Distinguished Minimum Latency Traffic in a Converged Traffic Environment (DMLT) Study Group

Requirements from the perspective of mission-critical automation

Oliver Kleineberg, Hirschmann Automation & Control

IEEE 802.3 Interim Meeting, January 2013, Phoenix

Agenda

- What is mission-critical automation?
- Not the average Ethernet bridge
- Use Case: Offshore Windpark
- Requirements in a Nutshell

What is mission-critical automation?

Mission-Critical Automation – what does the term really mean?

In an Office network, a short network outage or overstepping a time boundary is a nuisance. For a short time, no emails, no access to the fileserver… But when mission-critical networks fail:

- Production on shop floors come to a halt
- High-voltage primary switchgear melts down
- Vital voice and video communication stops
- Traffic control systems stop working
- Trains initiate the emergency brakes
- Danger for life and limb may arise

A mission-critical network is a network where:

- Network uptime is everything
- You need to be fault-tolerant
- **Devices need to accomodate highly use-case specific requirements (especially network media)**

What is mission-critical automation?

- Emerging Markets: Mission-critical networking
  - Emerges out of Industrial Automation, massively broadening the scope
  - Requirements (far) beyond standard IT equipment relating to determinism in time and protocol behaviour
  - Often used as black channel for End-to-End Safety Communication
  - Converged services on one network: RT control data (e.g. cyclic data for distributed control loops) and best effort data (CCTV, audio announcements, file transfers, device configuration, …)

Power Utility Automation

…

Traffic Control Systems

…

Transportation

Not the average Ethernet bridge

Mission-critical Ethernet bridges come in many forms and sizes (not exhaustive):

19“ rackmount bridges:
- Automation Backbone
- MAN connectivity
- Boundary bridge to IT network
- Higher port density

Railmount bridges:
- Modular/Expandable devices
- Control cabinets
- Lower port density, strong media diversity

IP67/Special bridges:
- Hazardous locations
- Rolling stock
- Food/Beverage
- Oil refineries

Diverse media requirements:

100 – 1000 Mbit/s

~ 60% Copper

~40% Fibre

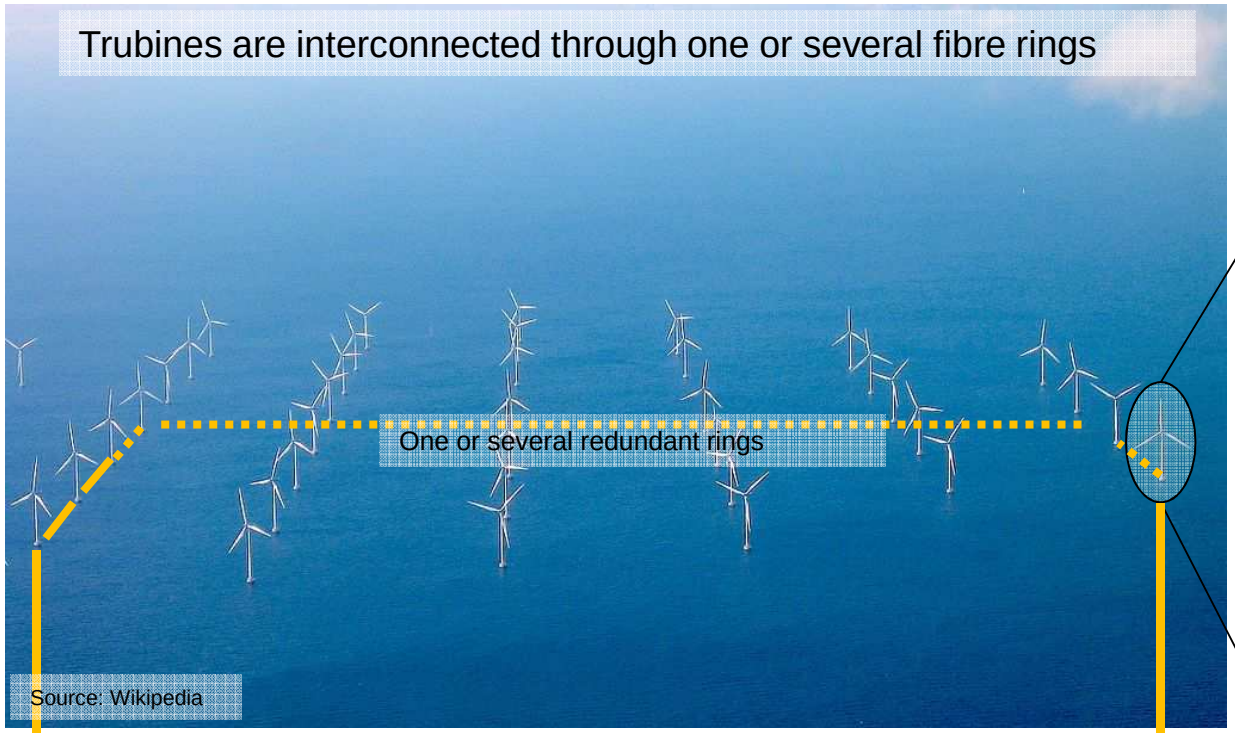
100 – 10000 Mbit/s

Multi mode

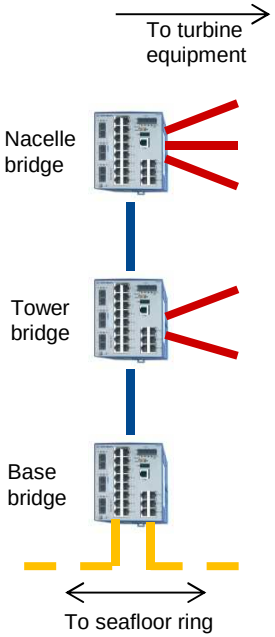
Single mode

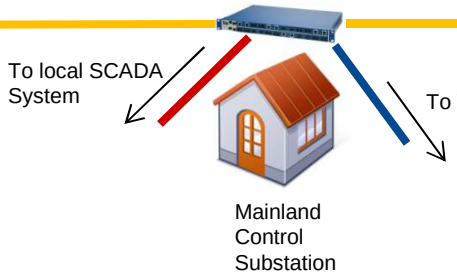
LH Single mode

Offshore Wind Park



Small networks (in a single turbine) connect to the backbone ring(s)





Traffic on the network (non-exhaustive):
Turbine RT control, device monitoring, software up/download, fault diagnosis, …

SM (poss. long haul) Fibre
MM Fibre 100/1000 Mbit/s
Copper 100/1000 Mbit/s

Requirements in a Nutshell

- Mission-critical Networking requires devices to be precisely tailored to use case requirements
- Devices need to support a high variety of different media configurations
- Media configurations and requirements for convered services are not interdependent: Almost all combinations of media and latency / network speed are possible!

Very basic requirement for use of DMLT in mission-critical automation environments:

DMLT must be available for all market-relevant Ethernet physical media available today and developed in the future

FIN

Thank you!