What is a Standard?

- Guideline documentation that reflects agreements on products, practices, or operations by nationally or internationally recognized industrial, professional, trade associations or governmental bodies,
- or is accepted de facto by industry or society.

Source: F. Coallier, An Introduction to International IT Standardization, 2002
Types of Standards

**Organization Standards**
- Such as internal company standards

**Market Standards (De Facto)**
- Such as Microsoft Windows

**Professional Standards**
- Developed by Professional organizations (e.g. IEEE)

**Industry Standards**
- Developed by industrial Consortia (e.g. OMG)

**National Standards**
- Developed by national standards organization (e.g. CSA)

**International Standards**
- Developed by formal international standard organization (e.g. ITU, ISO, IEC, …)

Added Value of International Standards

In addition to the Brand:
- They represent an international *consensus* attained through a very rigorous and uniform process
- They represent sets of conventions and/or technical requirements or practices that are *relatively stable*
- The development process makes it relatively difficult and costly for special interests to take over a given standardization project, especially if the topic is controversial.
- They are beneficial to users, companies, and tool vendors
Requirements Engineering and Standards

**Focus mainly on templates and processes!**
- IEEE 830-1998: Software Requirements Specifications
- ISO/IEC 12207: IT - Software Life Cycle Processes
- ESA PSS-05-02, 03: Guide to the User (resp. Software) Requirements Definition Phase

**Languages and notations**
- OMG: Unified Modeling Language 1.5
- ITU-T: MSC, SDL
- ISO/IEC: LOTOS, Estelle

**But are these really for RE ???**

---

URN Standardization Effort at ITU-T

- Question 18 of Study Group 17 is the **User Requirements Notation** (URN)
- Z.15x family of standards
- URN Focus Group
  - Progress on URN between SG17 meetings
  - [http://www.UseCaseMaps.org/urn/](http://www.UseCaseMaps.org/urn/)
URN – Main objectives

- Focus on early stages of development with goals and scenarios
- From user requirements to system functional and non-functional requirements
- No messages, components, or component states required
- Reusability
  - of argumentations (goal patterns and analysis)
  - of scenarios (patterns and architectural alternatives)
- Early performance analysis
- Traceability and transformations to other languages
  - Particularly MSC, SDL, TTCN, and UML

Proposal for URN

Combined use of two complementary notations:

- **Goal-oriented Requirement Language** (GRL)
  - for goals and non-functional requirements
  - [http://www.cs.toronto.edu/km/GRL/](http://www.cs.toronto.edu/km/GRL/)

- **Use Case Maps** (UCM)
  - for functional requirements
URN Family of Standards

Z.150 URN
- Recommendation Z.150, User Requirements Notation (URN) – Language Requirements and Framework.
- Approved in February 2003.

Z.151 GRL
Z.152 UCM
Z.153 Methodological Approach
Z.159 UML 2.0 profile for URN

To be available by March 2004...

GRL in a Nutshell

Goal-oriented Requirement Language
- graphical notation
- connects requirements to business objectives
- allows reasoning about (non-functional) requirements

GRL models the “why” aspect
- objectives, alternatives, as well as decision rationale
- no operational details

Supports goal analysis and evaluations
Basic GRL Notation

Advanced GRL notation (for your information only)

- GRL graphs can be allocated to actors.
- Dependencies can be defined between actors, together with intermediate resources.
Evaluations with GRL

- Evaluations of GRL graphs show the impact of qualitative decisions on high level softgoals
- Propagation is usually bottom-up
- Fuzzy evaluation of satisfaction level
- Takes into consideration the contributors:
  - Contributions and correlations (help, hurt, …)
  - Degrees of satisfaction (satisfied, denied, …)
  - Composition operators (AND, OR)
- One could use numerical values and functions instead of qualitative (fuzzy) values
UCMs in a Nutshell

Use Case Maps
- graphical scenario notation
- causal relationships between responsibilities
- scenario elements may (optionally) be allocated to components

UCMs model the “what” aspects
- functional requirements as scenarios
- integration and reusability of scenarios
- guidance for architecture and detailed behaviour

Performance analysis, conflict detection
From UCM Requirements to More Detailed Design Models

Requires:
- Path Data Model (global Booleans variables)
- Scenario Definitions
- Path Traversal Mechanism
- Mapping Rules (MSC, UML, TTCN, LQN, LOTOS...)
GRL - UCM Relationship

Goal-based approach
• Focuses on answering “why” questions

Scenario-based approach
• Focuses on answering “what” questions

Goals are operationalized into tasks and tasks are elaborated in (mapped to) UCM scenarios
• Focuses on answering “how” questions

GRL goals can guide the selection of a particular architecture for the UCM scenarios

Tool Support: UCMNav 2.1 (free, + source)
Conclusions

**URN**
- Allows engineers to specify or discover requirements for a proposed system or an evolving system, and review such requirements for correctness and completeness.
- Is usable in industry and in standardization bodies
- Combines goals and scenarios
- Helps bridging the gap between informal and formal concepts, and between requirements models and design models
- Big benefits for little modelling investment, even when used informally

**GRL**
- For incomplete, tentative, (non-functional) requirements
- Capture goals, objectives, alternatives and rationales

**UCM**
- For operational and functional requirements
- Enables analysis and transformations
- Architectural alternatives and dynamic systems
Ongoing Work on URN at U. of Ottawa

- URN Meta-model and Semantics
- UCM Scenarios to MSC, UML, TTCN
- URN and Requirements Management (DOORS)
- URN for Reverse Engineering
- URN and Requirements-based Design (synthesis of SDL and LOTOS specifications from UCMs)
- URN and Performance Engineering (UCM2LQN)
- UCM for Feature Interaction Detection
- Tool Development
- Case Studies

Related Work on RE Languages/Notations

**ITU-T**
- MSC, SDL, eODL, UML profiles

**OMG**
- UML 2.0

**ISO/IEC JTC1 SC7**
- High-Level Petri Nets
- UML 1.4.1
- UML profile for EDOC, UML for ODP viewpoints

**FIPA**
- Tropos and UML for multi-agent systems
Two events...

**URN Focus Group Meeting**
Tomorrow morning, 9:00-12:00
McMaster U., ITB 225

**7th Feature Interaction Workshop**
Ottawa, June 10-13, 2003

http://www.site.uottawa.ca/fiw03/