Sizing the Scenario RFID-Enabled Slap&Ship Outbound Processing using SAP Auto-ID Infrastructure, Release 2.1

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1 Introduction

Radio Frequency Identification (RFID) has quickly become a significant factor in enhancing efficiencies across the supply chain network. Thin, flexible, smart labels containing a silicon chip – so called RFID tags - can be attached to or embedded in products, boxes, and pallets, allowing companies to automatically track those items as they travel through the supply chain. As a tag moves past read points in various distribution centers or retail stores, its unique ID is automatically communicated back to a central database.

Overall, the technology gives managers real-time visibility into the movement of goods, helping them to make real-time decisions about inventory and shipments. SAP Auto-ID Infrastructure enables not only SAP software, but by integrating them via SAP Exchange Infrastructure, also non-SAP backend Systems, to make use of the RFID data. An integrated solution delivers full advantage to the customer, nevertheless for the first steps into the RFID world and pilot projects SAP Auto-ID Infrastructure can also be used standalone in the RFID-enabled Slap&Ship outbound processing scenario.

Slap&Ship is a term used in the RFID community for a simple RFID solution, which purpose mostly is to meet today's mandates of customers of manufacturers, e.g. retailers. A manufacturer applies RFID labels on cases and pallets shortly before he sends them to his customer. In this first step the manufacturer does not realize all possible benefits of RFID, which he could later try to achieve by integration with his own ERP system.

1.1 Initial Sizing - Disclaimer

This document is a guideline for an initial sizing. It makes assumptions about the process steps which may not fit precisely to the situation and process the customer has. It is not intended to be a substitute for tests at the customer's site with actual customer data, with the environment of RFID devices and device controllers the customer will have, as well as with the intended configuration of the SAP AII activities.

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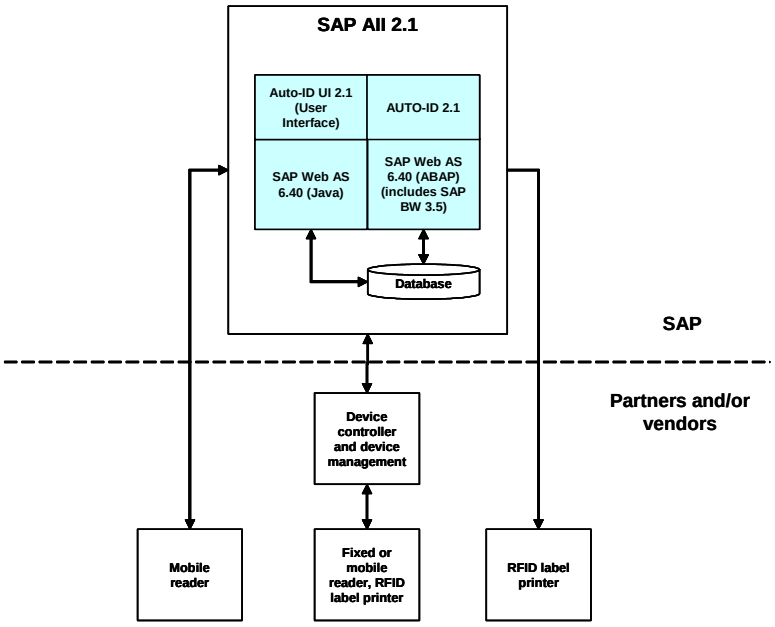
1.2 Functions of SAP Auto-ID Infrastructure in the RFID-Enabled Slap&Ship Scenario

The main capabilities of SAP AII 2.1 regarding Slap&Ship include:

- Tag Commissioning
  The warehouse worker requests the coding of RFID tags, optionally by printing RFID paper labels with a special printer. Additionally human readable data can be printed on the label, e.g. a delivery number and the consignee.
- Packing
  SAP Auto-ID Infrastructure registers the association of handling units. For example, the packing of cases on pallets is followed up. It's possible to register individual reads of cases and one pallet read and create the association within a transaction of the system as well as accepting messages from device controllers, which include the pallet identifier together with the identifiers of the cases packed on the pallet. The first mode is used by manual packing with mobile readers, the second mode is possible for packing with packing machines.
- Loading
  For this scenario step the already packed pallet is registered by SAP AII 2.1 as going out of the warehouse and reducing the stock. SAP AII uses the already given information about the content on the pallet to be able to register goods issue of the pallet with cases also, if only the pallet identifier is read.
  By customizing the administrator of the system is able to decide, whether only the pallet or also all cases or a certain percentage of the cases must be successfully read to accept the result. It allows registering goods issue correctly in physical environments, where reading 100 percent of the cases in a short moment at a loading gate is difficult.

1.3 Architecture of SAP AII 2.1

In the Slap&Ship scenario where SAP AII 2.1 is not integrated with a backend system, the architecture looks as follows. For a better understanding the devices and device controllers, delivered by third party vendors, are also included in the figure.



1.4 Factors that influence the performance

Tag Commissioning:

- Number of Requests
- Number of tags to be written in one request

Packing:

- Number of messages
- Number of tags per message

Loading:

- Number of messages
- Number of tags per message
- Reading pallet identifier only / requested percentage of successful reads of cases

Data retrieval and transfer to SAP Business Information Warehouse (BIW)

- Each of the processing steps can deliver data for SAP BIW if necessary (customizable)

Concrete implementation of activities in rules

- How SAP AII 2.1 reacts on messages from device controllers or devices, is customizable in a kind of rule engine. The reaction is set up by comprising activities in a rule. The customer selects out of a set of standard rules. New rules can be created by using another selection or even by using customer specific activities.
  The sizing rules described in this document are based on a specific setup (see section Assumptions).

2 Initial Sizing for the RFID-Enabled Slap&Ship Scenario

This section contains the initial CPU sizing procedure for SAP AII 2.1.

The formulas provide the CPU requirements in SAPS, a hardware independent unit to describe the processing power of a configuration. To obtain an equivalent configuration, please check www.sap.com/benchmark -> SD 2-tier.

You can size each scenario individually and add the results.

2.1 Assumptions

As discussed above, the resource requirements will depend on the individual parameters used in your scenario. Since it is not possible to provide all possible variations, we present here data for one typical scenario:

- Tag Commissioning:
  The warehouse worker prints RFID labels for labelling cases. He uses the SAP AII 2.1 user interface to request the labels.

- Packing:
  SAP AII receives a message from the device controller or device, which includes all the EPC information regarding one packed pallet. The user interface of SAP AII is not used. Within SAP AII 2.1, the rule “PSP” is applied.
  This could happen for example in the following scenario:
    - An automated palletizer takes the cases and puts them on a pallet. Pallet and cases are already tagged.
    - The palletizer and/or it’s controller collects all EPC- information of the cases and the pallet. The information regarding one completely packed pallet is placed in one message to AII.
- Loading
  Pallets with cases are pushed through a fixed reader when leaving the warehouse. Goods issue is registered. It is not always necessary to read all tags on the cases successfully, because for the registration of goods issue the information gathered in the packing step can be used in addition. Within SAP AII 2.1, the rule “PSL” is applied. We only regard the setup where only the pallet EPC has to be read successfully to register the goods issue of the pallet together with it’s cases.
- **Restriction for Packing and Loading**:
  During the processing time of one pallet, the respective device group and the document is blocked and no other pallet can be packed or loaded at this device group or for this document. Therefore one device group can serve not more than approximately 1 pallet per second (pallet with 20 cases per CPU with 600 SAPS as an example). A device group is designed to form a logical device, for example for two sensors for one gate. This means, that in the example one pallet per second can be registered per gate.
- SAP Business Information Warehouse: Delta Upload
  Each of the scenario steps prepares some records in the BIW delta queue of SAP AII 2.1 (BIW Update). This is included in the rules used for the scenario steps.
  The transfer of this information to the internal BIW needs extra time and is usually done periodically.
  The time consumed for that process strongly depends on how often the delta upload is done. So by reducing the frequency of delta uploads the CPU-requirements are reduced, too.
  For BIW sizing please refer to the Quick Sizer tool on the SAP Service Marketplace.

2.2 Sizing guideline

2.2.1 Hardware Requirements of SAP NetWeaver – Web AS

SAP Auto-ID Infrastructure 2.1 is installed on the Web Application Server (SAP Web AS) of SAP NetWeaver ’04. ABAP as well as the SAP J2EE Engine (as an Add-in installation) is used. Of course the hardware requirements of Web AS must be met. Therefore the requirements of Web AS for main memory and disk space must be added to the numbers given by the formulas of the following sections.

The hardware requirements of Web AS are described in the respective installation guides, which regard the different operating system and database management system combinations. Please refer to
Service.sap.com/instguides -> SAP NetWeaver -> Release 04 -> Installation -> SAP Web AS -> SAP Web Application Server 6.40 - Entry Page
and choose the documents “*SAP Web AS ABAP*” and “*SAP Web AS Java*” for your OS/DB combination. Please see the sections “Hardware and Software Requirements”.

2.2.2 Example Data

In the following chapter we use an example scenario to explain the formulas presented. We assume, that for tag commissioning, packing and loading the same number of cases and pallets are processed during a phase of two working hours .The formulas then give you the resource requirements for CPU and the disk space needed for this workload within exactly that timeframe.

In the example we produce, pack and load 1600 pallets with 50 cases each within 2 hours. When printing labels, we print labels for cases and pallets separately. Labels for 5 pallets are printed at the same time. That means, we request always 250 tags when printing case labels and 5 tags when printing pallet labels.

Every rule for the scenario steps also includes gathering BIW data.

2.2.3 Formulas for Tag Commissioning

- Number of print requests (EPC Write) in 1,000s, e.g.: 3 for 3,000 *EW*
- Number of RFID labels per print request *TAGS*
- Time frame for processing in hours *HRS*

- CPU: 100 SAPS * *EW* * (1+ 0.15 * *TAGS*) / *HRS*
- Disk space: *EW* * *TAGS* * 0.6 MB

Example

320 print requests with 250 case labels each and 320 requests with 5 pallet labels each within 2 hours
CPU: 100 SAPS * 0.32 * (1 + 250 * 0.15) / 2

+ 100 SAPS * 0.32 * (1 + 5 * 0.15) / 2

= 639 SAPS

Disk space: (0.32 * 250 * 0.6) + (0.32 * 5 * 0.6) MB = 48.96 MB

2.2.4 Formulas for Packing

- Number of packed pallets in 1,000s, e.g.: 3 for 3,000 *PP*
- Number of cases per pallet *CS*
- Time frame for processing in hours *HRS*

- CPU: 25 SAPS * *PP* * (1 + 0.4 * *CS*) / *HRS*
- Disk space: *PP* * (1 + 0.8 * *CS*) MB

Example

1,600 pallets with 50 cases each in two hours
CPU: 25 SAPS * 1.6 * (1+20) / 2 = 420 SAPS
Disk space: 1.6 * (1 + 40) MB = 65.6 MB

2.2.5 Formulas for Loading

- Number of loaded pallets in 1,000s, e.g.: 3 for 3,000. *LP*
- Number of cases per pallet *CS*
- Time frame for processing in hours *HRS*

- CPU: 70 SAPS * *LP* * (1 + 0.1 * *CS*) / *HRS*
- Disk space: *LP* * (0.9 + 0.44 * *CS*) MB

Example

1,600 pallets with 50 cases each in two hours
CPU: 70 SAPS * 1.6 * (1+5) / 2 = 336 SAPS
Disk space: 1.6 * (0.9 + 22) MB = 36.64 MB

2.2.6 BIW Delta-Upload

For Sizing of SAP Business Information Warehouse please refer to the SAP Quick Sizer tool on the SAP Market Place (http://service.sap.com/sizing).

For the BIW Delta-Upload, you have to make the following entries:

- Data Upload
  Number of Uploaded Objects:
  1,000**EW * TAGS* + 1,000**PP* * (*CS* + 1) + 3 * 1,000**LP* * (*CS* + 1)
  Upload period in hours: 1
- InfoCube
  Dimensions: 9
  Keyfigures: 6
- ODS Object
  No of Numeric Fields: 2
  No of Character Fields: 32
- Periodic Load: number of periodically uploaded objects/data
- No of Periods: total number of uploads that will be kept in the InfoCube

Example (refers to examples above)

BIW information for each step (commissioning, packing, loading) for 1,600 pallets with 50 cases

Number of Uploaded Objects (according to our example):

320 * 255 + 1,600 * 51 + 3 * 1,600 * 51 = 408,000

No of Periods:

According to our example, the 408,000 uploaded objects are created within 2 hours. If we assume 4 data uploads per day (8 hours working day), 5 days a week, in a quarter of a year (13 weeks) we'll get:

No of Periods = 4 * 5 * 13 = 260

3 Comments and Feedback

Both are very welcome; please send them to Uwe Schäfer, BSG M ASM (u.schaefer@sap.com).