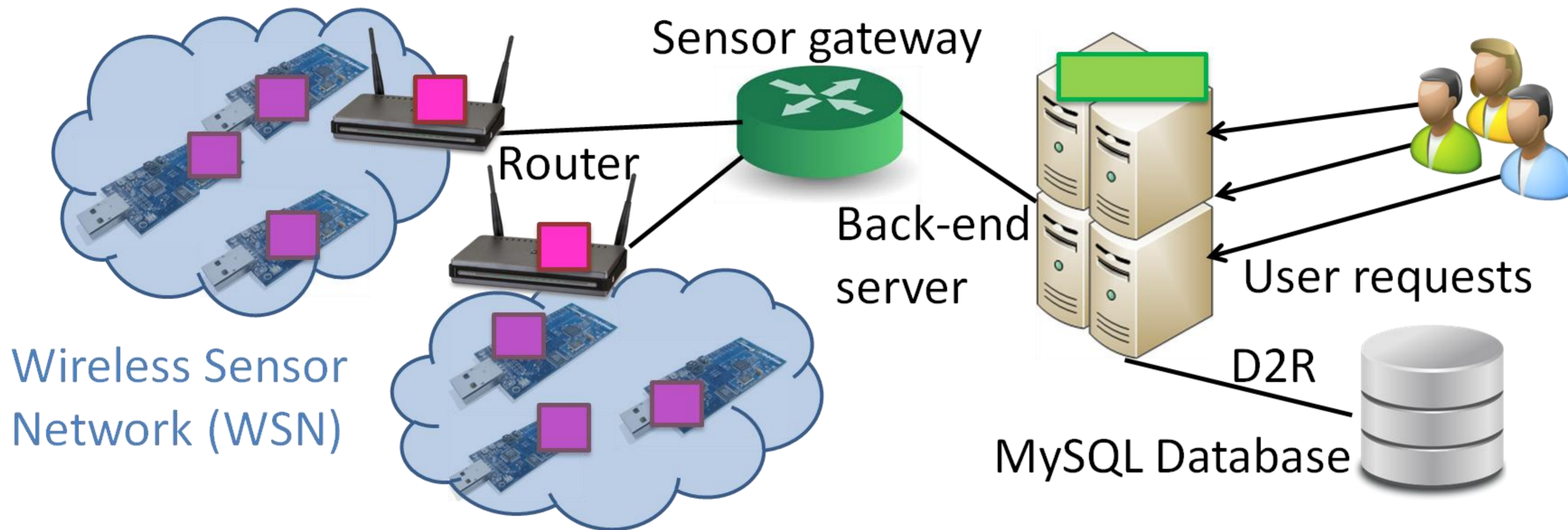


# A Distributed Reasoning Platform to Preserve Energy in WSNs

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A distributed reasoning platform is presented to reduce the energy consumption of Wireless Sensor Networks (WSNs) offering geospatial services by **minimizing the amount of wireless communication**. It combines **local, rule-based** reasoning on the sensors and gateways with **global, ontology-based** reasoning on the back-end servers.

## Reasoning architecture



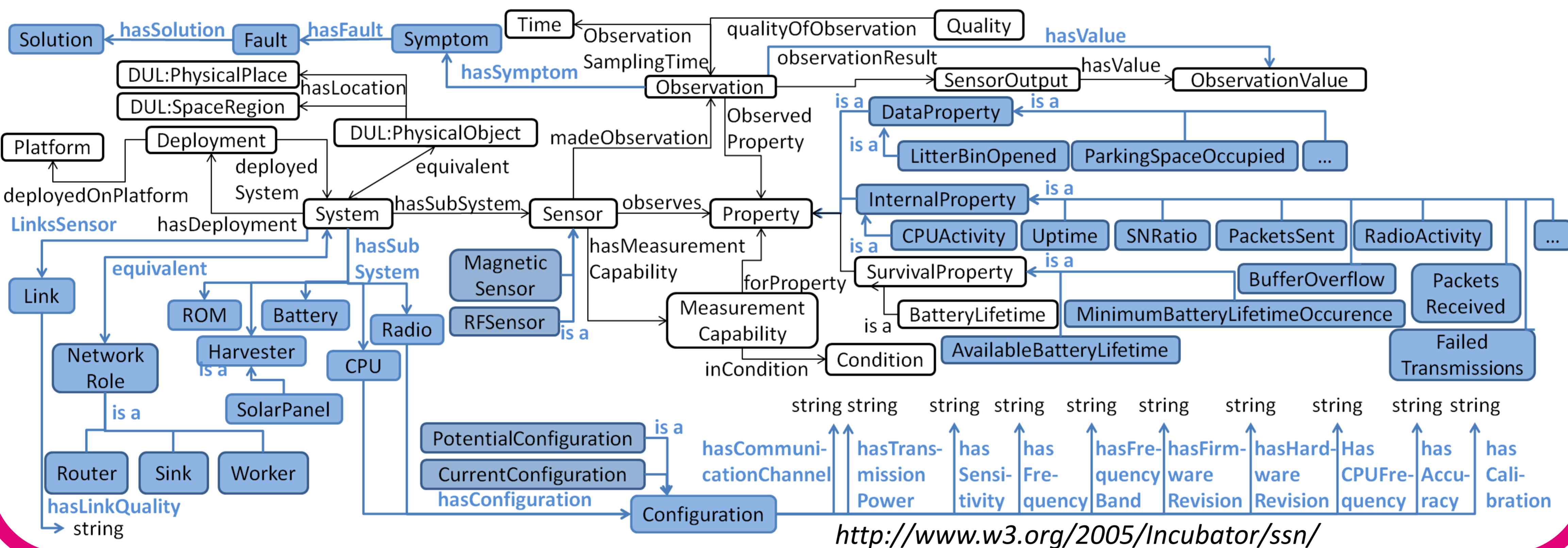
### Local reasoning

- Rule-based data pre-processing
- Transmit less data
- Complexity reasoning adapted to capabilities device
- Optimize & monitor energy consumption of the device

### Global reasoning

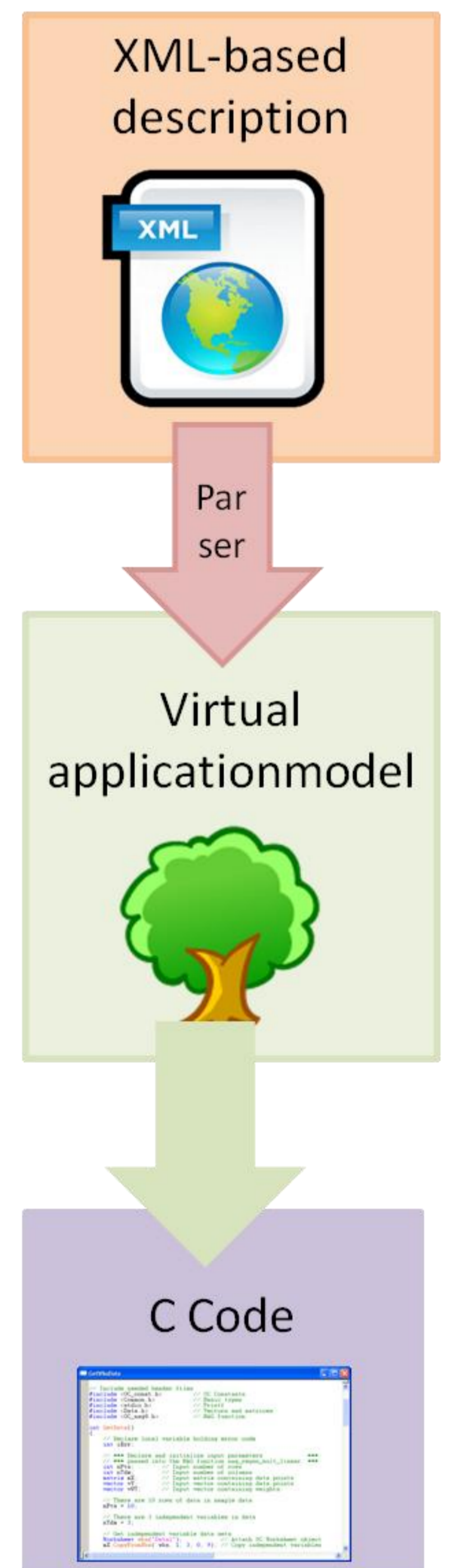
- Ontology-based back-end reasoning
- Optimize overall energy consumption of the WSN

## A SSN Ontology extension modeling energy usage

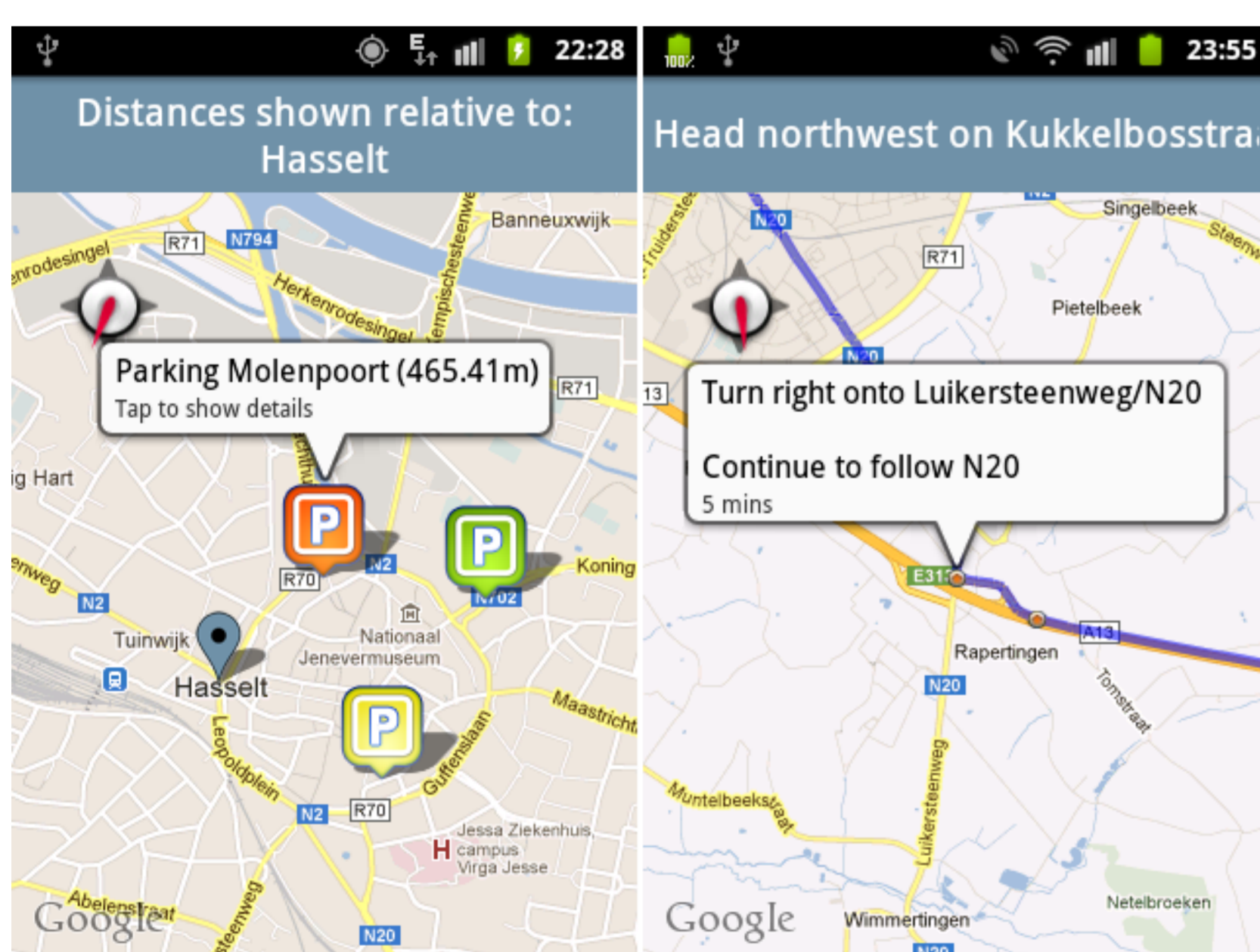


## Code generation workflow

### workflow



## Prototype: PPA



### Local reasoning

- Sensors: Detect occupation of parking spot
- Gateway: Cache measurements & request up-to-date ones
- Balance data freshness and amount of RF communication by adapting cache strategy

## Prototype: GBTM

**Sensor Observations Visualization**  
Number of (raw) sensor observations in the specified time interval: 6

**Raw Data**

Sensor ID	Value	Quality	Timestamp	Geolocation	Dustbin ID	Zone
1	1	1	2012-07-19 18:29:28	(3.730524; 51.04173)	1	Minskpark, Gent
1	1	1	2012-07-19 18:30:28	(3.730524; 51.04173)	1	Minskpark, Gent
1	0	1	2012-07-19 18:40:46	(3.730524; 51.04173)	1	Minskpark, Gent
1	1	1	2012-07-20 08:40:46	(3.730524; 51.04173)	1	Minskpark, Gent
3	1	1	2012-08-22 19:45:35	(3.729161; 51.042912)	4	Citadelpark, Gent
3	0	1	2012-08-22 20:47:45	(3.729161; 51.042912)	4	Citadelpark, Gent

**Aligned Data**

Sensor ID	Open Timestamp	Close Timestamp	Open Duration	Geolocation	Dustbin ID	Zone
1	2012-07-19 18:40:28	2012-07-19 18:46:46	18	(3.730524; 51.04173)	1	Minskpark, Gent
1	2012-07-20 08:40:46	undefined	undefined	(3.730524; 51.04173)	1	Minskpark, Gent
3	2012-08-22 19:45:35	2012-08-22 20:47:45	3720	(3.729161; 51.042912)	4	Citadelpark, Gent

### Local reasoning

- Detect open/close of the lid
- Accumulate sensor readings during configurable time interval
- Send in bulk



### Global reasoning

- Optimize wake-up scheme of the sensors

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