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Ground System Architectures Workshop

Big Picture – Top 50 words from our presentations

data  architecture  support  mission  collection  stations  server  gmsec  project  computing  space

big  based  development  current  technology  model  infrastructure  cloud  scheduling  satellite  esa  time

system  software  one  new  spacecraft  engineering  agile  operations  service  components  containers  station

design  cost  mission  development  model  time  systems

challenges  space  messages  requirements  models  work  file

engineering  services  security  message  systems
• Alexa
  – Alexa, launch the federated ground system
  – Alexa, move my satellite to the higher orbit
  – Alexa: please don’t do anything, I will take control and I will call you if there is any problem.
  – You don’t have to be the expert in everything, we can simply make a request
• “Ask Jim”, GMSEC is supposed to answer every question we have
Ground System Architectures Workshop

Themes, Ideas, and concepts

• Without vision, the people perish
• Dynamic international collaboration
• **PEMLOV’s architecture**: pluggable, extensible, modular, loosely-coupled, one-size-fits-all, vendor-agnostic, standards-based
• We can be compromised but we can reconstitute very quickly
• Good news is we have the data, bad news is we have a lot of data
• Operators and engineers do not consider security as innovation; hence it is even more painful
• Several needed technologies are already there, we just have to use it differently
Innovation is painful but necessary
Seven years ago, biggest threat is physical security, today: cyber security and software
Space is congested and competitive, but as of now, space is contested.
Ground system is going to change every 3-5 years, but on the software side, it is even faster than that.
This generation accepts app as standard way of communication. Future works have to build around the apps.
People can’t change because they are too focused on the now
From risk aversion to risk fondness
Inertia is polar opposite of the innovation
20 years later, we will still be talking about getting rid of stovepipes
• I think it requires more money than what I have
• With a “Big Money” new project, a new set of requirements is produced that makes the system “Complex, slower and more expensive”
  – “Fatty” budgets allows diversity, acting against reusability
• Don’t stop advocating to solve problems that people don’t know they have!
• Don’t require a big bang to get started, can run alongside existing networks
• There will be lots of questions about “how”; it’s the leader’s job to be several steps ahead
• We want to share the lessons learned that is quite often being treated as lessons forgotten
“Lowest staffing at program level at SMC; Twice as many programs”
“Maybe we’ve got the requirements wrong, maybe we don’t need 15-year satellites”

New terms
- **GSAW**: Ground Systems Architectures Workshop
- **MSAW**: Martian Systems; **EXSAW**: Exoplanet systems

Space Law is coming

As-a-Service
- Telemetry, and Tracking as a Service (TTaaS)
- Navigation as a Service (NaaS)
- Spacecraft as a Service (SCaaS)
- Flight Software as a Service (FSWaaS)
- Ground Segment as a Service (GSaaS)