MetaCase

Choosing the Best Level of Abstraction for Your Domain-Specific Language

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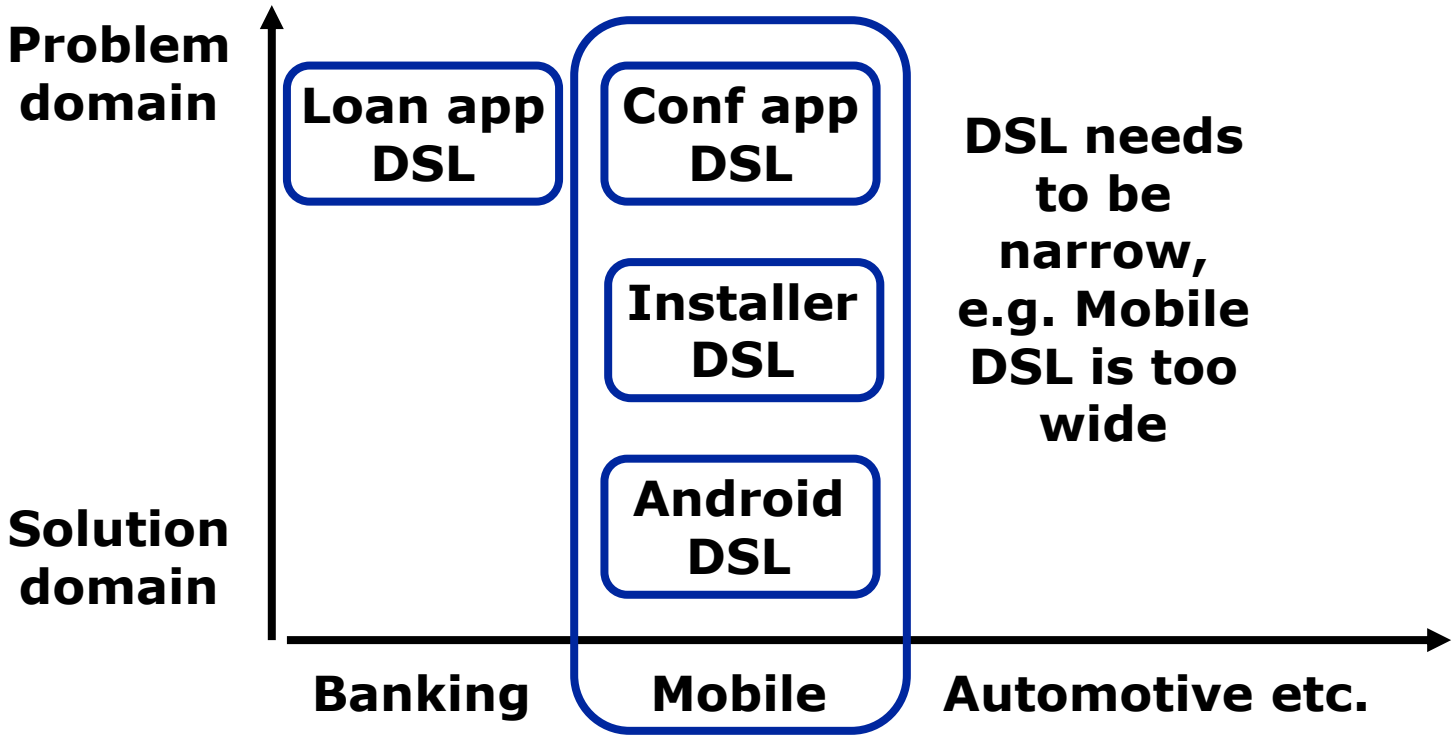
Some (repeated) definitions

- General-Purpose / Domain-Specific
- External / Embedded / Internal Languages
- Problem Domain / Solution Domain
- Graphical / text / matrix / table / maps etc. as concrete syntax
- Static / behavior
- Turing complete / in-complete
- Domain knowledge as first class citizen / naming convention

(Your) area of interest = domain



Where at the main benefits?

- More empirical research is needed, but studies show improvements in:
  - Productivity
  - Quality
  - Process
  - Maintenance tasks
  - Understanding and communication
  - Easier introduction of new developers etc.
- While time-to-market is often the most significant improvement, many industry cases shows 5-10x (**500-1000%**) productivity improvements (see references)

Industry experiences

"The setup effort to create the languages was a couple of weeks and provided more than **ten times faster speed**"

"The quality of the generated code is clearly better, simply because the modeling language **rules out errors**"

"The DSML solution makes development **significantly faster** and easier than the old manual coding practices"

Controlled empirical studies

Panasonic

- Built the same system twice: 425% faster
- Built code generator for a second platform: a fraction of time

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- Lab study: 6 engineers develop typical features: > 750% faster
- Built the same system twice: 900% faster

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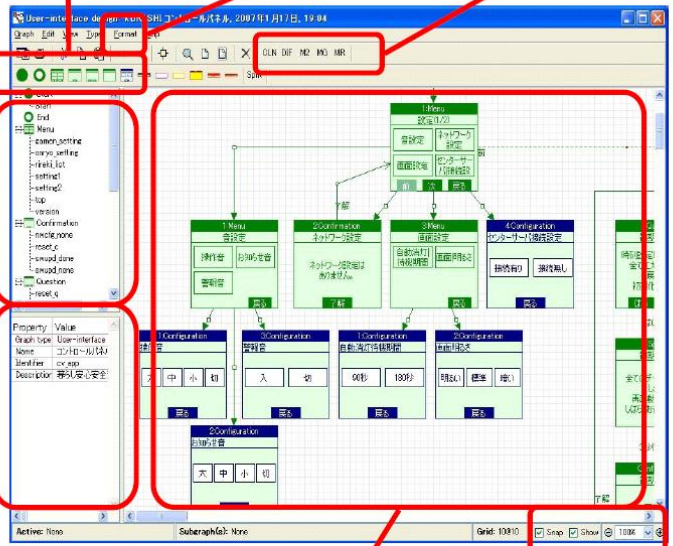
- Built the same production system in parallel
- Built several similar systems: Break Even Point = 3,14

Panasonic

Standard pages and connectors are available through the icon bar

On-site tool configuration facilities

Code generators and Work flow automations

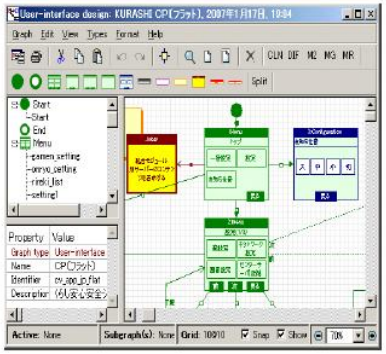


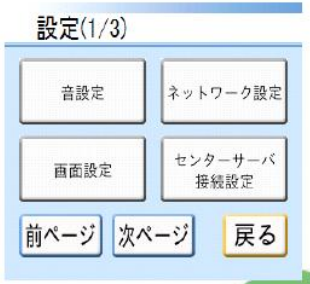
Concepts browser

Detailed view

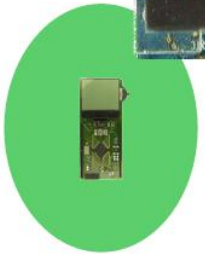
Visual modeling workspace

Zoom and other view modifiers





Embedded controller



Microcontroller

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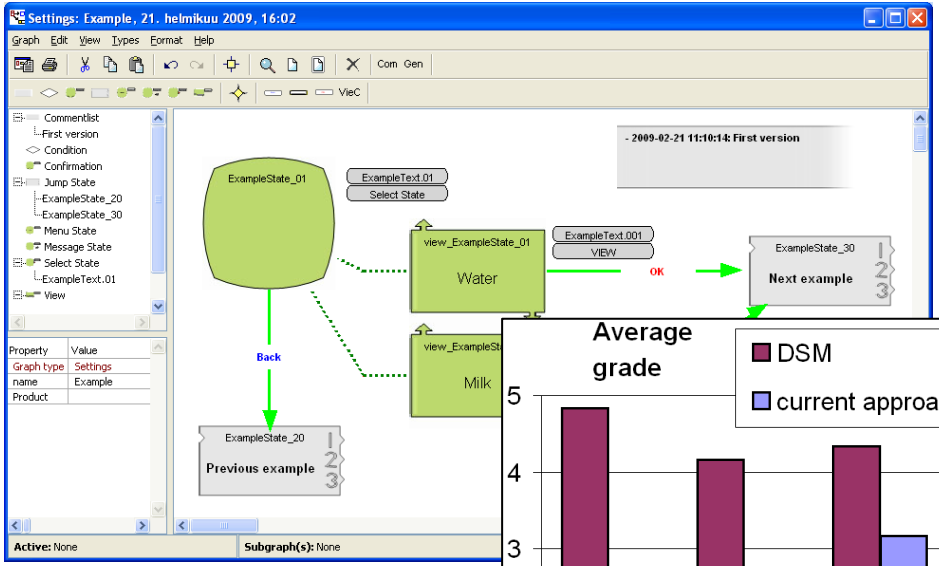

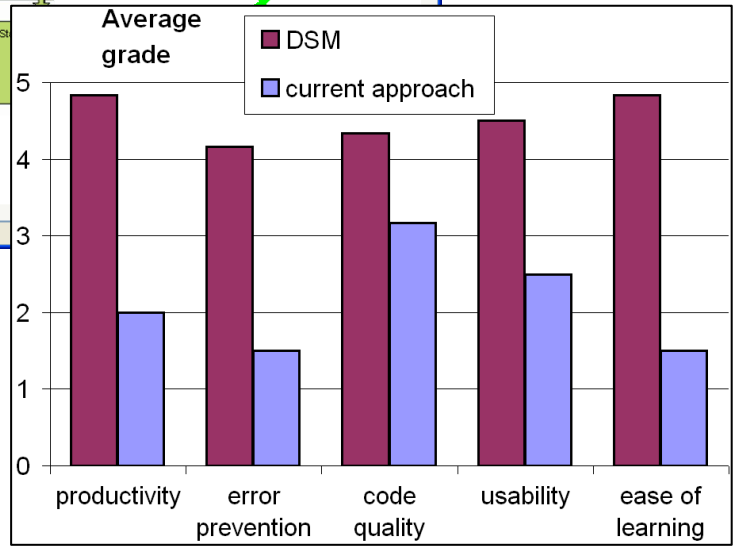

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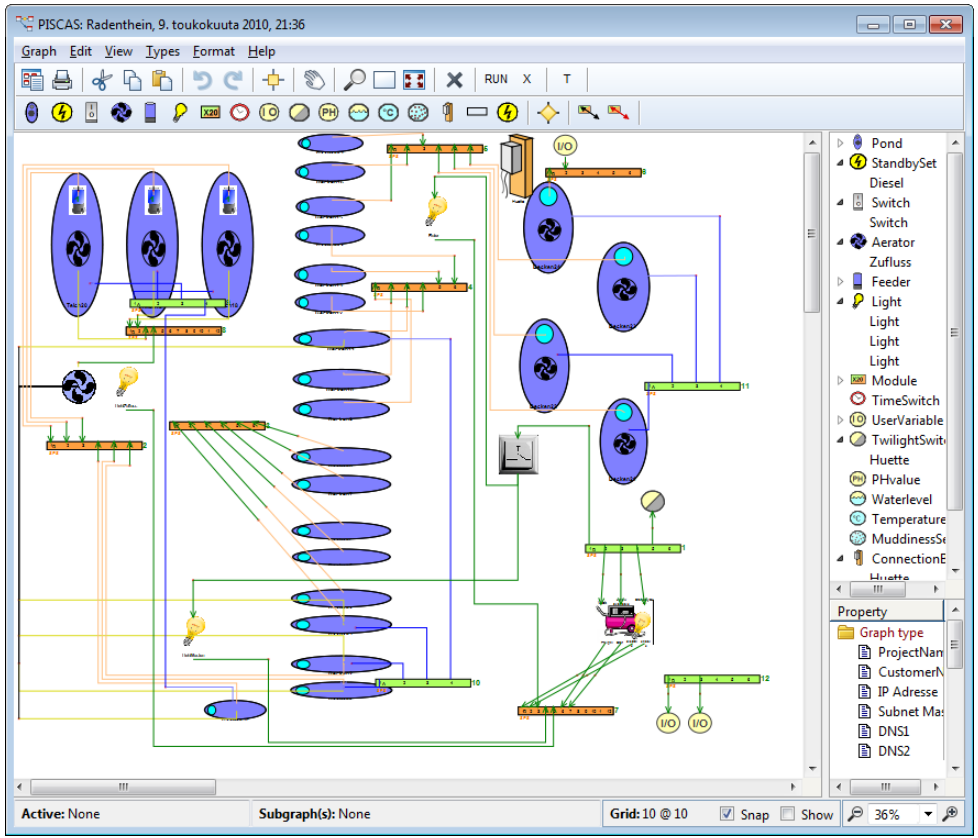
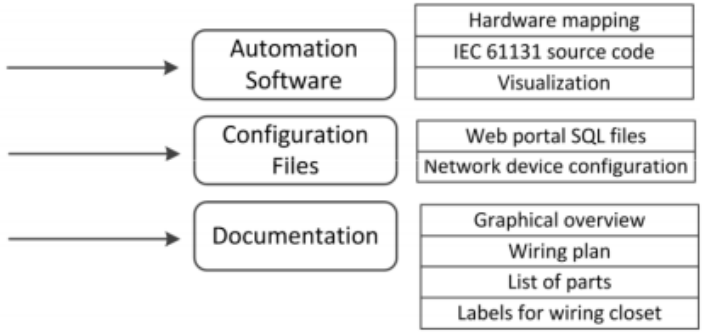
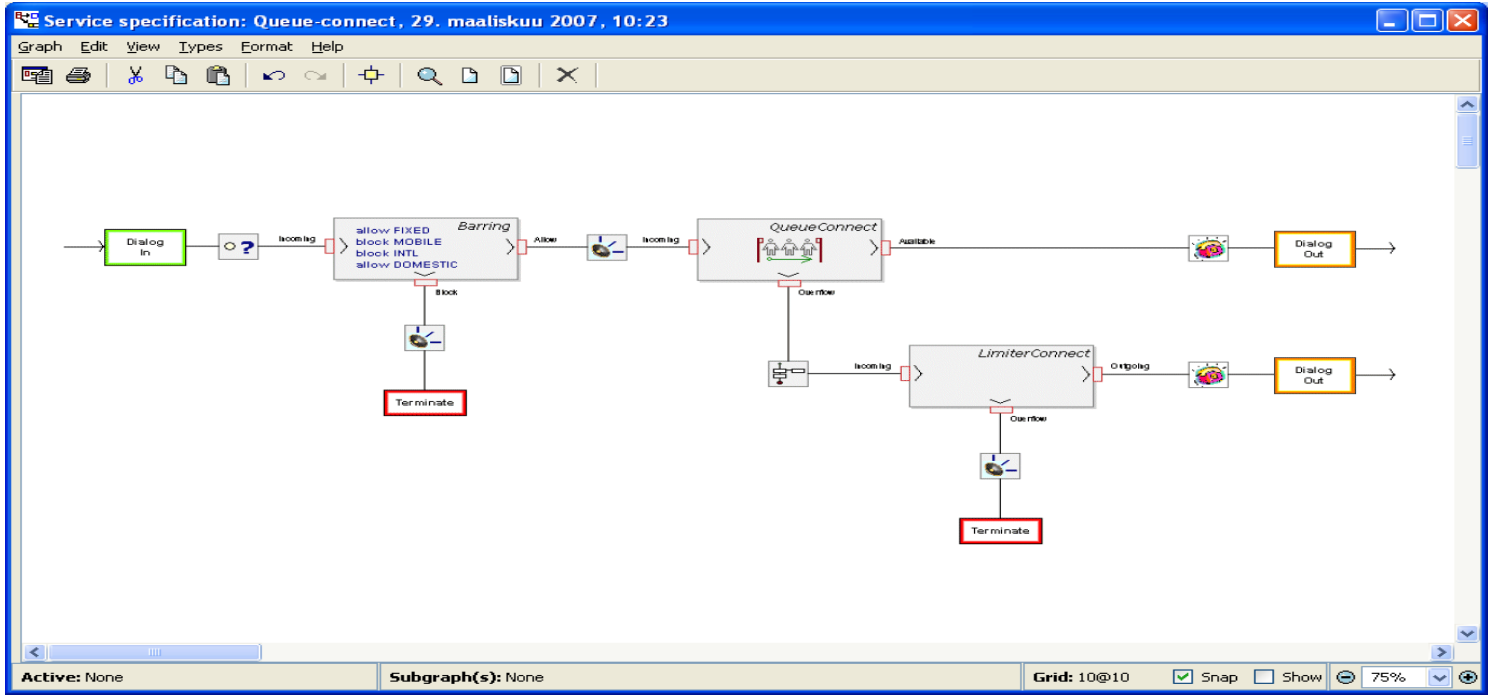
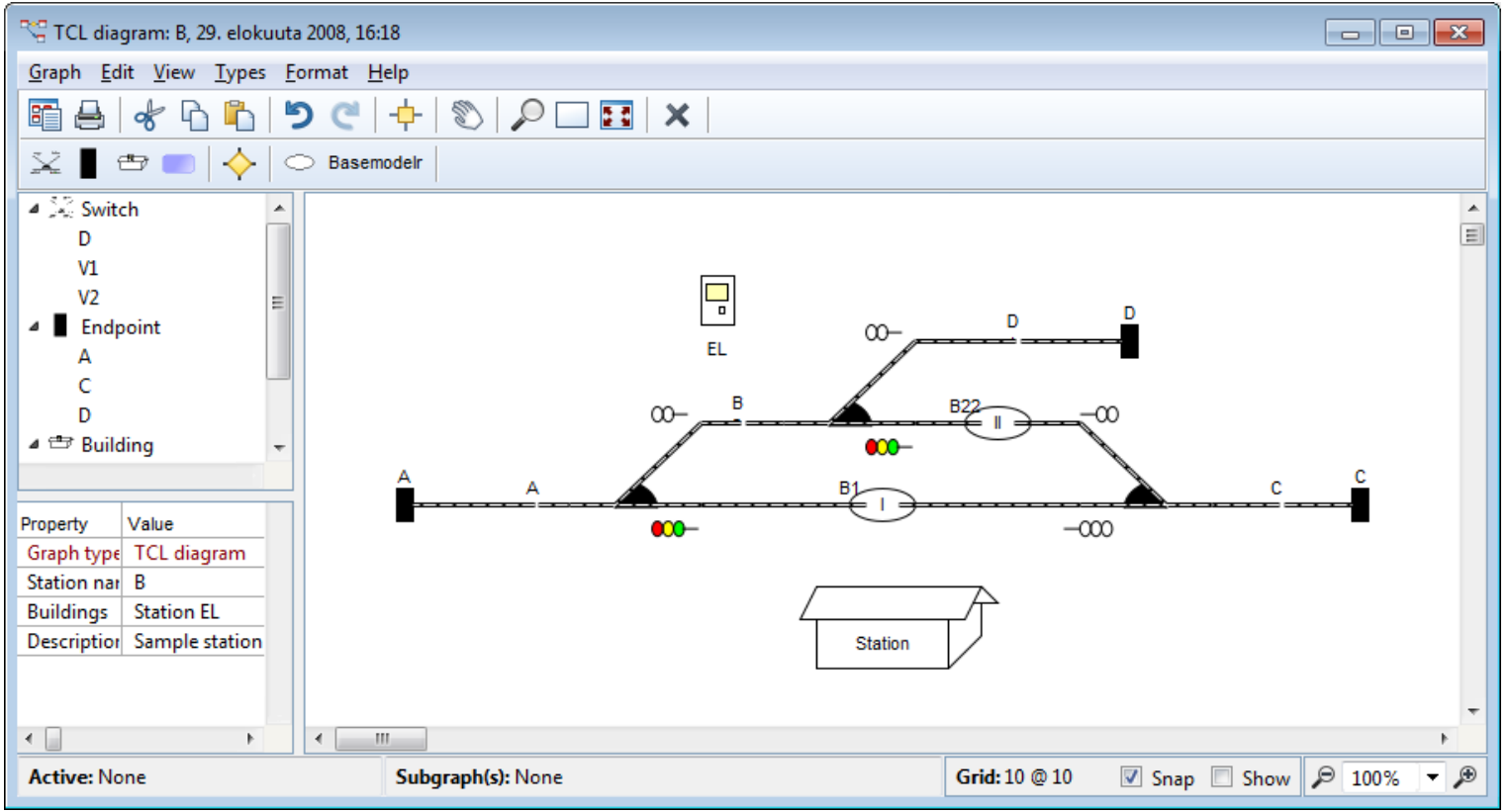




Telecom services

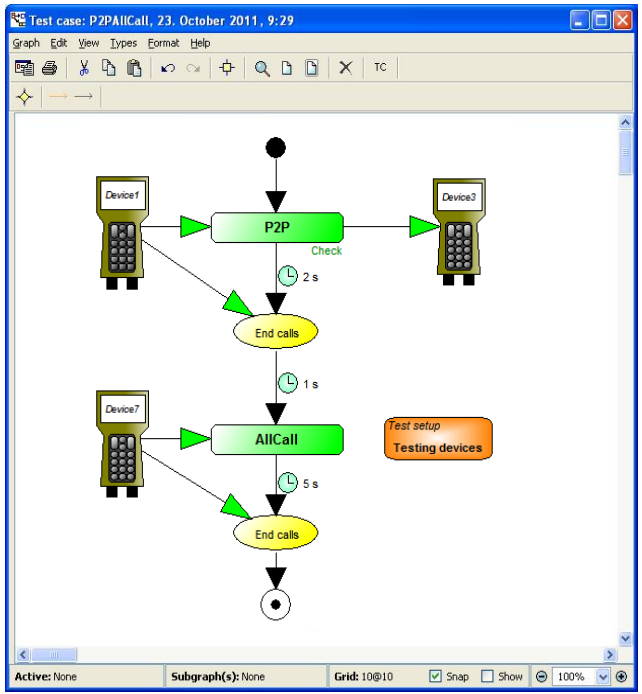


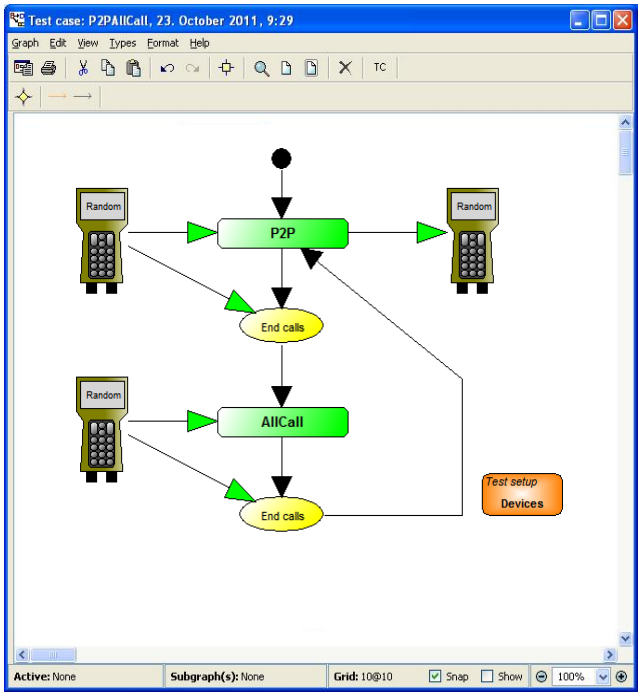
Railway interlocking



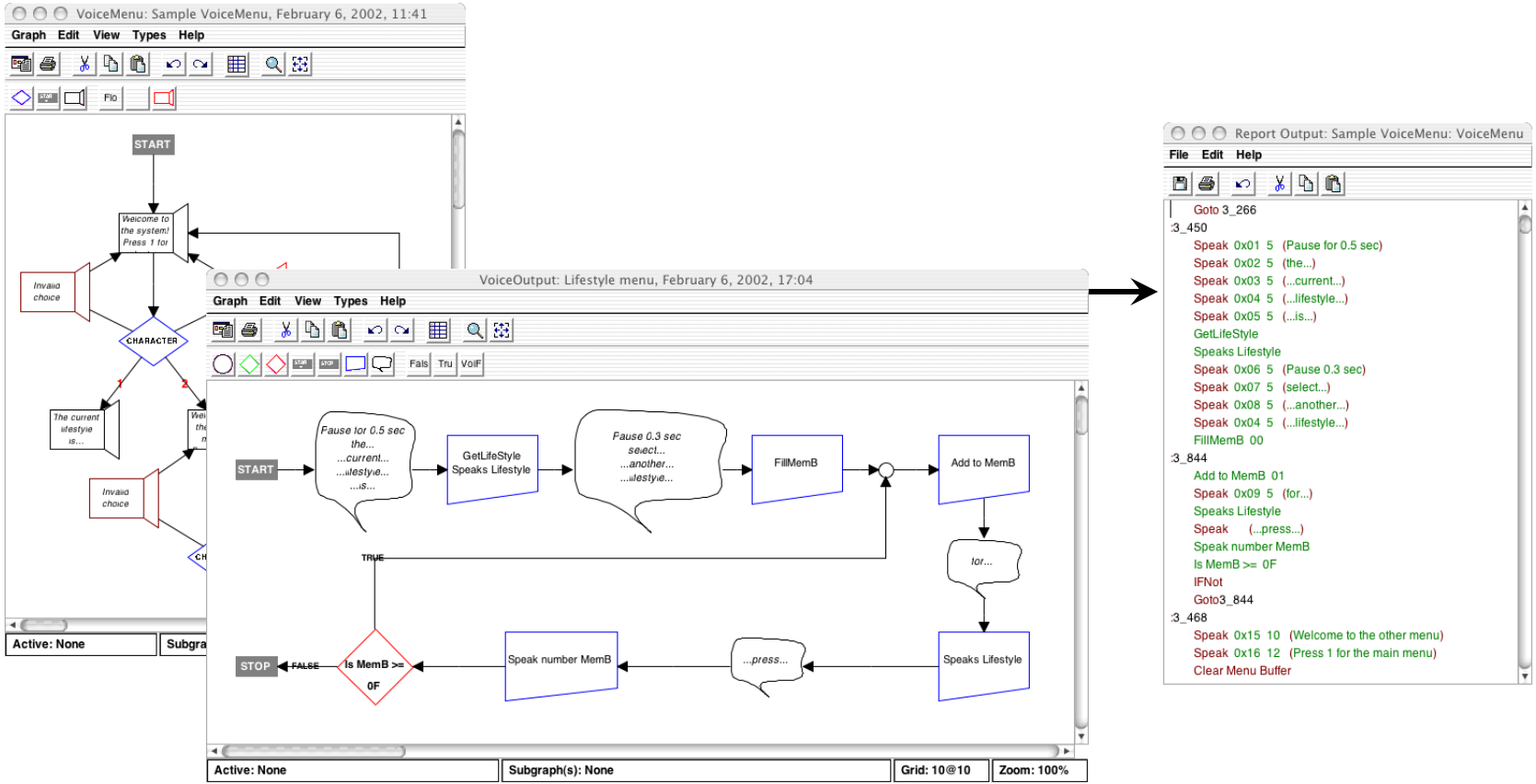
Radio network testing

- Modeling test cases/test logic and generating test data

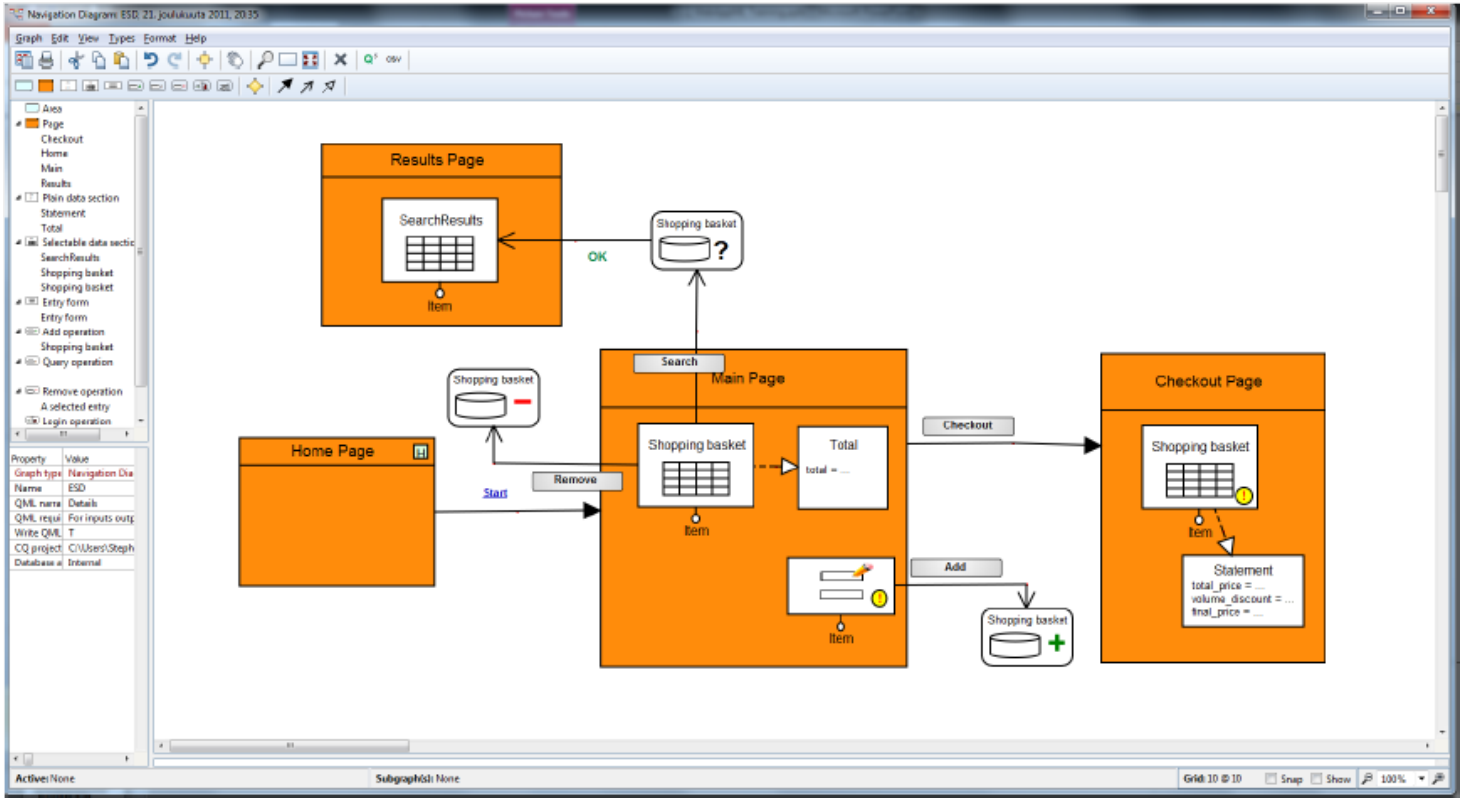




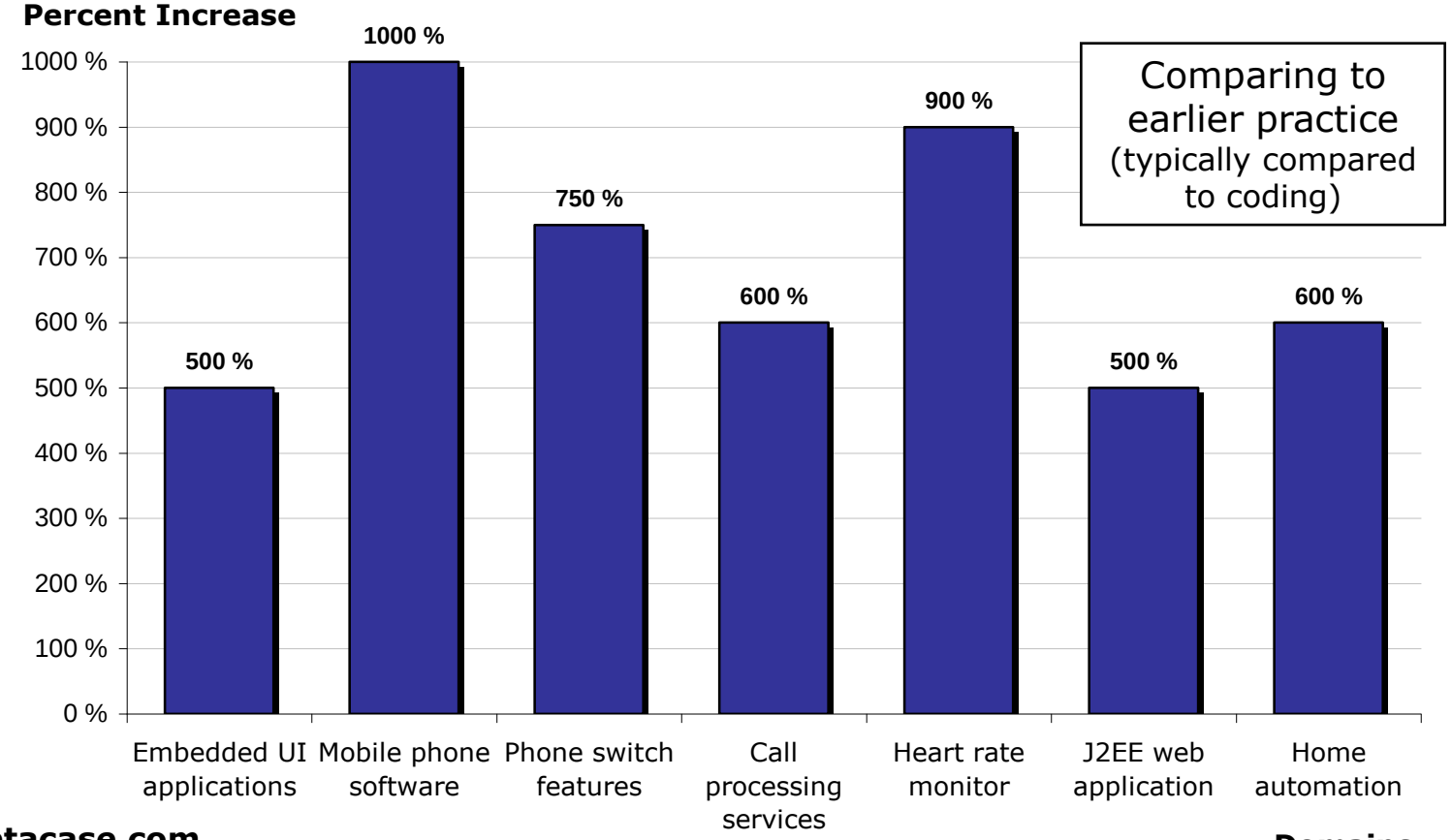
Voice control



Web app testing



Productivity increase measured



Analysis of the cases indicates

- DSL should raise the level of abstraction above the code
- DSL is not using necessarily linear text representation
  - Domain and problem solving dictates
  - Maps, diagrams, matrixes, tables etc.
- DSL focus on narrow domain
  - Exclude outside as much as possible
- DSL for other than producing the code
  - Higher abstraction is not applicable only for producing the code but can also be used for testing, deployment, interaction design, localization etc.

Tooling

- Some sort of tooling is always used, but big differences on tools, see
  - series of Language Workbench Comparison, LWC 2011-2013
  - Comparison reports, e.g. tinyurl.com/gerard12: Language implementation (Eclipse GMF 25 days vs. MetaEdit+ 0.5 days)
- Language creation is the first task but also other issues need to be handled, like
  - integrating multiple languages
  - sharing languages
  - maintaining languages
  - updating specifications made with earlier version of language
  - collaboration, like multiple language engineers

Summary

- Raise the abstraction as high as possible:
  ideally 1:1 to problem domain
- Exclude outside as much as you can
- Refine languages as needed (keep it flexible)
- Use tools that support “agile” language definition
  - And allow also models to automatically update to new language version

Thank You!
Questions?

To see various cases, examples, and download MetaEdit+ tool, visit http://www.metacase.com

References

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