



Thursday, October 24<sup>th</sup>

*NOTE: Short courses are a separate fee from the Conference.  
Half-day course \$450*

1:00-5:00      **CHEETAS FOR BEGINNERS**  
Instructor:     *Douglas Audirsch*, *KBR, CHEETAS User Support*

The Cloud Hybrid Edge-to-Enterprise Evaluation & Test Analysis Suite (CHEETAS) framework provides a common tool suite for building evaluation infrastructure for disparate acquisition portfolios. CHEETAS is provided to the test community at no cost by the Test Resource Management Center. CHEETAS is vendor and hardware agnostic and can run on anything from a laptop, to a full GPU-enabled hyper-converged cluster, to a commercial cloud environment. CHEETAS can natively ingest and process time series data in IRIG 106 Chapter 10, DarV3 and CSV format as well as ingest live streams such as from TENA. CHEETAS has features to query and playback data as well as APIs to interface with data analytic tools. This course will be helpful for people looking for a basic introduction to CHEETAS and it will cover the following topics:

- Using the CHEETAS Dashboard / Entity Editor
- Changing User Profile
- Searching/Viewing Documentation
- Checking User/Admin Status and Version Info
- Updating Preferences
- Importing, Viewing, & Editing ICDs
- Ingesting / Processing Data
- Creating/Editing Entity Types
- Managing Entities
- Using the Data Dictionary
- Creating/Editing Parameter Sets
- Running Quick-Look Jobs for an Entity
- Creating/Executing Queries for Entities
- Playing/Viewing Data and Video for an Entity
- Installing/Updating UI Modules

1:00-5:00      **FUNDAMENTALS OF AERONAUTICAL GROUND TELEMETRY SYSTEMS**  
Instructor:     *Mark McWhorter*, *Lumistar*

This course will present a high-level overview of the fundamental design of a typical range telemetry data ground system. Topics to be discussed will include the major sub-systems and components used, such as auto-track antenna, multicoupler, receiver/combiner, demodulation, bit synchronization, data recording and playback, time, decommutation and simulation, and real-time displays of telemetered parameters. The student will be exposed to a few mathematical exercises, such as “link analysis” calculations to help determine the “sensitivity” of the ground station and resultant system tradeoffs. A section on system calibration and periodic maintenance will be presented. After having completed the course, the student will have a better understanding of concepts related to RF and data processing of flight telemetry on the ground side.



1:00-5:00      **INTRODUCTION TO ANALYZING ETHERNET DATA**

Instructor:      *Paul Ferrill, Avionics Test and Analysis Corporation*

With the proliferation of Ethernet as a data transport on multiple commercial and military aircraft and weapon systems it is becoming even more important to get a basic understanding of how to analyze Ethernet data. This course will start with an introduction to the OSI model and lay out the basics that make up Ethernet traffic. Then we'll look at the open source Wireshark program and go through a crash course in using it to examine different types of Ethernet traffic. We'll also examine wireless traffic and how it differs from traditional wired Ethernet. Finally, we'll look at using the Python programming language along with several libraries to actually analyze and decode data embedded in Ethernet traffic.

1:00-5:00      **OVERVIEW OF MACHINE LEARNING AND DATA ANALYTICS APPLICATIONS  
USING PYTHON**

Instructor:      *William (Bill) Schneider, Dell EMC*

Machine learning has become an indispensable tool for processing the large and complex data structures being collected by modern sensor and data acquisition systems at every Test Range. This course will cover the fundamentals of data manipulation, visualization, and machine learning with open source tool python in the context of typical time series data acquisition applications, and provide an overview of intermediate and advanced modeling. Public data sets will be used for illustration and demonstration activity. Basic knowledge of programming in any language is assumed, but not necessarily advanced knowledge of Python. No previous experience with machine learning is assumed.

1:00-5:00      **INTRODUCTION TO SATELLITE COMMUNICATIONS AND TELEMETRY  
STANDARDS**

Instructor:      *Robert Ritter, IMI Technology*

The Introduction to Satellite Communications short course provides an overview of the theories and international standards for various means of space communications. It includes descriptions of practical applications for high-latency and error-prone links, describes the RF link characteristics, modulation schemes, various forms of error detection, correction and compression, practical mechanisms for data networking in space, considerations for IP, concerns over security, new applications of short and medium distance links, and interoperability interests between civil and defense systems. Questions related to new standards proposed for user interfaces are also explored. Optical communications and the new proposed Unified Space Link Protocols will also be introduced as the path forward for the international standards body, CCSDS (the Consultative Committee for Space Data Systems).



1:00-5:00      **PHASED ARRAY SYSTEMS FOR TELEMETRY APPLICATIONS**

Instructor:     Chris Patscheck, *Raven Defense*

This course will focus on the fundamentals of phased array antenna systems as applicable to flight test telemetry applications. Within this introductory session, the following topics will be covered:

- Antenna Design Considerations
- RF Front End Considerations
- Fundamentals of Beamforming
- System Design
- System Performance Modeling and Measurement

1:00-5:00      **SENSOR-PRINCIPLES OF DATA ACQUISITION SYSTEMS**

Instructor:     John Moors, *Diversified Technical Systems, Inc.*

This course provides an overview of the fundamentals of collecting data in flight test, from the physics of what is being measured through analog to digital conversion. Topics include: sensor theory, common sensors and limitations, shunt and empirical checks, data acquisition system features and functions, anti-alias filtering, sampling error, analog considerations of channel to channel time synchronization, grounding and shielding, and specifying a complete system. Compared to others, this course is more “analog” in nature, focusing on the physical measurement before data is formatted and streamed. Real-world examples are explored along with common field-testing challenges.

1:00-5:00      **TELEMETRY OVER IP**

Instructor:     Mark Roseberry, *NetAcquire Corporation*

This course begins by introducing the capability of transporting PCM telemetry over an IP network (TMoIP), including discussion of the benefits and limitations of this technology. The three key RCC IRIG standards for TMoIP are described: IRIG 218, IRIG 106 Chapter 10 over UDP, and TmNS. Interactive and scripted setup, configuration, status, and diagnostics approaches are presented. Advanced topics include minimizing latency, handling poor-quality WAN networks, inter-vendor interoperability, reliability and redundancy, one-to-many and mesh networks, configurable quality-of-service, and time/data correlation. The course ends with an overview of current and future trends in IP convergence and cloud-based architectures. Familiarity with basic networking and serial PCM telemetry concepts is presumed.

1:00-5:00      **THE TELEMETRY APPLICATIONS OF TENA, JMETC AND BIG DATA ANALYTICS**

Instructor:     Gene Hudgins, *KBR, TENA/JMETC*

TM often requires operators to be on location with receive system(s) or at a remote console, resulting in TDY for operators and possibly a shortage of operators to support all scheduled operations. A remote-control capability along with centralized data collection could eliminate



existing personnel requirements at both the local antenna site as well as the control facility, greatly reducing operational costs and providing insight to system status. TENA and JMETC, along with Big Data tools and techniques, allow for the most efficient use of current and future TM range resources via range resource integration, critical to validate system performance in a highly cost-effective manner. This presentation will inform the audience on the current impact of TENA, JMETC, and BDA on the T&E community; as well as expected future benefits to the range community and the warfighter.