RTI (Pallet Tagging)

Guideline

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Log of Changes

Version	Date	Author	Changes
0.1	5 March 2009	SP	Initial thoughts capture
0.2	7 May 2009	LG	Revised details based on various discussions
0.3	8 May 2009	PS	Document layout and structure refinements, plus addition of additional text where applicable
0.4	11 May 2009	PS	Tidy up of existing information in preparation for Group conf call on May 14th, 2009
0.5	12 May 2009	LG	New definition of SSCC
0.6	11 June 2009	PS	Adding of Data structure and pallet manufacturers' views; start on conclusion section , some cosmetic changes
0.7	17 June 2009	PS	Adding additional information n data structure and voting results; tidied up use case tables, inserted placeholder section for REWE input.

Version	Date	Author	Changes
0.8	23 June 2009	PS	Updated conclusions FINAL DRAFT FOR RTI MEMBER REVIEW
0.9	16 July 2009	PS	Added REWE input; made small amendments based on 2 group calls with RTI member community
1.0	20 July 2009	PS	Added comments from Stephane Pique; change of front cover picture
1.1	23 July 2009	PS	Added revised text around barcodes on pallets FINAL DRAFT FOR SUBMISSION
1.2	26 Aug 2009	PS	Added changes from comment period FINAL DRAFT FOR APPROVAL
2	28 Aug 2009	PS	Final Document Approved

Comment Period Feedback Capture

Id	Change requester	Section	Page	Subject	Comment	Response
1	Heinz Graf	2	5	...also made available in a 2 dimensional barcode...	The symbologies EAN/UPC, GS1 DataBar, GS1-128, GS1 DataBar are all 1D barcodes; only the GS1 DataMatrix would be a 2D barcode.	Change made as suggested
2	Heinz Graf	6.1.1	8	SSCC is matched with ASN...	In Europe, we normally use DESADV within the EANCOM	Change made as suggested
3	Heinz Graf	6.3.1	9	No new SSCC encoding...	The SSCC is the GS1 Key for a single "Logistic Unit". Therefore we must create an SSCC for each single pallet as each pallet itself is a logistic unit of its own. If several logistic units are gathered to a new logistic unit, you add an additional SSCC for the grouping (as explained on the telephone conference).	Change made as suggested
4	Heinz Graf	8	13	Only one tag read, so short reading time...	That is not correct: there's a 1:1 relationship between the SSCC and the GRAI (see my explanation above)	The Co-chairs have considered this comment, but as there is no obvious direct 1:1 relationship, it is only an option and therefore cannot be included as fact.
5	Heinz Graf	8	14	Both Scenario 2 and 3 need...	As each SSCC is linked to a single DESADV message, you'll find a file or you won't find a file. In other words: if you'd have an old SSCC you won't find a corresponding DESADV.	The Co-chairs have considered this comment, but the focus here is on the tag, not the system. If the system would identify an older SSCC, it would not find a corresponding DESADV otherwise.
6	Michel Kempeneers	N/A	N/A	General comment	this is certainly NOT a Guideline, but merely a Report. Therefore, suggestion to rename the document's title to e.g. "Results of First Research & Further Planning for the RTI (Pallet Tagging) Interest Group". Or, of course, to restructure the current document in order to make it a proper Guideline!	The Co-chairs disagree with this comment and consider it as a Guideline nonetheless, as clear guideline references for pallet tagging and tag positioning have been made.
7	Michel Kempeneers	2	5	...also made available in a 2 dimensional barcode...	suggestion to drop the "2 dimensional" and stay more general, e.g. "[...] also made available in a barcode and/or a human readable form [...]" For indeed, the note goes on talking about the GS1-128, which is a one-dimensional barcode!!	Change made as suggested
8	Michel Kempeneers	5	7	Definitions	either the GRAI's structure is completely described, as is done for the SSCC; either the SSCC's description is kept more limited in order to have the same approach as for the GRAI. But no mixture as is currently the case. Our suggestion would be to keep the wording for the GRAI and modify the SSCC description by deleting its second phrase.	Change made as suggested
9	Sylvia Stein	9	15	Objective 2: "There is an option to store the SSCC code in the user memory of the 2 GRAI tags, if required. Still, the use of a second key on the tag would require clarification and a definition by the GS1 EPCglobal TDTS WG."	My comment is, that the TDTS will only specify the technical way on how to store an SSCC in user memory, nothing more. But there is more needed then that to use this. If companies want to store the SSCC code in user memory, they have a few options. If they use it only for their own internal use, they can do that according to the technical specification from TDTS. But if they want their business partners to read the SSCC, they need to make bilateral agreements with them on how this SSCC in user memory is to be used and that they should read it. If there is a requirement for a widespread use of the SSCC in user memory then rules and guidelines around the use of the SSCC in user memory should be defined within the GS1 General Specifications.	Change made as suggested
10	Jens Friedrich	10	16	Table: Palpool Plastic pallet	BARCODE USED: NO	Change made as suggested

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1. RTI (PT) IG introduction

The use of returnable transport items (pallets, roll cages, returnable plastic containers, tote boxes, ingredients bins, dollies, IBCs, etc) is an increasing phenomenon in the modern supply chain, with companies constantly seeking to reduce costs, increase handling efficiencies and improve environmental responsibility through less waste. Increasingly stringent traceability regulation worldwide requires companies not only to provide a complete audit of product and ingredients movement in the supply chain, but also compels them to track secondary packaging and materials handling equipment flows associated with product shipment. In addition, the supply chain suffers significant costs annually, associated with the loss of equipment/assets and their subsequent replacement.

In the last month, several pallet producers and pool service providers have started to seriously explore the integration of the EPC/RFID technology into their pallets. The tag/s should hereby become an integrated part of the pallet in order to identify each pallet individually as this will help to improve the control of production and repair, will allow a clear authentication, gives the users in the pool a valuable tool to control flow, quality and ownership of the pallets, and will open new possibilities in supply chain management.

During the last EPCglobal EAP co-chair meeting, pallet companies have expressed the need to clarify the usage of EPC/RFID within the pallets as they could also use the EPC/RFID tag in the pallet as data carrier for their logistic processes (such as storing the SSCC).

This Interest Group will aim to produce an implementation guideline that may include problem statement, use case scenarios, and a recommended solution for integrated tags in pallets.

The implementation guidelines will be applicable to all parties involved in supply chain as well as the 3rd party logistics providers and solution providers. The final output will:

1. Analyze the scope of the problem including use cases, identify current applications affected and temporary solutions.

2. Provide guidance to produce business users on how to apply the GS1 System in this particular case within their sector and across all regions.

3. Gives pro's and con's of every recommendation and possibility of implementation.

2. Objectives

The objective of this INTEREST GROUP is to create a set of requirements as follows:

- Work with the "GS1 Key Clarification Group" which will define the appropriate GS1 identification key (GRAI or GIAI) to identify a pallet

  □ The recommendation of which GS1 identification key (GRAI or GIAI) is to be used on a pallet is the responsibility of the GS1 Key Clarification Group. Members of the RTI (PT) IG who are interested in providing input to this recommendation should participate in that working group.

- Define the specifications (orientation, placement) and amount of tag needed in order to use the EPC/RFID tagged pallet in several uses cases such as inbound/outbound, inventory management and also asset management

- Define the data structure and usage of memory of the tag (address information to be written to user memory in standardized format) – Section 8 Data Structure will outline in more detail a number of different scenarios.

The organization and development of the RTI Integrated Pallet Tag Definition Guideline topics are facilitated by co-chairs and their sub-teams. Guideline Topics are brought to the Work Group when they are in a draft format suitable for public review.

The guideline that is developed will include:

■ Detailed descriptions of multi-party business use cases that consider the need for identification and management of pallets

■ Requirements that relate to what data is to be captured in user memory portion of tag, how it is to be maintain, security considerations

The document should indicate where requirements may be met by existing GS1 and EPCglobal standards

The RTI (PT) IG should utilize the guideline for Returnable Transport Items developed in the previous RTI working group that was part of the EPCglobal Business Action Group.

Note: Although not mandatory it is advisable and therefore optional that the respective GRAI number is also made available in a barcode and/or a human readable form on the pallet. This visual readable GRAI number on the pallet itself needs to be the same GRAI number as stored in the respective tags. The purpose of this would be to enable the identification of the asset in an environment where RFID readers do not exist. It is recommended to use the GS1-128 barcoding standard.

3. Work approach/methodology

This Interest Group has been created with a number of active participants ranging from pallet manufacturers, pallet users as well as academic institutions sharing the same goal of finding answers and solutions around pallet tagging and tracking methods and results.

The RTI (PT) IG has appointed co-chairs to facilitate the day-to-day running of the group.

In order to establish regular communication across all RTI (PT) IG participants a number of face-to-face meetings as well as audio conference calls and voting facilities have been set up to share information and progress amongst the various teams.

Furthermore, four dedicated sub teams have been established to work on generating specific information on 4 distinct supply chain processes (receiving, inventory, order/picking/ shipping) which can be found in the use cases for pallet users chapter below.

The group will also synchronize/collaborate/share information with the following groups:

■ GS1 Key Clarification Group

■ GS1 in Europe E-com working group (presentation on *Reusable Transport Items Management Guideline with eCom messages* was given at F2F meeting of 11-Feb-2010)

■ GS1 Germany: some pallet tagging physical testing work will be done by REWE, Mars, Kraft Foods and Nestlé

4. Deliverables and Milestones

Initial milestone dates are provided in this charter for guidance purposes only. The INTEREST GROUP shall follow the current version of the EPCglobal Standards Development Process located at www.epcglobalinc.org.

Date	Milestone
Dec 2008	Charter ratification by RSC and BSC; approval by legal counsel
Jan 2009	Formal launch of RTI (PT) IG
Jan – Feb 2009	Complete Review of original EPCglobal Returnable Transport Items Guidelines and actual project involving pallet identification with RFID
Feb – Mar 2009	Development of Business Use Cases
Mar – Apr 2009	Development of Pallet Tagging Guideline and Synchronization with GS1 Key Clarification Working Group in GSMP for Objective 1
May 2009	Returnable Transport Items Guideline for Pallet Tagging Comment Period/Resolution
Jun 2009	Submit RTI Guideline for Pallet Tagging for BSC Approval
Ongoing through end	Ongoing support for, and ongoing reviews of, the interim and final workings and the work product of the resulting SAG Data Exchange WG by members of the INTEREST GROUP that have opted into the corresponding SAG WG.

5.   Definitions

- **GRAI –** The GS1 Identification Key used to identify Returnable Assets. The key comprises a GS1 Company Prefix, Asset Type, Check Digit, and optional serial number.

- **Pallet –** A pallet is a an asset (equipment) that serves as a base for assembling, handling, sorting, storing, and transporting goods as a unit load. Pallets come in different designs, dimensions and material (this group will focus on plastic and wooden flat pallets only).

- **Pallet load –** Pallet load is any product/goods carried by the pallet. Depending on the placement of the tag, the load can have a significant influence in the reading performance of the RFID tag and needs therefore to be considered.

- **Pallet user –** A pallet user is a company using the pallets for its purpose. This excludes processes related to the manufacturing and repair of the pallets.

- **SSCC –** The GS1 Identification Key used to identify logistics units. The key is comprised of an Extension digit, GS1 Company Prefix, Serial Reference, and Check Digit.

6.   Use Cases for pallet users

This section describes the use cases for pallet users. The information is based from active research carried out by assigning different processes and applications to varies RTI (PT) sub teams as shown in the table below.

The purpose of each sub team is to describe a typical process for their respective area that will capture 80% of the use cases occurring in the supply chain.

Application	Processes			
SCM	Receiving (1a)	Inventory (2a)	Ordering/picking (3)	Shipping (4a)
Asset Management	Receiving (1b)	Inventory (2b)		Shipping (4b)

6.1.   Receiving Use Case

The purpose of this section is to give a high level overview of the _receiving_ process for a typical wooden or plastic pallet that will capture the majority of the use cases occurring in the supply chain.

This process is part of the overall view of pallet use in the supply chain from both a supply chain / product logistics and a pallet asset management point of view.

High Level Process Description (and Assumptions)

a.   SCM / logistics relates to the product on the pallet

b.   Asset management relates to the pallet as a reusable asset

	Process	Application	Comments
1	Pallet moves from vehicle to goods receipt area	a + b	Vehicle – truck, container, rail wagon, etc.
	Single and multiple pallet combinations	a + b	
	SSCC + GRAI tag present	a + b	
2	Pallet (GRAI) is scanned/read – GS1 data captured	a + b	
	GRAI is stored in database and triggers further asset processes	a + b	
3	Product (SSCC) is scanned/read – GS1 data captured	a	
	SSCC is matched with ASN, information checked (bbd, GTIN, quantity, etc.), inventory update	a	Note: In Europe, we normally use DESADV within the EANCOM
	SSCC triggers further supply chain processes (a)	a	Movement to storage area
4	Check on physical damages		

6.2.   Inventory Use Case

The purpose of this section is to give a high level overview of the _inventory_ process for a typical wooden or plastic pallet that will capture the majority of the use cases occurring in the supply chain.

This process is part of the overall view of pallet use in the supply chain from a supply chain / product logistics and a pallet asset management point of view. See below for an overview.

High Level Process Description (and Assumptions)

a.   SCM / logistics relates to the product on the pallet

b.   Asset management relates to the pallet as a reusable asset

	Process	Application	Comments
1	Product identified for picking from warehouse location	b	GRAI
	Validate product at pick	a	
	Update inventory cycle count	a	Triggers update stock / warehouse system
	Validate against ASN	a	
2	Perishable / shelf life management check	a	Check against order / warehouse system

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	Process	Application	Comments
3	Product recalls	a	
4	Tracking and tracing	a	
	Managing lot mixing	a	
	Mixed unit load of different content type	a	
	Avoiding cross contamination	a & b	
	Odours	a & b	
	Chemicals	a & b	
	Fire risk isolation	a & b	

6.3.   Ordering/Picking Use Case

The purpose of this section is to give a high level overview of the _order/picking_ process for a typical wooden or plastic pallet that will capture the majority of the use cases occurring in the supply chain.

This process is part of the overall view of pallet use in the supply chain from a supply chain / product logistics and a pallet asset management point of view. See below for an overview.

High Level Process Description (and Assumptions)

SCM = Supply Chain Management / logistics relates to the product on the pallet

	Process	Application	Comments
1	Starting of the picking order	SCM	
	Picking list downloaded on picking devices	SCM	
	Operator goes to the empty pallet storing area	SCM	Powered or unpowered forklift or pallet truck
	Encoding SSCC on the pallet	SCM	
	Pallet (GRAI) is scanned/read – GS1 data captured	SCM	GRAI validate the pallet if pallets are included in the picking list
2	Picking process	SCM	
	During the picking process, there are possible scan to check the pallet location	SCM	
	In case of multiple layers, each new pallet (GRAI) is scanned/read – GS1 data captured	SCM	The SSCC is the GS1 Key for a single "Logistic Unit". Therefore we must create an SSCC for each single pallet as each pallet itself is a logistic unit of its own. If several logistic units are gathered to a new logistic unit, you add an additional SSCC for the grouping
	Single and multiple pallet combinations	SCM	
3	Picking is finished	SCM	
	Pallet moves from picking to shipping area	SCM	

	Process	Application	Comments
	Product (SSCC) is scanned/read – GS1 data captured	SCM	
	Pallet (GRAI) is scanned/read – GS1 data captured	SCM	
4	Pallets are ready to be shipped	SCM	

6.4. Shipping Use Case

The purpose of this section is to give an high level overview of the *shipping* process for a typical wooden or plastic pallet that will capture 80% of the use cases occurring in the supply chain.

This process is part of the overall view of pallet use in the supply chain from a supply chain / product logistics and a pallet asset management point of view.

High Level Process Description (and Assumptions)

a. SCM / logistics relates to the product on the pallet

b. Asset management relates to the pallet as a reusable asset

	Process	Application	Comments
1	Pallet moves from shipping area to vehicle	a + b	Vehicle – truck, container, rail wagon etc.
	Load pre-assembled with SSCC	a	
	Single and multiple pallet combinations	a + b	
	SSCC + GRAI tag present	a + b	
2	Pallet (GRAI) is scanned/read – GS1 data captured	a + b	
3	Product (SSCC) is scanned/read – GS1 data captured	a	
4	SSCC triggers further supply chain processes (a)	a	
5	GRAI triggers further asset processes (b)	b	

7.   RTI pallet manufacturers' views on pallet tagging

The following information has been collected during user presentations on February 11th, 2009. It outlines the various activities by some pallet manufacturers in regards to their individual experiences on pallet tagging:

■ **A North American pallet company** optimizes RFID tagging solutions subject to pallet type (material/dimension) and use case. On its most common wood pallets the company today recommends using 2 GRAI encoded EPC tags positioned at each diagonal corner of the pallet. The company further recommends the association (if desired) of the GRAI to other GS1 keys, e.g. SSCC, be made as a virtual association in the supporting information systems. As technology evolves the company will continue to optimize solutions based on read performance, cost and durability.

- **An European pallet company** is using 2 tags in the corner opposite to each other. The tag contains three sections. One with the GRAI, the second stores a password and the third is available for SSCC or any other information.

- **A Korean pallet company** uses one tag in the middle of the pallet with the GRAI stored. Over 30k pallets are already in circulation.

- **A European pallet association** has tested and approved that one tag on the side gives the best results considering the different products loaded and the manufacturing process of the pallet. The tag contains today only the GRAI. An additional usage of the memory for the SSCC could be supported.

- **An European pallet company** is using 2 tags in the corner opposite to each other. The tag is currently a Dogbone Rafsec with NXP tag 512bits. They are looking for additional sensitivity of couple (tag,reader) in order to increase interest from retailers and industrialists.

Note: Technical University Munich has done some tests with wooden and plastic pallets and found out that different RFID reading equipment (gate, truck-mount, forklift antenna) used has a major influence on the optimal tagging location. The test results show that the solution that works in most settings is to place two tags into opposite corners of a pallet. A very important influence factor is the tag orientation as not all systems operate with a linear polarisation / uniform orientation. The recommendation is to place the transponder in an angle to allow all systems to work. A mere horizontal or vertical placement should be avoided.

In order to validate the different views of the pallet manufacturers of the RTI (pallet tagging) group, a series of conference calls were held during May and June 2009 to canvass their views and opinions. The aim was to derive a common denominator amongst the findings for ways to tag pallets effectively and efficiently.

The pallet manufacturers recognised the fact that the more RFID tags are placed on the pallet, the better the processes need to be to ensure the consistency of high read accuracies of reading those tags in a supply chain environment. As a consequence, the investment into the tags and the complex handling of tag mounting during the manufacturing process of the pallets and tag re-placement at the repairing process of pallets becomes unacceptable.

As a conclusion from the conference calls, the pallet manufacturers recommend the following minimum specification for the integration of EPC/RFID tags into pallets:

- A minimum of two pieces of RFID tags should be placed on a pallet in order to assure a minimum process security

- Wooden pallets should have one RFID tag on the longer side and one tag on the shorter side of the pallet

- Plastic pallets should have one RFID tag in the corner and another RFID tag in the opposite corner of the pallet

Those minimum specifications proofed to be enough to realise the use cases (to be confirmed with the test results) and are seen as realistic and therefore acceptable from the economical point of view.

This graphic below should visualise where the pallet manufacturers recommend the RFID tag placement:

Figure 7-1 View from the upside of the Pallet
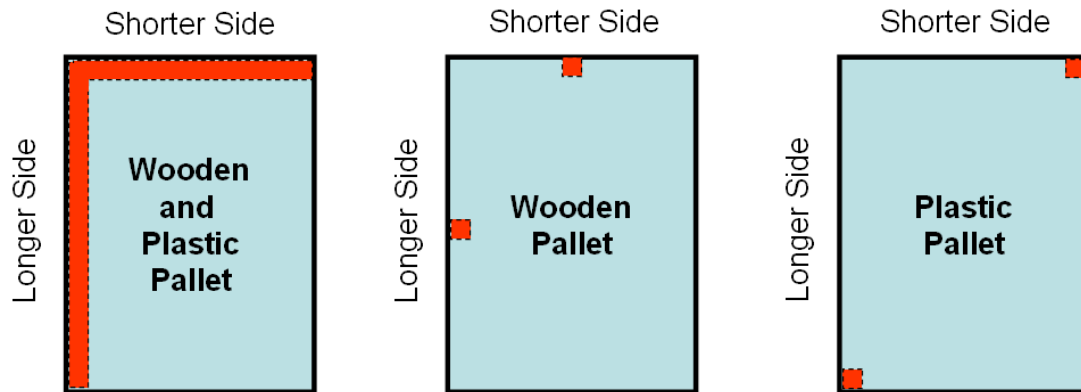
8.   Data Structure

On the 7-April-2009, a EPCglobal RTI (Pallet Tagging) IG Conference Call took place. During that call, the RTI members discussed the pros and cons of several data structure scenarios.

The following matrix has been established which summarises 7 possible scenarios; however, the matrix only defines the scenarios about the data content of the tag and does not handle the several scenarios possible about the amount of tags.

		Positive	Negative
1	GRAI tag only	1 tag	Connected via database with SSCC for SCM *
2	GRAI tag & separate SSCC tag	Fast reading compared to storage of SSCC in user memory If you have both GRAI & SSCC in database, one tag can fail	Multiple tags Won't work with multiple SSCCs which are not subordinated to a higher SSCC
3	GRAI tag & SSCC in the user memory	1 tag	Speed reduced Reliability
4	GRAI tag & unspecified data in the user memory	1 tag	Speed reduced Reliability No standard Arbitrary
5	Multiple GRAI tags		Multiple tags
6	Combination of 4 and 5 or 2x scenario 2	Fast reading compared to storage of SSCC in user memory If you have both GRAI & SSCC in database, one tag can fail	Multiple tags Won't work with multiple SSCCs which are not subordinated to a higher SSCC
7	SSCC tag & GRAI in the user memory (opposite scenario 3)	1 tag SCM: no reduced speed	May be technical constraints (01) rewrite Reduced speed for AM

Further discussions have taken place to narrow down the number of possible scenarios, by concluding that scenarios 4, 5 6 and 7 should not be considered any further in this context. Also various text changes (shown in red) have been made referring to the number of tags originally captured in that matrix.

The group has then finalized the matrix, by narrowing it down to three possible data structure options and their revised pros and cons and possible impact, which is shown in the table below.

	Positive	Negative	Possible Impact
1: GRAI tag only		Connected via database with SSCC for SCM *	Only one tag read, so short reading time. Necessary to design the system to be able to use the GRAI with time stamp to be able to associate the right SSCC at a certain point in time.
2: GRAI tag & separate SSCC tag	Fast reading compared to storage of SSCC in user memory If you have both GRAI & SSCC in database, one tag can fail		Reading time twice as long as with one tag, but since read spead is quite high impact is not substantial especially if is considered that normally only one or two pallets at one time are read. Still necessary to connect to database to see what the content of the SSCC is. Also for writing the tags there is more time needed. Writing has more impact than reading. Both Scenario 2 and 3 need processes to update the tags consistently. There is a risk of having the wrong (an old) SSCC in the tag.
3: GRAI tag & SSCC in the user memory		Speed reduced Reliability	Need to set reader to also read the user memory. Reading time a bit more, since you need to read both EPC memory and user memory. But same as scenario 2. If there are only one or two tags at the time not substantially. Also for writing the tags there is more time needed. Writing has more impact than reading. Both Scenario 2 and 3 need processes to update the tags consistently. There is a risk of having the wrong (an old) SSCC in the tag.

This matrix has then be forwarded to all RTI group members to poll their views and opinions on what should be the one preferred option. The poll was conducted online, using www.doodle.com, and although it has only attracted a small number of votes, there was a clear indication that the scenario 1 (GRAI tag only) was the preferred option by the majority of voters.

The following is a brief snapshot of the voting results as taken on 22-June-2009.

GRAI tag only	GRAI tag & separate SSCC tag	GRAI tag & SSCC in the user memory
15	5	4

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9. Conclusions

At the start of the RTI (PT) Interest Group, three key objectives have been agreed. The following will provide a brief overview of how each objective has been met:

Objective 1: Work with the "GS1 Key Clarification Group" which will define the appropriate GS1 identification key (GRAI or GIAI) to identify a pallet

Note: The recommendation of which GS1 identification key (GRAI or GIAI) is to be used on a pallet is the responsibility of the GS1 Key Clarification Group. Members of the RTI (PT) IG who are interested in providing input to this recommendation should participate in that working group.

Outcome: The discussions with the "GS1 Key Clarification Group" have defined the GRAI key to be the GS1 identification key to identify pallets

Objective 2: Define the specifications (orientation, placement) and amount of tag needed in order to use the EPC/RFID tagged pallet in several uses cases such as inbound/outbound, inventory management and also asset management

Outcome: In summary, the RTI (PT) Interest Group community has established that a minimum of 2 GRAI tags are sufficient on pallets which has been proven by various tests conducted and data collected in the industry.

- A minimum of two pieces of RFID tags should be placed on a pallet in order to assure a minimum process security
- Wooden pallets should have one RFID tag on the longer side and one tag on the shorter side of the pallet
- Plastic pallets should have one RFID tag in the corner and another RFID tag in the opposite corner of the pallet

Note: There is an option to store the SSCC code in the user memory of the 2 GRAI tags, if required. Still, the use of a second key on the tag would require clarification and a definition by the GS1 EPCglobal TDTS WG. The TDTS will only specify the technical way on how to store an SSCC in user memory, nothing more. If there is a requirement for a widespread use of the SSCC in user memory then rules and guidelines around the use of the SSCC in user memory should be defined within the GS1 General Specifications.

Objective 3: Define the data structure and usage of memory of the tag (address information to be written to user memory in standardized format).

Outcome: The GRAI data structure (GRAI 96 only) has been determined as the most feasible data structure key to be used on those tags.

Furthermore, the group has received valuable input and insights from the use cases, pallet manufacturer discussions and other industry sources that confirm the feasibility and viability of tagging pallets and associated data capture.

In conclusion, the three key objectives that where set out during the establishment of this group, have been widely achieved as defined.

10. Appendix

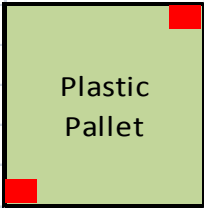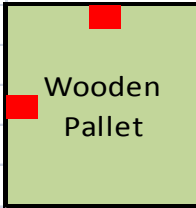## 10.1. Distribution Centre Use case by REWE Group

The following information has been gathered during some practical test scenarios at REWE DC around their inbound process.

The practical tests are performed in order to define the tag placement and amount of tags needed in the inbound process. Other processes e.g. outbound processes, asset management are not on focus of this test trial.

Incoming pallets (loaded and unloaded) have been automatic identified through the use of RFID or barcode. The barcode has been used as a backup solution. Data have been captured in a database.

All captured pallets (see table below) has been successfully gathered by RFID with a Mojix- System.

Table 10-1 Used Pallets

Pallet Typ	Amount pallet capture	Number of EPC Gen 2 Transponder	Reading process incoming pallets	GRAI - 96 used	Barcode used
Palpool Plastic pallet	151	2	successful	yes	no
EPAL Wooden EURO pallet	403	2	successful	yes	yes

Conclusion:

In order to achieve higher information value for other processes e.g. outbound process, disposal ramp, asset management or RTI inventory management additional practice test are absolutely essential.

That means that a higher amount of pallet tags (up to 4 Tags) are probably helpful to get a 100% process performance for overall processes, also for gate (Reader _ Antenna) installations, which have been tested and will be tested in another DC. The read-rate has not been so good as the result with a Mojix-System.

10.2. Technical Conclusion issued from the WP9 Bridge Pilot Carried out by Carrefour (Subject: Asset Management)

At the beginning of the pilot, Carrefour chose to use 4 tags to identify the RTIs and also the goods:

■ 2 tags with the same GRAI-96 to identify the RTI (one tag and its duplication)

■ 2 tags with the same SSCC-96 to identify the goods (one tag and its duplication)

All the 4 tags were permanently fixed to the exterior plots of the support. This choice permitted to maximize the performance in minimizing the absorption due to the wood or the plastic and the reflection due to the fork of the forklift. To guarantee the reading of the SSCC and the GRAI, it was also decided to place each tag and its duplication inside diagonal opposite plots :
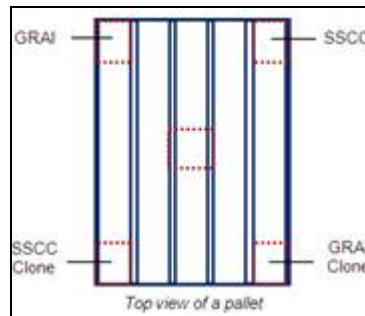
The GRAIs were encoded and locked by the pool operator to stay the same during all the life of the RTIs.

The SSCCs were generated at the warehouse after the aggregation between the goods and the pallet.

The original plan was to erase the SSCC tags of each pallet before their reuse. The erase procedure should have take place at the store (after the use of the goods), or at the warehouse (before the reuse of the pallets). Finally, due to technical difficulties and workload at the store, it was decided to abandon the erase procedure in favor of a rewrite procedure at the warehouse after aggregation between the pallets and the goods. Then the SSCCs stayed encoded into the tags until the reuse of the support with new goods. At the warehouse, a new rotation of the RTI involved a rewrite of the both SSCC tags of the pallet.

3 problems followed that system:

■ Problem 1 : **Meaning of the data.** SSCCs stayed encoded into the tags until the reuse. So at some moments, there were real encoded SSCCs on empty pallets !!!

■ Problem 1-bis: **Meaning of the data.** It was really hard for the operator to do the aggregation of 33 pallets straight off (and so a rewrite of 66 SSCCs). Especially when tags didn't operate as well as they had to. When they were wet or damaged, they required more proximity with the handle reader and more time to be successfully encoded or read. Then, most of the time, the operator encoded only one of both SSCCs and let an old SSCC corresponding to different goods in one tag. So many pallets were finally identified with 3 different codes: 2 different SSCCs and 1 GRAI codes.

■ Problem 3: **Time of the process.** Due to the proximity of the pallets at the shipping floor, it was really hard to singulate one tag from another… Then it has been decided to do the rewrite of SSCCs at a dedicated area, one pallet after another. The operator lifted each pallet, moved it to the area, did the aggregation and replaced the pallet at the shipping gate :

Tags proximity

To be brief, the main lessons from this pilot are:

■ Reading processes are successful and those requiring writing operation are more difficult to set up. The aggregation of the pallet and its goods should not be done physically, but only in the information system. Only RTI's identifier (GRAI) should be read and track all over the processes of the supply chain (preparation, shipping, receiving, storage, inventory). The link between GRAI and the goods (SSCC) should be made in the information system and managed in time.

■ Having two GRAI tags on each RTI to duplicate the information and guarantee the reading performances is also fundamental.

10.3. RTI (PT) IG Meetings and conference calls

■ 14th January 2009: Kick Off call

■ 11th February 2009, F2F meeting, Brussels

■ 9th March: Conference call

■ 23rd March 2009, F2F meeting (JAG/GSMP), Los Angeles

■ 14th May: Conference call

■ 2nd July: 1st Group call (America & Europe) to discuss/agree RTI document

■ 6th July: 2nd Group call (Asia & Europe) to discuss/agree RTI document