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Future of Automotive Security Technology Research

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WHAT IS FASTR?

- **Automotive security** is not a problem that can be solved by a single organization or in silos → it **requires an industry-wide effort**

- **Success** in securing tomorrow's vehicles **requires a unified approach** through knowledge exchange and technology-sharing

- FASTR is a non-profit consortium that provides a **neutral, open environment** to enable collaboration across the automotive ecosystem

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ACTIVE FASTR CORPORATE MEMBERS

Rambus

intel

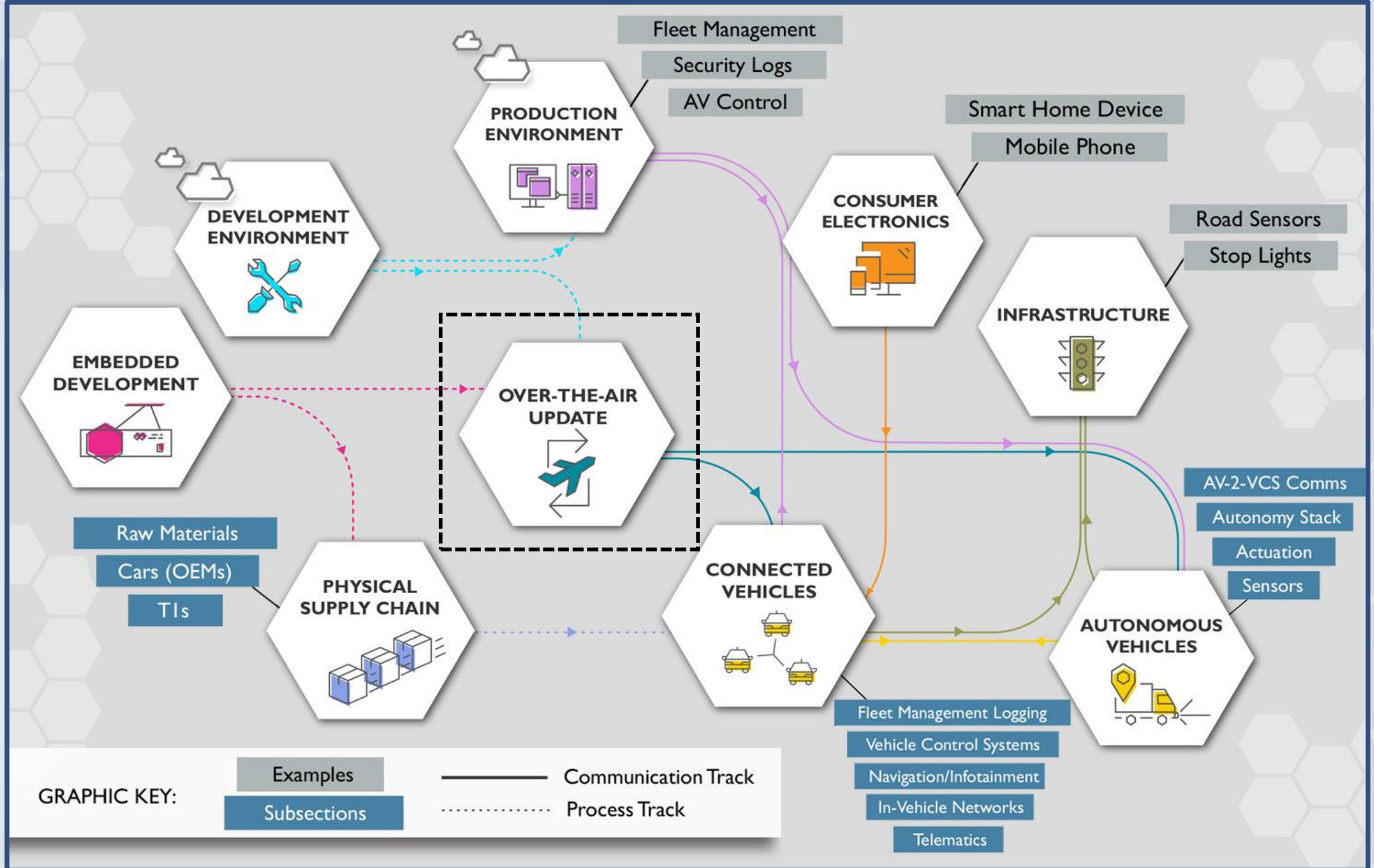
ARGUS CYBER SECURITY

aeris

UBER

RunSafe SECURITY

Karamba Security


Fleet Management
Security Logs
AV Control
PRODUCTION ENVIRONMENT
DEVELOPMENT ENVIRONMENT
Smart Home Device
Mobile Phone
CONSUMER ELECTRONICS
Road Sensors
Stop Lights
INFRASTRUCTURE
EMBEDDED DEVELOPMENT
OVER-THE-AIR UPDATE
AV-2-VCS Comms
Autonomy Stack
Actuation
Sensors
Raw Materials
Cars (OEMs)
TIs
PHYSICAL SUPPLY CHAIN
CONNECTED VEHICLES
AUTONOMOUS VEHICLES
Fleet Management Logging
Vehicle Control Systems
Navigation/Infotainment
In-Vehicle Networks
Telematics
GRAPHIC KEY:
Examples
Subsections
Communication Track
Process Track

FASTR Guidelines for Secure Over-the-Air Updates

Initial version published by FASTR in November 2017

Intended to assist the automotive industry in evaluating platforms for secure SOTA updates, the guidelines include:

	# of Guidelines
Description of **threat models & guidelines to address** these threats	21
Recommended **cryptographic algorithms**	18
Key management plan	17
A **detailed step-by-step checklist** for evaluating platforms	56

Access the Guidelines here https://fastr.org/guidelines-sota/

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Threat Models Considered

SOTA software update systems should be **resistant to any attack that does not physically modify the vehicle**, including

- Spoofing attacks **- emulation of SOTA component(s)**
- Tampering attacks **- install/use modified software**
- Repudiation attacks **- refute claims of proper/improper install**
- Information-leakage attacks **- sensitive info exposure (keys, code)**
- Denial-of-service attacks **- "graceful degradation" to an attack**
- Escalation-of-privileges attacks **- via agent/cloud compromise**

Examples of Guidelines to Address These Threats

- Software updates should **include a signed certificate containing the public key of the entity providing the update**
- Software updates should **include version information to prevent rollback** to genuine but obsolete software versions
- Secure all network transactions with **TLS public key authentication**, and the public keys should be signed by a trusted Certificate Authority
- Compliant SOTA software update systems should **log all important events**, in such a way the log entries cannot be altered later
- Compliant SOTA software update systems should **deliver software updates to authorized devices only**

Recommendations for Cryptographic Algorithms

- Random number generation - **TRNG entropy source**
- Symmetric key encryption - **@ least AES-128 & SHA-256**
- Cryptographic hash algorithm - **@ least SHA-256**
- Digital signature - **@ least ECDSA-256**
- Key agreement - **@ least ECDH-256**
- Digital certificates - **guidance on X.509 certificate fields**
- Network and point-to-point cryptography - **TLS**
- Passwords - **recommend multi-factor authentication**

Detailed Key Management Plan

- List of keys - **nine identified (may not need all for every case)**
- Key and random data generation **- use a TRNG entropy source**
- Storage and backup **- storage strategy is based on key type**
- Key distribution **- distribute keys in a secure manner**
- Usage **- use keys in an appropriate/secure manner**
- Key and certificate updates **- procedures to update keys & certs**
- Key and certificate revocation **- procedures to manage/revoke**

Summary

FASTR has provided this resource and checklist to initiate an industry dialog on these aspects of security

We welcome input, feedback, and collaboration with GENIVI on **utilizing these guidelines**, **identifying joint security research topics**, and **developing new intellectual capital**

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Potential topics for joint future research…

- Assessing the **security of 5G and DSRC**
- **Threat models for V2X**
- Standard methodology for **assessing the security of TCUs**
- Security concerns during **potential corner cases**, including
  - Loss of network connectivity
  - Loss of authentication services
  - Loss of GPS / mapping

  Could an attacker take advantage of a disruption event to do things they normally couldn't?

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Questions or Feedback?

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