GMV

GETDEN
Final Presentation

Nov 13th, 2019

INNOVATING SOLUTIONS

GETDEN

Activity Introduction

CONSORTIUM

- **GMV Aerospace and Defence, S.A.U. (GMV-ESP)** acting as **Developer** (Prime)
  - Requirements and Architecture (Task 1)
  - Demonstration (Task 3)

- **Seven Solutions** acting as **Inventor** and **Developer** (Subcontractor)
  - Design and Development (Task 2)

Activity Objects and Goals

The goal of this type B ITI "Gigabit Ethernet TSN DEtermnisitc Network (GETDEN)" activity is to provide a low-cost yet space-grade data bus solution based on open-source and standard technologies, already identified and implemented in other non-space domains.

Requirements for adapting a terrestrial standard technology such as TSN for a high reliability space on-board avionics application based on COTS, focussed on microlauncher applications but extendable to other space applications.

IP cores for HW (HDL) implementation of Gigabit TSN protocol that will ensure determinism

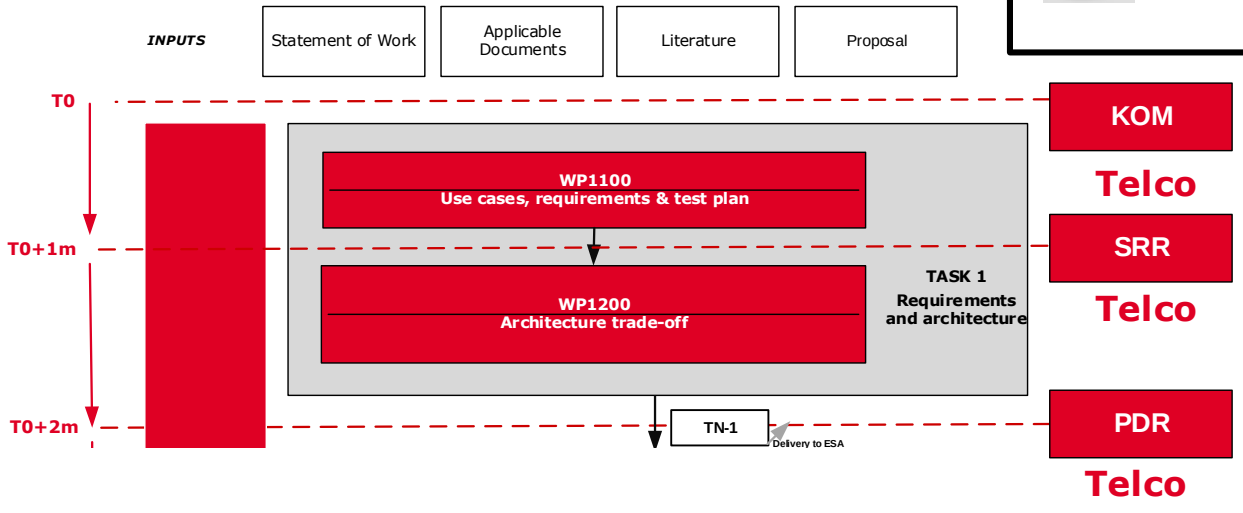
Drivers based on **RTEMS** to manage GigaEthernet in real-time for a board prototype based on Zynq SoC (ARM processors)

Testing an on-board network of nodes representative of a microlauncher scenario, in a laboratory environment. Board prototypes based on Zynq SoC.

A **technology roadmap** for further increase the TRL and enable the adoption of Gigabit TSN solution as on-board data bus for microlauncher and other spacecraft

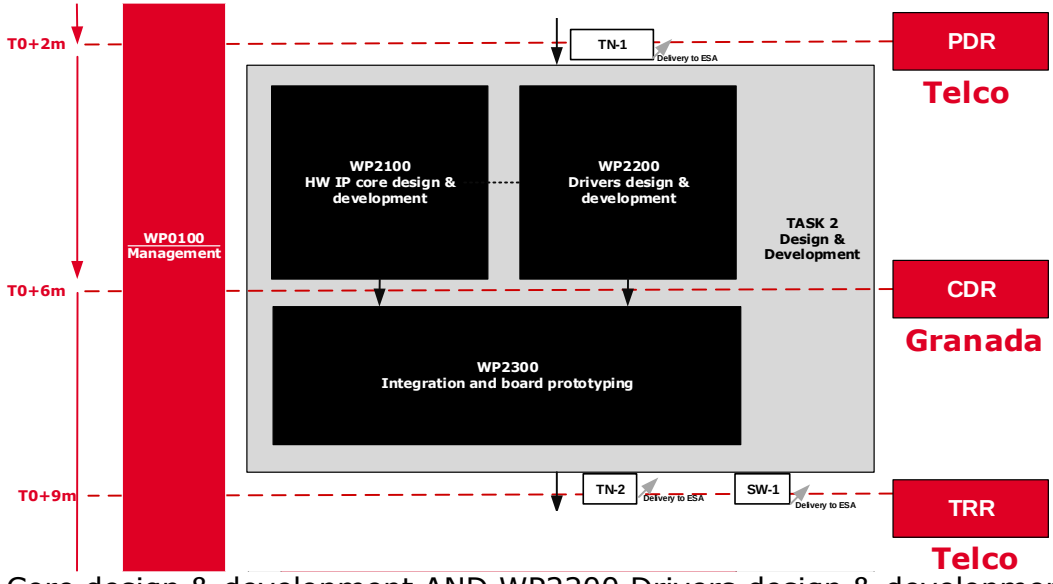
WORK LOGIC (KOM-PDR)

SAVOIR Requirements traceability.



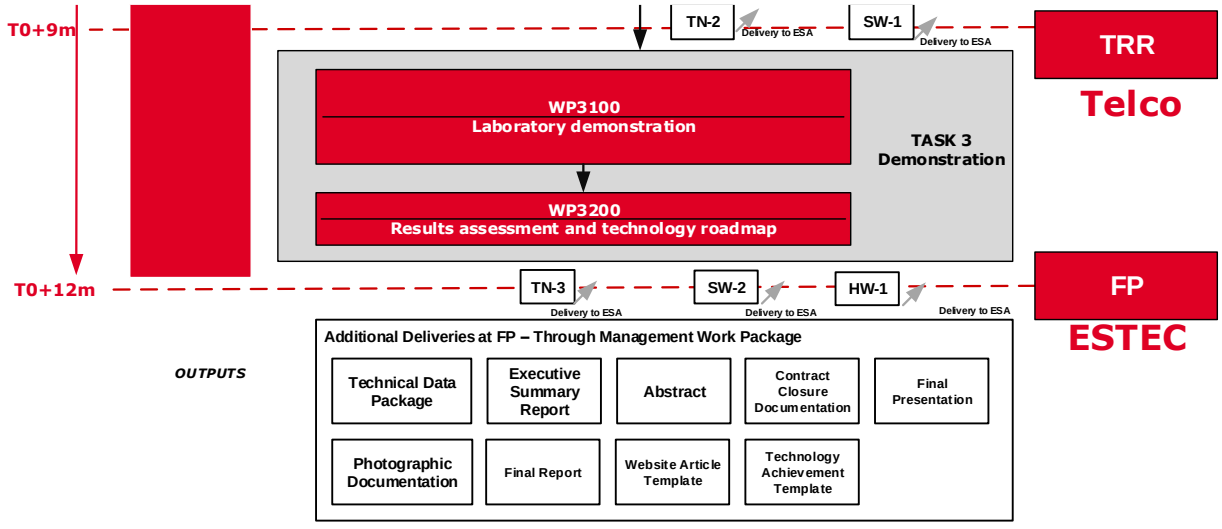
- WP1100 Use cases, requirements & test plan
  - TN-1 Draft version: GETDEN Requirements and Architecture
  - SRR-like review meeting (T0 +1month) added after the requirements definition
- WP1200 Architecture trade-off
  - TN-1 Final Version: GETDEN Requirements and Architecture
  - PDR meeting (T0+2months)

WORK LOGIC (PDR-TRR)



- WP2100 HW IP Core design & development AND WP2200 Drivers design & development
  - SW-1 (TSN gateware and firmware) and Reference design example
  - TN-2 Draft version: GETDEN Design and Development Report
  - CDR meeting (T0 +6m)
- WP2300 Integration and board prototyping
  - Complete TSN functionalities design example on target board including performance evaluation
  - TN-2 Final version: GETDEN Design and Development Report
  - TRR meeting (T0+9months)

WORK LOGIC (CDR-AR)

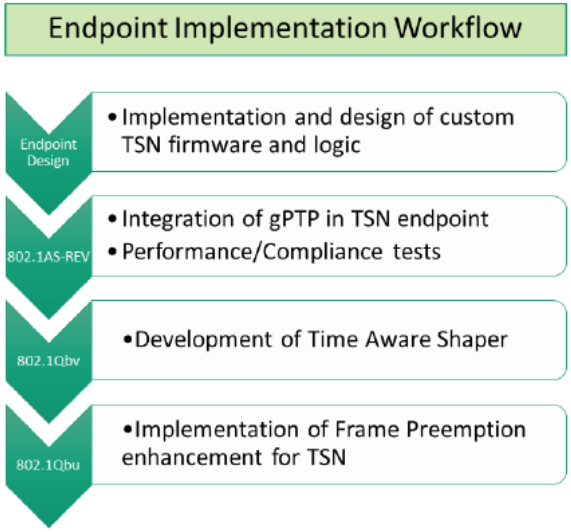


- WP3100 Laboratory demonstration
  - SW-2 Laboratory Testing software
  - HW-1 Laboratory test setup
  - TN-3 Draft version: GETDEN Demonstration Results and Roadmap
- WP3200 Results assessment & technology roadmap
  - Complete TSN functionalities design example on target board including performance evaluation
  - TN-3 Final version: GETDEN Demonstration Results and Roadmap
  - FP meeting (T0+12months)

TSN Design

- TSN implementation is performed supporting basic features related to:
  - Timing and synchronization (802.1AS-REV)
  - Frame Preemption and queuing (802.1Qbu/Qbr)
  - Traffic Shaping for time sensitive data streams (802.1Qbv)
  - Redundancy protocol based on ring-topologies (IEEE 802.1CB protocols) allowing zero recovery time and low-cost redundancy.

Standard	Area	Title
IEEE 802.1AS	Timing & Synchronization	*Enhancements and Performance Improvements*
IEEE 802.1Qbv	Forwarding and Queuing	*Enhancements for Scheduled Traffic – Time-Aware Traffic Shaping*
IEEE 802.1Qbu & IEEE 802.3br	Forwarding and Queuing	*Frame preemption and Interspersing Express Traffic*
IEEE 802.1Qca	Path Control and Reservation	*Path Control and Reservation*
IEEE 802.1Qcc	Stream Reservation (SRP)	*Enhancements and Performance Improvements*
IEEE 802.1Qci	Time Based Ingress Policing	*Per-Stream Filtering and Policing*
IEEE 802.1CB	Seamless Redundancy	*Frame Replication & elimination for Reliability*



Laboratory demonstration

- Ring topology implemented via a daisy chain configuration, allowing implementation of the IEEE 802.1CB protocol.
- Three board prototypes forming a ring topology for emulating the final microlauncher configuration.
- This test-bench is used for checking the different data bus requirements.

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Activity Status

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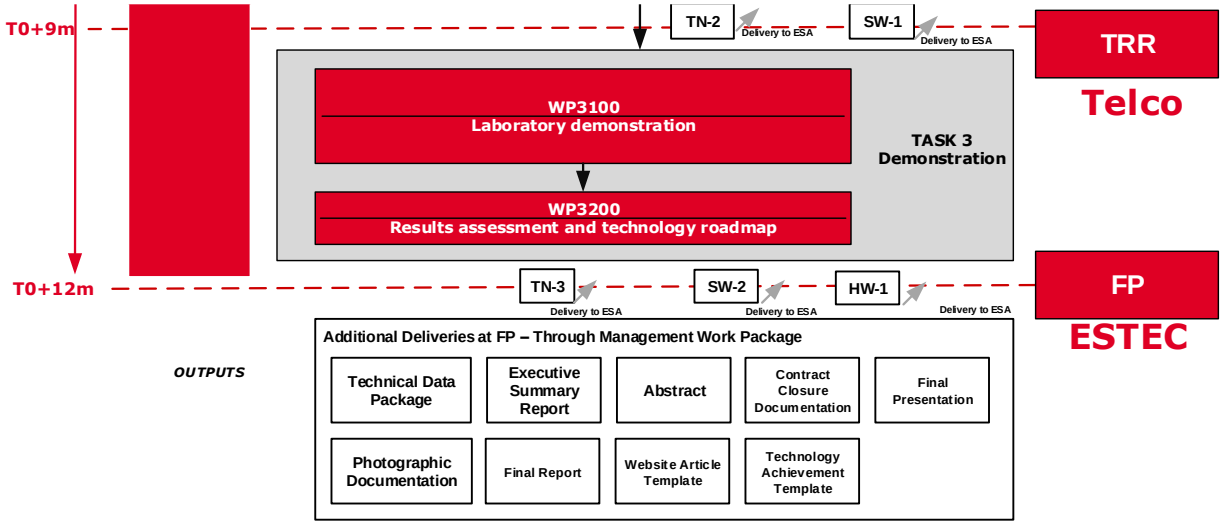
- Task 3 deliverables
  - TN-3 to be updated according ESA comments
  - HW Test Bench delivered
  - SW & IPCores packages to be delivered
- Additional Deliveries at FP – Through Management Work Package
  - Technical Data Package
  - Executive Summary Report
  - Abstract
  - Contract Closure Documentation
  - Final Presentation
  - Photographic Documentation
  - Final Report
  - Website Article Template
  - Technology Achievement Template



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THANK YOU

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