Implementation of an OBS access node supporting multiple services

Víctor López[1, 3], Georgios Zervas[2], Yixuan Qin[2], Sergio Lopez-Buedo[1], Dimitra Simeonidou[2], Javier Aracil[1] and Juan Fernandez-Palacios[3]

[1]*Universidad Autónoma de Madrid*

[2]*University of Essex*

[3]**Telefónica *I+D***

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- MAINS Reference Architecture
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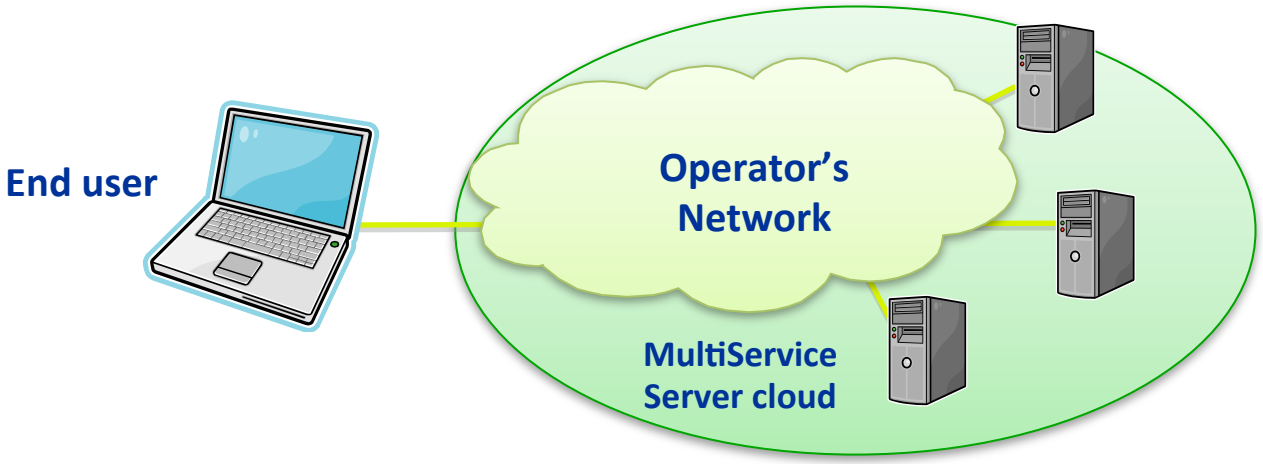
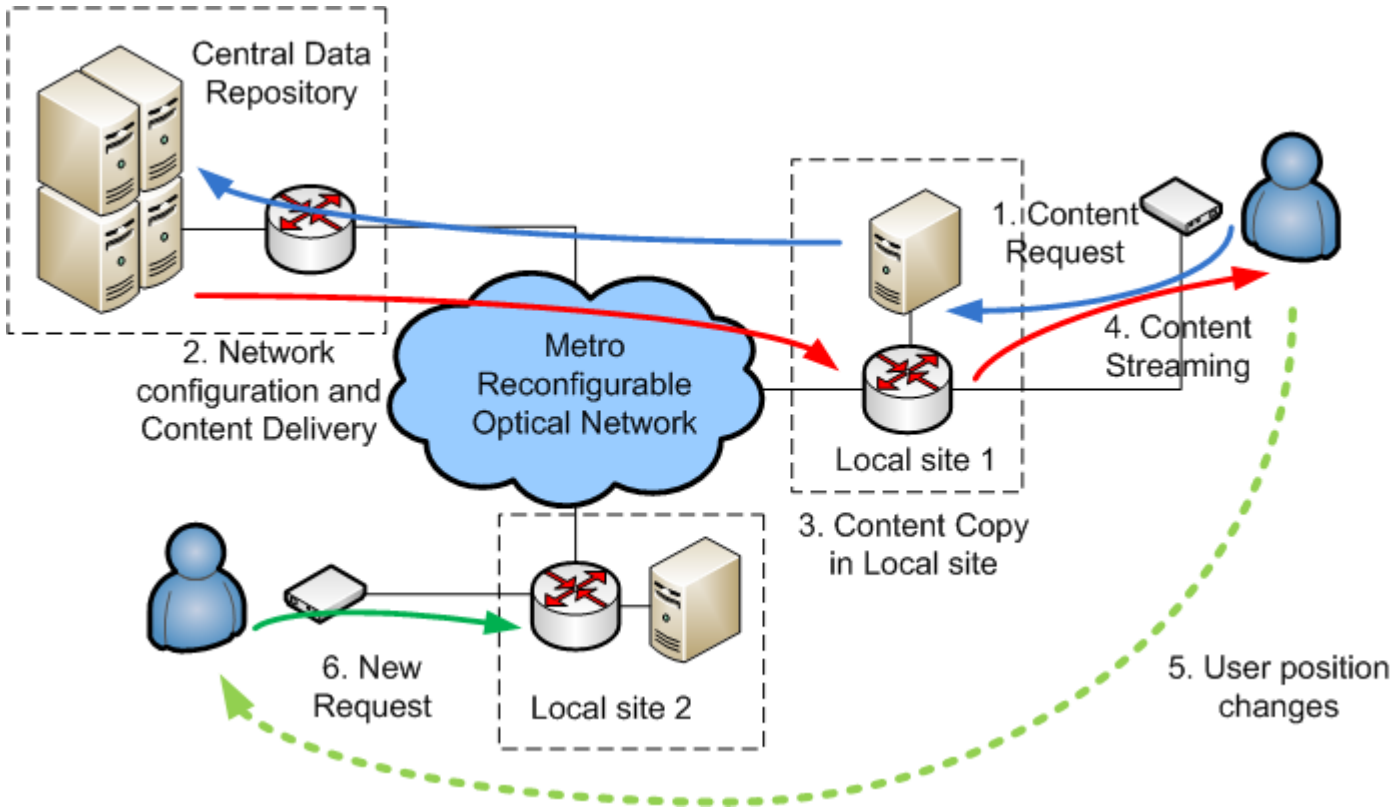
Motivation

- Operators are interested on Network Centric Services (NCS)
- What is a NCS?
  - Combined user of both network and IT resources.
  - Examples:
    - PC virtualization, VoD, 3D Internet gaming, SaaS and SAN

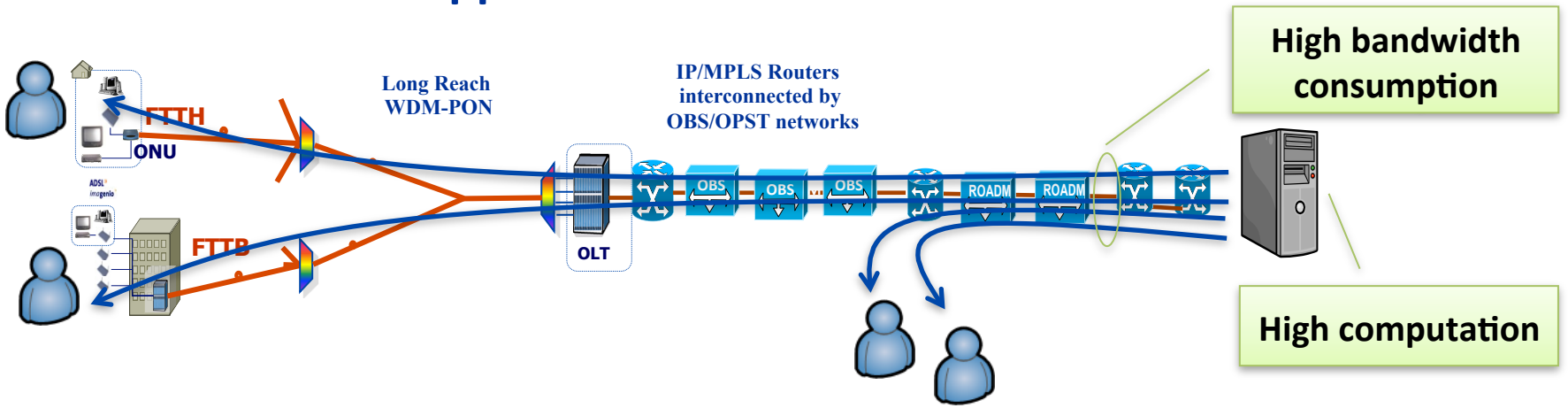


Network Centric Service: Virtual PC

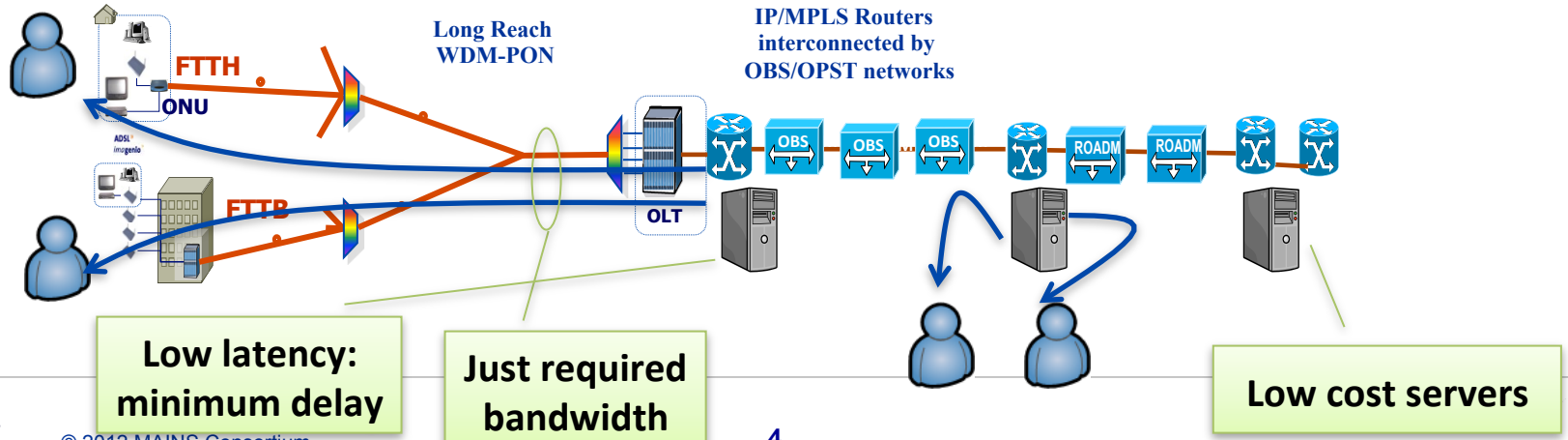


Metro Architecture

- **Centralized cloud approach:** Few servers located in core nodes

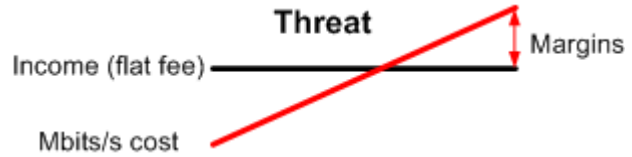


- **Distributed cloud approach:** Multiple multipurpose servers located in metro and core nodes



Motivation

- **Why NCS?**
  - Operator's perspective:
    - Network scalability
    - New business opportunity
    - CAPEX and OPEX optimization
  - End user's perspective:
    - Availability
    - Mobility
    - IT maintenance outsourcing
    - QoE: low latency and high bandwidth



- Increment of network traffic will impact on metro network
  - **New metro architecture is required to support such services.**

Motivation

- Metro Architectures enabliNg Subwavelengths (MAINS) project proposes a new metro architecture based on two pillars:
  - Subwavelength optical switching technologies in the Data Plane.
  - Enhanced GMPLS architecture in the Control Plane.
- The objectives of such architecture are:
  - Reduce cost and energy consumption.
  - Improve reliability and latency.

J. Fernandez-Palacios, et al., Metro Architectures enabliNg Subwavelengths: Rationale and Technical challenges, in Future Network & Mobile Summit, Jun, 2010.

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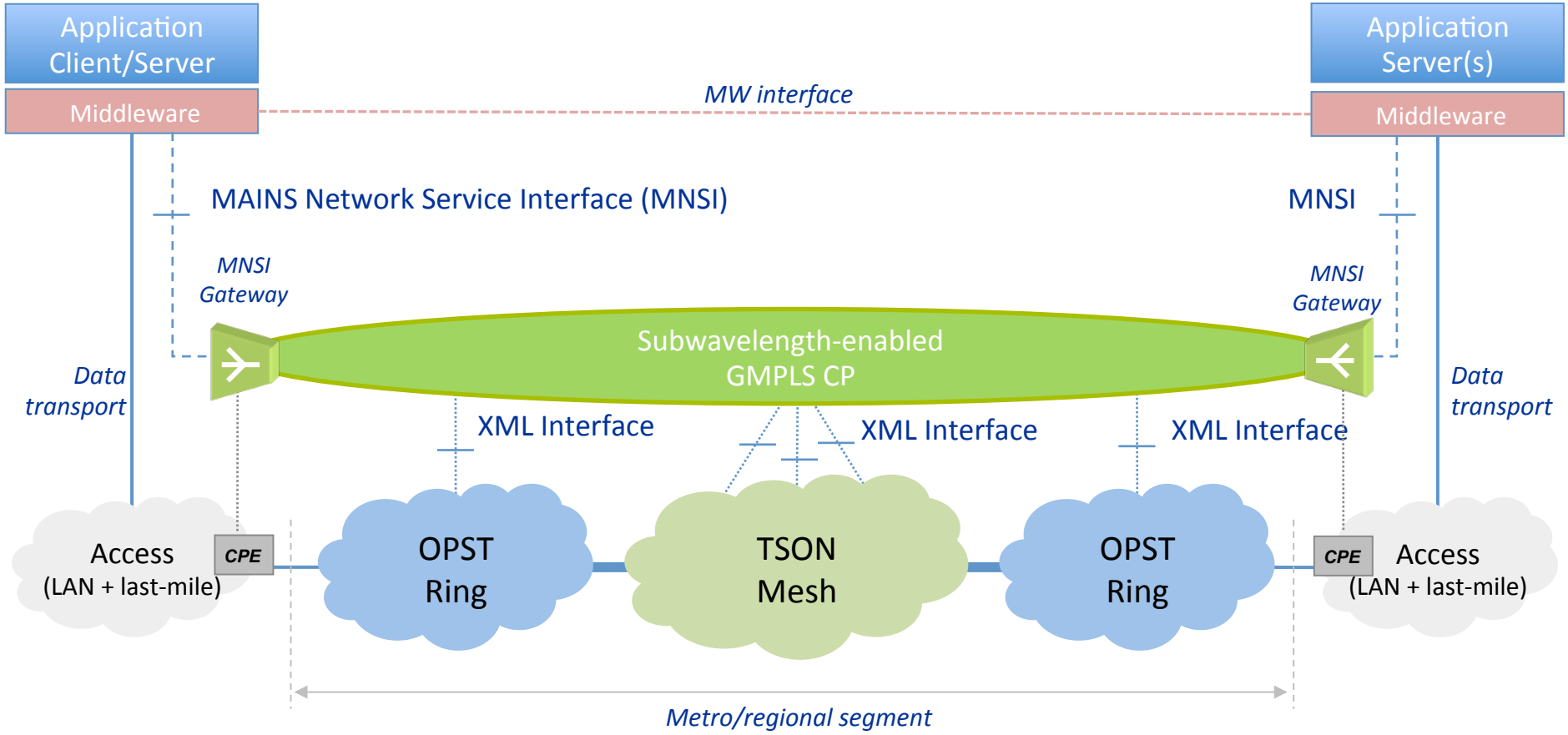
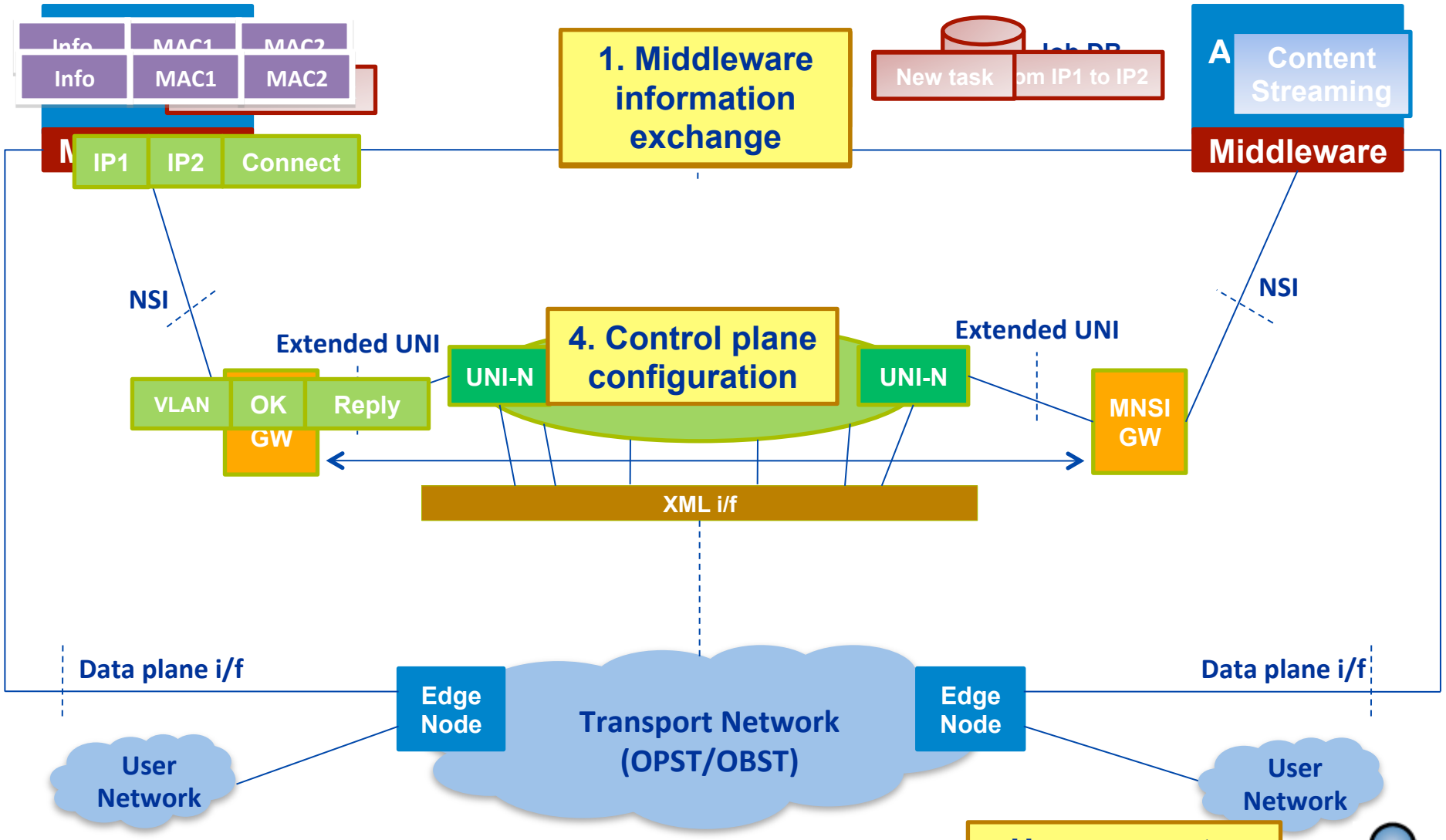
MAINS Reference Architecture



VM transference



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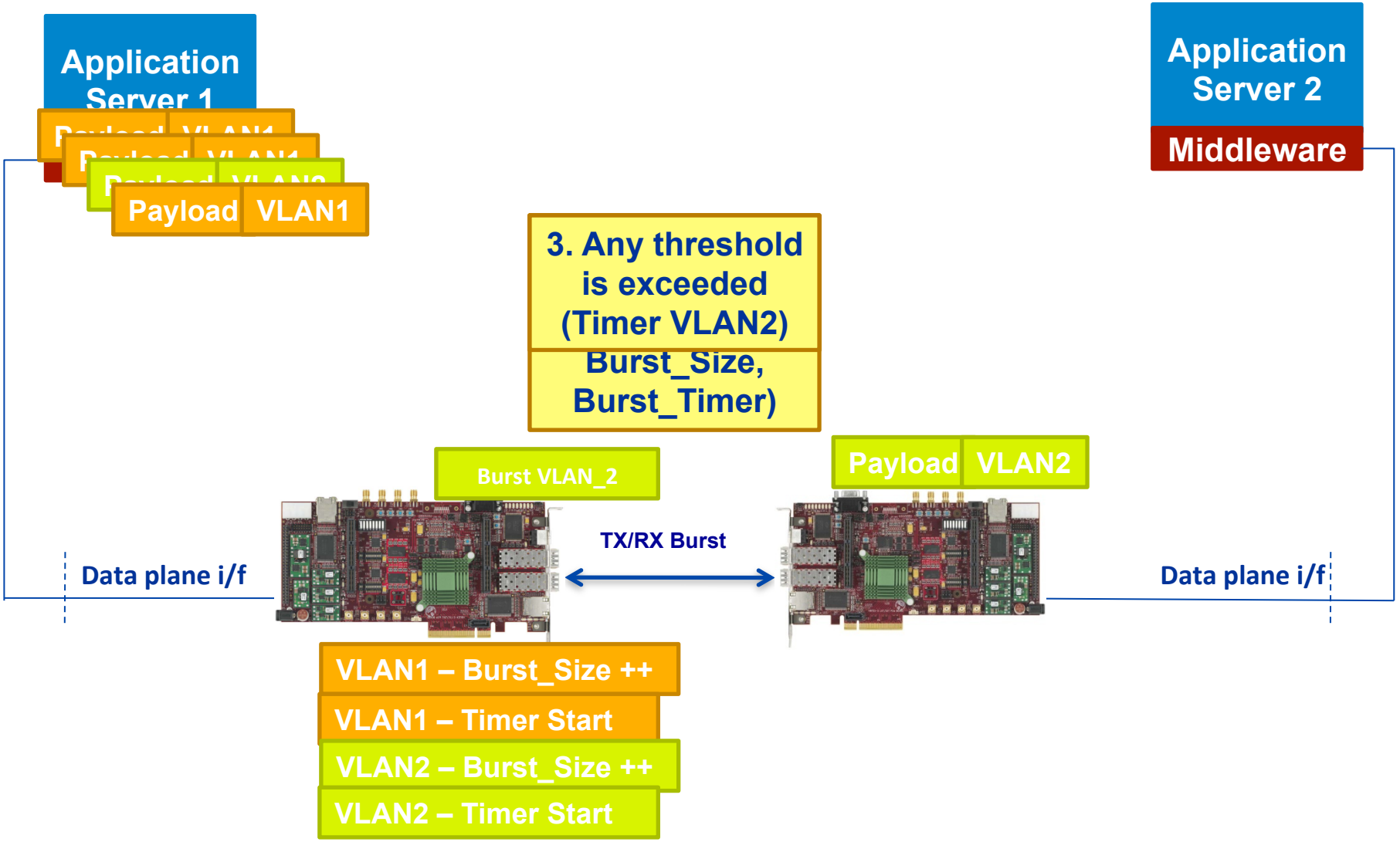
Prototype Implementation Architecture

- Metro network supports multiple services at the same time.

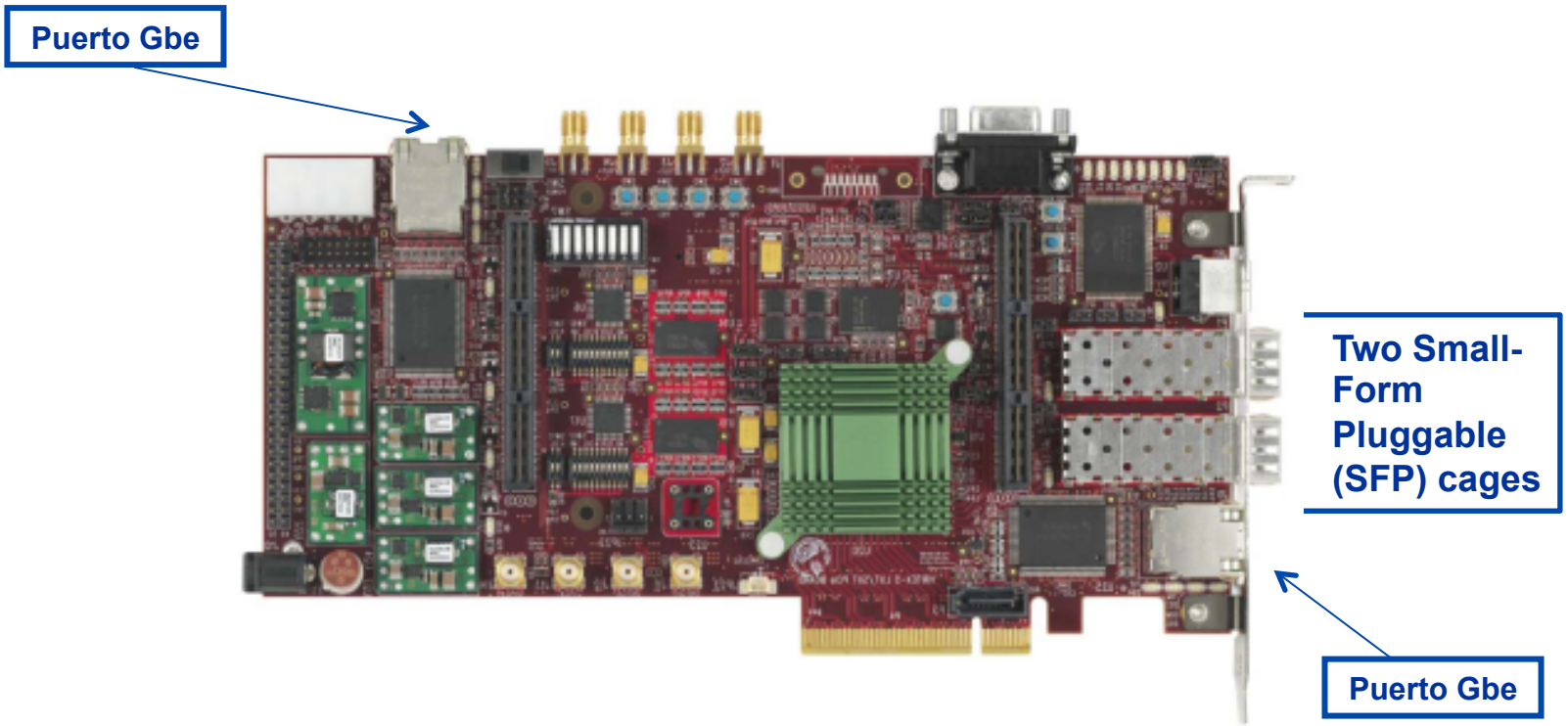
- A prototype is developed with the following requirements:
  - Data plane burst transmission
  - VLAN support for multiple services

Use case for the OBS access node

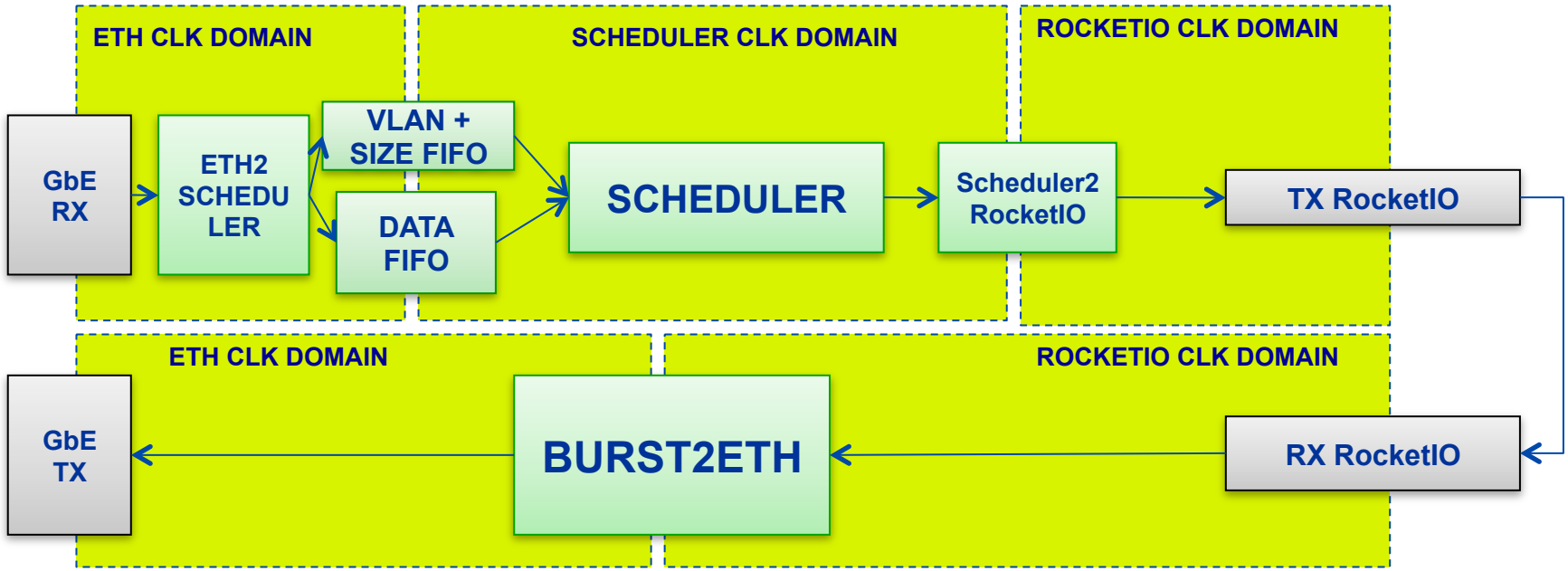


Implementation: Board details

- Xilinx® Virtex™-5 PCI Express Development Kit (Avnet)
  - Xilinx Virtex-5 XC5VSX95T-FF1136 FPGA



Implementation: Modules

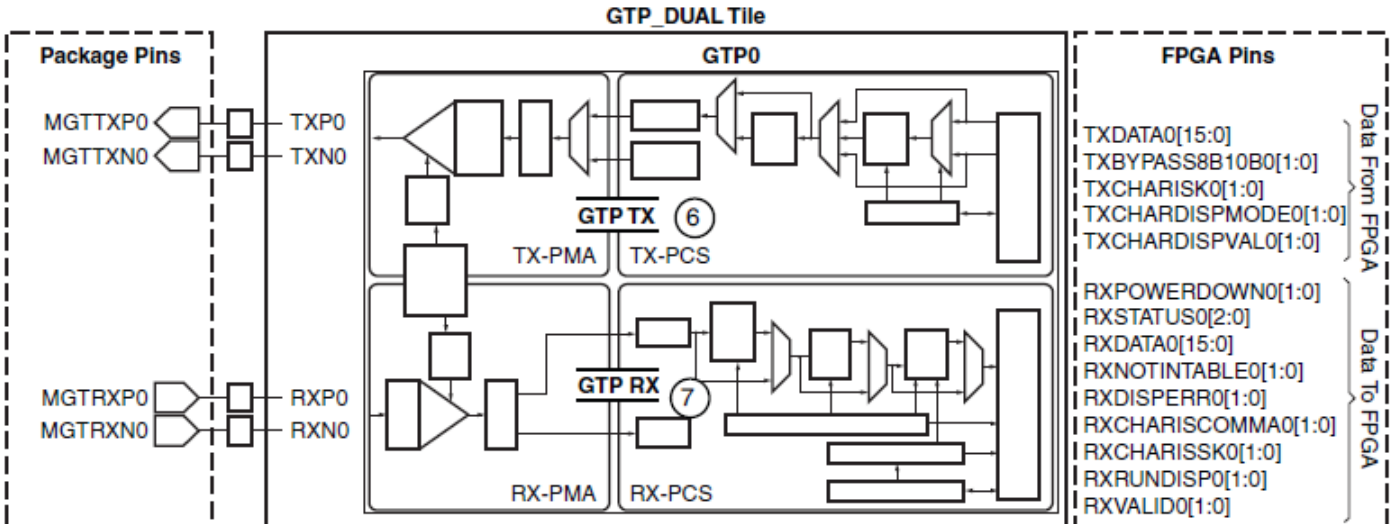


Implementation: TX modules

- Functions:
  - **Eth2Scheduler:** get VLAN_id and packet size while storing the incoming packet
  - **Scheduler:** burst generation and management
  - **Scheduler2RocketIO:** burst adaptation and transmission

Implementation: SERDES interfaces

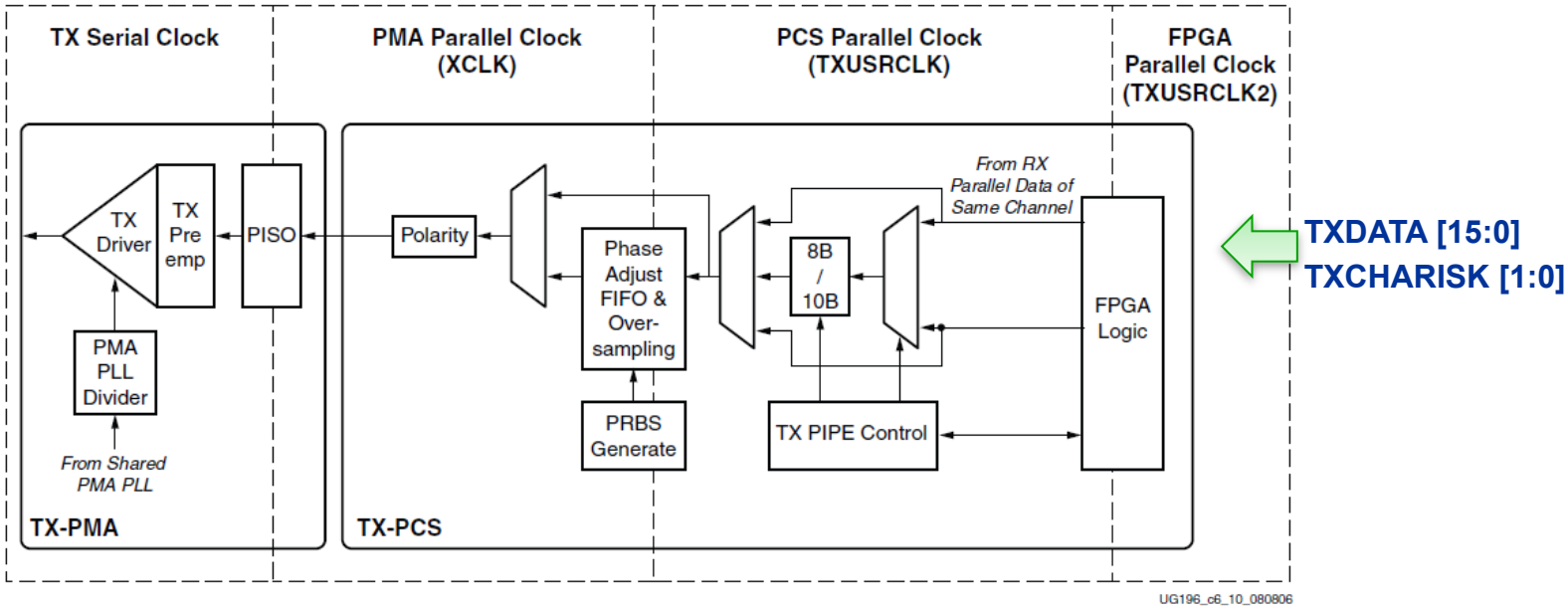
- SERDES interfaces are Serializer/Deserializer interfaces.
  - Input – output parallel interfaces has 16 bits.
  - Physical transmission is done with a differential signal.



High-Speed Serial I/O. Made Simple. A Designers' Guide, with FPGA Applications. R by Abhijit Athavale and Carl Christensen. Available online

Implementation: SERDES interfaces

- There is a 8B/10B module to provide redundancy.
- Channel management uses K-Characters
  - TXCHARISK signal is asserted if TXDATA is a K-Character.

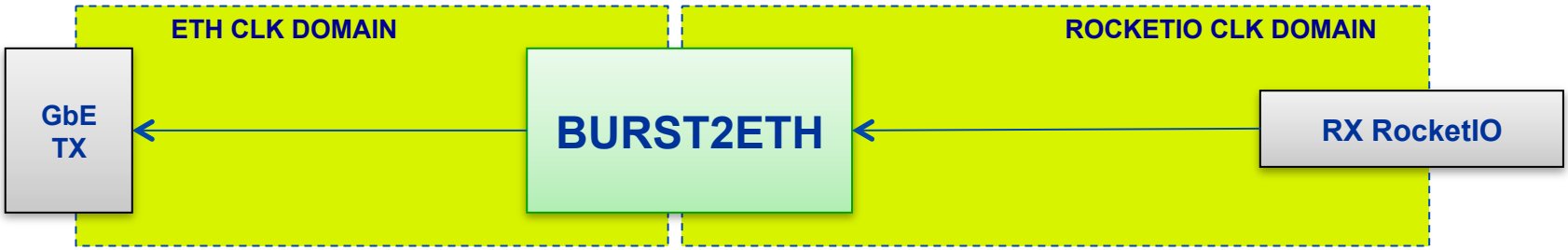


How to create a burst?

- There are two solutions to create a burst:
  - Send burst structure information in the burst control packet.
  - Insert K-characters in the burst while transmitting.
- There are two special characters for our burst:
  - End of burst character
  - Start of packet character

Implementation: RX Modules

- Functions:
  - **Burst2Eth:**
    - Extract packets from the burst
    - Transmittion over GbE interface



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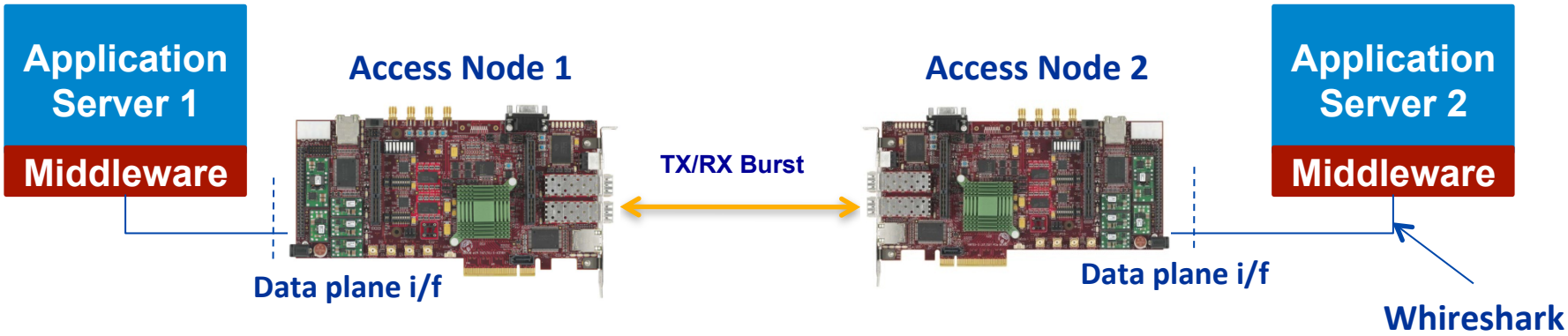
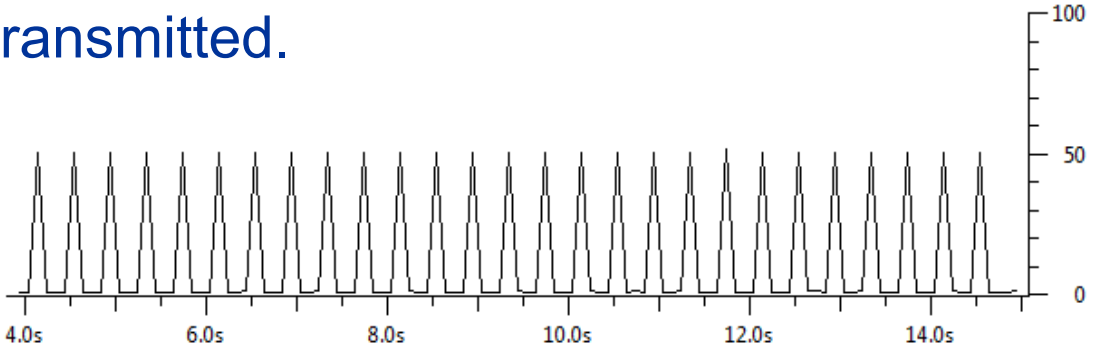
Burst size threshold validation

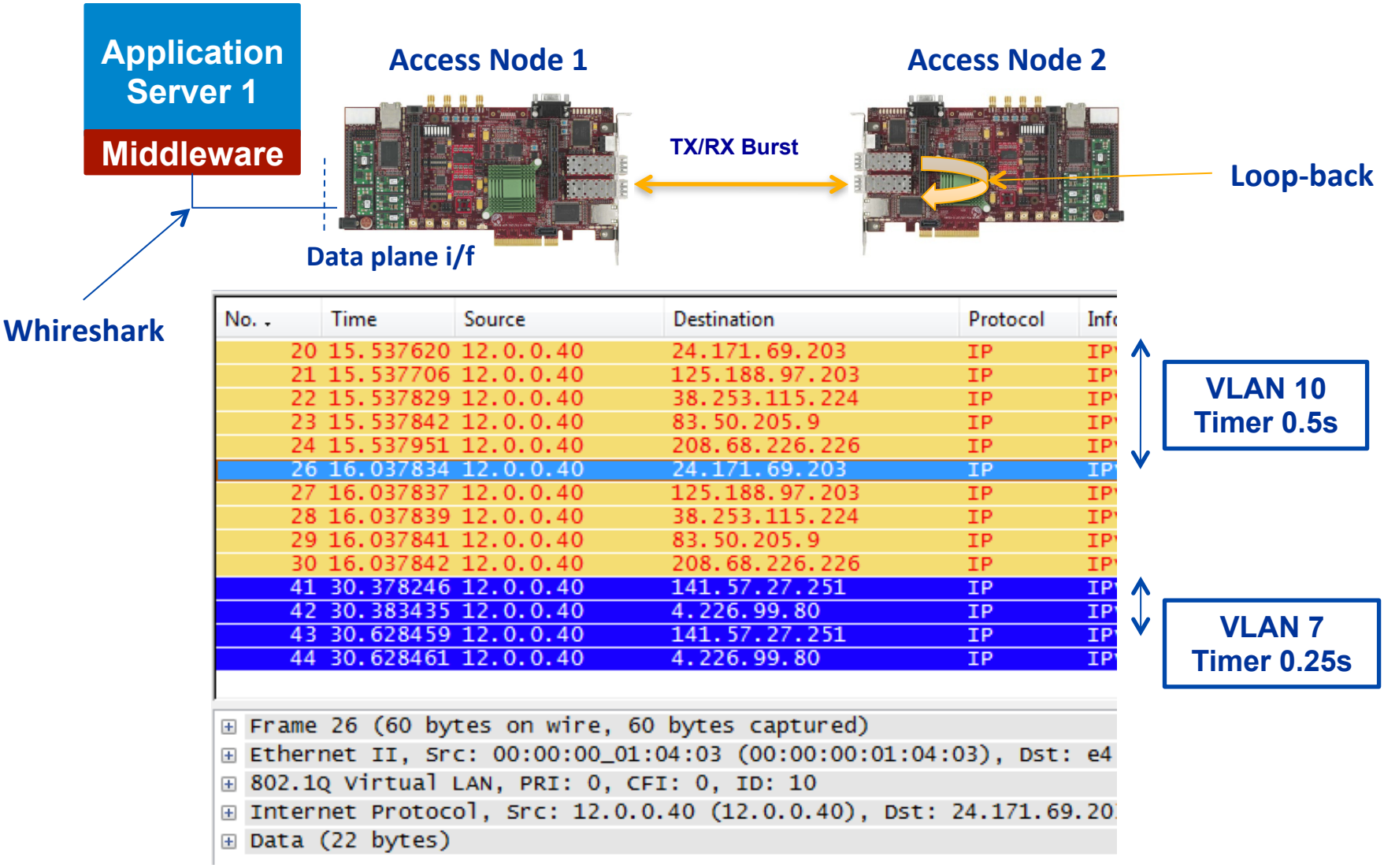
- For this experiment, the application server 1 sends traffic to the application server 2 with a fixed packet size of 128 bytes.



- The burst size threshold is set to 6400 bytes (50 packets). Based on the PCAP file captured at Server 2, the burst is correctly transmitted.



Support to multiple services



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Conclusions

- MAINS project is exploring sub-wavelength technologies as an efficient solution for metro networks.
- The architecture for a multi-service OBS access node based on a Virtex 5 FPGA is detailed explained.
- The modules of the access node are described and their functionality to support multiple services on an access node.
- A behavioural validation of the prototype under traffic from two different services is presented.

Thank you!!
Questions?