Compositional Assurance R&D Panel Session

Moderator: Michael McEvilley, MITRE

August 5th, 2009

MITRE

Panel Session Overview

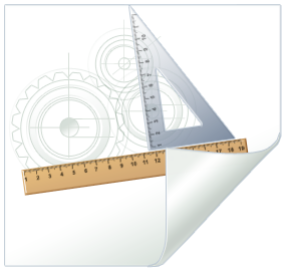
- Brian Snow will speak to a cross section of assurance issues
- Moderator to frame the panel discussion
- Panel discussion

Panel Discussion Context
Problem Statement

- How do we compose *complete* systems from a collection of parts?
  - *Complete*: functionally correct with a sprinkling of <insert your favorite > subjective properties (non-functional, "-ilities")
    - Examples: safe, secure, resistant to attack, able to sustain some specified data throughput, dynamically reconfigurable, robust, reliable, affordable
    - Subjective properties makes the hard problem incredibly hard
- We are not talking about the "GRAND CHALLENGE" composition problem
  - Unbounded integration of any A with any B to achieve a complete C
- Can we constrain the Grand Challenge problem such that there is a solution that can be practically applied?

Panel Discussion Context
Reality of the Problem

- Compositional assurance is not new
  - We do it every day, informally
- Compositional assurance is largely an ART
  - Smart people doing smart creative things
  - Methods, techniques, philosophy passed down
    - But not formalized, vetted, consistently reproducible



Compositional assurance needs SCIENCE to better leverage the ART

Panel Discussion Context
The Facets of Compositional Assurance

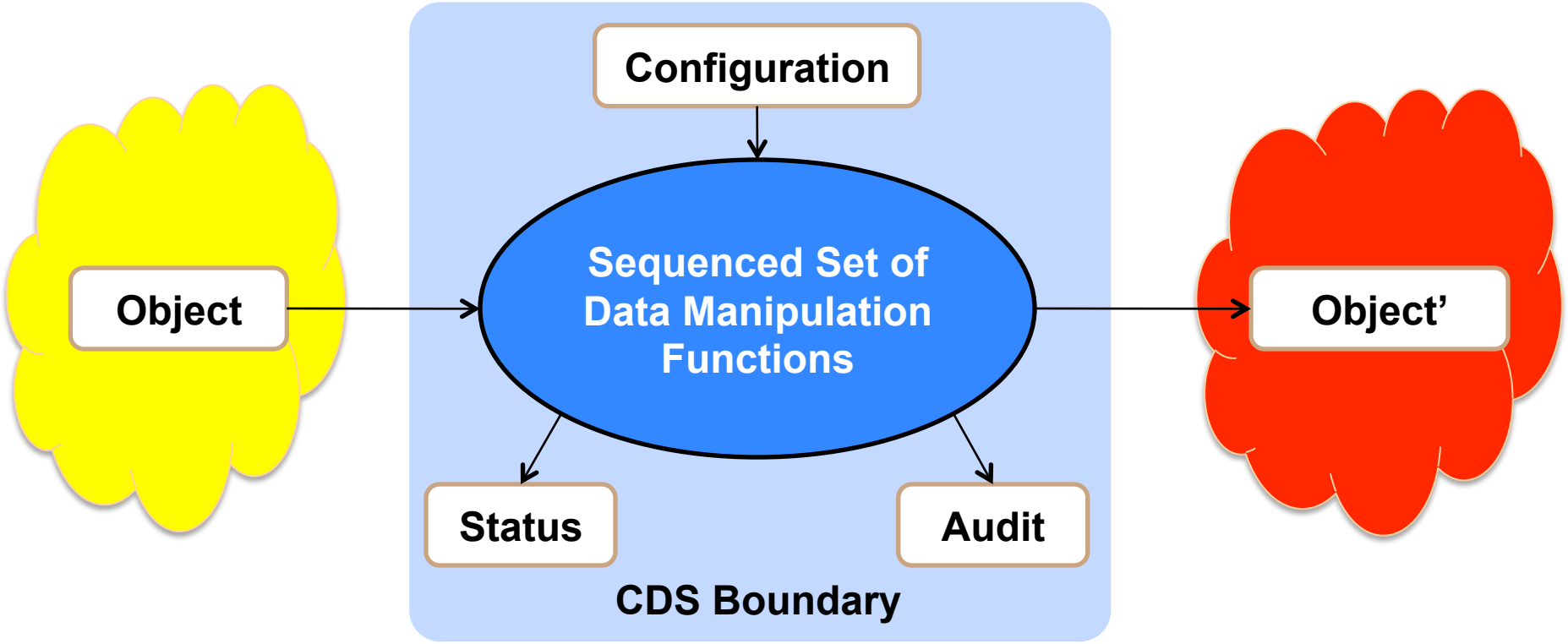
- There are multiple facets to that which must compose
  - Requirements and specifications used to architect and implement complete solutions
  - Individual components/products integrated to implement complete solutions
  - Requirements and specification used to architect and implement components/products
  - Runtime behavior composed via “late binding” of functions

Assurance arguments for ALL the above!

Use-case to illustrate the impending need

- Cross Domain Transfer Solutions are *trusted* components
  - Trust must be demonstrated and approved in the context of an environment
    - Certification and Accreditation (C&A)
  - C&A is taking more time as component capability, complexity and the threat increases
    - And current solutions are relatively simple (centralized and monolithic)
- Characteristics of future cross domain transfer solutions
  - Modularized and distributed
  - Remotely managed
  - Dynamically reconfigurable to provide “just in time” services
  - Continuously available with limited human interaction
  - Dependent on having confidence in a distributed trust model
- We must transition to the future without increasing risk

General Centralized Cross Domain Transfer Solution



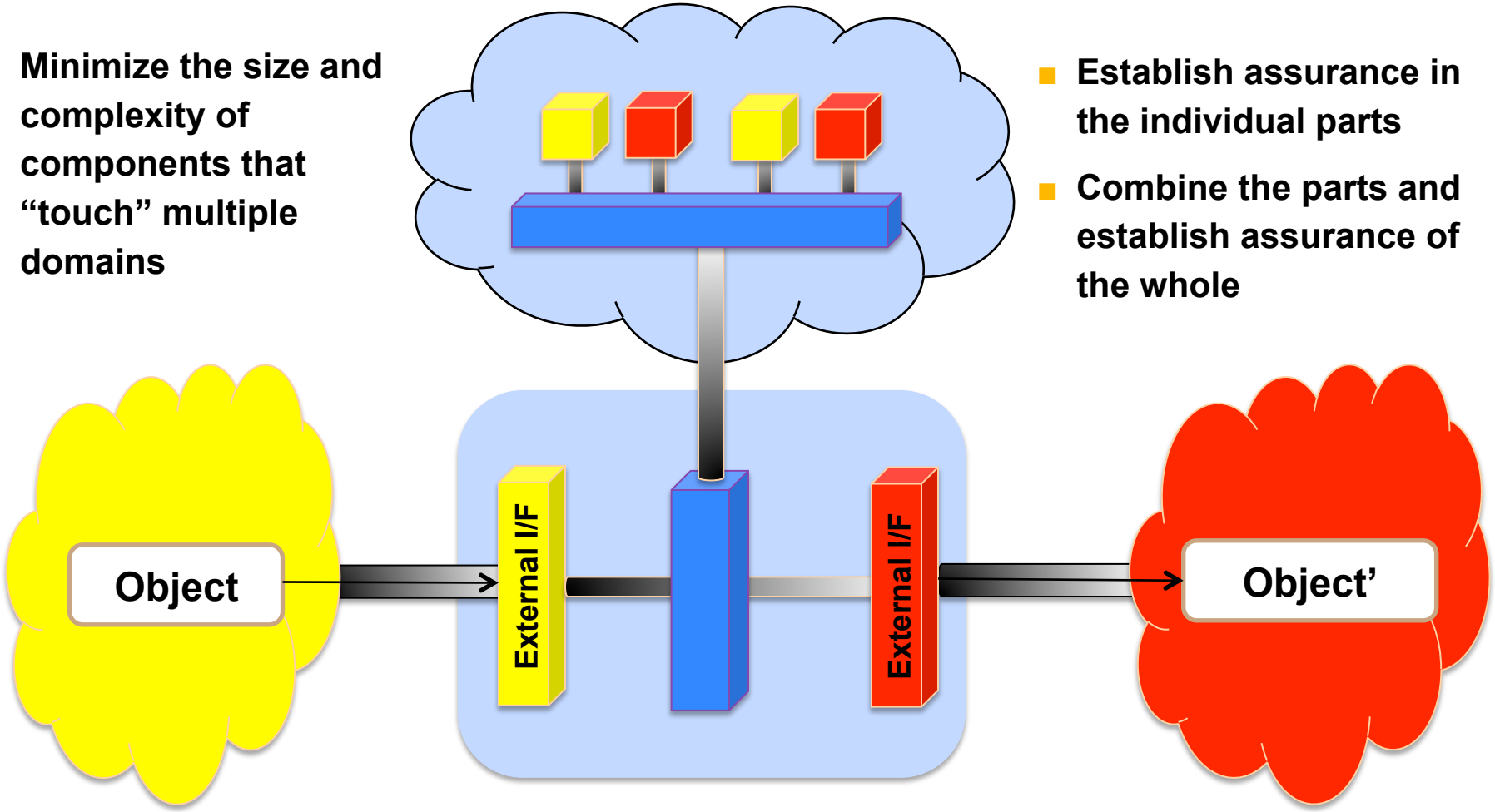
Security policy domain "YELLOW"

Trusted Multi Domain

Security policy domain "RED"

General Modularized and Distributed Cross Domain Transfer Solution

- Minimize the size and complexity of components that "touch" multiple domains



- Establish assurance in the individual parts
- Combine the parts and establish assurance of the whole

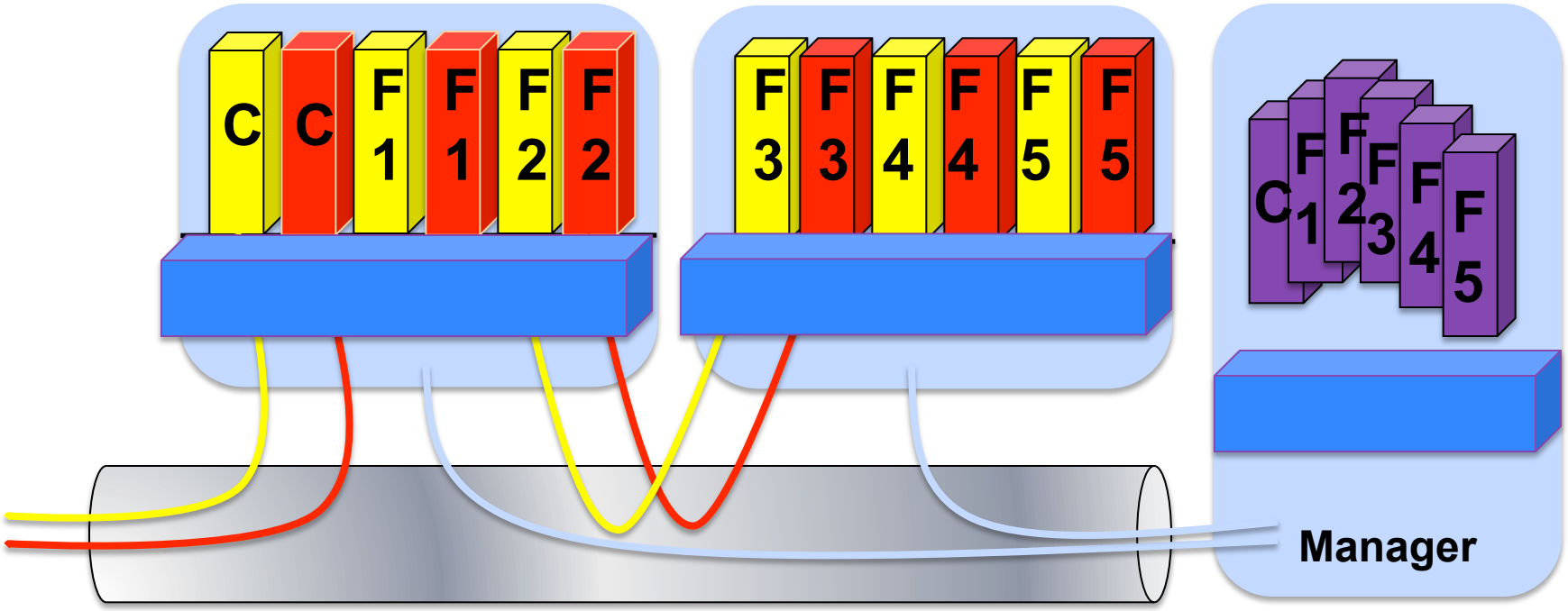
Security policy domain "YELLOW"

Trusted Multi Domain

Security policy domain "RED"

Transform the CDS into a Service Engine

- Add management and control allowing for “just-in-time” instantiation of only the functionality required for a particular cross domain flow



C = Control

F_n = Functional Capability

Security policy domain “YELLOW”

Security policy domain “RED”

Trusted Multi Domain

Reusable Untyped Image

The Role of Compositional Assurance

- **Compositional assurance is a *necessary* aspect for the realization of the modularized and distributed CDS use case**

- **Compositional assurance enables**
  - **Aggregation and dynamic instantiation of the functional decomposition**
  - **Distributed policy enforcement points to act as directed by their corresponding distributed policy decision points**
  - **Secure remote management of the *entire* distributed solution**
  - **Multi-threaded service invocation**

Panelists

- Chris Gill
  - Associate Professor, Dept of Computer Science and Engineering, Washington University
- Tim Kelly
  - Senior Lecturer, Department of Computer Science, University of York, UK
- John Rushby
  - Program Director and SRI Fellow, SRI International Computer Science Laboratory
- Brian Snow
  - former IAD Technical Director, NSA

Panel Session Game Plan

- Posing of questions to the panel from the floor
- Intent is to remain focused on the science of the problem
- Moderator reserves the right to alter questions
- Moderator may pose prepared questions
- Moderator to be moderated by Rance DeLong
- Lets have fun …