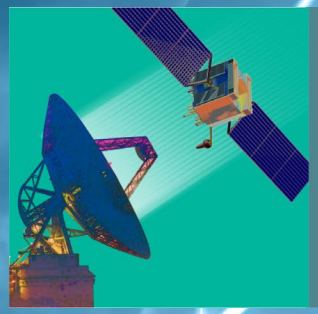


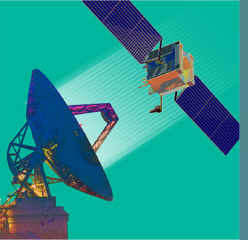
Ground System Architectures Workshop

Opportunities in Data Exploitation

March 2–5, 2020 | Renaissance Los Angeles Airport Hotel

GSAW Workshop Summary

Christian Wallisch,
The Aerospace Corporation



Ground System Architectures Workshop

Recent past and Now…

- GSAW 2018 : “Achieving the Resilient Enterprise”
  - ***Virtualization, stig, chaos monkey***
  - ***xOps:*** *DevOps, AcqOps, ParallelOps, DevService*
  - ***X-Agnostic:*** *Software / Hardware / Data / People Agnostic*
- GSAW 2019 : “Creating Smarter Ground Systems”
  - *“Automate”*
  - *“Data”*
- **GSAW 2020: “Opportunities in Data Exploitation”**

MACHINE Learning

ONTOLOGIES

1,000,000,000
Ground System Event Messages

Neural Networks

Semantic Consistency

Automation

Cloud Computing &
Big Data Technologies

ARTIFICIAL INTELLIGENCE

Scalable and Open Data
Platform for Data Exploitation

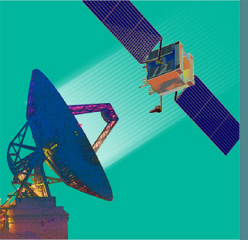
SMC's Data Landscape

Gen Shipton's Keynote Address

"***Facing Unprecedented Challenges for the Future Space Enterprise***"

- A warfighter focused approach to Data Exploitation
  - Integrate and Solve for Bigger Wins for the Enterprise
  - Making data meaningful, giving the right data to the right users at the speed of need
- Data Driven Vision
- Data Driven Success
  - *Enterprise Ground*
  - *Space Situation Awareness*
  - *Data as a Service*
  - *Agile DevSecOps*
- Architecture Based MA

A Once-in-a-generation Opportunity To Set The Next Generation Up For Success



Ground System Architectures Workshop

Highlights from Plenary Sessions

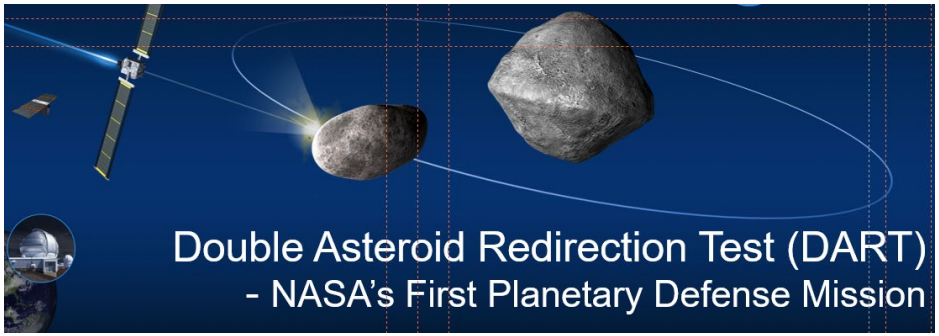
- Machine Learning (ML)
  - *Not as smart as humans but faster and cheaper*
- ML is based on meeting an objective function, such as accuracy prediction
  - *Simulation lets us change the odds to 50-50, where machines learn best*
- AI in execution is an elusive goal
  - *Only an estimated 13% of AI projects make it to production*
  - *Lack of definitions to discover, deploy, manage, and secure AI models introduces inertia and distrust*
- Data Ontologies Subdivides reality into two groups:
  - *Continuants and Occurrents; Ex. "The Moon" is a continuant and "Landing on the Moon" is an Occurrent*
- Explored the Minimum Viable Process (MVPr), which is a practical tool to winnowing legacy systems engineering practices to an optimized, scaled agile systems development approach
- "Structured Agile" and the concept of "No plan survives contact with reality" (The Mike Tyson Theory)

Ground System Architectures Workshop

Highlights from Lunch Time Keynote

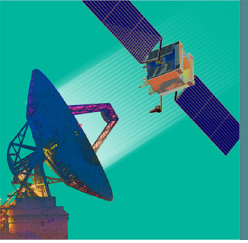
"DART" Double Asteroid Redirection Test

- Excellent Briefing and like the last 2 minutes out from reaching the end goal… it was lights out!
- Steady stream of Q&A in near total darkness.
- A memorable keynote address



STEM Team from Destination Space, Ashville, NC

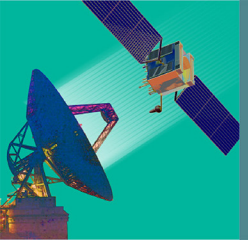
- Our replacement Engineers and Leaders of Tomorrow



Ground System Architectures Workshop

Highlights from Plenary Sessions

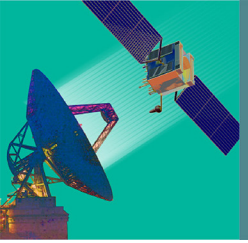
- Cloud Based Satellite Operations
  - *Lift-and-Shift Legacy Programs (Transport Digitized RF waveform to a data center where demodulation can take place)*
  - *Instantiate Capabilities On Demand*
- Archival flight data wants to tell a story…but first, there are some important hurdles to jump
  - *Integrating multiple missions*
  - *Security/ITAR considerations*
- What can be learned from One Billion Ground System Log Messages “The messages scroll so fast we can’t read them; but if they stop scrolling, we have a big problem”
  - *Seek help – from an Intern!*
- Learned how to prepare mission data for future analysis and Minimum Effort Telemetry Data Mining
- “How a Data Platform differs from a Data Lake”
- Docker, Kubernetes, Istio, Kafka
- Doppler characterization of LEO satellites



Ground System Architectures Workshop

Keynotes, NASA and SDA

- Dr. Prasun Desai, Deputy Associate Administrator STMD at NASA
  - *Develop critical technologies to enable:*
    - A sustainable Lunar surface presence
    - The future goal of sending humans to Mars
    - Critical technologies to enable future science and commercial missions
  - *Turning "Science Fiction" to "Science Reality"*
  - *"Go", "Land", "Live", and "Explore"*
    - Challenge: deliver 20 metric tons of supplies to Mars for Human explorers
  - *Strategic Investments:*
    - Exploration and Commerce "Growing Space Economy"
- Col Colburn, Chief, Support Cell
  - *Accelerating the development and fielding of next-generation space capabilities*
  - *Rapid and agile development models*
  - *Responsiveness and resiliency through proliferation*
  - *Leverage partnerships to achieve success*

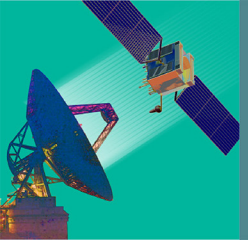


Ground System Architectures Workshop
Evening Session

Two Great Evening Session!

- JPL
  - *Deputy Director, Gen (Ret) Larry James- keynote*
  - *Data Driven Observing Systems*
  - *Planetary Data Services Ecosystem*
  - *Mars 2020 Ground Data systems*
  - *Mars image classification using Machine Learning*
  - *AI and Autonomy*
  - *Complex Data Explorer (CODEX) – "Know thy data"*

- Government and Industry Dialog
  - *Commonality initiatives between Space Force, NASA and commercial space*



Ground System Architectures Workshop

Conclusion

- Huge amount of information covered this week too vast to adequately fit into a short summary
- End with a quote, that we may already be living ***"in a world where there is more and more information, and less and less meaning"***
- Also that Perspective is important
  - *Look not only at your "Use Cases" but also your "Abuse Cases"*
  - *And as for Cybersecurity the main concern is "Protecting the data" vs "Exploitation"*
- And finally to close out this summary … we thank you all for your enthusiastic participation this week and see you next year at GSAW 2021