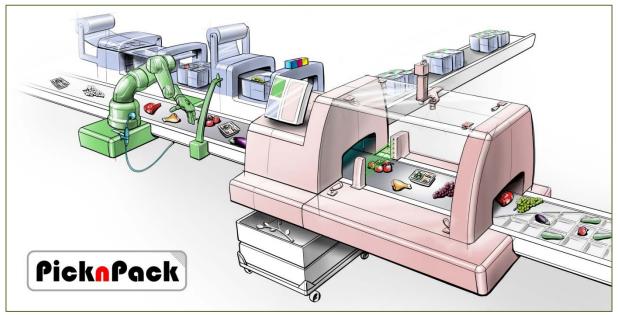
D3.1 – Traceability Database and Software Application

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Flexible robotic systems for automated adaptive packaging of fresh and processed food products



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Disser	nination level	
PU	Public	Х
PR	Restricted to other programme participants (including the EC Services)	
RE	Restricted to a group specified by the consortium (including the EC Services)	
СО	Confidential, only for members of the consortium (including the EC Services)	





Table of Contents

	Introduction
	The Traceability Database
	Application Interface
	Application Operations – Step1: Initial Setup
.1	1 Suppliers Management
.2	2 Factory and Production Lines
.3	3 Input Containers
.4	4 Output Containers 10
.5	5 Category 11
.6	6 Product Type and Product Attribute Value 12
	Application Operations – Step2: Prepare Ingredients13
.1	1 Goods Arrival 14
.2	2 Subdivisions 15
	Application Operations – Step3: Setting UP the Job Batch
	Application Operations – Step4: Setting the Packaging Event
	Scan and Query 22
	Delivery





1 Introduction

This document outlines the operation of the traceability database and software, relating to the deliverable of:

D3.1: Database and software for intelligent production

Two associated milestones are:

- M3.1: Database establishment (M6)
- M3.2: Software development (M12)

A database has been established with SQL Server 2008 as the outcome of M3.1. This database stores traceability information to support the functions of the traceability system. It contains logistical data, identification number, product, supplier, customer and other information. The information in the database could be retrieved from the traceability software written using Microsoft Visual Studio C#. Details of the database and traceability software design can be found in the deliverable report for D3.2.

This report illustrates how the software application is used with a series of screenshots. Further details of operation are given in the following sections.

2 The Traceability Database

The traceability system has a database used for recording the information of:

- (1) Suppliers
- (2) Goods supplied & ID codes
- (3) Production line processes: methods and procedures
- (4) Links to process databases
- (5) Product parameters: product type, weight, price, ID codes and others
- (6) Labelling details
- (7) Customers and delivery
- (8) Time stamp at various stages

The database is built using SQL server 2008, as it has an advantage of handling structured data. The implemented database structure is shown on Figure 1.





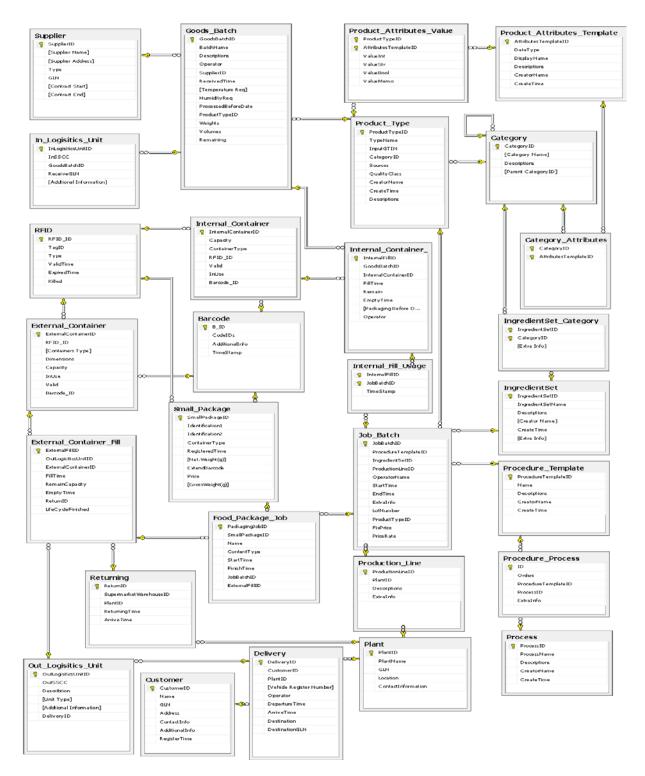


Figure 1 - Database structure

The current database can handle the traceability information. Its link to other distributed databases in WP2 is to be further developed when WP2 is ready for interfacing or integration.



3 Application Interface

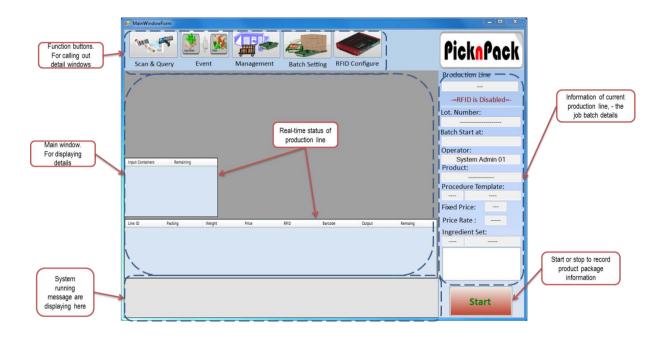


Figure 2 - The interface of the traceability software application

Function buttons. For calling out detail windows			PicknPack
Main window. For displaying details	Construction of the section of	2 Plannal Contener Page 302 Contener ID	roduction Line 03 Information of current production line, - the job batch details roduct: Meder Fuls 7 Ready Med Set Production line, - the job batch details 12 For Ready Med Set Production Start or stop to record product package information
System running message are displaying here			Start

Figure 3 - Interface with functions displayed

The traceability software application developed for the WP3 takes up a simple one-screen design. Starting from the first screen shown in Figure 1, all functions can be called to display further on the screen, as shown in Figure 2. In total, there are five function areas:



• Function buttons: these are for calling out related windows/interfaces.

PicknPack

- Main window area: This is where the windows are displayed. It also shows real-time information on the production line, including input source material, output packed product, and current packaging information.
- System running message: This area shows system running messages. They include error messages, notifications, and reminders etc.
- Production line setting and parameters: This area shows the current 'Job Batch/Lot Setting' of a production line.
- Start/Stop Button: This is used to start or stop recording the traceability information of a production line.

The procedures of using the software are illustrated in Figure 3. Mainly, there are four steps: (1) Initial setup for entities, (2) Preparing ingredients (source material), (3) Job batch settings (for packaging job), and (4) Packing event settings.

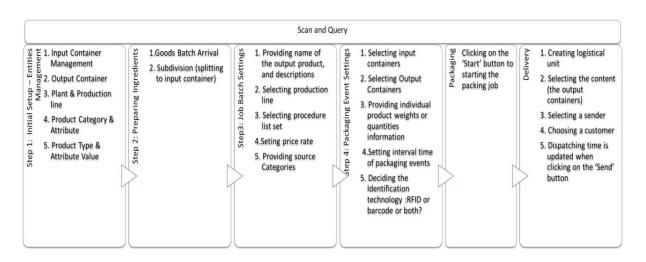


Figure 4 – Operation procedures in using the software

4 Application Operations – Step1: Initial Setup

Before operation, necessary entities need to be registered into the system. These include plant, production, supplier, customer, product type and category information, at least one record of each type of entity is required. The 'Management Function' is designed for creating new records or updating existing records of entities, and it can be called out by the 'Management' button as shown in Figure 4.





Scan & Quer	y Eve	ent Mar		Batch Setting RFI	D Configure
	,	ManagementFor	n		
		Internal Containers	External Containers	Suppliers Plant Categor	y Products
		Internal Container:	Refresh	Basic Information	
ut Containers ormai Container ormai Container	Remaining 44			Container ID: Capacity: Container Type: RFID: Barcode: Valid: • In	
ormai Container	26				Update
e ID Packing	Weight			Last/Current Content Infon Fill Time: Remain Unit: Operator:	New Internal Container
	- 5602 2.7			EmptyTime:	Cancel

Figure 5- The interface of Management function





4.1 Suppliers Management

'Suppliers' can be registered/ modified in the third tab of the Management interface. Supplier information can be modified by clicking on the 'Update' button after changes are made. New suppliers can be added to the system by clicking on the 'New Suppliers' button, and the layout of the window is then changed for creating new suppliers (Figure 5a). The layout can be switched back to 'Modifying Supplier' (Figure 5b) by clicking on the 'Edit Supplier' button. Figure 5 illustrates the two layouts.

nternal Containers	External Containers	Suppliers Plant C	ategory Products		Internal Containers	External Containers	Suppliers Plant	Category Products
Supplier: Refresh Test 1 (GLN: 1234567890)			Overseas 1234567890 25 September 201: a-1 Street b-2 City somewhere Contact No. 012345 Fax No. 98765435	678	Supplier: Test 1 (GLN: 00000	Refresh 000000)	Supplier Inform Supplier ID: Supplier Name Type: GLN: Contract Start Address :	1 Test 1 Overseas 0000000000
4	*	Create New Supp	ier Successful Cancel	Edit Suppliers	4	+	Update	Successful Cancel

Figure 6 – Interface for supplier information inputs

Figure 6 shows a supplier 'Test 1' is successfully added to the system with GLN '1234567890' and then the GLN number is modified to '000000000'.

temal Containers E	External Containers	Suppliers Plant Ca	ategory Products	Internal Containers	External Containers S	uppliers Plant	Category Products
Supplier: Test 1 (GLN: 1234567)	Refresh	New Supplier		Supplier: Test 1 (GLN: 00000	Refresh	Supplier Informa	tion
lest 1 (GLN: 123430/330)		Supplier Name: Type: GLN: Contract Start:	Test 1 Overseas 1234567890 25 September 2013 ▼			Supplier ID: Supplier Name: Type: GLN:	Overseas 0000000000
			a-1 Street b-2 City somewhere Contact No. 012345678 Fax No. 9876543210			Contract Start: Address :	25 September 2013 no. XXX a-1 Street b-2 City somewhere Update
		Create New Suppl	ier Successful Edit Suppliers			Update	Successful Ne Supp

Figure 7 – Illustration of a supplier being added into the system



4.2 Factory and Production Lines

The fourth tab of the management window is for adding or modifying the information of factory/plant and production lines. The 'Add New' and 'Modify' layouts can be switched between them by clicking on 'New Plant' or 'Modify Plant' button in these two layouts. Production line information can be changed in a separated window (Figure 7c) that is called out by clicking on the 'Edit Production Line' button. This button is only shown in 'Modify Plant' layout (Figure 7a).

Managment	Managment
Managment Managment Managment Managment Managment Plant Category Products Plant: Plant Information Plant ID: Plant Name: GLN: Address : Contact Info: Edit Production Line Update Production Line:	Internal Containers External Containers Suppliers Plant Category Products Plant: Refresh New Supplier Plant Name:
(a)	Cancel
New Production Line Edit Existing Production Line This production line belongs to: Description: Extra Info Plant Information Plant Name: GLN: Location:	OK Apply Cancel
(c)	

Figure 8 - Plant and production line settings

At least one plant needs to be created before creating production lines. Figure 7 (b) shows an interface for creating new plant record, and the created plant information is confirmed by clicking on 'OK' button in 'Create New Plant' layout (Figure 7b). Once a desired plant is successfully created (Figure 8a), production line information can then be added to the system by clicking on the 'Edit Production Line' button in 'Modify' layout (Figure 8b).

The information for a new production line can be confirmed by clicking on the 'OK' button, and the added production line information is also displayed in the 'Plant' tab (Figure 8c). The existing production line information can be changed by the 'Edit Existing Product Line' options (Figure 8e), and the changes can also be confirmed by clicking on the 'OK' button.





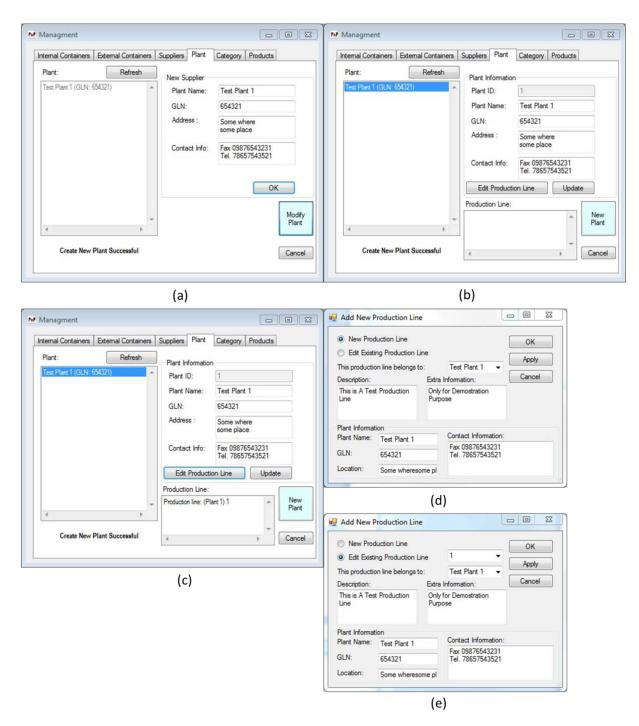


Figure 9 – Illustration of a plant and a production line being added into the system

4.3 Input Containers

The first tab of the 'Management' window is for 'Input Container' management. An 'Input Container' contains a group of products with assigned ID codes.

Figure 9 shows the 'Input Containers' management interface: the left layout is for modifying existing containers, and the right is for adding new containers. The layouts can be switched between them by clicking on the 'Modify Internal Container' button or the 'New Internal Container'.





nput Containers Output Containers S	uppliers Plant Category Products	Input Containers Output Containers Su	uppliers Plant Category Products
Input Container: Refresh	Basic Information Container ID: Capacity: Container Type: RFID: Barcode: Valid: Valid: Valid: Update	Input Container: Refresh	New Internal Container Capacity: Container Type: RFID: Barcode: Valid: Yes V InUse: No V
	Last/Current Content Information Fill Time: Remain Unit: Operator: EmptyTime: Cancel	« »	Modi interr Contai

Figure 10 - Input container settings

Figure 10 shows that an 'Input Container' is successfully added into the system with '100' capacity and then its capacity is modified to 200.

nput Containers Out	Refresh		egory Products	Input Containers	Output Containers Sup Refresh		gory Products
Wheel Engry	A Entry Capacit	New Internal Conta Capacity: Container Type:	100 Virtual	1-Vinual: Empty		Basic Information – Container ID: Capacity:	1 200
		RFID: Barcode:	E200TESTCODE 0123987654			Container Type: RFID:	Virtual E200TESTCODE
		Valid: Yes	VinUse: No VinUse: No VinUse: OK			Barcode: Valid: Yes	0123987654 • InUse: No • Update
			Modify Internal Container			Fill Time:	Ne
4	*		Cancel	4		Remain Unit: 0/20 Operator: EmptyTime:	Car

Figure 11 – Illustration of an input container being added into the system.

4.4 Output Containers

The second tab of 'Management' window is for 'Output Container' management. Figure 11 shows the layouts of 'Output Containers' management: the left layout is for modifying existing containers, and the right is for adding new containers. The operations of adding or modifying 'Output Container' are the same as that for the 'Input Containers'.





nput Containers Output Containers	Suppliers Plant Category Products	Input Containers Output Containers Su	ppliers Plant Category Products
Output Container: Refresh	Basic Information Container ID: Capacity: Container Type: RFID: Barcode: Valid: Valid: Update	Output Container: Refresh	New Internal Container Capacity: Container Type: RFID: Barcode: Valid: Yes VIUSe: No V OK
۰. پ	Last/Current Content Information Fill Time: Remain Unit: Content: EmptyTime: Cancel	· · · · ·	Modify Externa Contain

Figure 12 – Two layouts of output container settings

4.5 Category

The fifth tab is for product category management. Figure 12 shows the interface with two layouts. The right one is for creating new category, and the left is for modifying existing categories with an option for creating, modifying and assigning attributes. These two layouts can be switched between them by using 'New Category' or 'Edit Category' button. The feature of product attribute assignment is only available in the 'Creating New Category' layout.

nput Containers Output Containers	Suppliers Plant Category Products		Input Containers	Output Containers	Suppliers Plant Catego	Products	
Category: Refresh U-Comato Furt Grapes	Category Information Category ID: 4 Category Name: Grapes Parent Category: Furit • Description: Update Product Attributes List: Add Existing / Create New A Name: Des.:	✓ Add	Category:	Refresh	Category Information Category Name: Parent Category: Description:	оĸ	Edit Catego Cance
Add New Category Successful	Creator: Test	t Operator Add					

Figure 13 - Category management interface with two layouts

The category management is designed with a multiple-level structure, which is shown in Figure 13a. Four categories 'Vegetable', 'Tomato', 'Fruit', and 'Grapes' are added as an example to illustrate the multiple level structure.





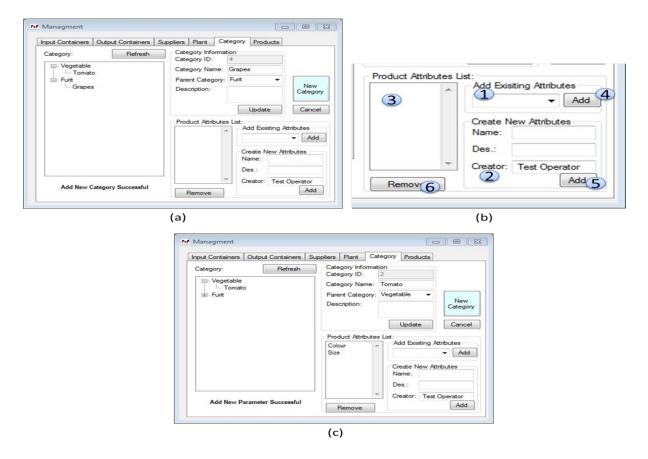


Figure 14- Example categories created with product attribute assignments

Figure 13b shows the interface of attribute assignment. The attributes can be inherited from the upper category level. For example, 'Vegetable' is already assigned an attribute 'Colour'. When a new attribute 'Size' is assigned to 'Tomato', 'Tomato' has then two attributes: the 'Colour' and the 'Size'.

Attributes can be assigned to a category in two ways, as illustrated in Figure 13b. If the attributes are already in the system, the user is able to choose it from location (1), and then clicking on the button (4) to add. If the desired attribute is not registered in the system, it can be created by filling the information in location (2) and clicking on the button (5) to add. Figure 13c shows the 'Tomato' category with its two attributes.

4.6 Product Type and Product Attribute Value

The sixth tab is for product type management and also for product attribute value assignment. Figure 14a shows that a product type named 'Tomato_0154' under the 'Tomato' category which has already been added into the system. The bottom left box on the window is a list of product types belonging to the selected category. Product type information is displayed on the top right of the window.

The attributes of the selected product type are then listed in the bottom right box. Brackets are used to indicate attributes without assigned values. Users can assign a value to the selected attribute by filling the value box and click on the 'Change' button. Figure 14b shows that colour 'Green' and size '10' are assigned to the product type 'Tomato_0154' as an example.





put Containers Output Containers Si	Appliers Fidin C	ategory Products		Input Containers Output Containers		Category Products	
Product List: Refresh	Product Informa	tion	a l	Product List: Refresh	Product Inform	nation	
	Product ID: Name:	Tomato_0154			Product ID: Name:	Tomato_0154	
- Tomato	GTIN:	Test09876543		- Tomato	GTIN:	Test09876543	
	Quality Class:	A			Quality Class:	A	
	Description:	This is only for application test	New Plant		Description:	This is only for application test	New Plant
Tometo 0154		Update	Cancel	Tomato 0154		Update	Cancel
roman_oro+	Attributes - Value	e List:		101100_0104	Attributes - Val	ue List:	
		(() ^	4		Gre 10	en
· ·	Change Attribu				Change Attrib		

Figure 15-Product type management windows

5 Application Operations – Step2: Prepare Ingredients

The functions for preparing ingredients include two major events: recording 'Goods Arrival' event and recording 'Subdivision' event. These two events are located in the 'Event' window, which can be called out by clicking on the 'Event' button, as shown in Figure 15.

MainWindowForm	
Scan & QueryWentManagementBatch SettingRFID Configure	Pick <mark>n</mark> Pack
WeventForm	Production Line
	-=RFID is Disabled=-
Products	Lot. Number:
월 Recived Date: 27 September 2013 - 15:03:28 중	
Input Containers Pecived Date: 27 September 2013 • 15:03:28 · · · Input Containers Suppler: Test 1 • Type: Tomato_0154 • · Unput Containers Processed Before Date: 29 September 2013 • Containers SSCC: Add Processed Before Date: 29 September 2013 • Containers Optimal Field Batch Goods Name: Test Goods Batch Descriptions:	Batch Start at:
Weights(or Units): Processed Before Date: 29 September 2013 -	
28 Logistical Units Information	Operator:
Input Containers SSCC: Add	System Admin 01
Z Received at (GLN): Test Plant 1(65 ▼ Gean	Product:
Additional Information:	
Optinal Filed	Procedure Template:
Batch Goods Name: Test Goods Batch Descriptions:	
	Fixed Price:
	Price Rate :
Line ID P O Humatity Hequiment;	
Volume: OperatorName:	Ingredient Set:
Clean Update	
	Start

Figure 16 - Event window



5.1 Goods Arrival

The event of raw materials arriving at a plant needs to be recorded by the user. Figure 16 shows the 'New Goods Arrival' window for the user to record incoming goods.

In order to create a complete record of incoming goods batch, the following information is required:

- The logistical unit information of the batch needs to be provided by clicking on the 'Add' button (3) with the SSCC code (1) and the GLN of the receiving place (2). A new logistical unit record is then displayed in the box (4).
- Supplier Information (5) and product type (6) need to be selected from the drop down list.
- Weight or quantity information (7) of the incoming goods batch needs to be added, which will be used to calculate the consumption amount /rate of input source material during the packaging.
- Information listed in (8) is optional.

Once all necessary information is provided, clicking on the update button is to create a record for incoming goods batch.

MP Ever	ntForm	
	Products	plier
Is Packing Jobs	Recived Date: 26 September 2013 20:19:26 Supplier: Test 1 Veights(or Units): 100 Processed Before D	
Delivery Out Unit Subdivisions New Goods	Logistical Units Information SSCC: Received at (GLN) Test Plant 1(65 • Additional Information:	Add 3 Clean
Subdivis	Optinal Filed 8 Batch Goods Name: Test Goods Batches D	Descriptions:
Out Unit	Temperature Requiment: Humidity Requiment:	
Delivery	Volume: OperatorName:	
		Clean Update

Figure 17 – Illustration of creating a record for an incoming good batch





5.2 Subdivisions

Before the source material (i.e. the incoming goods batch) can be used for packaging, it is put into containers. This activity is referred to as 'Subdivisions'. The subdivision function is located in the 'Subdivisions' tab of the 'Event' window (Figure 17a).

The first step is to locate an incoming goods batch is split into containers. A feature is provided in this screen to display the last 10 incoming goods (by clicking on the button 1) or to display goods batches by date (clicking on the button 2).

The result is shown in box (3), and valid input containers are listed in box (4) after a goods batch is selected. Buttons (5) and (6) are for adding or removing a selected container in box (7). The selection can be confirmed by clicking on the 'OK' button. The containers used for the selected batch are listed in box (8) (Figure 17b).

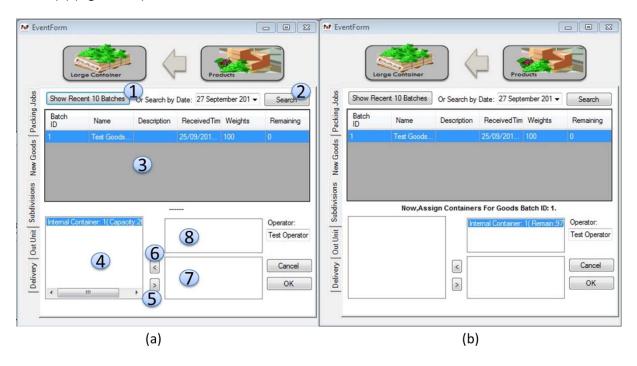


Figure 18 – Splitting a goods batch into containers

6 Application Operations – Step3: Setting UP the Job Batch

This step is for setting up job batch parameters. The related window can be called out by clicking on the 'Batch Setting' button, which is shown in Figure 18.



MainWindowForm		,			
Scan & Query	Event Man	agement - Ba	atch Setting RFID Con	nfigure	PicknPack
					Production Line
	atch/Lot Setting				
1	Product Name: (Leave Blank to use Template Name)		Operator:		-=RFID is Disabled=-
1	Comments:		Step 3: Choose Ingredients Info Set Name:	mation	Lot. Number:
1			Ingredient Set ID:	Edt	
1	Fixed Price: Yes Price Rat		Desciption:		Batch Start at:
1	OK Apply Can Step 1: Choose Production Line	Refresh			
1	Production Line ID:	✓ Edit	Ingredients List:		Operator:
Input Containers	Located in Plant:				System Admin 01 Product:
	GLN:				
	Step 2: Choose Procedure Temp	late	Step 4: Choose Output Product	Type	Procedure Template:
	Template Name:	-	Product Type:		
	Procedure set ID:	Edit	Product Type ID:	Choos Edit	Fixed Price:
Line ID Packis	Descirption:	^	Product GTIN:		Price Rate :
Line ID Packi		~	Category: Attributes:	rg	Ingredient Set:
	Process List:	^			
				j	
				i	
, I	<			· ·	
	~				
					Start
					Start

Figure 19 - Job batch setting window

There are four types of information that are required to complete the setup:

- Name of the product, descriptions, and product pricing method fixed or by weight.
- Production line information (the 'Step 1' area).
- Procedure set (the 'Step 2' area).
- Categories of Ingredients used in the job batch (the 'step 3' area) for checking against input containers.
- Output product type and its GTIN number.

There are four areas marked with 'Step' on the interface. 'Step 1' is for choosing a valid production line from a drop down list. If the user would add or edit the production line records, the button 'Edit' in this area could be used to call out an edit window in the same way as that in Section 3.2.





ProcedureEditForm		Batch/Lot Setting	
New Procedure Template Edit Existing Template	OK Apply Cancel	Product Name: (Leave Blank to use Template Name) Comments:	Operator: Step 3: Choose Ingredients Infomation Set Name:
Procedure Template Informat		Fixed Price: Yes Price Rate: 2.4 OK Apply Cancel Refresh	Desciption:
Procedure Template Name: Crea Description:	: Test Procedure Set 01 ated by: Created at:	Step 1: Choose Production Line Production Line ID: Located in Plant: GLN:	Ingredients List:
This is only for demo purpo	ose	Step 2: Choose Procedure Template	Step 4: Choose Output Product Type
This Procedure Includes the Following Process: Cut_01 Washing_01 Cut_01 Washing_01	Add Existing Process Washing_01 Cut_01 Add Create New Process Name: Cut_01	Template Name: Test Procedure Set 01 Procedure set ID: 1 Desciption: This is only for demo purpose Process List: Step 1: Cut. 01	Product Type: Product Type ID: Choos Edit Product GTIN: Category: Attributes:
Delete	Des.:	Step 2: Washing_01 Step 3: Cut_01 Step 4: Washing_01 + (b)	

Figure 20 - Creating/modifying procedure set and job batch setting

'Step 2' is for selecting a procedure set. The 'procedure set' is a list of processes of packaging jobs, and it is pre-assigned by the operator. The details of each process could be retrieved from other elements of PicknPack system in later stage of the project, and the 'procedure set' information describes where to retrieve the details. If there is no valid procedure sets available, the 'Edit' button can be used to call out a window (Figure 19a) to modify or create a procedure set. The changes can be confirmed by clicking on the 'OK' button, which are then shown in the main job batch setting window (Figure 19b).

Ingredient Set Edit 🗖 🔲 🔀	Batch/Lot Setting	
New Ingredients Set OK	Product Name: (Leave Blank to use Template Name)	Operator: Step 3: Choose Ingredients Information
Edit Existing Ingredients Set Apply	Comments:	Set Name: Tomato Set 01
Cancel groupBox1 Ingredients Set Name: Tomato_Set_01 Created by: Created at:	Fixed Price: Yes Price Rate: 2.4 OK Apply Cancel Refr Step 1: Choose Production Line Production Line Vertice	Ingredient Set ID: 1 Edit
Descriptions: This is only for demo purpose	Located in Plant: GLN:	
Comments:	Step 2: Choose Procedure Template	Step 4: Choose Output Product Type
nothing to say	Template Name: Test Procedure Set 01	Product Type:
Selected Ingredients: All Ingredients List:	Procedure set ID: 1	Product Type ID: Choos Edit
Tomato Vegetable Tomato Funt Coraces Caraces	Desciption: This is only for demo purpose	e Product GTIN: Category: Attributes:
	Process List: Step 1: Cut_01 Step 2: Washing_01 Step 3: Cut_01 Step 4: Washing_01	
(a)	(b)

Figure 21 - Creating/modifying ingredients settings and job batch setting window

'Step 3' is for selecting an 'ingredients set' for the packaging job. The information is used to check against the input material in the packaging stage. The ingredients information provided here is only





the 'Categories'. The actual ingredients information (i.e. the Input Containers) is assigned during the packaging process; a 'Edit' button can be used to call out an 'Ingredients Sets' interface (Figure 20a). The confirmed changes are shown in the main job batch setting window (Figure 20b).

		ng Batch/Lot Setting	
		Product Name: (Leave Blank to use Template Name) Comments:	Operator: Tester_01 Step 3: Choose Ingredients Infomation
		Fixed Price: No Price Rate: 0.0024 OK Apply Cancel Refresh	Set Name: Ingredient Set ID: Edit Desciption:
SelectionProducTypeForm		Step 1: Choose Production Line Production Line ID:	Ingredients List:
E-Vegetable └─ Tomato ⊕- Furit	Tomato_0154 Packaged_Tomato_015:Output	GLN: Step 2: Choose Procedure Template Template Name: Procedure set ID: Description:	Step 4: Choose Output Product Type Product Type: Packaged_Tomato_015:Output Product Type ID: 2 Choose Edit Product GTIN: Test01234567 Tomato (D-2) Attrobutes:
	Cancel Select	Process List:	ColourGreen Size10
	(a)	(b)	

Figure 22 - Output product type settings

'Step 4' is for selecting an output product type of a job batch. The product types are managed by the 'Management' window that discussed in Section 3.6. The window can be called out by the 'Edit' button.

In order to set an output product type, the user needs to click on the 'Choose' button, which calls out a window (Figure 21a) for product type selection. Once the product type is decided by clicking on the 'Select' button, the information is displayed in the job setting interface (Figure 21b).

The last step is to set the price, operator, comments and product name information. The price information is used for pricing individual packs of the output product. It can be a fixed price or dynamic price. If the fixed price option is set to 'Yes', the price rate is the total price of each package. Otherwise, the price rate is used to calculate the actually price with the quantity or weight information of each individual package.

The operator, comments and product name are optional. If these three types of information are not provided, default values are used. The complete setting of a job batch is shown in Figure 22.





Product Name:			Operator:	
(Leave Blank to use Template Name)		_	Step 3: Choose Inc	aredients Infomation
Comments:			Set Name:	Tomato_Set_01
Fixed Price: No	Price Rate: 0.0024		Ingredient Set ID:	1 Edit
	ply Cancel Refres	sh	Descirption:	This is only for demo purpose
Step 1: Choose Pro	duction Line			
Production Line ID:	1 +	Edit	Ingredients List:	Tomato
Located in Plant:	Test Plant 1			
GLN:	654321			
Step 2: Choose Pro	cedure Template		Step 4: Choose Ou	tput Product Type
Template Name:	Test Procedure Set 01	-	Product Type:	Packaged_Tomato_015:Outp
Procedure set ID:	1 Edit		Product Type ID:	2 Choos Edit
Descirption:	This is only for demo purpose	*	Product GTIN:	Test01234567
			Category:	Tomato (ID:2)
		-	Attributes:	
Process List:	Step 1: Cut_01 Step 2: Washing_01 Step 3: Cut_01 Step 4: Washing_01	* =		Green 10

Figure 23- A completed setting for a job batch.

The information of packaging job setting is confirmed by clicking on the 'OK' button, and the settings are displayed in the right bar of the main window (Figure 23).

HainWindowForm	California 1 Maril	industrian and in the	a the second second	(Despt) 1. Loost	fum - Despri	-	
Scan & Query Even	nt Managemer	nt Batch Se	tting RFID	Configure		Pic	cknPack
🚽 Batc	:h/Lot Setting		-	[=		Produ	ction Line
	luct Name: re Blank to use		Operator: Tester	_01			1
Temp	olate Name)		Step 3: Choose Ing	gredients Infomation		-=RI	FID is Disabled=-
Com	ments:		Set Name:	Tomato_Set_01	-	Lot. Nu	mber:
Fixed	Price: No Price Rate:	0.0024	Ingredient Set ID:	1	Edit	00	10001########
	OK Apply Cancel	Refresh	Desciption:	This is only for demo p	ourpose	Batch S	tart at:
Step	p 1: Choose Production Line						
Prod	duction Line ID: 1	✓ Edit	Ingredients List:	Tomato		Operat	
Input Containers Remaining Loca	ated in Plant: Test Plant 1						Tester_01
1- Virtual Container 97 GLN	N: 654321					Produ	
Step	p 2: Choose Procedure Template		Step 4: Choose Ou	tput Product Type			Procedure Set 01
Ten	mplate Name: Test Procedure S	iet 01 👻	Product Type:	Packaged_Tomato_0	15:Output	Proced	lure Template: Test Procedure Sel
Pro	ocedure set ID: 1	Edit	Product Type ID:	2 Choos	Edit		
Des	scirption: This is only for de	mo purpose 🔺	Product GTIN:	Test01234567		Fixed P	Price: No
Line ID Packing			Category: Attributes:	Tomato (ID:2)		Price F	Rate : 0.0024
	cess List: Step 1: Cut 01		Colour	Green	1	Ingred	ient Set:
	Step 2: Washing Step 3: Cut 01	_01	Size	10		1	Tomato_Set_01
	Step 4: Washing	_01 +				Tomat	.0
						0000000	
							Start

Figure 24- Completed job batch setting and that shown on the right bar of the main window





7 Application Operations – Step4: Setting the Packaging Event

The packaging job events are currently generated by an internal module as the RFID/ barcode system has not been implanted. The setting is made from the first tab of Event window. Figure 24 shows the interface of setting packaging events.

ne Eve	entForm	
Packing Jobs	This is for software Debug / Demo this section is collected by Barcode Small Package Use Barcode Only O Use RFID Only	Output Container
New Goods	 Use Both Small Package Type: Individual Weight: 500 g, ± 10 g 	Remain Capacity: 80 / 80 Form Source Container: 1-VirtuaTest Goods Batches
Delivery Out Unit Subdivisions New Goods	Input Container 1-Virtual Product Name: Test Goods Batches Category: Tomato Remain: 97 / 200 V 1-VirtualTest Goods Batches	To Destination Container: 2-Normal The system is waiting process System is Using RFID and Barcode interval time: 0.5 second Modify OK

Figure 25- Packaging event setting interface

There are four types of information required to generate a packaging event: input container, output container, interval time of packaging events, and weight/quantity of each individual package. The settings are confirmed by clicking on the 'OK' button. A message may be displayed on the main window, if a 'Job Batch' has not been started (Figure 25).





RainWindowForm	
Scan & Query Event Management Batch Setting RFID Configure	PicknPack
Scan & Query Event Wanagement Batch Setting Rid Container Imput Containers Remaining It is for software Debug / Demo ONLY. Normally, all information in this section is collected by Barcode/RFID system AUTOMATICALLY Imput Containers Remaining Use Barcode Only Use Brid Donly Output Container: Imput Containers Remaining Use Barcode Only Use Brid Container Prom Source Container: Invitud Container 97 Output Container: I-Virtual Container: I-Virtual Container: Invitud Container 97 Indi Container Indi Container: I-Virtual Impit Container: Invitud Container 97 Indi Container Indi Container: Indi Container: Invitud Container 97 Indi Container: Indi Container: Indi Container: Invitud Text Source Stand Indi Container: Indi Container: Indi Container: Indi Container: Invitud Text Source Source Stand Indi Container Indi Container: Indi Container: Indi Container: Invitud Text Source	Production Line 1 -=RFID is Disabled=- Lot. Number: 0010001####### Batch Start at: Derator: Tester_01 Product: Test Procedure Set 01 Procedure Template: 1 Test Procedure Set Fixed Price: No Price Rate: 0.0024 Ingredient Set: 1 Tomato_Set_01 Tomato Start

Figure 26 - A message displayed in the main window if the 'Job Batch' has not been started

A packaging job batch can be started by clicking on the 'Start' button on the main screen. Real time messages are displayed in the message box(Figure 26) and the status monitoring bar (Figure 27) shows the current status of the production line.

	SmallPackage - 5602	2.7	6.48	E200003000500000	00300050000066-0	1 - Virtural Continer	97	Ingredient Set:
								1 Tomato_Set_01 Tomato
[21:42:05]:A U [21:42:07]: Th [21:42:07]:A U	Unit of Test Procedure Set 0	1 is Packed, V Fed 1 unit of	Vith RFID tag: E2000 Tomato_0154 to the P	roduction Line ID:1, Remain				Start

Figure 27 - Message box showing packaging information



put Containers	Remaining	Line ID	Packing	Weight	Price	RFID	Barcode	Output	Remaing
Virtual Container	97	01	SmallPackage - 5602	27	6.48	E200003000500000	00300050000066-0	1 - Virtural Continer	97

Figure 28 – Production line status monitoring bar

8 Scan and Query

This function is a major feature of the traceability system. It allows the user to retrieve related information by providing an ID number, which can be a batch/lot number, RFID/barcode of the packaged product, or container number.

An interface of this function can be called out by clicking on the 'Scan & Query' button on the main window of the application. The interface is shown in Figure 28.

HainWindowForm				-	
					PicknPack
Scan & Query	Event Mana	gement Batch Settir	ng RFID Conf	igure	
					Production Line
					1
🖳 QueryForm					-=RFID is Disabled=-
Number/ID/Code: E2000010001	1000000010003	▼ Searc	th	Detail Search For Goods	Lot. Number:
Tags ID Object Name		Search Finished, 1	Records is displaying	J.	0010001########
SmallPackage: 3	RFID Tag ID: E200001	000100000010003		001000100000001	Batch Start at:
	Source Information	oods Batches(ID: 1)	Production Information		
	Batch Name: Test G Supplier: Test 1	GLN: 654321	Product Name:	Test Procedure Set 01(LotNumber: 001 -	Operator:
		/2013 19:52:58	Package Time:	25/09/2013 21:42:07	Tester_01
	Product Name(Source):	Tomato 0154	Lot. Number:	001000100000001	Product:
	GTIN: Test09	876543	Operator:	Tester_01	Test Procedure Set 01
	Gategory Name:	Tomato	Product GTIN:		Procedure Template: 1 Test Procedure Sel
	SSCC number (Source):	TEST0000001	Production Line	1 Plant: Test Plant 1	
	Containers (Input):	Internal Container 1	Plant GLN:	654321	Fixed Price: No
			Fixed Price:	No Price Rate: 0.0024	Price Rate : 0.0024
				: (or Indivdual, if Applicable): 500	Ingredient Set:
	OutGoing/Delivery Informat	ion		livdual Product(if Applicable): 1.2	1 Tomato Set 01
	Logistics Units SSCC:			de Number (if Applicable): 0050000120	Tomato
	Dispatch Location:		Containers (Outp		
	Dispatch Location GLN:			External Container ID:1	
	Dispatch Time:				
	Destination:				
	Destination Location GL	4:			
[21:42:05]: The Input Container ID:1 h			ıg: 98		
[21:42:05]:A Unit of Test Procedure S [21:42:07]: The Input Container ID:1 h			ıg: 97		
[21:42:07]:A Unit of Test Procedure Se [21:42:07]:Production Line Stopped	et 01 is Packed, With RFID tag	E2000010001000000010003	2044 A		Start
Le trace of the output of the output					

Figure 29 – Interface of 'Scan & Query' function





The user can key in an ID number for searching the information on the 'Number/ID/codes' box of the window. Once click on the button 'Search', all found information is displayed in the left list box in two formats: object name and the RFID/barcode number.

Details of a selection in the left list box are displayed on the right part of the interface. It includes source information, production information and delivery information. Some of the sections may have multiple records that can be shown by selecting from the drop-down lists.

9 Delivery

The delivery event is currently generated by simulation from an internal module located in 'Delivery' tab of Event window (Figure 29). This will be replaced by that generated by RFID/barcode inputs in the next step of development.

							P			
	Logistical U SSCC:	Line -packaging			TEST76					
	Send From (GLN):						Add Clean			
Out Unit Subdivisions New Goods Packing Jobs	Additional Information:									
	1- Normal Container Add Remove									
	Send to : Customer_TEST_01									
Delivery Out Unit	New Custo Name:		_TEST_0	GLN:	TEST	GLN00000	32			
	Address : Test A		ess	Contact In	fo: Tel. X	XXXXXXXX	Add			

Figure 30 – Interface for simulating delivery events





Four types of information are required to generate a delivery event:

- 1) Logistical unit's information a unit is created with a given SSCC number, a dispatch location GLN, and optional additional information. The unit can then be created by clicking on 'Add' button.
- 2) The content i.e. the output container. It can be selected from the drop down list and confirmed by clicking on the 'Add' button in 'Output Containers' window.
- 3) Customer information- it can be done either by selecting from the drop-down list (existing customers) or by creating a new one from the 'New Customer' window.
- 4) The dispatching time it is automatically updated by clicking on the 'Send' button.