OSD DOT&E Target Control Steering Group (TCSG)

Standard Target Control System Interfaces

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Dae Hong

Head Target Systems Division
NAWCWD 53100ME
(805) 989-5996
dae.hong@navy.mil

Joint Interoperable TCS Standard Interfaces
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Joint Interoperable TCS Standard Interfaces
Introduction

The Army, Air Force and Navy have their ground control stations that operate on their Training and T&E Ranges.

The data interfaces between the Ground Target Control System, Ground RF Unit, Target Transponder and Range infrastructure are different for each service.

This has created interoperability issues. Targets are closely coupled with the ground control system and the use of targets across ranges is limited.

This program is to develop Tri-Service Standard Interfaces to reach interoperability by developing hardware independent interfaces for the Ground Target Control System, Ground RF unit, Target Transponder and Range Infrastructure.
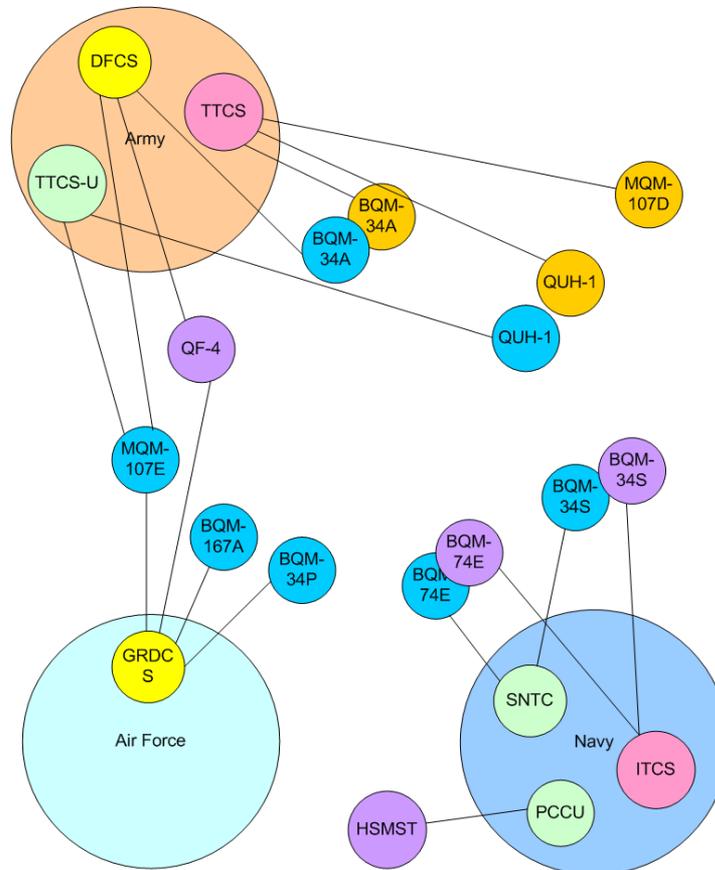
Target Control Systems and Targets

Program Description

- Goal
  - Achieve the 2005 Defense Science Board Report's vision of "the gradual introduction of common control elements into each range to provide an increasing degree of interoperability, test flexibility, and lower operational costs."
  - **Control Any Target with Any Ground Station**

- Target Control Steering Group (TCSG)
  - TCSG is a tri-service group with the mission to identify common control elements at key points in the Target Control System (TCS) architecture
  - OSD/DOT&E Memorandum Chartered the TCSG through the Target Management Initiative (TMI) in August 2007.
    - Prior to that TMI received 21 requests in excess of $16M for stove-pipe TCS related enhancements
  - Held Regular Technical Interchange Meetings (TIMs) to discuss Interfaces, review Target Control Systems, and discuss Architectures (OSD, WSMR, NBVC-Pt. Mugu, Tyndall AFB, TRMC, DOT&E)
    - Held 11 TIMs to-date

Joint Interoperable TCS Standard Interfaces
Program Description

- Reviewed and evaluated industry existing standards for reuse and concepts
  - TENA
  - JAUS
  - STANAG 4586
  - CAN/CDA

- Services have Similar Target Control Architectures:
  - Generic PC H/W platform in most systems
  - H/W dependent Control panel and RF Radio

- Services are Evolving to be Platform Independent
  - All Services using PC platform
  - Industry Standard Interfaces for control panels and manual control
    - USB2
    - Ethernet

Program Description

- Standard Interfaces provide methods for target control systems to communicate together
  - Provides a path for commonality of message types and definitions to reduce redundant data type
  - As systems and targets evolve, standard interfaces provide a path for interoperability

- Joint Interoperable TCS Standard Developed
  - Identified Primary Interfaces
  - Agreed to Five Interfaces to be Addressed
  - Prioritized Interfaces for Standardization

Program Description

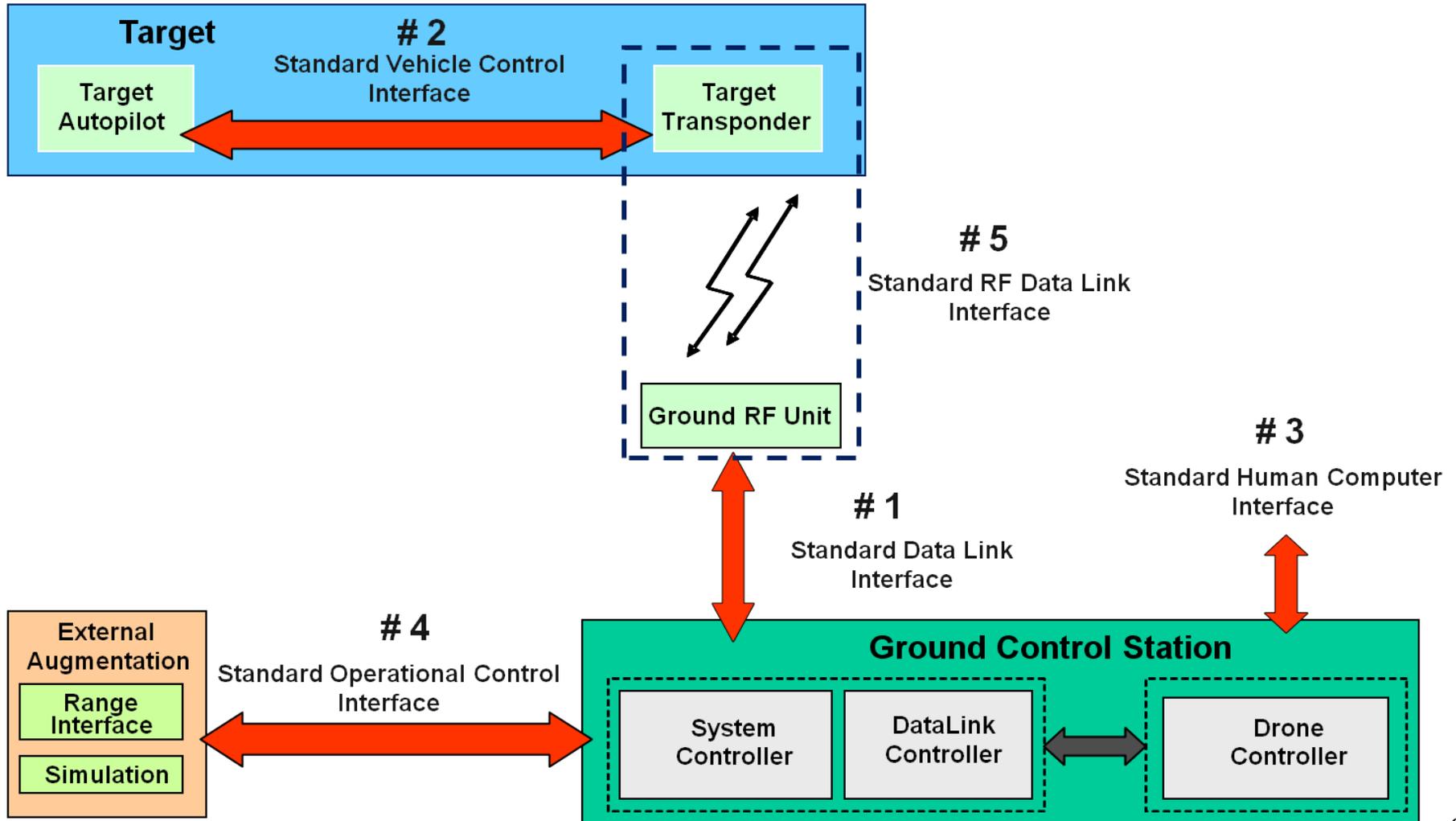- Target Control Steering Group (TCSG)
  - Identified common elements: five Independent Standard Interfaces in priority order
    1) Data Link Interface (DLI)
    2) Vehicle Control Interface (VCI)
    3) Human Computer Interface (HCI)
    4) Operational Control Interface (OCI)
    5) RF Datalink Interface (RF DLI)
  - Interoperable capabilities are achieved when Services implement one or more standard interfaces. i.e.
    - DLI Standard – interoperable Target Ground Control System and TCS ground RF units
    - VCI Standard – interoperable Target transponders
    - With each Standard Interface implemented, interoperability reached at the point of implementation

- Recommended Electrical Interfaces for QF-16 (Jan 2008)

Joint Interoperable TCS Standard Interfaces
Technical Status

- Released Joint Interoperable TCS Standard Interfaces
  - Data Link Interface (DLI), V1.0
  - Vehicle Control Interface (VCI), V0.3
  - Human Computer Interface (HCI), V0.1
  - Operational Control Interface (OCI)
    - Investigating the use of TENA
  - RF Data Link Interface (RFDLI)
    - Investigating a Navy proposal

- Key Issues and Critical Actions Accomplished
  - All stakeholders briefed (June-August 2008)
    - Army, Navy, Air Force, TRMC, DT&E, and DOT&E
  - Flight Demonstration program for Standard DLI began in FY09
    - New Common Target Control System, CTCS, system was developed to demonstrate Standard Interface in native format
    - Army Target Tracking Control System, TTCS, was chosen to demonstrate interoperability of Standard and legacy interface

Joint Interoperable TCS Standard Interfaces
Standard Interface Demonstration

- Completed three successful DLI Demonstration flight tests

    - New Common TCS with Navy BQM-74E
        - Standard TCS Data Link Interface
        - Flight Test: 28 October 2009

    - New Common TCS with Navy BQM-74E
        - STANAG 4586 Data Link Interface
        - Flight Test: 15 December 2009

    - Army TTCS/U with Navy BQM-74E
        - Standard TCS Data Link Interface with middleware
        - Flight Test: 21 June 2010

Joint Interoperable TCS Standard Interfaces
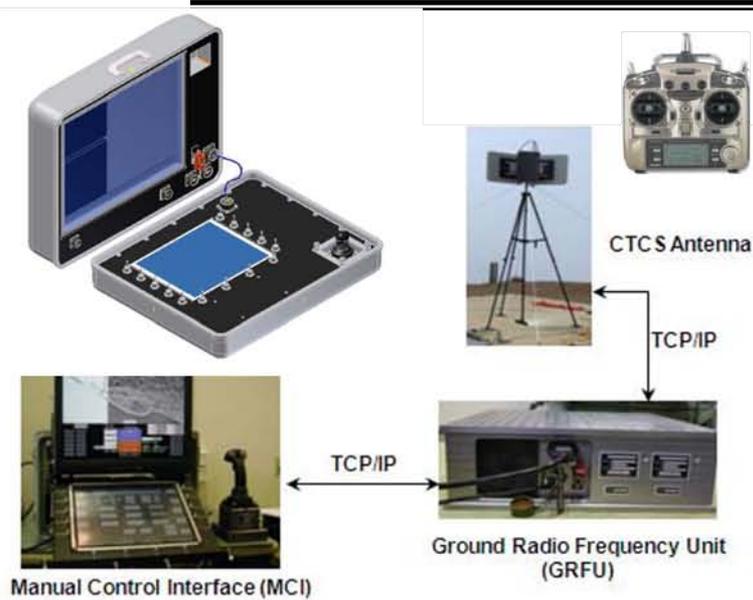## Standard Interface Demonstration

- Flight Test with Common Target Control System
    - Software and Hardware development and Ground Testing using the Navy BQM-74E Target, the Common Target Control System and the operational control room facilities has been satisfactorily completed.
    - The system successfully passed Environment and Electromagnetic Compatibility (EMC).
    - The Common Interface TCS was successfully demonstrated using the Standard Data Link Interface on 28 October 2009 at the Naval Air Warfare Center Point Mugu Sea Test Range.
    - A second flight demonstrating the STANAG 4586 data link was successfully flown on Tuesday 15 December 2009 at the Naval Air Warfare Center Point Mugu Sea Test Range.
    - There were no significant issues with the program.

Manual Control Interface (MCI)

CTCS Antenna

TCP/IP

TCP/IP

Ground Radio Frequency Unit (GRFU)

Joint Interoperable TCS Standard Interfaces
Standard Interface Demonstration

- **Flight Test with Army Target Tracking Control System – Ultra High Frequency, TTCS/U**

    – Completed Design of Reusable Middleware Components Implementing Standard Data Link Interface

    – Completed Design of TTCS/U Modifications

    – Completed Design of TTCS/U to Navy Target

    – Completed Integration of TCS Modifications, Middleware, and Target

    – A third flight demonstrating the Standard Data Link Interface with middleware successfully flown on 21 June 2010 at the Naval Air Warfare Center Point Mugu Sea Test Range.

Joint Interoperable TCS Standard Interfaces
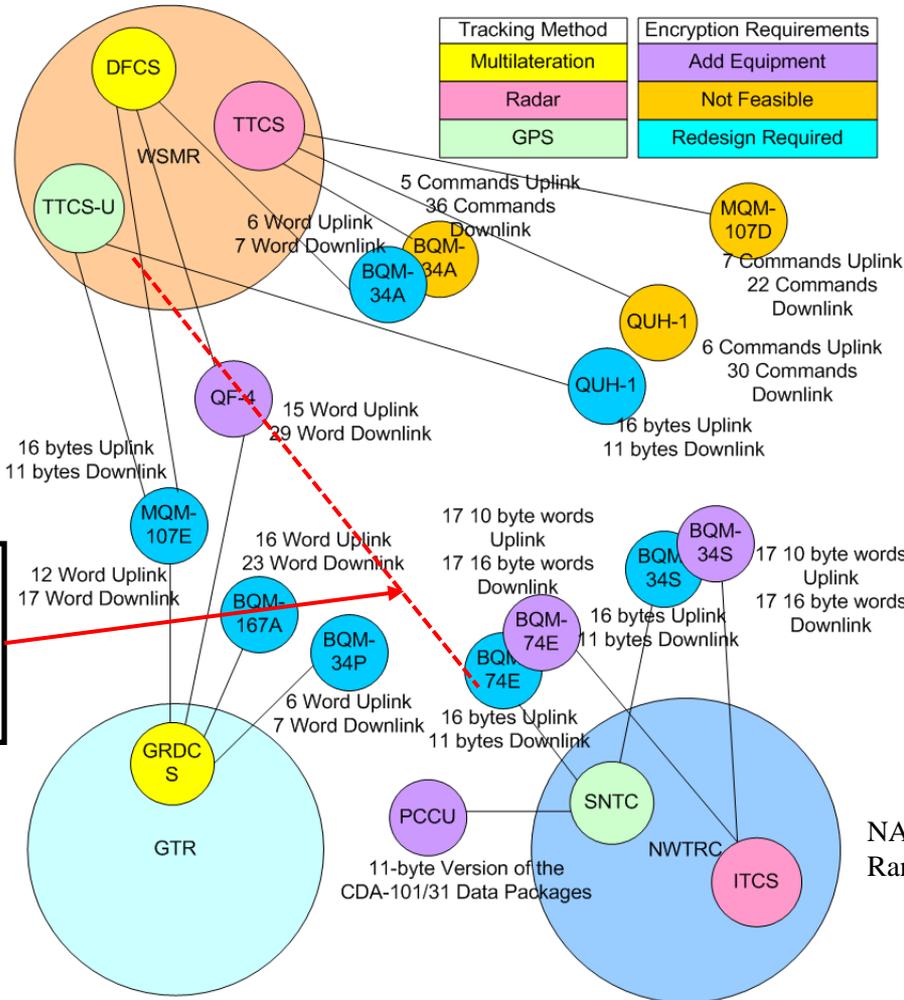## Standard Interface Demonstration

Standard Interface Demonstration

Army (White Sands Missile Range and McGregor Range)

The DLI Demonstration used the DLI Standard Interface to enable an Army TCS to control a Navy BQM-74E

Air Force Gulf Test Range (Eglin and Tyndall AFB)

NAWCWD Sea Range and Land Range (Pt. Mugu and China Lake)

** Diagram uses data taken from the 5D Systems "Interoperable Target control System Study" final report.

Joint Interoperable TCS Standard Interfaces
TCSG Path-Ahead Summary

- Current TCSG Primary Effort:
  - Integrate the Standard DLI into prototype Army ATCCS
    - SRR Approved, 26 July 2011
    - PDR Approved, 20 September 2011
    - CDR: 24 January 2012
    - TRR: 15 July 2012
  - Both the Navy and Air Force participating with the effort and plan to review the results for application to their systems.

- Demonstrate Standard Vehicle Control Interface (VCI)
  - NAWCWD UAV targets include Standard DLI and VCI
  - DOT&E 5th Gen Target initiative planning use of Standard DLI and VCI

- Develop Certification Program
  - VCI certification program in trial
  - DLI certification program in development