

# Towards the Dynamic Semantic Web

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TripCom meeting  
Helsinki

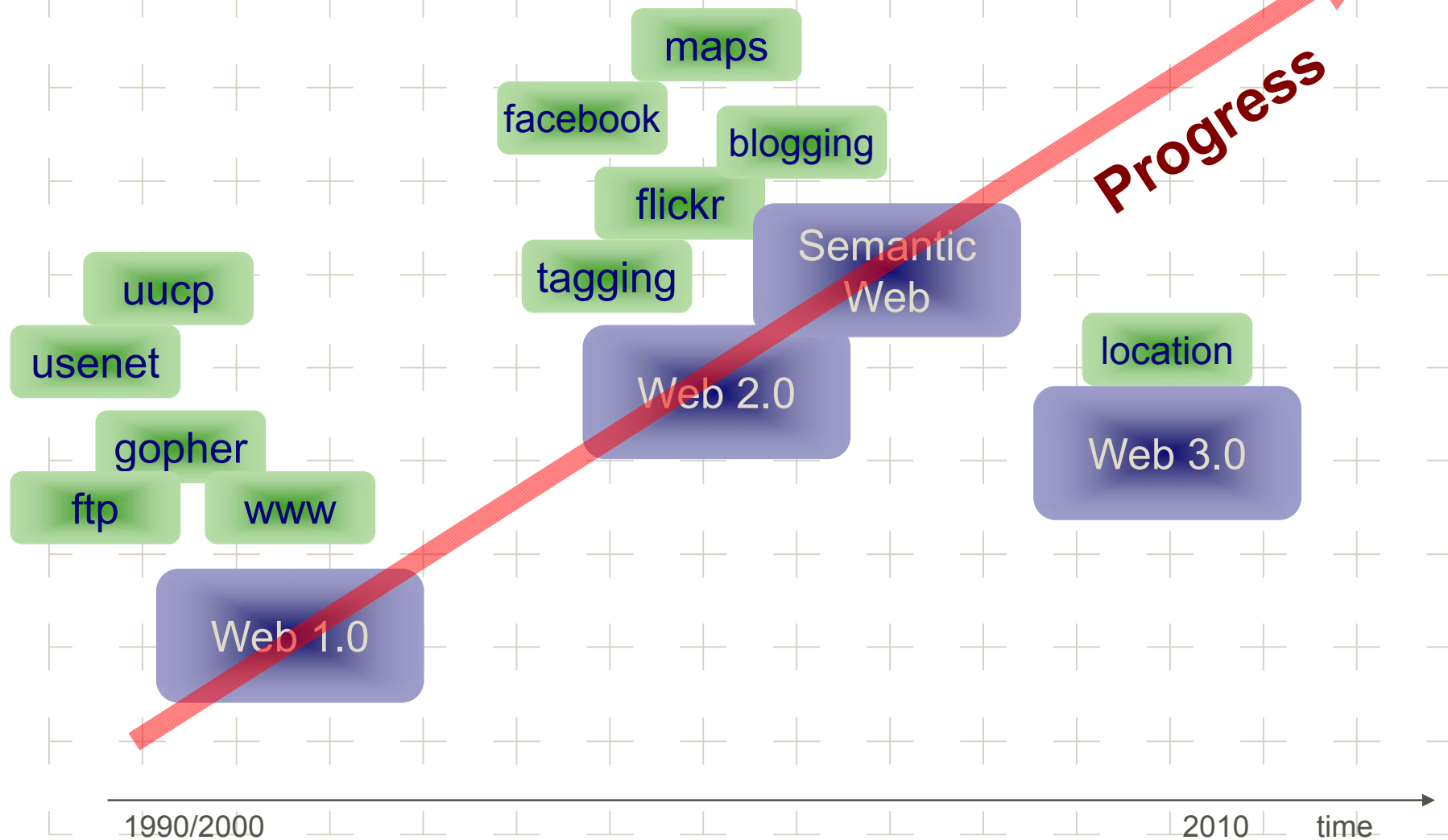
17 September 2008



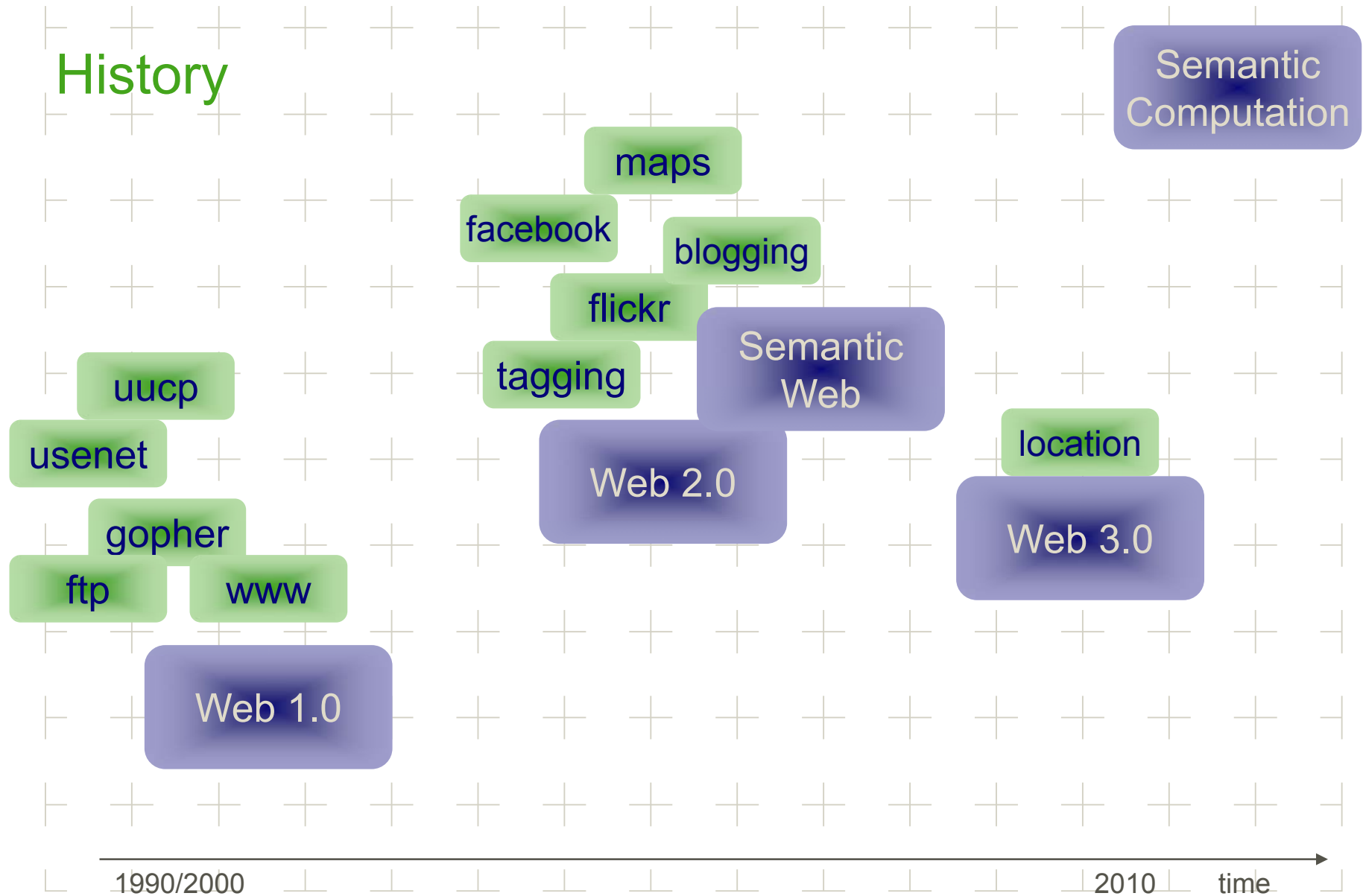
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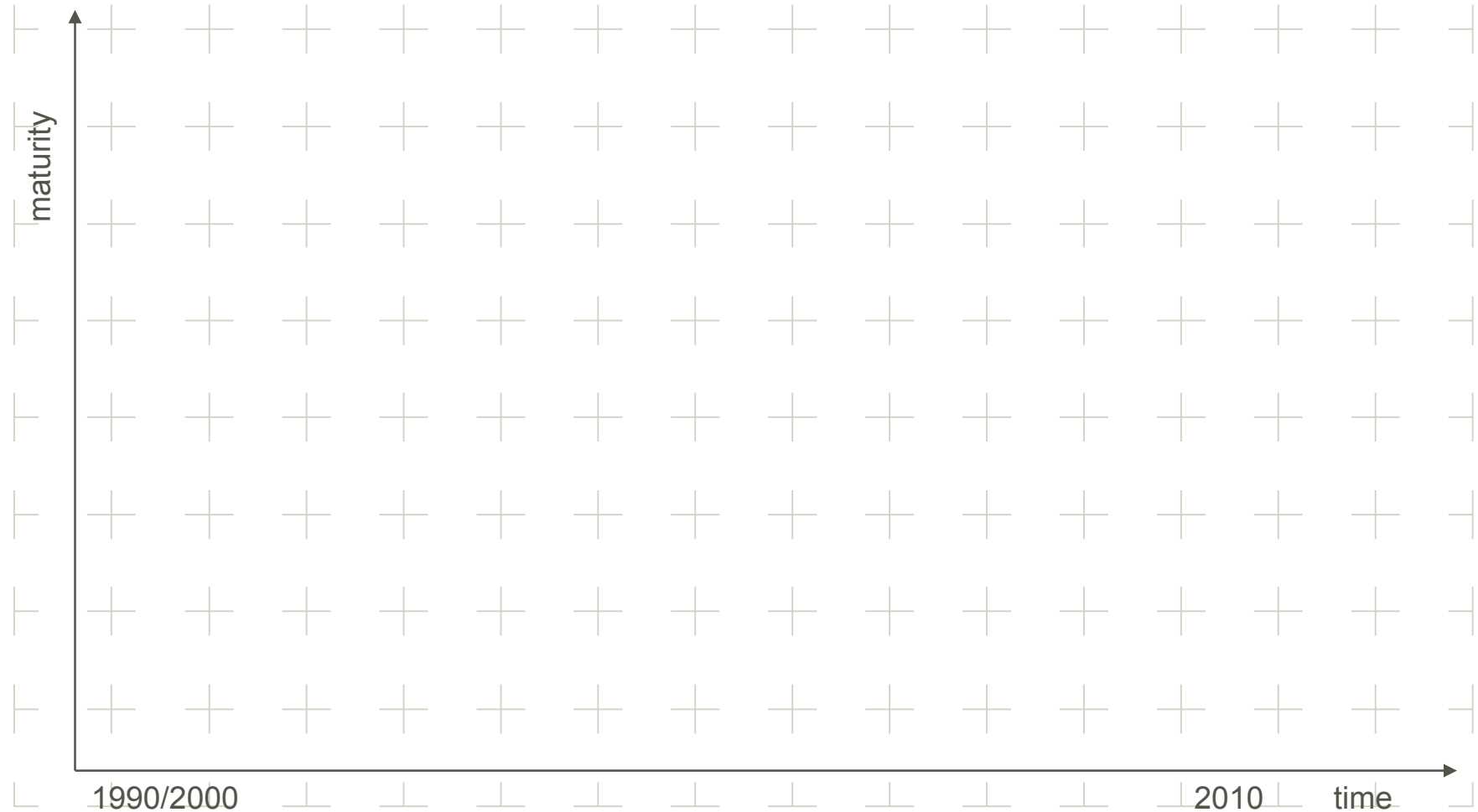
# History



# History



# Technologies - Applications



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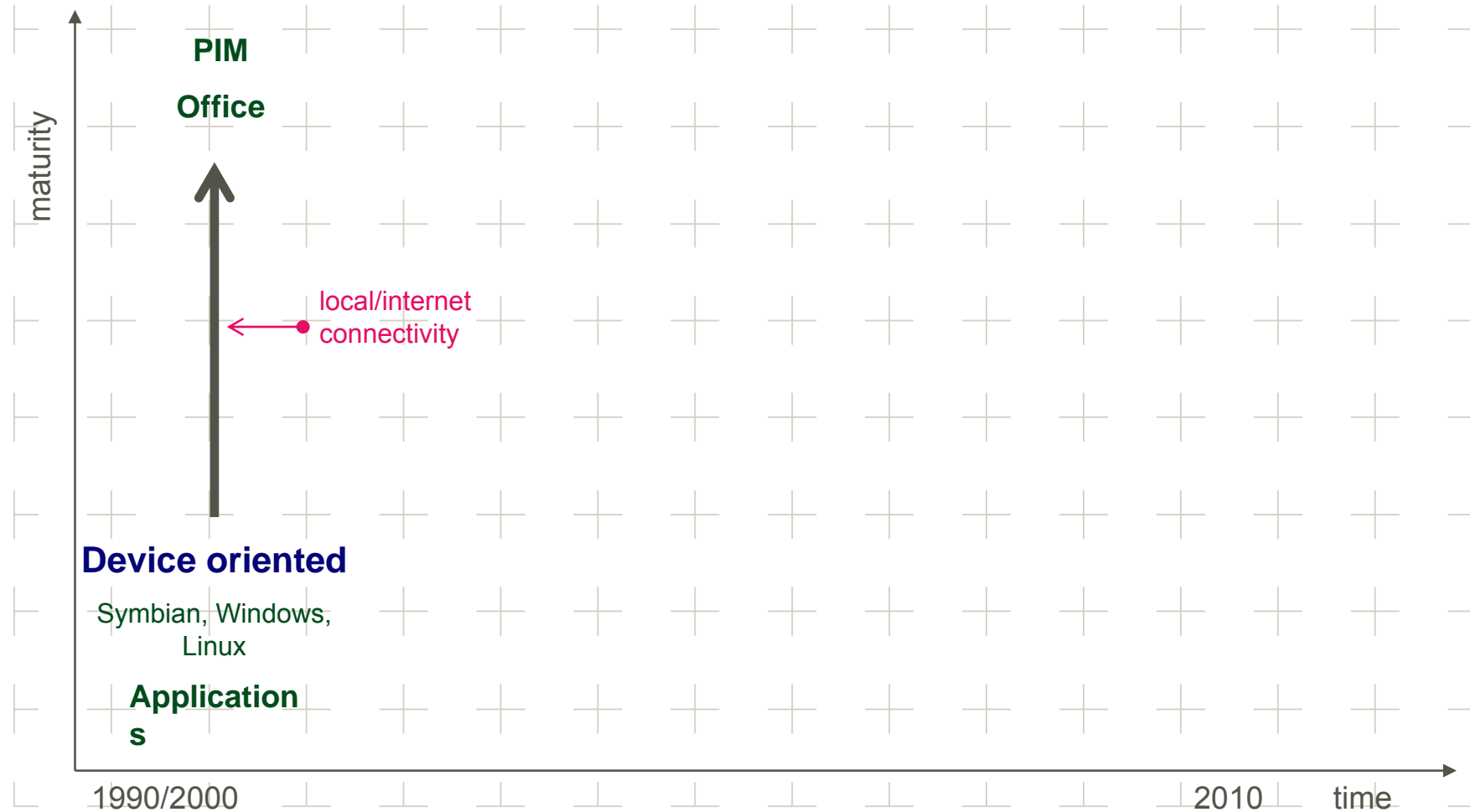
# Technologies - Applications



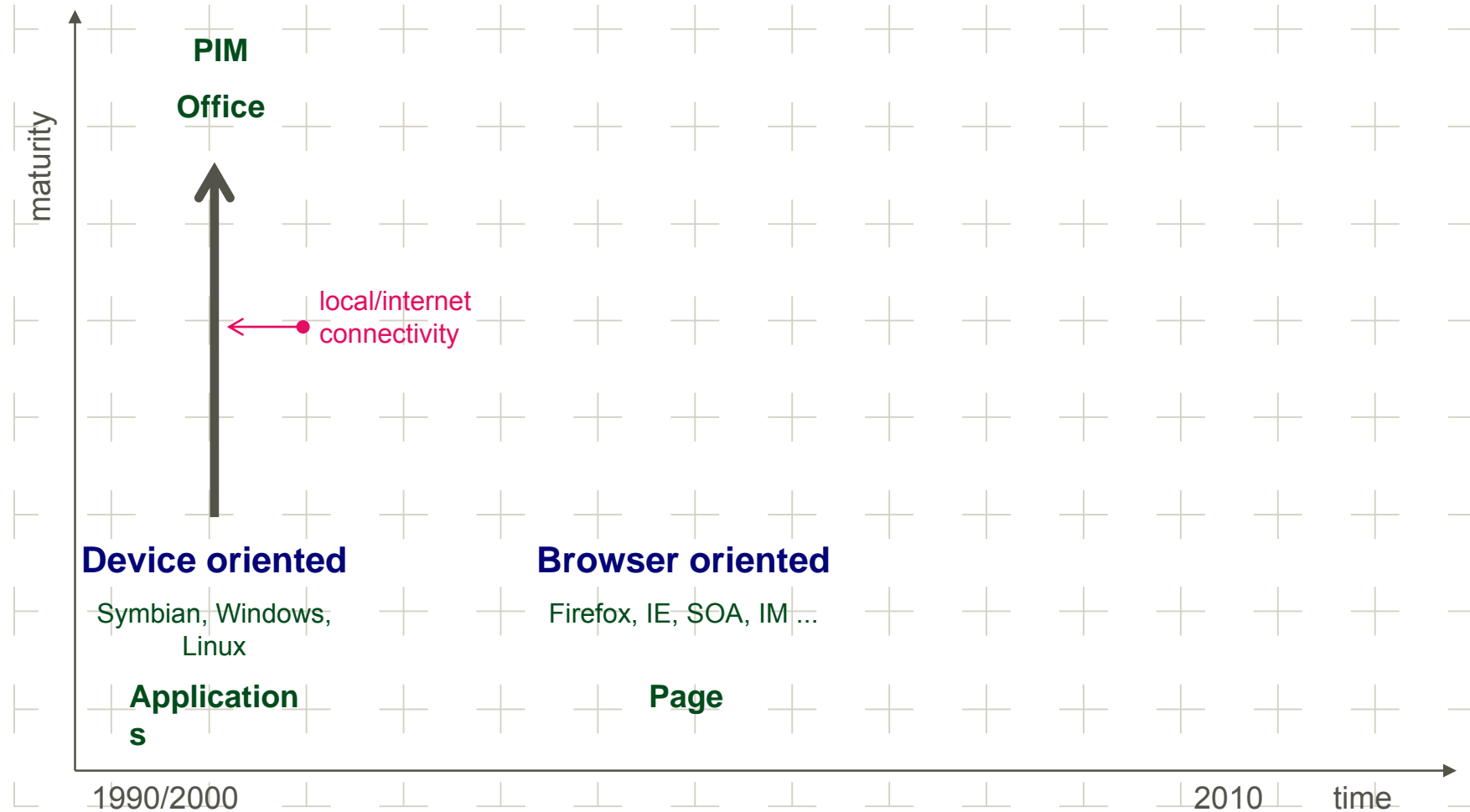
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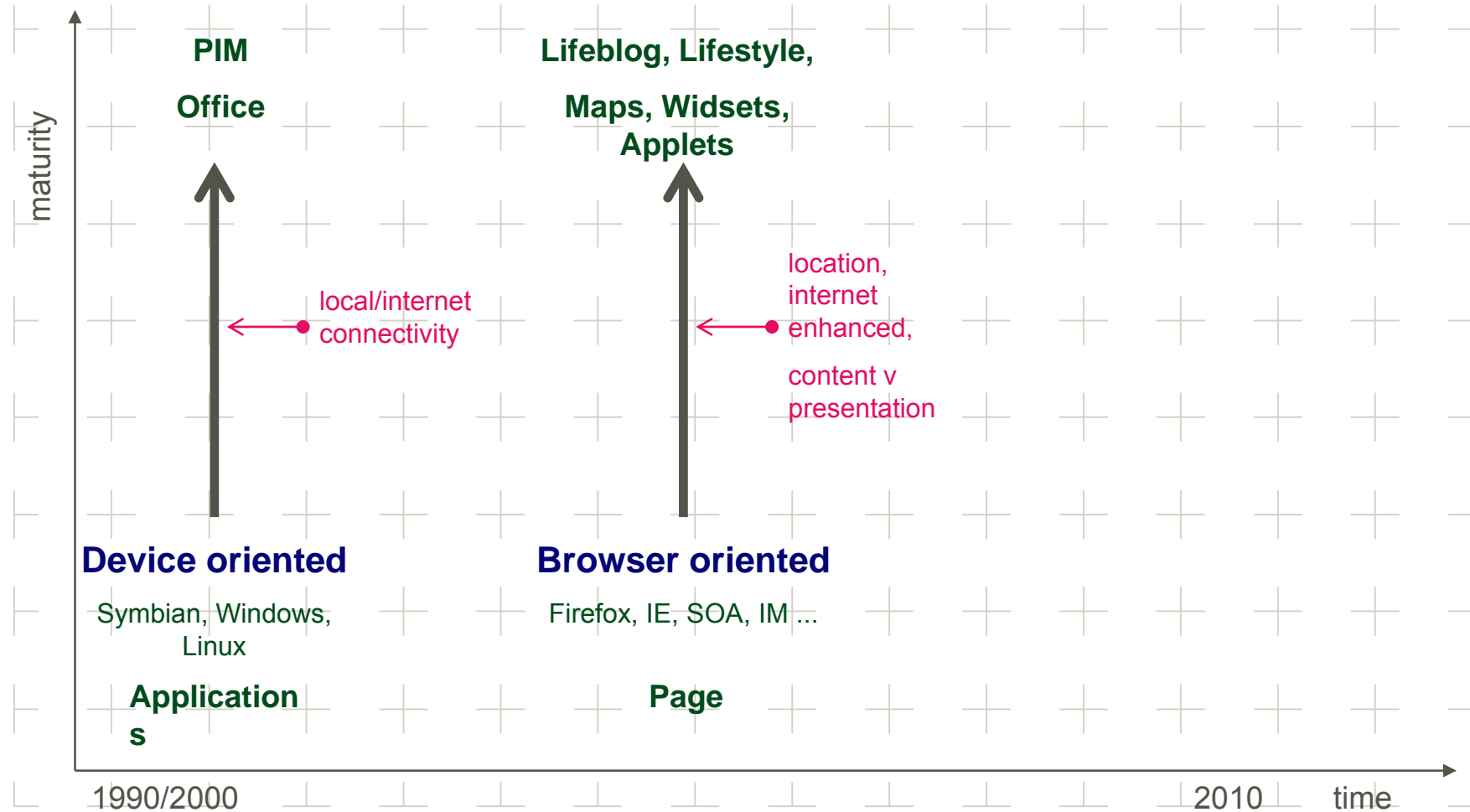
# Technologies - Applications



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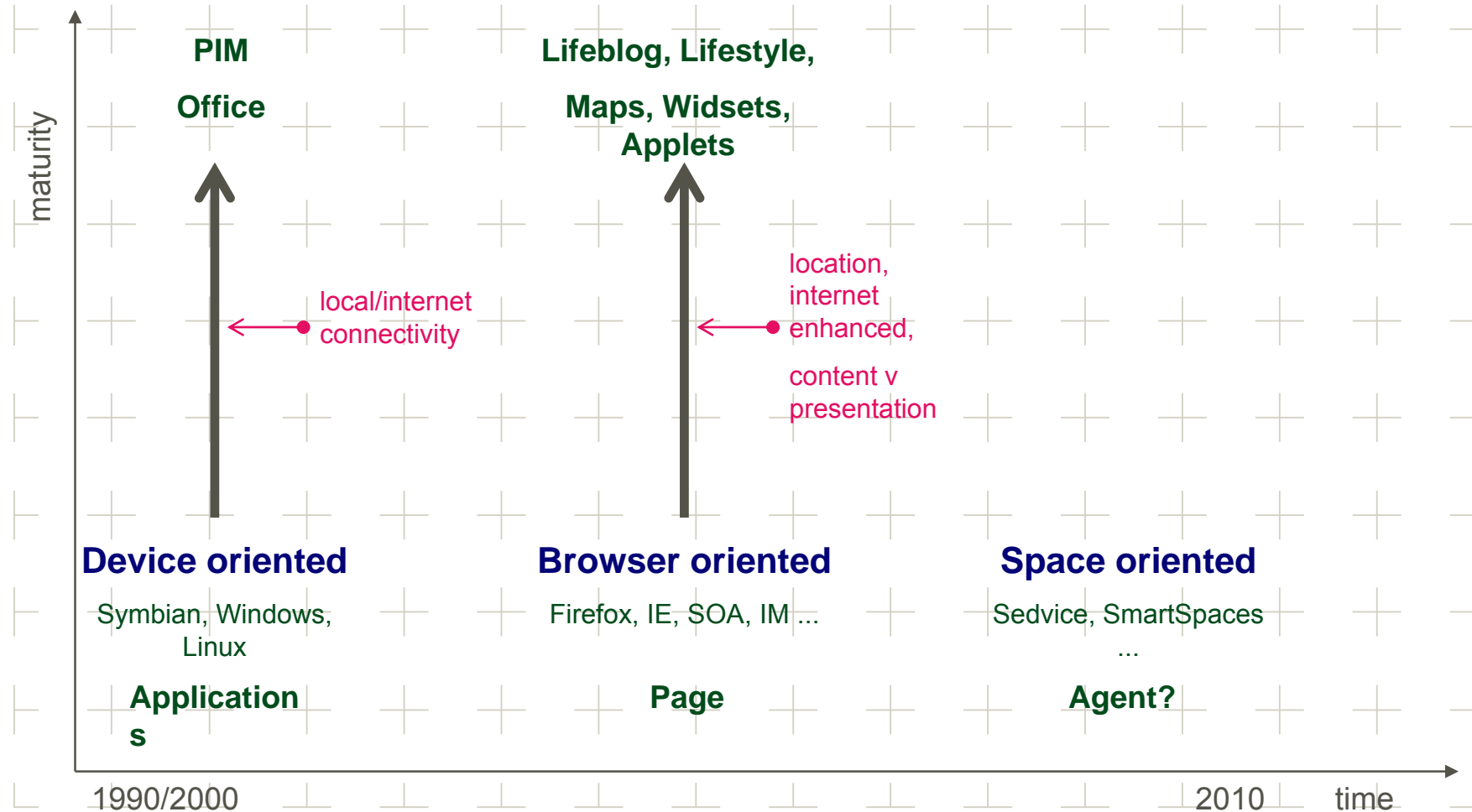


# Technologies - Applications

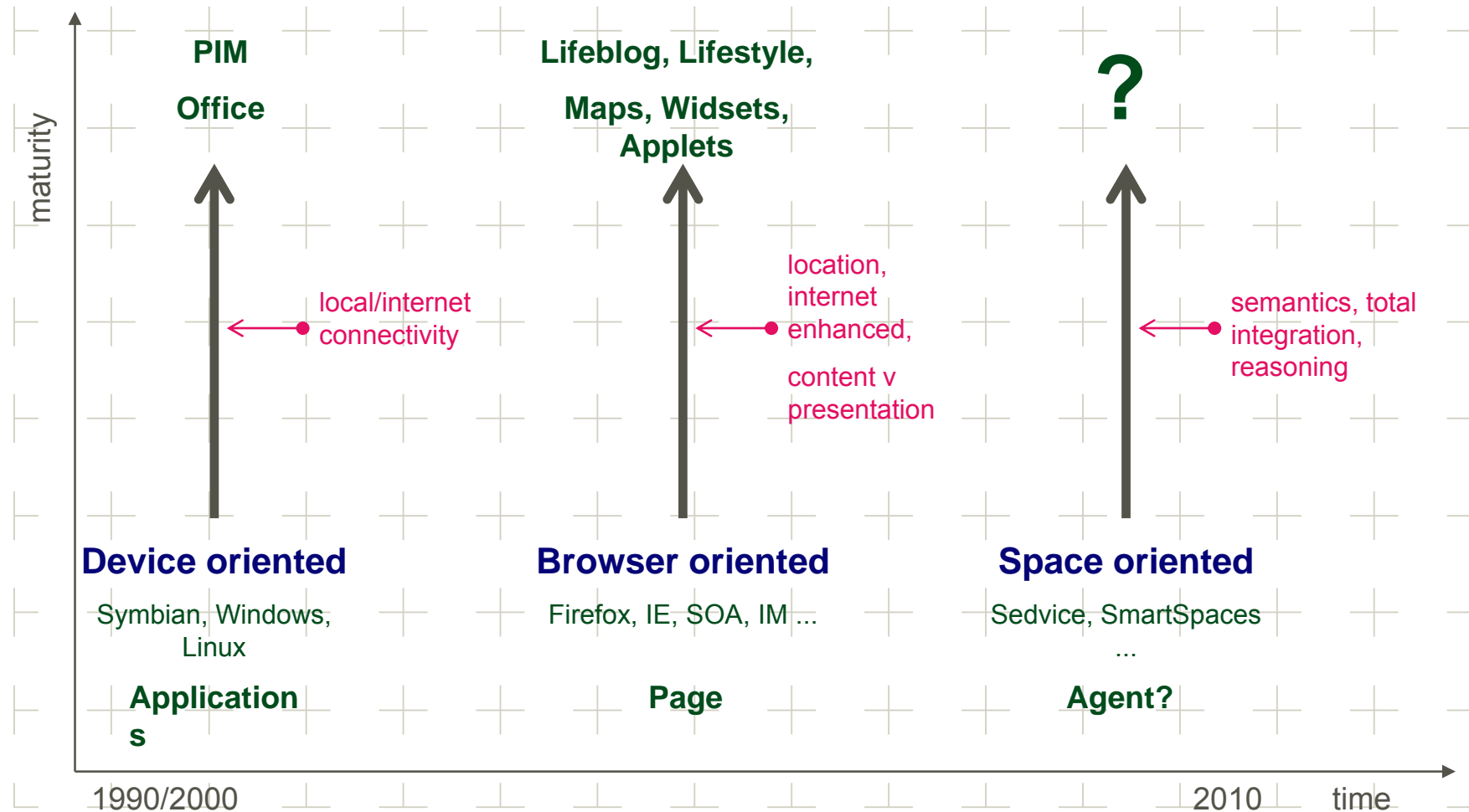




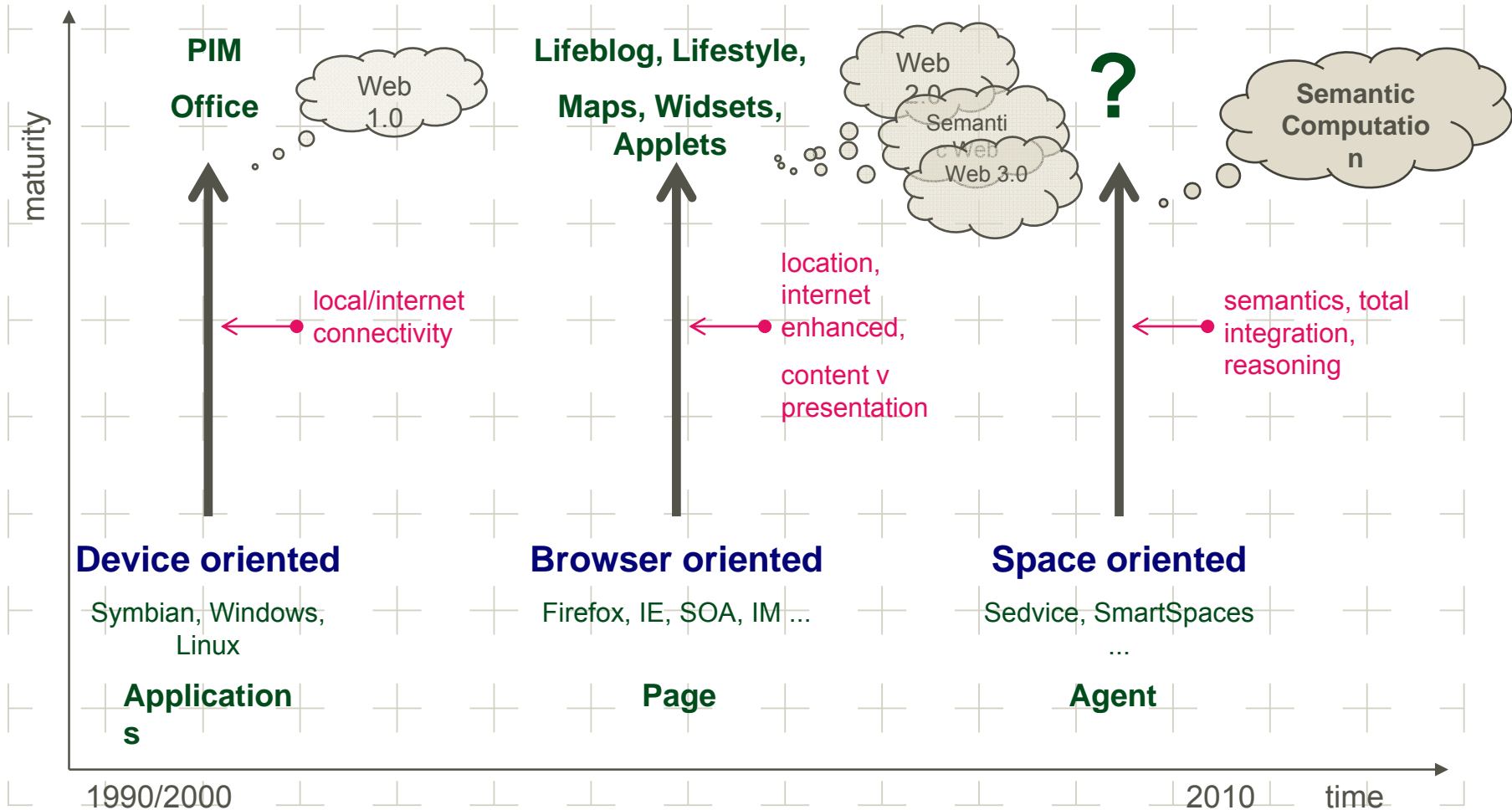
# Technologies - Applications



# Technologies - Applications



# Technologies - Applications



## Sedvice-M3

“An environment supporting an **space and actor/agent-based model of computation** upon a Semantic Web substrate providing for integration and interoperability between applications and devices”



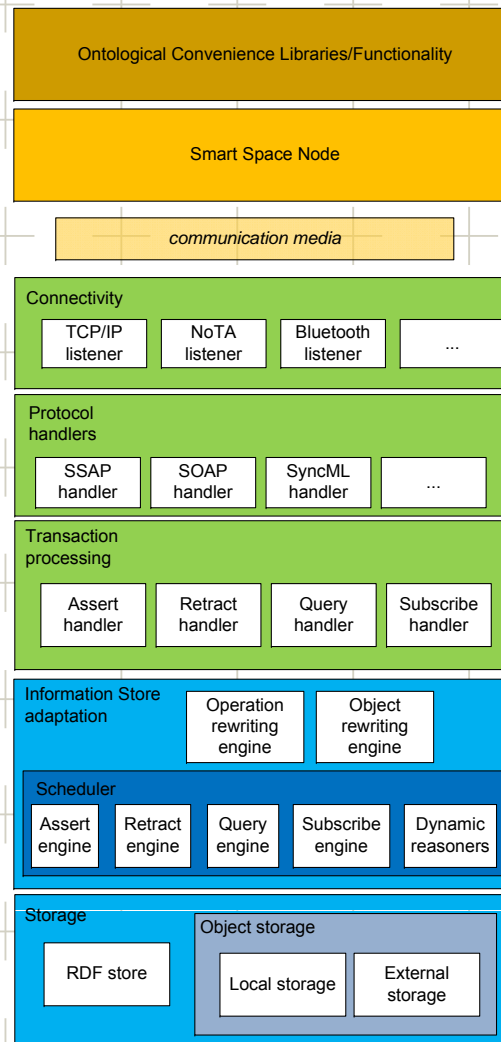
# Sedvice-M3 Philosophy

- space-based computing environment
- multiple, individual autonomous spaces
  - local information, reasoning, logics, ontologies etc
  - distributed deductive closure
- information sharing
  - RDF, Semantic Web
  - ontologies, tagging, folksonomies
- applications
  - constructed from agents
  - autonomous, anonymous, distributed, mobile
  - ontological control-flow

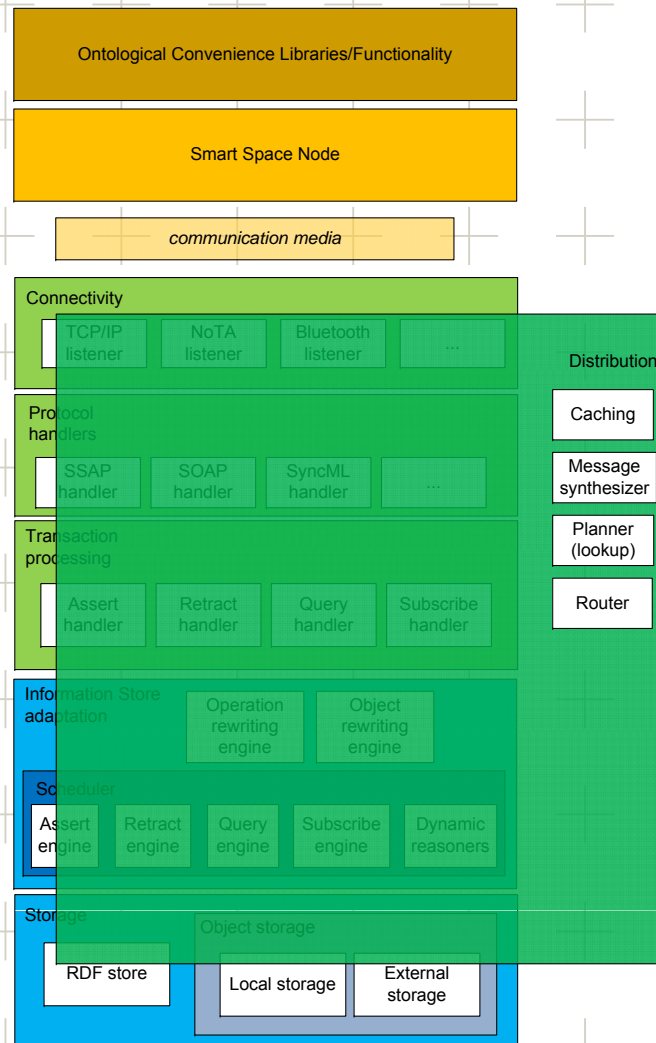
- no control flow !!??
  - may be made "outside" of the system via NoTA, UPnP, web services etc.
- semi-structured information
  - no strict ontology conformance
  - inconsistent information
  - free logics
  - non-monotonic
- semantics of information, belief and truth maintenance responsibility of the reader
  - everything is information
  - everything is first-order



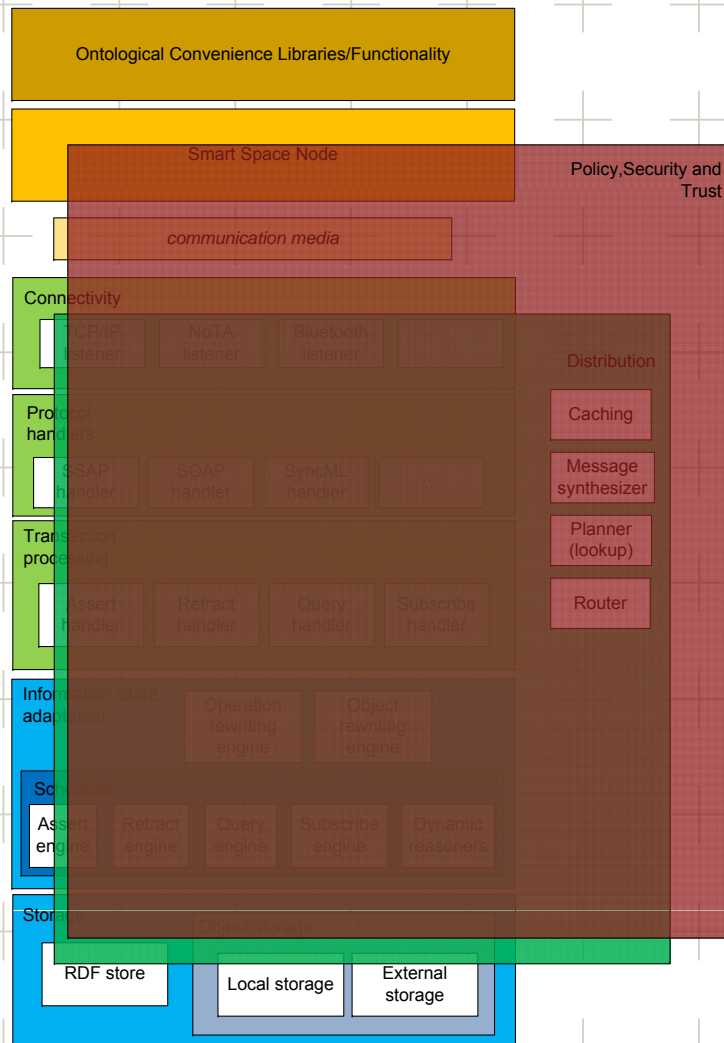
# Sedvice-M3 Architecture



# Sedvice-M3 Architecture

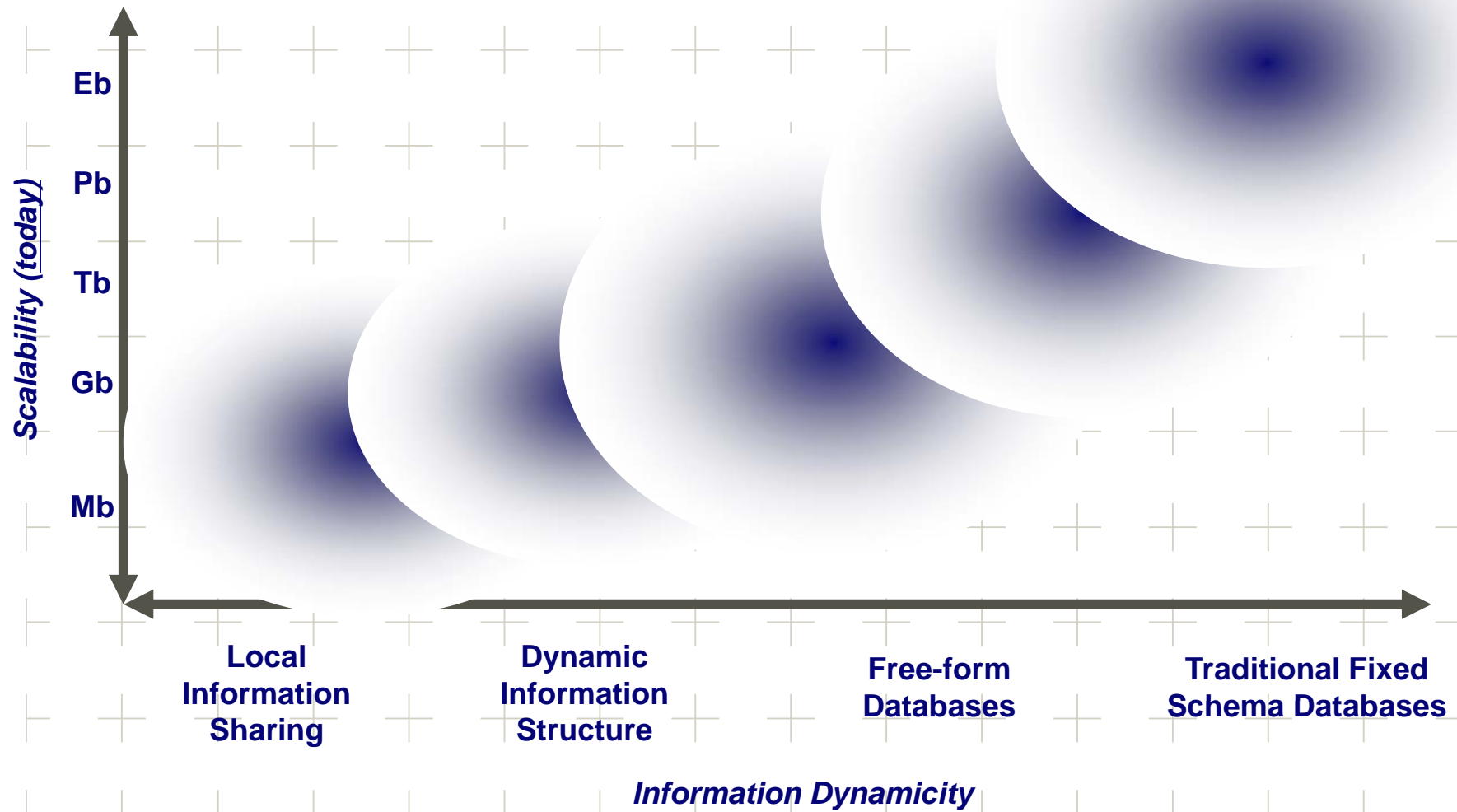


# Sedvice-M3 Architecture

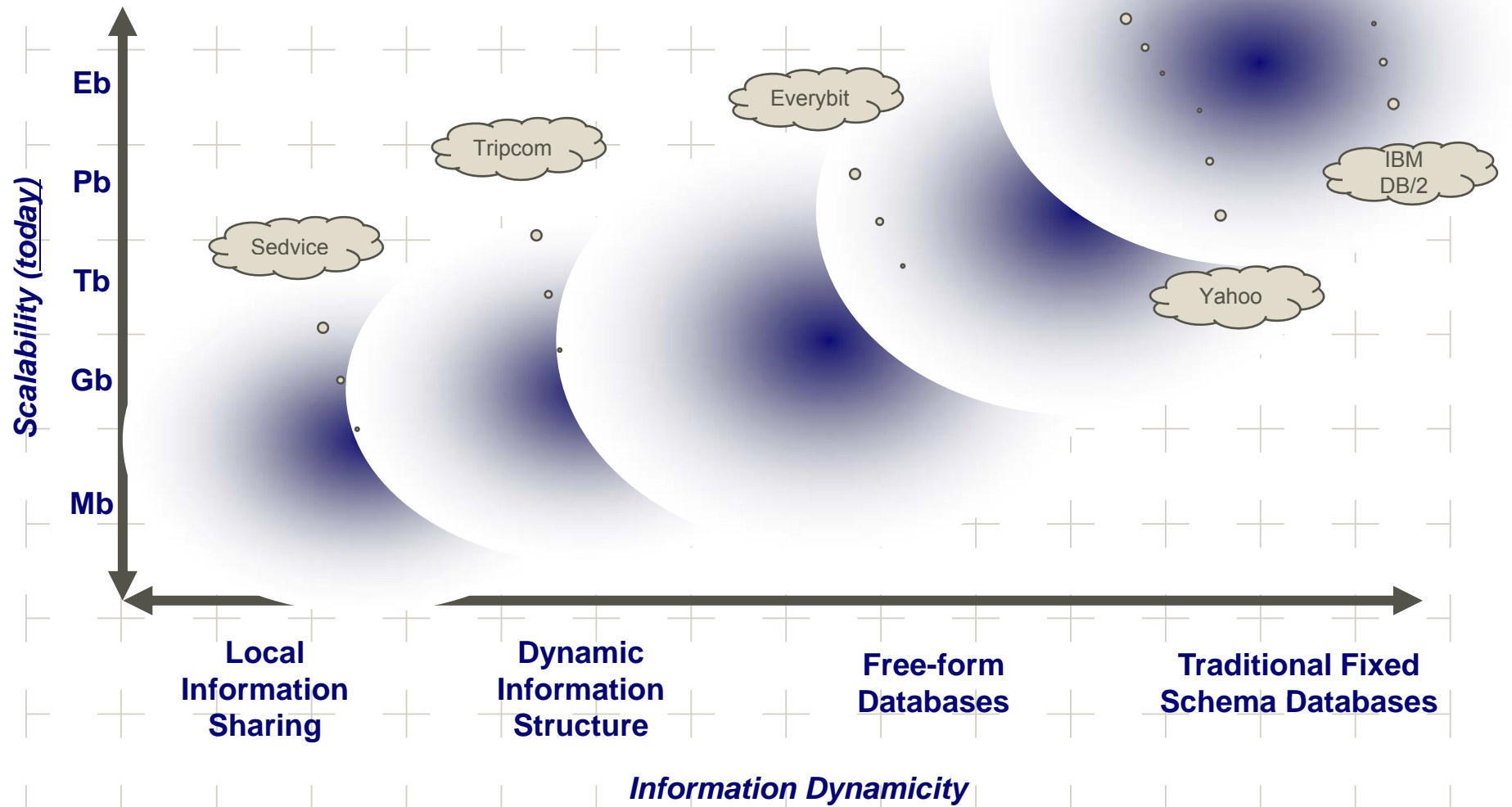




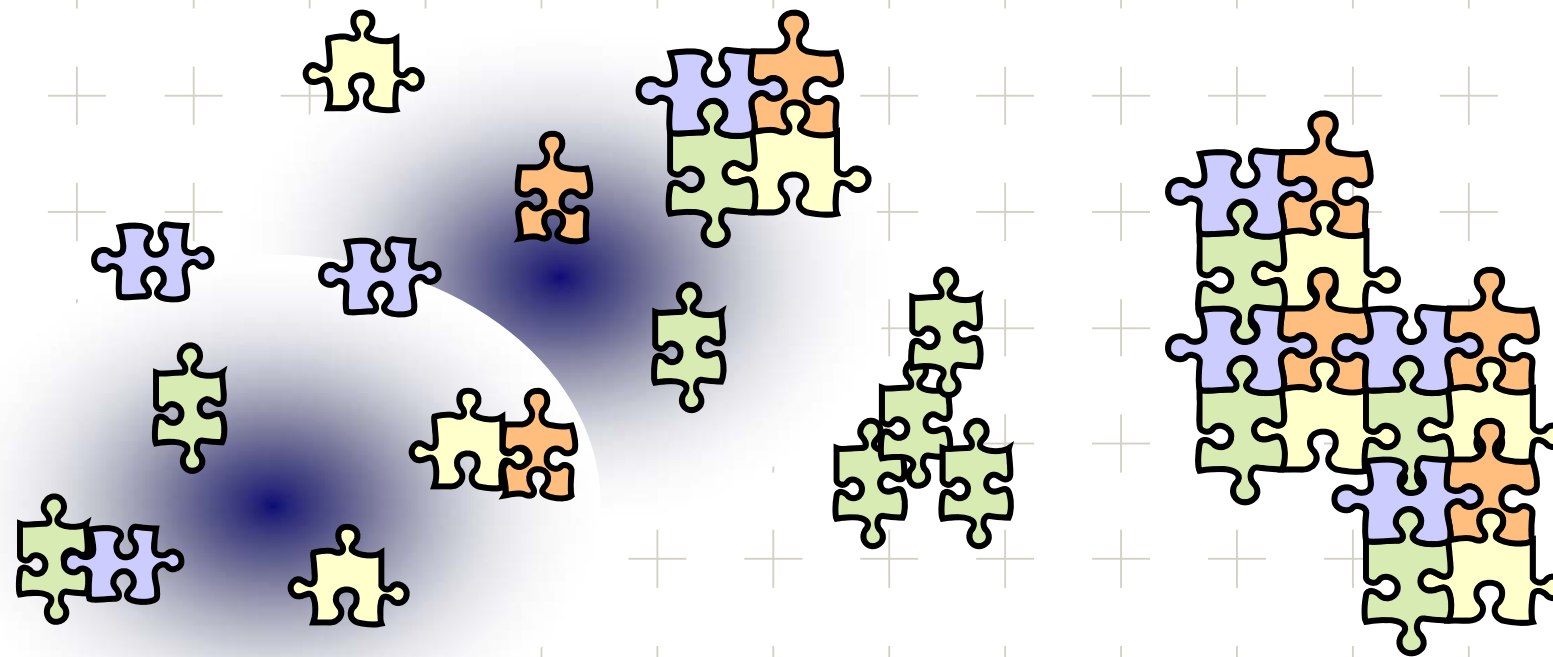
# Scalability



# Scalability



# Application Construction



Highly  
Unstructured

Highly  
Structured

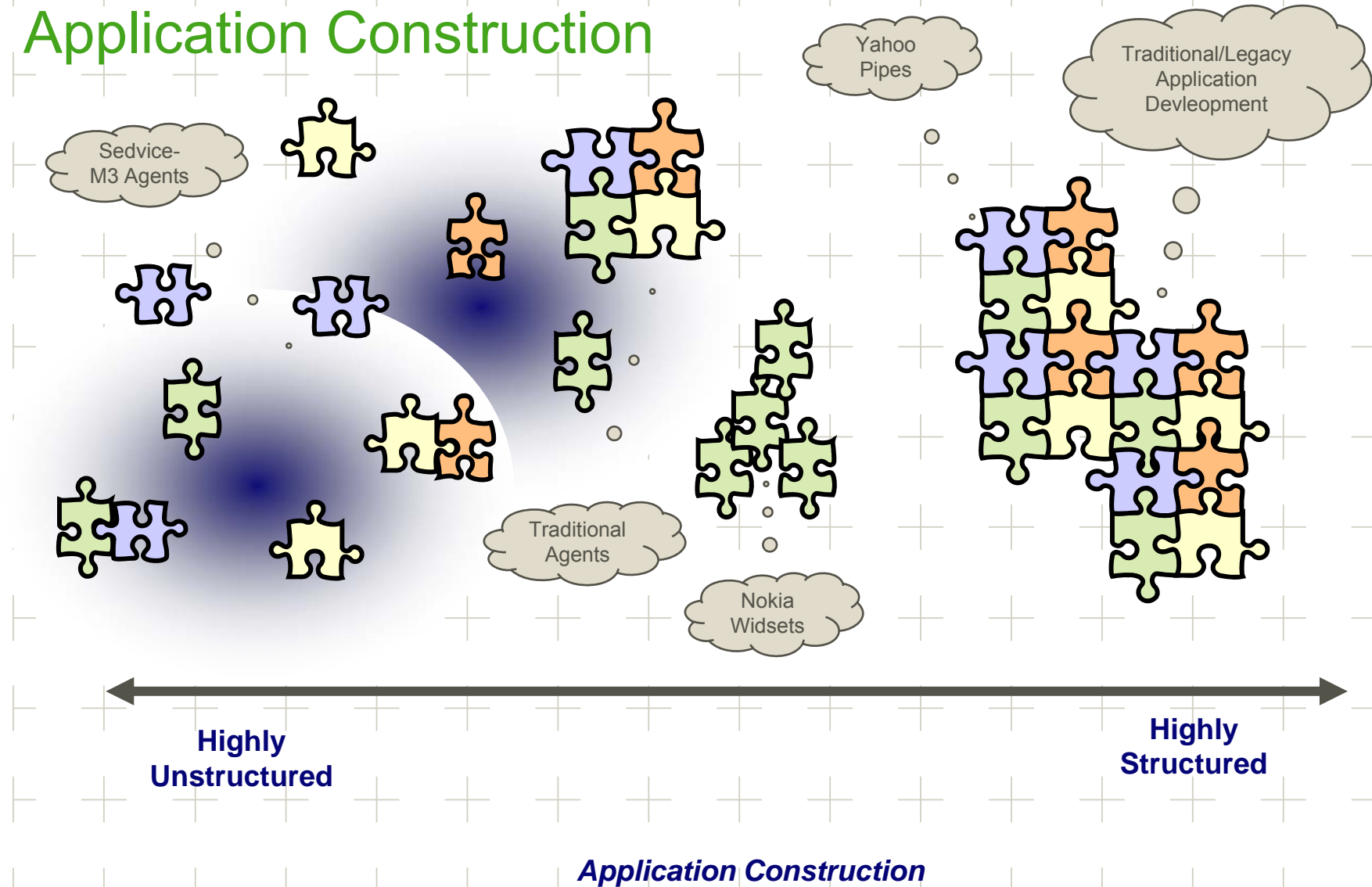
*Application Construction*



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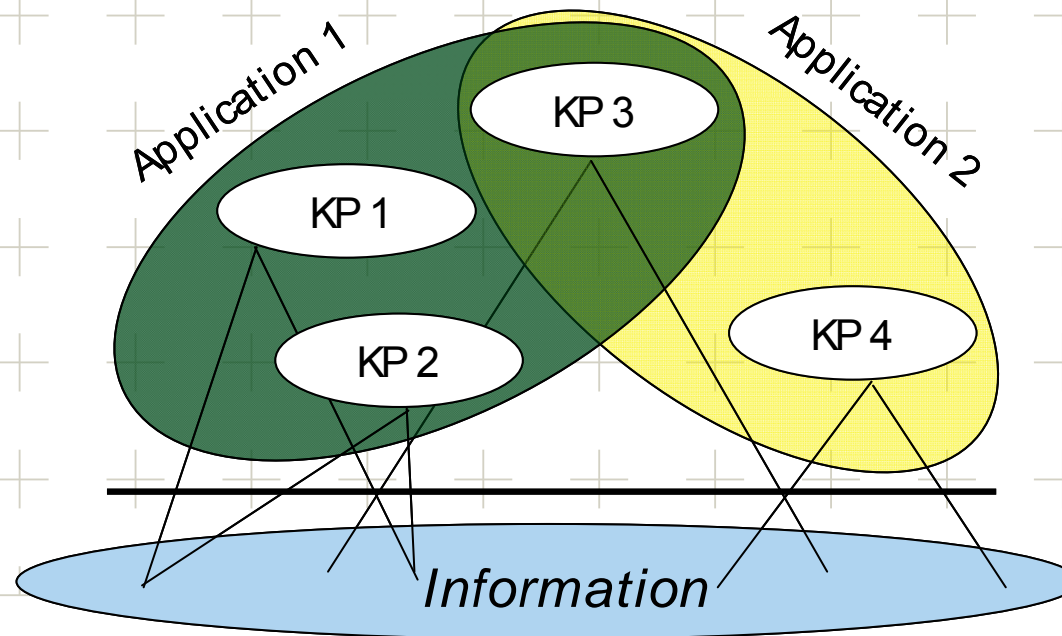
# Application Construction



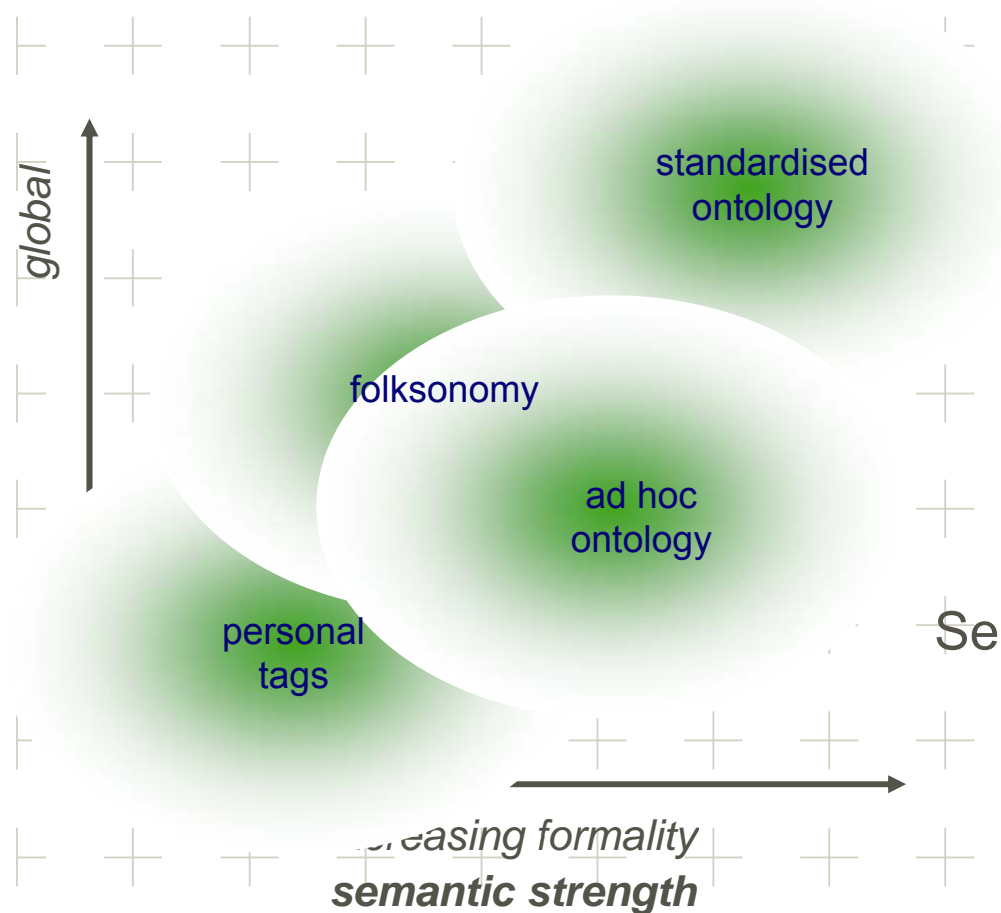
# Application Construction

Agents understand their own, non-exclusive part of the set of information available in a space

Applications emerge from actions over the information



# Ontology Evolution



ontologies might not be static:

· Tagging

· Folksonomies

· Standardisation

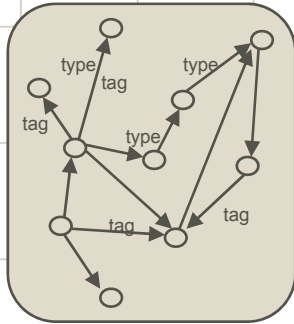
· Ontology emergence

Semantic Grounding

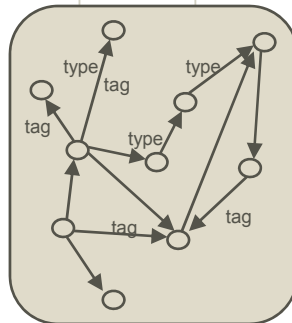
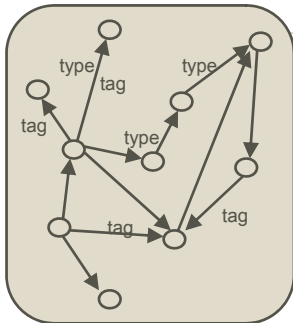
· semantic evolution, change and emergence



# Theoretical Underpinnings - Spaces

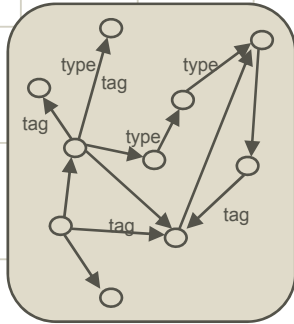


Individual graphs of information are localised as spaces

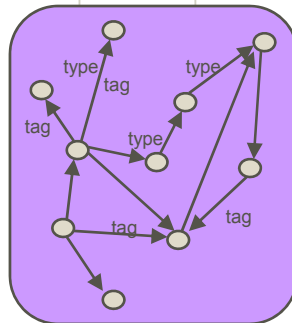
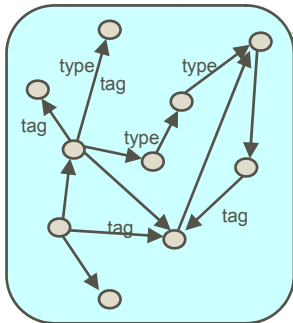


The partitioning of the “Giant Global Graph” concept into more localised and personal spaces.

# Theoretical Underpinnings - Spaces



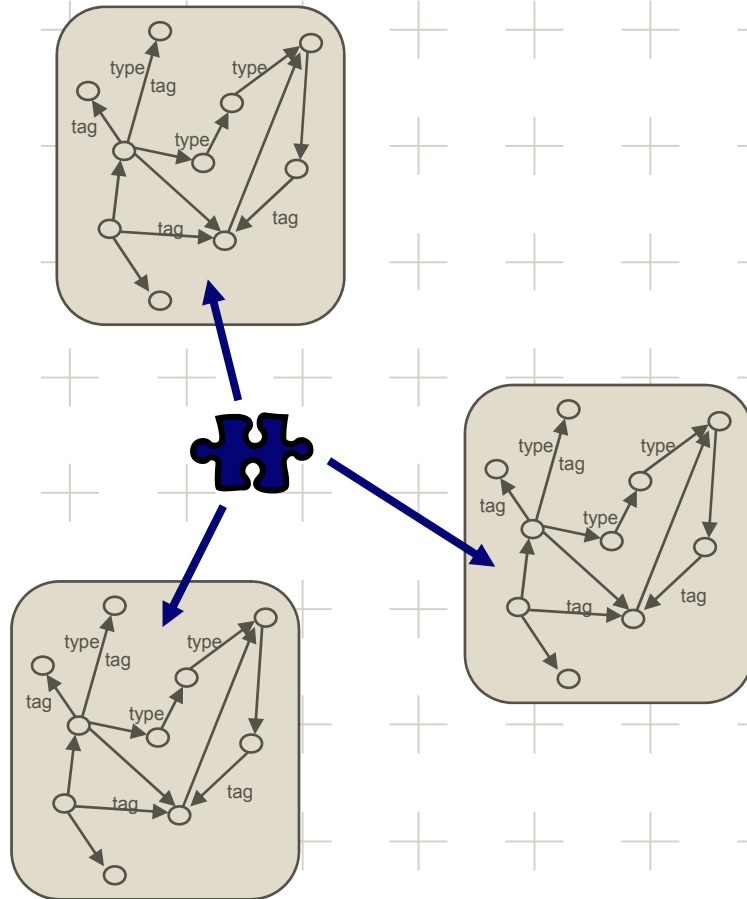
Individual graphs of information are localised as spaces



Each space may contain its own set of reasoning capabilities and logic for processing the given information

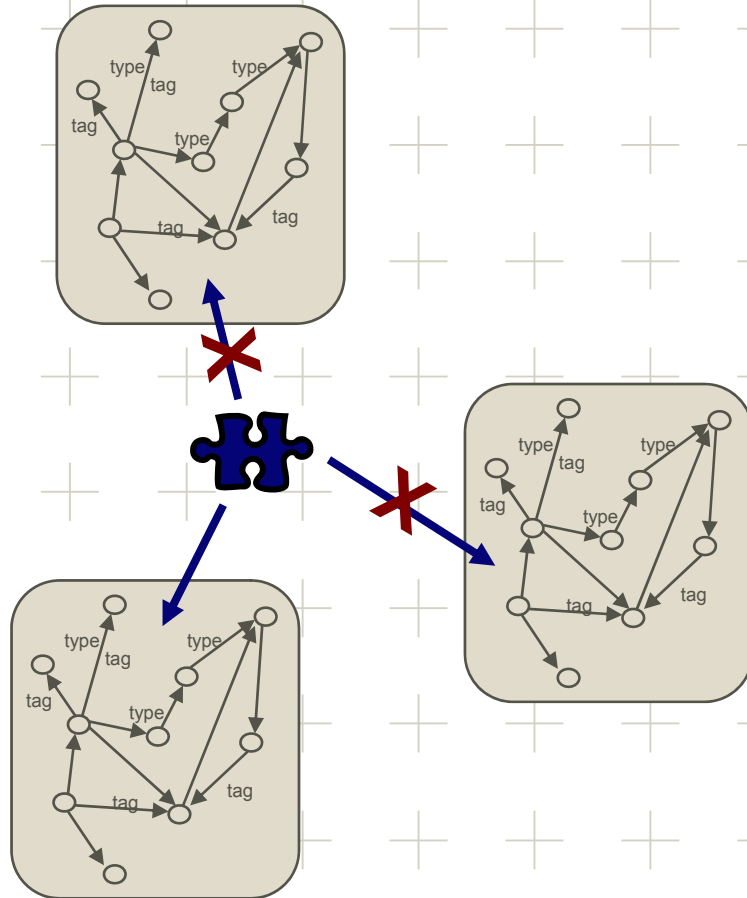


# Theoretical Underpinnings – Agents and Spaces



An agent may connect simultaneously to many spaces in order to gather the information it needs to reason over

# Theoretical Underpinnings – Agent-Space Membership

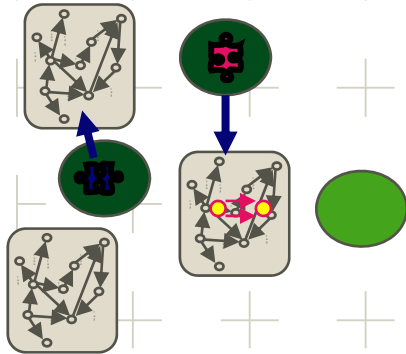


Spaces may be demarcated according to local policies

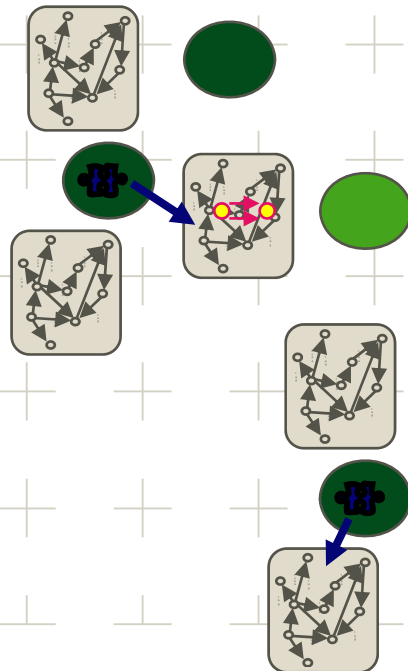
Possible demarcation criteria:

- identity (agent & user)
- location
- temporal characteristics
- keys

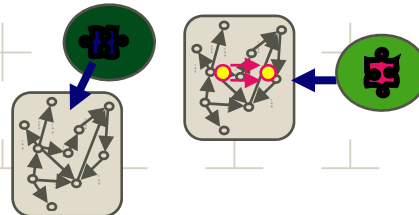
# Theoretical Underpinnings – Agent Mobility



Agents are *atomic entities* which execute on a *single device* at a time



Agents exist through spaces and are mobile related to spaces

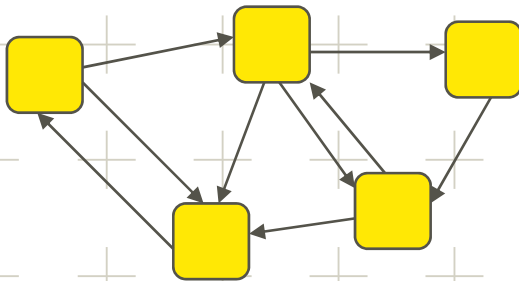


No mobility of code

# Theoretical Underpinnings – Space Structure



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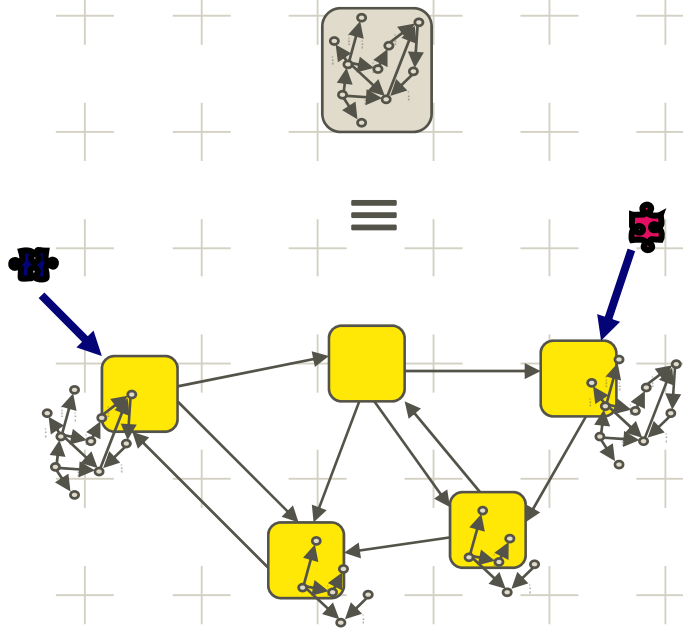


Spaces “just exist”

Spaces are represented by one or more **Semantic Information Brokers (SIB)**

SIBs making up a space are **totally routable**

# Theoretical Underpinnings – Space Structure

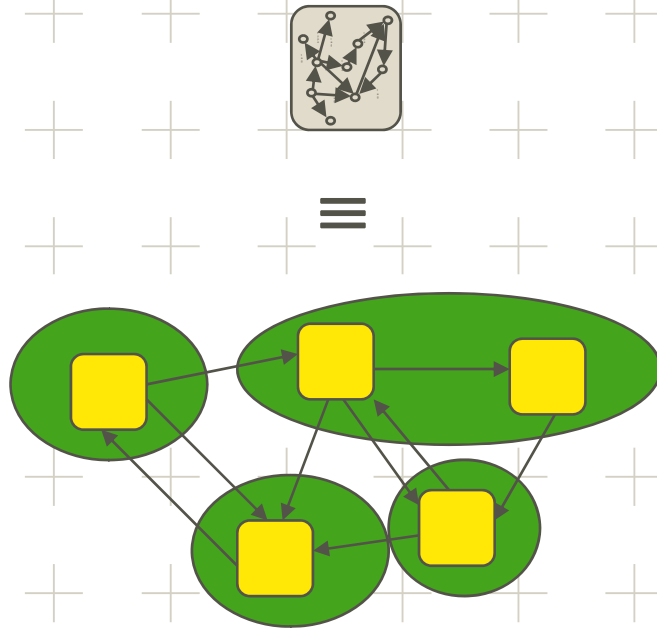


Each space contains:

- connectivity functionality
- information storage
- query distribution and information store synchronisation
- deductive closure calculation mechanisms

Agents always get consistent view of all information

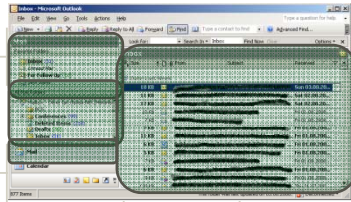
# Theoretical Underpinnings – Spaces and Devices



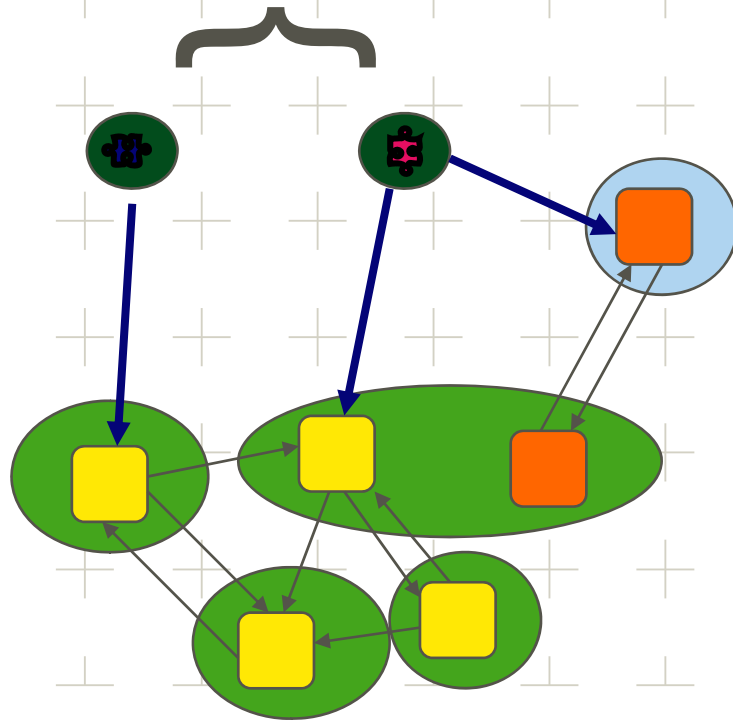
SIBs may have different storage and processing capabilities depending upon the hosting device

The capabilities of a space are given by the union of all the capabilities of the individual SIBs representing that space

# Theoretical Underpinnings – Device Abstractions



emerges from



Applications emerge from agents

Spaces emerge from SIBs

The notion of application is detached completely from its physical presence in any device

Even in UI the composition of an application UI is detached from the agents themselves

# Current Research

- Security
- Policy
- Trust
- Ontology Construction
  - tagging, folksonomies
  - ontology evolution
  - information recycling
  - semantics
- Synchronisation and Co-ordination of agents
- Connectivity Solutions
  - legacy integration
- Reasoning
  - non-monotonic logics
  - description logics
  - planning, AI ...
- Application/Agent Construction
  - tool environments
  - verification/validation strategies
- Distribution
  - query distribution and optimisation
  - distributed deductive closure calculation



# References

- Oliver, Honkola (2008) **Sedvice: A Triple Space Computing Exploration Environment**. Tripcom Workshop, Galway, April 2008
- Oliver, Honkola (2008) **Personal Semantic Web Through A Space Based Computing Environment**, MSW @ ICSC08, Santa Clara, August 2008 (arxiv.org: 0808.1455)
- Oliver, Honkola, Ziegler (2008) **Dynamic, Localised Space Based Semantic Webs**, WWW/Internet Conference, Freiburg, October 2008

Forthcoming:

- **Space Based Semantic Webs**, Journal of Semantic Computation, Sept'08
- **Semantic Computation**, Journal of Semantic Computation, Dec'08

# The Demo

The demo shows interoperability between an exercise logger (e.g. SportsTracker), a game and external speakers. When starting to play the game, the speakers react to the situation. If user has been exercising a bonus will be given in the game. The different components are not aware of each other—they only insert information about themselves to the smart space.

