

INNOVATION / CHANGE IN NEED > 1

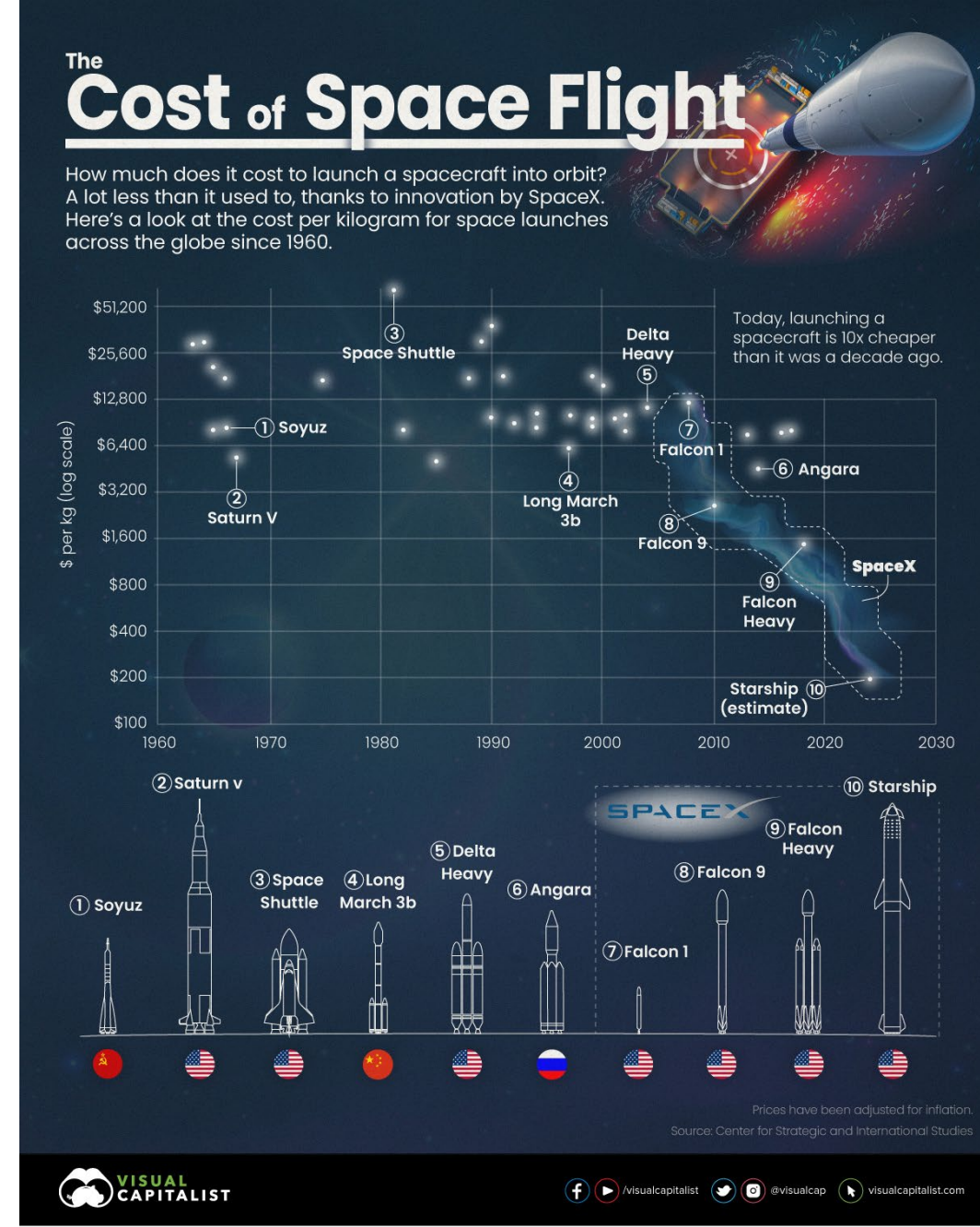
$$\frac{dI}{dt} \geq \frac{d^2N}{dt^2}$$

DRIVING INNOVATION TO FORM AN ENTERPRISE

Gerry Simon – Chief Architect / Mission Solutions / Parsons

BASIC TENANTS

- **Capability must be greater than Need**
 - $C > N$ or $\frac{C}{N} > 1$
- **Innovation (I) = Rate of change in capability (C)**
 - $I = \frac{dC}{dt}$
- **Need (N) = Full set of functional requirements to perform the mission**
- **Needs aren't just changing, they're accelerating:**
 - Space is no longer benign, threats are accelerating
 - Increasingly competitive commercial marketplace
 - Dependence on space is becoming critical for survival
 - Payload to orbit cost is dropping dramatically
 - $\frac{d^2N}{dt^2} > 0$
- **Capability must accelerate accordingly**
 - $\frac{dI}{dt} \geq \frac{d^2N}{dt^2}$



INNOVATION PATTERNS ENABLE ACCELERATED INNOVATION

- **Disruptive Technology**

- New technology that creates new solutions to old problems
- *Examples:* Cloud computing, Automated Test and Deployment, Software Defined Radio, Commercial Antenna Networks

- **Key standards**

- Key technical standards provide a foundation innovation can grow from
- *Examples:* C2MS, CCSDS Link Standards, XTCE, GEMS

- **Investment**

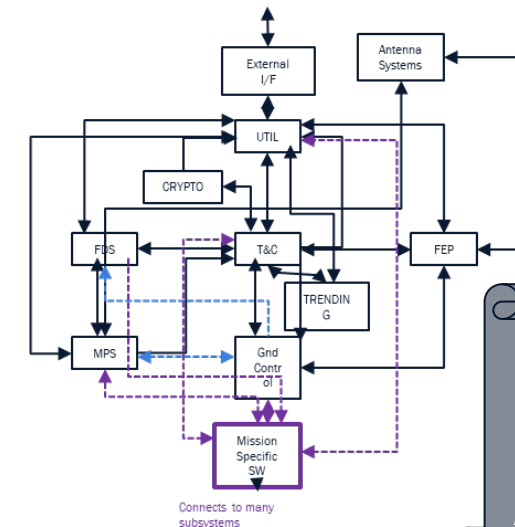
- Market must exist for new capability

- **Disruptive Thinking**

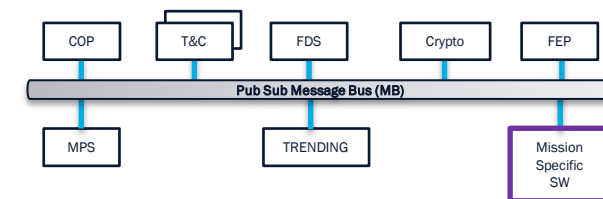
- New approaches to old problems or simply quit working old problems
- *Examples:* DevSecOps, Ruthlessly drive out touch labor, and things I haven't thought of

- **Competition**

- Competition rewards cost effective and innovative capability



Traditional
Tightly
Coupled
Architecture

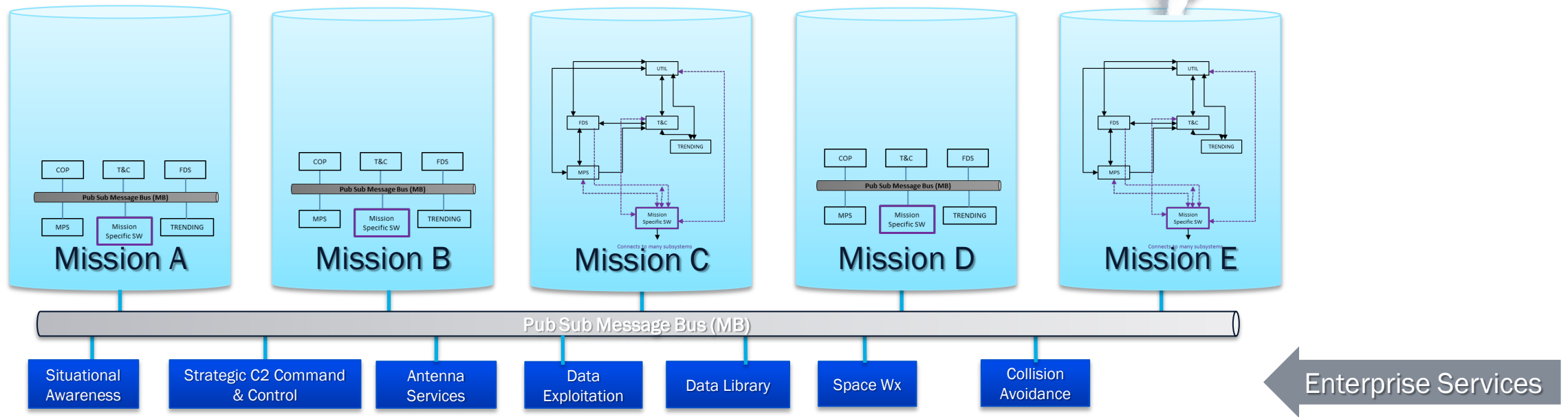


Modern
Service
Based
Architecture

ENTERPRISE INNOVATION

- **Enterprise Ground Systems**

- Must be observable and controllable to the larger enterprise – must adhere to boundary interface standards
- Being good at a single mission isn't good enough
- Must facilitate data sharing, yet keep cyber vigilance (conflicting goals)
- Purpose of Space Force missions is to protect and defend the US, not just operate a mission
- Purpose of Commercial missions is to make a profit, not just operate a mission



Select presentations on the merits of a message-based service-based architectures for ground systems:
<https://docplayer.net/14920598-Multi-mission-satellite-operations-center-ground-system-architecture-ms-tiffany-morgan-smc-sdtc.html>
<https://gsaw.org/wp-content/uploads/2015/03/2015s09sather.pdf>
<https://gsaw.org/wp-content/uploads/2018/03/2018s02simon.pdf>

QUESTIONS

- What areas are being innovated in to help form or foster an enterprise? Where is the commercial world going?
 - Digital Twins
 - Agile development
 - Cloud based deployments
 - Automated deployments
 - Frequent deployments → CI/CT/CD
- What types of organizational, governance, process and/or funding changes need to be in place to form and sustain a successful enterprise?
 - Stove-piped funding begets stove-piped systems
 - Hardware intensive waterfall-based acquisition models fail for innovative agile ground systems
- At what level should standardization occur to allow some freedom to achieve mission design optimization and still achieve enterprise goals? Is there an area of maximal return?
 - *Paradox of Standards*: While they seemingly confine innovation, the right standards accelerate innovation
 - There is a great temptation to enforce how everything is done within an Enterprise – this wouldn't just limit innovation, it would kill it
 - Standardize the socket not the light bulb