

# Outbound Delivery Using RFID in Sap System

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**Abstract:** Wang Sheng is a developer for the RFID solution; he is interested in RFID middleware and SAP RFID solutions. He is a master student at Shanghai Jiao Tong University. From Sep.2004—Jan. 2005, he is working a RFID Demo center project in Shanghai, and this article is about a Outbound Delivery process in SAP system with RFID technology. Wang Dong is professor at Shanghai Jiao Tong University. His area of expertise is logistics solution and RFID technology. This paper will tell you how RFID make magic in outbound delivery process.

**Keywords:** SAP: SAP is the biggest business software provider in the world.

**R/3:** SAP R/3 is an ERP software powered by SAP. It is the core software of all SAP systems. SAP R/3 a great brand in ERP.

**RFID:** Stand for Radio Frequency Identification, a technology similar in theory to bar code identification. With RFID, the electromagnetic of electrostatic in the RF portion

of the electromagnetic spectrum is used to transmit signals. An RFID system consists of an antenna and a transceiver, which read the radio frequency and transfers the information to a processing device, and a transponder, or tag, which is and integrated circuit containing the RF circuitry and information to be transmitted.

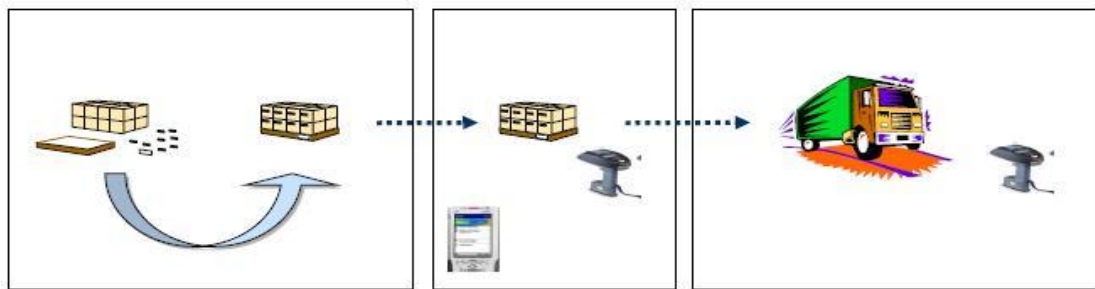
## Software and Hardware are used in the whole process.

Software: SAP R/3, CIP (Collaboration Inventory portal, a RFID Middleware), RFID Device Control

Hardware: SAP R/3 server (CPU P4 3.0\*4; Memory 4G), CIP Server (CPU P4 3.0 memory 512M), RFID Reader (Alien RFID Reader), RFID tags (Class0 tag).

## Outbound delivery process

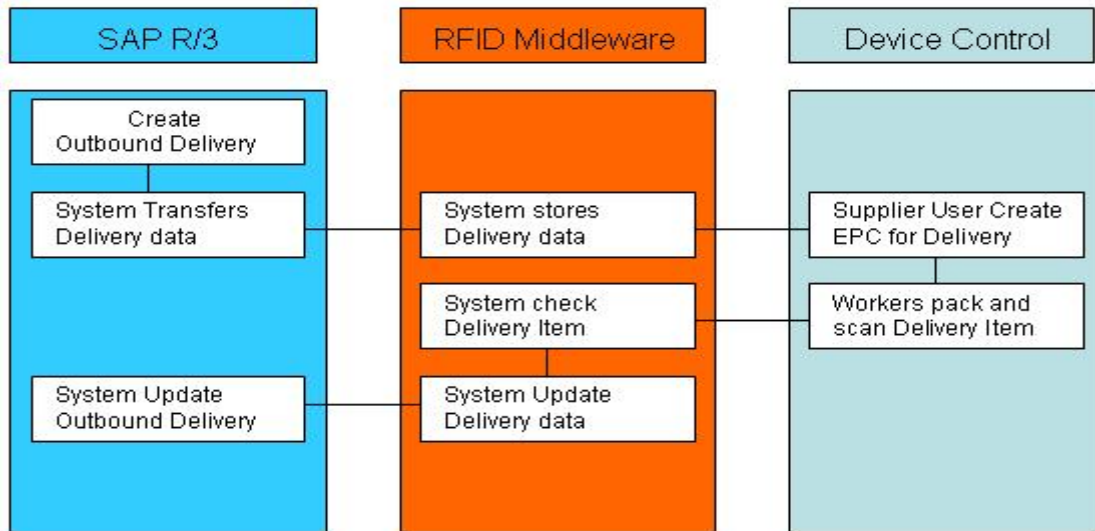
The physical view of RFID-enabled outbound delivery is like the picture.



RFID-enabled Outbound Delivery

We first paste the RFID tag to cases and pallet. This process is called “tag commission”. When the tags are print to the cases and pallet, Hierarchy of this mapping is record in the RFID middleware system. This is the process of “packing” in RFID solution. And packed goods are send out

through RFID-installed Gate, the RFID reader is mostly fixed Readers, and check out can be automatically. The third section we call this “loading”, the goods with RFID tags are loaded to the trucks and the mapping of this good issue is also recorded in both the RFID middleware and R/3 systems.



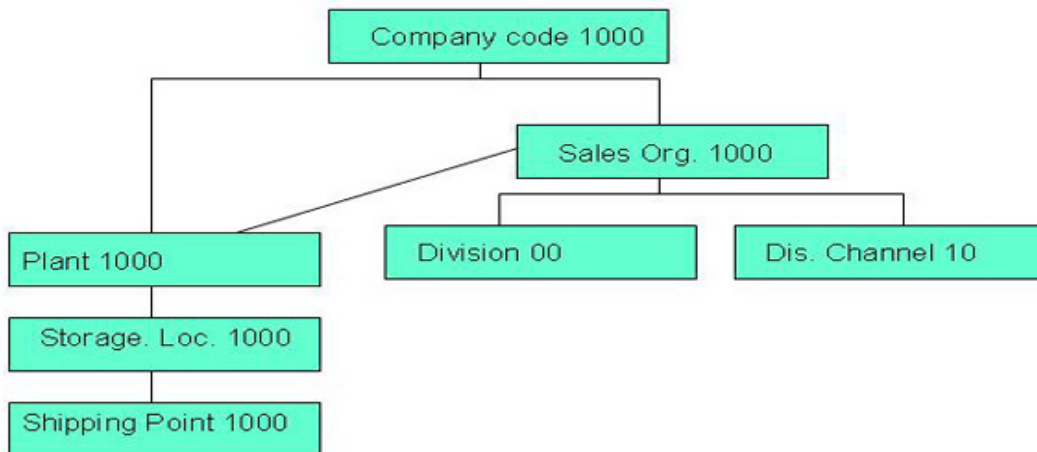
- 1) First we create a outbound delivery in SAP R/3 system, in the system we use transaction code"VL01n", and When the outbound delivery is created in SAP system, the delivery data is transfer to RFID Middleware systems automatically (a SAP technology call "BADI" is used here, it will be talked later).
- 2) The information about the EPC data are send to Device Control through XML, and Supplier user can doing tag commission.
- 3) After the tags are print to the cases and pallet, the workers pack them together. Then workers pushed the barrow though the RFID Gate.
- 4) The system gets the information from the RFID Reader installed in the Gate, then the system check the mapping of the cases and pallets with the original information stored in the system.
- 5) When the checking is OK, the RFID middleware update the delivery. And the information is transferred to system
- 6) R/3 system also updates the delivery data by BAPI calls.

**Master Data Management**

**Master Data in SAP**

There are information about Company, Plant, storage location and Material, and this information is saved the in R/3 system by customizing job.

A company with plant 1000 and sales organization 1000 is customized in SAP R/3 system. This company is a vender that will perform outbound delivery in our Scenario. The company's organization is show below.



**Master Data in RFID Middleware**

RFID Middleware contains information about RFID tag, RFID object, tag observation, Material and EPC mapping.

Table: STATUS

item	type	length	NULL	Prime Key	Default value
id	integer	4	NO	YES	
statusMessage	char	100	NO	NO	
timestamp	timestamp	10	NO	NO	

Table: READERID\_XXX (observation table of one Reader XXX)

Item	type	length	Null	Prime Key	Default value
id	integer	4	NO	YES	
epc	char	16	NO	NO	
timestamp	timestamp	10	NO	NO	

Table: Material (Material with EPC prefix)

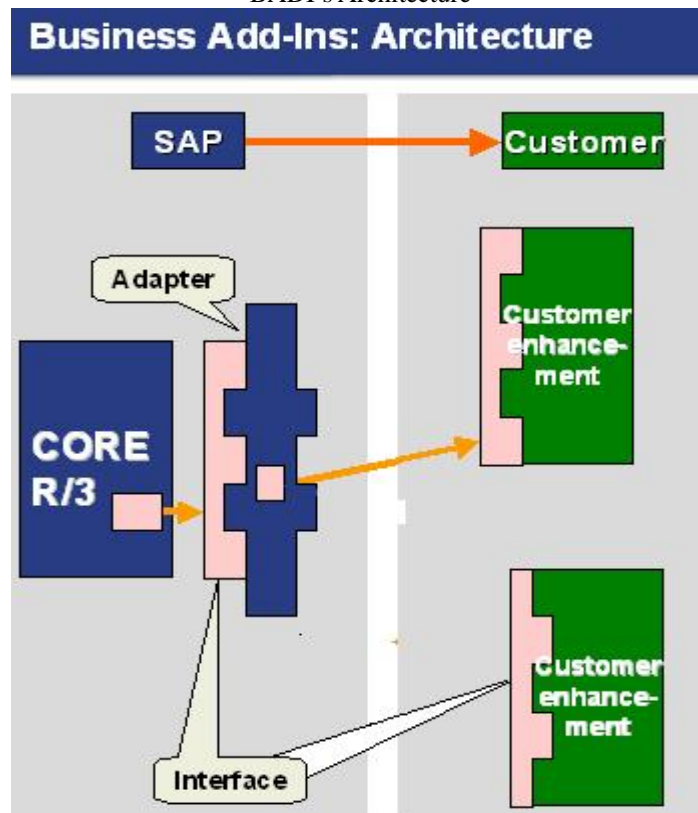
Item	type	length	Null	Prime Key	Default value
id	integer	4	NO	YES	
Material	char	16	NO	NO	
EPC prefix	char	16	NO	NO	

**Interface programming**

To fit this requirement, SAP BADI interface technology is been used here.

**Requirement 1: Delivery transport to Middleware system automatically**

BADI's Architecture



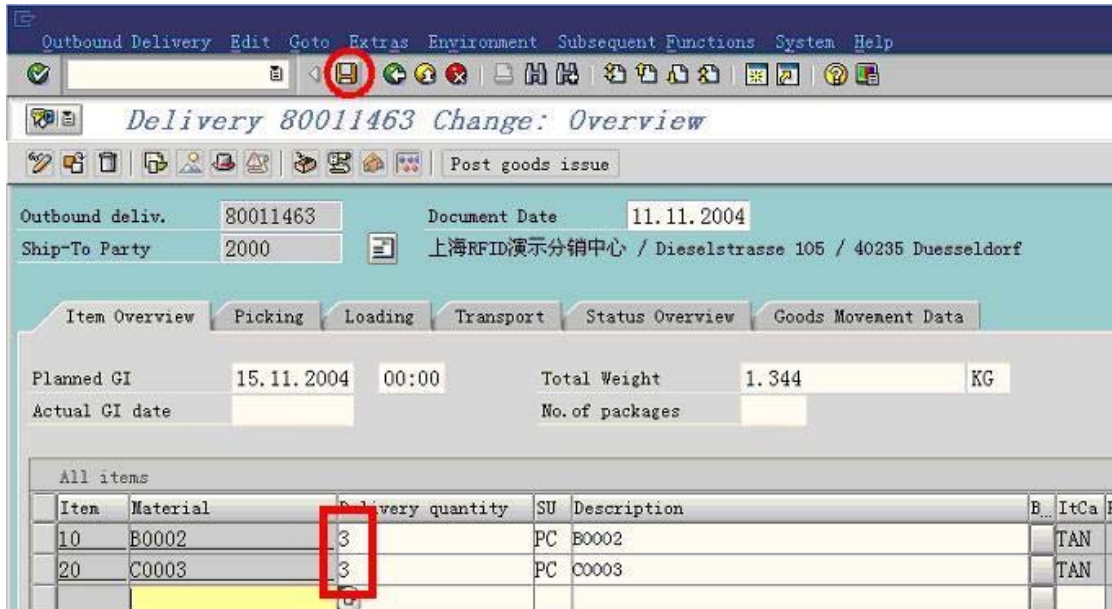
BADI (Business Add-In) is an Enhancement technology to provide connectivity to R/3 system. With BADI, SAP customer can change their software process easily and with good SAP support.

Enhancements are made possible by SAP application programs. This requires at least one interface and an adapter

class that implements it. The interface is implemented by the user.

Our Delivery process with BADI

1) When first Create or Change a delivery



2) Implement the delivery interface The method `publish_after_save` is called by the system "if\_ex\_delivery\_publish".

```

method if_ex_delivery_publish~publish_after_save .
  data: ltab_likplips type table of zstrc_likplips initial size 0 ,
        lwa_likplips type zstrc_likplips,
        lwa_likplips_tmp type zstrc_likplips.
  .....
  .....

  call function 'Z_RFID_SYNCDOTOCIP' destination 'JCO'
    exporting
      requtext          = '0000000000'
    tables
      z_likplips        = ltab_likplips
    exceptions
      communication_failure = 1 message msg_text
      system_failure       = 2 message msg_text.
  .....
  .....
endmethod.

```

3) Function 'Z\_RFID\_SYNCDOTOCIP' transfers the delivery data to RFID Middleware.

**Requirement 2: Post Good issue creates material back to SAP system.**

BAPI (Business Application Program Interfaces) is

defined as a method of an SAP Business Objects. SAP BAPI Interface. The BAPIs in the R/3 System are currently implemented as function modules all of which are created and managed in the Function Builder. Each function module underlying a BAPI:

- 1) Supports the Remote Function Call (RFC) protocol
- 2) Has been assigned as a method to an SAP Business

Object in the Business Object Repository  
 3) Is processed without returning any screen dialogs to the calling application

Our post Good issue with BAPI  
 1) RFID Middleware (CIP System) post goods



2) When post goods issue at RFID Middleware, it calls BAPI “z\_postdoforsap” to post goods issue in SAP system.

```
function z_postdoforsap.
*"-----
*"*"Local interface:
*" IMPORTING
*"   VALUE(I_VBELN) LIKE LIKP-VBELN OPTIONAL
*" EXPORTING
*"   VALUE(RETURN) LIKE BAPIRET2 STRUCTURE BAPIRET2
*"-----
.....
perform import_data using i_vbeln return.
.....
endfunction.
```

3) Delivery status in SAP is automatically change by this way

The screenshot shows the SAP Document Flow interface. At the top, there is a menu bar with 'Document flow', 'Edit', 'Goto', 'Environment', 'System', and 'Help'. Below the menu is a toolbar with various icons. The main area displays 'Document Flow' with a sub-header 'Status overview'. The document details are: Delivery 80011463, Business partner 2000, and 上海RFID演示分销中心. Below this is a table with three columns: Doc., Date, and Overall Processing Stat.

Doc.	Date	Overall Processing Stat
. Standard Order 8208	11.11.04	Being processed
Delivery 80011463	11.11.04	Being processed
. GD goods issue:delvy 4900026813	11.11.04	complete

Benefit of RFID-enabled outbound delivery.

Wal-Mart ask his vendors to do outbound delivery with RFID-enabled. And at January 2005, 132 Wal-Mart's vendor (32 voluntary vendors) has paste RFID tag in cases and pallet. The benefits are:

- 1) When delivery information is send to Wal-Mart, they can receive the goods automatically, because RFID Readers can scan RFID tag in a long distance. Here we need an Event Management in Wal-Mart side to handle the deliveries.
- 2) With RFID technology, the cases and pallets can be easily managed and reused.
- 3) At the vendor side, post goods issue can be check by RFID instead of by workers.
- 4) Goods information can be traced at every point of the delivery.

In a word, RFID-enable outbound delivery increases the efficiency of the whole Supply Chain Process.

## References

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- [4] The EPCglobal Architecture Framework EPCglobal Final Version of 1 July 200
- [5] BAPI User Guide SAP A.G. 2000