

# THE MEANING OF LIFE, CONTEXT & EVERYTHING

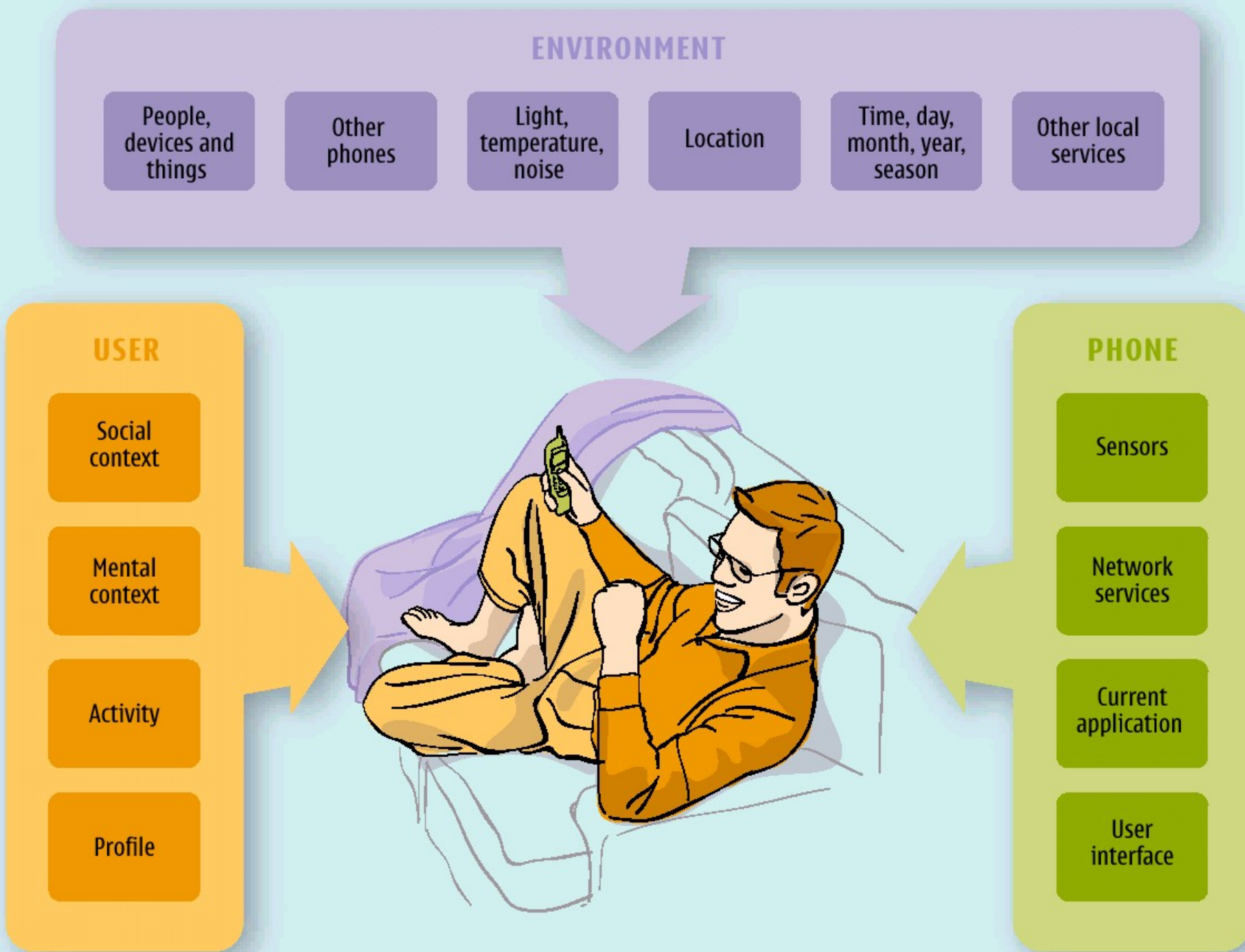


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presented by Heikki Saikkonen

IRISA March 15th 2005



# What is context?



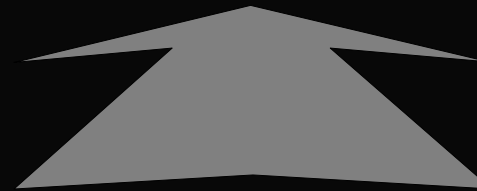
# How are contexts recognised?

Higher level context

Trip to work

0.93

Context recognition  
(time series sensor fusion)



Context atoms  
in a time sequence  
vector

Time ↑

Indoors	1.0
Arrival	0.7
WalkingFrequency	1.0
Car	1.0
WalkingFrequency	0.6
Elevator	1.0
WalkingFrequency	0.8
Indoors	0.9

Context atoms

Values

Terminal  
centric  
view

# Why is context awareness needed?

Enables  
new **UI**  
**features**

**Automates**  
some **functions**  
(there are too  
many for humans)

**Avoids disturbing**  
people at wrong  
times

Enables new  
**services**

Better  
**personalisation**

**Right**  
information,  
**right** time,  
**right** place

Better social  
**acceptance** of  
technology

Increases **user**  
**satisfaction**

Filters out  
**info noise**  
(Calm computing)



Computers are now moving with people, so they should adapt to situations.



# TYPICAL APPLICATIONS

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Such a lovely pink.  
Now, where can I  
find a matching  
dress?

# Web longa, vita brevis

240'000 choices

The screenshot shows a Google search interface with the search term "find pink dress" entered. The search results bar indicates "Results 1 - 20 of about 240,000". A red circle highlights the number "240,000", with an arrow pointing from the text "240'000 choices" above. The search results include a sponsored link for "Shop for Apparel at Orvis" and several organic search results related to "dress-up" games and "pink dresses".

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# Public situated messages



The image shows a woman with a red hat walking past a statue of two men. A public voting overlay is displayed on the right side of the image. The overlay contains a small image of the statue with yellow and red polka-dot shorts on the figures. Below the image is the text: "Should they put shorts on these naked men?" followed by "By: [Anonymous182]". At the bottom of the overlay, it shows "89% No" and "11% Yes" next to two buttons labeled "Yes" and "No".

Should they put shorts on these naked men?  
By: [Anonymous182]

89% No  
11% Yes

**Yes** **No**

Concept from the  
Between project at HIIT  
(Helsinki Institute of  
Information Technology)

Lili walks by Kolmensepän patsas, which is under renovation. She notices that there's a voting.

She votes "No", and continues.

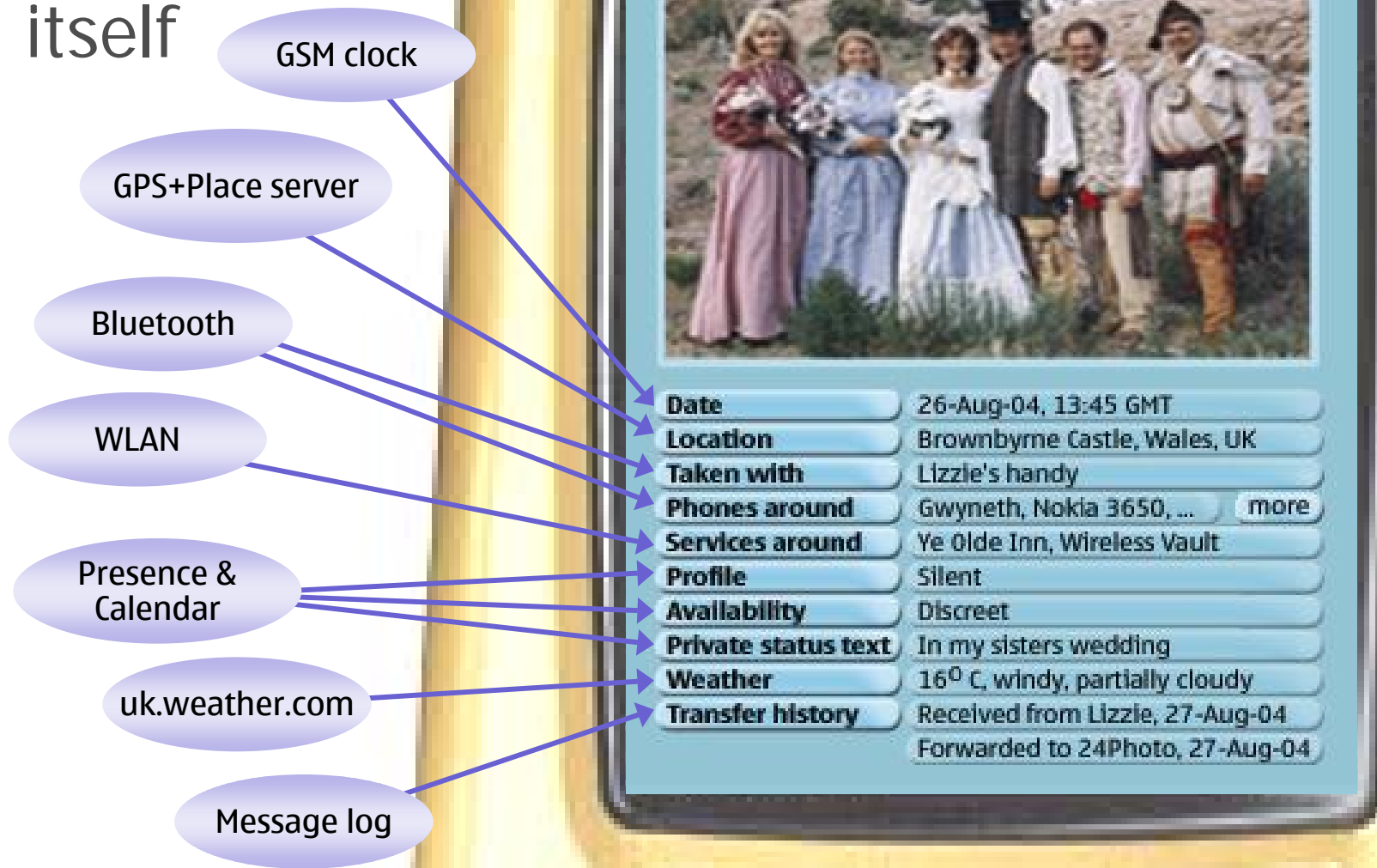
# Situated reminders





# METADATA:

information about the data itself



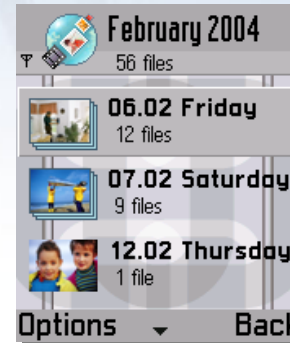
# NOKIA Album - Image and Video Organizer

Your content, your way, in your pocket!

First version of NOKIA Album is freely downloadable for NOKIA 7610 Imaging phone at [www.nokia.com/imaging/album](http://www.nokia.com/imaging/album)

**NOKIA Album** is a phone-based organizer for images and videos

- Offers multiple views on images and videos
- Based on their metadata like time, location, collections



## Automatic grouping by date and location

- Easy and quick browsing
- Location is based on network cell information



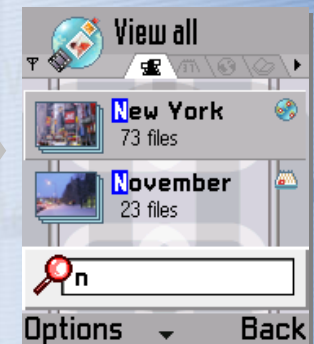
## Setting location names

- User decides when, how and which locations are named
- One named location can cover one or several cell-ID areas



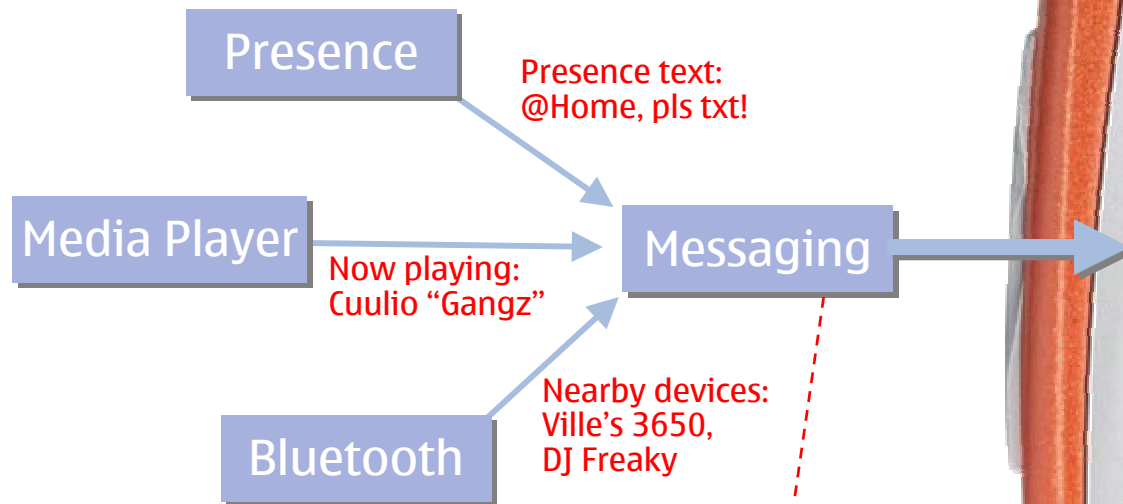
## Different searches for different situations

- Multicriteria search
- Interactive Quick search
- Find related files by date, location or collection



# Application-level context sharing

= SEMANTIC LEVEL DATA EXCHANGE  
FOR PHONE APPLICATIONS



Messaging app automatically fills in the **current context** when the message is going to a trusted person



# Other context aware applications



## Augmented reality

- Attaching reminders & comments to things, people, places
- Virtual comments from other people or subscribed services

## Filtering

- Selective push ads
- Selective presence
- Local social applications

## Augmented media

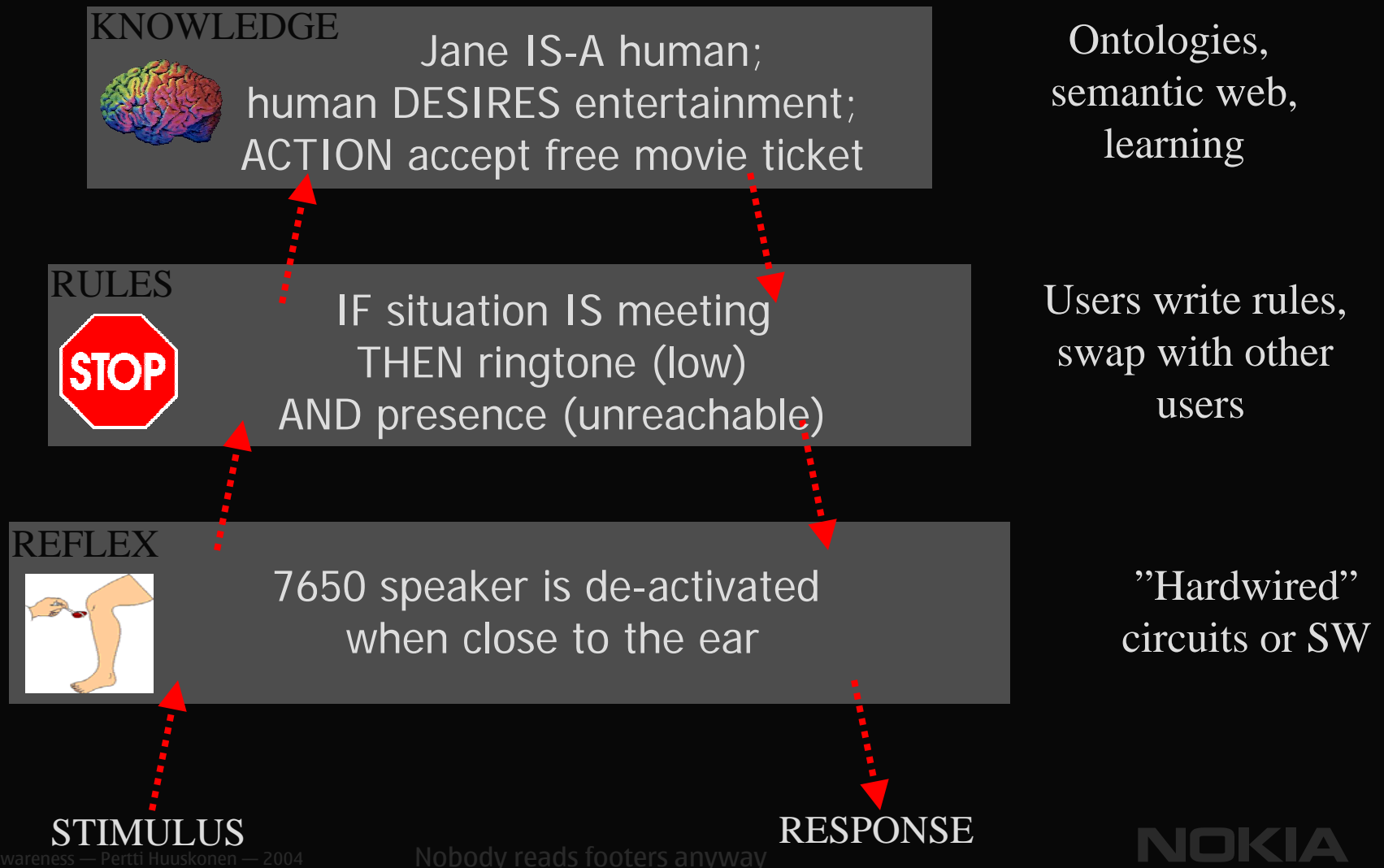
- Context stored with media
- Media diary
- Memory prosthesis

# HOW DOES IT WORK?



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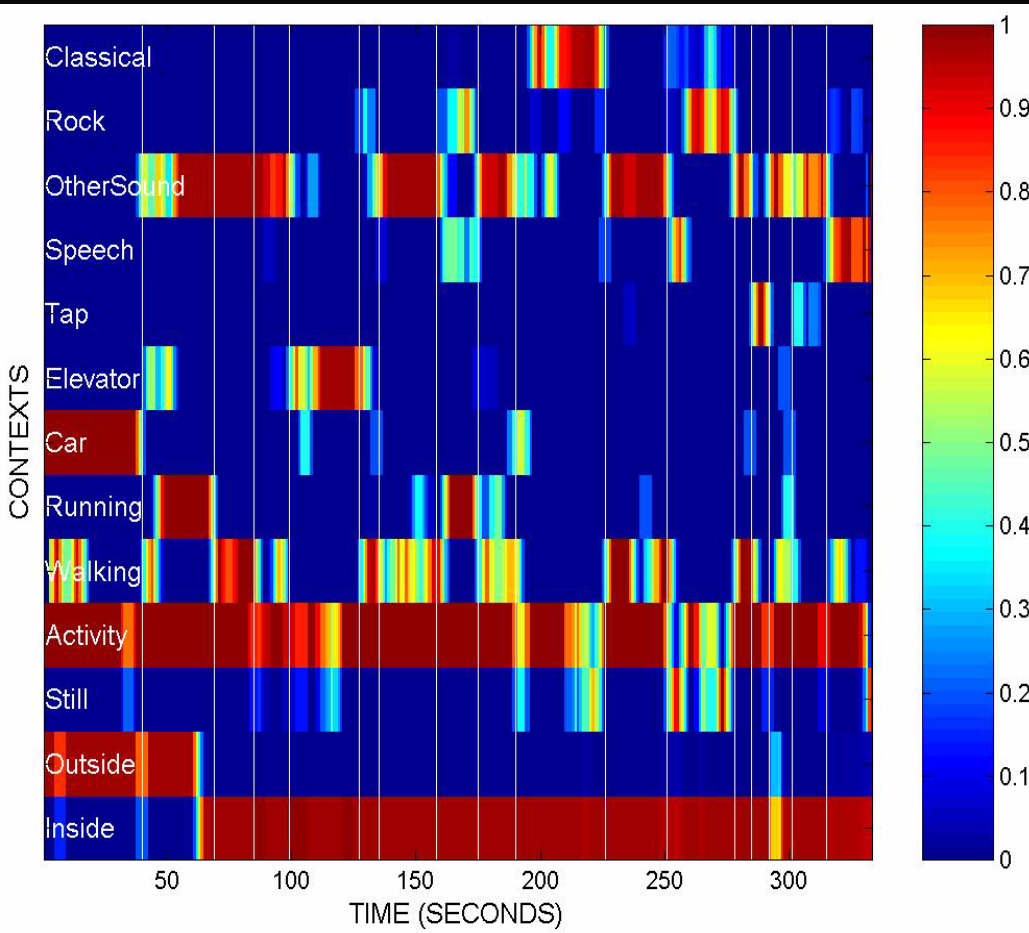
# Three levels of HUMAN & MACHINE cognition



# Multichannel sensor interpretation

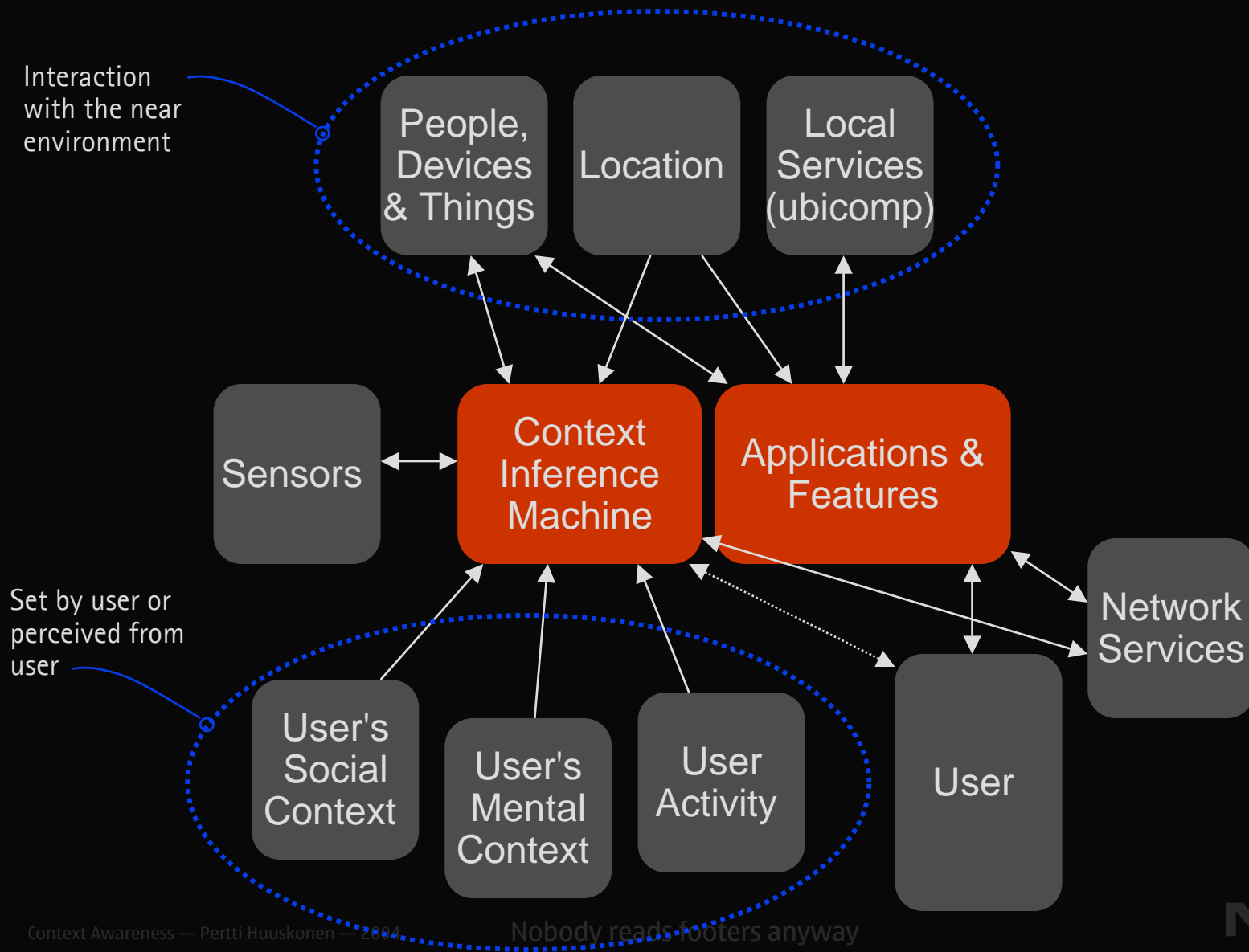
Source: VTT  
Electronics/  
Panu Korpipää

9 channels: 3x acceleration, 2x light intensity,  
temperature, humidity, skin conductivity, audio



Phase of the scenario	Correct set of contexts
1. Drive car	(Car, Activity)
2. Run to the door	(Other sound, Running, Outside, Activity)
3. Walk to the elevator	(Other sound, Walking, Inside, Activity)
4. Wait for the elevator	(Other sound, Inside)
5. Elevator	(Elevator, Inside)
6. Walk to the door	(Other sound, Walking, Inside, Activity)
7. Open the door, sit down	(Other sound, Walking, Inside, Activity)
8. Make a phone call	(Speech, Inside)
9. End call, put on music	(Other sound, Walking, Inside, Activity)
10. Classical music	(Classical music, Inside, Still)
11. Stop, change disc, play	(Other sound, Walking, Inside, Activity)
12. Rock music	(Rock music, Inside, Still)
13. Stop music, walk to tap	(Other sound, Walking, Inside, Activity)
14. Take tap water	(Tap water sound, Inside)
15. Walk to the table, sit	(Other sound, Walking, Inside, Activity)
16. Eat	(Other sound, Inside, Activity)
17. Conversation	(Speech, Inside)

# Context inference





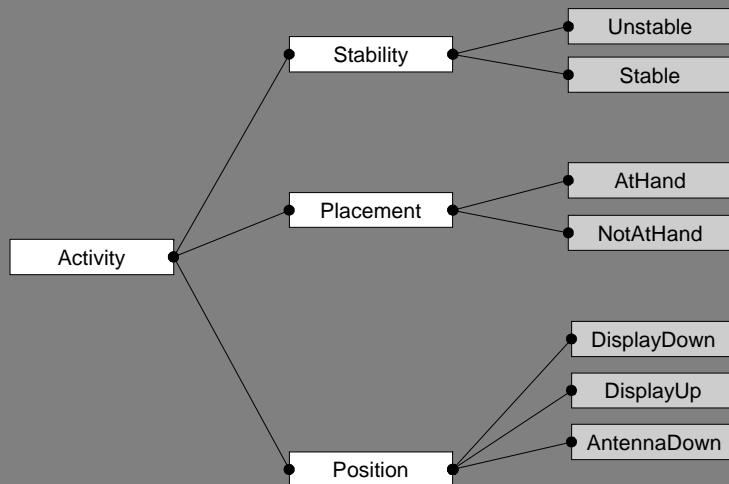
# How are contexts represented?

**Context atom** is the basic unit

- XML-based representations may be the best choice
- Semantic Web-based proposal: **use RDF!**

Device:Activity:Stability Unstable

```
<rdf:RDF
  xmlns:rdf='http://www.w3.org/1999/02/22-rdf-syntax-ns#'
  xmlns:con='http://localhost/Context_ontology_schema_ns#'
  >
  <rdf:Description rdf:about='online:#ContextDescription'>
    <con:Context_type rdf:resource='online:#Device:Activity:Stability'/>
  </rdf:Description>
  <rdf:Description rdf:about='online:#Device:Activity:Stability'>
    <con:Context rdf:resource='online:#Unstable'/>
  </rdf:Description>
</rdf:RDF>
```

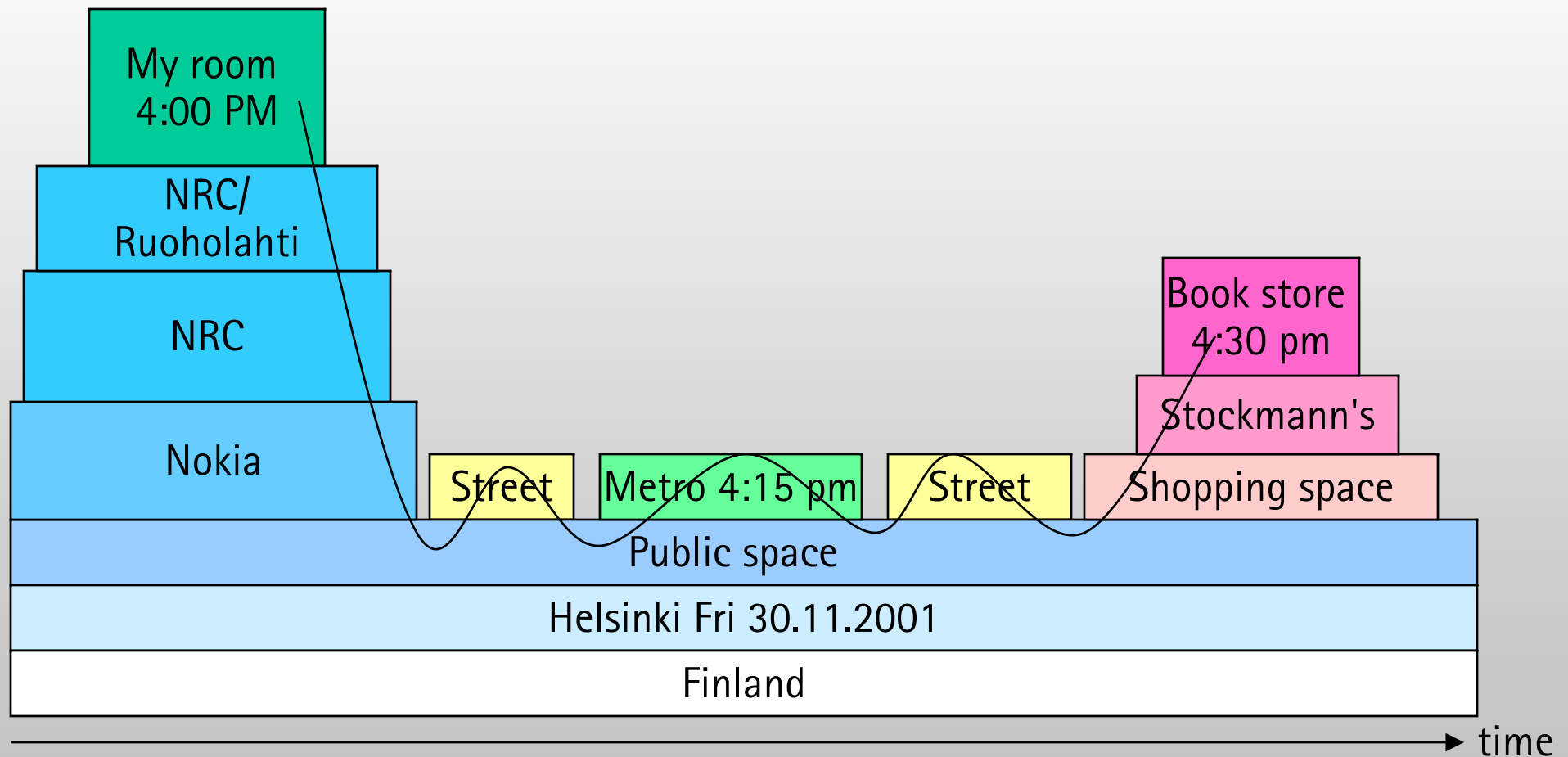


## Ontologies

- Hierarchical web-distributed "class definitions" of contexts
- Enjoys the benefits of object orientation

# Context Episode Example

A trip from NRC/Ruoholahti to Academic Bookstore, Helsinki 30.11.2001



# HOW COULD IT FAIL?



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# What the critics will say:



"Context sensing will never be reliable enough for me."



"Where's the promised development support, frameworks, standards..."



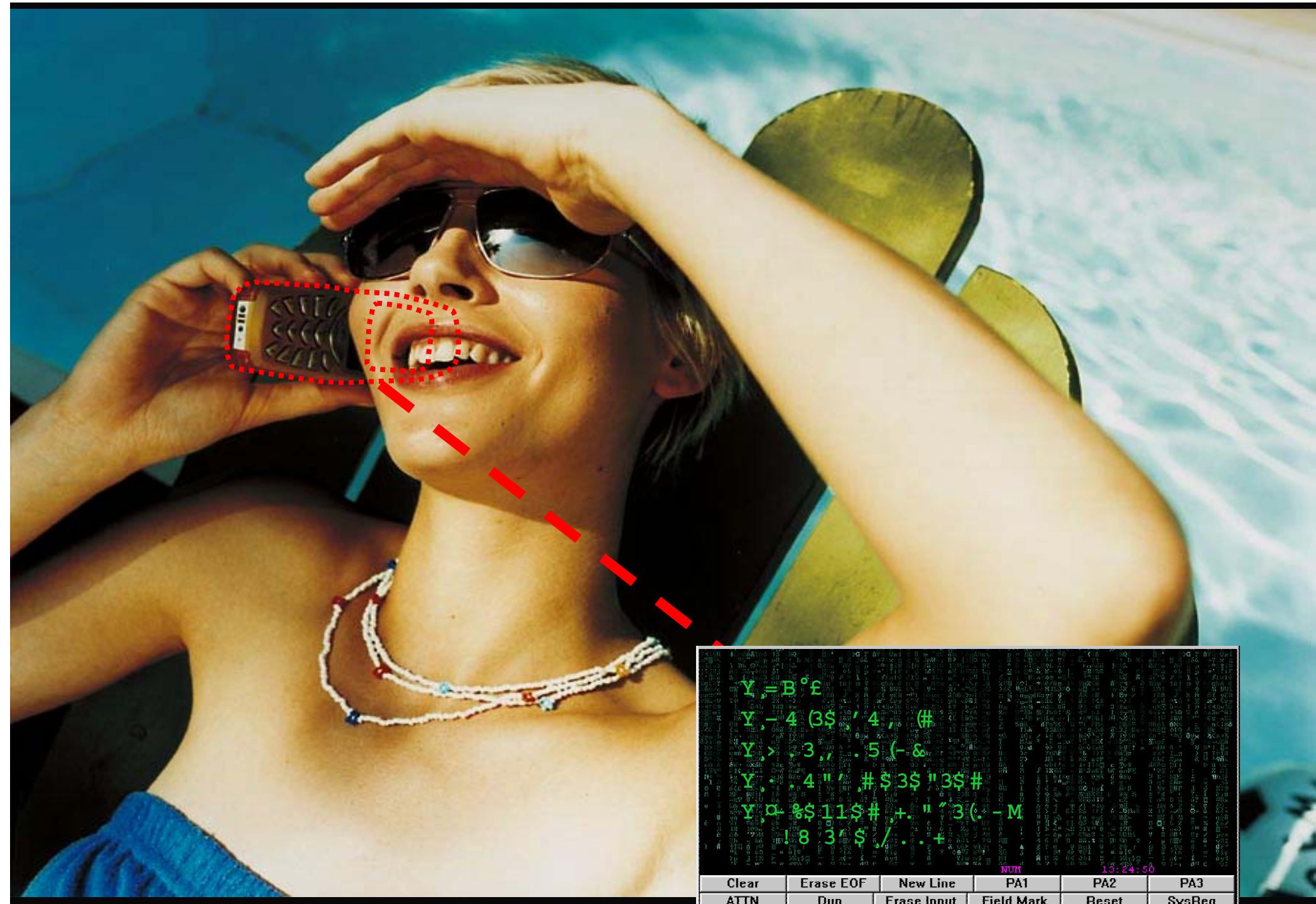
"Your short range social context SW is draining MY battery, buddy."



"Yeah, sure, but I just can't stand those %x\*@ adaptive UIs!"

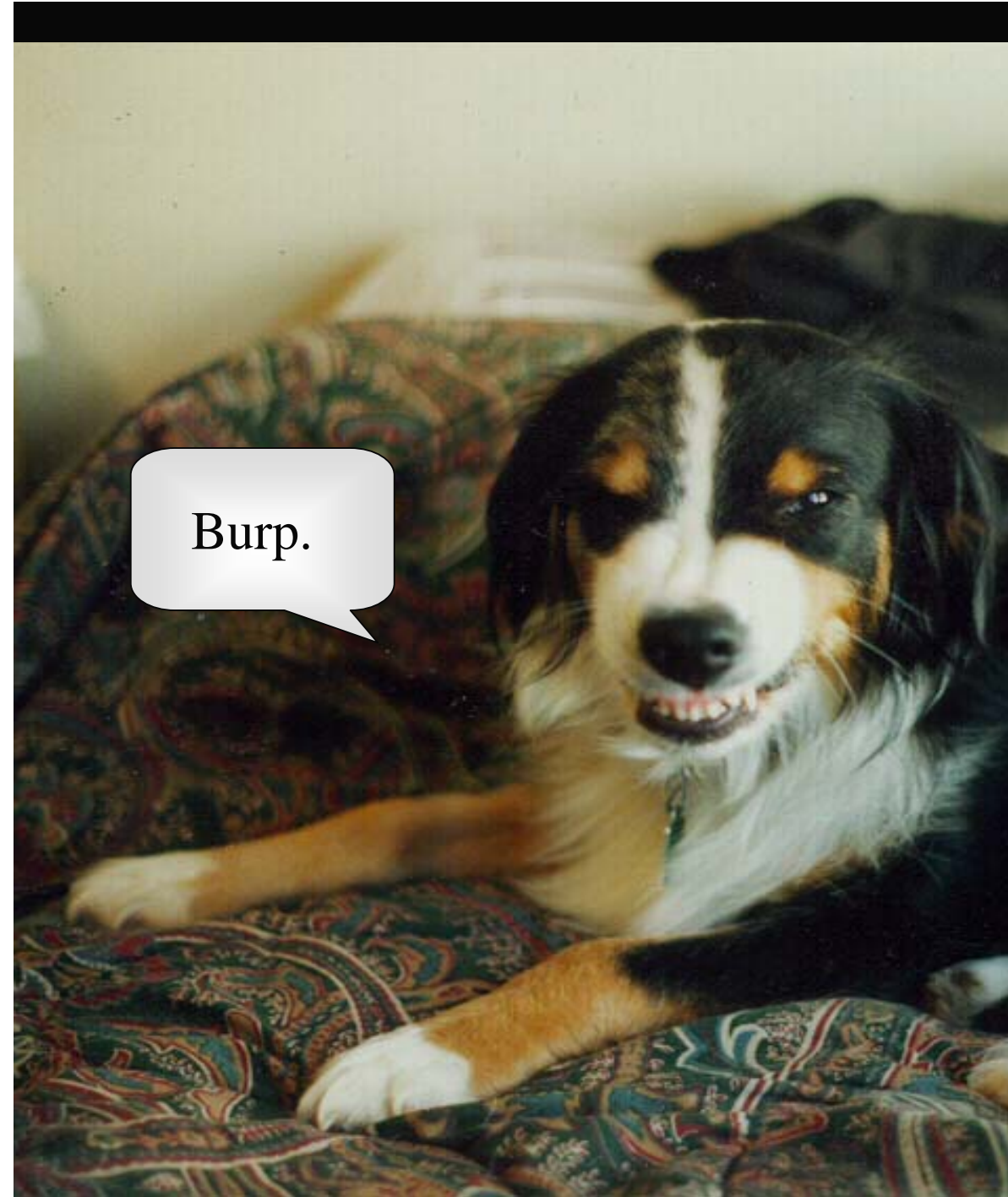


"But what about my privacy? I go for security first, features second."



```
Y=B°£
Y-4(3$'4, (#
Y>3,7.5(-&
Y.4" "#3$ "3$#
Yq 8$ 11$# + ." 3(- M
8 3 '$ / . . +
```

Clear	Erase EOF	New Line	PA1	PA2	PA3
ATTN	Dup	Erase Input	Field Mark	Reset	SysReq



```
Y = B ° £
Y . 4 ( 3 $ ' 4 ( #
Y . > 3 v : 5 ( &
Y , 4 " # $ 3 $ " 3 $ #
Y α % $ 1 1 $ # + " ' 3 ( - M
! 8 3 $ / . +
```

Clear	Erase EOF	New Line	PA1	PA2	PA3
ATTN	Dup	Erase Input	Field Mark	Reset	SysReq



Burp.

# Tokyo metro: the acid test for CA



The context machinery must be usable in real life situations. For instance, the algorithms should be prepared to meet a million people in a rush-hour Tokyo subway.

# WHAT'S GOING TO HAPPEN?



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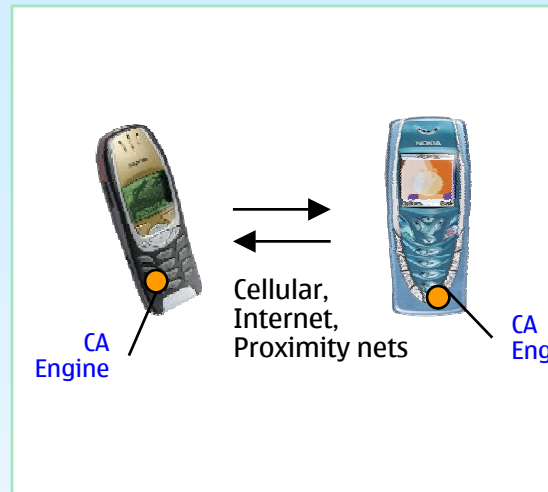
# From local to networked CA

- INCREASING: →
- COMMUNICATIONS
  - REPRESENTATION NEEDS
  - PRIVACY
  - INTEROPERABILITY



## LOCAL

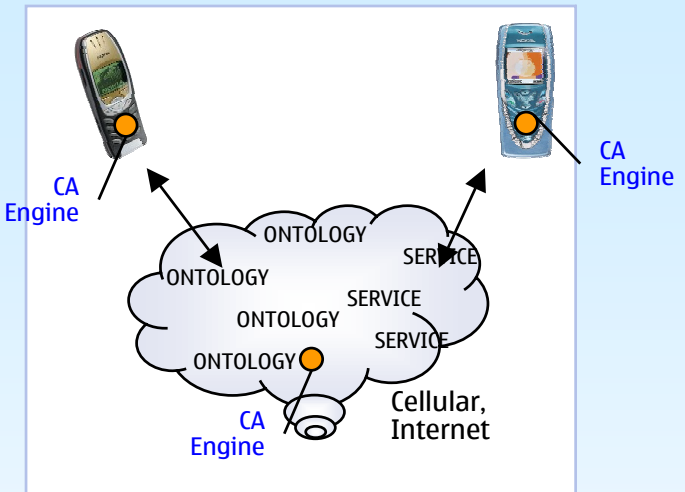
- Decisions and actions are local to the terminal.
- Data also from the outside (services, proximity).
- Depends only on a single manufacturer.
- For individual users.
- Minor privacy issues.



## SHARED

- Terminals share contexts, decisions and actions are mostly local.
- The networks are just plumbing.
- Needs interop between handsets.
- Supports peer groups (e.g. friends swap rules).
- Privacy already matters.

ALSO INCLUDES "LOCAL" FUNCTIONALITY



## INFRA-ASSISTED

- Decisions and actions happen partly in the net.
- Ontologies and web services add semantics.
- Needs standards, established industry.
- Corporations, operators, "professional" groups take over.
- Privacy becomes crucial.


ALSO INCLUDES "LOCAL" AND "SHARED"

# What research topics are open?

- User needs!
- Interaction machinery + principles + styles
  - How to automate, yet keep the user in control
  - What to show, what to hide
  - Where is adaption ok
  - UI developer support
- Modelling of contexts
  - fuzzy, overlapping, ill-defined, dynamic
- Context exchange
  - formats + policies + nets
- Ontologies for context
- Reasoning mechanisms



Major UI problems



Classical (Hard) AI



# SUMMARY AND RECOMMENDATIONS

# Why should Nokia bother?

... SADLY, MOST OF THE BENEFITS ARE VAGUE AND RATHER LONG-TERM

- Phone technology **renewal**
- New **features** + apps
- New **user experience**
- New **automated** (hidden?) functions
  - Or more razzling & dazzling technotoys, for some
- Better **e-commerce**
- Nokia, a leading context service **technology provider**

We have the **best** tangible **platform** for CA



- Always on, always with
- Trusted, personal
- Sufficient CPU + memory + data comms

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# NOKIA

## CONNECTING PEOPLE

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