

Technology Partner You Can Count On

Semiconductor Software Experts

Capital
Equipment
Software



11
Years

Factory
Automation

Industry 4.0,
IoT & AI/ML



About Us

- ▶ Global Presence
 - Headquartered in California, US
 - Global Operations
 - Europe – Germany, France & UK
 - SEA – Singapore, Philippines, Malaysia, Thailand
 - Taiwan, Korea, China & India
- ▶ Tier 1 & 2 Fab, A&T & OEM customers across the world
- ▶ Team with deep domain expertise

Equipment Software Expertise

- ▶ SECS/GEM implementation on Equipment
 - Both up to 200mm and 300mm wafer size SEMI standards SDKs
 - SDK as well as complete integration with compliance
- ▶ Main Controller(GUI) software development & maintenance
- ▶ AI/ML based Predictive Maintenance sub-system for equipment
 - Comes with required sensors & software
- ▶ Sub-tool Integration
 - EFEM, Robot, SMIF/FOUP, OCR, RFID etc.
- ▶ Image Processing & Computer Vision software
- ▶ Industry 4.0 capabilities
- ▶ Refurbishment Service
 - Replace the robot, etc. of old equipment without modifying controller software
- ▶ System audit & training
 - SECS/GEM compliance, software design & architecture, etc.

Factory Automation Expertise

- ▶ Adding SECS/GEM capability on legacy/old equipment
 - Plug-n-play : No software/hardware install
- ▶ Reduction in unscheduled equipment down time
 - Industry 4.0 & AI/ML based Predictive Maintenance
- ▶ Automated Optical Inspection (AOI)
- ▶ Fault Detection & Classification (FDC)
- ▶ Advanced Process Control (APC)
- ▶ Cycle Time, OEE & equipment up-time improvement
- ▶ Cost savings through automation
- ▶ MES development, customization & migration
- ▶ RFID based WIP tracking & Inventory Management

Delivery Model

- ▶ Products
 - SECS/GEM SDKs & Testing software
 - Predictive Maintenance System
- ▶ Custom Solution
 - Development & maintenance of controller software
 - OEMs own the IP & source code
- ▶ Staff Augmentation/Contract software engineers
 - With equipment software experience
 - Onsite, Offsite and hybrid options
- ▶ Compliance Audit & Training
 - Compliance of SEMI & software standards audit
 - Training for SECS/GEM

Quality First

- ▶ Use of Design Patterns & Best Practices
- ▶ Design & Code Reviews by experts
- ▶ Comprehensive Quality Assurance
- ▶ Simulators for hardware developed for testing

Case Studies

- ▶ One US based OEM saved \$220K annually
 - By switching software maintenance
- ▶ One metrology OEM improved productivity by as much as 30% while reducing cost by 20%
- ▶ Saved a Fab \$1.5M annually by tracking precious metals use and reclaim
- ▶ Saved a fab \$1.2M upfront and \$200K annually by increasing throughput by 22%

Accomplishments

- ▶ Developed a patent pending technology for automation of old, legacy equipment
- ▶ Only company in the industry to have successfully developed controller software from scratch & implemented SECS/GEM in Android
- ▶ Implemented SECS/GEM on a metrology equipment without having access to equipment
 - Developed equipment simulators and used those for development testing
 - “Just worked” on real equipment
- ▶ Implemented SECS/GEM on very old equipment running on DOS and PC with 640KB
- ▶ Helped OEM replace robot without making any changes to controller software at all

Customer Testimonials

- ▶ "...We found Nirav Thakkar and his [team to be very professional and competent](#). Since our legacy tool is hosted on a DOS operating system, this imposed memory limitations unheard of in today's terms. We lacked the headroom in the operating system to add a TCP/IP networking stack, let alone a full SECS\GEM implementation. elnnosys helped us to overcome this hurdle.... elnnosys assigned very knowledgeable engineers to the project that helped us to keep good project momentum. Their project management services also made tracking project progress easier on Revasum...[The final testing phase was surprisingly pain-free. We were able to shave months of NRE off the project timeline through the use of their API and knowledge of the SECS/GEM standard; their expertise was a huge time savings.](#) I found Nirav and his team to be very professional, collaborative, and helpful. We would not hesitate to ask for their help on future projects.
 - Bill Nagel, Director of Software & Controls, Revasum
- ▶ "To meet a PVA demand that did not align with the elnnosys engineer's schedule, Mr. Thakker himself travelled to the customer's site, installed the software and obtained acceptance from the customer. This is a [level of commitment to completing a project](#) PVA shares. All this while [keeping within quoted budget.](#)"
 - Walt Roloson, Engineering Manager, PVA Tepla
- ▶ "The development work was performed in absence of the tool which involves exceeding number of variable and parameters; complicated simulator software for subsystems has also been developed during the work. Mr. Thakkar also pointed out to us numerous legal and commercial aspects of the SECS/GEM software"
 - Dr. James TC Chen, President, Four Dimensions Inc
- ▶ "The results were exactly what we wanted and the [speed and quality of the work done by elnnoSys was very impressive](#). elnnoSys Inc. has provided us with the high quality of professional software development that we can count on. We plan to work with them for years to come and would highly recommend elnnoSys"
 - Ken Hall, Software Manager, SPEC
- ▶ "The professional staff at elnnoSys provides not only software development but also project management, an all-around professional software service from A to Z. elnnosys provides a [professional software service that is very customer focused and which you can count on.](#)"
 - Nico Ooms, Partner, Nile Techs

Equipment Software Portfolio

- ▶ **Process**
 - Plasma Etchers – Multiple flavors
 - Wet benches
 - Stepper
 - Polishers & Grinders
 - Mask Aligners
 - CVD & PVD
- ▶ **Metrology**
 - Thin film stress measurement from topography of wafer
 - CV measurement – 4 point probe
- ▶ **Laser Scriber**
- ▶ **Wafer handling systems**
 - Sorters
 - EFEMs

Staff Augmentation

- ▶ Team of 32 Software Professionals of various levels and skills
- ▶ Bachelor or Master in Computer Science from reputed universities
- ▶ Carefully selected through rigorous interview process
- ▶ Undergone various training programs upon acceptance
- ▶ Smart, dedicated, hard-working team players
- ▶ Work in customer time-zone and travel to customer site as needed
- ▶ Rates start at USD 3,990 per month

Profile of Software Professionals

- ▶ Roles: Software Engineers, Sr. Developers, System Architects, Team Leads, QA Engineers & Sr. QA Engineers
- ▶ Experience: From 2+ to 15+ years
- ▶ Technology stack
 - Language: C#, C, C++, VB.net, Java & Python
 - Platform: Windows, Linux, Android, iOS
 - Database: SQLServer, Oracle, MySQL, MongoDB
 - Protocols: SECS/GEM, GEM300, EtherCat, Modbus, DeviceNet, OPC
 - MES: PROMIS, FactoryWorks, Eyelit, custom

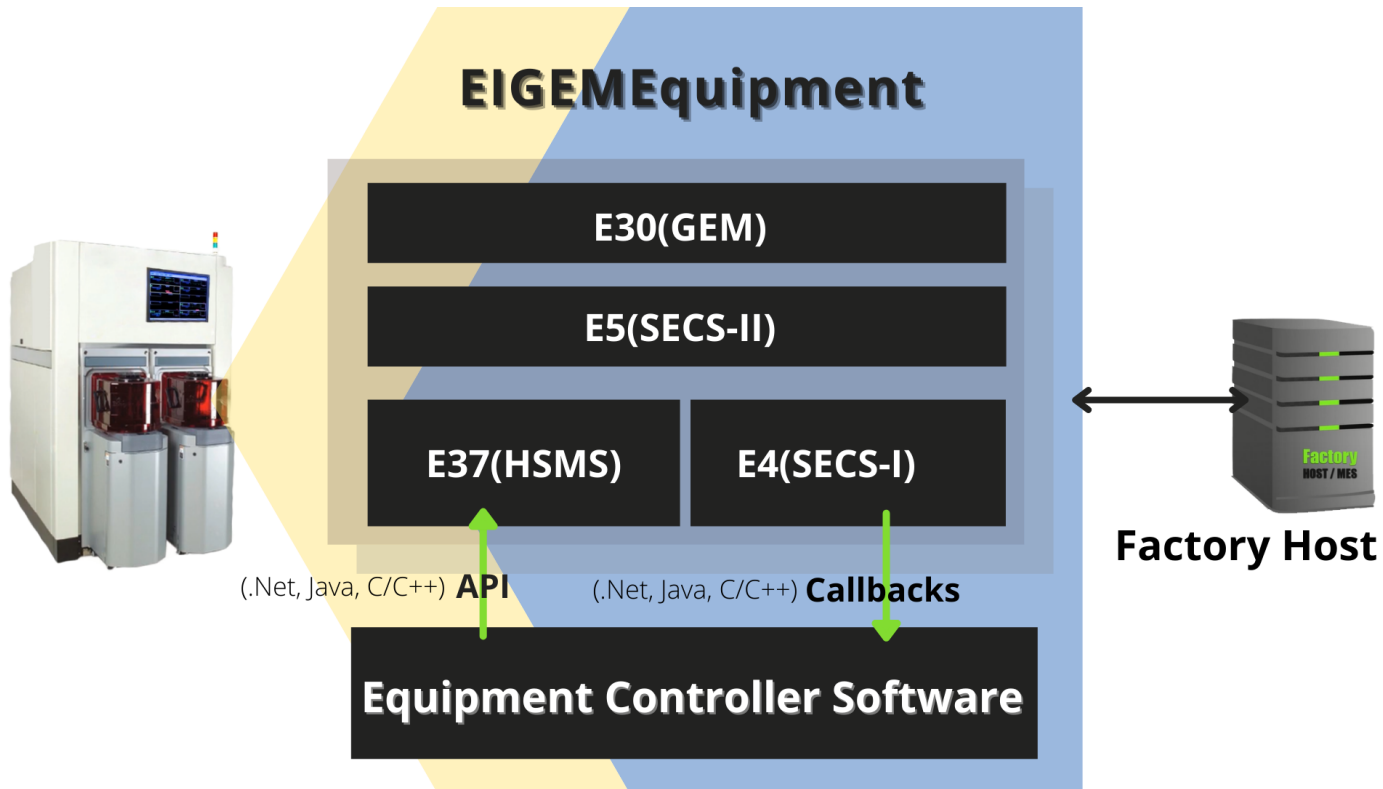
SECS/GEM Products

- ▶ EIGEMEquipment & EIGEM300Equipment
 - SDK for OEMs
 - C#.Net, C++, Java
 - Windows, Linux, Raspberry Pi, Android
- ▶ EIGEMHost & EIGEM300Host
 - SDK for Fabs/Assemblies
 - C#.Net, C++, Java
 - Windows, Linux, Raspberry Pi, Android
- ▶ EIGEMSim
 - SECS/GEM testing/simulation software (Win & Linux)
- ▶ EIGEMBox
 - Adding SECS/GEM capability in a plug-n-play way (no hardware/software installation)
- ▶ EIGEM-HMI
 - SECS/GEM for HMI (non-PC) based equipment

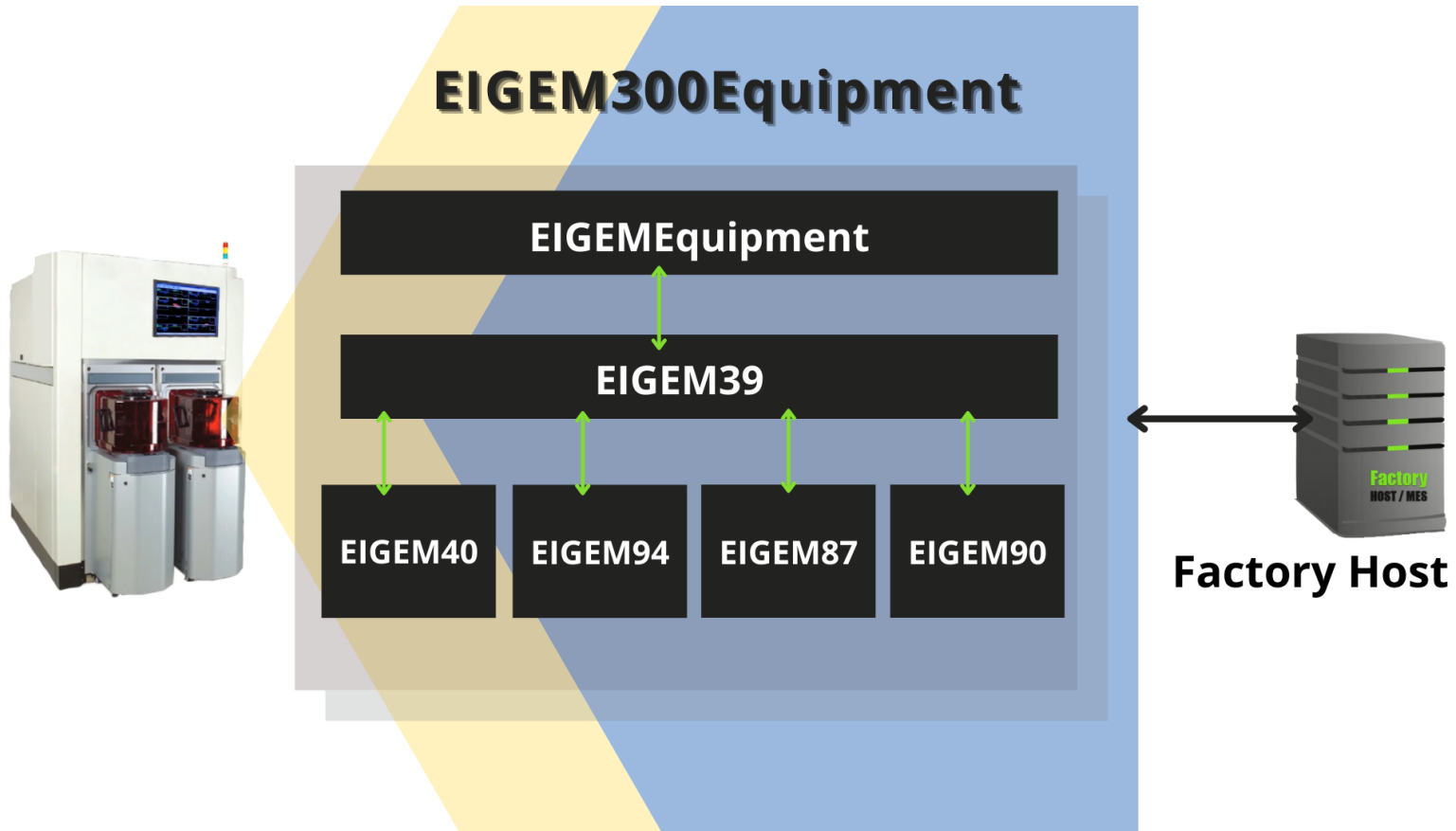
Product – EIGEMEquipment

- ▶ SECS/GEM software for 200mm equipment
- ▶ Built-in Support for following SEMI standards
 - E30 – GEM (Generic Equipment Model)
 - E5 – SECS-II Message Format
 - E37 – HSMS (Ethernet) Connectivity
 - E4 – SECS-I (RS232) Connectivity
- ▶ Multi-platform Support
 - Runs on Windows, Linux/Unix & Android
- ▶ Multiple Technology Support
 - Java, .Net and C/C++
- ▶ 80% of functionality out of the box

EIGEM Equipment SDK (200mm & lower wafer size equipment)

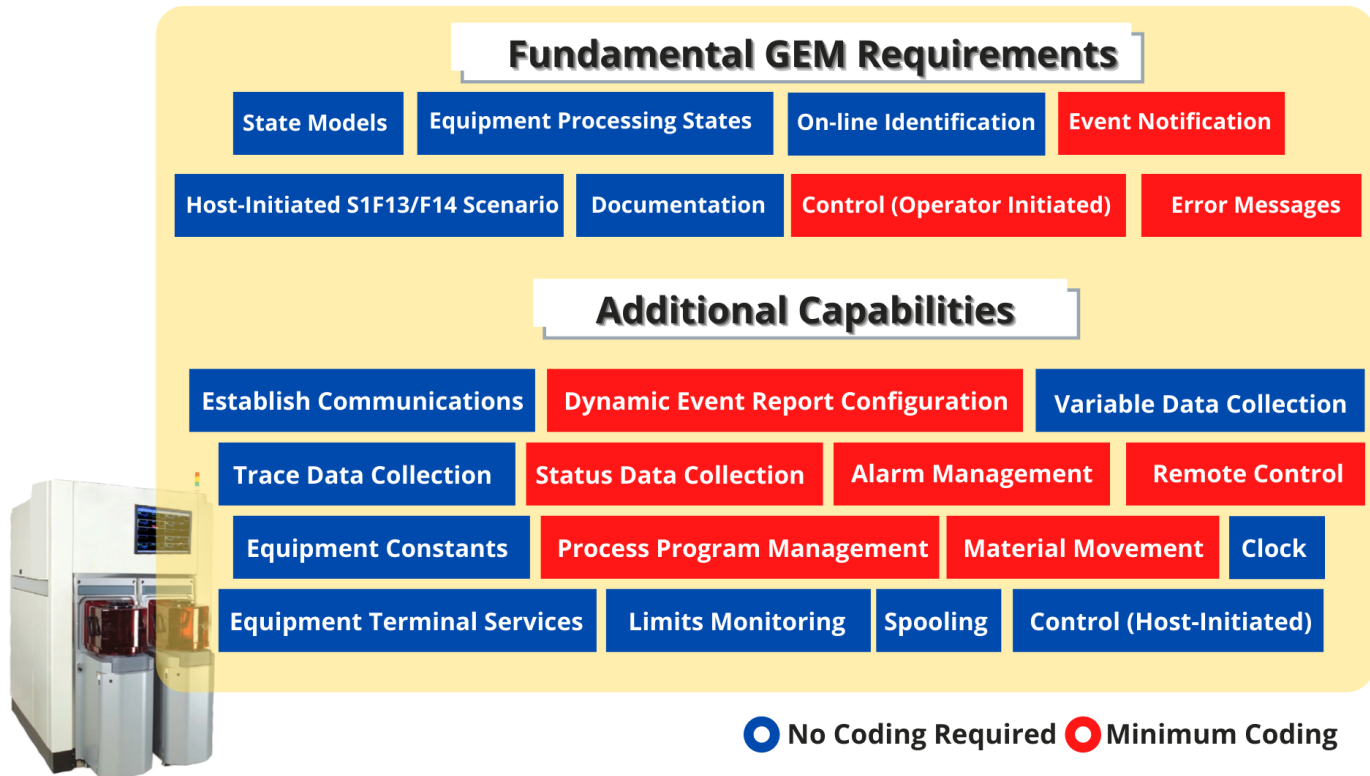


EIGEM300Equipment SDK (300mm wafer size equipment)



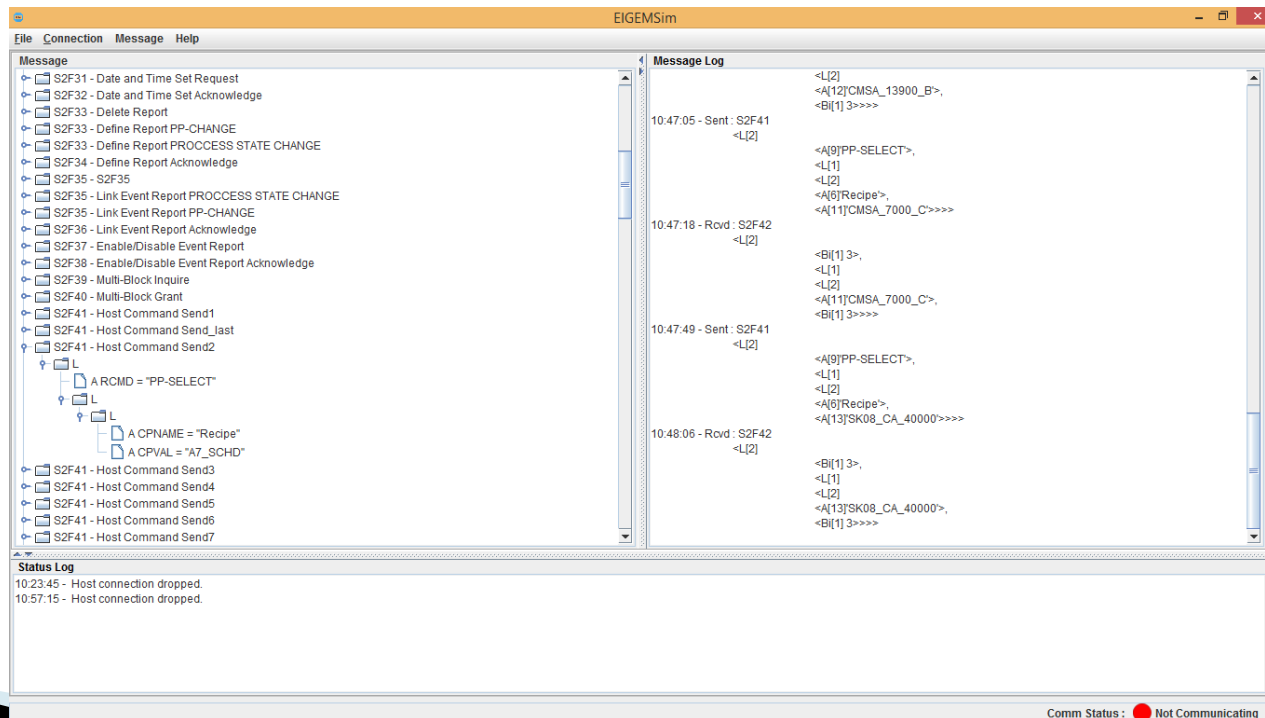
EIGEMEquipment SDK

- ▶ Most functionality out-of-the-box



Dev & Compliance Testing – EIGEMSim

- ▶ Simulator for factory host or equipment
- ▶ Most messages pre-defined
- ▶ UI & SML based configuration



Portfolio – Controller Software for Plasma Etch equipment (Linux)

EquipmentWorks

Vacuum Gas Flow

DIGITAL OUT (ACTUATORS)			DIGITAL OUT (ACTUATORS)			DIGITAL OUT (ACTUATORS)			ANALOG IN (FEEDBACK)			ANALOG OUT (SETPOINT)		
<input checked="" type="checkbox"/>	GAS1 PROCESS VALVE	<input checked="" type="checkbox"/>	GAS1 ISO VALVE	<input type="checkbox"/>	GAS1 BYPASS VALVE	<input type="checkbox"/>	100.00	GAS1 FLOW (SCCM)	<input checked="" type="checkbox"/>	100	GAS1 SETPOINT (SCCM)	<input type="checkbox"/>	24V DC is ON	
<input type="checkbox"/>	GAS2 PROCESS VALVE	<input type="checkbox"/>	GAS2 ISO VALVE	<input type="checkbox"/>	GAS2 BYPASS VALVE	<input type="checkbox"/>	0.00	GAS2 FLOW (SCCM)	<input type="checkbox"/>	0.00	GAS2 SETPOINT (SCCM)	<input type="checkbox"/>	24V DC is ON	
<input checked="" type="checkbox"/>	GAS3 PROCESS VALVE	<input checked="" type="checkbox"/>	GAS3 ISO VALVE	<input type="checkbox"/>	GAS3 BYPASS VALVE	<input type="checkbox"/>	0.00	GAS3 FLOW (SCCM)	<input checked="" type="checkbox"/>	300	GAS3 SETPOINT (SCCM)	<input type="checkbox"/>	Nirav T	
<input type="checkbox"/>	GAS4 PROCESS VALVE	<input type="checkbox"/>	GAS4 ISO VALVE	<input type="checkbox"/>	GAS4 BYPASS VALVE	<input type="checkbox"/>	0.00	GAS4 FLOW (SCCM)	<input type="checkbox"/>	0.00	GAS4 SETPOINT (SCCM)	<input type="checkbox"/>	N2 is Enabled	
<input checked="" type="checkbox"/>	GAS5 PROCESS VALVE	<input checked="" type="checkbox"/>	GAS5 ISO VALVE	<input type="checkbox"/>	GAS5 BYPASS VALVE	<input type="checkbox"/>	0.00	GAS5 FLOW (SCCM)	<input checked="" type="checkbox"/>	200	GAS5 SETPOINT (SCCM)	<input type="checkbox"/>	Gas Panel is Enabled	
<input type="checkbox"/>	GAS6 PROCESS VALVE	<input type="checkbox"/>	GAS6 ISO VALVE	<input type="checkbox"/>	GAS6 BYPASS VALVE	<input type="checkbox"/>	0.00	GAS6 FLOW (SCCM)	<input type="checkbox"/>	0.00	GAS6 SETPOINT (SCCM)	<input type="checkbox"/>	Chamber lid is Closed	
<input type="checkbox"/>	GAS7 PROCESS VALVE	<input type="checkbox"/>	GAS7 ISO VALVE	<input type="checkbox"/>	GAS7 BYPASS VALVE	<input type="checkbox"/>	0.00	GAS7 FLOW (SCCM)	<input type="checkbox"/>	0.00	GAS7 SETPOINT (SCCM)	<input type="checkbox"/>	Covers are Closed	
<input type="checkbox"/>	GAS8 PROCESS VALVE	<input type="checkbox"/>	GAS8 ISO VALVE	<input type="checkbox"/>	GAS8 BYPASS VALVE	<input type="checkbox"/>	0.00	GAS8 FLOW (SCCM)	<input type="checkbox"/>	0.00	GAS8 SETPOINT (SCCM)	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	GAS PANEL ISO VALVE	<input type="checkbox"/>	GAS PANEL VENT VALVE	<input type="checkbox"/>	GAS PANEL PURG VALVE	<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>		

Portfolio – Equipment Controller Software

Jul 4, 2014
1:50:21 PM

User:a
Secs/Gem:Online Local

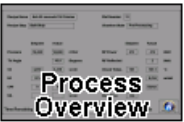
SW Version:1.00.00

System Status

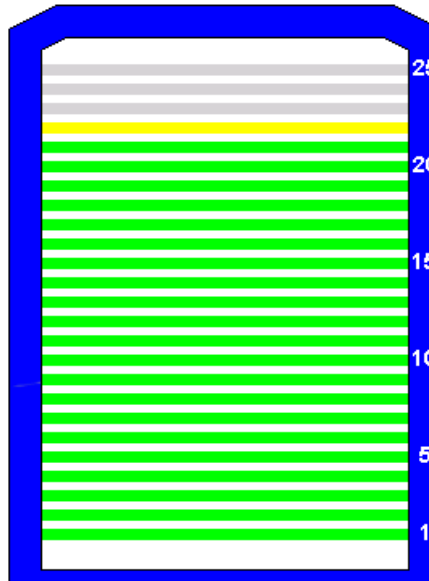
Idle

Processing

Standby



Process Overview





Graphics Property of Nile Technologies LLC

Sample Maintenance Screen

Burnin



Number of Cassettes ▼



Running Cassette 11 of 25 Current slot: 15

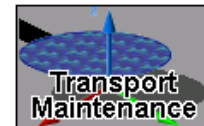
 

Cycle

Time Delay (Seconds)

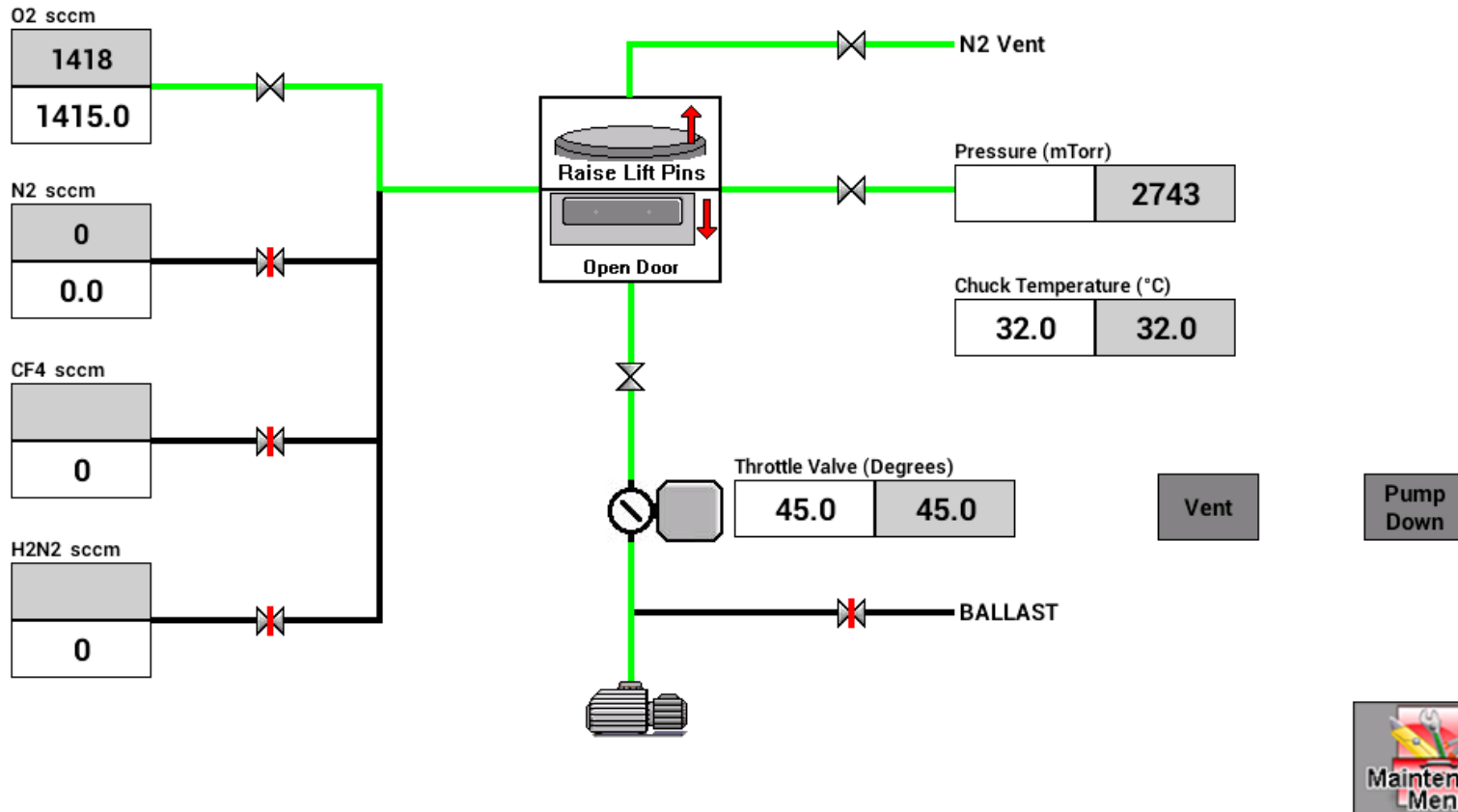
 



Graphics Property of Nile Technologies LLC

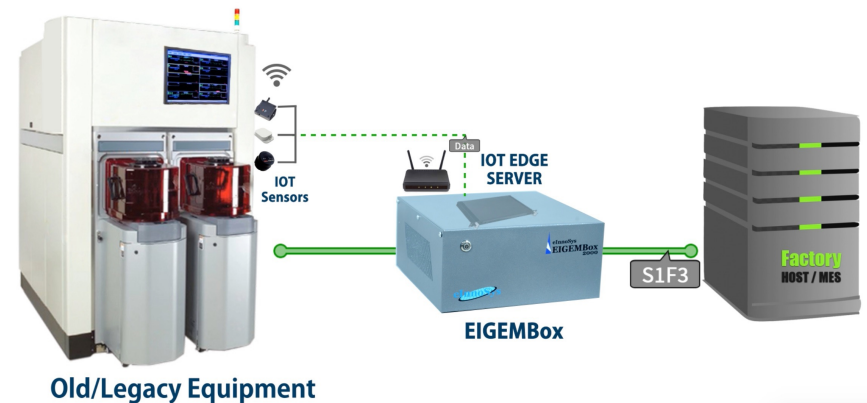
Process Maintenance UI



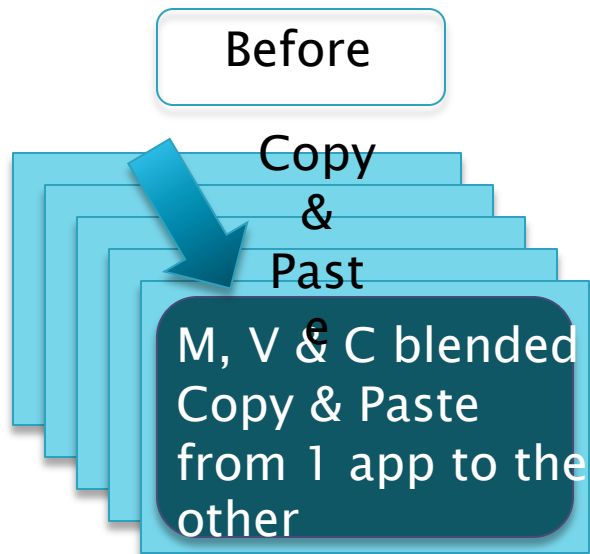
Graphics Property of Nile Technologies LLC

EIGEMBox

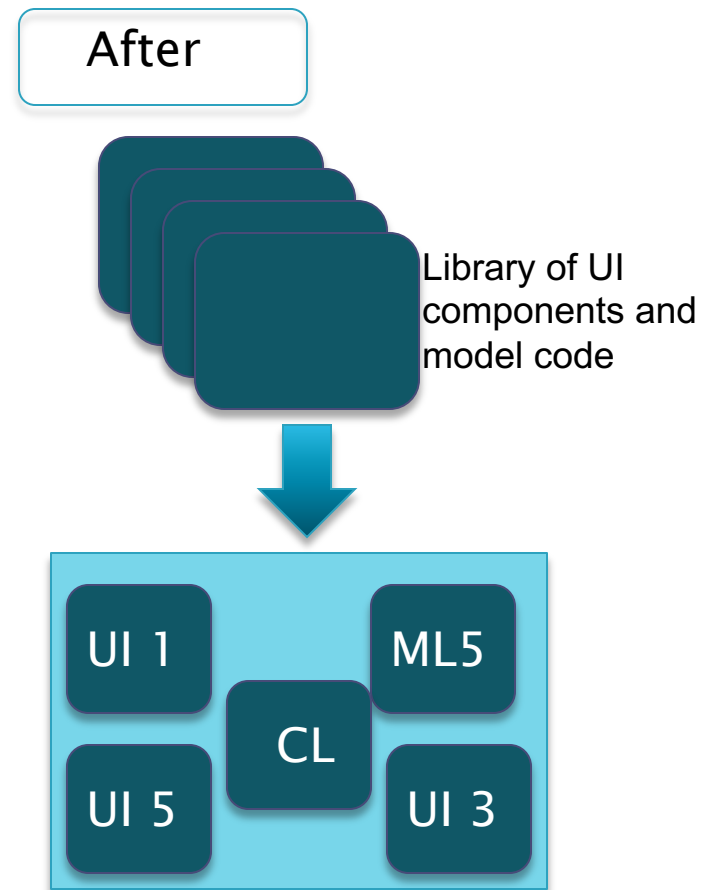
- ▶ Enables SECS/GEM capability on existing equipment
- ▶ Plug-n-Play, takes minutes to configure
- ▶ Patent pending technology



Portfolio – Software Design Recommendations



RESULT:
Development time down from 6 mo to 3 wks



Technology Portfolio

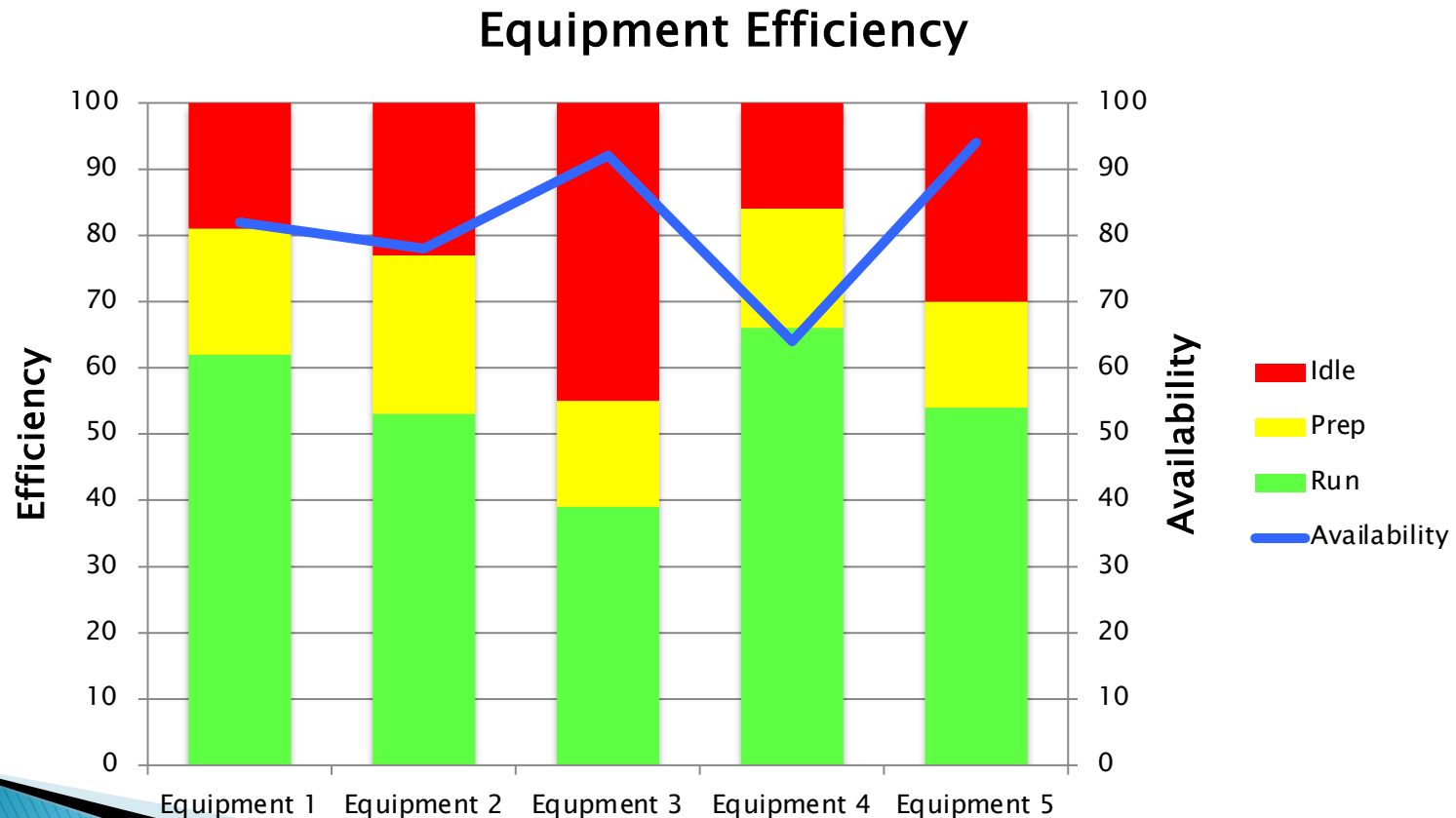
- ▶ Pioneer in ANDROID based software
- ▶ Tools
 - EIGEM – eInnoSys' own SECS/GEM software
 - Tools from Cimetrix, PeerGroup, AMAT, Wonderware and NI
- ▶ Technologies/Languages
 - Java, .Net, C/C++, VB, ActiveX and most others used in the industry
- ▶ Platforms
 - Windows, Unix/Linux, Windows CE, RT Linux, Android, iOS
- ▶ Protocols
 - SECS, GEM, GEM300, EDA (Interface A)
 - EtherCat, OPC, Modbus, DeviceNet and others
- ▶ MES
 - PROMIS, Workstream, FAB300, FACTORYworks, eyelit

Fab Automation Areas

- ▶ Yield Improvement
 - Station Controllers for 100+ different equipment models
- ▶ Cycle Time & Throughput Improvement
- ▶ Recipe download & data collection from OLD (non-SECS/GEM capable tools)
- ▶ Systems to ease troubleshooting of complex issues
- ▶ Advanced Process Control (APC)
- ▶ Fault Detection & Classification (FDC)
- ▶ Cost savings through automation
- ▶ Improving engineering efficiencies
- ▶ Experience in R&D size FABs to high volume high-tech ones

Throughput & Cycle Time Boost

- ▶ Case Study : **22% Throughput Improvement**



Advanced Process Control (APC)

- ▶ Run-to-Run (R2R) control and Wafer-to-Wafer (W2W) control
- ▶ Feedback System
 - Feeding overlay measurement into steppers
 - Improved cycle time & throughput
 - Better process
- ▶ Feeding other metrology results into process steps
 - Grinders
 - Polishers

Thank You

Contact Info

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