

Automation Overview

300mm SEMI Software Automation Standards and AEC/APC Trends

SEMI Standards Material Provided by Gino Crispieri, ISMI



ISMI's e-Manufacturing Team

- **Steve Fulton – Project Manager**
- **Harvey Wohlwend – Project Manager**
- **Jackie Ferrell – Project Manager**
- **Gino Crispieri – Member Technical Staff**
- **Lance Rist – Member Technical Staff**
- **Lorn Christal – Technical Staff**
- **Charisse Rosier – Technical Staff**
- **New Assignee to begin this month**
- **Brad Van Eck – Program Manager**

Key 300mm Published Guidelines

- **Factory Guidelines**
 - Factory interfaces, equipment productivity and operations, PGV, reticle handling, wafer shipping, CIM
- **Global Joint Guidelines (with J300E)**
 - Integrated Factory Vision (CIM)
- **Minienvironment Best Practices**
- **Equipment and AMHS Performance Metrics (180nm)**
 - with Selete: Unified 130nm Equipment Performance Metrics
- **Silicon Wafer Specifications (180nm, 130nm)**

Key Attributes of 300mm Transition

- **Global cooperation**
- **Driven by business issues**
 - \approx Throughput and footprint as 200mm (single wafer)
 - \approx 1.3X total equipment cost as 200mm
 - $>30\%$ reduction in $\$/\text{cm}^2$
- **Consortium guidelines**
 - Comprehensive equipment capability expectations
 - Productivity
 - Factory HW and SW interface methods
 - Standards interpretation
- **Standardization before the fact**
 - HW and SW interfaces

Key Attributes of 300mm Fabs

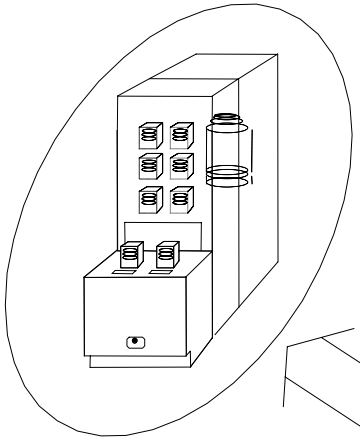
- **Completely automated**
 - Ergonomics and productivity
- **Sealed carriers**
 - Front Opening Unified Pod (FOUP)
- **Mini-environment-integrated tools**
 - Degraded class clean room
- **Uniform interfaces to equipment**
 - Hardware and software
 - Facilities not quite as comprehensive
- **Extremely complex logistical operations supported**
 - Multiple lots per carrier (+ auto-recipe support)
 - Individual wafer tracking through tools (+ data reporting)
- **Standards compliant**

Key Challenges

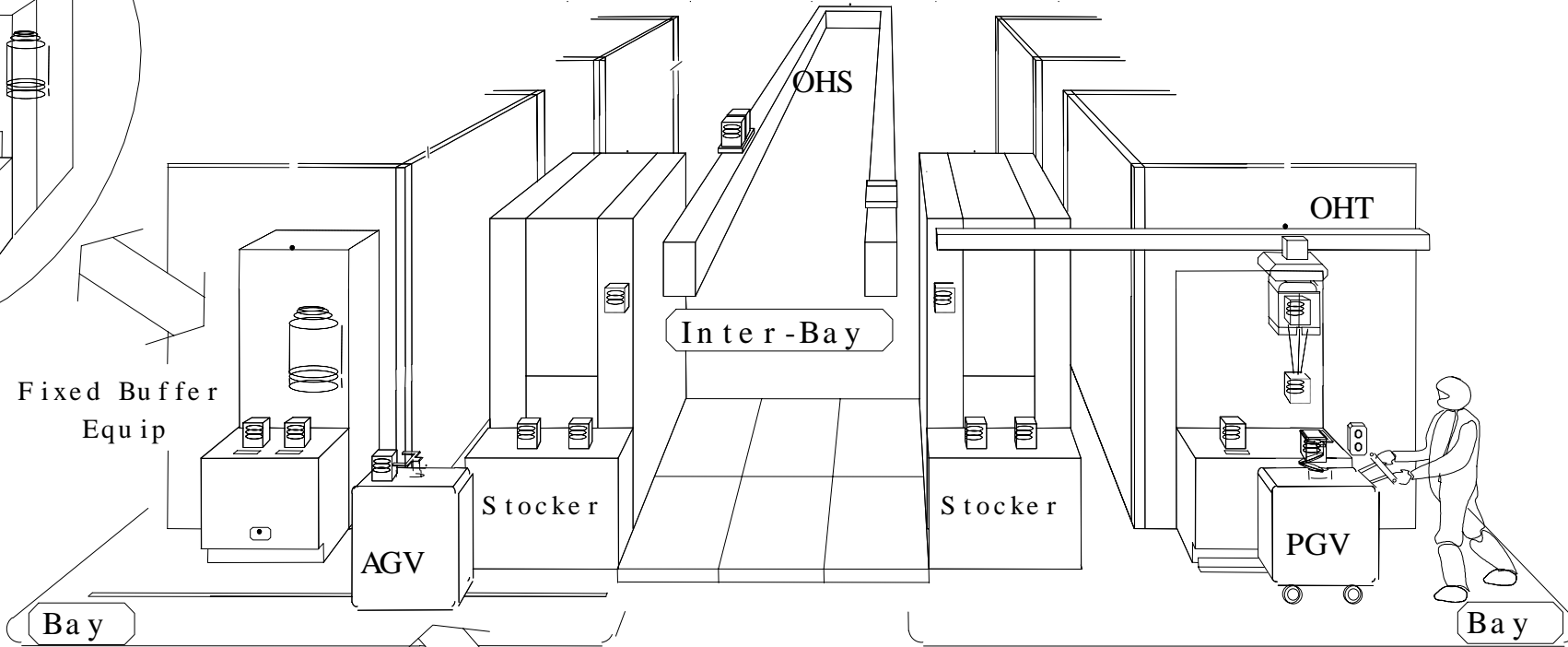
- **Enable faster ramp of 300mm factories**
 - 300 mm must be the most productive fab generation ever
- **Maintain awareness of productivity (cost) issues associated with impending technologies, wafer size, and factory strategies**
 - Guide the industry to aggressively solve the right problems
- **Drive the industry to the highest level of unity -- derived directly from chip-maker strategies**
 - Every sector of supply chain must focus on core issues, not wasted differentiation

Schematic of 300mm Fab Automation

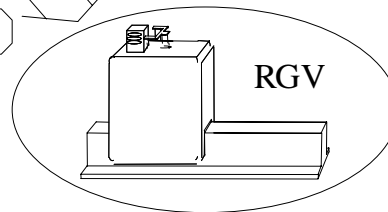
Internal Buffer Equip



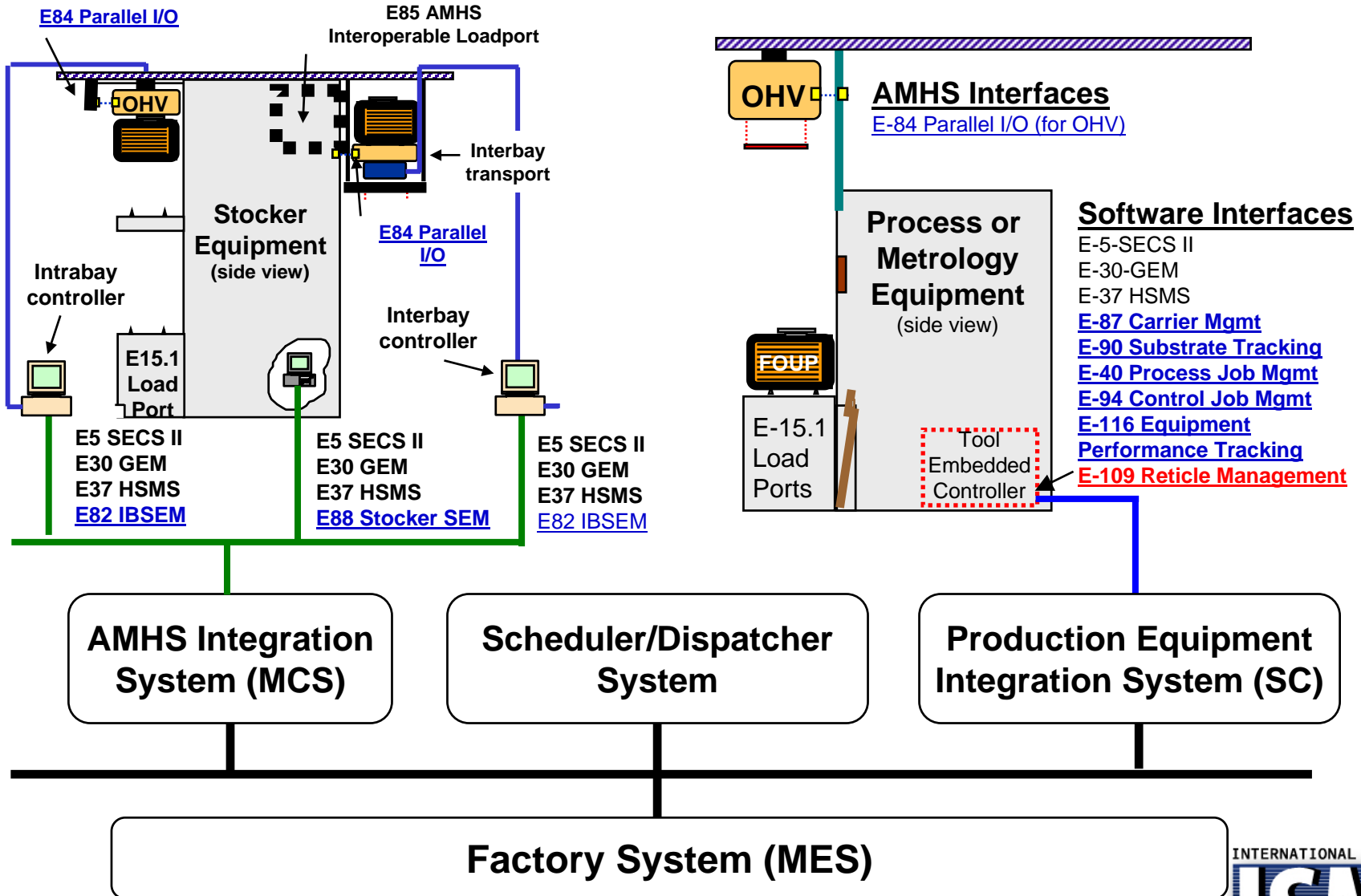
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Intra-Bay



Equipment and MES Standards



Equipment Integration Standards

- **AMHS (Material Control Systems - MCS)
Related Standards**
 - Enhanced Parallel I/O (SEMI E84)
 - Intra and Inter-bay SEM (SEMI E88)
 - Stocker SEM (SEMI E82)
 - Carrier Management Standard (SEMI E87)
- **Production Equipment Related Standards**
 - Carrier Management Standard (SEMI E87)
 - Process Management (SEMI E40)
 - Control Job Management (SEMI E94)
 - Substrate tracking (SEMI E90)
 - Equipment Performance Tracking (SEMI E116)
 - Integrated Metrology Standard (SEMI E127)
 - **Reticle Management Standard (SEMI E109)**

AEC/APC Symposia

Key Directions and Trends

AEC/APC Symposia

AEC/APC North America

- Planning 17th annual for September 2005

AEC/APC Europa

- Planning 6th annual for April 2005

AEC/APC Asia

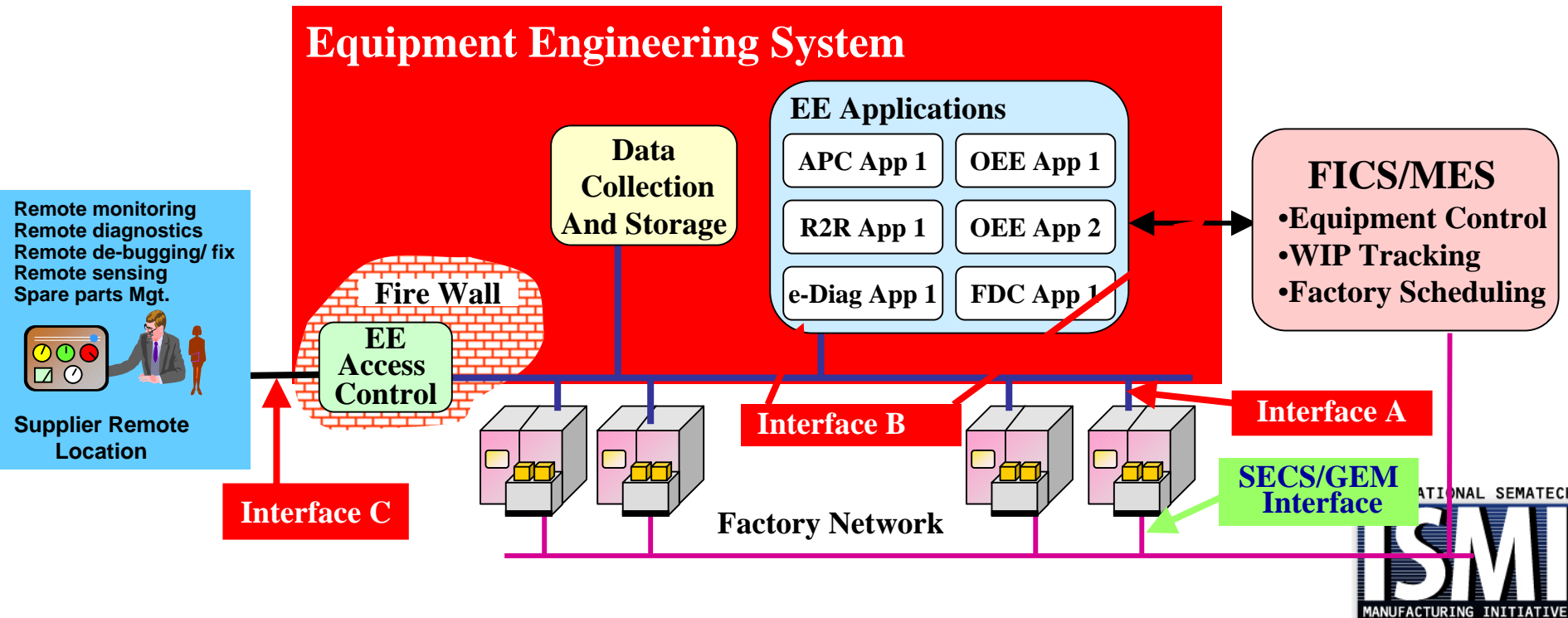
- Planning 3rd annual for December 2005

AEC/APC Symposia

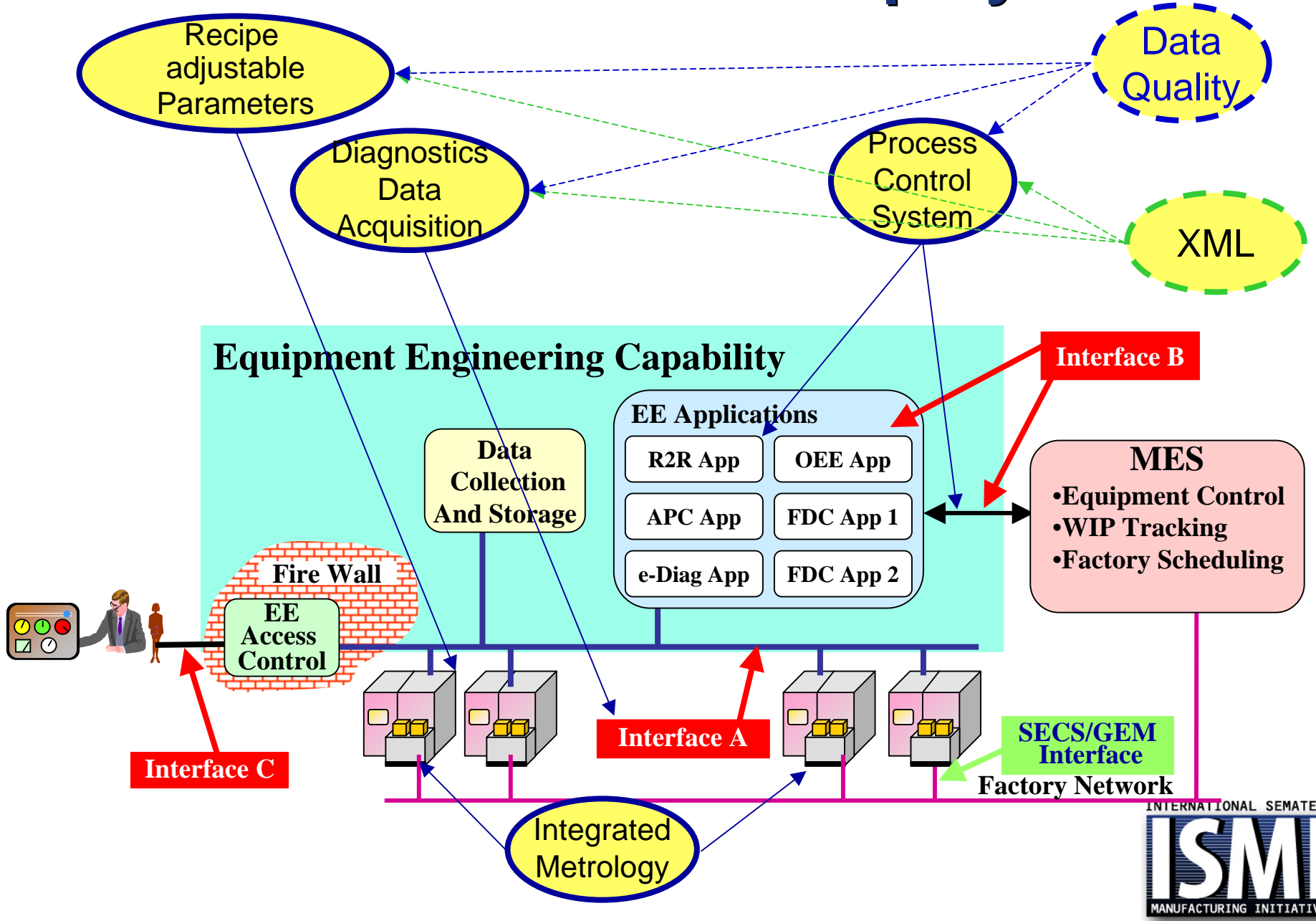
- **Early symposia focus was individual tool control**
 - **Data collection for fault detection and classification**
 - **Model-based process control**
- **Over time focus shifted**
 - **Integration of new sensors**
 - **in situ particle sensors**
 - **defect metrology data integration**
 - **yield prediction**
 - **Run-to-run control**
 - **Feed forward and feedback control**
 - **Span to information flow increased requiring more complex data collection and decision-making software systems**
- **Chipmakers now are presenting a factory control system vision for data-driven automated decision-making**

Interface Standards

- **SECS/GEM** – Still The Primary Equipment Control I/F
- **Interface A** – Equipment Data Interface
 - Getting more & better data from the equipment
- **Interface C** – External Access to e-Diagnostics
- **Interface B** – Among Applications and to FICS/MES



Standards in Fab-wide Deployment



Mask Manufacturing

Possible leverage of wafer fab stds/trends

- **SECS/GEM equipment control**
- **Data collection - critical processing tools**
- **Integration of new sensors for fault detection**
- **Equipment health monitoring**
- **Equipment utilization monitoring of critical tools**
- **Yield prediction tools**
- **In situ particle monitoring**
- **Improved process monitoring**
 - **prior to product commitment to process equipment**
 - **data fingerprinting – prediction of good process tool**