universidade de aveiro

instituto de telecomunicações

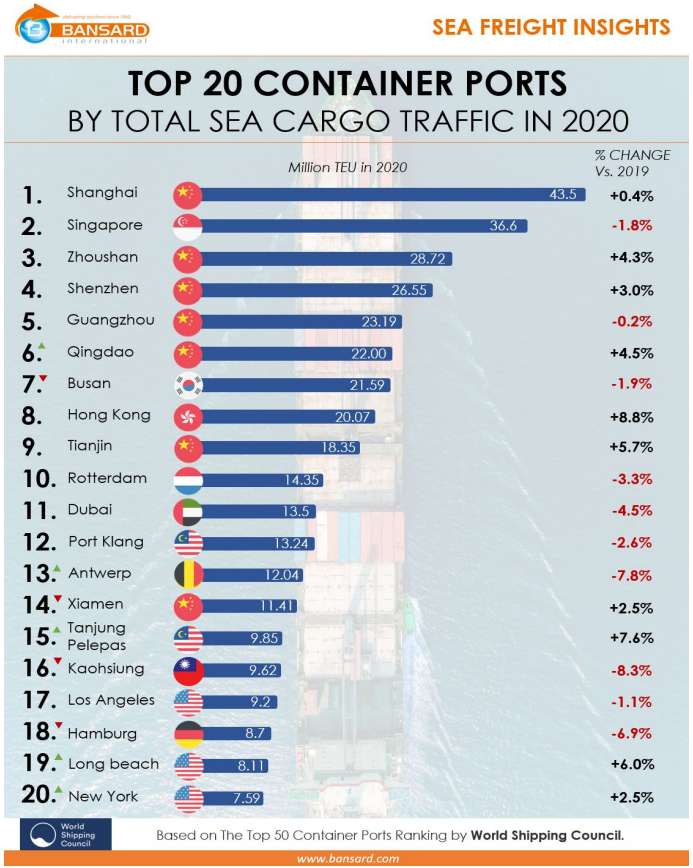
Vehicle-to-Vehicle and Vehicle-to-Infrastructure Communication Protocols for Trains in Ports Environments

João Torrinhas - 98435

January 23, 2024

Introduction

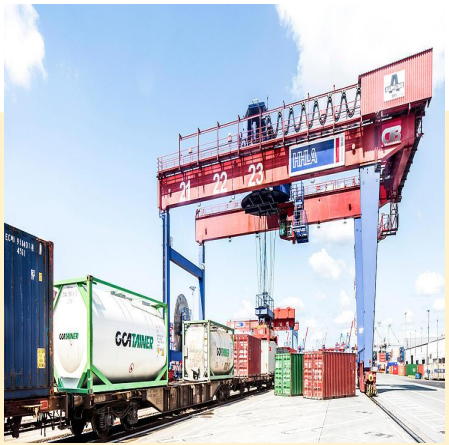
- Ports are the most important factor in the growth of the global economy.
- Ports serve as crucial gateways for international trade, facilitating the movement of goods between countries.



Benefits

Safety

Improves security protocols.



Logistics

Increases logistics efficiency in port environments.

Efficiency

Improves efficiency.

Objectives

The objectives of this dissertation are to develop vehicle-to-vehicle and vehicle-to-infrastructure communication protocols that allow connecting information from sensors on different trains and information/data regarding goods in each train taking advantage of existing mobile communication technologies (5G) integrated with ITS-G5 and C-V2X for vehicular communication.

Example of Technologies for Seamless Connectivity

MP-TCP:

-Allow TCP connection to use multiple paths.

-Maximize throughput and increase redundancy.

MP-DCCP:

-Provides multipath transport latency-sensitive services and/or services with no or less demand.

-Enhance DCCP communication capabilities.

-Allow the simultaneous use of multiple network paths.

SDN:

-Enables the simultaneous use of multiple network paths.

-Allow SDN controller to dynamically choose the optimal path based on real-time conditions.

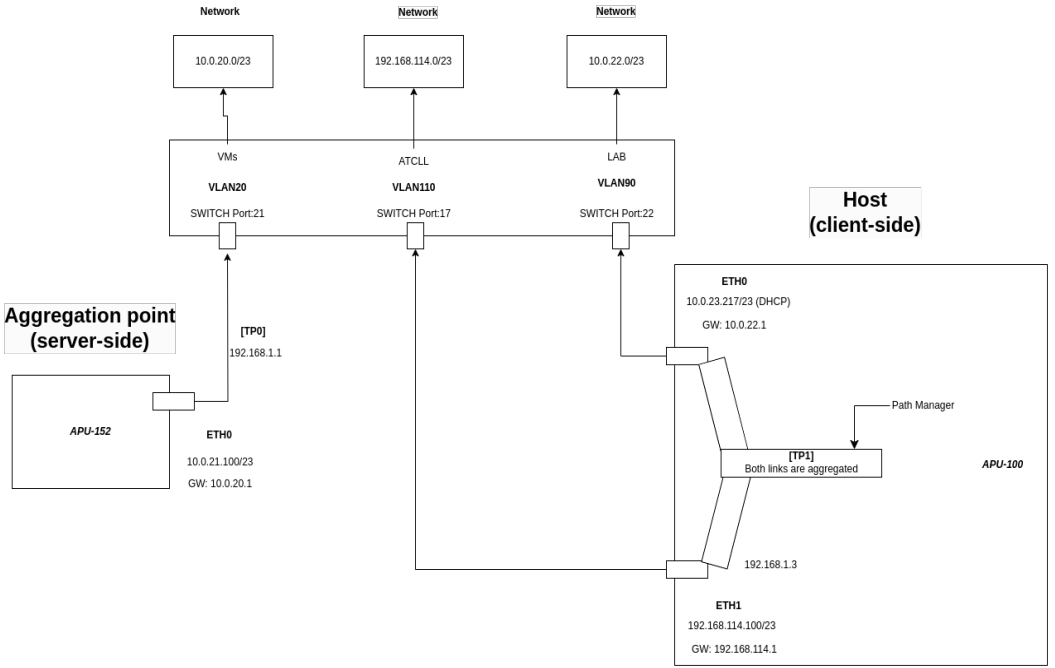
ATSSS:

-Enhance overall network performance, reliability, and user experience by leveraging the strengths of each available access technology.

-Optimizes traffic management by dynamically steering, switching, or splitting it across different access networks.

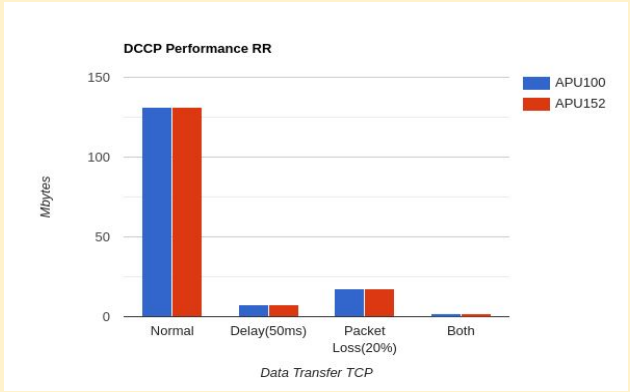
MP-DCCP Scenario

- Simple scenario to test the MP-DCCP protocol where multipath sessions are established between the two hosts (client-server).

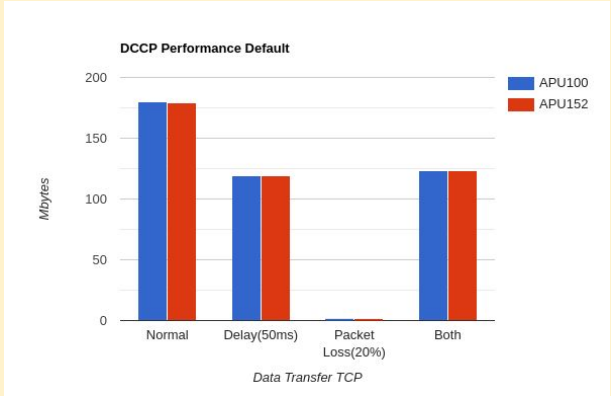


MP-DCCP Tests (TCP)

Despite having carried out several tests for the UDP and TCP protocol, I will present, as an example, the tests related to the amount of data transferred in TCP (packets generated during 30 seconds using the iperf command) in the previous scenario in each APU for round robin (RR) and default scheduling algorithms present in MP-DCCP.



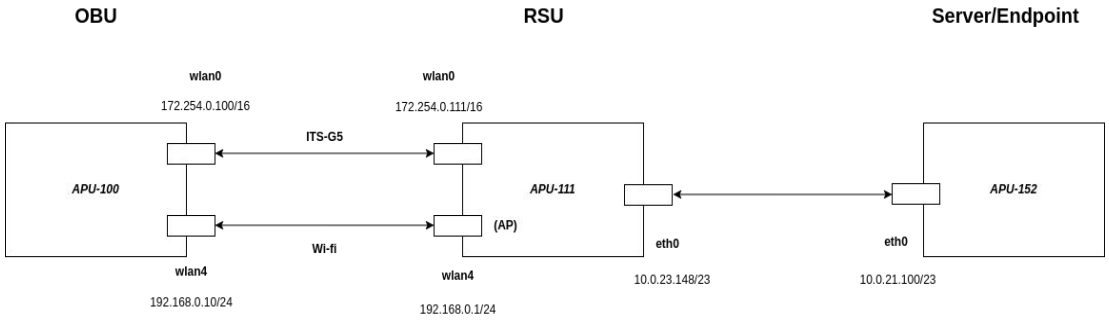
The **Round Robin** scheduler iterates over the available paths (load balancing).

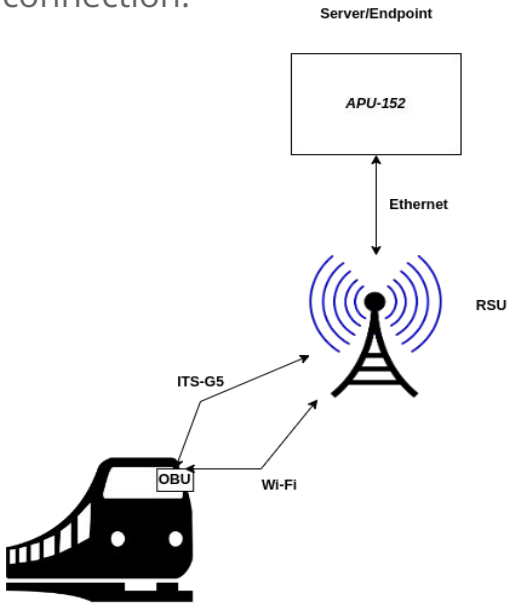


The **Default** scheduler selects the first available path.

MP-DCCP New Scenario

Currently, this new scenario has been created where there is an OBU, an RSU and an Endpoint and tests will be carried out in the near future. Between the OBU and the RSU there are two links: one ITS-G5 and another Wi-Fi, the RSU and the Endpoint are connected by an ethernet connection.





Communication in railway infrastructures

- Some possibilities are being studied, such as:
  - VANET network to exchange information between network entities such as trains and infrastructure.
  - Architecture consisting of end-node, gateway and master gateway where data will be exchanged through these entities.

Conclusion

- Increase efficiency.
- Increase security protocols.
- May increase the global economic growth.
- Efficient logistics.