

e-Manufacturing Workshop

Interface A Background

Harvey Wohlwend

Harvey.Wohlwend ismi.sematech.org

INTERNATIONAL SEMATECH

ISMI

MANUFACTURING INITIATIVE

SEMATECH, the SEMATECH logo are registered servicemarks of SEMATECH, Inc. AMRC, Advanced Materials Research Center, ATDF, the ATDF logo, Advanced Technology Development Facility, ISMI, and International SEMATECH Manufacturing Initiative are all servicemarks of SEMATECH, Inc. All other servicemarks and trademarks are the property of their respective owners.

What is e-Manufacturing?

e-Manufacturing is the use of advanced and emerging information technologies to provide automated, data-driven, productivity optimization

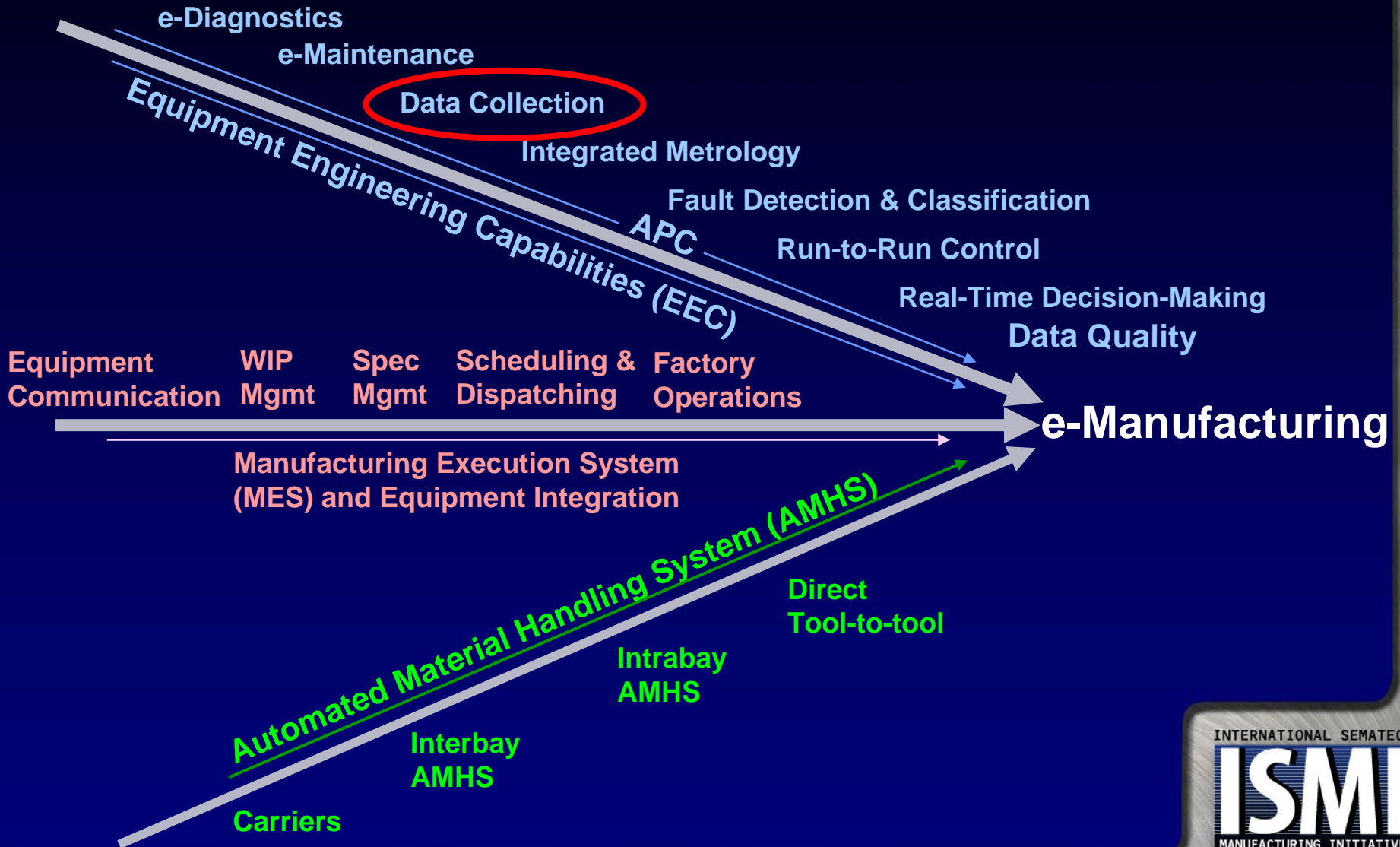
e-Manufacturing has a wide scope

- Improved data availability to enable factory decision support (**enabled by EDA Interface A**)
- Enhanced tools and applications for data utilization in decision making for productivity optimization

INTERNATIONAL SEMATECH

ISMI
MANUFACTURING INITIATIVE

Industry Path to e-Manufacturing



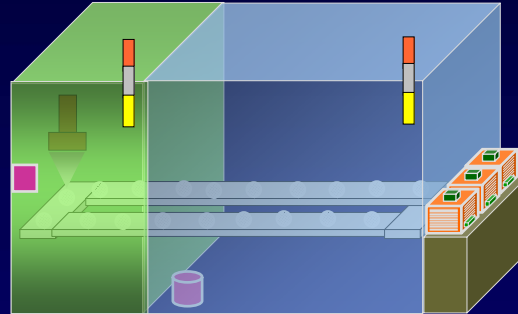
Environmental Pressures and Some Motivations for Change

Support Increasing
Process Complexity
+
2-3 Year Technology Nodes

Focuses Few Expert
Resources on Solving Issues
vs. Finding Data

Sustain Complex
Equipment Design
+
Fierce Competition for
Next Design Win

Reduces
Misprocessing



Shorten Time to Money for Install,
Configure, and Qualification

Reduces High
Cost Downtime

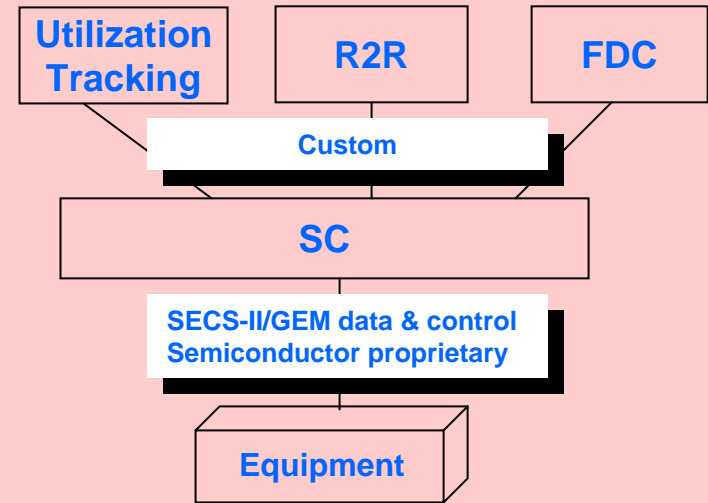
The right data and the right tools to meet
the complex needs of future technology

Background: Equipment Data Acquisition Requirements

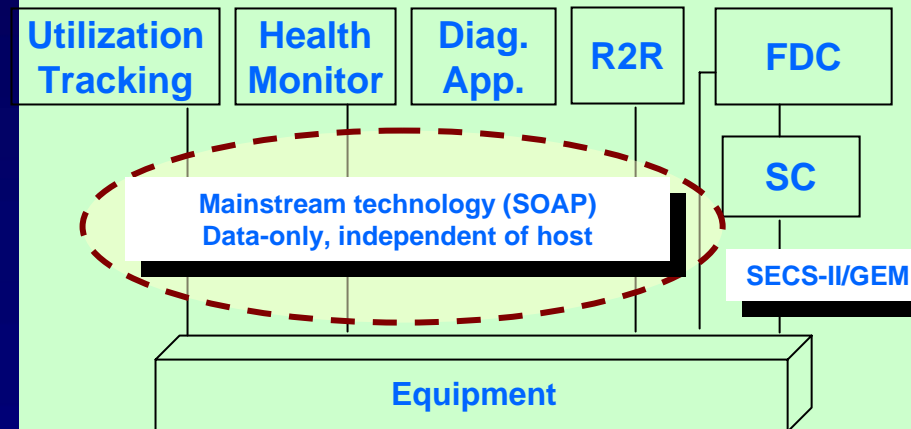
System Requirements:

- **Host-independent data collection:** clients set up and collect data near-real-time independent of host on/off-line status
- **Security:** only factory-authorized applications permitted to collect data, single point of control is enforced at factory level
- **Self-describing interface:** equipment structure, implemented state models, available data items & types, events, exceptions, and alarms can be learned at runtime from the tool
- **Process control data:** improvements in the ability to collect sampled data for up to 50 parameters per process chamber at a frequency 1% of shortest recipe step (worst case assumption is 1000 scalar parameters at 10Hz)
- **Equipment operational data:** visibility into module- subsystem- and actuator-level activity for facilitating equipment health monitoring, OEE, and diagnostics / troubleshooting

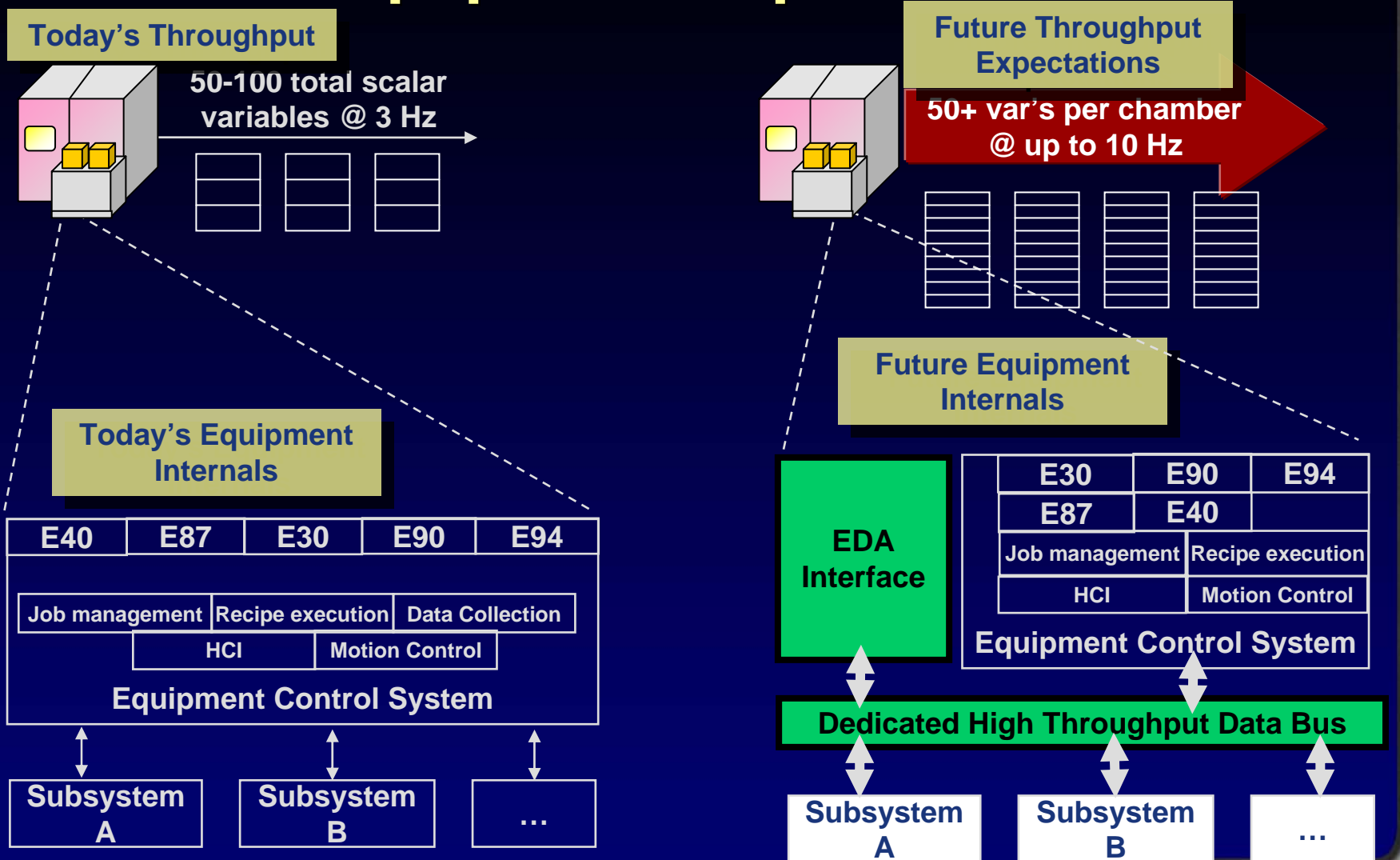
Current State



Desired State

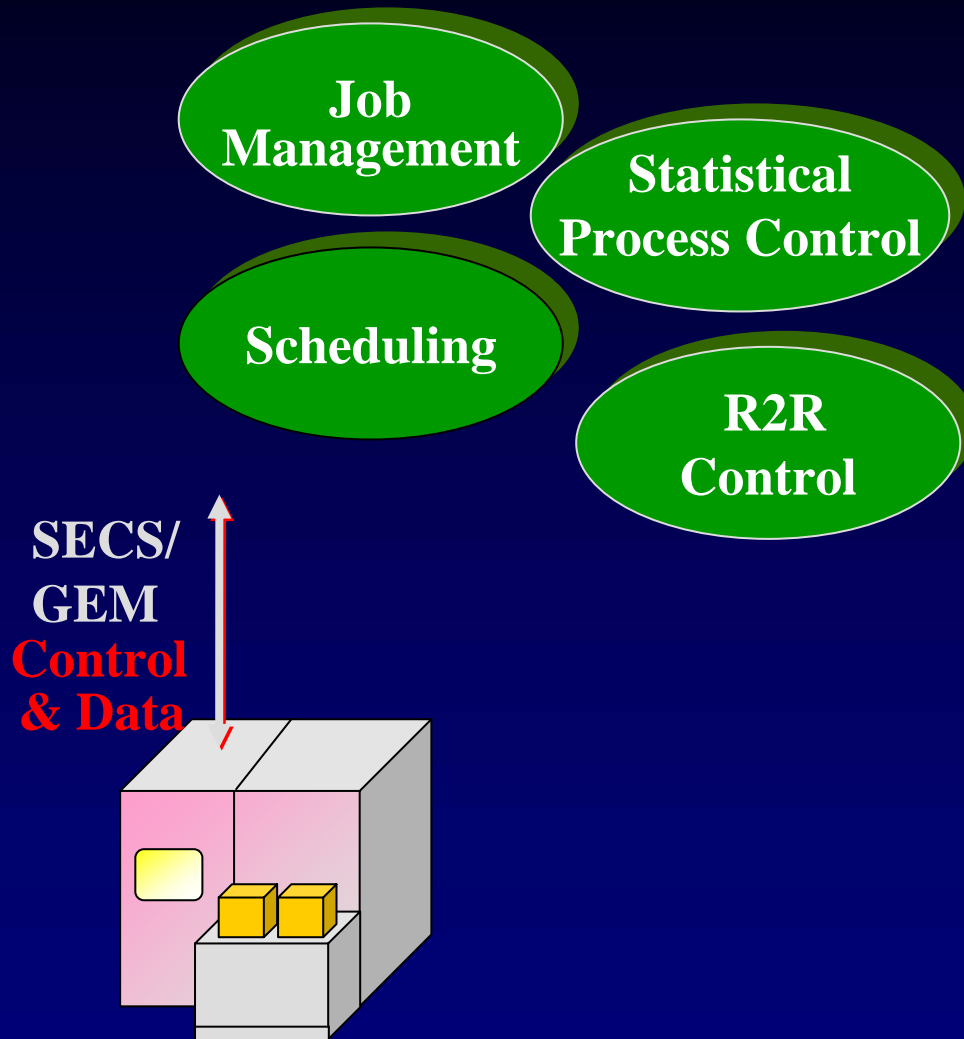


Equipment Expectations



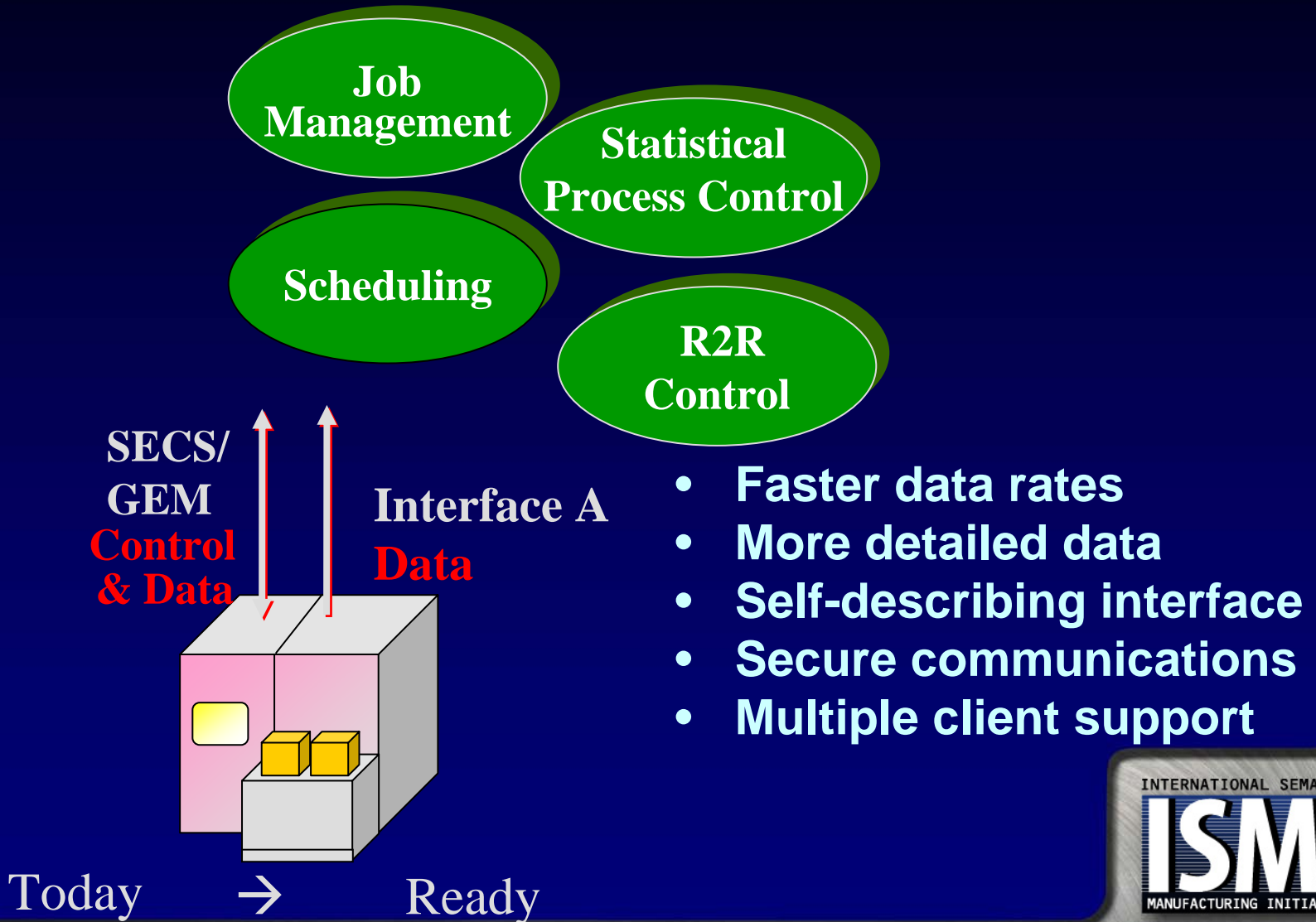
- Equipment internals behind the EDA interface must be designed to provide dedicated high-throughput data acquisition while maintaining equipment run rates
- For this reason, ISMI will be focusing on current and future generations of 300 mm tools for EDA implementation

Supporting Factory Applications

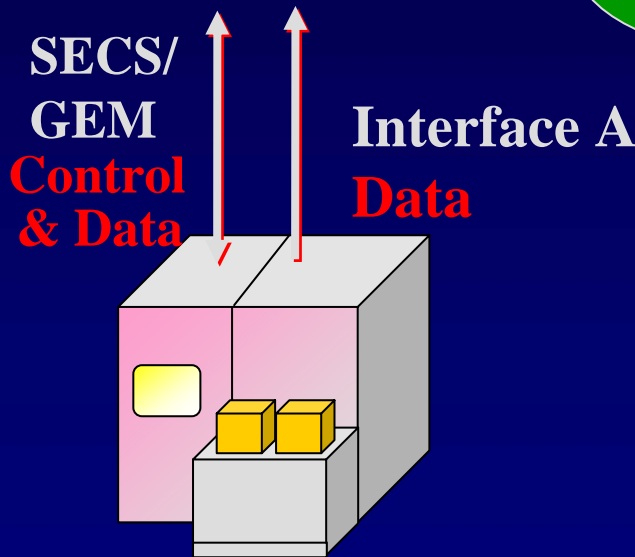
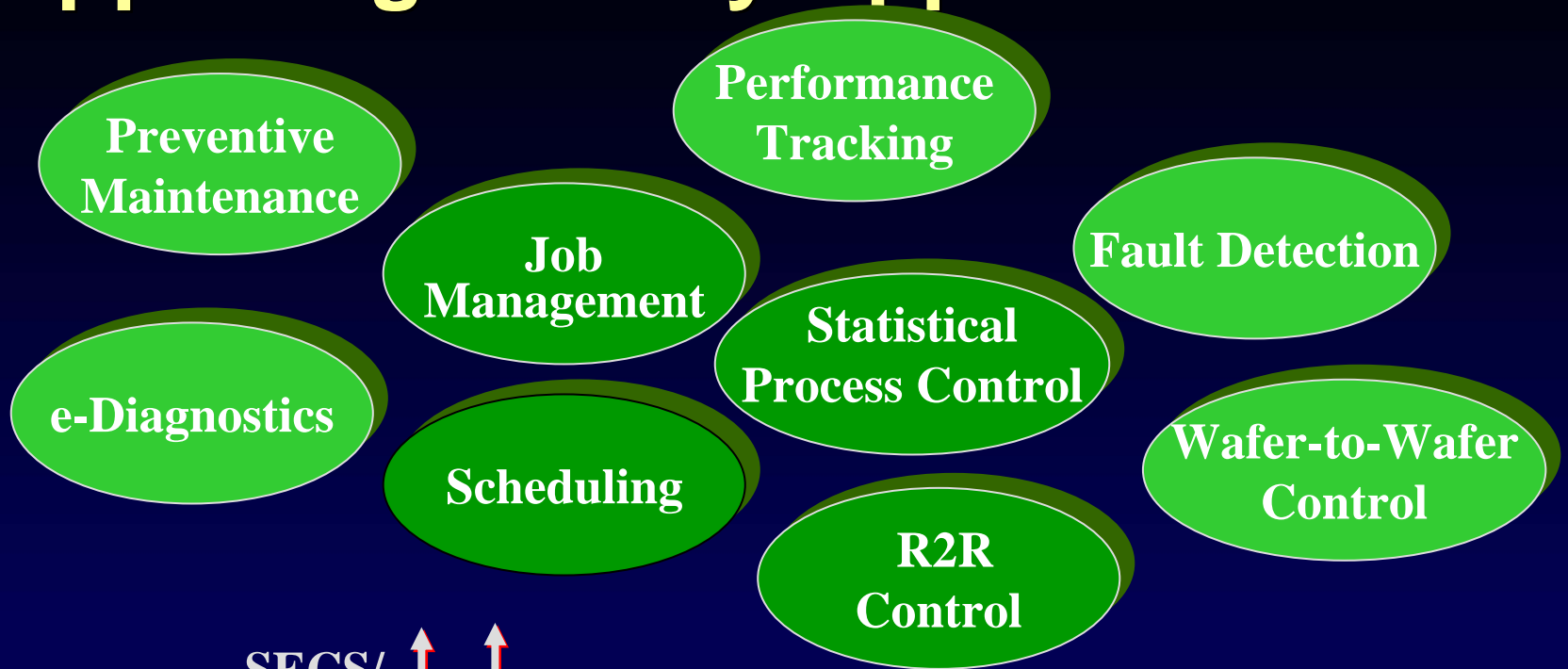


Today

Supporting Factory Applications



Supporting Factory Applications



- Faster data rates
- More detailed data
- Self-describing interface
- Secure communications
- Multiple client support

Standards

Today

Fab network

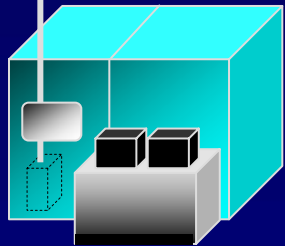
Ready

SECS II

S/W Interface Stds

E-4-SECS 1
E-5-SECS II
E-30-GEM
E-37 HSMS
E-40 Process Job Mgt.
E-87 Carrier Mgt
E-90 Substrate tracking
E-94 Control Job

✓ **Data**
✓ **Control**



Embedded controllers

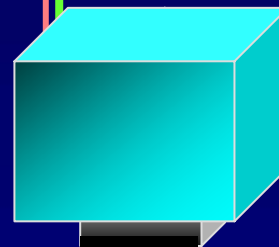


SECS II

← S/W Interface Stds →

E-4-SECS 1
E-5-SECS II
E-30-GEM
E-37 HSMS
E-40 Process Job Mgt.
E-87 Carrier Mgt
E-90 Substrate tracking
E-94 Control Job

✓ **Control** ✓ **Data**



Emerging equipment

SOAP/HTTP

- Common Eqp Model E120
- Data Collection Mgt E134
- Authentication and Authorization E132
- Eqp Self Descrip E125

XML style guide E121
XML common components E138

Interface A

INTERNATIONAL SEMATECH

ISMI
MANUFACTURING INITIATIVE

EDA Accomplishments to Date

- ✓ Established ISMI member company consensus requirements and communicated requirements to suppliers
- ✓ Standards are complete, modern Internet-based interface standards (Ethernet TCP/IP)
- ✓ Prototypes have demonstrated EDA (Interface A) feasibility
- ✓ Performance Studies have demonstrated EDA (Interface A) capabilities
- ✓ Evaluation Method
 - ✓ ISMI Usage Scenarios represent the member company fab usage and define expected behaviors.
- ✓ Compatibility Profiling
 - ✓ Support for commercial implementers to check software interoperability
- **Testing**
 - ✓ ISMI providing common client software to suppliers (exe file) and ISMI members (source code)
 - Developing Advanced Tester Software

EDA Open Issues

1. Tester

2. Further clarification of IC maker factory architecture

- Sharing software components across clients
- Control point for data volume
- ...

3. DDA TF is working on open issues list

- Currently there are no Critical or Must-Have issues
- Some result in document and schema changes

4. Cross Version Compatibility

- Interoperability depends on the use of the same Interface A standards version
 - Different versions will not interoperate - by definition

Key Workshop Topics

- Experiences getting equipment data via Interface A
- Leveraging a new generation of recipe management for improving process control
- Doing this securely in the Internet era

Acronyms

- AMHS – Automated Material Handling System
- AEC – Advanced Equipment Control
- APC – Advanced Process Control
- aka – Also Known As
- API – Application Programmer Interface
- App – application
- AST – Advanced Software Test (or Tester)
- ATP – Advanced Technology Program
- CAA – Client Authentication and Authorization (E132)
- CEM – Common Equipment Model Standard (E120)
- CID RW – Carrier ID Reader/Writer (E99)
- CIM – Computer Integrated Manufacturing
- CJM – Control Job Management Standard (E90)
- CMS – Carrier Management Standard (E87)
- DCM – Data Collection Management Standard (E134)
- DCP – Data Collection Plan
- DDA – SEMI Diagnostics Data Acquisition TF
- DQ – Data Quality
- ECCE – EDA Client Connection Emulator
- EDA – Equipment Data Acquisition (also called Interface A or I/F A)
- EEC – Equipment Engineering Capabilities
- EES – Equipment Engineering System
- EH – Exception Handling
- e-Mfg – e-Manufacturing
- EPIO – Equipment Parallel Input/Output
- EQIP – Equipment Interface Parameters (E126)
- EqSD – Equipment Self-Description Standard (E125)
- EPT – Equipment Performance Tracking (E116)
- F2F – Face-to-face (also called FtF)
- FAST – Factory Automation Standards Tracking
- FDC – Fault Defect and Classification
- FICS – Factory Integration Control System
- GEM – Generic Equipment Model Standard (E30)
- GJG – Global Joint Guidance
- HCI – Human-to-Computer Interface
- HSMS – High Speed Messaging Services Standard (E37)
- HTTP – Hypertext Transfer Protocol
- HVM – High Volume Manufacturing
- ICM – Integrated Circuit Maker
- I/F A – Interface A (also called EDA Interface)
- IMM – Integrated Metrology Measurement Standard (E127)
- MES – Manufacturing Execution System
- MTBF – Mean Time between Failure
- MTTR – Mean Time to Repair
- NIST – National Institute of Standards and Technology
- OEE – Overall Equipment Effectiveness (or Efficiency)
- OEM – Original Equipment Manufacturer
- OS – Operating System
- OSS – Object Services Standard (E39)
- PCS – Process Control System Standard (E133)
- PJM – Process Job Management (E40)
- PO – Purchase order
- R2R – Run-to-run (also called RTR)
- RaP – Recipe and Parameter Management Standard (E132)
- RMS – Recipe Management System
- SECS – SEMI Equipment Communications Standard
- SOAP – Simple Object Access Protocol
- SPC – Statistical Process Control
- SPOC – Single Point of Control
- STS – Substrate Tracking Standard (E94)
- SC – Station Controller
- TDI – Tool Data Interface
- TF – Task Force
- TSP – Test Service Provider
- WIP – Work in Process
- wspm – wafer starts per month
- XML – Extended Mark-up Language

INTERNATIONAL SEMATECH

