e-Manufacturing Requirements

Harvey Wohlwend / ISMI
harvey.wohlwend@ismi.sematech.org 512.356.7536

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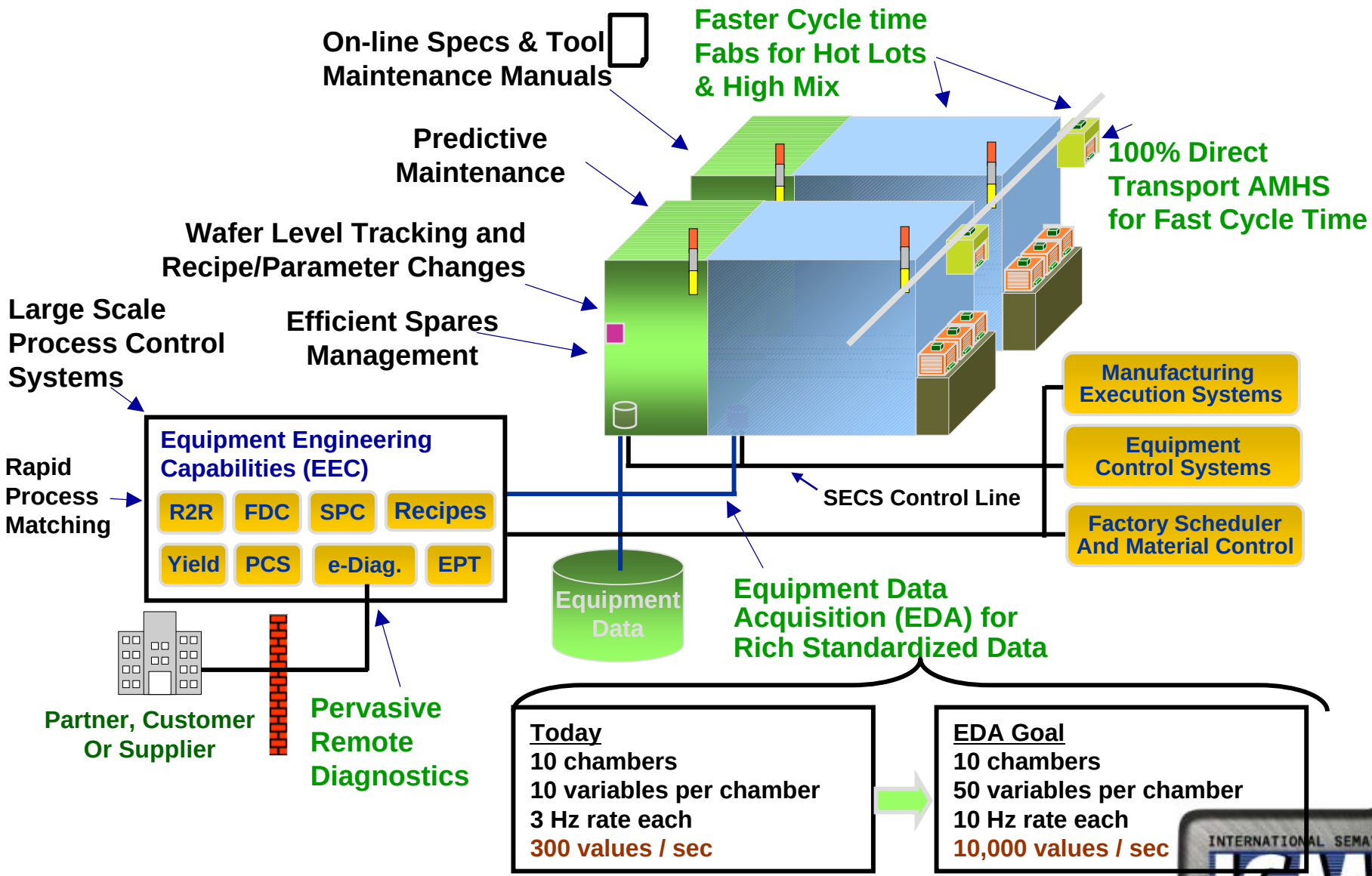
Outline

- “e” Future
- Interface A
- Interface C
- Implementation Roadmap
- Prototyping Interface A at ISMI
- Summary

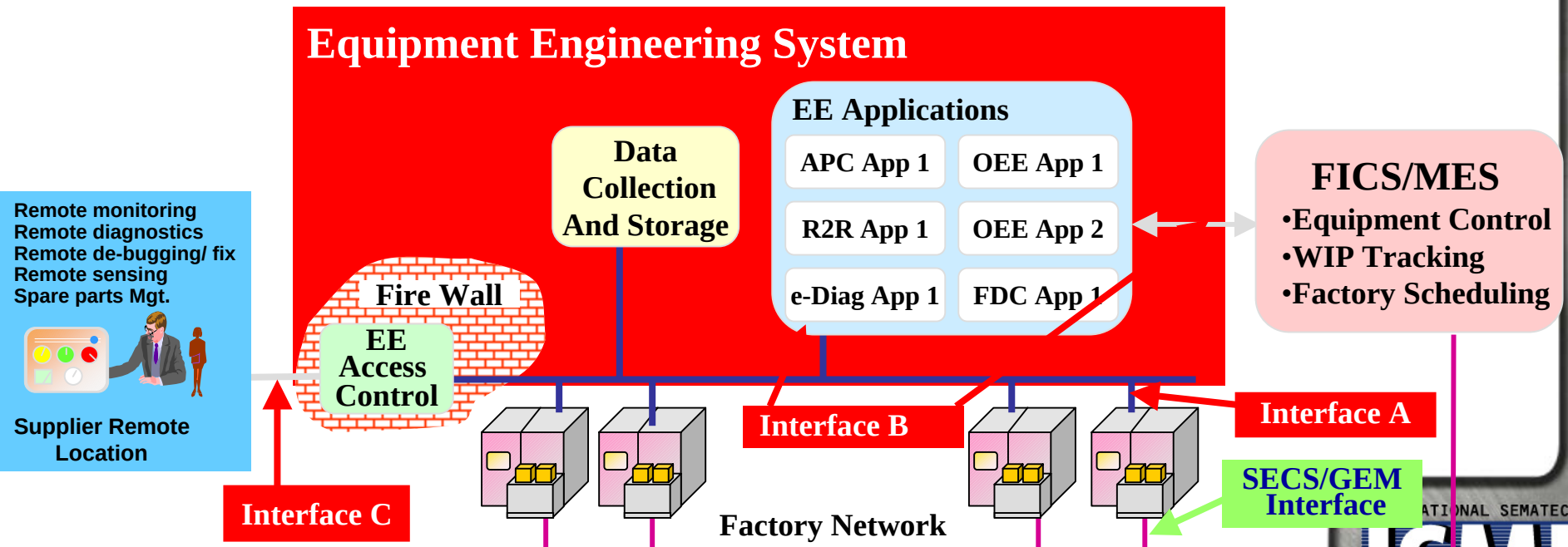
“e” Attributes of Future Fabs - ITRS



Semiconductor Industry Association. The International Technology Roadmap for Semiconductors, 2003 edition. International SEMATECH: Austin, TX, 2003.

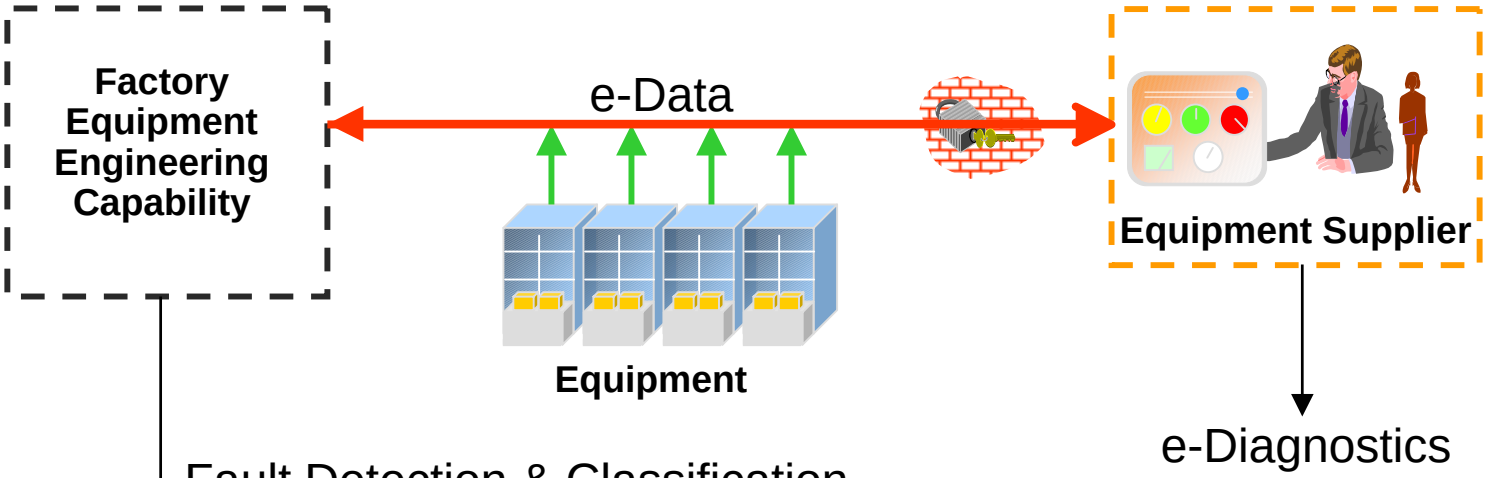
Interface Refresher

- 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



Responding to needs for more data

Standardizing the Interface A Data Port Leads to e-Manufacturing



Fault Detection & Classification
Run-to-Run Control
Machine matching
Spare Parts Management
Predictive Maintenance
...

e-Manufacturing is automated,
data-driven,
productivity optimization

Interface A Standards Timeline

#1 priority for the ISMI Member Companies is access to data from equipment. The embodiment of this goal is called Interface A, a second port on the equipment for data access. Several SEMI standards are required to support this.

Standard	Description	Concept Level Status	Implementation Level Status
Common Equipment Model (CEM, E120)	Describes the physical structure of equipment	Approved, in revision	Approved, March 2004
Equipment Client Authentication / Authorization (E132)	Restricts access to equipment services	Approved, in revision	July 2004
Equipment Self Description (E125)	Describes the data provided by equipment	Approved, in revision	July 2004
Data Collection Management (SEMI Doc 3509)	Defines and activates data collection plans	Approved, March 2004	July 2004

Interface A Standards are Nearing Completion!

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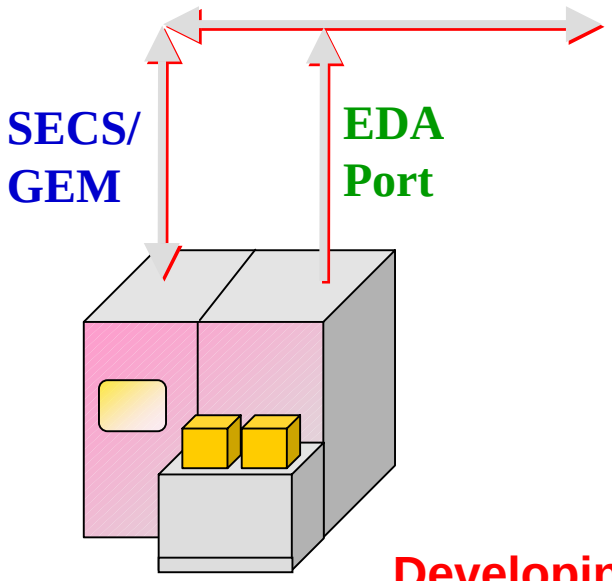
Data Quality Needed

- Quality of Reporting of Data - The Protocol
- Quality of the Data Itself
- Moving from 200 mm to 300 mm did not solve this issue
- Volume is about to explode



(1) Quality of Protocol
-Missing Messages
-Missing Variables
-Duplicate Events
-Out-of-order Messages
-Completion before Start
-Proper Events Reported
-…

SEMI Task Force Focus

(2) Quality of Data
-Accuracy and Precision
-Resolution
-Correct Data
-Correct time-stamping
-Sufficient Data Context
-Data Freshness
-…

Developing Data Quality Standard and Tester

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Interface C Requirements

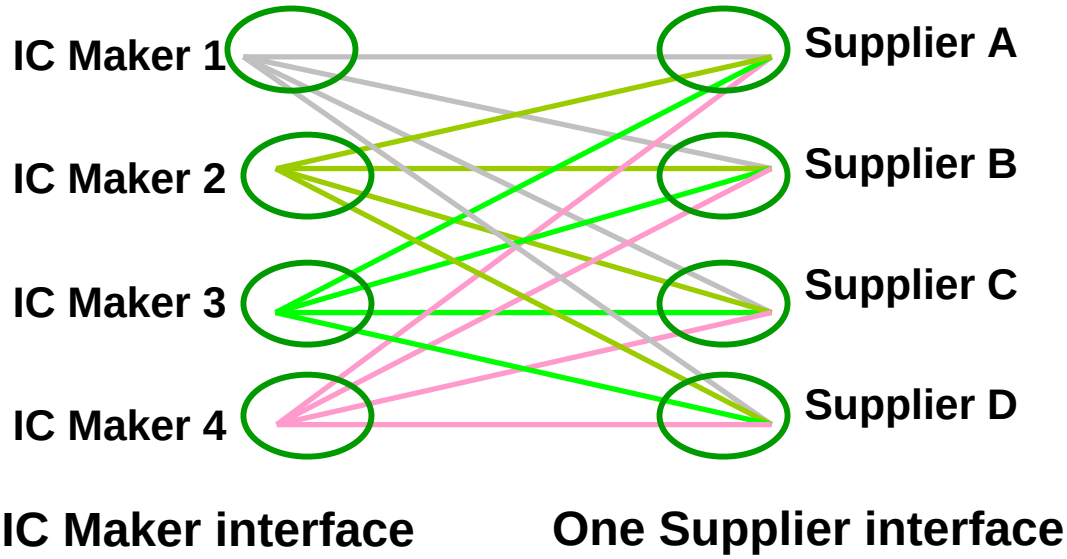
- ISMI Working Group defining requirements for moving data securely from the factory to the supporting organization
  - Requirements and Guidelines defined
  - Assessment checklist being defined
- Active participation from Member Companies, Equipment Suppliers, 3rd Party Suppliers
- Requirements and Guidelines include:

Interoperability	Performance
ICM and OEM data separation	Security: VPN, SSL, etc.
IC Maker private data as well as supplier private data handled by agent within factory	Enable remote tool operation, Safety
Guaranteed data delivery	Not limited to data directly from tool

Interface C Benefits

- **Consistency of transporting data for diagnosis of equipment and process**
  - IC Maker to/from multiple OEMs
  - OEM from/to multiple IC Makers

Simplifying connections with Interface C



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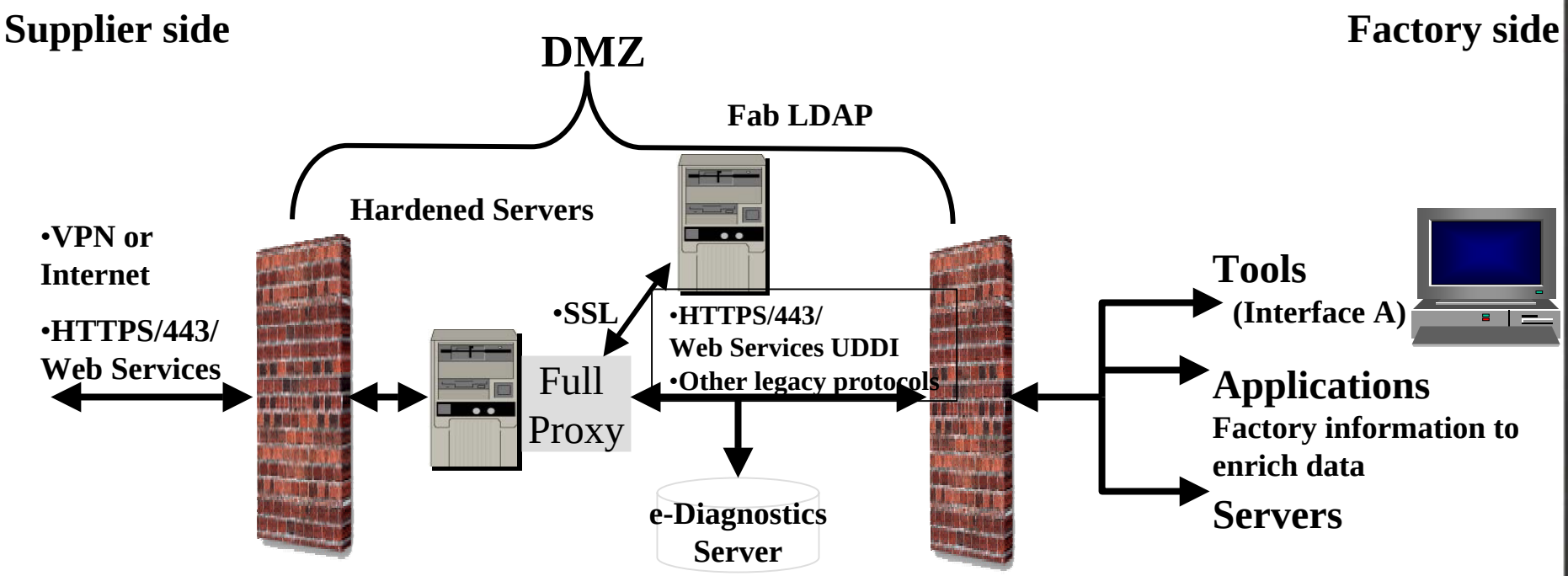
Interface C Requirements

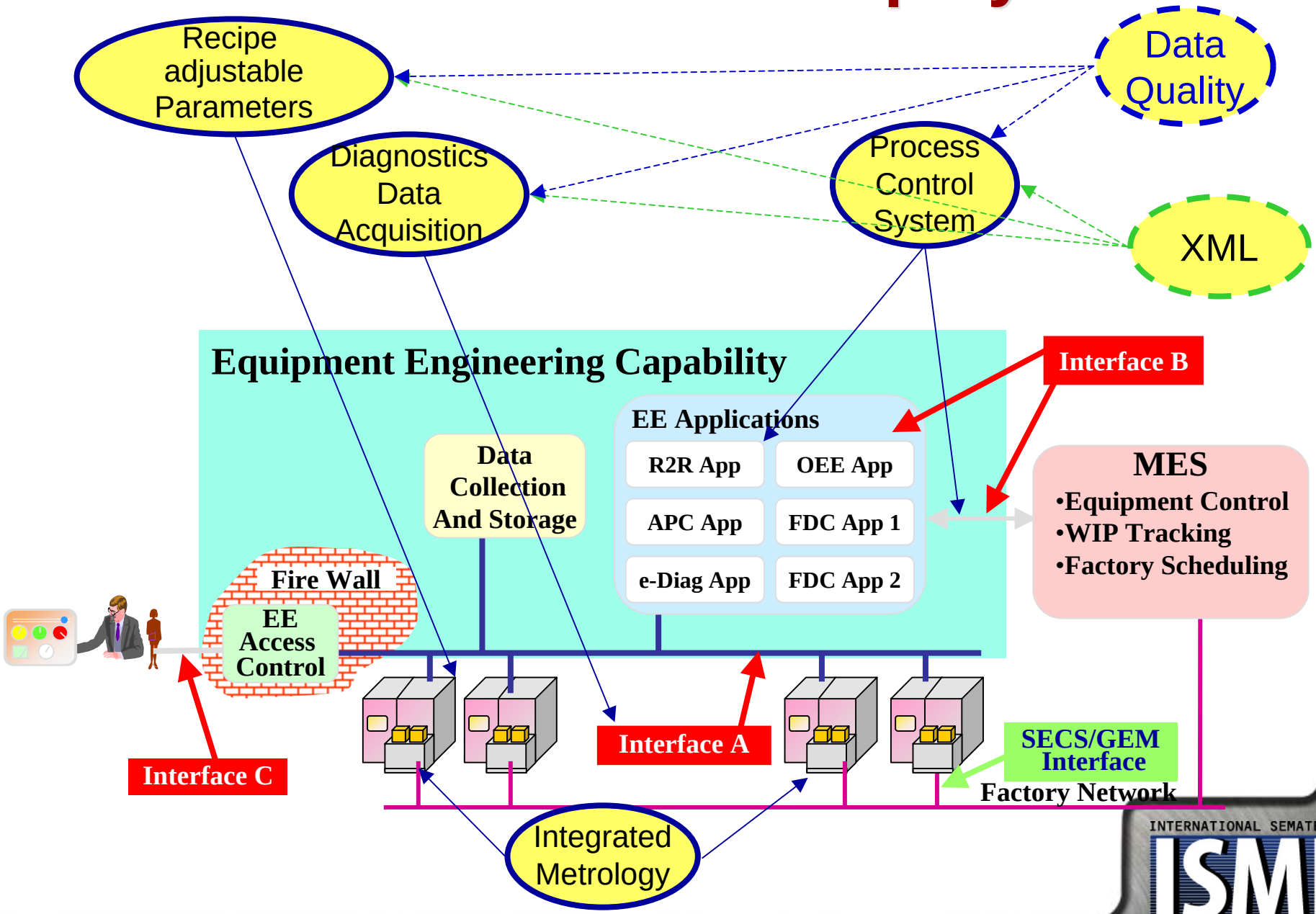


- Supplier data base authenticates each user and authorizes and supports supply chain
- Once pipe is open many different legacy protocols must be allowed

- All connections and data go through a proxy, no direct tool access
- By default the e-Diagnostics server lives in the DMZ.
- Authentication required for each session
- Privileges for which applications, servers, or tools an external user may access are centralized here

- More detailed privileges for each application, server, or tool may be handled here
- Must de-crypt at application/tool/servers
- Factory data base authenticates & authorizes

Standards in Fab-wide Deployment



e-Manufacturing Standards Implementation Roadmap

Objectives:

- **Provide early notification to suppliers about need dates to assist with their planning**
- **Provide an industry-wide, implementation roadmap for new standards**
  - Focus on implementation of 11 Factory Automation software standards
  - Co-developed with IC Makers, OEMs, and 3rd party suppliers
  - Involve more than ISMT IC Makers
  - Include priorities, evaluation software need date, production software need date
- **All participants in the factory automation space know and understand the roadmap.**
  - Schedules and expectations widely available
  - Support this roadmap with appropriate education, value, etc.

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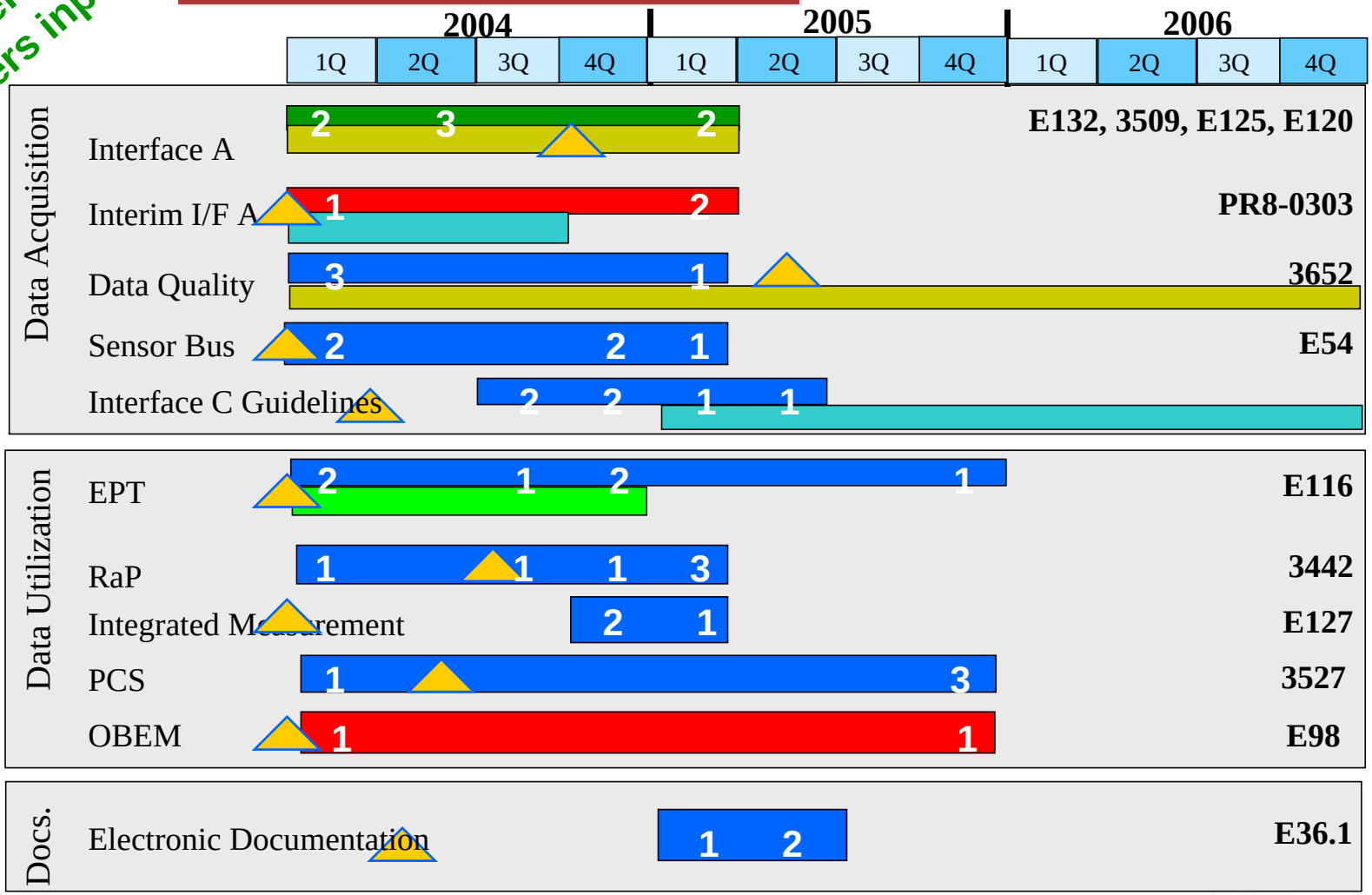
Industry e-Manufacturing "FAST" Roadmap

Evaluation Software Need Dates

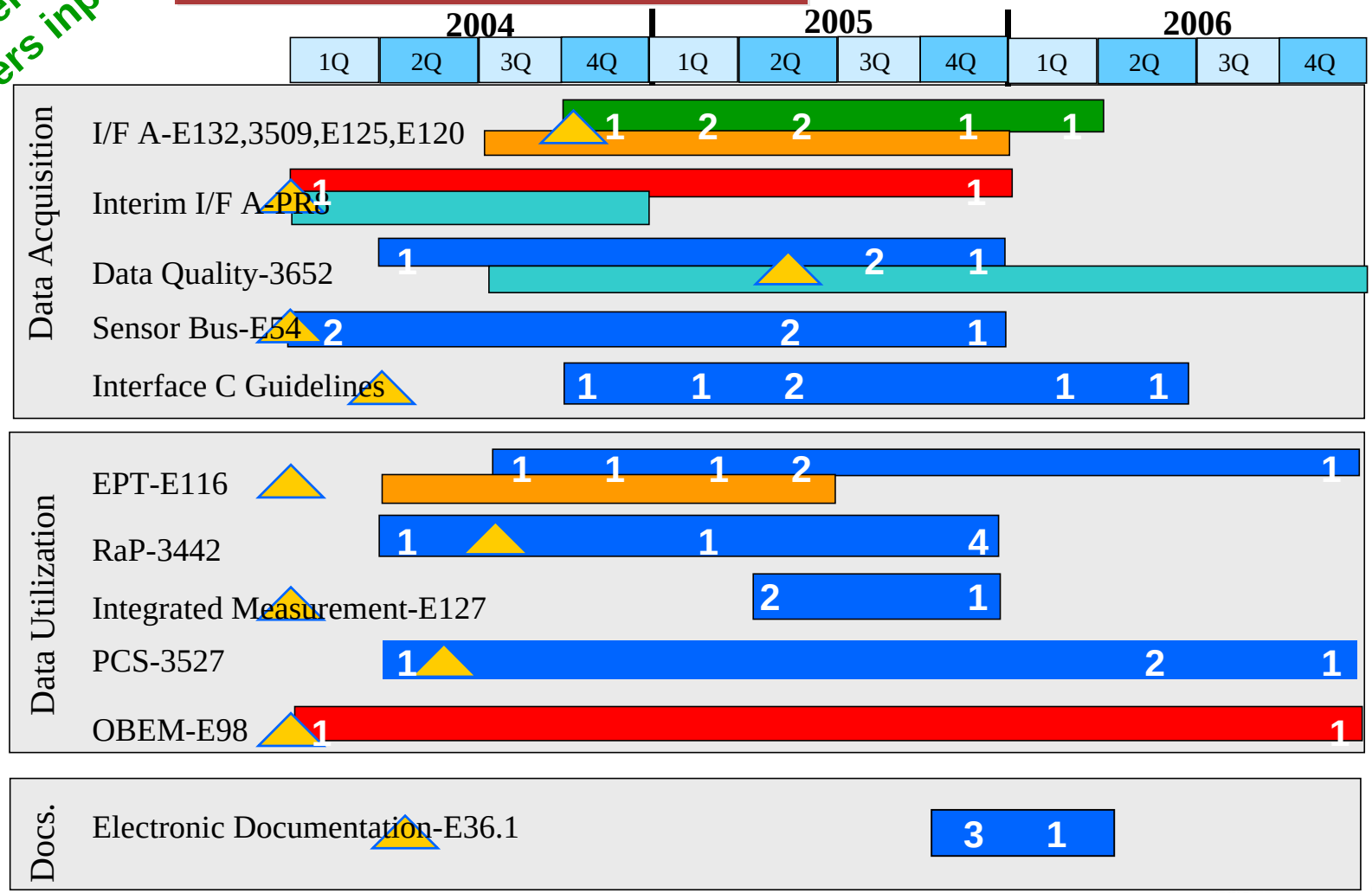
7+ IC Makers + 10 Suppliers input



Industry e-Manufacturing "FAST" Roadmap

Production Software Need Dates

7+ IC Makers + 10 Suppliers input



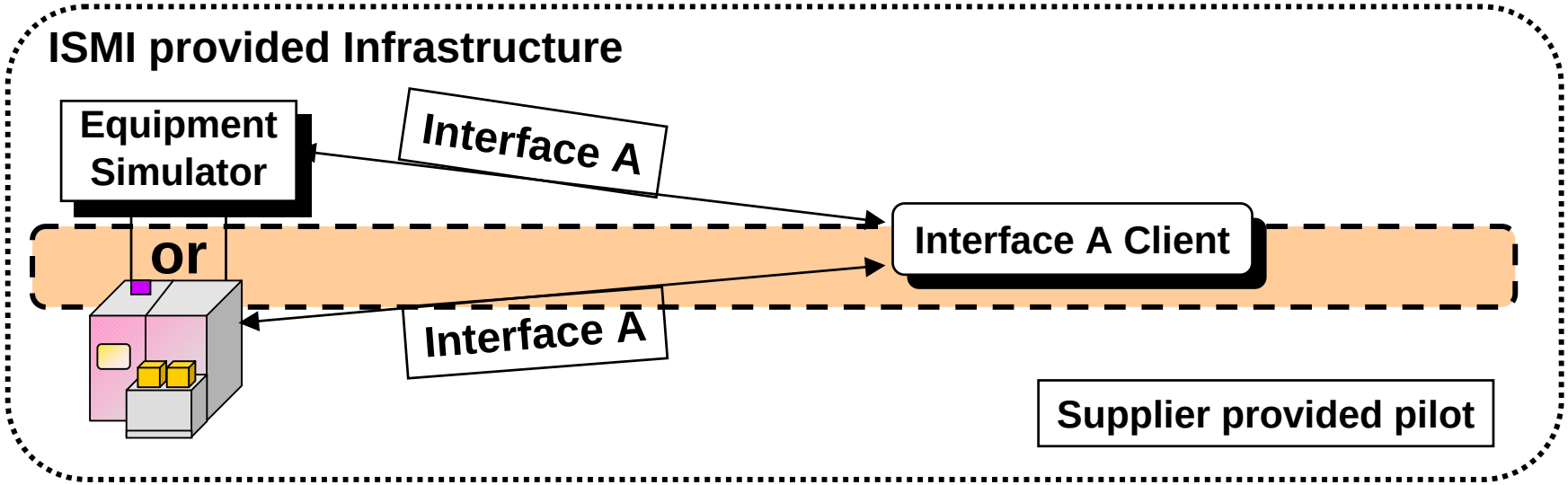
Key Roadmap Messages

- Interface A need is unanimous – highest ranking by both IC Makers and suppliers
- IC Makers top 4: Interface A, RaP, Sensor Bus, and Data Quality
- Suppliers top 3: Interface A, EPT, and RaP
- Message and Data Quality needed now
- OBEM has the lowest priority of this set of e-Manufacturing requirements
- GAP exists between the IC Makers need dates and the expected standards approval dates for Interface A, Data Quality, and RaP
- Prototyping of standards add value

Prototyping Interface A at ISMI

- **Prototype concepts and standards by suppliers**
  - Confirm integrity of standards and guidelines
  - Early analysis of feasibility
  - Creation of early use case scenarios
  - Prove standards interoperability
  - Demonstrate implementability
- **Prototypes accelerate commercial implementations**
  - Acceleration of standards implementations
  - Equipment supplier learning
    - Characterize performance issues - by tool type, if possible
    - Identify interoperability issues - different messaging and OS platforms
  - Feedback to supplier based on validation method
  - Leads to higher first pass testing success rate

ISMI Interface A Prototype example



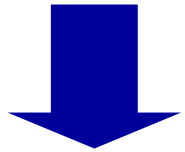
- **ISMI Provides**
  - Network infrastructure, hosts pilot activities, assessment method, $$
- **Supplier Provides**
  - Equipment tool or simulator, Interface A pilot interface, Interface A Driver
  - Must include OEM, but may also include 3rd party

www.ismi.sematech.org/fab/emanufacturing/prototype.htm

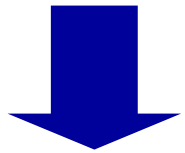
What we are seeing

- **Grand assumption of e-Manufacturing**
  - **Access to the required data makes decision making more effective**
- **e-Manufacturing is becoming a reality:**

APC (FDC, R2R) + e-Diagnostics



SEMI standards



Implementations

Key Messages

- e-Manufacturing factories build on 300 mm communication standards; E37, E40, E84, E87, E90, and E94
  - Full functionality is assumed
- Interface A is the current focus: standardized, open, accurate data
  - Standardization is nearing completion
- Interface A prototypes are being evaluated at ISMI
  - More prototypes are solicited for standards learning and improvement
  - ISMI may be helping fund your competitors implementation
  - To participate contact Harvey.Wohlwend@ismi.sematech.org
- The ISMI MCs are cooperating with suppliers early to assure mutual understanding and success
- ISMI MCs will require I/F A on equipment purchased starting as early as Q4 of 2004

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