A billing integrated EPCglobal Network
Synchronisation of material, information and financial flows

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Abstract—This article shows a prototype installation based on an open source billing solution and the Electronic Product Code Information Service (EPCIS). A beverage supply chain scenario is used to visualize the flow of material, information and money. This approach allows a flexible and scalable solution for cost benefit sharing and may enable new business models for the Internet of Things (IOT). After the demonstration, a questionnaire is distributed to all attendees to collect feedback from experts in the IOT.

RFID; Internet of Things; billing; cost benefit sharing

I. INTRODUCTION (HEADING 1)

The EPCglobal Network is one of the most promising approaches in the IOT. However, until today a wider usage of the EPCglobal Network is still missing. One of the reasons is the difficulty to calculate an ROI in distributed environments. Cost benefit analysis has been used as the main tool for economic analysis. However, cost benefit analysis of RFID usage is most often based on best guesses [1],[2]. Historical data, providing a better calculation fundament, is still missing.

In the demonstration, a different approach to measure economical feasibility will be shown. The goal is to use a billing system to aggregate small financial amounts for information access as a means to pay for the necessary infrastructure (e.g. RFID tags) and to enable new business opportunities. Additionally, usage fees (e.g. for returnable transport items) and product fees can be added. For the demonstration, an online connection to the LogDynamics Lab in Bremen will be used to show the physical movements of goods as well as the event handling through the EPCIS and the conversion into billable amounts.

II. COST BENEFIT SHARING IN THE IOT

Costs and benefits are not always balanced between all stakeholders. Some (IOT) related applications may never come true, because some of the stakeholders would need to spend more on technology and integration than can be justified by internal benefits. For RFID adoption across supply chains, cost benefit sharing has been suggested to solve this issue. However, contrary to the widespread usage of cost benefit analysis, cost benefit sharing is not a common instrument [3]. There are several problematic aspects in cost benefit analysis and sharing:

- Detailed cost benefit analysis can be time consuming
- It is difficult to identify, measure and analyze all cost and benefits associated with an (IOT)
- Companies are reluctant to share benefits
- Cost benefit sharing models do not scale, as they are subject to bi-directional negotiations

It may be more promising to use standard market forces of selling and buying rather than sharing [4],[5]. A seamlessly integrated billing solution into the EPCglobal Network would be able to provide this functionality.

III. TECHNICAL DESIGN

In order to set up a corresponding demonstrator at the LogDynamics Lab in Bremen, several different functionalities are being implemented.

A. Logistics hardware

Fortunately, the LogDynamics Lab at the University of Bremen is equipped with a large logistics infrastructure funded by the DFG, one of the largest research funding organizations in Germany (Figure 1).

Figure 1. The conveyor at the LogDynamics Lab

While it is easy to demonstrate the conveyor belt or automated buffer storage in the Lab environment, remote functionalities are needed for presentations at conferences. Currently, there is an ongoing student project called the Virtual Logistics Lab (http://www.virtual-logistics-lab.de/), where interfaces and web-services are developed to allow remote
operation and control. The project has a two year time frame and will finish in July 2011. First results will be shown during the demonstration in Tokyo. The conveyor belt will be operated remotely to simulate a product flow through a simplified supply chain that is based on a beverage scenario [6]. Miniature demo pallets (1:4) running on the conveyor will be used.

B. RFID hardware, the EPCglobal Network, and the billing solutions

Each demo pallet is equipped with 29 tags to identify one metal pallet, 4 dollies and 24 trays. It will pass RFID gates on the conveyor resembling dock doors in real logistics environments. There are four read points to show end of production and warehouse exit at the bottler as well as at the warehouse entry and exit at the wholesaler.

The RFID readers are connected to an REVA edgeware server (Figure 2).

The REVA server is connected to the Fosstrack open source EPCIS software. ObjectEvents and AggregationEvents are used and linked to an open source billing system. A combined login procedure for the ECPCIS query interface and the billing system is used to enable and simplify billable queries (Figure 3).

IV. CONCEPT VERIFICATION THROUGH AN EXPERT QUESTIONNAIRE

The concept of the billing integrated EPCglobal Network shall be validated through a questionnaire that is provided to all participants of the demonstration. In general, the applicability of the concept shall be questioned. As the conference attracts numerous experts concerning the (IOT), it provides the ideal platform to collect high level feedback in a few days and to interact directly with the conference attendees.

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REFERENCES


