

e-Diagnostics Working Group Meeting

# e-Diagnostics Project

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INTERNATIONAL  
**SEMATECH**

# e-Diagnostics Project Summary

**Background:** The internet is revolutionary productivity enhancer. Semiconductor fabs have not yet broadly incorporated its advantages due to concern for security, lack of standards, and diverse and inadequate supplier support. Many ad hoc implementations are being initiated.

## **Objectives:**

**Focus on e-Diagnostics first:** Create guidelines, best practices, prototypes, compliance assessments, and drive commercialization of open, internet-based access methods for suppliers to monitor their equipment, providing improved uptime, optimized predictive maintenance, and faster repair. Project can add scope per MC direction.

## **Stakeholders:**

- Primary: Fab equipment engineers and operations managers; equipment suppliers
- Secondary: Infrastructure software suppliers

**Competitive Benefit:** Member companies create industry-leading direction for driving suppliers to support a new generation of data gathering in fabs. Assured common supplier implementations (to reduce cost and enable data analysis applications) and encourage competition around standardized approaches. Leverages value from other ISMT investments in automated data collection (TP2™), sensors (AEC/APC), and SW interface standards.

# Overall Program Goals

- ❑ Leverage the internet: Controlled access to tool data by supplier to “real-time” information from their equipment to support remote monitoring, failure prevention, and rapid, remote diagnosis and repair
  - **Access via network or modem connection**
  - **Ability to remotely monitor, configure (particularly initial setup), and (with authorization) control equipment**
  - **Provide guidelines and standards to enable this capability**
- ❑ Improve equipment availability
  - **Reduce diagnostics time and MTTR**
  - **Allow suppliers to service equipment remotely**
  - **Anticipate problems before they happen (PM, SPC)**
- ❑ Reduce field support costs by reducing need for field engineers, travel
- ❑ Facilitate supplier insights into real-time diagnostic data and accurate historical performance data
  - **Facilitate tool and process improvements**
  - **Improve equipment design based on knowledge acquired**
  - **Leverage computing technology to attract richer depth of technical experts**
- ❑ Satisfy ALL safety and security concerns

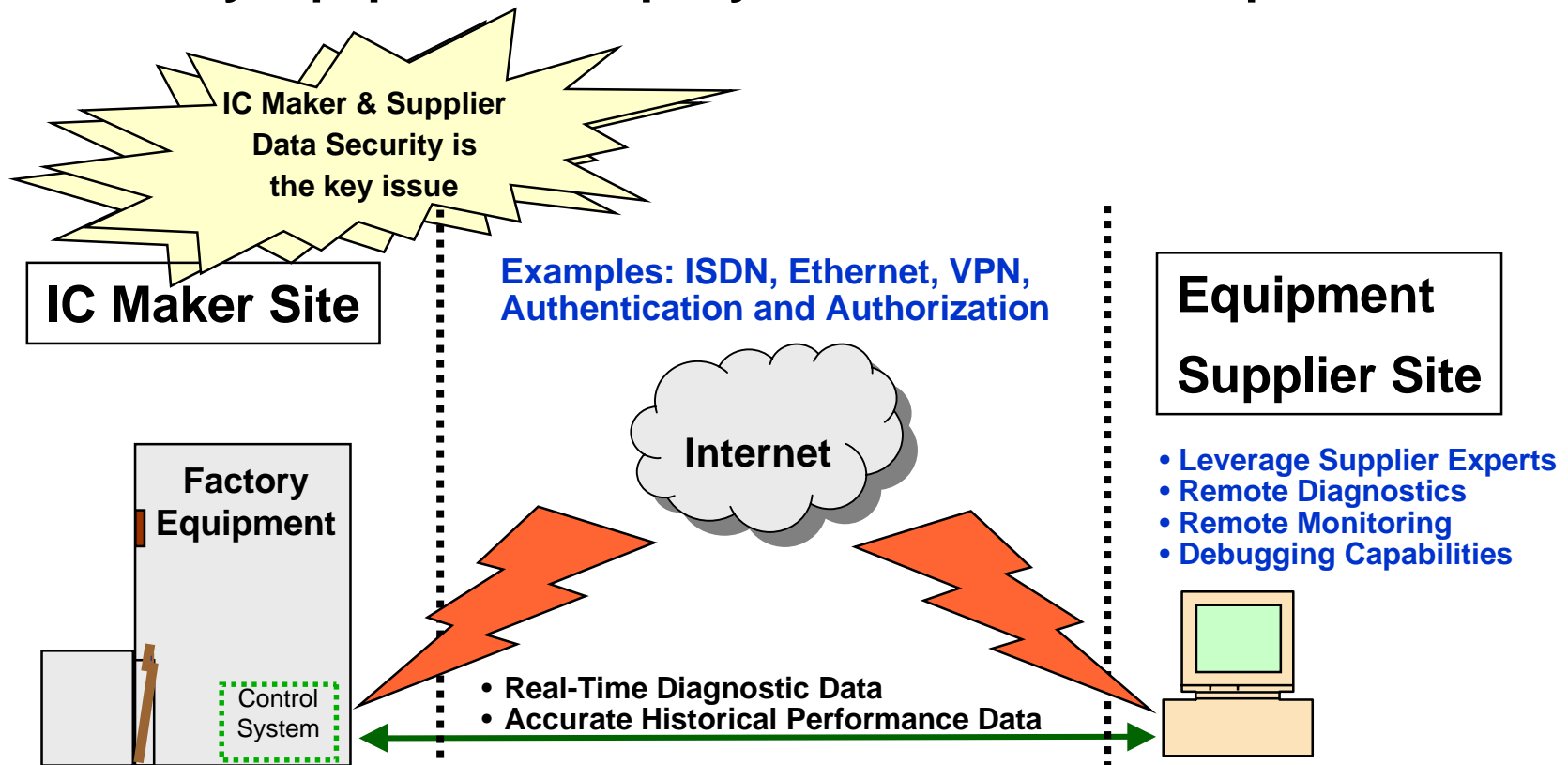
# e-Diagnostics Program Assumptions

- **ISMT BOD/IEF call for action - 4/2000**
- **General industry support for ISMT doing program**
- **Member companies provide overall program leadership**
  - Virtual assignees
  - High, energetic personnel involvement
- **ISMT provide facilitation**
  - Draw on MC (and others') expertise
  - Align MC requirements -- "The Voice of the Industry"
- **ISMT draw from internal, part-time resources**
- **Speed is of the essence**
  - Supplier announcements occurring

***Member companies are in the "driver's seat"***

# e-Diagnostics Overview

1. Remote monitoring & diagnostics allow supplier experts to rapidly fix factory equipment issues from their sites.
2. Suppliers need accurate historical performance data from factory equipment to rapidly drive continuous improvement.



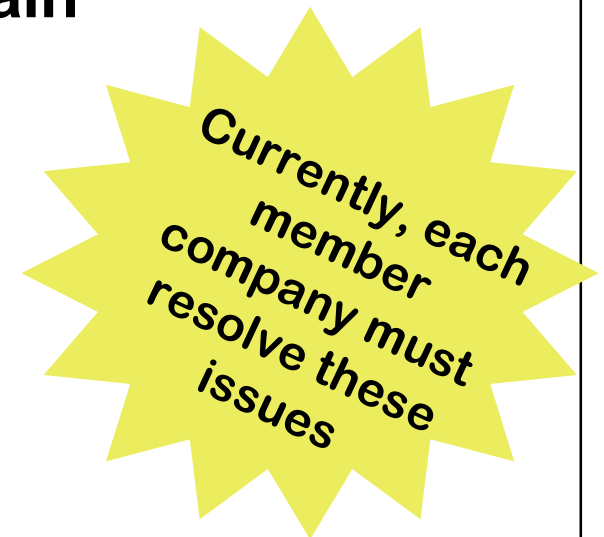
# In Scope

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- Establish e-Diag. Guidelines, Lessons Learned, and BKMs
- Facilitate definition of which fab tool data to provide suppliers
- Identify functions that can be executed during specific equipment states
- Roadmap for what should be done first, next, ...
  - **Synchronize to the ITRS**
- Create and communicate industry consensus
  - **Open architecture**
  - **Workshops, Semicon forums**
- Compliance assessment

# Out of Scope

- Methods for data analysis
- Data mining algorithms and implementations
- Industry benchmarking of tool data
- Expert systems algorithms and implementations
- e-business, e-commerce, Supply Chain Management
- Business practices



# Deliverables

- **Key Program Output**
  - e-Diag. Guidelines (with adjunct standards) - 6/29/00
    - Structured, consensus MC requirements for suppliers
  - Best Known Methods
    - Benchmarking semiconductor and other industries
  - Implementation Roadmap, Rev. 1 - 7/17/00
    - What should be done first, second, next, ...
    - Synchronized to the ITRS
  - Demonstrations
    - Prototyping
    - Compliance assessment
- **Major deliverables at least “every 3 months”**
  - Starting with SEMICON/West press release - 7/5/00
- **Collaboration with Security Council**

# Semiconductor Manufacturers IT Security Council

## May 18<sup>th</sup> 2000 Kick-Off meeting attendees:

Greg Nelson	AMD
Debbie Christofferson	Intel
Dave Reisenauer	IBM
Richard Hnath	Lucent
Elaine Cole	Motorola
Joe Norman	STMicroelectronics
Greg Herbst	TI
Michael Sigman	International SEMATECH
Carol MacNaughton	International SEMATECH

# IT Security Council Highlights

- **Supplier guest speaker was well received**
- **e-Diagnostics was unanimously and rapidly voted as first priority**
  - Want to be involved early in the process
  - Serve in an enabling role
  - Want to work closely with the e-Diagnostic team (joint meeting)
  - Inevitable

## Other Areas of Interest

- **Benchmarking of Best Practices i.e., Virus prevention, remote access, VPN...**
- **Mergers, acquisitions and joint ventures**
- **Encryption and certification of email and software**
- **Foundry data exchange (e.g., TSMC)**
- **European Member meeting**

# e-Diagnostics Technical Issues

## Infrastructure

- Safety and Security for all constituents
- Factory Automation software implementations are incomplete

## Data Management

- What data does supplier need for effective e-diagnostics?
- What data will fabs share with the supplier?
  - Prohibiting deducing loads, process recipes, etc.
- Data collection ala E10/E58 vs. new methods (EPM) vs. APC data
- Volume of data? Data expiration? Bandwidth?
- Data ownership and Intellectual Property protection
  - New legal clauses needed?

## Other Internet usage opportunities

- Product descriptions, technical bulletins, documentation, SW+HW upgrades, and tool BKMs via the internet?
- Requesting open (with control) defect tracking data base?

# Cost Benefit and Impact of Remote Diagnostics\*

Cost Justification Basis	Technology			
	Computers & Office Automation	Tele-communications	Medical Electronics	Building & Plant Automation
Gain General Competitive Edge	55%	35%	50%	64%
Capture & Retain Some Expertise /Knowledge	41%	45%	48%	55%
Improved Telephone Troubleshooting	35%	42%	28%	31%
Improved Call Avoidance	31%	43%	21%	34%
Reduced Training Time & Costs	21%	18%	14%	21%
Reduced Mean Time to Diagnose & Repair in the Field	37%	28%	19%	34%
Reduced Broken Calls Due to Parts/Technical Skills	31%	21%	22%	20%
Other (Increased Revenue, Justifiacion of added Product Value/Price)	11%	10%	12%	10%

Percentage improvement in cost savings & other benefits, based on history of diagnostics projects.

\*Service Program Diagnostics & Decisions Support Technology for Improving Health Technology Service Efficiency & Productivity, Biomedical Instrumentation & Technology, July/August 1998, p370.

# Cost Benefit and Impact of Remote Diagnostics\*

Benefits	Effects	Supplier	Customer
Reduce the training time & skills level of maintenance personnel	Reduce labor costs per maintenance person	Yes	
Reduce or eliminate effort required to analyze data	Reduce personnel requirements	Yes	
Reduce or eliminate effort required to collect data	Reduce personnel requirements	Yes	
Reduce elapsed time required to assess & diagnose problem, i.e., reduce MTTR	Reduce personnel requirements, Improve uptime	Yes	Yes
Improve predictability of failure in order to initiate PM prior to emergency failure, i.e., increase MTBF	Reduce personnel requirements, Improve uptime	Yes	
Improve response time to service call and/or call avoidance probability	Greater customer satisfaction & customer retention	Yes	Yes
Improve craft & resource allocation	Reduce personnel & parts, Inventory costs	Yes	
Reduce “broken” calls due to lack of parts/skills	Reduce personnel costs & MTTR	Yes	Yes
Greater service & product differentiation	Potential to gain new markets & improve position in currently served markets	Yes	
Ability to deliver service in remote or inaccessible areas	Reduce personnel & parts, Inventory costs	Yes	Yes

\*Service Program Diagnostics & Decisions Support Technology for Improving Health Technology Service Efficiency & Productivity, Biomedical Instrumentation & Technology, July/August 1998, p370.

# e-Diagnostics Guidelines V0.4

## Purpose/Scope:

The fundamental purpose of e-Diagnostics is to increase the availability of production and facilities equipment, reduce mean time to repair and provide significant reduction in field service resources/costs. This capability must be available for 200mm and 300mm fab equipment, Probe/Assembly/Test equipment, and key Facilities equipment.

## e-Diagnostics definition:

Capability to enable an authorized equipment supplier's field service person to access any key production or facilities equipment from outside the IC maker's facility/factory via a network or modem connection. Access includes ability to remotely monitor, diagnose problems or faults, and configure/control the equipment in order to bring it into full productive state rapidly, within security and safety guidelines.

The e-Diagnostics solution consists of equipment and auxiliary hardware and software applications.

# e-Diagnostics Guidelines V0.4

## Safety and Security:

- **Safety** is imperative. Potential solutions must address worker, product, and equipment safety. An operational interlock is required to ensure safety.
- Data **security** is paramount. Potential solutions must address network, communications, data encryption and other relevant issues. Only authorized personnel may be able to access the view based, relevant data to perform diagnosis.
- Remote data and control **access** must be **selectively provided**. Therefore the e-Diagnostic system must have built-in capability that determines when to allow specific remote functions to be executed based on specific states or condition of the equipment.

## Architecture:

- The solutions must support **remote accessibility** of equipment diagnostic data from outside the IC maker's firewalls. **Two-way communications** between these two locations is needed to support interactive problem solving.
- The solutions must permit sharing of key diagnostics and monitoring data between multiple factory and supplier sites on an as-needed basis to enable **remote detection of issues** and proactive trouble-shooting.
- The solutions must enable **predictive maintenance**, including notification when equipment will need service or repair.
- e-Diagnostics solutions must be implemented using an **open architecture** based on mainstream computer technologies, non-proprietary standards and data models.

## Collaboration:

- The solutions must provide the same equipment monitoring/diagnostics data at the **local and remote sites**. Identical representations and user interfaces at both sites are highly desired.
- The solutions must enable run-time data collection, storage, and retrieval. The e-Diagnostics system must enable **analysis of** this data and decision support capability.
- The solutions must allow **audio-visual collaboration** such as video teleconferencing or video over Internet Protocol to enable remote experts to view/diagnose equipment and sub-assembly problems in real-time and communicate with factory personnel.