



e-Diagnostics Seminar

Connectivity

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INTERNATIONAL
SEMATECH

Agenda

- **The Connectivity Team – Charter, Participation, Milestones**
- **Analysis results to date – Capability Review, System Overview, Use Cases & Analysis**
- **Diagnostic Data Acquisition Task Force – Charter and Scope**
- **Summary**

Connectivity Team – Charter

- **Charter**

- Develop preliminary e-Diagnostics system software specifications for each identified capability, in accordance with the e-diagnostics capability and data taxonomies.

- **In Scope**

- Identification and definition of e-Diagnostics system requirements
- Definition of e-Diagnostics software design specifications

- **Out Of Scope**

- e-Diagnostics business model definition
- e-Diagnostics business value definition
- e-Diagnostics security infrastructure definition

- **Reforming as SEMI Diagnostic Data Acquisition Task Force**

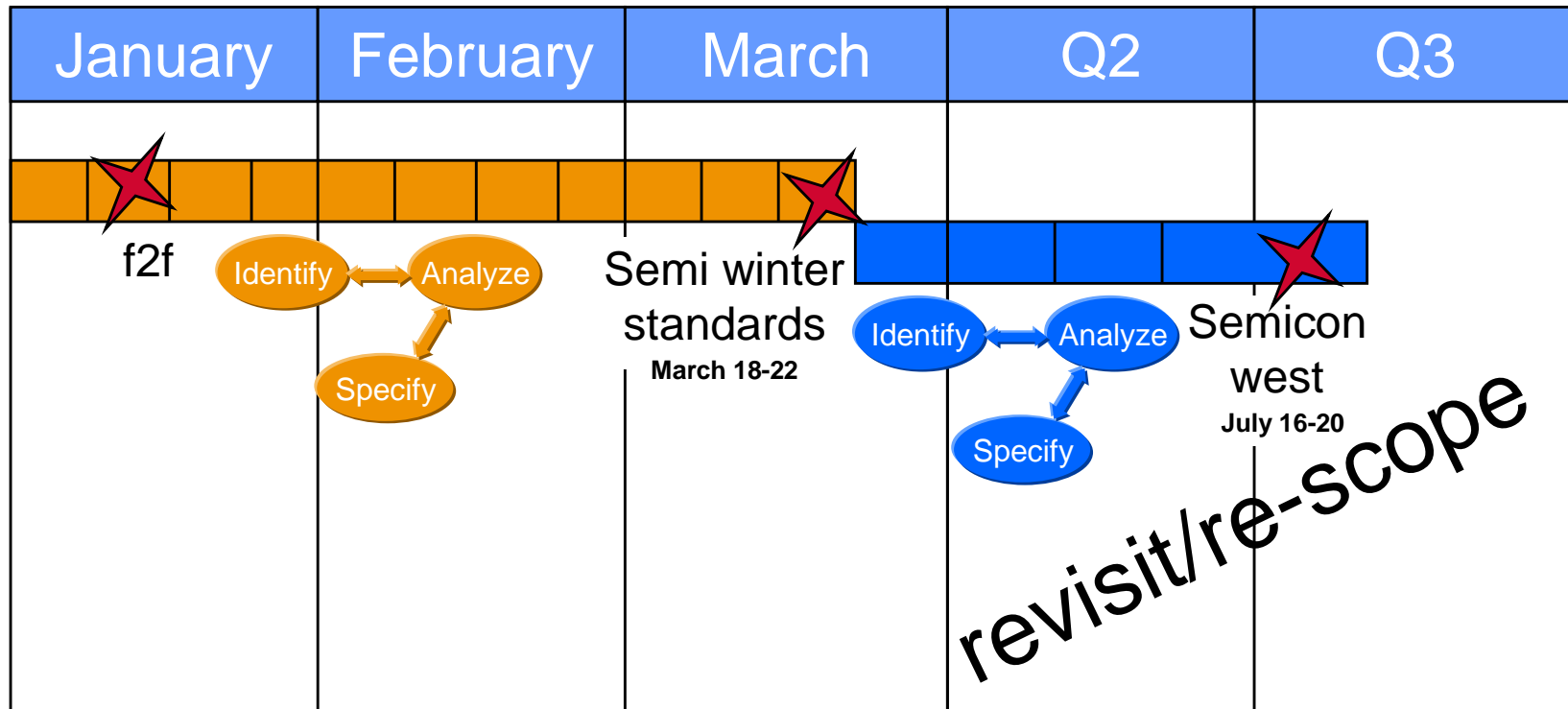
Connectivity Team – Participation to Date

Participant	Weekly Time Commit	Duration	Team Role	Background
Equipment Supplier	10-20%	Jan – Mar	Requirements definition	Knowledge of e-diagnostics goals, information needs of support job functions at company, company security and IP issues
Equipment Subsystem Supplier (e.g., pumps, abatement systems, etc.)	10-20%	Jan – Mar	Requirements definition	“
Manufacturer	10-20%	Jan – Mar	Requirements definition	“
Supplier Software Engineer / Architect	30-40%	Jan – Mar	Analysis and design	Knowledge of e-diagnostics goals, familiarity with web, security, database, and application development technologies, familiarity with SEMI software standards, semiconductor equipment control and interfacing “
Manufacturer Software Engineer / Architect	30-40%	Jan – Mar	Analysis and design	“
3 rd Party Software Engineer / Architect	30-40%	Jan – Mar	Analysis and design	“
International SEMATECH representative	5-10%	Jan – Mar	Guidance and steering	Involvement in e-diagnostics roadmap definition, prototyping efforts

Connectivity Team – Milestones

- **Current work scope represents a second iteration on e-Diagnostics system definition**
- **First iteration (as the Protocol Definition team) identified 12 use cases**
 - Detailed 7 use cases to develop essential criteria and communication protocol recommendations
- **First iteration results completed December, 2000**
 - See the Protocol Definition section of the Guidebook
- **2nd iteration (as the Connectivity Team) has identified 17 use cases, focus on 12.**

Original – 2001 Milestones



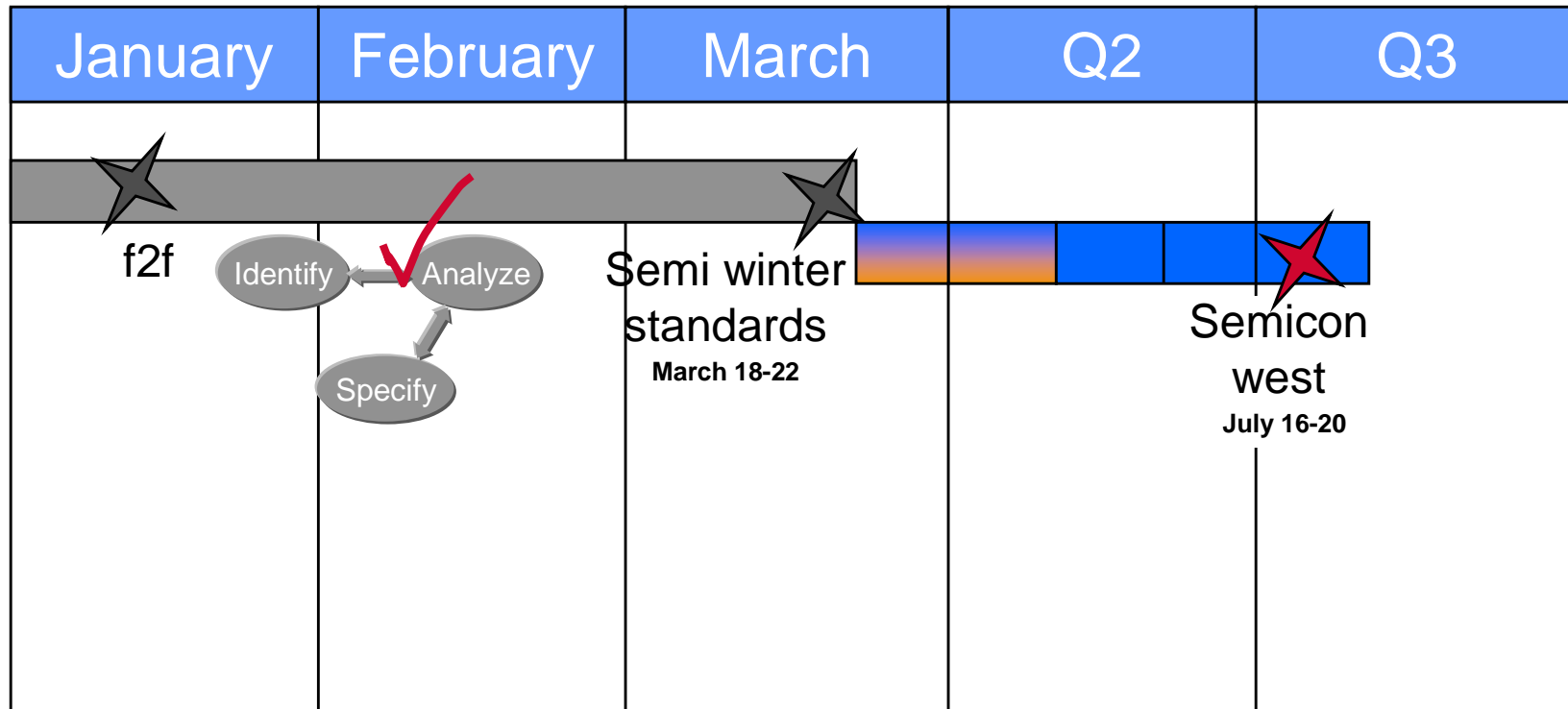
2nd Iteration

Rev 0

Rev 1

- System model overview
- Remote tool sessions
- Administration
- Steady state data collection
- Live equipment status viewing
- Historical reporting
- Sign-on/off
- Collaboration
- File transfer

Updated 2001 Milestones



Work Scope:

Connectivity wrap-up

DDA TF

- Complete use cases id & detail
 - Administration
 - “Diagnostic panel”
 - Tool session request
 - Supplier infrastructure access
- Incorporate into guidebook
- Comprehend SEMI processes
- Are we going to have SECS?
 - Pro/con
 - Yes/no
- Survey applicable standards
- Hold first f2f

Q2 Goals

- **What Connectivity work will remain after Q2?**
 - Maintain Use Cases
 - Team will shift gears into DDA TF mode
 - Exclusive focus on data collection for e-Diagnostics
- **What DDA TF work will remain after Q2?**
 - Information model gap analysis
 - Standards pro/con
 - Technology platform definition
 - Technology platform pro/con
 - Standards approach definition
 - Timeline definition
 - Standard definition
 - Reference implementation(s)

Q2 Goals

Three tracks of work in Q2

– Complete use case work

- Administration
- “Tool Diagnostic Executive”
- Access to supplier assets
- Tool session request

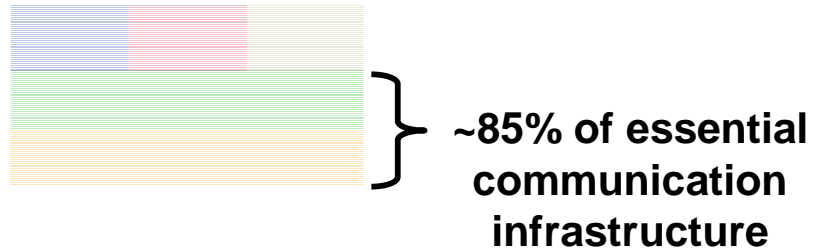
– SECS

- What’s needed by e-Diagnostics (and why)
- SECS gap analysis
- SECS recommendation

– Standards survey

- Understand SEMI standards
- Understand OPC and DAIS

Capability Review



Capability Taxonomy	
Level 0: Connection	Basic remote connectivity with connection management.
Level 1: Collection and Control	Remote Performance Monitoring and Remote Operation
Level 2: Analysis	Automated Data Reporting and Analysis
Level 3: Prediction	Predictive Maintenance, Self Diagnosis, and Automated Notification
Level 4: Correlation	Cross-tool correlation

Current iteration focus:

Level 0

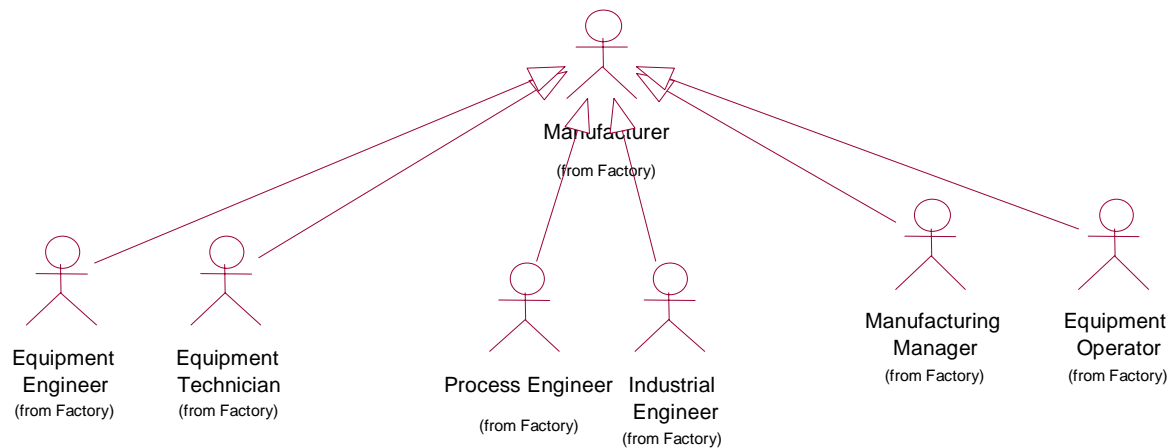
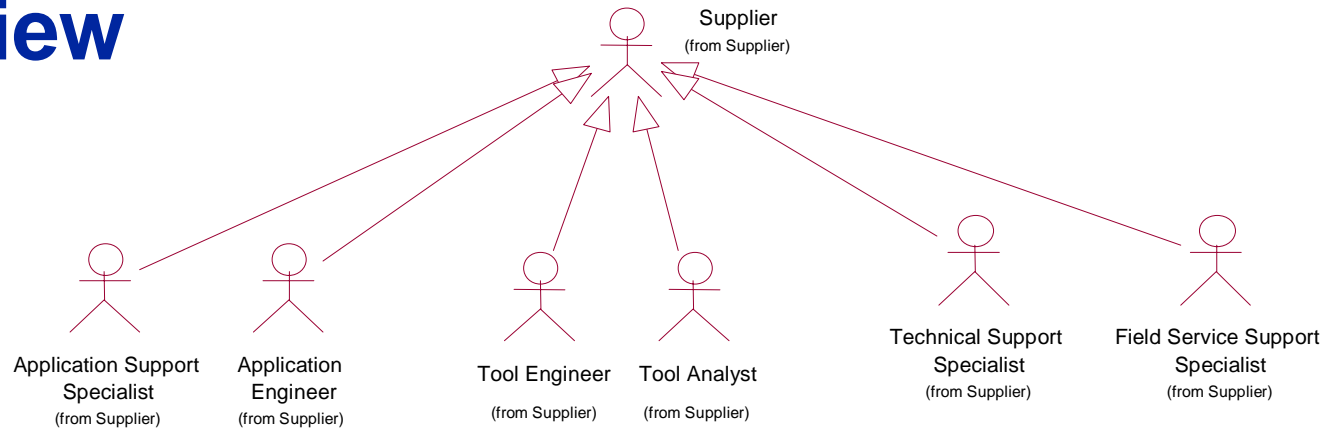
- Authorize new user
- Sign on
- Sign off
- Collaborate
- Transfer files

Level 1

- Conduct a Remote Tool Session

System Overview

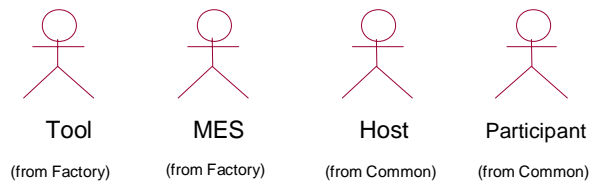
e-Diagnostics Actors



Associated diagrams:

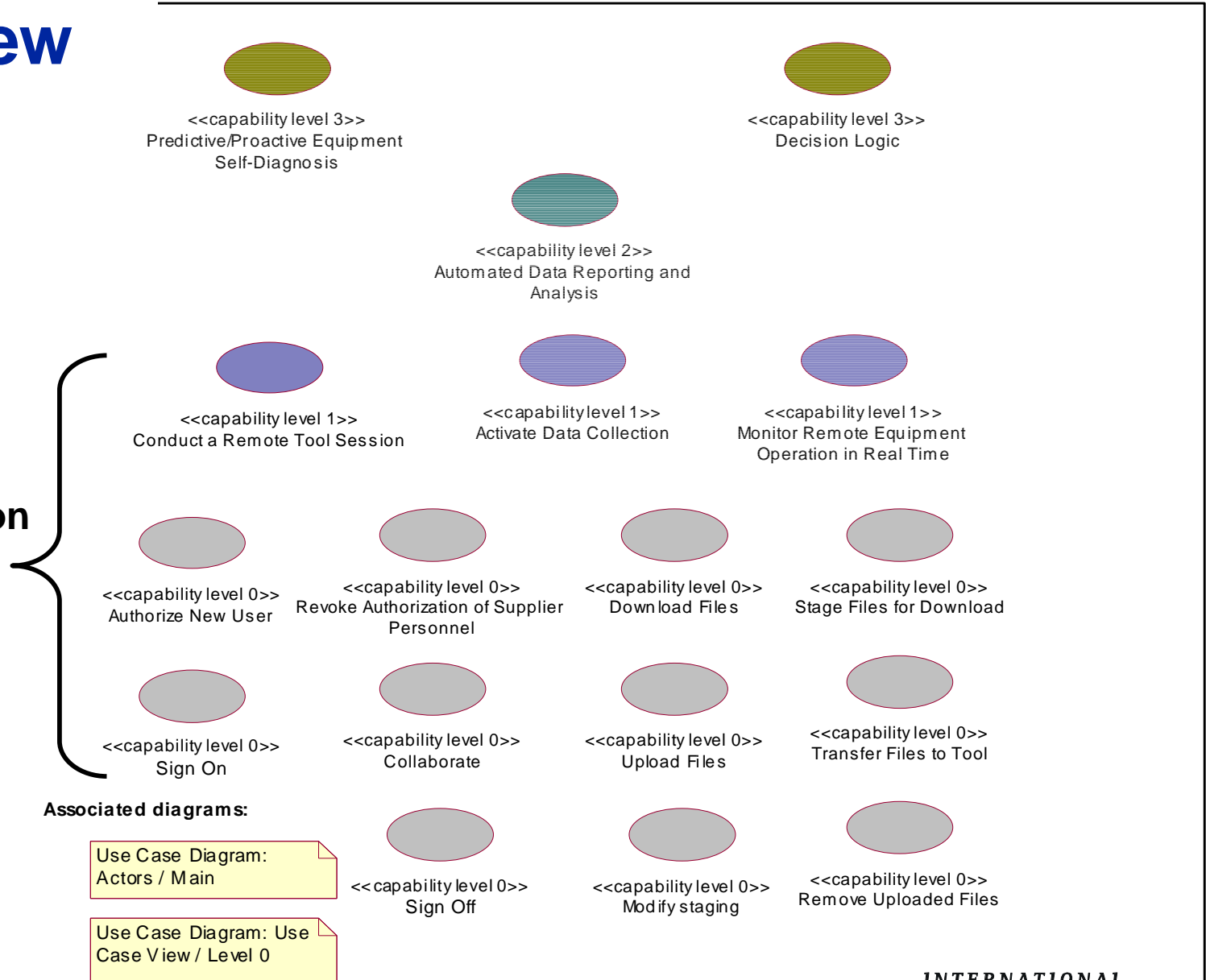
Use Case Diagram: Use Cases / Main

Use Case Diagram: Use Case View / Level 0



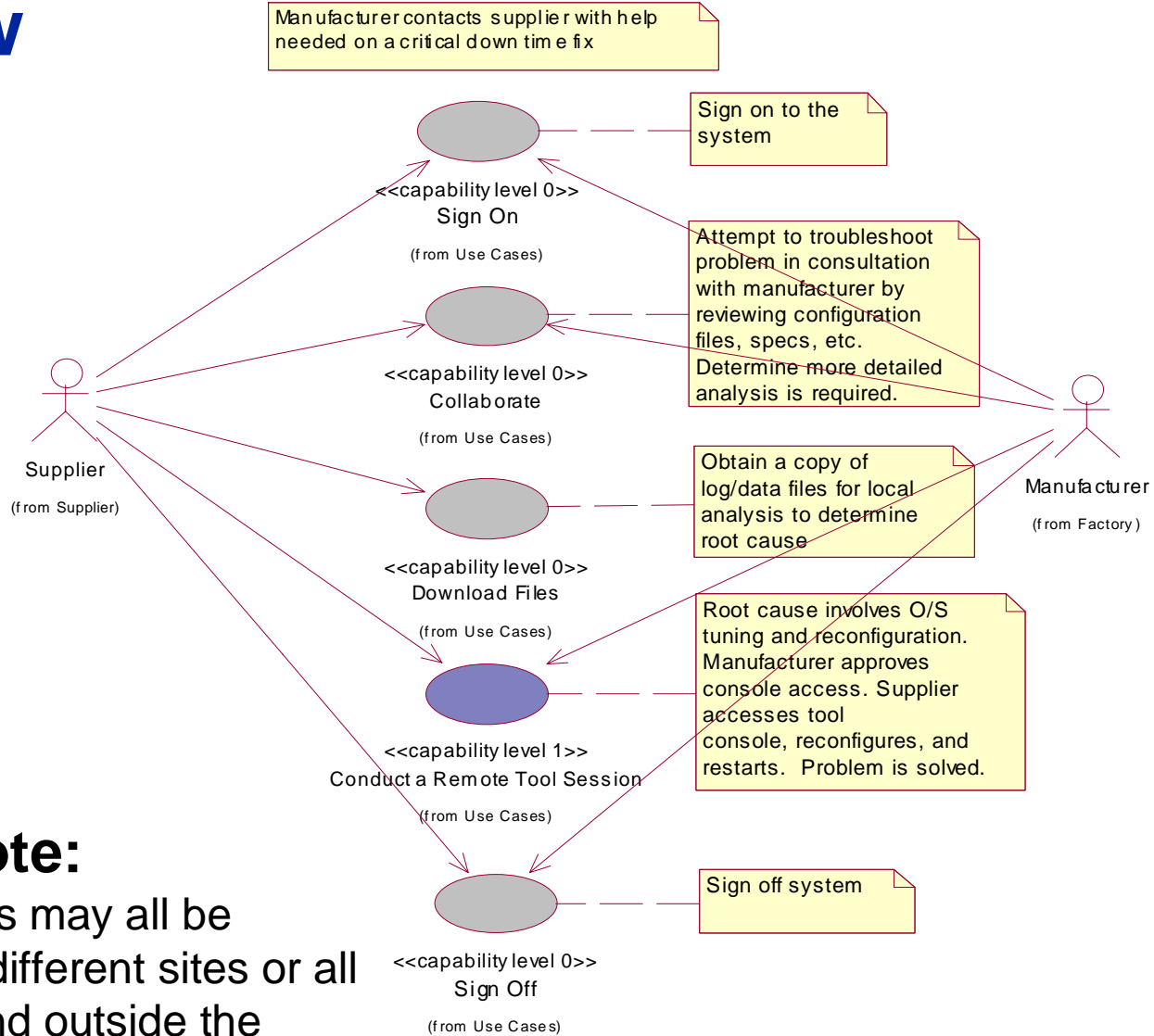
System Overview

Use Cases by Capability Level



System Overview

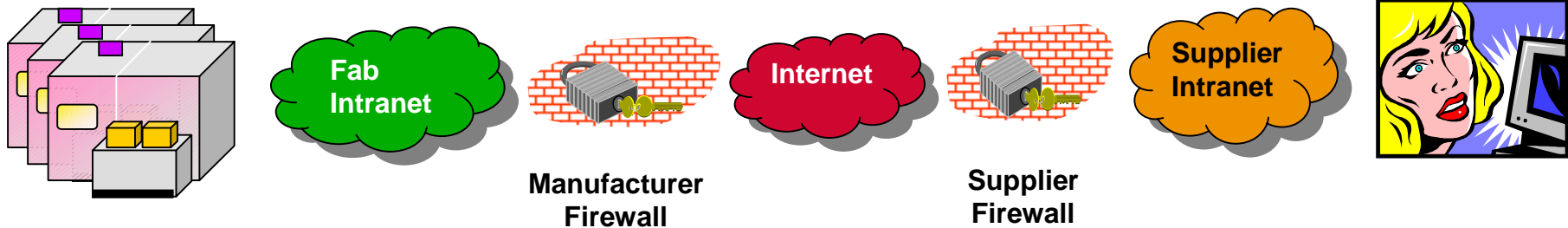
Example Troubleshooting Scenario



Note:

Participating actors may all be manufacturers at different sites or all suppliers inside and outside the factory, or any imaginable permutation

Use Case – Authorize New User



Pre-conditions: • **Authorized Administrator**

Post-conditions: • **User has unique identity known to system + privileges**

Essential Criteria

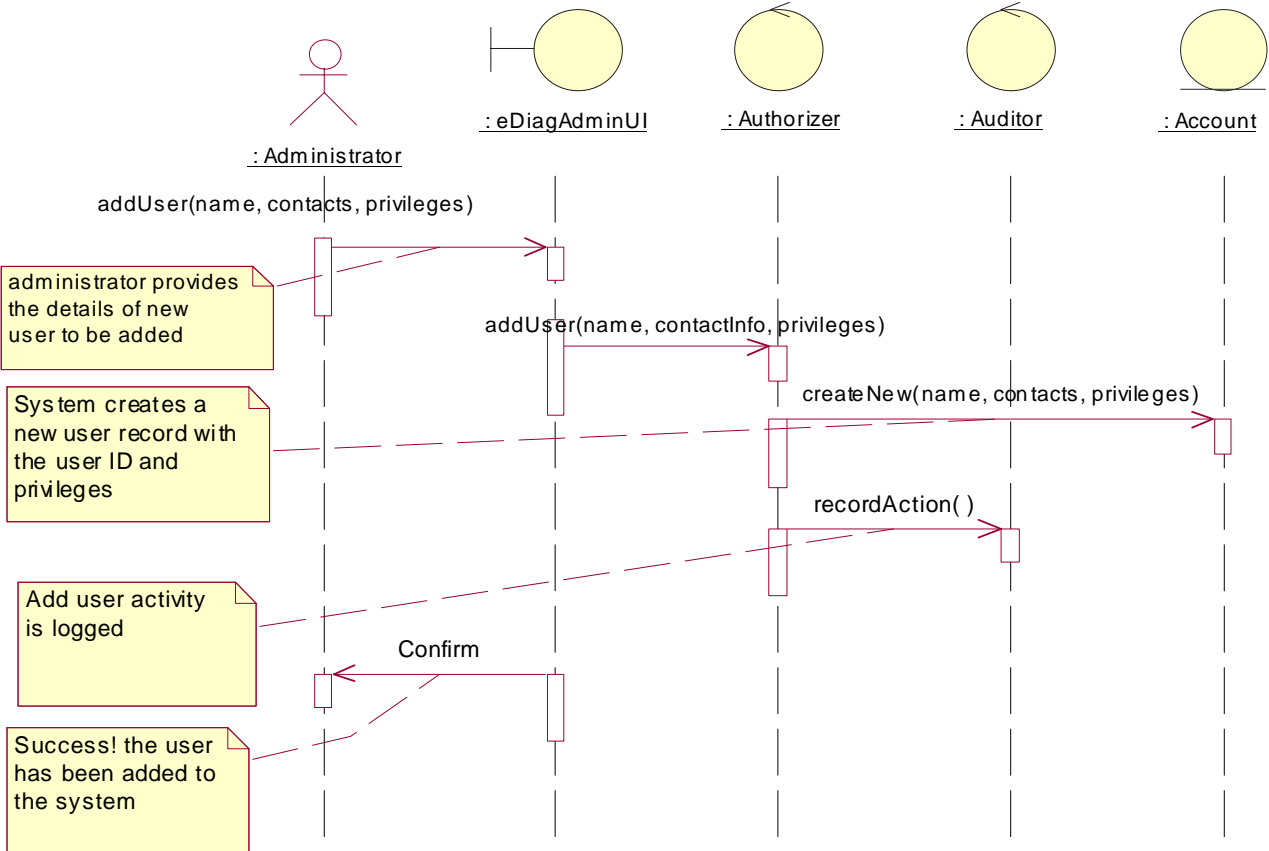
- Single point of access, authorization
- Heterogeneous h/w & s/w
- Encrypt-able
- Support group concepts
- Support designated admins

Protocol Recommendation

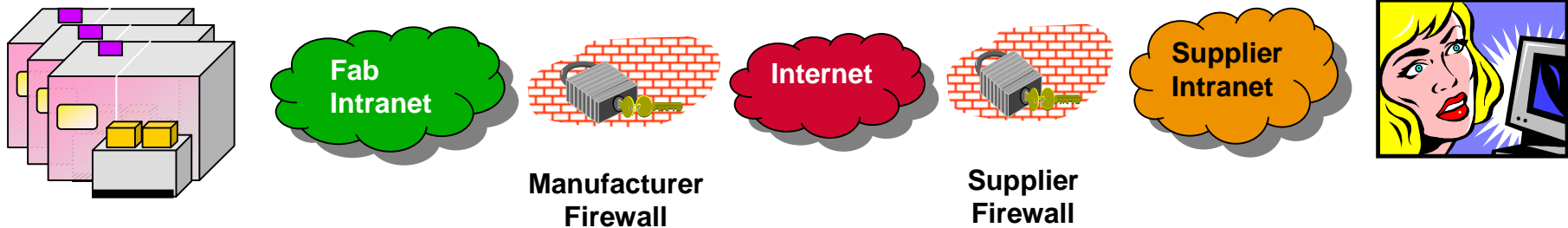
- HTTP on SSL
- Working with security team (looking at PKI + LDAP)

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New User



Use Case – Sign On



Pre-conditions: • **Authorized**

Post-conditions: • **User has access to system, according to authorization**

Essential Criteria

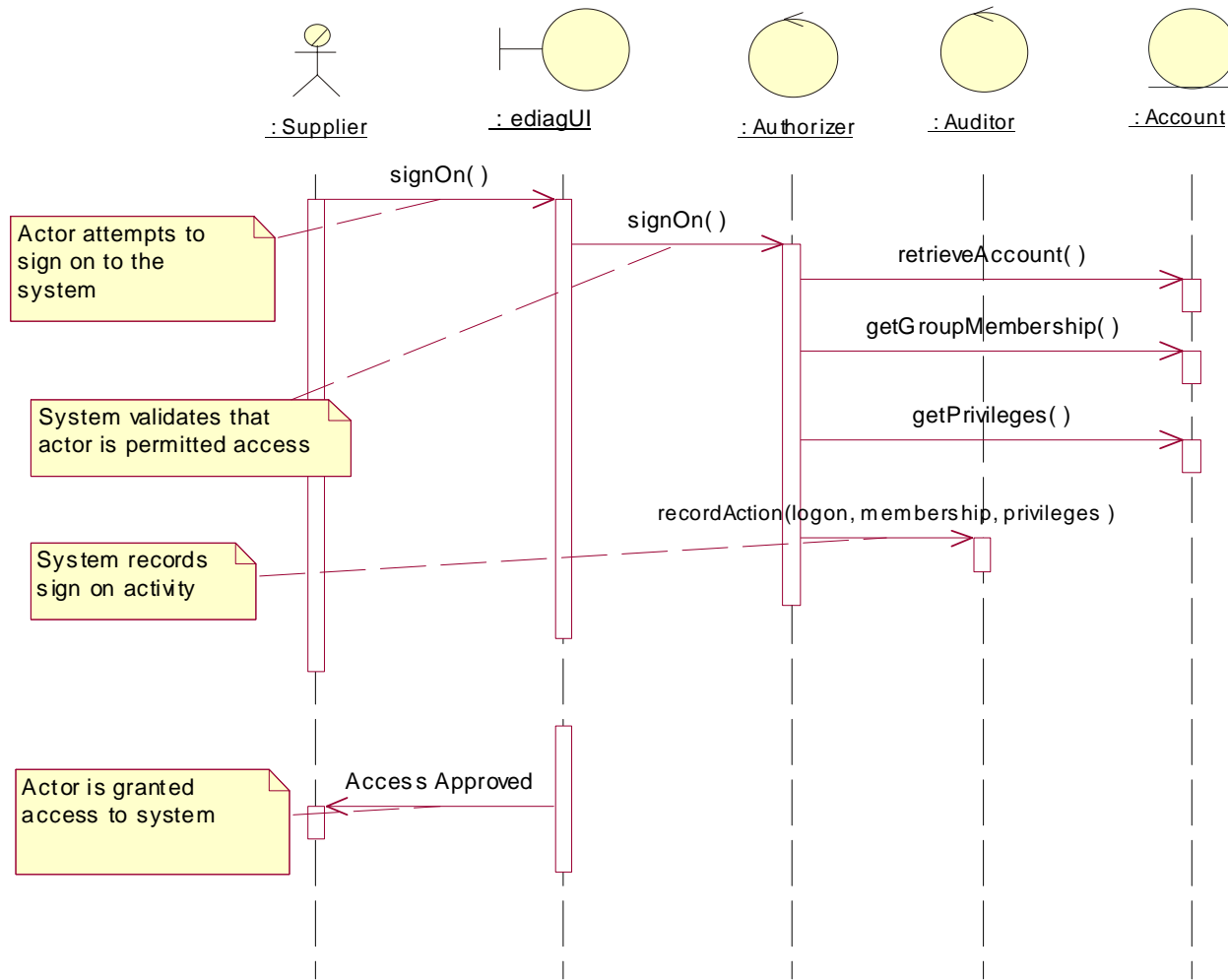
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- Encrypt-able

Protocol Recommendation

- **HTTP on SSL**
- Working with security team (looking at PKI + LDAP)

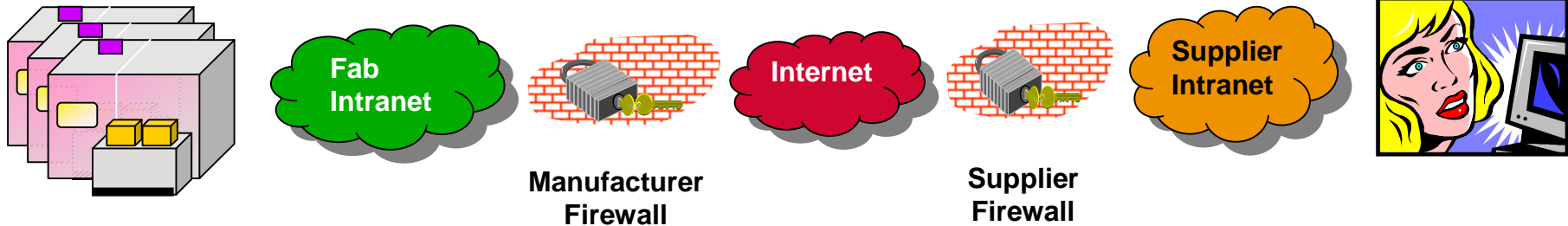
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Sign On



Sequence Diagram: Sign On / Sign On Failure

Use Case – Sign Off



Pre-conditions: • **Signed on**

Post-conditions: • **User has no further access to system**

Essential Criteria

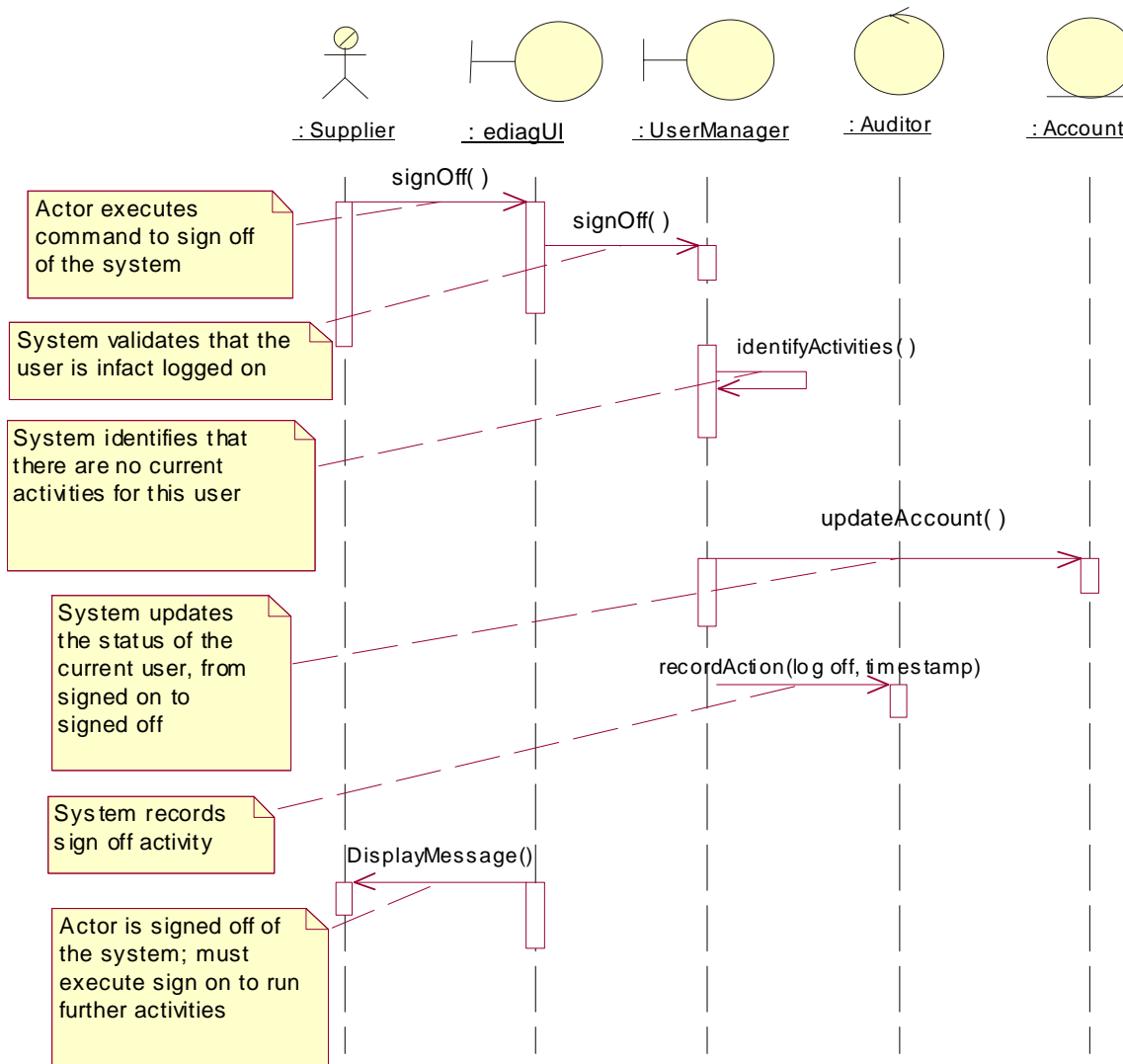
- Single point of access, authorization
- Heterogeneous h/w & s/w
- Encrypt-able

Protocol Recommendation

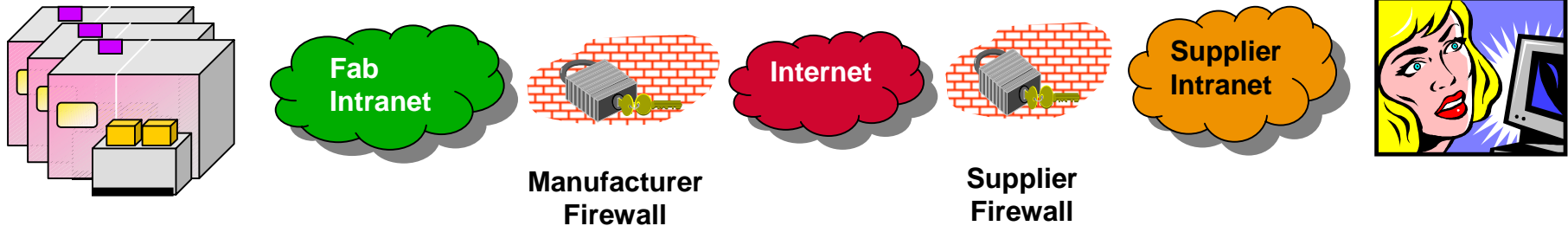
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Sign Off



Use Case – Stage Files for Download



- Pre-conditions:**
- Signed on
 - Authorized to stage files
- Post-conditions:**
- Files available for download

Essential Criteria

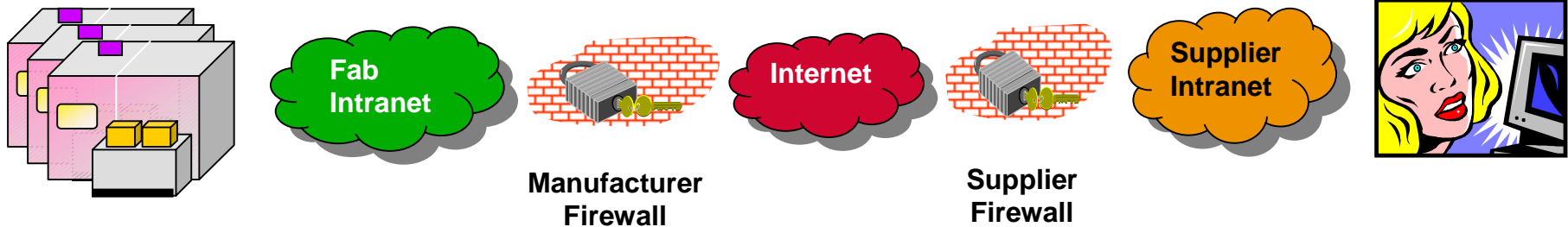
- Single point of access, authorization
- Multiple data formats
- Heterogeneous h/w & s/w
- Ability to specify continuous update
- Ability to set storage limitations
- Ability to restrict “stageable” files
- Staged files stored off-tool

Protocol Recommendation

- New to this iteration

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Use Case – Download Files



- Pre-conditions:
- Signed on
 - Authorized for download
- Post-conditions:
- Requested files are downloaded

Essential Criteria

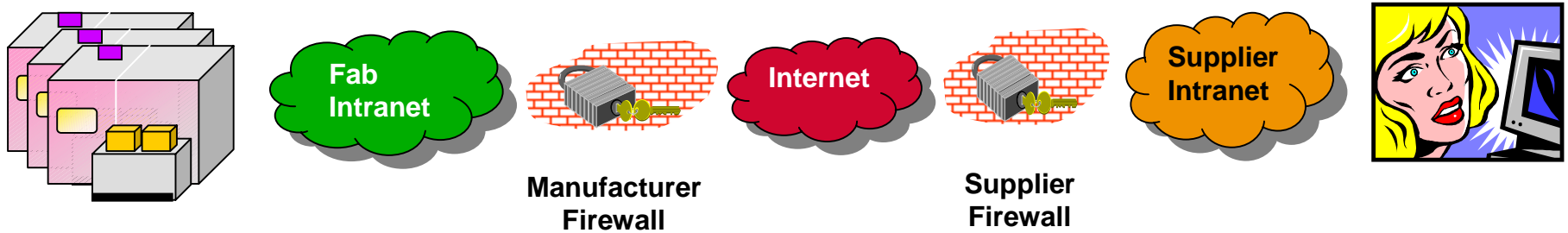
- Single point of access, authorization
- Multiple data formats
- Heterogeneous hardware & software
- Encrypt-able
- Ability to control access by company, geography, site, etc.
- Only staged files can be downloaded
- Equipment computer resources do not participate in the download

Protocol Recommendation

- FTP/HTTP on SSL

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Use Case – Upload Files



Pre-conditions:

- Signed on
- Authorized to upload

Post-conditions:

- Files uploaded to e-diagnostics system

Essential Criteria

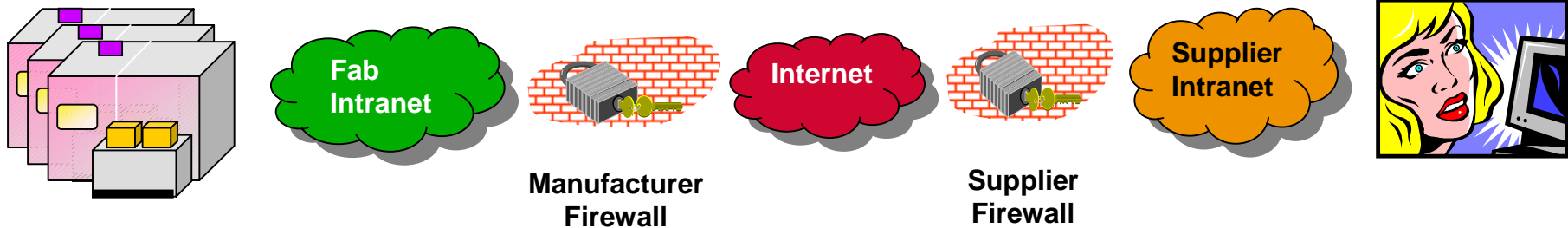
- Single point of access, authorization
- Multiple data formats
- Heterogeneous hardware & software
- Encrypt-able
- Uploaded files not stored on tools
- Require separate privilege to upload files to tool computers
- Ability to enforce storage limits
- Ability to specify file storage lifetime

Protocol Recommendation

- New to this iteration

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Use Case – Transfer Files to Tool



- Pre-conditions:**
- Signed on
 - Authorized to transfer to tool
- Post-conditions:**
- File(s) Transferred to tool computer(s)

Essential Criteria

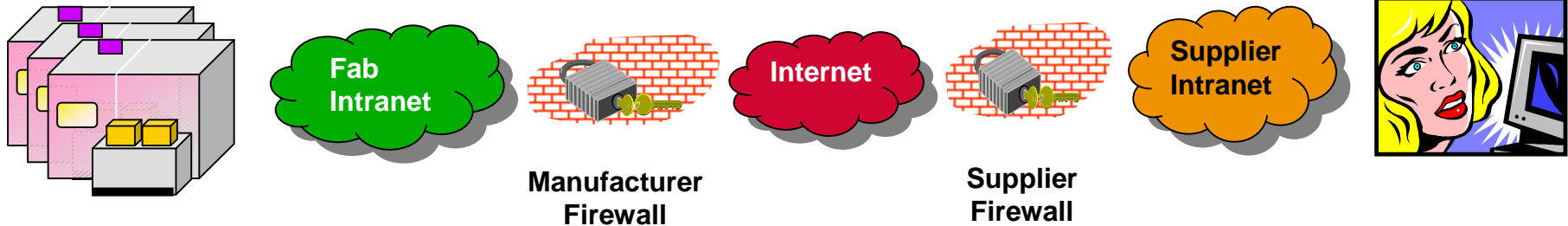
- Single point of access, authorization
- Multiple data formats
- Heterogeneous h/w & s/w
- Transferred files placed in a single location specifically for uploads
- Ability to restrict privilege by company, geography, site, etc.

Protocol Recommendation

- New to this iteration

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Use Case – Collaborate



Pre-conditions:

- User is authenticated
- Max session count not exceeded

Post-conditions:

- Real time n-way collaboration session established

Essential Criteria

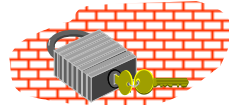
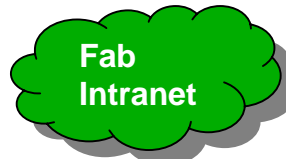
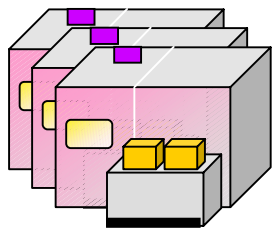
- Shared file viewing
- Encrypt-able
- Participants able to selectively share information
- Multiple simultaneous participants
- Support for meeting host role

Protocol Recommendation

- T.120 over TCP

Capability Taxonomy	
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Use Cases – Conduct a Remote Tool Session



Manufacturer Firewall



Supplier Firewall



Pre-conditions:

- Authenticated, authorized
- Equipment in non-production state

Post-conditions:

- User able to view equipment config/state
- User able to change equipment config/state

Essential Criteria

- Fab can authorize/deny any operations
- Fab can abort session at any time
- Single sign-on for like tools
- Proxy-friendly

Protocol Recommendation

- SSL on TCP

Capability Taxonomy

Level 0: Connection

Basic remote connectivity with connection management.

Level 1: Collection and Control

Remote Performance Monitoring and Remote Operation

Level 2: Analysis

Automated Data Reporting and Analysis

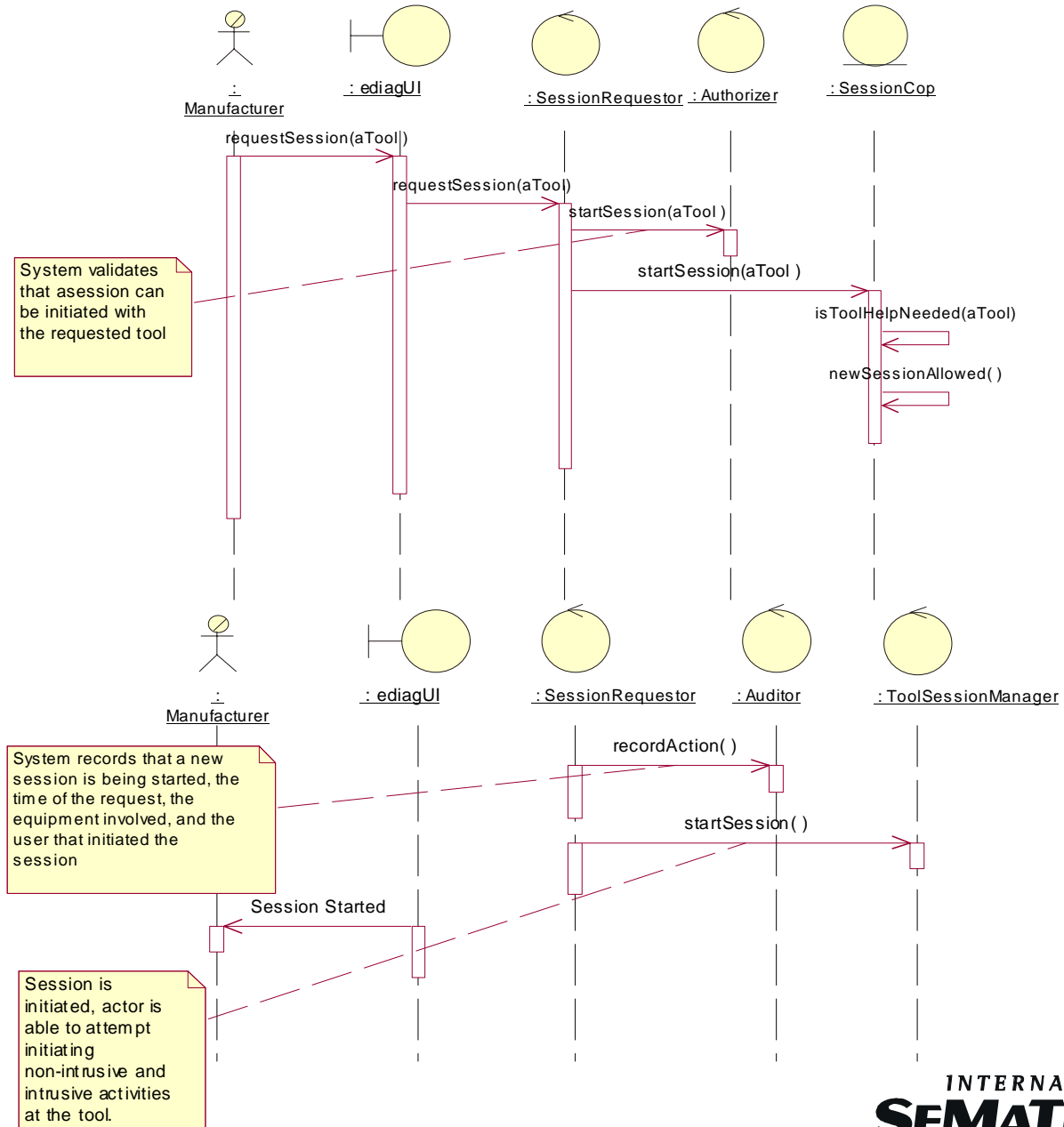
Level 3: Prediction

Predictive Maintenance, Self Diagnosis, and Automated Notification

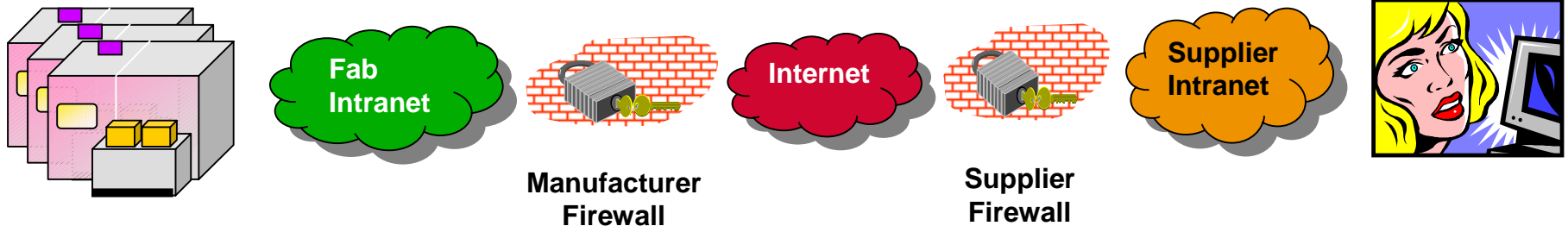
Level 4: Correlation

Cross-tool correlation

Conduct a Remote Tool Session



Use Case – Enable Data Collection



Pre-conditions:

- **Authenticated, authorized**

Post-conditions:

- **Equipment data is published for off-tool storage**

Essential Criteria

- **Multi-platform**
- **Guaranteed Delivery**
- **Encrypt-able**
- **High Performance**

Protocol Recommendation

- **Evaluate XML on HTTP**
- **CORBA Middleware**

Capability Taxonomy

Level 0: **Connection**
Basic remote connectivity with connection management.

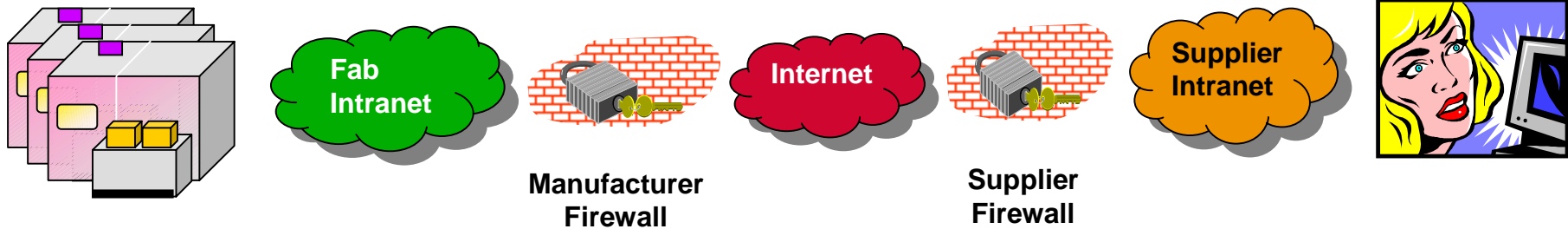
Level 1: **Collection and Control**
Remote Performance Monitoring and Remote Operation

Level 2: **Analysis**
Automated Data Reporting and Analysis

Level 3: **Prediction**
Predictive Maintenance, Self Diagnosis, and Automated Notification

Level 4: **Correlation**
Cross-tool correlation

Use Case – Monitor Equipment Operation



Pre-conditions: • Data collection is enabled

Post-conditions: • Supplier able to view equipment data in near-real time

Essential Criteria

- Multi-platform
- Encrypt-able
- Graphics-capable
- Firewall-friendly

Protocol Recommendation

- HTTP on SSL (browser front end)

Capability Taxonomy

Level 0: Connection

Basic remote connectivity with connection management.

Level 1: Collection and Control

Remote Performance Monitoring and Remote Operation

Level 2: Analysis

Automated Data Reporting and Analysis

Level 3: Prediction

Predictive Maintenance, Self Diagnosis, and Automated Notification

Level 4: Correlation

Cross-tool correlation

Emerging Topics

- **Newly identified capability**
 - Access to supplier infrastructure from within factories (e.g., on-site field service engineer access)
 - Addition to capability model
- **Capability level 0**
 - Mobile access: explicit goal for e-Diagnostics?
- **Capability level 1 – Remote Tool Sessions**
 - For executing diagnostics applications on the tool, a remote console access model is less securable and auditable than an explicit diagnostic management application could be. Will need to structure requirements to accommodate.

Diagnostic Data Acquisition Task Force

Charter:

- Provide a data acquisition interface to semiconductor equipment for supporting the diagnosis of equipment health issues.

Scope:

- First step is to evaluate and select an approach:
 - 1. Extend E53 (and possibly E39) in support of the following:**
 - **Mandatory multi-user support**
 - **Real-time data collection (on source changed)**
 - **Improved type metadata**
 - **Improved configuration discovery**
 - **Explicit bandwidth management and control**
 - **Support for access control**
 - 2. Adopt the OPC and/or DAIS data acquisition standards**
 - 3. Create additional standard to supplement E53**

Diagnostic Data Acquisition TF

- **Scope (cont.):**

- Scope includes protocols and data format for equipment health
- Once an approach is chosen, define the ballot development timeline
- Goal is to utilize industry-standard software technologies
- Expect to start via teleconferences between April and July 2001. First F2F meeting at SEMICON West 2001 (Mon 7/16 9a-12n).

- **Approach**

- Document analysis, pros/cons
- Describe information model with use cases and UML
- Incorporate necessary information into SEMI ballot format

Summary

- **Active participation from IC Makers, suppliers, and 3rd party vendors**
- **Completing 2nd iteration on system definition for capability Level 0 (+ Remote Tool Sessions)**
 - First iteration identified & detailed some use cases, recommended communication protocols
 - Completed analysis on about 70% of identified use cases
 - Complete the remaining level 0 use cases
- **Diagnostic Data Acquisition Task Force**
 - Phase 1 - Evaluate and Select Approach
 - Phase 2 - Execute