GSAW 2011 Tutorial G:

Introduction to Satellite Communications: Telemetry & Command Paths

Length: Half day

Overview:

This half-day course provides attendees an introduction to satellite communications with a focus on the telemetry and command paths. Attendees will follow the flow of satellite telemetry and commands between the space-vehicle and the operator. Each step in the path (spacecraft, space link, antenna site, ground network and control center) is described; areas of complexity discussed; criteria for architectural decisions are highlighted; and technology trends are presented.

Instructors: Rob Andzik, Randy Culver, Mark McMillen, AMERGINT Technologies

Biography:

Rob Andzik
I have been working in the space industry for 15 years. During this time I have had the great fortune to work with some incredibly talented people and on a number of key satellite programs. For me, AMERGINT is the culmination of all the hard work and it is the place I call home.

I graduated from the University of Colorado in 1994 with a BS in both Aerospace Engineering and Computer Science. After college I started working for Lockheed Martin, where I was able to help develop satellite TT&C systems, a scheduling system and a few other programs. In 1998, I went to work for RT Logic as a software developer, then a software architect, Core Products Manager and finally a Business Area Manager over the control center product lines. I have participated in the design, implementation and support of numerous ground systems including GPS, the AFSCN, DigitalGlobe, and many others. I am also a co-chair of the OMG Space Domain Task Force and helped author the Ground Equipment Monitoring Service (GEMS) specification.

I have a beautiful wife and two kids. I enjoy spending time with my family and riding my mountain bike in this incredible playground called Colorado. I also work with a small relief organization in Kenya and Ethiopia called Lalmba. Through this work I have been able to meet some incredible people and see very remote parts of Africa.

Randy Culver
I have the great fortune to work here at AMERGINT with some incredibly talented people. Many of us have been together before at IBM and then RT Logic where I was the company president for nearly twelve years. I've been working in the space industry for 25 years now, after getting BS and MS engineering degrees from Virginia Tech and then Purdue.

I enjoy envisioning new products, figuring out how products can help our customers implement their satellite ground/test systems more effectively. I'm excited about our new products here at AMERGINT. We're getting the chance to once again deliver disruptive technology. Technology that's disruptive in a good way, the innovative way.

I have a beautiful wife, two daughters in college who take after her, and a teenage son who's suddenly taller than me. I can often be found training and racing my Pinarello bike in the mountains here in Colorado.

Mark McMillen
Working in the space industry is a privilege. Working with the talented and dedicated people at AMERGINT to support this industry is an honor. Prior to AMERGINT, I spent 12 years at RT Logic as co-

founder and CEO/CTO. I was a co-founder and VP of Engineering at AP Labs prior to that. My career has been focused on real time data acquisition, signal processing and telemetry for space and flight test systems since the beginning. I received my BS and MS degrees in Engineering from MIT.

I enjoy working with customers to solve technical problems, architect new systems and help make our industry more efficient and cost-effective. Musing and working with really smart people is incredibly fun and energizing. AMERGINT provides a great avenue for all of these pursuits.

My wife and I have two awesome girls, both of whom are planning to be engineers (yes, there is hope for the world!), and we love being in Colorado. When I'm not busy at AMERGINT, I like climbing mountains, playing music and building barns.

What Participants Should Expect to Learn:

Attendees will learn the basics of how ground command counts (GCC) and vehicle command counts are used and the application of more advanced topics such as CCSDS COP---1 command processing.

Who Should Attend:

Students should be familiar with the space domain and have a basic understanding of satellite operations. Upon taking the course, students will have an understanding and appreciation of the ground and space communication links and the complexities involved.