

THE GRID CONNECT FIELDBUS COMPARISON CHART

BACKGROUND INFORMATION				
Fieldbus Name	Technology Developer	Year Introduced	Governing Standard	Openness
PROFIBUS DP/PA	Siemens	DP-1994, PA-1995	EN 50170 / DIN 19245 part 3(DP) /4 (PA), IEC 1158-2 (PA)	ASICs from Siemens and Profichip, Products from over 300 vendors
INTERBUS-S	Phoenix Contact, Interbus Club	1984	DIN 19258 EN 50.254	Products from over 400 manufacturers
DeviceNet	Allen-Bradley	March 1994	ISO 11898 & 11519	17 chip vendors, 300+ product vendors, Open specification
ARCNET	Datapoint	1977	ANSI/ATA 878.1	Chips, boards, ANSI docs
AS-I	AS-I Consortium	Fall 1993	Submitted to IEC	AS-II.C. Market item
Foundation Fieldbus H1	Fieldbus Foundation	1995	ISA SP50/IEC 61158	Chips/software/products from multiple vendors
Foundation Fieldbus High Speed Ethernet (HSE)	Fieldbus Foundation	In development - lab test phase, Prelim spec available to members	IEEE 802.3u RFC for IP, TCP & UDP	Multitude of suppliers for Ethernet components, Extremely low cost

IEC/ISA SP50 Fieldbus	ISA & Fieldbus F.	1992 - 1996	IEC 1158/ANSI 850	Multiple chip vendors
Seriplex	APC, Inc.	1990	Seriplex spec	Chips available multiple interfaces
WorldFIP	WorldFIP	1988	IEC 1158-2	Multiple chip vendors
LonWorks	Echelon Corp.	March 1991		Public documentation on protocol
SDS	Honeywell	Jan., 1994	Honeywell Specification, Submitted to IEC, ISO11989	17 chip vendors, 100+ products
ControlNet	Allen-Bradley	1996	ControlNet International	Open Specification, 2 Chip Vendors
CANopen	CAN In Automation	1995	CiA	17 chip vendors, 300 product vendors, Open specification
Ethernet	DEC, Intel, Xerox	1976	IEEE 802.3, DIX v. 2.0	Multitudes of Chips and Products
Modbus Plus	Modicon			Proprietary, requires license/ASICs
Modbus RTU/ASCII	Modicon		EN 1434-3 (layer 7) IEC 870-5 (layer 2)	Open specification, no special hardware required
Remote I/O	Allen-Bradley	1980		Proprietary
Data Highway Plus (DH+)	Allen-Bradley			Proprietary

PHYSICAL CHARACTERISTICS				
Fieldbus Name	Network Topology	Physical Media	Max. Devices (nodes)	Max. Distance
PROFIBUS DP/PA	Line, star & ring	Twisted-pair or fiber	127 nodes (124 slaves - 4 seg, 3 rptrs) + 3 masters	100m between segments @ 12Mbaud; 24 Km (fiber) (baudrate and media dependent)
INTERBUS-S	Segmented with "T" drops	Twisted-pair, fiber, and slip-ring	256 nodes	400 m/segment, 12.8 Km total
DeviceNet	Trunkline/dropline with branching	Twisted-pair for signal & power	64 nodes	500m (baudrate dependent) 6Km w/ repeaters
ARCNET	Star, bus, distributed star	Coax, Twisted-pair, Fiber	255 nodes	Coax 2000 feet; Twisted pair 400 feet; Fiber 6000 Feet
AS-I	Bus, ring, tree star, of al	Two wire cable	31 slaves	100 meters, 300 with repeater
Foundation Fieldbus H1	Star or bus	Twisted-pair, fiber	240/segment, 65,000 segments	1900m @ 31.25K wire
Foundation Fieldbus HSE	Star	Twisted-pair, fiber	IP addressing - essentially unlimited	100m @ 100Mbaud twisted-pair 2000m @ 100Mbaud fiber full duplex
IEC/ISA SP50 Fieldbus	Star or bus	Twisted-pair fiber, and radio	IS 3-7 non IS 128	1700m @ 31.25K 500M @ 5Mbps
Seriplex	Tree, loop, ring, multi-drop, star	4-wire shielded cable	500+ devices	500+ ft
WorldFIP	Bus	Twisted-pair, fiber	256 nodes	up to 40 Km
LonWorks	Bus, ring, loop, star	Twisted-pair, fiber, power line	32,000/domain	2000m @ 78 kbps
SDS	Trunkline/Dropline	Twisted-pair for signal & power	64 nodes, 126 addresses	500m (baudrate dependent)

ControlNet	Linear, Tree, Star, or Combination Thereof	Coax, fiber	99 nodes	1000m (coax) 2 nodes 250m with 48 nodes 3km fiber; 30km fiber w/ repeaters
CANopen	Trunkline/Dropline	Twisted Pair + optional Signal & Power	127 Nodes	25-1000m (baudrate dependent)
Industrial Ethernet	Bus, Star, Daisy-Chain	Thin Coax, Twisted Pair, Fiber; Thick Coax (rare)	1024 nodes, expandable to more via Routers	Thin: 185m 10 Base T (Twisted Pair): Max 100m long (90 metres horizontal cable, 5m drops, 1m patch) Max 4 hubs/repeaters between nodes 4Km distances w/o routers Fiber: 100 Base FX 400m 2.5 Km multi mode w/o Switches; 50 Km mono mode w/ Switches
Modbus Plus	Linear	Twisted Pair	32 nodes per segment, 64 max	500m per segment
Modbus RTU/ASCII	Line, star, tree Network w/ segments	Twisted Pair	250 nodes per segment	350m
Remote I/O	Linear Trunk	Twinaxial	32 nodes/segment	6 km
DH+	Linear Trunk	Twinaxial	64 nodes/segment	3 km

TRANSPORT MECHANISM						
Fieldbus Name	Communication Methods	Transmission Properties	Data Transfer Size	Arbitration Method	Error Checking	Diagnostics
PROFIBUS	Master/slave	DP: 9.6, 19.2,	0-244 bytes	Token	HD4 CRC	Station, module &

DP/PA	peer to peer	93.75, 187.5, 500 Kbps, 1.5, 3, 6, 12 Mbps PA: 31.25 kbps		passing		channel diagnostics
INTERBUS-S	Master/slave with total frame transfer	500kBits/s, full duplex	1-64 Bytes data 246 Bytes Parameter 512 bytes h.s., unlimited block	None	16-bit CRC	Segment location of CRC error and cable break
DeviceNet	Master/slave, multi-master, peer to peer	500 kbps, 250 kbps, 125 kbps	8-byte variable message with fragmentation for larger packets	Carrier-Sense Multiple Access w/ Non-Destructive Bitwise Arbitration	CRC check	Bus monitoring
ARCNET	Peer to peer	19.53K to 10M	0 to 507 bytes	Token passing	16-bit CRC	Built in Acknowledgements at Datalink layer
AS-I	Master/slave with cyclic polling	Data and power, EMI resistant	31 slaves with 4 in and 4 out	Master/slave with cyclic polling	Manchester Code, hamming-2	Slave fault, device fault
Foundation Fieldbus H1	Client/server publisher/subscriber, Event notification	31.25 kbps	128 octets	Scheduler, multiple backup	16-bit CRC	Remote diagnostics, network monitors, parameter status
Foundation Fieldbus HSE	Client/Server, Publisher/Subscriber, Event Notification	100Mbps	Varies, Uses Standard TCP/IP	CSMA/CD	CRC	

IEC/ISA SP50 Fieldbus	Client/server Publisher/ subscriber	31.25 kbps IS+1, 2.6, 5 Mbps	64 octets high & 256 low priority	Scheduler, tokens, or master	16-bit CRC	Configurable on network management
Seriplex	Master/slave peer to peer	200 Mbps	7680/transfer	Sonal multiplexing	End of frame & echo check	Cabling problems
WorldFIP	Peer to peer	31.25 kbps, 1 & 2.5 Mbps, 6 Mbps fiber	No limit, variables 128 bytes	Central arbitration	16-bit CRC, data "freshness" indicator	Device message time-out, redundant cabling
LonWorks	Master/slave peer to peer	1.25 Mbs full duplex	228 bytes	Carrier Sense, Multiple Access	16-bit CRC	Database of CRC errors and device errors
SDS	Master/slave, peer to peer, multi-cast, multi-master	1Mbps, 500 kbps, 250 kbps, 125 kbps	8-byte variable message	Carrier- Sense Multiple Access w/ Non- Destructive Bitwise Arbitration	CRC check	Bus monitoring
ControlNet	Producer/Consumer, Device Object Model	5 Mbps	0-510 bytes variable	CTDMA Time Slice Multiple Access	Modified CCITT with 16-bit Polynomial	Duplicate Node ID, Device, Slave Faults
CANopen	Master/slave, peer to peer, multi-cast, multi-master	10K, 20K, 50K, 125K, 250K, 500K, 800K, 1Mbps	8-byte variable message	Carrier- Sense Multiple Access w/ Non- Destructive Bitwise Arbitration	15 Bit CRC	Error Control & Emergency Messages
Industrial	Peer to Peer	10, 100Mbps	46-1500	CSMA/CD	CRC 32	

Ethernet			Bytes			
Modbus Plus	Peer to Peer	1Mbps	variable			
Modbus RTU/ASCII	Master/Slave	300 bps - 38.4Kbps	0-254 Bytes			
Remote I/O	Master/Slave	57.6 - 230 kbps	128 Bytes		CRC 16	none
DH+	Multi-Master, Peer<>Peer	57.6 kbps	180 Bytes			none

PERFORMANCE			
Fieldbus Name	Cycle Time: 256 Discrete 16 nodes with 16 I/Os	Cycle Time: 128 Analog 16 nodes with 8 I/Os	Block transfer of 128 bytes 1 node
PROFIBUS DP/PA	Configuration dependent typ <2ms	Configuration dependent typ <2ms	not available
INTERBUS-S	1.8 ms	7.4 ms	140 ms
DeviceNet	2.0 ms Master-slave polling	10 ms Master-slave polling	4.2 ms
ARCNET	Application Layer Dependent	Application Layer Dependent	Application Layer Dependent
AS-I	4.7 ms	not possible	not possible
Foundation Fieldbus H1	<100 ms typical	<600 ms typical	36 ms @ 31.25k
Foundation Fieldbus HSE	Not Applicable; Latency <5ms	Not Applicable; Latency <5ms	<1ms
IEC/ISA SP50	Configuration dependent	Configuration dependent	0.2 ms @ 5 Mbps 1.0 ms @ 1 Mbps

Seriplex	1.32 ms @ 200 kbps, m/s	10.4 ms	10.4 ms
WorldFIP	2 ms @ 1 Mbps	5 ms @ 1 Mbps	5 ms @ 1 Mbps
LonWorks	20 ms	5 ms @ 1 Mbps	5 ms @ 1 Mbps
SDS	<1 ms, event driven	5 ms polling @ 1 Mbps	2 ms @ 1 Mbps
ControlNet	<0.5 ms	<0.5 ms	<0.5 ms
CANopen	<1 ms	5 ms polling @ 1 Mbps	<2.5 ms
Industrial Ethernet	Application Layer Dependent	Application Layer Dependent	Application Layer Dependent
Modbus Plus			
Modbus RTU/ASCII			
Remote I/O	12msec @230, 40 msec @57.6 bus cycle time		
DH+			