effort	Cust. Bus. Area	Program Type	Product Types	Platform	Relevance
ZZDemo1	1.20 M		ISRS	LRIP	Platform Integration		
ZZDemo10	4.00 M		ISRS	SDD	Data Links		
ZZDemo11	2.30 M		ISRS	SDD	Embedded Software Applications		
ZZDemo12	4.30 M		ISRS	SDD	Mission Applications		
ZZDemo13	5.00 M		ISRS	SDD	Platform Locating and Targeting		
ZZDemo14	2.00 M		ISRS	Sustainment	Data Links		
ZZDemo15	6.00 M		ISRS	SDD	Advanced Communications		
ZZDemo16	15.0 M		ISRS	SDD	Passive Situational Awareness		
ZZDemo17	3.00 M		ISRS	Sustainment	Advanced Communications		
ZZDemo18	3.00 M		ISRS	Sustainment	Electro-Optical Systems		
ZZDemo19	4.00 M		ISRS	SDD	Passive Situational Awareness		
ZZDemo2	14.0 M		ISRS	FRP	Passive Situational Awareness		
ZZDemo20	5.00 M		ISRS	Sustainment	Signal Intelligence Systems		
ZZDemo3	5.00 M		ISRS	FRP	Passive Situational Awareness		
ZZDemo4	3.50 M		ISRS	LRIP	Subsystem Integration		
ZZDemo5	4.50 M		ISRS	FRP	Platform Integration		
ZZDemo6	2.20 M		ISRS	SDD	Advanced Communications		
ZZDemo7	10.0 M		ISRS	SDD	Embedded Software Applications		
ZZDemo8	800,000		ISRS	C&TD	Embedded Software Applications		
ZZDemo9	5.50 M		ISRS	SDD	Advanced Communications		

Done Local intranet 100%

Detail Data Queries

Calculated Statistics



Detail Project Data

Lower-level WBS

WBS #	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	1.1.7	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	1.2.7	1.2.8	1.3.1	1.3.2	1.3.3	1.3.3.1	1.3.3.2	1.3.3.3	1.3.3.4	1.3.3.5	1.3.3.6
Hours	3.2%	0.2%	7.3%	9.6%	6.3%	0.8%	0.0%	2.6%	0.0%	0.3%	0.2%	0.0%	2.0%	4.7%	0.0%	1.4%	11.9%	3.7%	9.3%	0.6%	10.6%	0.7%	2.8%	27.7%

ZZDemo1 1.20 M  TS SDD Platform Integration 

BAE Systems Proprietary Information

Full Details

Breakdown by hours:

Discipline	CD	DI	IV	TV	OS	Total
SE	418.20	8,970.90	16,112.90	2.00	0.00	25,504.00
SW	900.00	7,195.00	8,550.00	0.00	0.00	16,645.00
ME	336.00	16,015.00	2,520.00	0.00	0.00	18,871.00
EE	155.00	6,571.00	2,905.00	0.00	0.00	9,631.00
SU	310.00	9,265.00	10,551.00	84.00	35.00	20,245.00
IPM	709.00	10,287.00	7,060.00	210.00	31.00	18,297.00
Total	2,828.20	58,303.90	47,698.90	296.00	66.00	109,193.00

SUMMARY **COST MATRIX** **ABOUT THE PROGRAM** **ENGINEERING PHASE NOTES** **SYSTEM LEVEL DRIVERS**

Consistent Process is a Cornerstone

Qualification of Data Point

- Is project complete?
 - Clear start and finish?
 - Clear funding line?
- Is it relevant to future bids?
- Project points of contact found?
- Project financial, technical and other supporting data available?

Identify historical programs

- Quality program
- Establish program technical and financial POCs

Conduct initial data collection training session

- Learn the Data Collection Template
- Learn metrics definitions

Collect raw data

- Financial database
- Technical data records

Interview and data review sessions

- Recollect questionable data
- Additional interview sessions

Conduct analyses

- Normalization
- Statistical analysis

Practical Lessons Learned

- Data quality
 - Consistency, consistency, consistency!
 - **“If you are consistently wrong, you’re not wrong”**
- Give it an extra time
- Problem solving exercise
- Corporate expertise
- Management championship

In Closing

- Enterprise-level Engineering Data Repository
 - Data
 - Tools
 - Process
 - Training
- Used throughout project and system design life cycles
- Proven effective
 - Easy-to-use, popular with engineers
 - Improved accuracy, confidence and credibility
 - Save cost and reduce cycle time
 - Enhanced business competitiveness

Questions & Comments

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