

# CIMflex

Computer  
Integrated  
Manufacturing

## Preparing for the Future



# What is CIM?

Computer Integrated Manufacturing is ...



- A conceptual goal
- An application of technology
- The utilization of computers
- An approach to operating a business enterprise

# WHY CIM? Trends in Industry

Three **driving forces pushing change** in industry:

- **Economic competition**: company must become more efficient and productive
- **Financial responsibility**: to company's share-holders, remain profitable
- **Government regulations**: increasingly more stringent, continuously evolving



# WHY CIM? Meeting the Demands

Meeting demands of competition, shareholders and regulations requires increased **automation**:

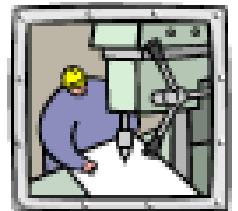
- **Instrumentation**: automatic on-line, off-line, intelligent sensors to monitor processes and QC
- **Computers**: control systems, data analysis, information, display systems
- **Communications**: networks, distributed computing and databases, telecommunications



# WHY CIM? New Technology Makes it Possible

Increased automation in the plant and the office is possible because:

- More powerful computing capabilities of CPUs and PCs and decreasing costs of computer power
- Evolution of networking and migration to distributed computing architecture
- Growth and application of automated equipment

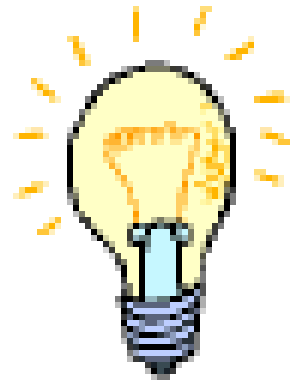


# CIM is ...

The **integration**, through computers, of:

- Design
- Engineering
- Manufacturing
  - Logistics
  - Warehousing and distribution
  - Customers and suppliers
  - Sales and marketing activities
  - Financial management

AND the **overall control of the enterprise**



# CIM is ALSO...

## A strategy:

- Getting the **right** information ...
- At the **right** time ...
- To the **right** place ...

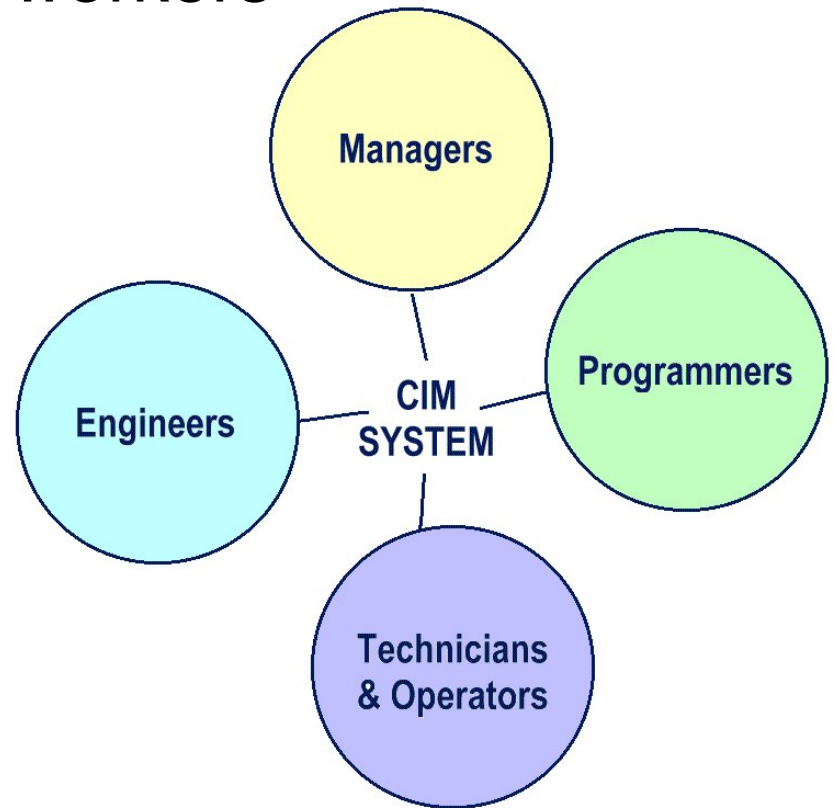
**For decision making**



# Putting CIM Theory to Work

CIM does not replace workers

Rather, it requires  
**technicians,**  
**programmers,**  
**engineers** and  
**managers** who are  
competent and  
skilled in CIM  
technologies





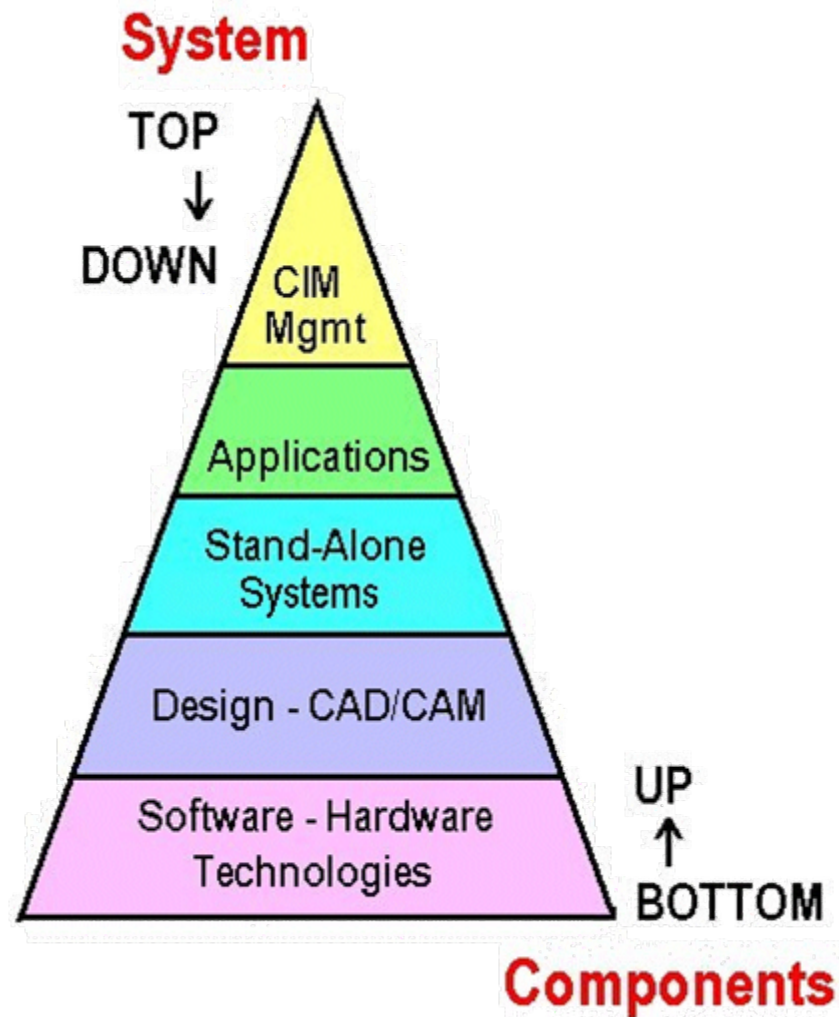
# Educational Trends in CIM Training

Together with the expansion of CIM in industry, institutions of higher learning have intensified their efforts to train workers skilled in the implementation and integration of software and hardware required for automated manufacturing and CIM.

**Bridging the gap between classroom and industry**



# Approaches to CIM Training



# Educational Trends in CIM Training

Students must acquire general knowledge of product design and manufacturing along with their specific education in mechanical, electrical, electronics or other engineering fields.



Students must also have background and knowledge from related technical fields that will sufficiently equip them for successful careers in computer integrated manufacturing environments.

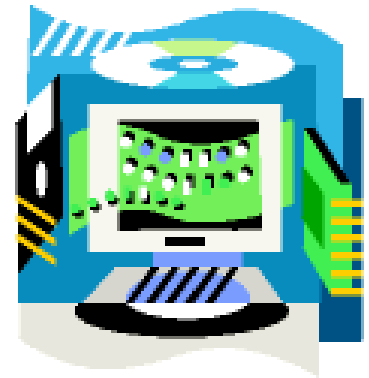
# Topics in CIM Training

- Manufacturing processes and materials
- Computer-aided design, engineering, manufacturing, process planning
- Inventory control, economic order quantity, lot-sizing
- Modeling manufacturing lead time
- Computer-aided production management,
- Materials and manufacturing resource planning (MRP)
- Just-in-time techniques, optimized production
- Shop floor data collection and control



## Topics in CIM Training (cont'd)

- Flexible manufacturing systems
- Material handling systems
- Low level devices, sensing and actuation
- Quality control, statistical process control
- Computer-aided inspection and testing
- Robotics, automatic assembly
- Systems-analysis and design tools
- Human and financial issues



# CIM Training Cell - **Basic Elements** (example 1)

Closed-loop  
pallet conveyor

Automatic  
storage and  
retrieval  
system  
(ASRS)

Open CIM  
software

At least one  
work station

Central management  
control station

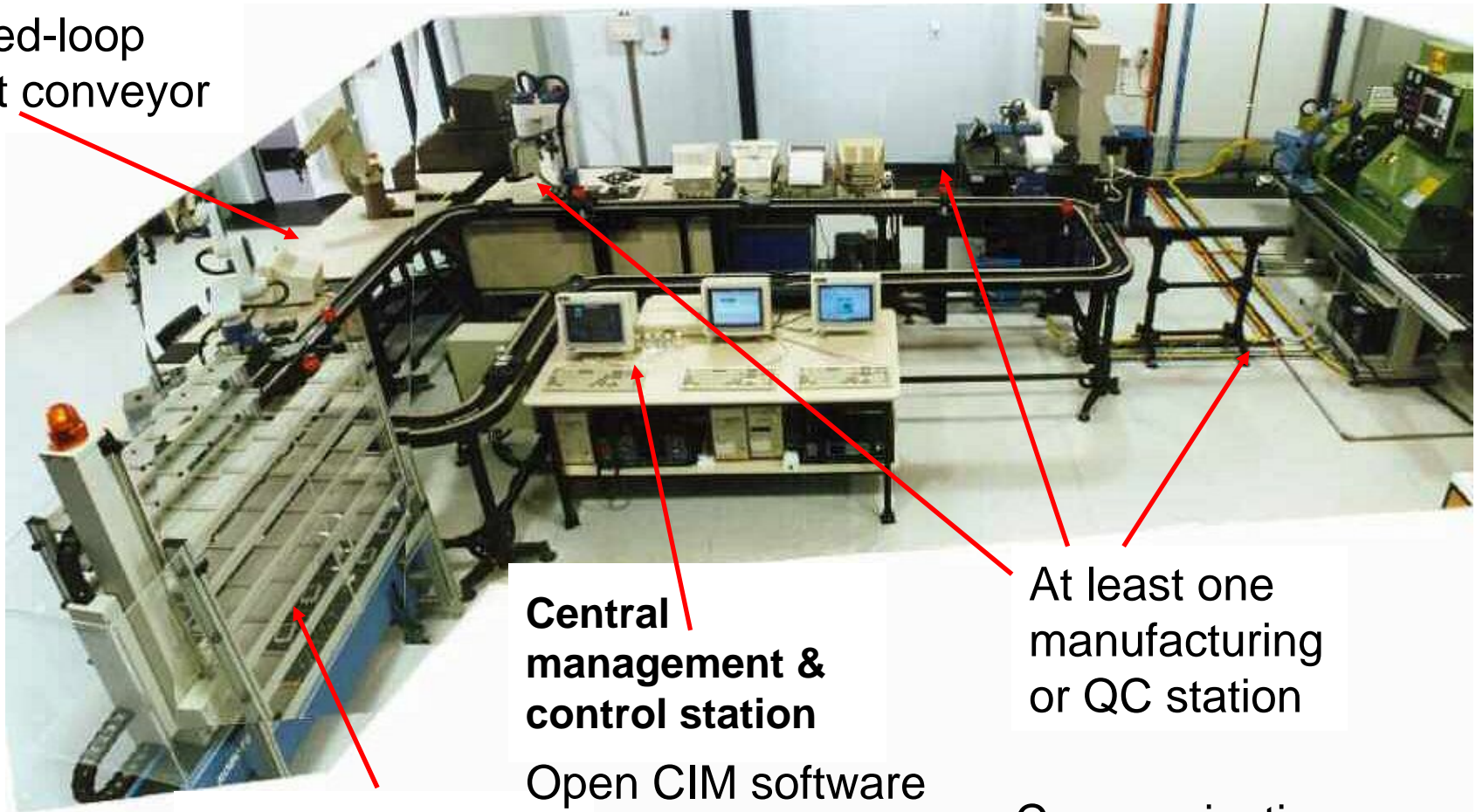
Communication  
network(s)





# CIM Training Cell - **Basic Elements** (example 2)

Closed-loop  
pallet conveyor



**Central  
management &  
control station**

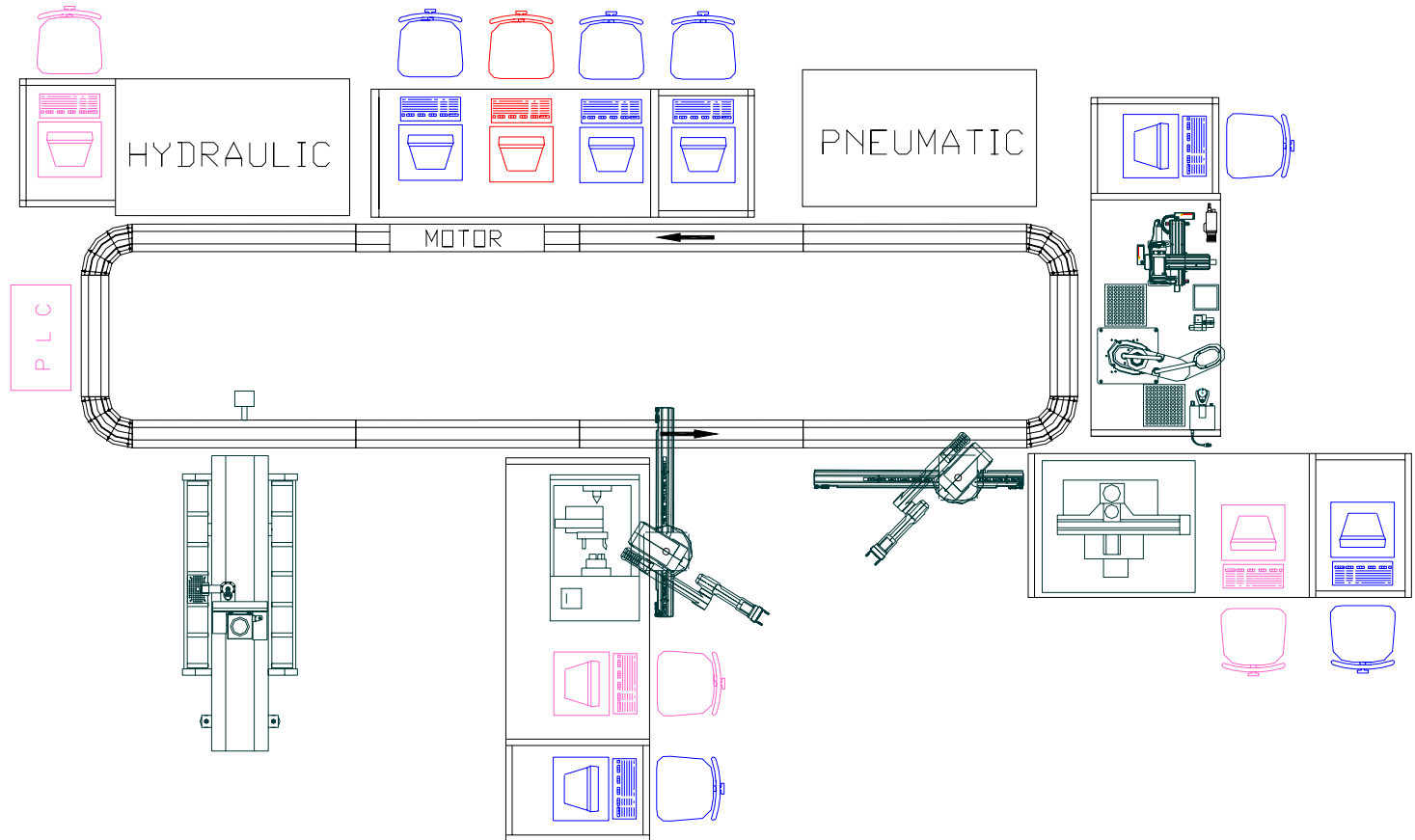
Open CIM software

At least one  
manufacturing  
or QC station

**Automatic storage  
and retrieval  
system (ASRS)**

Communication  
network(s)

# CIMflex - Basic Configuration





# ASRS Station: Automatic storage and retrieval

- Automated Storage and Retrieval
- Barcode - Automatic Identification
- Robotics
- Inventory Control
- Information Systems



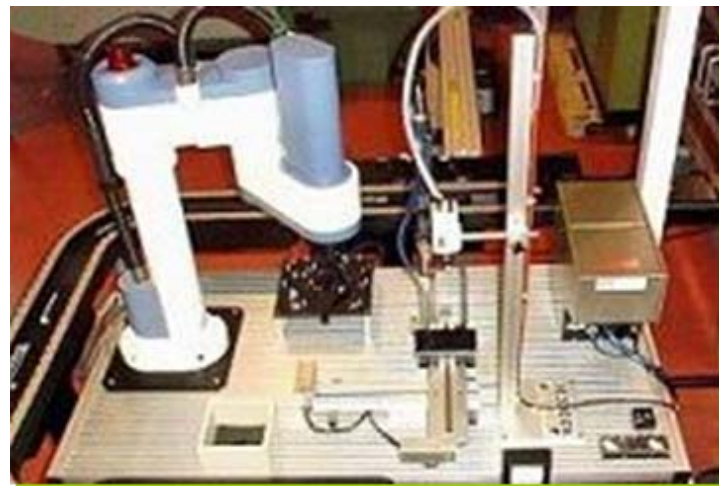
# CIM Station: Machine Tending (FMS)



- CNC Machining
- Robotics
- CAD/CAM
- Flexible Manufacturing
- Materials Specification
- Rapid Prototyping
- Machine Design
- Shaping of Materials
- Cutting of Materials

# CIM Station: Assembly

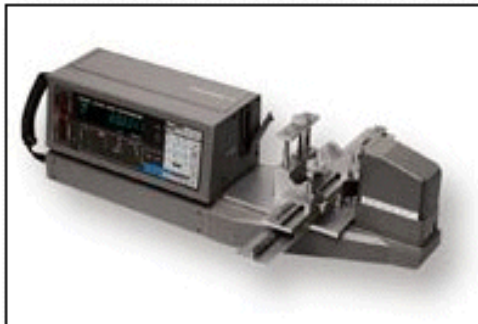
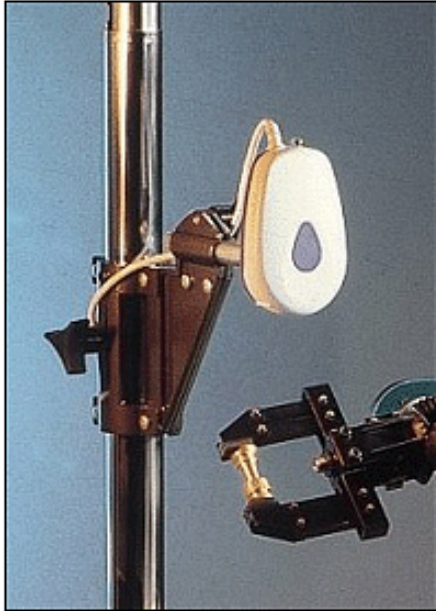
- Low Cost Automation
- Robotic Workcells
- CAD/CAM/CAE
- Design for Production
- Machine Design
- Production Control





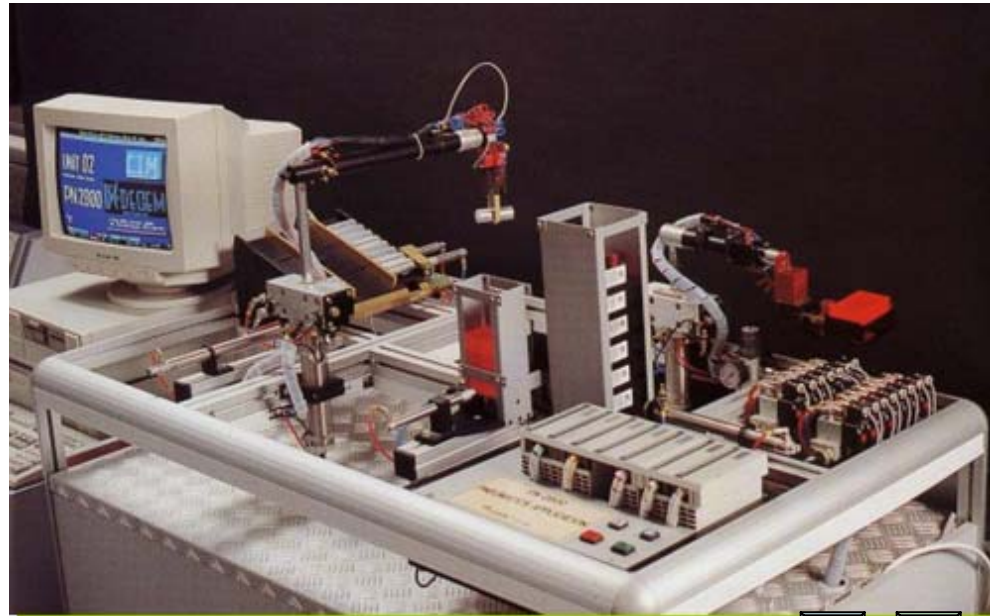
# CIM Station: Quality Control

- Machine Vision
- Inspection Devices:  
CMM, LSM, caliper, etc.
- Mechanical Measurement
- Quality Function  
Deployment
- Quality Systems
- TQM



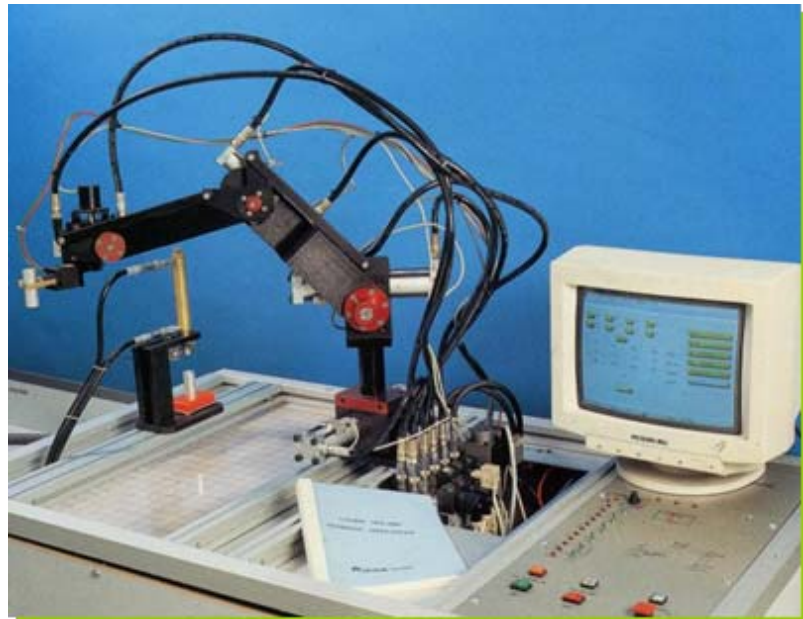
# CIM Station: Pneumatic Feeding

- Pneumatic Systems
- Sequencing Control
- Sensors
- Materials Handling
- Inspection Processes



# CIM Station: Hydraulic Press

- Hydraulic Systems (robot, press)
- Hydraulic Components (valves, pistons, etc.)
- Fluid power and control
- Manufacturing processes



# CIM Station: Other Applications

## Process Control

- Production Control
- Coating Processes
- Level Control
- Flow Control
- Temperature Control
- Proportional (P) Control
- Integral (I) Control
- Derivative (D) Control



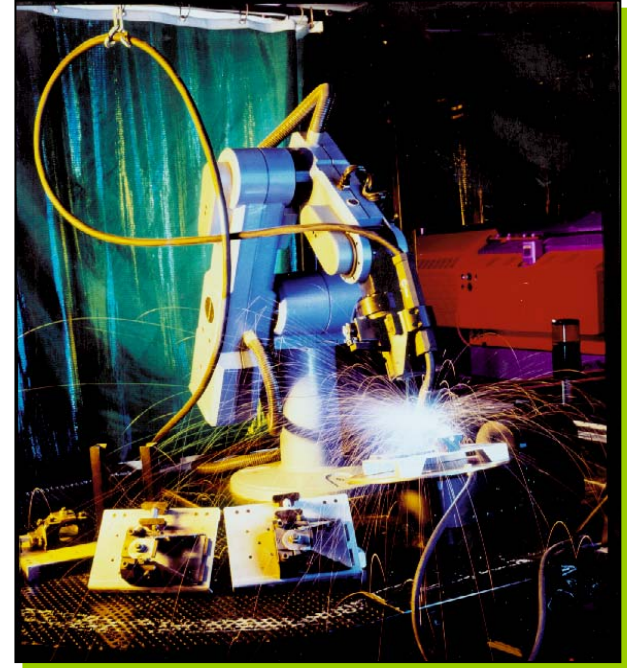


# CIM Station: Other Applications



## Laser Engraver

- CAD/CAE
- Design for Production
- Machine Design

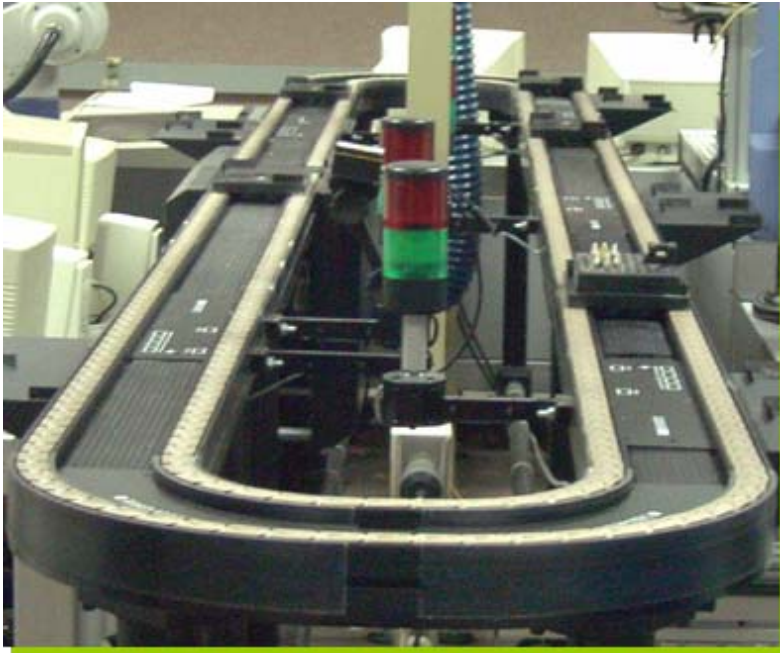


## Automated Welding

- Robotic Work Cells
- Production Control



# Conveyors and Materials Handling

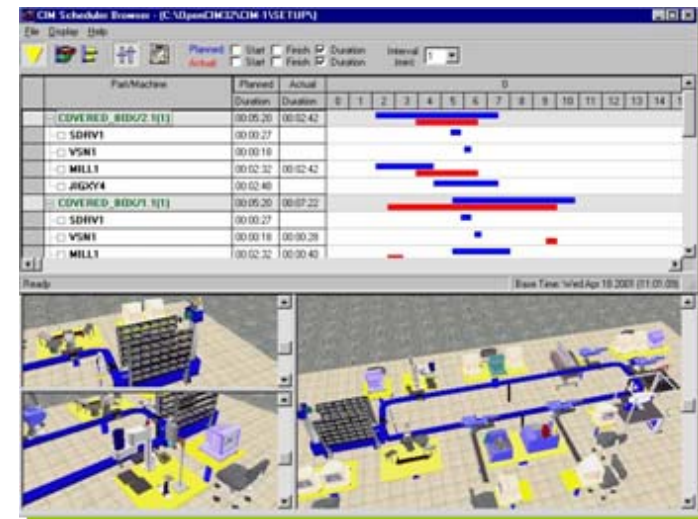


- PLCs
- Sensors
- Automatic ID systems
- Pneumatics
- Operations engineering
- Communication networks
- Information systems
- Field bus communication



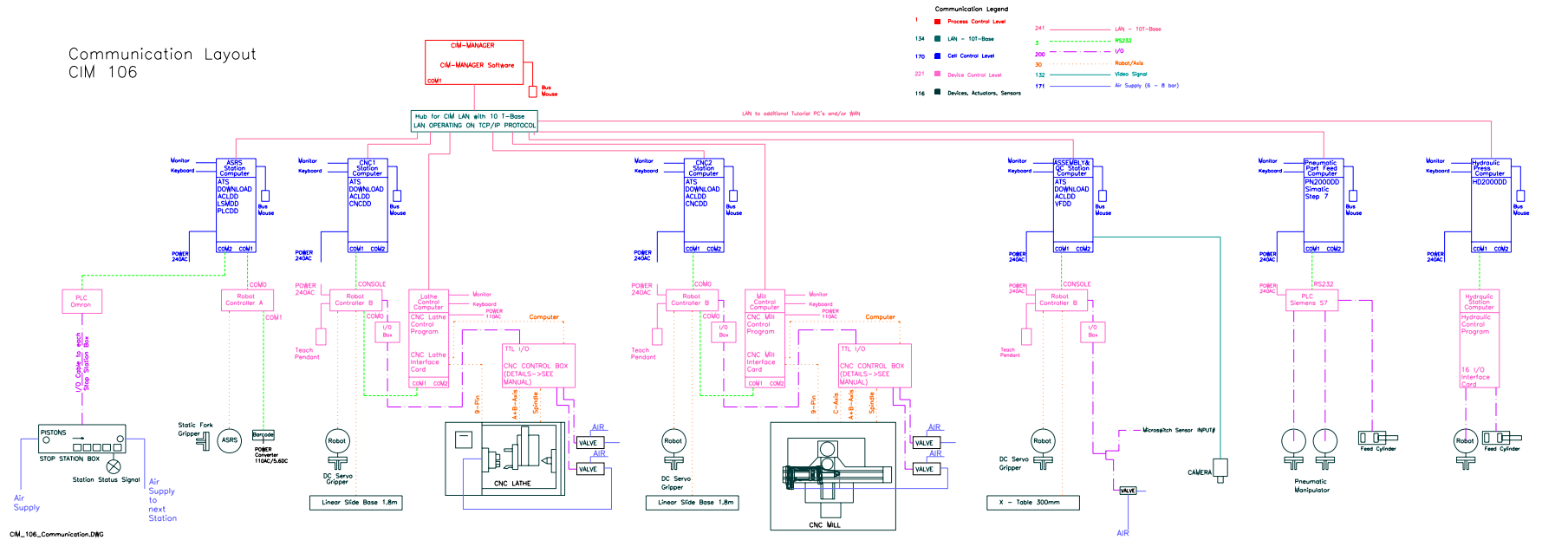
# Central Management Control Station

- Supervisor Communication and Data Acquisition (SCADA)
- Materials Requirements Planning (MRP)
- Computer Aided Design and Computer Aided Manufacturing (CAD/CAM)
- Quality Control (QC)
- Statistical Process Control (SPC)



# CIMflex - Communication Network

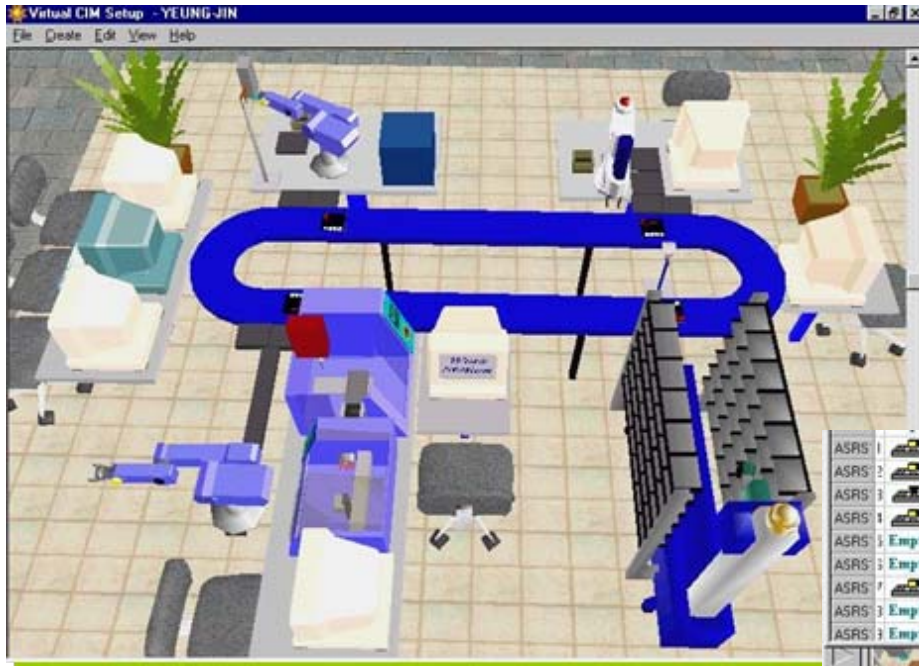
Communication Layout  
CIM 106



DECEMBER 2001



# OpenCIM Software



ASRS	Item	Location	Status
ASRS 1	CUBE	TEMPLAT 11	
ASRS 2	COVEREC	TEMPLAT 11	
ASRS 3	TEMPLAT	11	
ASRS 4	CUBE	TEMPLAT 11	
ASRS 5	Empty	EMPTY 11	
ASRS 6	Empty	EMPTY 11	
ASRS 7	CUBE	TEMPLAT 11	
ASRS 8	Empty	EMPTY 11	
ASRS 9	Empty	EMPTY 11	

Machine	Status	Product	W. No.
36ASF	STOP		W 11
ROBO	STOP		W 21
ROBO	STOP		W 31
RDR1	STOP		W 13
MILL1	STOP		W 23
VSN1	STOP		W 33
SDRV	STOP		W 34

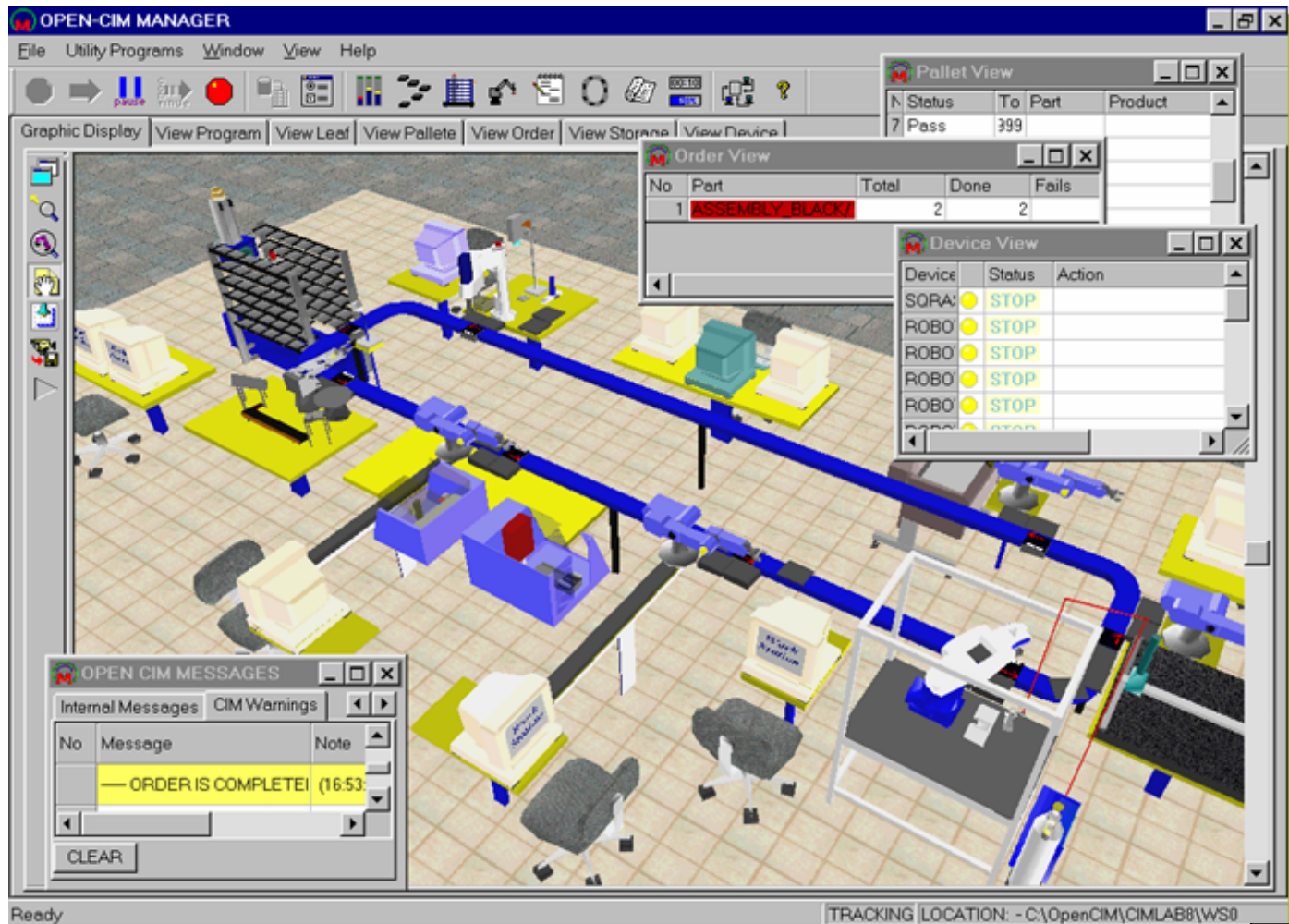
Sub Part	Action	Status	P. Bal	Lt
BOX11	DELIVER TEMPLA		1 106	3 61
of PROCE	→ SCREWING BO			21
BOX12	MILL1 BOX MILL1		1 112	4 61

Rel.	To Part	Product	Template
1	3 BOX	BOX	TEMPLA
2	3 BOX	BOX	TEMPLA
3	Pass K99		
4	Pass K99		
5	Pass K99		
6	Pass K99		
7	1 BOX	COVERED_B	TEMPLA



# Virtual CIM Cell Design - 3D Simulation



# Educational CIM Training Cell

## Lab Features:

- Educational (non-industrial) robots and machine tools
- Basic manufacturing system
- CAD/CAM, Simulation, Management software



# Educational/Industrial CIM Training Cell

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- Industrial robots and educational machine tools
- Expandable and versatile configuration
- **Project Integration Station** with 4 PLCs and 2 industrial robots.



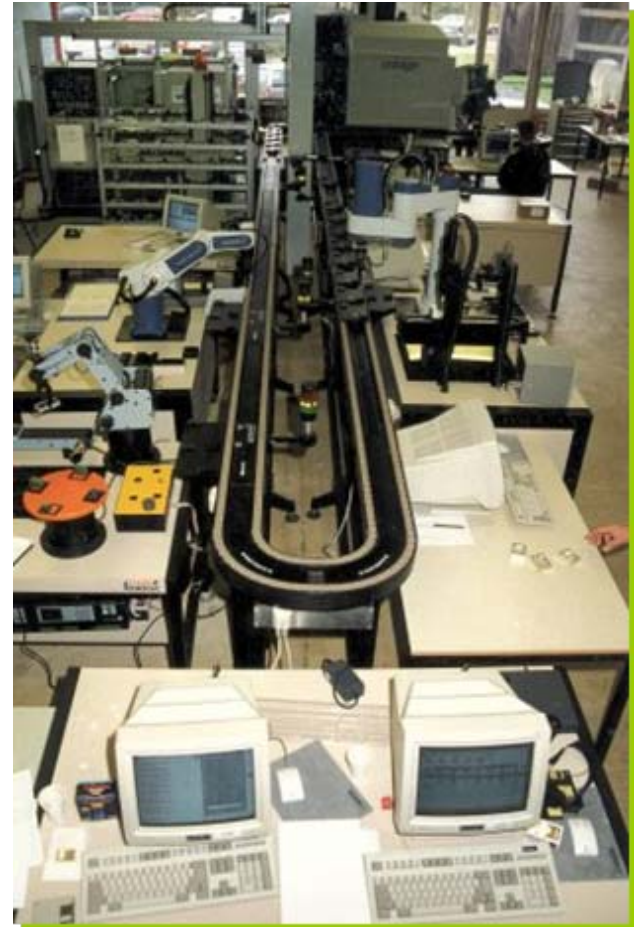
- |           |                     |
|-----------|---------------------|
| •Lifting  | •PLC Control        |
| •Pressing | •DC Servo Control   |
| •Drilling | •Linear Positioning |
| •Stamping | •Rotary Devices     |



# R&D /Industrial CIM Training Cell

## Lab Features:

- Industrial machine tools and educational robots
- Expandable and versatile configuration
- **Project Integration Station** for robotics and quality control applications





# CIMflex ADVANTAGES...

- Can combine industrial and non-industrial manufacturing equipment
- Can integrate many different robots, tools and devices
- “Open” system:
  - Expandable and versatile configuration
  - Stations for project integration
  - Large conveyor
  - High-capacity ASRS

