GSAW2003 Breakout Group "Architecture Granularity - A COTS Vendor's Perspective"

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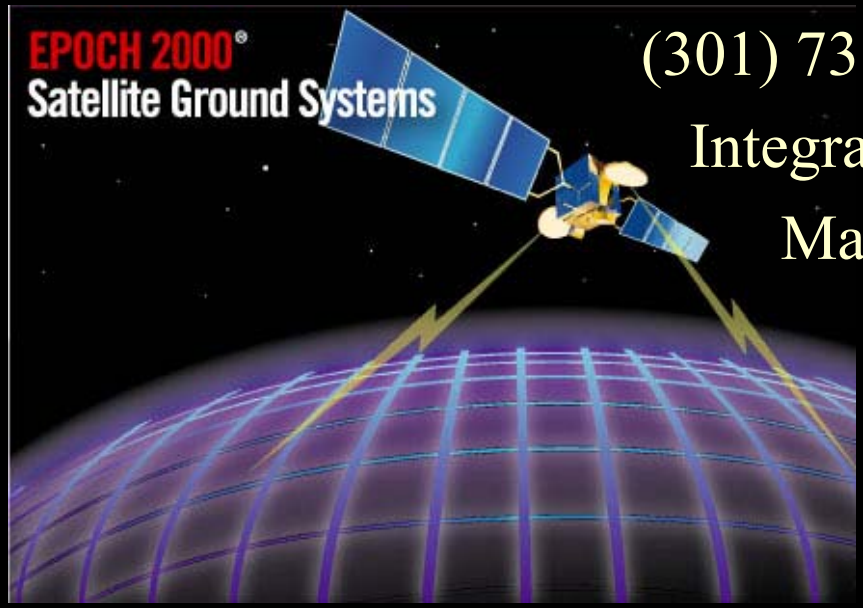
March 5, 2003



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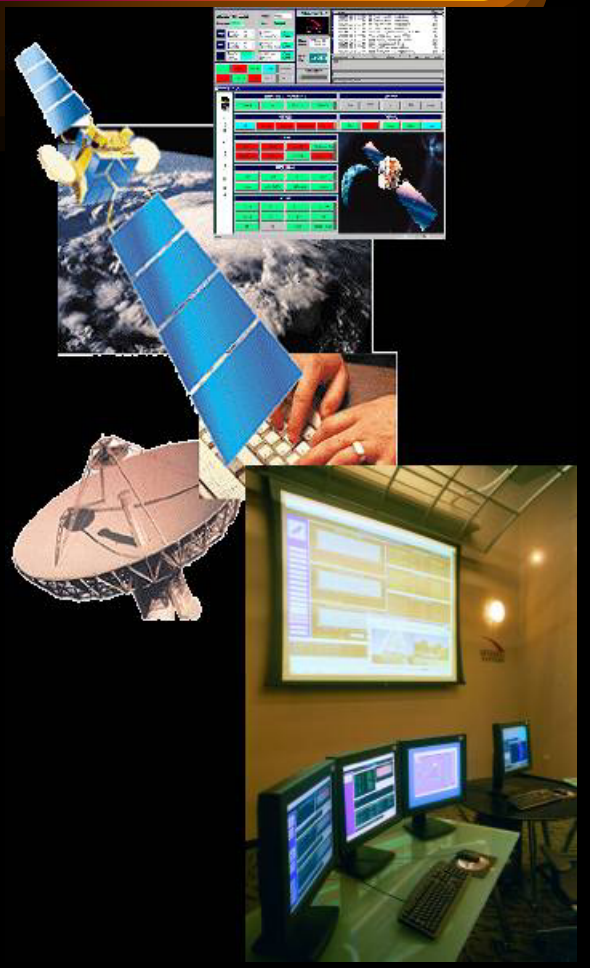
Agenda

- Company Background
- Discussion Statements
- Examples of Architecture Granularity
  - COTS vs. Custom Code
- Summary



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Background

- Integral Systems provides satellite ground systems
  - Founded in 1982, 350 employees
  - Headquartered in MD; Offices in CO, OH, & Toulouse
  - Three subsidiaries RT Logic! Enabling Your Solutions; SAT Corporation An Integral Systems Company; NEWPOINT
- We produce COTS software packages
- We act as system integrators for turnkey systems
  - Bundling 3rd party hardware and software
- Prime Contractor for CCS-C

Customer Base and Experience

Commercial			Government	
NewSkies	Optus	MeaSat	NOAA	APL
Skynet	Sirius	B-SAT	NASA	JPL
Americom	EuropeStar	N-STAR	USAF	NSPO
EchoStar	Shin	PanAmSat	USN	NRO
Manufacturers			**Missions**	
Boeing	Orbital	Matra	Communications	GEO
Lockheed	TRW	Aerospatiale	Science	LEO
SS/L	DLR	Alcatel	Remote Sensing	Deep Space

Over 190 Installations Supported to Date

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We're a COTS Company

Product	Description
EPOCH T&C	COTS T&C Processing
OASYS	Spacecraft Mission & Orbital Analysis
ABE/AM	Analysis of Archived Satellite Telemetry Data
Skylight	Remote Sensing, Direct Broadcasting Terminal
EPOCH DB	RDBMS to define satellite T&C at the bit level
MonicsNet/CSM	RF Signal Monitoring Products
Compass	Ground System NMS
Telemetrix	Ground System FEP Equipment

Relevant Discussion Statements

- Component-based architecture
  - Organized in terms of components with well-defined interfaces
  - Facilitates a level of abstraction away from implementation specifics, yet can easily be mapped to implementation
- Architecture as a basis for system implementation
  - Granularity refined to enable the mapping of architectural components directly into COTS components, custom components and hardware

Architecture Granularity

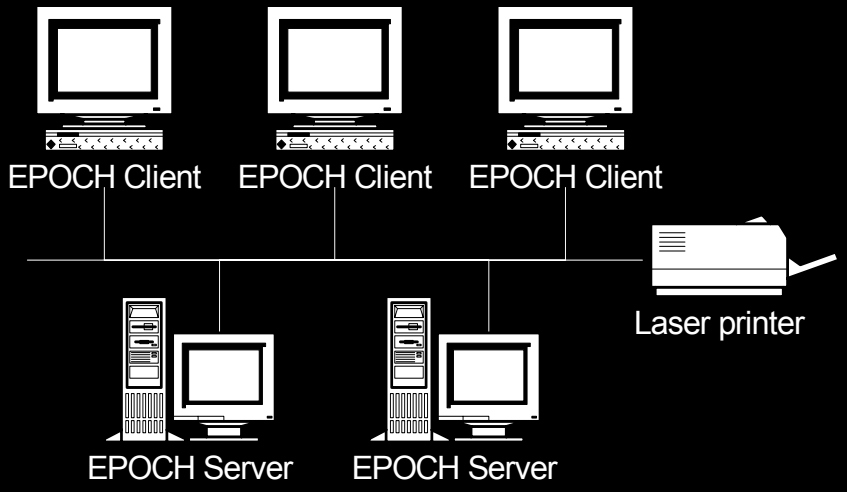
- Architecture should focus on components
  - Describe the functions
  - Describe the data flows between components
- Architecture should provide multiple views
  - Logical, physical, COE, hardware, software

Architecture Granularity Cont.

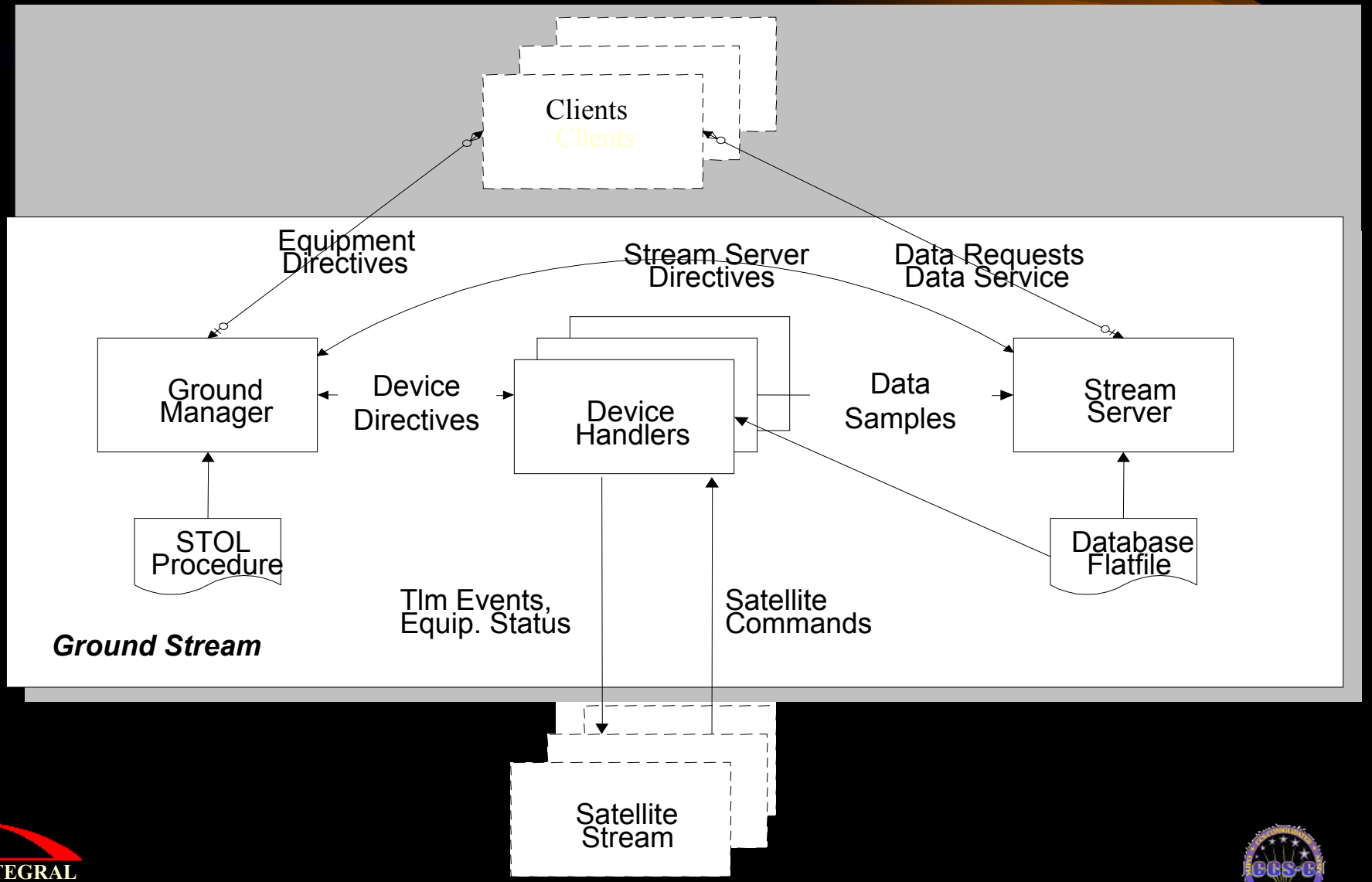
- COTS components are treated as "Black Box"
  - Define functions & I/O interfaces, but not internal design
  - Details of COTS components are proprietary
  - Architecture information is generally limited to that in our COTS User's Guides and Manuals --- General Data Flow is Defined
  - Application Program Interface (API) defines external access in LLD
- Custom components should be defined in greater detail with additional sub-components, dataflows, processes and design elements

Typical ISI COTS Architecture

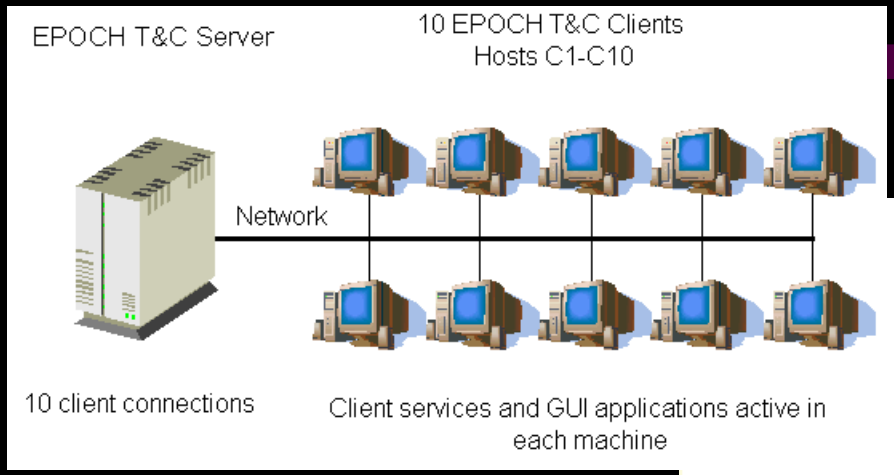
- Epoch Architecture
  - One/more servers and one/more user client workstations interconnected via LAN/WAN
  - Each server can control one/more satellites
  - Each client can connect to any/all servers
  - Spacecraft defined via database

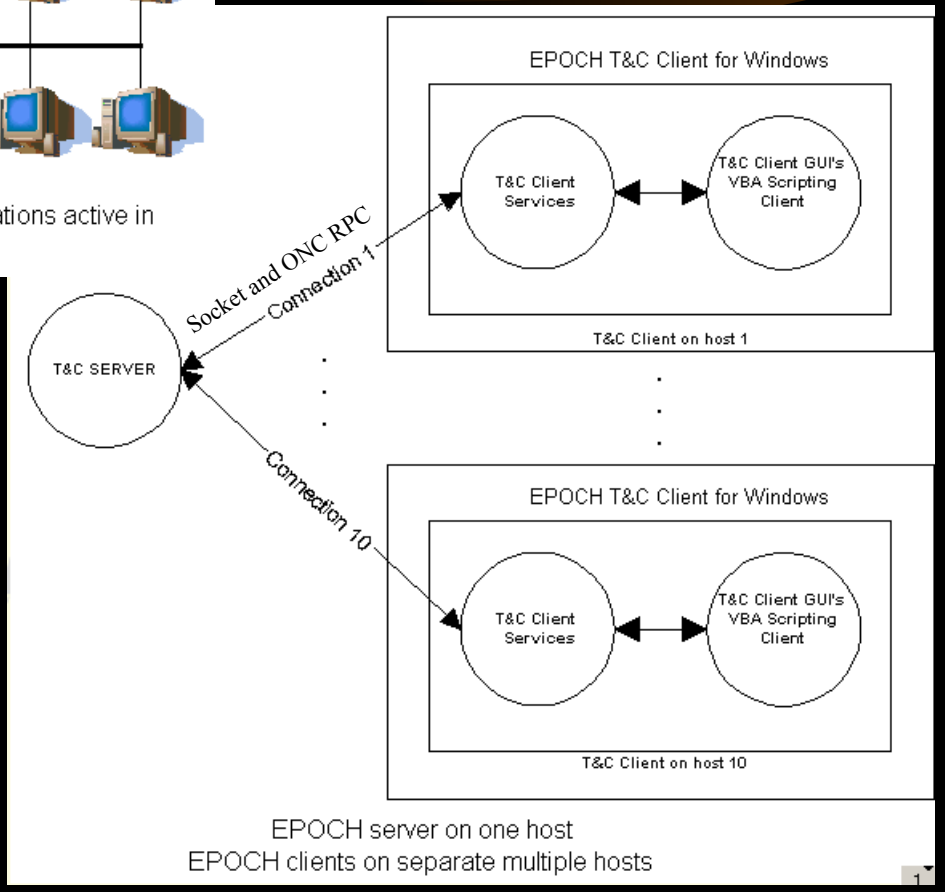


ISI Architecture Cont.



Typical ISI COTS Architecture Cont.





Open interfaces using industry standards allows integration with other COTS products

- SS API, ONC RPC, TCP/IP, COE, JTA

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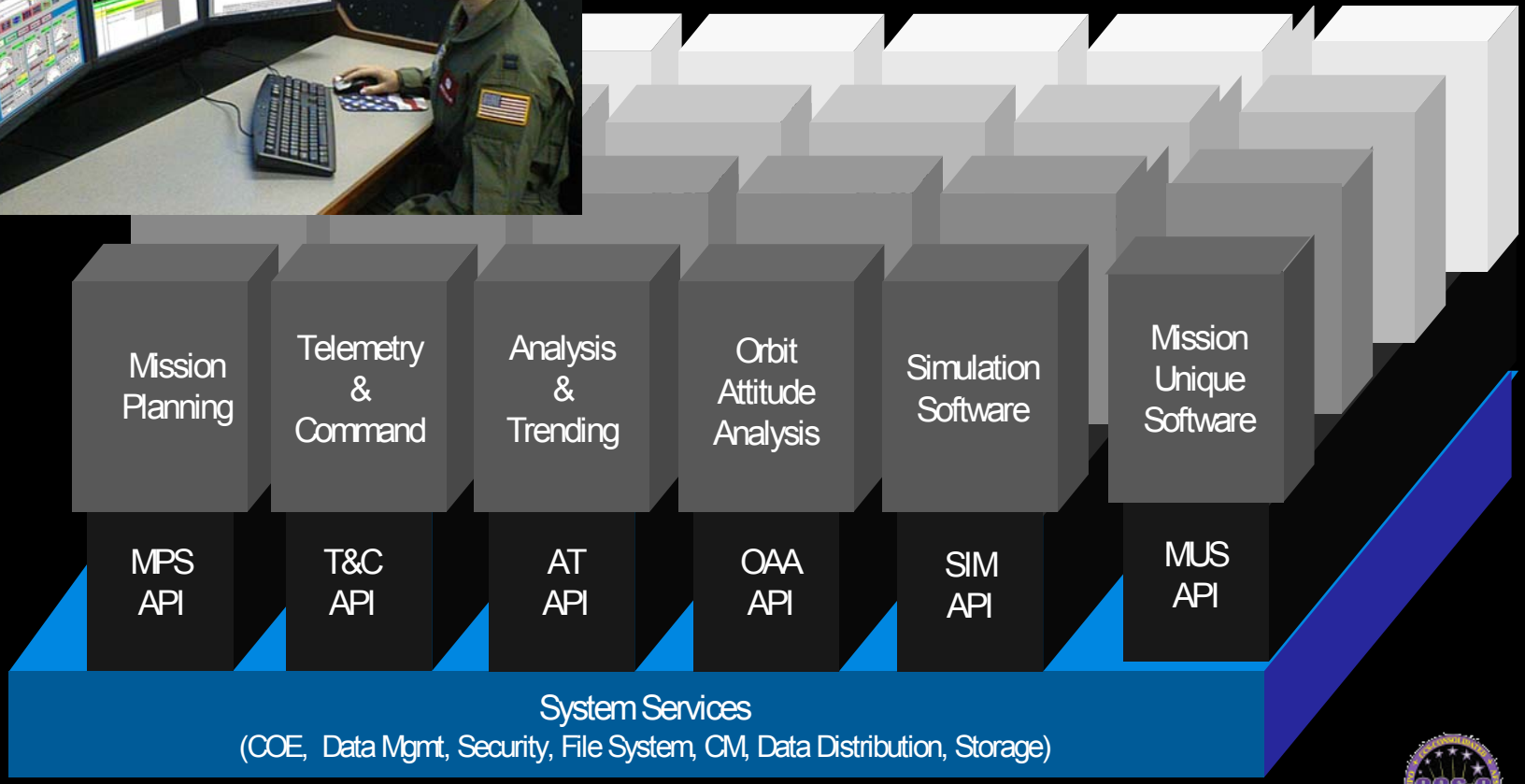
Project Specific Example from CCS-C

A Simplified View of the Architecture



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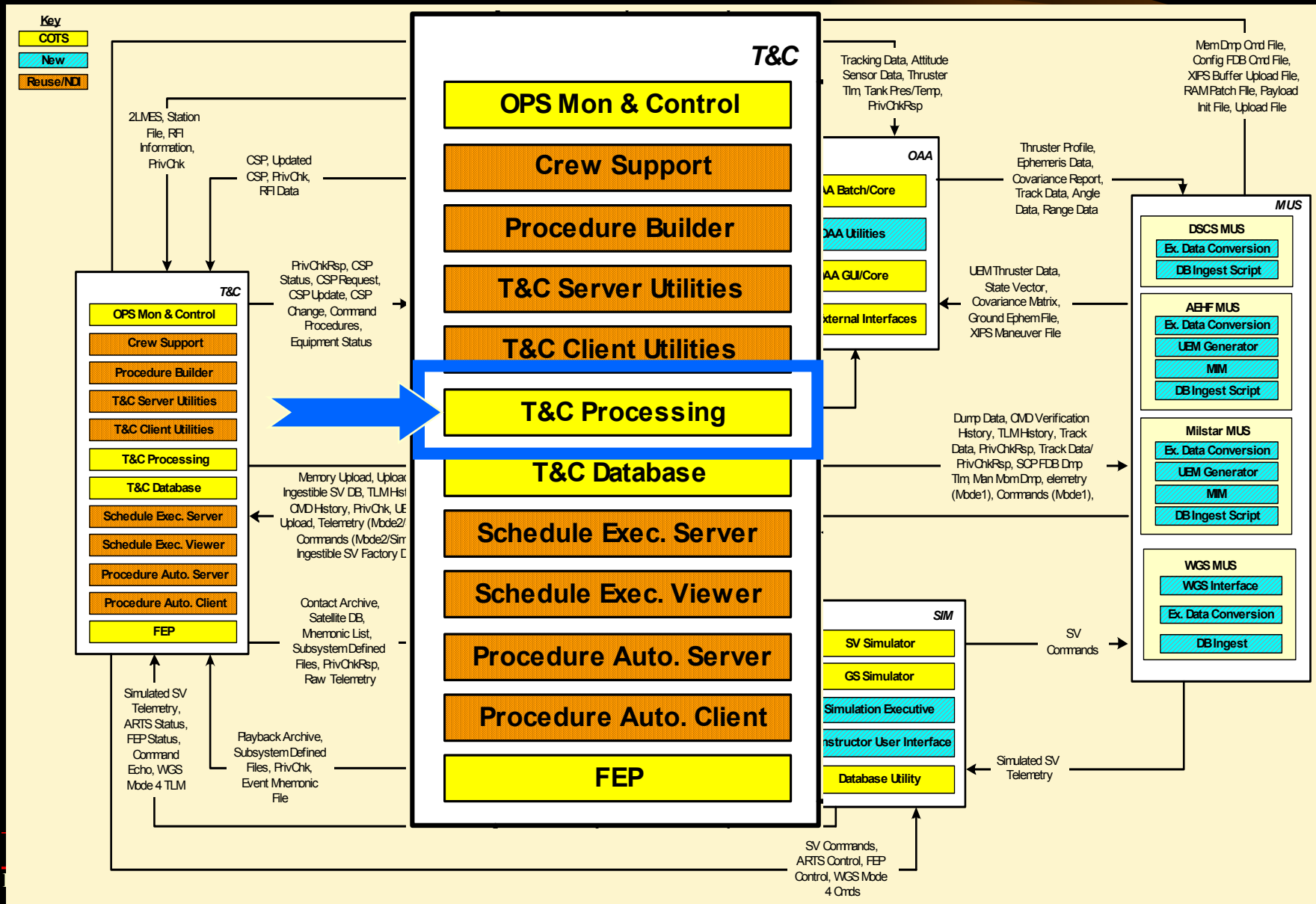
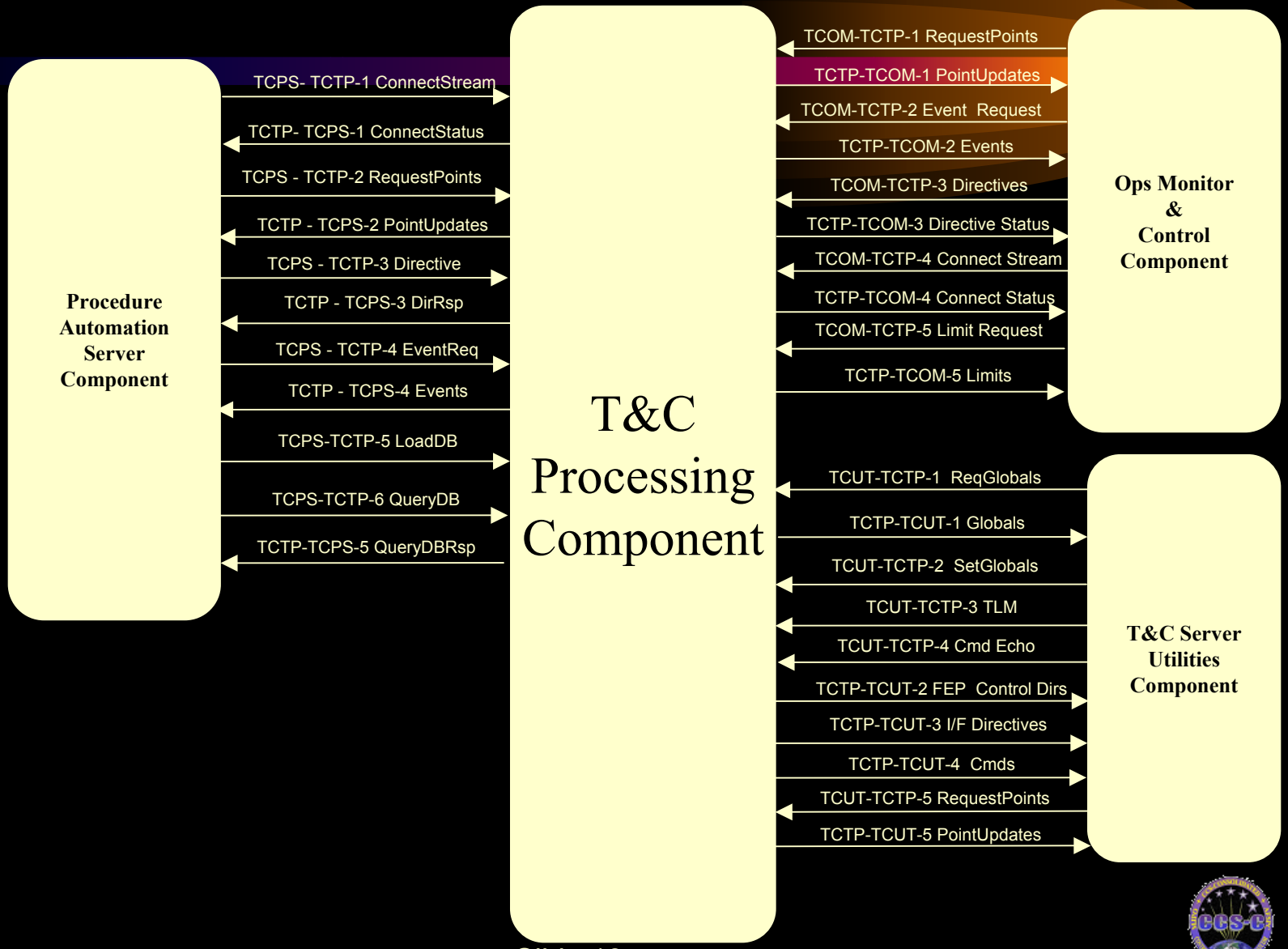
CCS-C Components



Component Diagrams



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T&C Processing Component Purpose

- Telemetry processing
  - Decommutation
  - Limit checking
  - EU conversion
  - COTS supported derived parameters
- Command processing
- Ground equipment monitor and control
- Contact data distribution via API
- Archive data playback
- Event generation and logging

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Sample Data Dictionary

Label	Data Description	Mechanism	Media	Period
TCCU-TCTP-1 accfile	Epoch User Access File	File	FTP	CM Driven
TCCU-TCTP-2 ConnectStream	Connect to stream request	EPOCH API	Electronic	User Driven
TCTP-TCCU-1 ConnectStatus	Status of connect stream request	EPOCH API	Electronic	User Driven
TCCU-TCTP-3 ReqGlobals	Request information on global variables	EPOCH API	Electronic	User Driven
TCTP-TCCU-2 GlobalInfo	Information on requested globals	EPOCH API	Electronic	Periodic
TCCU-TCTP-4 SetGlobals	Set a value of a global	EPOCH API	Electronic	User Driven
TCCU-TCTP-5 RequestCmdSt	Request command status queue	EPOCH API	Electronic	User Driven
TCTP-TCCU-3 CmdStatus	Command status queue	EPOCH API	Electronic	Periodic
TCCU-TCTP-6 CmdControl	Add/Delete of a command in the command queue	EPOCH API	Electronic	User Driven

Summary

- Architecture granularity should be at component level for COTS
  - Internal design is proprietary and not published
  - I/O Defined w/API to provide modularity
- Custom components should provide at least 1 additional level of detail/decomposition
- Primary purpose of architecture is for communication of functionality and requirements linkage, not necessarily for maintenance
  - The vehicle for the latter is detailed as-built design

Backup Slides

COTS Products

- The ISI line of COTS is designed for widespread use, and are stand-alone products with key "***true COTS***" features including:
  - Generic designs intended for the entire market
  - Product evolution driven by industry mission needs
  - Ability to be installed, configured, and sustained by the customers, without on-site developer support
  - Open interfaces using industry standards allows integration with other COTS products
    - SS API, ONC RPC, TCP/IP, COE, JTA

Architecture is Configurable Multi-Tier Client/Server

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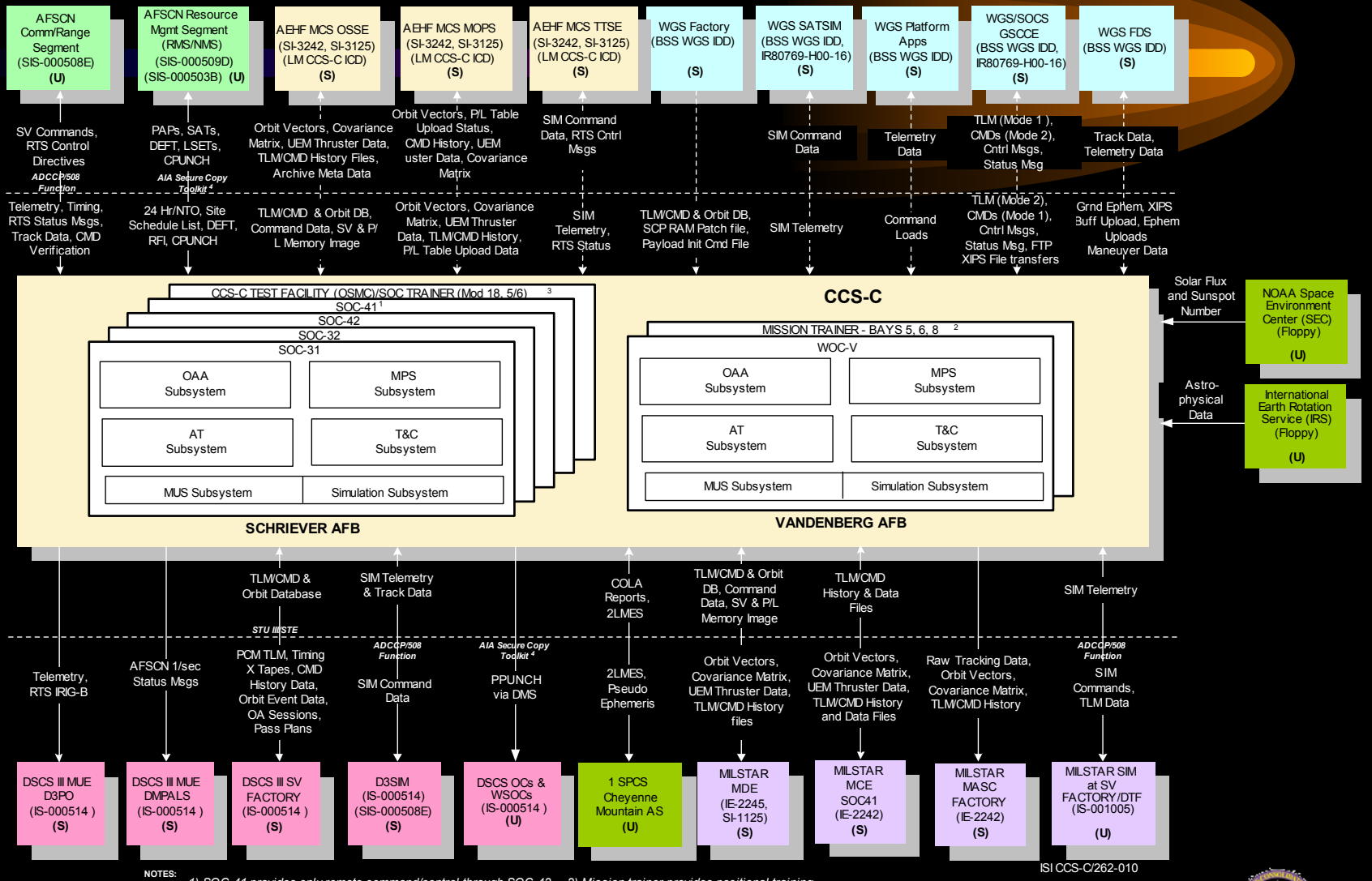
Open API

- Provide an open data service for two-way communications
  - Let external programs share data, commands, telemetry, etc. with core functions
  - Allows system to be reconfigured for mission-unique requirements without impacting the core architecture

Project Specific Examples



NOTES:

1) SOC-41 provides only remote command/control through SOC-42. 2) Mission trainer provides positional training.
3) SOC trainer provides crew training as well as positional training. 4)AIA NT Toolkit (Secure Copy / Dirty Word Checker) used to copy data to floppy.

DSCS Interfaces | OAA Interfaces | AFSCN Interfaces | Milstar Interfaces | AEHF Interfaces | WGS Interfaces

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