RFID Solutions for Industry.

RFID Middleware Implementation Considerations

6.5.2008, Odette Seminar
Gothenburg

Antti Virkkunen, CEO
Vilant Systems Oy
Agenda

• Generalization of an RFID system
• Component responsibilities and alternatives
  – With case examples
• Case example process
  – Valtra AGCO Tractor manufacturing
Vilant facts 2007

- Personnel 19 (R&D + services 15)
- 1,4M€ revenue
- 3 year growth 347% (Deloitte Fast 50: 3. place)
- Market leader in Finland (over 75% of production use logistics RFID systems)
- 200 networked readers in production and supported
- 150 handheld RFID readers in production use
- 50 000 assets tracked
- 300 000 daily events
- Winner of Symbol EMEA Enterprise Mobility Award 2006
- EPC Global solution provider member
SAP-example

Tags
- Hold Data
- Transmit data using radio waves

Readers
- Read / write
- Transmit data to systems

Device Management
- Manage multiple
- Readers & standardize data

Auto-ID Infrastructure
- Store and translate raw EPC data to
- business data

Exchange Infrastructure
- Route business data and events to
- applications

Enterprise Applications
- Provide Decision Support and
- execute transactions

SAP Offering

Partner Offering
IBM Domain model
- generic system pieces to look for

Usual question:
• Microsoft vs. Java
• Current corporate (web-)application server platforms

Tools – support for customized business logic
The weighting – it is not unusual, that "pure RFID" is only 10 - 20% of the process improvement project...
Components
RFID system components

RFID Middleware

EDI

RFID handheld

Smart RFID Gate

RFID DC Gate

Reader Client

LAN

WAN

WLAN

GPRS

3G

RFID Application

Device Manager
(Monitoring & EPCIS events)

Basis (Event repository & application plugins)

Eg. inventory data

Back end applications

SAP

Oracle

WMS

...
Typical transactions
- Goods receive
- Kanban-order
- Transfer order
- Inventory take
- ...
RFID system components

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RFID handheld
- Viلانt Client for Handheld

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RFID Application
- Device Manager (Monitoring & EPCIS events)
- Basis (Event repository & application plugins)

Eg. inventory data

Back end applications
- SAP
- Oracle
- WMS
- ...

vilant
Smart RFID gates

Typical transactions
- Goods receive
- Kanban-order
- Transfer order
Forklift RFID readers

Typical transactions
- Goods receive
- Kanban-order
- Transfer order
- Putaway
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RFID gates for distribution centers

- Reader & I/O unit
- Traffic light stack
- Motion Sensor
- 4 Antennas
- Cables
- Mechanics
- Power supply
ABB outbound gates

Truck loading - right product in right truck?
Valtra Inbound gates

Goods receive automation
Finnair container tracking (pilot)

Pallet / container movement tracking
RFID gates for automation systems

- Reader
- IP65 enclosure
- Traffic light
- Motion Sensor
- 1-4 Antennas
- Cables
- Mechanics
- Power supplies
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...
Aker Yards employee tracking

WLAN connection

→ Autonomous & buffered operation needed
VR Cargo rugged gates (Finnish Railways)

GPRS connection

→ Autonomous & buffered operation needed
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Screenshots Device Manager
Example why device management is not same as central event repository

Global device manager

Global repository & event routing server

WebServices

Central server instance

Optimal additional device manager (load balance)

Device Management can be decentralized to other sites
### Business locations

**LOKE (urn:epc:cid:sgln:6438120.00000.0)**

<table>
<thead>
<tr>
<th>Logical read point</th>
<th>ID</th>
<th>Unique ID</th>
<th>Address</th>
<th>Antennas</th>
<th>Status</th>
<th>Remove read point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porti 3</td>
<td>0</td>
<td>CBE0507AG82BD60</td>
<td>10:80.13:70</td>
<td></td>
<td>operational</td>
<td>Remove reader</td>
</tr>
</tbody>
</table>

**Add reader**

**VIRKATIE (urn:epc:cid:sgln:6438120.00001.0)**

<table>
<thead>
<tr>
<th>Logical read point</th>
<th>ID</th>
<th>Unique ID</th>
<th>Address</th>
<th>Antennas</th>
<th>Status</th>
<th>Remove read point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porti 1</td>
<td>0</td>
<td>CBE0507AG83806E</td>
<td>10:80.13:76</td>
<td></td>
<td>operational</td>
<td>Remove reader</td>
</tr>
</tbody>
</table>

**Add reader**
### Physical Readers

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reader ID</td>
<td>1</td>
</tr>
<tr>
<td>Unique ID</td>
<td>C80507AG8280885F</td>
</tr>
<tr>
<td>IP address</td>
<td>192.194.41.110</td>
</tr>
<tr>
<td>Firmware Version</td>
<td>XR480 3.2.6</td>
</tr>
<tr>
<td>Type</td>
<td>XR480</td>
</tr>
<tr>
<td>Is Accepted</td>
<td>true</td>
</tr>
<tr>
<td>Command Channel Port</td>
<td>1</td>
</tr>
<tr>
<td>Is Active Monitoring</td>
<td>true</td>
</tr>
<tr>
<td>Type of Address</td>
<td>IP</td>
</tr>
<tr>
<td>Total Tags Read</td>
<td>78569</td>
</tr>
<tr>
<td>Up Time</td>
<td>675h 43min.</td>
</tr>
<tr>
<td>Taken to use</td>
<td>Thu Feb 14 13:12:42 EET 2008</td>
</tr>
<tr>
<td>Antennas</td>
<td></td>
</tr>
<tr>
<td>Admin password</td>
<td>Viewer</td>
</tr>
<tr>
<td>Admin username</td>
<td>Viewer</td>
</tr>
<tr>
<td>Command channel port</td>
<td>1</td>
</tr>
<tr>
<td>Operating mode</td>
<td>1</td>
</tr>
<tr>
<td>Polling interval</td>
<td>1000</td>
</tr>
<tr>
<td>Monitoring interval</td>
<td>30000</td>
</tr>
<tr>
<td>Unique identifier</td>
<td>C80507AG8280885F</td>
</tr>
<tr>
<td>Reader specific arguments</td>
<td>tclens/queryEvents</td>
</tr>
</tbody>
</table>

### Save configuration
- Save config

(c) Vilant Systems - Vilant Device Manager, 4.1.133
Device manager is connected to central Basis server.
### Last seen tags

<table>
<thead>
<tr>
<th>Tag</th>
<th>Time</th>
<th>Readpoint</th>
<th>Direction</th>
</tr>
</thead>
</table>
RFID system components

RFID Middleware

EDI

RFID handheld

Smart RFID Gate

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Back end applications

SAP

Oracle

WMS

...
Basis – event repository
Event list for local debugging
Locations of events are managed here.

<table>
<thead>
<tr>
<th>Name</th>
<th>External ID</th>
<th>Update</th>
<th>Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td>test1</td>
<td>1</td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td>test2</td>
<td>2</td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td>Jetain</td>
<td>Jee</td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td>LOKE</td>
<td>7336</td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td></td>
<td></td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td></td>
<td></td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td></td>
<td></td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td>TÄÄonTesti</td>
<td>Prüssel</td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td>Potsi</td>
<td>HKI</td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td>TEST</td>
<td>75024</td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td>Huhuu</td>
<td>88767</td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td>huu-uh</td>
<td>ewq</td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td>hips</td>
<td>177</td>
<td>update</td>
<td>delete</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Device managers can be added and removed.

### Enabled device managers

<table>
<thead>
<tr>
<th>Name</th>
<th>Management URL</th>
<th>Status</th>
<th>Latest IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vilant DM 1</td>
<td><a href="http://susetest:8080/DM/">http://susetest:8080/DM/</a></td>
<td>OK</td>
<td>127.0.0.2</td>
</tr>
</tbody>
</table>

### Disabled device managers

<table>
<thead>
<tr>
<th>Name</th>
<th>Management URL</th>
<th>Status</th>
<th>Latest IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vilant DM 1</td>
<td><a href="http://localhost:1234/foobar">http://localhost:1234/foobar</a></td>
<td>?</td>
<td>127.0.0.2</td>
</tr>
<tr>
<td>DM1</td>
<td><a href="http://susetest:8080/VilantBasisWeb/">http://susetest:8080/VilantBasisWeb/</a></td>
<td>?</td>
<td>10.6.1.239</td>
</tr>
<tr>
<td>DM4</td>
<td><a href="http://susetest:8080/VilantBasisWeb/">http://susetest:8080/VilantBasisWeb/</a></td>
<td>?</td>
<td>10.6.1.239</td>
</tr>
<tr>
<td>DM2</td>
<td><a href="http://susetest:8080/VilantBasisWeb/">http://susetest:8080/VilantBasisWeb/</a></td>
<td>?</td>
<td>10.6.1.239</td>
</tr>
</tbody>
</table>
Plugins redirect RFID event to corresponding RFID applications
User management

- Manage users
  - admin
  - dm-admin
  - user

- Manage groups

- Back
- Delete selected groups
- Add group
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...
The application framework allows the use of standard components and custom reports.
Case example
Case Video – Valtra AGCO
Conclusions

• 100 projects and no one-size-fits-all
• Analysis of process parts
• → Leanest possible solution (KISS)
RFID project process

Step 1:
Site survey
1 day, most of the answers & process blueprint

Step 2:
Feasibility testing
2 - 5 days, is it doable with RFID

Step 3:
Pilot
3 months, to put the system to a real life stress test

Step 4:
Production
Includes ERP / warehouse system integration and full scale roll out

Step 5:
Support
On going, starting from pilot with site support and system maintenance

Step 1.
Phases 1 and 2 work components

- Identified need for RFID
- Process analysis
- Site survey
- Improved process concept
- Proof of Concept RFID testing
- RFID Training, standards, etc
- Project Plan
- Proposal
- Statement of work
- Bill of materials
- Order
- Project
- System Specification work, implementation etc

Solve and verify the architecture solution before the project!
Thank you!

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        02630 Espoo
        Finland
References
Vilant installations
References: Industry

- **ABB Drives SAP-integrated system (since 2004 in production)**
  - Automated reorder, shipping and goods receipt
  - ISO18000 and EPC G2 UHF RFID
  - 10 RFID portals, 16 supplier shipping stations

- **Nokia SAP-integrated system (since 2007 in production)**
  - Automated shipping and goods receipt
  - 20,000 EPC G2 UHF RFID tags per month
  - Bea / Oracle -based ERP integration

- **Valtra Agco tractor manufacturing (since 2007 in production)**
  - ERP-integrated system
  - EPC G2 UHD RFID
  - Automaattinen goods receipt, warehouse level and reorder point
  - Portals (16 in full rollout), conveyor and forklift readers
References: Industry

- Paper bin tracking (since 2003 in production)
  - 10 plants / 40 RFID handhelds / 30 000 assets tracked / HF
  - 1000 daily events
  - Bea/Oracle based ERP integration

- Itella (Finnish post) logistics centre briefcase tracing
  (pilot 2007 ongoing)
  - EPC G2 UHF RFID
  - Bea/Oracle –based system

- Finnair cargo container tracking (pilot 2006)
  - EPC G2 UHF RFID
  - Tracking of international air freight containers

- Finnish railways cargo wagon tracking (pilot 2007 ongoing)
  - EPC G2 UHF RFID
  - GPRS connected reader systems, tracking of wagons
References: Industry

- Fenestra window frame identification in production (in production 2007)
- 45 portal readers in production (HF)
- 22 Million read events yearly

- AkerYards employee safety tracking system
- 5000 EPC G2 UHF RFID tags in helmets
- 15 000 events per day
- 23 UHF portals
References: Apparel

- NP Naisten pukutehdas
- Product tracking G2 RFID from production over DC to store
- Printers, labels, packing stations, portals, RFID system
- Pilot ongoing in 2007

- Apparel RFID Solution Centre
- Whole supply chain demonstration centre
- Boxed and hanging garments from production to store
- 2007