- Securing Santa‘s Sleigh -

INET XMAS Presentation 2018

by Timo Häckel

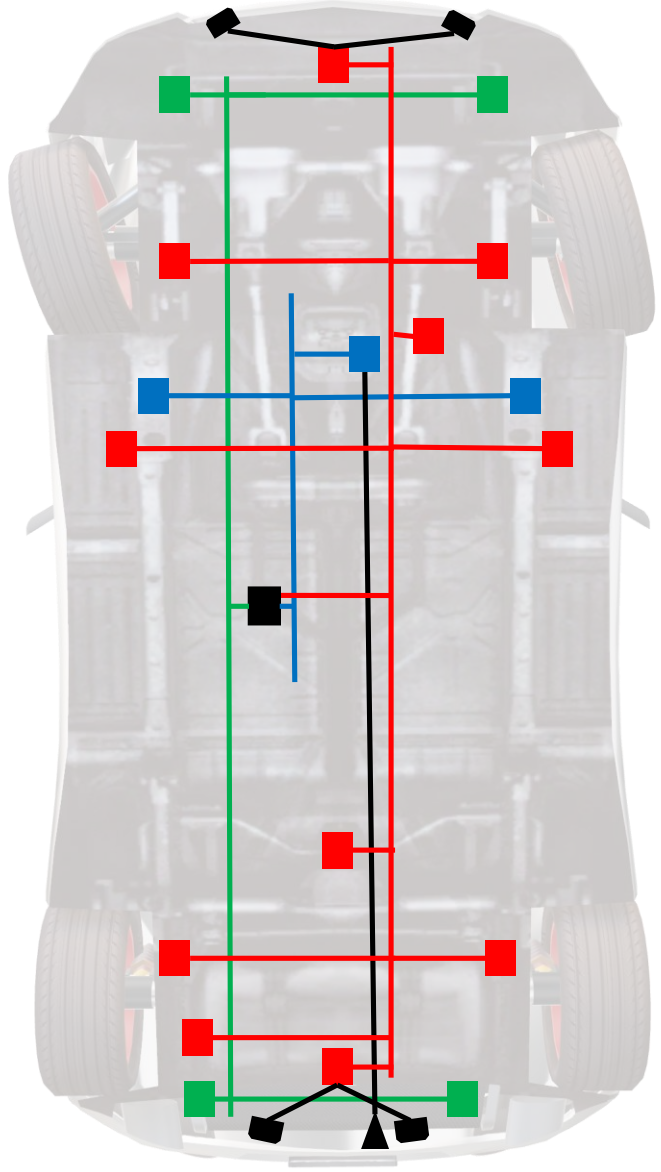
- Securin[illegible] Sleigh -

Overview

1. Automotive Networks
2. SecVI Research Project
3. Software-Defined Networking (SDN)
4. Time-Sensitive Software-Defined Networking (TSSDN)
5. Current State and Outlook
6. Party

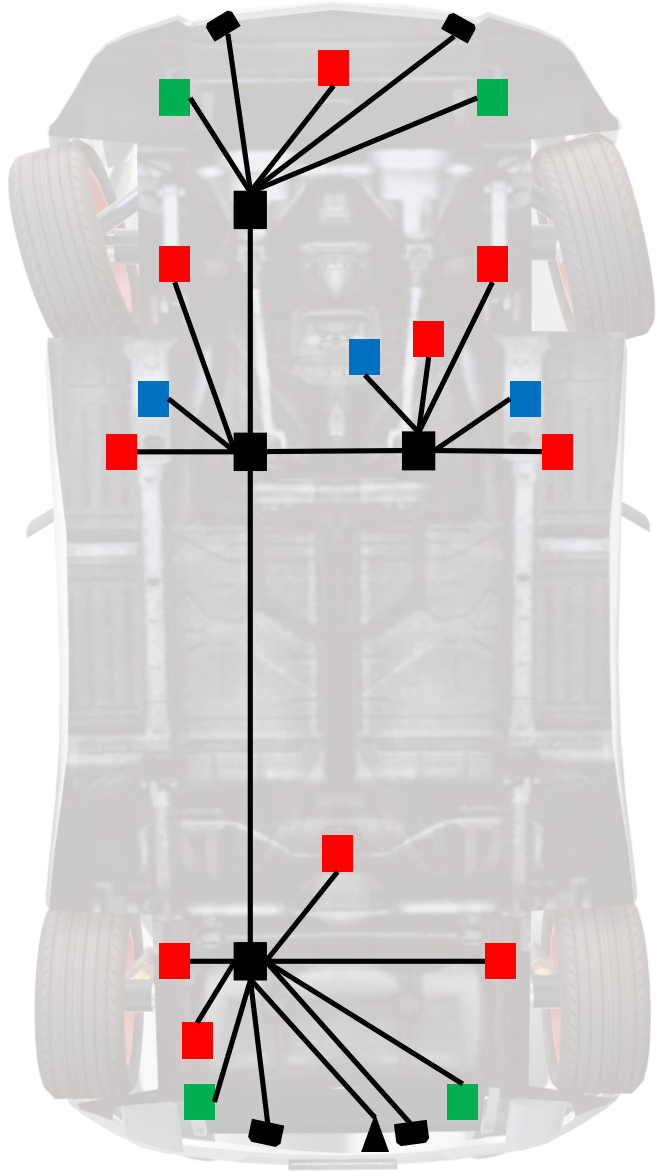
1. Automotive Networks

- Electronic Control Units (ECU's)
  - About 100 ECU's in Premium Vehicles
  - Different Strength
- Different Transmission Media
  - Bus Technologies (CAN, LIN, FlexRay, etc.)
  - Point-to-Point Connections (Ethernet)
- Cross-Communication for Advanced Functions
- Step-by-Step to Ethernet



1. Automotive Networks

- Advantages of Ethernet
  - Simple and Efficient Communication Architecture
  - Availability of the Technology
  - High Bandwidth
- But: No Real-Time Guarantees
- Real-Time Extensions to Ethernet
  - Time-Triggered Ethernet (TTE - AS6802)
  - Audio Video Bridging (AVB - 802.1QBA)
  - Time-Sensitive Networking (TSN - 802.1Q)

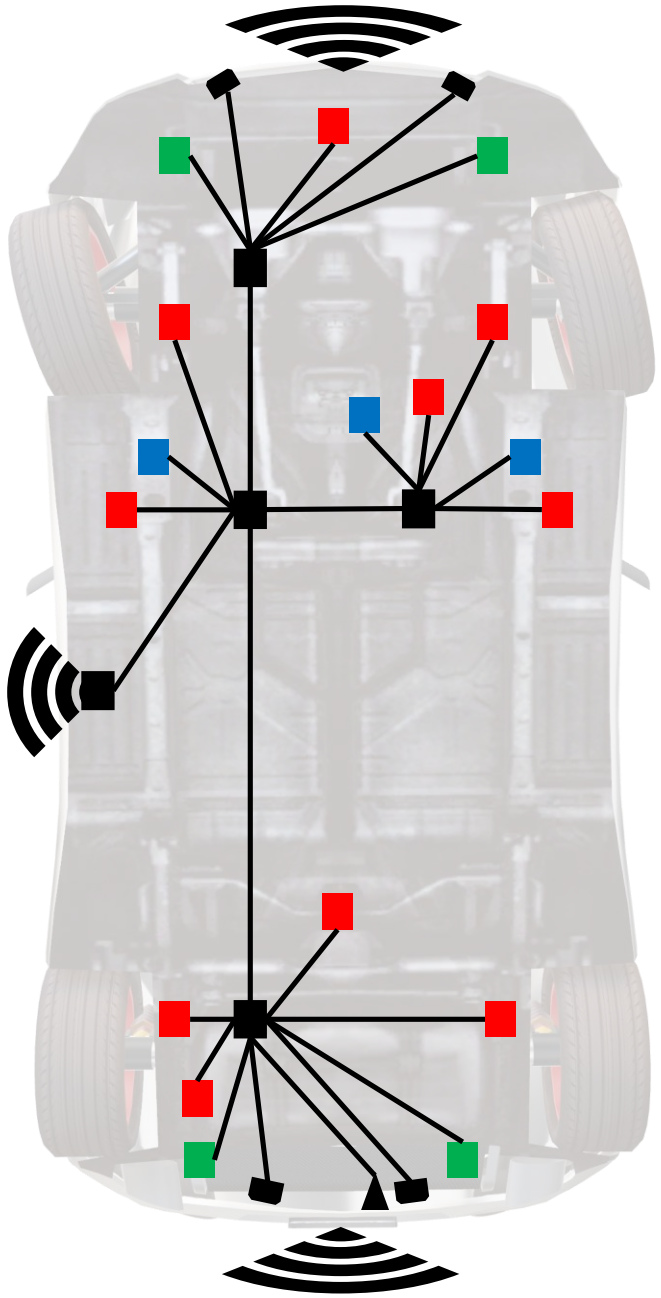


1. Automotive Networks

- Opening the Network to the Outside
  - Radio Communication
  - Cloud Connection
  - Car-to-X Communication

- Current vehicles are vulnerable!

https://www.youtube.com/watch?v=RZVYTJarPFs



secVI

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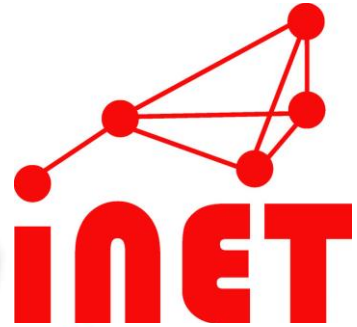
2. SecVI Research Project

Security for Vehicular Information

04/2018 - 03/2021

Federal Ministry
of Education
and Research



automotive
engineering

easycore

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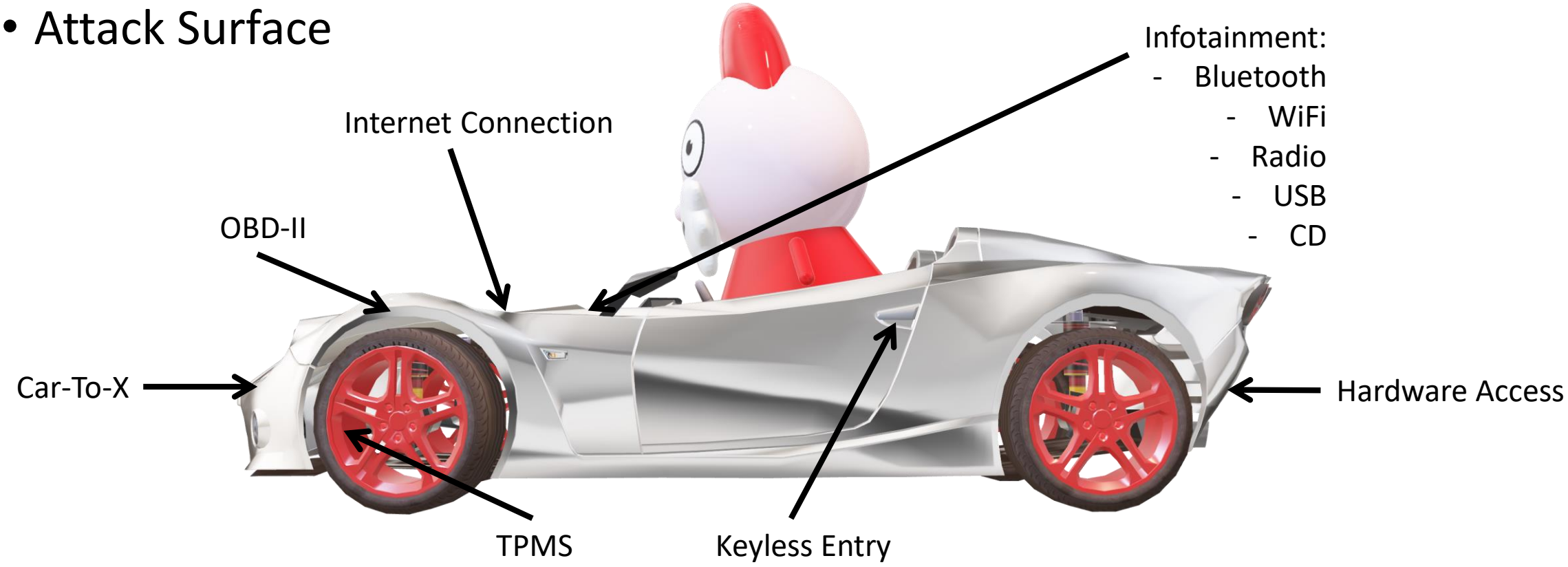
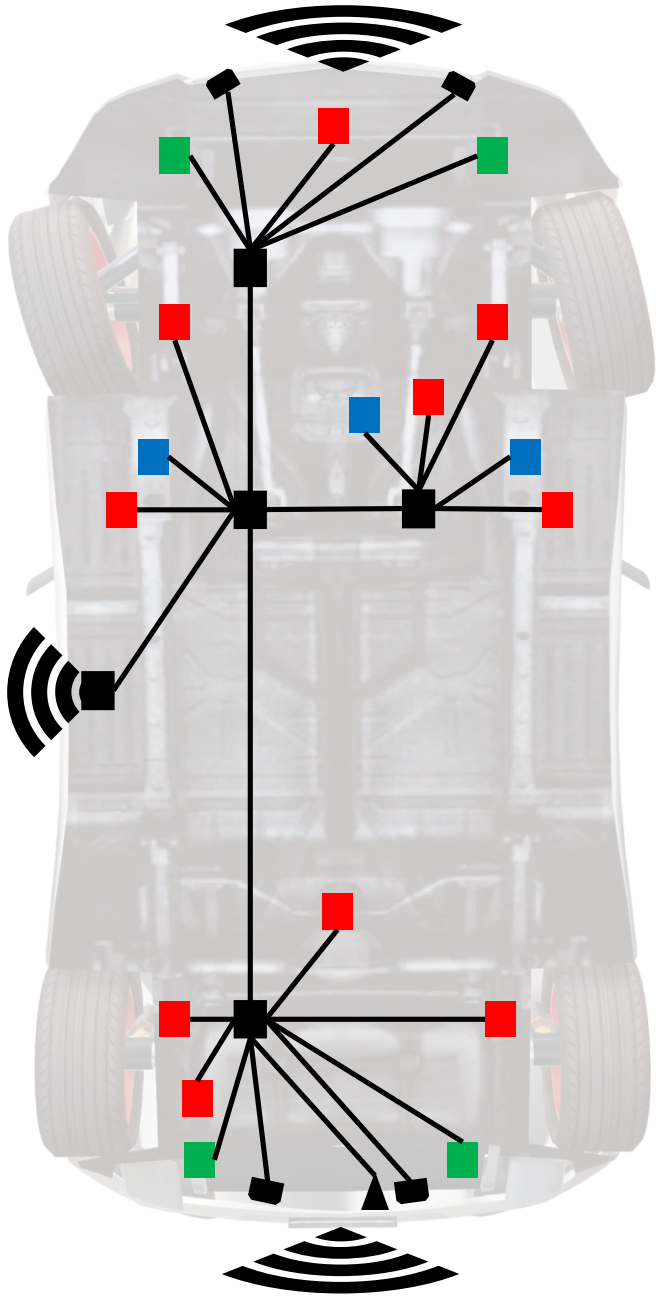
2. SecVI Research Project

- Attack Surface



2. SecVI Research Project

- Goal: Creating a Robust, Secure and Updatable Communication Architecture
- Building Blocks
  - Security Defense Center (Backend)
  - Secure Gateways (Firewalls)
  - Secure Networking (SDN + Anomaly Detection)
  - Secure Communication (Encryption, etc.)
  - Secure Boot
  - Secure Update



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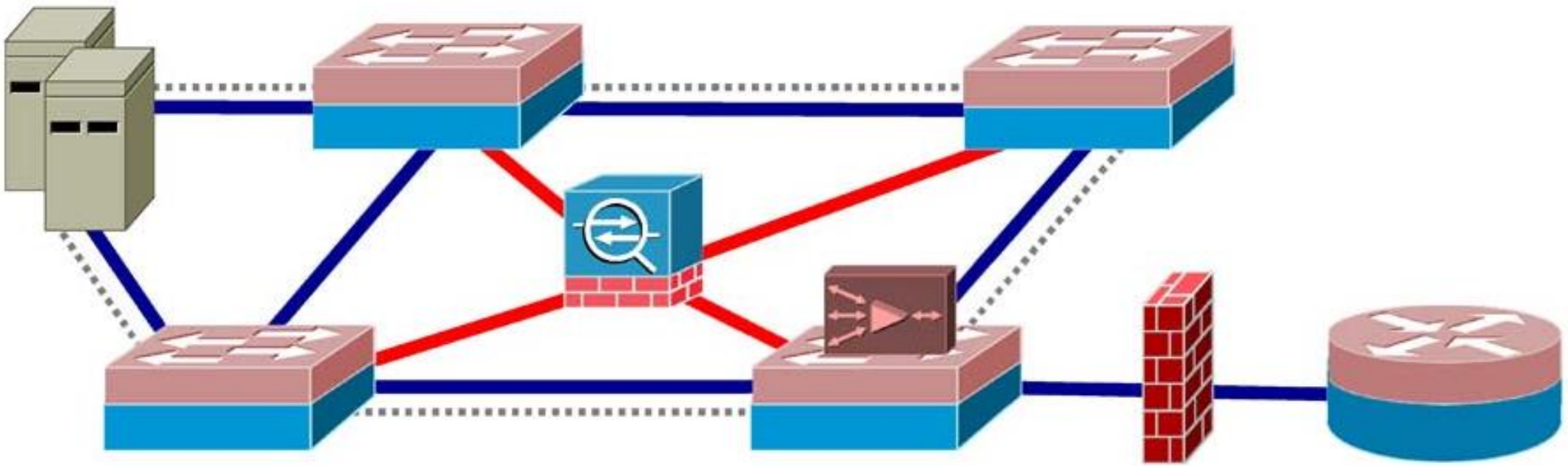

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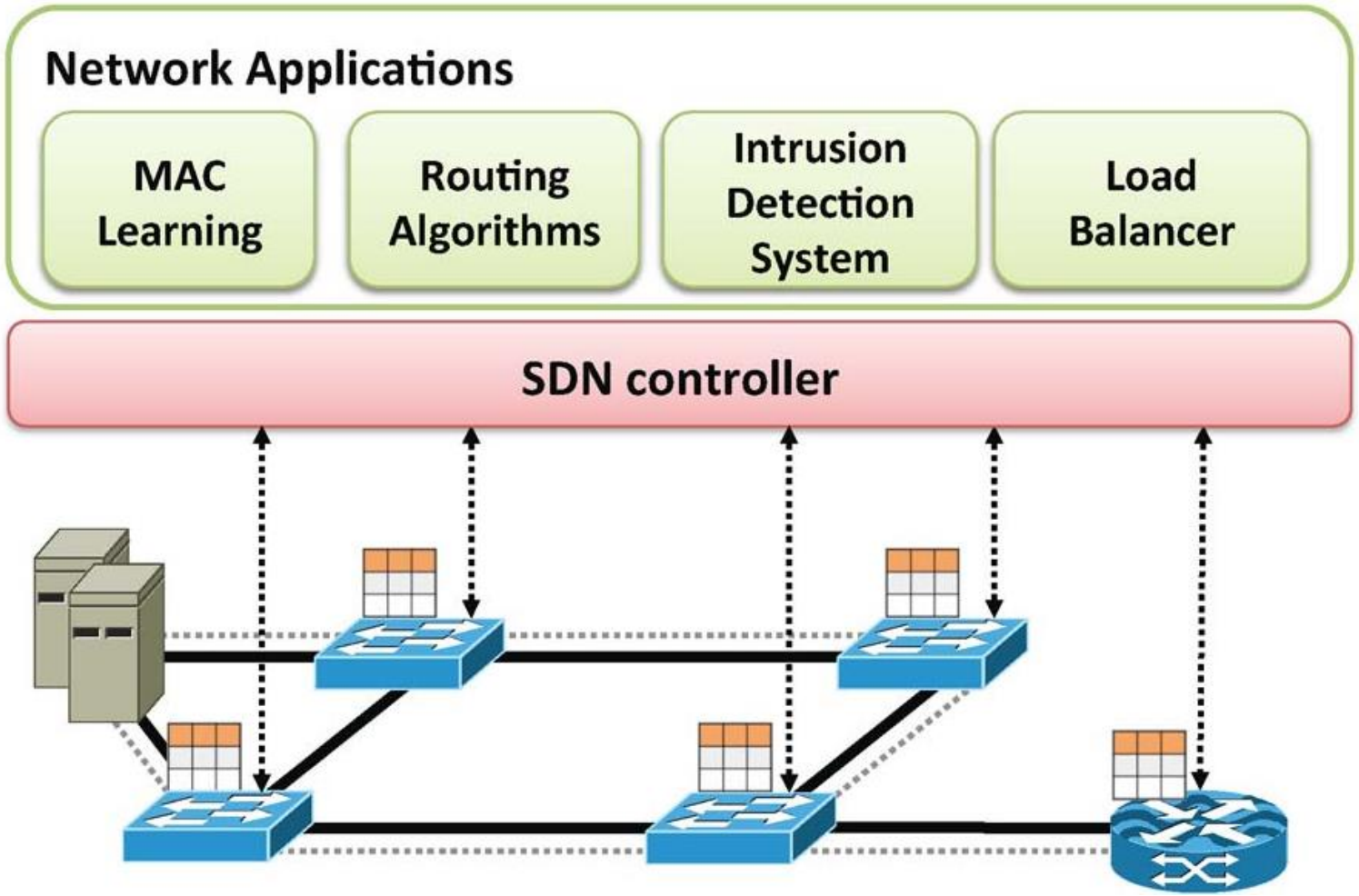

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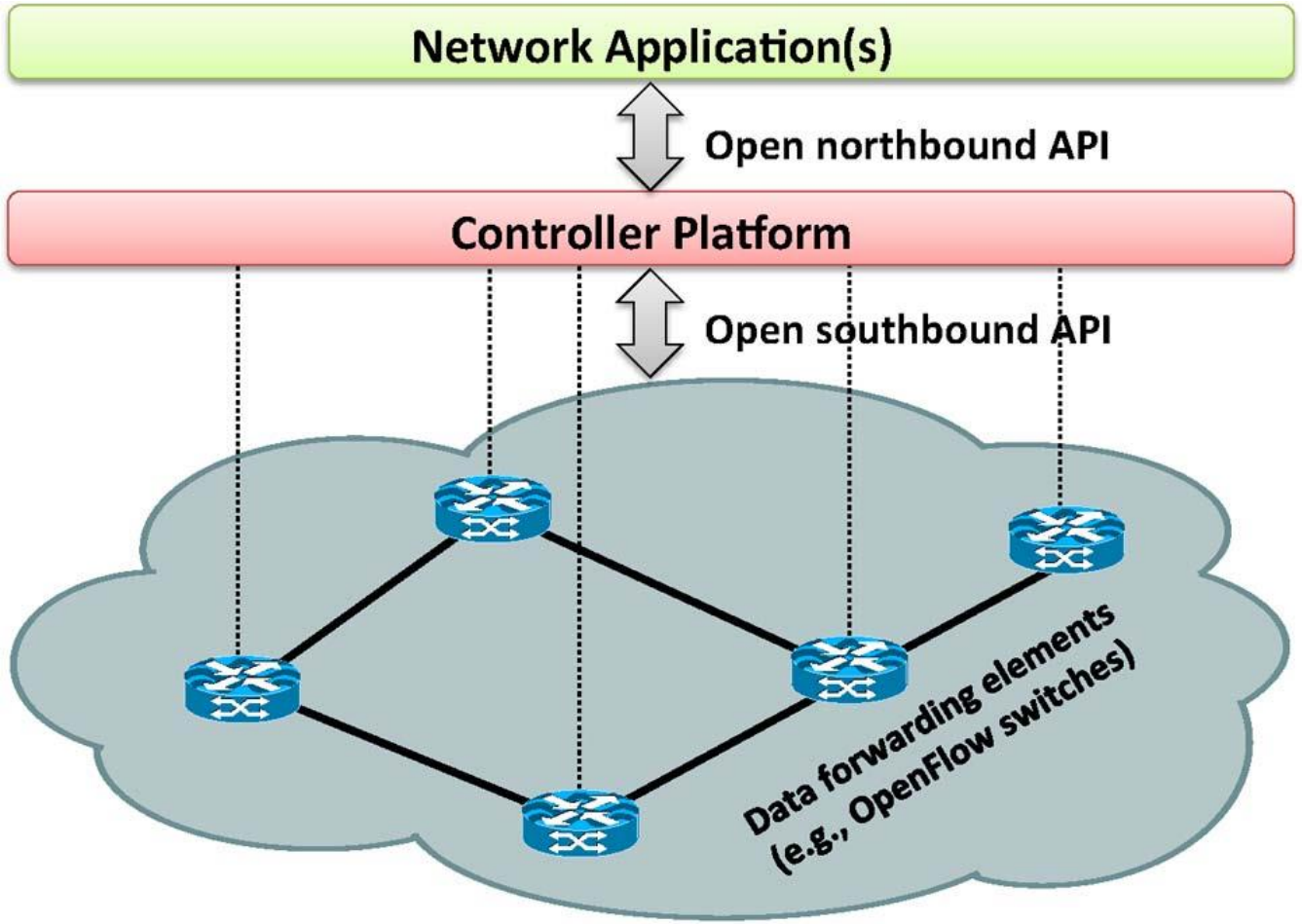

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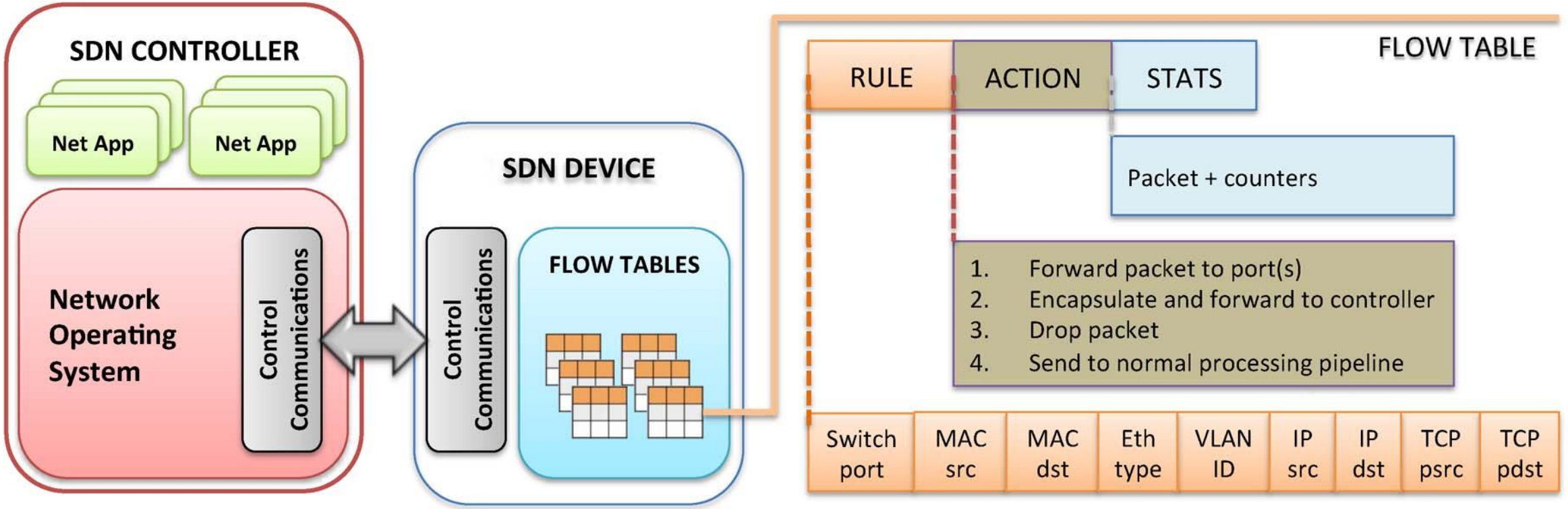

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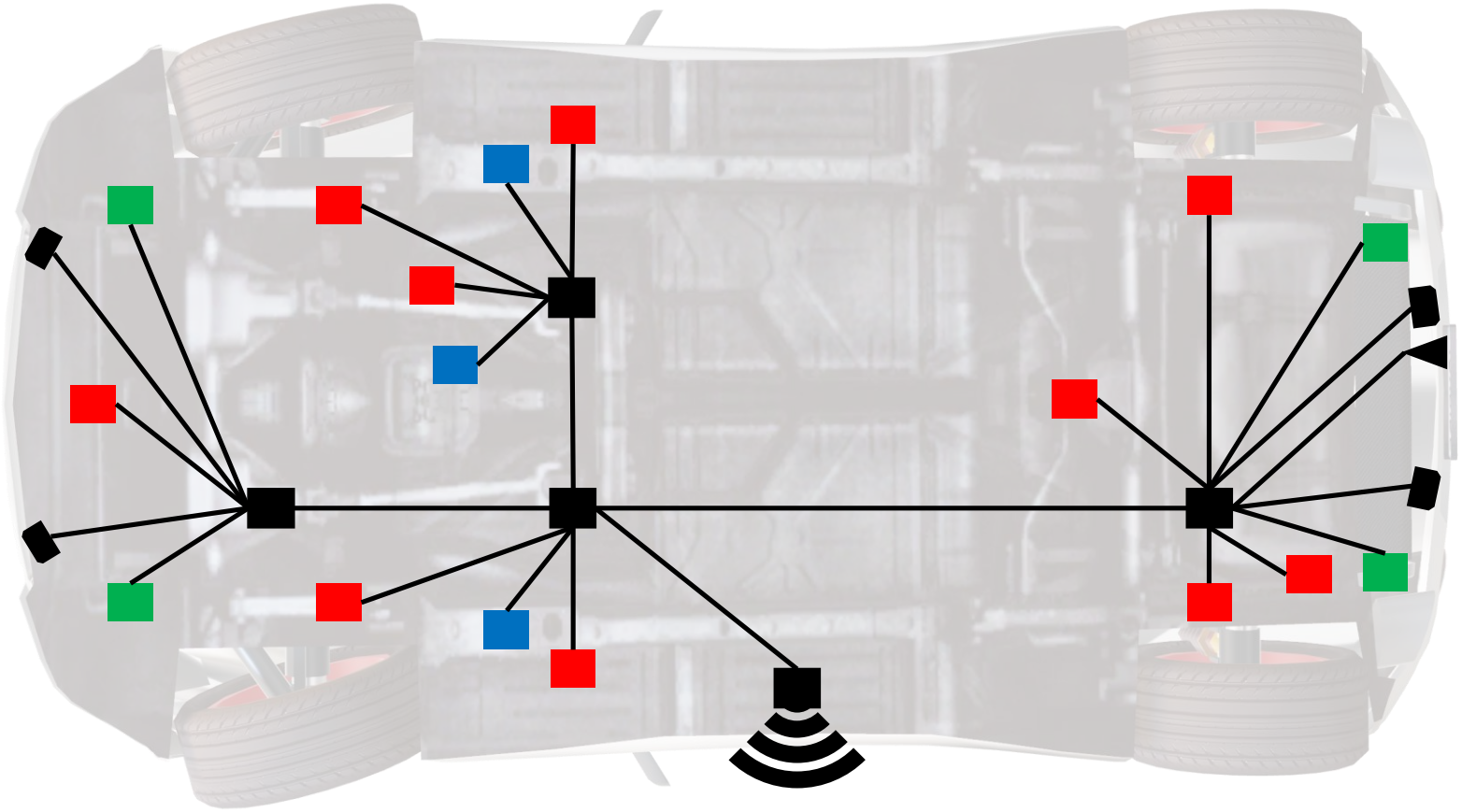

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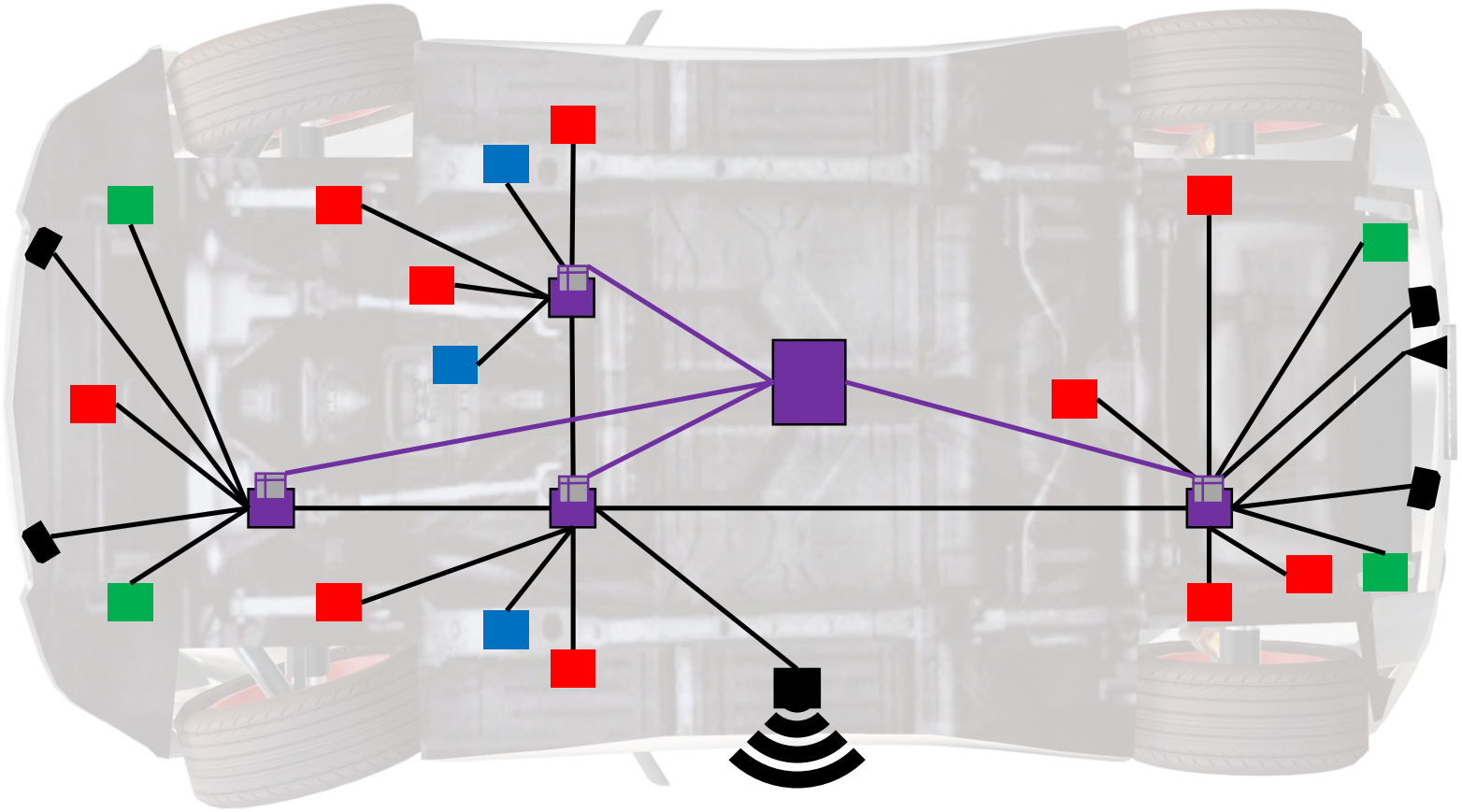

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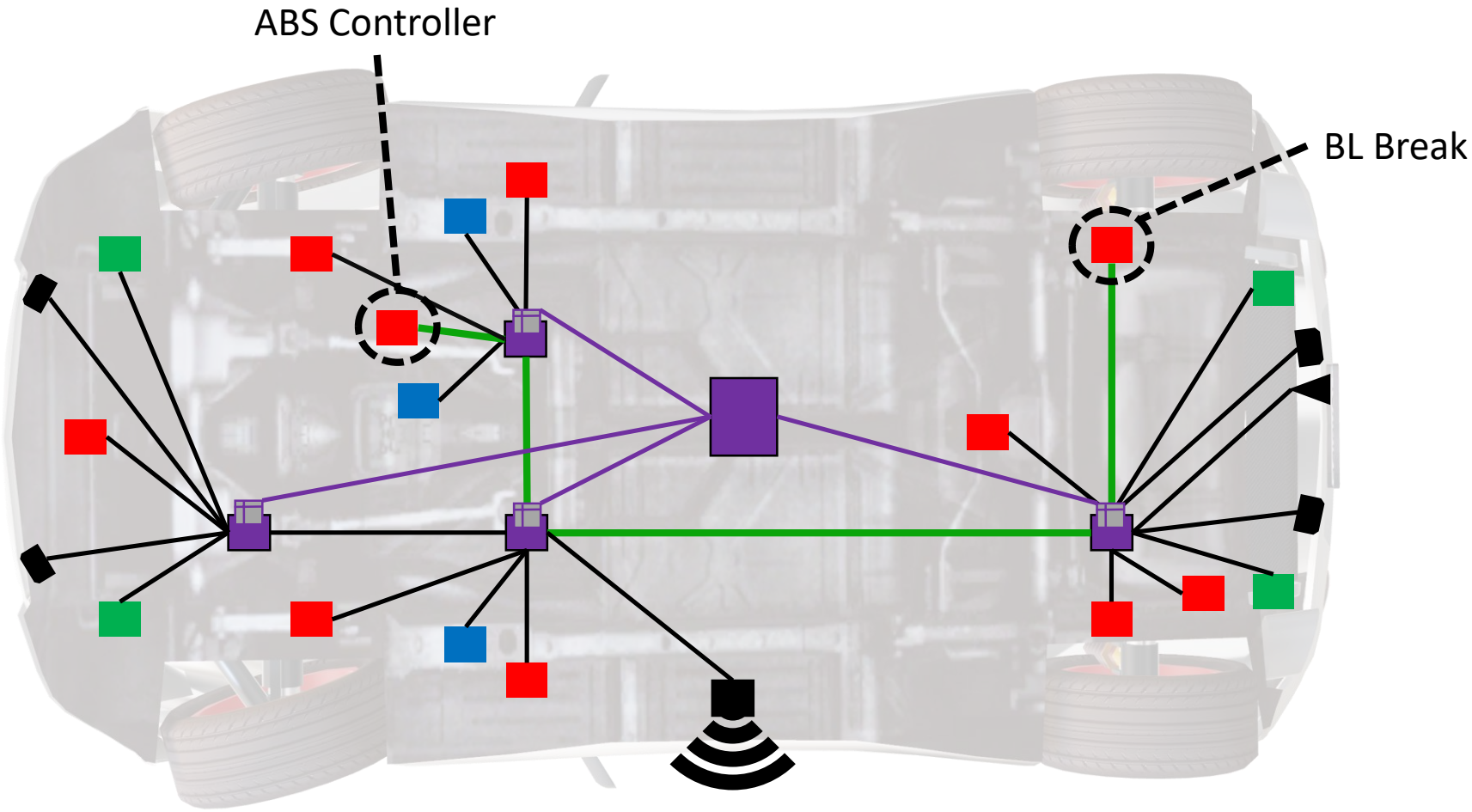

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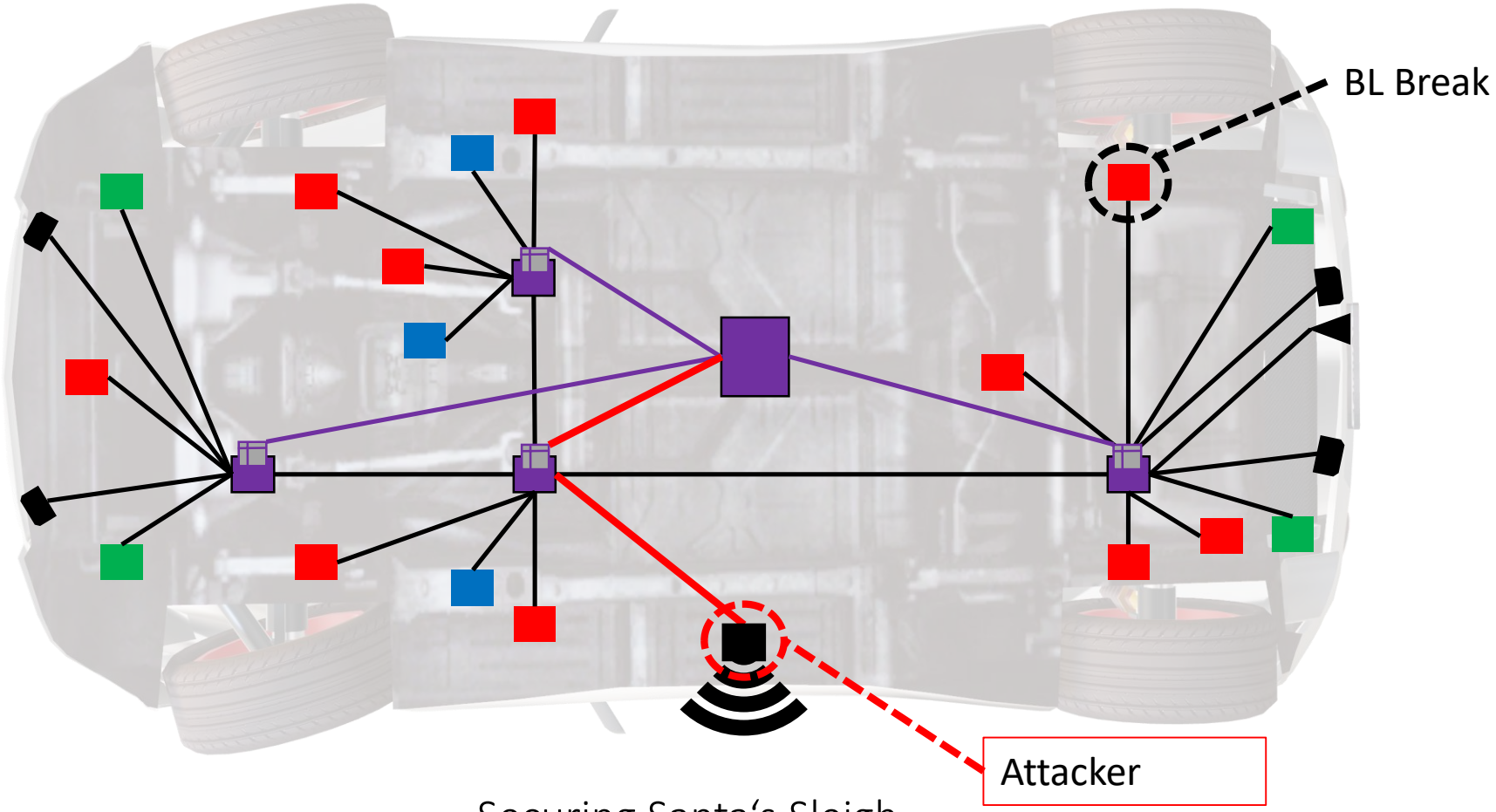


3. Software-Defined Networking

- Advantages:
  1. Vendor Neutral Centralized Network Logic
  2. Global Network Knowledge
  3. Robustness
  4. Security Applications

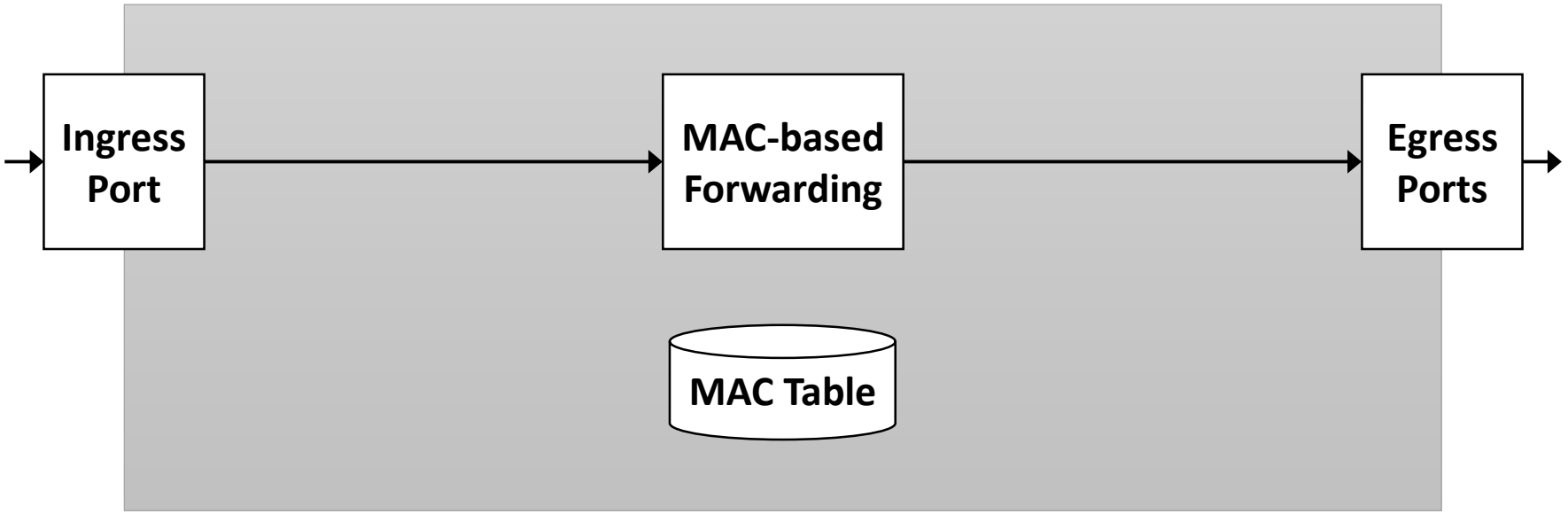
- But: We need to avoid the single point of failure.

4. Time-Sensitive Software-Defined Networking

- Goal:
  - Make TSN Controllable by an SDN Controller
  - Make SDN Real-Time Capable and TSN Compatible

- Steps:
  - Combine the Switch Architecture
  - Extract the TSN Control Logic
  - Extend OpenFlow to Allow Real-Time Flows

4. Time-Sensitive Software-Defined Networking



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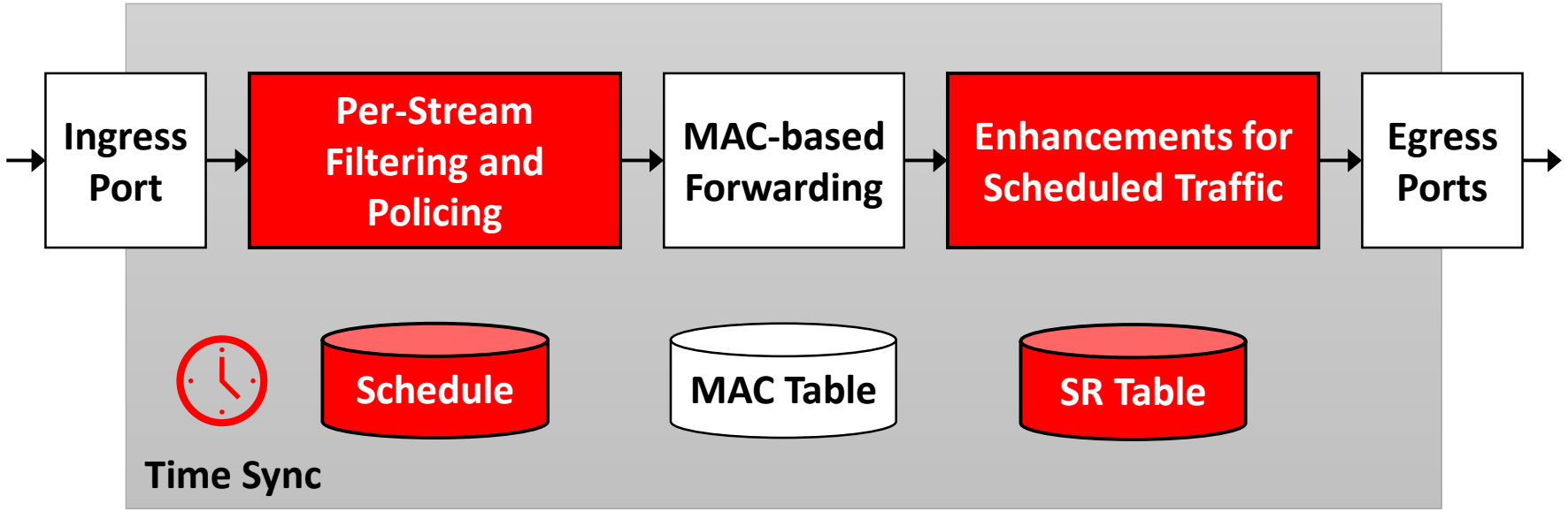

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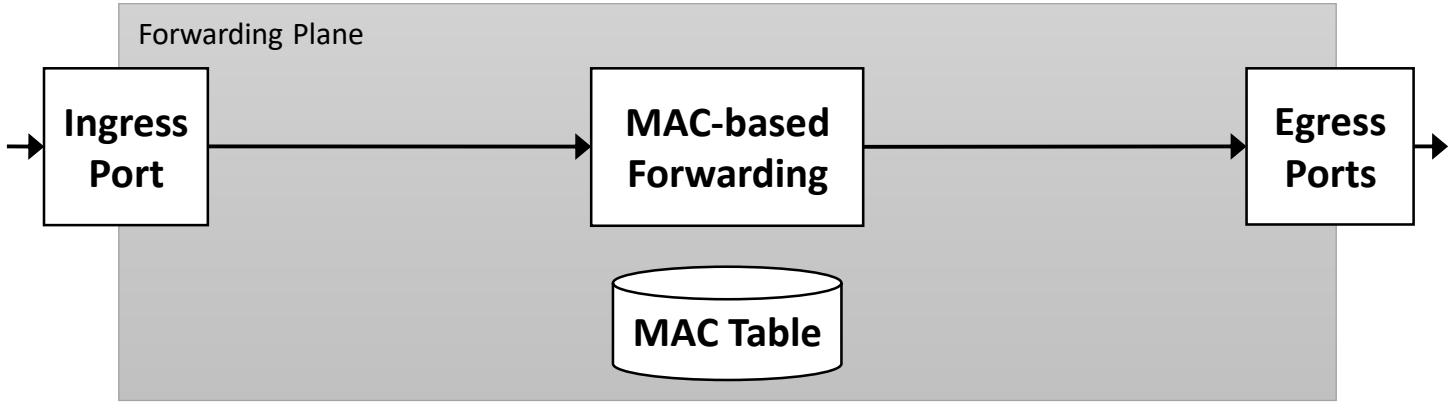

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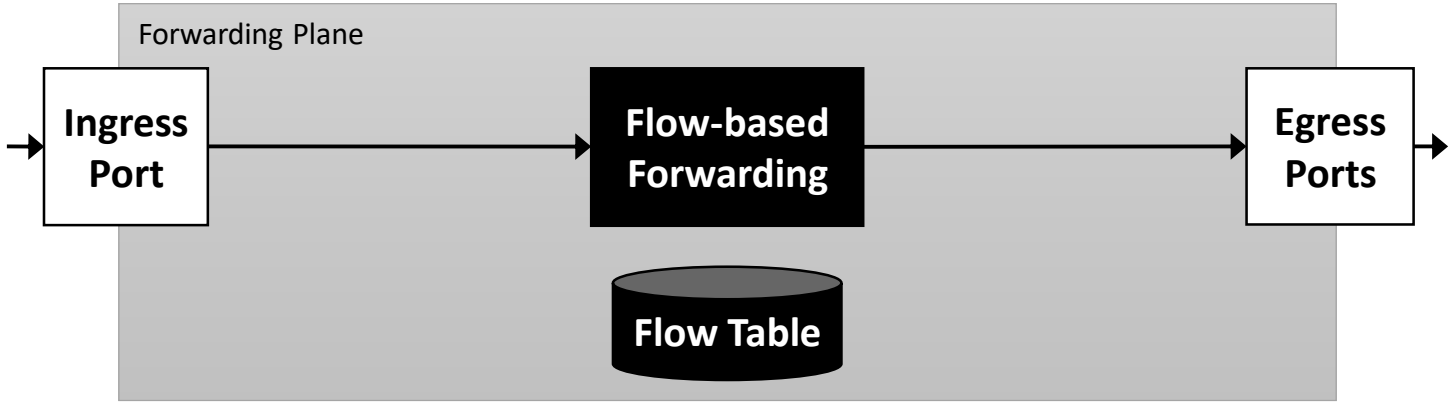

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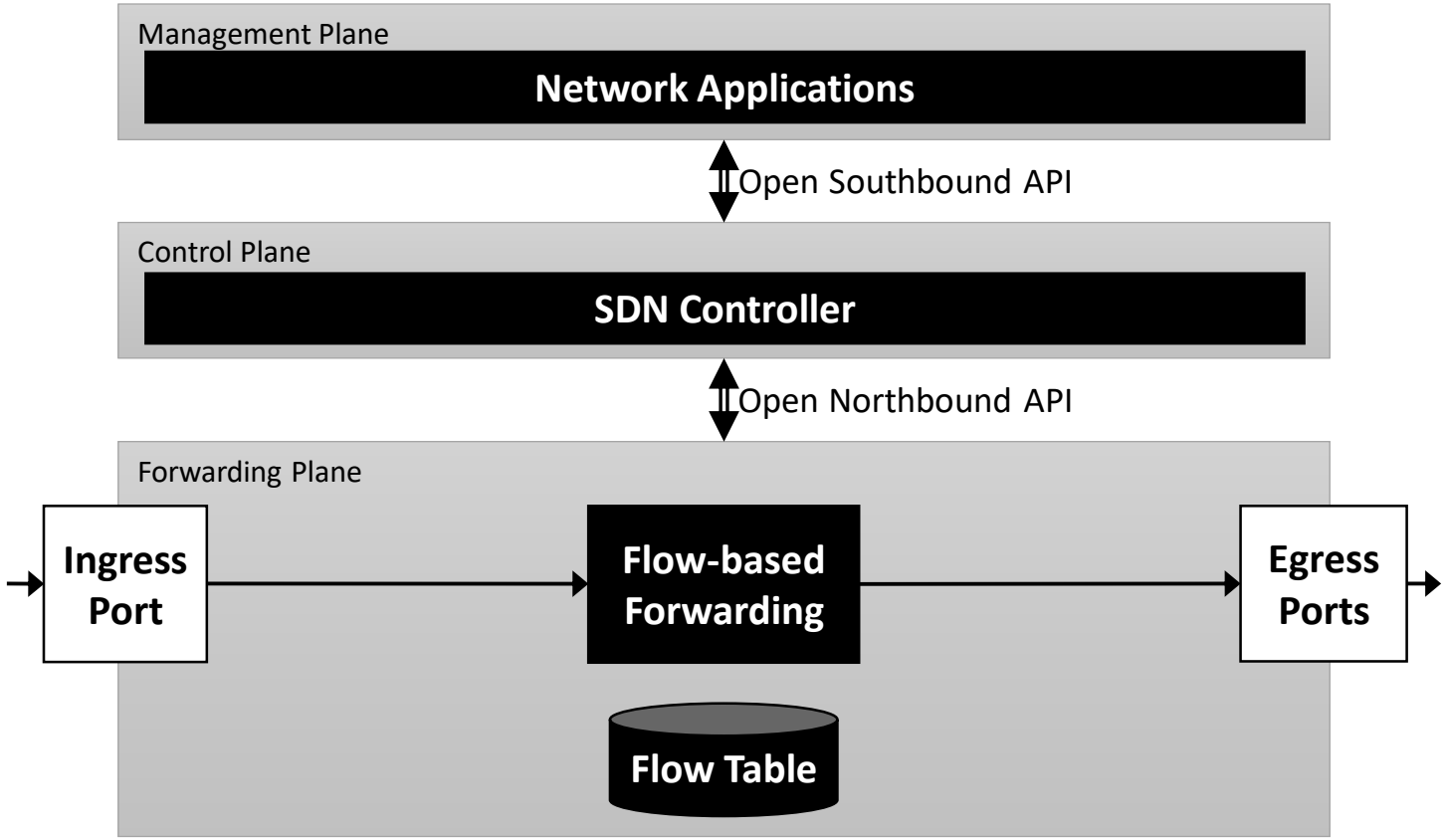

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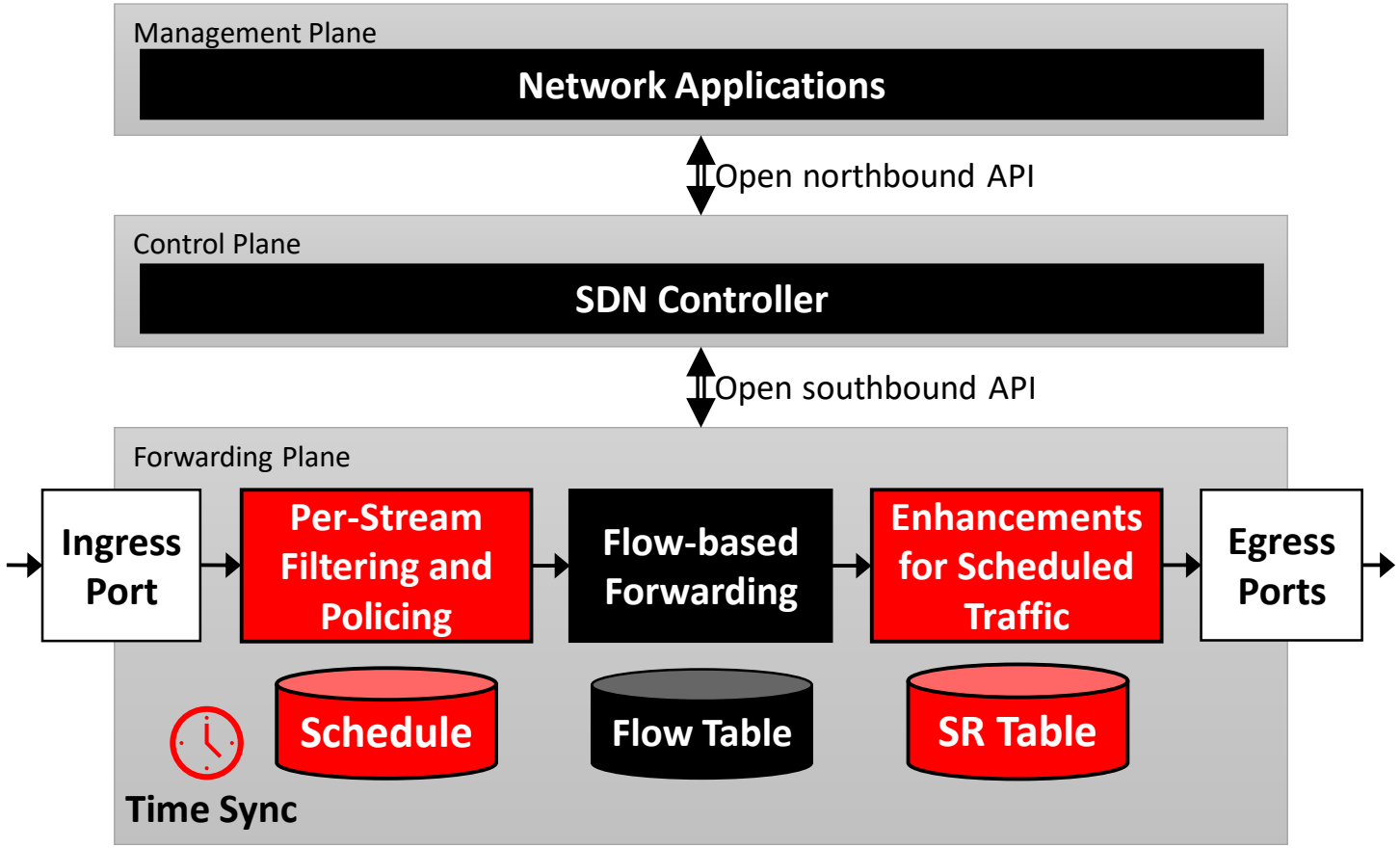

5. Current State and Outlook

- Currently
  - Implementing Time-Sensitive Software Defined Networking
  - Exploring SDN Hardware and Openflow Simulation
  - Exploring Automotive Network Security, Attacks and Countermeasures

- Future
  - Introducing SDN to our Demonstration Vehicle
  - Implement Whitelists for Known C-Matrix of a Vehicle
  - Let the CCC try to hack the demo vehicle

6. Any Questions?

XMAS Party