

PEER Tool Orchestrator

Tool Automation Software

PEER Tool Orchestrator (PTO™) is a tool automation software platform used by OEMs in the Semiconductor, Solar, LED, and MEMS industries to manage all tool activities beyond chamber process control and data analysis, including job processing, material movement, material scheduling, recipe management, user interface, data management, and factory host communications. Virtually all 300mm fabs around the world, as well as numerous other high technology factories, are currently operating production equipment that uses PTO.

Using the latest software technology, PTO provides useful and timesaving features such as self-discovery, extensibility, dynamic material scheduler, and vacuum control engine.

In addition to its ability to manage a variety of tool topologies, substrate shapes and sizes, and industry standards, PTO provides additional flexibility for software design, configuration and maintenance. Whether your needs are driven by equipment design changes or specific customer requirements, PTO makes it easy to meet the on-going demands of the market.

Product Family

PTO has evolved into a family of product offerings to meet the automation needs of different tool types and processing scenarios. Choose the version that suits your current needs, and as production requirements for your equipment grow, take advantage of additional capabilities by migrating to a different version of PTO.

- ▶ **PTO 300** For tools that need to communicate with a factory host and manage automated material hand-off, job execution, and equipment states based on the 300mm SEMI standards. PTO 300 includes full support for cluster tools. An E30 adaptor can be included for tools also running in older fabs.
- ▶ **PTO 200/PV** For tools where factory host communication is based on the E30 GEM standard (200mm, photovoltaic, assembly, etc.), this is the best solution for tools deployed in fabs with simple factory automation needs. PTO 200/PV includes full support for cluster tools, provides a competitive price point and can be upgraded seamlessly to PTO 300.
- ▶ **PTO BenchTop** For tools without factory automation requirements or EFEM hardware integration. PTO BenchTop relies on PTO's robust infrastructure to provide basic manual control capabilities and co-ordinate wafer processing. A complete user interface is provided.

Product Highlights

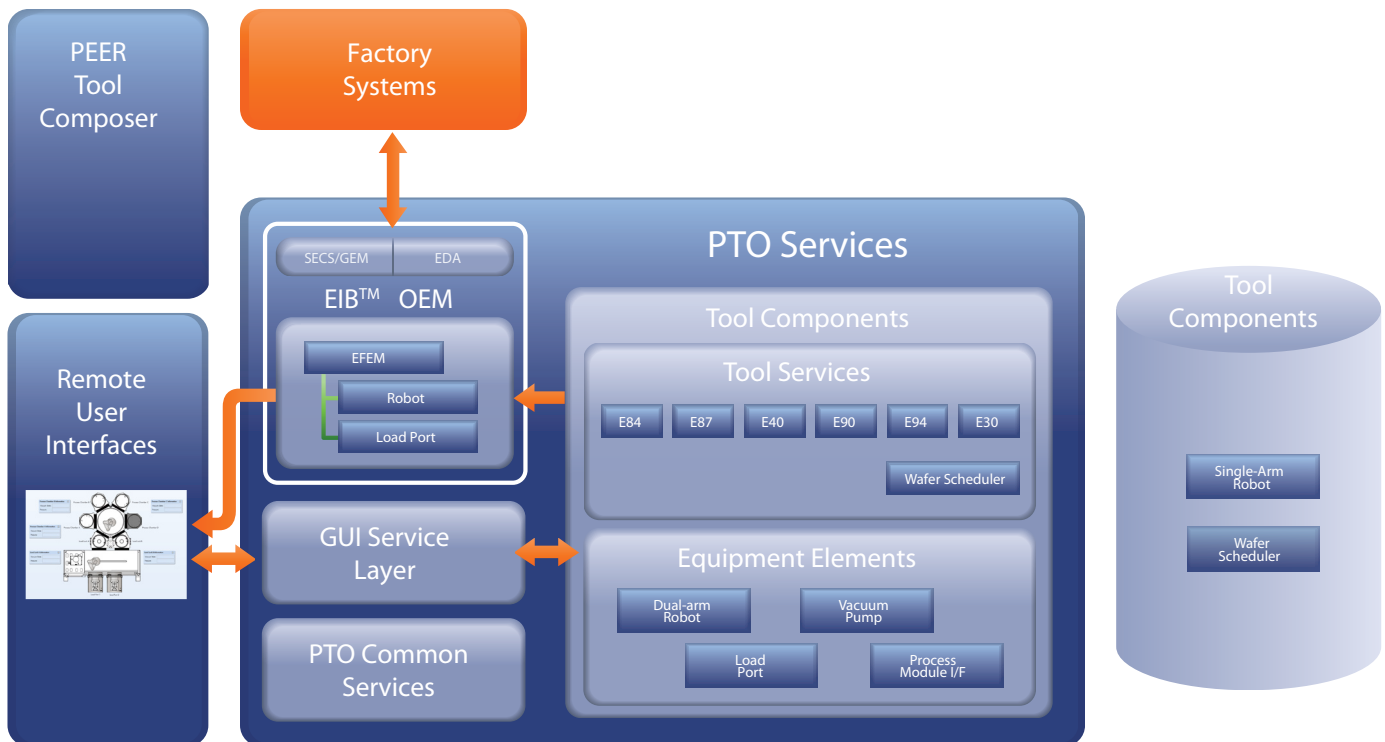
PTO controls all automation hardware including robots, load ports, wafer ID readers, aligners, light towers, and vacuum systems. It also manages most of the workflow logic on the tool including factory host communications, user interface and scheduling.

FEATURE	DETAILS
<i>Full SECS/GEM, GEM 300 and Interface A (EDA) Compliance</i>	<p>Full host connectivity capabilities are built into the PTO core based on its integration with EIB (Equipment Interface Bridge) ; they can be configured to work with any level of host integration, including:</p> <ul style="list-style-type: none">▶ Lab tools with no host connectivity▶ GEM/E30 compliant tools (E4, E37, E5, and E30)▶ 300mm compliant tools (E4, E37, E5, E30, E39, E40, E84, E87, E90, E94, and E116)▶ Interface A compliant tools (300mm standards plus E120, E125, E132, and E134)
<i>Dynamic, Flexible Substrate Scheduling</i>	<ul style="list-style-type: none">▶ Innovative, task-based Scheduler that supports pluggable, custom scheduling algorithms for more complex tools, targeted to your specific tool topology▶ Any processing scenario and equipment topology can be handled:<ul style="list-style-type: none">• Varying number of substrate locations• Parallel or serial substrate flow• Collaborative, adjustable substrate routing• Deadlock detection• Backwards substrate flows▶ PTO Scheduler comes with many reference Planners, or algorithms, supporting common tool configurations out of the box for rapid development
<i>Largest Library of Hardware Drivers</i>	<ul style="list-style-type: none">▶ Field-proven drivers for all major commercial hardware components: integrated EFEM platforms, load ports, aligners, robots, tag readers, WID readers, light curtains, vacuum systems, and other peripheral devices▶ PTO's extensible framework enables rapid development of new hardware components
<i>Advanced Tool Configuration</i>	<p>PEER Tool Composer (PTC) automates tool configuration and simplifies on-going tool configuration management.</p> <p>Provides complete, extensible tool configuration in the following areas:</p> <ul style="list-style-type: none">▶ Tool components (PTO building blocks) used on the equipment▶ EIB Model, used to publish data from tool components▶ Choice of layout and GUI screens▶ Visualization screens for real-time processing data and tool control▶ Vacuum workflows customized to suit the equipment's hardware and processing needs▶ Communication and diagnostic settings

Product Highlights

FEATURE	DETAILS
State of the Art User Interface	<ul style="list-style-type: none"> ▶ GUIs written with Windows Presentation Foundation (WPF), run out-of-process using Windows Communications Foundation (WCF) communication, support multiple client connections and can be re-themed to meet corporate presentation standards ▶ Visualization Engine lets you create your own graphical screens for both status and control without coding
Hardware Simulation	<ul style="list-style-type: none"> ▶ Ability to simulate any equipment hardware or factory automation robotics in order to test the equipment in a development environment ▶ Unique PTO validation module provides PEER Factory Acceptance Tester (PFAT™) integration, allowing you to perform white box testing of complex, time-dependent scenarios
Utilities and Security	<ul style="list-style-type: none"> ▶ Log viewer provides synchronized view of all real-time or historical log files from multiple sources, allowing engineers to quickly pinpoint data of interest and export relevant log files when troubleshooting abnormal scenarios ▶ Convenient installer loads all applications necessary to run PTO and host communications; supports ability to incorporate PTO installation within your own installer ▶ Choice between PTO-defined security model or hybrid model integrated with Windows security ▶ Security is applied to both GUI and back-end services

Architecture



Written entirely in C#, PTO is an object-oriented framework of modular components and services organized into layers. Each layer provides an incremental level of functionality, from the minutiae of protocol-specific commands for individual hardware pieces to the high-level requirements for job execution and host communications. Because of this modular approach, your solution can use a combination of out of the box components, components customized for your tool's specific needs, or components written by your own engineering team. With such a flexible architecture, PTO can be adapted and extended to fit the unique needs of any tool while still taking advantage of a common framework and proven, standardized components.

Client/Server Architecture

The user interface runs in a separate process from the PTO services. Communication between the user interface and the PTO services is based on Windows Communication Foundation (WCF).

The service layer of PTO exposes a well-documented, public interface known as the GUI Services Layer (GSL) that the UI or any other client code can access. Both the PTO UI and the GSL implement security.

Multiple UI connections to a single tool are possible. The local UI instance running on the tool has control capabilities while remote UI connections are read-only.

Common Services

A common infrastructure is utilized by all members of the PTO product family, providing fundamental functionality for all modules and services. Its extensive configurability gives PTO the flexibility required to address virtually any tool topology or processing requirement.

Tool Services

This layer of PTO's architecture contains the principal building blocks or "services" for automated tool functionality:

- ▶ The Host Services utilize the industry-proven connectivity product, EIB™ OEM, to provide GEM and 300mm functionality for job management, carrier management, automated material hand-off, internal material movement, performance tracking, data collection, alarm management, etc. Host Services provides optional Interface A data publication.
- ▶ The Task Engine, responsible for substrate scheduling, contains a customizable set of services for task-based scheduling of substrates, maximizing throughput and ensuring optimal substrate handling for your specific tool topology.
- ▶ The customizable Vacuum Control service for vacuum-based tools provides complete control of pump-down and venting sequences by coordinating all pumps, valves, and gauges.
- ▶ The Recipe Management service manages recipe upload/download from the host and co-ordination with your process chamber(s). This service supports both cluster and chamber-specific recipes.

Equipment Elements

Equipment Elements are tool components that control hardware elements by translating high-level processing commands from the scheduling-based services into hardware-specific commands. They also provide hardware concurrency control. These elements contain drivers for all major commercial components as well as interchangeable low-level hardware communication protocols, allowing for easy exchange of hardware on a tool.

Features At-A-Glance

FEATURE	300MM	200/PV	BENCHTOP
E30/GEM host link	•	•	
300mm host link	•		
Recipe management	•	•	•
Alarm management	•	•	•
Automated wafer recovery	•	•	•
Carrier management (open cassette, SMIF, FOUP, FOSB)	•	•	
AMHS management	•		
E95-compliant GUI infrastructure	•	•	•
Job management screens	•	•	•
Tool status screen	•	•	•
Advanced status screens (vacuum, facilities)	•	•	•
Advanced, pluggable substrate Planner	•	•	•
Hardware concurrency control	•	•	•
Manual control (robots, pumps, valves)	•	•	•
Vacuum scheduling control	•	•	•
EFEM drivers (load ports, ATM robot, aligner, tag reader, WID reader, FFU)	•	•	
Vacuum drivers (load locks, pumps, gauges, valves, vacuum robots)	•	•	•
Security infrastructure	•	•	•
Log management	•	•	•
Threading framework	•	•	•
UI Layout configuration	•	•	•
UI screen configuration	•	•	•
Communication configuration	•	•	•
Tool component configuration	•	•	•
EIB Model configuration	•	•	•
Vacuum workflow configuration	•	•	•
Visualization configuration	•	•	•

About PEER Group

PEER Group provides innovative factory automation software solutions and consulting services to the semiconductor, photovoltaic, and electronics industries. The world's best manufacturing companies turn to PEER Group to solve their most challenging equipment automation, data management, and process control problems. With more than 100,000 licenses shipped, we are the world's leading supplier of equipment connectivity and testing products to automated factories around the globe. Our innovative and reliable products and services help lower the cost of automation for high-volume manufacturers and their equipment suppliers.

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