

TCS(NZ) Ltd gives you Distributed Intelligence (based on IEC 61499 standard)

Agile manufacturing is no longer just a dream, it is a reality. TCS has this exciting new paradigm and leading edge technology available now.

An industrial automation and control technology that simplifies complexity, markedly reduces the cost of engineering time and hardware, and is also extensible and scalable. The technology is called Distributed Intelligence (“DI”) and it is the way forward for agile manufacturing. DI is an automation and control technology for industry that is reliable, readily reconfigurable, and able to be continually changeable.

DI equips traditionally unintelligent network devices with control software and many benefits are gained by distributing the control or decision making over a multitude of processes. The greatly flattened architecture of DI makes possible the performance of all control activities in intelligent peripheral devices without the need for any central control units. The vision of intelligent and collaborative industrial environments that truly have dynamic, agile, and reconfigurable production and manufacturing equipment is then a reality.

Current automation control technologies are either:

- through a multitude of proprietary Programmable Logic Control (PLC) devices designed to lock end users into a single vendor supply; or
- distributed control systems (DCS) that use a few large central processors that provide supervisory control and data acquisition, communicating via local networks with numerous controllers, instruments, sensors, and actuators located out in the plant.

The following diagrams depict the contrast between PLC topography and DI topography.

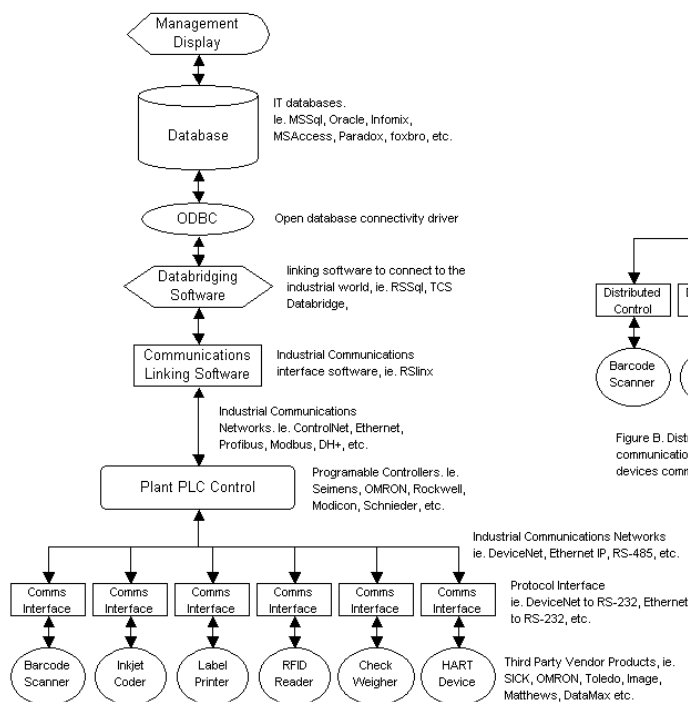


Figure A. The current control architecture means data is exchanged through multiple layers of communications protocols and control devices. Each step adds another degree of complexity and propagation delays

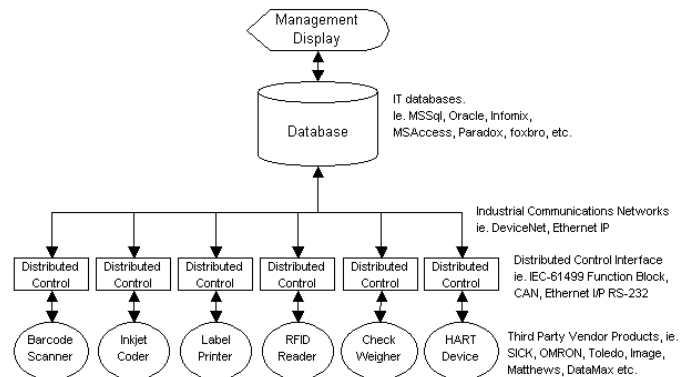


Figure B. Distributed control shows the removal of multiple layers of communications and control. The control is carried out at the device level and the devices communicates directly to the IT level.

Benefits of DI

Flatter architecture

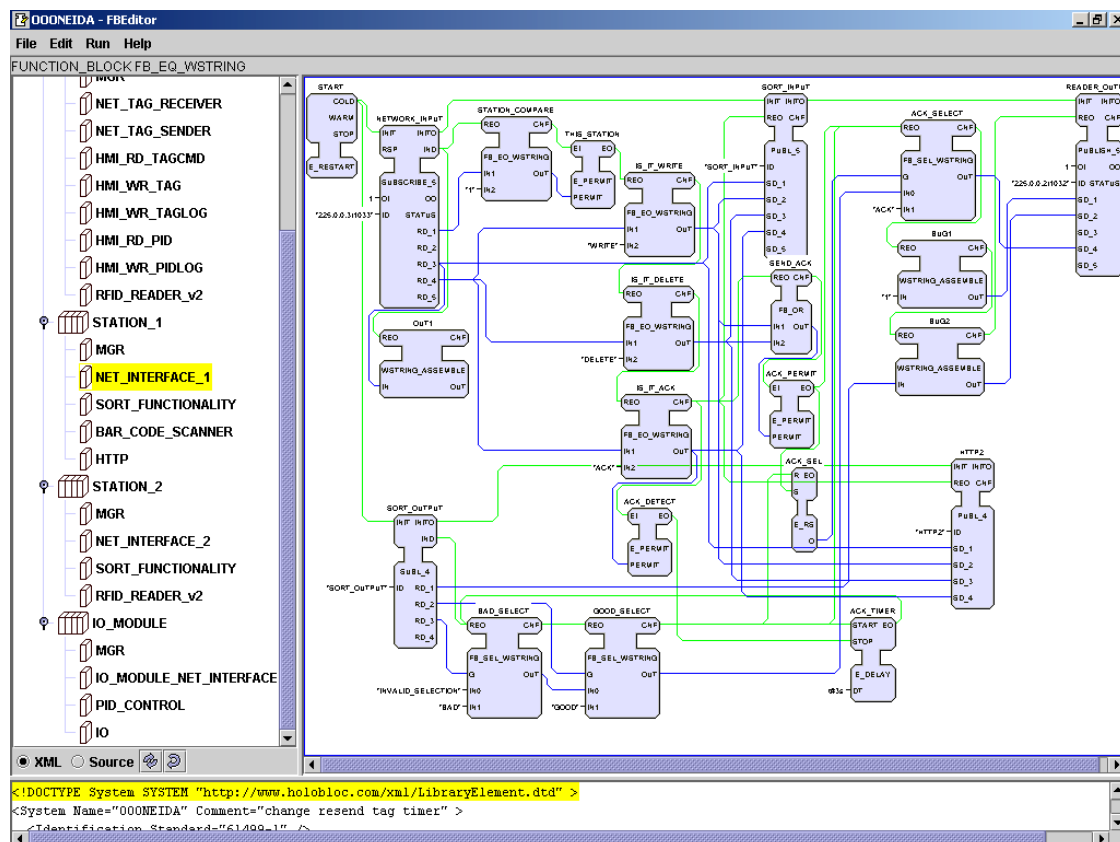
The flatter architecture means significantly less hardware cost and less engineering time for installation or reconfiguration.

Robust, object orientated, software

DI is programmed via a function block programming language (IEC-61499) which is an international standard for highly distributed automation control. IEC-61499 provides seamless event driven sequencing over multiple devices and less software engineering time.

The standard (IEC-61499) defines an architecture and the compliance rules that promote interoperability between devices of multiple vendors, portability of software between tools from multiple vendors, and the configurability of devices from multiple vendors by software tools of multiple vendors.

Function block programming provides a simple engineering tool with 100's of developed function blocks already available and the further creation of complex function blocks using JAVA. These function blocks are reusable and are robust because their software is encapsulated and object focused. Therefore the function blocks do not corrupt and cannot be corrupted by other software in the system.



Lights-out reliability

There is no one point of failure because the Intelligence is distributed out into the devices and the system can withstand partial failure through cellular design techniques. The devices are self-contained therefore they are easier to test and verify as correct. The network topography of DI reduces the wiring complexity and builds in an inherent redundancy capability through the communications paths and other processing nodes.

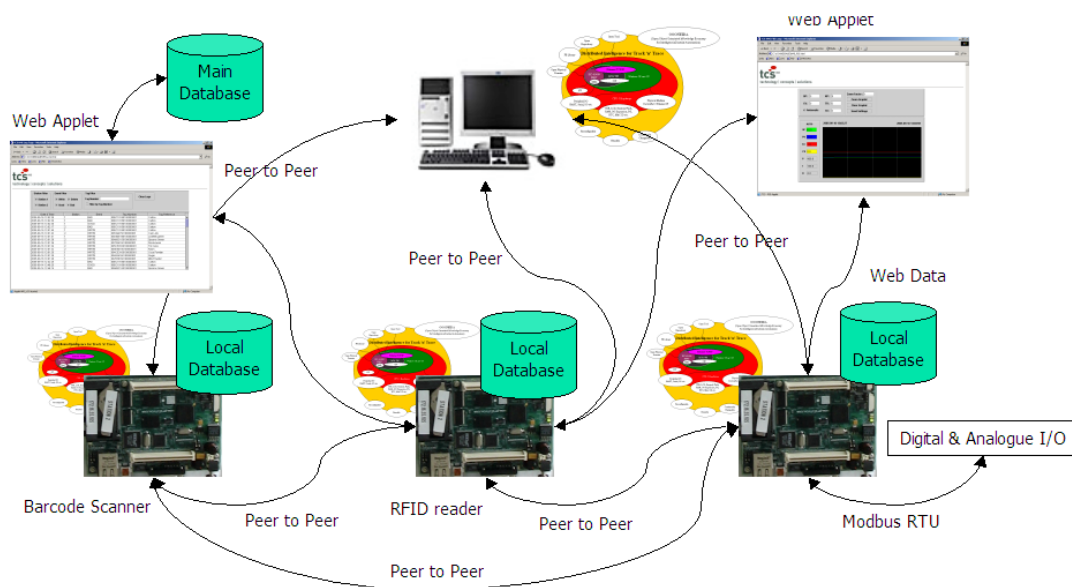
Scalability and extensibility

DI permits the ability to start small and, once satisfied and as budgets allow, to then go bigger. The architecture allows a migration path from the existing control technology to DI technology in a staged and cost effective manner.

The modularity decomposes complexity into smaller, more logical modules. Modularity lends itself well to object orientated software and modules can be easily swapped over with other devices, based on features and requirements, enabling additional functionality by merely adding modules or software. DI allows devices with I/O to be normalised as well as allowing the integration of disparate systems.

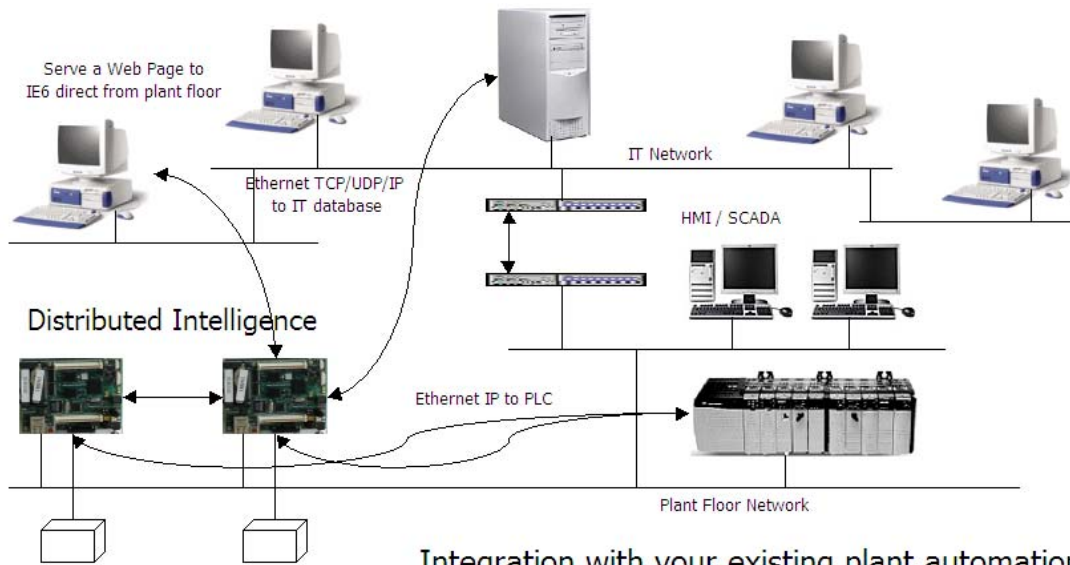
Interoperability

Device level interoperability is a key attribute of the IEC-61499 standard. Interoperability is the ability to distribute an application over the entire network of function block controllers. Data and Event inter-processor communication over Ethernet or DeviceNet automatically occurs as a result of the linking of the function blocks data and event lines. For example, the I/O for one function block can be derived from the I/O of a function block running on a different piece of hardware. Interoperability provides end to end communications to all levels of an enterprise.



Seamless communications

Interoperability and connectivity between devices (peer-to-peer), operations, and management IT provides real-time data and direct linkage between plant floor and management systems.



Integration with your existing plant automation

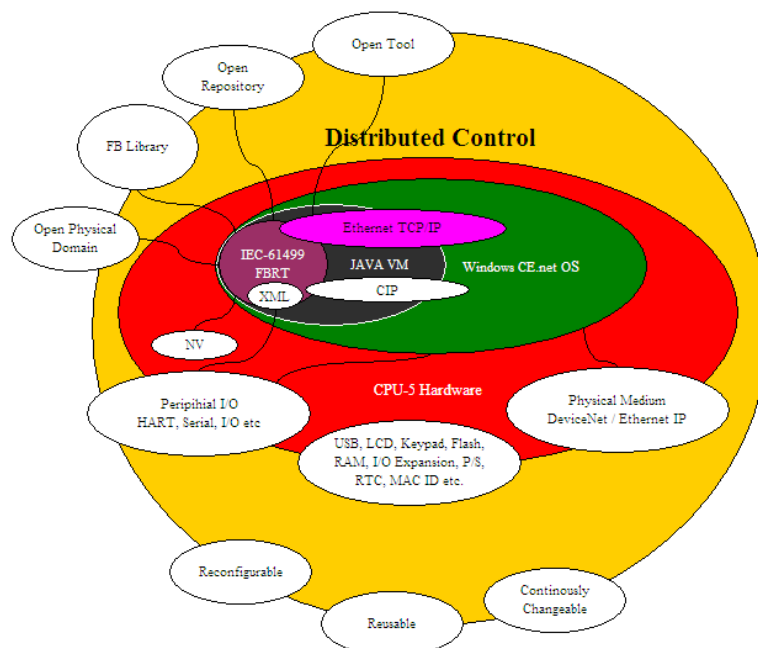
Determinism

The ability to be certain that an operation will be completed within its allotted time. The factors that affect determinism are medium access control, network utilisation, data frame size, and data frame prioritisation.

A deterministic operation time can be achieved because the control functionality is performed in real-time at the device. The adoption of deterministic communications protocols, such as DeviceNet and Ethernet IP, provides deterministic operations where the control is distributed over many devices.

Open Technologies

TCS DI is based on open technologies or widely adopted technologies to provide the user with the maximum flexibility and interoperability possible. The adoption of open technologies is one of the most critical factors in providing a truly multi-vendor product environment. DI uses the following open technologies:



- Windows.CE.net RTOS. (Windows Consumer Electronics) Microsoft's version of Windows for hand-held devices and embedded systems that use x86, ARM, MIPS and SHx CPUs.
- JAVA KVM (virtual machine), a version of the Java Virtual Machine for small devices with limited memory.
- Extensible Markup Language (XML) a standardised set of rules for adding structure to any form of data using a system of markup tags.
- IEC 61499 defines a general model and methodology for describing functions blocks in a format that is independent of implementation. System designers can use the methodology to construct distributed intelligence systems. IEC61499 allows a system to be defined in terms of logically connected function blocks that run on different processing resources.
- Ethernet, the most widely used local area network (LAN) access method, defined by the IEEE as the 802.3 standard.
- TCP/IP (Transmission Control Protocol/Internet Protocol) is a protocol for communication between computers, used as a standard for transmitting data over networks and as the basis for standard Internet protocols.
- UDP (User Datagram Protocol) - Transport layer protocol in the TCP/IP protocol suite used in the Internet. UDP is used at the two ends of a data transfer. However, it does not establish a connection or provide reliable data transfer like TCP.

Why DI?

DI provides robust reliability with cost benefits of less hardware and engineering and an ability to start small and go to full scale. The present day architectures, although mostly effective are difficult to alter, to reconfigure, are not in real time and do not have seamless communications throughout the total processes of the industry and therefore are unable to meet the needs of agile manufacturing. DI is fast, efficient and promotes reliability due to its interoperability and connectivity amongst the devices.

To learn more about DI and what it can deliver, contact Peter Tait at TCS (NZ) Ltd and he and his team will be delighted to discuss DI with you in detail.