BossID Vendor Requirements

BossID

Vendor Requirements

Version 3.2
Preliminary

Tore J. Mehl, MSc
BIR AS
IT Department

BossID Vendor Requirements

Content

1 BossID Vendor Requirements

1.1 Introduction

BossID is the BIR business solution for handling RFID card based solutions for household- and commercial waste collection and waste handling systems.

The BossID creates *a single point of administration* in BIR for all these RFID card based solutions.

All vendors that will supply any RFID card based solution to BIR must fulfill the requirements as stated in this document.

1.2 Important statements

The vendor requirements stated in this document is based on the fact that all household- and commercial customers of BIR are charged for their use of any waste collection or waste handling system in BIR identified by their use of an RFID card based solution/service.

That is – each RFID card issued to any customer is considered to be bound to a certain cost based on the card usage. The RIFD cards are to be considered of monetary value.

As any RFID card based solution/service in BIR is to be considered as of monetary value, the requirements raised to the different vendors are created to ensure BIR that all customer, card and event handling conforms to established best practices for customer and invoice documentation systems.

BossID is the system that binds together the different RFID card based solutions using a standardized method for customer and card handling, a standardized way to communicate with the different solutions, and a standardized way to collect all RFID based customer events/actions for invoicing.

1.3 History

BossID has its base in need for administration of customers and RFID-cards for the "Bossnett", the stationary vacuum system waste handling system for Bergen Town Center.

The system will have six real-time control systems each serving a particular part of the town center. Each system will in turn have their own customer and RFID-cards system for customer maintenance and waste disposal events. Each system is hardware and location dependent and must be located in its own terminal building.

Maintaining about 20000 customers in these six systems and terminal buildings was seen as an impracticable manual task that would result in many human resources to maintain and to be kept synchronized with the BIR CRM.

Maintaining all RFID cards for all customers would also be a tremendous task when a customer misplaces a card, a card is broken, and so on.

The solution would be some middleware that acted as a connection point between the BIR CRM and the six different Bossnett systems. The requirement from BIR was always to keep track of all changes, changes identified with a BIR user account, and all history for all six systems.

The "Bossnett Warehouse" was born.

Later on, it was signaled from BIR that this solution could be used for all RFID card based waste handling solutions that BIR was going to use now and in the future. The system now escalated to include all other RFID card based solutions, independent of vendor.

The "BossID Warehouse" was born.

1.4 The document content

- Chapter 2 – Overview of the BossID warehouse and its connected systems.
- Chapter 3 – About customers and how they are identified in the system.

- Chapter 4 – Access points
- Chapter 5 – About RFID cards in BIR
- Chapter 6 – Vendor requirements
- Chapter 7 – Web Services. This section also defines the XML objects used in data interchange.
- Chapter 8 – Collecting daily events
- Chapter 9 – Real time events

1.5 Terms - Abbreviations

Term	Description
Accommodation unit	Self-contained unit used by one or more households as a home
Boss	The Bergen local phrase for waste
BossID	«Waste Identification» system
Cadastre	A comprehensive register of real estate or real properties. See: http://en.wikipedia.org/wiki/Cadastre
Condominium (Condo)	The form of housing tenure and other real property where a specified part of a piece of real estate (usually of an apartment house) is individually owned.
CRM	Customer Relationship Management system
FDV	Norwegian: Forvalting, Drift Vedlikehold English: Management, Operation, Maintenance Facilities Management system
Fraction	Commonly used term for waste type
Fraction number	4 digit waste number. Sees waste product number
GUID	Globally Unique Identifier
Household Customer	A customer is BIR is not a specific person or persons, but a specific *property*.
Inlet	Waste inlet
LSB	Least significant bit
MSB	Most significant bit
Municipality	An urban administrative division having corporate status and usually powers of self-government or jurisdiction
N/A	Not applicable (not usable/no value)
Inlet point	Group with two or more waste inlets
RFID	Radio Frequency Identification
UID	Unique identifier in an RFID card
Waste type	Waste classification
Waste product number	A 4-digit waste type classification number according to Norwegian National standard NS 9431-2000. The term fraction is also used.

1.6 References

- NS 9431-2000 Waste Classification Standard
- Norwegian Register of Business Enterprises. (http://brreg.no)
- Norwegian Land Register and Cadaster (http://www.statkart.no/en/Land-Registry-and-Cadestre/)
- ISO 14443 A (http://en.wikipedia.org/wiki/ISO/IEC_14443)
- Envac (http://www.envac.se , http://www.envacuk.co.uk/). The Bossnett Vendor.
- Smart Card Handbook Fourth Edition 2010, Wiley & Sons, ISBN 978-0-470-74367-6

1.7 Document History

Date	Version	Description	Av
08.10.2014	0.1	Preliminary version	TJM
26.11.2014	1.0	Important! RFID card UID encoding changed according to ISO 14443 A standard, section 5.5 Modified general access point status to three levels including a status code, A=Available, W=Warning, U=Unavailable, sections 4.7, 7.8.3 and 7.8.5. Access point XML is extended with a point type. Added detailed access point information and XML, sections 4.8.2, 7.8.4 and 10.4 Terms and abbreviations update Customer events value changed, section 7.8.7	TJM
05.12.2014	2.0	Added new web service for point access through an external device, e.g. by a smartphone	TJM
11.03.2016	3.0	Important! - Major WebServices change: All web services methods now with an additional parameter: installationid. See sections 6.5, 6.7 and 7. All previous Web Services sections (8-12) are moved to section 7. Previous Section 7 chapters are renumbered. All references are updated. New section 1.2 – "Important statements" Section 1.4 - Rearranged document content New section 4.6 – Household and Commercial Waste Inlets/Access Points (inlet size). Section 4.10.1 - Added Size of waste inlet Section 6.2 Web Services Requirement - Additional information Section 6.3 Vendor requirements - Added inlet size New section 6.4 "Dataflow between BIR and vendor" New section 6.5 "The vendor hosts several BIR installations" New section 6.6 "Vendor ID" New section 6.7 "Installation ID"	

		Section 6.10.1 – Added decimal degrees and UTM. Added size of waste inlets New section 6.15 "Daily access point events" New section 6.16 "Daily Extended access point events" New section 6.17 – "Real Time events – alarms and statuses" Section 7.4.2 – "Customer XML – New customer methods" – Added installationid to customer XML. Section 7.4.3 – "Access point XML" – Added installationid to XML. Section 7.4.4 – "Access point detail" - Added installationid to XML. Section 7.4.5 – "Access point status XML" - Added installationid to XML. Section 7.4.7 . "Customer Events XML" - Added vendorid and installationid to XML. New Section 7.4.8 – "Extended Events XML' Section 7.5.2 – "CustomerNewCommercial" - Added additional parameter InletSize, to web-service Section 7.8.2 CustomerEvent – Added note about compressed XML when all customers option. New Section - 7.8.3 – «ExtendedEvents» New section 8 – "Collecting daily access point events " New section 9 - "Real Time events – alarm and status"	
18.08.2016	3.1	Section 4.3 – Renamed to "Access Point Types and groups". Added further explanation/pinpoint Access Points as stated in section 4.1 Section 6.14 – Access point Redundancy – Improved description when redundancy not needed. Changed all occurances of the word inlet to access point.	
07.12.2016	3.2	New methods for further commercial customer support: • To be added Method changes: • CustomerNewHousehold and CustomerNewCommercal. The vendor may choose to return only the customerkey as a single return value or a full customer return XML as described. Additions in XML definitions: • Section 7.4.8 Added missing eventtype in extended events XML. Added the tag idtype to be able to distinguish between an ID and an RFID. • Section 7.4.7 Added extra data eventtype in events XML, both normal and compressed mode.	

		This to be able to handle non-successful events and deviations. An example may be usage of unknown RFID, deleted RFID, etc. New section 10 "Implementing BossID WebServices". The section defines some SOAP elements and common error codes that may be used.	

2 About BossID Warehouse

2.1 About the warehouse

The BossID warehouse consists of three components:

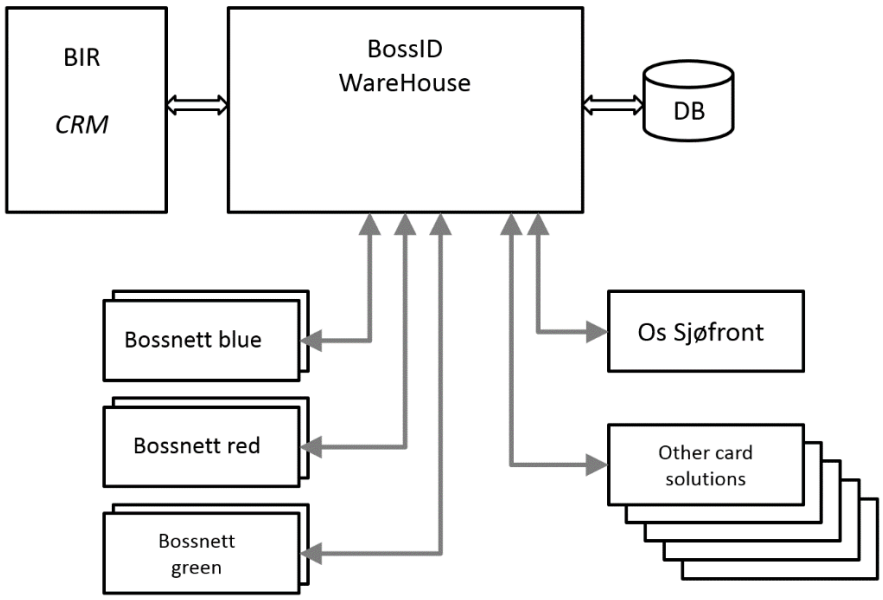
- A Microsoft SQL Server database
- A set of stored procedures
- BossID WebServices that binds the BIR CRM with BossID and all connected systems/vendors

2.2 Overview

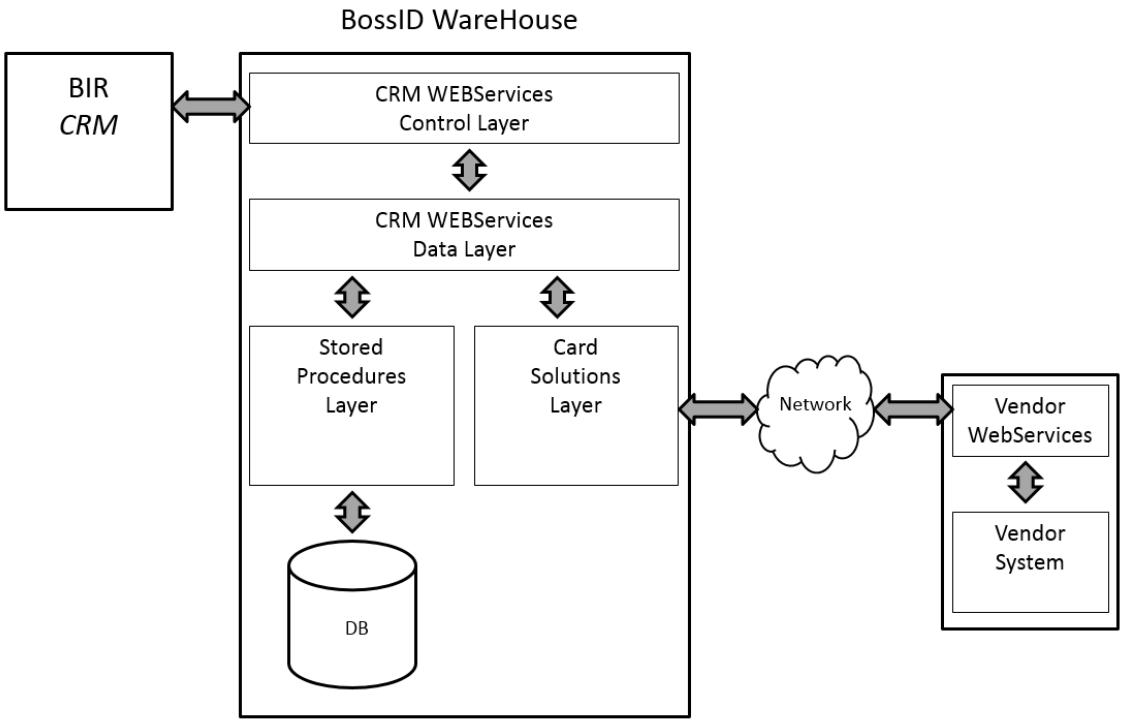
The BossID solution consist of:

- The BIR CRM System
- BossID WebServices – the link between BIR CRM, BossID and all the card based solutions
- The BossID database with a large set of stored procedures
- Vendor WebServices
- Vendor Systems

The figure below shows an overview of the system regarding systems that may be connected to BossID. The six Bossnett system handles over 20.000 customers.



The next figure details the layered structure of the BossID Warehouse.



2.3 The BossID Database

The BossID database contains a large set of supporting stored procedures for the BossID WebServices. In addition, the database contains:

- Cadastral units
- Properties
- Accommodation units
- Street index

for all cadastral and accommodation units for all customers that may be may be subject of a card based solution. That is, the registers will not be complete for the nine municipalities in the BIR area.

Secondly, the warehouse will contain:

- Customer information
- Customer to CRM link
- Card information
- Customer and card history
- Customer to card solution link
- Customer to access point link
- Customer access point events
- Card based solution (vendor system) information
- Card based solution (vendor system) web services information
- Access point information for each card based solution
- Access point waste product number and type mapping
- Event log

2.4 The BossID CRM WebServices

The BossID CRM WebServices is the "engine" in the BossID solution. The web services creates *a single point of administration* for all customers in BIR that are to be included in a card based solution – typically a system where the customer must use a RFID card to open a waste inlet to dispose waste.

The CRM WebServices consists of four layers:

- The control layer that performs a parameter control of all parameters as supplied by the CRM. Control will be based on vendor rules, if such rules exist, to avoid unnecessary data to be stored in the database and sent to the vendor system.
- The data layer performs all event logging and communication with the stored procedures. The data layer will also access the card solutions layer if the CRM invoked method includes such an operation.
- The stored procedures layer that handles all customer and card logic in the system.
- The Card Solutions layer is the interface between BossID and all vendor systems. New vendor systems can easily be "popped" on using a dll, and a vendor web service definition stored in the database.

Example of a web services execution flow (new customer):

- CRM calls the new customer method and all parameters are checked.
- The data layer performs the following in sequence:
    - Gets information of the vendor system the customer is belonging to, based on cadastral and accommodation information for the customer.
    - The event is logged
    - A transaction is started
    - The new customer is added to the database with cards
    - The customer is allocated to access points
    - The data layer calls the appropriate vendor method through the card solutions layer
    - The returned customer key and access point information, as required form the vendor system, is stored in the database.
    - The transaction completes
    - Returns information about system and points
- CRM receives necessary information of which system the customer belongs to and which access points the customer may use.

2.5 Waste Inlets – Property mapping

Waste inlets are the main type of access point in BossID. The *Bossnett* system contains hundreds of these. Each inlet in turn may have a specific waste type (paper, plastic, rest waste, organic, etc.).

In any system, especially with the size of the Bossnett, a well-balanced system is important for an optimal and economic production. For the Bossnett, and other similar waste collection system, all waste inlets will have a fixed location. Each inlet in turn, will also have a limited number of customers based on average disposal, average disposal frequency and average quantity.

In Bossnett, as an example, balancing the system has created a predefined set of properties that may use a set of specific inlets based on these average numbers. That is, there exists a property to inlet map for the entire Bossnett.

As a part of the BossID implementation, a decision was made stating that the map should be as static as possible and that the master of this map should be in BossID. All map maintenance for all six Bossnett systems should be in BossID.

By this, BossID could then allocate inlets (access points) to each new customer based on the map with the prerequisite that BossID had detailed information of each inlet for each system including vendor specific identification of each point.

There was also a discussed how detailed such allocation should be. Per actual accommodation unit or should it be possible to say that "all customers in Skottegaten 13" (five units) should use these inlets.

The solution is a mix of these two methods. Allocation of points may be done as follows:

- By street address. Will include all accommodation units.
- By a single accommodation unit
- By cadastral unit (only cadastral unit number and property unit number). Will include all accommodation units for that specific cadastral unit numbers.
- By cadastral unit – detailed – one specific cadastral unit

With this model, it is possible to say that all customers, let say in Skottegaten 13, may use "these inlets". The method also allows that the disabled customer on the first floor cannot use "these" and must be allocated to another set of inlets that is prepared for disabled persons.

The cadastral units, properties, accommodation units and street index allows this type of automatic allocation together with vendor system mapping and vendor access point mapping.

All vendors that are to be connected to the BossID solution must follow this implementation principle.

3 Customers

3.1 Customer identification – The BIR CRM

The BIR CRM operates with two identification elements, customer-id and a GUID (Globally Unique Identifier), both representing the same customer. The customer-id is typically an integer. The term contract is also used in the BIR CRM for customer. Contract-id is synonym with customer-id and contract-GUID with customer-GUID.

A vendor normally selects their own customer identification key based on their system. However, it will be appropriate if the vendor can use the BIR CRM customer-GUID as the primary key for their customers.

It is not a requirement to do this, since the BossID system handles all types of customer keys as a string and performs a mapping between BIR CRM keys and vendor keys. However, it is required that the vendor stores both the BIR customer-id and customer-GUID as a reference.

3.2 Customer types

There will exist two customer types:

- Household customers
- Commercial customers

3.3 Legal customer identification

3.3.1 Commercial customers

All commercial customers are identified with its organization number (or business unit number) as registered in the Norwegian Register of Business Enterprises. (http://brreg.no).

3.3.2 Household Customers

All waste handling for households are required by law, and will always be bound to a specific property or real estate. The identification is thereby by the Norwegian Land Register and Cadaster (http://www.statkart.no/en/Land-Registry-and-Cadestre/). See next section.

That is, household waste handling is not bound to a specific person or persons, but to a specific property. A specific property is also bound to a specific street address and a specific unit (e.g. an apartment) at the address.

3.4 Land Register and Cadastre

All properties in Norway have a set of numbers that identifies the property unit in the land register and cadaster.

Each property (Cadastral unit) is identified as follows:

- Municipality number (Kommunenummer)
- Cadastral unit number (Gårdsnummer)
- Property unit number (Bruksnummer)
- Leasehold number (Festenummer)
- Condominium unit number (Seksjonsnummer)

All household customers in BIR CRM are identified which such a cadastral unit. An example may be:

- 1201.165.698.0.4

Which means:

- 1201 - Municipality number for Bergen
- 165 - Cadastral unit number
- 698 - Property unit number
- 0 – No Leasehold number
- 4 - Condominium unit number four

3.5 Accommodation unit number

From 1999, all accommodation units in Norway should have their own address. A typical apartment block may have 10-20 apartments but only one cadastral unit number. To create the required address for each accommodation unit, a unique code was assigned identifying each apartment in the block, e.g. H0201 that means:

- H – A main floor
- 02 – Second floor
- 01 – Apartment number one on that floor

To give the apartment its unique address, the unit number was combined with the street address, not the cadastral unit number since one cadastral unit may have several street addresses (e.g. number 1, 1A, 1B, 2,2A and so on).

Each full accommodation unit number is identified as follows:

- Municipality number (Kommunenummer)
- Street index number (Gatekode)
- Number (Gatenummer)
- Accommodation unit number (Bruksenhetsnummer)

An example may be the cadastral unit from section 3.1.4 (1201.165.698.0.4), which have six apartments. The condominium unit number four will have the following accommodation unit number:

- 1201.14900.13.H0301

Which means:

- 1201 - Municipality number for *Bergen*
- 14900 – Street index number for Skottegaten
- 13 – Number 13
- H0301 – A main floor, third floor, apartment number 1.

3.6 BossID Household Customers

All household customers are identified with the following:

- Customer id number from BIR CRM
- Customer GUID from BIR CRM
- Property unit (see section 3.8) - a combination of cadastral unit number and accommodation unit number.

Since law regulates all household waste handling, and cadastral unit identifies all households, BossID must have a way to identify which apartment in e.g. an apartment block that have used a specific card for paper disposal.

To be able to do so, BossID has combined the cadastral unit number and accommodation unit number. See next section 3.8.

3.7 BossID Commercial Customers

All household customers are identified with the following:

- Customer contract number from BIR CRM

- Customer contract GUID from BIR CRM
- Norwegian organizational unit number
- Property unit (see section 3.8) - a combination of cadastral unit number and accommodation unit number.

A commercial customer is not always bound to a specific property unit. However, a commercial customer may rent offices or buildings on a specific property unit. The property unit is the key in all access point allocation also for commercial customers.

3.8 BossID Property Unit

BossID has combined the cadastral unit number and accommodation unit number to an entity called *Property Unit*.

The Property unit will be a unique key into the BossID system, identifying the actual property or accommodation unit for a customer.

The main purpose of the Property unit is:

- Identify which property and accommodation unit that has performed an action, e.g. done a waste disposal. Note that a BIR customer currently is bound to a cadastral unit and not an accommodation unit. This will be changed in the near future.
- Perform automatic access point allocation based on either a cadastral unit or an accommodation unit. In a typical waste collection system, all waste inlets will normally have a fixed position. The vendor has in this case often a predefined customer to inlet mapping.

The BossID property unit is built as follows:

- Municipality number (Kommune)
- Cadastral unit number (Gnr)
- Property unit number (Bnr)
- Leasehold number (Fnr)
- Condominium unit number (Snr)
- Street index number (Gatekode)
- Number (Gatenr)
- Accommodation unit number (Boenhet)

These values are combined in a string as follows:

<Kommune>.<Gnr>.<Bnr>.<Fnr>.<Snr>.<Gatekode>.<Gatenr>.< Boenhet >

As an example Skottegaten 13:

Gnr/Bnr: 165/698

Sectioned: No

Accommodation units: 5 (H0101, H0201, H0202, H0301, H0302, H0401)

Street id: 14900

Street number: 13

Will give the following key if the BIR contract follows the property:

1201.165.698.0.0.14900.13.0

With one customer per accommodation unit:

1201.165.698.0.0.14900.13.H0101

1201.165.698.0.0.14900.13.H0201

Etc.

3.9 Customer deletion

In BossID, no customers are deleted. They are only marked as deleted and with all cards as deleted (se section 5.9 for card delete handling). All data associated with the customer and cards will be kept as history. This follows the best practices of deletion with history preservation.

That is:

- Customer is marked as deleted
- All associated cards are marked as deleted
- All associated data are kept

The BossID is implemented such that the "same customer", with the same properties (customer-id, property unit, etc.) may be recreated but with different cards (cards cannot be reused). With such recreation, the "new same customer" is assigned a new internal key in the BossID system.

All vendor systems are required to implements such practices.

4 Access points

4.1 Overview

An access point is any device or installation that can identify a BIR customer with an RFID card. Such customer identification is recognized for:

- Waste disposal. An access point may be one or more inlets for rest waste and an inlet for paper or plastic, or other waste types.
- Access to recycling centers for both commercial and household customers for waste disposal with waste type, weight or volume.
- Etc.

4.2 Access Point identification

Access to any point is usually by an RFID card issued by BIR. However, with the introduction of smart devices like smart-phones, the BossID will allow access to any point based on such devices as long as the access is controlled by BIR through BossID.

4.3 Access Point types and groups

BossID can handle any RFID card based solution and different types of access points. Each *access point* is classified based on access point behavior, functionality and the access point properties.

So far, there exists two distinct types of access points in BossID.

- Waste Inlet points
- Recycle Center points

An Access Point in BossID may be:

- A group of two or more other access points
- A group of two or more waste inlets with one or more waste types.
- A single physical waste inlet
- A single access point

4.4 Access Point redundancy - Access Point roles

Several waste collection systems implements access point redundancy for waste inlets, where a customer is assigned a set of main inlets and may have alternative inlets if the main inlets are out of order. Access point redundancy is in use for the Bossnett in Bergen Town Centre.

Typically, main inlets, first alternative inlets and secondary alternative inlets.

In BossID, the term "role" is used for each kind of redundant inlet. This is based on the role an inlet has for the customer.

4.5 Waste Inlets

Waste inlets are the main type of access point in BossID. The Bossnett system contains hundreds of such access points and with different waste types. In Bossnett, all inlets are grouped into "Inlet points", each with a unique id and location. Customers in Bossnett will be related to "Inlet points" and not one or more physical inlets.

Systems that will be associated with the inlet term will be:

- Stationary vacuum systems like Bossnett, indoor or outdoor
- Stationary containers below ground with inlets
- Containers with compactor and inlet
- Other similar waste systems with inlets

4.6 Household and Commercial Waste Inlets/Access Points

Commercial and household customers has different needs for waste disposal volume.

The BossID system differentiates between two distinct types of waste inlets depending of waste volume:

- Normal (small) primarily for household customers, but may also be used by commercial customers with no need for a large inlet. Typically waste unit is a bag of maximum 20 liter.
- Large for commercial customers only. Typically waste unit is a sack of about 100 liter.

4.7 Recycle Center Points – other access points

In BIR, all customers, will at a point in time, be issued a RFID card, a card that may be used on all BIR installed locations – from waste inlets to recycling points.

Currently, about 1000 customers in the municipality of "Askøy", one of the nine municipalities in the BIR system, received an RFID card that is required be used on the local Recycle Center to be able to dispose waste.

Other usages of RFID card identification is planned for the near future.

4.8 Access point property mapping

See section 2.5.

4.9 Access point status - availability

The availability of all access points in BossID will be identified with three status levels:

- Available (green)
- Warning (yellow/orange)
- Unavailable (red)

The term *Warning* means that there may be some problems with the point, but the point is still available for use by the customer. An example of a warning may be an inlet with a level indicator, and with a warning level of e.g. 80% full.

4.10 Access point information

4.10.1 General access point information

The main focus for BossID is the customer. There is over 170.000 household customers and thousands of commercial customers in the BIR system. All customers has one central point of administration and one customer/call center. That is, all customer communication, including inquiries, complaints, etc. has one single communication point.

One important day-to-day concern for customers will be the access to waste inlets for waste disposal. For BIR it is important, at any point in time to have access to information for all waste inlets and waste inlets assigned to each customer, to be able to serve the customer if any problems arise.

BIR decided that all inlets and all other access points from all vendor systems should provide precise and relevant information on both location and status of each point.

This information should include:

- GPS position such that all points could be shown in a map with their status
- Type of point
- Waste type for each point, where appropriate
- Size of waste inlet, where appropriate
- Relevant information like a name (street name), an identification tag, and where appropriate, a description of the point (e.g. "at the corner of")

4.10.2 Access point details

Some point types will by nature contain more information than the general access point information like gps, type of point, waste type, and so on.

For a typical battery operated underground waste system with fill level indicators, and with wireless communication for access control and status information, access point details may include one or more information elements from this list:

- Fill level
- Battery level
- Voltage
- Temperature
- Battery type
- Volume – weight - dimensions
- Position
- Serial number - tag
- Id
- Point type
- Picture URL
- Camera URL
- Warning information
- Error information
- Etc.

The list is not exhaustive.

5 RFID cards in BIR

5.1 Overview

This section will describe and define the RFID card usage in BIR and all standards regarding the card usage.

5.2 Current use of RFID technology in BIR

BIR has good knowledge of the RFID technology. RFID tags has been used for years for all household waste bins and where each disposal is registered in real-time by tag readers in all waste collection vehicles and sent into the BIR CRM system.

The BossID solution will, in principle, do the same - with the different vendor systems as "real-time" systems, inlet systems as virtual "waste collection vehicles", and inlets as "waste bins".

5.3 The BIR RFID standard

BIR has established an RFID requirement for all systems that will identify and collect data from any BIR customer. The requirement is as follows:

- All card readers and cards shall support/communicate according to "ISO 14443 A" standard.
- All cards shall support 7 byte serial number (UID), cascade level 2 according to the standard.

5.4 Customer RFID identification

The BIR usage of RFID is solely identification of a specific customer using the card UID. BIR has no plan yet to use other RFID card options in the "ISO 14443 A" standard.

5.5 RFID information interpretation – BIR standard

The information/serial number/tag (UID) on each RFID card will be used to identify each customer. The UID may be read and interpreted in different ways in different systems, regardless of the RFID standard used.

BIR will not allow any vendor to use "their own" interpretation of the UID information since this may imply unnecessary modifications and complexity to the CRM system. This may also imply usage of several different card readers to be able to generate information for the different interpretations, when new cards are issued.

To avoid such problems, BIR has selected an interpretation standard as follows, according to ISO 14443 A compliant cards with 7 byte UID:

- 14 digit hexadecimal string representing the 7 byte UID

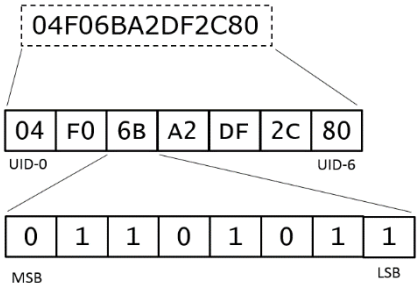
The bit and byte sequence encoding creating the 14 digit sequence, regardless of card manufacturer, shall be as follows for the UID string "04F06BA2DF2C80". This encoding is according to the "ISO 14443 A" standard.

The UID shall be encoded as follows:

- UID[6], most significant byte rightmost
- UID[0], least significant byte leftmost

Each byte shall have encoding as follows:

- LSB rightmost
- MSB leftmost



5.6 RFID Uniqueness

Every card that is to be used in BossID must be unique, regardless of how the RFID information is interpreted.

5.7 Card Dependency

All cards in BossID will be associated either with a household customer or with a commercial customer.

For household customers, all cards will follow the cadastral unit or accommodation unit. If the unit is sold, all associated cards are to be handed over to the new owner. Cards not handed over to a new owner will be deleted and new cards will be issued.

For commercial customers, the cards follows the company and is not bound to any property.

5.8 Card Issuing

All RFID cards are to be issued at the BIR customer center and will be distributed to customers by mail, by other ground delivery, or picked up by the customer.

5.9 Card Deletion – Removal - Reuse - Disposal

All RFID cards that are to be used in the BIR BossID system will be issued to only one single customer ever.

In BIR, a specific card will always be associated with a specific customer, whatever happens with the card in the future. That is:

- A card, once issued by BIR to a customer *can never, and shall never, be reused by associating it with any other customer ever*.
- A specific card shall forever be associated with one specific customer.

When a card is lost, misplaced, broken, etc. such a card will be "deleted" from the BossID system and all vendor systems. "Deleted" does not actually mean deleted – for the customer view it is – but not for the system. The system marks the card as deleted but keeps all the history of that card. This is a standard principle for data implementation of deletion with history preservation.

To clarify when a card is "deleted":

- A card is never deleted – only marked as deleted
- When a card is marked as deleted the system shall never remove any data associated with the card. That is - customer relationship and all events associated with the card.
- A card marked as deleted, can never be used by another customer.

6 Vendor requirements

6.1 Main Requirements

Each vendor that is to supply an RFID card based solution must provide:

- Necessary communication and integration software as described in this document
- An internal (vendor) customer and card management system, which meets the requirements as stated in this document.
- Hardware, e.g. card readers and other electronic/hardware equipment that fulfills the requirement stated here.

The requirements that are to be met are grouped as follows:

- Web Services
- Vendor System
- Master and slave principle
- Vendor changes
- BossID Synchronization
- Customer data
- Access Points
- Access Point allocation
- RFID cards and RFID standard
- Waste types (fractions) and access point types
- Weight and value for customer events

6.2 Web Services requirements

The following requirements must be met:

- The vendor must provide a set of web services *equal to or similar* to the services described in this document, chapter 7 WebServices.
- Each web service must have the same functionality as described, and the web services is required to return information, where appropriate, *equal to* what is described in this document.

A standard web-services shell implementation will be handed over to the vendor as a Visual Studio C# file as a guideline. In addition, a C# file implementing the return object (see section 7.3).

6.3 Vendor system requirements

The vendor system must implement necessary functionality and data elements to support the required functionality.

As a minimum, the vendor system must:

- Differentiate between household and commercial customers
- Be able to store the BIR CRM customer ID, customer GUID (section 3.1) and the Property Unit (section 3.8)
- For commercial customers the organizational unit number must be stored.
- The vendor system must be able to handle customer deletion and recreations as stated in section 3.9
- Must implement a secure card management that can guarantee that any customer can never use a deleted/removed card.
- All customer events shall include a value and size where appropriate. For waste inlets, this value shall be synonym to weight.
- If hosting several BIR installations the vendor system must conform to chapter 6.5 and 6.7.

6.4 Dataflow between BIR and vendor

The main dataflow principle between BIR and the vendor system will be as follows:

- BIR performs push of all customer information RFID cards and which access points to use to the vendor
- BIR performs pull of customer events and informational data

That is – all customer related dataflow is always initiated by BIR.

6.5 If the vendor hosts several BIR installations

In BossID, each installed waste collection identification system is treated as a distinct system with its own properties. Each belonging vendor system is defined with its own properties and with one external web services to use for communication.

If the vendor system hosts several BIR installations, it would be a bad solution to ask the vendor to set up one webservice for each hosted BIR system.

Instead, BossID enables the vendor to select how they want to identify the different customers, access points, and other elements for the different BIR installations:

The preferred method:

- Using GUIDs (Global Unique Identifiers) for identifying both customers, access points and other elements included in the integration with BossID.
- In this case, the vendor system handles all necessary operations based on the supplied IDs in all web-services methods, and all other communication.
- No need for BossID to inform which BIR installation it communicates with. The BIR installation communicating with is implicit with the given IDs.
- One web-services definition for all communication.

The alternative method:

- BossID supplies an agreed identifier to the vendor system to tell which BIR installation the webservice call belongs to.
- As above – only one web-services definition for all communication.

The BossID web-services supports both methods as from version 3.0 of this document.

6.6 Vendor ID

Each vendor will be issued a vendor ID by BIR. The ID shall be used by the vendor whenever requested in this document in the interface between the vendor and BossID.

The ID will be a GUID.

6.7 Installation ID

When a vendor hosts several BIR Installations, each installation shall be identified with a distinct ID within the vendor system.

The vendor must create such an IDs for each BIR Installation hosted in the vendor system, and hand them over to BIR. The format and value of the ID is to be defined by the vendor as long as it can be represented by a string value.

BIR will use these IDs to refer to the correct BIR Installation in the vendor system.

6.8 Master and Slave – data ownership

The vendor must acknowledge the following:

- The master of all customer and card information is BossID
- The master of all access point allocation to is BossID
- The master of all access points is the vendor system.

This means that the vendor must acknowledge that no customer data, no card data or no access point allocation shall ever be changed in the vendor system.

6.9 Vendor system changes

If the vendor is in need to change their access point or access allocation point structure, either by adding new points or by operational circumstances, the vendor must acknowledge to collaborate with BIR, in ample time before the change is to take place, such that both the vendor system and the BossID system is consistent with each other after the change.

Note that such changes will involve from BIR point of view:

- BossID changes and allocation changes
- All customers, where existing access points are subject of change, must be informed about the change from the BIR customer center.

6.10 BossID Synchronization requirements

6.10.1 Access Points

At startup, the vendor must supply a list of all access points that may be used. Each point shall contain at least:

- Installation id identifying the BIR installation
- The id of the point – the internal id in the vendor system
- The type of the point
- Name of point (e.g. "First floor paper")
- The tag of the point
- The waste product number of the point if the point is a waste inlet
- GPS position of the point in standard notation, decimal degrees and UTM
- If waste inlet point - the supported sizes of the inlets, small, large or both sizes. See section 4.6.

Additional information may be:

- Description of the point (e.g. "On the corner of street X and street Y")
- Point GUID if such identification exists in the vendor system.

The delivery format shall be in a typical flat file csv format that can be imported to the BossID database.

If the vendor makes changes in their access point structure, the vendor must immediately supply BIR with the changes. See section 6.9.

6.10.2 Access Point Allocation Map

To enable automatic access point allocation in BossID, the vendor must create a *property* to *access point* map that is to be delivered to the BossID system.

The map shall contain the following information:

- Access point id - the internal id in the vendor system
- Map type
- Allocation information

The map types with their allocation information are as follows:

Map Type	Description	Allocation information
1	All in street	<Kommune>.<Gatekode>
2	All in street number	<Kommune>.<Gatekode>.<Gatenr>
3	Specific accommodation unit	<Kommune>.<Gatekode>.<Gatenr>.< Bohenhet >

4	All in property	<Kommune>.<Gnr>.<Bnr>
5	Specific leasehold unit	<Kommune>.<Gnr>.<Bnr>.<Fnr>
6	Specific condominium unit	<Kommune>.<Gnr>.<Bnr>.0.<Snr>

Whenever a change in this map is necessary, the vendor must start a process with BIR such that both the vendor system and the BossID system consistent with each other. See section 6.9.

6.10.3 Extended report identification units

For extended reporting, as described in sections 6.16, 7.8.3 and 7.4.8, BIR need the following information of each unit that are to be included in the extended event report.

- Installation id identifying the BIR installation
- The id of the unit – the internal id in the vendor system
- The type of the unit
- The waste product number if the unit is related to waste collection
- The relation between the unit to other units/and or access points.

Additional information may be:

- Description of the unit
- GUID if such identification exists in the vendor system.

The delivery format shall be in a typical flat file csv format that can be imported to the BossID database.

6.11 RFID cards – card readers - requirements

6.11.1 BIR RFID Standard

BIR has established an RFID requirement for all systems that will identify and collect data from any BIR customer. The requirement is as follows:

- All card readers shall support/communicate according to ISO 14443 A

If the vendor is using other technologies or standards for customer identification, then the vendor should consider a change to the required standard.

6.11.2 Card interpretation

The vendor is required to interpret the RFID information, producing a string as identification key, according to the statement in section 5.4.

6.11.3 Card deletion and card history

The vendor system is required to implement card deletion logic that implies the following (see section 5.9):

- A card is never deleted – only marked as deleted
- When a card is marked as deleted the system shall never remove any data associated with the card. That is - customer relationship and all events associated with the card.
- A card marked as deleted, can never be used by another customer.
- The vendor must guarantee that a card can never be reused.

6.11.4 Card Reader to customer center

If the vendor is using another RFID standard than the BIR requirement, by agreement, the vendor must supply the following to BIR:

- A card reader for use at BIR customer center with necessary equipment

- Necessary components or source code in C or C# for communication with reader, including components or source code that can be included in the BIR CRM system for card issuing.

6.12 Weight/value

The BossID implements the possibility to include (waste) weight or other numerical value to any event int the system. Currently weight is not used in BIR but may be included in the near future.

All vendor systems that are to communicate with BossID must support this option as a part of their design. The values shall be included in all reports, even if not used (zero values).

6.13 Access points – waste types and point types

An access point may be any point where customer identification is done using an RFID card.

6.13.1 Point types

In BIR, there will be several types of access points, where a waste inlet will be the most commonly used access point type. BIR is in process to introduce RFID card identification at all recycling centers. These will points will be of type two. At this point in time, BIR has only identified these five types. The list may be extended dependent of systems added to the BossID.

Access Point type	Description
1	Waste inlet group with one or more inlets and with one or more waste fractions
2	Single waste inlet with one specific fraction
3	Recycling center access with waste type and weight/volume
4	Recycling point access with waste type and weight/volume
5	Container for cabin/cottage waste
……	

6.13.2 Waste product numbers – Fraction numbers

BIR is using waste product numbers from the Norwegian National standard NS 9431-2000.

The most commonly used waste product numbers in BIR are:

Number	Description
1100	Organic waste
1200	Paper
1299	Mixed paper and cardboard
1300	Glass
1700	Plastic
1799	Mixed plastic
9999	Rest waste/mixed waste

If the vendor implements waste management using waste inlets or other waste related management, all customer waste disposal events shall include a waste product number.

The recommendation is that the vendor implements the national waste product numbers as above.

If the vendor is in position that the vendor's waste product numbers cannot be changed, then the vendor is required to map these vendor-numbers to Norwegian National standard numbers when returning information through the web services as described in section 7.

6.14 Access point redundancy

The vendor is required to implement access point redundancy on request from BIR, if not already implemented in the vendor system.

Access point redundancy is required for all waste inlet handling systems where two or more inlets exists and where different customers are assigned to the different access points. From BIR point of view, a customer shall always be able to dispose the waste even if the customer assigned access point is out of order.

Access point redundancy requirement can be deviated from, if the vendor system is of such a size and/or at a location where it is inappropriate to implement redundancy and where the best solution is that any customer can use any access point in the vendor system. Such a deviation must be in agreement with BIR.

6.15 Daily access point events

The vendor is required to implement the web-services method *CustomerEvents* as described in section 7.8.2 for daily access point events.

However, if this data collection method results in problems when the collected data amount increases, or if the vendor hosts several BIR installations and want to reduce number of BIR daily access point event method calls, BossID implements a secondary transfer method using FTP.

Further description, requirements and discussion regarding FTP is given in section 8.

6.16 Daily Extended access point events

All waste handling systems involves larger waste units (weight/volume) than a typical customer event containing one bag/sack of waste. With larger waste units, we mean a temporary storage for the waste that is to be emptied at one point in time.

A typically temporary storage may be:

- A chute with a certain volume that will emptied when full or at certain points in time
- A temporary storage tank that will emptied/replaced when full or at certain points in time
- A container emptied/replaced when full or at certain points in time

In a typical vacuum waste collection system and other similar systems, there is often at least a two stage temporary storage – one for e.g. a chute and one container with e.g. compressed waste when waste is collected from all temporary storage tubes. Both kinds of temporary storage is included in this extended access point event reporting.

Between two points in time when such a temporary storage unit is emptied, there exists a distinct number of registered customer events, both for household and commercial customers.

When the vendor supports both household and commercial customers, or commercial customers only, BIR is in need to receive/collect the events when these temporary storage units are emptied.

To meet these requirements the vendor must:

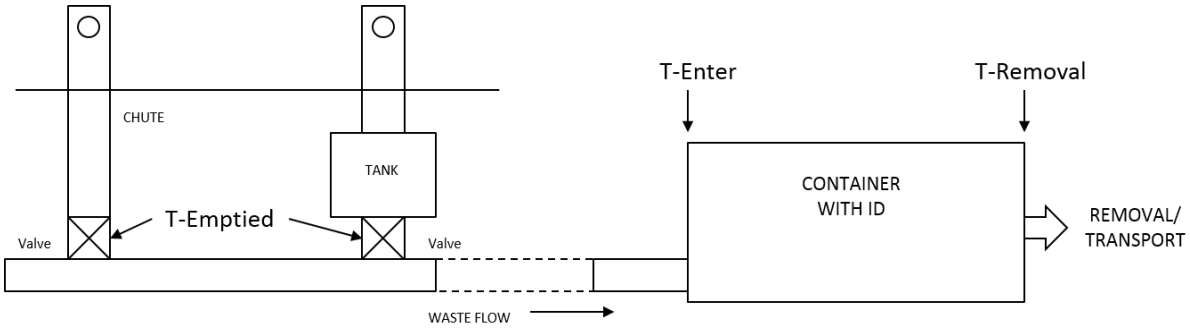
- Implement (if not already implemented) as a part of the vendor system necessary data acquisition, logic and data filing for these events.
- Implement the web-services method *ExtendedEvents* as described in section 7.8.3
- Include all identifiers for these units, together with which sub-units and inlets/points (thus creating a dependency tree, hierarchy, between each unit, sub-units and inlets/points) to the BossID synchronization as stated in section 6.10.

The extended event information will be used by BIR to track and calculate commercial waste amounts for payment. The payment model for commercial customers in BIR is rather complex and will not be a subject of this document.

6.16.1 Extended events by example

The following figure show an example from a typical vacuum based waste collection system, with inlets, tanks/hoppers and a terminal where the waste is sucked into a container.

- *T-Emptied* is the point in time when the valve is opened and the chute/tank/hopper is emptied. At this point, we know exactly how many household and commercial customers that have used the corresponding inlet(s) since the last time the chute/tank/hopper was emptied.
- *T-Enter* is the time when an empty container with a specific ID is placed at the terminal waste intake
- *T-Removal* is the point time where the container with the specific ID is removed for transportation to the final waste management point, a waste incinerator, waste depository, or other waste processing.



- At the final waste management location, the weight of the container content is measured and the weight of the specific container is sent to BIR for invoice processing.

Based on the three points in time, the last time the chutes/tanks/hoppers was emptied, the waste weight and average waste volume to weight calculation, it is now possible to calculate the necessary values needed for invoicing commercial and household customers.

6.17 Real Time events – alarms and statuses

There is no requirement to supply BIR with real-time events like alarms and statuses.

However, the web-services, as required implemented, shall support the possibility for BIR to obtain such information on a periodically basis.

If the vendor has the ability to deliver real-time events, such as alarms, errors, status indicators, etc., BIR has implemented a web-services interface with a standardized message layout, where the vendor may post such events.

The web-services interface for real-time events are specified in section 9.

7 WebServices

7.1 Overview

Five categories of WebServices must be implemented by each vendor:

- Customer methods
- Card methods
- Status methods
- Reporting methods
- Action methods

7.1.1 Customer methods

Name	Description
CustomerNewHousehold	Adds a new household customer with one or more RFID cards.
CustomerNewCommercial	Adds a new commercial customer with one or more RFID cards.
CustomerMove	Move a customer from one location to another
CustomerDeactivate	Deactivates all cards belonging to s customer
CustomerActivate	Activates all cards belonging to a customer
CustomerDelete	A customer and all associated cards are "removed" from the system.

7.1.2 Card methods

Name	Description
CardNew	Adds one or more card to an existing customer
CardReplace	Replaces on card with another
CardDeactivate	Deactivates one or more, or all cards
CardActivate	Activates one or more, or all cards
CardDelete	Deletes one or more, or all cards
CardList	Collects all card belonging to a customer. Includes activated, deactivated and deleted cards.

7.1.3 Query methods

Name	Description
CustomerAccessPoints	The method shall return information and status of all access points allocated to a specific customer.
AccessPoints	The AccessPoints method shall return access point information for one specific point or all points.
AccessPointDetails	The AccessPointDetails method shall return appropriate detail for a particular point or for all
AccessPointStatus	The method returns status of access points in the vendor system.

7.1.4 Reporting methods

Name	Description
CustomerEvents	The method will be used to collect access point events for a specific customer or all customers for a specific period in time.
ExtendedEvents	The method will be used to collect extended events for a specific installation for a specific period in time.

7.1.5 Action methods

Name	Description
AccessPointOutOfOrder	All BossID customers will always contact the BIR customer/call center when an access point is not working as expected. This method enables the customer/call center to report all anomalies for a specific access point.

7.2 The Installation ID

The *InstallationID*, as described in sections 6.4 and 6.7 will be the first argument in all web services methods.

The *InstallationID* will be used if the vendor hosts several different BIR installations and where each installation has its own customer and access point identification. This field refers to which installation the event belongs to.

If no *InstallationID* is to be used, the argument will be set by caller to the value "NA".

7.3 Return Object

All WebService methods shall return a response object called *ReturnObject*.

The Object shall have three attributes as follows:

Attribute	Type	Description
ReturnCode	Integer	Return code representing success or failure. ReturnCode with value of 0 shall indicate success.
Message	string	Error message if ReturnCode other than 0
ReturnValue	string	Context dependent return value.

C# notation for the return object:

```
public class ReturnObject
{
   public int ReturnCode;
   public string Message;
   public string ReturnValue;
}
```

7.4 XML Objects

7.4.1 XML formats

All web-service parameters shall use string objects only. Where a parameter or return value is indicating an XML, either as in-parameter or out-value, this XML should be an HTML-coded string.

In Microsoft terminology - HttpServerUtility.HtmlEncode/HtmlDecode.

7.4.2 Customer XML – New customer methods

Both CustomerNewHousehold and CustomerNewCommercial shall return an XML with information from the vendor system. The XML shall contain:

- The installation id
- The customer key/id in the vendor system
- List of access points allocated to the customer

The XML shall be is as follows:

```
<customer>
   <installationid>. . .<installationid>
   <customerkey>. . .</customerkey>
   <accesspointlist>
      . . .
   </accesspointlist>
</customer>
```

7.4.3 Access point XML

All methods returning a list of access points, except AccessPointStatus (7.8.5) and AccessPointDetail (7.8.4), shall return an XML as follows:

```
<accesspointlist>
   <accesspoint>
      <installationid>. . .<installationid>
      <accesspointid>. . .<accesspointid>
      <accesspointguid>. . .</accesspointguid>
      <category>. . . </category>
      <name>. . .</name>
      <tag>. . .</tag>
      <description>. . .</description>
      <role>. . .</role>
      <wpn>. . .</wpn>
      <gps>. . .</gps>
      <decimaldegrees>. . .</decimaldegrees>
      <zone>. . .</zone>
      <x>. . .</x>
      <y>. . .</y>
      <state>. . .</state>
   </accesspoint>
   <accesspoint>
      . . .
   </accesspoint>
   . . .
</accesspointlist>
```

The table below shows the format and description of each tag:

Field/tag	Type	Description
installationid	string	The installation ID. See section 7.2, 6.4 and 6.7. Set to "NA" if not appropriate for the event.
accesspointid	string	Access point id in vendor system
accesspointguid	string	The GUID of same. If the vendor system does not implement guids, this field may be empty

category	string	The type of this point (category)
name	string	The name of the access point
tag	string	The «tag» belonging to the access point
description	string	A description of the point, if any
role	string	The role or type of this access point. PR=Primary inlet, S1=First alternative inlet or S2=Secondary alternative inlet. The role shall have a value of «NA» if the access point list is not associated with a customer related request
wpn	string	Waste product number in vendor system
gps	string	GPS position of point, e.g. "6025.532N00518.864E"
decimaldegrees	string	The gps position in decimal degrees, e.g. "60.3890;5.3187"
zone	string	UTM zone. UTM zone may be empty if zone 32V. Otherwise the zone must be specified
x	numeric	UTM x-value
y	numeric	UTM y-value
state	char	State of this point, A=Available, W=Warning, U=Unavailable

The decimal degrees format may be used directly in Google Map, kart.finn.no, and other map systems.

Point type may be one of the values as given in section 6.13.

7.4.4 Access point detail

The AccessPointDetail shall return an XML with appropriate details for all or a specific point. Which details that shall be returned is dependent of both the type of access point and the equipment installed at each point, e.g. a fill level indicator in a container.

Each vendor must support/supply one or more of the XML-tags as shown in the table below on an "access point detail request", dependent of equipment. The tag-list is not exhausted.

The main structure of the XML is as follows:

```
<accesspointdetaillist>
   <accesspointdetail>
      <installationid>. . .<installationid>
      <accesspointid>. . .<accesspointid>
      <accesspointguid>. . .</accesspointguid>
      <pointtype>. . . </pointtype>
      ...
      ...
      ...

   </accesspointdetail>
   <accesspointdetail>
      . . .
   </accesspointdetail>
   . . .
</accesspointdetaillist>
```

- **installationid** - The installation id

- **accesspointid** – The vendor system internal ID of the access point
- **accesspointguid** – The GUID of same. If the vendor system does not implement guids, this field may be empty.
- **pointtype** – The type of this access point. Vendor specific value

XML Tag	Value type	Description
fillevel	Integer	Fill level in a container or waste bin, in percent
batterylevel	Integer	Battery indicator level, in percent
temperature	Integer	Temperature in Celsius degrees
batterytype	String	Type of battery
voltage	Integer	Voltage of equipment, e.g. 220, 12, 6
volume	Integer	Volume of equipment in liter
weight	Integer	Weight of equipment in kilo
length	Integer	Length of equipment in kilo
width	Integer	Width of equipment in kilo
height	Integer	Height of equipment in kilo
serial	String	Serial number of equipment
tag	String	Tag of equipment, e.g. an FDV tag
barcode	String	Bar code of equipment
warning	String	Warning information
error	String	Error information
pictureurl	String	URL to accessible picture
cameraurl	String	URL to accessible camera

7.4.5 Access point status XML

The AccessPointStatus method shall return an XML as follows:

```
<accesspointstatus>
   <accesspoint>
      <installationid>. . .<installationid>
      <accesspointid>. . .<accesspointid>
      <state>. . .</state>
      <statuscode>. . .</statuscode>
      <statustext>. . .</statustext>
   </accesspoint>
   <accesspoint>
      . . .
   </accesspoint>
   . . .
</accesspointstatus>
```

- **installationid** - The installation id
- **accesspointid** – The vendor system internal ID of the access point
- **state** – state of this point, A=Available, W=Warning, U=Unavailable

- **statuscode** – An integer identifying the actual status - an error or warning code. Value of zero shall always indicate that a point is fully operable. Any other values will be vendor specific and will be used as reference.
- **statuscode** – A text or message following the status code. Only when status code other than zero.

7.4.6 Card list

The XML as returned from CardList shall be as follows:

```
<cardlist>
   <card>
     <rfid>. . .</rfid>
     <status>. . .</status>
   </card>
   <card>
      . . .
   </card>
   . . .
</cardlist>
```

- **rfid** for card
- **status** – A=Active, B=Blocked, D=Deleted

7.4.7 Customer Events XML

7.4.7.1 DATA TO BE RETURNED

The following table identifies all fields that are to be returned by the CustomerEvents method as described in section 7.8.2:

Field/tag	Short Tag	Type	Description
timestamp	t	string	Point in time for the event – «yyyy-mm-dd hh:mm:ss»
vendorid	vi	string	Vendor identification.
installationid	i	string	The installation ID. See section 7.2, 6.4 and 6.7. Set to "NA" if not appropriate for the event.
eventtype	et	string	0=Successful, other values indicates unsuccessful/deviation. See below
customerkey	c	string	Customer identification in vendor system
accesspointid	a	string	Access point id in vendor system
size	s	character	If the vendor supports small and large inlets (see section 4.6) the size shall be given as follows: N-Small inlet used L-Large inlet used For all other events the value must be defaulted to "N".
rfid	r	string	The RFID card used
wpn	w	string	Waste product number in vendor system
unit	u	string	Measurement unit for value
value	v	numeric	A value connected to the event. Weight, volume or other measurement units

When eventtype is "0" (successful) all tags must have valid values indicating a successful event.

When unsuccessful, all necessary timestamp, vendorid, installationid, accesspointid and rfid must have a value. The other tags may be empty depending of the actual unsuccessful event.

The eventtype may have following values:

Value	Description
0	Successful
1	Unknown RFID
2	RFID is blocked/deactivated
3	RFID is known but deleted

7.4.7.2 CUSTOMER EVENTS XML – NORMAL MODE

The XML, as returned from all event methods in normal mode, shall be as follows:

```
<customerevents>
   <event>
    <timestamp>. . .</timestamp>
    <vendorid>. . .</vendorid>
    <installationid>. . .</installationid>
    <eventtype>. . . </eventtype>
    <customerkey>. . .</customerkey>
    <accesspointid>. . . </accesspointid>
    <size>. . . </size>
    <rfid>. . . </rfid>
    <wpn>. . .</wpn>
    <unit>. . .</unit>
    <value>. . .</value>
   </event>
   <event>
      . . .
   </event>
   . . .
</customerevents>
```

7.4.7.3 CUSTOMER EVENTS XML – COMPRESSED MODE

The compressed customer events XML shall be used for *ALL* day to day reporting. The XML format is identical to the format as given in section 7.4.7.2, but with tag abbreviation to reduce message/file size as follows:

```
<customerevents>
   <e>
    <t>. . .</t>
    <vi>. . . </vi>
    <i>. . . </i>
    <et>. . . </et>
    <c>. . .</c>
    <a>. . . </a>
    <s>. . . </s>
    <r>. . . </r>
    <w>. . .</w>
    <u>. . .</u>
```

```
    <v>. . .</v>
   </e>
   <e>
      . . .
   </e>
   . . .
</customerevents>
```

7.4.8 Extended Events XML

The only concern of the extended events data collection is when a specific event has occurred on which identification unit. See section 6.10.3 and 6.16.

```
<extendedevents>
   <event>
    <timestamp>. . .</timestamp>
    <vendorid>. . .</vendorid>
    <installationid>. . .</installationid>
    <unitid>. . . </unitid>
    <idtype>. . . </idtype>
    <eventtype>. . . </eventtype>
   </event>
   <event>
      . . .
   </event>
   . . .
</extendedevents>
```

The following table identifies all fields in the XML:

Field/tag	Type	Description
timestamp	string	Point in time for the event – «yyyy-mm-dd hh:mm:ss»
vendorid	string	Vendor identification.
installationid	string	The installation ID. See section 7.2, 6.4 and 6.7. Set to "NA" if not appropriate for the event.
unitid	string	Extended report identification unit. See section 6.10.3 and 6.16
idtype	string	"0" if unit identified by an ID known by BossID, "1" if unit is identified with an RFID (ISO14443A UID) known by BossID.
eventtype	string	Type of event. See below.

Eventtype may have one of the following values:

Value	Description
0	Container/tank/chute emptied
1	Container/tank inserted
2	Container/tank removed

Additional values may be added when appropriate and in agreement with BIR.

7.5 Customer methods

7.5.1 CustomerNewHousehold

New household customer are added to the vendor system using the CustomerNewHousehold method, including one or more RFID cards.

The service will be used for all new properties/households identified with a property unit number.

Note: Household customers does not have a "Name" in BossID since the customer is a property unit. If the vendor is in need to have a name for the customer, the property unit should be used.

The WebService shall do the following:

	Description
Operation	Add the customer to the vendor system Bind the RFID-card(s) to the customer Bind/allocate access points to the customer
Result	When the operation is successful, the customer will be able to use the given card(s) on all allocated access points.

CustomerNewHousehold must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerID	string	BIR CRM Customer ID
CustomerGUID	string	BIR CRM Customer GUID
PropertyUnit	string	BossID Property Unit See section 3.8
StreetAddress	string	Street name and number. For reference only
Description	string	Additional information about the customer. For reference only
RFID	string	RFID cards. Semicolon separated list. Each RFID will be a valid RFID interpretation as required by the vendor system. At least on card will be specified
Primary	string	Primary access points. Semicolon separated list of points, where each point is a vendor access point id.
Secondary1	string	Secondary access points #1 if any. List as above
Secondary2	string	Secondary access points #2 if any. List as above

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK. Customer key and detailed access point information in ReturnValue. Se section 7.4.2 Error
Message	Error	Only if ReturnCode other than 0

ReturnValue	string	A customer key or an XML with the customer key and detailed access point information. See section 7.4.2

7.5.2 CustomerNewCommercial

CustomerNewCommercial shall be used to add a new commercial customer to the vendor system, including one or more RFID cards.

The WebService shall do the following:

	Description
Operation	Add the customer to the vendor system Bind the RFID-card(s) to the customer Bind/allocate access points to the customer
Result	When the operation is successful, the customer will be able to use the given card on all allocated access points.

CustomerNewCommercial must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerID	string	BIR CRM Customer ID
CustomerGUID	string	BIR CRM Customer GUID
Name	String	Company name
BusinessUnit	String	Business unit number. See section 3.3.1
PropertyUnit	string	BossID Property Unit See section 3.8
StreetAddress	string	Street name and number.
Description	string	Additional information about the customer. For reference only
RFID	string	RFID cards. Semicolon separated list. Each RFID will be a valid RFID interpretation as required by the vendor system. At least on card will be specified
InletSize	String	N-Normal, L-Large, B-Both
Primary	string	Primary access points. Semicolon separated list of points, where each point is a vendor access point id.
Secondary1	string	Secondary access points #1. List as above
Secondary2	string	Secondary access points #2. List as above

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK. Customer key and detailed access point information in ReturnValue. Se section 7.4.2 Error
Message	Error	Only if ReturnCode other than 0

ReturnValue	string	A customer key or an XML with the customer key and detailed access point information. See section 7.4.2

7.5.3 CustomerMove

Occasionally, there may be a change in cadastral unit, access point structure, etc., where it is necessary to change the properties of a customer but preserving the card associated with the customer.

Typically:

- The customer cadastral unit has been split into two or more condominium units and the customer is associated with one of them.
- The municipality has decided to change the street address
- An access point change according to section 6.10
- A commercial customer has moved from one location to another but is still inside the area served by the vendor.

Note: A customer cannot be moved from one installation ID to another.

The WebService shall do the following:

	Description
Operation	Moves or performs changes according to the given parameters, for a given customer.
Result	The customer is "moved". If a move implies new access points, the customer may use all associated cards for the new points and access to previous points should be denied.

CustomerMove must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerKey	string	The customer key/id in the vendor system
Name	String	Only for commercial customers. The name is changed
PropertyUnit	string	BossID Property Unit See section 3.8 EMPTY if no change
StreetAddress	string	Street name and number. EMPTY if no change
Description	string	Additional information about the customer. EMPTY if no change
Primary	string	Primary access points. Semicolon separated list of points, where each point is a vendor access point id. EMPTY if no change
Secondary1	string	Secondary access points #1 if any. List as above EMPTY if no change
Secondary2	string	Secondary access points #2 if any. List as above EMPTY if no change

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	N/A	XML with the customer key and detailed access point information. See section 7.4.2

7.5.4 CustomerDeactivate

The service will deactivate all cards belonging to the specified customer.

The WebService shall do the following:

	Description
Operation	Deactivates all cards for the specified customer.
Result	The customer cannot use the bound cards at any access point.

CustomerDeactivate must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerKey	string	The customer key/id in the vendor system

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	N/A	

7.5.5 CustomerActivate

The service activates all card bound to a specific customer.

The WebService shall do the following:

	Description
Operation	Activates all cards for a customer.
Result	When the operation is complete, the customer may use all cards for all assigned access points.

CustomerActivate must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerKey	string	The customer key/id in the vendor system

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	N/A	

7.5.6 CustomerDelete

The service "deletes" the specified customer and all bound cards.

Note: With delete means that both the customer and all the bound cards are marked as deleted. The vendor system must implement such deletion mechanism to preserve both customer, card and event history.

Note: In BossID, the requirement is that no card shall ever be reused. Once a card is removed/deleted the card is unavailable for future use by any customer.

Note: For household customers, this method will be used when e.g. an existing property is split into two or more separate sections.

The WebService shall do the following:

	Description
Operation	Deletes all cards for a specific customer Deactivates all access points for a specific customer Deletes all other customer information.
Result	When the operation has completed, no one shall ever be able to use the cards on any access point ever.

CustomerDelete must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerKey	string	The customer key/id in the vendor system

Return values:

Attribute	Value	Description

ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	N/A	

7.5.7 CustomerEnablePoint

The service shall

The WebService shall do the following:

	Description
Operation	Enable customer access to allocated points as if an RFID card was used.
Result	The customer should be

CustomerEnablePoint must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerKey	string	The customer key/id in the vendor system

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	N/A	

7.6 Card Methods

7.6.1 CardNew

One or more new RFID cards are issued to a specific customer.

The WebService shall do the following:

	Description
Operation	Add one or more new RFID card to a specific customer.
Result	When the operation is complete, the customer may use all new cards on all access points assigned to the customer.

CardNew must provide parameters as follows:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerKey	string	Customer key/id in the vendor system
RFID	string	RFID card(s) that are to be added to the customer. Semicolon separated list. At least one RFID must be accepted.

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	N/A	

7.6.2 CardReplace

The customer has misplaced or lost a card. A new card is issued and sent to the customer. The misplaced/lost card is removed from the customer.

Note: In BossID, the requirement is that no card shall ever be reused. Once a card is removed/deleted, the card is unavailable for future use by any customer.

Note: The vendor system must implement the necessary logic to keep the history of all deleted cards. That is, a card is not actually "deleted" but marked as deleted/removed and unusable.

The WebService shall do the following:

	Description
Operation	The card to be replaced is deactivated and removed from the customer. Adds the new card and binds it to the customer.
Result	When the operation is complete, the customer may use the new card on all access points assigned to the customer

CardReplace must provide parameters as follows:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerKey	string	Customer key/id in the vendor system
RFIDReplace	string	RFID card that is to be replaced
RFIDNew	string	The new RFID card

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	N/A	

7.6.3 CardDeactivate

The method shall deactivate all specified RFID cards for the specified customer.

The WebService shall do the following:

	Description
Operation	Deactivates all specified cards for the specified customer
Result	The customer cannot use any of these deactivated cards on any assigned access point.

CardDeactivate must provide parameters as follows:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerKey	string	Customer key/id in the vendor system
RFID	string	RFID cards that are to be deactivated. Semicolon separated list. If RFID is "ALL", all cards shall be deactivated

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	N/A	

7.6.4 CardActivate

The method activates all specified cards or all cards for a specified customer.

The WebService shall do the following:

	Description
Operation	Activates all specified card(s) for the specified customer.
Result	The customer may use all activated card(s) for all assigned access points.

CardActivate must provide parameters as follows:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerKey	string	Customer key/id in the vendor system
RFID	string	RFID cards that shall be activated. Semicolon separated list. If RFID is "ALL", all cards shall be activated

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	N/A	

7.6.5 CardDelete

The specified card(s) shall be deleted and removed from the specified customer.

Note: In BossID, the requirement is that no card shall ever be reused. Once a card is removed/deleted the card is unavailable for future use by any customer.

Note: The vendor system must implement the necessary logic to keep the history of all deleted cards. That is, a card is not actually "deleted" but marked as deleted/removed and unusable.

The WebService shall do the following:

	Description
Operation	Deactivate and delete the specified card(s) for the specified customer.
Result	When the operation has completed, no one shall ever be able to use the specified card(s) on any access point ever.

CardDelete must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7

CustomerKey	string	Customer key/id in the vendor system
RFID	string	RFID cards that are to be deleted for the customer. Semicolon separated list. If RFID contains the string «ALL», the all cards should be deleted.

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	N/A	

7.6.6 CardList

The method shall return all cards bound to a specific customer. The list shall include all active and deactivated cards. In addition, the list shall include all cards that have been removed/deleted from the customer.

The WebService shall do the following:

	Description
Operation	Retrieve all cards for the specified customer, activated, deactivated and deleted.
Result	List of cards bound to the customer.

CardList must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerKey	string	Customer key/id in the vendor system

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	XML	List of cards as an XML. See section 7.4.6

7.7 Query Methods

7.7.1 Overview

The query methods shall supply information from the vendor system as follows:

- Customer access points
- Access point information, one or all.
- Other query methods may be requested in the future.

7.7.2 CustomerAccessPoints

The method shall return information and status of all access points allocated to a specific customer.

The WebService shall do the following:

	Description
Operation	Collect access point information for the specified customer
Result	XML with access points

CustomerAccessPoints must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerKey	string	Customer key/id in the vendor system

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	XML	XML with access point information. See section. 7.4.4

7.7.3 AccessPoints

The method shall return information about one single access point or all access points in the vendor system.

The WebService shall do the following:

	Description
Operation	Retrieve information about the given access points or all access points
Result	XML with access point information

AccessPoints must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
Type	string	«ID» - Access point ID in the vendor system «TAG» - The tag of the access point «NAME» - Name or address of access point «ALL» - All access points. The AccessPoint parameter is empty
AccessPoint	string	Value according to type

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	XML	XML with access point information. See section 7.4.3

7.7.4 AccessPointDetails

The method shall return detailed information about one single access point or all access points in the vendor system.

The WebService shall do the following:

	Description
Operation	Retrieve detailed information about the given access points or all access points
Result	XML with access point information

AccessPointDetails must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
Type	string	«ID» - Access point ID in the vendor system «TAG» - The tag of the access point «NAME» - Name or address of access point «ALL» - All access points. The AccessPoint parameter is empty
AccessPoint	string	Value according to type

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error

Message	Error	Only if ReturnCode other than 0
ReturnValue	XML	XML with access point information. See section 7.4.4

7.7.5 AccessPointStatus

The method shall return status information about all access points in the vendor system. The method is a "short form" of AccessPoint and shall return only status of each point.

The method will be invoked periodically, from a controlled environment, for displaying "real-time" access point status on a map.

The WebService shall do the following:

	Description
Operation	Retrieve status information about all access points
Result	XML with access point status information

AccessPointStatus must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	XML	XML with access point status information. See section 7.4.5

7.8 Reporting methods

7.8.1 Overview

The different reporting methods shall supply information from the vendor system as follows:

- Customer events
- Other reporting methods may be requested in the future.

7.8.2 CustomerEvents

The method will be used to collect access point events for a specific customer or all customers for a specific period in time.

Note: For a single customer query with no dates specified, the method should return the last 20-100 real-time events. This method will be used, on demand by BIR call center, to collect the latest access point events for a specific customer.

Note: "All customers" option will only be used nightly to collect daily activity data.

Note: "All customers" option shall return a compressed XML as defined in section 7.4.7.3.

Note: A customer event is a successful operation, e.g. a successful waste disposal.

The method shall have three options:

- The last 25 events in real-time. Both *FromDate* and *ToDate* are empty.
- All events from a specific date for one customer
- All events from and including date to and including date for one customer or all

The WebService shall do the following:

	Description
Operation	Collect access point events for a customer or all events for all customers for a specific period in time.
Result	XML with event information

CustomerEvents must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
CustomerKey	string	The customer key/id in the vendor system If "ALL", the method shall return activity for all customers for the specified period
FromDate	string	From date in iso format: YYYY-MM-DD.
ToDate	string	To date in iso format: YYYY-MM-DD.

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	XML	XML with events. See section 7.4.7 for normal mode XML and compressed mode XML. See also note above.

7.8.3 ExtendedEvents

The method will be used to collect extended events for a specific installation for a specific period in time.

The WebService shall do the following:

	Description
Operation	Collect extended events for a specific installation for a specific period in time.
Result	XML with event information

ExtendedEvents must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
FromDate	string	From date in iso format: YYYY-MM-DD.
ToDate	string	To date in iso format: YYYY-MM-DD.

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	XML	XML with events. See section 7.4.8.

7.9 Action methods

7.9.1 Overview

All BossID customers will always contact the BIR customer/call center when an access point is not working as expected.

7.9.2 AccessPointOutOfOrder

The customer call center at BIR reports that an access point is out of order.

The intention of this method is to report to the vendor all discrepancies/anomalies regarding any access point.

An access point may be identified with:

- The vendor access point id
- The vendor access point tag
- A street address/string identifying the point

The WebService shall do the following:

	Description
Operation	Reports discrepancy/anomalies for a specific access point. Activates secondary access points for customers if redundancy exists in the vendor system.
Result	NA

AccessPointOutOfOrder must provide the following parameters:

Parameter	Type	Description
InstallationID	string	The installation ID. See section 7.2, 6.4 and 6.7
Type	string	«ID» - Access point ID in the vendor system «TAG» - The tag of the access point «NAME» - Name or address of access point
AccessPoint	string	Value according to type
Message	string	Message describing the discrepancy/anomaly

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	N/A	

8 Collecting daily access point events

8.1 Introduction

BossID supports different ways of collecting daily access point events:

- WebService method as described in 7.8.2
- File transfer with XML file
- File transfer with flat file

The transfer method that will be used is dependent on one main factor:

- The amount of data to be transferred in each daily transfer unit

8.2 WebServices CustomerEvents Method

The preferred method from BIR is to collect data using then CustomerEvents method.

8.3 File Transfer

BIR may allow file transfer when the following conditions are met:

- If the amount of data becomes so large that web services data transfer becomes inappropriate.
- The vendor hosts several BIR installations and its seems to be more convenient to assemble all daily events into one unit for transfer.

Such file transfer will by specific arrangement between the vendor and BIR.

8.3.1 Data file formats

8.3.1.1 FLAT FILE FORMAT

The flat file format shall be in standard csv-file format; that is semicolon-separated data with one line per event. No ending semicolon.

timestamp;vendorid;installationid;customerkey;accesspointid;size;rfid;wpn;unit;value

Each line shall be terminated with CRLF (not NL).

The file shall be in UTF-8 format.

The flat file format is preferred since no XML transformation is necessary for importing the received data into a database for further processing.

8.3.1.2 XML FILE FORMAT

The XML file content must follow the XML format as described in section 7.4.7 and 7.4.7.3.

The file shall be in UTF-8 format.

8.3.2 File names

Files that are to be transferred form a vendor shall be named in a recognizable format as follows

<date>_<InstallationID>.<extension>

Or, if all installation ids in one file:

<date>_ALL.<extension>

8.3.3 Vendor role and requirements

The vendor must implement the following:

- The vendor must supply the necessary FTP service, with necessary credentials and rights.
- The vendor must create the necessary files for transfer on an agreed point in time each day, where the files are named as described in the previous section.
- The vendor must implement the necessary routines and services for removing files older than an agreed number of days.
- The transfer shall use secure-FTP

8.3.4 BossID role

- BossID initiates FTP transmission at the agreed point in time each day, and collects all necessary data files for further processing in BossID.
- No confirmation will be sent when a file is received and processed.
- BossID keeps track of received daily event collection for all involved installation ids.

9 Real Time events – alarm and status

9.1 Overview

BossID implements a WebService that may receive alarms and other status events. That is, vendors may "push" alarms, statuses and other significant events to a central point at BIR.

9.2 Purpose – when to use

The purpose of the interface is to enable vendors to push significant events regarding e.g. equipment like temperature alarms, fill levels, shock alarms, status changes, etc. Typically, alarms and warnings will be submitted to BIR FDV system for further action.

The web-services interface shall not be used for typical "heart-beat" messages.

9.3 BossLive WebServices

The BossLive WebServices is accessible as follows:

	Value
URL	https://bosslive.bir.no/BossLiveWebService.asmx
API Key	Will be handed over
User ID	Will be handed over
Password	Will be handed over

9.4 WebServices Method – BossLiveEventHandler

BossLiveEventHandler provides the following parameters:

Parameter	Type	Description
VendorID	string	The vendor this event originates from. See section 6.6.
InstallationID	string	The installation ID this event belong to
Timestamp	string	Point in time for the event – «yyyy-mm-dd hh:mm:ss»
EventSourceID	string	ID of the access point or other element included in the integration with BossID
MessageType	string	A=Alarm, E=Error, W-Warning, I=Status/Information, S=Synchronization, O=Other See below
Message	string	Message content – An HTML encoded XML. See section 10.4

Return values:

Attribute	Value	Description
ReturnCode	0 >0	Operation OK Error
Message	Error	Only if ReturnCode other than 0
ReturnValue	N/A	

9.5 Message types

The following table lists the different message types and their main usage:

Type	Description
A	Alarms – Typically: fill-level threshold-value reached, temperature too high
E	Error – Equipment error detected, must be investigated
W	Warning – Typically: The temperature has passed a certain level and should be investigated
I	Information/Status – Typically: An access point has changed its status from inaccessible to accessible and vice versa.
S	Synchronization – For future use. Future use may e.g. be synchronization of access point properties like serial number, tag, picture url, etc.
O	Other – For future use

9.6 XML Message Content

The message content shall be a rather simple HTML encoded XML.

9.6.1 Tag values

The following standardized value set shall be used for the different indicators and tags:

Type	Description
Percentage	The actual percentage as integer. If fill level is 90% the tag value shall be 90.
Temperature	Value in centigrades
Status	A=Available, W=Warning, U=Unavailable, E=In error Supplementary information in the text-tag
Trigger	Value=On
Text	A maximum of 255 characters with UTF-8 encoding

9.6.2 Threshold values

Threshold values for different sensors are not a subject of this document.

9.6.3 General message format

The message format is simple. Each message may contain one or more tags of each message type.

```
<message>
   <tag1>. . .</tag1>
   <tag1>. . .</tag1>

   <tagn>. . .</tagn>
</message>
```

9.6.4 Available tags

The following table shows the available message tags. The list is not exhaustive, further tags may be added when needed.

XML Tag	Value type	Description
fillevel	Integer	Fill level in a container or waste bin, in percent
batterylevel	Integer	Battery indicator level, in percent
temperature	Integer	Temperature in centigrades
voltagelevel	Integer	Voltage level if voltage level has dropped
jammed	Trigger	Inlet jammed
smoke	Trigger	If smoke detector triggered
status	String	Status indicator
text	String	Supplementary text
extra	String	For future use

10 Implementing BossID WebServices

10.1 Overview

This section summarizes experiences with vendor implementation of the web-services and the variations between the different SOAP implementations like Microsoft .NET (WCF) and eg. PHP.

The BossID is implemented on a Microsoft Platform using C# and .NET 3.5. The communication between BossID and a vendor implementation will use the SOAP 1.1 protocol definition as defined in .NET 3.5.

A WSDL-file for the entire webservice definition may be received upon request.

10.2 SOAP and BossID

10.2.1 The BossID SOAP Namespace

The namespace that identifies BossID must be defined as:

```
http://bossid/webservices
```

10.2.2 Wsdl for method return

The Microsoft Web Services SOAP protocol handler is rather strict on the returned SOAP envelope format and content, to be able to transform the returned content to a valid C# return object and as defined in in section 7.3.

Each method in the vendor WSDL must be defined with a separate "Response" and "Result" element as defined below:

```
<s:element name="CustomerNewHousehold">
   …….
<s:element>
<s:element name="CustomerNewHouseholdResponse">
   <s:complexType>
      <s:sequence>
            <s:element name="CustomerNewHouseholdResult" type="tns:RO" maxOccurs="1"
            minOccurs="0"/>
      </s:sequence>
   </s:complexType>
</s:element>
<s:complexType name="RO">
   <s:sequence>
      <s:element name="ReturnCode" type="s:int" maxOccurs="1" minOccurs="1"/>
      <s:element name="Message" type="s:string" maxOccurs="1" minOccurs="0"/>
      <s:element name="ReturnValue" type="s:string" maxOccurs="1" minOccurs="0"/>
   </s:sequence>
</s:complexType>

tns:    xmlns:tns=http://bossid/webservices/
s:      xmlns:s="http://www.w3.org/2001/XMLSchema"
```

10.2.3 Returned Soap Envelope example

As an example: In PHP the return object should be defined as the following, and the elements must be returned in the same order.

```
class RO {
      public $ReturnCode;
      public $Message;
```

```
    public $ReturnValue;
}
```

As an example, the returned SOAP envelope for CustomerNewHoushold from PHP (or any other SOAP implementation) must be:

```
<soap:Envelope
   xmlns:soap=”http://schemas.xmlsoap.org/soap/envelope>
   <soap:Body>
      <CustomerNewHouseholdResponse xmlns=”http://bossid/webservices”>
         <CustomerNewHouseholdResult>
            <ReturnCode>0</ReturnCode>
            <Message/>
            <ReturnValue> Returned data from method </ReturnValue>
         </CustomerNewHouseholdResult>
      </CustomerNewHouseholdResponse>
   </soap:Body>
</soap:Envelope>
```

The sequence of the three elements in the must be exact as the above example. No prefix on either CustomerNewHouseholdResponse or CustomerNewHouseholdResult.

If the “response” and “result” tags are not defined as above, the BossID system will not be able to receive and interpret the received response object.

10.3 Common error codes

Generally, the requirement specification does not define any error codes that are to be returned in case of an error. The only defined value is zero for a successful operation. Other error codes and with corresponding message text are considered as vendor specific.

The BossID system keeps track of all customers, rfid cards and access points. The system also stores all information of which vendor systems each customer belongs to with their rifd cards and assigned access points.

Before a request from the CRM system (see section 2) is passed on to the vendor system, an extensive error control is performed in BossID, to ensure that the data and parameters as supplied in each web-service method are according to the specification. The data and parameters also have a format and value as defined in this document and as synchronized with the vendor (section 6.10).

An example may be CardNew from CRM. The BossID performs validity and existence control of both the customer and the new rfid cards. Cards are rejected if already in use or is deleted – all this control is done before CardNew is called.

With this extensive parameter and error control, the possibility for an error should be equal to zero, except for errors that may occur internally in the vendor system which results in an unsuccessful operation. From BossID point of view, *the parameters will always be correct*.

However, errors may occur caused by various reasons. The table below shows error codes that may be used for the most common errors that may occur:

Code	Message
10	The InstallationID is invalid or unknown
20	The CustomerID is invalid or unknown
30	One or more access points are invalid or unknown

40	One or more RFIDs are invalid
41	One or more RFIDs are already in use
42	One or more RFIDs are deleted
50	One or more parameters are invalid (Additional information may be which one)
100	Vendor system error. (Should be supplied with additional error information)

Note that all activity are logged in the BossID database including all message data returned in unsuccessful operations, thus creating a starting point for error problem solving.