

A dark blue world map is centered in the background of the slide. A semi-transparent dark blue horizontal bar is positioned across the upper middle of the map, containing the title text.

# Summer 2016 Internship

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**PAE**

Enduring Support | Essential Missions

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- Founded in 1955
- Wide range of customers, including the U.S. Government, its allied partners and international organizations
- Approximately 15,000 employees in over 60 countries
- Manufactured and supplied more than 100,000 fully functioning training devices to law enforcement, Department of Defense, Department of State, and others
- Capabilities include:
  - Aviation
  - Capacity Building and Stabilization
  - Critical Infrastructure
  - Expeditionary Logistics
  - Identity and Information Management Solutions
  - Integrated Security Solutions
  - Test and Training Ranges
  - Enterprise-Level Technology Products and Software



Improvised Explosive Device (IED) Training Device

- Located on the Patuxent River Naval Air Station in Patuxent River, MD
- ATR controls fully-instrumented and integrated test ranges that are use for test and evaluation of aircraft and for warfighter training missions
- Telemetry Data Center provides real-time radio-link reception, translation, processing and display of test data using the Real-Time Telemetry Processing System (RTPS)
- Provides real-time test information from up to nine separate in-flight aircraft, and test teams can operate the system in one of nine Project Engineer Stations (PES)



- Develop knowledge of the Test and Training Enabling Architecture (TENA)
- The purpose of TENA is to support the DoD range community by providing the necessary enterprise-wide architecture and the common software infrastructure to:
  - Enable interoperability among range systems and facilities
  - Leverage infrastructure to keep pace with test and training requirements
  - Foster the reuse of assets to reduce cost of future developments



- TENA Middleware is a set of software that performs real-time data exchange between systems

### User Application Code:

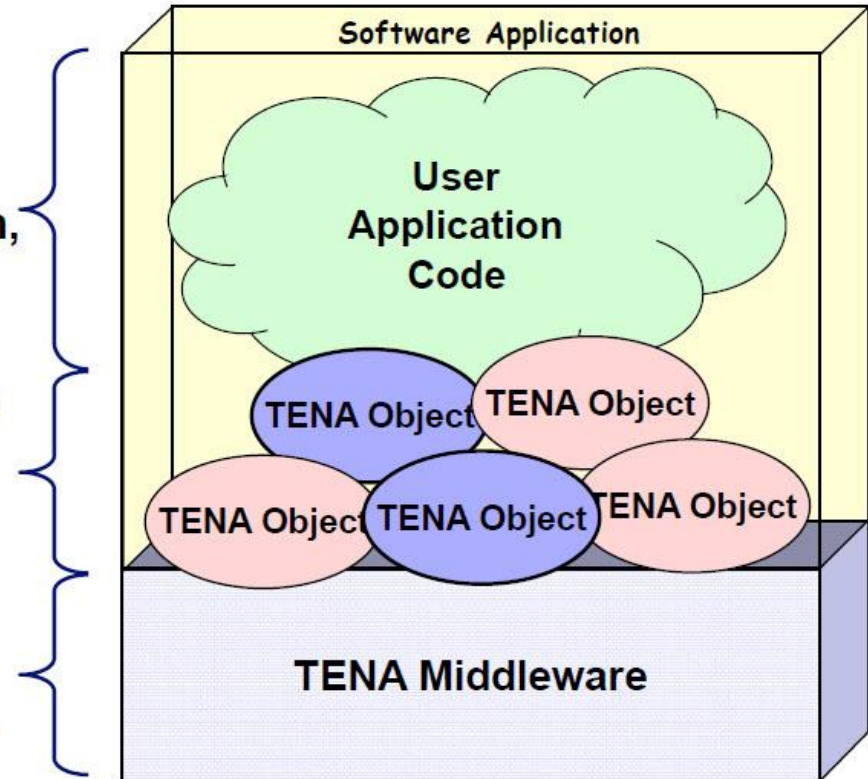
Specific to an individual application  
(range instrumentation, display system,  
analysis system, simulation, etc.)

### Object Model Code (Auto-Generated):

Standard data definitions and  
common software algorithms

### TENA Middleware Code:

Common across all TENA applications



- The TENA Middleware, TENA objects, and the user's application code are compiled and linked together to make a TENA compliant software application



- Tasked to develop a gateway from Range Data Distribution System (RDDS) to TENA
- Allows ATR to provide Time Space Position Information (TSPI), platform, weather, and telemetry data to external entities, and allows ATR to receive TSPI and other data from external entities using TENA
- Gateway works as follows:
  - Read in RDDS Common TSPI Message
  - Send notification data was received
  - Extract data
  - Populate TENA TSPI Object Model with data
  - Send notification and publish data

## Common TSPI Message

*Table 3.1 - RDDS Common TSPI Message (Message Id 1)*

Byte	Type	Description
0	unsigned short	Message Version
2	unsigned short	Track Identifier
4	unsigned long	Message Flags: Bit 15 = Position Valid (1 = True) Bit 14 = Velocity Valid (1 = True) Bit 13 = Acceleration Valid (1 = True) Bit 12 = Attitude Valid (1 = True) Bit 11 = Attitude Rate Valid (1 = True) Bit 10 = Reserved Bit 9-7 = Instrument (0 = Other, 1 = Radar, 2 = LASER, 3 = Video, 4 = GPS) Bit 6-5 = Quality (0 = Good, 1 = Potentially Degraded, 2 = Degraded) Bit 4-3 = Classification (0 = Unclassified, 1 = Secret, 2 = T/S, 3 = Special Access Required) Bit 2 = Recorded Data (1 = True) Bit 1 = Simulated Data (1 = True) Bit 0 = Filtered Data (1 = True)
8	double	Time (GMT seconds into year)
16	double	X Position (ECEF in meters)
24	double	Y Position (ECEF in meters)
32	double	Z Position (ECEF in meters)
40	double	X Velocity (ECEF in meters/second)
48	double	Y Velocity (ECEF in meters/second)
56	double	Z Velocity (ECEF in meters/second)
64	double	X Acceleration (ECEF in meters/second <sup>2</sup> )
72	double	Y Acceleration (ECEF in meters/second <sup>2</sup> )
80	double	Z Acceleration (ECEF in meters/second <sup>2</sup> )
88	double	Roll (degrees)
96	double	Pitch (degrees)
104	double	Yaw (degrees)
112	double	Roll Rate (degrees/second)

- Future Goals for the Gateway
  - Modify the gateway so that it can also go from TENA to RDDS
  - Expand the types of data the gateway can transfer between RDDS and TENA
    - RIR-778 Radar, GPS, Telemetry messages, etc.

- Tasked as the Student Lead
- Total of 12 student interns
- Assisted with student check-in/check-out process
- Held weekly meetings with students
- Worked with students and their supervisors to schedule exit interviews and outbriefs
- Scheduled tours at various sites across the Patuxent River Naval Air Station
  - VX-20/C-130
  - F-35 JSF
  - ACETEF/Manned Flight Simulator
  - Triton
  - Test Pilot School
  - Air Ops Tower





- Learning TENA
  - No one onsite at ATR knows TENA very well
  - Self-taught through PowerPoint and examples
  - People who work exclusively with TENA would visit periodically to bring more training materials
- Difficulty Defining Requirements
  - Main Tasker and TENA people had different ideas of what the gateway should be
- Communication Difficulties
  - Could only communicate via email/phone with the TENA people
  - Often would have to wait long periods of time to hear back

- Basic programming concepts and algorithms
- Knowledge of C++ language
- Experience with Visual Studio
- Classes:
  - COSC 120
  - COSC 220
  - COSC 320
  - COSC 350

- Better understanding of the real-world work experience
  - Professional environment
  - 40-hour work week
- Experience in a Government work environment
  - Mandatory training
  - Security procedures
- Importance of networking
- Patience is key when communicating
- Received career advice from coworkers