
Open, Modular Architecture Controls and the Impact of SoftSERCANS

Date: 21.-23. March 2000
Hannover

Jerry Yen
General Motors Powertrain

Outline

- **Introduction of OMAC and OMAC Users Group**
- **OMAC Controller Concept**
- **SERCOSⁱ Implementation**
- **Summary**

OMAC Concept

As defined in the 1994 Whitepaper.....

open:

allowing the integration of off-the-shelf hardware and software components into a “de facto” standard environment

modular:

permitting “plug and play” of components

scalable:

enabling easy and efficient reconfiguration to meet specific application needs

economical:

achieving low life cycle cost

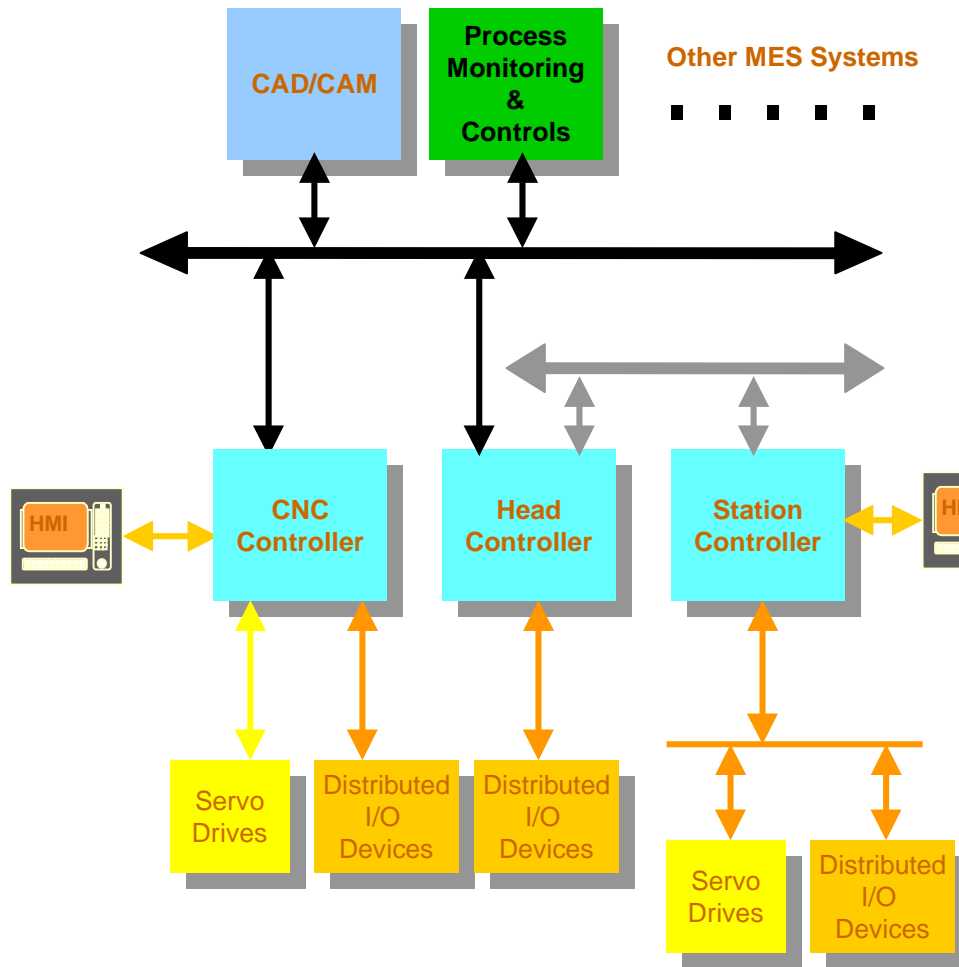
maintainable:

supporting robust plant floor operation

maximum uptime - reliable hardware and software

minimal downtime - expeditious repair and easy maintenance

OMAC is more than a controller



- International and Industry *Standards*
- Standard *interfaces*
- *Commercially available* components conforming to standard interfaces
- *Tools* to integrate commercial components
- *Support* for implementations

OMAC Users Group Purposes

- **Collectively drive common solutions**
 - for technical and non-technical issues
- **Promote OMAC development and adoption**
- **Act as a repository**
 - OMAC requirements and operating experiences
- **Facilitate the accelerated development and convergence of OMAC technology standards**
 - satisfies common user requirements
- **Collaborate with users groups around the world in pursuit of common international OMAC technology standards**

OMAC Users Group Goals

- **Develop a baseline OMAC architecture**
 - an industry common use standard can devolve
- **Inform prospective users on OMAC application and support requirements**
- **Foster commercial OMAC products**
 - control builders and OEMs actively supplying OMAC-compliant hardware and software products
- **Achieve open industrial automation market**
 - available to large and small suppliers

OMAC Working Groups

- **System Technology Issues**
 - OMAC Architecture Working Group
 - Real-Time Operating Systems Working Group
 - PC Application Integration Working Group
 - Microsoft Manufacturing User Working Group
 - Packaging Motion Control Working Group
- **System Business Issue**
 - Business Benefits Working Group
- **Controller Standard Interface Issues**
 - HMI Controller API Working Group
 - OMAC API Working Group
- **Controller Programming Issues**
 - CNC Programming Language Working Group

End User Applications

- **Replace PWM drives with SERCOSⁱ drives**
- **Add closed loop scanning probe**
- **Add acoustic emission sensor for tool breakage**
- **Add real time image recognition of surface finish**
- **Add LAN communications functions to support part program upload part program download, remote status monitoring and remote data acquisition**
- **Replace human interface module with industry de facto standard operator interface**
- **Replace part program interpreter to support CL data generated from AutoCad or ProEngineer**
- **Enable "art to part" such as feature-based or NURBS-based machining**

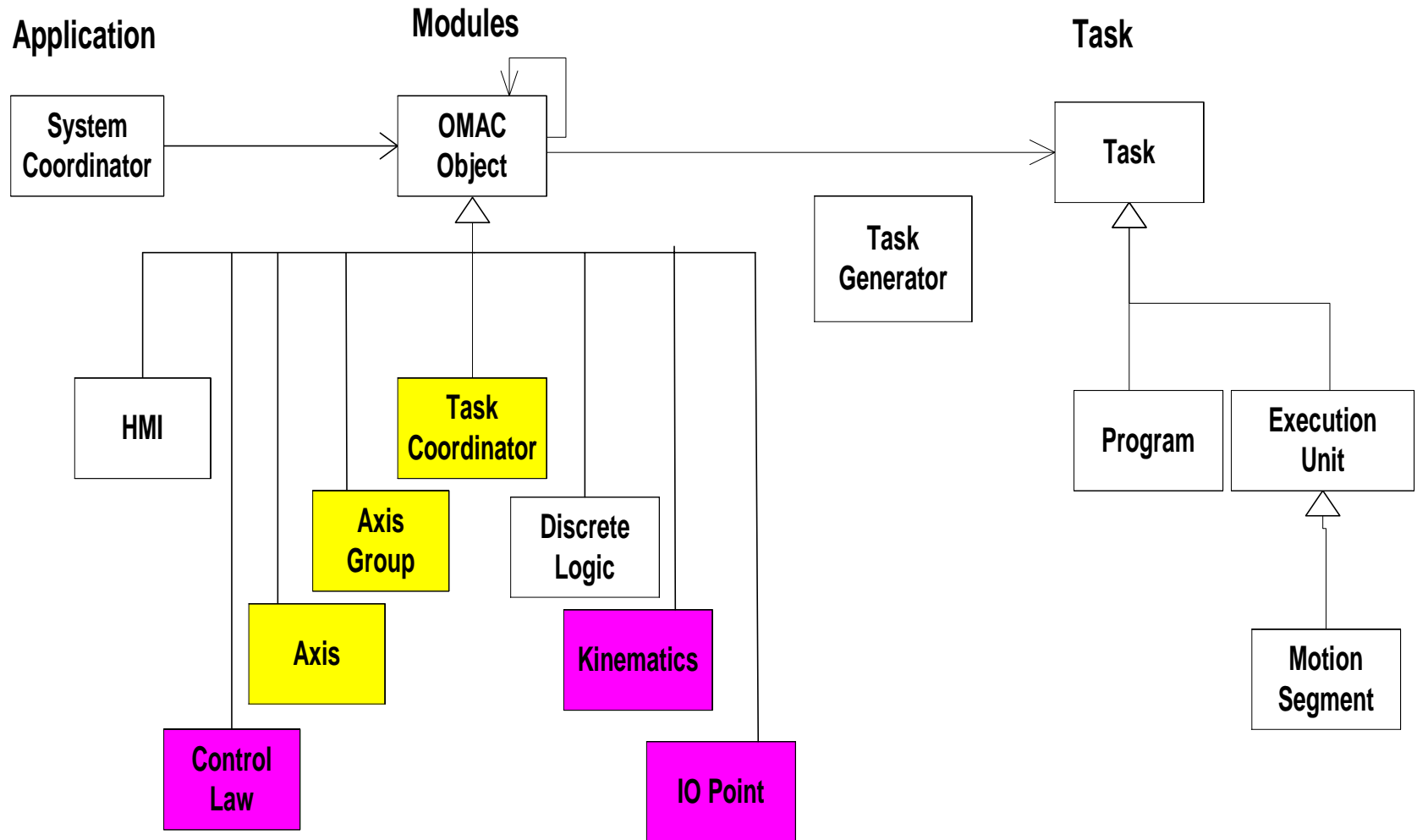
OMAC Controller Objective

- **Enable control vendors to supply standard components that machine suppliers configure into machine control systems.**
- **The integrated control system and machine are then delivered to the end-user**

OMAC Controller Goals

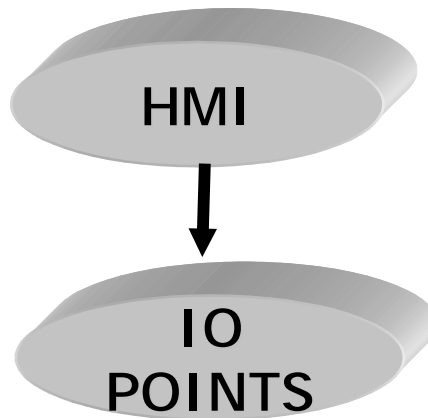
- **Component based plug and play analogous to PC industry**
- **Integration of third party process modeling with control e.g., sensor feedback**
- **Controllers built from best value components**
- **Design and Component reuse to reduce cost**

OMAC Controller



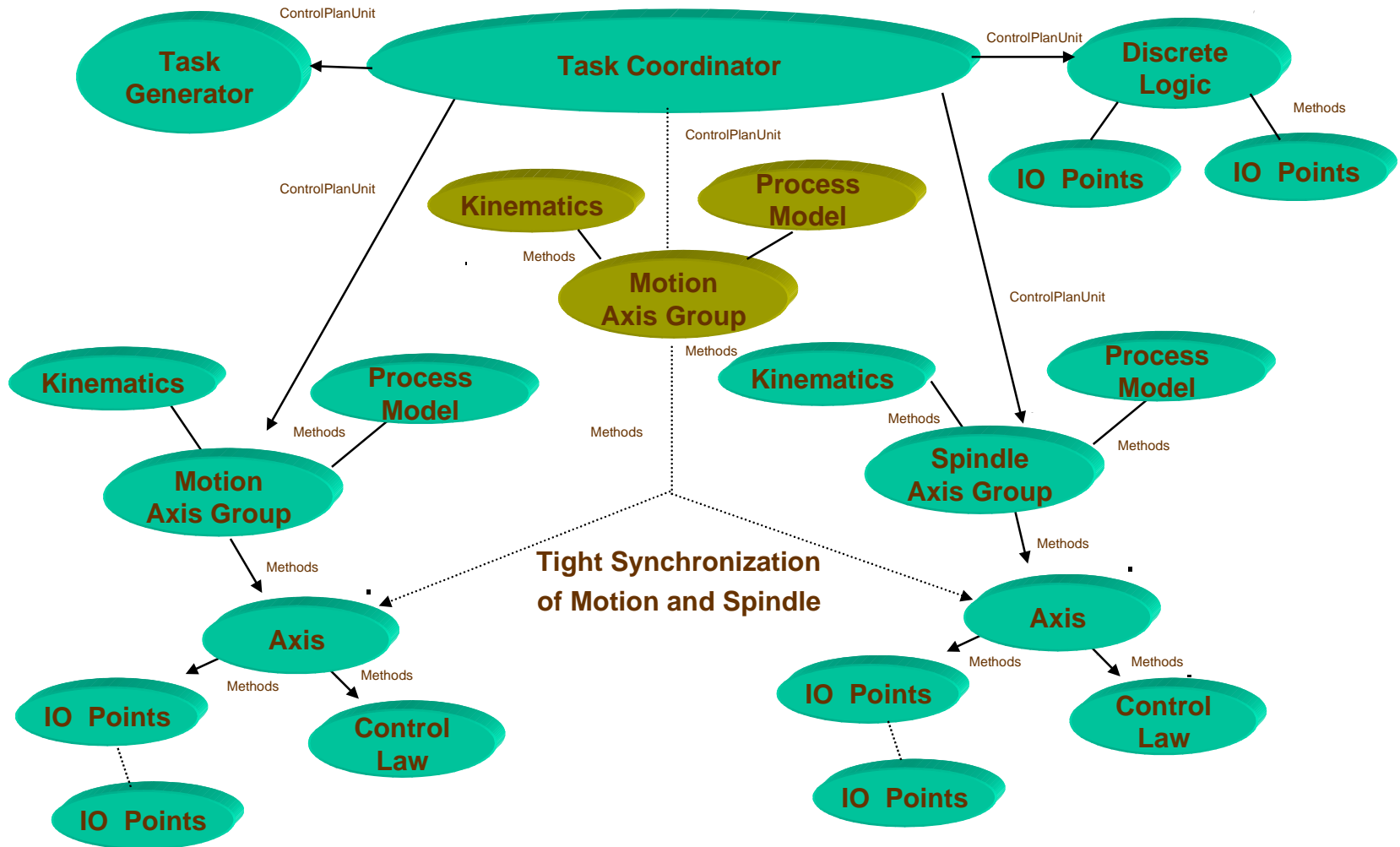
OMAC Controller Example

- **OMAC Controller is not monolithic**

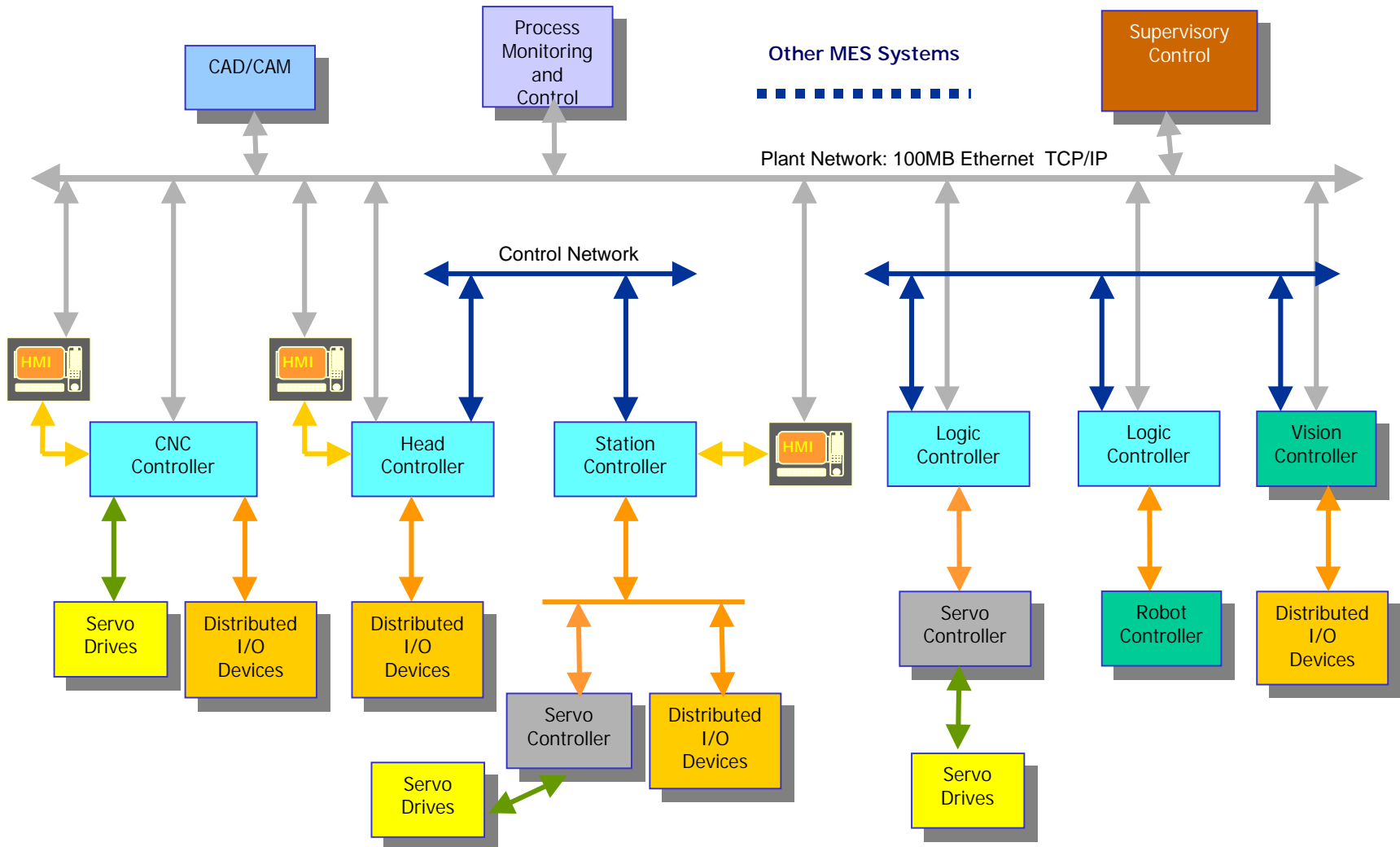


Operator controlling several IO points

OMAC Controller Example



GMPT Manufacturing Systems





- **Standalone CNC Machines**
- **Multiple Axis Servo Applications**
- **Retrofit of Tool Room Machines**

Discussion Items

- **Concept vs. Implementation**
- **Perception vs. Fact**
- **Expectation vs. Reality**
- **Centralized vs. Distributed**

Mixing controller and drives from multiple vendors, is it a realistic solution?

Implementation Improvements

- **Reduce vendor specific parameters**
- **Enhance conformance testing**
- **Increase support to North American auto industry**
- **Educate end users on the benefits of SERCOSⁱ**
- **Simplify implementation of SERCOSⁱ**

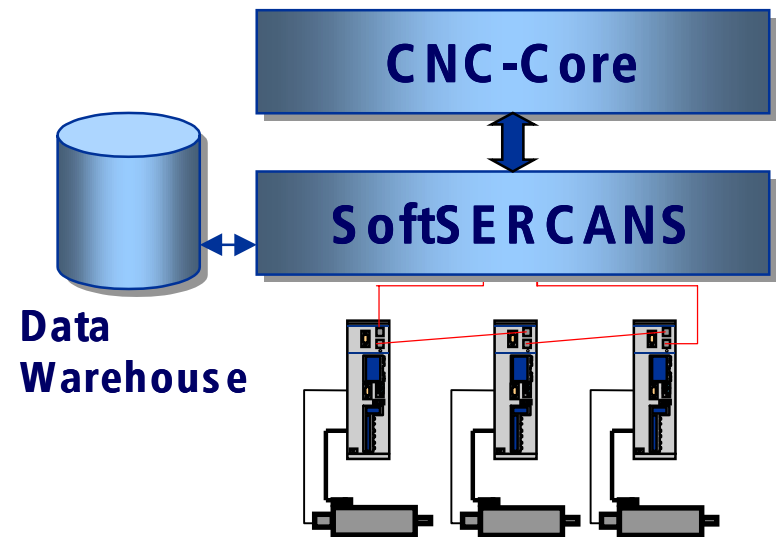
Trends in Manufacturing

- **Applying Object Oriented Technologies**
- **Distributed Manufacturing Systems**
- **Totally Integrated Manufacturing Environment**

Advantages of SoftSERCANS

- Make SERCOSⁱ implementation easy and less costly
- Lower barrier of entry
- Align with the OMAC concept
- Enable intelligent axis modules

SoftSERCANS can use PC-resources (μ p-capacity and HD-memory) to expand the user comfort required for the drive.



Summary

- **Advantages in using market standards**
 - Easy interfacing of various systems
 - Readily available toolkits and support
 - Reduced development time and trouble shooting
- **Issues in implementing market standards**
 - Level of conformance
 - Incompatible versions
 - Lack of robust product certification requires extensive validation by end users
 - Standard might not cover all the end user future requirements