

Use of FabGuard for Tool Monitoring

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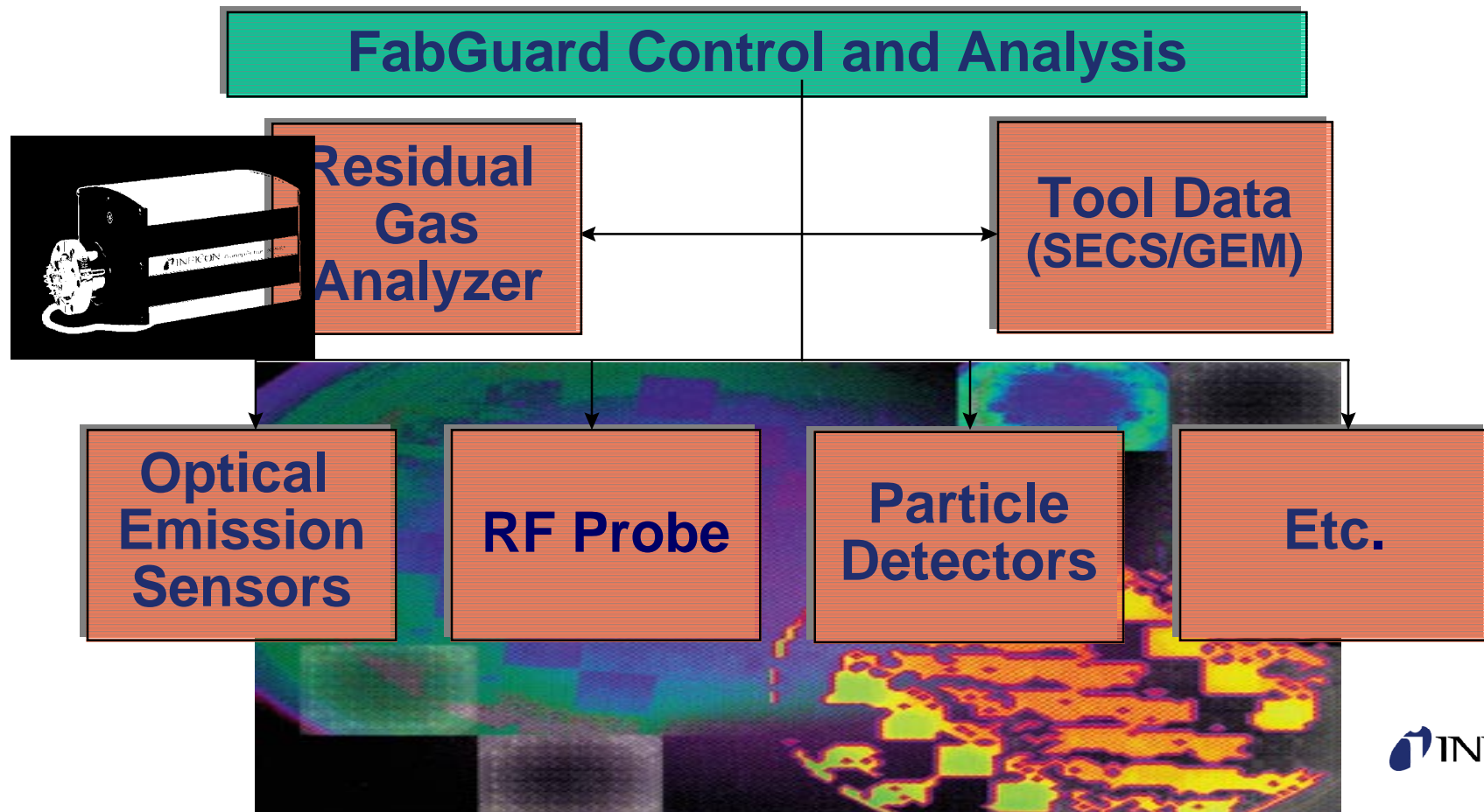


PRESENTED TO Integrated Measurement Association Meeting

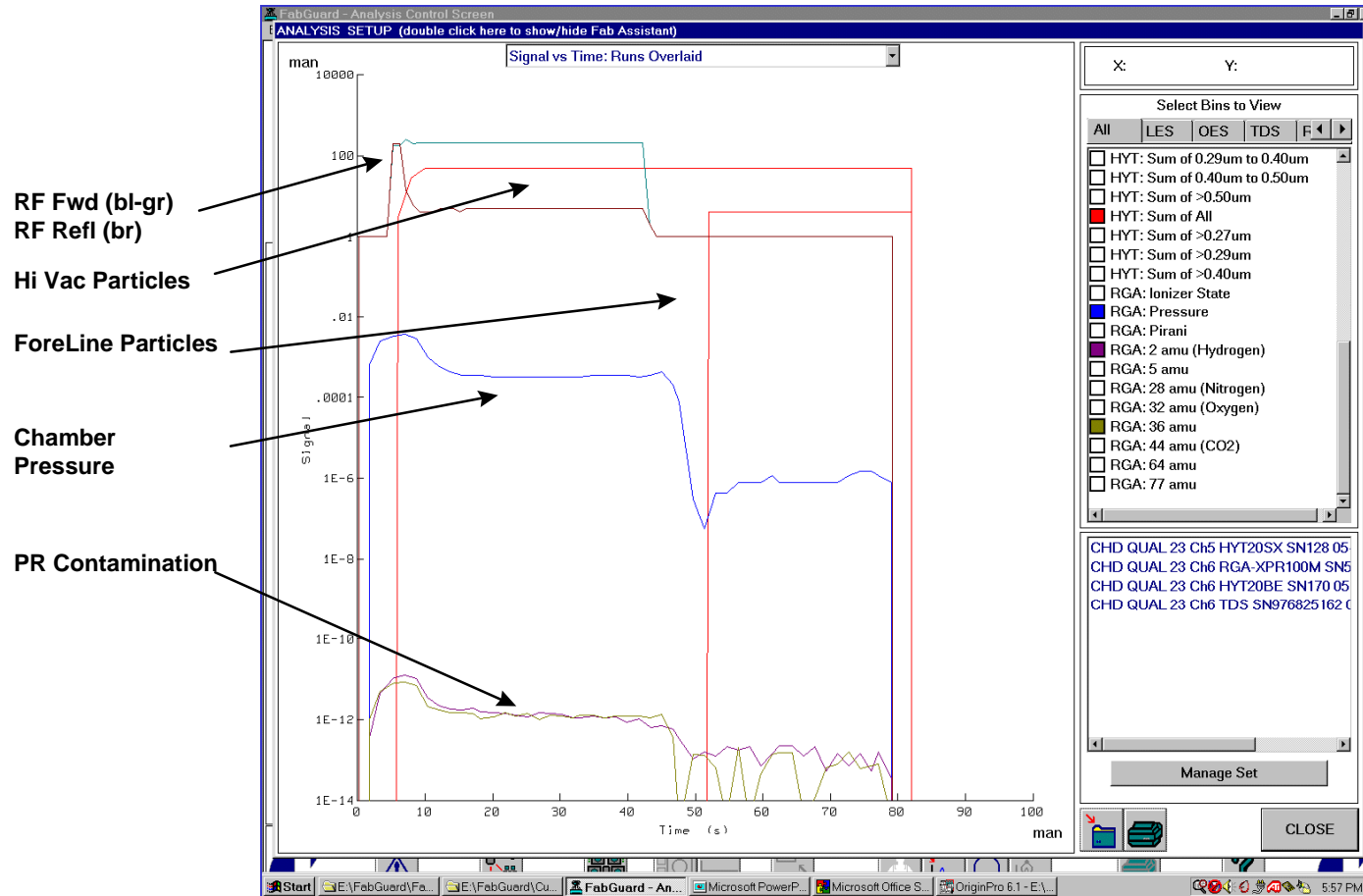
Thursday, 11 October 2001

FabGuard: Sensor Integration & Analysis System

Multi-Sensor Integration Platform for Process and Equipment Diagnostics.



FabGuard: Comprehensive Process State



FabGuard: Sensor Integration & Analysis System

Expert system for improving tool productivity with complex diagnostic sensors.

- **RT Control of Any *In Situ* Sensor**
 - Operation of Diagnostics Sensors Often Depends on Process State.
 - FabGuard Synchronizes Sensor Operation to the Tool.
- **RT Analysis of Sensor Data**
 - Many Applications Are RT. (Endpoint, PRD, etc.)
 - Automates “learned” diagnostics.

FabGuard: Sensor Integration & Analysis System

- Full and Independent Control of All Sensors
- Independent Analysis of Each Sensors Data
- Data Acquisition and Analysis Synchronized to Individual Chamber States
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The screenshot displays the FabGuard - Tool (Acquisition Control) interface. At the top, a menu bar includes: Exit, Screens, Run, Recipe, Acquire, Analysis, Database, Maintenance, Configure, Help. Below the menu is a 'SYSTEM STATUS' box with the following information:

- User Access Level: All Functions
- Run in Memory: None
- Communication: Serial: 1, SECS: On, Verified, Executive: Off
- Computer: Disk: 33140M
- Alarm Count: 0 Yellow, 0 Red
- Last Alarm: None

The main area shows a top-down view of the tool layout with various components labeled 'MET 19606'. A large inset image in the top right corner provides a detailed view of the tool's internal structure. On the right side, a panel displays sensor information for 'Sensor #1: TDS SN994715208.1' and 'Chamber #2: TxZ'. The 'INFO' section includes:

- Lot ID: 1-2
- Sub. ID: 3
- Tool: TXZHP.2X50
- Recipe: TDS ch2 TxZ

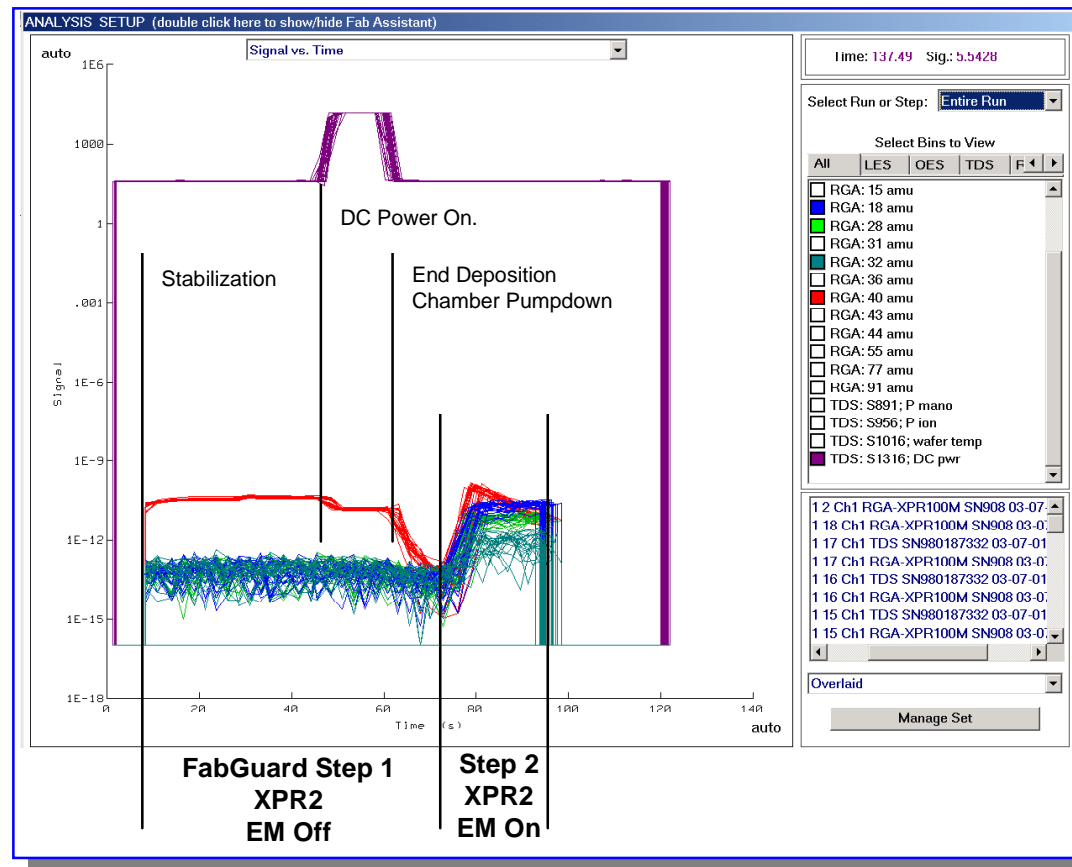
Buttons for 'Quick Manual Record' and 'Manual Record' are located below the sensor information. At the bottom, a navigation bar contains icons for Alarm, Database, Tool, Chamber, Sensor, Analysis, Print, and Help.

FabGuard: Sensor Integration & Analysis System

- FabGuard Recipes Can Be Triggered By Any Change in Process or Equipment State.

- Each Recipe Controls Acquisition and Performs an Analysis.

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FabGuard: Application Examples

Example 1: The use of time series values calculated from raw data to detect deviations between process tool setpoints and actual values.

Example 2: The combination of data from an RGA with data from the processing tool to detect contamination of one chamber by another and determine which chamber caused the contamination.

Example 3: The combination of an HYT in situ particle monitor with data from the processing tool to detect, and determine the cause of, unacceptably high particle levels.

Example 4: The use of Principal Components Analysis (a multivariate statistical technique) for endpoint detection with an optical emission sensor.

Example 5: The use of Principal Components Analysis for fault detection using tool data.

Example 6: The creation of virtual signals for specific wafer contaminants. These virtual signals correlate to *ex situ* wafer state measurements.

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Example n:

FabGuard: Developing Apps Content

A Systematic Way to Implement Many Disparate Applications

Model Builder

- Analysis Models Are Created and Tested Using Historical Data
- Model GUI Provides Easy to Use Interface
- Physical – Logical Algorithms, FT, etc.
- Statistical – SPC, MVSPC (PCA, EFA, EWFA, etc.)
- Virtual Signal Creation

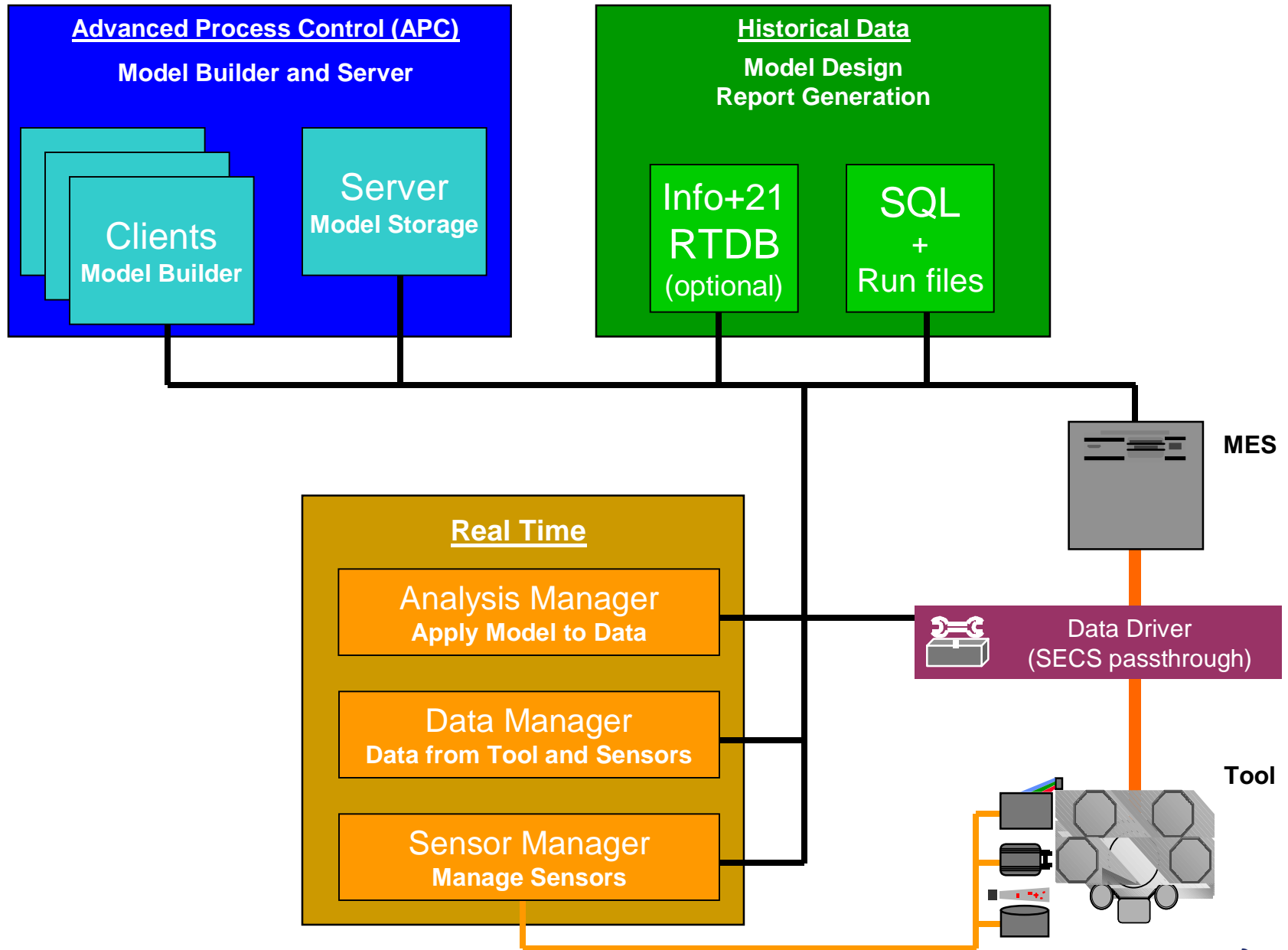
Decision Logic

- Fault Definition Logic
- Persistence

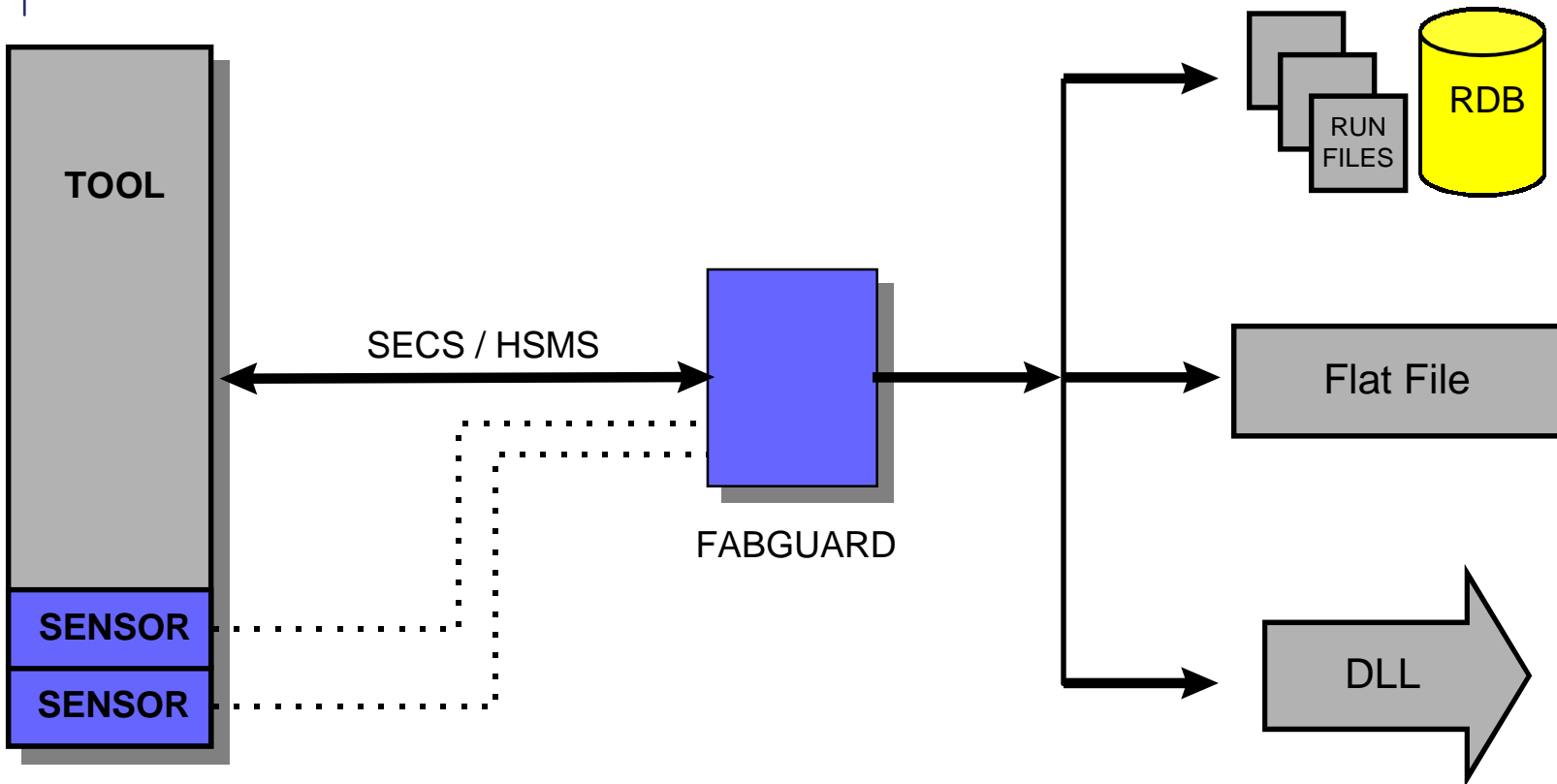
Action

- Tool Inhibit
- Tool Stop / Pause
- Endpoint

Network System Topology



FabGuard: Open Data Access





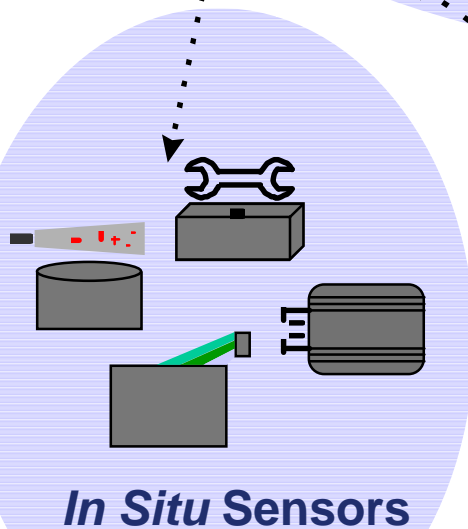
eFabGuard **Global Support Network**

Process Diagnostic Subsystem

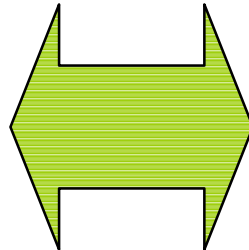


FabGuard Sensor Integration & Analysis System

- Integration of multiple *in situ* sensors and tool data
- Analysis of actual process conditions
- Recipe Verification
- Problem source identification.
- Process completion control



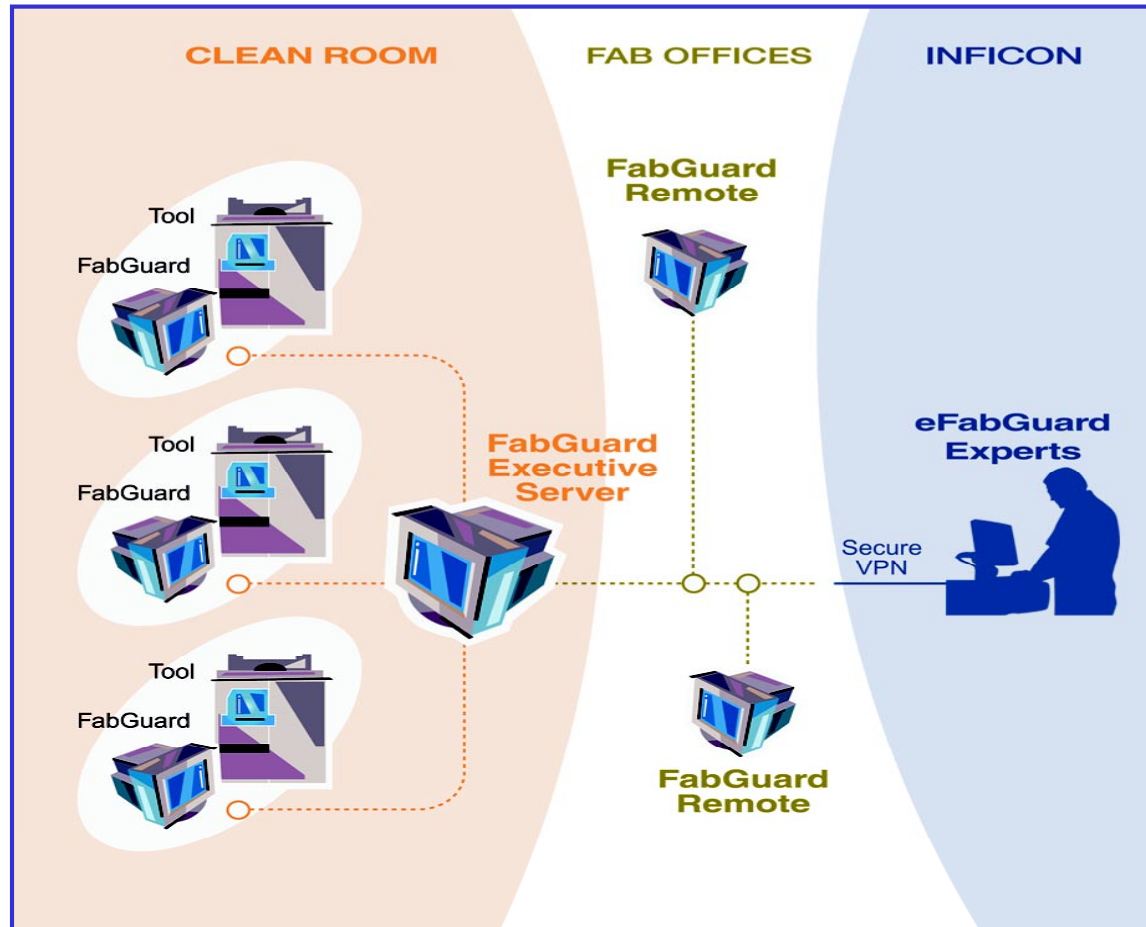
In Situ Sensors



Delivery / Supply Subsystems

- Tool controller
- Gas delivery
- Pressure control
- Vacuum generation
- Power delivery

eFabGuard Global Support Network



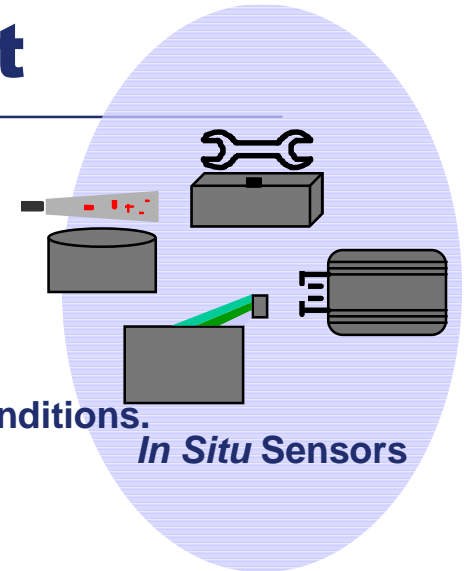
FabGuard Applications Support

Automation

- Comprehensive fingerprint of normal process and tool conditions.
- Reduction of “reams of data” to meaningful information.
- Faster, robust detection of process faults.

The Human Side

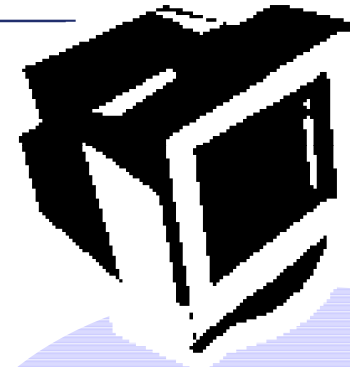
- INFICON experts for faster problem diagnoses of “new” problems.
- Incorporation of “learned” diagnostics into automation.



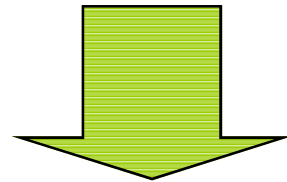
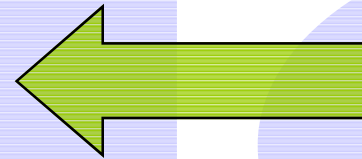
eFabGuard

Extending the Reach of FabGuard

- Increased understanding of process
- Faster localization of problems
- Faster tool recovery
- Reduction of lost product
- Faster yield learning
- Better process technology transfer



FabGuard
puts INFICON
expertise
at every tool.



eFabGuard
brings INFICON
expertise inside the fab.

