Potential Alignment of 1722.1 and "TSN for Industrial"

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NATIONAL INSTRUMENTS

Key Ideas

Many industrial applications need capabilities defined in the 802.1 TSN Task Group

- Examples: ASrev, Qbv, Qbu, CB, Qci, Qcc, etc.

Some new TSN capabilities require centralized network management

- i.e., these applications require a "God box" to configure paths, reserve bandwidth, connect streams, etc.

802.1 Qcc is defining a data model for centrally managing TSN services, but it does not specify protocols

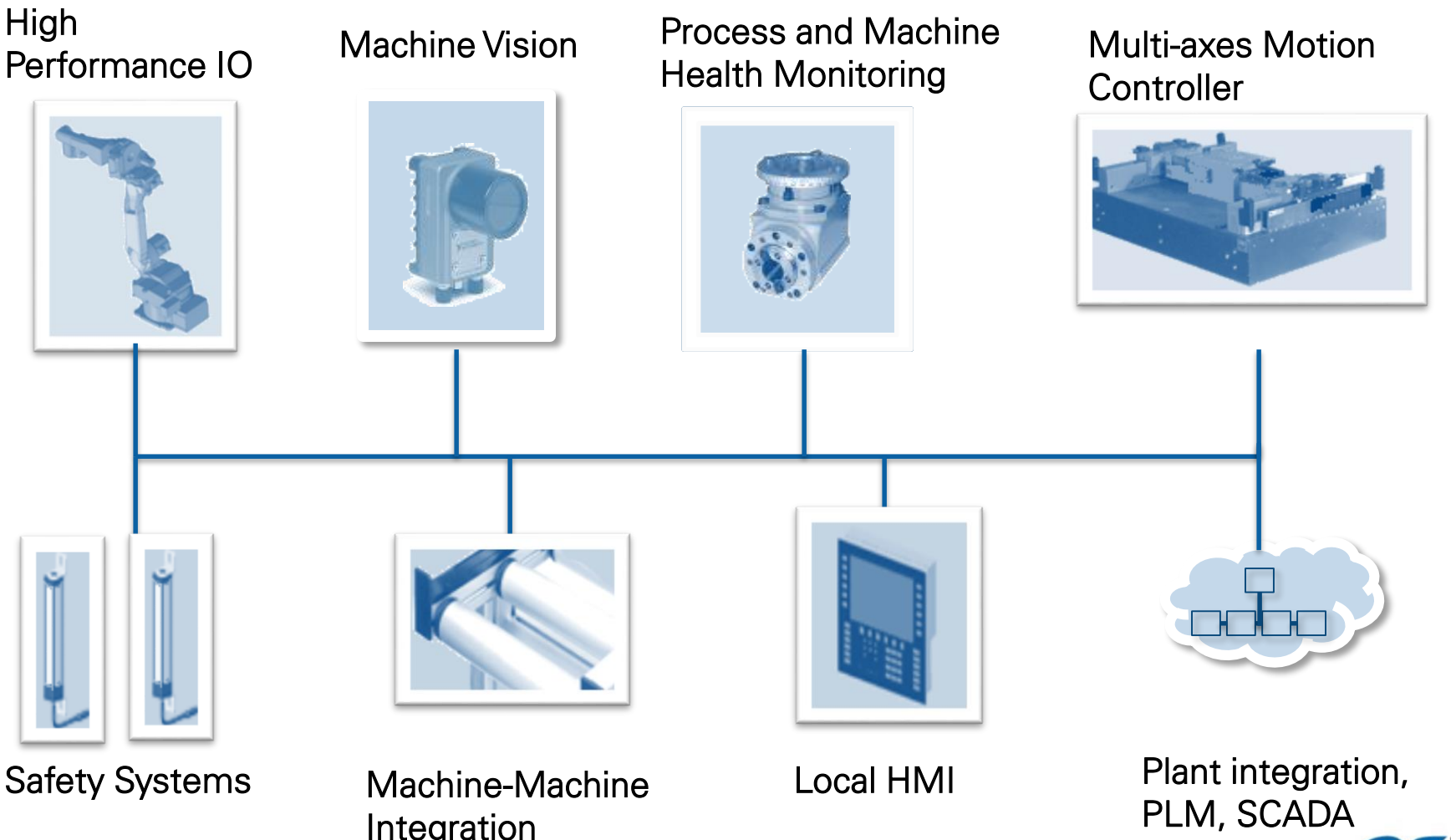
1722.1's new work can potentially select/specify protocols for configuring centrally-managed TSN networks generally and TSN-based industrial networks specifically

- We want to explore areas of potential alignment

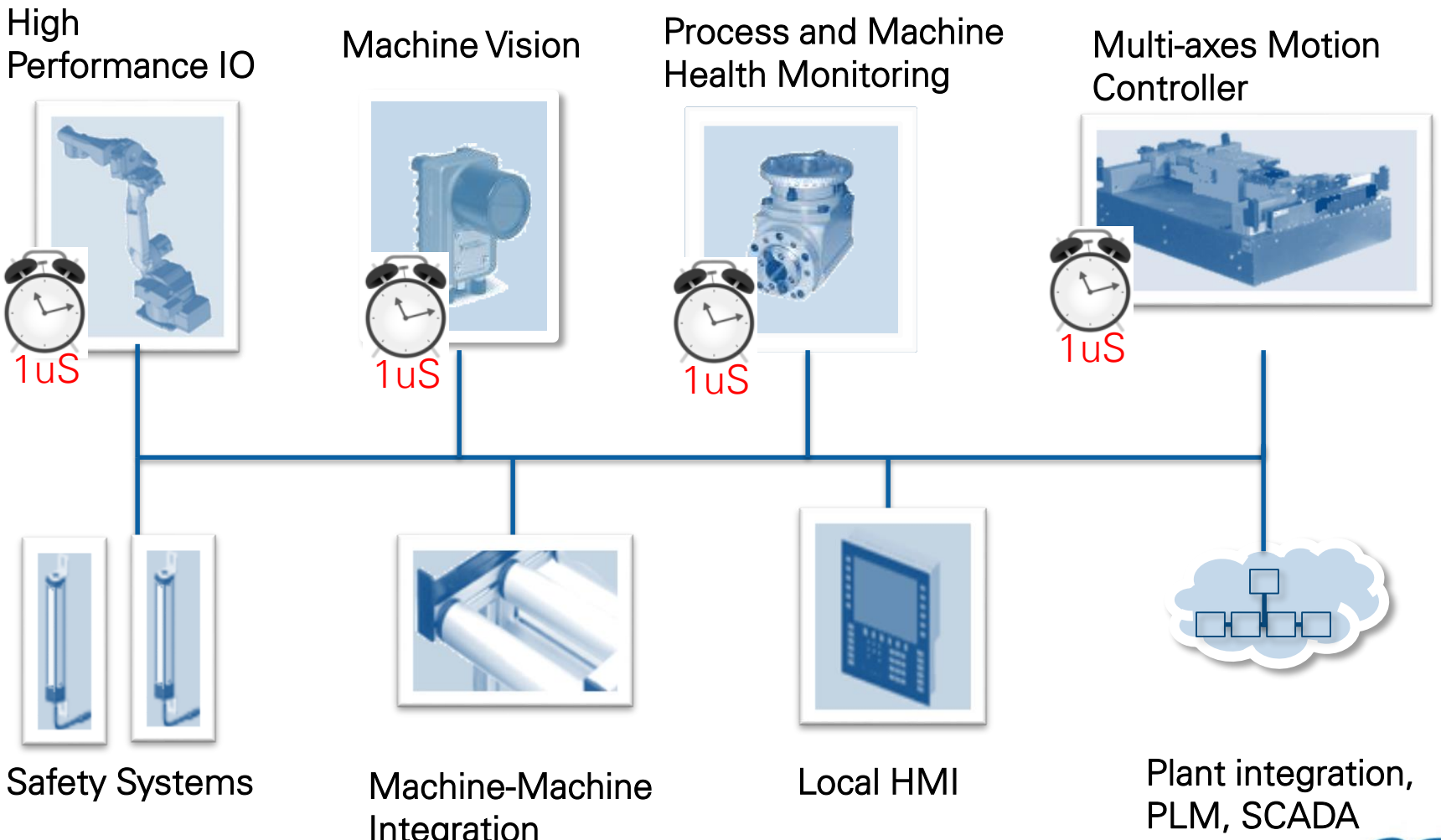
Example Industrial Application: Machine Control

Electron Beam Welding Machine

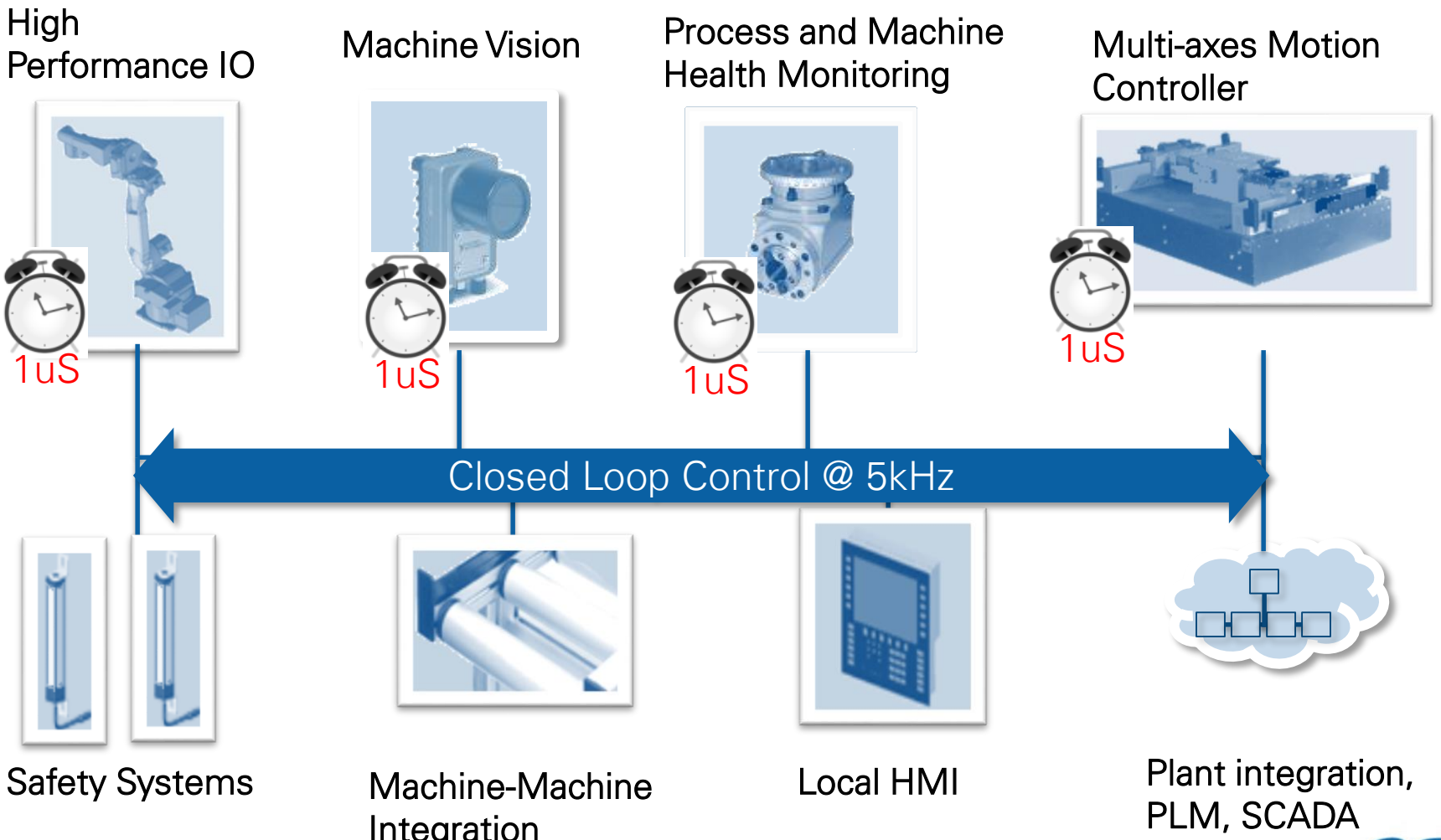
Example Industrial Application: Machine Control



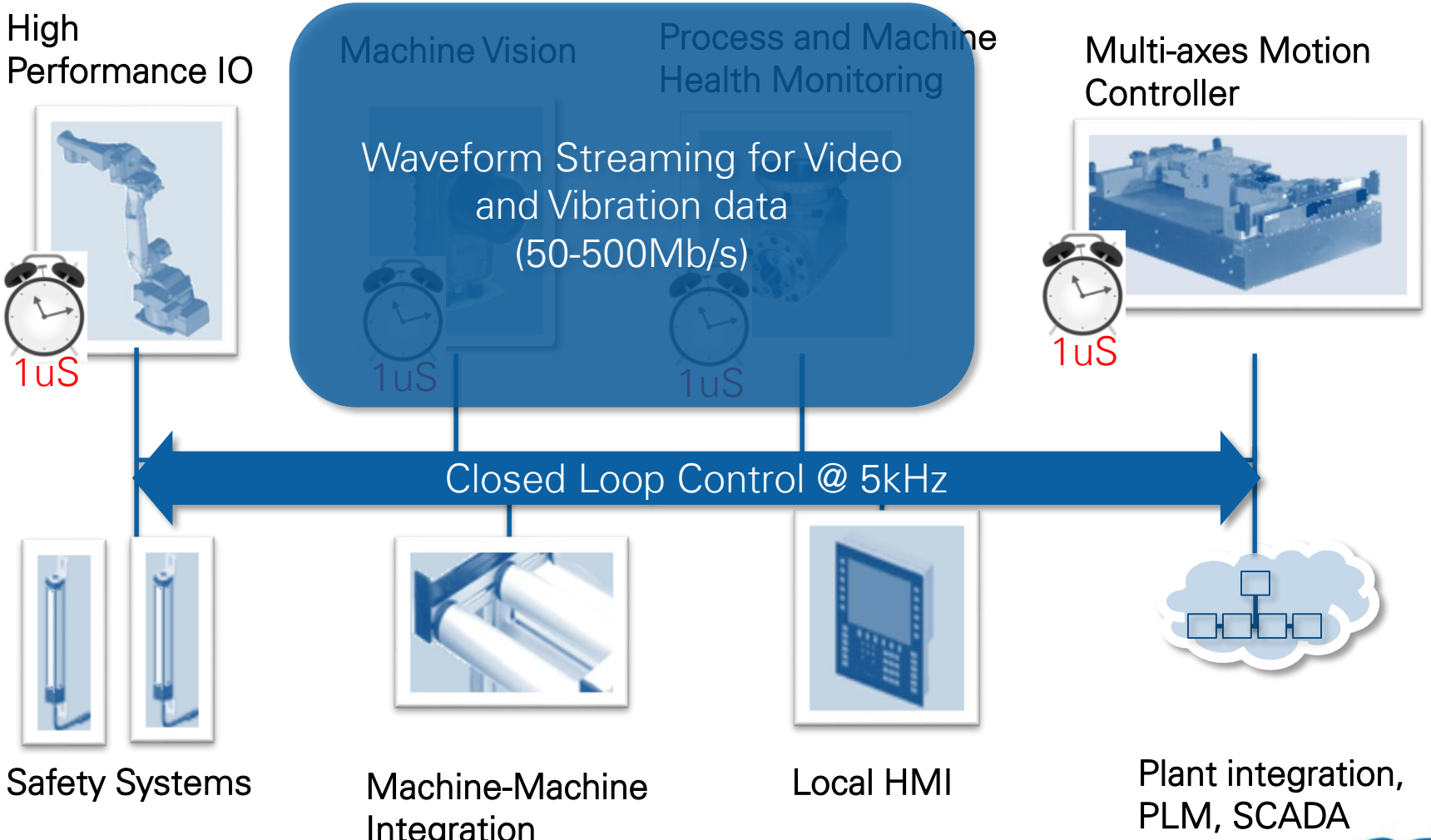
Example Industrial Application: Machine Control



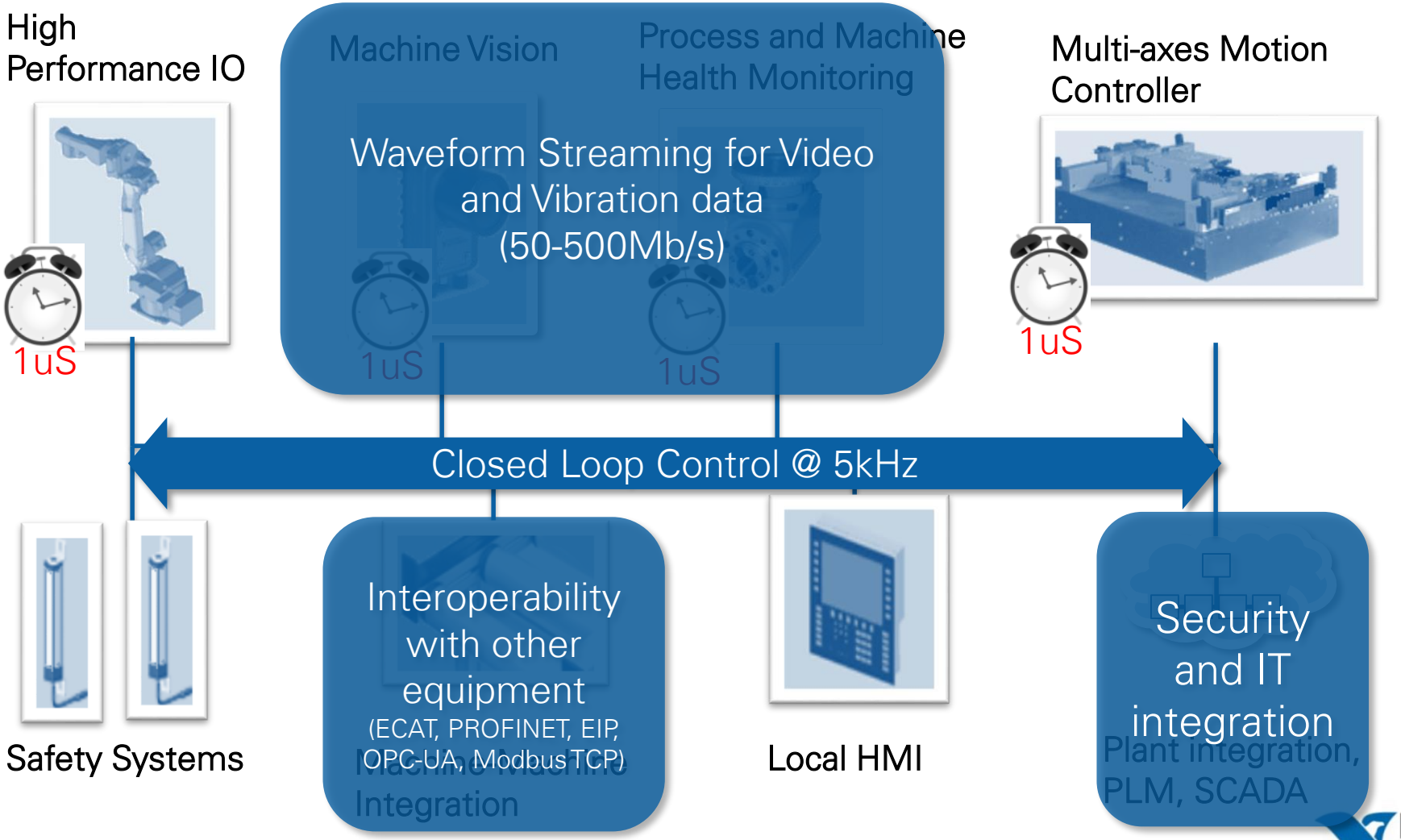
Example Industrial Application: Machine Control



Example Industrial Application: Machine Control



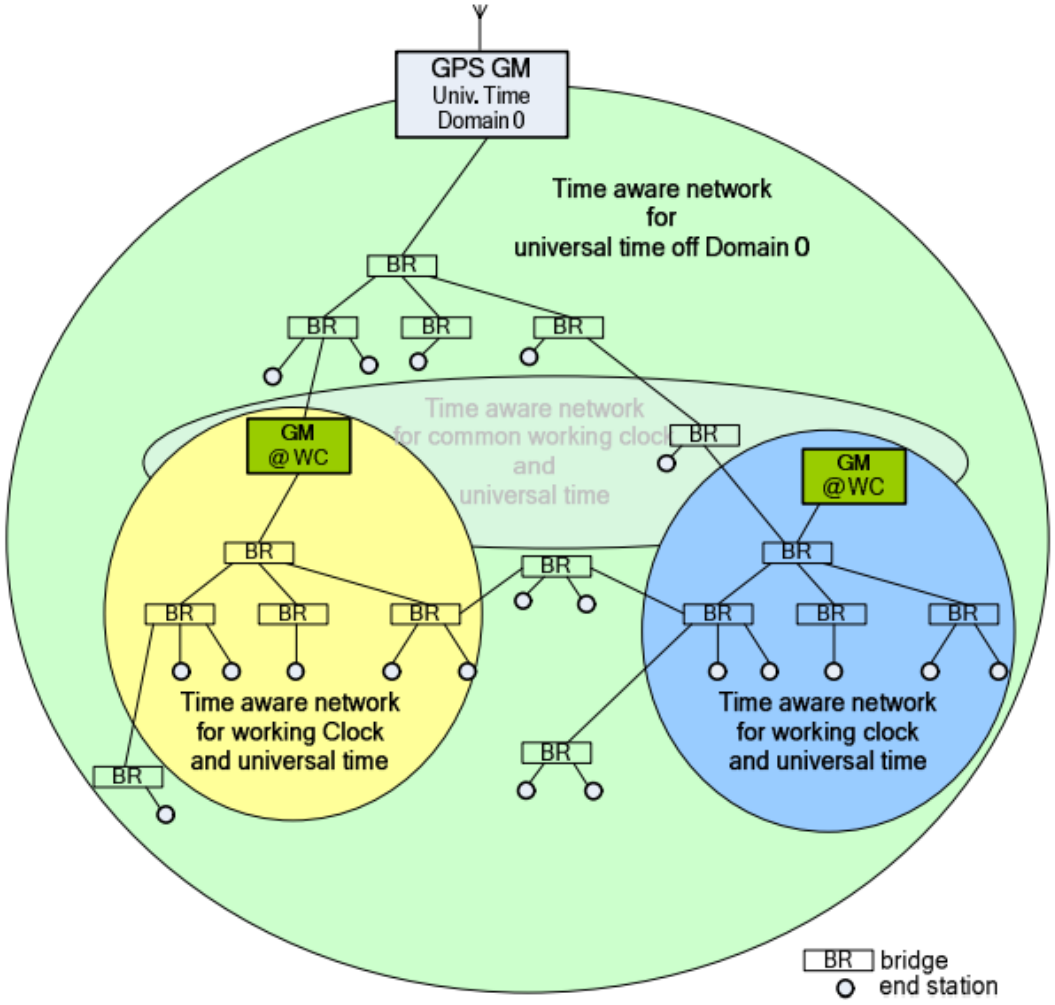
Example Industrial Application: Machine Control



What This Application Needs

- Synchronized time (< µS, and support for multiple timescales)
- Guaranteed, low latency (10s of µS)
- Bandwidth (Gb+)
- Path redundancy for data and control planes
- Fault tolerance
- Network convergence (interoperability with “best effort” traffic)
- Topology flexibility (line, ring, tree)
- Security (access control, etc.)

802.1ASrev is Enabling Support for Multiple Timescales



End stations and switches can be grouped according to time domain

- A common "working clock" defines the domain
- Working clock enables time-based scheduling, synchronized I/O, etc.
- Domain has its own GM

"Universal clock" can apply to multiple working clock domains

- Enables correlation to global traceable time (GPS, etc.)
- Implemented as second timescale

Image source: http://www.ieee802.org/1/files/public/docs2012/as-goetz-ind-req-5014-v1.pdf

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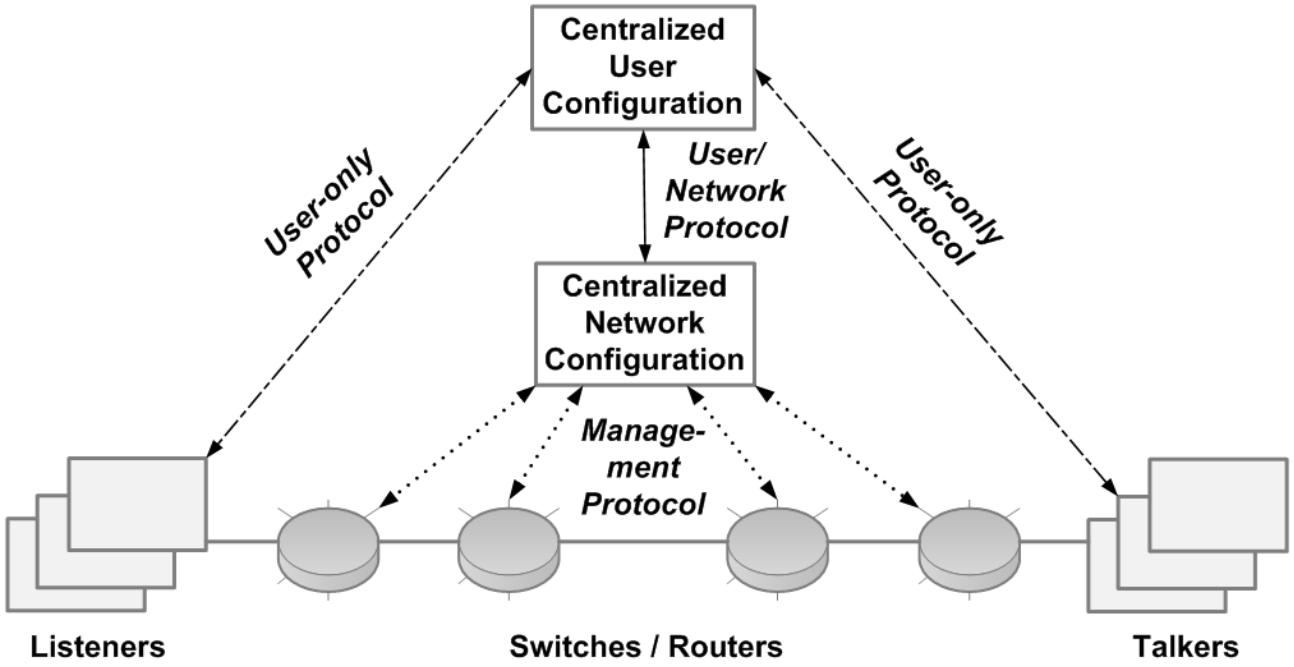
802.1Qcc is Enabling Fully Centralized Network Management



"Centralized User Configuration" manages end stations

- Requires "User-only protocol"

"Centralized Network Configuration" manages network (switches, routers)

- Requires "Management Protocol"

"User/Network Protocol" abstracts network configuration for CUC

Image source: P802.1Qcc/D0.3

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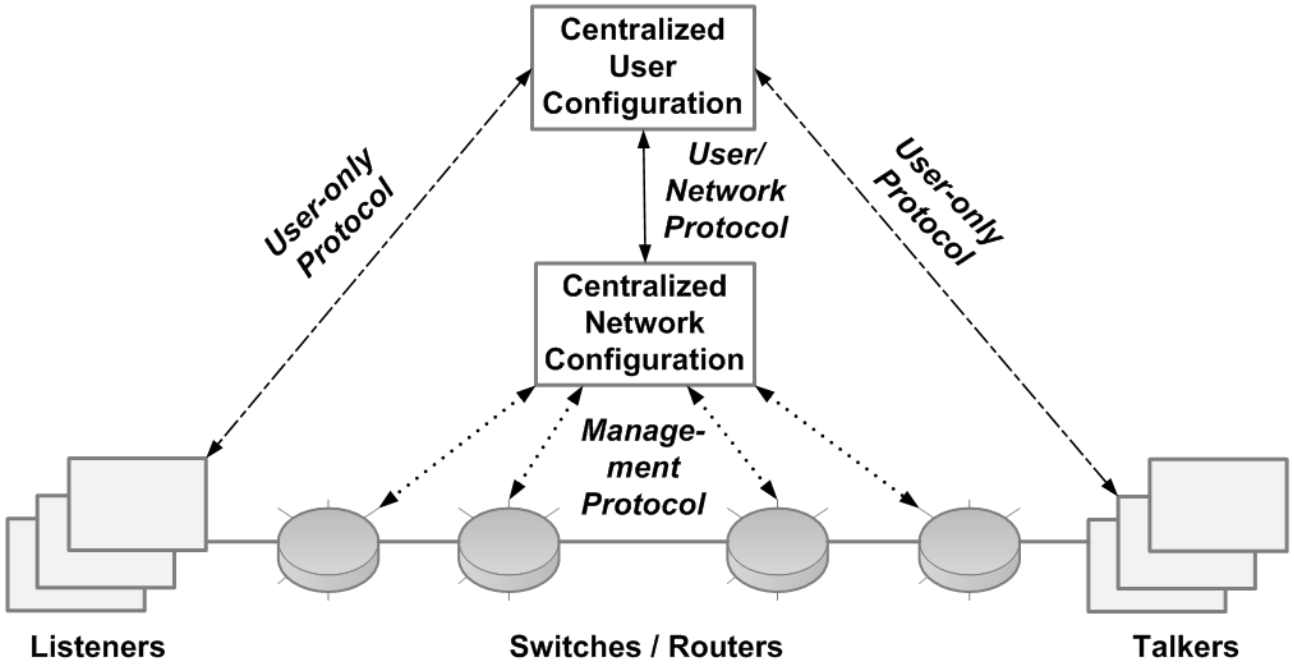
Potential Alignment With 1722.1 New Work



Definition of a "User-only Protocol" for configuring TSN services on end stations

- Schedule management, talker/listener state management, etc.

Selection of a "Management Protocol" for configuring TSN services on bridges/routers

- Schedule management, path management, etc.

Definition of a "User/Network Protocol" for CUC ←→ CNC communication

- Schedule management, path management, etc.

Image source: P802.1Qcc/D0.3

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