Managing Standards Compliance

Wolfgang Emmerich, Anthony Finkelstein, Carlo Montangero, Stefano Antonelli, Steve Armitage and Richard Stevens

Dept. of Computer Science
University College
Gower Street, London WC1E 6BT, UK
http://www.cs.ucl.ac.uk/staff/W.Emmerich

Overview

What are Standards?

"Standards are documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics, to ensure that materials, products, processes and services are fit for their purpose." [ISO 1997]

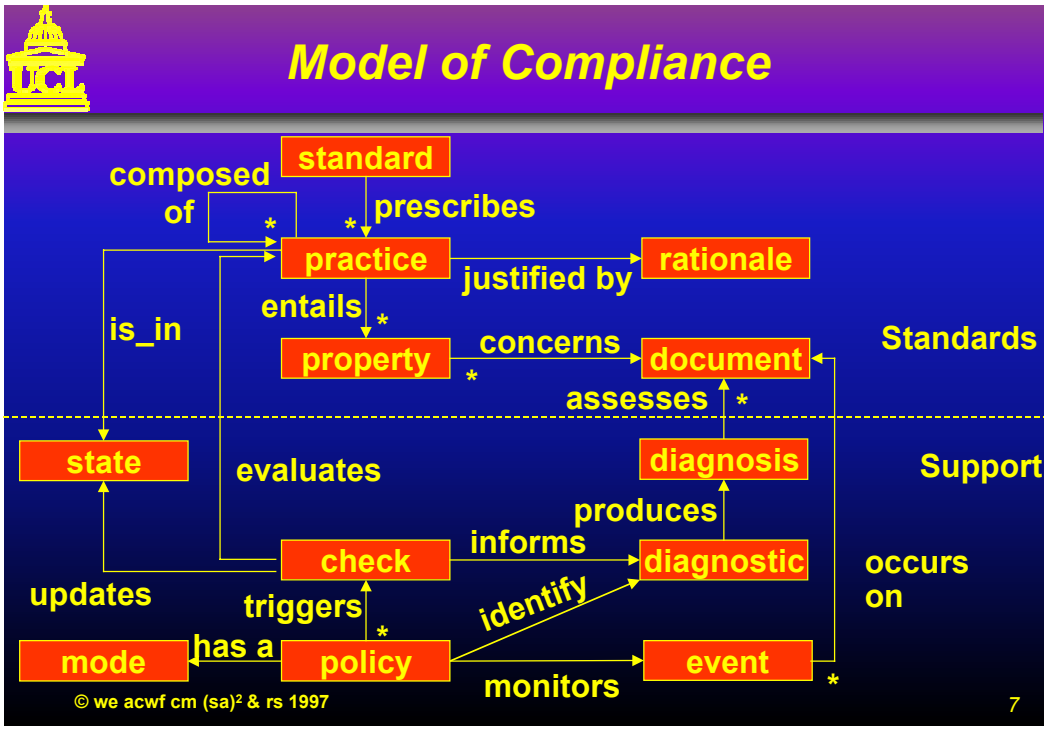
Software Engineering Standards

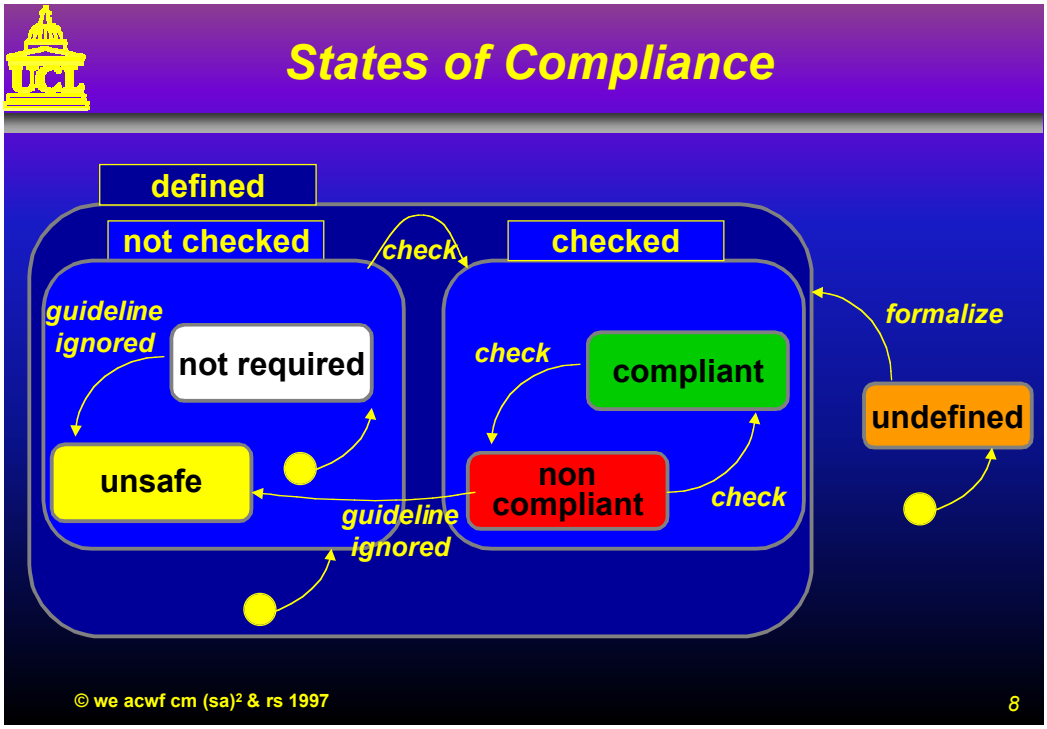
- **Software & System Engineering Standards**
  - PSS-05 (ESA)
  - ISO-12207
  - DoD Mil-Std 2915
  - IEEE 1074-1995
- **Software Process Improvement Standards**
  - CMM
  - ISO-15504 (SPICE)
  - BOOTSTRAP
  - Quality Improvement Paradigm

Compliance

- *Compliance is the extent to which software developers have acted in accordance with practices set down in the standard*
- *Consistency between actual development process and normative models embedded in standards.*

Overview


Model of Compliance
standard
composed of
prescribes
practice
rationale
justified by
entails
is_in
property
concerns
document
Standards
assesses
state
evaluates
diagnosis
Support
produces
informs
check
diagnostic
occurs on
updates
triggers
identify
has a
mode
policy
event
monitors
© we acwf cm (sa)² & rs 1997
7


States of Compliance
defined
not checked
check
checked
guideline ignored
not required
check
compliant
formalize
undefined
unsafe
non compliant
check
guideline ignored
© we acwf cm (sa)² & rs 1997
8

Sample Practices (PSS-05)

UR04: For incremental delivery each user requirement shall include a measure of priority so that the developer can decide the production schedule.

UR10: An output of the User Requirements phase shall be the User Requirements Document.

Policy Modes

- Error: Prevent the developer from completing the action that would result in non-compliance
- Warning: Indicate to the developer that the result of the action is non-compliance
- Guideline: Suggest to the developer that compliance to a practice should be checked

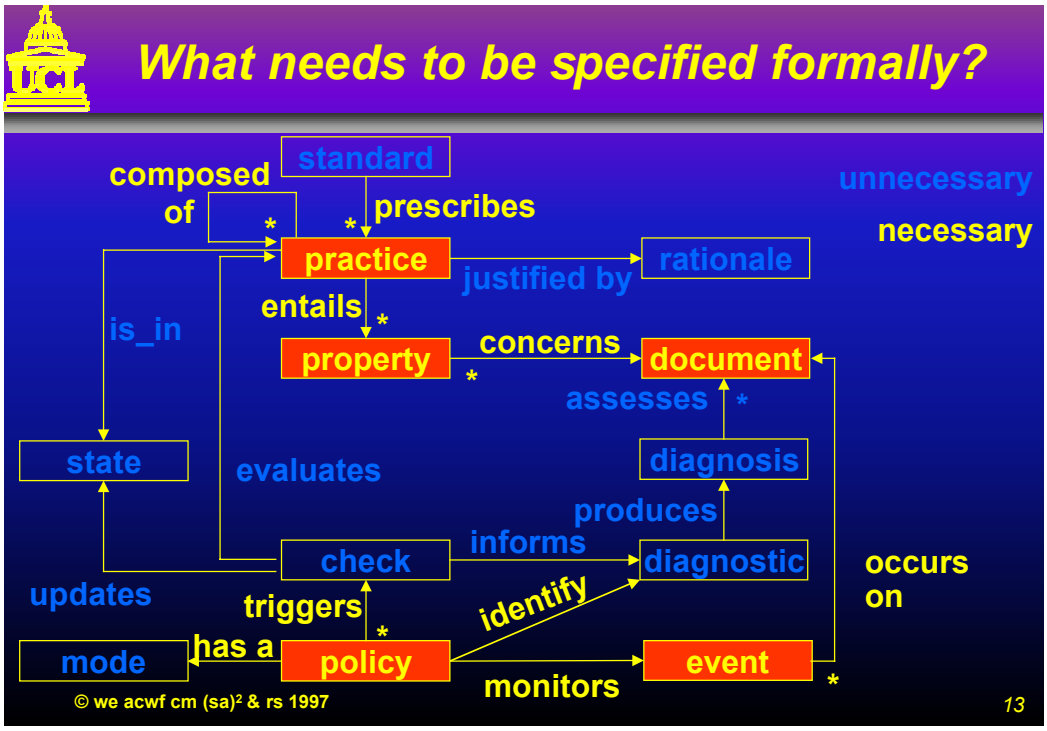
Diagnostics

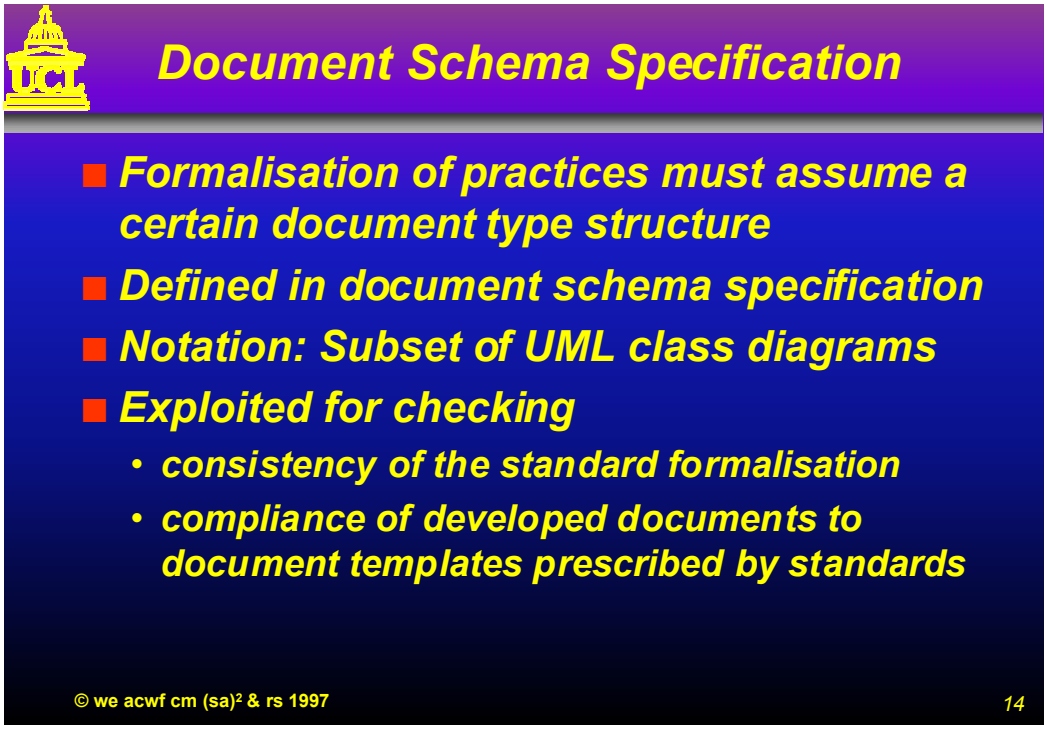
Statistics: Indicate percentage of non-compliant document components.

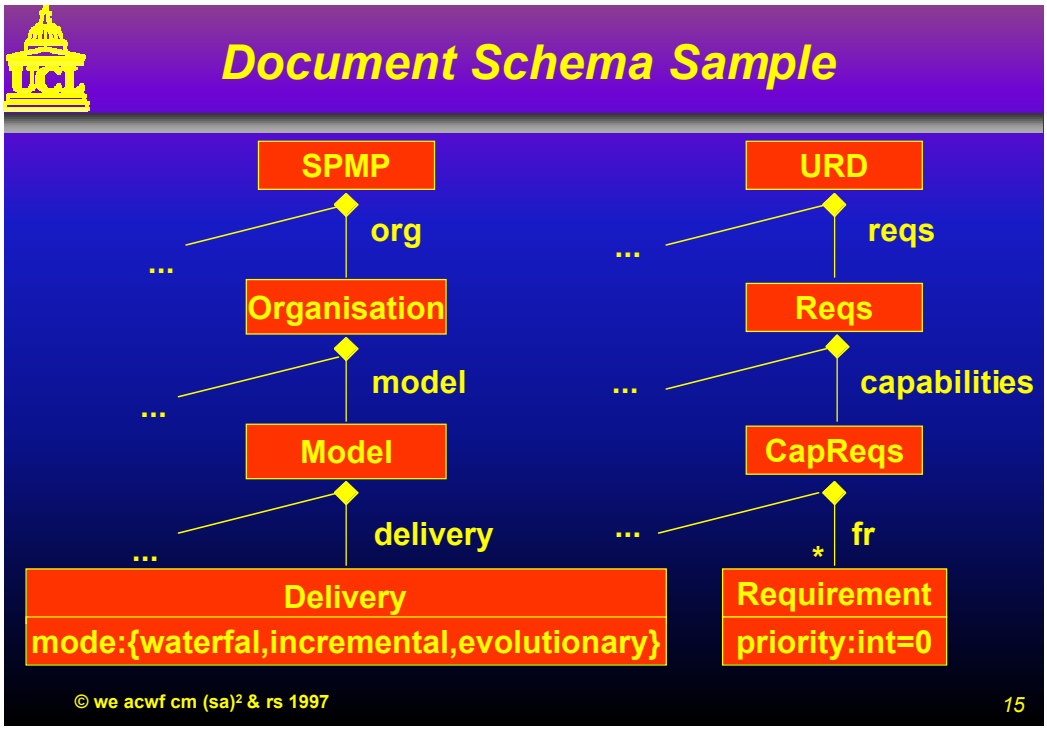
List: Indicate the non-compliant document components.

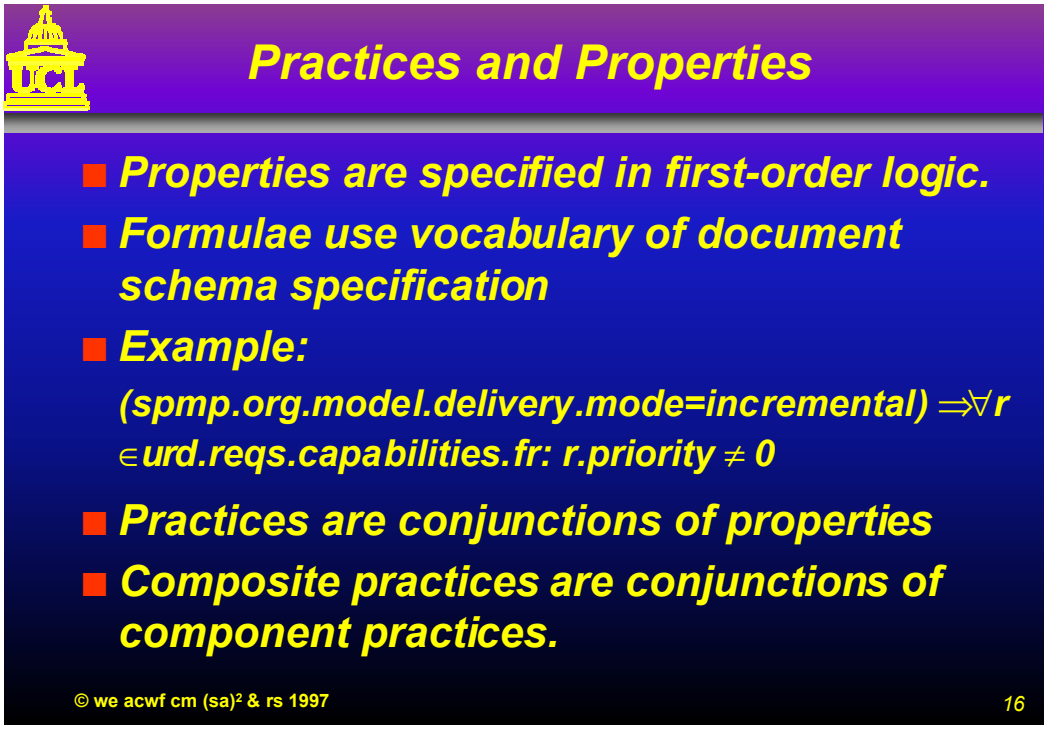
Traversal: Generate an iteration of all non-compliant document components.

Overview


What needs to be specified formally?
standard
composed of
prescribes
unnecessary
necessary
practice
rationale
justified by
entails
is_in
property
concerns
document
assesses
state
evaluates
diagnosis
produces
informs
check
diagnostic
occurs on
updates
triggers
identify
has a
mode
policy
event
monitors
© we acwf cm (sa)² & rs 1997
13


Document Schema Specification
Formalisation of practices must assume a certain document type structure
Defined in document schema specification
Notation: Subset of UML class diagrams
Exploited for checking
consistency of the standard formalisation
compliance of developed documents to document templates prescribed by standards
© we acwf cm (sa)² & rs 1997
14


Document Schema Sample
SPMP
org
...
Organisation
model
...
Model
delivery
...
Delivery
mode:{waterfal,incremental,evolutionary}
URD
reqs
...
Reqs
capabilities
...
CapReqs
fr
...
*
Requirement
priority:int=0
© we acwf cm (sa)² & rs 1997
15


Practices and Properties
Properties are specified in first-order logic.
Formulae use vocabulary of document schema specification
Example:
(spmp.org.model.delivery.mode=incremental) ⇒∀r ∈urd.reqs.capabilities.fr: r.priority ≠ 0
Practices are conjunctions of properties
Composite practices are conjunctions of component practices.
© we acwf cm (sa)² & rs 1997
16

Event Specification

- **Atomic Events:**
  - Update
  - Close
  - Open
  - Baseline
- **Logical Event Composition:**
  - Open(doc) OR Update(att)
- **Temporal Event Composition (as in FLEA):**
  - Open(doc) THEN Update(att)
  - Update(att) IN-TIME(5h) Baseline(doc)
  - Open(doc) TOO-LATE(5h) Close(doc)

Policy Specification

- **Policies are tuples P=(E,P,M,D) where**
  - E is an event specification
  - P is a practice
  - M is a policy mode
  - D is a diagnostic function
- **Example:**

Update(spmp.org.model.delivery.mode), UR04 ,WARNING, STAT

Overview

1 What is Standard Compliance?

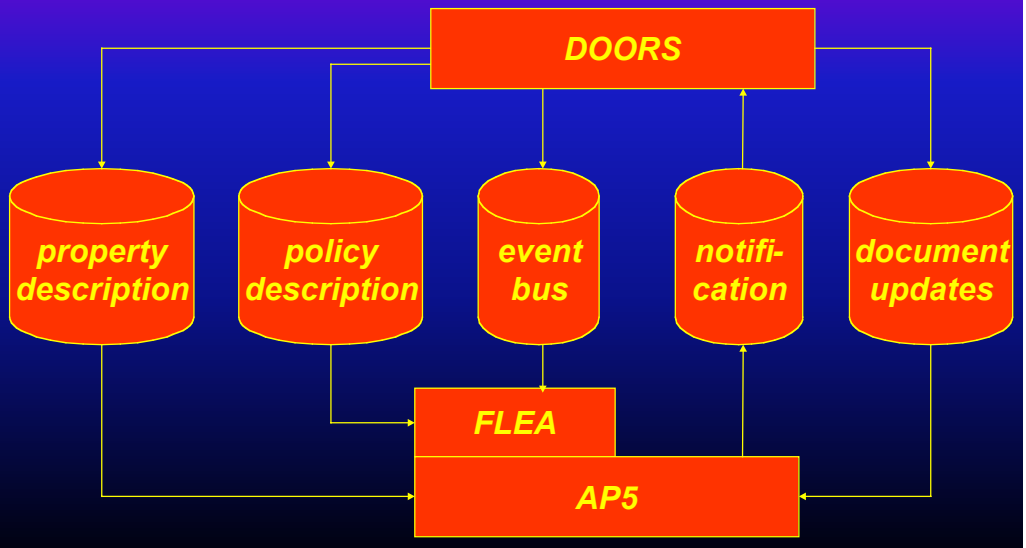
2 A Model of Standard Compliance

3 Formalising System Engineering Standards

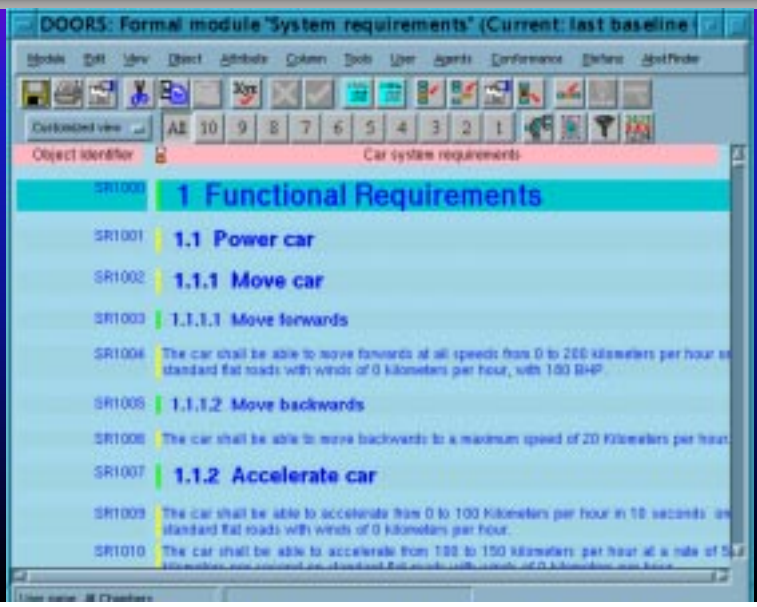
4 Tool Support

5 Related and Further Work

Prototype Architecture

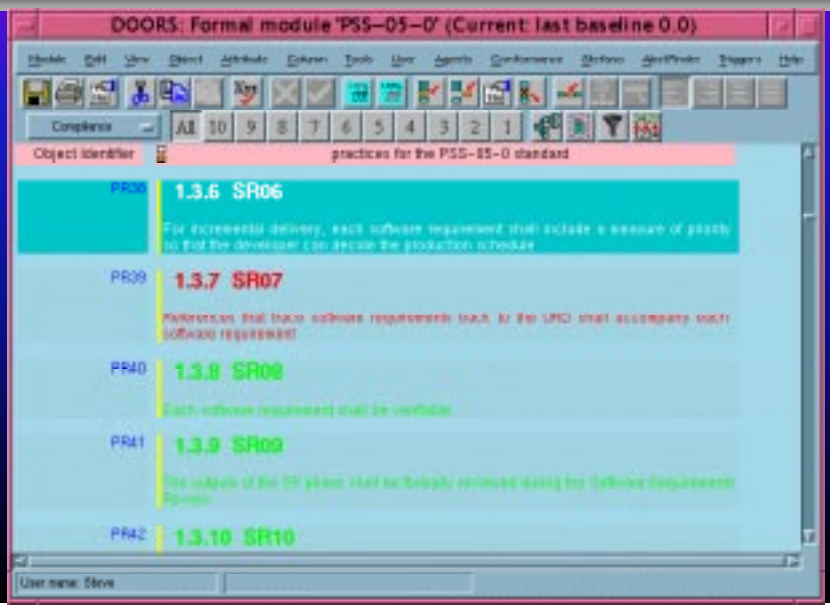


Document Management



21

Compliance Management



compliant

not required

unsafe

undefined

non compliant

22

Compliance Overview

Overview

1 What is Standard Compliance?

2 A Model of Standard Compliance

3 Formalising System Engineering Standards

4 Tool Support

5 Related and Further Work

Related Work

- Software Process Technology
  - Merlin
  - Marvel, Oz, OzWeb, ...
  - SPADE
  - ...
- SPI Standards (SPICE, BOOTSTRAP, CMM)
- SENTINEL (Cugola et. al 96)
- Event Data Analysis (Cook and Wolf 97)
- Yeast (Barghouti and Krishnamurthy 95)

Further Work

- Provide efficient implementation by replacing FLEA and AP5
- Evaluate approach in industrial setting (at GTE)
- Provide feedback to standards committees