Smart Distributed System is:

- Open
- CAN-based
- Event-driven
- Highly reliable
- “Smart” device-level network

For real-time communication of Process, Configuration, and Diagnostic information
1988  Initial investigations
1990  Protocol Stack work started
1991  Initial Specification finished
1992 / 1993  Beta System test
January 94  Official Launch
1995  PC based Control
1995  Protocol enhancements (SDS ALP 2.0)
1996  Distributed Control / Auto-configuration
1997  Product portfolio development finished
1997  SEMI Int’l Std E54.5-0997 (Sensor/Actuator Network)
1998  Smart Solution Provider Group
- CAN technology provides a robust architecture and high volume production to drive component costs down.

- The SDS Application Layer Protocol was developed by Honeywell to define and optimize event-driven CAN for industrial control applications in a Microsoft Windows-based control environment.

- The SDS Application Layer Protocol is optimized for “Smart Sensors and Actuators”, where Configuration, Diagnostic, and Process information can be embedded cost-effectively in a very small footprint.

**SDS was Developed to Improve I/O System Reliability and Deliver More (and Better) Process Information.**
Smart Distributed System and PC-Based Control

• Time spent troubleshooting I/O failures was reduced with a PC controller that could interpret and communicate detailed device and diagnostic information

• Embedded intelligence reduced downtime and provided greater information and control capabilities when combined with a Microsoft-based control platform

• System development and commissioning time and cost was 30-50% less than obtained with traditional methods

SDS Improves Productivity and Facilitates Access to Information to Decrease Total Cost of Ownership
Smart Distributed System Network Architecture

Software
Think & Do
Steeplechase
Wonderware
Intellution
Nemasoft
C Code & Others

OS
QNX
UNIX
NT
DOS

PC Interface
Honeywell
Holjeron
DIP Inc
Synergetic Microsystems
Advantech

Activator
Honeywell
I+ME GmbH
MicroSmith

Annunciators
Nematron
Exor
Q-Term
Holjeron

Industrial I/O
Western Reserve
Opto-22

Protocol Converters
SDS<>Lonworks
SDS<>RS-232/485
SDS<>Profibus

Honeywell

Other PLCs

DIRECT PLC INTERFACE

Auxiliary Devices & Components
Daniel Woodhead
Molex
Motorola
Phillips
Brand Rex
Beldon

Auxiliary Devices & Components

FUNCTIONAL BLOCKS

OPERATOR INTERFACES
GE ED&C
Exor
Q-Term
Holjeron
Advantech
Xycom

MINI BASE
Prox or Photo

ADDITIONAL COMPONENTS

12mm Prox

Fiber Optic Photos

12mm Prox

BARCODE/RFID
Microscan
Accusort

MOTOR STARTERS
GE ED&C
Square D

DRIVES
GE Fanuc
Magnatek
Pacific Scientific
Infranor

HONEYWELL Products unless noted

CPAC
Center for Process Analytical Chemistry
Smart Distributed System Network Architecture

- Communication rates of 125, 250, 500, and 1,000 kBaud
- 1500 ft maximum distance at 125 kBaud (longer with Bridge)
- 64 maximum electrical loads (Nodes) per network. 126 with repeater
- 12-24VDC, 2 power wires + 2 communication wires + shield
- Multiple physical layers topologies
- 126 logical addresses - not related to physical location on the network
- Proven event driven architecture for maximum throughput (<1ms)
- Event-Driven, Master-Slave, Multicast and Peer to Peer Services
- Network heartbeat to insure device health every 2.5 seconds
- Robust Network Management capabilities (Microsoft architecture)
ISO OSI 7 Layer Model

- Application Layer
- Presentation Layer
- Session Layer
- Transport Layer
- Network Layer
- Data Link Layer
- Physical Layer

SDS Network Stack

Process Data Services
Diagnostic Data Services
Configuration Data Services

- Event driven
- Polled
- Cyclical
- Single Master
- Multi Master
- Peer to Peer
- Multicast

← SDS
← CAN
← CAN

Honeywell
SDS Object Model / Address Mechanism

Logical device

- 32 Objects
  - 255 Attributes
  - 255 Actions
  - 255 Events

Up to 126 Logical Devices

Data Variables
Function Calls
Event Reports
SDS System Architecture - Application Layer Protocol

SDS Supports Master/Slave, Multicast, and Peer-to-Peer Architectures.
  • Allows for a wide variety of control implementations

• SDS supports Event-Driven, Polled, and Cyclical Reporting Structures.
  • Multiple structures can be used on the same network. For example, sensors may report ‘Change Of State’ in the Event-Driven mode while analog values are reported every 50 ms. in the Cyclical Reporting mode

• SDS has 2 Special APDU (Application Layer Protocol Data Unit) Forms:
  • Short Form APDU - Shortens the CAN message for single-bit commands such as COS, Write, and Acknowledgement. This allows for greater throughput and improved system response time.
  • Fragmented APDU - Allows for data messages longer than the standard 6 data byte format. Up to 256 bytes of data may be sent. This allows complex data such as ASCII strings to be sent across the network.

SDS Application Layer meets Industrial Needs
SDS System Architecture - Embedded Functions

- Network Health Diagnostics: Examples: Power, CRC Error, Message Overrun, Missing Device, ISA Board and/or Channel Failure
- Device Diagnostics: Examples: Misaligned/dirty photo, prox target too close/far, mechanical switch operation limit, switch arm return too slow, motor overload tripped, disconnect opened, barcode good/bad read, VFD faults, and missing device.
- Device Embedded Control Functions: Examples: NO/NC, light/dark operate, on delay, off delay, one shot, batch count, motion detection, jam detection, barcode format, temperature setpoint, analog high/low alarm, etc.
- Devices can be changed/installed with power on:
  - Only the address must be set
  - Other functionality is optional and can be auto-configured
- Universal Data Communication: Any digital, analog, or serial data may be embedded in a device or connected via a wide selection of remote I/O nodes.
SDS Network Advantages - for Developers

• Well-defined, stable, open, and free Application Layer Protocol
  Download all necessary specifications for free

• Solid acceptance in many markets
  Semiconductor, Electronics Assembly, Automotive, Food & Beverage,
  Machine Tool, Parcel & Package Distribution, etc

• Quick and cost-effective implementation
  Low cost, small footprint integrated microprocessors (6805X4, PIC - <<$10)
  No approval process is required

• Wide variety of developer tools, devices, and services are available.
  Preloaded chipsets, C - code libraries, NT .dll, UNIX and QNX software
  toolkits, device conformance tester software, high-end bus analyzer
  software, developer support, etc.

• Well-developed infrastructure
  • Smart Solution Providers Network comprised of mutually supportive
    vendors dedicated to providing the ‘whole product’ solution.
  • UL Testing to insure interoperability and conformance
SDS Network Advantages - for Customers

• Fast, Reliable, Open, and Proven Device Network
• Internationally-approved industrial network protocol
• Field-proven reliability in system critical applications
• Flexibility to Expand, Reconfigure, adapt to new applications
• Built to handle Process, Configuration, and Diagnostic data
• Optimized for Microsoft Distributed iNternet Architecture
• Backed by Global Service and Support from Honeywell

SDS Offers Significant Advantages to Users
Scalability - SDS and Windows CE Distributed Control

“SAM” Powered By

User Computer Or Analyzer Supervising one or more “SAM”

“SAM” - WinCE-based Think & Do with SDS Master and optional Local I/O and Bluetooth

SDS Network - All Device Types Supported
### SDS Customers - (partial listing)

#### Electronics and Semiconductor:
- Dell Computer **
- Compaq
- IBM
- Tektronix
- Hewlett-Packard
- Silicon Graphics/Cray
- Motorola
- Gateway Computer
- Lucent Technologies
- Xerox
- OKI
- Samsung
- QSC Audio **
- SCI Systems

#### Other Markets:
- General Motors
- Ford
- Honda
- Boeing
- Halliburton energy Services
- U.S. Postal Service
- Proctor & Gamble
- Coca-Cola
- Hunt-Wesson
- Fastenal Company
- Target Stores
- Eagle Logistics
- UPS
- DHL Worldwide
- TNT Courier

** Modern Material Handling Manufacturing Site of the Year Award
SDS Market Share - Microsoft-based Control Applications

- DeviceNet: 22%
- Profibus-DP: 15%
- Optomux: 14%
- Ethernet: 11%
- SDS: 38%
Major SDS Installations - U.S.
Smart Distributed System - Contact Information

SDS Web Site: (with Links to other manufacturers and developers)
http://www.honeywell.com/sensing/prodinfo/sds
  - SDS Application Layer Protocol
  - SDS Physical Layer Specification
  - Component Modeling Specification
  - Component Interface Specification
  - Control Interface Specification
  - Conformance Test Procedure Specification
  - Product Information and Developer’s Training

Conformance Testing: Underwriter’s Laboratories (UL)
Chuck Goetz 847-272-8800 ext. 43163 or E-Mail: goetzc@ul.com

Application and Technical Support: Honeywell Sensing & Control
Bob Nickels 815-235-5735 or E-Mail: bob.nickels@honeywell.com

Smart Solutions Providers Organization (formerly Partner’s Program)
Contact Paul Jensen at 503-675-1667 or E-Mail: pjensen@holjeron.com
http://www.simpleaswire.com

SEMI SAN committee representative for SDS - John Mosher
(209)339-4004 or E-Mail: john.mosher@honeywell.com