

## Ubiquitous Smart Space Management

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## Introduction

- Rationale, Objectives and Principles
  - Integration of management and middleware
- Key Issues
  - Usage, operation, control, administration, maintenance (UOCAM)
  - One example of an integrated approach for each
- Conclusions
  - Summary and Outlook

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## Rationale

- Demand for integrated solutions
  - Telecommunications – 3G and beyond
  - User-centric Communications – context awareness
  - Network Computing – converged networks
  - Devices and Wearables – network appliances
- Ubiquitous Management by means of
  - Integrating management on all layers
- Vision
  - Middleware for use, control and management of Smart Spaces

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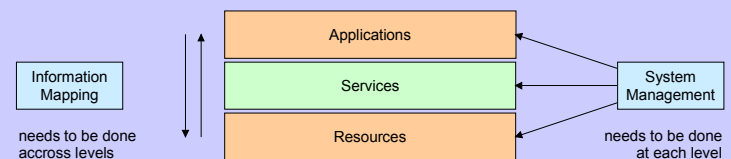
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## Objectives and Principles

- Information Mapping and System Management
  - Information is mapped across levels, upwards and/or downwards
  - Systems are managed at each level
- Principles for the Integration
  - Smart Spaces are used and operated
  - For long time usage, Smart Spaces are controlled, administered & maintained



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## Examples

- I am hungry!
  - Send restaurant information
  - Order food
- I want to talk to a colleague!
  - Call him/her
  - Start chat via instant messaging
- What is 1+2?
  - 1+2 = 3
  - 1+2 = 2+1

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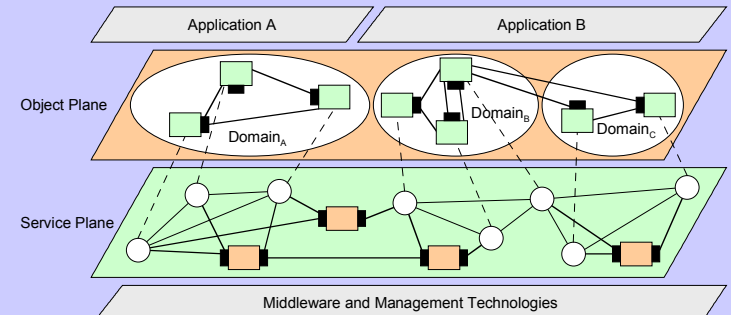
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## Conceptual Model

- Application design follows business models, not predictable
- Technology is changing fast, portability not granted



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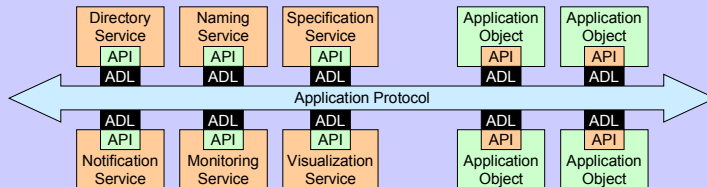
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## Integrated Architecture

- Development, execution and deployment
  - Object Model
  - Application Definition Language (ADL)
  - Core Model
  - Application Protocol
  - Application Programming Interface (API)
  - Application Services



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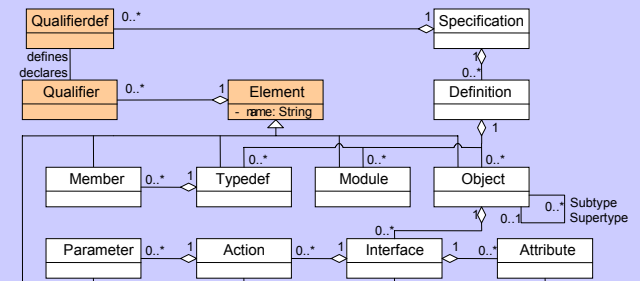
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## Usage – Object Model

- Basis for the description of application objects
  - language elements must be qualified to generate repositories
  - language(s) impact the used protocol between application objects



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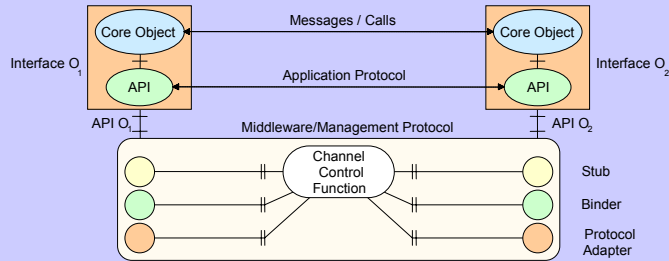
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## Operation – API & Protocol

- Protocol defines rules for exchanging information
  - decouple applications from middleware/management technology
  - simple interface hiding complexity



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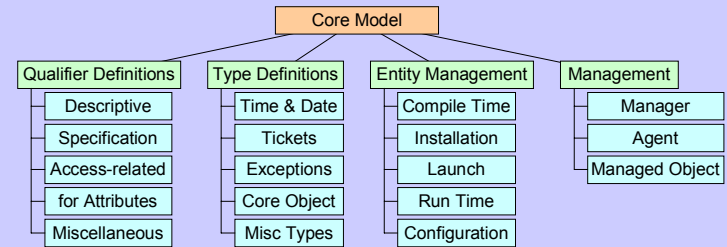
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## Control – Core Model

- Reasonable set of information for building repositories
  - defines a set of information for qualifying language elements
  - identifies type definitions, e.g. time & date
  - specifies base classes for processing control information



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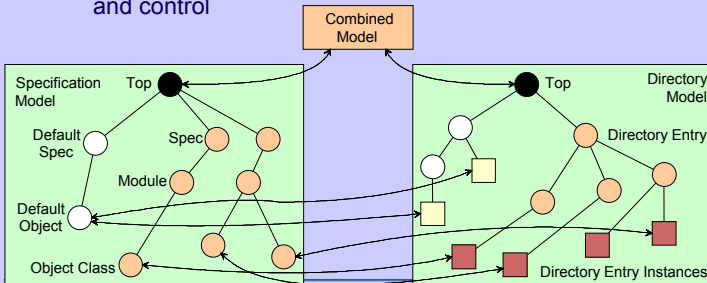
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## Administration – Specification and Naming

- Single interface to directories handling object naming and specifications
  - relationship between object instances and object specification
  - distributed repository supporting also usage, operation, and control



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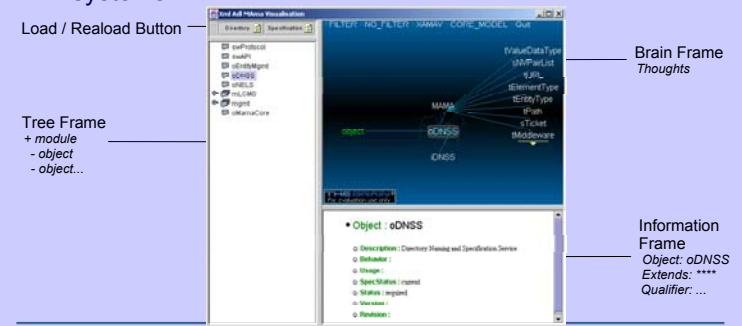
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## Maintenance – Visualization

- simple visualization of complex relationships of objects and instances
- independent of concrete object models, languages systems



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## Conclusion

- Middleware for use, control and management of Smart Spaces
  - Management Architectures
  - Application Models
  - Implementations as proof concepts
  - Experimental test-beds and simulations for dissemination & exploitation
- Combination of theory and practice
  - Architecture as theoretical background
  - Application models as realisation for specific areas
  - Implementation as of lightweight, open and smart solution
- Hiding Complexity
  - Hiding middleware and management technologies
  - Providing a simple interface to application programmers
  - Supporting easy to use visualisation tools

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