AEROSPACE
Assuring Space Mission Success

Using Frameworks to Do More With Less

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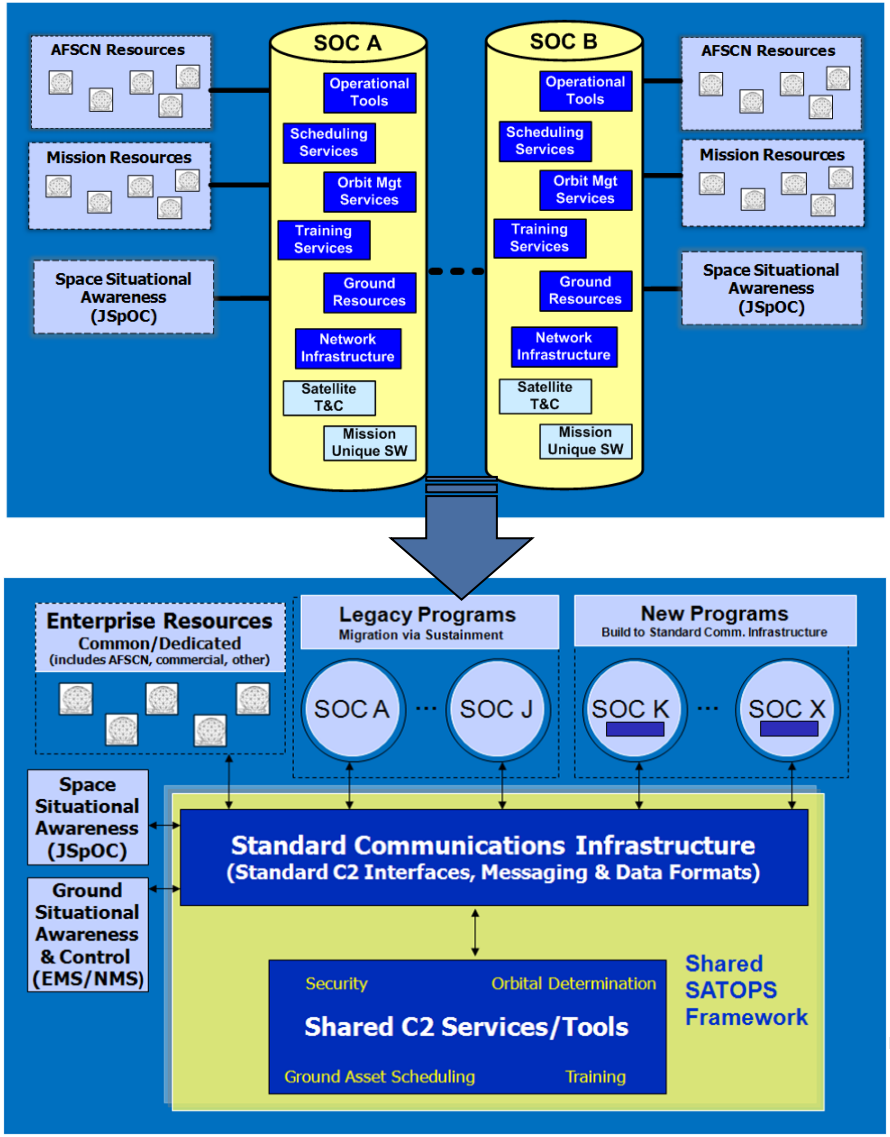
Compatible SATOPS Architecture

Enabling SATOPS Transformation – Doing More with Less



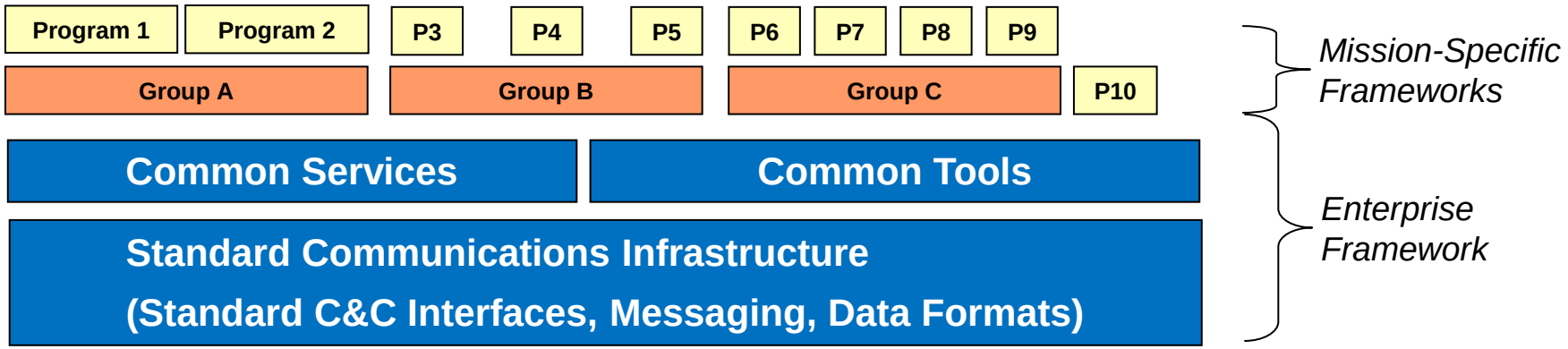
Key Benefits

- Enables integration of legacy & commercial systems, tools & services
- Allows differing CONOPS across programs
- Reduces duplication of services
- Allows program choice of best products from multiple vendors
  - Levels playing field for commercial ground S/W vendors – prevents "vendor lock-in"
- Enables space and ground situational awareness
- Amenable to adoption of new standards & technology

What is a Framework?

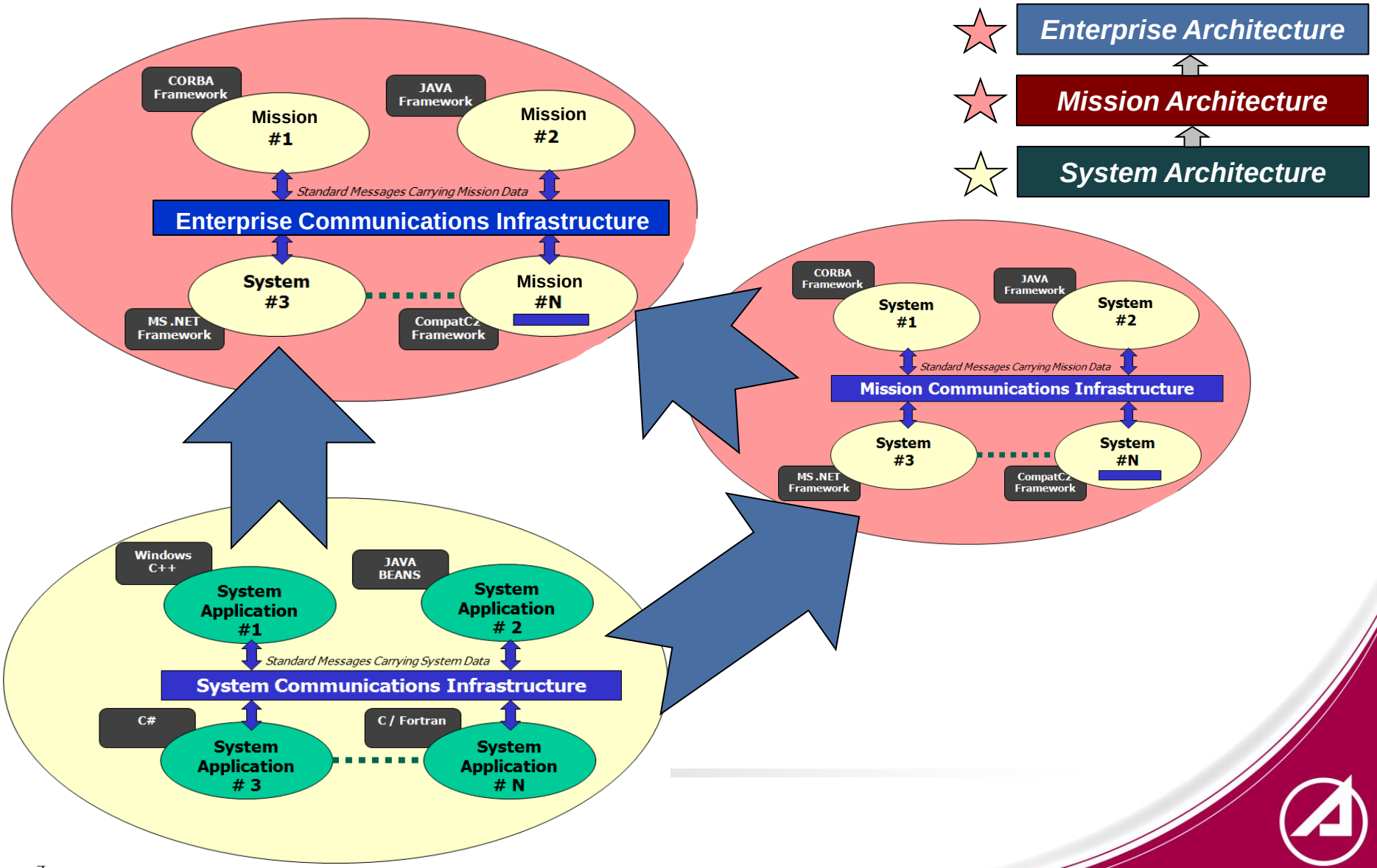
*"**Framework:** An implementation of the foundation portion of the overall system architecture. It is a structured set of software components and standards, and possibly hardware, upon which to build additional functionality."*

- NASA

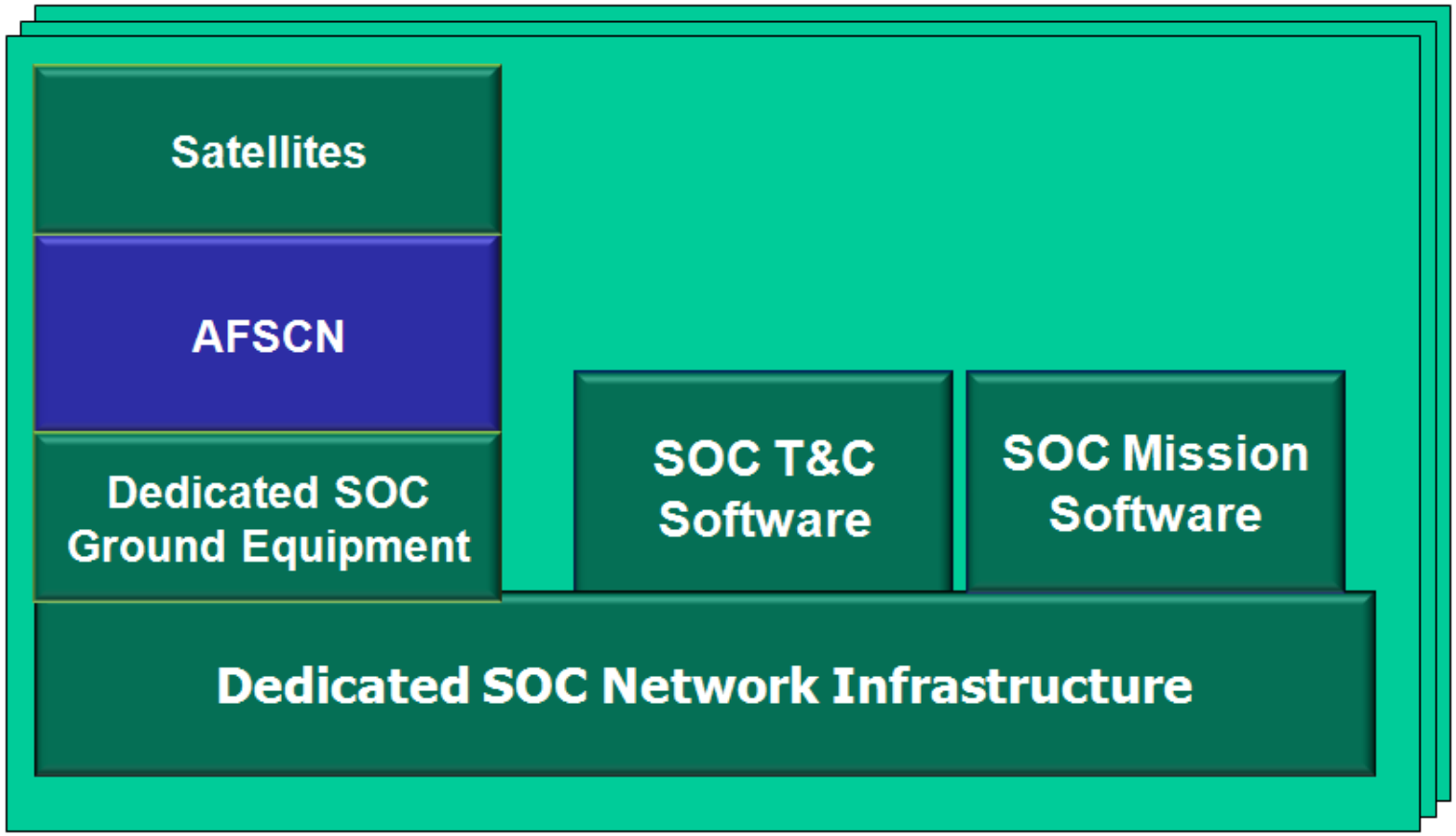


Frameworks are commonly used in industry. Examples: MS Windows, iPhone, 3G Network
It is not an architecture, but can form the foundation for many!

Use of Frameworks in Architectural Levels

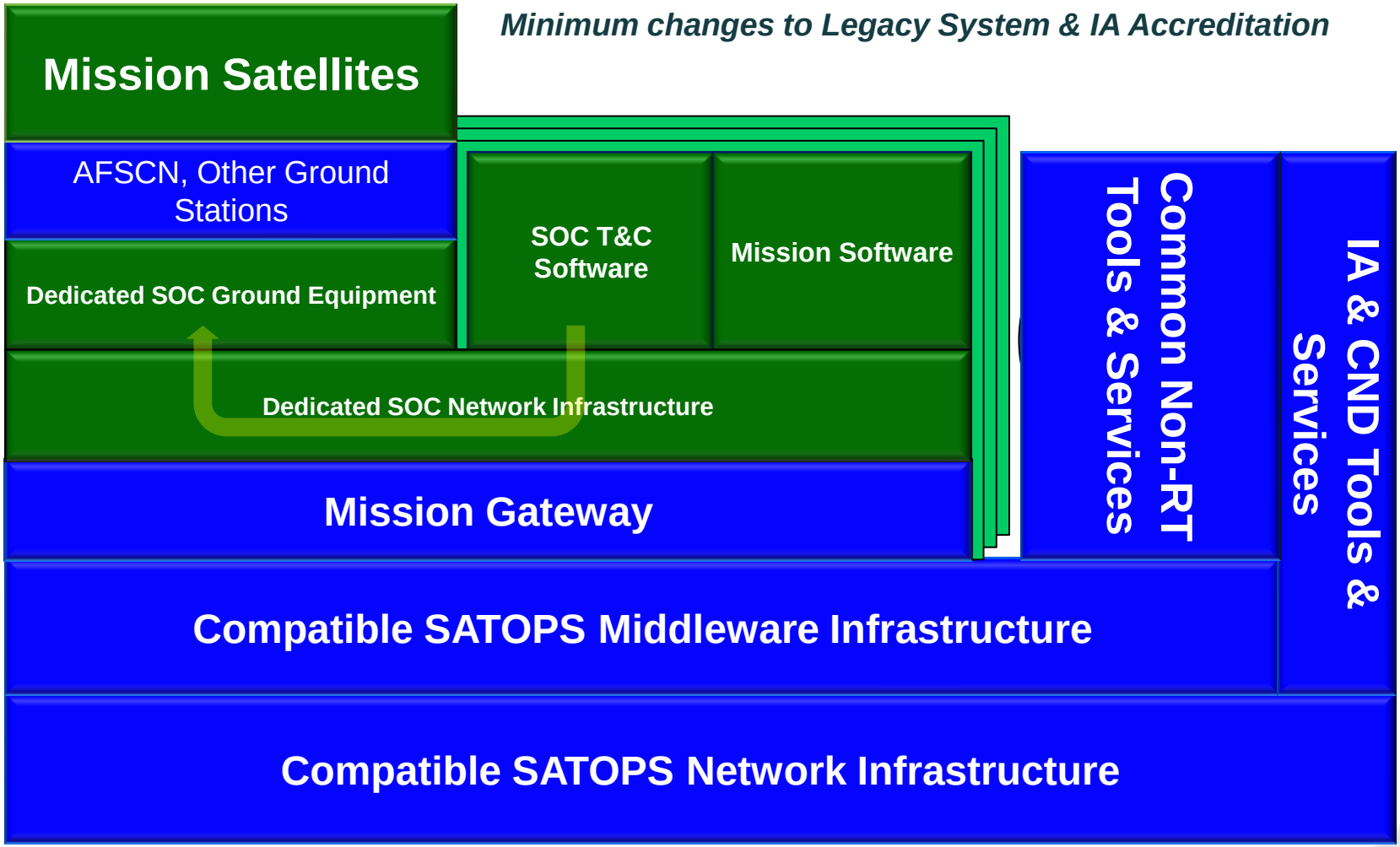


Typical SOC Ground Infrastructure Today (Layered View)



- *Each SOC (mission area) has dedicated infrastructures*
- *No sharing of data for SA, dedicate interfaces, duplicate functions*

1st Step Transition to a Compatible SatC2 Enterprise

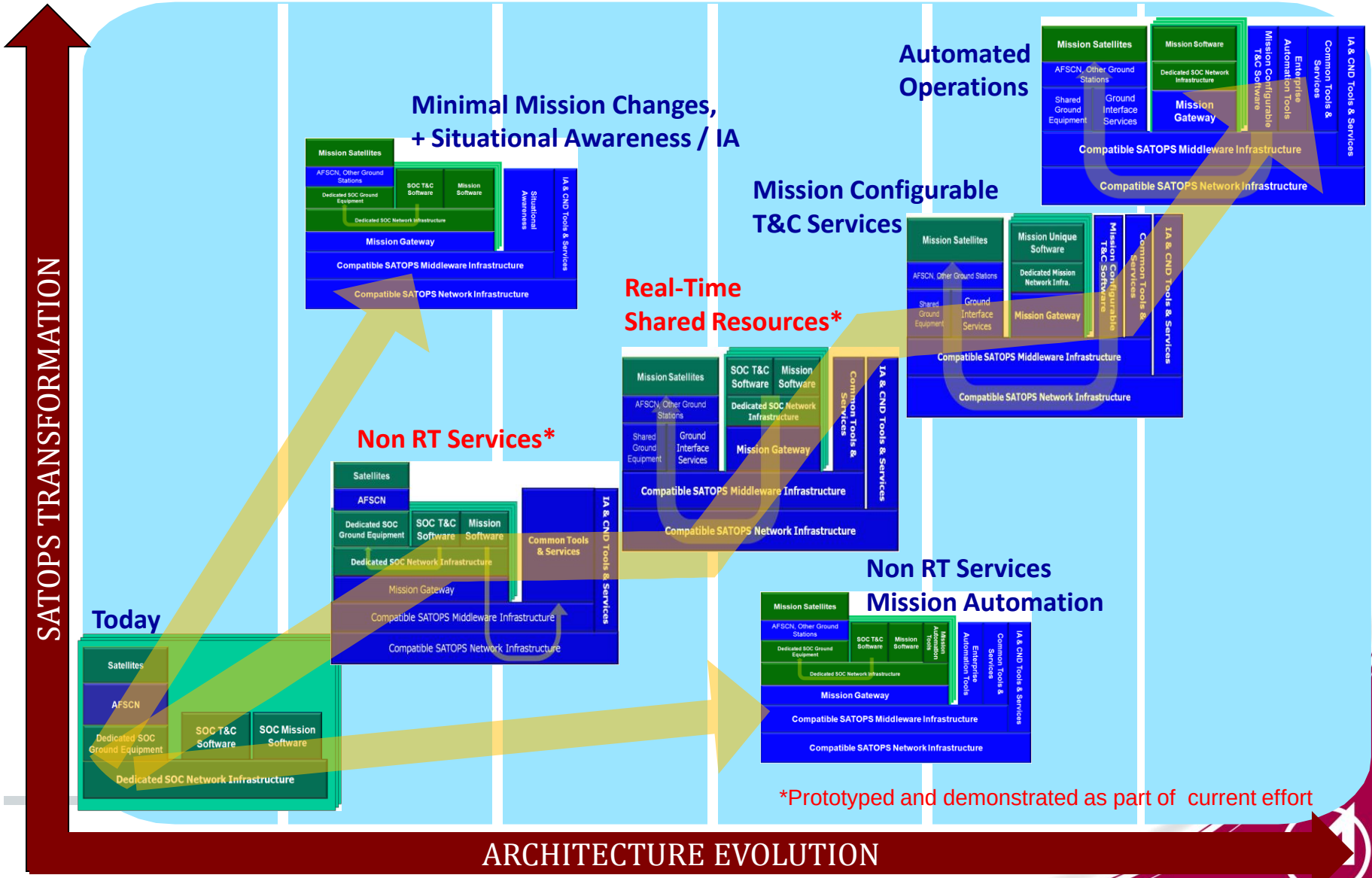


1st Step in Transition: Tasks & Decisions

- **The First Things to Decide:**
  - ***What initial systems and data do you expose?***
    - Related to what services and capabilities you will create first
  - ***What are the initial low risk services?***
    - E.g. engineering analysis tools, data storage, orbit analysis
  - ***Are the first services built based on legacy capabilities or a new build?***
  - ***Who will build the network and middleware infrastructure?***
  - ***Who will govern the framework and architecture implementations?***
    - **Need to be empowered to maintain consistent application/implementation across programs**
  - ***Enterprise IA schema to be implemented***

- **The First Things to Do:**
  - ***Build network and middleware infrastructure that connects to selected legacy networks and applications***
  - ***Build the initial services***
  - ***Create adaptors for legacy systems to expose data*** ***(using Framework API)***
  - ***Document the standard interfaces implemented*** ***(messages & data)***

Architecture Evolution Examples Enabled by Framework



*Prototyped and demonstrated as part of current effort

Doing More with Less

- Use of framework can fundamentally change the way ground systems are developed, procured & sustained
  - *New systems simply choose "best of breed" products and integrate into framework*
    - No need for a system developer, only an integrator
  - *As enterprise matures all missions and the enterprise use the same framework*
    - Much easier to compete sustainment as all contractors have access and experience with the framework
  - *Levels the playing field for product vendors as well as sustainment and integration companies*
- Amenable to funding ebbs and flows – evolution of enterprise can be paused and restarted at any time
- Initial framework implementation does not require a full definition of an endstate
  - *Framework offers opportunity to try new concepts without impacting operations – discover what works for your organization & CONOPS*
- Allows both internal & external users and systems with authorization to have a single access point and interface to data from any enterprise system
- With authorization, ground equipment and processes can be monitored and controlled from anywhere

Study Conclusions & Status

- The Compatible Satellite C2 Framework based on NASA's GMSEC can be applied to an Enterprise Architecture and bring substantial benefits
- The publish-subscribe CONOPS in Compatible SatC2 can effectively provide real-time situational awareness
- Standard IA methodologies and tools can effectively be added to meet 8500 requirements for Compatible C2 Framework
- The Compatible SatC2 Framework enables new CONOPS and capabilities that are unavailable today

The use of a standardized framework does allow more to be done with less!

Joint SATOPS Compatible Committee (JSCC)

- Multiple organizations have recognized common evolutionary challenges
  - *Reduce life cycle costs*
  - *Increase interoperability of satellite control between systems and organizations*
  - *Provide enterprise-wide space and ground situational awareness*
  - *Enhance current SATOPS capabilities & availability*
- JSCC collaboration formed among AFSPC, NRO, ORS, NAVSOC and NASA organizations
  - *Investigate methodologies & architectures to address challenges*
  - *Need mature technical alternatives and industry acceptance*

JSCC shares lessons learned on defining a SATOPS framework and associated standards that foster compatibility

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