

# Air Traffic Management Blockchain Infrastructure for Security, Authentication, and Privacy

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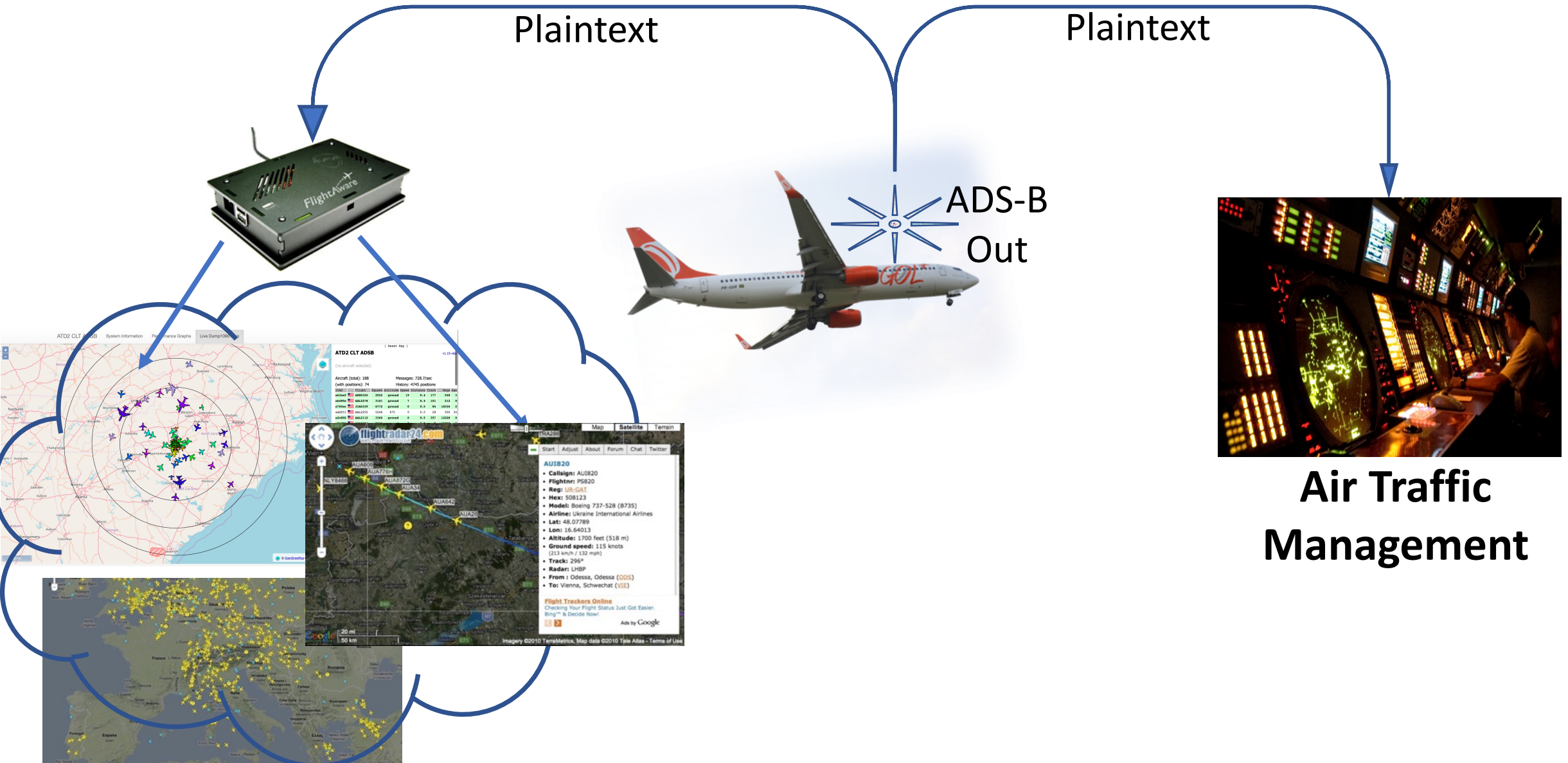
January 11, 2019

*Not Presented due to Government Shutdown*

# Outline

- FAA NextGen Surveillance Mandate Challenges
- Air Traffic Use-Cases & Enterprise Blockchain
- Cryptographic Remedies

# Automatic Dependent Surveillance – Broadcast (ADS-B)



# FAA Mandate: ADS-B by January 1, 2020

## ADS-B (plaintext) Security Concerns

- Privacy: FAA redacted ~10% Air Traffic from publication
  - Military (~4.7 %)
  - Corporate (~4.4.%)
- Authentication
- Signal Injection vulnerabilities (spoofing, denial-of-service)

# Government Accounting Office Conclusions:

- *No approved solutions for ADS-B related risks*
- *DOD is not integrating NextGen requirements*
- *FAA will require ADS-B for Air Traffic Services*
- *Unresolved issues between DOD & DOT*



United States Government Accountability Office  
A Report to Congressional Committees

January 2018

HOMELAND  
DEFENSE

Urgent Need for DOD  
and FAA to Address  
Risks and Improve  
Planning for  
Technology That  
Tracks Military Aircraft

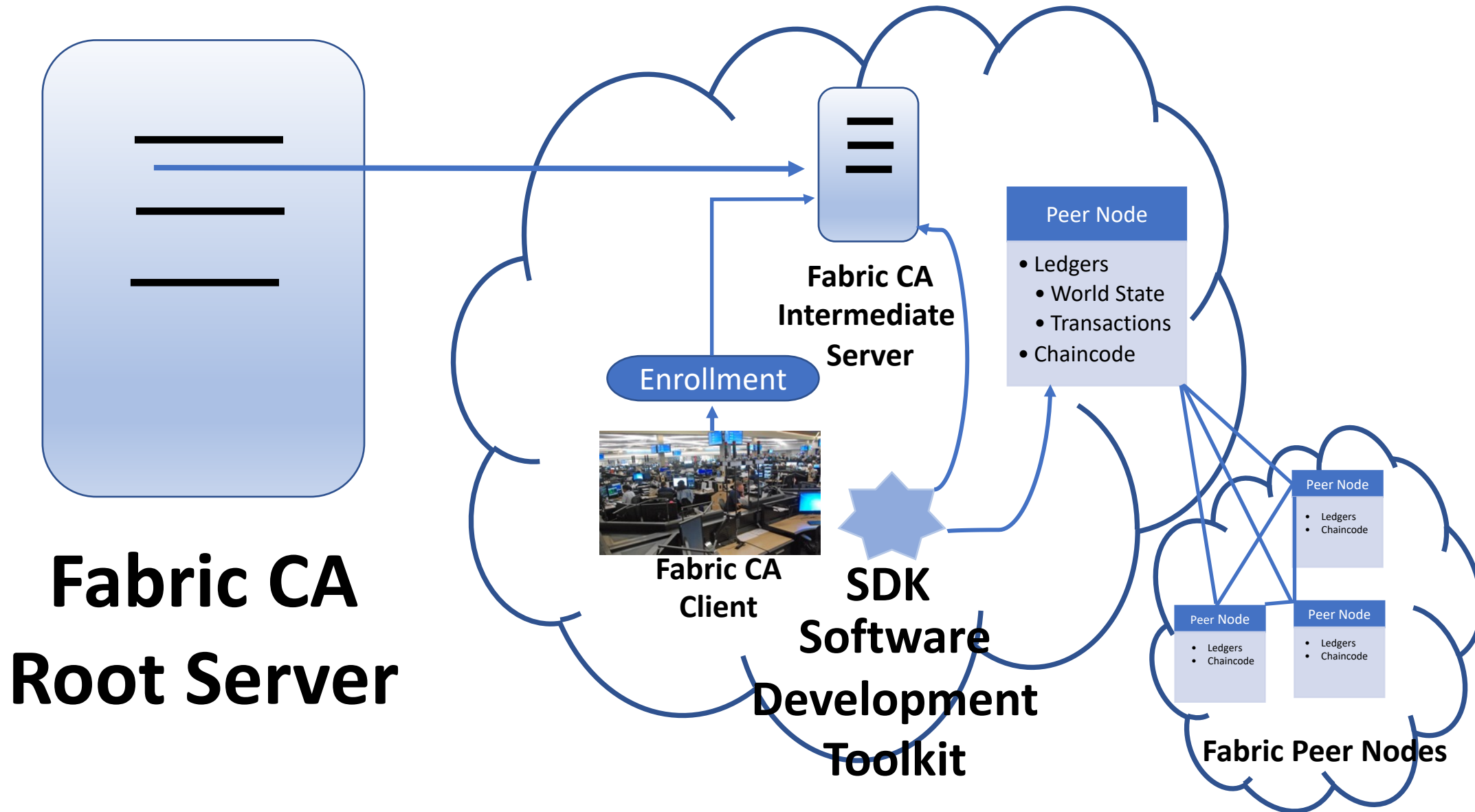
<https://www.gao.gov/assets/690/689478.pdf>

# Hyperledger Fabric

## Differentiating Concepts

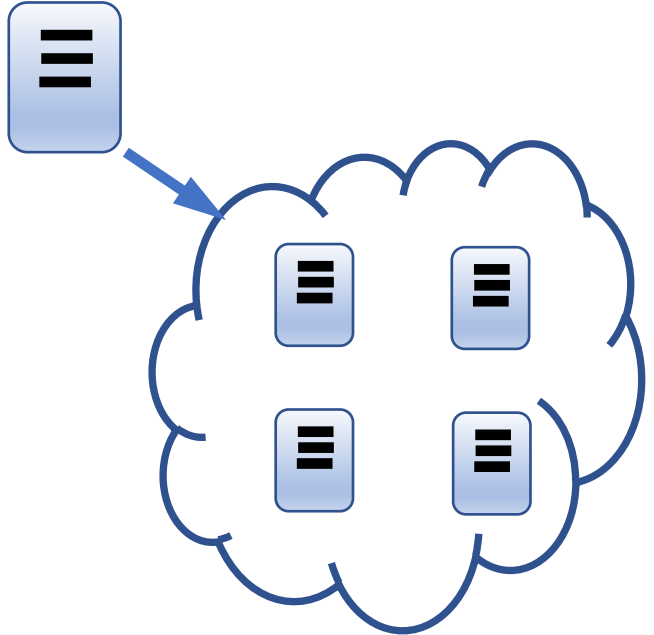
- **Private and Permissioned**
- **Enrollment** (not “Proof of Work”)
- **Membership Service Provider (MSP)**
- **Ledgers have two parts**
  - **World State**
  - **Transaction Log**
- **Chaincode (smart contracts)**
- **Peer Nodes**
  - **Run chaincode**
  - **Keep copies of ledger**

# Hyperledger Fabric Certification Authority (CA)

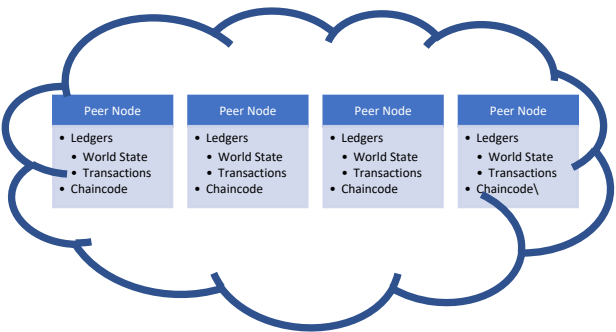




**Fabric CA Root Server**



**Geographically Separated Fabric CA Intermediate Servers**



**Geographically Separated Fabric Peer Nodes**



Membership

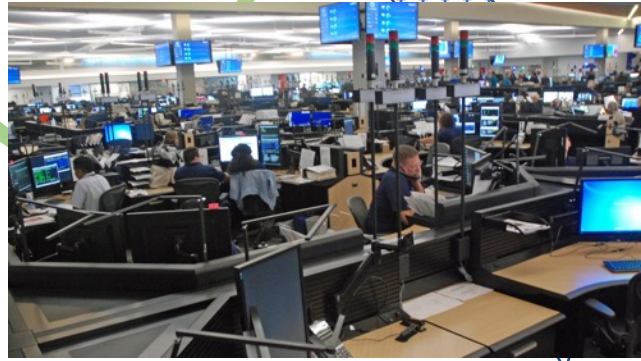


**Air Traffic Management Services**



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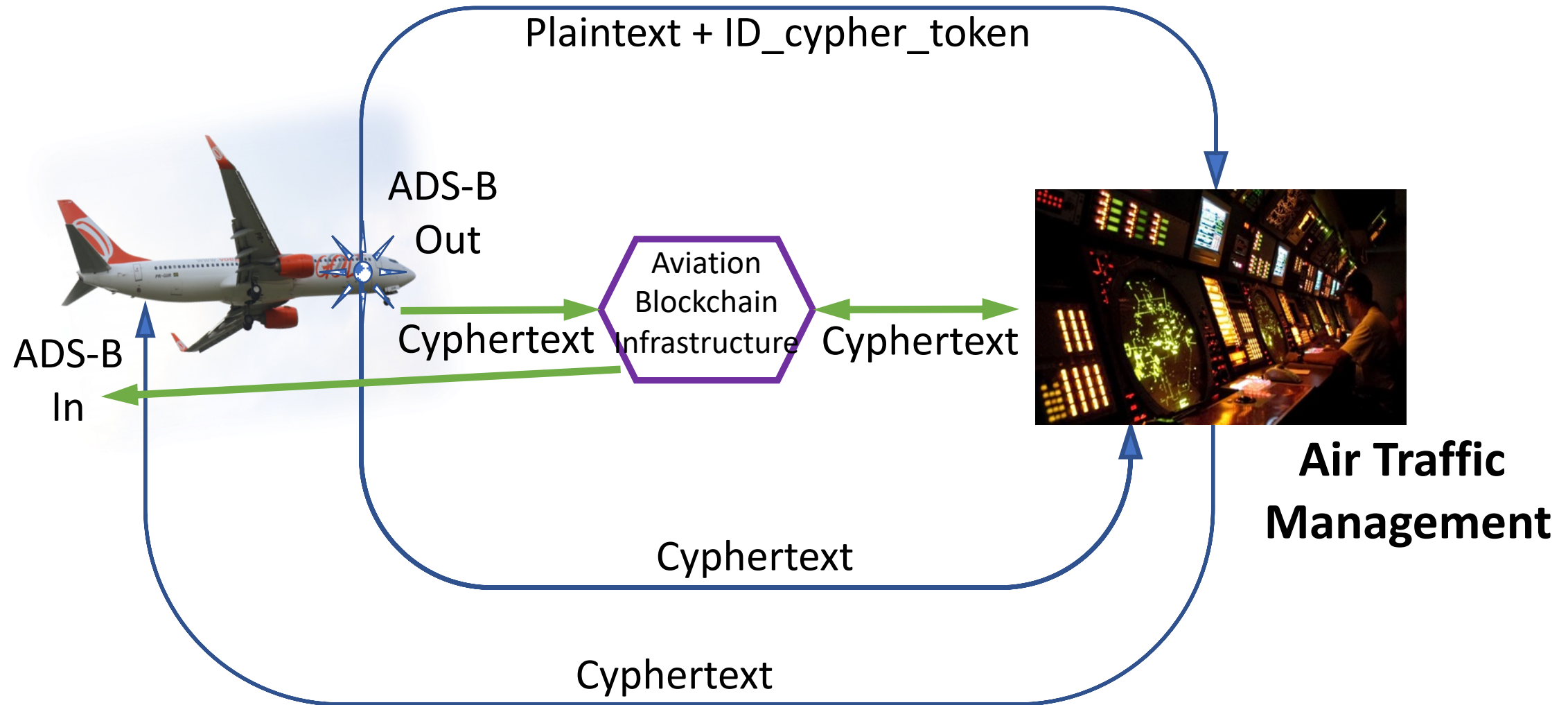
*Unauthorized recipients see only unintelligible cyphertext*



**Airline Operation Services**



# Aviation Blockchain Infrastructure (ABI) Enables ADS-B Authentication & Privacy



# Concluding Remarks

- Open-source enterprise-oriented blockchain platform (Hyperledger Fabric) may be leveraged as a practical cryptographic solution to provide security and privacy for ADS-B
- Demonstration Needed: ADS-B hardware running cryptographic codes without any additional expense or modification
- Research Issue: How will future Collision Avoidance technology work reliably with encrypted surveillance signals?