



Research, Technology:  
Infrastructure, Client, Server

# Project Sens-ation

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# Outline

1. Concept: Infrastructure, Client, Server

2. Use cases

3. Sensors, Parsing, Regular Expressions

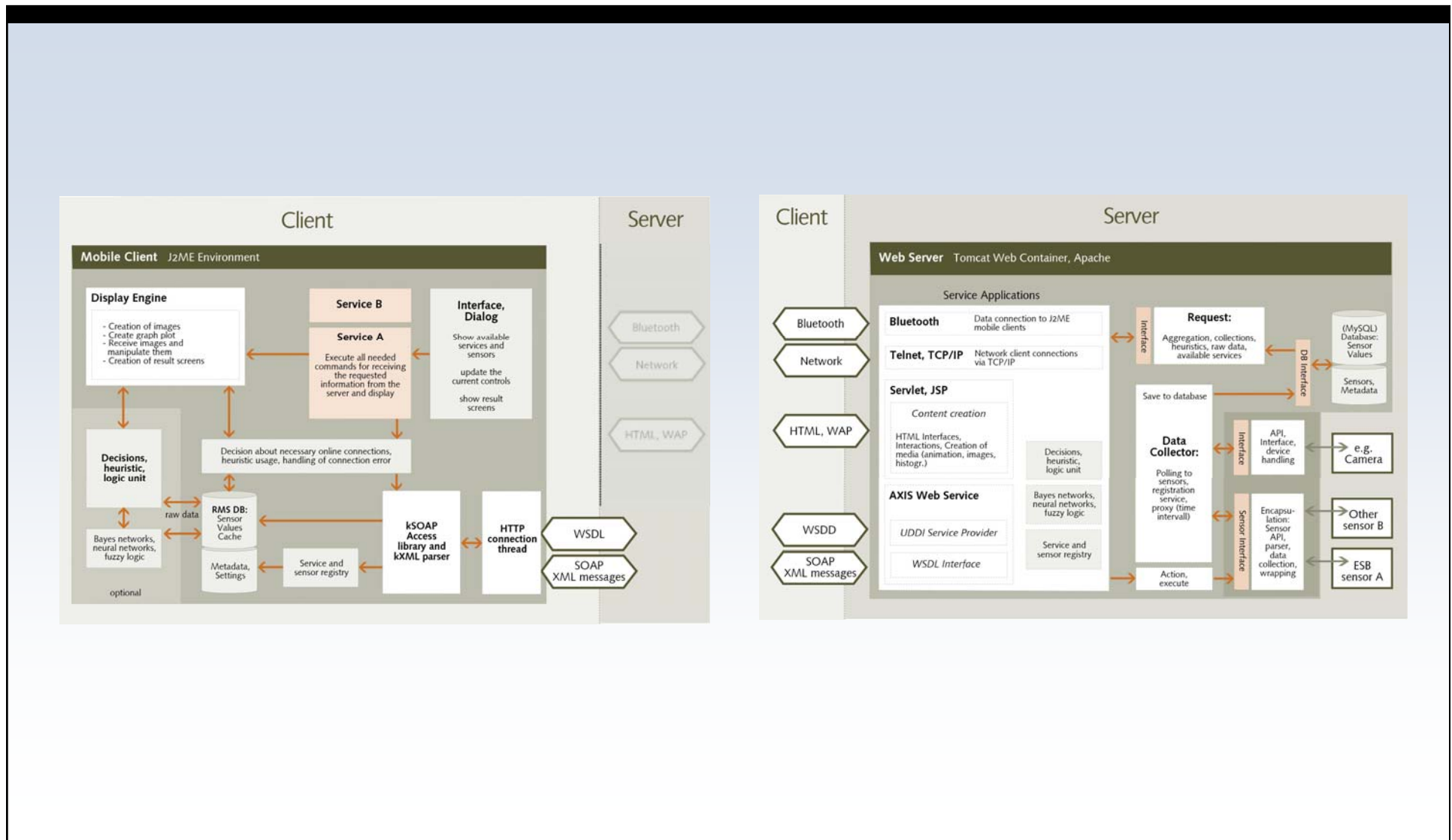
4. IR Control, Interface

# 1. Concept: Infrastructure, Client, Server

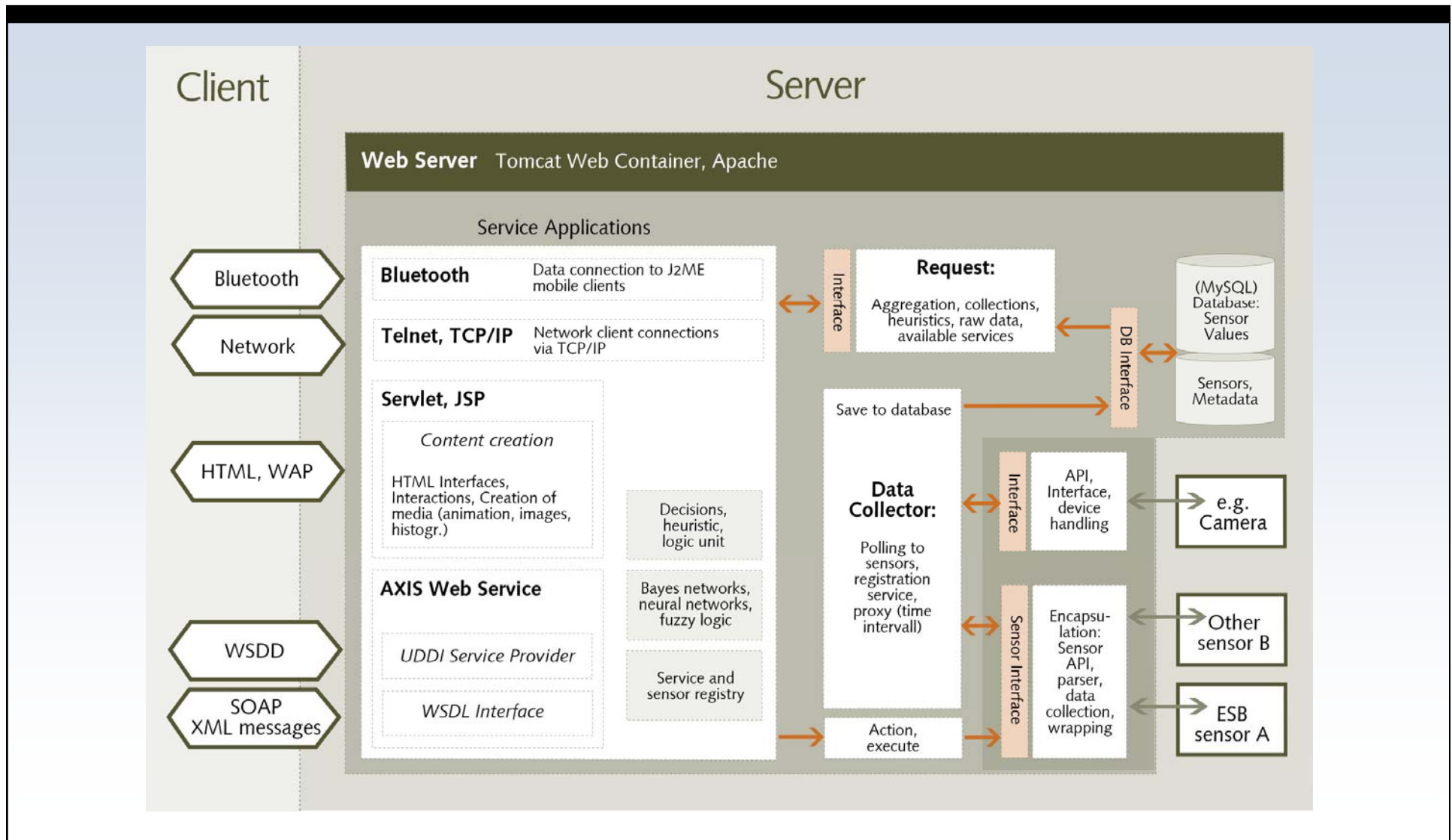
## The objectives for the sensor infrastructure:

- Easy integration of different sensors (and implementation hiding)
- Different interfaces and their evaluation
- Using web services, SOAP, AXIS
- Implementation of clients, especially for mobile devices
- Intelligent connection decisions: save costs and time
- Predict values, use heuristics, “sensor paths”
- Proxy for web service access via mobile devices
- Independence from Hardware, OS and Programming Language

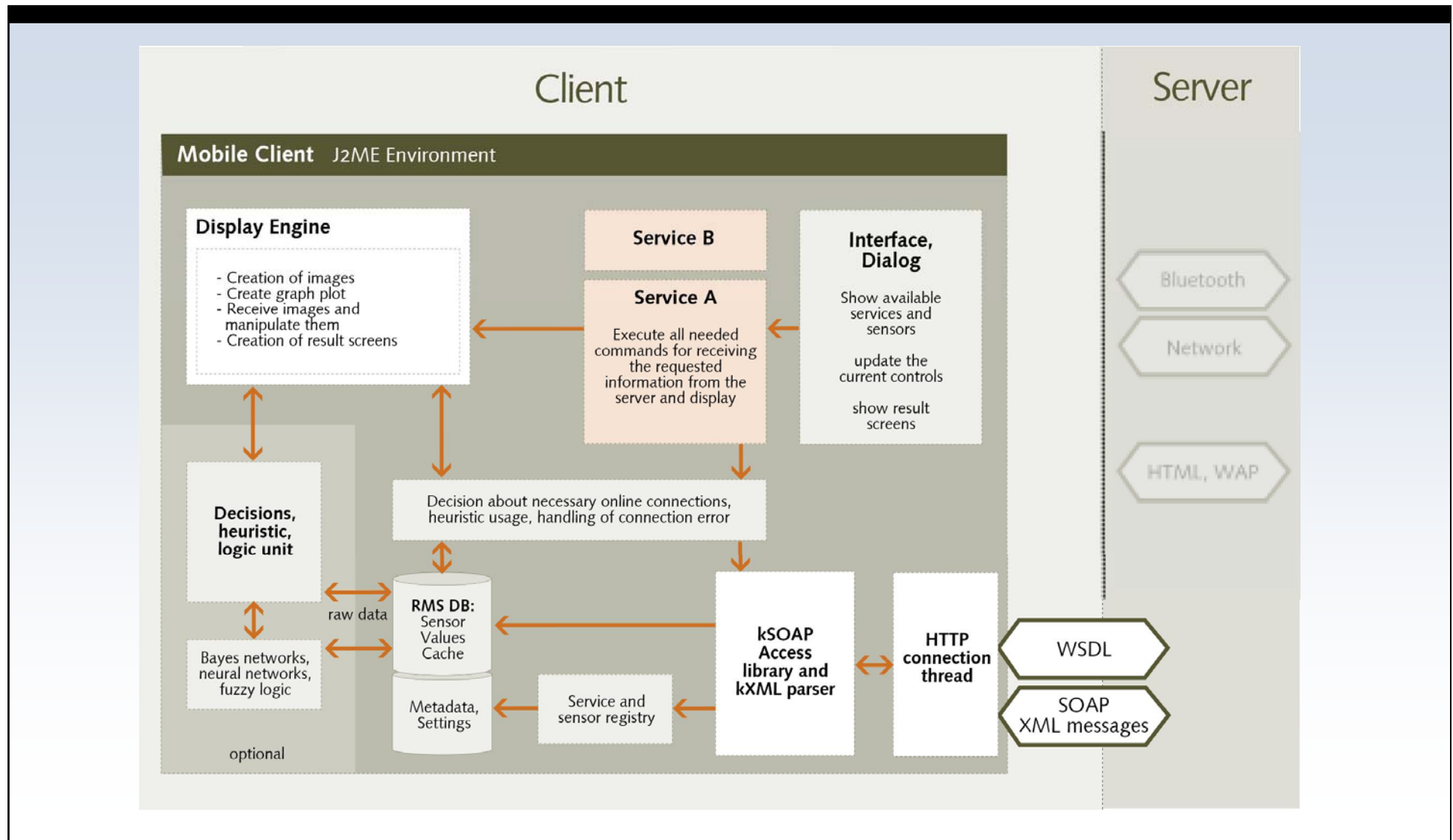
# 1. Concept: Infrastructure, Client, Server



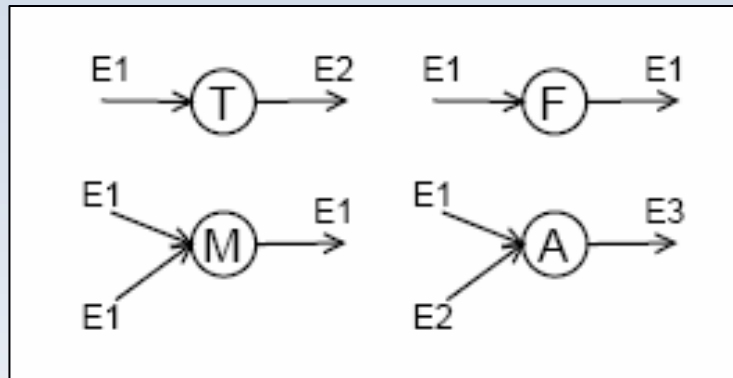
# 1. Concept: Infrastructure, Client, Server



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# 1. Concept: Infrastructure, Client, Server



Reference: [Chen, Kotz 02a]

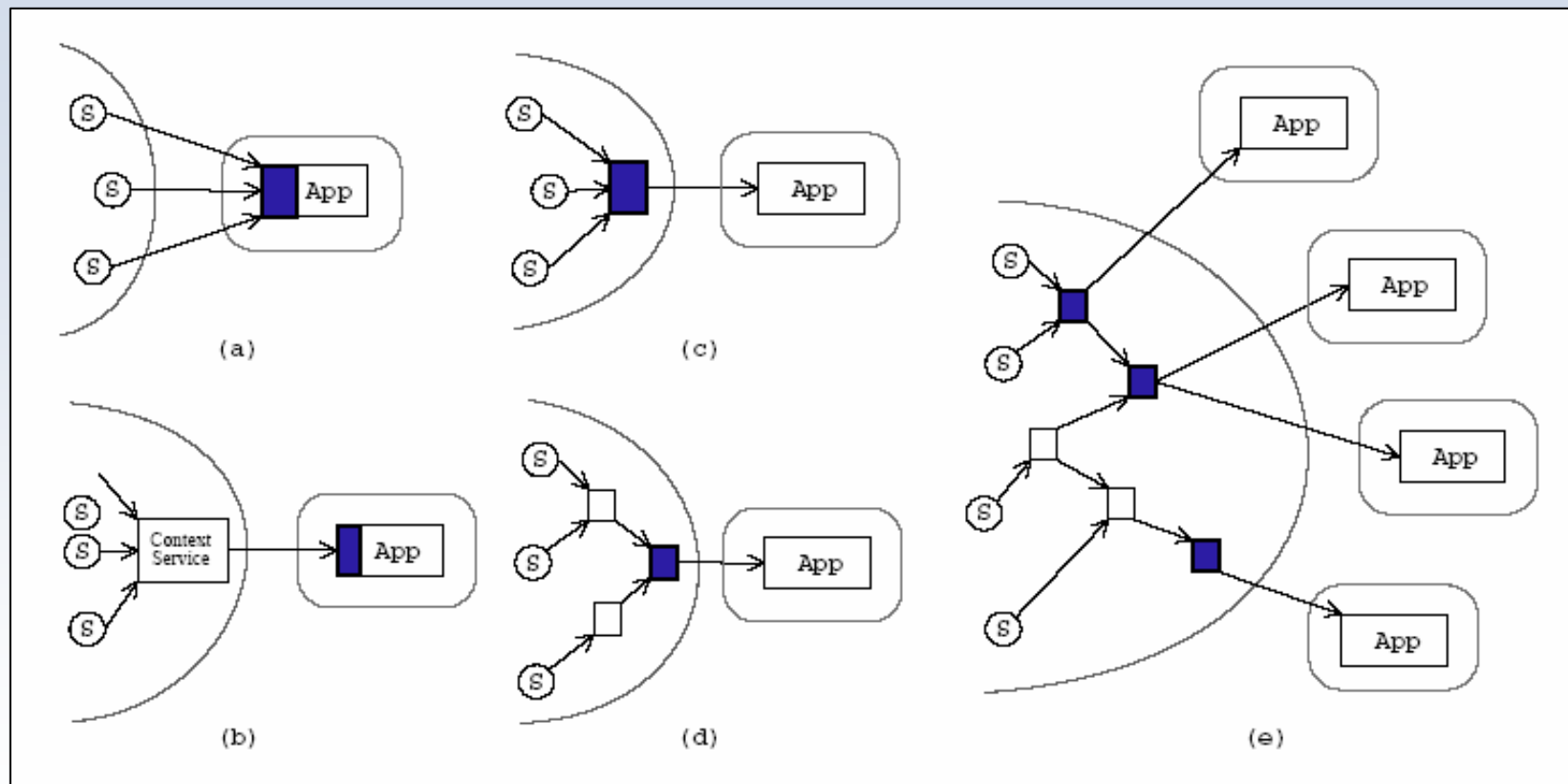
## Types of operators [Chen, Kotz 02a]:

- Transformer
- Filter
- Merger
- Aggregator

- Building of operator graphs
- Useful for heuristic calculations

- Other related work to sensor technology: [Beigl], [Schmidt], TeCO, [Jonsson], [Hong, Landay]
- Sometimes other main focus: mobile sensors (→ TeCO), exact location detection, exact object tracking (e.g. with RFID)

# 1. Concept: Infrastructure, Client, Server

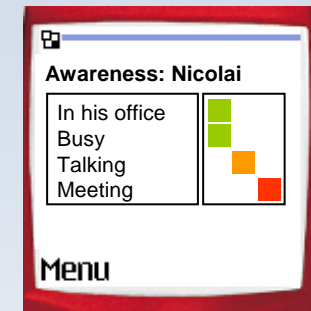


Reference: [Chen, Kotz 02a]

## 2. Applications, Use cases

### I. Awareness information

- Sensor network in the office (or lab)
- Heuristic calculation: use current sensor data and history
- Abstract information, e.g. colors (red, yellow, green)
- Interface for mobile clients → propose communication methods to contact user: telephone, email, system message
- Useful for working groups, meeting scheduling, etc.



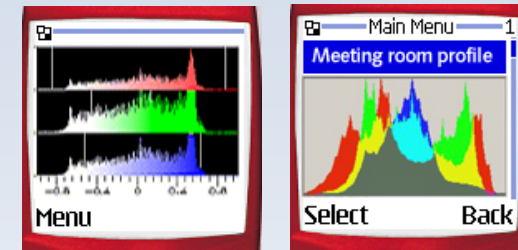
### II. Connect context with mobile availability service

- Mobile client can access sensor values (raw and abstract) in the neighborhood (e.g. office, conference room, etc.)
- Connection via Bluetooth, or IR
- Gets information about context: meeting, presentation, alone, ...
- Change profile and availability setting of the mobile phone

## 2. Applications, Use cases

### III. Room profile

- Sensor network in the lab, public rooms, meeting rooms, conference rooms, ...
- Heuristic calculation: use history data
- Request: usage in the future (predictive) or in the past, “room profile” overview, histogram like graphs



### IV. Notification service

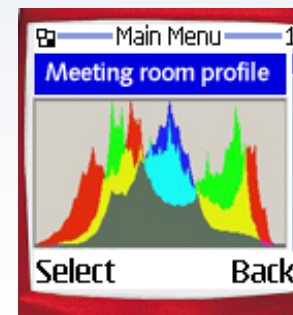
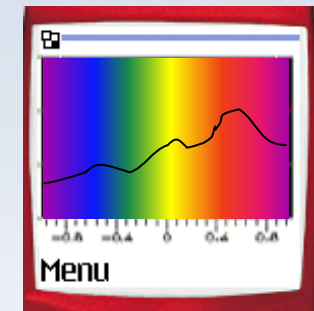
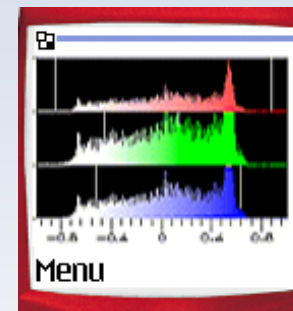
- User can specify the activities he is interested in
- Control: threshold values, e.g.:
  - Notification if there are people working for more than 2 hours in the CML lab
  - Notification if there is a presentation in RO15 between 1pm and 5pm
- Service can decide which message type is used:  
Bluetooth connection, SMS, Email, ...

## 2. Applications, Use Cases

### Access to awareness information for mobile devices (J2ME Platform):

- Easy to learn/use interface
  - Text or graphic usage depends on information volume
  - Compact information on one screen
  - Detail on demand; from general to specific
  - Overview and context
- Graph plot engine for J2ME, Library
- Display Manager

Design concepts for graphical presentation (not yet implemented):



### 3. Sensors, Parsing, Regular Expressions

Request	Description	Parameter	Return	Delay
<code>getID()</code>	Identification of sensor	-	int	5s
<code>getTemperature()</code>	Temperature °C	-	Double (with sign)	5s
<code>getMovement()</code>	Movement sensor	-	int	0s
<code>getLight()</code>	Light intensity (negative)	-	int	0s
<code>getCurrentNoise()</code>	Microphone level	-	int	0s
<code>getCounterNoise()</code>	Microphone counter	-	int	0s
<code>getAverageNoise()</code>	Average microphone level	-	int	2s
<code>getDate()</code>	Clock	-	Date object	10s/0s (Zeit)
<code>setDate(Date)</code>	Set integrated clock	Date object	-	-
<code>getVibration()</code>	Vibration / tilt sensor	-	int	0s
<code>getPower()</code>	Battery check	-	int	0s
<code>getSensorDataCollection()</code>	All sensor values	-	SensorDataCollection	0s

### 3. Sensors, Parsing, Regular Expressions

- Parser for sensor summary (`rsr`, `saf`), working with regular expressions
- `rsr`: receive all sensor values, `saf 32` activates automatic sensor report
- Class/struct for sensor data collection (instead of single requests): `SensorDataCollection`, with getter and setter for all values

#### Regular Expressions:

- Packages: `java.util.regex` (since JDK 1.4) or `jakarta regexp`
- `Pattern.compile(<regexp>) → Matcher → matcher.find() → matcher.group()`
- References: [Darwin] [Jakarta RegExp] [JakartaRE Syntax]

```
Pattern pattern = Pattern.compile("\\[Mic:\\s[0-9]*\\]");
Matcher matcher = pattern.matcher(toParse);
if (matcher.find()) String microphone = matcher.group();
```

### 3. Sensors, Parsing, Regular Expressions

#### Example `rsr` value from the ESB:

```
[20|30.11.04 15:08:46|+026.0][IR: C(5) A(20)]  
[Btn: 0][Light: 1046 Hz][Pir: 2][Vib: 0][Mic: 0]  
[BAT: 2266][EXT: 158]
```

#### The regular expressions (some examples):

30.11.04  $\Rightarrow$  `[0-9]{2}\.\.[0-9]{2}\.\.[0-9]{2}`

+026.0  $\Rightarrow$  `(\\+|\\-)[0-9]{3}\.\.[0-9]{1}`

[Light: 1046 Hz]  $\Rightarrow$  `\\[Light:\\s[0-9]*\\sHz\\]`

[Vib: 0]  $\Rightarrow$  `\\[Vib:\\s[0-9]*\\]`

[Jakarta RegExp] [JakartaRE Syntax]

## 4. IR Control, Interface

- **Idea: Use an handheld device (Palm) to interact with the ESB IR receiver/transmitter.**
- Infrared Communication: ESB and protocol
  - Uses RC5 remote protocol
  - IR Codes: RC5 (Phillips), Sony Pulse-Width, Sony 12, Sony 15, Daewoo, Panasonic, Onkyo, JVC
  - Instruction set: 2048 commands, divided into 32 addresses with each 64 instructions
  - RC5 Technical specifications: [De Vleeschauwer] and the ESB websites [ESB IR] [ESB Term]
  - Link collection for IR: [Engdahl]
- IR development for palm size devices: PPC [DevNet] and Palm [PalmSource], developer kits (C++, eVC, eVB)

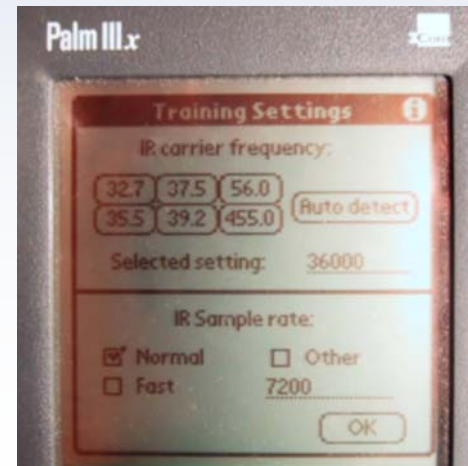


# 4. IR Control, Interface

- Prototype using Palm existing remote software, training mode for application to learn RC5 commands
- Communication with the ESB
  - ESB commands: `sir xxxx, rir`
  - Received IR bytes also available via `rsr` and the polling mode `saf 32` → Parser
  - Examples of commands (codes for home entertainment):

Address:	Device:	Command:	
0	TV1	0...9	Numbers 0...9 (channel select)
1	TV2	12	Standby
5	VCR1	16	Master Volume +
6	VCR2	17	Master Volume -
17	Tuner	18	Brightness +
18	Audio Tape	19	Brightness -
20	CD Player	50	Fast rewind
		52	Fast run forward
		53	Play
		54	Stop
		55	Recording

- Combination of two bytes (hex coded)
- These commands are used for Palm <> PC communication



## 4. IR Control, Interface

# Software: IR Control, Parser

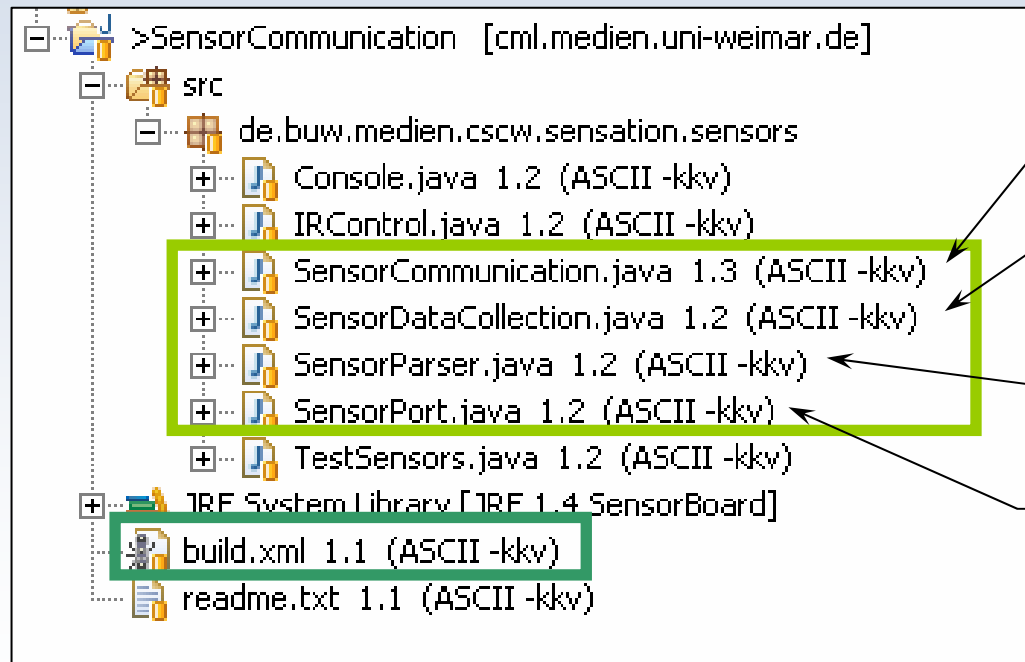
Eclipse: Sensor Project, IR Control

Start tool:



# 4. Current CVS Project

The CVS project part for the sensor communication:



Implementation of the SensorPort Interface for the ESB

An instance of this object can store all sensor values (private members, getter and setters)

Can parse an result string from the ESB with all sensor values

The common interface for all integrated sensor modules for our infrastructure

# ToDo

## **My working topics for the next week:**

1. Extend and merge the concepts and ideas
2. Tiki-Wiki Update (text, graphic)
3. Extend the console application for ESB (Create “Must-have” list, implement communication options)
4. First version of an J2ME mobile graph toolkit, especially to display awareness information in CSCW and UbiComp context
5. Test applications for IR communication (PPC, Palm); if we need such an application
6. IR application development

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**Thank You**  
For Your Attention!