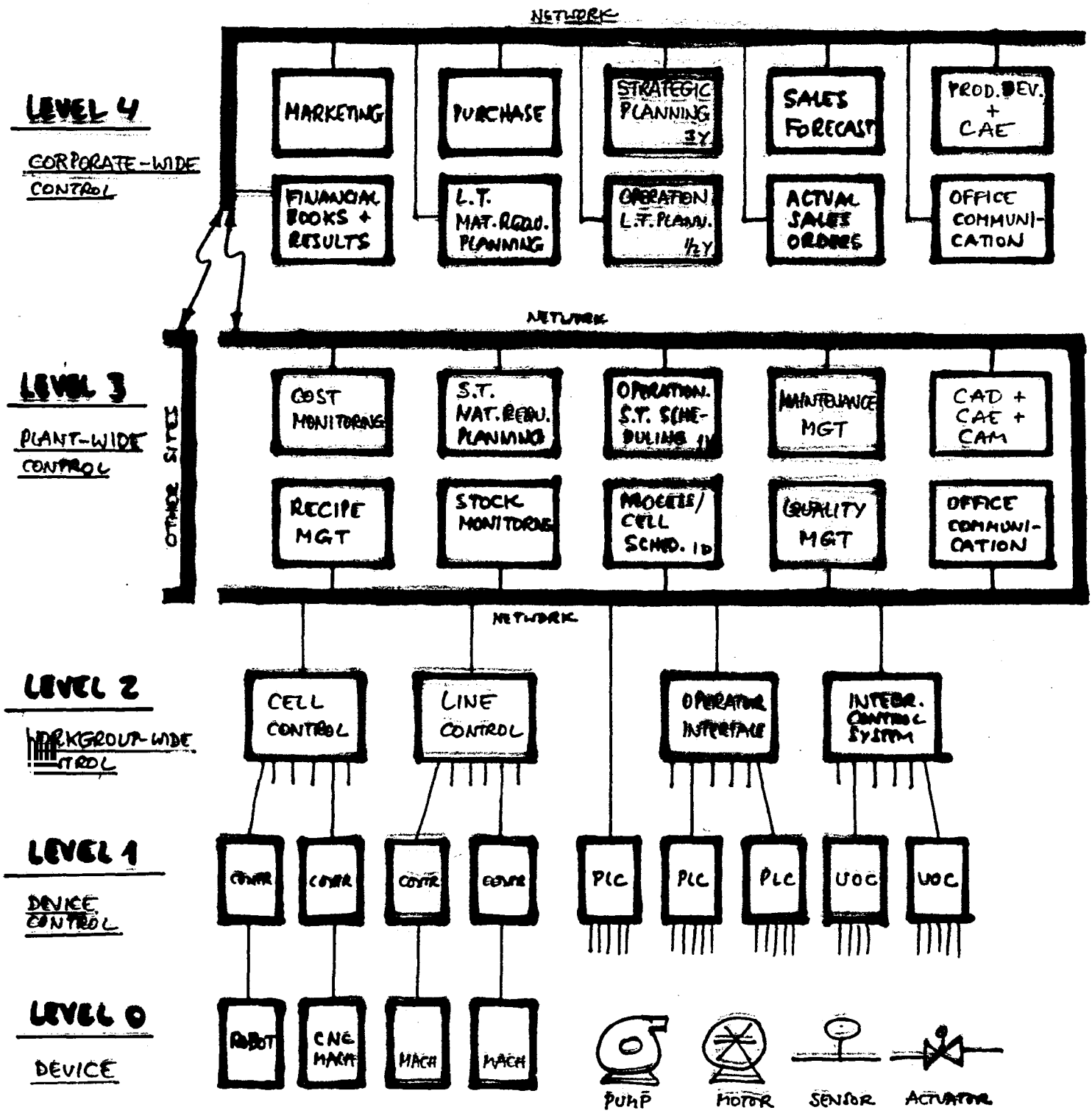
MANUFACTURING FUNCTIONAL MODEL



HJ Vos
APR 88

NETWORK APPLICATIONS IN CIM

- TWO CLASSES OF EQUIPMENT
  - GENERAL PURPOSE COMPUTERS
    - DESIGN, FINANCE, SALES
    - MRP, PROCESS ENGINEERING
    - CELL CONTROLLERS, DISTRIBUTED PROCESS CONTROL
  - MANUFACTURING DEVICES
    - ROBOTS
    - PLCs
    - N/C MACHINES
    - PROCESS CONTROLLERS
- REQUIRE TWO DIFFERENT SOLUTIONS
  - ENTERPRISE-WIDE COMPUTER NETWORK
  - DEVICE CONNECTION SUBNETWORK

Enterprise Wide Network:

- DECNET/ETHERNET #1 computer LAN IN MANUFACTURING TODAY.
  - Performance
  - Reliability
  - Flexibility
- DECNET functionality for factory:
  - Diskless nodes.
  - Down line loading
  - Remote booting.
- Most fexible product set.
  - Terminal servers.
  - Bridges , Routers Repeaters.
  - Gateways - X25 , SNA , TCP/IP.
  - Printservers.
  - Baseband/Broadband Ethernet.
  - VMS , RSX , VAXELN ULTRIX support.
  - DECNET DOS integrate the PC.
  - Distributed System Services.

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Digital's Leadership in OSI

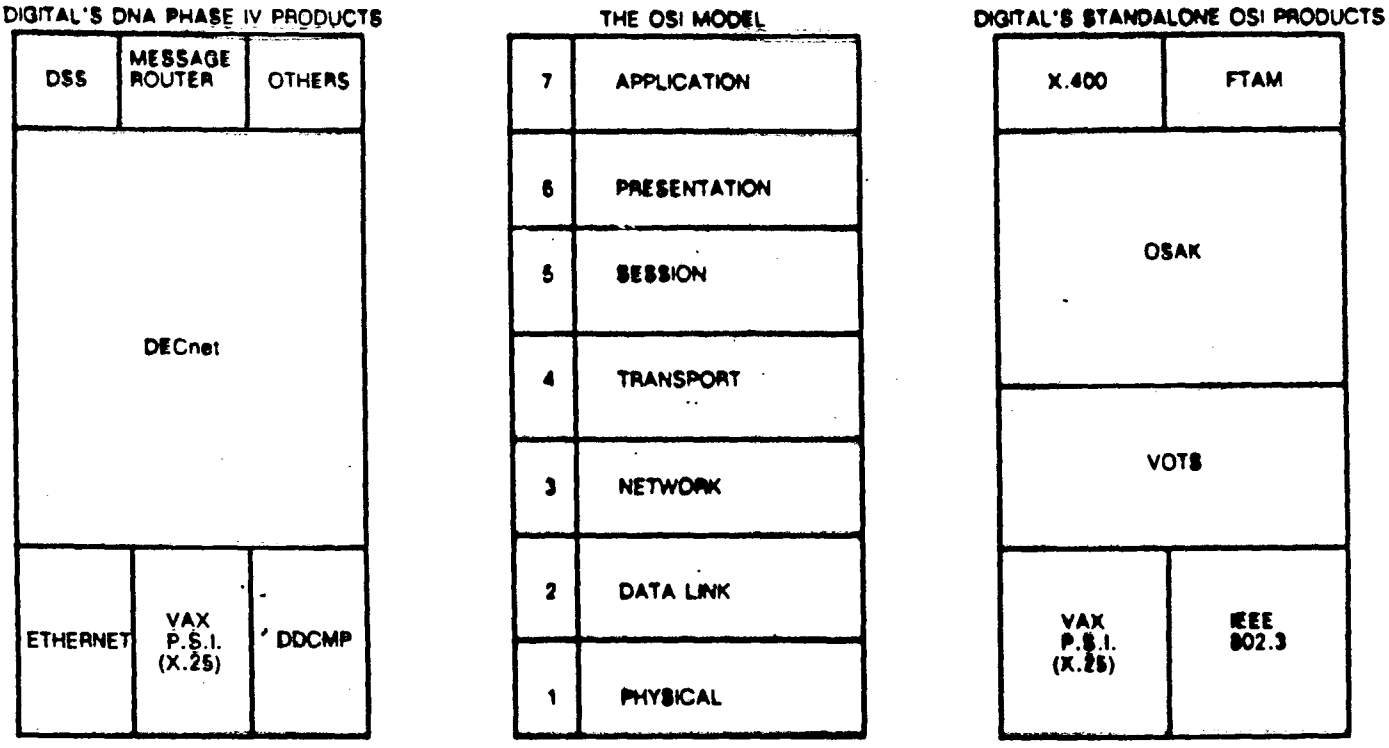
Digital is committed to OSI standards

- Strategic direction set in 1980
- Public commitment in 1985
- Shipped VOTS & OSAK in 1986
- Founding member of COS
- DNA/OSI Phase V announced September, 1987

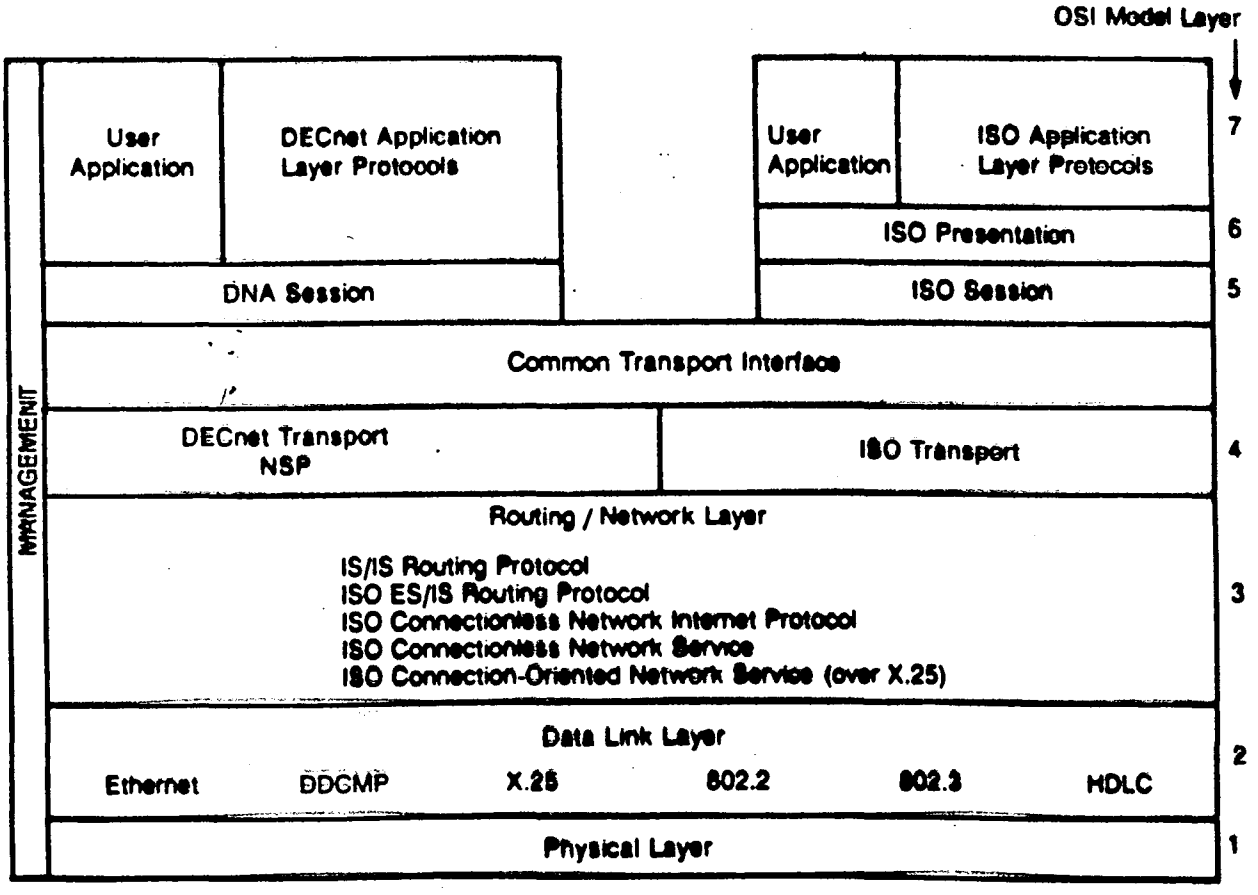
Will migrate DECnet to OSI

- OSI product leadership
  - X.400 - Mail
  - FTAM - OSI File Transfer
  - OSAK - OSI Session
  - VOTS - OSI Transport
  - 802.3 - Ethernet
  - X.25 - PSI
  - VAX DEC/MAP

DIGITAL'S STRATEGY: DNA AND OSI PRODUCTS *COEXIST* ON THE SAME NETWORK



DIGITAL'S STRATEGY FOR THE FUTURE: DNA AND OSI ARE *INTEGRATED*



DNA/OSI Phase V Architecture Overview

SYSTEMS SPECIFICATIONS TABLE

INDUSTRIAL VAX/PDP PRODUCTS

	Large Box 12-slots	Small Box 6-slots
OPERATING TEMP.	10 C to 40 C	05 C to 50 C
OPERATING RH %	20 % to 80 %	10 % to 95 %
MAXIMUM WET BULB TEMP.	25 C	32 C
MAXIMUM TEMP. CHANGE	11 C / hr.	20 C / hr.
OPERATING SHOCK	08 g, 10 ms.	10 g, 10 ms.
OPERATING VIBRATION	5-30 hz. .010" DA 30-500 hz. .5 g pk.	5-30 hz. .010" DA 30-500 hz. .5 g pk.
HEIGHT	24.4" (.62 M)	19.2" (.49 M)
WIDTH	17.5" (.44 M)	11.9" (.3 M)
DEPTH	11.5" (.29 M)	11.6" (.295 M)
WEIGHT (No Modules)	58 lbs. (26.3 kg)	30 lbs (13.6 kg)
MAX. POWER	675 Watts	340 Watts
MAX. HEAT	2304 Btu/hr.	1156 Btu/hr.
ACOUSTICS	42 dBA	38 dBA
STATIC DISCHARGE	10 KV	15 KV
RMS CURRENT	10.2 A Max. @ 100 VAC 4.7 A Max. @ 220-240 VAC	5.2 A Max. @ 100 VAC 2.3 A Max. @ 220-240 VAC
RIDE-THROUGH	1 Cycle Min., 3 Cycle Typ.	1 Cycle Min., 3 Cycle Typ.
APPARENT POWER (MAX.)	1030 VA	520 VA
POWER FACTOR	.65	.65
SURGES	600 V, Ipk=10A,T=10us	600 V,Ipk=10 A,T=10us
SPIKES	2.0 KV,Ipk=100A,T=10us	2.0 KV,Ipk=100A,T=10us

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Philips Presentation

Enclosures:

- Industrial VAX systems.
- E-series VAX systems.
- Serie 19.
- Ruggidised systems.
- Milspec systems.

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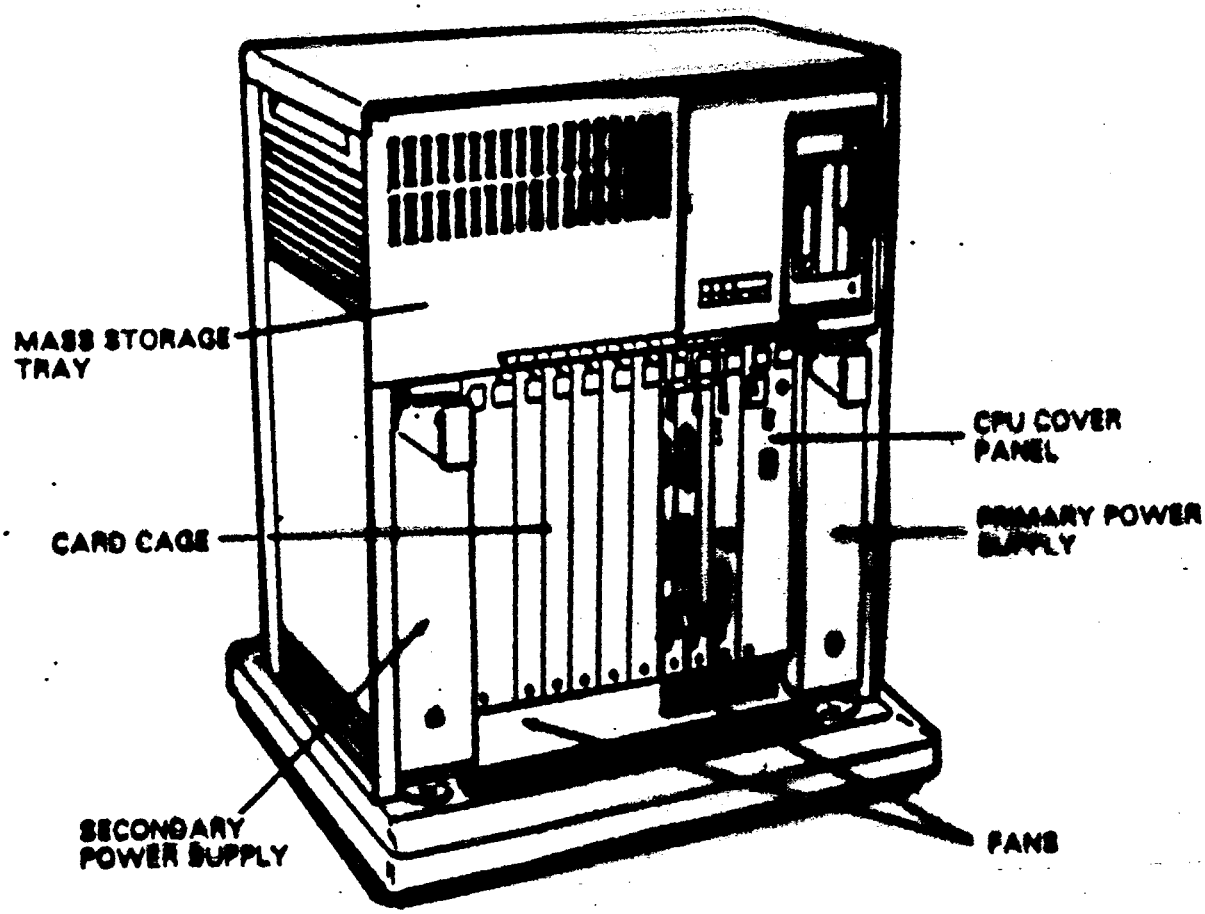
S-BOX enclosure:



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Device Connections Subnetwork:

- Direct IO:
  - Analoog I/O.
  - Digitaal I/O.
  - Industrial I/O
- Bus I/O:
  - IEEE I/O
  - Peripheral Processor.
  - Bitbus.
  - Ethernet.
  - MAP
  - Async Communication controllers.

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Device Connections Subnetwork:

Connection with leading vendors:

- Honeywell TDC 3000.
- Allan-Bradley
- Siemens Sinec H1.

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Micro-Bus I/O option for Programmeerbare Realtime klok

- 16 bit counter/divider.
- 5 tyd instellingen.
- 4 operation modes.
- 2 Schmitt trigger inputs.

Support onder VMS en ELN.

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BUS I/O:

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Micro-Bus I/O optie voor IEEE 488 naar de GPIB

IEQ11-CA

- Twee onafhankelyke IEEE-488 bussen.
- Data transfer op DMA basis.
- Iedere IEEE-488 controleert tot 14 devices.
- Support VMS.
- Support ELN.

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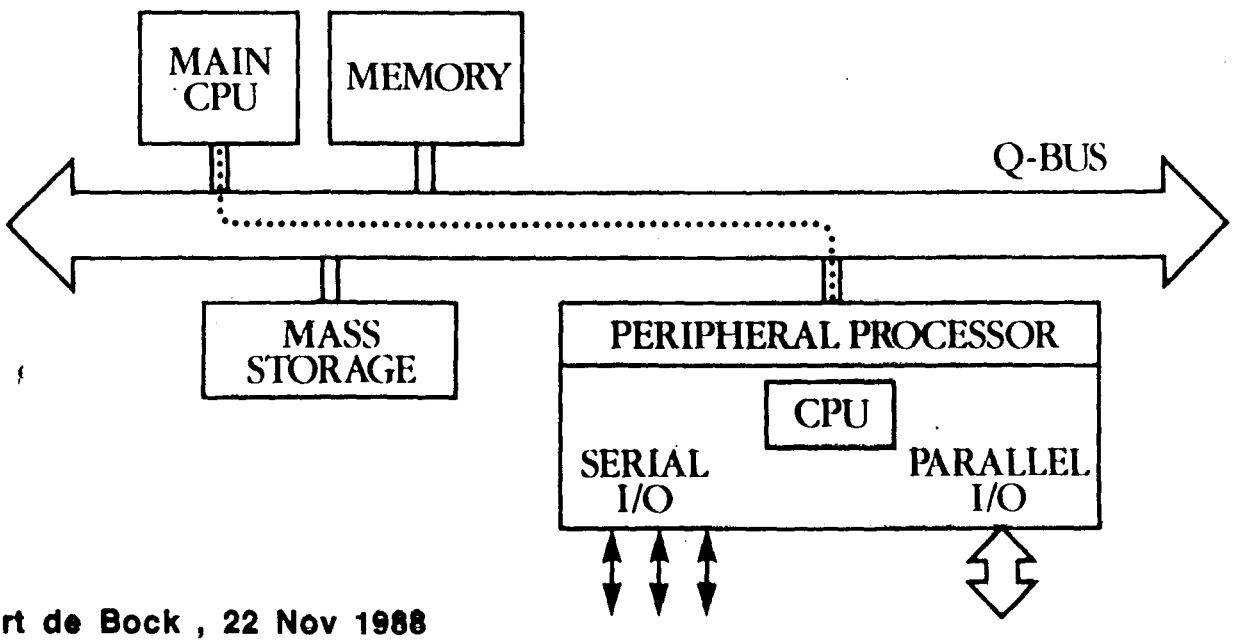
Micro-Bus I/O option for Peripheral Processing

Purpose of Peripheral processors:

- **Increased interrupt througput**
- **Improved interrupt response**
- **Minimise bus traffic**
- **Data reduction**
- **Protocol handling**



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Micro-Bus I/O option for Peripheral Processing

Beschikbare PP's:

- KMV1A : T11, 32kb mem , 1 com lyn.
  Speciaal voor communicatie protocollen zoals HDLC.
  Support onder VMS en ELN.

- KXT11-CA : T11, 32kb mem
  2 com lynen en 1 par poort(20 lynen).
  Support onder VMS : Toolkit en MPP.
  Protocol voor com met Siemens S5 PLC.
  VAX Dust onder VMS.

- KXJ11-CA : J11, 512kB mem
  2 com lynen 1 par poort (20 lynen)
  Drie 16 bits timers.
  Support onder VMS : Toolkit en MPP.

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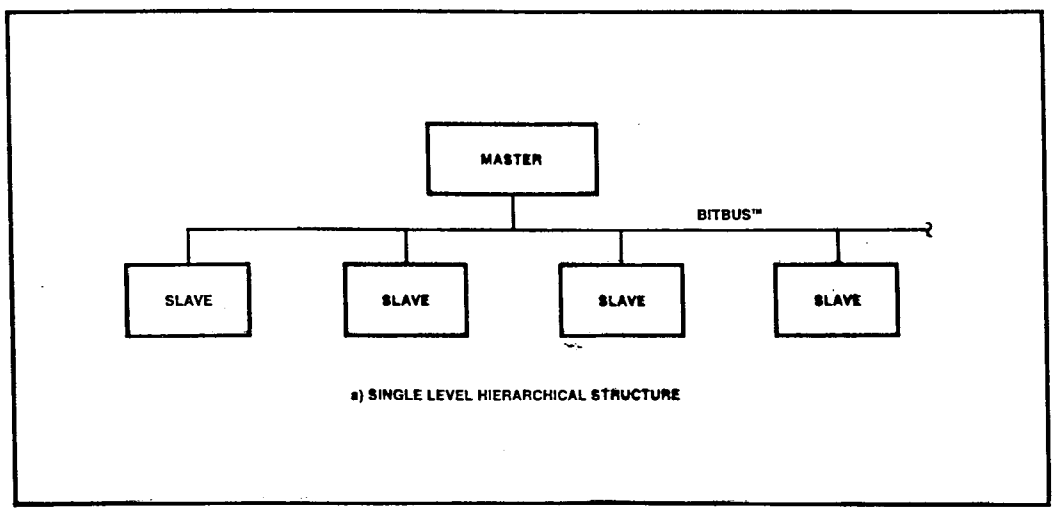
Micro-Bus I/O option for Bitbus Communication

Wat is bitbus ?

- Een open architecture voor communicatie tussen laag 0 en laag 1 , gedefinieerd door INTEL.
- Een seriele bus voor communicatie tussen proces computer en intelligente substations.
- Een bus een niveau onder Ethernet-Map.
- Een real-time bus voor besturingsdoeleinden.
- Een bus die nu beschikbaar is.
- Open communicatie architecture volgens OSI.
- Master-slave relatie tussen de bus units.



a) SINGLE LEVEL HIERARCHICAL STRUCTURE

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Micro-Bus I/O option for Bitbus Communication

Software support:

Driver plus 8044 cross assembler

onder VMS en ELN

Toolkit onder VMS voor het bouwen van een

I/O process control of data monitoring applicatie

Interactieve definitie van bitbus configuratie

Afscherming hardware via IOV ' s

Limit Alarms

State Alarms

On/Off closed loop en PID closed loops

Action sets

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Micro-Bus I/O option for Bitbus Communication

IOV Support:

1. Honeywell SID 2000 modules:
   Analog I/O.
   Sensor inputs.
   Temperature inputs.
   Thermocouple inputs.

2. Phoenix IB-C modules:
   Analog I/O.
   Digital I/O.

3. Intel modules:
   Digital I/O.

Deze zomer:
Guide to writing an IOV.

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Micro-Bus I/O option for Bitbus Communication

Performance voor configuratie:

- **Micro-Vax 2 met IBQ01 controller**
- **VMS met DECSCAN toolkit**
- **Bitbus snelheid 375 kbit/sec**

400 berichten per seconde

Per micro-vax2 tot 8 IBQ01 controllers

Iedere IBQ01 kan tot 250 slave devices supporten

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Micro-Bus I/O option for MAP:

DTQNA: Digitals Token-bus to Q-bus Network Adapter.

Implements MAP version 2.1

DECMAP includes:

- **FTAM: File Transfer, access and Management.**
- **CASE: Common Application Service Elements.**
- **MMFS: Manufacturing Message Format Standard.**
- **CSA: Directory Services/Client Services.**

DIGITAL intends to support MAP V3.0.

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Micro-Bus I/O option for Ethernet:

DESQA: Ethernet to Q-bus communication controller.

Interface to:

- **Ethernet cable.**
- **Thin wire cable.**

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Micro-Bus I/O option for Async serial communication:

- CXA16 : 16 lines , DEC423.
- CXB16 : 16 lines , EIA423.
- CXY08 : 8 lines , Full modem.
- DHF11 : 16 or 32 lines fiber optic link.
- DHQ11 : 8 lines full modem.
- DLV11J: 4 lines limited modem support.
- DZQ11 : 4 lines limited modem support.

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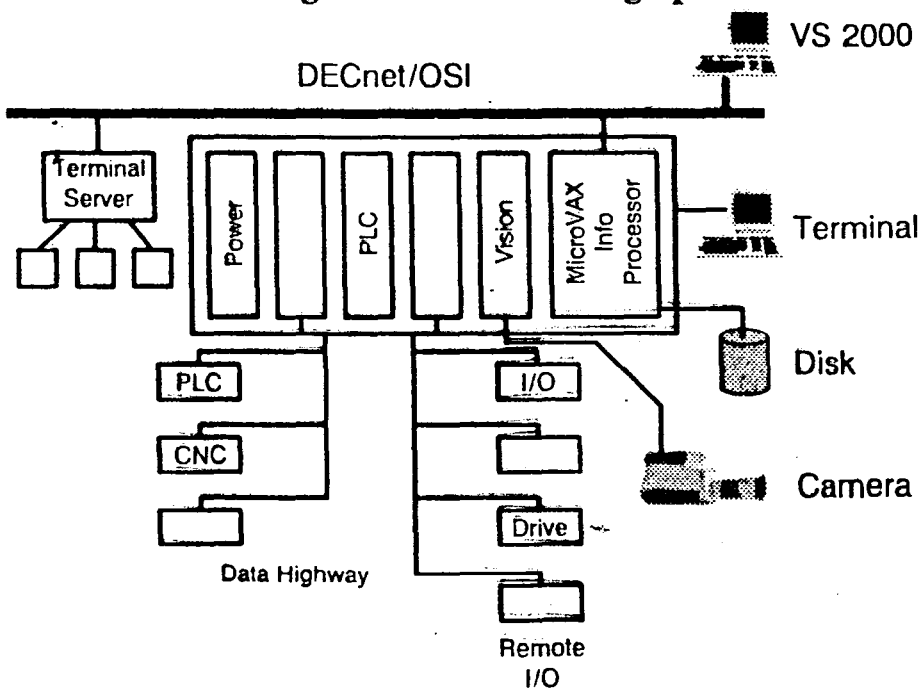
Micro-Bus I/O option for Allan-Bradley:

ALLEN-BRADLEY'S PYRAMID INTEGRATOR WITH MicroVAX™ INFORMATION PROCESSOR

VAX, VMS AND DECnet IN ALLEN-BRADLEY'S NEXT GENERATION OF CONTROLLERS

- Backplane interconnect for high-speed data access
- Supervision and coordination of PLC and vision controllers
- MicroVAX CPU with 8 MB memory
- Software included
  - VMS operating system, single-user license
  - DECnet connection
  - Local Area VAXcluster Software
  - Standard windowing user interface with graphics



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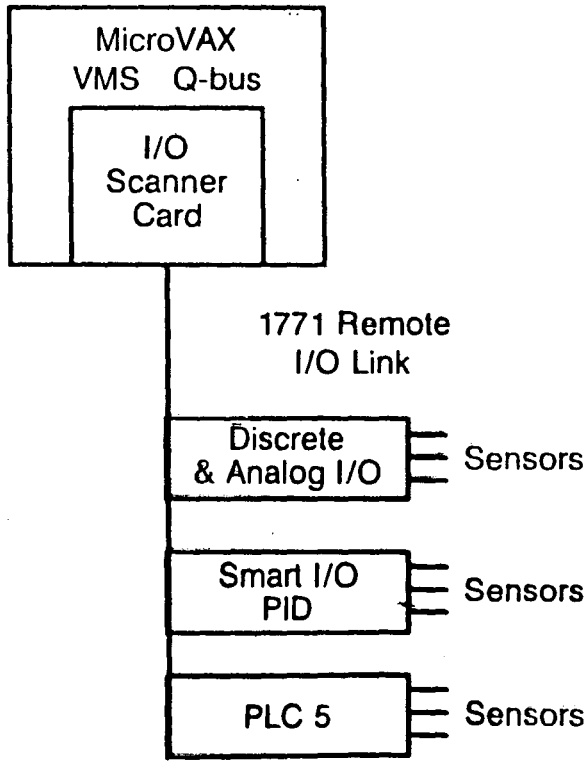
Micro-Bus I/O option for Allan-Bradley:

ALLEN-BRADLEY'S DATA ACQUISITION & CONTROL SUBSYSTEM

- Allen-Bradley 1771 industrial I/O system connected to the Q-bus scanner card
- I/O scanner card connected to the Q-bus backplane of a MicroVAX
- Scanner utility software on VMS
  - Configure 1771 I/O subsystem
  - Monitor I/O; installation and debug
  - Scanner manager
  - Named data in VAX global memory



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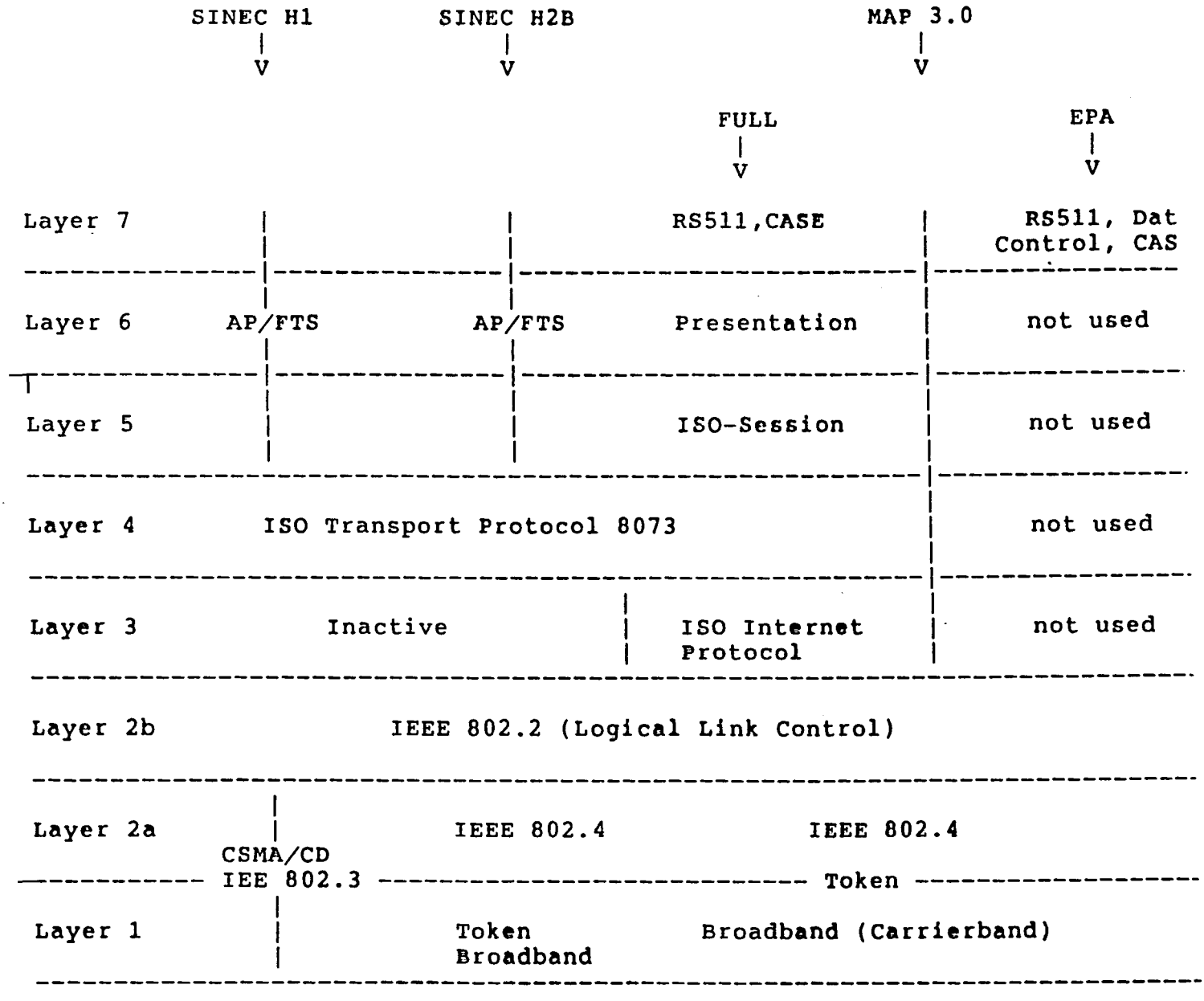
SINEC - PROTOCOL LAYERS



Note:

1) FTS is a file transfer protocol commonly used in Siemens.
2) Siemens uses Ethernet over triax cable. DEC uses Ethernet over coax cable.

IMPORTANT:

2.3 Other Siemens communication protocols (NONE SINEC)

LSV2

Used in NC market and RC market. Protocol is widely spread and has a large installed base.

Products using LSV2 are:

SINUMERIK (NC) and
SIROTEC (RC)

3964 (DUST)

Historical solution to connect SIEMENS computer to SIEMENS shop floor devices, such as:

to PLC's, S5 devices (including the PG programming devices), (S5 = SIMATIC S5, Programmable controllers (S5-115U,-135U,-150U) and SIMATIC S5 Programmers (PG675,685)

to the Process Monitoring and Control System, TELEPERM M,

to Factory Data Collection devices like ES120/121,

to Personal Computer, PC 16-11

to Micro Computer System, SMP, AMS

The SIEMENS specified protocol is based on RS232 (Point to point) and covers communication layers 1, 2a, 2b.

MAP V2.1

Some implementations of MAP V2.1 exist. This version not included in the SINEC architecture.

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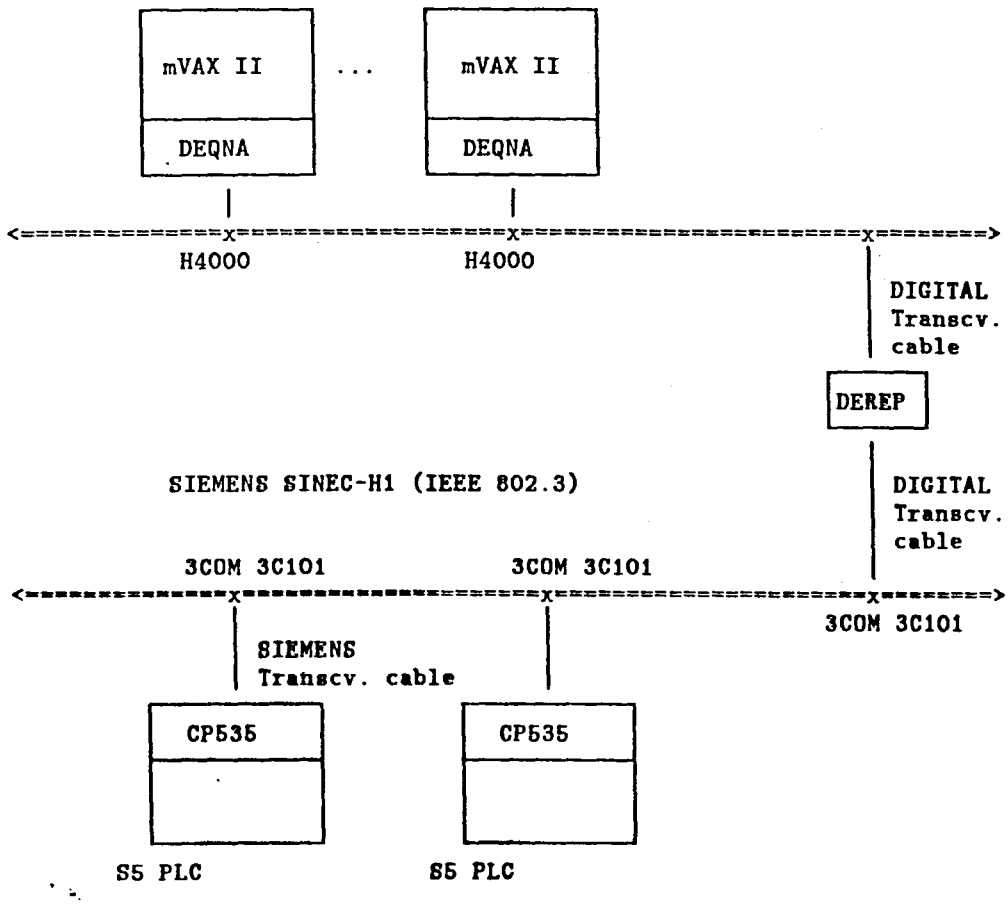
Micro-Bus I/O option for Siemens Sinec H1:



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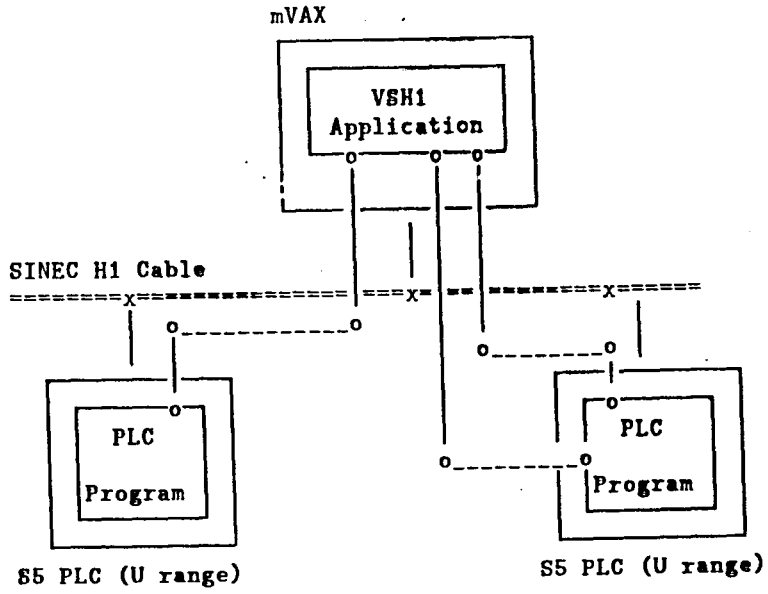
Micro-Bus I/O option for Siemens Sinec H1:



Application layer	protocol for MESSAGE EXCHANGE and Data Elements values (VSH1 Applications)
Presentation layer	not implemented
Session layer	Device Window Logical Connections to access PLC memory locations and to exchange Messages (VSH1 Software)
Transport layer	ISO IS8073 ECMA 72,Class 4 (VOTS Software)
Network layer	not implemented ,NSAP is IEEE
Link layer	LL Control IEEE 802.2 Media Access Control CSMA/CD (Ethernet Interface Board)
Physical layer	IEEE 802.3 (Ethernet Interface Board)

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CHAPTER 1

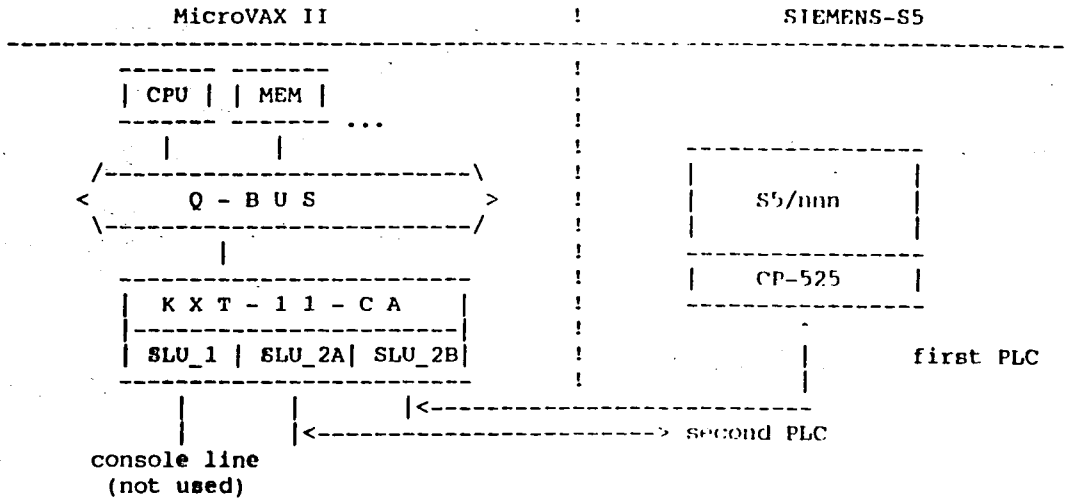
OVERVIEW OF VAXDUST

This chapter will give an overview of VAXDUST, a software package that allows a programmer of process-monitoring or process-control applications to exchange data with a PLC of the S5-family from SIEMENS.

The VAXDUST package runs on DIGITAL's MicroVAX II. The S5-family PLCs are connected to a serial port (EIA) of an KXT11-CA single-board computer which in turn is used as an I/O-processor (slave) of the MicroVAX II (host). Physically the KXT11-CA is plugged into the MicroVAX II's Q-Bus.

A maximum of two PLCs may be connected to a KXT11-CA. A maximum of eight KXT11-CAs may be used in one MicroVAX II for VAXDUST, thus allowing the connection of up to sixteen S5-family PLCs to one MicroVAX II.

The following figure shows the basic hardware components of a system running VAXDUST.



CPU,MEM, ...	components of the bus-arbitrator MicroVAX II (host)
KXT-11-CA	slave CPU in the Q-BUS
SLU_2A, SLU_2B	serial lines, doing the 3964R- and the S5-protocol
S5/nnn	PLC-family from SIEMENS
CP-525	communication-front-end of the PLC