How to Secure Your Network

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What is TRANSEC

- Transmission Security (TRANSEC) prevents an adversary from exploiting information available in a TDMA satellite network even without defeating encryption.
- With only link encryption, an adversary can still answer questions like:
  - What types of applications are active on the network?
  - Who is talking to whom?
  - Is the network or a particular remote site active now?
  - Based on traffic analysis, what is the correlation between network activity and real world activity?
  - Is a particular remote site moving?
  - Is there significant acquisition activity?

All Defense-Grade Products Support TRANSEC

Hub & Line Cards

DLC-T, DLC-R

- DLC-T supports DVB-S2/DVB-S2X
- DLC-R demodulates up to 16 channels
- FIPS 140-2 Level 3, TRANSEC
- Evolution, Velocity

Tactical Hub

- Cost-effective, compact, durable
- Compatible with any Defence remote
- FIPS 140-2 Level 3
- MIL-STD 810G
- **R**uggedized **a**nd **V**irtualized **E**nviron.

Remote Solutions

9-Series

- Rackmount and board (manpack)
- DVB-S2/ACM w/ ATDMA returns
- 8-port GigE switch (9350)
- 30% reduced SWaP (950mp)
- FIPS 140-2 Level 3, TRANSEC, MIL-STD 810G, WGS
- Evolution, Velocity

9-Series Aero

- Board, rackmount, and ARINC
- Ultra high-speed COTM (over 1,600 km/hr)
- 2nd demodulator for multicast overlay or beam switching
- FIPS 140-2 Level 3, TRANSEC, MIL-STD 810G/DO-160G, WGS
- Evolution, Velocity

ST Engineering

TRANSEC Goals

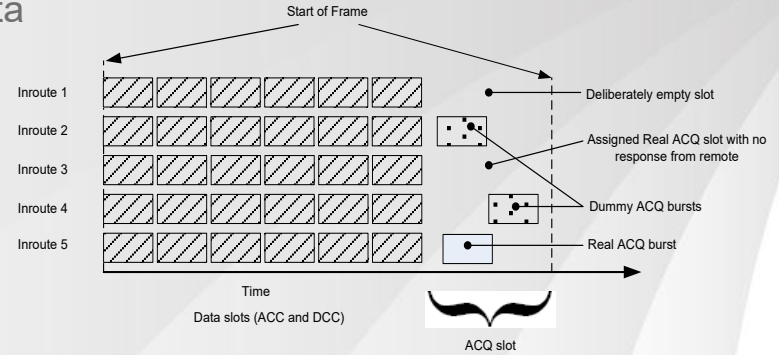
	TRANSEC Requirement	Benefits
1	Mask Channel Activity	Prevents transmission activity from being used as an intelligence gathering
2	Control Channel Information	Detection of repetitive data streams unsuccessful
3	Hub and Remote Authentication and Validation	Ensures only authorized use of network resources

TRANSEC Goal #1 – Mask Channel Activity

- Transmission activity can be used as an intelligence gathering mechanism
  - TDMA carriers are based on dynamic traffic bursts so changing traffic volumes and number of active senders can be detected.
  - DVB-S2 carriers send easily identifiable “fill frames” when there’s no user data to send.
- These vulnerabilities allow adversaries to extrapolate information on timing, location or scale of strategic activities.

TRANSEC Goal #1 – Mask Channel Activity

- TRANSEC negate these risks by:
  - Using Free Slot Allocation for TDMA bandwidth distribution
    - Creates a constant “wall of data” regardless of traffic profiles
    - Empty bursts are indistinguishable from user data
  - Creating fill-frames with random data for underutilized DVB-S2 carriers
    - Empty frames are indistinguishable from user data
  - Obfuscating acquisition activity
    - Creates traffic in the acquisition slot when no remotes are actually joining the network
    - Suppresses acquisition slot bursts even when remotes are acquiring



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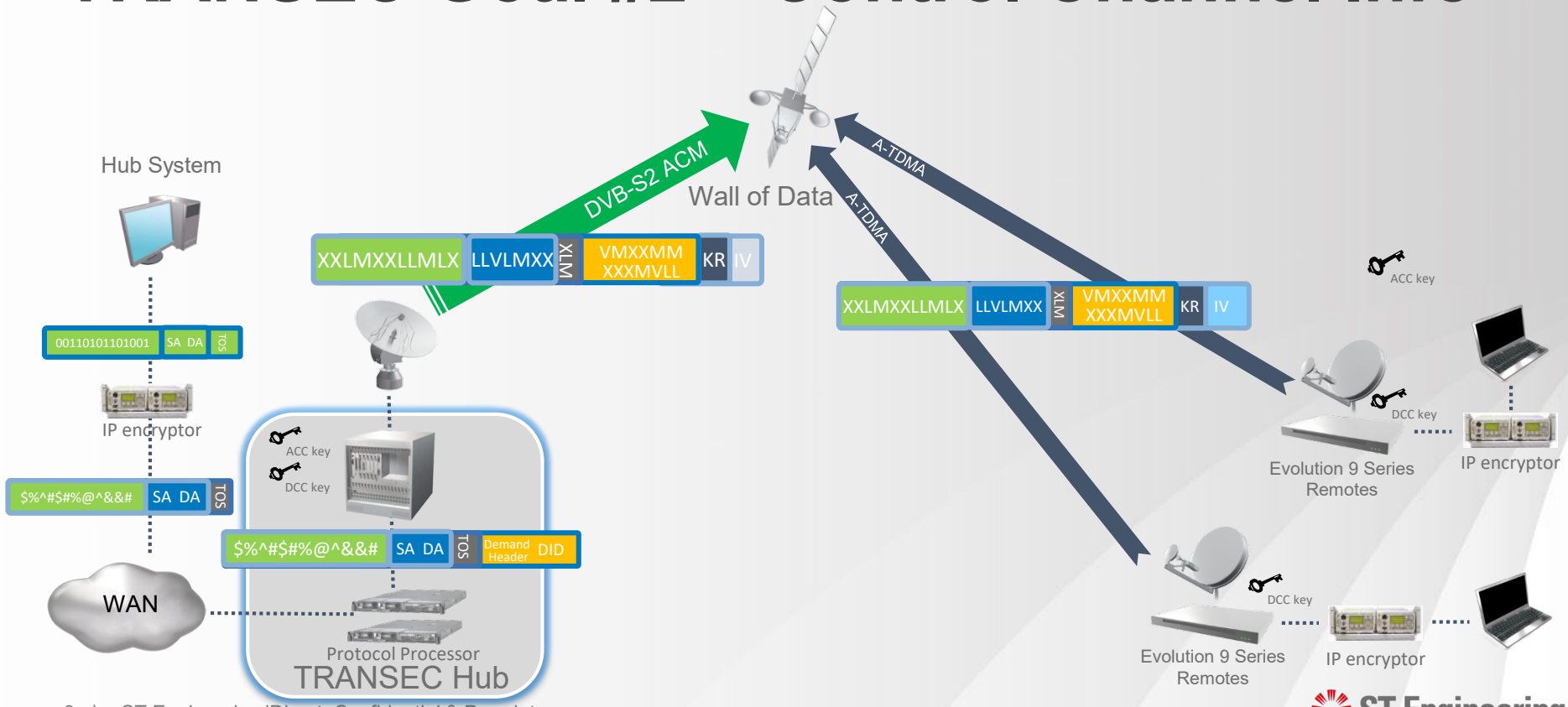
TRANSEC Goal #2 – Control Channel Info

- When only user data payloads are encrypted, a great deal of data is still available
  - Both Layer 2 and Layer 3 packets have traffic engineering information (source, destination, priority, size) embedded in their headers
    - Size and priority information can betray the type of application in use.
    - Source and destination tell an adversary who is talking and when.
  - Layer 2 Control & Signaling information sent in the clear can reveal network activity levels.

TRANSEC Goal #2 – Control Channel Info

- TRANSEC solves this by:
  - Encrypting both Layer 3 payload, header, as well as Layer 2 traffic and signaling.
  - Changing encryption keys frequently.
- Acquisition Ciphertext Channel (ACC)
  - Only used during Acquisition and Authentication.
  - AES 256-bit CBC symmetric encryption.
  - Key is initially injected into the remote manually (RSP) then updated over the air in operation.
  - Key is rolled every 28 days by default. Key is stored if the power is turned off. Remote must manually rekey if it is out of network for two keyrolls.
- Data Ciphertext Channel (DCC)
  - Encrypts all user data traffic with the DCC key using AES 256-bit CBC symmetric encryption.
  - Masks activity with random blocks of data when remotes have no data to send (“Wall of Data”).
  - Key is updated over the air every 8 hours by default. Not stored if power is cycled.

TRANSEC Goal #2 – Control Channel Info



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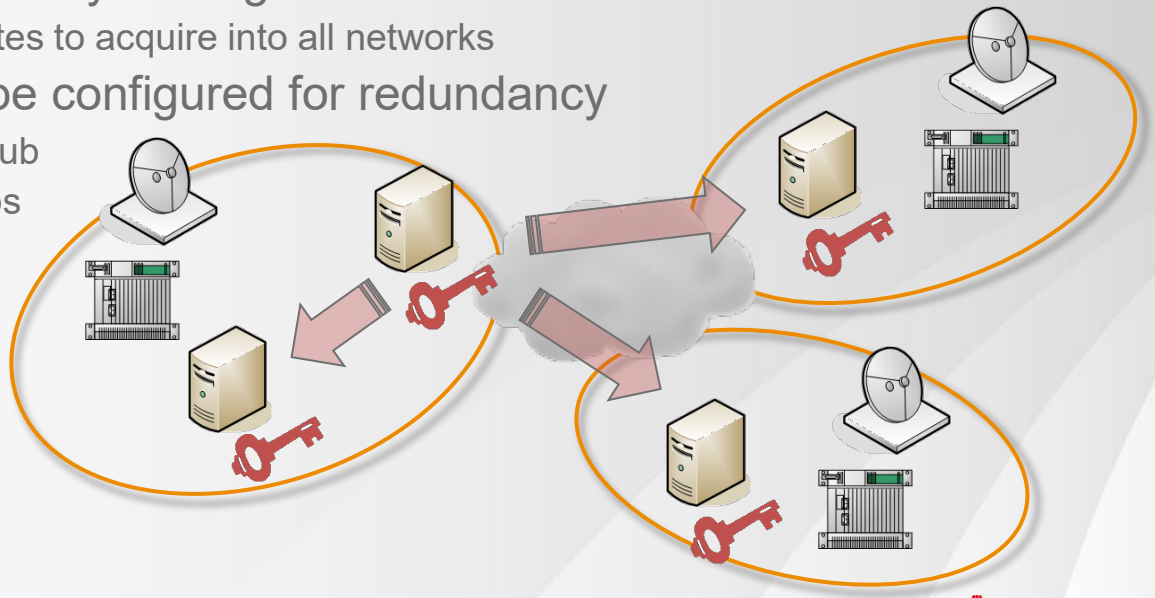
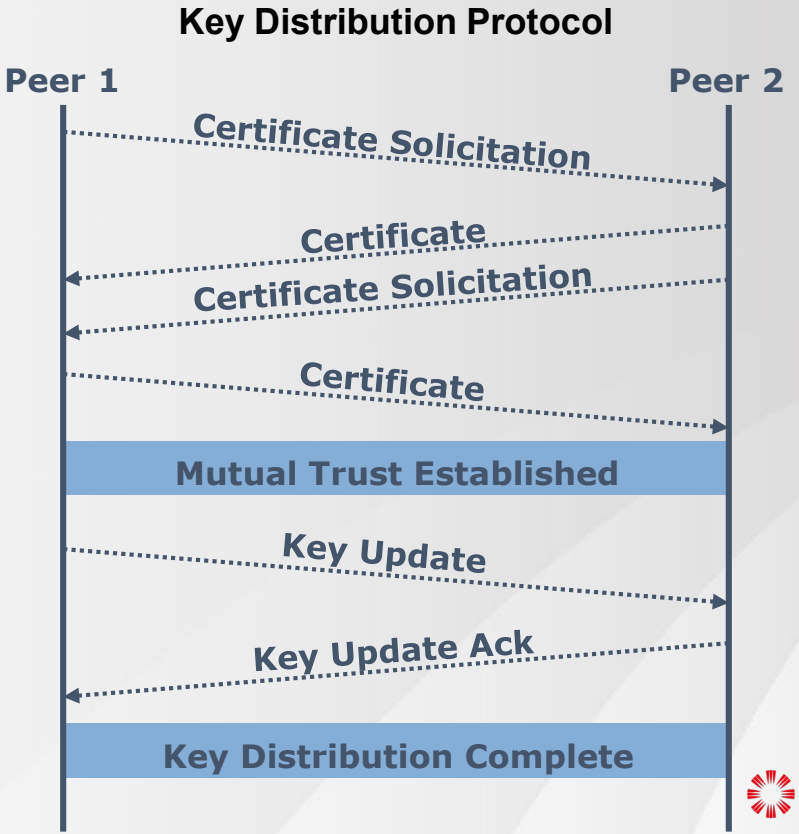
TRANSEC Goal #2 – Control Channel Info

- Global Key Distributor (GKD)
  - GKD distributes ACC key among one or more networks
    - Allows roaming remotes to acquire into all networks
  - Multiple GKDs can be configured for redundancy
    - Within an individual hub
    - Between multiple hubs



TRANSEC Goal #2 – Control Channel Info

- Key Rolls
  - Changing encryption keys periodically helps prevent attackers from deriving keys from captured data (cryptanalysis).
  - iDirect TRANSEC makes rolling period configurable.



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TRANSEC Goal #3 – Hub/Remote Validation

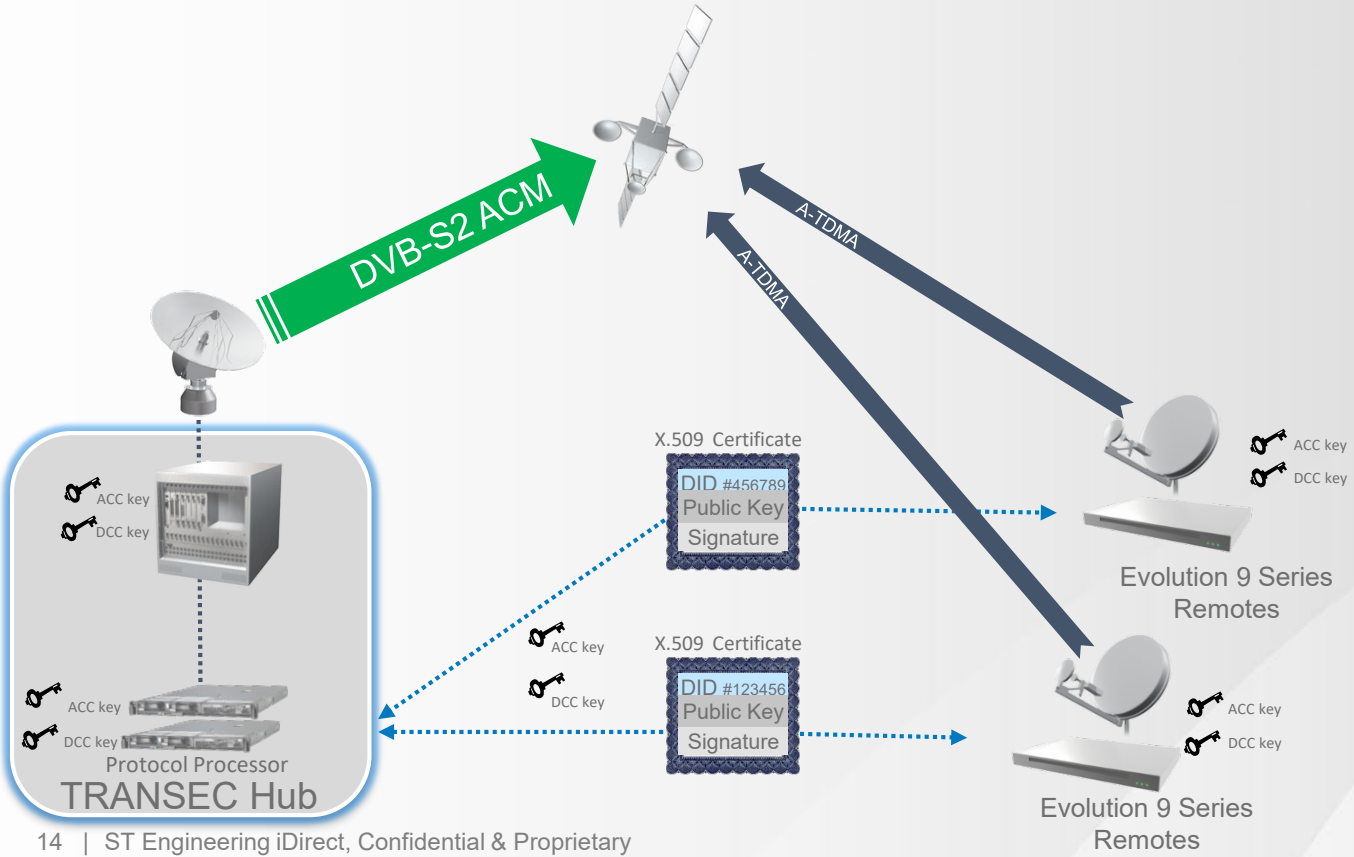
- Unauthorized use of network resources can lead to a “man-in-the-middle” attack
  - A remote might be “spoofed” and inserted into a secure network.
  - A secure remote might be coerced into joining an insecure network.

- While these kinds of attacks are extremely difficult even in non-TRANSEC environments, the risk of eavesdropping cannot be ignored.

TRANSEC Goal #3 – Hub/Remote Validation

- TRANSEC eliminates these threats by:
  - Using Public Key Infrastructure (PKI)
    - Key distribution
    - Message authentication
  - Employing X.509 standards for:
    - Verifying identities
    - Establishing trust between network elements
    - Providing methods for dealing with security compromises
- Each network element (PP, HLC, remote) has a X.509 certificate
  - A certificate is a document that connects a public key to an identity.
  - Used to authenticate remotes, PPs, HLCs, and build a chain of trust.
  - Certificates are issued by iDirect CA (embedded in iVantage NMS).

TRANSEC Goal #3 – Hub/Remote Validation



Acquisition and Authentication

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TRANSEC Goal #3 – Hub/Remote Validation

- Handling Security Compromises
  - “Zeroize” is a process for removing all Critical Security Parameters (CSPs) from a network element (ACC and DCC keys, Public/Private keys, options file).
  - Certificate revocation adds a certificate to the CRL, breaking trust between an entity and the rest of the network.
    - Network acquisition fails
    - Key distribution ceases to work
  - Operator-triggered key rolls, in combination with certificate revocation prevents network elements from decoding data.

FIPS 140-2 Compliance

- FIPS 140-2 Background
  - Federal Information Processing Standard (FIPS) Publication 140-2
  - Published by the National Institute of Standards and Technology (NIST).
  - Documents US Standard for Security Requirements for Cryptographic Modules
  - Four Increasing Levels of Security for Crypto Modules
  - Lab Testing and Agency Submittal to achieve Certification
- We have expanded our existing FIPS 140-2 certification from Level 2 to Level 3
  - Cloak module 1.0.2.0
  - Embedded in the 9 series remotes and DLC line cards
  - Features a strong physical measure for tamper prevention

A Best in Class Cybersecurity Solution

At Satellite 2019, iDirect Government was recognized as having the Top Cybersecurity Solution in 2019 by the Mobile Satellite Users Association (MSUA) for TRANSEC solution.

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Thank You