Why Choose CCSDS SM&C for your next Ground Segment?

GSAW, Redondo Beach, 2 Apr 2008

CCSDS Spacecraft Monitor & Control Working Group (SM&C)
Mario Merri (ESA), Chair

Spacecraft Monitoring & Control Working Group

Agenda

- Consutative Committee on Space Data Systems (CCSDS)
- Spacecraft Monitoring & Control (SM&C) state-of-the-art
- Why choose CCSDS SM&C?

Spacecraft Monitoring

CCSDS: Consultative Committee for Space Data Systems

Spacecraft Monitoring & Control Working Group

SM&C: Spacecraft Monitoring & Control

- CCSDS working group
  - ⇨ 4 year lifetime (started in Dec 2003)
  - ⇨ 10 Space Agencies actively involved
  - ⇨ very active (9 workshops, 50 telecons)
  - ⇨ very productive
    - ↳ 2 green books published
    - ↳ 1 blue book published
    - ↳ 3 red books almost published
    - ↳ 3 magenta books under finalisation
    - ↳ several white books in early draft
  - ⇨ excellent team work among agencies!

- Goal
  - ⇨ Standardize the **Mission Operations Services** to enable the build up M&C systems by using “plug & play” components

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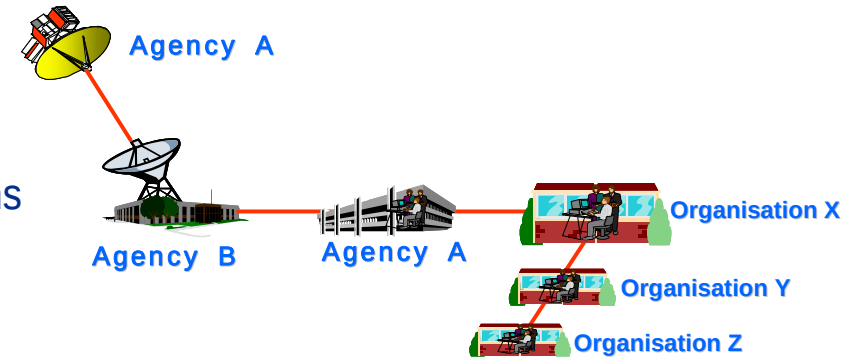
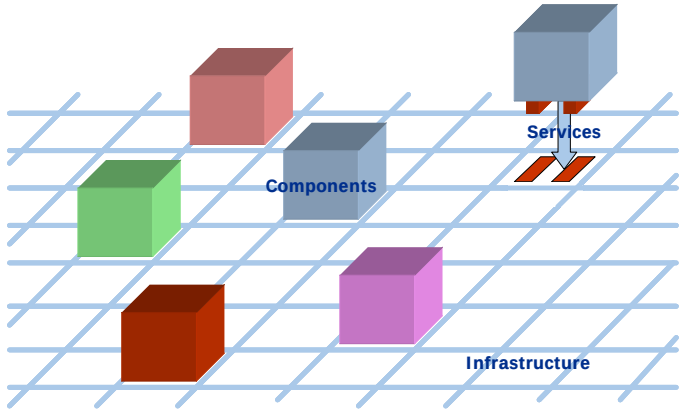
Wider "Interoperability" Scope in SM&C

- **Before:** strictly inter-organization
  - ⇨ closely related to the notion of administratively separate domains



- **Now**: inter- and intra-organization
  - ⇨ i.e. added the ability to identify functionality that allows for swappable components that agencies may choose to exchange or "contract-out"



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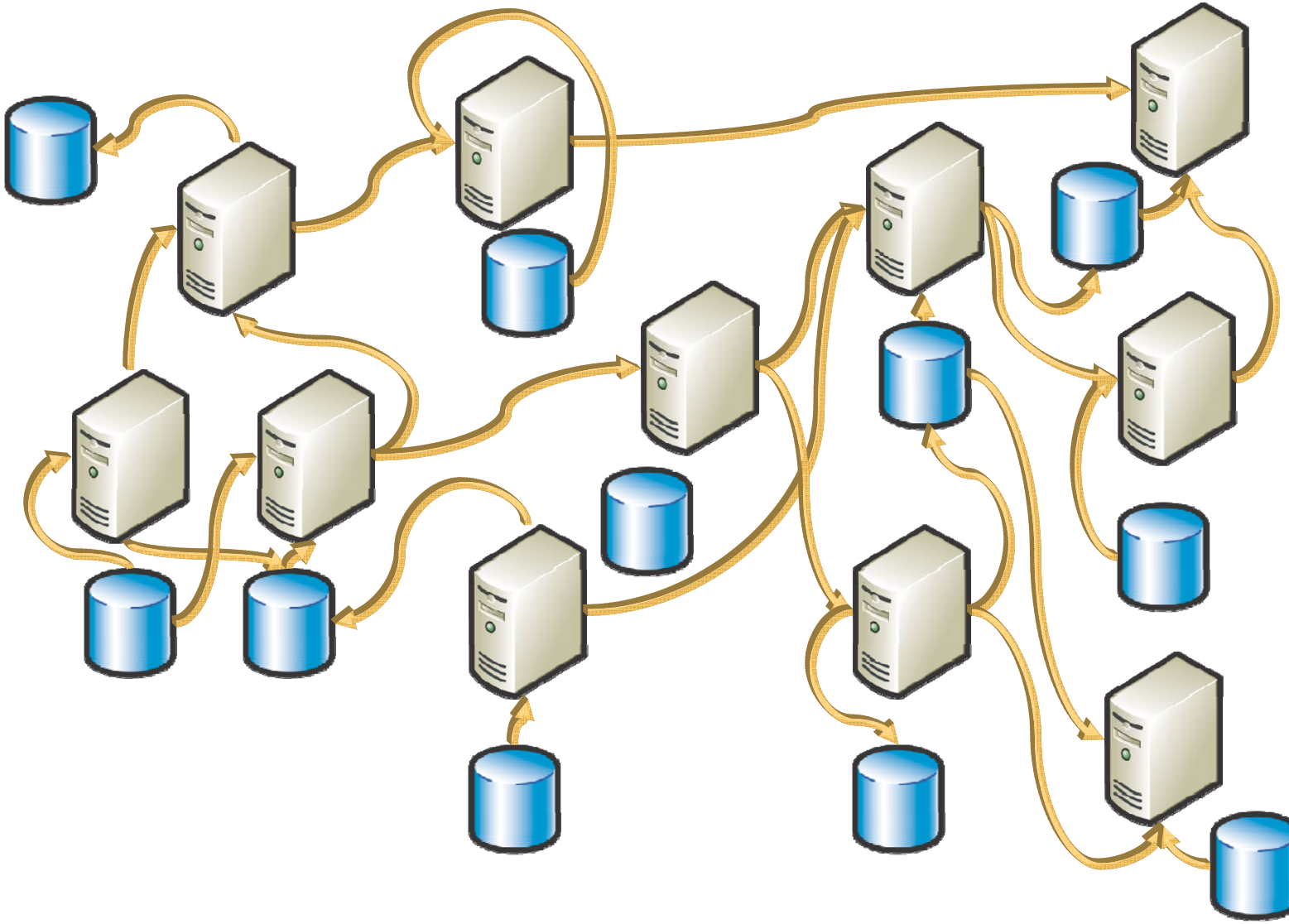
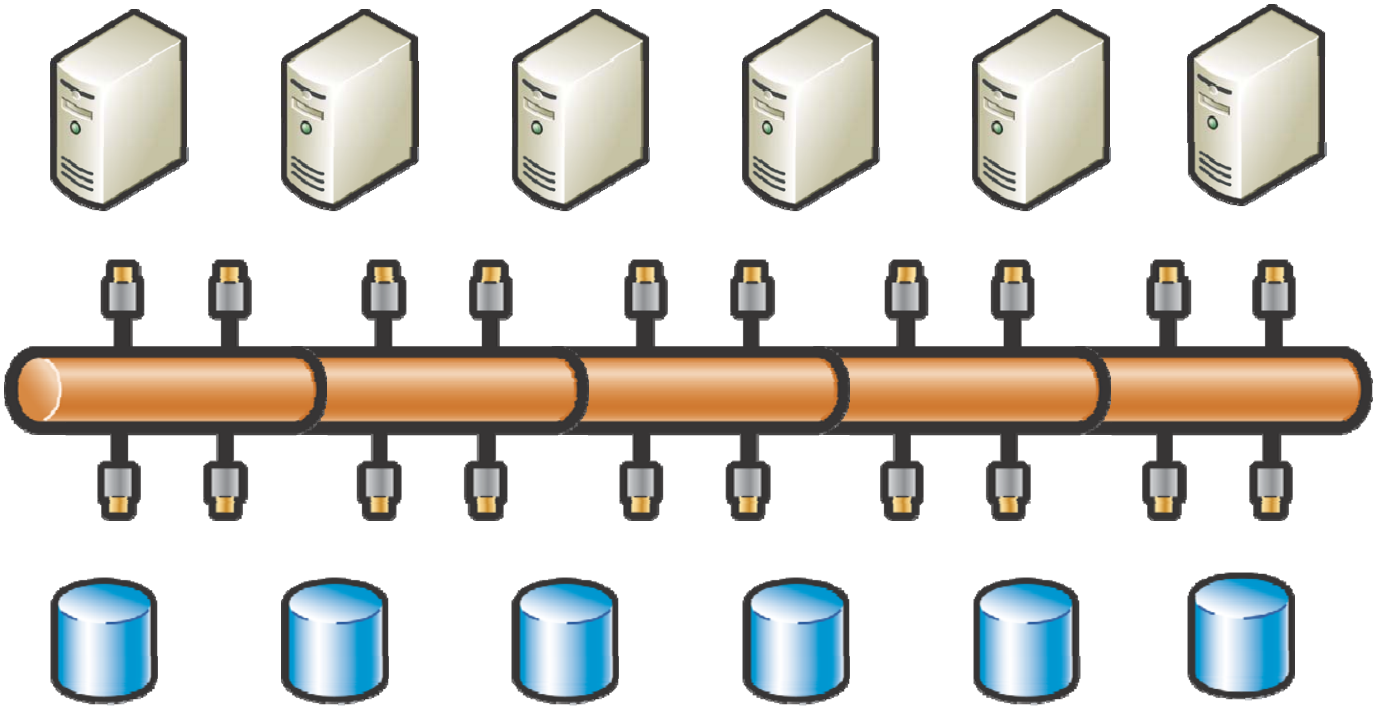
We had this ...



… were promised this …



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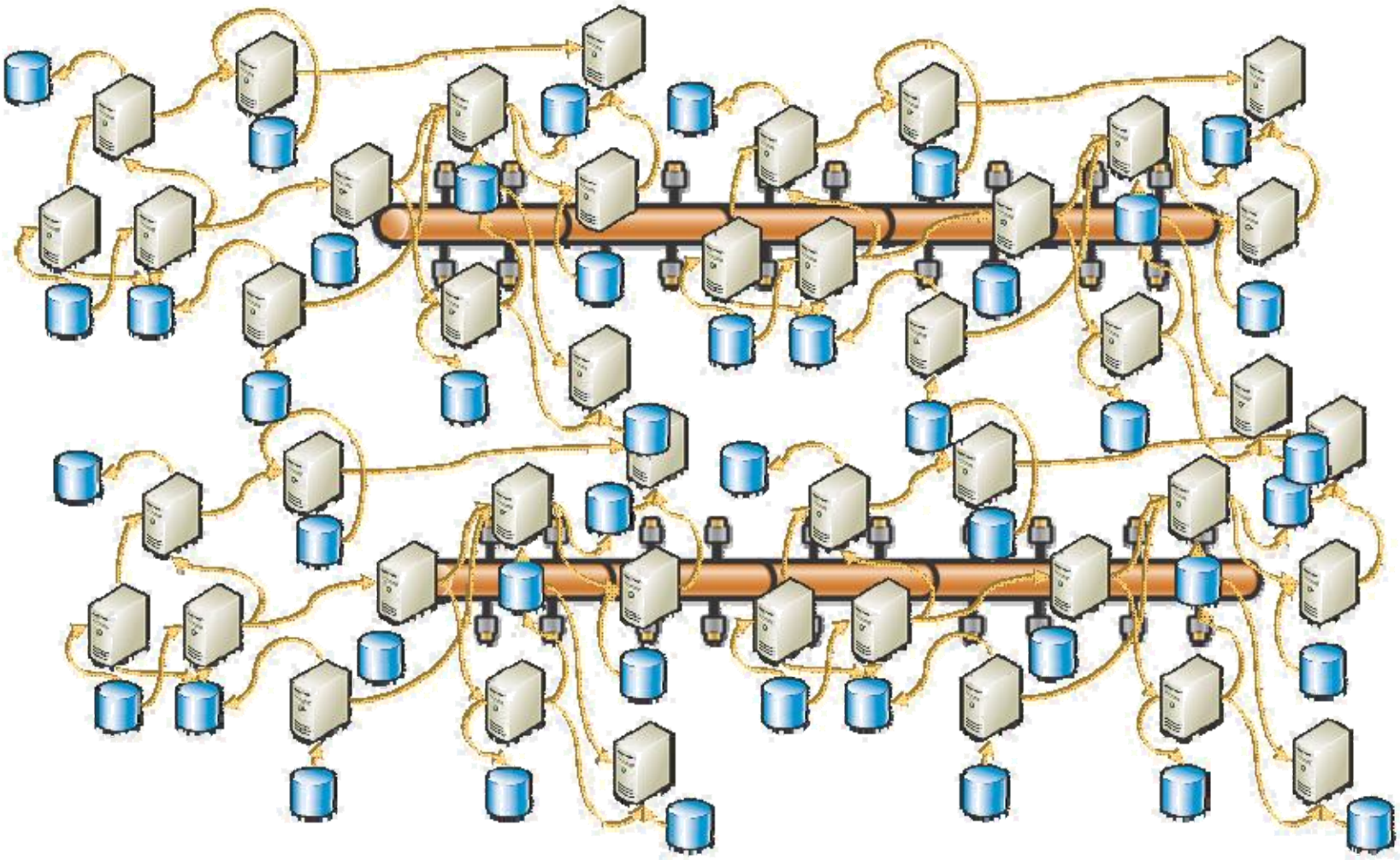
… but ended up with this!



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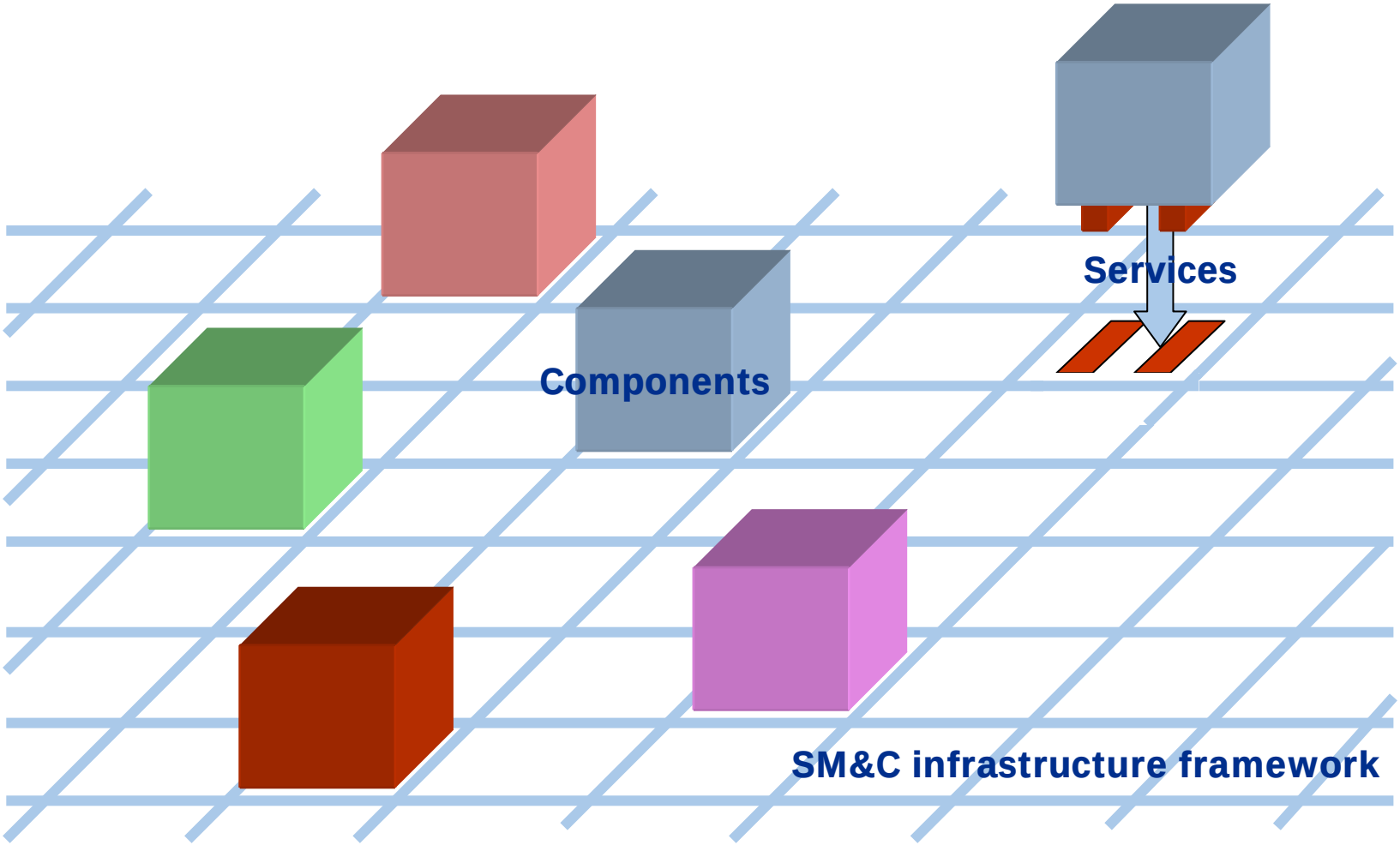
Service-Oriented Architecture: Plug-in Components



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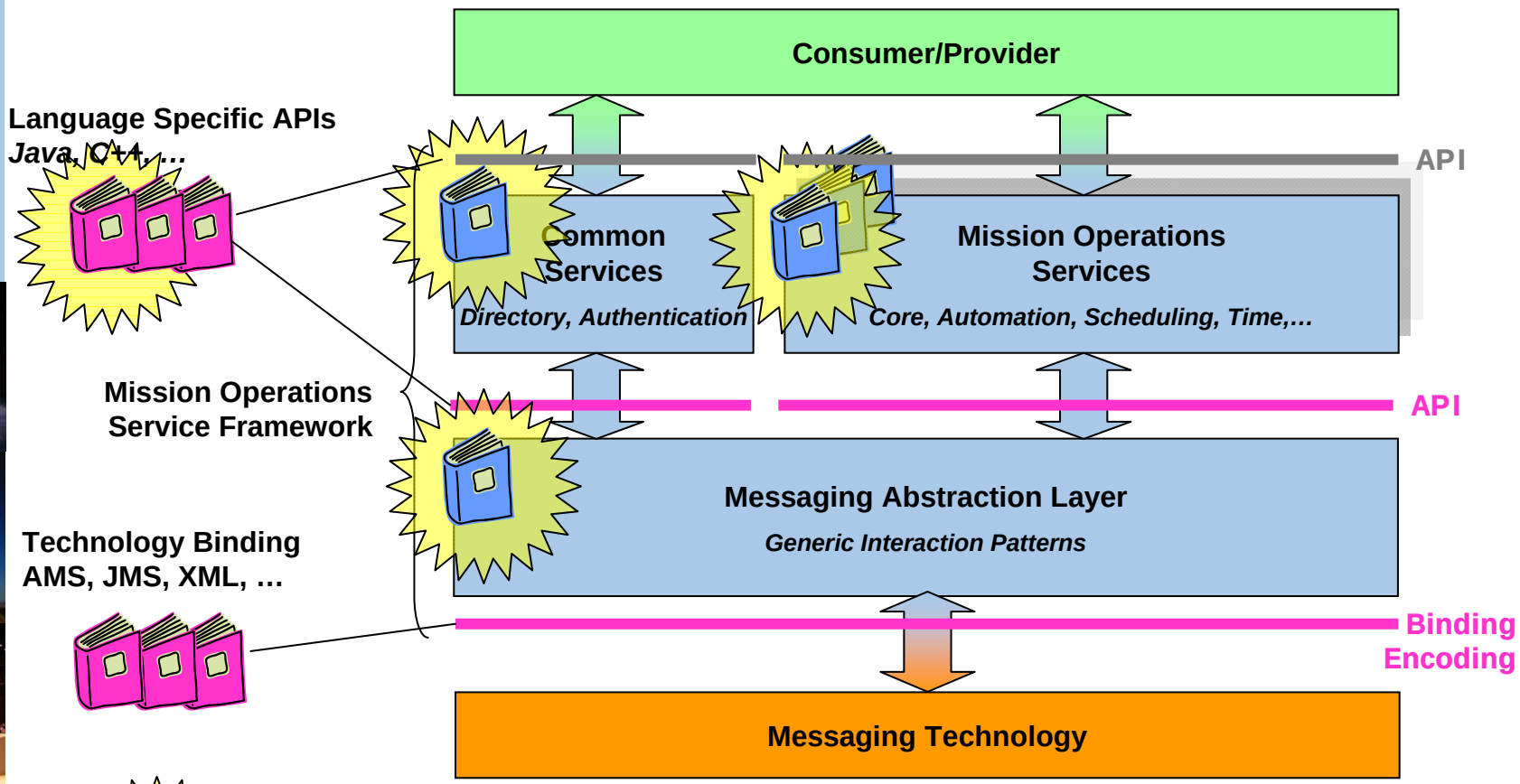
SM&C Mission Operations (MO) Services

- Coherent set of application level services needed to monitor, control and operate a remote system:
  - ⇨ Classical TM, Event monitoring & TC generation (Core)
  - ⇨ Remote software management
  - ⇨ Time management
  - ⇨ Mission product data management
  - ⇨ Mission planning and automation
  - ⇨ Orbit, Attitude and Position determination
  - ⇨ Standard interaction with the operator
  - ⇨ ... more to come

- A SM&C infrastructure framework where MO services plug-in

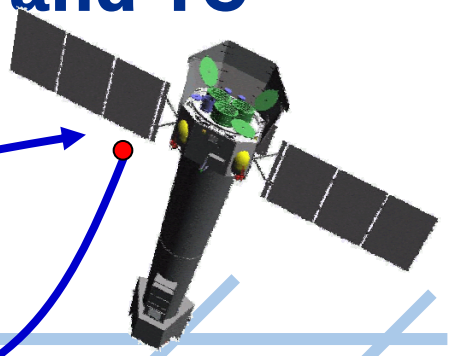
SM&C Architecture and Books

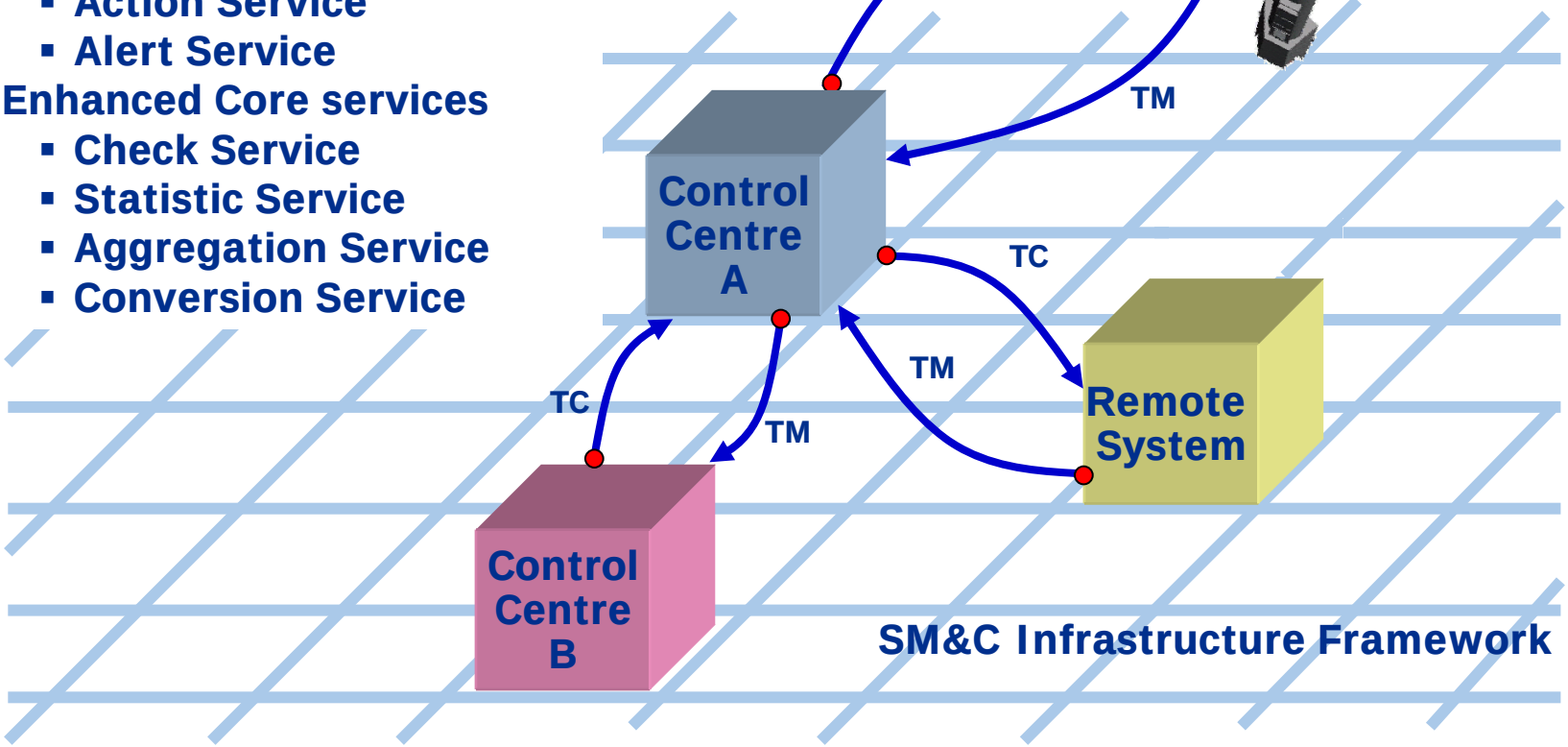


SM&C Core Services: Classical TM and TC

The SM&C Core Service Menu:

- **Standard Core services**
  - **Parameter Service**
  - **Action Service**
  - **Alert Service**
- **Enhanced Core services**
  - **Check Service**
  - **Statistic Service**
  - **Aggregation Service**
  - **Conversion Service**





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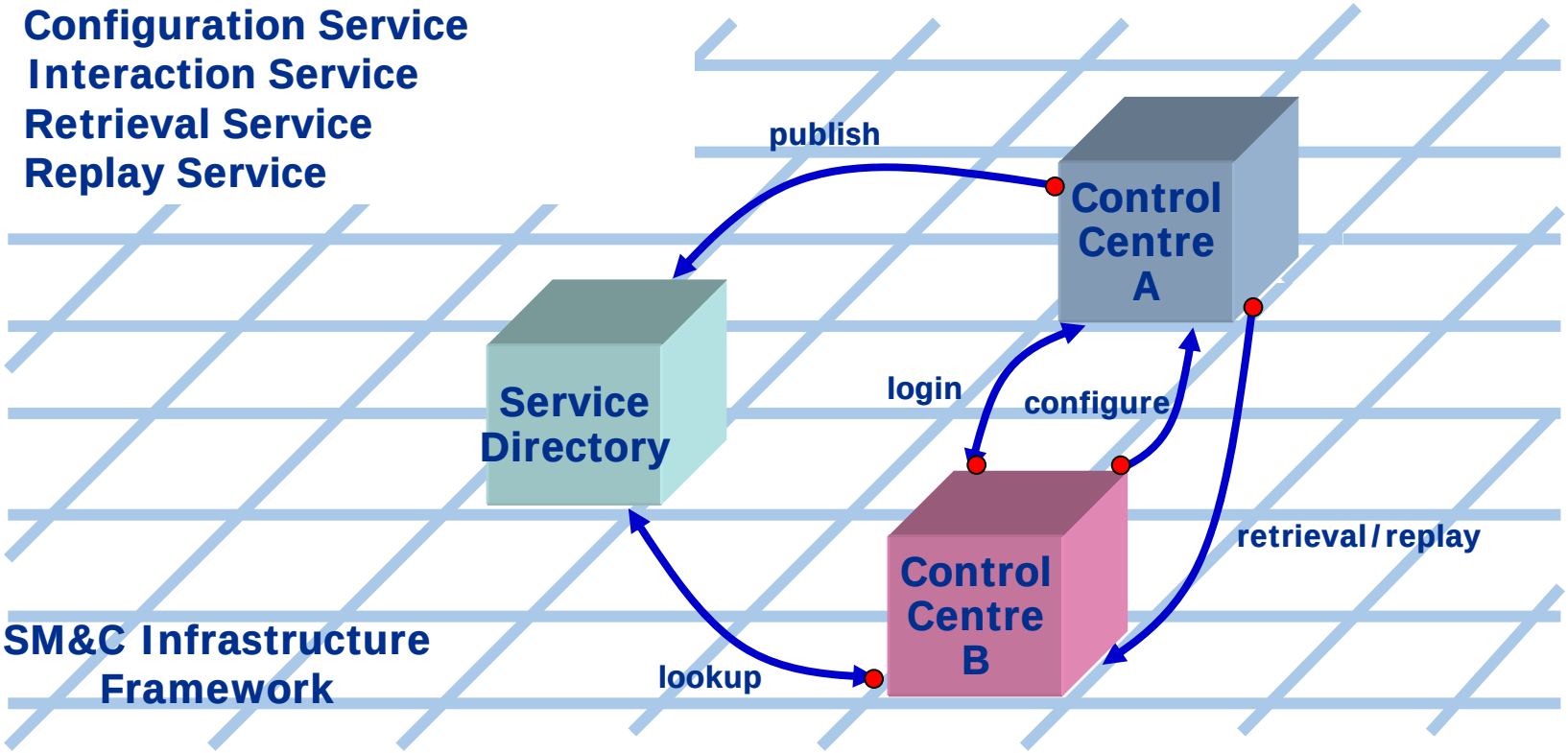
SM&C Common Services

The SM&C Common Service Menu:

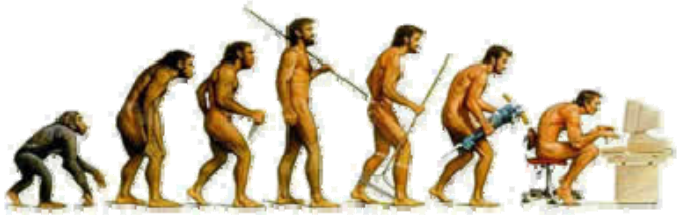
- Directory Service
- Login Service
- Configuration Service
- Interaction Service
- Retrieval Service
- Replay Service



We want to …

be ready for the future

more complex missions



protection from technology evolution

expandable systems

more collaboration across organisations

scalability

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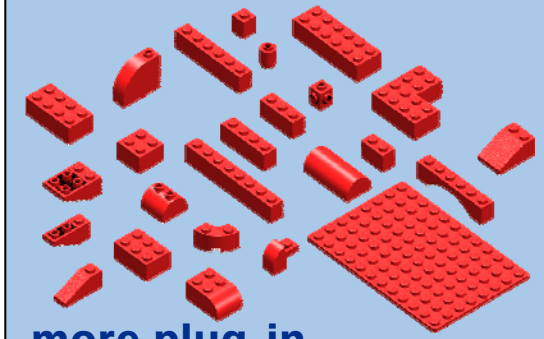
… and to

reduce cost (i.e. schedule, risks, …) of

Systems' Development

more generic software infrastructure



more plug-in components

Re-use

- Infrastructure
- Components
- Legacy systems
- Operational concepts
- People (expertise)

Operations

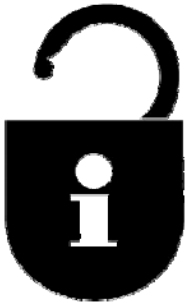
less variability across operational concepts

less variability across systems

It is about using what you already have

Your Systems

Your Data



Your Processes

and only adding enabling technology

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Why Choose CCSDS SM&C?

Old Way	New Way
Designed to last	Designed for change

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Why Choose CCSDS SM&C?

Old Way	New Way
Tightly Coupled	**Agile and Adaptive**

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Why Choose CCSDS SM&C?

Old Way	New Way
Build in isolation	**Build Services**

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Why Choose CCSDS SM&C?

Old Way	New Way
Code is King	**Metadata Princess**

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Why Choose CCSDS SM&C?

Old Way	New Way
Takes time to complete	Interactive progressive development

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Why Choose CCSDS SM&C?

Old Way	New Way
Middleware Focus	**Architecture Focus**

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Why Choose CCSDS SM&C?

Old Way	New Way
Homogeneous	Heterogeneous

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Conclusion: the SM&C Key Design Driver

What few things must be the same, so that everything else can be different

- Eliot Christian

Let SM&C do the boring part of the job so that you can focus on the smart part

- Mario Merri