Extended Warehouse Management Overview

July 2011
Agenda

Introduction
Overview: Main Features
Detailed Functional Overview
Current Status
Panel Discussion and Wrap Up
History & Outlook (1994 - 2011)
A long history of warehouse mgmt. business, process and IT expertise

SAP R/3 ERP Warehouse Management (R/3 2.0 - 4.7)

- Goods Storage
  - Inbound / outbound
- Logistics Execution
  - Native RF support
  - Value added services
  - Cross docking

SAP SCM Extended Warehouse Management (EWM 5.0 - 5.1)

- Distribution Center Logistics
  - End-to-end processes & visibility
  - Advanced storage strategies
    - Slotting
    - Picking
  - Architecture for high performance & volume operations

SAP SCM Extended Warehouse Management (EWM 7.0 - 7.01)

- Advanced Warehouse Mgmt.
  - Material flow system
  - Integrated warehouse & supply chain management
    - Cross docking
    - Integrated warehouse & production planning
    - Production warehouse management

SAP SCM Extended Warehouse Management (EWM 7.02)

- Best-in-class Warehouse Mgmt.
  - Complete, advanced solution
    - Advanced returns handling
    - Industry-specific capabilities i.e. Retail
  - Implementation & migration accelerators
    - Rapid Deployment Systems
    - Migration tools

Planned -- subject to change
Mission & Goals
Extended Warehouse Management

SAP Mission

- The MARKET LEADER in Supply Chain Execution
- The THOUGHT LEADER in Supply Chain Convergence

- Best-in class functionality
- Complete, comprehensive solution

- Industry-specific functionality
- Multi-industry offering

- Intra & inter-enterprise solution
- End-to-end process integration
- Out-of-the-box connectivity

SUPPLY CHAIN EXECUTION LEADERSHIP

Best-in Class Solution

Verticalized Offering

Integrated & Connected Processes
Solution Positioning
SAP ERP Warehouse Mgmt. & SAP SCM Extended Warehouse Mgmt.

SAP ERP
Warehouse Management
(Continuous improvement / maintenance)

SAP SCM
Extended Warehouse Management
(Strategic investment solution / strong roadmap)

Migration Tools

- Basic warehouse processes
- Simple warehouse operations
- Small & medium-sized warehouses

- Comprehensive warehouse mgmt. processes
- High performance, high volume warehouse operations
- Medium & large-sized warehouses
# Solution Details

## SAP EWM: A complete offering resulting from solid, continuous investment

### Inbound Processing
- ASN data receiving, validation, correction
- Transportation unit mgmt.
- Goods receipt
- Putaway bin determination
- Internal routing
- Slotting
- Deconsolidation
- Putaway
- Returns / reverse logistics
- Goods receipt optimization
- Advanced returns mgmt.

### Storage & Operations
- Rearrangement
- Inventory counts / record accuracy
- Replenishment
- Freight order management
- Kit-to-stock

### Outbound Processing
- Order deployment
- Route determination
- Wave management
- Picking bin determination
- Warehouse order creation
- Work assignment
- Picking, packing, staging
- Loading & goods issue
- Kit-to-order
- Manual outbound deliveries
- Production supply

### Core Processes
- EWM 5.0
- EWM 5.1
- EWM 7.0
- EWM 7.01
- EWM 7.02

### Support Areas
- RF / RFID Enablement
- Quality inspection
- Import / export integration
- EH&S integration
- eSOA enablement

### Cross Processes
- Transportation cross docking
- Pick from goods receipt/push deployment
- Yard management
- Labour management
- Opportunistic cross docking
- Merchandise distr. X-docking

### Supporting Areas
- Packaging specification
- Batch management
- Serial numbers
- Catch weight
- Material Flow System
- Warehouse cockpit
- Graphical warehouse layout
- Transp. integration (LES)
- Claims & Returns
- ERP transportation integration
- Multiple EAN
- Cartonization
- Rapid deployment package

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EWM Releases

- 2006: EWM 7.01
- 2007: EWM 7.0
- 2010: EWM 5.1
- 2011: EWM 5.0
Agenda

Introduction

Overview: Main Features
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Main Features – Inbound

- Receive ASN Data
- ASN Validation & Correction
- Transport Unit Arrival
- Manage Transport Unit
- Unload Transport Unit

- Goods Receipt
- Deconsolidation
- Putaway Bin Determination
- Slotting
- Putaway

**Process Exceptions/Manage Work in Process**
Main Features – Inbound

- Pick From Receiving/
  Push Deployment/ Opportunistic CD

- Transportation Cross Dock

- Returns/Reverse Logistics

- Packaging Specification

Process Exceptions/Manage Work in Process
Main Features - Internal

- Kitting & VAS
- Inventory Counts
  Record Accuracy
- Replenishment
- Rearrangement

Process Exceptions/Manage Work in Process
Main Features – Outbound

- Order Deployment
- Route Determination
- Wave Management
- Picking Bin Determination
- Warehouse Orders
- Work Assignment
- Picking
- Packing
- Staging
- Loading and Goods Issue

Process Exceptions/Manage Work in Process
Main Features – Additional Processes

Yard Management
Quality inspection Engine
Environmental Health & Safety
Foreign Trade/Bonded Warehouse

Process Exceptions/Manage Work in Process
Agenda

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### Example of Business Requirements & EWM Functionality

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Possibilities of Internal Routing

*Layout based internal routing* defining intermediate points between storage types for handling of multi-step picking and putaway

*Process oriented internal routing* defining mandatory / optional steps
  - Loading / Unloading
  - Packing
  - Counting
  - Deconsolidation
  - Putaway / Picking
  - Staging
Flexible Modeling of Warehouse Processes

Storage Type

Door 1

Door 2

Door 3

Pallet rack

Small Parts
Flexible Modeling of Warehouse Processes

Storage Type

- Door 1
- Door 2
- Door 3
- Goods receipt area
- Pallet rack
- Small Parts
Flexible Modeling of Warehouse Processes

Work Stations

- Goods Receipt area
- Door 1
- Door 2
- Door 3
- Quality check
- Repacking/Deconsolidation

Work stations
- Modelled as storage bins
- Operational Tasks w/o Material movement
- Staging areas as P&D points

Small Parts
Process Flow Modeling

Process- and Layout-oriented Routing
- Flexible Process Modelling, e.g. Unloading, Counting, Repacking, Sorting, Putaway
- Automated decision rules for relevance of process steps
Stock and Process Transparency

Stock Transparency
- Visibility of stock on storage bins in the inner warehouse, on staging areas, on work stations and on resources

Process Transparency
- Control and Track&Trace of respective process steps and involved resources

Diagram:
- GR area
- Quality Check
- Repacking/Deconsolidation
- Door 1
- Door 2
- Door 3
Warehouse Process Modeling

Conclusion

Warehouse Process Modeling

Adaptability

- Physical Warehouse Layout
- Material Flow
- Simple to Complex Warehouses
- Process Transparency
- Stock Visibility
**Example of Business Requirements & EWM Functionality**

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Slotting

- Product
  - Dimension
  - Demand
  - Value
  - ...

Slotting Rules

Storage Concept

Adaptable
Slotting

Find and optimize bin for material

Physical criteria to find appropriate bin type
  -> Space optimization

Demand criteria to find appropriate bin section
  -> Time optimization

Rule based Rearrangement of material in bins
  -> Closing the optimizing loop
Slotting automatically determines a storage concept for a product.

The system determines the underlying storage parameters that are relevant for put-away on the basis of master data, including:

- product data
- storage requirement data
- packaging data

These parameters describe

- the storage section in which the product is to be stored
- the properties that the storage bin is to have
- the putaway strategy that is to be used.

Slotting takes into account master data that is not dependent on the execution process. If the putaway process for a product is dependent on execution parameters, this dependency is taken into account later on during storage bin determination. This does not, however, have an effect on the results of slotting.
## Example of Business Requirements & EWM Functionality

| Central monitoring of the warehouse activities | Warehouse Monitor |
| Handling Resources (Fork lift, picker) in the warehouse and assign only the work that can be done by this resource. | Resource Management |
| Assign the right workload (weight, volume, number of items) to the warehouse worker, that can be picked together | Warehouse Order Creation |
| Visibility of stock on resources | |
| Wave picking based on flexible criteria | Wave Management |
| Handling of multi step picking and putaway | Internal routing |
| Finding the best location in the warehouse based on product demand (fast changing) and product dimensions. | Slotting |
| Optimize warehouse constantly (Housekeeping) | Rearrangement |
Rearrangement optimizes warehouse management and reduces operational costs

Pick Order before Optimization

Rearrangement Execution

‘Golden Zone’ for Fast Movers

Business Case

60,000 line items a day

~ 450 hours time saving per day

> $1,000,000 savings per year!

and...Improved Service Level!
### Example of Business Requirements & EWM Functionality

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Warehouse Order Creation – Schematic Flow

Grouping by Activity Area:

- **AA 01**
  - WT
  - WT
  - WT

- **AA 02**
  - WT
  - WT
  - WT
  - WT

- **AA 03**
  - WT
  - WT

WO Creation Rules (Customizing):

<table>
<thead>
<tr>
<th>AA 01</th>
<th>AA 02</th>
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<tbody>
<tr>
<td>a) WOCR1</td>
<td>a) WOCR2</td>
<td>a) WOCR1</td>
</tr>
<tr>
<td>b) WOCR2</td>
<td>b) WOCR2</td>
<td></td>
</tr>
<tr>
<td>c) WOCR3</td>
<td></td>
<td></td>
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</table>

Created Warehouse Order 4711

- WT
  - WT
  - WT

Created Warehouse Order 4712

- WT
  - WT
  - WT
Wave Handling: Grouping of Delivery Lines
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Resource Management:

Resource Management: Users and equipment combination which can be defined as being allowed to execute work in the warehouse.

- RF (automatic or manual)
- Non-RF environment (manual)
- Tracked and Displayed in the Warehouse Monitor
- Visibility of stock on Resources

Resource Type:

Groups resources with similar technical or physical characteristics

Resource Group:

Groups resources for queue assignment purposes
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Wave Management

Wave Creation methods to control amount of work released to the warehouse floor at a specific time

- Automatic, Immediate or Manual release
- Full or Partial delivery may belong to a wave

Content:
- Release time / date
- Order Type (e.g. Emergency / Stock)
- Process Type

Grouping by route, pick area(s), packing lanes...

Warehouse Order x

Bundle assigned to a worker

WO Item 1
WO Item 2
WO Item 3
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Warehouse Monitor
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**Transportation of HUs across different DCs or WHs** Transportation Cross-Docking
Transportation Cross-Docking

Sales order -> outbound del. XD determined.

Order

Distribution WH

Outbound del.

Cross-Dock WH

Inbound & outbound deliveries

Customer
### Example of Business Requirements & EWM Functionality

<table>
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<th>Technology</th>
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<td>Manage the time and productivity of warehouse workers</td>
<td>Labor Management</td>
</tr>
<tr>
<td>Monitor the performance of workers, teams, warehouse areas</td>
<td>Warehouse Cockpit</td>
</tr>
<tr>
<td>Create Inbound Deliveries based on shipping documents</td>
<td>Expected Goods Receipt</td>
</tr>
<tr>
<td>Automate your business processes and react flexibly to changes in your business processes</td>
<td>eSOA Enablement</td>
</tr>
<tr>
<td>Connect and control an automatic warehouse</td>
<td>Material Flow System</td>
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<td>Create kits and transfer to stock</td>
<td>Kit-to-Stock</td>
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<tr>
<td>Optimize warehouse processes by using RFID technology</td>
<td>RFID Enablement</td>
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Labor Management

Labor management modules are used to better manage the time and productivity of warehouse workers. They consist of the ability to plan, measure, view, and simulate labor activities.

For effective management of the labor supply chain, it is necessary to:

- Get the right person to the right place at the right time
- Track people throughout the day and measure performance on individual tasks
- Measure the quality and safety for each employee’s performance
- Provide alerts when performance falls below expectations
- Calculate costs and incentives for employees
- Simulate impacts to labor as a result of changes to the process flow or inventory
- Highlight the cost and efficiency of individual employees, facilities, teams, and the enterprise
Measurement and KPIs

- Track people throughout the day and measure performance on individual tasks
- Capture direct vs. indirect time
- Interface to HR
  - Time and attendance
  - Compensation and incentives
- Resource definition (processor and equipment)
- Measurement services (KPI builder)
Indirect Labor: What is It?

Work that is not product-related. For example, sweeping the warehouse floor or attending a meeting.

<table>
<thead>
<tr>
<th>Direct labor</th>
<th>Indirect labor</th>
<th>Unproductive time</th>
</tr>
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<tbody>
<tr>
<td>Picking</td>
<td>Sweeping the floor</td>
<td>Breaks</td>
</tr>
<tr>
<td>Put away</td>
<td>Housekeeping</td>
<td>Bathroom</td>
</tr>
<tr>
<td>Inventory counting</td>
<td>Cleaning</td>
<td>...</td>
</tr>
<tr>
<td>VAS</td>
<td>Meeting</td>
<td>Assumption: HR captures unproductive time implicitly</td>
</tr>
<tr>
<td>...</td>
<td>Assumption: Indirect labor tasks are based on external process steps. You can capture them via indirect labor document.</td>
<td><strong>Assumption:</strong> HR captures unproductive time implicitly</td>
</tr>
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Assumption: Direct labor is captured in EWM via existing documents like WO, PI document, VAS order, etc.
Processor

HR

Personnel number (optional)

Supervisor

Create / change

Business Partner (role Processor)

Labor Management

Will be used for

System user (optional)

TMS

Will be used for

System user

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Planning and Simulation

- Standards creation and feedback
  - Traditional measurement: Measure lines per hour, cases per hour, etc.
  - Engineered labor standards: How long should it take to complete a specific task?
- Workload and capacity planning for different aspects
- Measurement services/formula editor
- Workforce and load simulation
- Operational planning
Basic Concepts

Planning:

• frequently used tool to determine the number of required employees and the expected workload
• based on workload, which is created by every activity planned to be executed in the warehouse
• will be based only on preprocessing workload, planned workload, measurement services and processor data
Visualization

- Events and alerts
- Exceptions
- Workforce analytics and reporting:
  - Actual vs. planned task time
  - Review performance data across multiple facilities along common metrics
- SAP NetWeaver® BI integration
  - Extractors
  - SAP NetWeaver BI content
  - Strategic planning
  - Drill-down visibility
Employee Performance: Supervisor’s View

Supervisor’s View ...

<table>
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<tr>
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Labor Management
SAP BusinessObjects Dashboard

Volume (m³) / Weight (kg) by Month

Actual vs. Planned Duration (hrs)

OF MAR 2009 by Day

Top / Bottom 30 Deltas in 02.03.2009 by Processor

OF GONZALES by External Step

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Warehouse Cockpit

Intended for Supervisor and Warehouse Manager

Monitors team performance
Monitors the performance of areas or the whole warehouse
At-a-glance view of several key figures enables you to react to critical situations quickly
### Example of Business Requirements & EWM Functionality

| Manage the time and productivity of warehouse workers | Labor Management |
| Monitor the performance of workers, teams, warehouse areas | Warehouse Cockpit |
| Create Inbound Deliveries based on shipping documents | Expected Goods Receipt |
| Automate your business processes and react flexibly to changes in your business processes | eSOA Enablement |
| Connect and control an automatic warehouse | Material Flow System |
| Create kits and transfer to stock | Kit-to-Stock |
| Optimize warehouse processes by using RFID technology | RFID Enablement |
| Generate outbound delivery orders indirectly | Create Outbound Delivery manually |
GR Process Based on Expected Goods Receipt (EGR)

- Daily list of expected deliveries
- Gate check-in
- Goods receipt (GR) preparation
- Door assignment
- Physical GR
- Release Door

Report on Expected Goods Receipt (EGR)/Planned Delivery

Compare delivery papers – system
a) EGR → Planned Delivery
b) Assign Planned Deliveries to Transport Unit

Compare physical goods – system
Identify Planned Delivery items
# Example of Business Requirements & EWM Functionality

| Manage the time and productivity of warehouse workers | ➔ Labor Management |
| Monitor the performance of workers, teams, warehouse areas | ➔ Warehouse Cockpit |
| Create Inbound Deliveries based on shipping documents | ➔ Expected Goods Receipt |

**Automate your business processes and react flexibly to changes in your business processes** ➔ eSOA Enablement

| Connect and control an automatic warehouse | ➔ Material Flow System |
| Create kits and transfer to stock | ➔ Kit-to-Stock |
| Optimize warehouse processes by using RFID technology | ➔ RFID Enablement |
| Generate outbound delivery orders indirectly | ➔ Create Outbound Delivery manually |
eSOA Enablement

Warehouse/Yard Organizational Data
Inbound/Outbound Delivery
Dock Appointments
Transportation Unit Appointments
Vehicle Appointments
## Example of Business Requirements & EWM Functionality

<table>
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<th>Solution</th>
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</table>
Material Flow System as Part of EWM

- **Inventory**: SAP ERP
- **Warehouse Mgmt.**: SAP LES
- **Material Flow**: 3rd Pty. MFS
- **Control of Sensors & Drives**: PLC

**EWM**
- SAP ERP
- SAP EWM
- SAP MFS
- SAP Plant Connectivity

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Material Flow System
Routing
EWM Controls Movement Steps

1. **Scanner-Message HU 1 at CP01**
   - a) Scanner-Message HU 1 at CP01
   - b) Task HU 1 From CP01 To CP02

2. **Move**
   - Scanner read

3. **Final Dest.**
   - Interim Destination

4. **Final Dest.**
   - Final Destination

5. **Aisle 1**
   - Aisle 2

**Diagram Elements**
- EWM
- PLC
- CP01
- CP02
- TCAR
- Scanner
- Move
EWM Controls Movement Steps

- EWM
- PLC
- Aisle 1
- Aisle 2
- Warehouse Task
- Interim Dest.
- Final Dest.
- CP02
- CP11
- Scanner
- TCAR
- Sensors
- Drives TCAR and Conveyors

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EWM Controls Movement Steps

Warehouse Task → Task Confirmation
ewm
plc

Scanner

Aisle 1
Aisle 2

Final Dest
Interim Dest

Sensors

Drives Conveyors
EWM Controls Movement Steps

Warehouse Task to Rack Feeder

Task Confirmation

Final task confirmation

Sensors

Final Dest.

Drives Rack Feeder

Bin

CP12

Aisle 1

Aisle 2

Task Confirmation

PLC
(for Rack Feeder)

PLC
(for conveyors)

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Material Flow System

Conclusion

Automatic Warehouse Integration

- Identification
- Routing
- Posting
- Monitoring

One Software
One Monitoring
One Technology Stack
Lower TCO / TCI

Performance
Integration
## Example of Business Requirements & EWM Functionality

<table>
<thead>
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<td>Create Outbound Delivery manually</td>
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Kit-to-Stock

- Can use ERP Bill of Material & Production Order
- Use VAS completely in EWM
- Dismantle Kits (de-kitting)
- Streamlined Kit Creation process
### Example of Business Requirements & EWM Functionality

<table>
<thead>
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<th>Requirement</th>
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Optimize warehouse processes by using RFID technology

Create Outbound Delivery manually
RFID enabled EWM

Set unload status, confirm WT (with resource user) and post GR based on ASN

Confirm WT incl. resource, e.g.:
- internal stock transfer
- change batch no
- stock level change

Attach boxes/items to Handling Unit, set status to packed

Update HU and send ASN
Task Interleaving

Queue Types for Task Sequencing

Inbound → Internal → Outbound
Execution Constraint

To optimize the work with RF devices in a warehouse, we focus on three types of optimization:

**Task interleaving:** a process by which a resource, having just completed and confirmed a task, is assigned a new task, the source of which is close to the resource’s current location

**Execution constraint:** enables you to control the execution of tasks in predefined zones of a site, preventing resource bottlenecks and ensuring the workability of the semi-system guided mode of task selection

**Semi-system guided work:** whenever the user has finished his actual task and requests new work, the system checks the available open tasks in an area and sends a user to this area without assigning a specific task
Execution Constraint Example

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There are currently four pickers subscribed to the destination zone ZN06 so EC 2 is available. However, since the source zone ZN04 has reached its capacity of four pickers, EC 1 is unavailable. Since the movement task is subscribed to an unavailable EC, it cannot be assigned to the worker, Marcus.
Cross Docking

- GR area
- Quality check
- Repacking/Deconsolidation
- Pallet rack
- Small parts
- Door 1
- Door 2
- Door 3
- Door 11

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Cross Docking
Merchandise Distribution
EWM 7.01
Transportation Integration LE-TRA<->EWM

Benefit for the customer:

Out of the box integration
- Up to now done as part of the implementation project
- 2 pre defined scenarios easy to implement
- Allows integration of external transportation planning system
- Allows usage freight cost calculation in ERP
Order and Transportation Information Used in Warehouse

- Customer
- Ship-to
- ...

- Waving
- VAS
- Packaging
- ...

- Carrier
- Appointment
- Load sequence
- ...

Delivery

Warehouse

Transportation
Transportation and Warehouse Processing

**Transportation**
- Load Building
- Carrier
- Scheduling
- Costing
- Settlement

**EWM**
- Transportation Unit
- Vehicle
- Appointment
- Wave Planning
- Confirmations
Scope of SAP EWM — Transportation Integration

Transportation Management Planning by means of SAP ERP Transportation drives warehouse processing of SAP EWM.

SAP EWM Warehouse Execution notifies SAP ERP Transportation about execution of planned transports (TU activities) in order to allow follow-up actions (e.g., freight cost calculation, follow-up transport planning for complex multi-step transports.)
Transportation Management Planning by means of an external transportation management system drives warehouse processing in SAP EWM.

SAP EWM Warehouse Execution notifies external transportation management system about execution of planned transports (TU activities) in order to allow follow-up actions (e.g., freight cost calculation, follow-up transport planning for complex multi-step transports).
Internal Logistics Networks (ILN)
Claims and Returns in Internal Distribution Networks

- Enhance existing EWM discrepancy and returns capabilities
- Cover exception processes via standardized procedures
- Document quality issues between internal locations
- Improved visibility of inventory across network locations & minimized time required for correction postings

- Create stock transparency and inventory correctness according to physical situation
- Visibility of Damage or loss of goods within an internal network
- Improve material availability situation
- Adjustments (pricing, quantity, returns, scrapping) enabled across company codes and countries
- Keep Service Levels high

- Create customer <-> supplier relationship between internal locations
- Improve shipment and delivery quality in the network
- Trigger follow up process from warehouse to ensure financial corrections
- Financial correctness between locations in case of intercompany business
Internal Logistics Networks

Additional Item Discrepancy Process

- Handle Additional Items in Stock Transfer Orders
- Intra-/Intercompany Case
- Subsequent STO creation initiated from EWM in receiving location
- Physical receipt on dock of product B
- Correct inventory / financial situation

Wrong Items Returns Process

- Return wrong items via Returns-STO
- Intra-/Intercompany Returns
- Initiate rSTO from EWM
- Perform Quality check in receiving location
- Financial clearance based on quality check results
- Reimburse based on inspection result (IC business)
Agenda

Introduction
Overview: Main Features
Detailed Functional Overview

Current Status
Panel Discussion and Wrap Up
EWM Adoption
Status: July 7, 2011

EWM Live Customers and Sites

- Live Sites
- Live Customers
Countries with active EWM deployments
July 2011
# Select Active SCM EWM References

## June 2011

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Agenda

Introduction
Overview: Main Features
Detailed Functional Overview
Current Status
Panel Discussion and Wrap Up
Thank You!

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