

PROFIBUS - FMS

System), (Cluster Tool),
(In-Line) (Track)

/ (KAIST)

(Cell Controller)

<

(System Controller)

>

PROFIBUS,

WorldFIP, Foundation Fieldbus

I/O

(I/O)

PLC(Programmable
Controller)

Logic
I/O

PROFIBUS - FMS(Fieldbus Message
Specification), SubMMS(Sub - Manufacturing
Message Specification), FMS(Fieldbus
Message Specification)

PROFIBUS, WorldFIP,
Foundation Fieldbus, CAN, DeviceNet,
LonWork, Interbus
(Fieldbus)가

가

PROFIBUS - FMS

가

(IEC 61158 FDIS)

PROFIBUS - FMS

PLC

PROFIBUS 가

가

PROFIBUS - DP(Decentralized Peripherals)
I/O

, 가 , NC, Robot, Process
Module,

PROFIBUS -

Robot (Robot Cell),
(Flexible Manufacturing

PA(Process Automation)

PROFIBUS-FMS I/O
 PLC, NC, Robot, PC, MMI(Man -
 Machine Interface)

FMS

1

1

FM7(Fieldbus Management) 7) FMS

, OD

FMS

13가

가

39가

PROFIBUS-FMS

FMS

FMS PROFIBUS-FMS

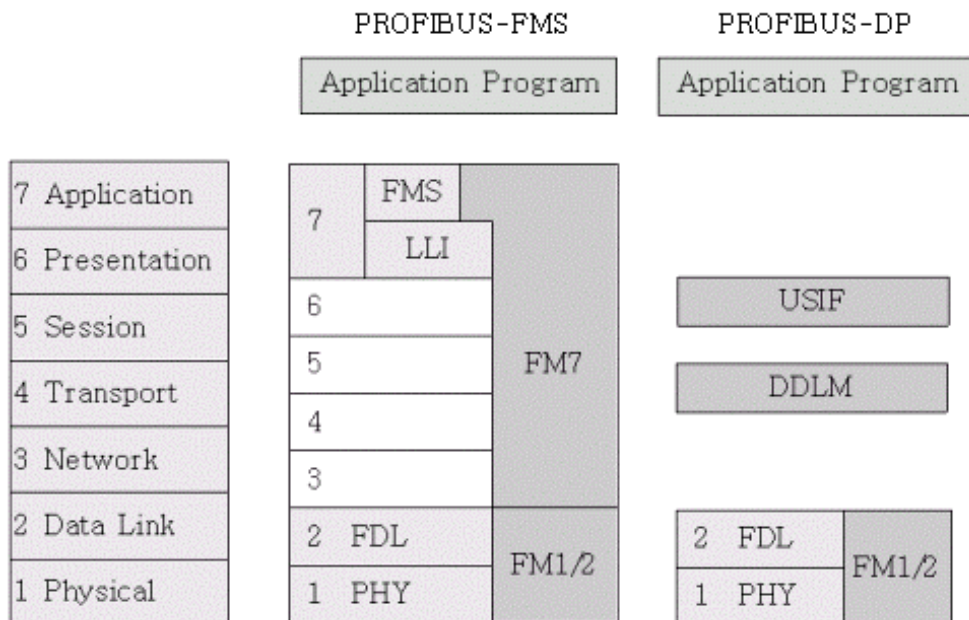
GM(General Motors) '80

PROFIBUS-DP

MAP(Manufacturing Automation Protocol)

PROFIBUS-FMS DP

'90



FMS : Fieldbus Message Specification FM : Fieldbus Management

LLI : Lower Layer Interface FDL : Fieldbus Data Link

USIF : User Interface DDLML : Direct Data Link Mapper

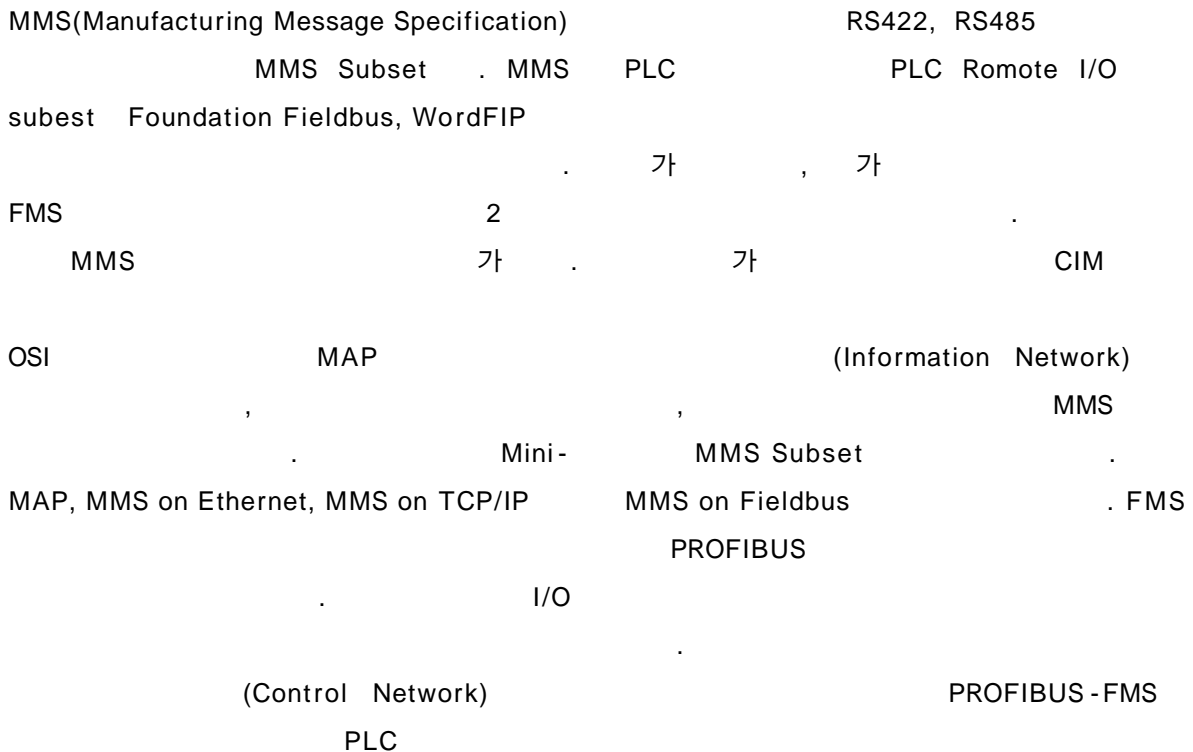
1. PROFIBUS-FMS

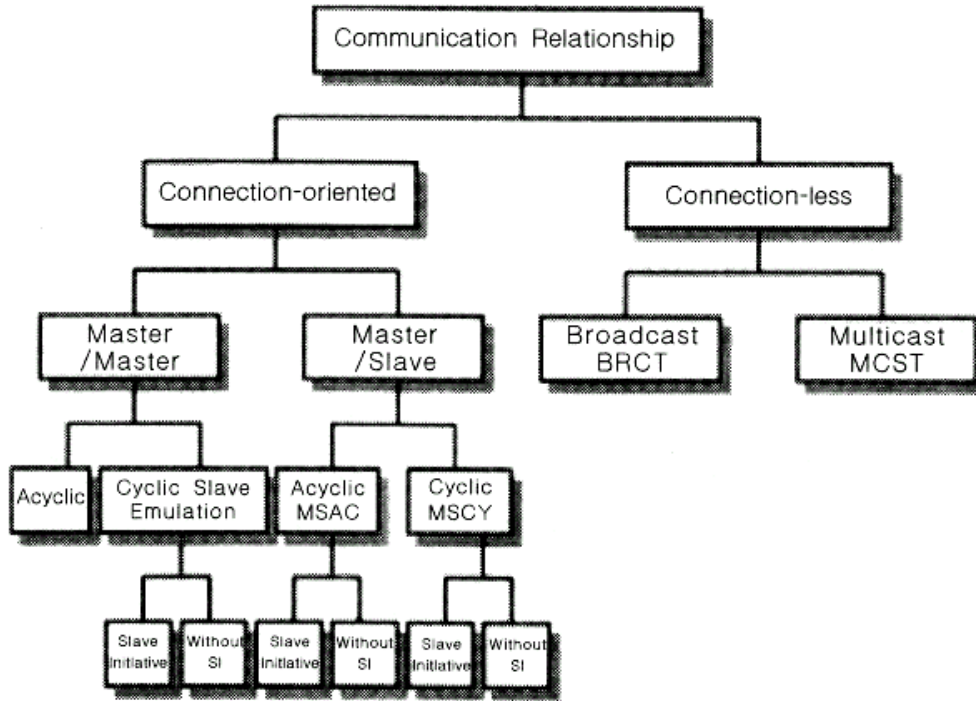
계층	MAP 3.0	Mini-MAP	MMS on TCP/IP	MMS on TCP/IP
Application	MMS, FTAM, ACSE, directory, network mgt	MMS, directory, network mgt	MMS, FTAM, ACSE, directory, network mgt	MMS, FTAM, ACSE, directory, network mgt
Presentation	ISO 8822	없음	ISO 8822	Mapping /Adaptation
Session	ISO 8326		ISO 8326	
Transport	ISO 8072 (TP Class 4)		ISO 8072 (TP class 4)	TCP
Network	ISO 8348 (CLNP)			IP
Data Link	CSMA/CD (802.3), LLC 1/3, Token bus, MAC(802.4)	802.2 class 3, Token bus(802.4)	CSMA/CD (802.3), LLC1/3	Ethernet 등 다양한 통신망
Physical	Token bus 10Mbps, broadband, Token bus 5Mbps, carrierband	broadband /carrierband, optical fiber	Ethernet	

1980년대 중반 '80년대 말~ '90년대 초 '90년대 초반~ '90년대 중반 '90년대 중반~ ???

- Proprietary Control/Sensor Network/PLC Remote I/O → Open Fieldbuses
 Open Fieldbuses+ MMS Subset = Control+ Messaging

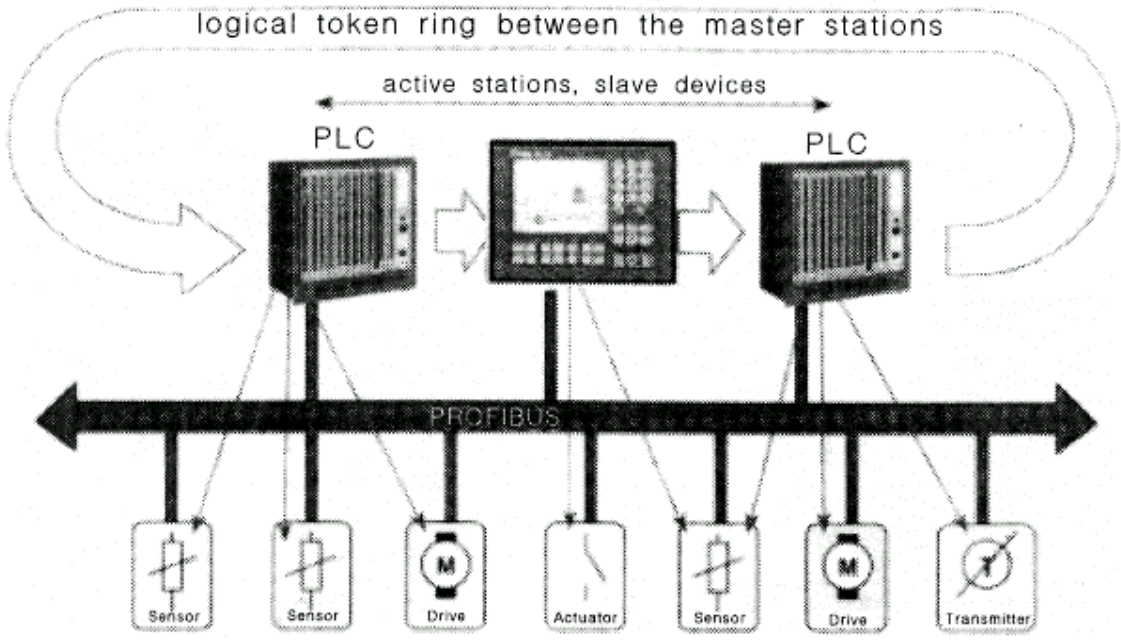
2. MMS





3.

LLI(Low Level Interface) FMS FDL(Fieldbus Data Link) 가 FMS FDL Mapping (Communication Relationship : CR) 가 Token Bus (4) 가 가 LLI CRL(Communication Relationship List) 가 Communicat- ion Relation List(CRL) . FMS NC, Robot, PLC, PC, Remote I/O 가 FMS Connection- Oriented/Connectionless, / (Variables), (Events), (Programs), (Domains) 3 가 Acyclic() 가 Cyclic()



4. FMS

(Request) 244 byte

FMS DP

FMS DP

FMS 가 DP, FMS가

PLC , , 가

PLC , Cabling, Connectors, Repeater,

Fiberoptic 가

, 가 NC, Robot, PLC 가

Cluster Tool 가

/Recipe 가 가

/ PC 가

Baud Rates 9.6KBd 12MBd

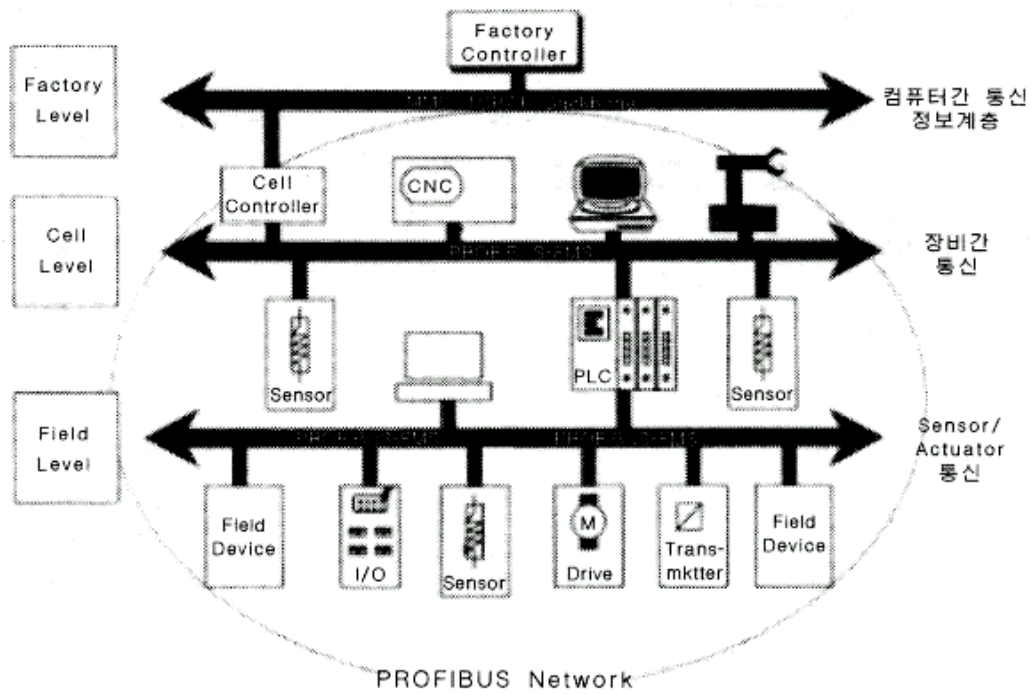
가 1~244bytes

(PLC, NC, Robot)

32

Stations(RS485 Drivers), 126 Stations

가



5. PROFIBUS

PROFIBUS

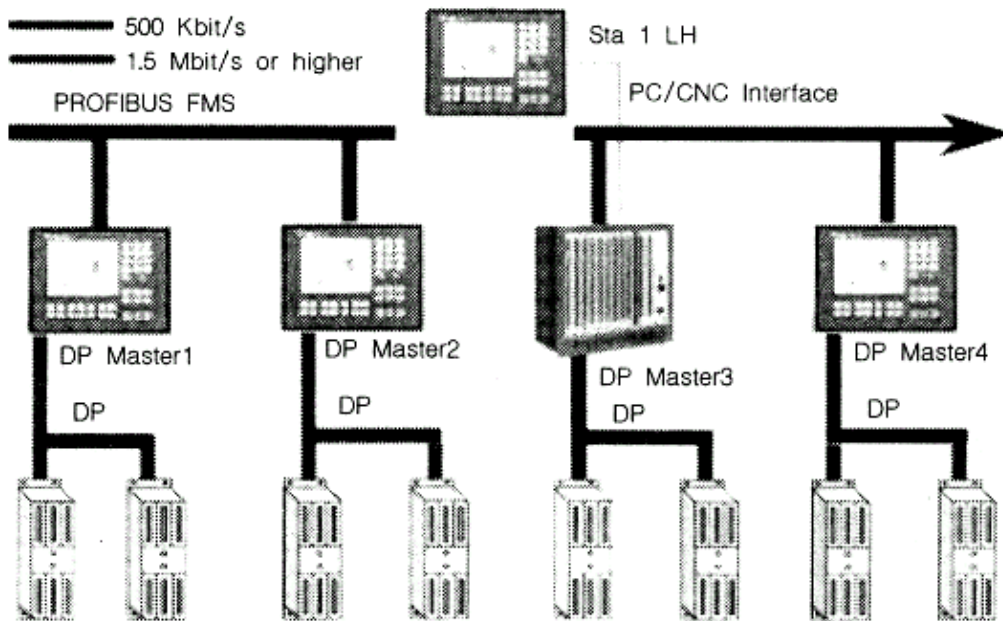
5

DP

FMS

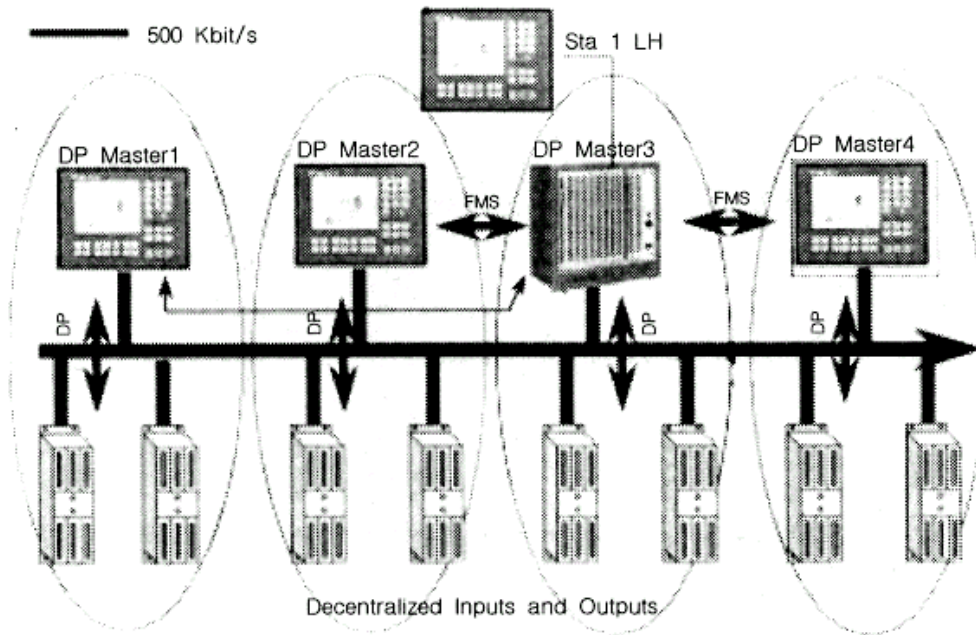
PLC

PLC



6. FMS

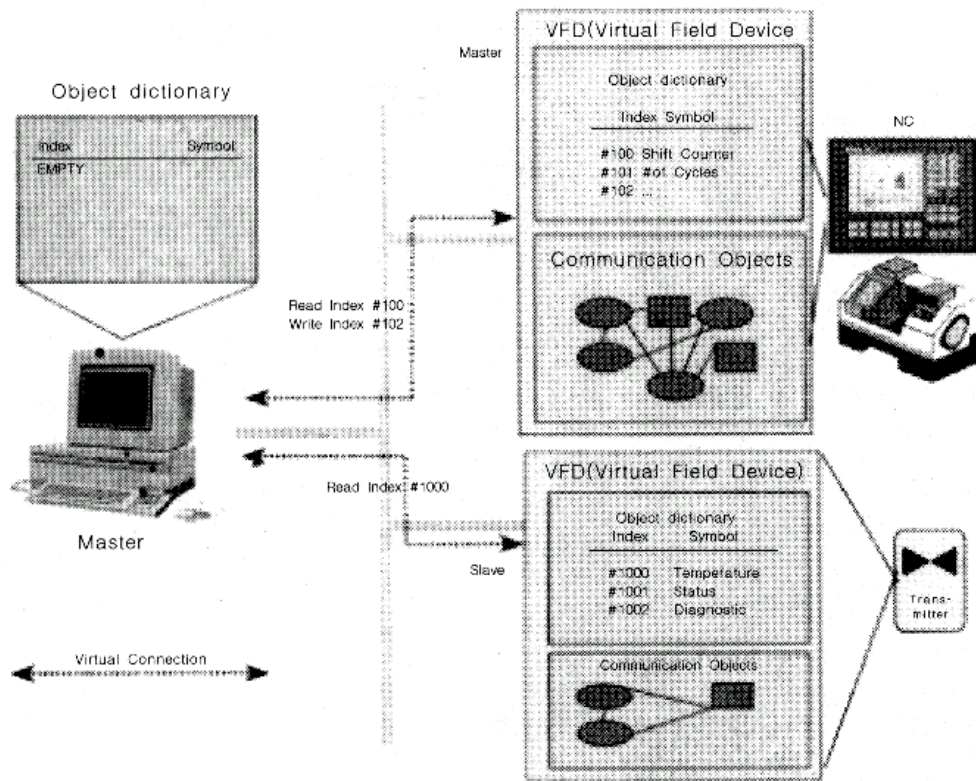
PLC



7. FMS/DP

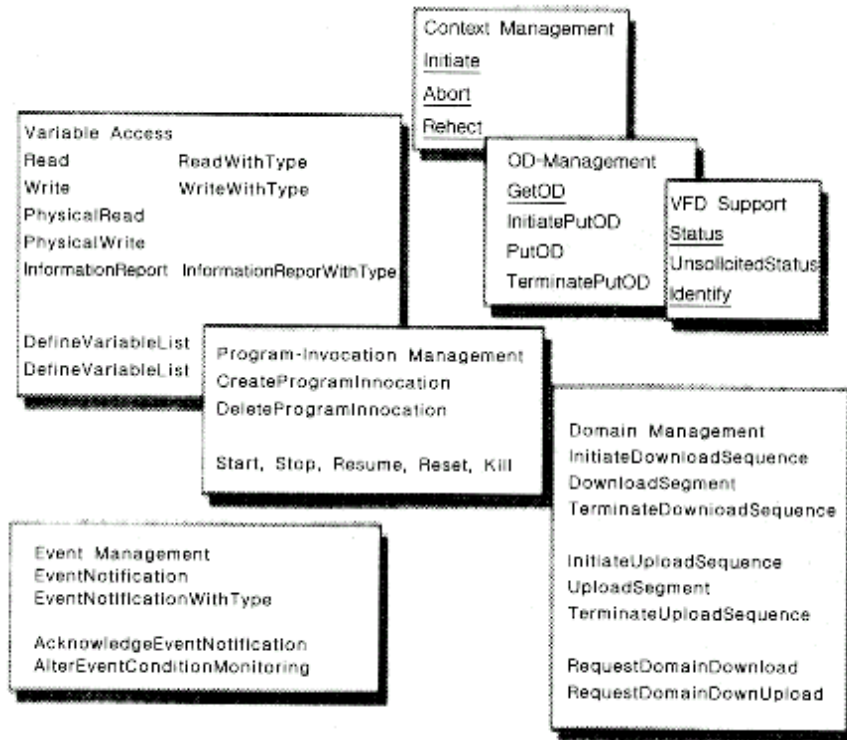
PLC

가 . FMS Variable, PI(Program
 PLC FMS Invocation), Domain, Events, OD(Object
 (6, 7 Dictionary) .
). VFD
 가
 PLC (8).
 PRIFIBUS - FMS Methods . OD
 가
 FMS . OD
 (Configuration)
 가
 (Virtual Field Device : VFD) -
 가
 VFD가
 (READ, VFD
 WRITE, START, DOWNLOAD)
 . VFD 가



8. VFD

FMS 가
 9 가
 MMS Semaphore, Journal,
 Operator PLC Stacker
 domain, Event Crane RGV가 가
 OD Stocker NC가 , ,
 FMS PC PLC FMS
 . PC FMS . Variable
 PC (, Softing
 PROFIBoard) PLC
 API(Application Program Interface) Variable
 10 .
 FMS
 (Command) TO
 (Transport Order), TO_START,



9. FMS

```

Variable TO
struct{
  TO-type      Octet String[6]
               //Fetch, Put, Move
  NodeName    Octet String[3]
  PalletId    Octet String[22]
};
Variable TO-START
Boolean(TRUE, FALSE)

```

```

Variable ShuttleReport
struct{
  TO-type      Octet String[6]//Which Command?
  TO-PalletId  Octet String[22]//Which Pallet?
  State        Integer16
  ErrorCode    Integer16
  Store-Node   Octet String[3]//Which Node?
  Store-PalletId Octet String[22]//Which Node?
};

Variable NodeId
struct{
  state        Octet String[6]
               //empty, reserved, undnown
               Octet String[22]
};

```

10.

SZ

ShuttleReprot, NodeId 가
FMS Server Stacker Crane Control PLC

PC

10

FMS

API

Variable Service

OD

. Softing PROFIBoard (12).

PC TO_START , 가

OD

11

C

13

```

od-entry[20].vfd-number = 1;
od-entry[20].obj-descr.jd.s-var-obj-descr.index = 20;
od-entry[20].obj-descr.jd.s-var-obj-descr.obj-code = SIMPSE-VAR-OBJECT;
od-entry[20].obj-descr.jd.s-var-obj-descr.length = 1;
od-entry[20].obj-descr.jd.s-var-obj-descr.index-of-type = OD-BOOL;
od-entry[20].obj-descr.jd.s-var-obj-descr.access-ass-word = 0;
od-entry[20].obj-descr.jd.s-var-obj-descr.access-ass-groups = 0;
od-entry[20].obj-descr.jd.s-var-obj-descr.access-ass-right = 255;
od-entry[20].obj-descr.jd.s-var-obj-descr.local-address = 0xFFFFFFFF;
od-entry[20].obj-descr.jd.s-var-obj-descr.extension[0] = 0;
od-entry[20].obj-descr.jd.s-var-obj-descr.name[0] = 8;
strcpy(&od-entry[20].obj-descr.jd.s-var-obj-descr.name[1], "TO-START");

```

구조체 작성

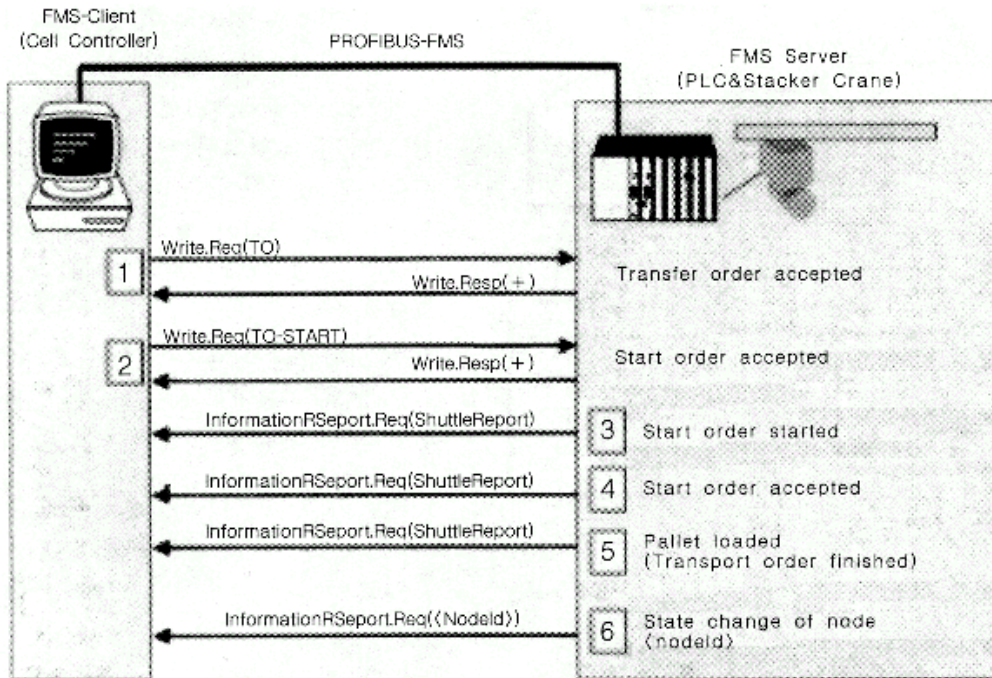
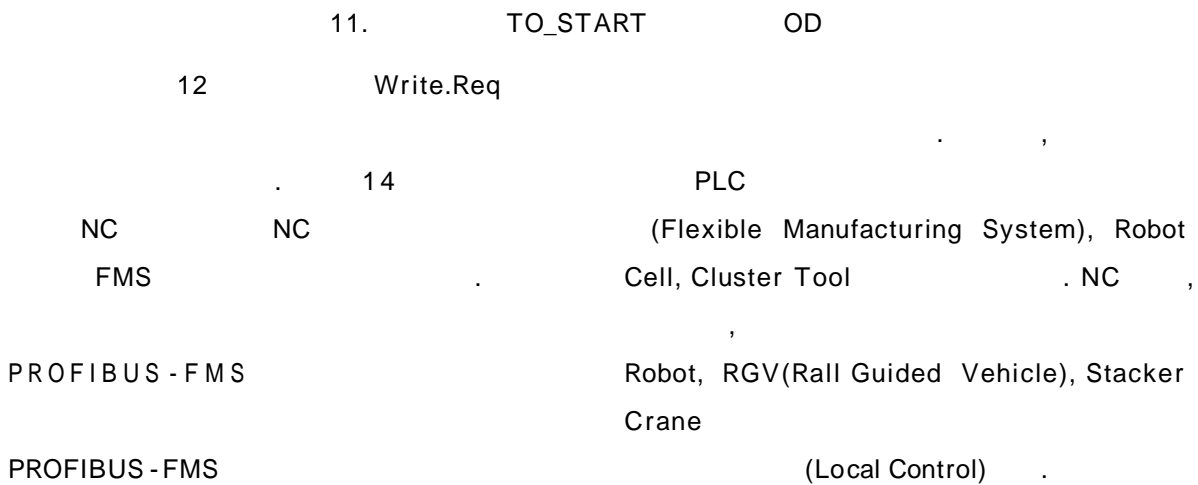
객체를OD에 등록

```

T-PROFI-SERVICE-DESCR FAR sdb;
sdb.comm-ref = 0;
sdb.layer = FMS;
sdb.service = FMS-LOAD-OD-LOC;
sdb.primitive = REQ;

profi-snd-req-res(&sdb,&od-entry[20], PB-TRUE);

```



12. Variable

```

FUNCTION static INT16 Write-Req(VOID)
{
  T-VAR-WRITE-REQ FAR write-req ;
  PB-BOOL write-data = PB-TRUE ;

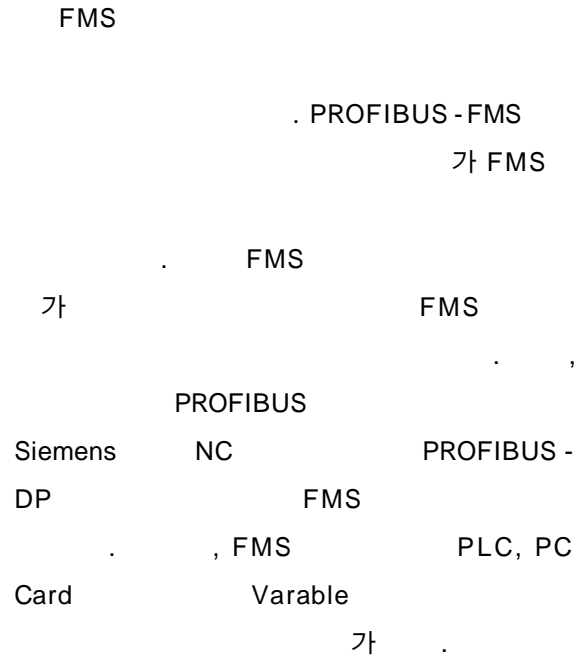
  write-req->acc-spec.tag = ACCESS-INDEX ;

  write-req->acc-spec.id.index = 20 ;
  write-req->subindex = 0 ;
  write-req->length = 4 ;

  T-PROFI-SERVICE-DESCR sdb ;
  sdb.comm-ref = CR[STACKER] ;
  sdb.layer = FMS ;
  sdb.servimitive = FMS-WRITE ;
  sdb.primitive-id = REQ ;
  compute-invoke-id() ;
  profi-snd-req-res(&sdb, &write-req, PB-TRUE);
}

```

13. Write-Req



FMS

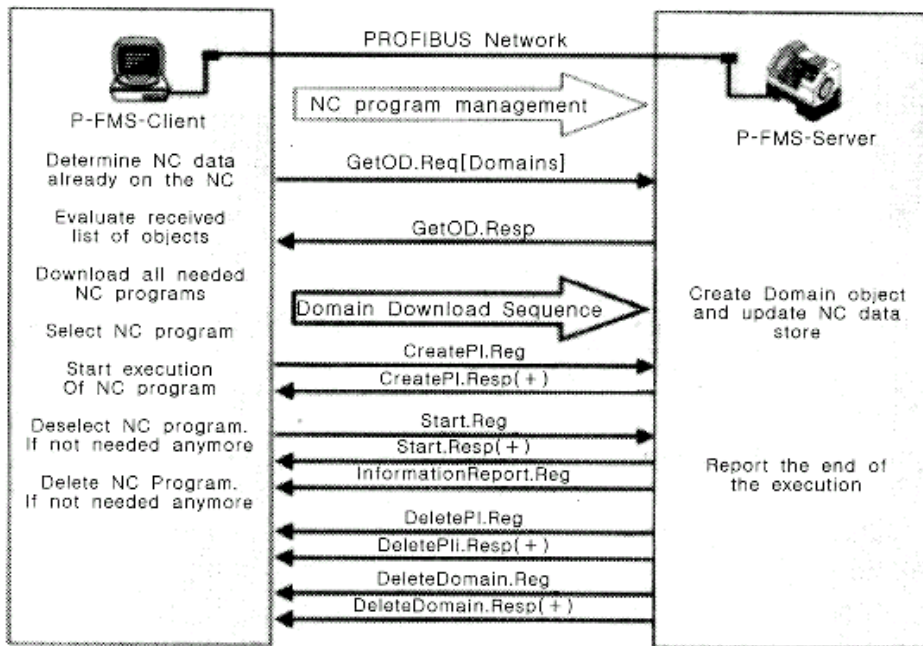
FMS

가

PC

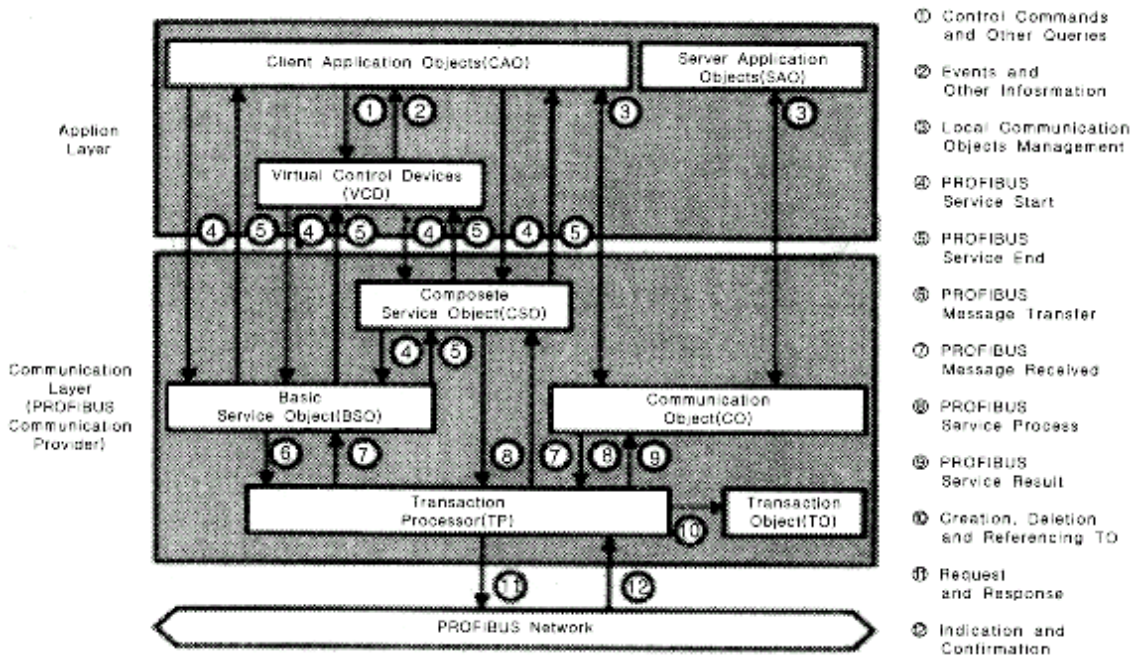
가

FMS

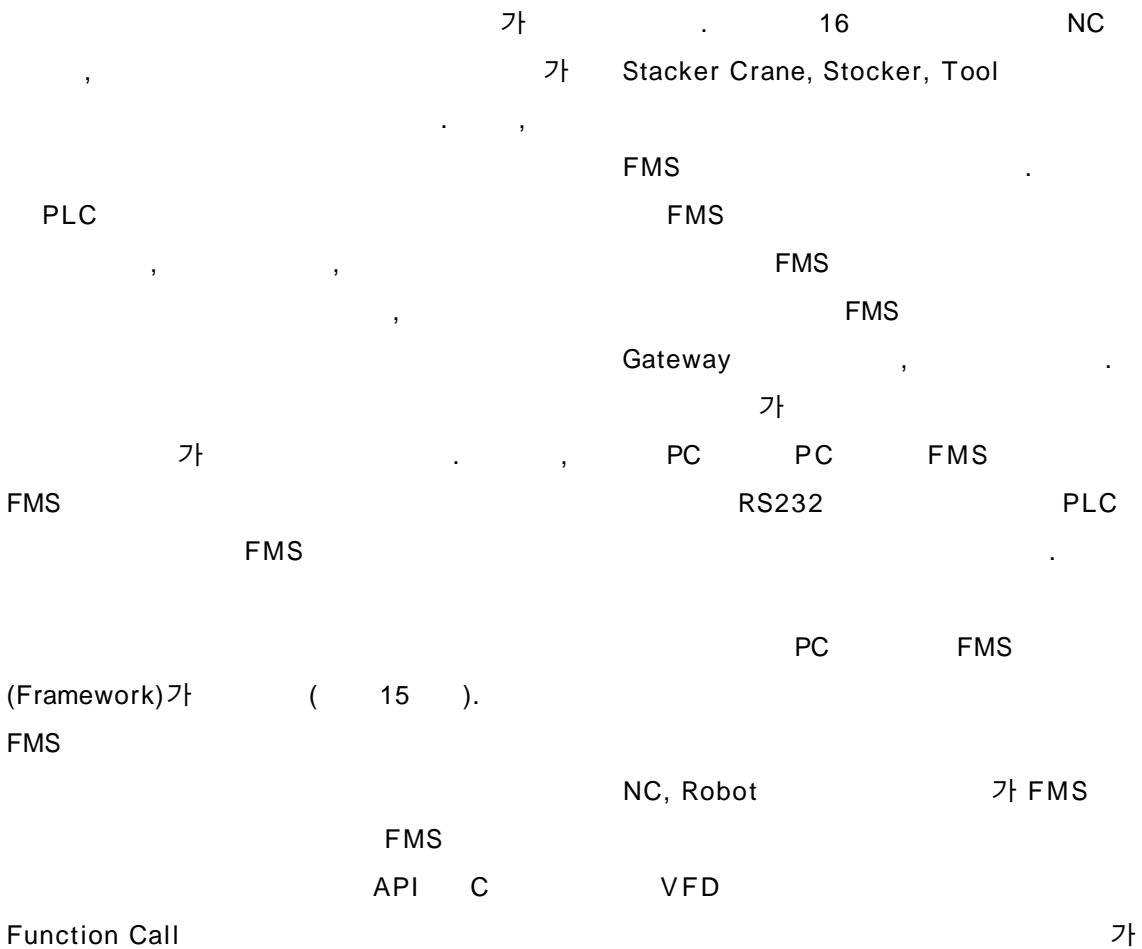


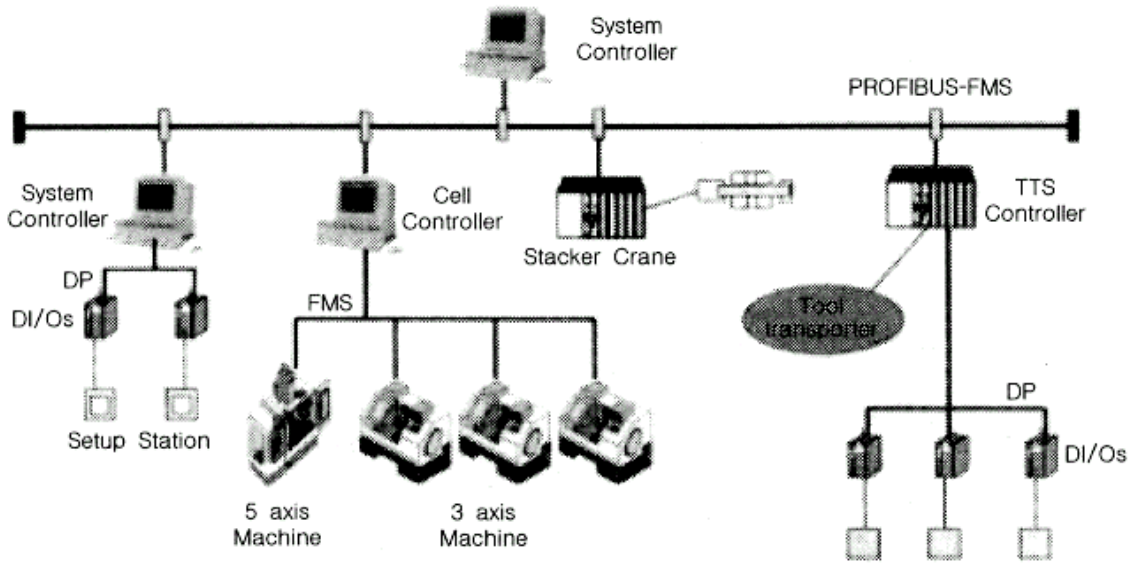
14. Domain

NC



15. FMS





16.

FMS

, NC FMS OMAC(Open Modular Architecture Controller), PLCOpen

NC

Variable

PI(Program Invocation)

OPC(Object Linking and Embedding for Process Control)가

PROFIBUS-DP

FMS

FMS

OPC

FMS

NC,

Robot, PLC

PROFILE 가 FMS

MMS

(Flexible Manufactur-

Robot, NC, PLC Standard

Companion ing System),

,

. NC

, , ,
.
, PLC
FMS
, FMS가
,
, ,
FMS
, FMS
Gateway
:
- 2001 2