



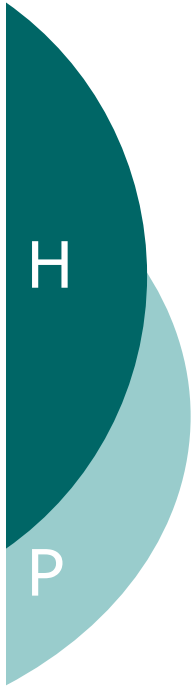
# A Reflective Goal-based System for Context-aware Adaptation

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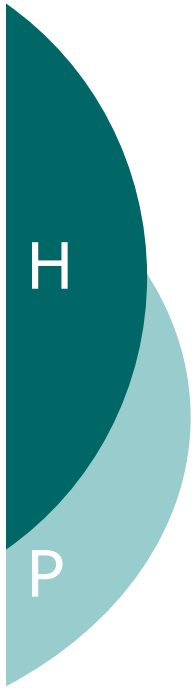
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## Outline

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- Problem Background
- Objectives
- Framework
- Implementation and Results
- Conclusions and Future Work

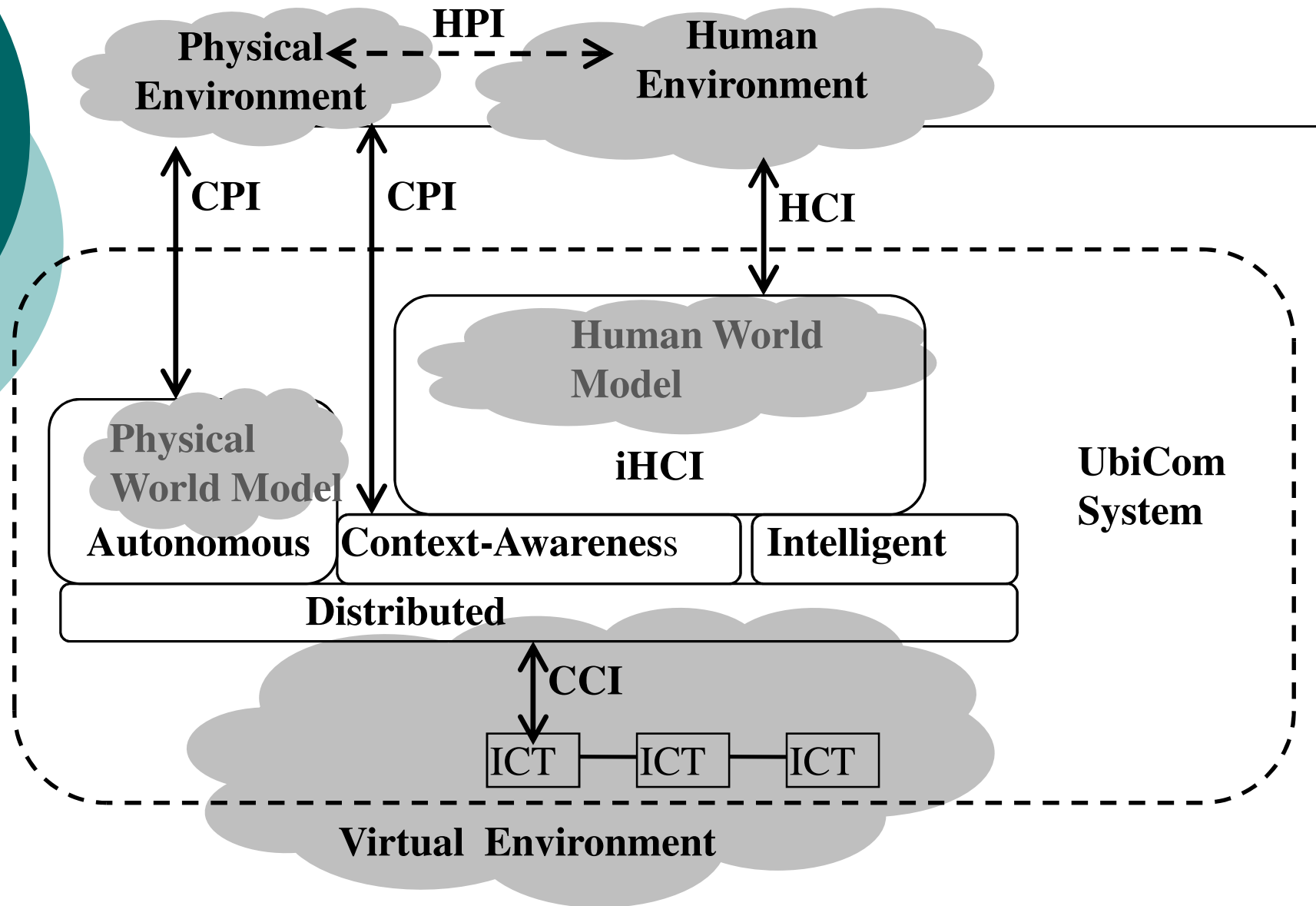


# Problem Background 1

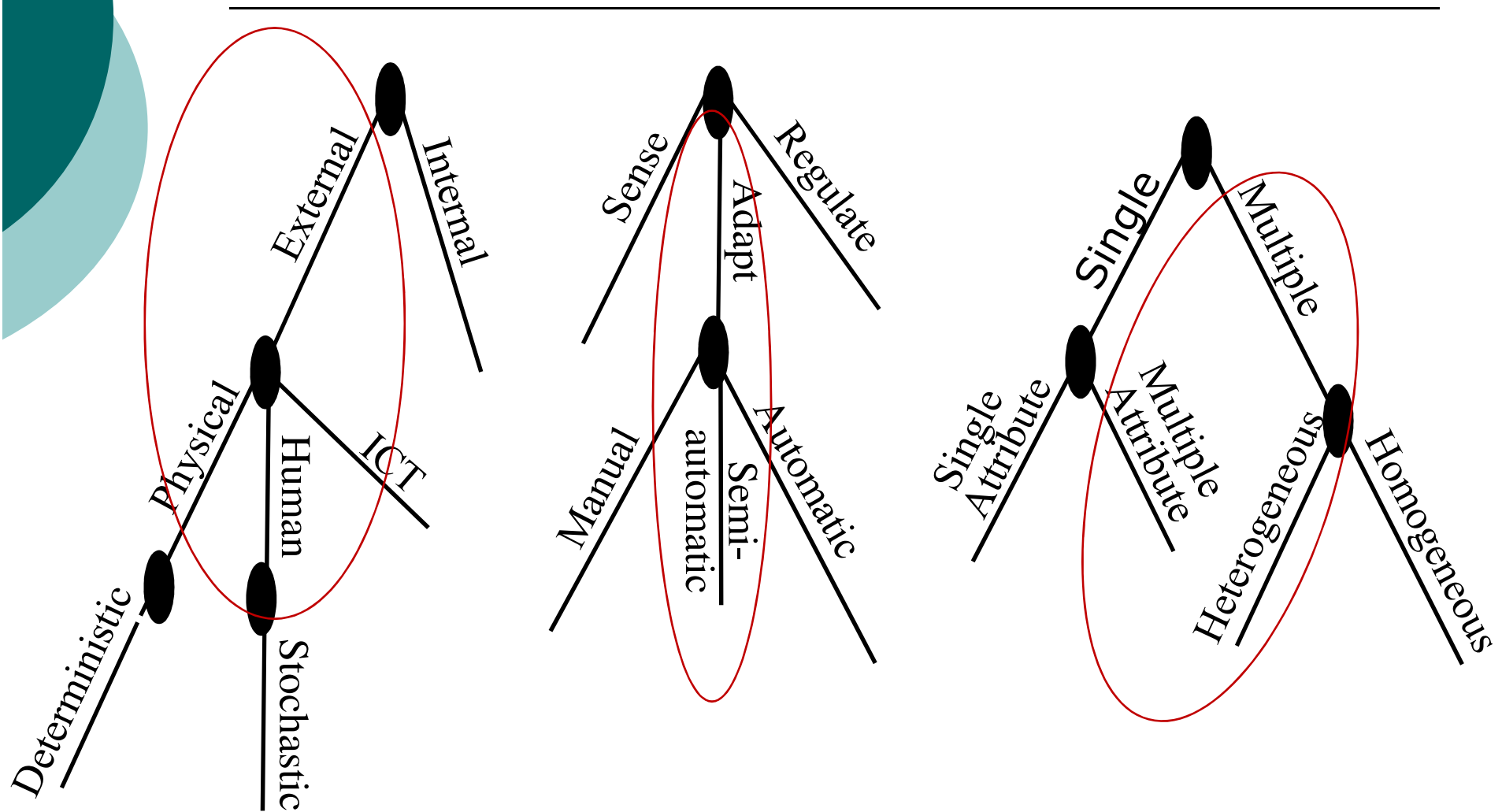
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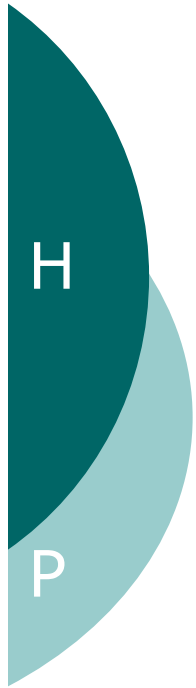
- Context-aware Application: Spatial Routing
- Single vs. Multi-dimensional objectives
  - E.g., combine a shorter route, a faster route, and a more scenic route
- Static vs. Dynamic
  - E.g., External environment changes: when following the route, w.r.t time, human env. changes, etc

# Problem Background 2: UbiCom System



# Problem Background 3: modelling context

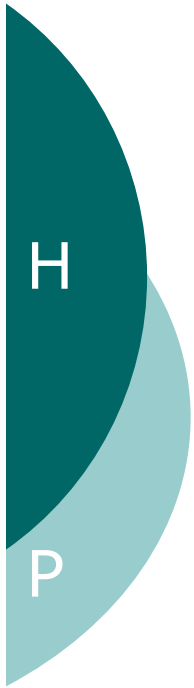




# Research Objectives

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1. To combine (physical world and human) environment context-awareness with a user goal-driven system
  - a. To define & deploy a goal-based context model of context-awareness
2. To investigate a reflective middleware model supporting loose-coupling between:
  - a. External / environment context adaptation
  - b. Internal / system / service context adaptation



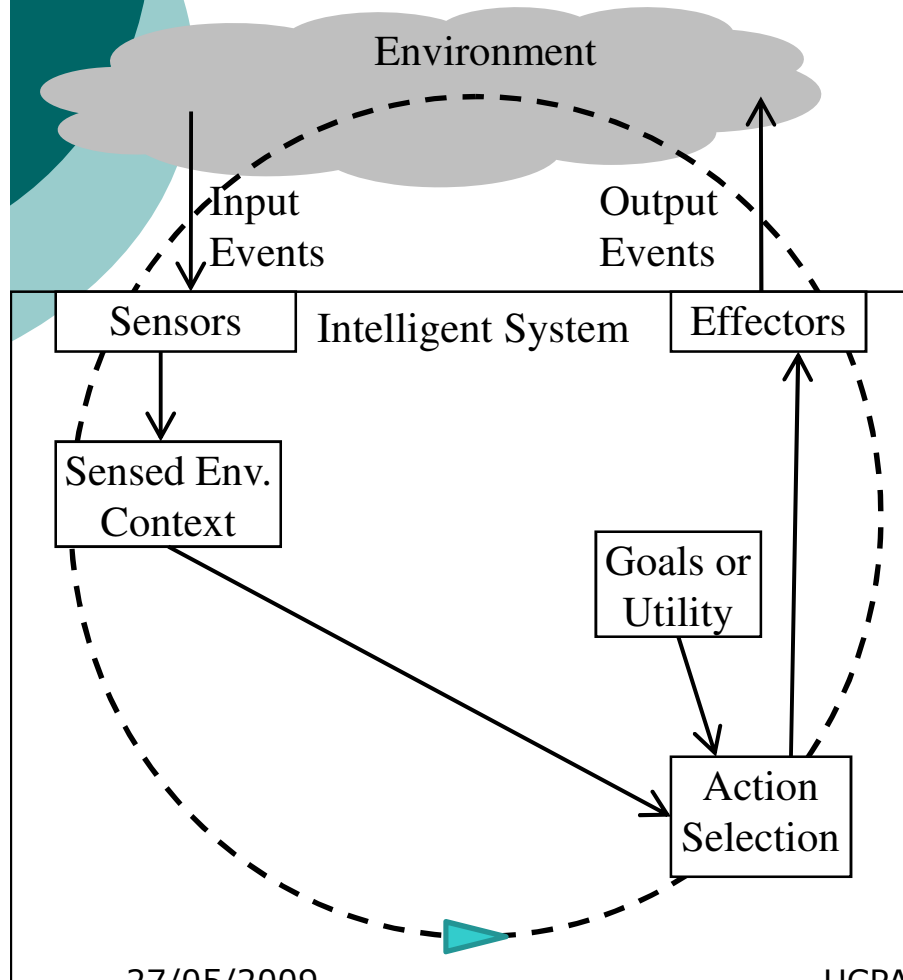
# Research Challenges

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- How to make the possible context space more manageable
- How user goals can be defined to accommodate both variable user preferences
- How a goal-based and dynamic planning approach can be used to introduce more flexibility into exiting static context-based adaptation
- How any ambiguities and inconsistencies occurring in the planning process can be handled

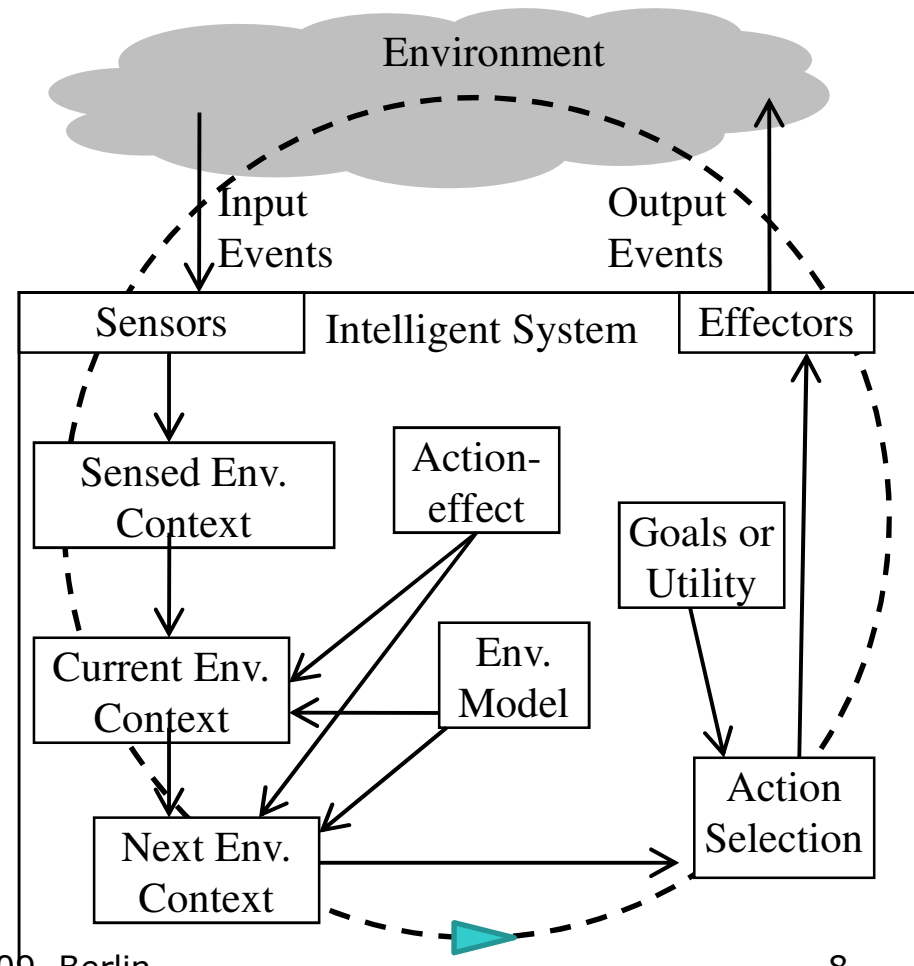
# Goal-based, Context-aware Framework

## Basic Goals or Utility-based IS



27/05/2009

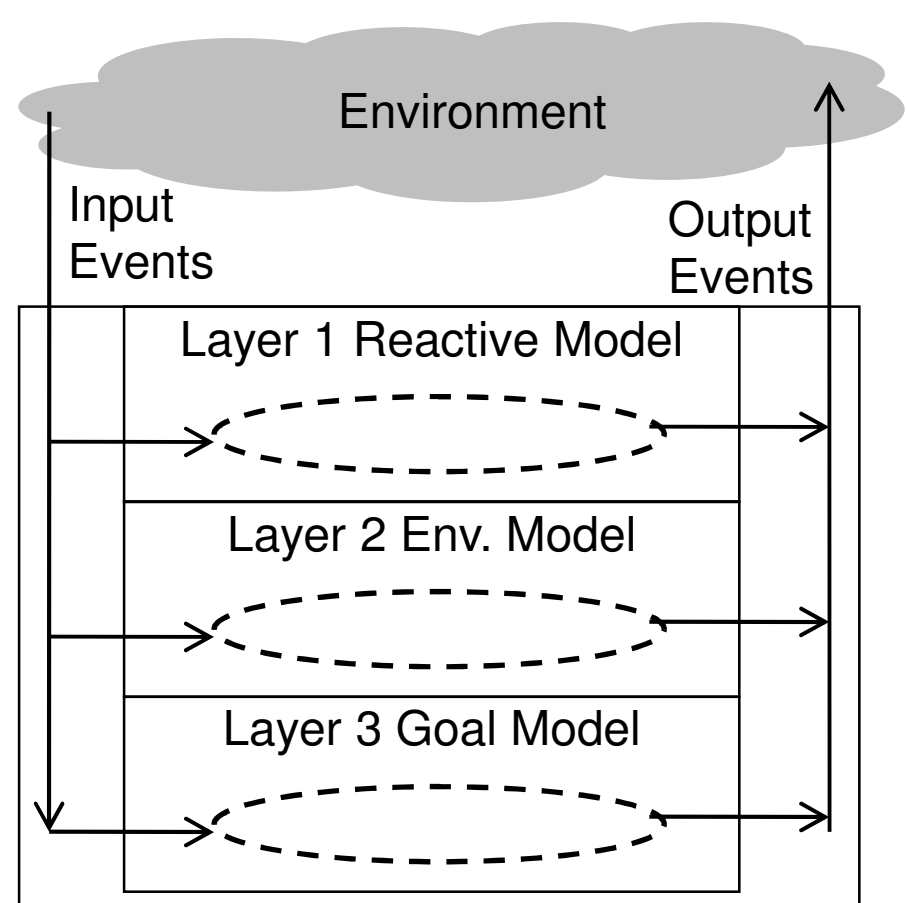
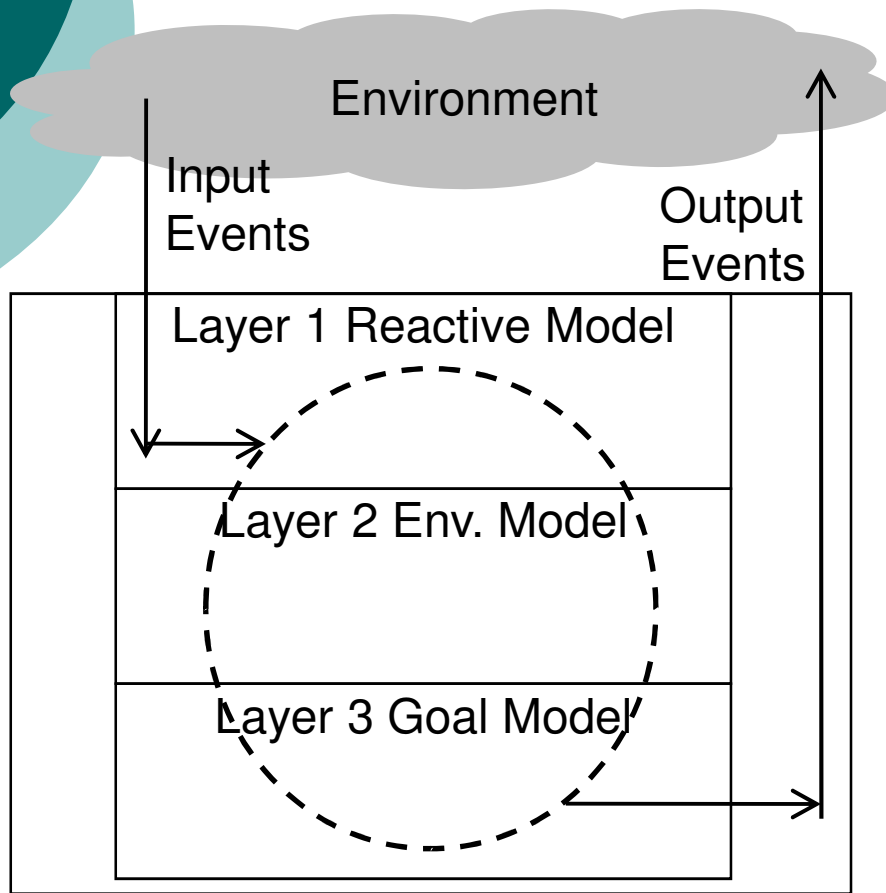
## Hybrid Goal or Utility-based IS (which also includes Environment Model based behaviour)



UCPA 2009, Berlin

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# Goal-based, Context-aware Framework





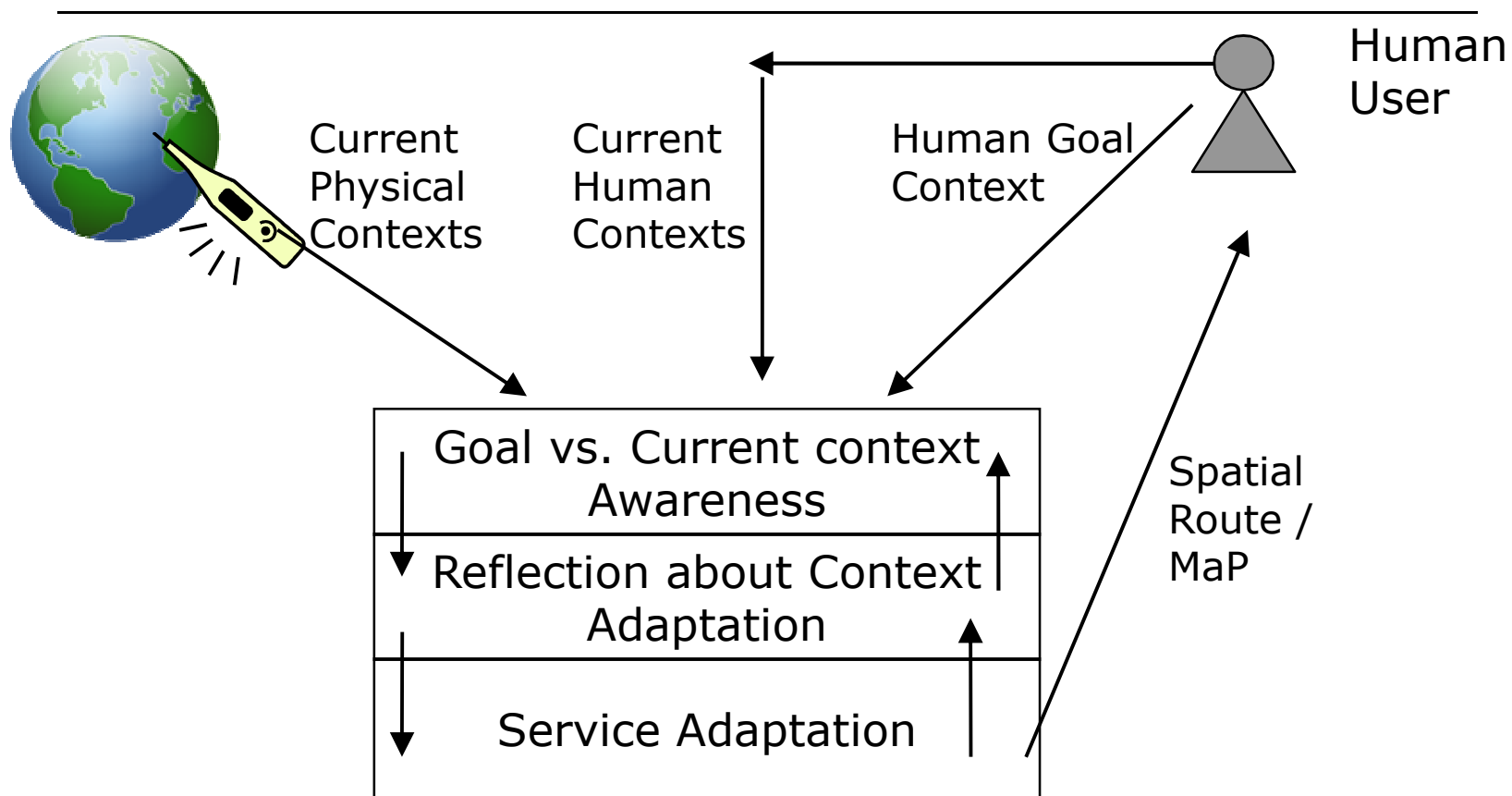
# Layered Context-aware Framework

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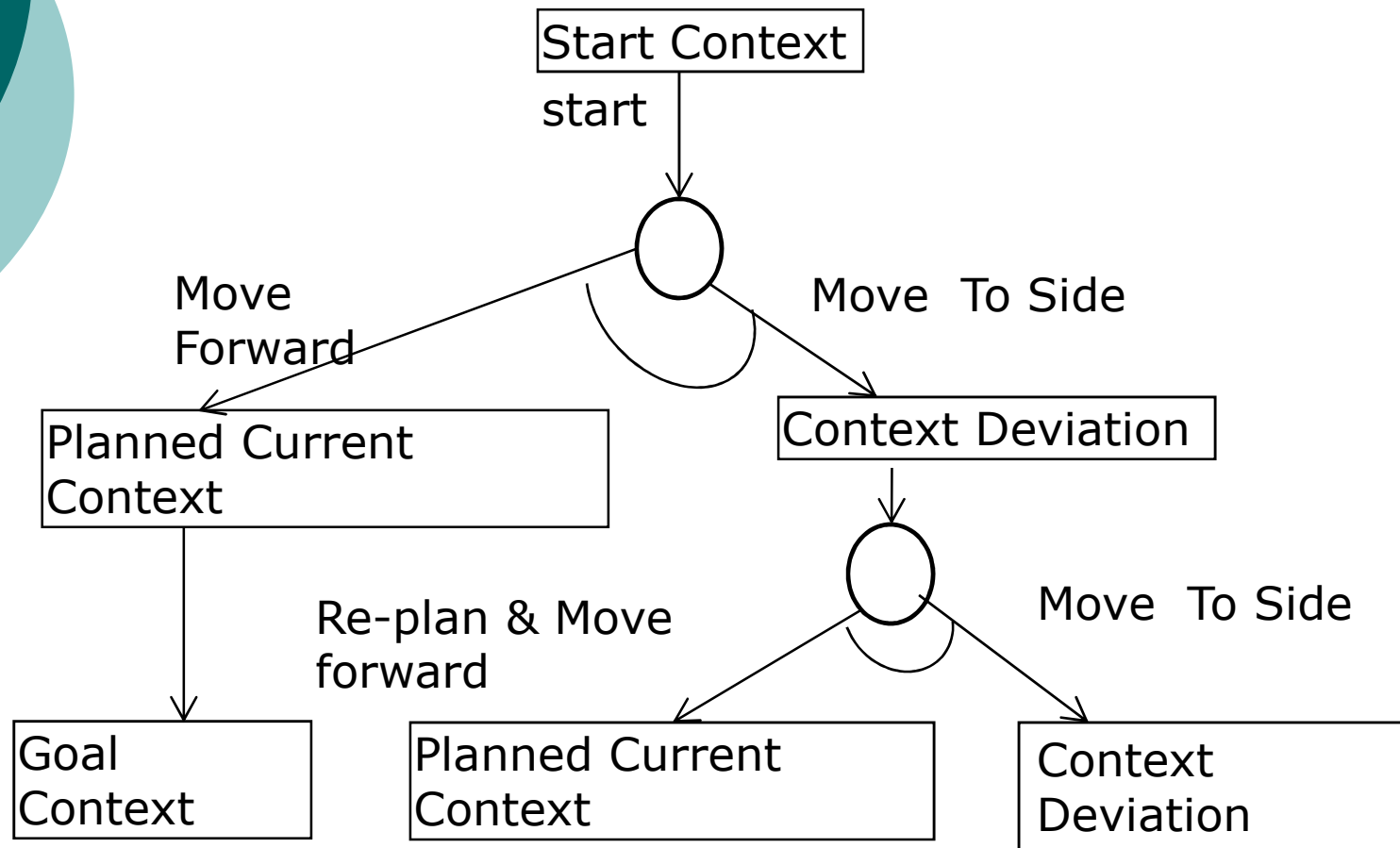
## Layered Model

1. Current context & goal context acquisition
2. Service, e.g., Spatial routing, adaptation to:
  - Current context in relation to the goal context
  - Multi-valued contexts: short, scenic, fast
3. Reflective Middleware
  - Reflection about context adaptation
  - Context events trigger context adaptation including context (re)composition & mediation
  - Context adaptation generates the specification for service adaptation (for the spatial routing)

# Layered Context-aware Framework

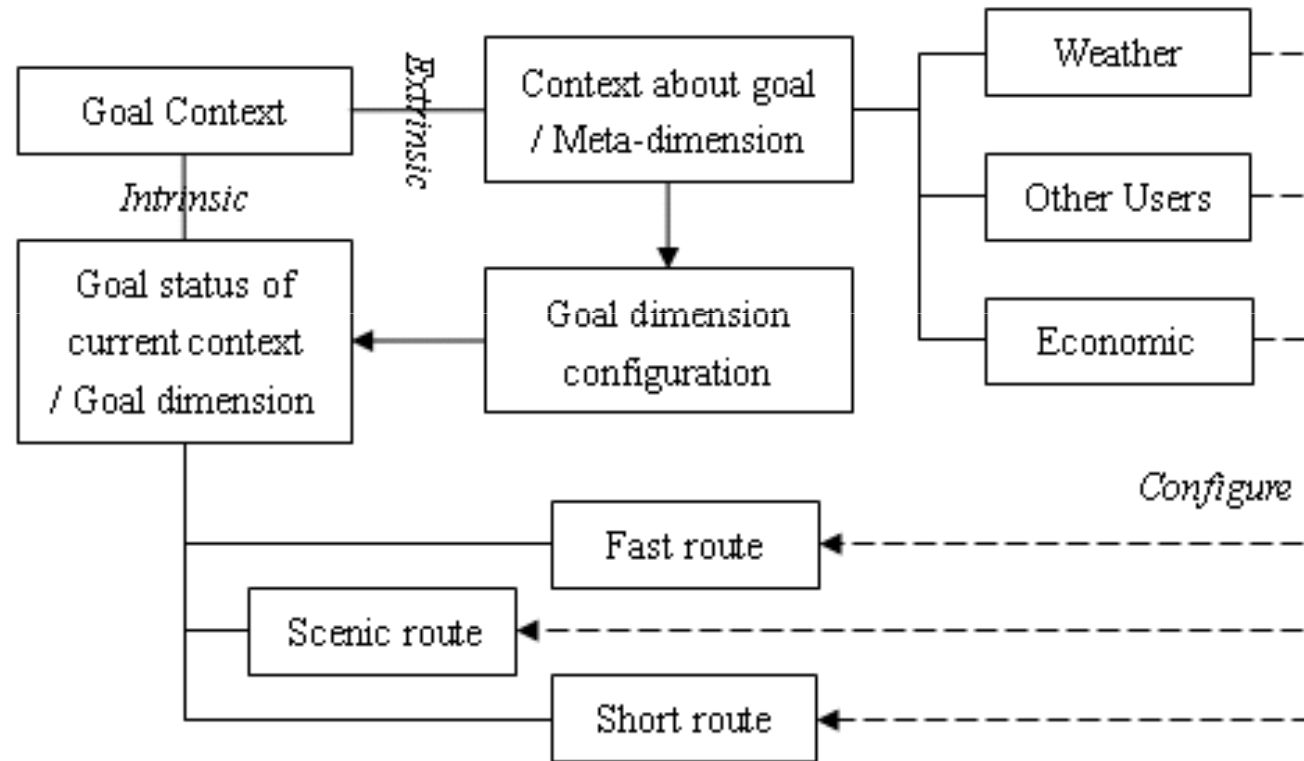


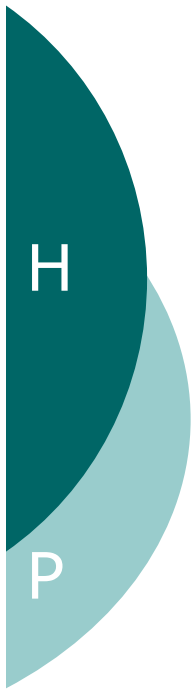
# Goal-based context awareness



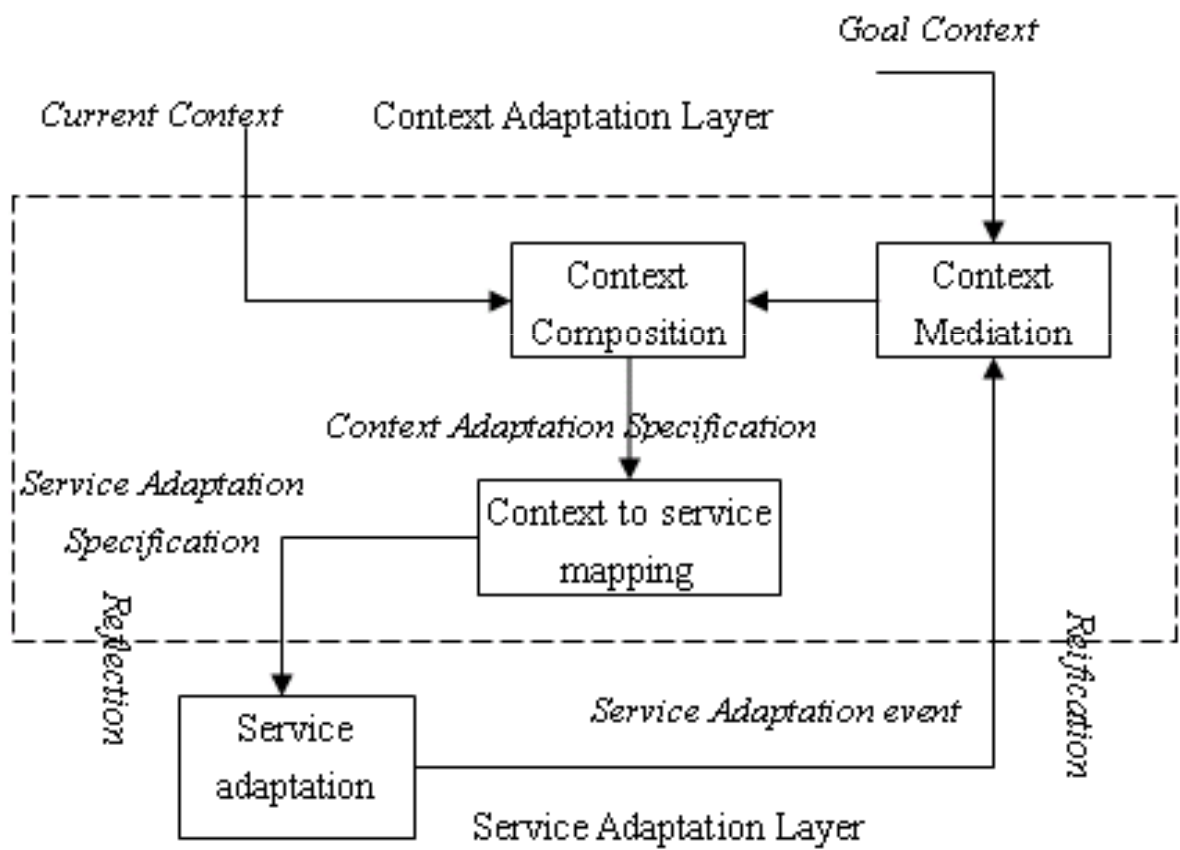


# Multi-valued Goal-based context awareness

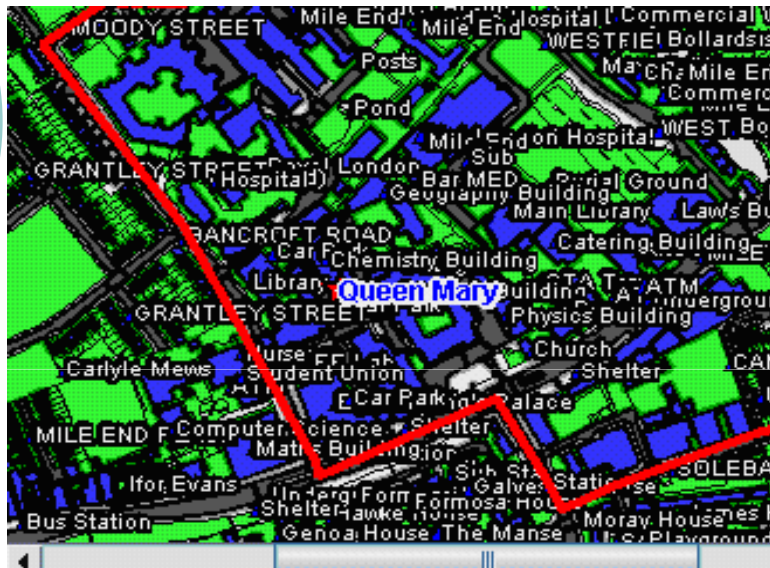




# Reflective Middleware

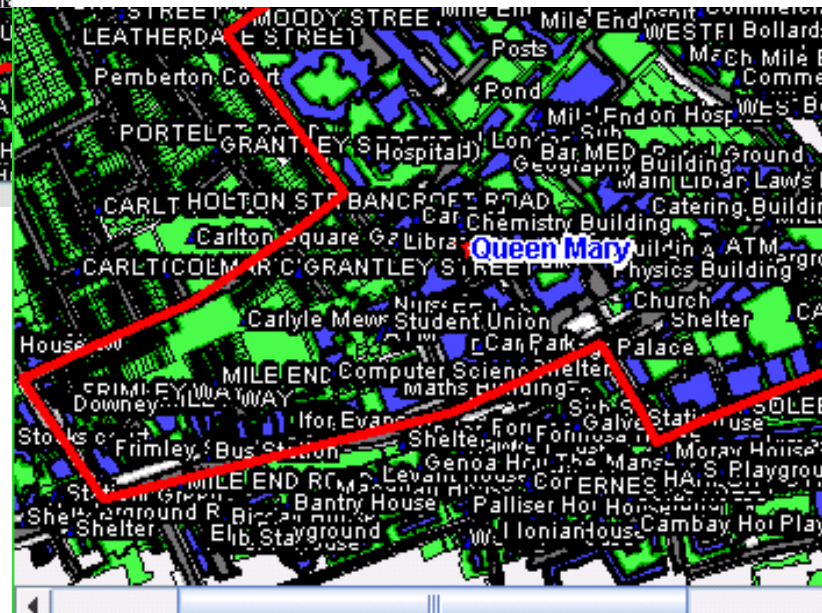


# Implementation and Results (2)



**Static routing**

## Reflective goal-based routing

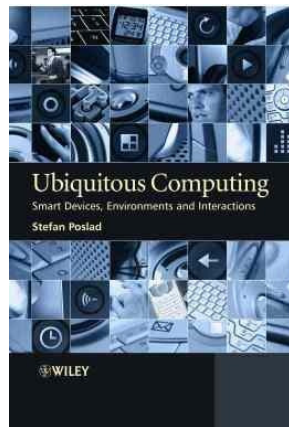




# Conclusion and Future work

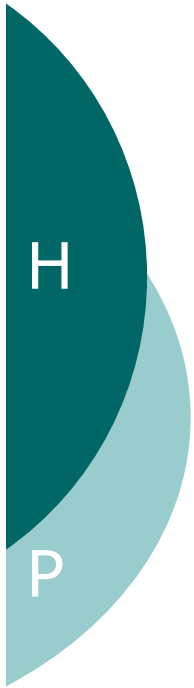
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- Conclusion concerning reflective context-aware middleware app.:
  - Goal context deployed into multi-lateral adaptation
  - Route generation that is adaptive and dynamic
  - Loosely-coupled context domain & service domain
- Further work will investigate:
  - performance overhead, generalization of method.



**\*\* Out Now \*\***

**Ubiquitous Computing: Smart Devices, Environments and Interactions, Stefan Poslad .  
Wiley, ISBN: 978-0-470-03560-3,  
2009**



# Discussion Ideas

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- Terminology: Are these concepts (UCPA, context-aware, iHCI) synonyms?
- How well is it possible to sense and model user's mental, psychological, human, state?
- Where is the system boundary / Who controls the system? System versus Users?
- Can usable, safe, reliable UCPA systems be developed?
- What are good applications for true UCPA systems?
- Some researchers claim, pervasive computing, has failed to live up to its promise in ~ 20 years to date