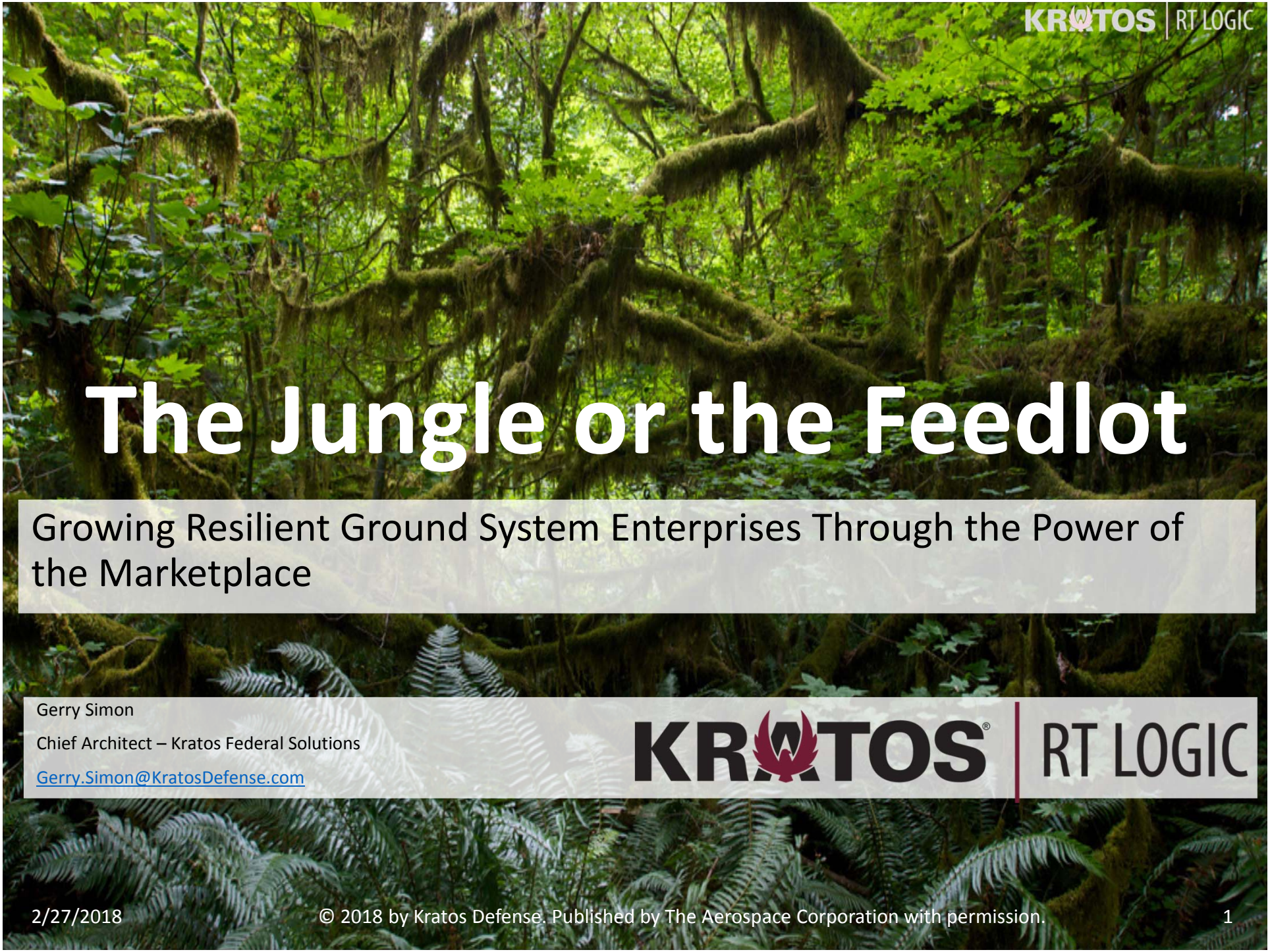


The Jungle or the Feedlot

Growing Resilient Ground System Enterprises Through the Power of the Marketplace

Gerry Simon

Chief Architect – Kratos Federal Solutions

Gerry.Simon@KratosDefense.com

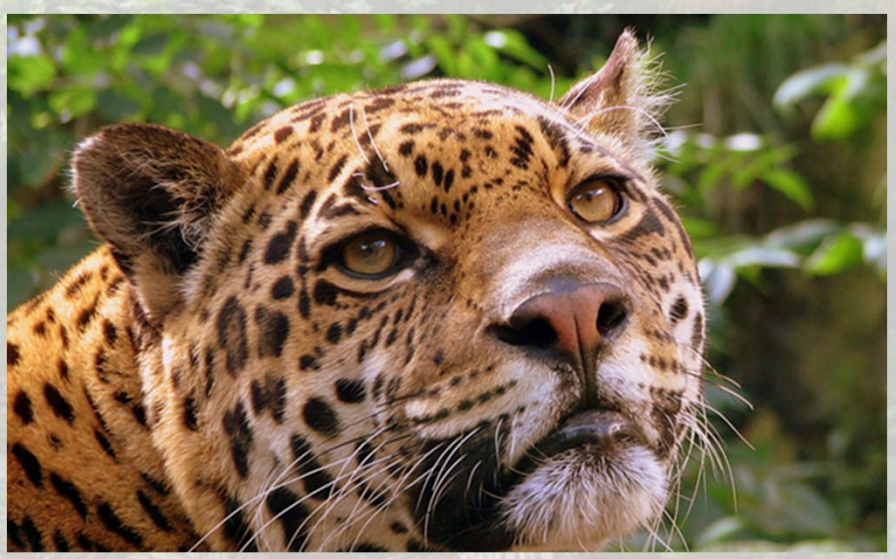
Jungle vs Feedlot

Feedlot

- Slow, Fat, Weak - destined for slaughter
- Bred to be large and well marbled
- Government Development
  - Troubled developments receive more funding

Jungle

- Fast, Nimble, Strong – survival of the fittest
- Evolved to be strong, fast and cunning
- Commercially Developed
  - Troubled products disappear



Air Force Space Commander's Direction

"Even our newest systems lack required resiliency and survivability," Gen. John Hyten, commander of Space Command, said in a letter to senior subordinates. "We must retool our entire space architecture to one that can be commanded through a robust common platform"

Service Terms

- **Service**: A function that is well defined, self-contained and does not depend on the context or state of another service.
- **Service Contract:** Specifies what a service must do, and some performance characteristics
- **Service Provider**: Software or hardware that implements a service
- **Service Capability Profile**: A representation of a particular Service Provider's capability in terms of performance to provide a Service
- EXAMPLE:
  - **Service:** Toaster
  - **Service Providers**: Hamilton Beach, Cuisinart, Oster, KitchenAid
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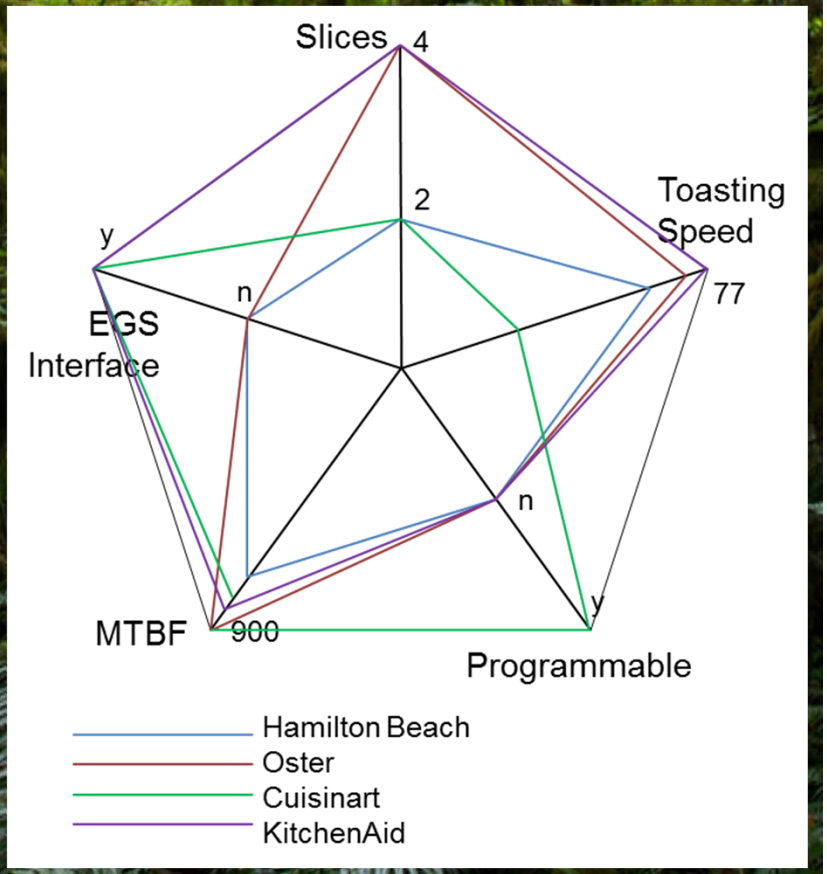


Resiliency Through Evolvable Architecture

KRATOS | RT LOGIC

- Infrastructure
  - Pets → Cattle
- Services Layer
  - Use Case #1: Missions use different service providers for the same service
  - Use Case #2: Replace one service provider with another (toaster)
- If it costs too much to evolve, then it's not resilient

Pets – Legacy Infrastructure	Cattle – Cloud Friendly
Assets are named	Assets are numbered
Setup takes weeks	Setup takes minutes
Capacity is fixed	Capacity scales
Modified during scheduled down-time	Modified on the fly
Specialty admins make updates	Updates made with version controlled scripts

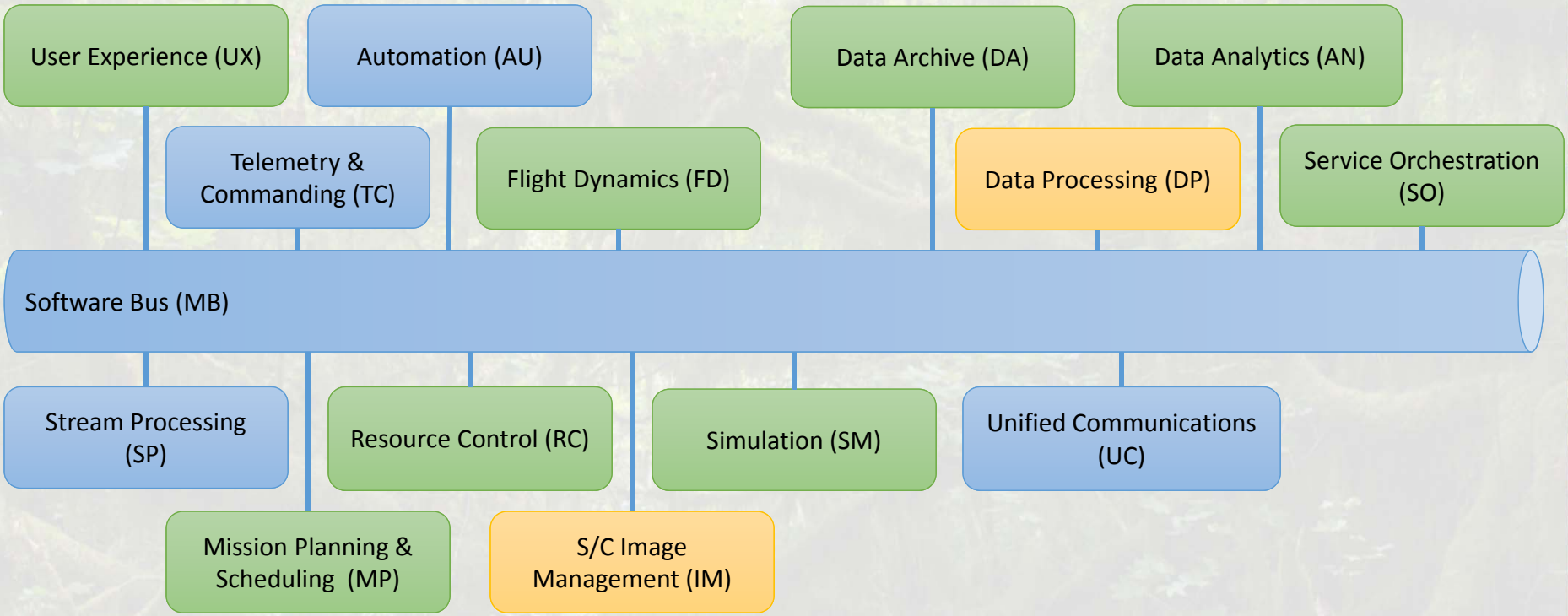
Flexibility is Essential to Resiliency

A New Paradigm

- Enterprise Ground Services architectures represent a major opportunity to fundamentally change the way ground systems are acquired, evolved, and are maintained.
- Historically ground systems have been acquired as single large single system acquisitions sometimes even combined with space assets and launch services.
- With Enterprise Ground Systems, mission ground system capability can be competed and acquired as individual services – possibly even micro-service acquisition.

With this new paradigm, the power of the marketplace can be fully exploited to create efficient, performant, cost effective, and resilient ground system implementations

Generic Enterprise Ground Services



Common Capability

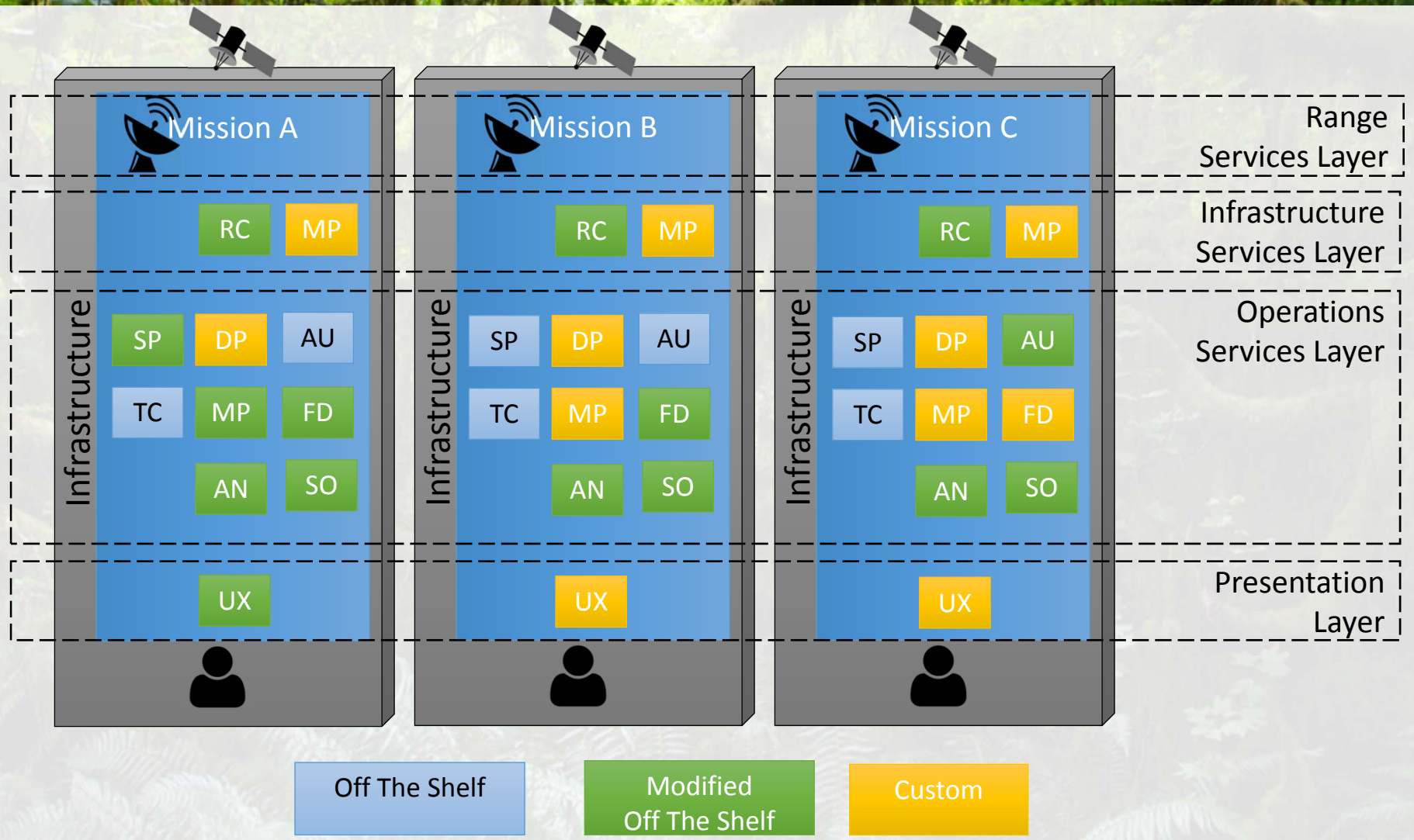
Off The Shelf

Modified Off The Shelf

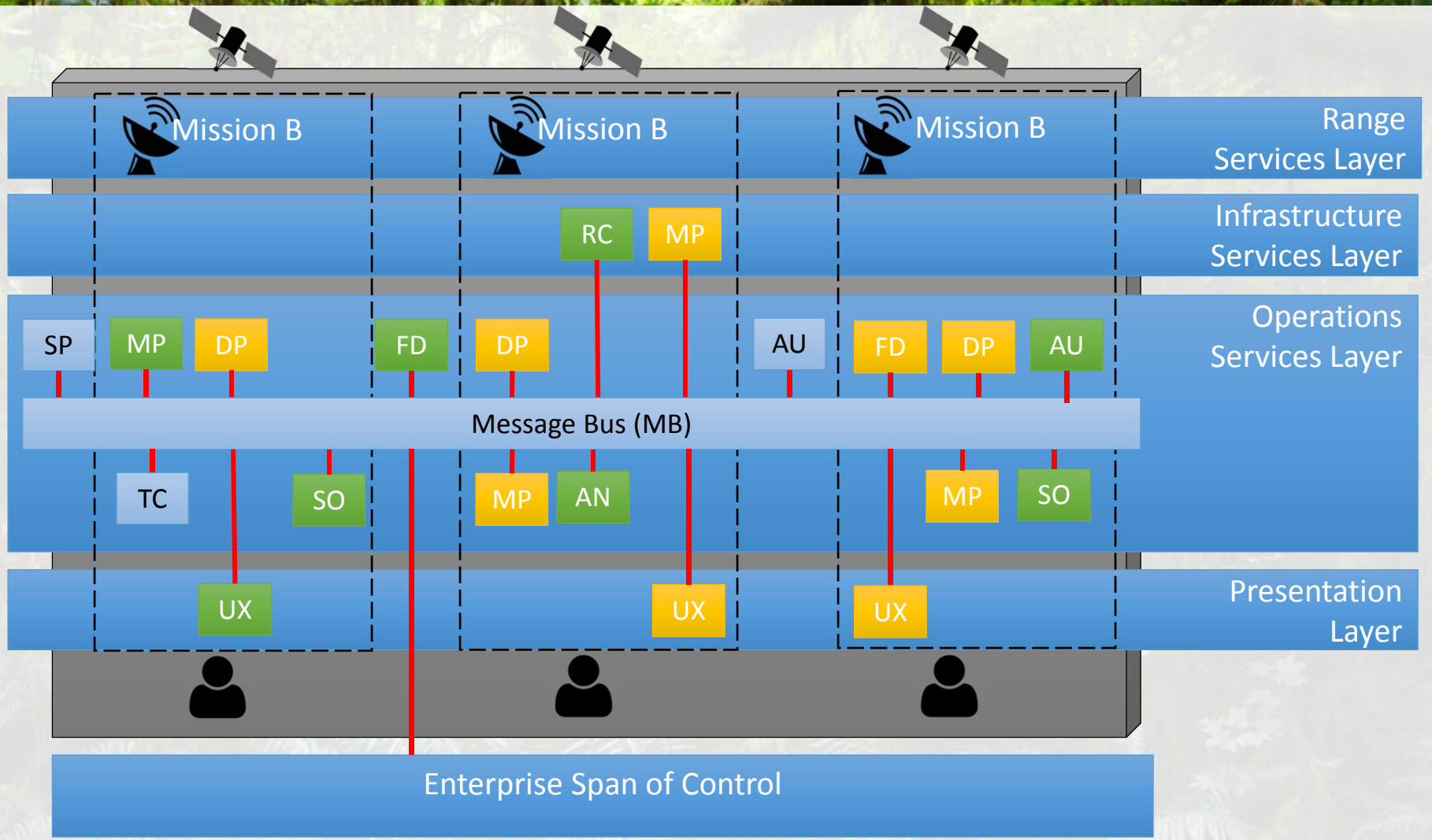
Custom

Mission Unique

Transition from Vertical Integration



To Horizontal Integration



Enablers

- Open Interface Standards
  - A standard that is publicly available has an open adoption/review process and has publically available rights to use
    - Supported by a Standards Development Organization (SDO)
  - Open Interface Standards drives how major system components are integrated into the solution
  - Platform specific model backed by a technology independent platform independent model
- Software intensive system acquisitions – NO WATERFALL
  - Ideally integrated in with DevOps
- Risk acceptance
- System connectivity using a single base protocol (Internet Protocol)
- Agile training and logistics
  - Heavyweight training and logistics programs are incompatible with lightweight acquisition and development

Measuring and Testing Service Capability

- Service Capability Test Fixtures
  - Perform service provider characterization
  - Are possibly more complex than the service capability
- Enable automated testing
  - Critical for multi-mission enterprise environments
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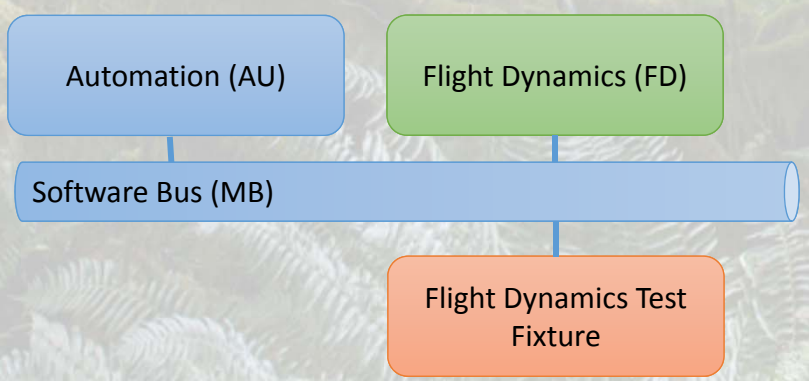


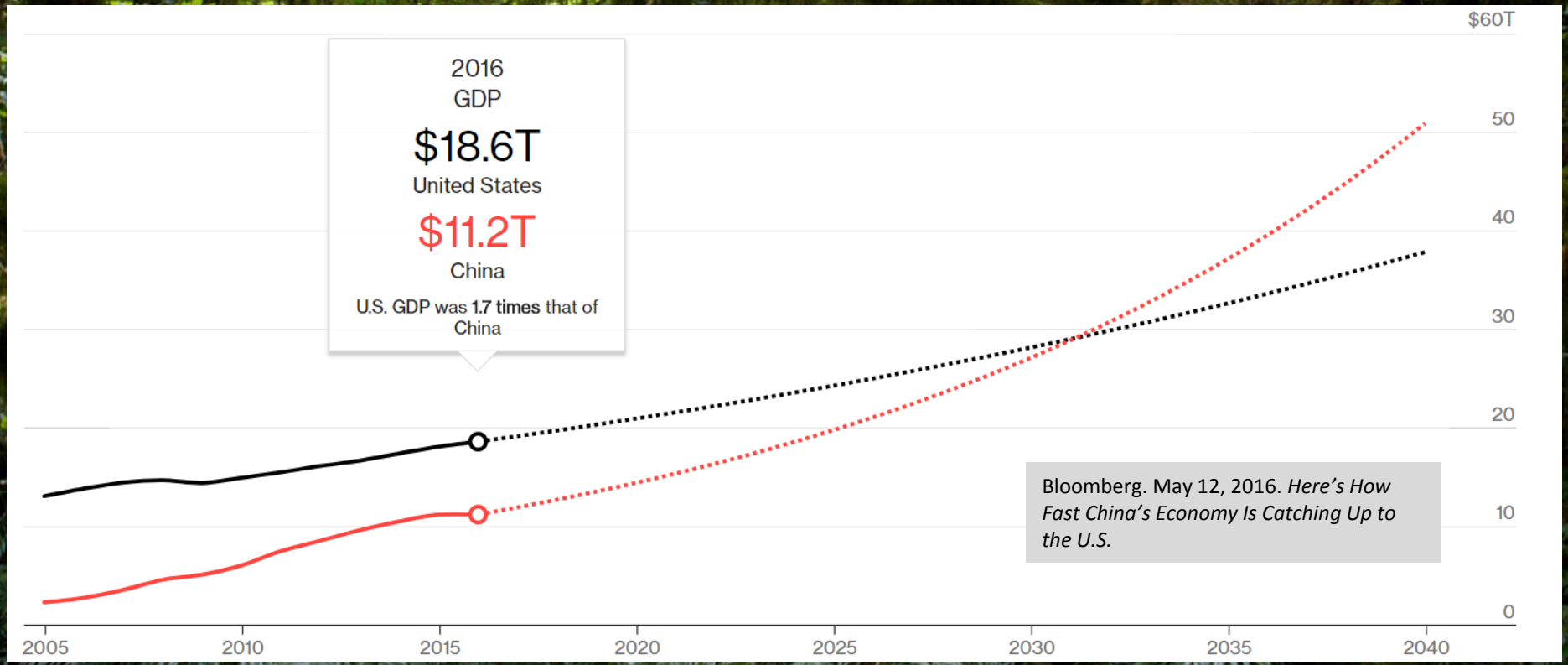
Simple Confidence test

1. Create random orbit
2. Request FD Service to propagate orbit
3. Request FD Service to generate look angles
4. Request FD Service to perform OD using look angles as tracking data
5. Does new orbit match original random orbit?

Imperative

I watch what our adversaries do. I see them moving quickly into the space domain, they are moving very fast, and I see our country not moving fast, and that causes me concern.

- Gen Hyten said Nov. 18 at the Halifax International Security Forum



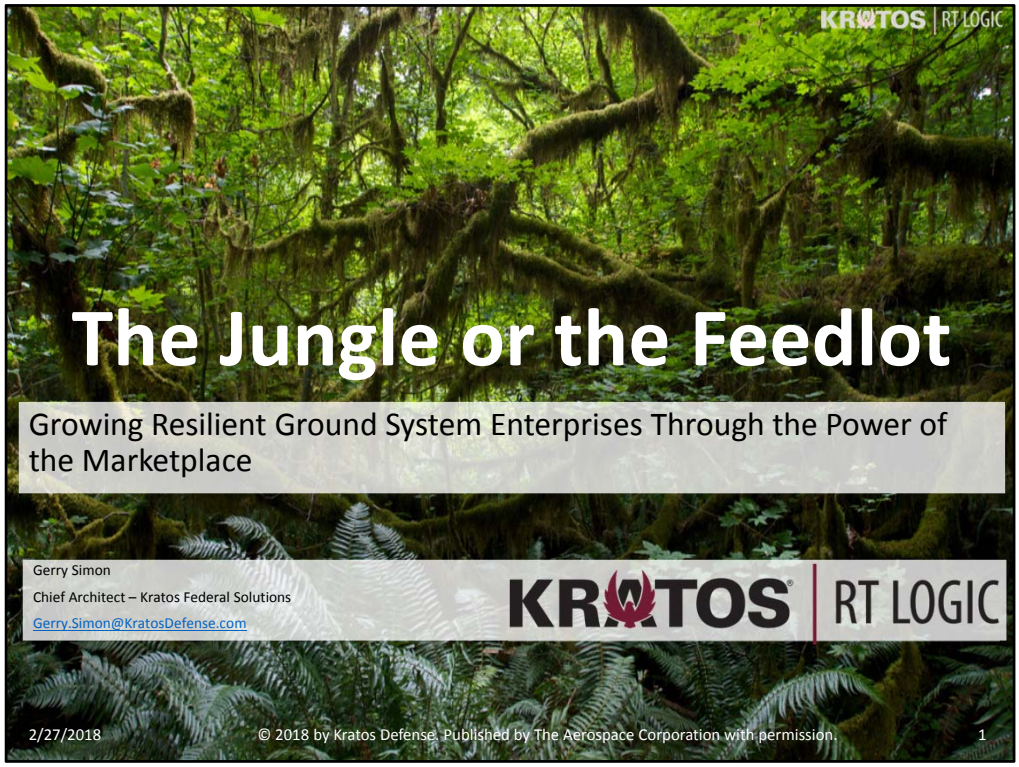
Bloomberg. May 12, 2016. *Here's How Fast China's Economy Is Catching Up to the U.S.*

Begin !

The reasonable man adapts himself to the world; the unreasonable one persists in trying to adapt the world to himself. Therefore all progress depends on the unreasonable man.

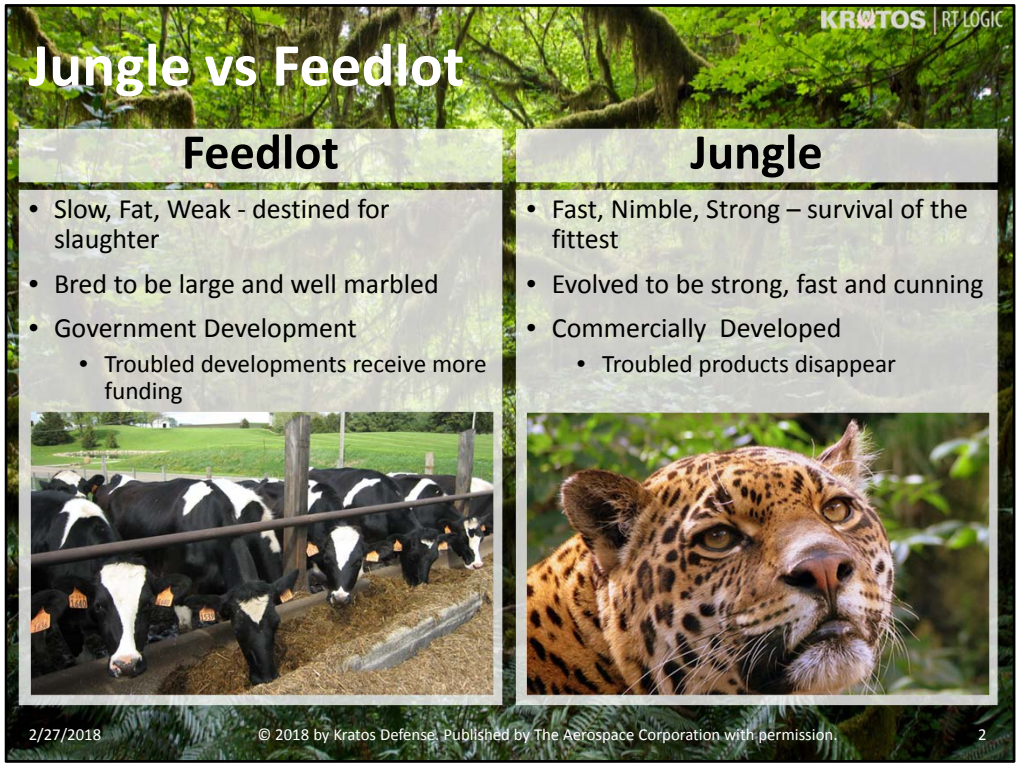
- George Bernard Shaw

Presenter's Note Pages



Put hat on

The Enterprise Ground Services (EGS) architecture is more than just a new paradigm for ground system architectures, EGS represents a grand opportunity to fundamentally, change the way ground systems are acquired, evolve, and are maintained. Historically ground systems have been acquired as single large single systems acquisitions sometimes even combined with the space assets. With EGS, needed mission ground system capability can be competed and acquired as individual services – possibly even micro-service acquisition. Now the power of the marketplace can be fully exploited to create efficient, high performant, cost effective and highly resilient ground system implementations. This presentation will explore the concepts, processes, implications, and benefits of this new paradigm.



As we strive for more resilient systems, we can draw a metaphor from the animal kingdom:
- Animals that grow up in the jungle will be inherently more resilient than animals that are raised in a feedlot

Excited about Enterprise Architectures because of the opportunity they offer to break up government monstrosities

Several examples of Ground Enterprise Architectures: AF EGS, CCSDS MOIMS, NOAA GEARS

Full disclosure, work for a commercial company that builds products and does mostly FFP contracts, am an unapologetic capitalist

What does this have to do with resiliency?

Believe picture is of a competitor's ground system which after re-baselining is back on track for delivery in 2021

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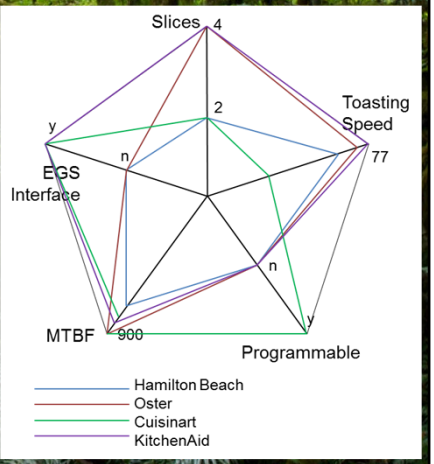
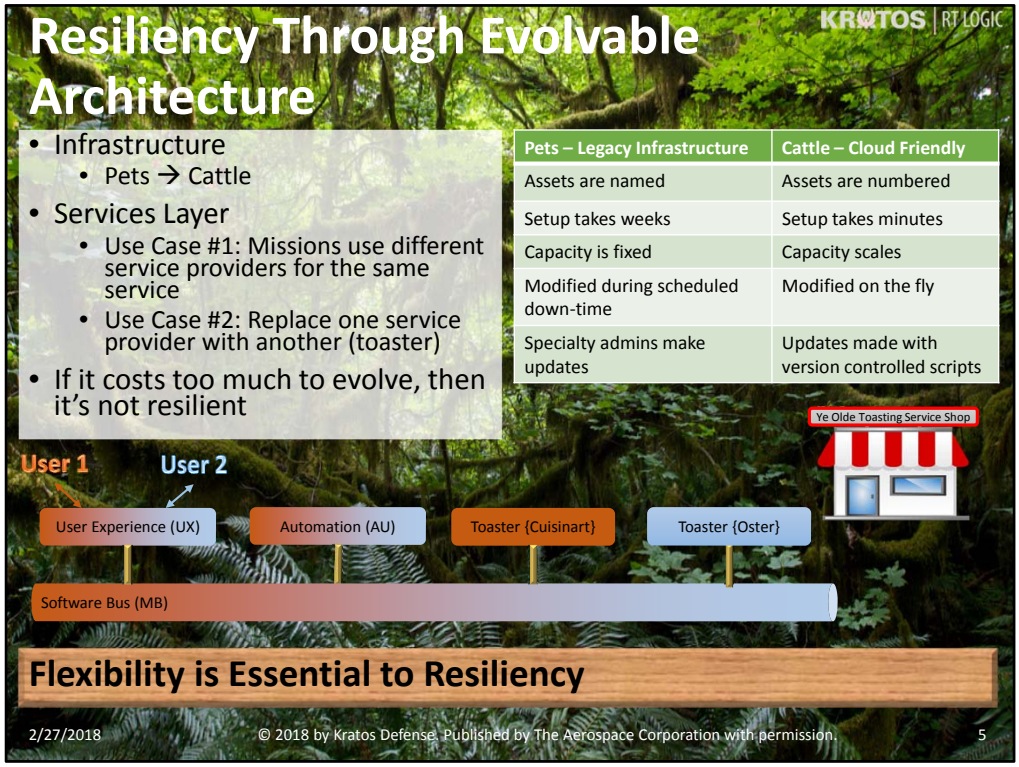


Example shows multiple toaster service capability providers



Two key elements of Enterprise Architectures: Infrastructure and Software bus

Clarify Pets → Cattle metaphor

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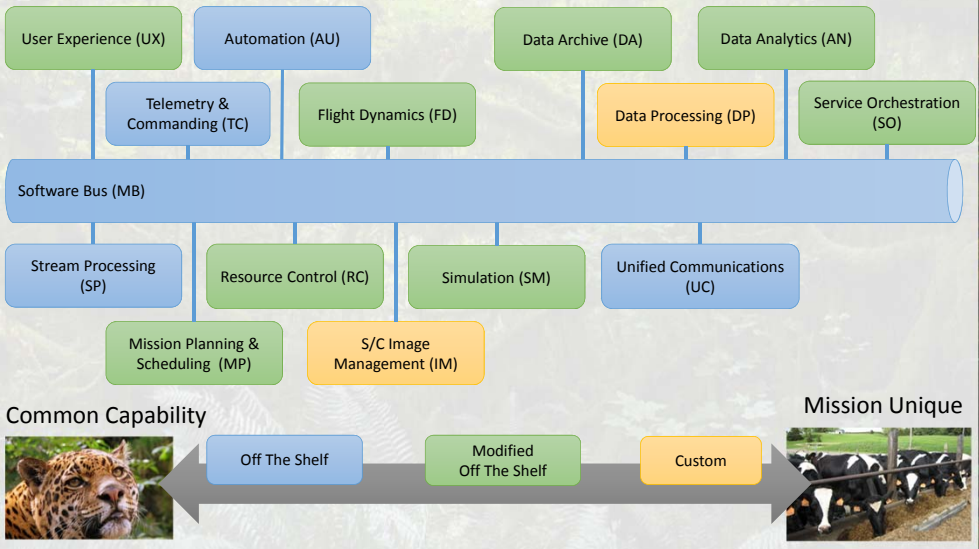

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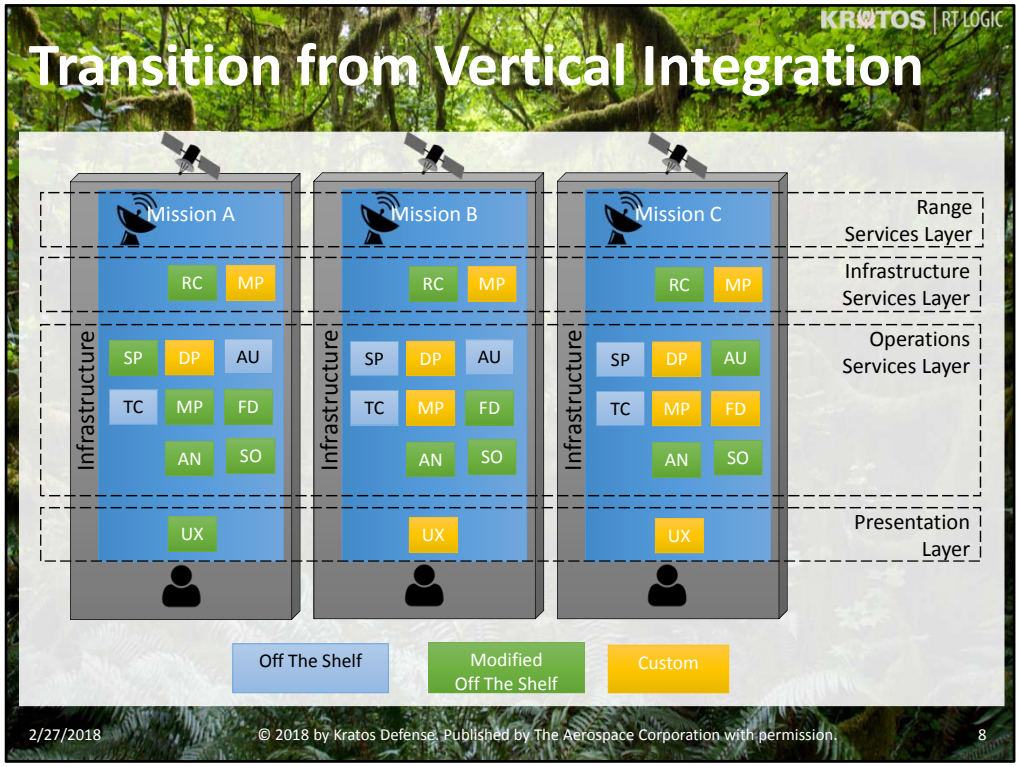
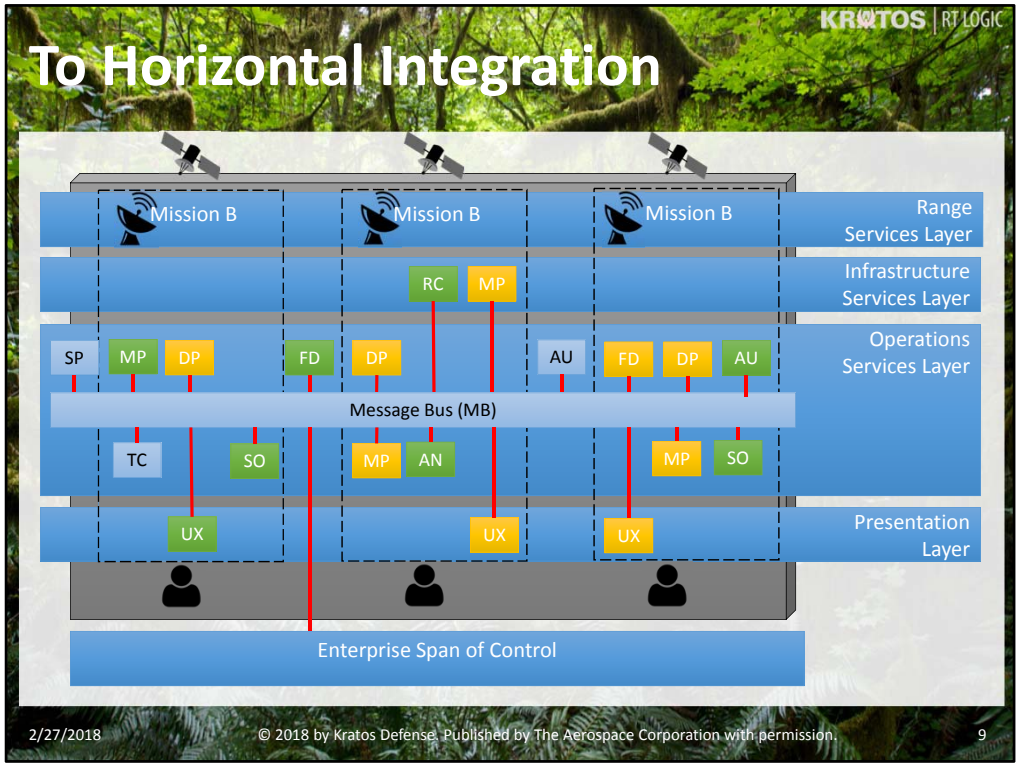


Photo by Milada Vigerova on Unsplash
Photo by Annie Spratt on Unsplash
Photo by Paul M on Unsplash



Common mode software failure

Photo by Milada Vigerova on Unsplash
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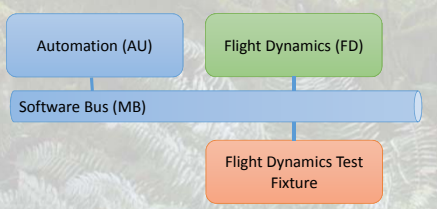

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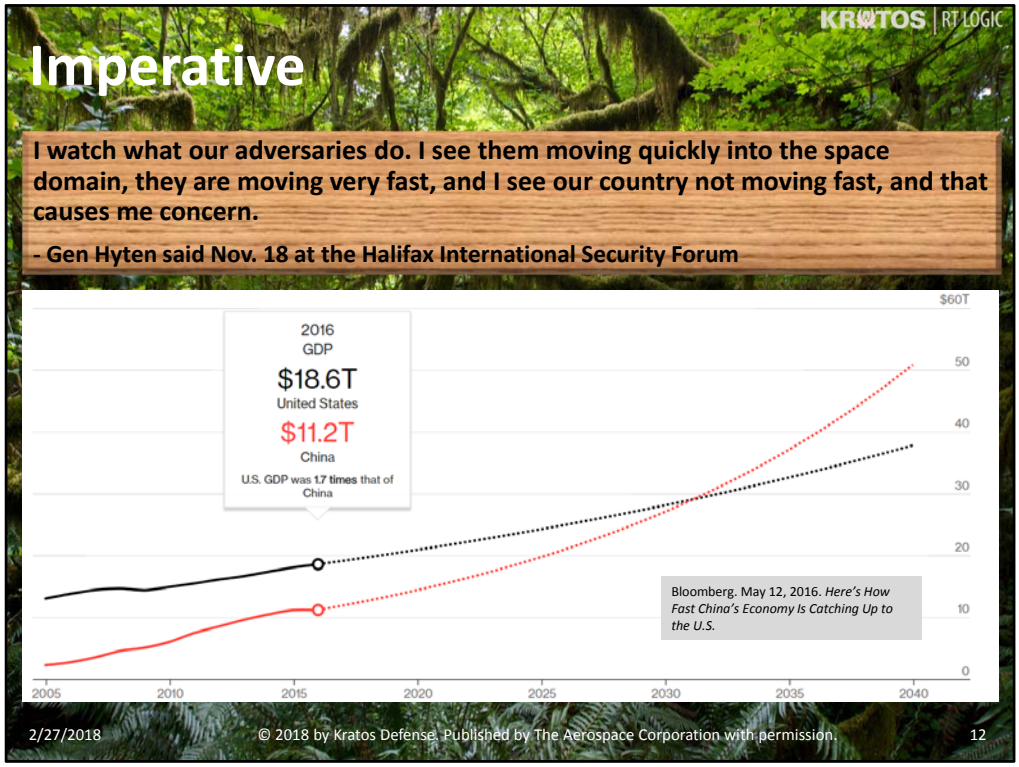
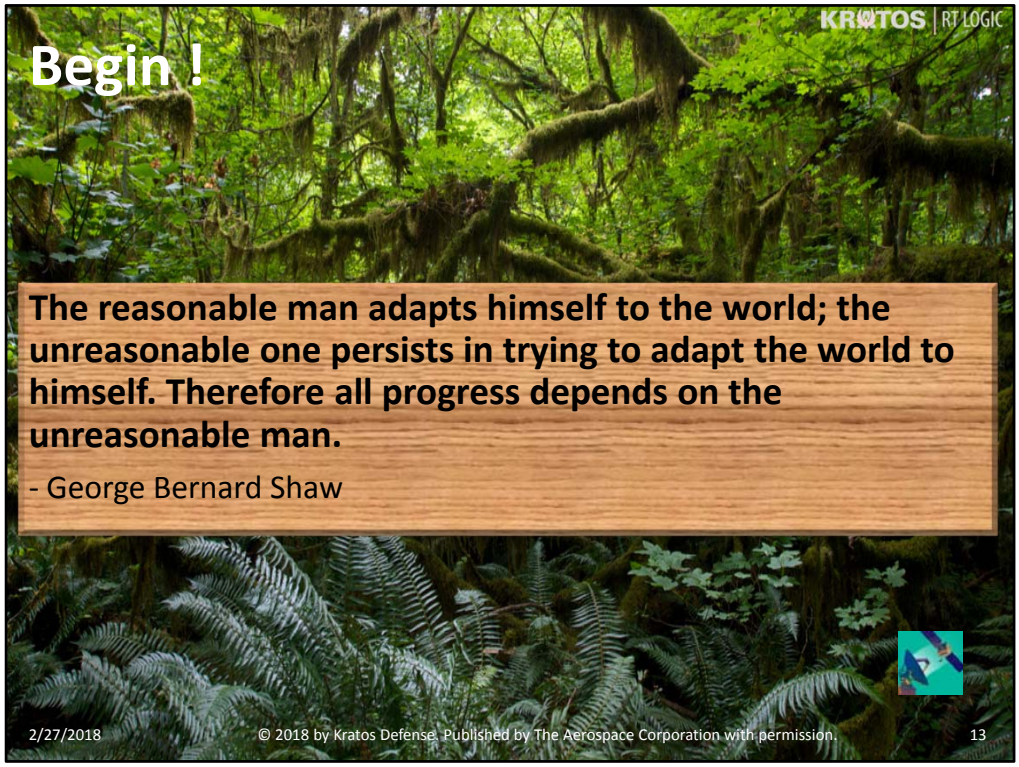


Chinese GDP will overtake US GDP in about 15 years, we can't continue to spend our way to superiority in space

Ironically, it was the introduction of market reforms that caused the Chinese economy to accelerate



Not a conclusion slide, this is a beginning slide

Be unreasonable!