



ASPIRE

Advanced **S**ensors and lightweight **P**rogrammable
middleware for **I**nnovative **R**fid **E**nterprise applications

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*ASPIRE: WSNs and Cooperating
Objetcs– June 2, 2010*

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Introduction

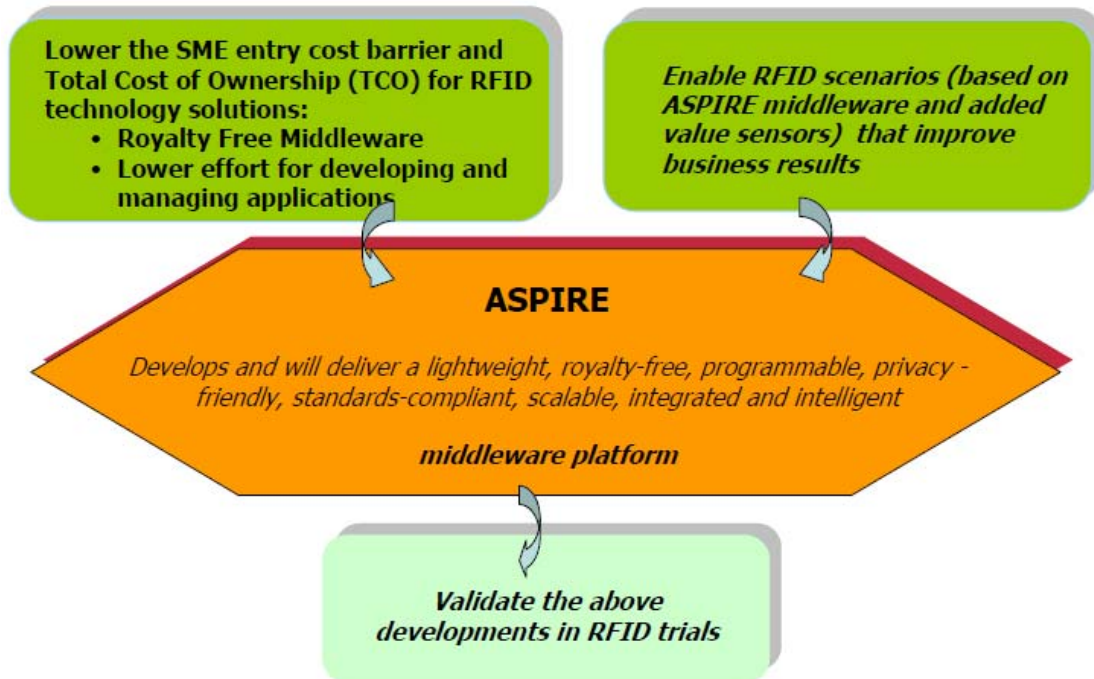
- ASPIRE is researching a new middleware paradigm for RFID solutions
- The motivation is the cost barriers experienced by European SMEs when deploying RFID
- Overall: Lower the total cost of ownership for SME RFID solutions!



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Objectives



Middleware – What and Where?

- What?
- In RFID...
 - ...the middleware adds functionality for collection, filtering, formatting, etc.
 - ...the middleware turns data into information suitable for processing e.g. generation of business events
 - ...the middleware is essential as the tags are often just dumb devices



Middleware – What and Where?

- Where?
- No consensus – it depends on the application...
- Centralized
 - Sensors, tags and readers are relaying to one or more central entities
- Distributed
 - Intelligence is centered at sensors, tags or readers
- ASPIRE has taken a centralized approach

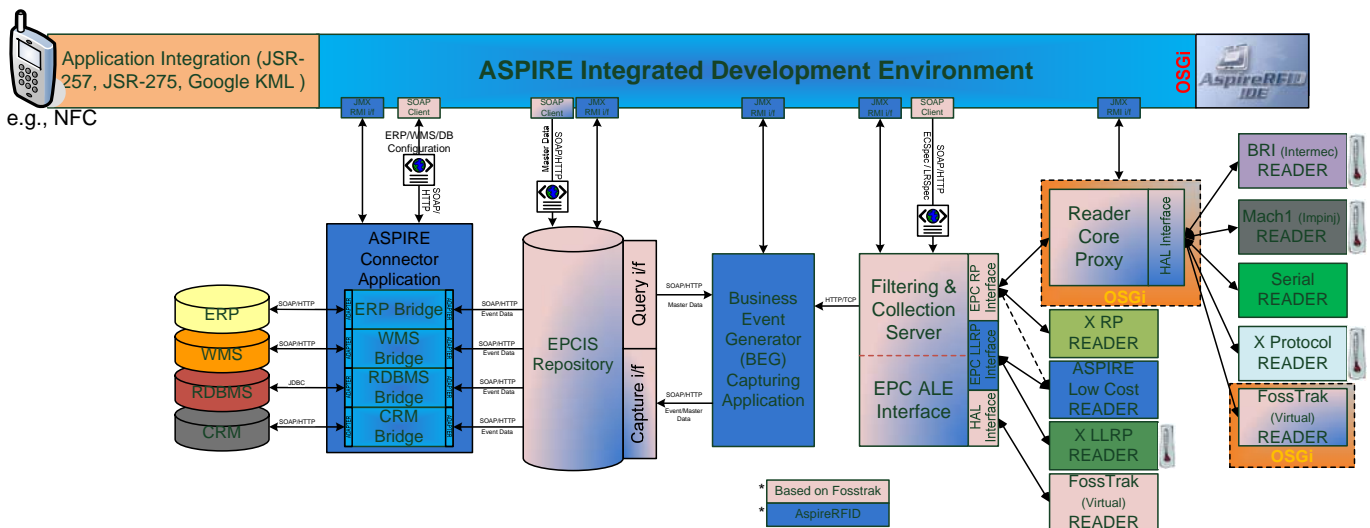


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The ASPIRE Middleware Architecture



- An extended EPCGlobal architecture



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The ASPIRE Middleware Functionality

- Collection of data from the underlying network
 - RFID interrogators, readers, antennas and tags.
- Transportation and presentation of RFID data to higher level (applications) software.
- Filtering of RFID detection and optimization of the use of network bandwidth while RFID data are carried over networks

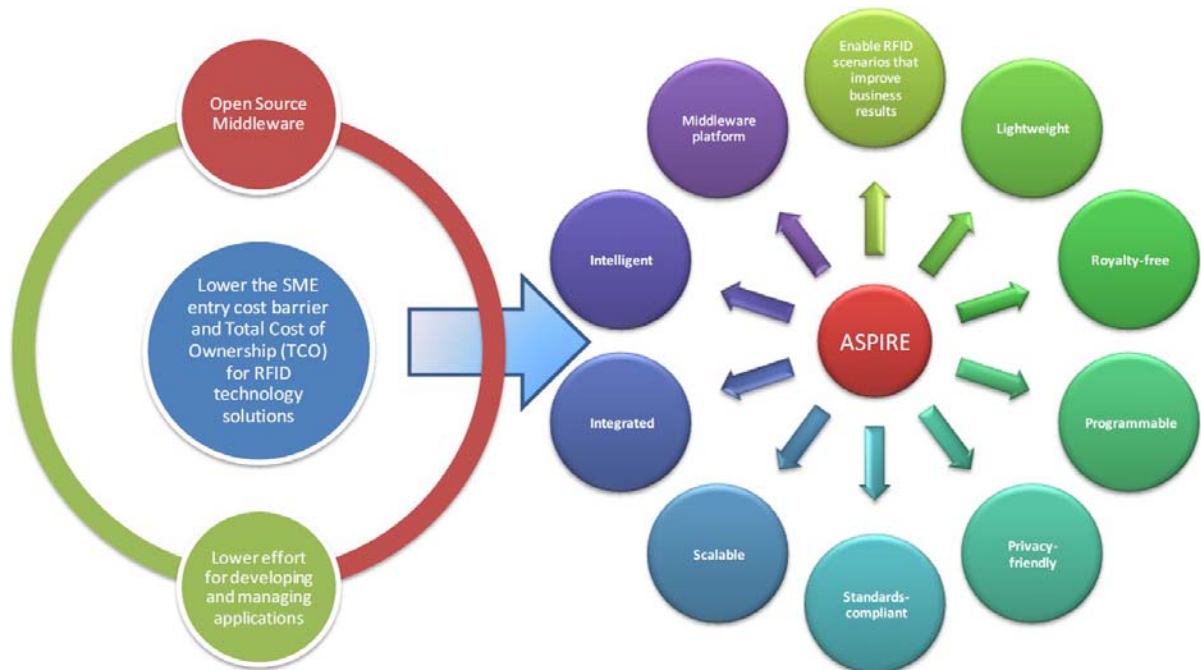


The ASPIRE Middleware Functionality

- Filtering of sensor streams and according detection and delivery of higher-level application events to the applications.
- Management of each connected reader, as well as other aspects of the reader network.
- Implementation of routing i.e. choosing on which network level/layer RFID data should be transported (local server, warehouse server, company main server, etc..).



Objectives and Design Goals



Middleware Design Goals

- The ASPIRE middleware is:
 - Lightweight
 - Royalty-free
 - Programmable
 - Privacy-friendly
 - Scalable
 - Intelligent

All features that are needed for ubiquitous sensing!



Lightweight

- Lightweight
 - The ASPIRE middleware is lightweight enough to run on legacy systems or low resource embedded systems
 - Sensing, filtering and communication capabilities in small electronic systems
 - Important to SMEs, but also for the full-scale deployment of IoT



Royalty-Free

- The ASPIRE middleware is open-source and free for anyone to use
- ASPIRE believes that the open-source approach is the best way to cooperate with other projects
 - It provides the flexibility, quick trial and feedback for true innovation
- Standard-compliant, technology neutral and multi-vendor
- Transparent privacy: Open to public scrutiny!





Programmable

- The ASPIRE middleware can be programmed with a minimum of code
- In many cases no code at all is needed due to predefined solution templates and tools
- Easy customization
- The only way forward for true RWI!



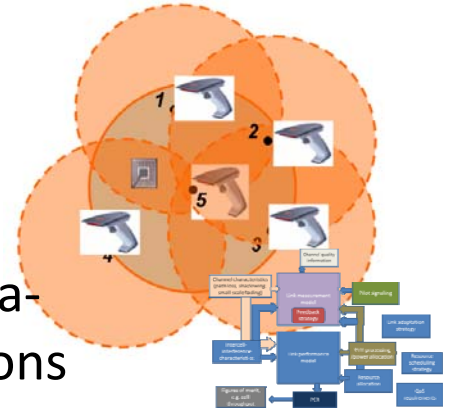
Privacy-Friendly

- The ASPIRE middleware works from a minimalist data generation approach
- Incorporating measures for:
 - Anonymity, Blurring, Cleanup, Encryption, Separation, etc.
- Open to public scrutiny
- Important, as privacy can become an obstacle for the future vision of ubiquitous sensing!



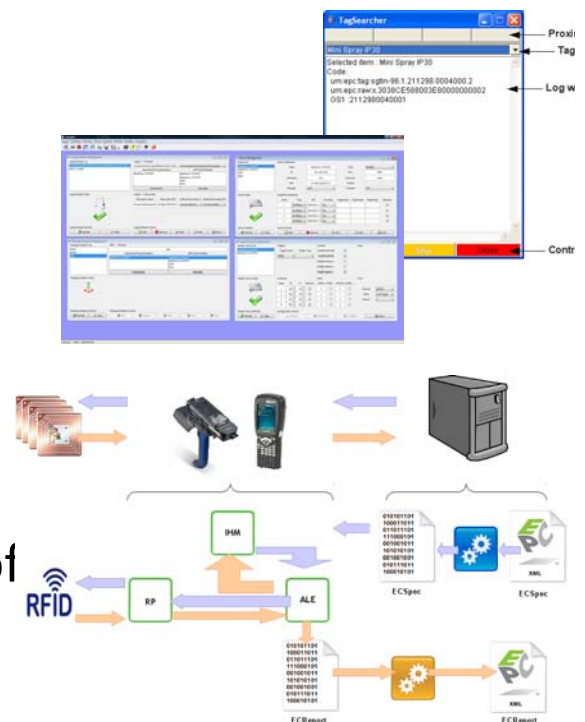
Intelligent

- The ASPIRE middleware incorporates intelligence enabling context-analysis and reasoning over numerous sensors' observations
- It automatically adapts to the capabilities of the underlying network of readers
- Anti-collision protocol
 - Adding readers to increase reliability leads to the risk of collisions



Usage Scenario

- The ASPIRE middleware has been successfully showcased in two trials with SMEs
 - Inventory tracking for Greek retailer with smart picking and packing
 - Asset management and tracking with generation of business events





ASPIRE and Ubiquitous Sensing

- Ubiquitous sensing = low cost
- ASPIRE emerged from the need for low cost, flexible solutions for SME deployments
- Cost as a barrier will also be experienced when considering ubiquitous sensing, IoT, RWI, etc.



Conclusion

- The results from ASPIRE and the ASPIRE middleware itself are valuable for the whole concept of ubiquitous sensing
- The design goals and designed middleware overlap with the general requirements of ubiquitous sensing
- The results from ASPIRE can be reused to provide intelligent solutions for IoT and ubiquitous sensing networks

