

# EEC Phase 2.5 Guideline Rollout

## e-Diagnostics / EEC Workshop

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# Presentation Purpose

- **Phase 2.5 Guidelines have reached full consensus**
- **The EE Capabilities discussed here today are needed to help us meet the ITRS goals for equipment productivity**
- **Selete/JEITA and International SEMATECH are collaborating in order to send a unified message**

# Revised Guidelines Phase 2.5

# Single Point of Control at the Factory Level (revised from Phase 2)

- **Factory level systems must present a Single Point of Control to the production equipment.**
  - **Additional control points may delegate to Factory Master Controller (FMC)**
  - **Delegation done under device makers' direction**
  - **Functions defined by equipment logical interfaces**
  - **device makers may assign all functions to a single application**
  - **Single Point of Control at the Factory Level (revised from Phase 2)**

# New Guidelines Phase 2.5

# Maintenance Document Guideline

- **Equipment Operation and Maintenance documents shall be provided in a standardized electronic format along with all the supplementary information required to read this electronic document. This set of information shall be maintained and accurate.**
  - **Documentation inaccessible at the point of need difficult to navigate, and not always current.**
  - **Move from hardcopy medium to electronic medium**

# Equipment Logical Interface (ELI)

- **Communication with the equipment shall be divided into separate logical interfaces**  
**Communication with these interfaces needs to be coordinated by SPOC.**
  - **Divide up the responsibilities to reduce complexity.**
  - **User chooses which clients access each ELI.**
  - **access to ELIs may be limited to a single client.**

# Equipment Logical Interface (ELI)

## – Possible ELI's

- **Job control and material management**
  - Parameter adjustment
  - APC, EPC3 (Equipment Performance Conditioning, Control, and Configuration)
  - Delivery, material movement
- **Data collection**
  - Data Collection definition
    - Sampling rate
    - Transmission rate
  - Data Collection activation
  - Data transmission

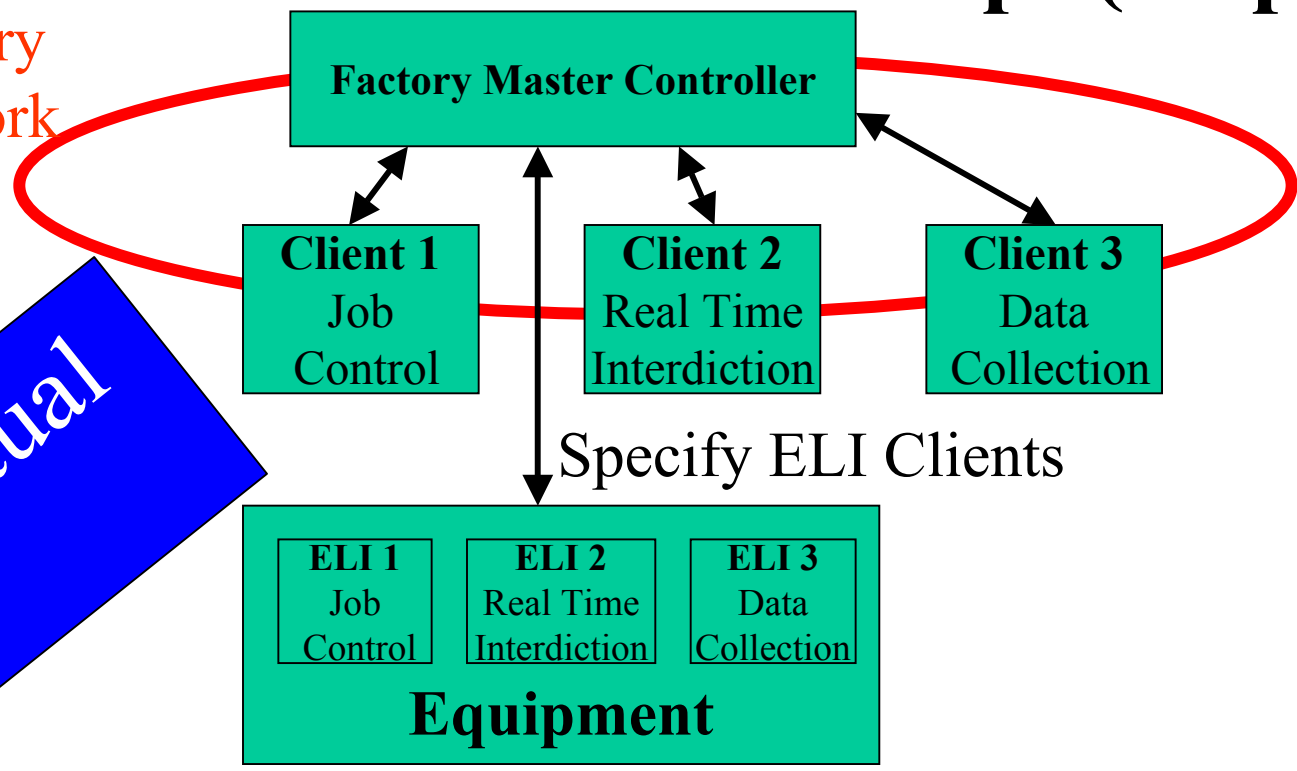
# Equipment Logical Interface (ELI)

## – Possible ELI's (continued)

- Recipe upload/download
- Real time interdiction
- EPC3 (Non-job parameter adjustment)

# ELI/Master Controller Concept (Step 1)

Factory network



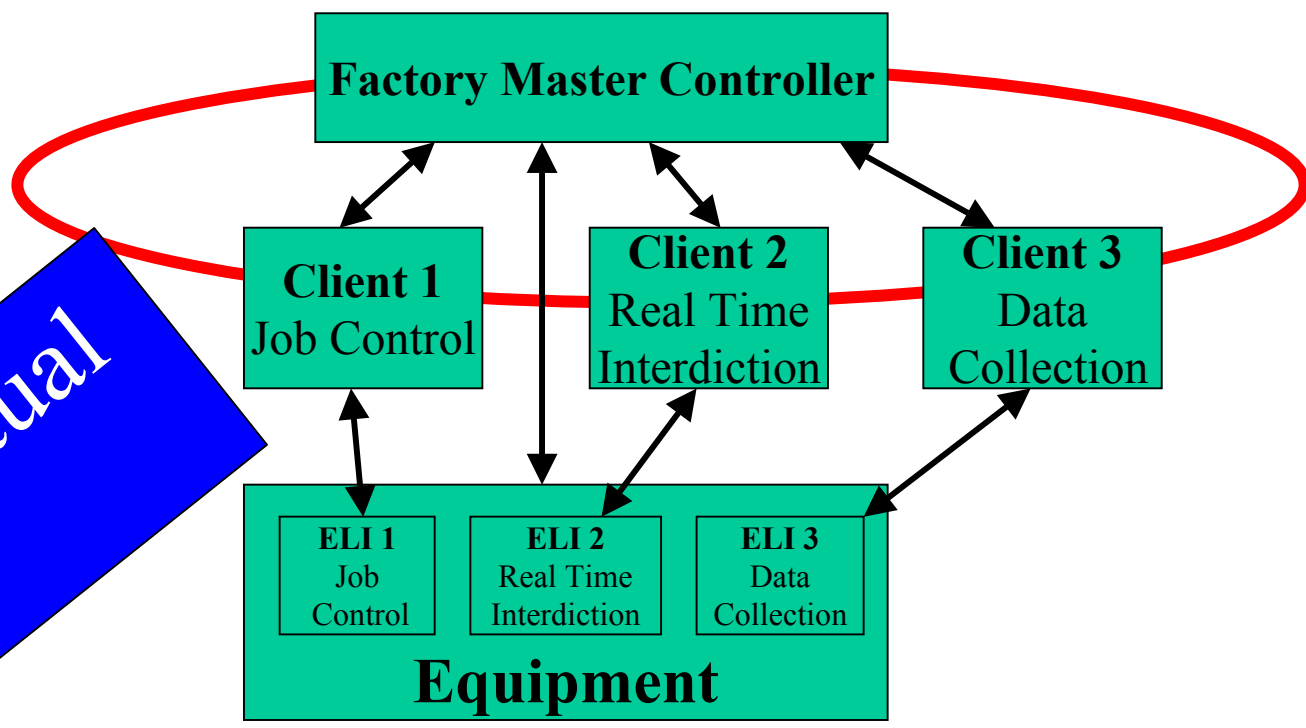
**Conceptual Only**

The Factory Master Controller specifies to the equipment which clients will use which ELI's

# ELI/Master Controller Concept (Step 2)

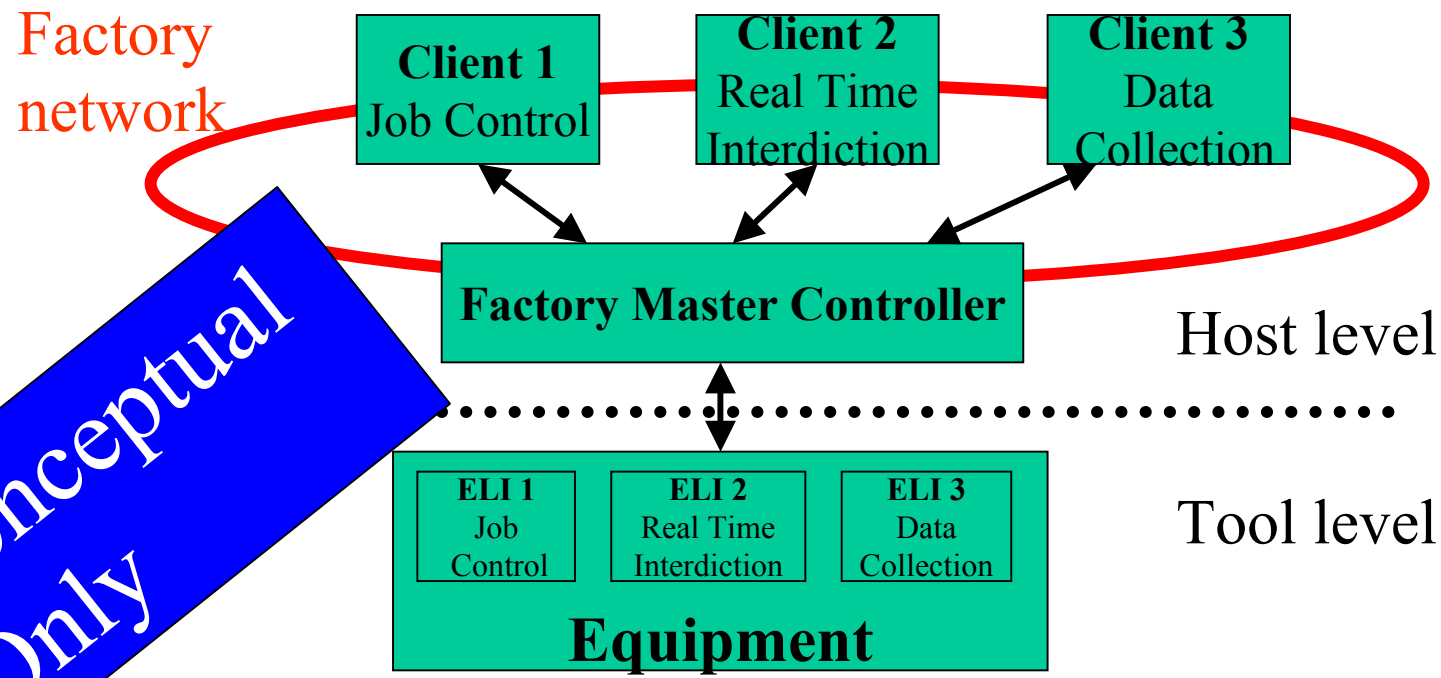
Factory network

Conceptual Only



ELI Clients communicate with the tool through their assigned ELI and may continue to coordinate with master controller. The master controller can disable any ELI connection.

# Single Point to Single Point Configuration



ELI Clients communicate with the tool through a single factory master controller.

# Equipment Performance Conditioning, Control and Configuration

- **A standard interface for controlling equipment stability shall be provided by the supplier. The systems and algorithms used to achieve equipment performance conditioning, stability control and configuration may be provided by the equipment supplier, the IC maker, or third party supplier.**
  - **Stability control examples are as follows:**
    - **Minimization of machine-to-machine difference**
    - **Minimization of chamber-to-chamber difference**
    - **Performance deterioration due to consumables life**
    - **Performance variation due to idle time between processing**

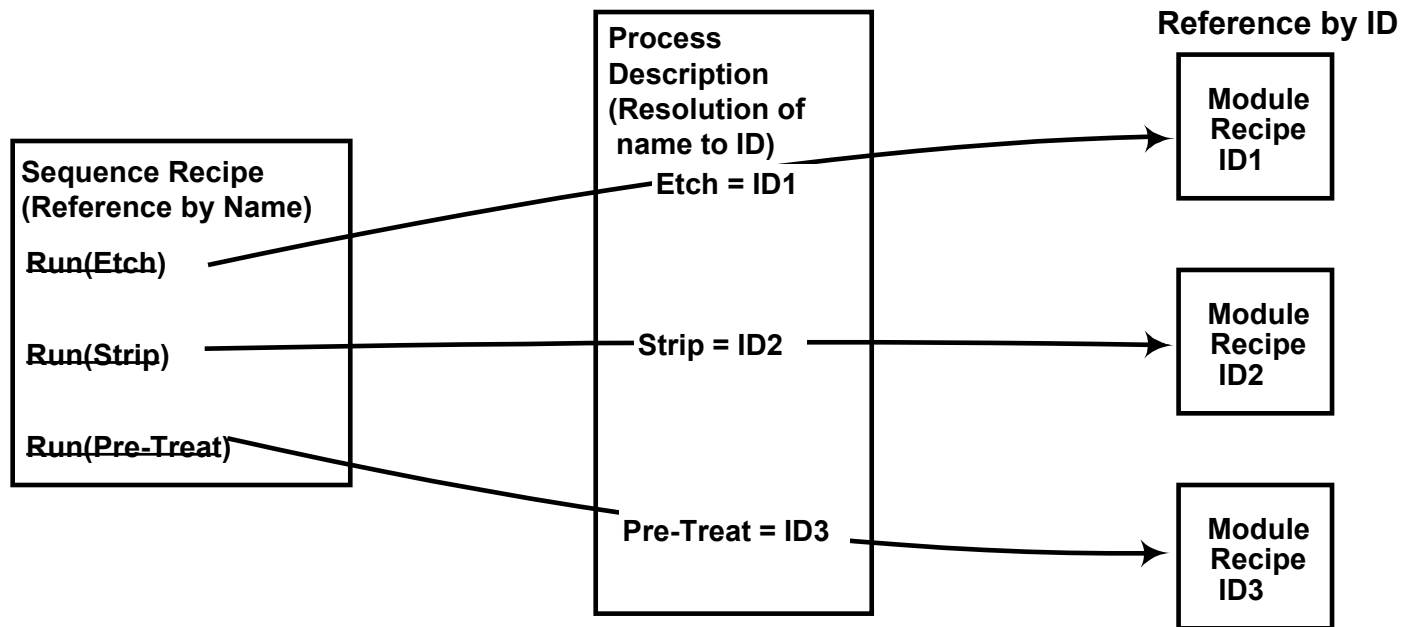
# Equipment Performance Conditioning, Control and Configuration

- **Device makers want to understand the gradual change in equipment performance and the impact that change has on yield.**
  - **Examples include consumables life, idle time between processing, etc.**
  - **Process drift is a problem for devices with advanced process rules.**
  - **It is not linked with a particular run.**
  - **In the case multiple tools of the same type; “machine to machine matching” or “chamber to chamber matching has to be managed to assure the process margin.**

# Process Specification Management Guidelines

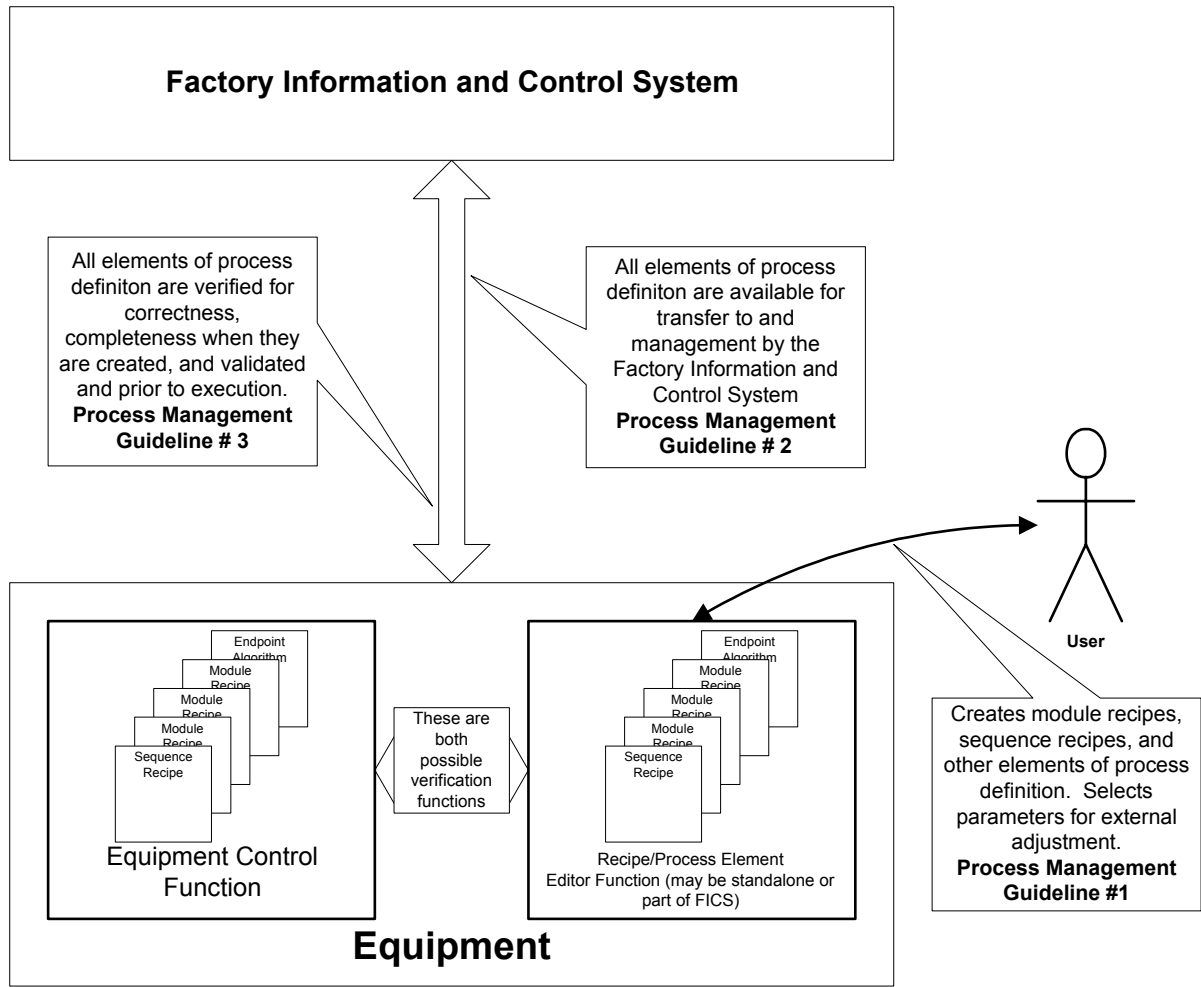
- **These guidelines are intended to address the management of recipes and/or other elements, which control processing. These guidelines augment currently defined standards (Process Job/Control Job) governing the run-time adjustment of variable parameters**

# Process Specification Management Overview



- Recipes are multipart. Recipes often refer to each other by name, this can lead to significant recipe integrity problems. Reference by ID resolves integrity problems but can lead to additional management overhead. This is a fundamental problem in process specification management.

# Process Specification Management Overview



# Parameter Adjustment

- **Any parameter supporting value assignment by a user during the definition of a process element must be adjustable by both on- and off-equipment software systems.**
  - **Process Engineers are able to specify fixed values for parameters in recipes or other process definition elements**
  - **Some parameters adjust the process on a run by run basis.**
  - **Any parameter whose value is manually assignable is also assignable by the Factory System.**
  - **The selection of which parameters are available is selectable by the user.**

# Process Specification Management

- All elements that define control or affect the execution or outcome of a process or metrology run on a piece of equipment must all be available to be managed.
  - The Factory Information and Control System is the system of record.
  - FICS must be able to manage all of the artifacts that contribute to or control the manufacture of product.
  - Where factory level systems are not available, other means shall be provided.
  - Process elements may include equipment constants/settings, recipe parameters, recipes, data collection plans, fault detection plans, APC algorithms, endpoint algorithms, metrology images, etc.

# Process Specification Verification

- **Verification of process elements must be supported. Verification may include checks for validity, integrity, correctness and completeness of process parameter settings.**
  - **Verifying the integrity of process elements avoids potentially unsafe operation of the equipment. Validation may include insuring that the process to be executed exactly matches the processing requested.**

# Proposed Equipment Engineering Guideline Phasing Strategy

## Previous Guidelines

- EEC Big Picture
- EEC Framework
- Equipment Engineering Data Sharing
- Equipment Engineering Responsibility Sharing
- Equipment Standards
- e-Diagnostics
- Maintenance Support
- Equipment Ramp-up Support

## Phase 2.0 Guidelines – SEMICON Japan

- Single Point of Control (SPOC)

## Phase 2.5 Guidelines – SEMICON West 2002

- Equipment Logical Interfaces (ELI)
- Run-to-Run Control (R2R)
- Fault Detection and Classification (FDC)
- Recipe Download and Parameterization
- Enhanced e-Diagnostics
- Machine-to-Machine Matching

## Phase 3 Guidelines – Direction needed from ITRS

- IM and Standalone Metrology Equipment Operation
- Integrated or Linked Equipment Operations
- Predictive Maintenance
- Spare Parts Management
- Data Mining
- Procurement
- Yield Management

# Future Activity

- **Need ITRS inputs to trigger Phase 3 items Guideline development**
- **ISMT & JEITA/Selete continue EEC collaboration**
- **Put the most of effort on Standardization**
- **Identify/adopt existing standards for implementation**
- **Creation of any missing standards**
- **Implementation!**