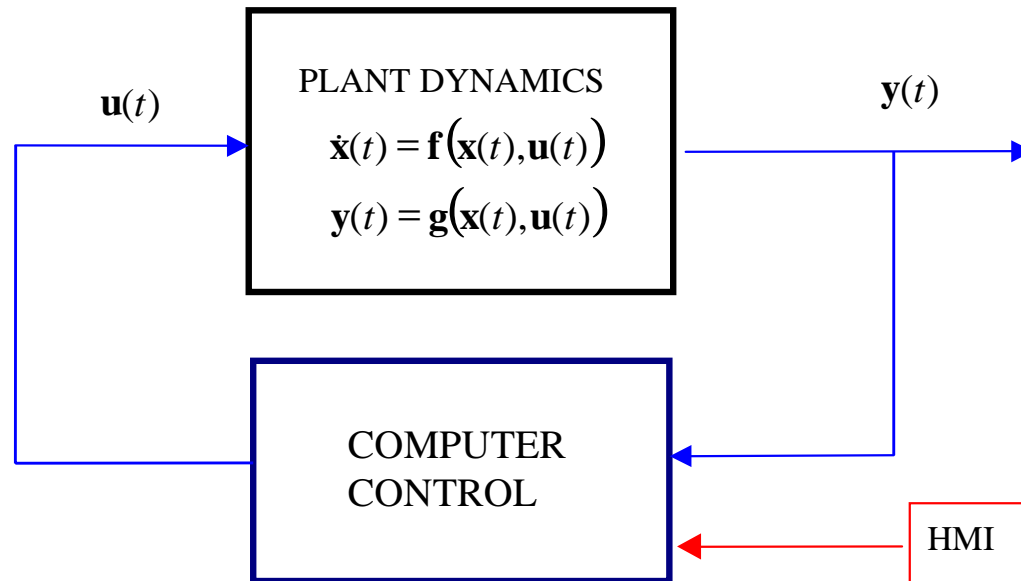

Open, PC-based SERCOS interface Applied to Tire Industry

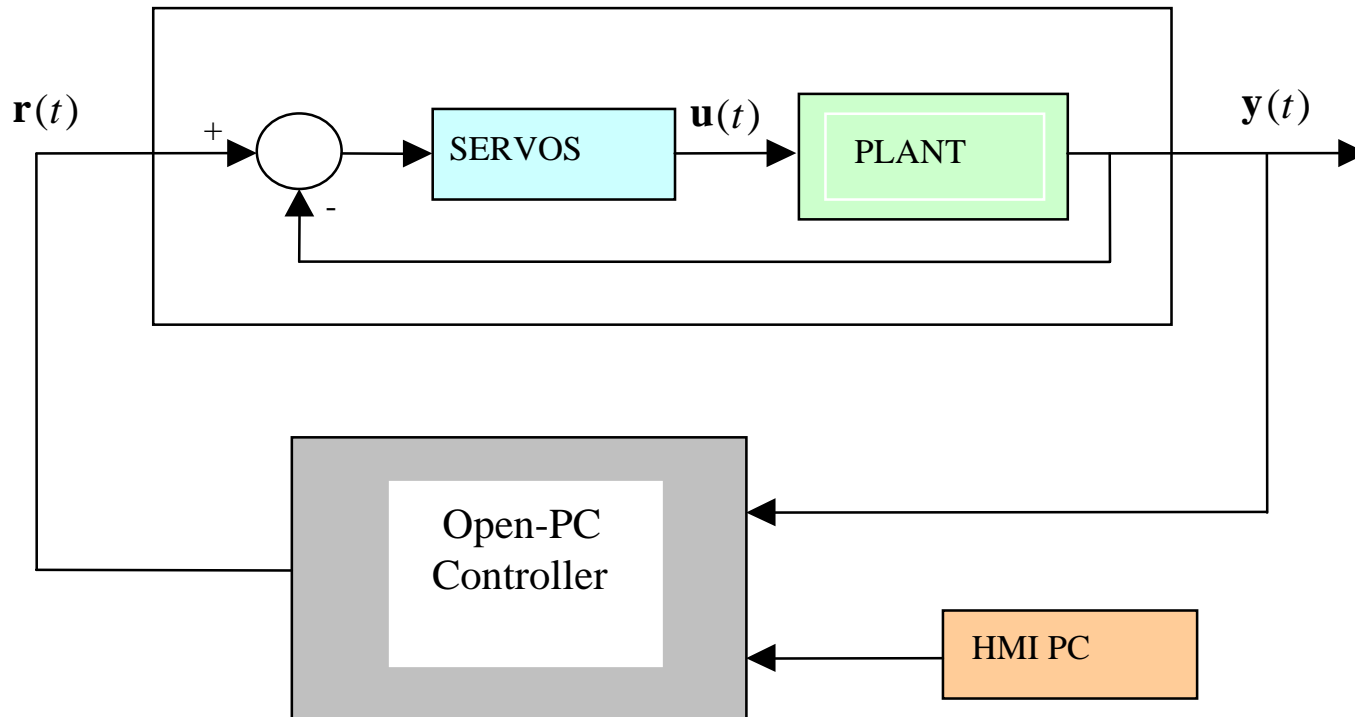
Date: 21-23 March 2000
Hannover, Germany

Speaker: Dr. Alex De Abreu-Garcia
The University of Akron,
Goodyear Tire & Rubber Co.

- **Open-Architecture PC Control System**



- **Open-PC Control of Servos**

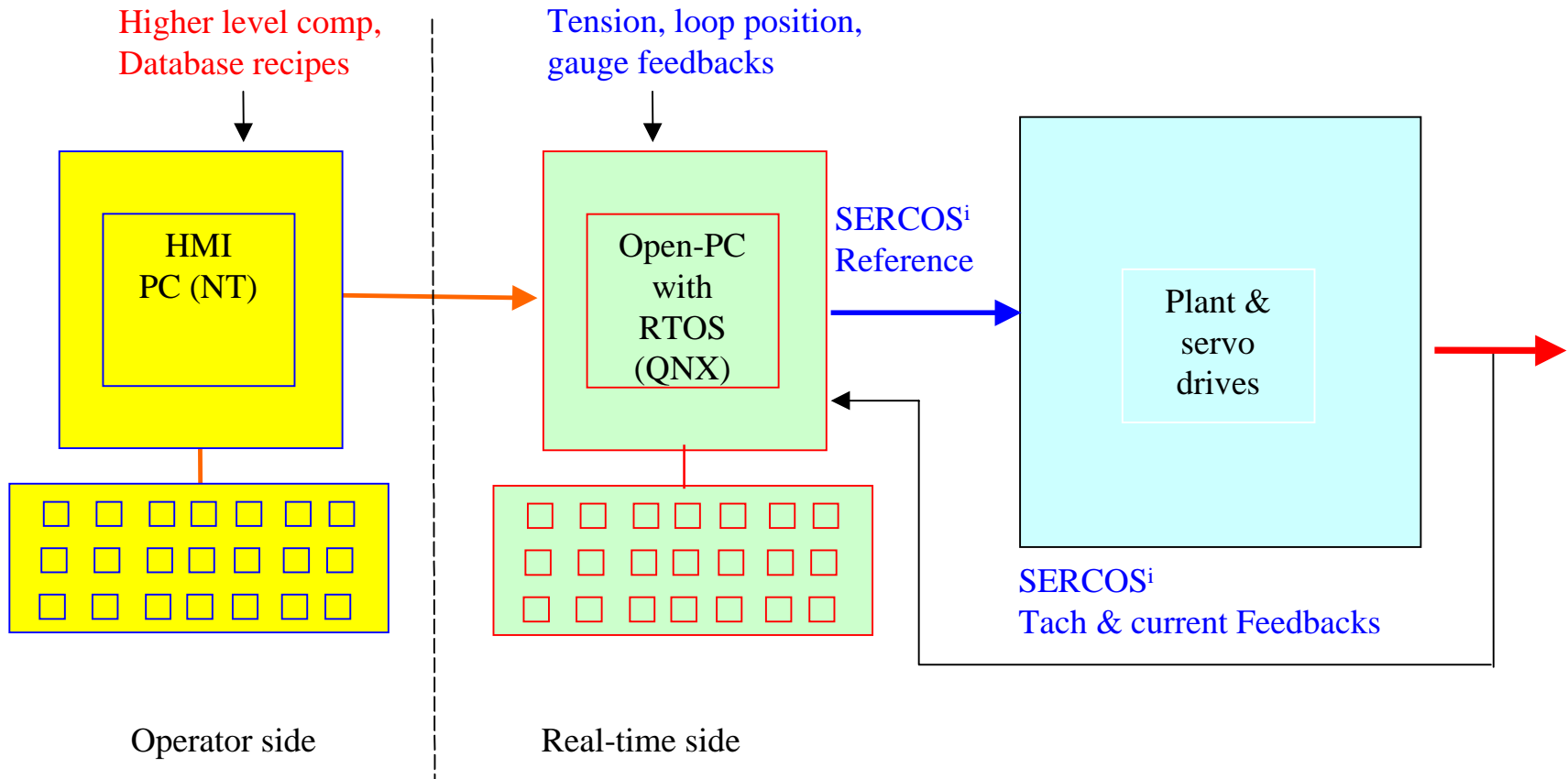


Open, PC Based SERCOSⁱ Applied to Tire Industry



- **Open-PC Control of Servos**
 - Configuration used in tire manufacturing
 - Real-time PC with RTOS, QNX
 - HMI PC computer, NT with GUI builder
 - SERCOSⁱ drives with memory map interface card

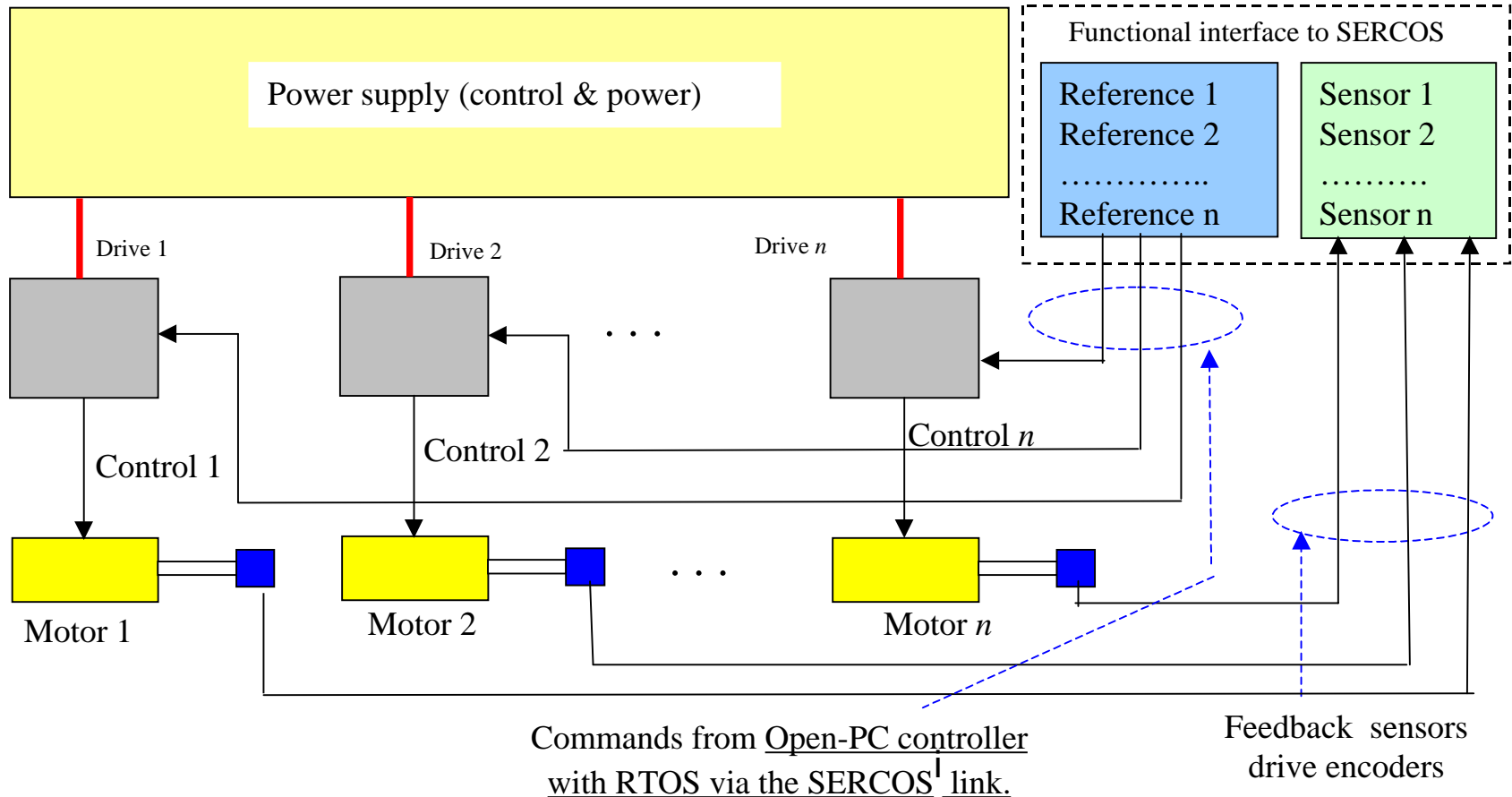
- **Hardware for open-PC SERCOSⁱ**



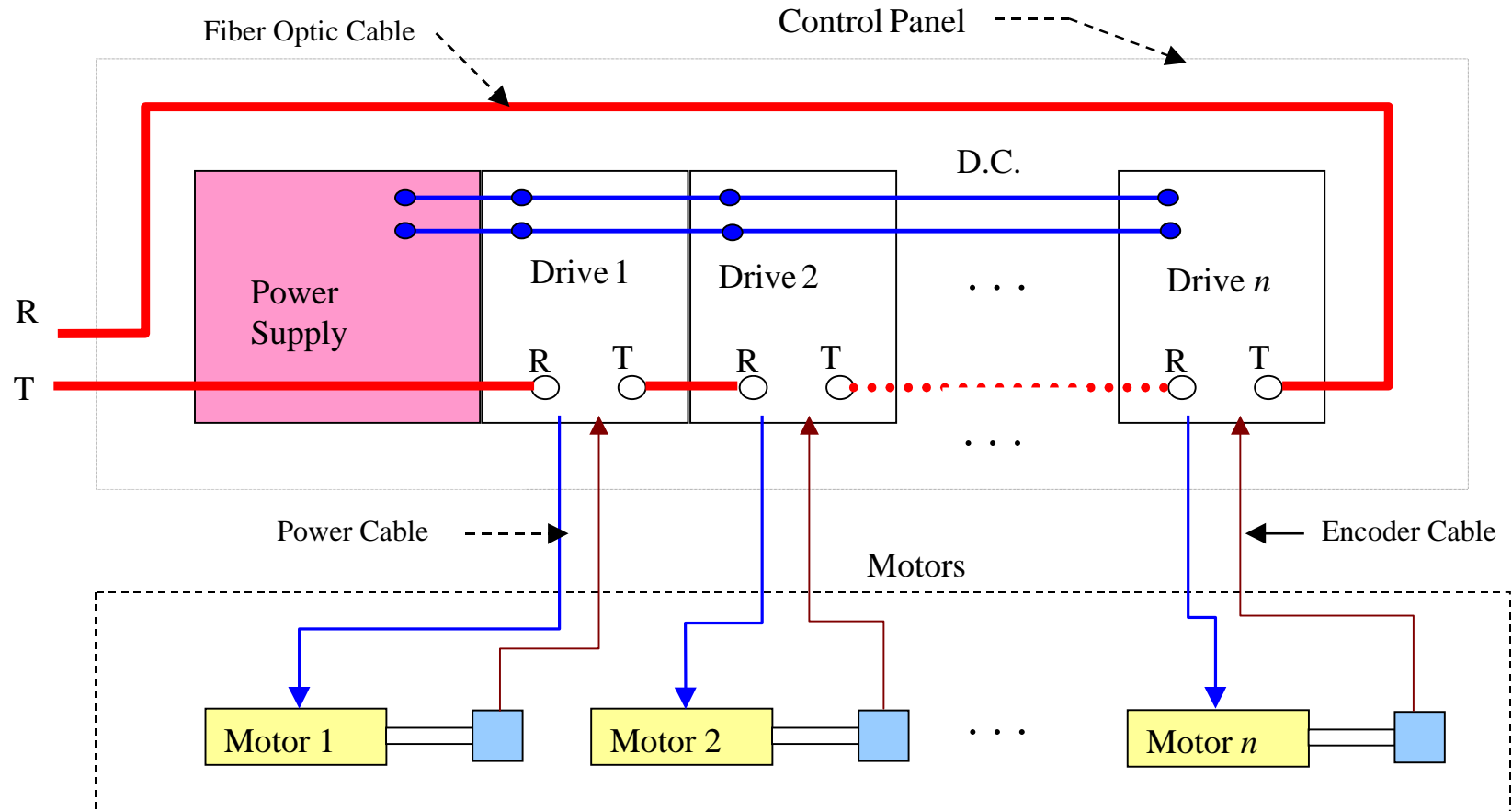


- **Hardware interconnections**
 - **Fiber optic communications, noise immunity**
 - **Pre-assembled cables for quick installation (power & encoder feedback)**
 - **Other signals can be interfaced to the drive or (for special signals) through the Real-Time PC**

• Structure of the SERCOSⁱ Drive Control

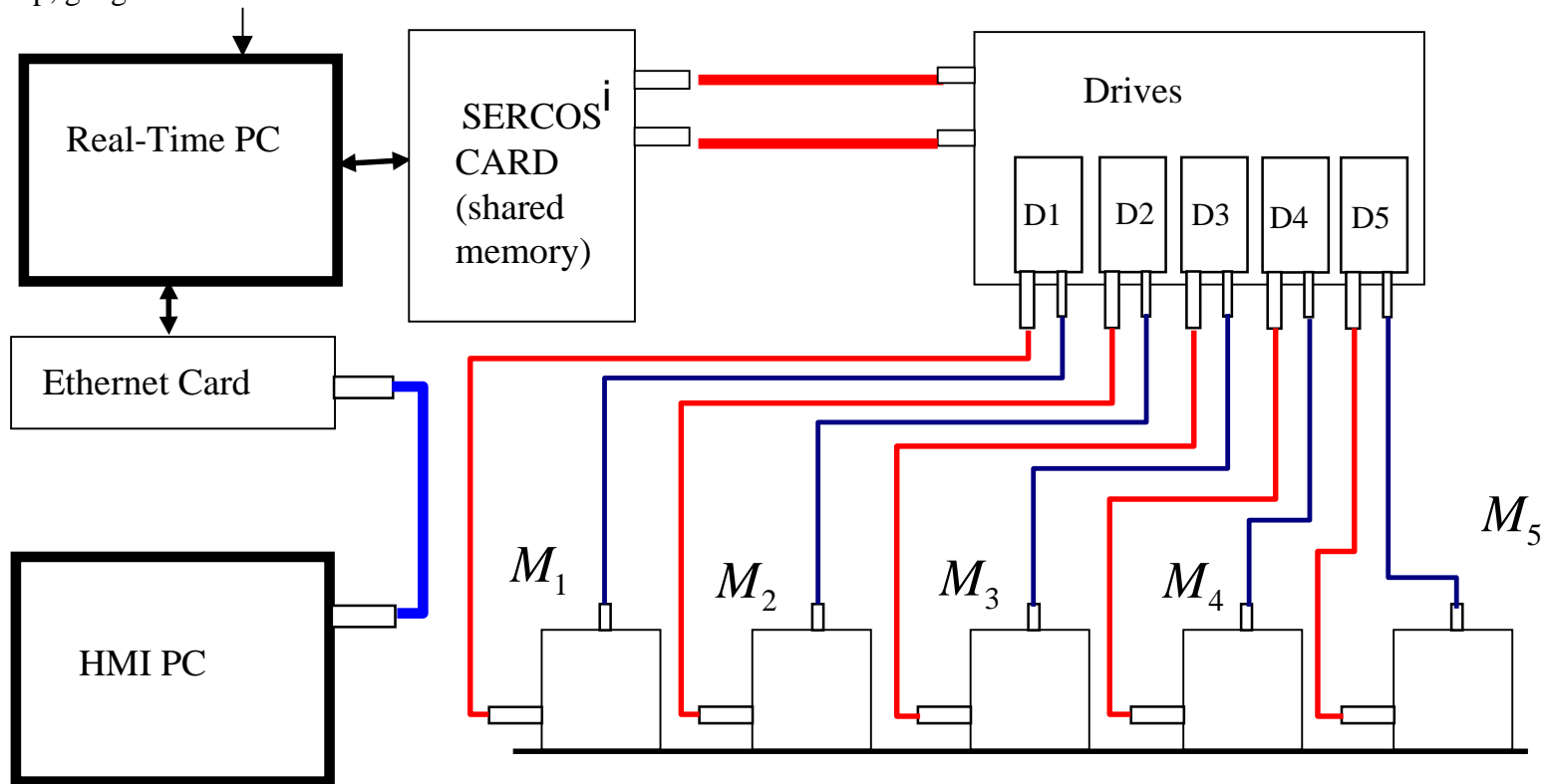


• Motor-to-Cabinet Interconnection



• Open-PC SERCOSⁱ Control of 5 Drives

External feedback signals -
Load cell, loop, gauge or thickness

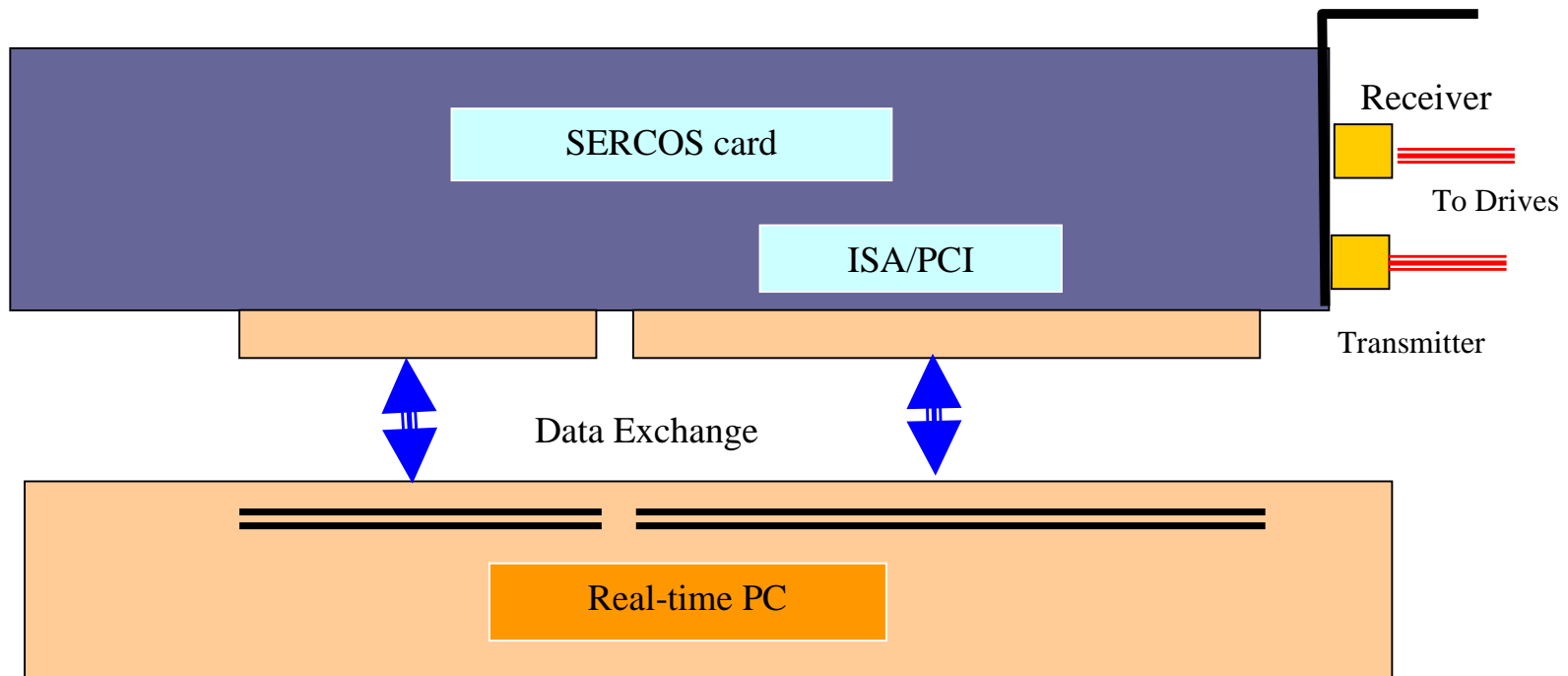


Open, PC Based SERCOSⁱ Applied to Tire Industry



- **SERCOSⁱ communications**
 - **Current jobs, a memory mapped, intelligent ISA card**
 - **New card for PCI memory mapped**
 - **New Card (PCI) where PC assumes computational burden (use power of newer PCs, reduce cost)**

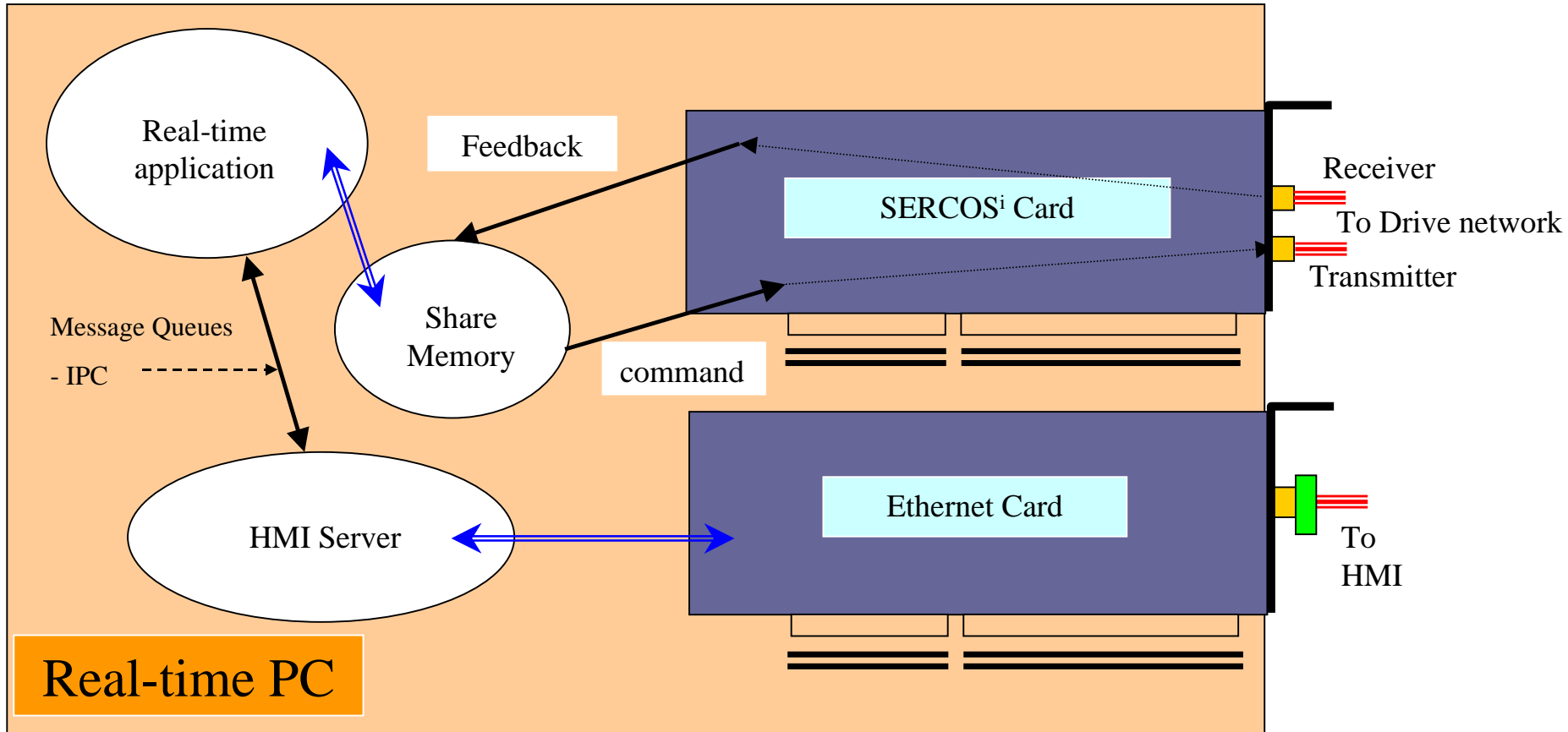
- SERCOSⁱ Communication Card**





- **Software architecture of real-time PC**
 - HMI PC sends data/set points to Real-Time application task via the HMI server (IPC or inter-process communication task)
 - Real-time task uses advanced algorithms to calculate the set points for the drives
 - Real-time task writes data to shared memory in the SERCOSⁱ CARD
 - SERCOSⁱ card sends commands to drives

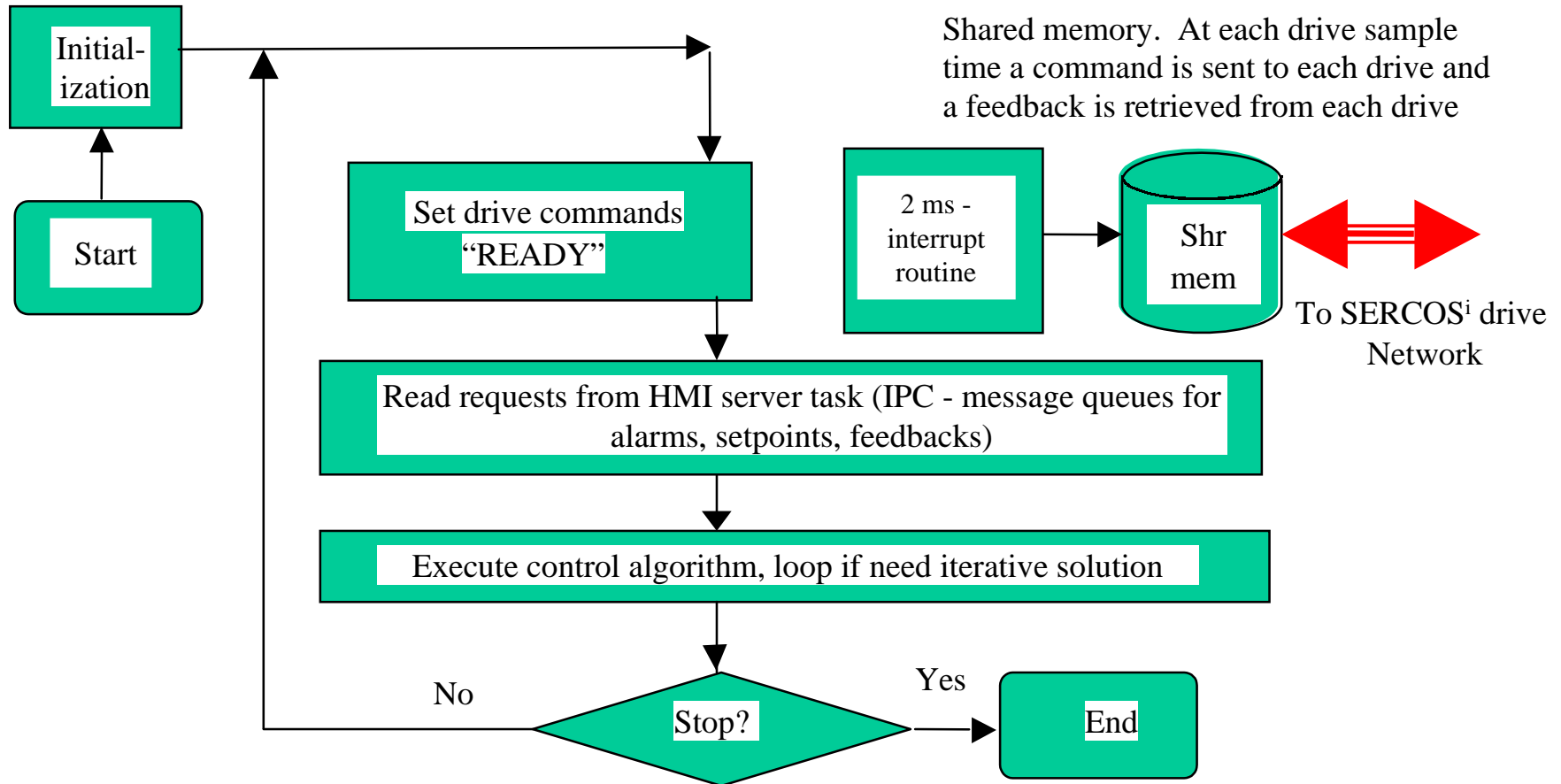
• Open-Architecture in Real-Time PC





- **Real-time application software**
 - Prepare n set point commands for each drive
 - Handle requests from the HMI server task
 - Calculate control algorithms (a multiple of 2 ms update time) & loop to beginning
 - Each 2 ms, handle interrupt to send the next group of set point commands to drives via SERCOSⁱ network

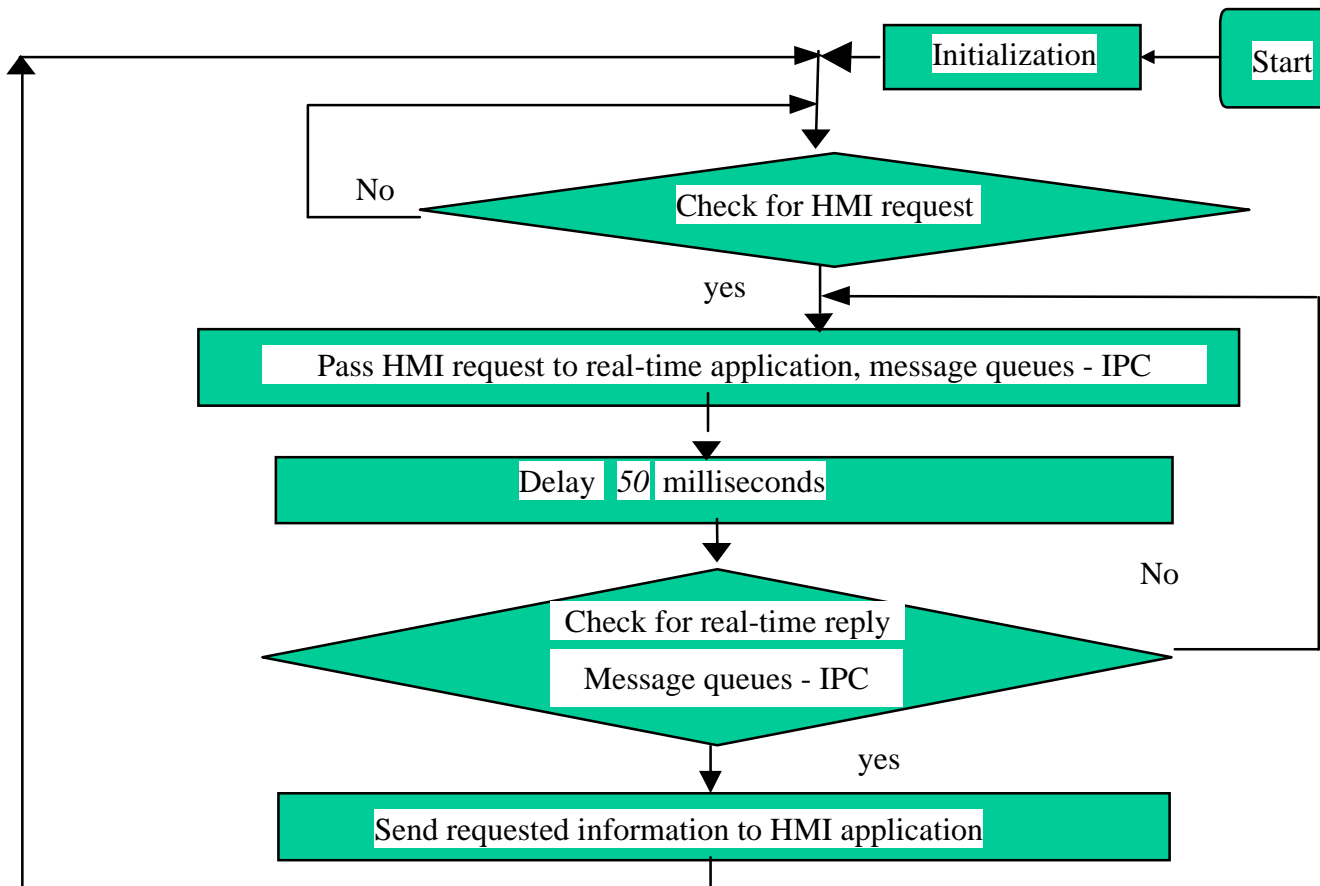
- Real-time application software





- **HMI server (task in control PC)**
 - Loop, waiting for HMI PC to send request via Ethernet
 - After HMI PC request, every 50 ms pass the request to real-time task in control PC
 - If reply from real-time task, send information to the HMI PC via Ethernet
 - Again, wait for HMI PC

- HMI server application, QNX PC

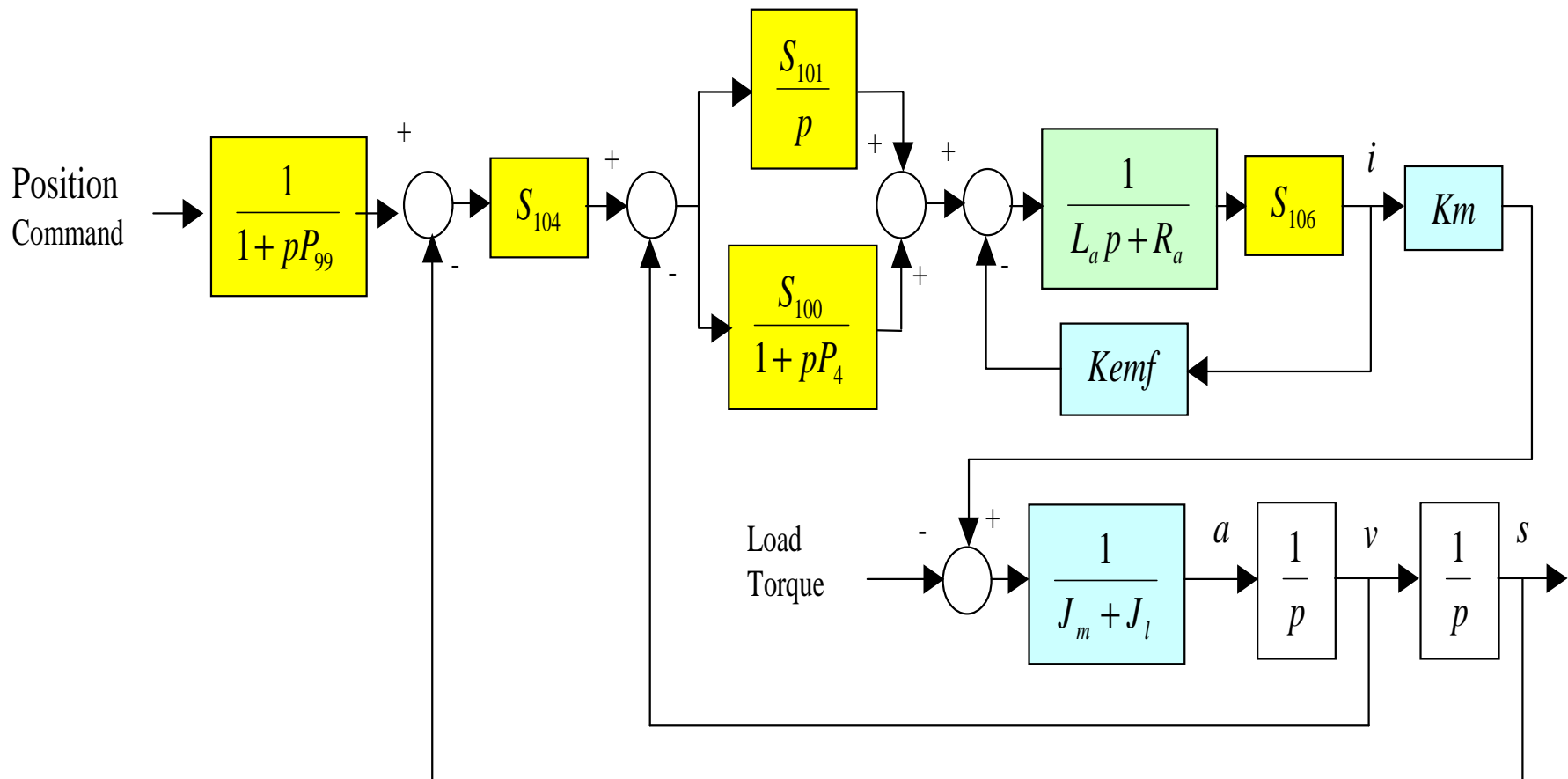


Open, PC Based SERCOSⁱ Applied to Tire Industry



- **Math models & Open SERCOSⁱ allow:**
 - **Complex designs, when needed**
 - **Higher performance controls**
 - **Reduced startup, via computer simulation**

- Typical servo drive model





- **Configurations (existing & future):**
 - QNX
 - Real-time CE
 - Real-time Linux
 - 1 PC for both HMI & control
 - 2 PCs (1- HMI PC, 1- control PC)
 - “Soft” interface card, more in PC
 - “Smart” interface card, less in PC



- **Advantages of PC SERCOSⁱ**
 - Implement more advanced control strategies than “canned” software
 - Apply graphical code generation tools, place code in the “control” PC
 - Simulation and modeling, since SERCOSⁱ is deterministic
 - High performance, due to continuous increase in PC computing power



- **Advantages (continued)**
 - **Can have all hardware from 1 supplier or “mix and match” supplier’s drives**
 - **Reusable, supportable code design that can be used with other SERCOSⁱ supplier’s drives**
 - **Cost advantages in installation**
 - **Best drive and vendor for an application can be selected**

Open, PC Based SERCOSⁱ Applied to Tire Industry



- **Disadvantages of open SERCOSⁱ**
 - Effort to learn standard
 - New paradigm