RFID Added Value Sensing Capabilities:

European Advances in Integrated RFID-WSN Middleware

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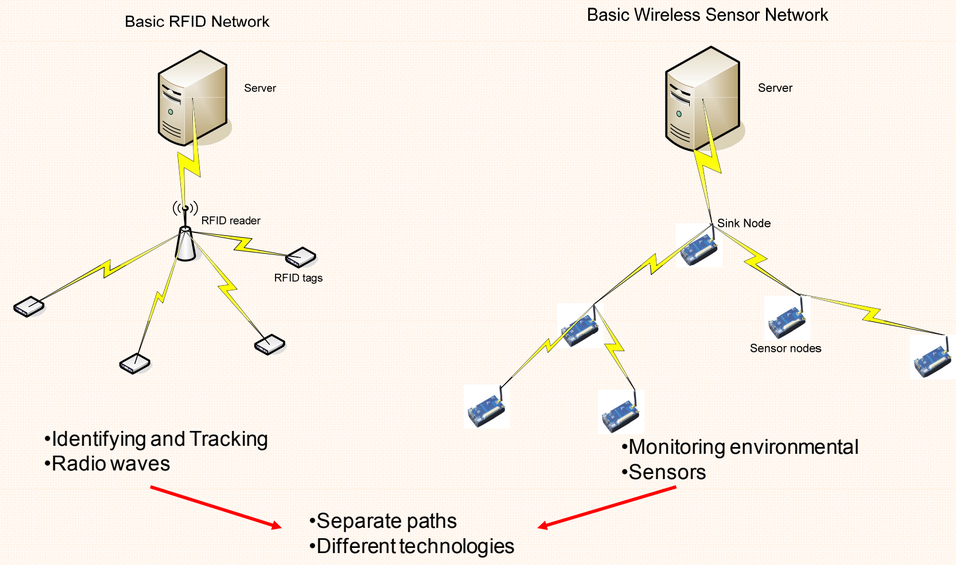
Advanced Sensors and Lightweight Programmable Middleware

FP7 ICT project ASPIRE is one of the coordinated European efforts to further the advancement of this technology, in the areas of enabling technology development for RFID. The focus of ASPIRE is on the design, development and adoption of an innovative, programmable, royalty-free, lightweight and privacy friendly RFID middleware.

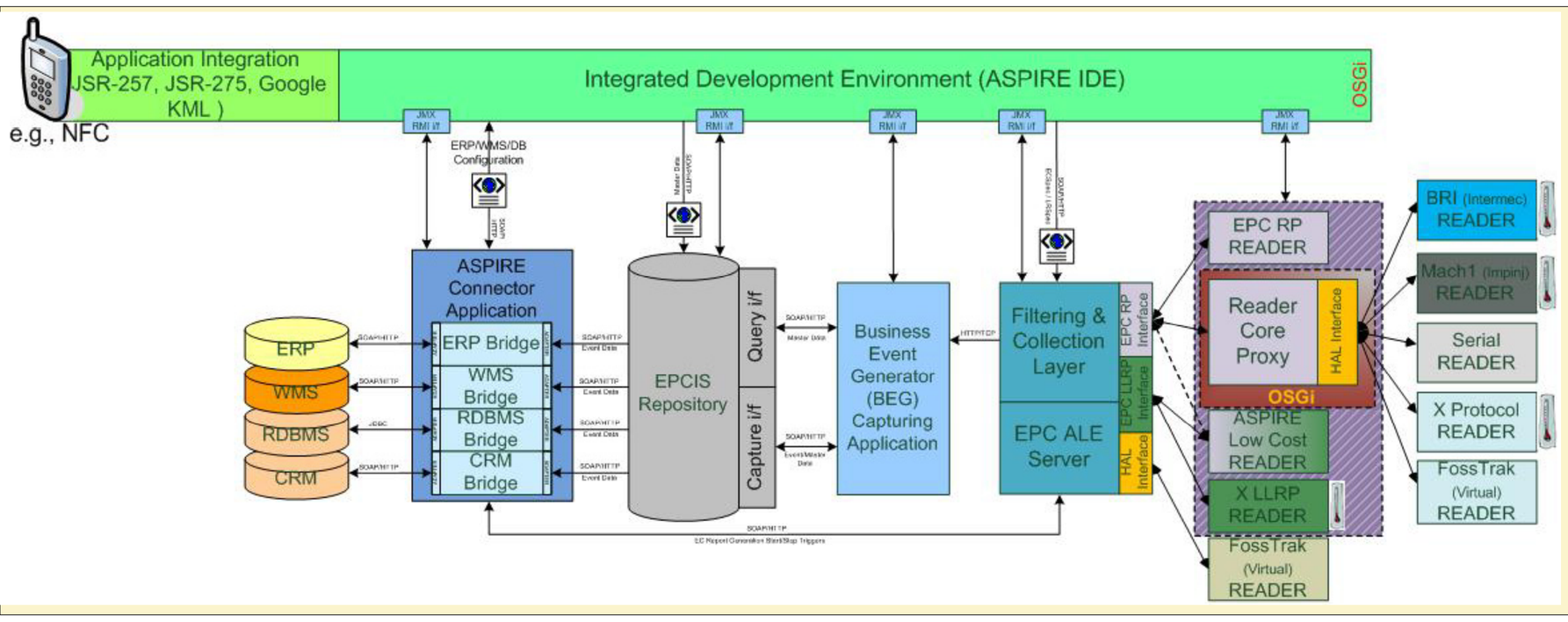
Advances in active RFID integration with WSNs allow for more RFID-based applications to be developed. In order to fill the gap between the active RFID system and the existing middleware, a HAL for active reader and ALE server extension to support sensing data from active tag were developed and integrated to the ASPIRE middleware.

RFID vs WSNs

	RFID Technology	WSN Technology
Components	Readers, tags	Sensor nodes, relay nodes, sinks
Protocols	RFID Standard by EPC Global and ISO	Zigbee, Wi-Fi
Communications	Single-hop	Multi-hop
Types	Passive, Semi-Passive, Active	Sensor nodes (such as temperature, humidity, light, vibration)
Aims	Detect presence and location of tagged objects	Sense interested parameters in environments and attached objects
Mobility	Tags move with attached objects.	Sensor nodes are usually static
Programmability	Usually closed systems	Programmable
Deployment	Fixed	Random or fixed
Price	Tag-cheap, Reader-expensive	Sensor node-medium



ASPIRE MIDDLEWARE ARCHITECTURE

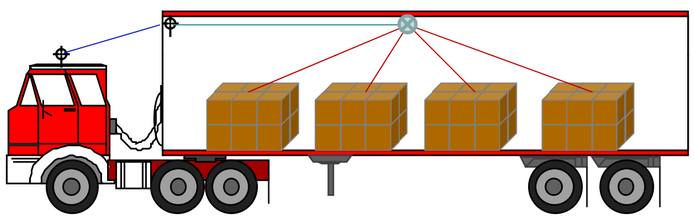


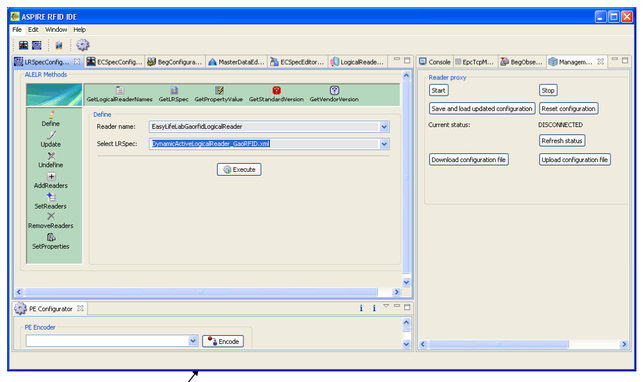
- Development of new hardware abstraction layer (HAL) to integrate both the active reader and tag to the ASPIRE middleware. The active tag works with reader and it is vendor-dependent with proprietary protocols.

- Extending the original application layer events (ALE) server of the ASPIRE RFID Middleware to support sensing data read by an active tag with sensing capability.

Two bullet points here only mention about active RFID ,but from the middleware point of view it should also support passive and semi-passive RFID. Although from hardware point of view, the sensor integration with passive RFID is difficult. (at least not available in the market yet)

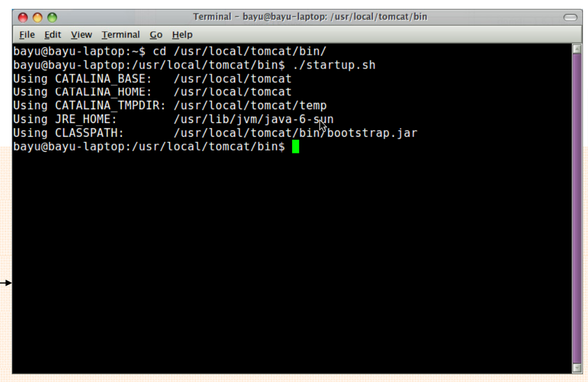
APPLICATIONS for RFID ADDED VALUE SENSING

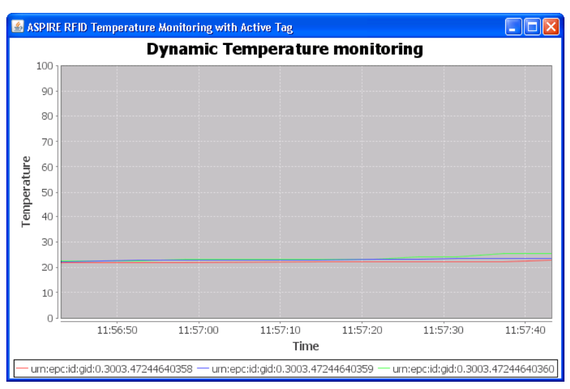




Aspire IDE
- Setting up LRSpec
- Setting up ECSpec
- Subscribe to the report

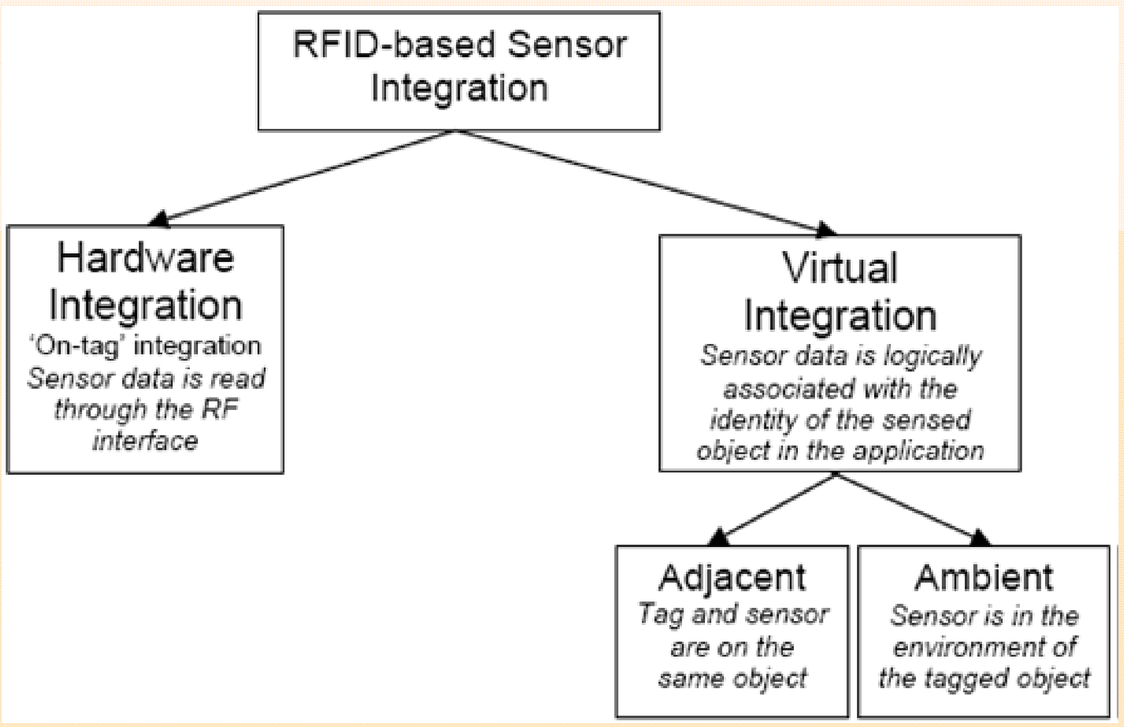
ALE Server under Apache Tomcat



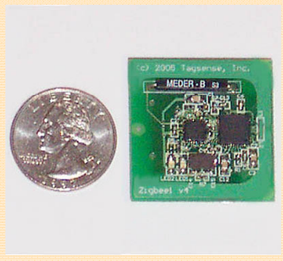


Subscribed ECReport:
- Temperature history chart

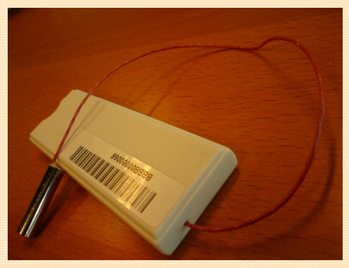
INTEGRATION of RFID and WSN



Screen shot of a demonstration scenario



Active RFID tag circuit board with input sensor



easy integration with sensor