

Context Inference for Mobile Applications in the UPCASE Project

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Inovação

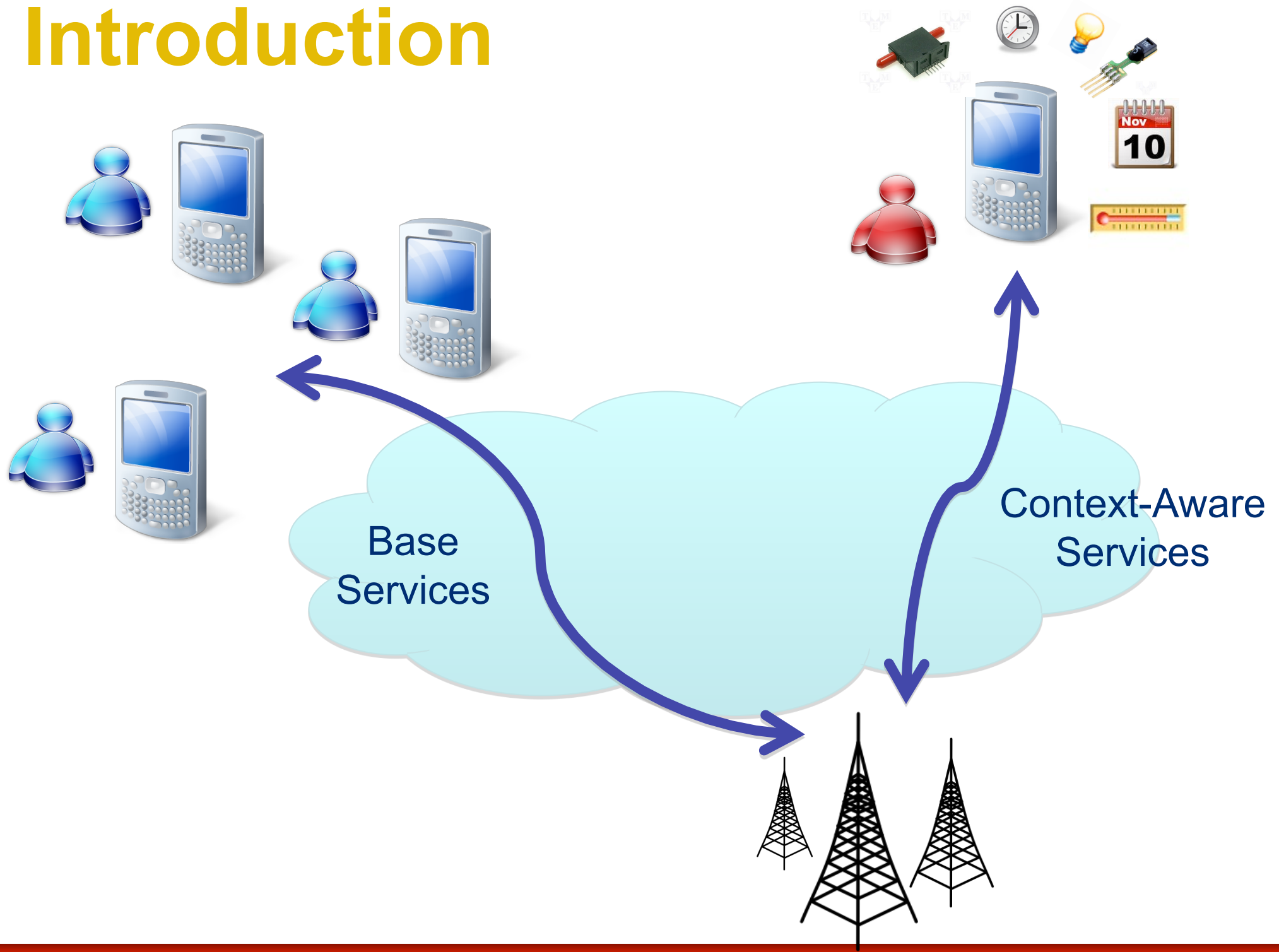
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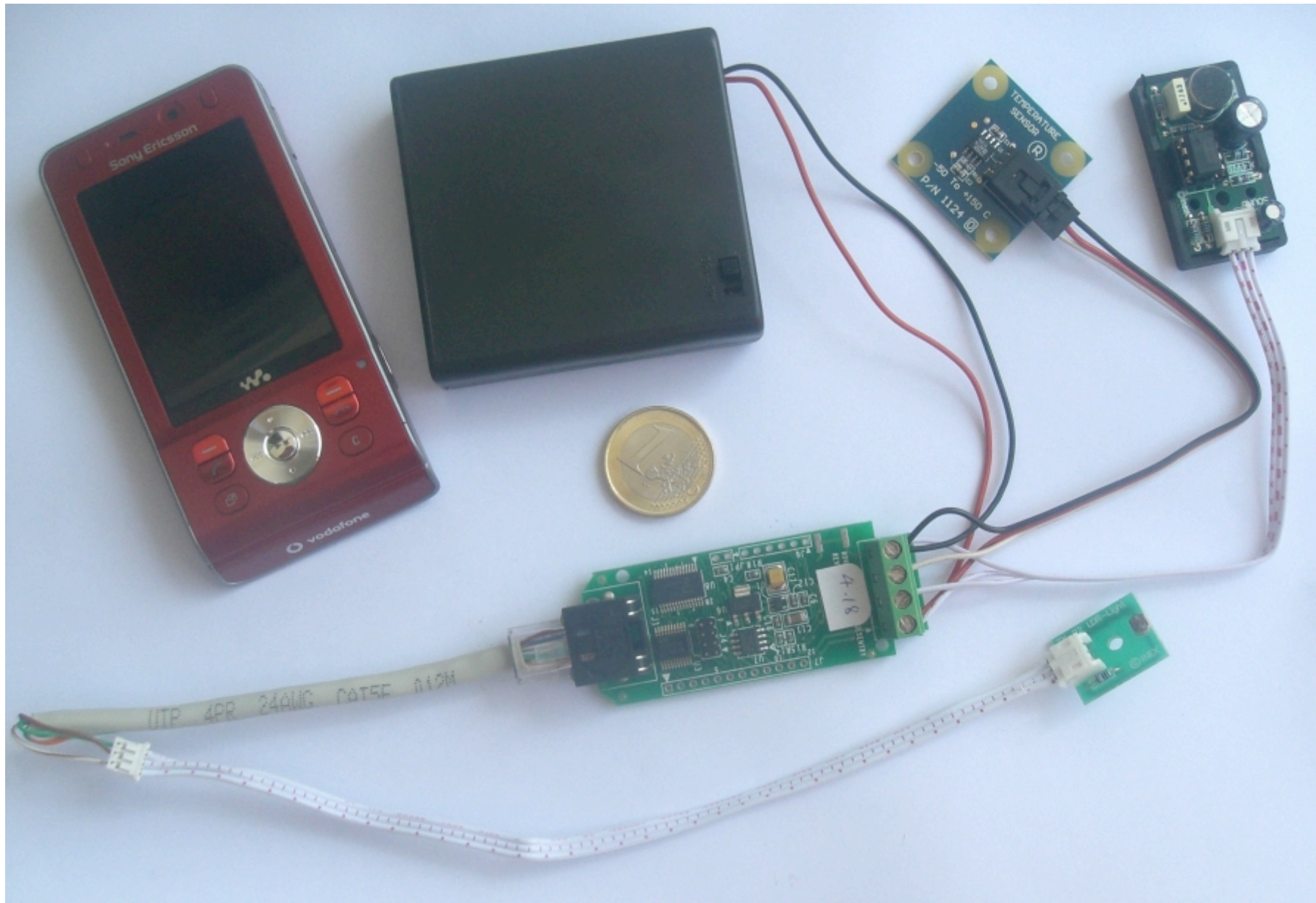
Outline

- Introduction
- Prototype
- Global Architecture
- Context Inference
- System Learning
- Smartphone Application
- Context Server
- Applications
- Conclusions

Introduction



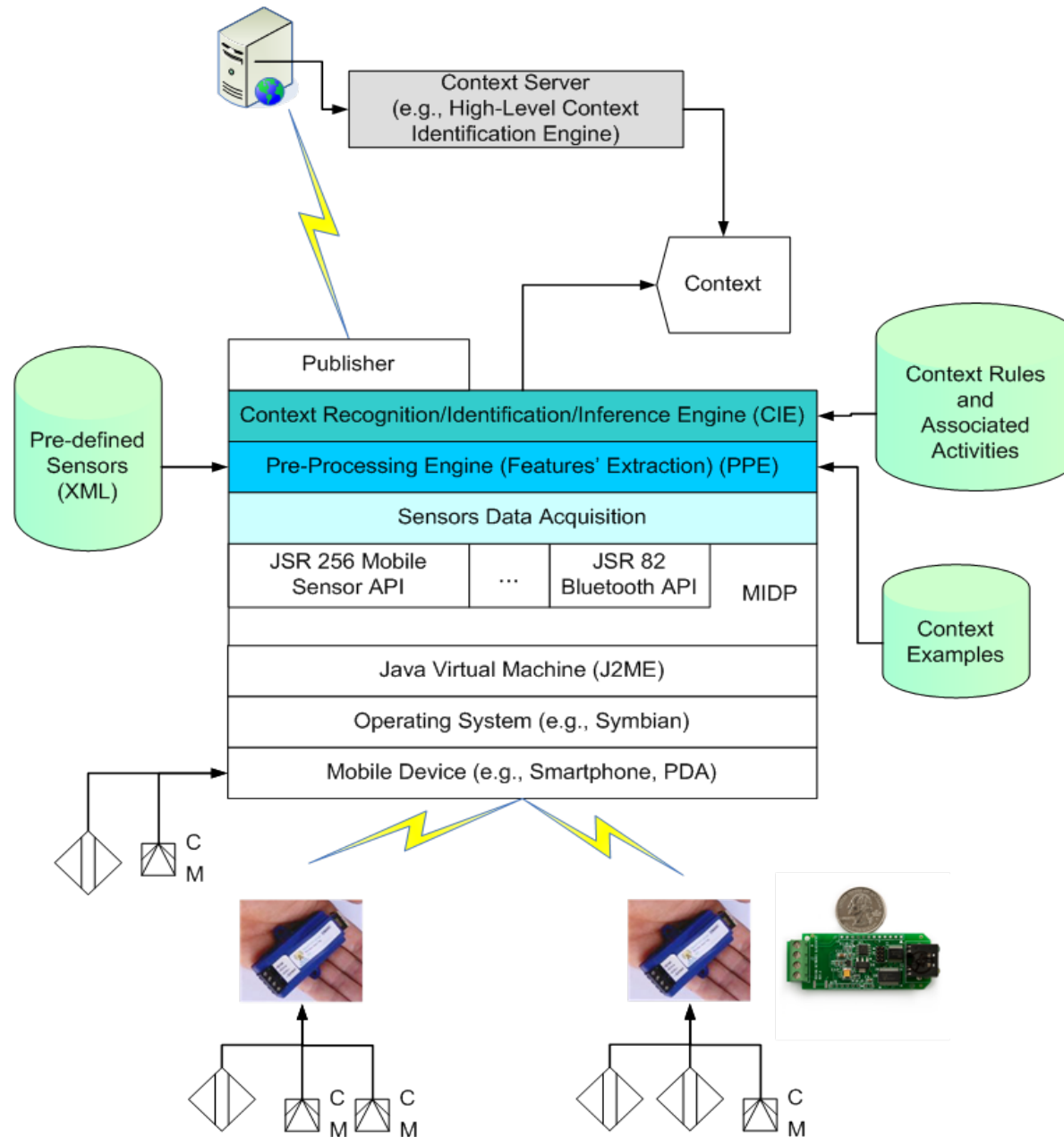
Prototype

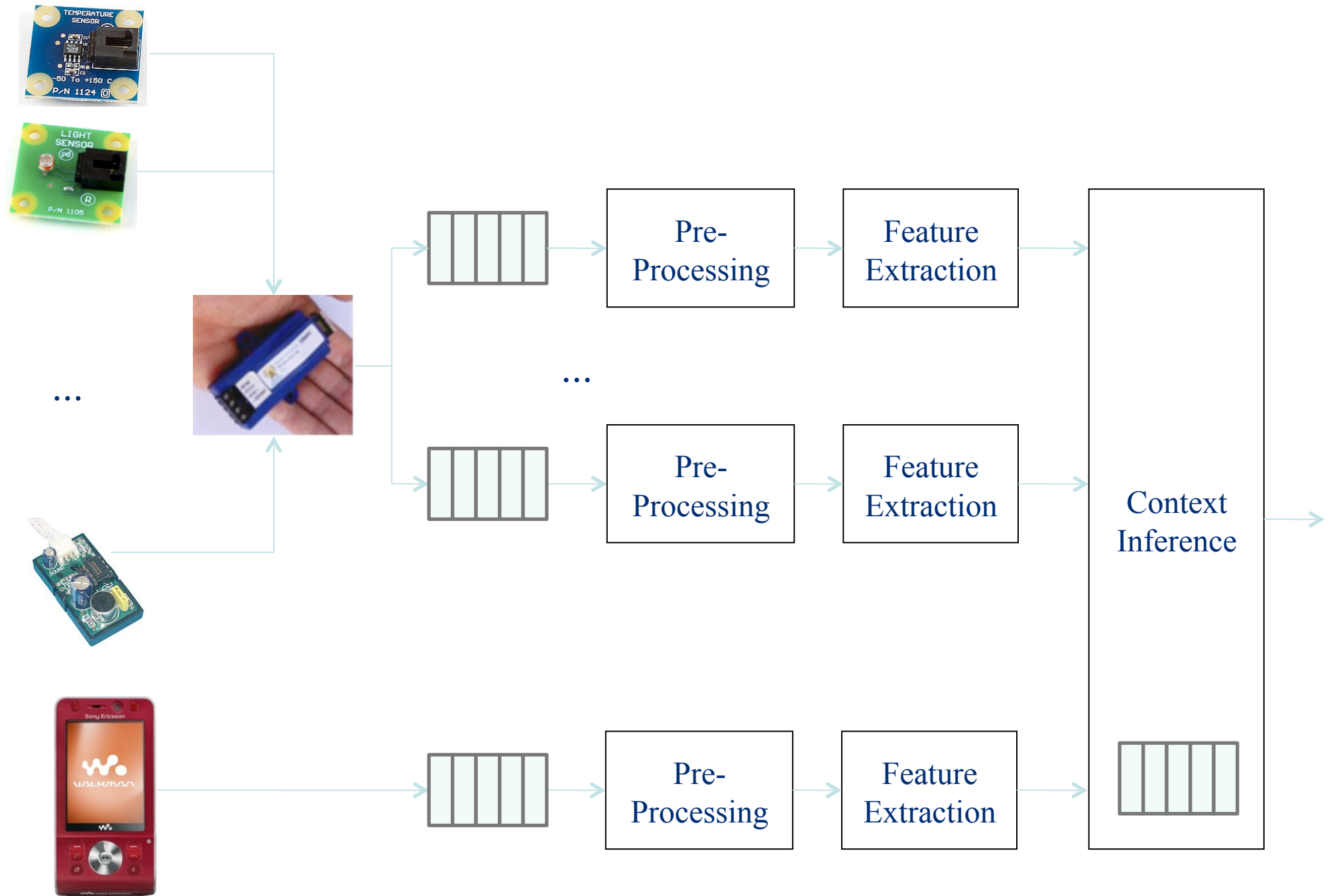


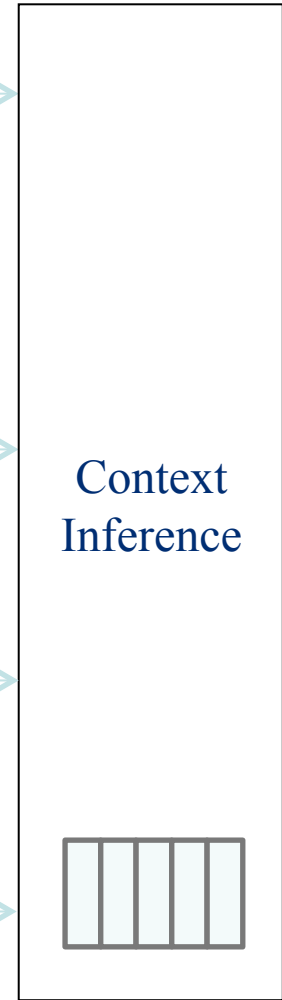
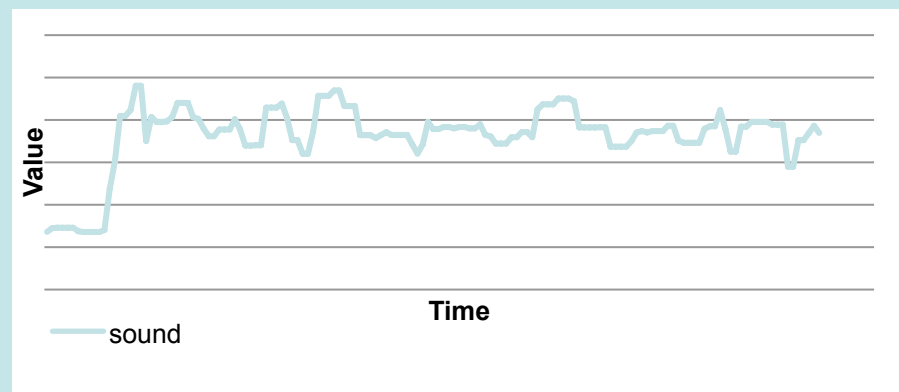
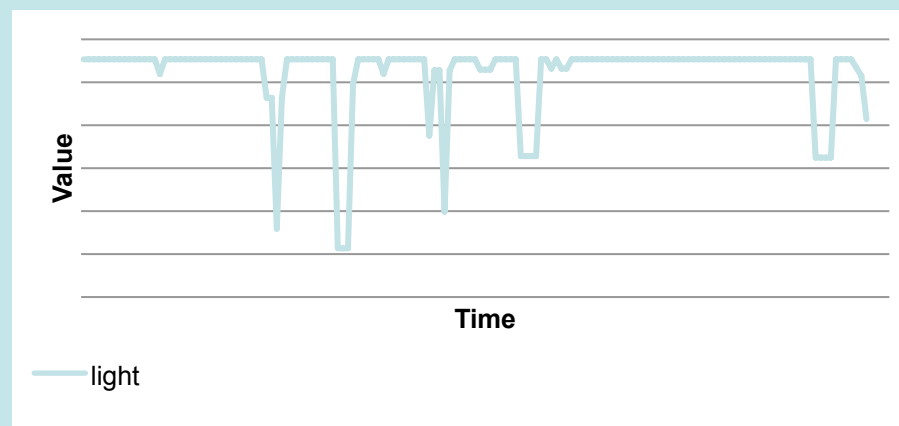
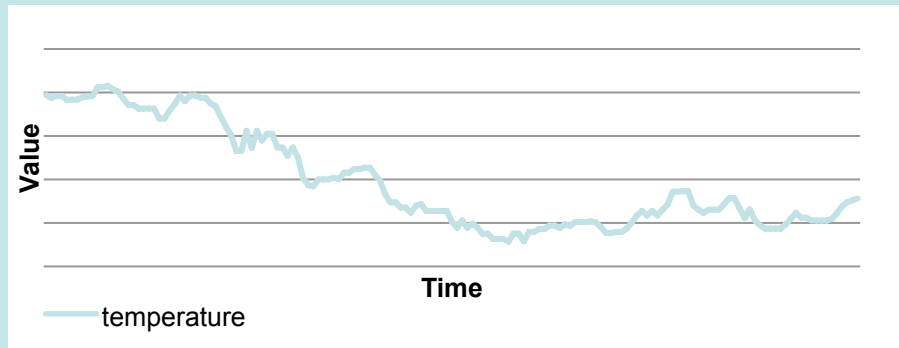
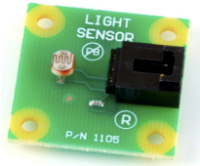
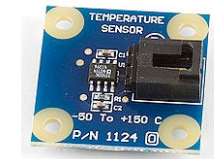
Prototype

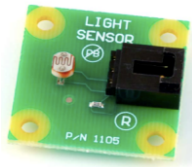
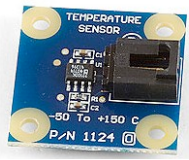


Global Architecture

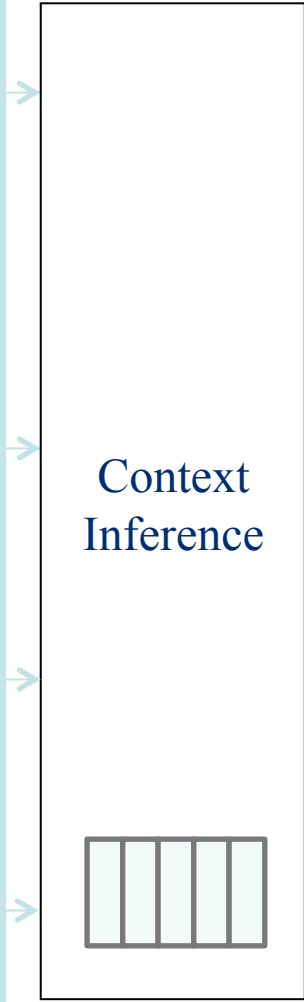


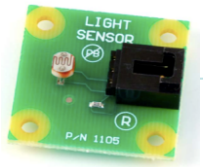
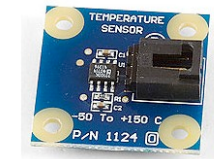




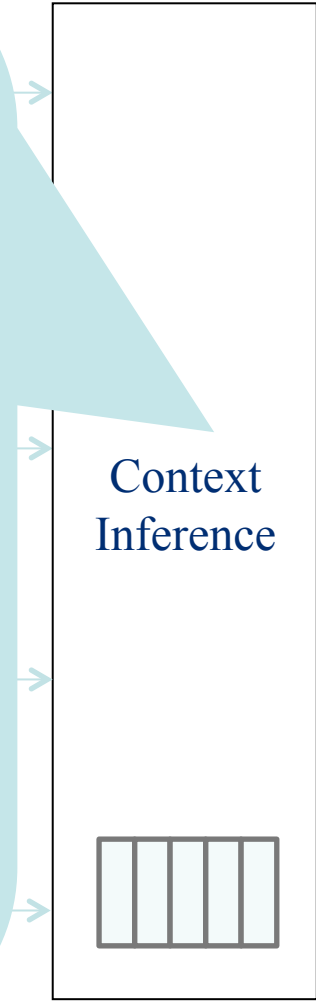
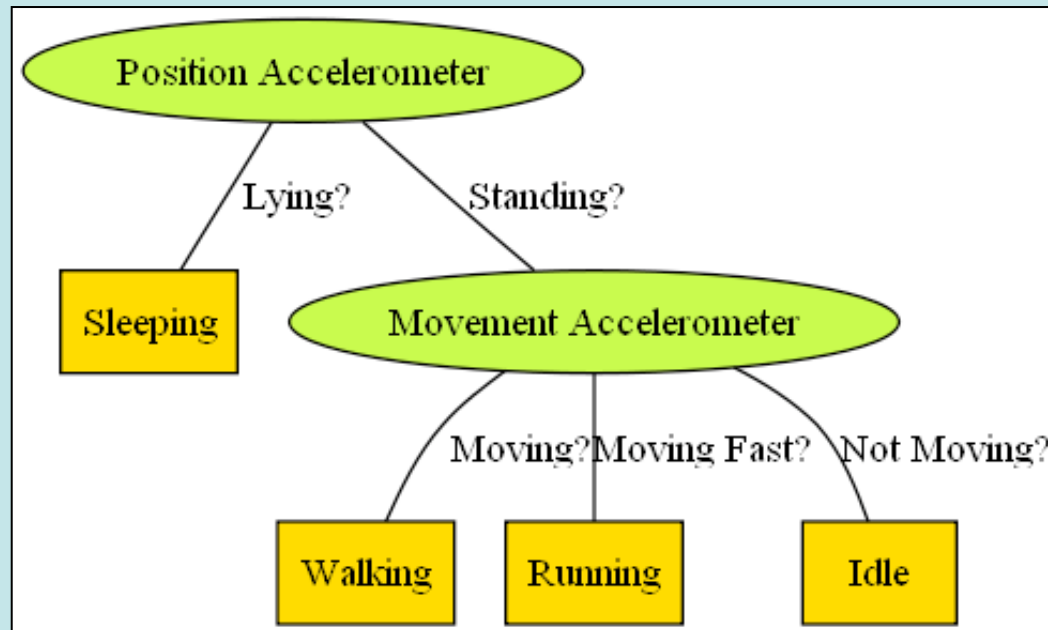


Sensor	Category	Value range
sound	very silent	0% - 20%
	silent	20% - 40%
	moderate	40% - 60%
	loud	60% - 80%
	very loud	80% - 100%
light	very dark	0 - 200
	dark	200 - 400
	normal	400 - 600
	bright	600 - 800
	very bright	800 - 1000
temperature	very cold	-50° - 0°
	cold	0° - 15°
	mild	15° - 25°
	hot	25° - 30°
	very hot	30° - 150°
time	dawn	0h - 5h
	morning	6h - 11h
	afternoon	12h - 17h
	night	18h - 23h
accelerometer	not moving	variance-based detection
	moving	variance-based detection
	moving fast	variance- and FFT-based detection



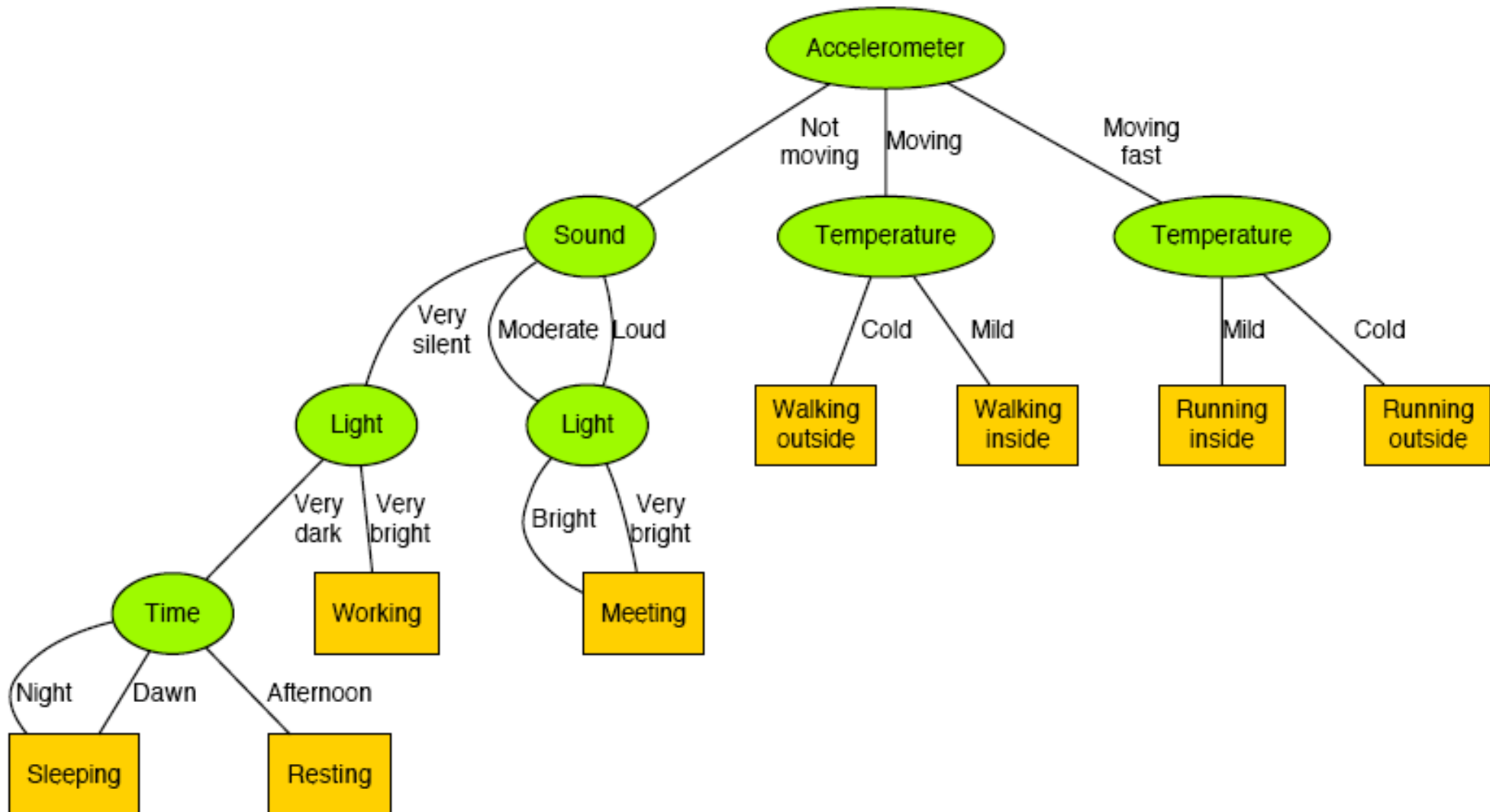


Context Inference based on decision trees!

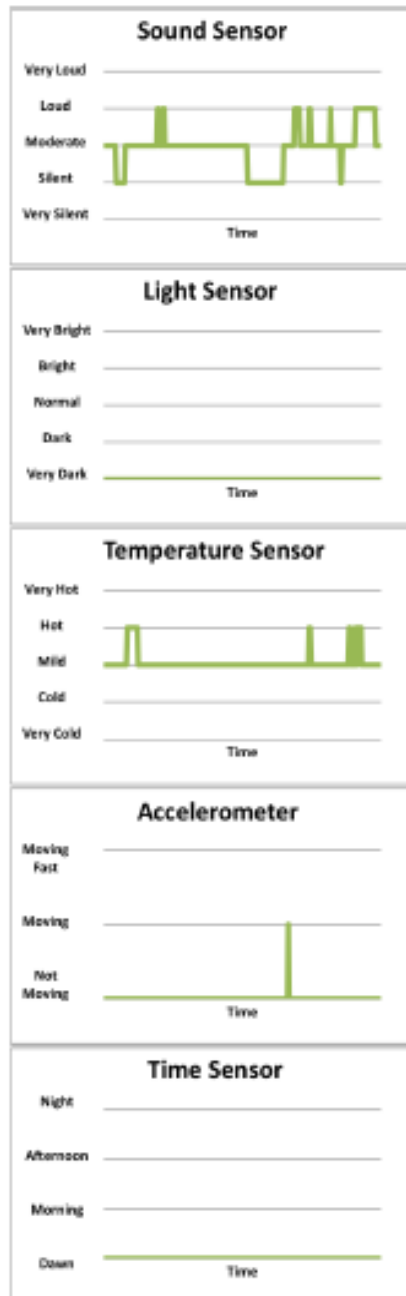


Context Inference

Relying on a decision tree, built using the ID3 algorithm using the feature categories generated from sensor data.



System learning



- Learning phase with specific duration and associated context.
- Updates the context decision tree.

Captured rule example

Sound: **Silent**

Light: **Very Dark**

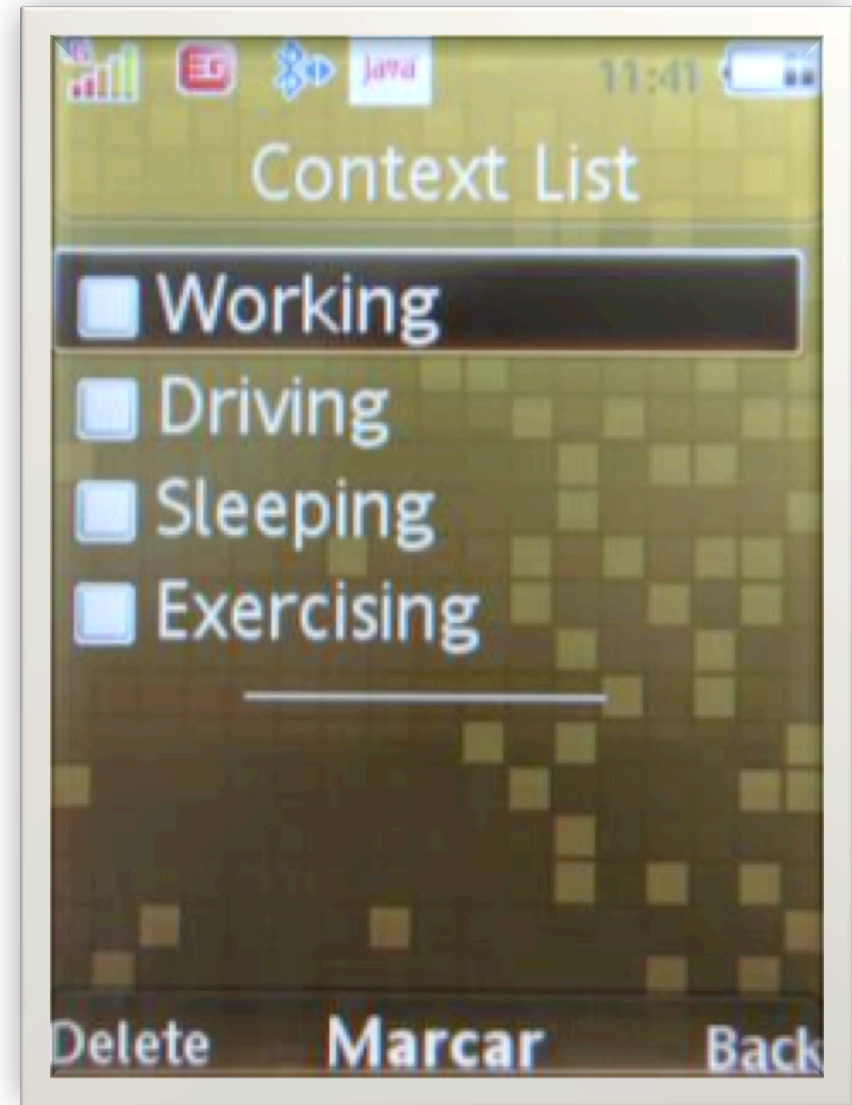
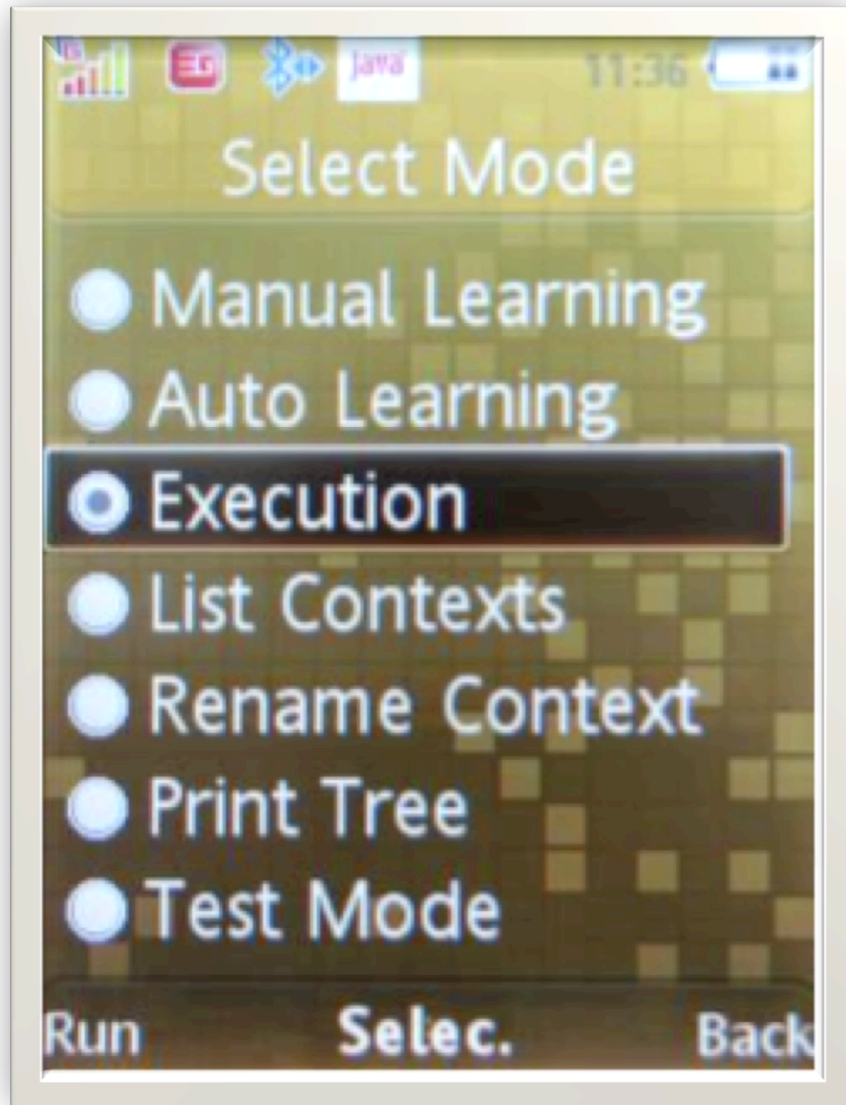
Temperature: **Mild**

Movement Accelerometer: **Not Moving**

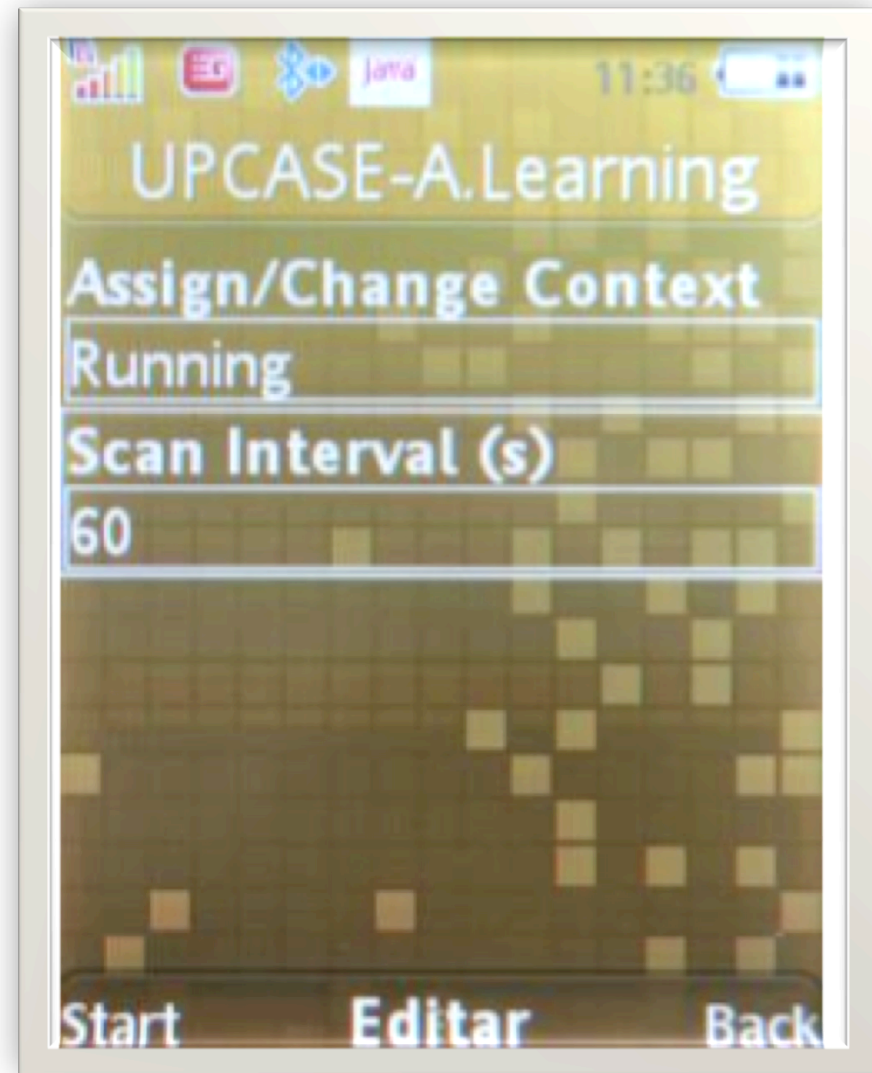
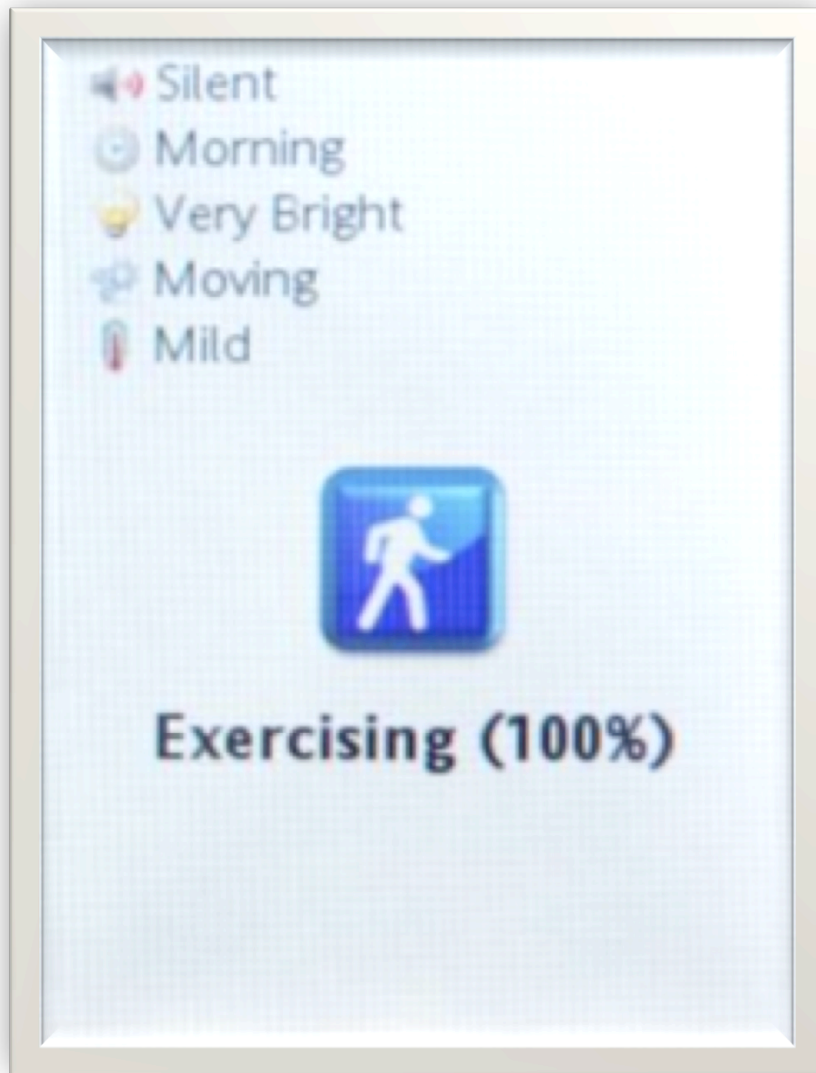
Period of Day: **Dawn**

Context: **Sleeping**

Smartphone Application



Smartphone Application



Context Server



Local context uploaded to a higher level!
(Wi-Fi/3G)

- Ability to enable/disable services.
- Local inferred context augmented with non-local information.
- Availability of user context for networking services and remote monitoring.

Applications

- **Elderly Care**

For elderly people that have an active life but still inspire some care, such general-purpose system can help family members keep track of their daily activities.



- **Emergency Management**

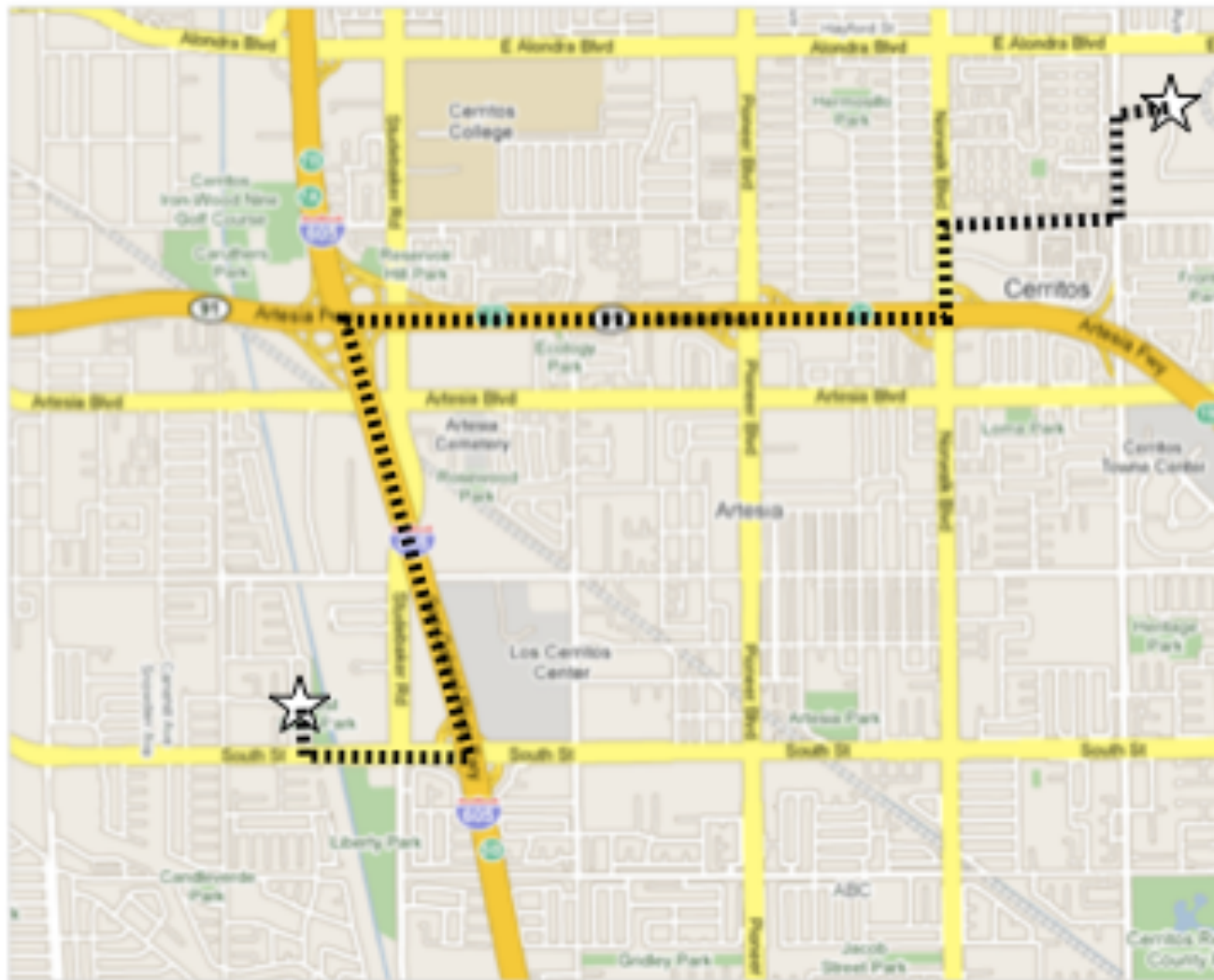
An essential feature of any emergency response system is the ability to know the state of readiness of the workforce. For a given situation, both team members that are on duty and team members that are off-duty may have to be summoned, depending on their current context.



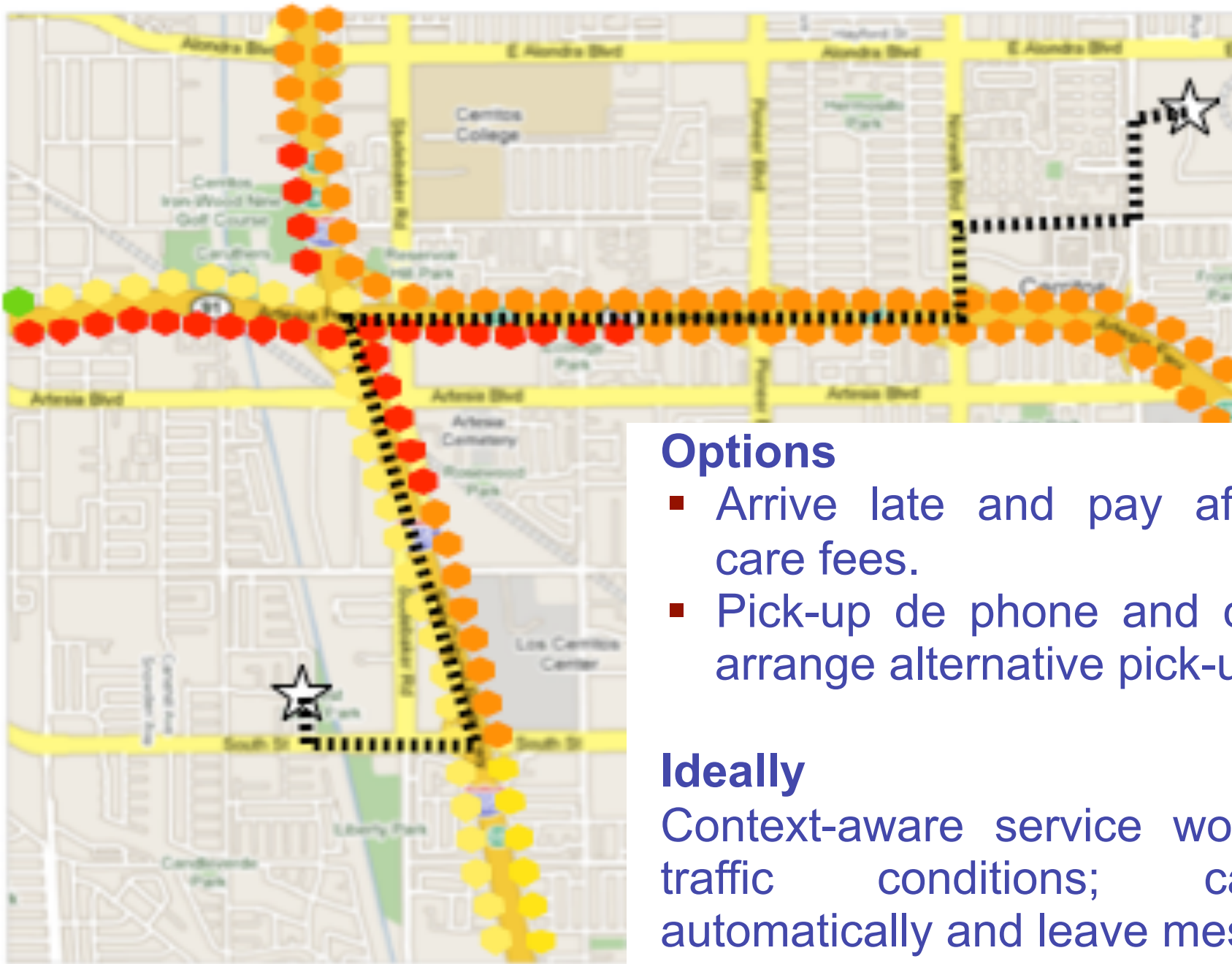
Potential Application

Problem:

Picking up your child at day care in the face of traffic.



Potential Application



Options

- Arrive late and pay after-hours day care fees.
- Pick-up de phone and call spouse to arrange alternative pick-up.

Ideally

Context-aware service would recognize traffic conditions; call spouse automatically and leave message.

Conclusions

- **General-purpose system**

Inexpensive sensors connected to a regular smartphone via a bluetooth-enabled sensor node.

- **Context inference**

- Based on decision trees - simple and lightweight method for smartphones.
- Supplied with enough rules, contexts are identified fairly accurately.

- User context can provide a **new generation of context-aware services and applications!**

Thank You!

Questions?