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DAU

Distributed Test Operations (DTO)

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Technology Description

- "Distributed Test Operations" (DTO): The use of Defense Research Engineering Network (DREN), DISA connectivity or microwave links to transport ***real-time*** telemetry, voice communications, TSPI and other data between a remote test range and end user mission control facilities (Government/DOD and contractor) to perform flight testing. (*See Slide 6 for a high-level diagram of DTO components*).
  - Enables ***real-time T&E missions*** involving flight test engineers, Range Control Offices, contractors, etc. at one location with the actual aircraft flight testing occurring at another remote location.
- How it works:
  - Edwards AFB (412th Range Squadron) uses a DREN or DISA network connection or microwave links, coupled with specialized edge equipment for telemetry, voice communications, video and TSPI processing in it's mission control facility to effectively allow use of AFTC-wide assets, as well as other DOD ranges (Navy, Army, contractor), for flight test missions.
  - **Example:** F-16 flight test telemetry and voice communications is received while the aircraft is flying over Edwards, AFB. The mission data is ingested into 412 Range IP network and attached edge devices, bulk encrypted and transported via DREN. At Eglin AFB, the process is reversed; data is processed and displayed in their control room as if the jet is flying locally.
  - Local TM/voice/TSPI networks maintains an Authority to Operate (ATO) using the Risk Management Framework for Information Assurance.

Technology Description (continued)

- From AFTCI99-104 dated 31 May 2018: “DTO is defined as any and all operations where an AFTC Wing or Complex leverages capabilities or resources existing outside of that organization.”

- DTO connectivity is not just limited to Air Force to Air Force ranges!
  - Edwards connects to White Sands Test Center (WSTC) and Boeing Hazelwood (St. Louis) via DREN and China Lake Naval Weapons Center via dedicated fiber and microwave links.
  - Edwards 412 Range also acts as a “hub” for the Southwest Range Complex, regularly supporting DTO by receiving, patching/routing and re-transporting data between two external ranges.

- Edwards also connects to Sea Test Range (off of Vandenberg AFB and Pt. Mugu Navy base) via microwave links.
  - Recently upgraded IP-based microwave transport has created a more seamless integration with Range squadron Juniper network, vs. older Asynchronous Transfer Mode (ATM) technology.
  - Sea Test Range used extensively by Edwards-based test programs, and others.

- Future connections are coming!
  - Customer requests for connections to several other test ranges have been received by the 412 Range Squadron.

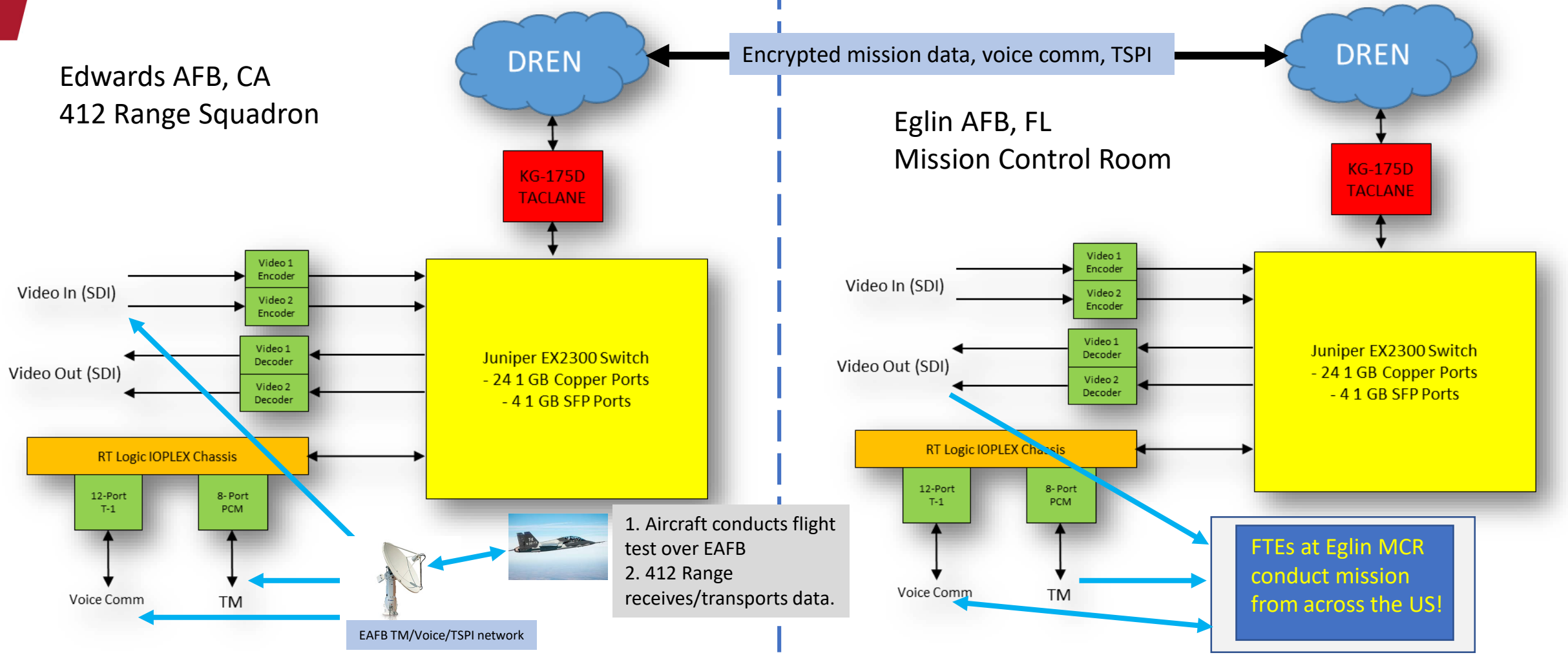
T&E Applications

- Applications for DTO:
  - Weapons/ aircraft testing using remote ranges/specialized test assets while T&E professionals reside at home base with their own data analysis/processing capabilities.
  - DTO is not just limited to aircraft/weapons testing! Any test program that is evaluating a vehicle/system that transmits telemetry, video etc. could leverage DTO! (Unmanned Ground Vehicles, Unmanned Surface/Underwater Vehicles, etc.)
  - Avoidance/limitation of duplication of expensive national range resources.
    - Test programs can leverage inter-range/DOD-wide assets without relocation/deployment of large test teams and/or aircraft.
    - 412 Range personnel have used DTO to help test programs meet requirements for certain targets/sensor assets that would have otherwise had to be transported across the US to a local test site!
  - Cross-training, certification, testing opportunities.
    - Connection of remote facilities may offer training and testing opportunities for teams or programs that may be unable to travel, budget constrained, time constrained.

Advantages & Disadvantages

- Advantages:
  - Reduces TDY and travel costs; keeps testers “safer at home”!
  - COVID 19 has drastically increased 412th Range Squadron DTO business: Customers are knocking on the door!
    - Following 412 TENG successful connection to Boeing St. Louis for flight testing of the T-7A, several additional customers requested DTO connectivity in support of their test programs within a few months.
  - Can facilitate more complex multi-player testing/training scenarios.
  - Avoids/limits duplication of expensive national range resources. Test programs can leverage inter-range/DOD-wide assets without relocation/deployment of large test teams and/or aircraft.
- Disadvantages
  - Politics! Inter-range/interservice differences in ATO/IA requirements, equipment choices and compatibility.
  - Coordination across time zones, deconflict of local flight/test schedules, program prioritization vs. local asset availability.
  - Dependence upon external data transport (for DISA and DREN).
  - Cost can be a factor, however if this is recovered from paying test customers, it becomes less so.
    - DREN connection for Edwards to WSTC costs about $130k/year.
    - DISA is centrally funded, but service/repair isn’t as quick as DREN sometimes.
    - Maintenance of microwave and/or fiber links between ranges requires expert personnel, budget and sustainment planning,

Additional Information



Inter-range data transport isn't new, but how were are using it for DTO is changing the way we test!

References

- Work experience:
  - Current Flight Chief, 412 Range Squadron Engineering
  - ➢ Co-lead of T-7A DTO link creation and implementation from EAFB to Boeing Hazelwood (St. Louis) project.
  - ➢ 20+ years Range Squadron experience, including microwave, voice communications and transport equipment.

- AIR FORCE TEST CENTER INSTRUCTION 99-103, 31 MAY 2018, *AFTC DISTRIBUTED TEST OPERATIONS*