

Potentials and benefits of RFID/GPS integration: focus on construction

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Background

- Materials and Equipment constitute about 50-60% of project cost (Song 2005, Song *et al.* 2006)

-Report by the Strategic Forum for Construction in 2005 suggest that:

Up to 10% of working hours on construction site can be wasted due to ineffective logistics management

Up to 30% extra construction cost & exceeded project duration

- Why?
 - Low (or absent) of coded identifier for materials/ equipment ordering
 - Low (or absent) of e-tagging for tracking and locating materials/ equipment as they traverse suppliers to construction site and on site
 - Insufficient information on inventories and lead time for ordering subject to an overall project progress

Manufacturing industry (e.g HUM Ltd)

- Honda-UK Manufacturing Ltd (HUM) utilises UHF-RFID to track components as they traverse HUM's supply chain throughout Europe to the HUM's plant in England

Also, DHL + Fraunhofer Institute for Factory Operation and Automation developed a 'Smart box'. The system can identify the box's cargo and location (+ GPS) and the internal condition (Wessel, 2007)

The Research Aim

- The aim of this research is to show that RFID technology should not only be used for automation and tracking to overcome the supply chain complexity but also as a tool to generate, record and exchange process-related knowledge among the supply chain stakeholders

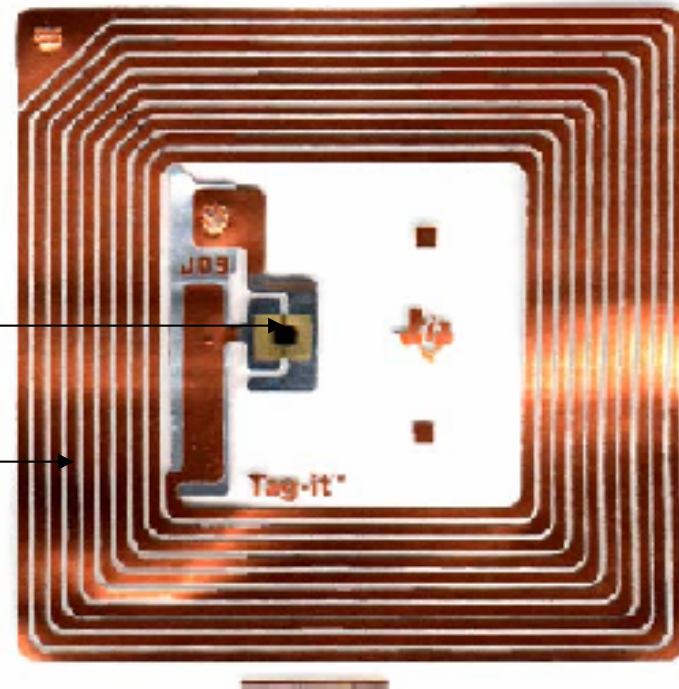
RFID Fundamentals

- RFID is basically one of the automated tracking enabler technologies that have a big impact on logistics and supply chain management (*Wilding and Delgado, 2004 and ERABUILD, 2006*)
- Technical Characteristics of RFID
 - Passive RFID - Active RFIDClassifications depend on the powering method
 - A typical RFID systems consist of:
 - (i) Transponders/Tags; Small objects attached to host objects to be identified or track,
 - (ii) Interrogators/Readers; Fix or mobile device that reads and may write to the transponders/tags through RF wireless communication when tags come within its read range, and
 - (iii) A host computer or the database

Sample of RFID Tag

The Tag **Chip** store information

Radio **antennas** that allow the Tag to communicate with the reader



Differences between Passive and Active RFID

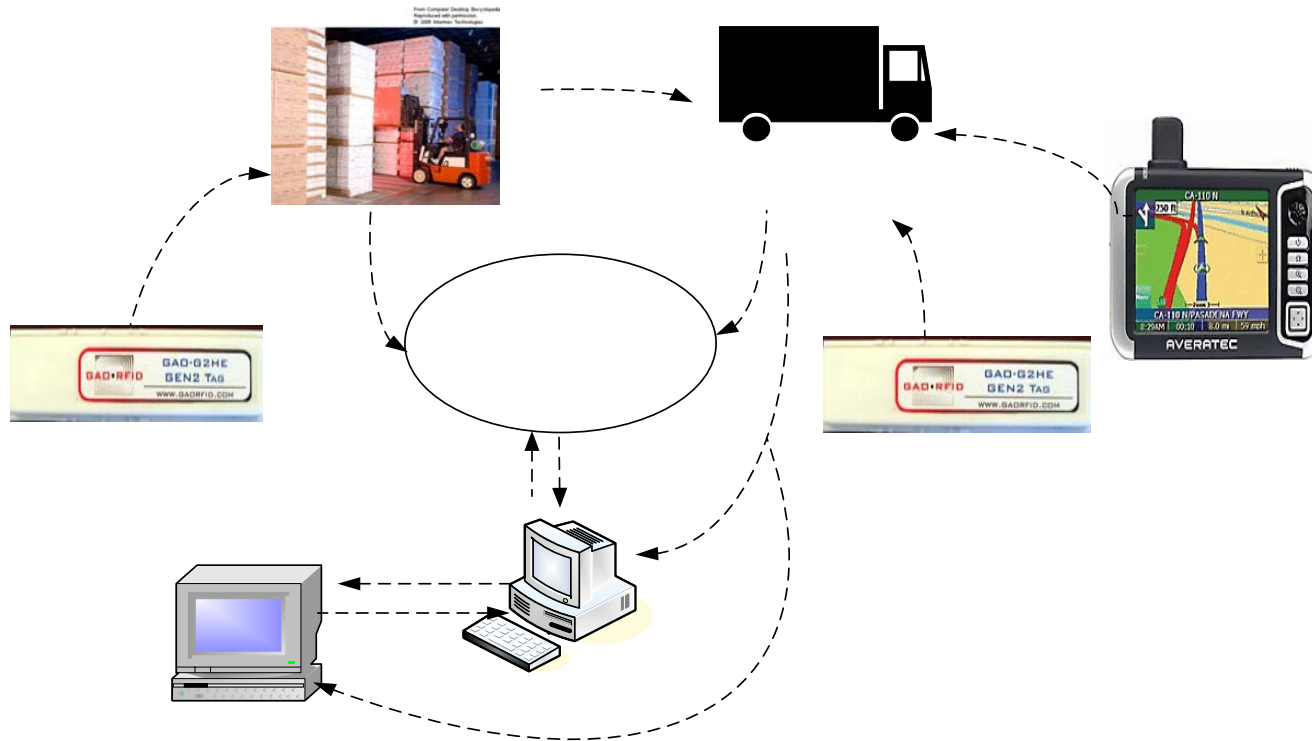
	Active RFID	Passive RFID
Tag power source	Internal to Tag	Energy transferred from the Reader via RF
Tag Battery	Yes	No
Availability of Tag power	Continuous	Only within field of Reader
Required signal strength from Reader to Tag	Low	High (must be power the Tag)
Available signal from Tag to Reader	High	Low

RFID/GPS Integration in Construction

- Traceability
- Location/Locating
- Real-time coordination
- Expectation notice
- Schedule planning
- Inventory
- Health and safety
- Project performance

The Conceptual Framework

Suppliers' warehouse **Scan 1 (S1)**



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**Packaged, tagged &
Scanned materials**

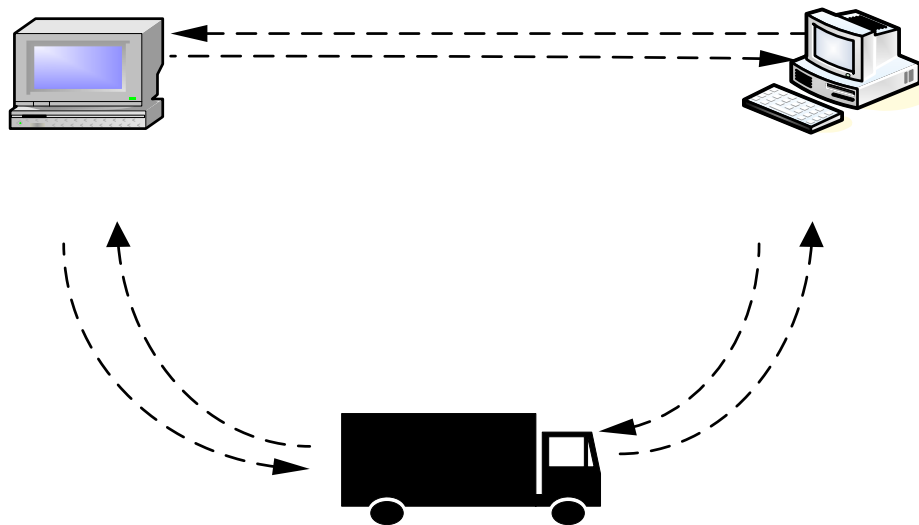


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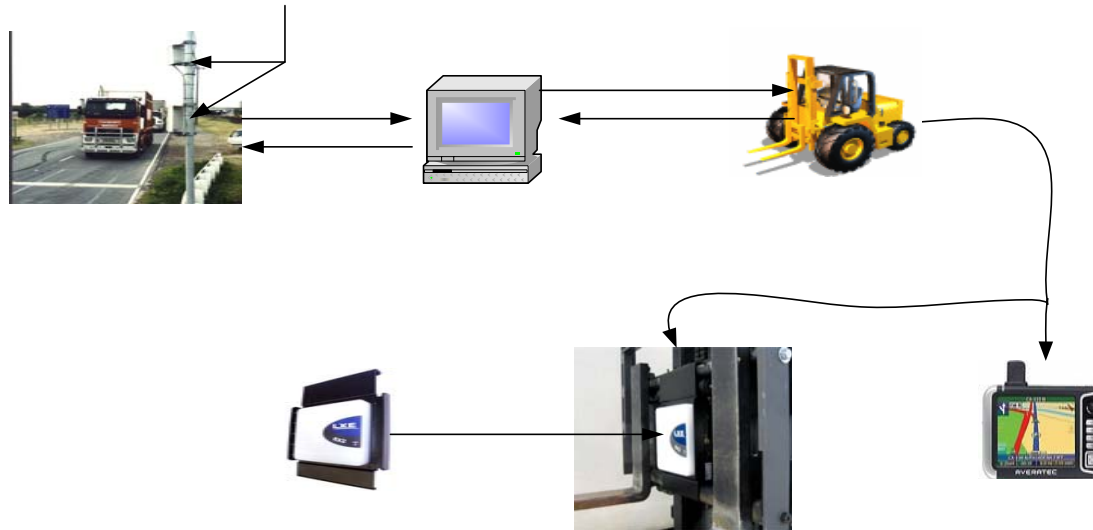
External Transportation

- Tracking of the vehicle position for delivery information and communication



Arrival at the Site Gate

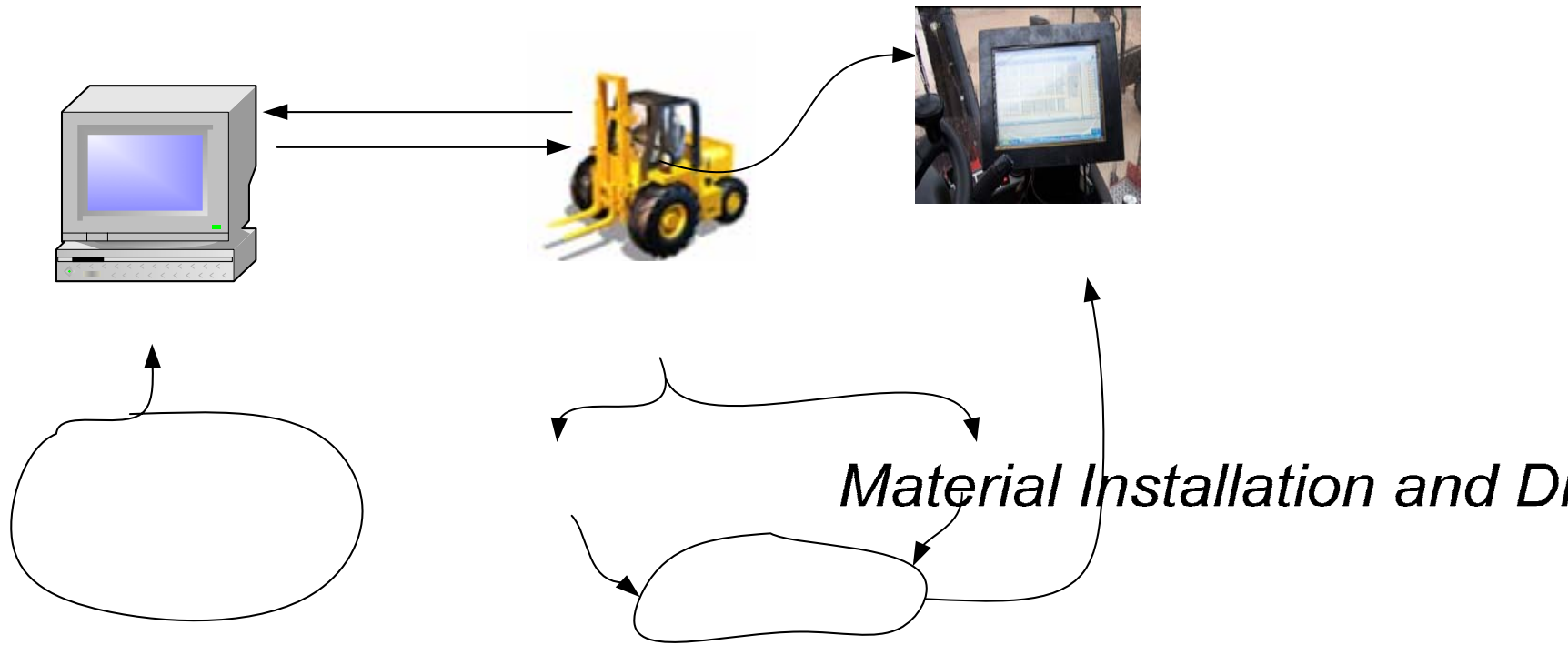
- Confirming the vehicle and quality of contents **Scan 2 (S2)** *Source: WindowsForDevices.com



Materials Delivered to

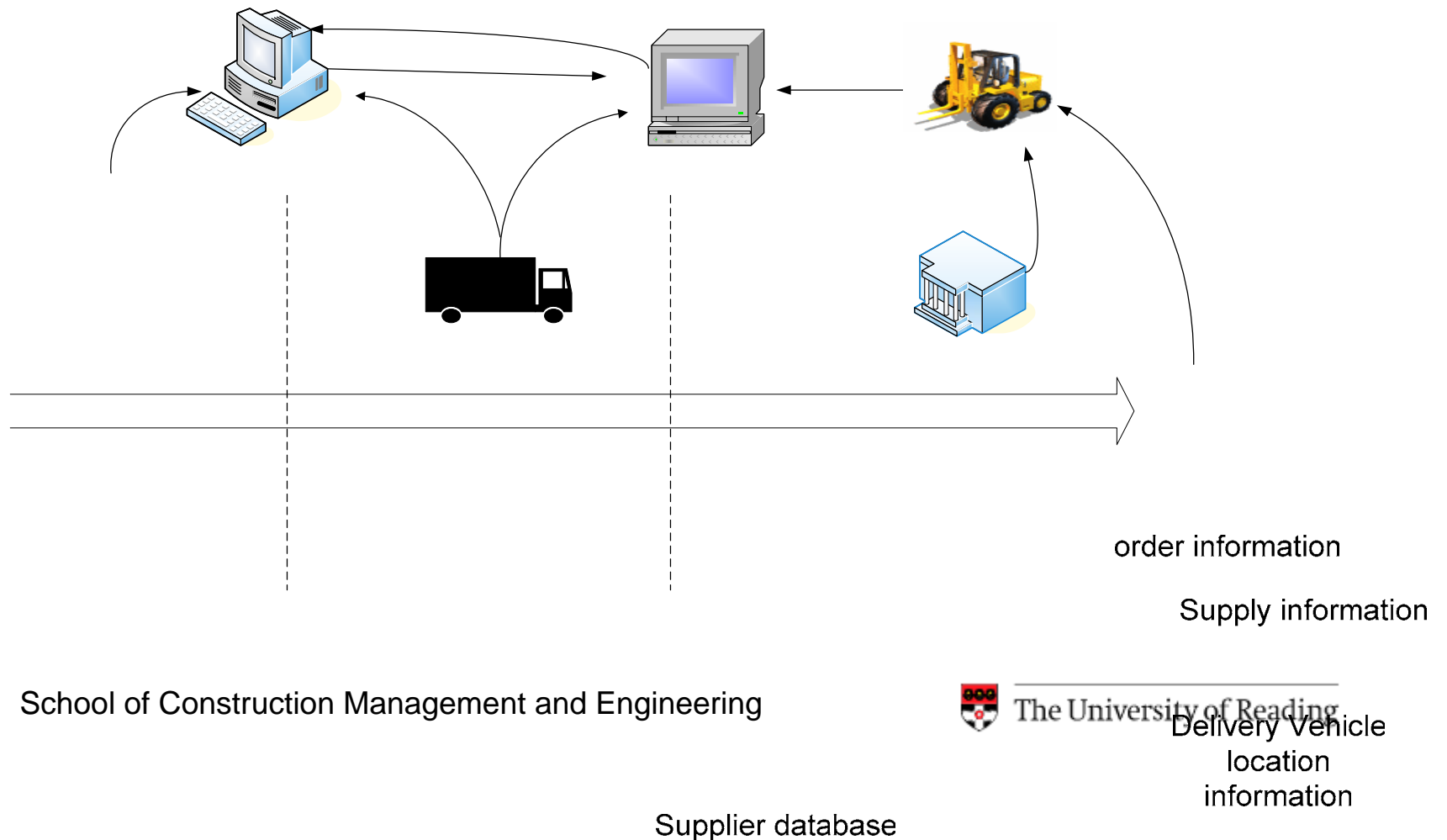
On Site

- Receiving and unloading **Scan 3 (S3)**



The Flow of Information

- The Flow of information between the materials/equipment Supplier and the project manager



Requirements

- The General Identifier (GID-96) Source: ERABUILD, 2006

	Header	General manager No.	Object Class	Serial No.
General Identity (GID-96)	8 bits	28 bits	24 bits	36 bits
	00110101 (Binary value)	268,435,455 (Max. decimal value)	16,777,215 (Max. decimal value)	68,719,476,735 (Max. decimal value)

Example of Material Codes

(Source: Building Supplies R Us Ltd)

Product Categories	Type	Code	Description
Drainage	Concrete Diamond Domestic Sewage Treatment Plant	11142	Diamond DMS2 up to 6 Domestic person-each
		11143	Diamond DMS3 up to 11 Domestic person-each
		11144	Diamond DMS4 up to 15 Domestic person-each
Sand and Aggregates	Plastering Sand	9540	Plastering sand-bag
	Sharp Sand	9541	Sharp sand-bag
	Granular Dust	95442	Grano Dust-bag
Foundation Block and Damp Proofing	Concrete Foundation Block	9508	3.6N/mm ² , 440mmX215mmX275mm-sqm
		9509	7N/mm ² , 440mmX215mmX200mm-sqm
	Flexible Damp Proof Course	9510	Flexible Damp Proof Course 100mm-roll

Other Requirements

- Unified Codification system
- Databases
- Integrated Scheduling software

Conclusions

- RFID/GPS Integration
- Supplies are made subject to overall progress
- Mitigate risks by allowing proactive action (e.g. Handling, reclaims, delays etc)
- Health and safety on site by associating materials and equipment to the right activities and craftsmen
- Reduce storage space on site
- Increase working hours
- Activities communication

Thank You

