Exercise A: Sizing the System

Presented by:
Karen Lum
JPL Software Quality Improvement Project

International Conference on
Space Mission Challenges for Information Technology
July 13, 2003

Project Description

1. Your company is developing mission critical embedded software for a flight project. It is a reusable telecom system.
2. The flight software's three primary functions are monitoring data, data transfer, and command and control.
3. The telecom system has some design heritage with an existing telecom system that has been developed. There is a small amount of code inheritance. All new code developed will be in C.
4. A software development environment including a test-bed exists.
5. The software is nearing its preliminary design review (PDR). The software must be delivered in 17 months (68 weeks), with a small, though experienced (3 years C experience, but very little experience in the development tools), development staff.
6. Requirements are immature, therefore 10-20% requirement volatility is expected.
7. There is concurrent HW development. The HW is being developed by a contractor in another state.
8. The project is currently budgeted at 75 Work-Months.
9. The cost of maintenance does not need to be included.

This is an example of a software development project. It is meant to illustrate the basic steps of developing a software estimate. It is not intended to serve as a source for answers to all questions that may arise regarding software estimation.

Analogy

- You have historical size data from Project X (a completed system) in physical SLOC
- Convert Software Size from Physical to Logical SLOC

Segment Name	Analogous Project Size	
	Actual (Physical SLOC)	Actual (Logical SLOC)
Monitor Data	10,000	7,500
Data Transfer	10,000	
Command and Control	25,000	

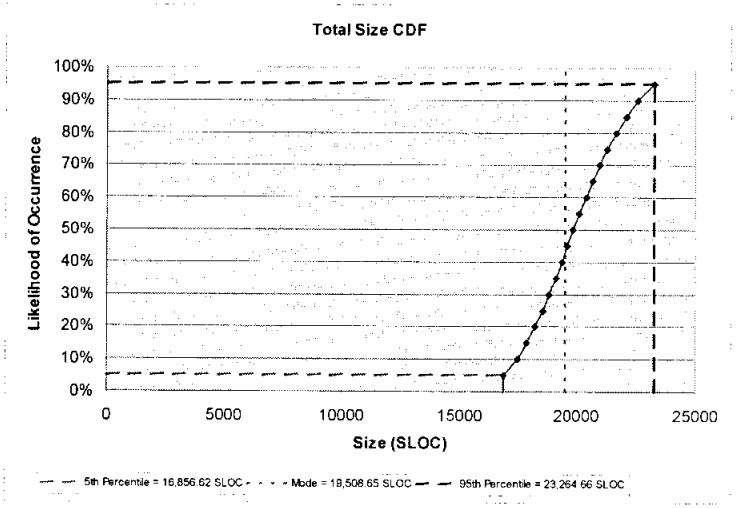
Estimate the Software Size

- Estimate Size Distribution parameters
  - Derive ML based on analogous functions from completed software systems
  - Adjust estimate for differences between current fn and analogous fn
  - Estimate low and high estimates based on best and worst case scenarios and document basis of estimate
  - Convert to logical lines if needed
- Fill in the table

	Segment Name	Analogous Project (SLOC)	New (SLOC)			Reuse (SLOC)	%Mod		Basis of Estimate
		Actual	Low	Most Likely	High		Low	High	
Logical SLOC	Monitor Data	7,500	3750	5250	7500	0	N/A	N/A	Similar design, new code. At least 50% as big; most likely 70% as big; at most is the same size as analogous segment.
	Data Transfer	7,500	3,000	5,000	6,500	1,000	15	25	Some new code and some inherited code with modifications Reuse of 1,000 SLOC with 15-25% mods of analogous segment. Need to write at most 6500 more new lines of code; most likely 5000, and at least 3000 new LOC.
	Command and Control								Some new code, some inherited code with no modifications. Reuse of 2,500 SLOC with no mods of Radio Function Y At least 5,000 SLOC new code needs to be added to complete this function Most likely 8,000 SLOC new code needs to be added to complete this function At Most 13,000 SLOC new code needs to be added to complete this function

Compute Total SLOC

- Compute Total SLOC based on
  - Monte Carlo Simulation
- Step 1: Open Sizing Tool
- Step 2: Enter Size numbers from previous slide into tool
- Step 3: Run Monte Carlo Simulation
- Step 4: Fill in the following table with the results



	Segment Name	New SLOC Mean	Reuse SLOC Mean	Total Mean Equivalent SLOC	5th Percentile Eq. SLOC	Mode Eq. SLOC	95th Percentile Eq. SLOC
Logical SLOC	Monitor Data	5500.0	0	5500	4266.08	6356.18	6841.74
	Data Transfer	4833.3	344.0	5177.33	3931.58	5969.05	6334.05
	Command and Control						
			Total				