

# Smart Indicator Environment

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# TEN Competence

Building The European Network for Lifelong Competence Development



# Smart Indicator Environment

Christian Glahn



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# Overview

- Background, Purpose, and Objectives
- Context Model
- Smart Indicator Architecture
- Building and Processing Learner Profiles
- Context Adaptation
- Web Integration



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*with the context*  
Learning changes ~~throughout life~~

... and the learner support has to change, too!



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Knut Illeris

# The Challenge

How to utilize  
interaction footprints  
for learner support in  
unstructured or emerging  
environments?



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# Our Approach

Highlight and unveil

interaction footprints

(about effort, interest, and concepts)

for *reflection support*

to the learner



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# The underlying Interaction-Model

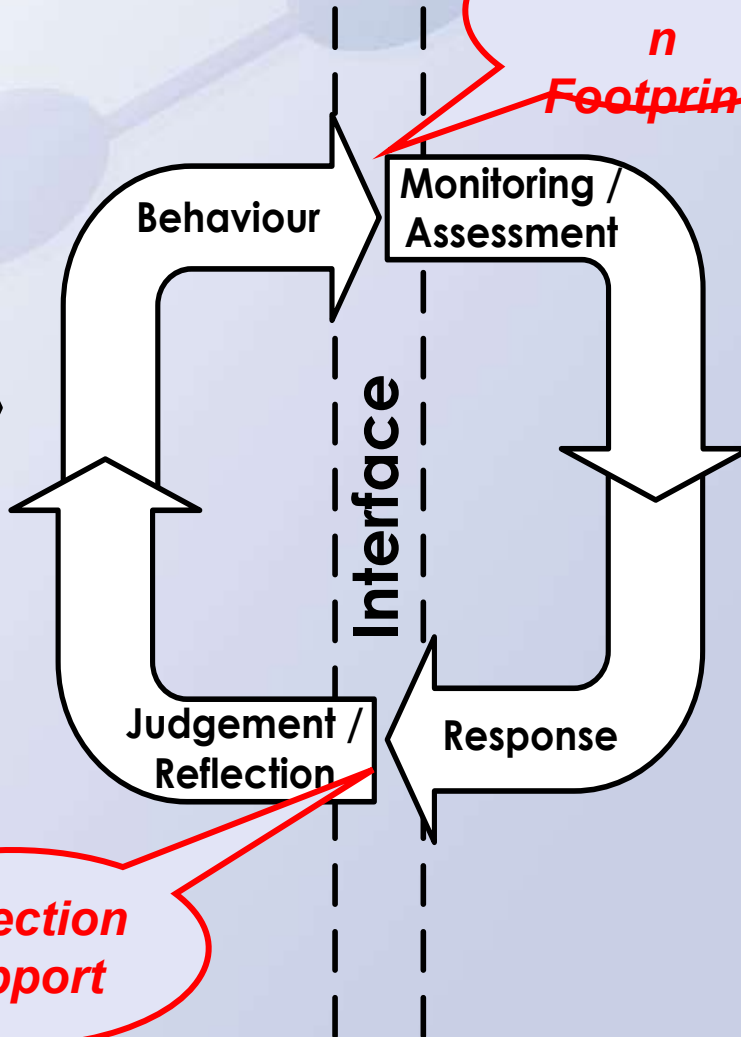
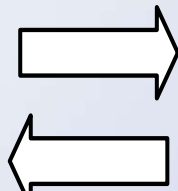
(Dey, 2000)



Actor

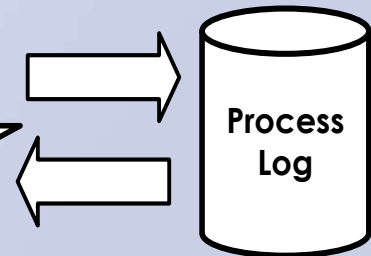


Experience Knowledge

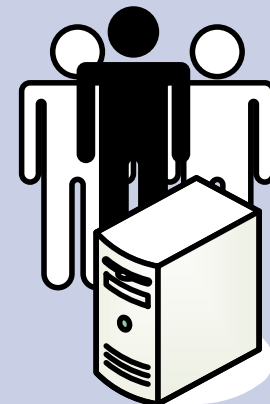


*Interaction  
Footprints*

*Reflection Support*



Process Log



System

(Butler & Winne, 1995)



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# Example: Context Adaptation for Informal Learning

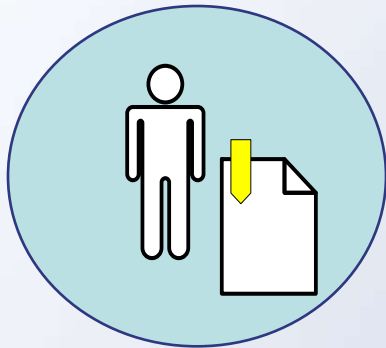


**Engage**


▼ activity 

▼ tags ComputerGames ComputerHistory  
ComputerScience Demos Design Flash  
FutureTechnologies GameBasedLearning Gaming  
GraphicDesign GUI HCI Journals JSON  
LearningTechnology Literature LSA Mace MMURPG  
MobileLearning OpenSource SOAP SocialSoftware  
TENCompetence Usability Visualisai  
WebAnimation WebApplications We  
XUL

*actions*

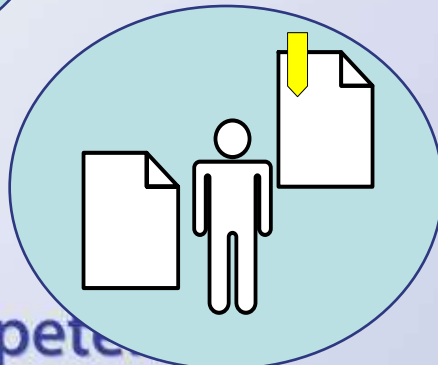


**Motivate**


▼ activity 

▼ tags ComputerGames ComputerHistory  
ComputerScience Demos Design Flash  
FutureTechnologies GameBasedLearning Gaming  
GraphicDesign GUI HCI Journals JSON  
LearningTechnology Literature LSA Mace MMURPG  
MobileLearning OpenSource SOAP  
TENCompetence Usability Visualisai  
WebAnimation WebApplications We  
XUL

*performance*



**Reflect**

▼ activity 

▼ tags ComputerGames **ComputerHistory**  
ComputerScience Demos Design Flash **Flow**  
FutureTechnologies GameBasedLearning  
**GraphicDesign** GUI HCI Journals JSON  
**LearningTechnology** Literature LSA Mace  
MMURPG MobileLearning OpenSource **Perl**  
SOAP SocialSoftware  
**TENCompetence** Usability  
Visualisation Web WebAnimation  
**WebApplications** WebDesign XML XUL

*interest*



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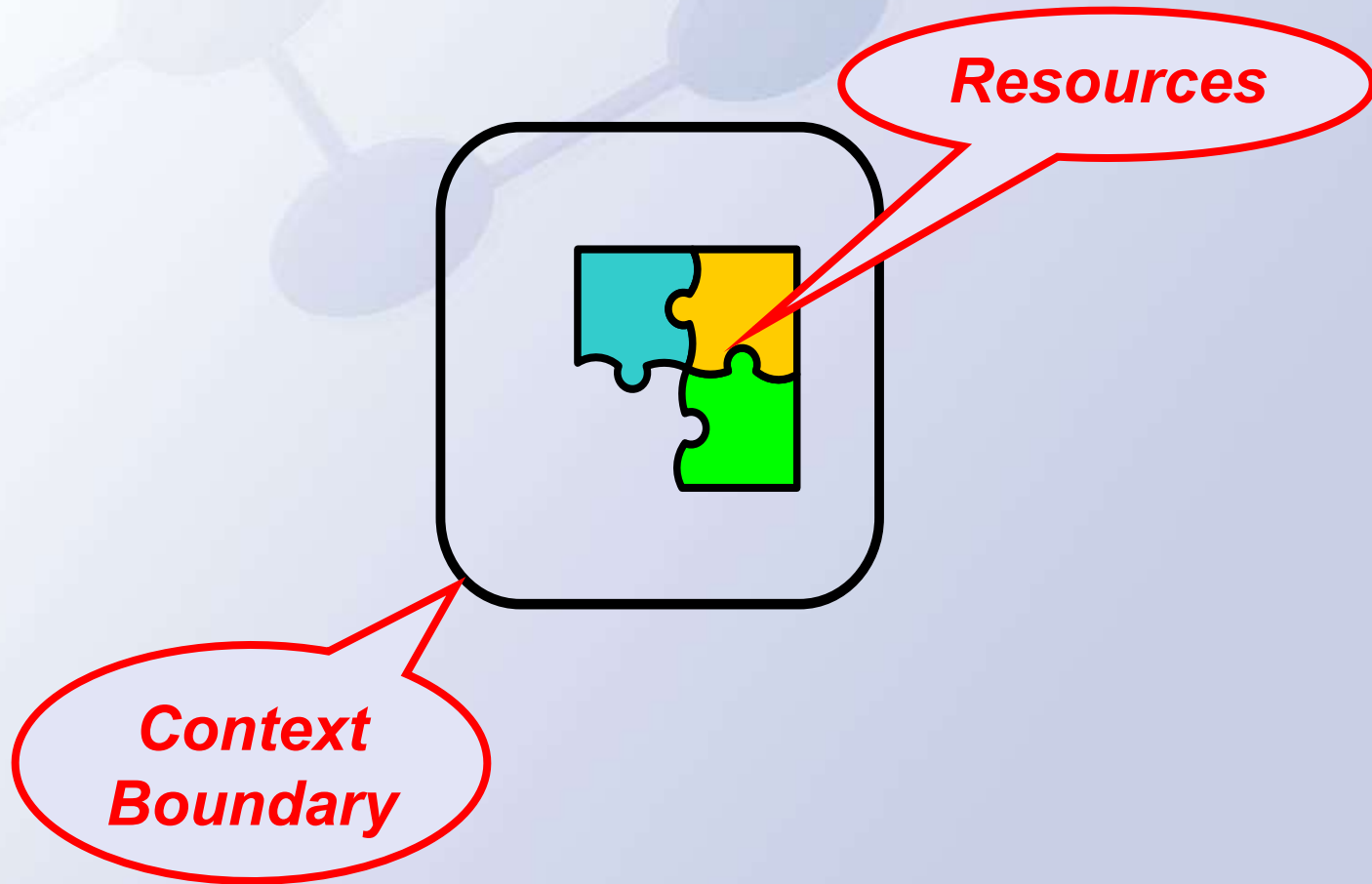
# The Context Model



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# Core Elements



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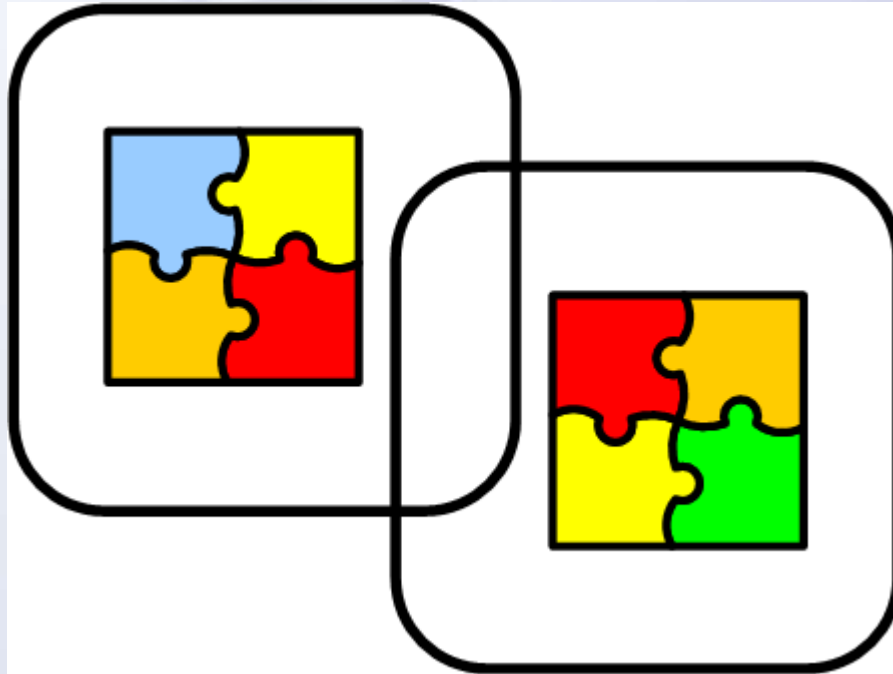
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# Context Boundaries

- Constants
- User or Environmental Variables
  - User ID
  - Physical Location
  - URL
  - ...
- Aggregator References
- Conditions
- Results are always TRUE or FALSE



# Adaptation Strategies



***Adaptation  
Strategy***



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# Adaptation Strategies

- Pre-defined or Static Strategies
  - Controlled
  - Driven by design principles
- Dynamic Strategies
  - On-the-fly combining of context definitions
  - Driven by
    - User preferences
    - Process dynamics
  - Combine static strategies



Think Adaptation Strategies the Web2.0 way

Parts and components that can  
be integrated and reused in  
unforeseen contexts

**Limit design to context definitions**



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# Why is it called “Smart Adaptation”?

- Context boundaries are rule based
- Adaptation depends only on Boolean operations
- No artificial intelligence is required

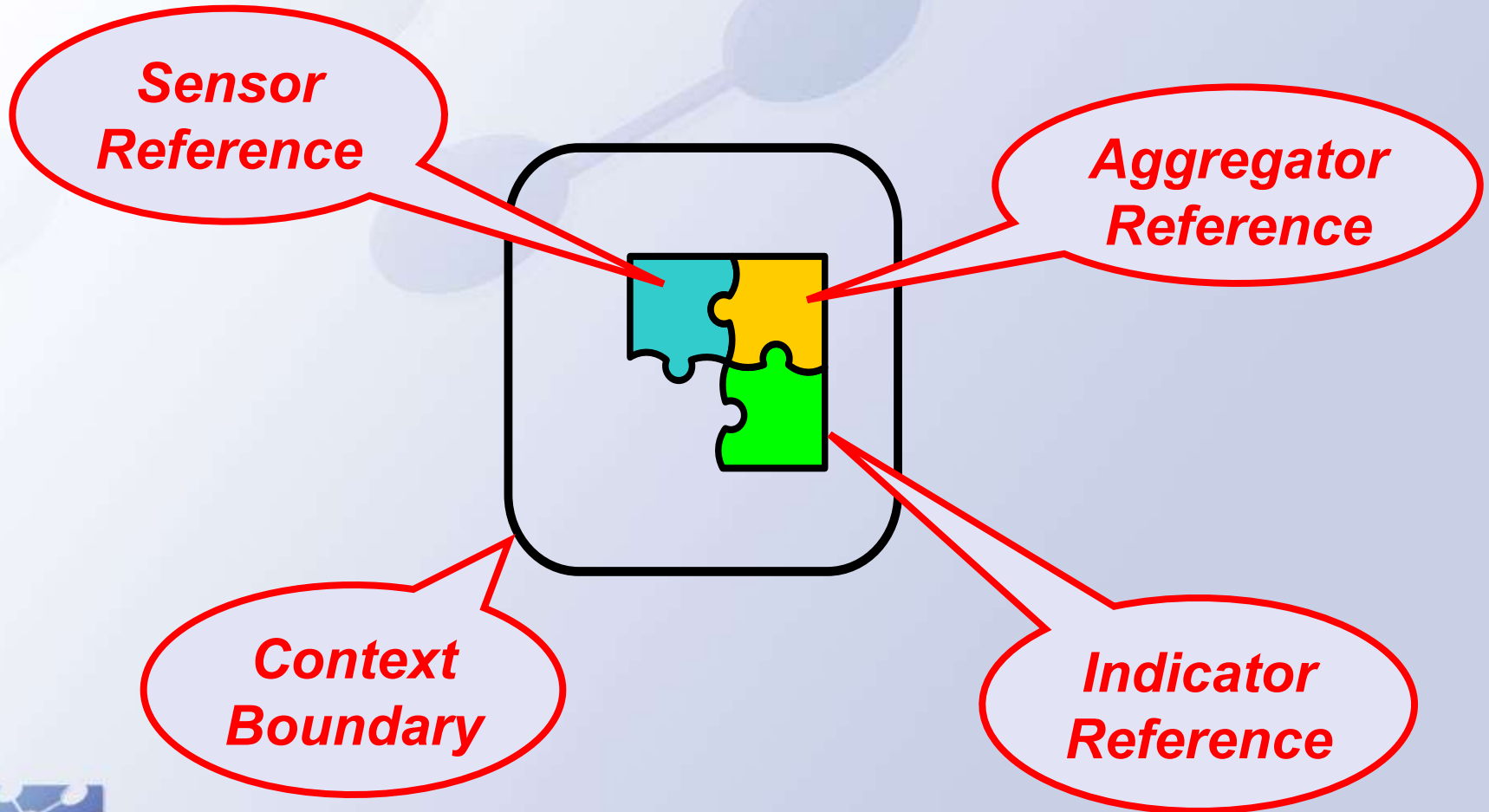


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# Smart Indicator Contexts



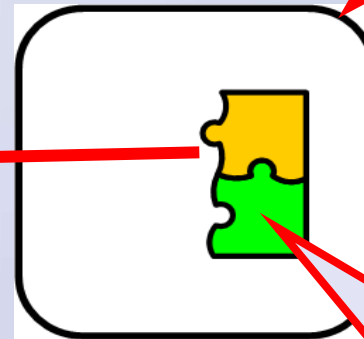
# Explore and Engage



**activity**

**tags** clear selection

ajax architecture art audiocaster blog  
coding conferences context coolstuff  
culture design education events flash  
gaming hci home innovation javascript  
kinder languagetechology learning  
learningtechnology linux literature mace  
mobile mobilelearning museum music  
opencontent opensource oss perl  
projects publications **research**  
semanticweb smalltools socialsoftware  
software technologiez technology  
tencompetence theory tools web2.0  
**webapplications** wiki

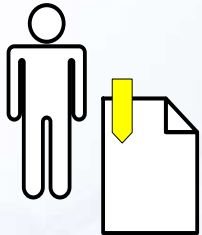


**#blog-entries = 0**

- click through
- delicious links
- page visits

**every action counts**

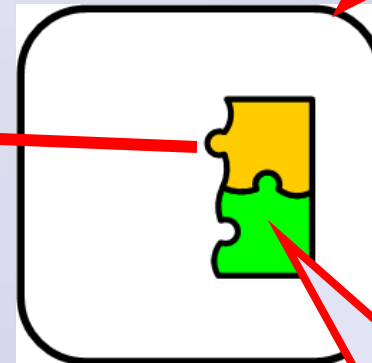
# Compare and Motivate



**performance**

**tags** [clear selection](#)

ajax architecture art audiocaster blog  
coding conferences context coolstuff  
culture design education events flash  
gaming hci home innovation javascript  
kinder languagetechnology learning  
learningtechnology linux literature mace  
mobile mobilelearning museum music  
opencontent opensource oss perl  
projects publications **research**  
semanticweb smalltools socialsoftware  
software technologiez technology  
tencompetence theory tools web2.0  
**webapplications** wiki



**#blog-entries >**

- delicious links \* 5**
- blog entries \* 10**
- click through \* 1**

**every action has its value  
for the user and the community**

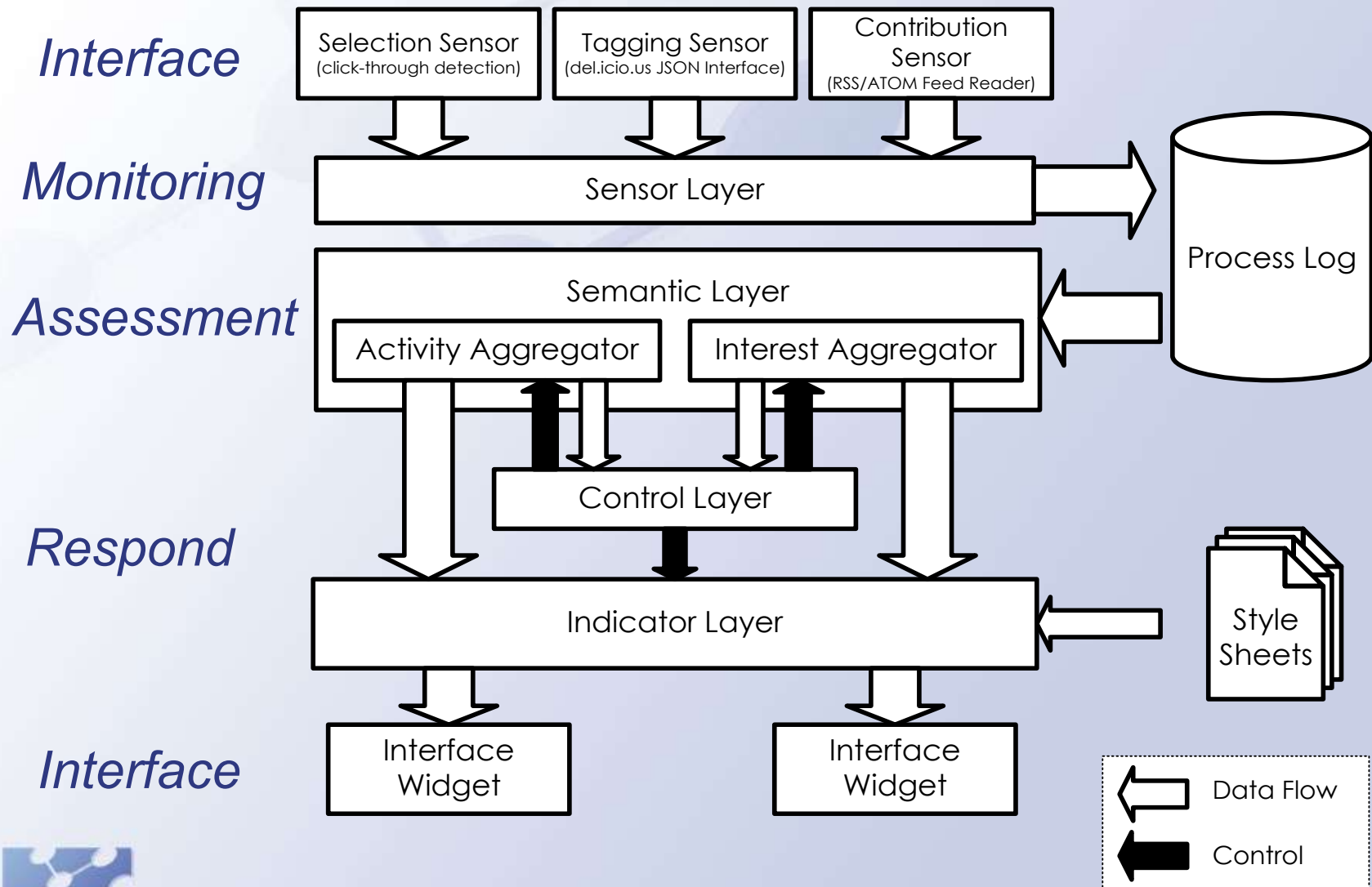


# The Smart Indicator Architecture

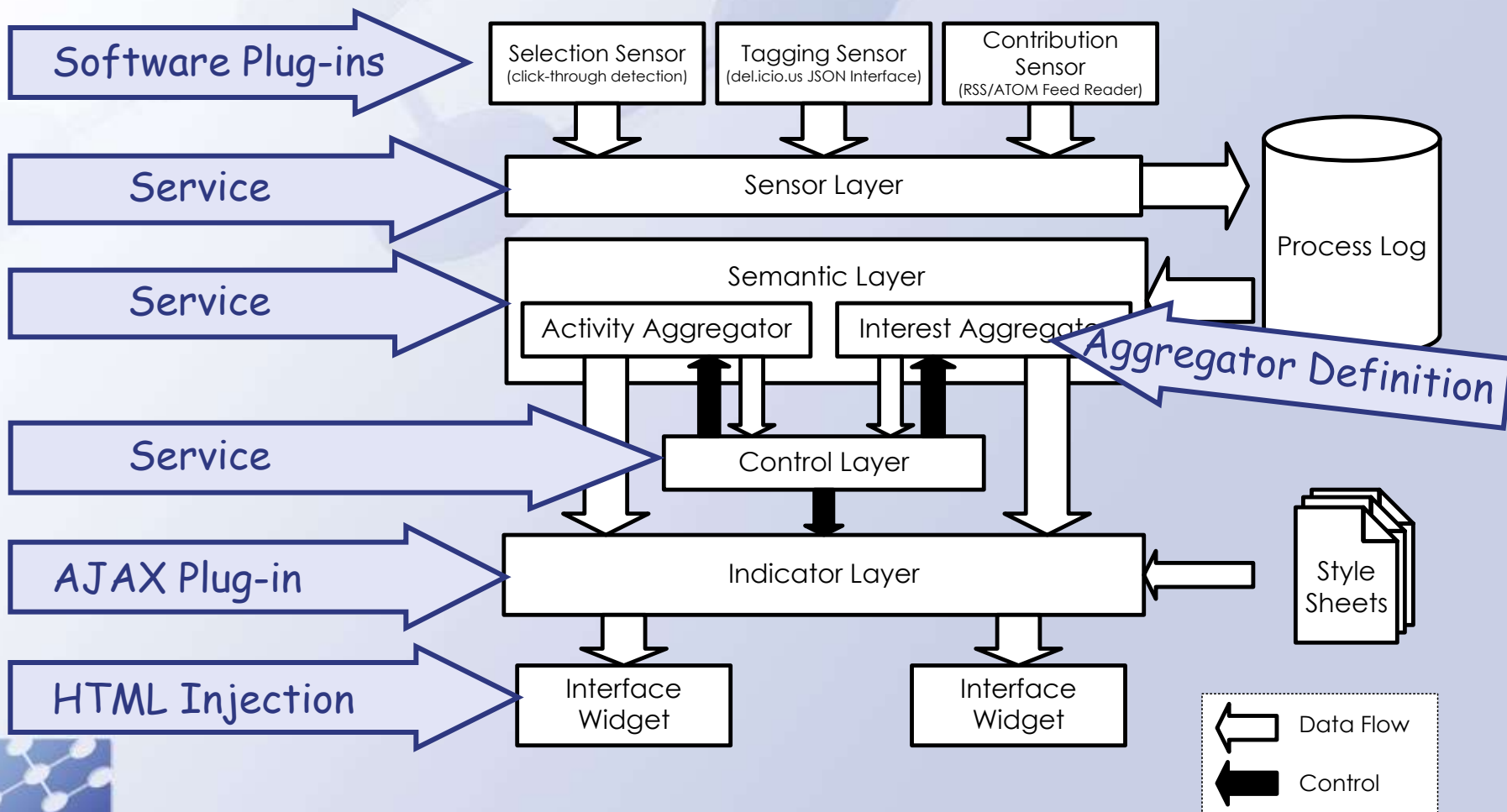


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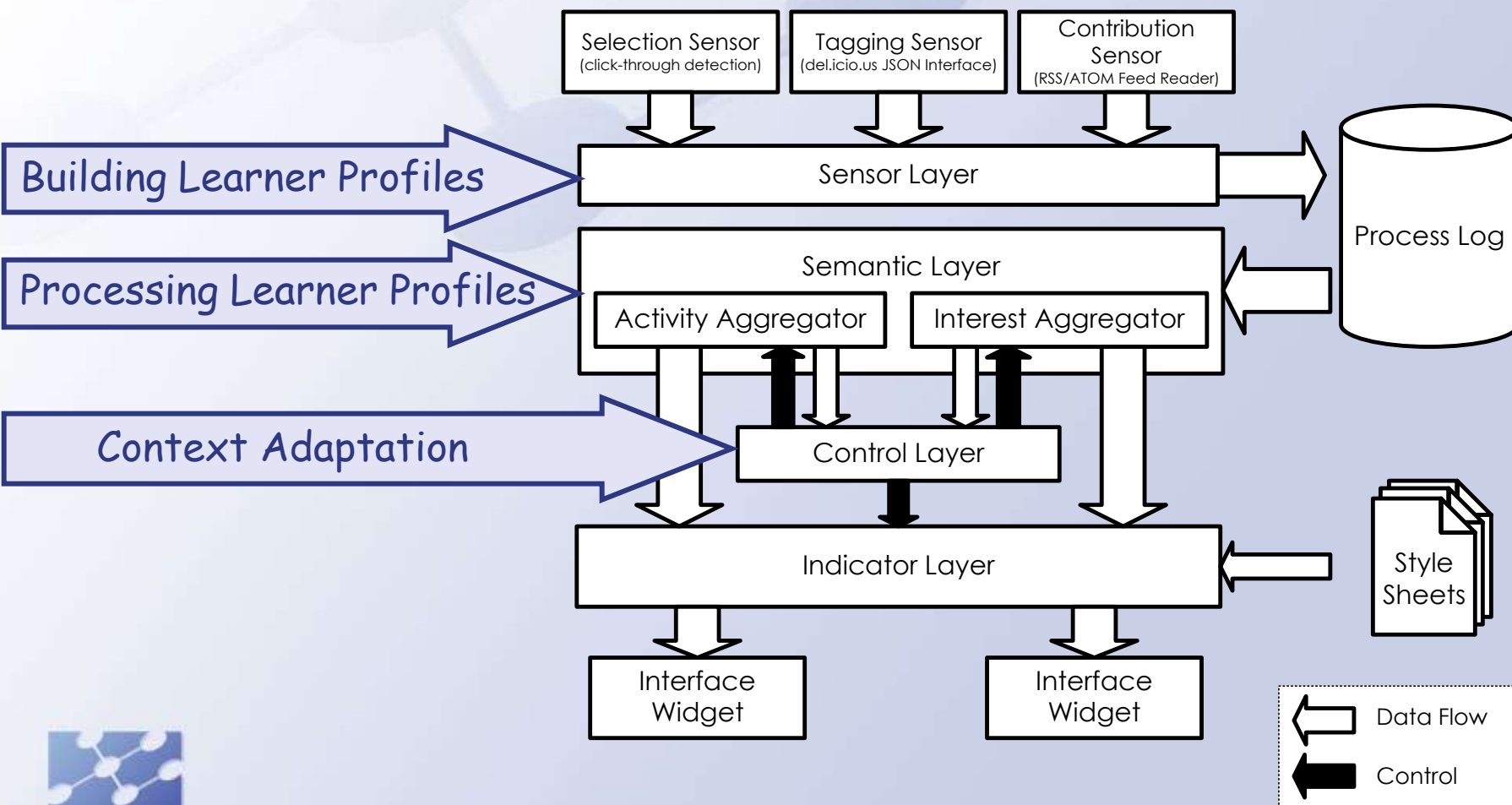
# Actual Implementation



# A Few Technical Details about the Services

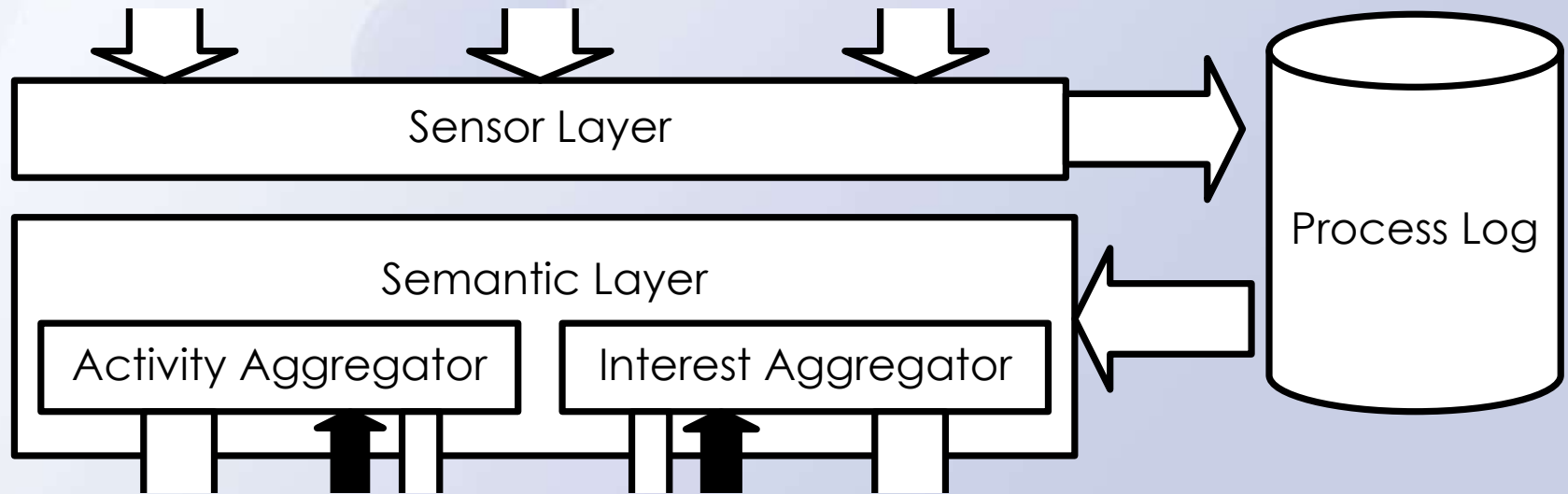
- RESTful services
- implemented as LAMP  
(Linux, Apache, MySQL, and Perl)
- XML and JSON as output content types
- XML and JSON as input content types

# Purpose of the Architecture





# Building and Processing Learner Profiles



# Sensor Layer

- Simple Sensors Registration
- Collects Interaction Footprints
- Extensible Sensor Events
- Sensor Event Clustering

The sensor layer is ***not*** a replacement of Log4J or similar debugging systems



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# Simple Sensor Registration

- Attach new sensors to the sensor layer
- Start to send events from the sensor



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# Collect Interaction Footprints

- Sources
  - RSS News Feeds
  - Del.icio.us Bookmarks
  - Online Web-interaction
- Sensors submit interaction events
- Interaction events are stored in the learner's process log



# Extensible Sensor Events

- Core data
  - Sensor ID
  - Referrer URL
  - Recoding Time
  - Referee URL (optional)
  - User ID (optional)
- Additional Attributes
  - Named and anonymous attributes
  - No limit of attributes



# Sensor Event Clustering

- Collect events from multiple sensors at once
- Minimize network traffic
- Allow sensor caching, sensors proxies, or sensor cues

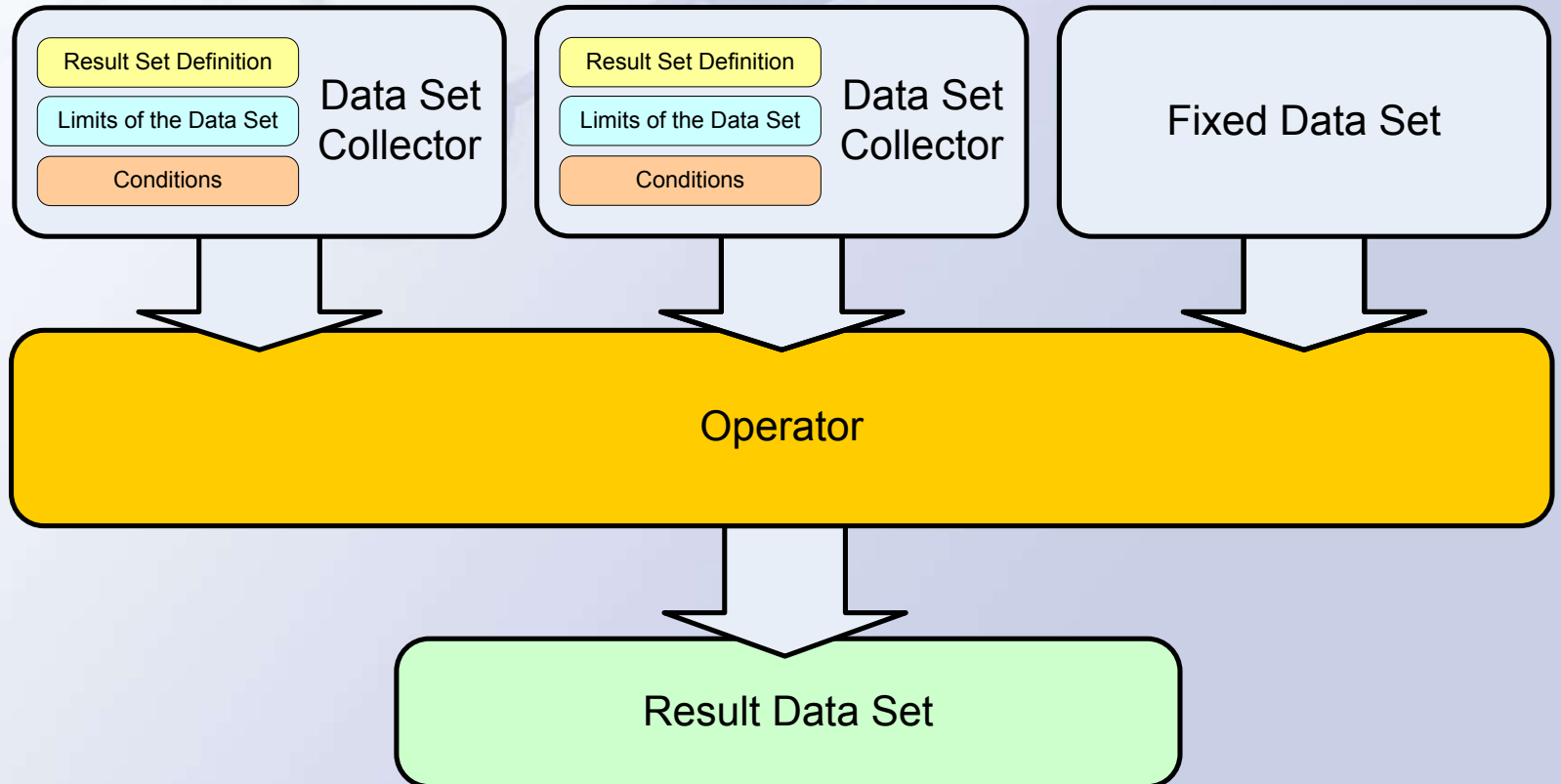


# Semantic or *Aggregation* Layer

- Analyze the process log
  - Anonymous analysis
  - User centered analysis
- Open framework for sensor analysis
- Named aggregators
- Extension through aggregator scripts

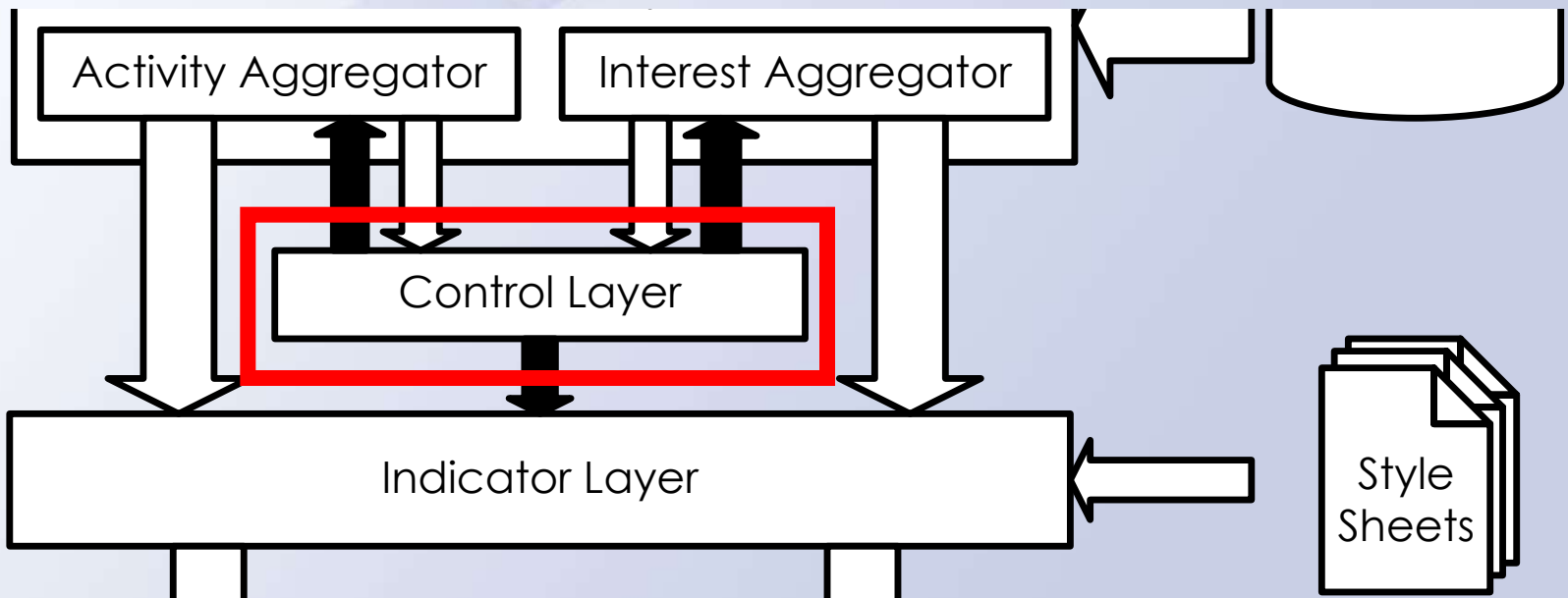


# Aggregator Scripts





# Context Adaptation



# Key functions

- Test context boundaries
- Provide a list of active contexts
  - For a user
  - For a location
  - For a URL



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# Test context boundaries

Request information from a given aggregator

- Optional: with user information

Test the result set of the aggregator with another value

If the test succeeds the context is considered as active



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# Provide a list of active contexts

*Result set contains for each context*

- Context reference
- List of resource URL
  - Aggregator references
  - Indicator style-sheet references



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# Web Integration



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# Case: TeamSpace

**Team Space**

del.icio.us Links

- [Blackboard Academic Suite](#)  
posted by Marcus Specht, on 2007-10-10 15:12:04
- [Programme - Online Educa Berlin 2007](#)  
posted by Marcus Specht, on 2007-10-17 14:48:03
- [ASSION Electronic - Kompliziertes machen wir einfacher](#)  
posted by Marcus Specht, on 2007-10-17 14:48:03
- [Ten Steps to Complex Learning](#)  
posted by Marcus Specht, on 2007-10-17 14:48:03
- [Apple - Web apps - All Categories](#)  
posted by Marcus Specht, on 2007-10-16 13:48:03
- [Eclipse IDE for Java Developers](#)  
posted by Marcus Specht, on 2007-10-15 13:48:03

Blog Entries

- [the platform is the platform is the ... 2.0](#)  
posted by Marcus Specht, on 2007-10-17 10:17:56  
I like discussion about web 2.0 especially those of dilbert. are you web 2.0 ready? So did you ever have such discussions with your colleagues? Lets stop buzzword bingo I mobile socialsoftware, technologie2, web2.0
- [Educating People](#)  
posted by Christian Glahn, on 2007-10-16 06:17:07  
Opposite to many people I met, I like clear communication and proper structure when it comes to work organisation. Maybe I am just in the wrong business, but the people I meet over time seem to prefer reinventing structure and hide important information in a lot of talk. Yesterday, I just learned one of these lessons. [read more](#)
- [Approaching Adaptation Smartness Systematically](#)  
posted by Christian Glahn, on 2007-10-06 18:48:17  
Since EC-TEL it has been pretty quiet here. But never mind, it wasn't that quiet under the surface. I have been pretty busy in polishing and breaking my [smart indicator prototype](#) and sharpening the evaluation design for the follow-up studies of my research. In this post I discuss some of preliminary results that nonpartum while I have been worked on the

Hello **Christian Glahn** [tools](#) [logout](#)

**performance**

**tags** [clear selection](#)

ajax architecture airt audiacaster blog coding conferences context coolstuff culture design education events flash gaming hci home innovation javascript kinder languagetechnology learning learningtechnology linux literature mace mobile mobilelearning museum music opencontent opensource oss perl projects publications **research** semanticweb smalltools socialsoftware software technologie2 technology tencompetence theory tools web2.0 **webapplications** wiki

Done 0.3 MB / 10 MB 6.6 MB / 48.0 MB



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# Sensor and Indicator Integration

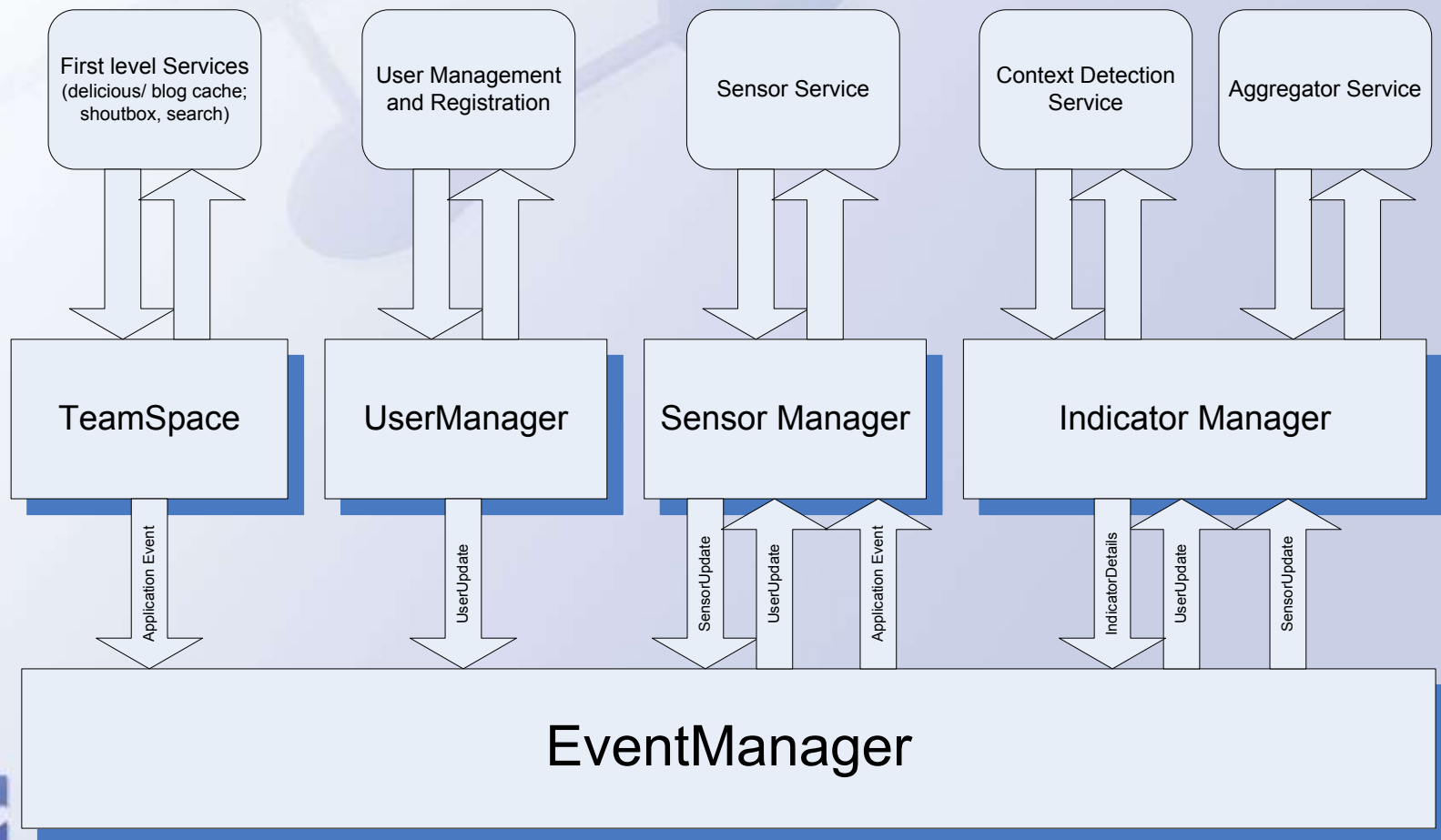
- Completely implemented as AJAX components
- Injection Code written in native Javascript
- Independent sensor and indicator components



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# Frontend Architecture





# Purpose of the Architecture

Minimize interference with the business logic of a web-application

- Application independent code injection
  - Sensor Code
  - Indicator Code
- Modular frontend for web-applications



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# Sensor Manager

- Connects to the sensor service
- Requests registered sensors
- Registers supported sensors with the application
- Gathers user interface events
- Submits the collected events to the sensor service



# Indicator Manager

- Connects to the context adaptation service
- Requests the active contexts
- Fetches visualization XSLT templates
- Prepares aggregator requests
- Handles HTML injection of the indicators



# Management of Non-DOM-Events

Non-DOM-events = high level application logic

- Richer meaning of things that happen in the UI
  - Independent from the DOM structure of the UI
  - Connection points for events on code level
- Sub-systems can hook in on high-level functions
  - E.g. “followlink”, “userupdate”, or “sensorupdate”
- Events can be triggered by different sub-systems



# EventManager

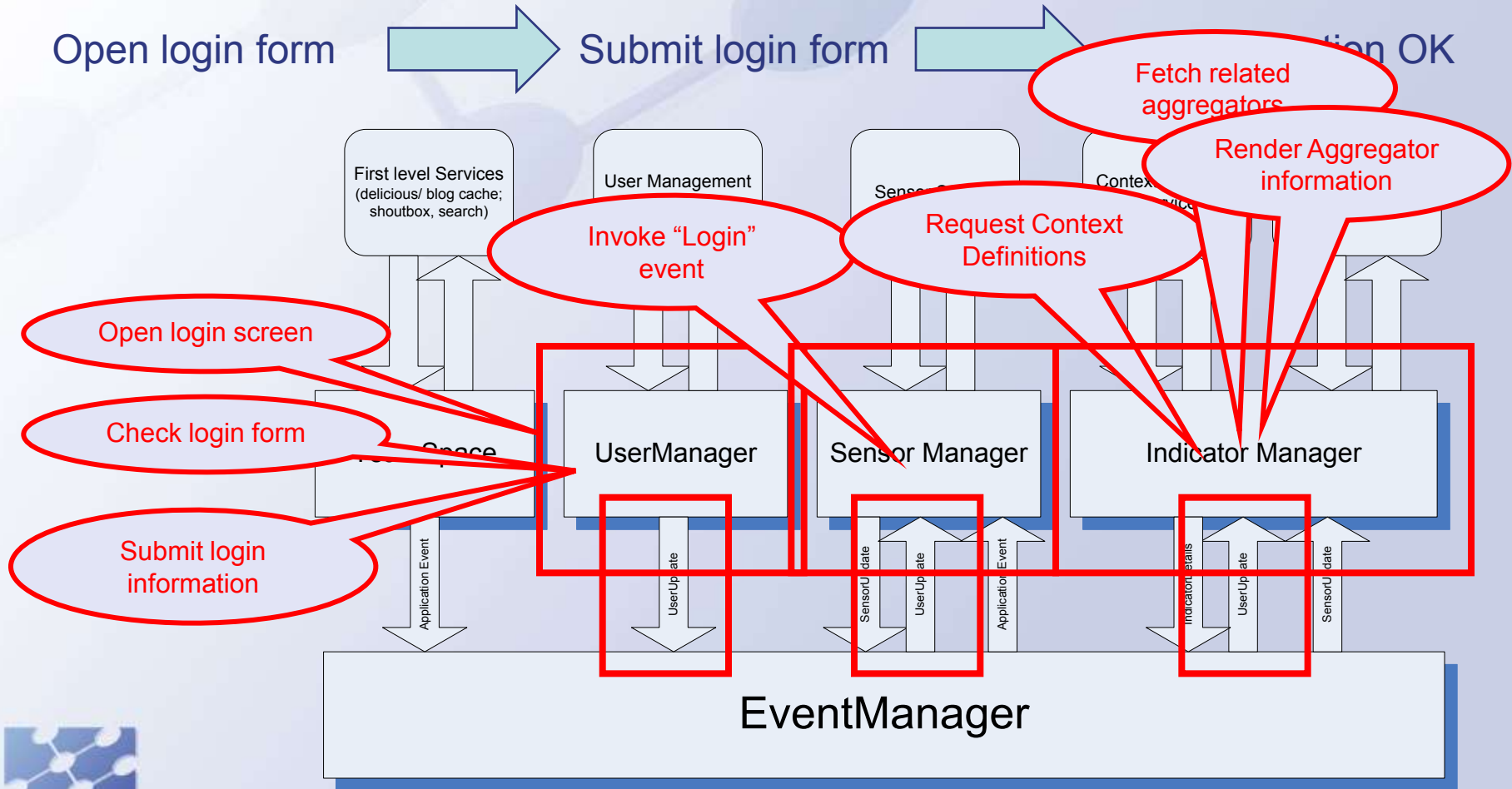
- Handling ambiguous DOM events
  - E.g. Follow link
- Assignment of application events to DOM events
- Entry point for sub-systems
- Event distribution across sub-systems
  - Following the principles of DOM events



# TeamSpace Example

## User login

Open login form → Submit login form → Login OK



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Thank you



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