



Non-functional User Interface Requirements notation.  
(NfRn) for modeling the global execution context of tasks

### Authors

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### *Presentation Plan*

- Rationale and context of the work
- Method base line
  - Objective
  - Instruments used
  - Process for using the instruments
  - Outcomes
- Tool description using a case study
  - Ongoing R&D project eKONES



### *Objective & research question*

- Scenario-based representation for expressing / specifying requirements for adaptable & adaptive interactive behaviors
- Rationale
  - Model-based tools & NfRs
    - they cannot model underlying goal requiring adaptable and adaptive behavior
    - They have to shift from task-level to goal-oriented and activity modeling and linking with recent advances in goal-oriented RE and requirements-driven system development
  - Visual languages (such as UML) & NfRs
    - They offer no obvious mechanism to allow designers to model explicitly NfRs during analysis and design.
    - on-going effort addressing partially the issue e.g. UML class diagrams as seen by Cysneiros



### *Objective & research question*

- Relevant methods
  - Scenario networks
    - Scenario Requirements Analysis Method (SCRAM) by Sutcliffe et al.
    - Scenario construction process by Leite et al.
    - CREWS-SAVRE tool by Maiden et al.
    - Scenario Evolution tool (SET) by Breitman et al.
    - etc.



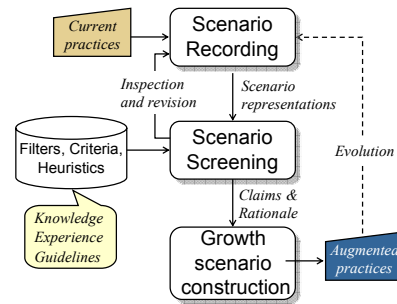
## Proposed approach

- Evolutionary scenario management
  - Reference scenarios as explicit (accountable) resources
    - Computer-mediated representation
  - Scenario critiquing to identify design breakdowns
    - Using heuristics
    - Using non-functional requirements
    - Using (user-, task-, context-) specific filters
  - Scenario augmentation
    - Scenario relationships
    - Growth scenarios
  - Global execution context graph (GECg)
    - Integration of reference and growth scenarios into a single representation



## Process for using the instruments

- Three stages for scenario management



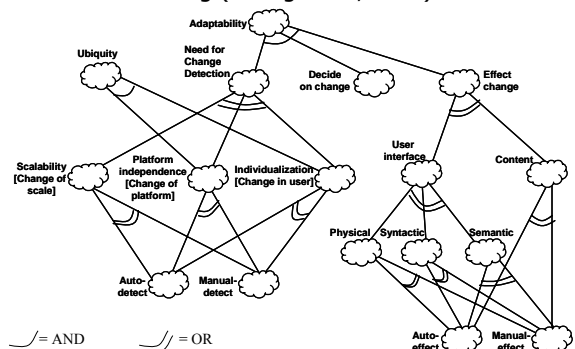
## Scenario recording

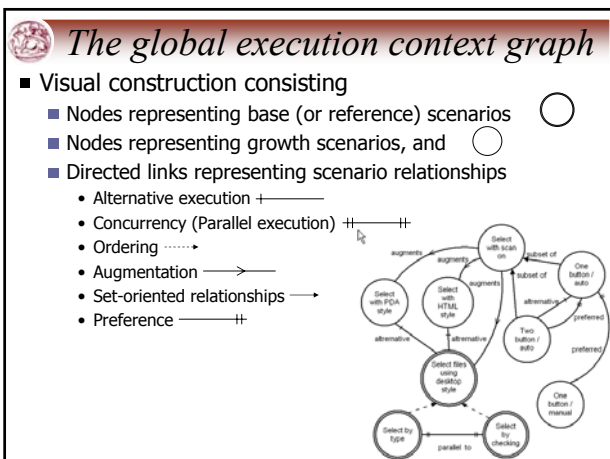
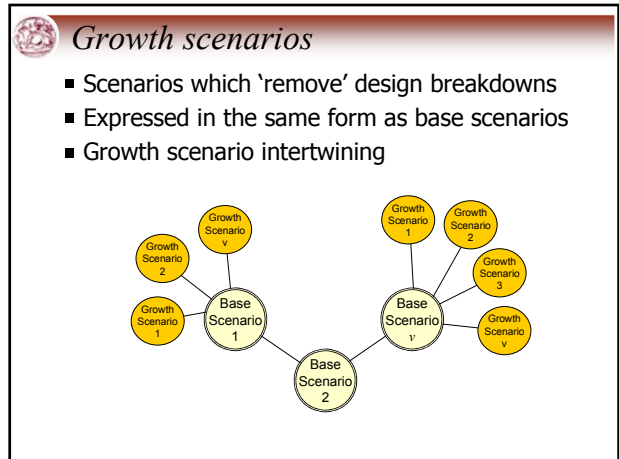
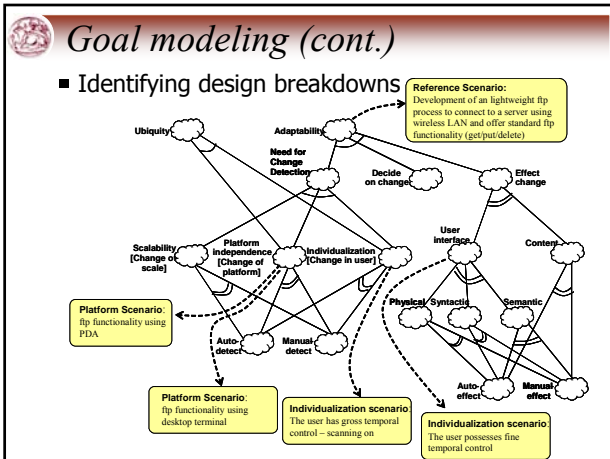
- Techniques for representing scenarios
  - Free narratives
  - Partitioned narratives
  - Task hierarchies
  - Use case diagrams
  - Pseudocode
  - Video
- Why so many alternative forms?
  - Scenarios may change form
    - ... as our understanding is improved
    - ... depending on the use it is put
    - ... as a result of arbitrary factors (designer's choice)
  - Each form offers alternative insight



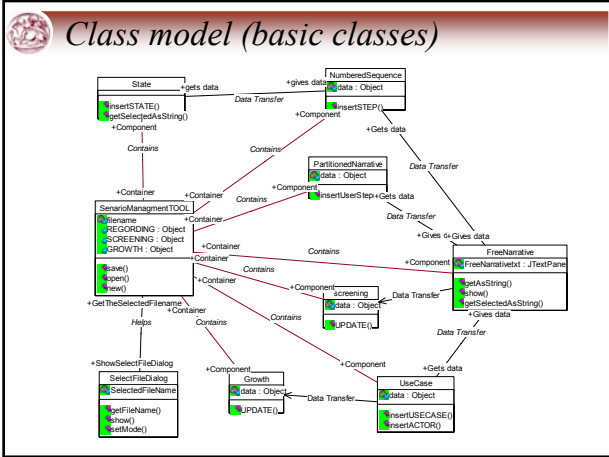
## Scenario filtering

- Goal modeling (Chung et al., 1992)

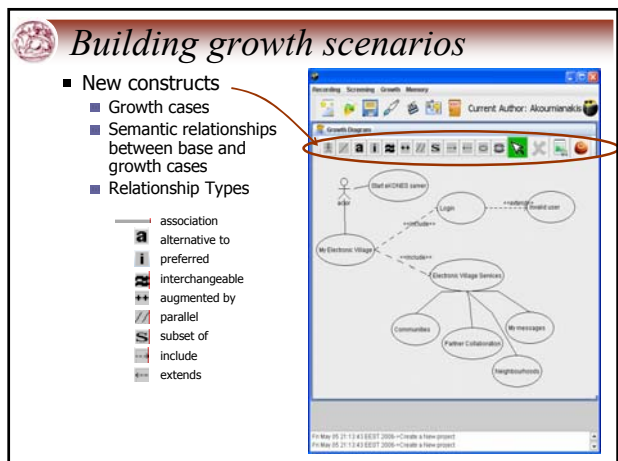
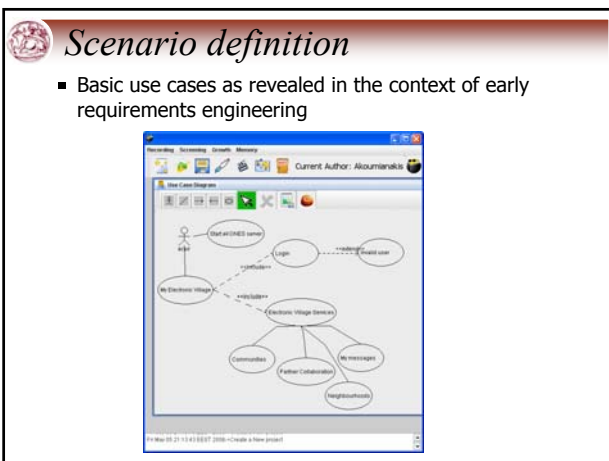




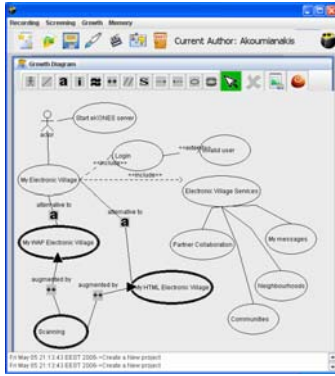
- ### Tool requirements
- Provide support for the basic steps of the method
    - Recording scenarios in alternative forms suitable for the scenario's fidelity level
    - Smooth transformation across scenario forms as understanding improves
    - Support base and growth scenario management
    - Incremental construction of the global execution context graph
    - Capturing scenario rationale
  - Link tool with existing research prototypes in model-based user interface development
    - Tereza (Mori G., Paterno F., Santoro C., 2004, Design and Development of Multidevice User Interfaces through Multiple Logical Descriptions, IEEE Trans. Soft. Eng., 30 (8), 1-14)



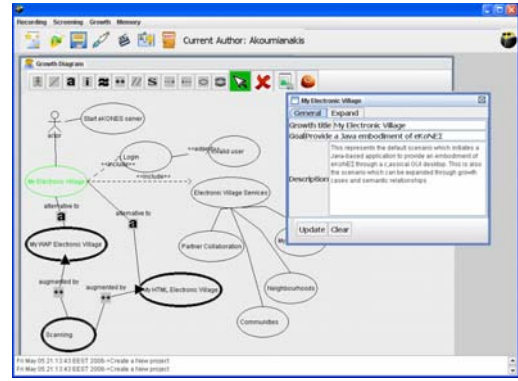
- ### eKoNEΣ project Example
- eKoNEΣ is an R&D project which started in 2006
  - Objective: to establish a local electronic village on tourism in the region of Crete.
  - Currently in its initiation phase where concepts are being formed and articulated through scenarios and user-involved prototyping.
  - A variety of scenarios are being considered ranging from:
    - static scenarios such as the visual depiction of the electronic village at a point in time to
    - dynamic scenarios emphasizing behavioral patterns of participants leading to activity aggregation / desegregation, etc.



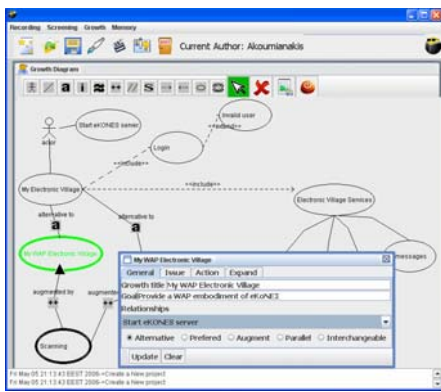
## The GEC of eKoNES



## Use case exploration



## Growth case exploration (Cont.)



## eKoNES Project Interface



### Output – XML issue database

```

<?xml version="1.0" encoding="UTF-8"?>
<Project-Diagram author="Akoumianakis">
<actor>
<UseCase name="Start eKoNES server">
<UseCase>
<UseCase name="My Electronic Village">
<goal>Provide a Java embodiment of eKoNES</goal>
<description>This represents the default scenario...</description>
<issue id="1">
<relationship type="include">
<UseCase name="Login">
<issue id="1">
<relationship type="extend">
<UseCase name="Invalid user">
<goal>test</goal>
</UseCase>
</relationship>
</issue>
</UseCase>
</relationship>
</issue>
<issue id="2">
<relationship type="include">
<UseCase name="Electronic Village Services">
<issue id="1">
<relationship type="Association">
<UseCase name="Partner Collaboration">
<goal>test</goal>
<description>...</description>
</UseCase>
</relationship>
</issue>

```

### Output – XML issue database cont.

```

<issue id="2">
<relationship type="include">
<UseCase name="Electronic Village Services">
<issue id="1">
<relationship type="Association">
<UseCase name="Partner Collaboration">
<goal>test</goal>
<description>...</description>
</UseCase>
</relationship>
</issue>
<issue id="2">
<relationship type="Association">
<UseCase name="Communities">
<goal>test</goal>
</UseCase>
</relationship>
</issue>
<issue id="3">
<relationship type="Association">
<UseCase name="Neighbourhoods">
<goal>test</goal>
<description>...</description>
</UseCase>
</relationship>
</issue>
<issue id="4">
<relationship type="Association">
<UseCase name="My messages">
<goal>test</goal>
<description>...</description>
</UseCase>
</relationship>
</issue>
<issue id="4">
<relationship type="Association">
<UseCase name="My messages">
<goal>test</goal>
<description>...</description>
</UseCase>
</relationship>
</issue>
</UseCase>
</Project-Diagram>

```

### Current focus

- Finalization of the scenario-based representation for the GeC
- Development of tools to map GeC representation to device independent mark-up languages such as UIML

### Summary & contributions

- Synergy between
  - Scenario-based requirements engineering
  - Goal modeling in requirements engineering
  - Non-functional requirements
- Global execution context graph
  - Unified representation of existing & foreseen practices
  - Scenario relationships
- Growth scenarios explicitly linked to base scenarios
  - Managing evolutionary requirements
- Representation of adaptable & adaptive behavior
  - Tracing what is to change, why and how



*Questions!!*

Thank you for your attention!

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