Electronic Systems Design and Manufacturing Solutions

SLN Technologies Pvt. Ltd.
Overview

SLN Technologies is an electronic systems design and manufacturing (ESDM) solutions company. SLN's business focus is providing D&E services in:
- Embedded Systems Solutions,
- Board Design Solutions,
- Embedded Software Development
- Automated Test Equipment
- Product re-engineering and value engineering,
- Product testing and qualification,
- Manufacturing services.

SLN serves Aerospace, Defence and Nuclear industries.

SLN is striving to delight customers through its founding principles: customer service, leadership, innovation.

SLN is headquartered in Bengaluru, India along with design centre and manufacturing facility and offices across the country in few major cities.

Quality Focus

SLN is a quality focused organization with robust processes which have matured over a period of time.

SLN builds products for mission critical applications where quality and reliability are the basic requirements. SLN strives for continual improvement in people, processes, products and services. SLN's development processes conform to IEEE, IPC and DOD standards.

SLN Technologies is an ISO 9001:2008 certified company. SLN is in the process of implementing AS9100 Rev C.

Awards and Recognitions

- SLN has received SIATI Award 2014 for Excellence in Aerospace Indigenisation.
- SLN was awarded National Award – 2008 Special recognition award for Research and Development by Ministry of MSME, Govt. of India.
- SLN was awarded 1st prize for “Excellence in Electronics in Research and Development for the year 2007-08” by ELCINA–DUN & BRAD STREET.
- Outstanding Performance in R&D for the year 2009-10 by ELCINA-EFY

Certifications / Registrations

- ISO 9001:2008 certification
- Recognized in-house R&D Unit by the Department of Scientific and Industrial Research (DSIR), Govt. of India
- Approved Design house from Centre for Military Airworthiness and Certification (CEMILAC), DoD, India
- Registered Vendor for Defence Research & Development Organisation (DRDO), Department of Atomic Energy (DAE), Hindustan Aeronautics Limited (HAL), Bharat Electronics Limited (BEL) and Nuclear Power Corporation of India Limited (NPCIL).

Customer Profile

- Defence Research & Development Organisations (ADA, ADE, ANURAG, LRDE, CVRDE, NPOL)
- Department of Space Organizations (ISAC, LPSC, ISTRAC, MCF)
- Public Sector Units (HAL, BEL, ECIL, NPCIL)
- Private Sector and MNC Organizations

Strengths

- Commitment and Long term Relationship
- Innovation
- Technical Strength
- Project Management skills
- Strong Processes
- Quality Management Systems
## Capabilities
- Product Design and Development from concept to End Use
- Hardware Design and Development
- Software Development
- System Engineering
- Integration
- Manufacture
- Product Qualification (Functional, Environmental and EMI/EMC)
- Field Installation and Commissioning and Trials support
- Capability to Handle turnkey projects of System level development

## Expertise
- Bus Architectures: PCI, cPCI, PXI, PC104, VME64X, PMC and Custom busses
- Processors & DSP: 8051, XAG (philips), PowerPC, X-Scale, ARM, RISC, ADSP, TIDSP
- FPGA, CPLD Design
- Devices: Xilinx, ALTERA, Actel, Cypress, Lattice
- IP Cores: ARINC 717, USART, I2C, Hand-Wheel, SSI, BISS, PCM
- IP Implementation: PCI IP, EnDAT IP
- HDL: VHDL, Verilog, RTL simulation & verification
- SoC NIOS II based solutions
- Board Design
- Mixed Signal Board Design
- Simulation and Modeling
- High speed digital design
  - LVDS, SDR, DDR, 60x, PCI-X, PCI-Express, GIGA-Ethernet, HDMI, DVI
- Boundary Scan
- Signal Integrity, Thermal Analysis, EMI-EMC analysis
- Impedance Control
- Conduction cooled boards (Metal core & Metal ladder) for defense applications
- DFX (DFT, DFM) criteria
- RoHS
- Up to 16 layers
- Firmware
  - Device driver development
  - I/O interfaces – MMIs like LED/LCD displays, keyboards
- Communication interfaces – UART, I2c, SPI, RS232, CAN, Ethernet, MIL1553B, ARINC717, ARINC429 etc, GSM, GPRS.
- OS: Windows, Monta Vista Linux, Fedora
- RTOS: VxWorks, WinCE
- BSPs development
- OS porting
- Embedded application software development
- Programming languages: C, C++, VC++, Assembly
- Standards - DO-178B, IEEE 12207, DOD 2167 A

## Standards Followed
- DO-254 : System Design and Development
- MIL-STD-2164 : Environmental Stress Screening
- MIL-HDBK-217E : Reliability
- MIL-STD-1472 : Human Engineering Design Criteria
- MIL-STD-810F : Environmental Tests
- MIL-STD-461C/D/E : EMI/EMC
- MIL-STD-704D : Power supply
- IPC-D-275, IPC-A-610D : PCB Design & Assembly
- DO-178B, IEEE 12207, DOD 2167 A : Software Development
- System Bus Standards: VME, PMC, cPCI, PXI, GPIB & VISA
- Communication: ARINC 429, ARINC 717 and MIL1553B

## Tools
- **Circuit & PCB Design and Analysis**
  - OrCAD, PSpice
  - Cadence Allegro
  - CADSTAR
  - PADS Power PCB
  - Hyperlynx, Incases, Cadstar SI, HyperLynx
  - Beta Soft
  - EMC Advisor
  - EXCELCAM

- **JTAG and ICE Tools**
  - Motorola BDI 2000
  - ADSP Emulator
  - ARM Debug tool
  - ALTERA NIOS II debug tool
  - Xilinx, ALTERA and Lattice download
  - ESA Universal Programmer

- **Software Development Tools**
  - Code Warrior
  - Visual DSP++
  - Keil Compiler
  - Tasking Compiler
  - Monta Vista Linux DevRocket
  - Microsoft Visual Studio 6.0
  - Autocad 2000
  - Xilinx ISE
  - Altera Quartus
  - ISP Lever for Lattice

- **Manufacture**
- Product Qualification (Functional, Environmental and EMI/EMC)
- Field Installation and Commissioning and Trials support
- Capability to Handle turnkey projects of System level development
SLN is specialized in electronic systems product development and manufacturing viz. system architecture, hardware development, software development, enclosure design and fabrication, integration, testing, qualification and manufacturing.

SLN undertakes full life cycle product development. SLN has core strength to develop products from concept to end use. Most of the projects in SLN portfolio are turnkey product development contracts.

**Services**

Embedded Product Design & Development from concept to end use
System Development based on combination of COTS and custom design modules / sub-systems.

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**Solid State Flight Data Recorder (SSFDR)**

SSFDR is a three LRU (DAU, RU & CIU) Airborne System. It acquires data from Analog signals, Discrete Signals, Tacho, Audio Signals, MIL1553B Data, ARINC 429 Data and ARINC 717 Data. 10GB Flash memory for Day to Day analysis. 320 MB Crash Protected Memory. Data Milking is through Ethernet interface.

This was a total turnkey project of full product life cycle development involving Requirements Analysis, Design & Analysis, Development, Engineering, Software Development (Firmware & Device Drivers), System integration and Testing and Qualification of the system.

System is qualified as per MIL-STD-810F and MIL-STD-461D.
SLN has a unique advantage for developing embedded software because of its in house expertise on developing embedded systems. SLN has strong skills & expertise on microprocessors, microcontrollers, DSP architectures, communication interfaces, industrial I/Os and application knowledge.

We have strong process knowledge apart from technical skills and passion to contribute to customer's success. Our standards compliance make it easy to integrate our software with customer systems. Reliability is the key in our product/service range as most of products go for very critical applications.

**Services:**
- Device driver development for leading platforms
- Board support packages
- Operating system porting (Embedded Linux, RTLinux, VxWorks)
- Firmware/BIOS Development
- Total turnkey software solution.

**Operating System**
- Linux
- Embedded Linux
- Montavista Linux
- RT Linux
- VxWorks
- WinCE
- Microsoft Windows

**DEVICE DRIVERS**
- Ethernet, USB, UART, IEEE1284 (Parallel port), HDLC/SDLC, CAN, MIL1553, ARINC717, ARINC429, VFD, LCD ENDAT, Thermal Head, Industrial I/Os

**HARDWARE**
- Open Bus Architecture Platforms: PCI, cPCI, VME, PC104, PXI, Microprocessor Platforms: 8051, PowerPC, X-SCALE, ARM, RISC - 8, 16, 32 and 64 Bit architectures DSP : ADSP, TI

**Software Processes**
- Planning Process
- Development Process
- Requirements Process
- Design Process
- Coding and Integration Process
- Testing and Verification Process
- Configuration Management Process
- Quality Assurance Process

**Software Verification**
- Independent Verification and Validation
- Test Coverage- MCDC, Decision Coverage, Statement Coverage
SLN offers board design solutions for high reliability applications, high speed digital design and mixed signal board design. SLN has a wide array of expertise in designing and developing single board computers, user specific Controller board, FPGA Boards, I/O Interface boards and power supply boards. SLN has expertise in design and development of bus based board viz. VME, VPX, PMC, cPCI, PCI and custom bus.

SLN offers total end to end solutions from specification to tested final board which includes Circuit design, PCB design, PCB fabrication, Components procurement, Components assembly and testing.

**Customer Input**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Architecture/Design</th>
<th>Circuit Schematics</th>
<th>PCB Layout &amp; Analysis</th>
<th>Gerber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specification</td>
<td>Digital, Analog, Mixed signal</td>
<td>Design Simulation FPGA / CPLD HDL simulation Netlist Dfx FMEA</td>
<td>Component Engg, BOM optimization RoHS Target Cost Component procurement</td>
<td>PCB Fab &amp; Assembly Up to 16 layer Impedance Control Flex, Flex-right PCB RoHS IPC 610D Basic Electrical Test</td>
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**Services Offered**

Following services are offered to the industry vertical mentioned in SLN's expertise areas

- Board Design, Development and Manufacture from specification to tested board.
- Schematics Design and PCB design (input is specification and output is Gerber data)
- PCB Design with Analysis (SI & Thermal) (Input is circuit/netlist and output is Gerber data)
- Board manufacture for customer Gerber data (Prototype, Small and Medium volumes)

**VME CPU**
- MPC 7447A Power PC
- Boot Protect
- Ethernet, Serial Ports
- PMC slot

**ePCI AXIS Card**
- MPC 32 bit 33 MHZ
- Analog & Digital mixed signals
- ADC auto acquisition by FPGA
- Angle encoder i/f (EnDAT, SSI)

**Communication Card**
- MPC860 CPU based Communication Module
- MIL1553B – 04 Dual Redundant Channels
- ARINC 429 Receive : 20 Channels
- ARINC 429 Transmit : 10 Channels
SLN offers Automated Test Equipment (ATE) for testing electronic modules, sub-systems and systems where testing and validation is not possible using standard off the shelf test and measuring equipments. SLN has expertise to build embedded system specific ATE and Integration rigs for testing a selected few similar embedded systems. SLN has vast knowledge and expertise to build rugged ATE to test aerospace and defence systems in harsh environments. SLN can design ATE to test comprehensively the i/o interfaces of the embedded system and provide detailed analysis reports for each and every interface. SLN also has expertise to design and build graphical user interface to provide Go-No Go ATE for the end user.

SLN has expertise in design and developing ATE based on National Instruments(NI) products and LabVIEW. SLN is a value added reseller to NI and have delivered ATE for critical avionics applications. SLN has qualified professionals on LabVIEW. SLN also has expertise to build ATE on other open bus architecture viz. cPCI, PCI, VME and VPX.

SLN builds the following types of ATE's

<table>
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<tr>
<th>ATE Types</th>
<th>Unit Under Test</th>
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<tbody>
<tr>
<td>Dedicated Embedded Tester</td>
<td>Module</td>
</tr>
<tr>
<td>PCI/ cPCI/VME based ATE with user friendly GUI Software</td>
<td>Sub System</td>
</tr>
<tr>
<td>NI PXI based ATE with Labview Software</td>
<td>System</td>
</tr>
<tr>
<td>Boundary Scan based ATE</td>
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</tbody>
</table>

Why SLN?

SLN has an advantage in building ATEs being designer of embedded modules, sub-systems and systems. SLN can deliver unique value to the customers giving total test systems solution.
For every business it is necessary to be competitive all the time, meeting the changing regulatory needs viz ROHS, and overcoming obsolescence in technology. This challenge needs to be met by re-engineering the products by adopting new technology and innovation. SLN has proven track record in re-engineering the electronics products by adding value through innovation.

Product re-engineering and Value Engineering

Product Testing & Qualification
SLN offers Product Testing and Qualification services for customer built products.
- Preparation of Test cases, test report documents
- White box, Black Box Testing
- Preparation of Qualification Test Plan
- Approval from approval agency (For Ex. CEMILAC, DOD in India)
- Conducting tests at third party Environmental, EMI/EMC labs
- Preparation of Qualification Test Report
- Type approval from approval agency (For Ex. CEMILAC, DOD in India)

Onsite Consulting
Due to time to market pressure it is a necessity to quickly ramp up the team size at project sites either to assist the team to increase the bandwidth or to carry out certain specialised tasks. Also due to IP protection, customers can not outsource the development outside the customer site. In such situations SLN offers engineers who will come to customer site and support the customer in the project completion.

Manufacture
SLN manufactures products based on its own design & development. SLN also undertakes the manufacture of customer designed products.

SLN’s product development and manufacturing expertise and experience of meeting standards compliance, test rigs handling along with testing capability, Infrastructure and experience of manufacturing products for critical applications where quality and reliability are the basic requirements and provides good value proposition to customers.

SLN undertakes full life cycle manufacturing service from customer manufacturing document to product shipping ie process ranging from components procurement, assembly, enclosure/rack/sub-racks fabrication / procurement, integration, software porting and testing.
SBCs & Bus Based I/O Cards

High performance VME64x Single Board Computer (SBC)

- 6U, VME64x based Single Board Computer
- Based on PowerPC based RISC Processor (MPC7448)
- On board 1GB DDR2 RAM, 512MB Flash, RTC, WDT etc.
- On Board 2Gig Ethernet ports, 2 USB, SCSI, CF Flash, 2 SYNC & 2 ASYNC Serial ports,
- 2nos, 64 bit PMC Slots, Optional rear Transition Module
- Available in Air cooled & Conduction Cooled Version
- Supporting OS: Linux, Vx Works, LynxOS, QNX.

VME Single Board Computer (SBC) based on MPC7447a Processor

- 6U, VME32 based Single Board Computer
- Based on PowerPC based RISC Processor (MPC7447a)
- On board 512MB SDRAM, 256MB Flash, RTC, WDT etc.
- On Board 2,10/100 Ethernet ports, 2 SYNC & 4 ASYNC Serial ports,
- 1no, 32 bit PMC Slots, Front panel 4 Character Display, Optional rear Transition Module
- Available in Commercial & Industrial grade Version
- Supporting OS: Linux, Vx Works, LynxOS, QNX.

Standard BUS Based I/O Cards

- SLN has developed Standard bus based I/O cards i.e. VME, cPCI, PCI, PXI, PMC, PC104 etc.
- SLN has developed the below cards for the above mentioned Bus
  - Standard OS drivers available for all the I/O cards.
Solid State Flight Data Recorder (SSFDR)

- SSFDR is used in aircraft to acquire voice data from cockpit and aircraft parameters such as, analog, thermocouples, RTDs, Tacho, discrete, MIL 1553B bus, ARINC 717 & ARINC 429 channels and the captured parameters are stored in crash protected flash memory.
- The stored parameters in FLASH memory are milked out through Ethernet 10/100 port and are used for post flight & engine run analysis and Crash analysis.
- The recorder consists of 3 LRU’s, Data Acquisition Unit (DAU), Recorder Unit (RU) & Control and Indication Unit (CIU).
- Data can be recordable in both DAU & RU.
- Laptop based Software application to perform the data download and parameter analysis (Both Tabular and Graphical), Voice data decompression and reply.

Air Data Computer (ADC)

- ADC computes different variants of air data calculations such as Air speed, pressure etc.
- The system comprises of processor board with Analog board with OPAMP’s, Multiplexers etc., The Power Supply board is stacked on to the motherboard, terminated with 38999 connectors.
- The complete system is housed in a ruggedized chassis.

Solid State Memory Module

- Solid state memory module LRU is a replacement for tape based Flight data recorders. It uses the existing data acquisition systems and store the data in solid state crash protected memory. This helps in replacing reliable solid state technology with obsolete tape based technology.
- The Micro controller will read the data and simultaneously store onto the FLASH disc.
- During downloading, the last stored data (Maximum 150 minutes) will be transmitted to the output device through either RS422 / RS232 port to the PC (Laptop) or to the custom equipment through the Service Data Selector unit in 18 Minutes.

Signal Conditioning & Data Acquisition modules used for Flight Test Instrumentation (FTI)

- FTI System is a distributed data acquisition system consisting of remote acquisition units (RAU), used to measure various aircraft parameters viz. temperature, strain, AC/DC voltage, Voice, Vibration, Angle, GPS, Frequency / period, etc.
- RAUs which are 3U cPCI bus based system, is qualified for airborne applications.
- The total system consists of 13 types of signal conditioning and data acquisition modules, Test Jig, Real time Device drivers & Test software on Vx works platform.
- Voltage, AC-DC, Strain Gauge, RTD, Thermocouple, TP Scanner, Accelerometer, Synchro, Voice, Frequency, Discrete, IRII-B, GPS.
Antenna control system for Tactical Control Radar & Rohini Radar
- 6U VME 64X platform with customized Modules
- Interfaces with Hydraulics, Analog, Drives, Encoders, Vehicle Leveling sensors
- Ethernet UDP interface with Radar controller
- Device Drivers Development and Porting Montavista Linux
- Application Software Development

Antenna Deploy Control unit (ADCU)
- Highly rugged sealed enclosure with based on PowerPC RISC Architecture processor
- Interface with Drive Amplifiers, Encoders, Sensors, Interlocks, Remote PC etc.
- Used to deploy the Radar Antenna in Elevation Axis
- Vehicle mounted chassis with front panel Display, indicators, Switches etc.
- Used in Weapon Locating Radar/Flight locating Radar.

Antenna Control Servo system for 32mtr. DSN Antenna for Chandrayan-1
- ACSS-ACU is Antenna Control Unit for 16 to 32 meter Antenna
- The antenna axes configuration is Elevation over Azimuth
- AZ has steer ability of 270° and EL steer ability is 0-90
- Drives can support up to 80Nm motors
- Four motors used for two axes in anti torque drive mechanism
- 6U cPCI based control unit along with I/O cards
- RT Linux based servo loop control software
- Used to control DSN 32 which is used to track chandrayaan-1

Mobile Antenna Control system (MACS) for 1.8Mtr ‘Ku’ band
- Based on MPC 565 PowerPC controller system.
- MACS is a 230VAC 50Hz mains operated, rugged 19” rack mountable 2U system.
- Controls the movement of vehicle mounted antenna system (1.2M to 1.8M) in Azimuth, Elevation & Polarization axis to track the desired satellite.
- Interfaces with integrated stepper drive & motor for AZ & EL axes, AC geared motor for POL axis, Limit switches, Encoders, Inclinometer, GPS, compass.
Automated Test Equipments

ATE for SSFDR
- Testing - Electronics Modules / Sub System / Integration
- 6U cPCI platform with customized Modules
- Windows based GUI software developed using VC++
- Simulation of aircraft inputs such as Analog, RTD, Thermocouple, Discrete, Tacho, Audio
- Simulation of avionic bus data via ARINC429 and MIL 1553B interfaces
- Analysis of Data recording performance

Automated Test Equipment (ATE) for Air Data Computer (ADC)
- ATE for ADC is used to test the different modules of ADC independently (SRU Level) and ADC as a whole system (LRU Level).
- The system is modular using 19” rack mountable units. ATE built on NI PXI platform with customized I/O Modules, Electronic Load and Programmable power supply.
- Software Developed on NI LabVIEW
- ATE is capable of testing SRU & LRU modules as per customer’s specs in manual and auto modes

Automated Test Equipment (ATE) for LEVCON Air Data Computer (LADC)
- ATE for LADC is used to test the different modules of LADC independently (SRU Level) and LADC as a whole system (LRU Level).
- The system is modular using 19” rack mountable units. ATE built on NI PXI platform with customized I/O Modules, Electronic Load and Programmable power supply.
- Software Developed on NI LabVIEW
- ATE is capable of testing SRU & LRU modules as per customer’s specs in manual and auto Modes

Software integration Rig (SIR)
- Software integration rig (SIR) used evaluate the application functionality of Display & Mission Computer
- SIR will simulate MIL1553, ARINC429, ARINC717, Video, Audio, Serial, Ethernet, Discrete I/O,
- Analog I/O, Power Supply etc. signals in various (Mission Scenario, Math Functions, from Scripts etc)
- User friendly GUI software to evaluate the DMC application S/W.

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