Single Electricity Market

MARKET PARTICIPANT UPDATE DOCUMENT

TECHNICAL VOLUME

SEM R2.5.0

V1.0

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Table of Contents

Document History

Version	Date	Author	Comment
1.0	10 July 2014	SEMO	Initial Draft – SEM R2.5.0 Release

Distribution List

Name	Organisation
All Market Participants	

Source / Reference Documents

Document Name	Document Reference
MPUD Overarching Volume	1.0
MPUD Market Interface Volume 1 Trading & Registration	1.0
MPUD Market Interface Volume 2 Reporting	1.0
MPUD Technical Volume	1.0

1   DISCLAIMER AND CONTENT INFORMATION

This document has been prepared to provide Market Participants with sufficient information in order to develop their own systems to interface with the SEM.

The following disclaimers relate to the content of this document and associated volumes and any use by Market Participants of the information provided therein.

1. SEMO accepts no responsibility for decisions made or actions taken by Market Participants as a result of the information presented in this document or associated documents. Furthermore, SEMO does not indemnify any commercial or organisational decisions made by Market Participants in relation to the information herein.

2. This document represents the most up-to-date information on the SEM Central Market Systems as they have been developed. With this in mind, it is not appropriate simply to compare the document against an issued version of the Trading and Settlement Code (the Code). Instead, it is a combination of Version 15.0 of the Trading and Settlement Code and subsequently agreed Change Requests.

3. The information provided in this document is based entirely on documentation and information provided by the software vendor. Although SEMO has made all reasonable efforts to ensure that the information presented is correct, it cannot guarantee the information provided.

4. The Code references presented in this document are intended to guide Market Participants to relevant sections of the market rules. It is not a one-to-one mapping, as this would be impossible due to the inherent differences between market rules and the requirements of trading systems.

5. Further changes to the processes described or schema elements presented may result as new information comes to light during future phases of the market development. To mitigate the impact of such changes, SEMO will be issuing planned updates to this document and associated documents (where appropriate). Updates to this document will be consistent with ***Agreed Procedure 11 – Market System Operation, Test, Upgrading and Support.***

2   INTRODUCTION

The Market Participant Update Document (MPUD) exists across a number of volumes to assist Market Participants in building their systems to interface with the SEM Central Market Systems (CMS).

This document covers the **technical aspects** of the Interfaces which are available for Market Participants to communicate with the Central Market Systems.

3   INTERFACES ARCHITECTURE OVERVIEW
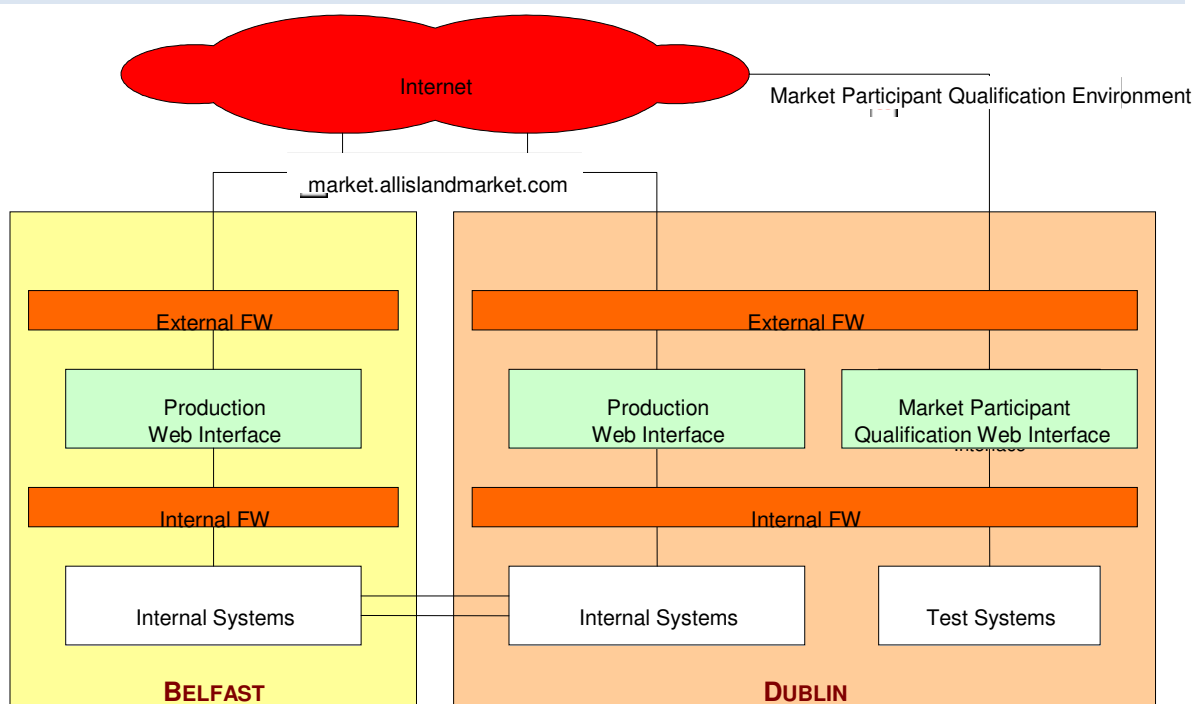
3.1   PHYSICAL OVERVIEW

Figure 1: Messaging Architecture – Physical Overview

- Figure 1 above presents the physical connections in place to the CMS
- From the internet, the market web interfaces can be accessed via:
  - https://market.allislandmarket.com/MIWebService/ws for WebService access

    or

  - https://market.allislandmarket.com/mi_webapps/ for Internet access (GUI)
    - An external service (load balancer) will continuously monitor both production web interfaces and redirect traffic to the alternate site should there be a problem with one of the web interfaces.
    - Market Participants should not make any assumptions on which site they are connecting to as it will vary according to the Market Operator's operational decisions.
- The Settlements System (Metering Service) is similarly accessed via:
  - https://stl.allislandmarket.com:448/POMAX/Services/MeterService/MeterService.asmx
- The URL for the Market Participant Qualification Environment for Communication Channel Qualification Testing (CCQT) is available, if required, from the Market Helpdesk (markethelpdesk@sem-o.com)
- 100 Mbps links will be in place at both Belfast and Dublin SEM sites.
- Security measures for the solutions, such as firewalls and anti-virus, are detailed in **Agreed Procedure 5 (Data Storage and IT Security).**
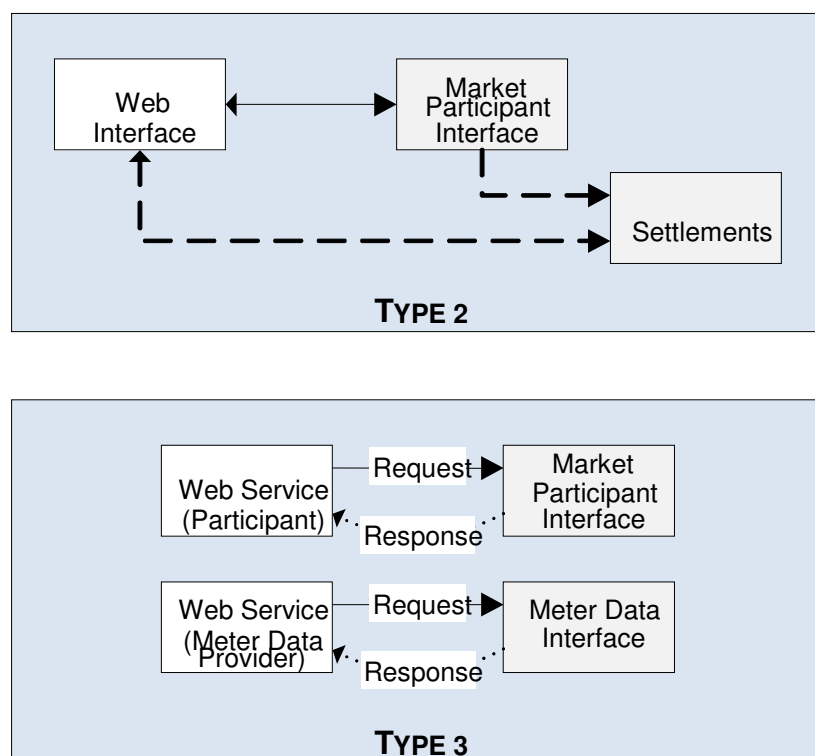
3.2   LOGICAL OVERVIEW

Figure 2: Messaging Architecture - Logical Overview

- Figure 2 above gives an overview of both the Type 2 and Type 3 Communication Channels.
- All connections are initiated external to the CMS – i.e. by Market Participants, Meter Data Providers, etc. – and operate in a synchronous request-response mode.
- With Type 2 communications, the Market Participant user connects to the Market Participant Interface (MPI) and is authorised by selecting the appropriate Digital Certificate. From here, they can select one of the following options: Trading; Registration; Reports; File Exchange; or Settlements. In the case of Settlements, this is handled by a different web server component.
- The Market Participant client system pre-requisites can be found in Appendix A of this document.
- The MPI is based on Java technology, while the Settlements and Meter Data Interface are developed on Microsoft's .NET platform.
- All data submitted to the CMS is required to be in XML format.
- The majority of data published via the MPI will be formatted in either XML or HTML (as selected by the Market Participant).
- The format of the Settlements reports, however is broken down as follows:
    - o   Settlement Statements – CSV
    - o   Participant Information Report (PIR) – CSV
    - o   Invoices – XML
    - o   Settlement Reallocation – CSV

- o Energy Market Financial Publication (MFR) – CSV
- o Energy Market Information Publication (MIR) – CSV
- o Capacity Market Financial Publication (MFR) – CSV
- o Capacity Market Information Publication (MIR) – CSV
- o Metered Generation Information Publication (MGR) – CSV
- o Credit Cover Report (CCR) - CSV
- o Cancelled Reallocation Report (CRR) – CSV

- The settlements reports can be accessed via the Type 2 and Type 3 channels. Reports in CSV format must be requested using the SubmitAttachment method rather than SubmitBody[1].

3.3 TYPE 2 VS TYPE 3 COMMUNICATION CHANNELS

- Type 3 Communications use web services to provide an automated, computer-to-computer interface.
- The Type 2 Communication Channel is screen (GUI) based, to provide a human-to-computer interface. These requests, other than Settlement Reports, are processed by the same web service as is used for the Type 3 Channel.
- In certain cases, the Type 2 Channel may have additional configuration to appropriately present the information returned by the Web Service.
- Some additional information is available via the Type 2 Channel that is not available on Type 3:
  - o On accessing the MPI from an internet browser session, three separate windows/screens are presented.
    - The First is the **<u>Functional Screen</u>** which provides identical operations and information to the Type 3 channel.
    - Secondly the **Market Status** window provides persistent windows to the Market Status such as Day Ahead Energy Market Window.
    - Finally the **Market Messages** window provides persistent windows to Market Messages such as advisory and emergency messages issued by the Market Operator.

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[1] Details on SubmitBody and SubmitAttachment are available in the Market Participant Web Services Client Toolkit. This can be downloaded from the SEMO public website.

4   SECURITY AND USER ACCESS

4.1   USERS

- Each Market Participant defines the access roles and rights of its Users.
- An initial limited set of users are created during the manual registration process (e.g. MAIN_USER). This is done by the Market Operator.
- User maintenance is managed by the Market Operator on request for changes from Market Participants.
- The Market Participant is responsible for designating the read and write privileges for its Users to each of the Functional Areas of the MPI.
- Each User is assigned a Digital Certificate which provides their credentials to the CMS (see Digital Certificates section of this document).
- A Market Participant may have multiple Users, but a single User is associated only with a single Market Participant.
- The above does not preclude a person, e.g. working for a Data Processing Entity, to act as a User for more than one Market Participant. However, the Data Processing Entity must have a valid Digital Certificate for each relevant Market Participant.
- VeriSign Digital Certificates are used for interactions with the CMS. These certificates will be supplied by VeriSign to Market Participants, on behalf of SEMO. ***Agreed Procedure 3- Communication Channel Qualification*** contains further details on this process.
- The Username is determined from the Digital Certificate used to establish the SSL connection.
- The Username in the Digital Certificate has the format *user_name@participant_name*.
- This Username must match the user_name/participant_name in the request XML when using mint_sem.xsd (Market Interface) or mi_file_exchange_sem.xsd (Non-Settlement Reports). **Note:** The fields in mpr-all.xsd for ActAsMarketParticipant are only for Market Operator use.
- In a Digital Certificate, the Certificate Name (CN) will have the user_name@participant_name in each certificate issued by VeriSign, on behalf of SEMO. The Digital Certificates are x509 compliant.
- There is no Digital Signing of details returned by the Market Operator to Market Participants.

4.1.1   FUNCTIONAL AREAS AND ACCESS LEVELS

The following table illustrates the functional areas to which access can be given, and the access levels within that Functional Area (if applicable):

	Access Level	
Functional Area	**Read-Only**	**Read-Write**
Trading	-	Yes
Registration	Yes	Yes
Settlements	Yes	-

Table 1: Functional Areas and Access Levels

4.1.2   SAMPLE SCENARIOS

1. A user who only looks at invoices would need access to the Settlements functional area only, which is always Read-Only access.
2. A Full Access user, who can administer and view all details for a Market Participant, would have: Read-Write access to Trading; Read-Write access to Registration (including the ability to administer users) and Read-Only access to Settlements.
3. A User who needs to be restricted to Browser access could be given Read-Only access to both Registration and Settlements, but not Trading as only Read-Write access is available.

4.1.3   USER TYPES

Users are maintained via the Registration system, through which requests for changes are made. These requests are then actioned by SEMO, in this case to set-up Users with the correct privileges and initiate the Digital Certificate issuance process.

The Market Operator uses the User Type and Comment fields when creating a User via the MPI, or the "user_type" and "comments" elements of the "User" type if using web services, to determine the correct access levels for each User.

The User Types available are as follows:

- Main Organisation User – this is the first user set-up for the Market Participant and has Full Access User status.
- Full Access User – This user has access to all functional areas.
- Trading User – This user only has access to the Trading system (at a Read-Write level).
- Invoicing User – Access to the Settlements area (at a Read-Only level).
- Settlement Statements User – Access to both the Settlements area (at a Read-Only level) and the Trading system (at a Read-Write level).
- Registration User – This user has Read-Write access to the Registration area.

- Other User Type – This is used in conjunction with the Comments field for any other functional area/access level combination.

User Type	Functional Area		
	Registration	Trading	Settlements
Full Access	Read-Write	Read-Write	Read-Only
Registration	Read-Write	-	-
Trading	-	Read-Write	-
Invoicing	-	-	Read-Only
Settlement Statements	-	Read-Write	Read-Only
Other	Any combination, based on the Comment element		

Table 2: User Types to Functional Area/Access Level mappings

For the sample scenarios in section 4.1.2 above, the user types specified would be as follows:

1. A user who only looks at invoices requires access to the Settlements functional area only, which is Read-Only by default – Invoicing User.
2. A Full Access user, who can administer and view all details for a Market Participant, would have: Read-Write access to Trading; Read-Write access to Registration (including the ability to administer users) and Read-Only access to Settlements – Full Access User.
3. A User who needs to be restricted to Browse access could be given Read-Only access to both Registration and Settlements, but not Trading as only Read-Write access is available – Other User Type, with comments detailing the exact access to be granted.

4.2   DIGITAL CERTIFICATES

- Each User identifies themselves to the CMS using a Digital Certificate (this includes screen-based Users accessing the MPI and automated Users via Web Services).
- A Digital Certificate is obtained as per the procedure in **Agreed Procedure 3: Communication Channel Qualification.**
- Users are associated uniquely with a single Market Participant. Each User with access to a particular Functional Area will be able to view or enter information for the entire Functional Area. For example, a User with access to the Trading Functional Area will be able to trade for all Units registered to the Market Participant.

- The above does not preclude a person, e.g. working for a Data Processing Entity, acting as a User for two Market Participants but that person must have a Digital Certificate for each User/Market Participant.

- A pop-up window will now be displayed when a Participant logs into the MPI if their digital certificate is due to expire in less than one month. Note: This pop up will be displayed each time the user logs into the MPI.

- Information (text only) will be provided on screen outlining the implications of not renewing in time along with instructions on how to go about renewing the certificate.

- The user will be required to acknowledge the reminder through selecting 'OK' before proceeding with MPI activities.

4.3   MISCELLANEOUS

- If a User has Read-Only access to a system, they may be able to edit data on a Market Participant Interface web page, but will not be able to submit as the SUBMIT button will be disabled.

5   MESSAGING OVERVIEW (TYPE 3 INTERFACES ONLY)

This section provides an overview of interfacing using the Type 3 Communications Channel. The detail behind this is extracted from the Market Participant Interfaces User Guide and the Market Participant Web Services Client Toolkit.

5.1   PARTICIPANT SYSTEM PREREQUISITES

The Participant system prerequisites for, and standards used in, accessing the system are in Appendix A of this document

5.2   DATA FORMAT

For Type 3 Communications, data can only be submitted in XML format and the entire XML data stream will be considered as one Transaction.

A Transaction may contain a number of processing Requests – details on which Transactions support multiple requests are specified on a Transaction Type or specific Transaction level in the **MPUD Market Interface Volume - 1 Trading & Registration - SEM R2.5.0** document
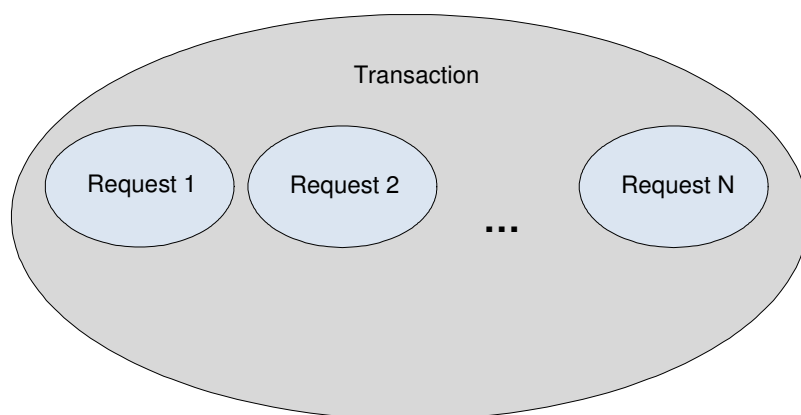

Figure 3: Some Transactions may contain multiple Requests

The following rules are associated with the XML data streams:

- An XML data stream is a simple text file containing ASCII characters only. Each data field in the data stream begins with a pre-defined XML begin tag and ends with a pre-defined XML end tag. No hidden formatting information is allowed. The XML data streams submitted must adhere to the corresponding MI (Market Interface), MPR (Registration), MI File Exchange (Standard Reports), and Invoice (single report in Settlements) XML Schemas.

- Blank lines are permitted in the data streams and are ignored by the XML parser. White space in the number data field is also ignored.

- Comment lines must begin with "<!--" and end with "-->". Any text between these two tags will be interpreted as a comment and will be ignored.

- All data in a given data stream must be included in exactly the same order as listed in the defined XML schema. Any additional information or omissions will be considered as an error and the relevant Transaction will be rejected.
- For the Market Interface XML schemas, an optional field can have a value of null. If a value has been entered, it will take precedence over the default value.
- All mandatory fields must have values entered.

Each Transaction submitted receives a Response, which consists of:

- Processing Statistics;
- Messages; and
- Original Data Submitted by the Market Participant.

The following describes the processing statistics data fields:

Data Field	Description
Valid	The number of valid Requests
Invalid	The number of invalid Requests
Received	The number of received Requests
time_ms	The time spent in processing the data in milliseconds.
time_stamp	Received time (string format as below)
XML_time_stamp	Received date-time in XML format
transaction_id	Transaction ID is a unique 10-character code generated during processing. Please refer to Section 5.5 for further detail.

Table 3: Processing Statistics Data Fields

Notes:

- Further details on the Web Services are available in the Market Participant User Interface Guide document.
- Further details on the XML and relevant schemas are packaged with the MPUD and will also be available in the Market Participant User Interface Guide document.

The time_stamp field is not designed for automated consumption – the XML_time_stamp field is recommended for this.

The time_stamp field is a string of the following form:

dow mon dd hh:mm:ss zzz yyyy

Where:

- dow is the day of the week (Sun, Mon, Tue, Wed, Thu, Fri, Sat);
- mon is the month (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec);
- dd is the day of the month (01 through 31), as two decimal digits;
- hh is the hour of the day (00 through 23), as two decimal digits;
- mm is the minute within the hour (00 through 59), as two decimal digits;

- ss is the second within the minute (00 through 59), as two decimal digits;
- zzz is the time zone (and may reflect daylight saving time). Standard time zone abbreviations include those recognized by the method parse. If time zone information is not available, then zzz is empty – that is, it consists of no characters at all;
- yyyy is the year, as four decimal digits.

5.3 WEB SERVICE BUILD

Please review the detail in the Market Participant Web Service Client Toolkit. This gives details of the SOAP Envelope, SubmitBody and SubmitAttachment methods, and explains the WSDL.

5.4 DATA VALIDATION

When Market Participants submit data Requests, the following processing is performed in the order below:

- The submitted data is first validated to ensure it is valid XML and complies with the Schema;
- For Market Interface requests: Market Window validation is performed. Submit data Requests require the appropriate market window to be open. Query data Requests are only valid for 7 days after a market window has been closed. See section 3.3 for Market Window details;
- The security permission for the combination of Market Participant and Participant User is checked – including some checks against Registration data, e.g. resource name is valid, the Market Participant owns the resource etc.;
- Validation related to submitted data is performed. There are two kinds of validation:
  - o Validation related to the submitted data that does not require any external data – i.e. data external to the Transaction/Request – is performed. Examples of these include checking that Price-Quantity Pairs are monotonically increasing; ending hour and interval are greater than starting hour and interval; etc.
  - o Validating offers against parameter data – e.g. validating bids and offers against Market Price Cap and Market Price Floor.
- When data has been successfully validated and processed, this is indicated to the Market Participant through information messages. When data has failed validation and has not been processed the failure is indicated by error messages.
- If any validation fails, then all subsequent validations are also performed to the extent possible so that all errors are reported to the Market Participant. However, there are some critical validations like "market not open" or "invalid resource", which will stop further validations.
- Validation Rules specific to individual Requests are detailed in the relevant sections of the accompanying **MPUD Market Interface Volume 1 Trading & Registration - SEM R2.5.0** - document.

5.5 TRANSACTION IDENTIFICATION

5.5.1 SEM TRANSACTION ID

The CMS will assign a Transaction ID, which is a unique 10-character code which will be received by the Participant in the Response message. There is one Transaction ID per XML stream, regardless of how many Requests form part of that stream.

5.5.2 EXTERNAL ID

Market Participants have the option of submitting an External ID as part of a Market Interface or Registration submission. These (External IDs) are optional items at a Request level, so a submit Transaction made up of five Requests could have External IDs provided for none, or up to all five, of those Requests.

The External ID is not used by the CMS in processing and is treated as a pass-through field. The last External ID (if applicable) used to submit Market Interface and Registration Data is also returned when a Query is run against that data.

The External ID is returned as part of the Transaction response, at a Request level, and may be used by Market Participants for their own tracking purposes.

5.6 PROTOCOL FOR INTERFACING

All Transactions to the CMS are Synchronous and will typically take under two seconds per Request. However, there are a number of factors that will affect the total time taken:

- The number of Requests that are part of the Transaction;
- The volume of data to be downloaded (mostly in the case of reports);
- The Market Participant's internet connection speed; and
- The Market Participant's Web Service implementation and choice of SubmitAttachment or SubmitBody operation.

Transactions received by the CMS are generally processed on a first come first served basis. However, to facilitate throughput, various levels of parallelism and pooling are implemented which could result in certain scenarios under which this sequencing cannot be guaranteed. Also, as a Transaction may be serviced by either of the Web Interface systems, at either SEMO site, sequencing may also be affected.

- The solution architecture for SEM is cognisant of the fact that there are multiple users on multiple channels that may be submitting updates to the same data.
- As such, any specific requirement around sequencing which a Market Participant identifies will need to have appropriate business and system processes implemented by the Market Participant to match the implementation required by them.
- For example, a Market Participant who chooses to only use the Type 3 Channel from a single user with a single login could configure their application such that each transaction is submitted in sequence and a subsequent transaction is not submitted until a response has been received.

- Other implementations may need to recognise that not all submissions may need to be sequenced, e.g. Market Interfaces vs. Registration, but that there may be submission by multiple users on multiple channels.

- Users may initiate multiple sessions using the same Digital Certificate. (As per the Market Participant Interfaces User Guide, the exception is for Settlement access on the Type 2 channel but this is not relevant to Type 3, which is being covered here.) Sessions will be timed-out at the Firewall after 15 minutes of inactivity.

- Specific details relating to specific Transaction Types are addressed in this document.

- There are some circumstances beyond the control of the CMS, e.g. a user may not see or receive a response (PC frozen before response seen). As per the Code, these are treated as valid Data Transactions if they pass the relevant validations applied by CMS.

Recommendations

- SubmitAttachment is the recommended method for SOAP requests, as it offers full compatibility with all Data Transactions and has better performance for large data streams.

- Transactions should be kept to less than 1MB in size.

- If Market Participants are unsure whether a Data Transaction was successfully submitted, it is recommended they query their data and ensure that their transaction came through and was successfully validated.

- The ResponseInfo.ResStatus in the SOAP body will indicate the success or failure of a request at the wsdl level. Valid values are "SUCCESS" and "FAIL".

- The ResStatus will be set to "FAIL" if any problems are encountered in validating digital signatures and if any low level web service code exceptions are raised.

- Also, when requesting a standard Report or Settlement Report, the ResponseInfo.ResFileName in the SOAP body will indicate the filename of the returned file. In the event of an error, the ResponseInfo.ResFileName in the SOAP will be blank[2]. The error message will be written to the specified response file – e.g. to output.html if that was the name given – but adhering to the mi_file_exchange_sem.xsd and including embedded messages relating to the error.

5.7   NON-REPUDIATION

Non repudiation of submitted data is handled through the use of Digital Signatures. The Digital Signature can be used at a subsequent date to support Non-Repudiation of submitted data.

The CMS require Digital Signatures for data submitted by Market Participants as follows:

- Market Interface data submit Transactions;

- Registration data submit Transactions;

- Meter Data submitted by Meter Data Providers (via the Meter Data Interface); and

- Any Market Interface data submitted through the Type 2 channel will be Digitally Signed by the application automatically.

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[2] 2 "ResponseInfo.ResFileName" is a mandatory field, so blank here would mean <ResFileName></ResFileName> or <ResFileName/>

Note 1: The ReqDigSig element in the SOAP message is optional as not all Transactions (such as downloading reports) require Digital Signatures. However, the server-side code ensures that the Digital Signatures are mandatory for any data submit Transactions. If a Market Participant does not provide a Digital Signature for these Transactions, the following error message will be issued:

<error> Digital signature is mandatory and not provided for this transaction </error>.

Note 2: XML references for Digital Signatures are not included in the remainder of this document. Please refer to the Market Participant Interfaces User Guide and the Market Participant Web Services Client Toolkit for details.

5.7.1 CLIENT SIDE

A Market Interface Client (i.e., Browser for Type 2 or a Web Service client for Type 3) creates the Digital Signature for the XML data being submitted to the Market Interface Web Service. The Digital Signature is created as the RSA encrypted SHA1 digest of the canonicalised XML data. The steps a Market Interface Web Service client needs to follow to create the Digital Signature are:

1. Create a DOM representation of the XML data;
2. Create a canonicalised representation of the DOM data. The canonicalised representation should follow the form described in http://www.w3.org/TR/2001/REC-xml-c14n-20010315#WithComments;
3. Create the signature RSA encryption of the SHA1 digest of the canonicalised representation. The signature is encrypted using the Market Participant's private key;
4. Encode the binary signature into a base64-encoded string
5. Place the Signature string in the SOAP message "ReqDigSig" element;
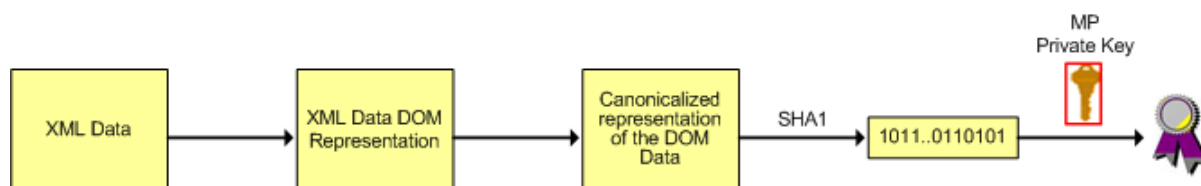6. Store the XML data as it may be needed later to support Non-Repudiation of the submitted XML data.

Figure 4: Digital Signature Generation Process

Figure 5: Data Transfer Process

- In Figures 4, 5 and 6, the yellow boxes represent the steps on the Market Participant side and the salmon boxes represent the steps happening on the SEMO side.
- The XML data along with the Digital Signature is then encrypted using the Market Operator public key. This encrypted data is sent within an SSL tunnel to the Market Operator web server.
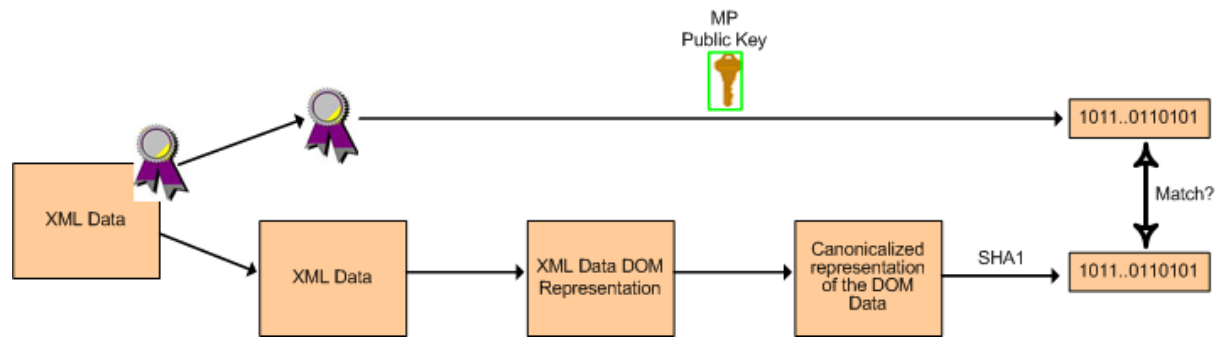
Figure 6: Non-Repudiation Process

5.7.2 CONTESTING

The contesting party should send the "original" xml file to an agreed third party. Using a dedicated off line application, the agreed third party would generate the SHA1 hash code for the file being contested and compare it with the hash code obtained by using the Market Participant Public Key to decrypt the Digital Signature which was stored against the original Transaction.

In the case of multiple Requests in the same Transaction a single Digital Signature is created relating to all data submitted.

5.8 OTHER

Timestamp: Market Time will be maintained by the Market Operator and appropriate systems and processes will be implemented to ensure a consistent Gate Closure etc. Timestamps submitted by Market Participants will not affect decisions on Market Windows.

6   APPENDIX A – PARTICIPANT SYSTEM PRE-REQUISITES

The following are lists of the hardware and software system pre-requisites for Market Participants systems to access the CMS applications

6.1   TYPE 2 CLIENT REQUIREMENTS

Any clients accessing the CMS require one of the following Operating Systems:

PC with Windows 7.

PC with Windows XP requires Service Pack 3 (SP3) to be installed. SP3 can be downloaded at this link.

http://www.microsoft.com/downloads/details.aspx?familyid=5b33b5a8-5e76-401f-be08-1e1555d4f3d4&displaylang=en

Specifications

The following are the minimum machine specifications needed for Client PC access to the CMS.

Please note that the details listed below are the minimum specifications as recommended by Microsoft.

Windows XP

http://support.microsoft.com/kb/314865

The minimum hardware requirements for Windows XP Professional include:

- Pentium 233-megahertz (MHz) processor or faster (300 MHz is recommended)
- At least 64 megabytes (MB) of RAM (128 MB is recommended)
- At least 1.5 gigabytes (GB) of available space on the hard disk
- CD-ROM or DVD-ROM drive
- Keyboard and a Microsoft Mouse or some other compatible pointing device
- Video adapter and monitor with Super VGA (800 x 600) or higher resolution

Windows 7

http://windows.microsoft.com/en-GB/windows7/products/system-requirements

The minimum hardware requirements for Windows 7 Professional include:

- 1 gigahertz (GHz) or faster 32-bit (x86) or 64-bit (x64) processor
- 1 gigabyte (GB) RAM (32-bit) or 2 GB RAM (64-bit)
- 16 GB available hard disk space (32-bit) or 20 GB (64-bit)
- DirectX 9 graphics device with WDDM 1.0 or higher driver

6.2   TYPE 2 SOFTWARE REQUIREMENTS

The following software is required for clients accessing the CMS

- Internet Explorer 8 (32Bit)
- BackPlaneBX 1.0.19
- Java version 1.6 update 27 (32Bit) or Java version 1.6 update 43 (32Bit)

Please note that Windows XP and Windows 7 are available as 32Bit or 64Bit Operating Systems. If you are using the 64Bit Operating system, you must use the 32Bit Version of Internet Explorer 8 that comes as default with the software.

BackPlaneBX 1.0.19 is only compatible with Internet Explorer 8 32Bit

6.3   TYPE 3 CLIENT REQUIREMENTS

For Type 3 (webservices) connections please refer to the Market Participant Web Services Client Toolkit kit which can be found on the SEMO public website.