AimValley

Expertise Brief
Time Sensitive Networking

Introduction

Time Sensitive Networking (TSN) is an extension to traditional Ethernet networks. Traditional Ethernet applications must be robust in order to withstand corner cases such as packet loss, delay or even reordering. TSN provides deterministic latency and packet loss under congestion, allowing critical and non-critical traffic to be converged in the same network.

For TSN networks, time awareness (sub micro seconds), is essential for achieving bounded latency. The recent IEEE 802.1AS-REV standard defines a profile of the IEEE 1588 Precision Time Protocol (PTP) to distribute accurately time across the network.

1. TSN Main Features

1.1 Bounded Latency

Providing bounded latency is one of the main features of a TSN-enabled network. Several IEEE 802.1 standards have been defined to enable queuing management, gating, policing and traffic shaping to ensure time-critical packets receive priority as they are being forwarded through the network.
Frame preemption provides low bounded latency while increasing the efficiency of the network. Very much like a green wave traffic control system in the urban domain restricted to emergency vehicles only.

1.2 Reliability

The bounded latency performance must often be delivered with very high reliability. The TSN-enabled network must ensure that every packet is delivered within a given latency bound with no packet losses and delays due to congestion. In addition, to account for device failure and/or media errors, packet replication and elimination capabilities were also defined to enable redundant links and paths

1.3 Resource Management

Configuring the TSN capabilities and managing the network and device resources is fundamental to assure end-to-end performance for time-critical flow across the network in presence of other traffic flows. By managing the resources in each node, the availability of buffers and timing of transmission can be guaranteed.

AimValley
Utrechtseweg 38
1213 TV Hilversum
The Netherlands
phone +31 35 689 1900
sales@aimvalley.com
aimvalley.com

2. General TSN Architecture

TSN enables time critical applications in many domains e.g. industrial automation, automotive networks, mobile front-haul networks, power utility, audio video bridging. And recently also in the wireless domains for example 3GPP release 16, enhances 5G networks to satisfy the requirements of industrial applications.

It is quite obvious that not only sophisticated and reliable software and TSN capable hardware is required, but also a good understanding and experience in design and realization of networking solutions. This is exactly what AimValley offers, given its long history in design and realization of telecommunication solutions.

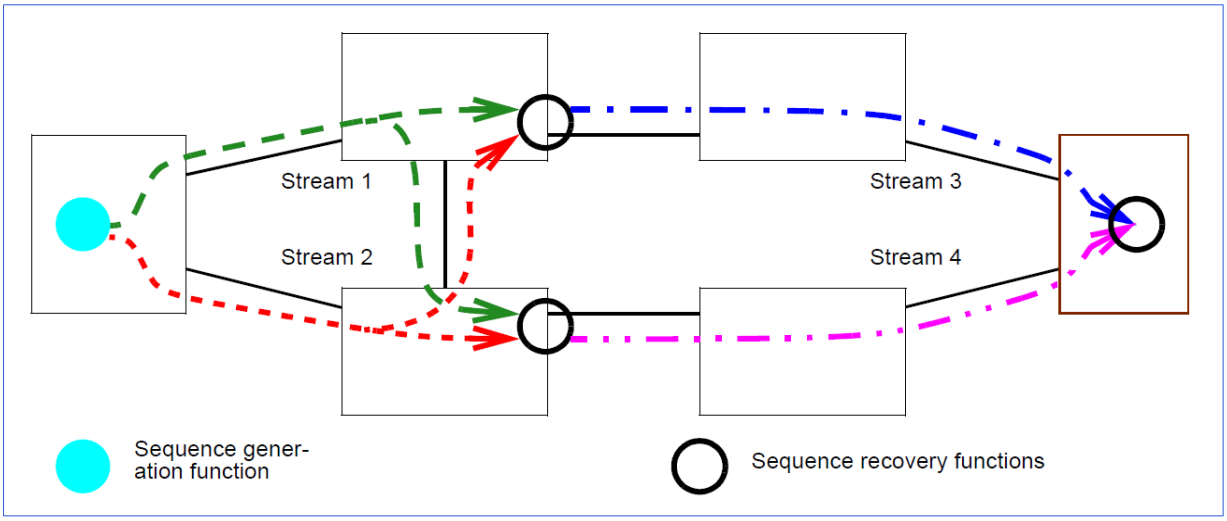

Figure 1: TSN Network Flow

3. AimValley TSN Expertise

AimValley provides a wide range of expertise regarding Time Sensitive Networking.

- Synchronization; Interpretation and knowledge of synchronization standards, 802.1AS-REV, IEEE1588, ITU-T G.826x for frequency synchronization, ITU-T G.827x for Time of Day synchronization.
- Consultancy and architectural support for; a.o selection of key synchronization components. Including FPGA and PCB design and testing, considering signal integrity, PLL bandwidth and hold-over performance
- Customized low and high speed hardware design including Single Pair Ethernet (SPE) variants, Power over Ether, Power-over-Data-Line (PoDL)
- Reliability and resilience, including TSN frame replication and elimination

A more detailed overview of AimValley's synchronization expertise is described in expertise brief: AimValley Synchronization.

Utrechtseweg 38
1213 TV Hilversum
The Netherlands

phone +31 35 689 1900
sales@aimvalley.com
aimvalley.com

AimValley

Expertise Brief
Time Sensitive Networking

4. AimValley Proven Track Record

Our expertise is successfully deployed in various product designs across many industry sectors. From telecom operators to the transport sector (Railway/Aviation) our design services include software design, test and integration; drivers, communication stacks, OS independent services and security solutions.
Our TSN expertise has been incorporated in the designs of the NXP Evalboards, types SJA1105 and SJA1110.

- Network Demarcation Devices
- Custom Railway Switches
- In-flight Entertainment Systems
- Mobile Fronthaul Systems

All product development can include system verification and robustness testing and can be delivered as prototype as well as be mass produced.

5. Why AimValley?

AimValley provides state-of-the-art technological solutions for telecommunications and data communication systems providers. The company offers a full range of system level services including product definition and architecture, software design, systems testing, hardware design, and factory introduction. From stand-alone consultancy to comprehensive turnkey solutions, AimValley builds on its experience at leading telecom suppliers and technology research labs.

- Reliable partnership
- Design flexibility
- Extensive experience in developing telecom and datacom systems
- Strong track record in delivering as planned and within budget
- Evaluation of jump-start product development
- Support of various hardware platforms

We take care of every step in your development process,
either in a turn-key design based on your requirements or as a joint development project.

6. Further information

Our experienced engineering team with expertise in Time Sensitive Networking can support you through all phases in your product development.

For further information contact sales@aimvalley.com

AimValley
Utrechtseweg 38
1213 TV Hilversum
The Netherlands

phone +31 35 689 1900
sales@aimvalley.com
aimvalley.com