



The SilverBox™ Software Suite (SBSS) is a full range of distributed software products allowing semiconductor fabs to implement a complete integrated solution for both Automation and Advanced Equipment Control / Advanced Process Control (AEC / APC) .

SBSS offers both capabilities and solutions for:

- Equipment Integration & Automation,
- Data Collection & Monitoring, Univariate Analysis,
- Global Process Control (GPC) : Automatic Real-Time Fault Detection, Classification, Identification,
- Implementation of Equipment Engineering Capabilities (EEC) architecture in new or existing fab.

The SilverBox™ Software Suite (SBSS) is packaged around development tools and execution tools:

- **SBSS Integrated Development Environment (SBSS IDE)**, the configuration and development tool,
- **SBSS Automation Package (SBSS APack)**, run-time for equipment integration and automation,
- **SBSS Process Monitoring Package (SBSS MoPack)**, run-time for Data Collection & Monitoring and Univariate SPC, with **SBSS Process Control Builder (SBSS MoPack PCB)**, the associated modeling and analysis tool,
- **SBSS Global Process Control Package (SBSS GPack)**, run-time for automatic real-time Fault Detection, Classification & Identification, with **SBSS Global Process Control Builder (SBSS GPack PCB)**, the associated modeling and analysis tool based on the **Global Process Control (GPC)** methodology,
- **SBSS Global Deployment System (SBSS GDS)**, the fab-wide deployment methodology and supervision tool.

Si Automation products are open to third party products, can be used independently and are provided with an XML API.

Automation

SBSS Automation Package (SBSS APack) is an Equipment Integration & Equipment Automation solution that provides the end user with a complete set of configuration Templates, Drivers and Gateways to connect process and metrology equipment to any MES and MessageBus. It includes an **Equipment Manager** (EM) Template & a **GEM Equipment Driver Template** (GEM EDT), and meets the major requirements for equipment automation scenarios.

Automation Components

SBSS APack includes two main components :

■ Equipment Manager (EM) Template

The **Equipment Manager** (EM) Template has a generic design that can adapt any tool, tool-type, site and / or scenario. 300mm requirements covered by the EM include :

- Lot Tracking
- Identification
- Loading / Unloading
- Process Program Control
- Batching / Unbatching
- Cluster Tools
- Processing Management
- Alarm & Event Management
- Material Handling
- Equipment Management
- User Interface
- Extensibility to Advance Process Control

■ GEM EDT

The **GEM Equipment Driver Template** (GEM EDT) with its GEM Interface is compliant with SEMI standards, and with open source for the software developers to adapt it to equipment specificity. Standards covered by GEM EDT include :

- E30 : GEM,
- E39 : Object Service Standard (OSS),
- E40 : Processing Management Standard,
- E42 : Recipe Management Standard,
- E87 : Carrier Management Standard,
- E90 : Substrate Tracking,
- E94 : Control Job Management.

Process Control

Process Control products include both tools and methodologies to allow monitoring and control of processes & equipments. They offer scalable capabilities from simple data collection to sophisticated solutions for automatic fault identification.

Process Control products are packaged in two complementary packages :

- **SBSS Process Monitoring Package** (SBSS MoPack),
- **SBSS Global Process Control Package** (SBSS GPack),

SBSS MoPack offers both capabilities and solutions for :

- **Data Collection,**
- **Data Monitoring,**
- **Data Pre-Treatment,**
- **Real-Time Univariate Analysis**
- **Out-of-Control Action Plans** (OCAPs).

SBSS GPack includes SBSS MoPack and offers additional capabilities :

- **Real-Time Multivariate Analysis**
- **Fault Signature Identification and Classification.**

Each package includes :

- a configuration & analysis tool, **SBSS Process Control Builder** (SBSS PCB), for the user to build models or process control strategies,
- an execution tool which runs the models and executes the process control strategies, **SBSS Process Control Executor** (SBSS PCE).

Process Control Components

DATA COLLECTION

The basic brick of Process Control is Data Collection and its context. Data is collected from process and / or metrology equipment and in some cases from equipment sensors and / or external smart sensors.

Key Features :

- Market standard **SQL Data Base**,
- Real-time **Data Collection Capabilities**,
- If needed, field proven **PassThrough** is available.

Benefits :

- Available (time to market),
- Open to third party applications,
- Field proven.

Capabilities :

- Multiple Data Collection Plans, activated at the same time on selected chambers, recipes, lots,
- Configuration by process steps, by recipes, by chambers, with a sampling rate parameter by parameter,
- Capability to be launched by event & by parameter change,
- Analog/Digital Inputs Acquisition at less than 0.1Hz,
- Collection of more than 300 SV/s,
- Smart sensors integration,
- Synchronization and unification of data from sensors, equipment and automation context.

Also, Si Automation's Data Collector provides a library of gateways to third party software and of interfaces to smart sensors using SBSS connectivity capabilities.

DATA ANALYSIS

Prior to analysis, Si Automation products include a Data Pre-Treatment module which offers capabilities based on mathematical functions such as mean or integral.

Three main functions are available today :

- **Univariate Analysis** using standard SPC functions such as Control limits, Cp, Cpk, Cpu,
- **Multivariate Analysis** using Hotelling T²,
- Extension of the multivariate analysis to **Fault Signature Classification & Identification** using a unique technology based on the Global Process Control (GPC) methodology.

Construction and deployment of Control Strategies are scalable and incremental and include :

- **Data Collection**,
- **Data Monitoring**,
- Real-Time **Univariate Analysis**
- Real-Time **Fault Identification**.

SilverBox™

Si Automation provides a multi-connectivity hardware platform, the SilverBox™, which :

- Provides reactivity at wafer level,
- Guarantees the software and hardware integrity,
- Provides capabilities for Sensor Integration, and Analog/Digital Inputs acquisition at less than 0.1Hz,
- Allows connection to Multiple network, to enable the implementation of Equipment Engineering Capabilities (EEC) in a new or existing fab.
- Supplies equipment with all the hardware connectivity capabilities necessary to its environment.

Global Deployment System (GDS)

The architecture based on SBSS and the SilverBox™ is a distributed one. The GDS methodology :

- performs fast deployment of the combined software and hardware,
- eases the software maintenance and upgrade with minimum interruption of the production,
- allows fast ramp up of a new fab and fast recovery in case of hardware failure,
- enables SBSS to be a virus proof solution.

GDS COMPONENTS

- **Disk Image Initialization System (DIIS)** allows the customer to build and own its proprietary disk images,
- **File Server Repository (FSR)** centralizes, deploys, backups, maintains & upgrades all SBSS projects.

Training

Si Automation offers a comprehensive selection of technical courses for fab wide range of automation, maintenance, and engineering operations. These courses particularly address automation, maintenance and process engineers, and ensure them to be completely independent with Si Automation products, for fast learning curves and ramp ups.

Our offerings are designed to help the user achieve results quickly and cost effectively. Students achieve learning through class theory and hands-on exercises. Classes are held at our facilities in Montpellier, France for Europe, and by special arrangement, at customer sites.

Expertise & Consulting Services

Si Automation provides also services of high level and high skilled automation experts for Project Management, Automation Architecture Design, automation scenarios development and implementation.

By working in concert with engineering staff, Si Automation Consulting Services will provide powerful resources to implement the latest in planning, development and design that can provide a critical edge in today's highly competitive marketplace.

Moreover, they allow the customer to get implemented projects in very short delays, without waiting for his own engineers to be trained and operational.

Moreover:

- Each product can be used independently and is open to third party applications. Si Automation data collector is open to third party Process Control products, and Si Automation Process Control products can interface with third party data collector.
- Si Automation recommends to start the Process Control implementation with univariate analysis and move step by step to GPC.
- To get the best from Si Automation Process Control products, the use of Si Automation data collector and of the SilverBox™ are recommended. SBSS APack is also recommended to get the best from SBSS MoPack or SBSS GPack.
- If another data collector is used, Si Automation can provide an API to interface with it.
- Even if SBSS brings the most benefits when embedded in a SilverBox™, it can also run on a standard PC.
- All Si Automation's products comply with SEMI Standards and International SEMATECH Guidelines for 200mm and 300mm wafer sizes.

