Joint IEEE-SA and ITU Workshop on Ethernet

IEEE 802.3
Distinguished Minimum Latency Traffic

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Reflector and Web site

- Study Group reflector

  stds-802-3-DMLT@listserv.ieee.org

To subscribe to the DMLT-reflector, send an email to: ListServ@ieee.org with the following in the body of the message (do not include "<>"):
subscribe stds-802-3-DMLT <yourfirstname> <yourlastname>

- Study Group web page URL:

http://www.ieee802.org/3/DMLT

Draft PAR (P802.3br) title & scope

- Scope:
  - The scope of this project is to specify additions to and appropriate modifications of IEEE Std 802.3 to add a support for interspersed express traffic.

Draft PAR (P802.3br) title & scope

- SG DMLT proposes a PAR title:

IEEE Standard for Ethernet

Amendment Specification and Management Parameters for

Interspersing Express Traffic.

Abstract

There is a need for support of time sensitive traffic in a converged traffic environment in IEEE 802.3 networks that supports interspersed express traffic and the traditional normal traffic. This would help address the requirements in markets such as industrial and automotive control networking, where control data is time-sensitive and often requires minimum latency. This workshop presentation will examine the needs of time sensitive traffic in IEEE 802.3 networks, the support for interspersed express traffic and the ordinary traffic, and will provide background for the PAR proposed by the IEEE 802.3 Distinguished Minimum Latency Traffic (DMLT) Study Group.

Market needs and market potential

- Specific to automotive environment Streaming, Data, Control, over single LAN segment that supports, infotainment, driver assist and diagnostics within various functional LAN segments within a vehicular network. Control systems require lower-latency bridged networks for this convergence.

Market needs and market potential

- Specific to Industrial automation
  Low Latency Sampling Data, (closed loop) Control, Image streaming (e.g. image processing) and data traffic, sampling data and closed loop control traffic have very demanding latency requirements.
  Image streaming and associated processing as a part of a control loop has greater requirements than best effort could provide in a converged network. Best effort traffic is not time-critical, but provides a constant source for interference traffic.

Ethernet captures more and more Applications

Traditional Markets

- Industrial Automation
  - Factory Automation
    - e.g. Material handling, Automotive Manufacturing, Transfer lines,
  - Process Automation
    - e.g. Oil, Gas, Chemical / Petrochemical, Food & Beverage
- Energy Automation
  - Power Generation
    - e.g. Fossil Power Plants, Wind Turbines
  - Power Transmission and Distribution
    - e. g. Smart Grid Application
- Building Automation
  - Climate Control
  - Fire Safety

New Markets

- Avionics
  - Fly-by-Wire
- Railway Systems
  - Train Control
  - Railway Traffic Management Systems
- Medical
  - Patient Imaging,

A bit of History of Industrial Automation

1990 to 2000: Non-ETHERNET Solutions dominated the market

- PROFIBUS, INTERbus, ControlNet, DeviceNet, ..

Since 2000 Ethernet based solutions enter the industrial market

Up to now Ethernet offers not the required real time capabilities (QoS) therefore specific Ethernet solutions appeared on the market, like:

- CiP, EtherCAT, Ethernet Powerlink, TCnet, PROFINET, ...

All these solutions contain specific additions or adjustments to the "standard ETHERNET" in order to provide the required real time capabilities (QoS) for industrial applications.

➔ Customers ask for <u>one</u> IEEE 802.1/.3 standard based solution

Required: Converged Traffic Environment

Customers ask for a solution which:

- **guarantees minimum latency for Scheduled Traffic and**
- **provides guaranteed bandwidth for Reserved Traffic and**
- **still allows the transfer of Best Effort Traffic**

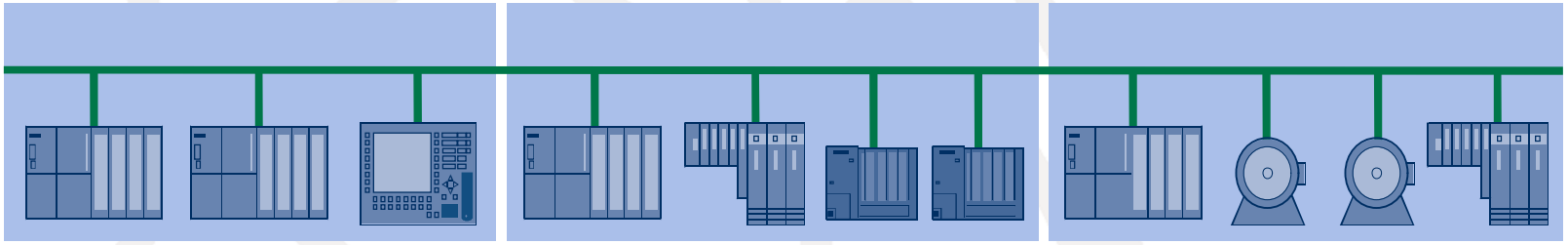
on one single network

Overview of Industrial Communication Requirements

Factory Automation
Energy Automation
Smart Grid Applications

Process Automation

Motion Control



Application Cycle or Control Cycle

100ms ← → **31,25µs**

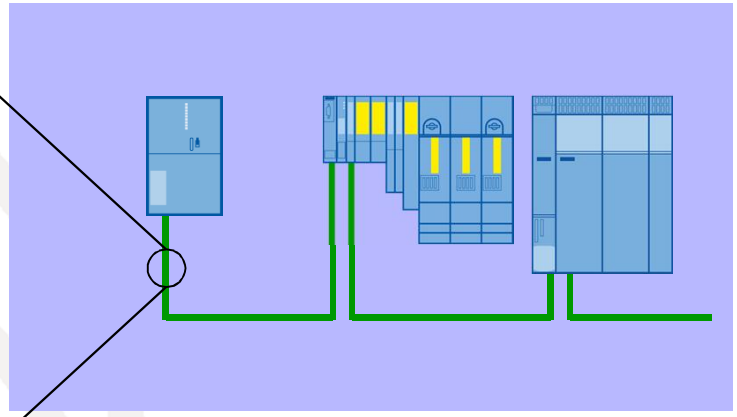
10GBit/s **1GBit/s** **100MBit/s**	Linkspeeds	**1GBit/s** **100MBit/s**
Copper **Fiber** **Wireless**	Required Media	**Copper** **Fiber**

Overview of Industrial Communication Requirements

Best Effort Traffic
- Configuration, Online Parameterization, Web Services, Events, IT-Communication

– Reserved Traffic
- Real Time Diagnostic like inspection, identification, tracking, counting and measurement

– Scheduled Traffic
- Cyclic exchange of process values
- Profile specific data (Safety profile, Drive profile, ...)



	Today		Future: Only one Network:
• Best Effort Traffic:	No guaranteed bandwidth		Guaranteed bandwidth for Best Effort Traffic
• Reserved Traffic:	Separate network		Guaranteed QoS for Reserved Traffic
• Scheduled Traffic:	Dedicated solutions to guarantee minimum latency, resources and bandwidth and often a separate network for the Best Effort Traffic is necessary		Standardized solution to guarantee minimum latency, resources and bandwidth for Scheduled Traffic

Why one single Network for all Communication Services

Only one network means:

- Reduced possibility of network failures
  - wire breaks, reduced confusion in case of maintenance
- Reduced installation costs
  - less cables, less connectors, less installation efforts as in the industrial area "field preparation on site" is common sense
- Enables smaller devices
  - reduced space for connectors, lower power consumption (only 1 or 2 PHYs instead of 2 respectively 4 PHYs)
- Reduced maintenance costs
  - easier to understand and to maintain
- Only one interface in the devices
  - only one MAC address, only one IP address, easier to understand and to maintain, easier coordination of the communication relations in the stack and application layer in the devices

THANK YOU
for your attention