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Message Exchange in the Utility Market Using SAP for Utilities

Point of View by Marc Metz and Maarten Vriesema

Introduction

Liberalisation of utility markets has required unbundling, new rules and new roles. This also means new processes in order to make the market work. How can all these new roles, market parties and processes be linked together so that everything falls into place? The answer, in short, is communication or, more concrete, exchanging information through messages. Messages are a vital ingredient of a competitive market since they allow each market party to realise its intended role and execute the required processes. Without the ability to process messages a utility company may as well close down.

This Point of View will look into the question of how SAP for Utilities supports message exchange in a deregulated utility market. Because the messages are essential as input for underlying processes and vice versa (as output from processes), this document will also look into the deregulated processes supported by SAP for Utilities. Basis is the functionality of the Intercompany Data Exchange module (IDE) available in SAP for Utilities version 4.72.

This Point of View will not go into the details of the different market rules and requirements regarding messages and processing thereof. However the influence of IT-architecture will not be dealt with.

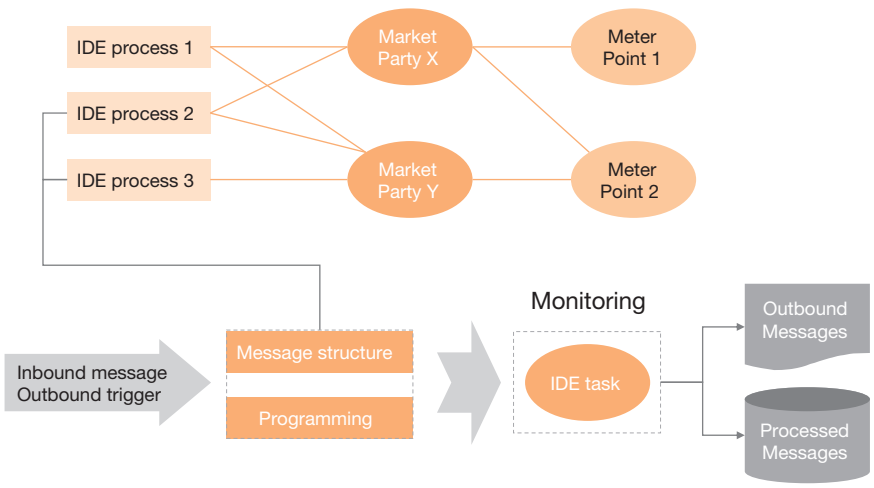
Intercompany Data Exchange (IDE) explained

The following high level outline of the IDE functionality will help to understand how it fits in with the underlying processes in the system. In essence IDE supports the processing of inbound and the creation of outbound messages.

IDE processes

The IDE functionality is focussed on so-called IDE processes. An IDE process is the definition of the exchange of a single message type between two non specific parties. For instance a distributor sends message type x to a supplier. An IDE process is either inbound or outbound.

High Level Overview of IDE



The IDE process also defines the message structure used in the information exchange and it specifies the programs that can either process an inbound message or that can create and populate an outbound message. With these two parts in place the basic requirements for successful information exchange are fulfilled.

Market Parties and Meter points

The IDE processes are assigned to each market party that is defined in the system for which the exchange process is applicable. In this way each party is subscribed to one or more message exchange processes which enable the messages exchange requirements for each market party. The relationship between a market party and a meter point is defined by the role the party has at that meter point.

IDE task

An inbound process handles incoming messages. Inbound messages contain the sender of the message and relevant meter point: therefore all information necessary for processing is included. When an inbound process is executed an IDE task is generated that processes the data in the message received.

Outbound processes are triggered by events occurring in the system. These processes take care of executing IDE tasks which create outbound messages. SAP has defined a number of business events that trigger outbound processes (e.g. customer data changed, bill created, etc).

In the case of an event in the system, the system checks for which meter points the event is relevant. Next the system determines which market parties are assigned to the meter point(s). For each market party found that is subscribed to the process, an IDE task is created. The IDE task then takes care of creating the messages with the proper data.

The IDE task (both inbound and outbound) can be monitored and managed, thus providing valuable information for process management. A call centre employee for instance can retrieve information on the progress of a change of supplier process for a specific meter point as part of a customer inquiry.

Flexibility of IDE in various markets

With the introduction of the IDE process concept, SAP has provided a framework for implementing message exchange in a variety of markets. The same IDE process even allows processing of multiple message formats, thus providing options for using the same system to support different markets.

Since inbound IDE processes are triggered by receipt of a message, any inbound process can be built although in many cases custom development is required. Outbound IDE processes however are triggered by SAP provided system internal events. When there are requirements for outbound processes for which SAP has no events defined, user-exits can often be used to provide the required functionality.

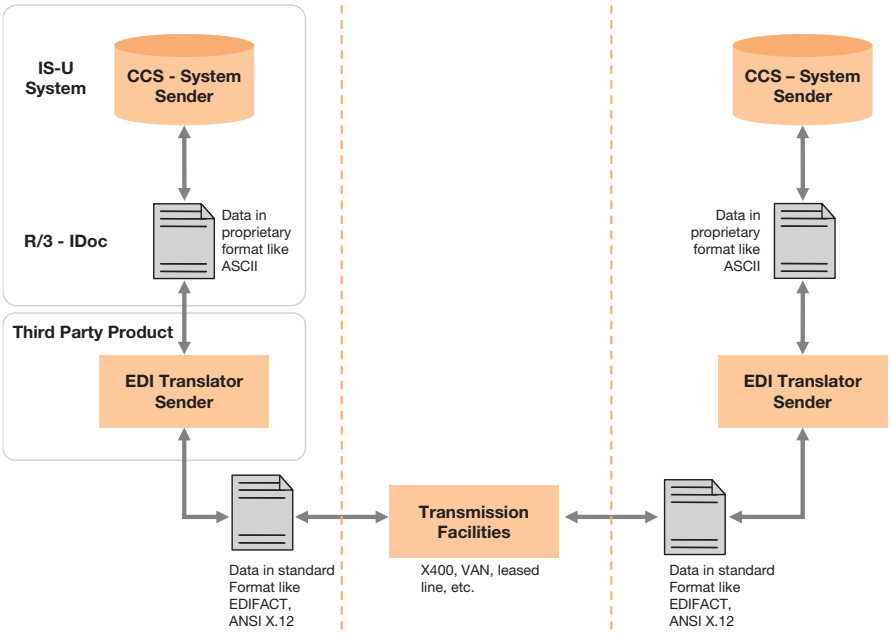
Realisation aspects

For some markets (e.g. the German, Nordic and American markets) SAP delivers message structure definitions and supporting programs. For most markets, however, the implementation of the IDE processes requires customer specific development.

Besides additional programming, workflow functionality is also usually required when implementing IDE. The reason for this is that an IDE process defines a single message exchange whereas business processes often require multiple messages (both inbound and outbound), manual interventions under specific circumstances or timing dependencies between messages and/or process execution. Workflow functionality allows control over these dependencies.

The company-specific implementation of IDE not only depends on the external requirements and rules but also on the internal IT-architecture. The basic questions here are: “Can any one outbound message be built completely by a single application or is data required that is maintained in different applications in order to fully and correctly populate a message?” and “Does any one inbound message need multiple applications for processing?” Obviously a requirement for support of multiple applications would increase the complexity substantially. As stated in the introduction this Point of View will not explore the impact of IT architecture since it is a topic in its own right.

Technical realisation: Connecting SAP for Utilities to the outside world



Another realisation aspect is that the IDE toolbox only has functionality within the SAP for Utilities boundary. A separate system is required to connect to the outside world. This can be SAP Netweaver, SeeBeyond, WebMethods or other EAI packages. For an inbound message, these systems handle the translation of for instance XML format (or other market defined standard)T into Idoc format and the posting of that Idoc in SAP for Utilities. The posting triggers the execution of an IDE process. Vice versa an internal event, for instance the billing of a meter read, triggers the execution of an outbound IDE process. This process will create an Idoc.

SAP Basis functionality takes care of informing the EAI system that an Idoc is ready to be sent. This system will then translate this Idoc into for instance XML and send it to the intended recipient via the communication channel that has been agreed. As far as the IDE process is concerned, the correct creation of the Idoc ends the process successfully: the IDE process has no knowledge of the result of the translation and transmission outside the SAP for Utilities boundary.

Messages and the processes in SAP for Utilities

In the introduction the point was made that messages are one important aspect in making utility markets work. Messages play an enabling role in the deregulated utility processes. Therefore examining how messages are handled by SAP for Utilities should also involve how messages integrate in supported processes. Getting information through messages is not enough; a system needs to be able to process the content of the messages. In order to clarify in a structured way how SAP for Utilities integrates messages and processes, the following framework is used to differentiate groups of similar messages and identify the main processes they belong to.

SAP Netweaver

Under the name Netweaver, SAP markets a set of technologies that are aimed at integrating (complex) IT environments and thus lowering the Total Cost of Ownership (TCO). SAP Netweaver enables the concept of an Enterprise Service Architecture (ESA). The objective of ESA is to add new levels of flexibility to IT environments by integrating

- people
- information and
- processes

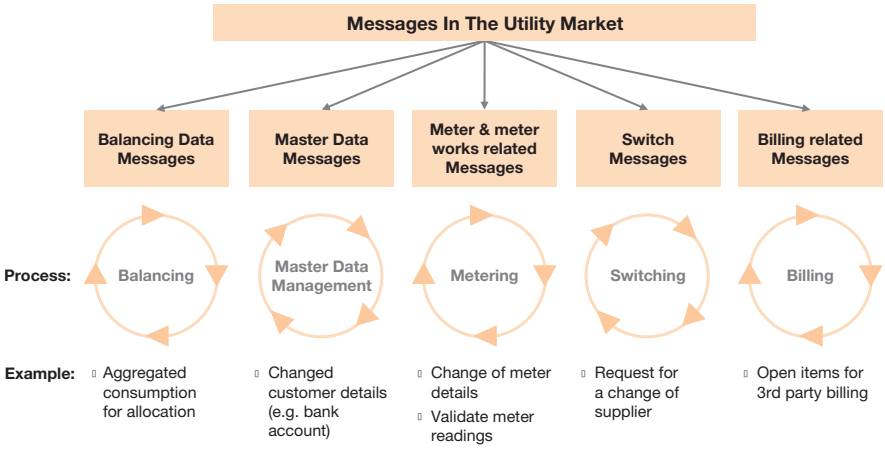
The integration is across organisational boundaries and between SAP, non-SAP and legacy systems. This is realised by an application platform that offers interoperability with IBM websphere and Microsoft.NET technology.

At the process level SAP Netweaver contains SAP Exchange Infrastructure (XI). XI provides the XML based messaging in a complex systems landscape that will allow Idocs to be communicated to other market parties.

Example in the Dutch Utility Market

In The Netherlands the customer payment method was often used to include transportation costs on the supplier's bill. Clear rules around non-payment however were not agreed yet. A supplier went bankrupt and the distributor dunned the customers from which he had not received any payments for the transportation costs. It turned out that the customers had paid the supplier already, however the supplier had not transferred the payments to the distributor. Legal actions were taken on both sides to resolve the situation. Result of this is that combining bills has dropped dramatically thus increasing the total costs of billing.

High Level Messages and Processes in Utility Markets



SAP for Utilities is an integrated system based on single registration of data. In SAP for Utilities the meter and meter reading data is the single basis that is used for multiple processes such as balancing, metering and billing. The followings paragraphs investigate how these processes interact in SAP for Utilities.

1 Metering

On a high level, meter and meter works related messages are part of two general processes:

- Meter Reading administration (recording and managing the readings that are taken from a meter) and
- Meter administration (technical aspects of meters like storage, installation, (re)placement).

This section first explores these two general processes in SAP in order to examine how the system fits with market reality.

Before exploring this, it is important to realize that in SAP consumption is calculated in metering processes for validation purposes only; the final consumption determination and capture is part of the billing process.

Consumption determination is therefore covered in the part on billing and not in this paragraph on metering.

Meter Reading administration.

First examining the input side of the meter reading process in SAP for Utilities, messages containing meter reading data per meter point are input for the role of supplier or market parties like a metered data aggregator. The SAP system provides standard functionality to process meter reading data. However this functionality requires a certain data format as input. Therefore the content of messages with meter reading data must be transformed to fit the required input format. Once this functionality is programmed the meter reading data from the messages is stored and can be used for further processes such as billing.

Examining the output side of the meter reading process in SAP for Utilities, the system has no standard trigger to independently send meter reading data. This means, for example, that a company with the role of metered data collector using IS-U has no standard starting point that enables sending messages with meter reading data. In the system meter reading data needs to be billed first before an outgoing message containing meter reading data can be triggered.

Meter administration.

Secondly, looking at SAP for Utilities for Meter administration processes, the system supports the generation and sending of messages for changes in the technical meter data through an IDE process. An example is the exchange of a meter. The messages triggered by processing the meter change, however, do not include meter reading data. This fits with some markets where technical meter data and meter reading data are exchanged in separate messages.

Market fit.

After this description of how meter reading administration and meter administration processes support the handling of messages, it becomes interesting to explore the fit with the reality of the market. Looking at the market organization two situations can exist. Market rules either require the exchange of meter readings for calculating consumption or the rules require the exchange of consumption data.

If the market rules require the exchange of meter readings and each market participant is responsible for calculating consumption, technical meter data is imperative as part of the message exchange. Without this technical meter data it is impossible for the recipient to unambiguously calculate consumption. Moreover, when technical changes occur, a need for timely exchange of data to other market parties exists because their processes depend on the same technical information for consumption calculation.

On the other hand, should the market rules require the exchange of consumption, possibly with meter readings and technical meter data for informational purposes only, the need for exact synchronization is far less. The reason for this is that meter readings and technical data are not required when billing consumption.

Besides the market rules regarding what data exchange are required, business requirements on how to process corrections on both the meter reading and meter administration processes can have a profound influence on decisions on how to implement the market rules.

This leads to the conclusion that both market organizations can be supported. However the first option, exchanging meter reads and technical data can lead to complex processes, whereas the second option, exchanging consumption, leads to simpler processes.

2 Billing

Billing in SAP is the process whereby consumption is determined and used to calculate payable amounts. It is the central cyclical process in SAP for Utilities. From the perspective of message exchange, billing in SAP has two key aspects.

First key function is calculating and capturing consumption from meter readings. In the process flow of the system, it is not until billing that consumption is calculated from start and end meter readings. In this calculation transformation factors and losses, calorific values for gas, etc are taken into account. The important implication of this is the dependency on billing for communicating consumption data to other market parties.

The second key function of billing in SAP for Utilities is ensuring that any data used in billing, including meter reading data, cannot be changed freely anymore. This allows creation of a full audit trail of any changes in data that are used in billing since a reversal of billing is necessary before the data (and thus the reading) is ready to be changed again.

Because of the consumption calculation functionality and the full audit trail that is available around billing, it is the billing process that results in a trigger for sending messages containing consumption data and meter reading data.

In the Utility industry billing is usually a tightly managed cyclical process. The requirement to bill in order to create outbound messages for either meter reads or consumption information influences the design of the billing process. This becomes evident when looking at interim customer reads or meter exchange readings which normally would not trigger billing. When market rules or business rules require the exchange of those readings, SAP for Utilities requires an ad-hoc billing process next to the normal cyclic billing.

The recipient of the message with consumption or meter read data, usually a Supplier, also needs to have a close look into the design of its billing process. Here also it is a tightly controlled cyclical process. However since it is not (precisely) known when he will receive meter reads or consumption, he must allow consumption or meter read data to be received and processed in his system outside his normal billing schedule. Also if no data is received at the time of his billing schedule he will most probably bill on estimated meter reads or estimated consumption. Bills based on estimates often require re-billing or recalculation when actual consumption becomes available. SAP for Utilities supports this, but it can complicate the design of the billing process.

The implication of billing being required to send consumption and/or meter read data to other market parties must not be underestimated. The billing engine of SAP for Utilities is highly flexible. However communication requirements can easily lead to complex situations that have to be resolved in both the design and implementation of the billing process. Another implication is of organizational nature. The usual place for managing meter read and consumption messages is the data processing department. With SAP for Utilities this is now pushed into the billing department with its organizational implications.

3rd Party billing.

Another often required functionality is the inclusion of third party items on the customers' bill. For instance a Supplier can include transportation costs billed by the Distributor. The financial relationship between the billing partner and the partner handling the customer contacts is one of the determining aspects in the implementation of this functionality. SAP for Utilities supports three possible financial relationships:

- Sole provider - the party that sends the customer's bill becomes the owner of the open items and runs the financial risk
- Advanced payment - the party that sends the customer's bill pays the 3rd party when the bill is issued
- Customer payment - the party that sends the customer's bill pays the 3rd party when the customer has paid

An example of the sole provider option is the bill of a supplier that includes items of a distributor on that bill. If the customer doesn't pay, the supplier is still required to pay the distributor. In the other two options the distributor is still financially responsible for the open items. Therefore it has to be decided how to manage non payment by customers.

In IDE the sending of bill information by the distributor to the supplier in the example above is triggered by running a program that creates a message for each meter point of that supplier based on the open items posted.

The receiving party most probably will want to implement a bill verification process. SAP for Utilities supports a framework of verification of inbound messages with bill information, creation of billing information to be included on the next customers' invoice and creation of remittance advices and payments. The receipt of a customer payment can also trigger the creation of remittance advice. The remittance advices received by the distributor are used to settle the open items. In short IDE supports various financial relationships for 3rd party billing well.

Billing reversal.

One other aspect of using billing for triggering message exchanges is the reversal of billing a meter point. The reversal usually implies that some error occurred that needs rectification. Therefore reversal also triggers the creation of outbound messages and thus allows informing the recipient about the reversal.

In some cases, however, the reason for reversal is not relevant for other market parties. For example a distributor used the wrong price data which doesn't impact the consumption information used by a supplier. Still, a message exchange will be triggered by the reversal though the information should not be sent. To suppress this, programming is required as part of the sending process to handle this properly.

An important observation is that the proper handling of the messages can become highly dependent on the correct use of the system by the employees. Many activities in the system are tied to other, new processes that are less visible to end users. These new processes cross company boundaries and therefore mistakes by end-users can have far reaching implications.

Extensive training and careful selection of well qualified employees are no longer just costs but essential investments.

3 Balancing

SAP for Utilities supports balancing and the sending of the results using IDE well. However market rules can hamper easy implementation when there are conflicting requirements between billing (and the need for billing to process meter reads) and balancing.

4 Switching

In all markets, switching suppliers is a complex process in which a number of different messages are exchanged between a number of participants. All kinds of rules and regulations govern the process and there are huge differences between markets. Therefore SAP for Utilities delivers a template implementation of the process only for Germany. As a consequence any implementation will require a substantial build effort.

IDE supports the process by using a so-called switch document. In this document all data relevant to the switch process for a specific meter point are stored and can thus be shared between the different steps of the process. These steps are connected using workflow. The new supplier starts the process by manually activating a workflow. The first step of that workflow creates a switch document and generates and sends the required message(s) to the Distributor. On the Distributors side the process is started by the receipt of the message. The receipt of the message triggers an IDE task. This task creates a switch document, message(s) to the old supplier and kicks-off a workflow which will handle all follow-on activities. The end of the process for both Supplier and Distributor is a standard SAP transaction for a move-out and/or a move-in of a customer on a meter point. Those transactions take care of registering the proper market parties and their roles on the meter point.

Depending on the market rules, there can be great differences in the Distributors' relationship with the old and the new supplier. The old supplier for instance included the transportation costs on the invoice to the customer whereas the new supplier does not. Therefore in the new situation the Distributor must send his own invoice to the customer. To support the changeover from the old to the new situation, one can configure and develop so-called supply scenarios.

SAP supports the switching process properly.

Concluding Remarks

In this Point of View we have explained/investigated the basic workings of Intercompany Data Exchange (IDE) in SAP for Utilities. SAP has integrated this functionality in the existing system that was already market leader for the regulated markets.

IDE is a toolbox, i.e. SAP does not deliver all functionality required for a specific market. It delivers functionality by which a customer can implement custom developments within a supported framework. If market requirements cannot be supported by customization within the framework, SAP will strive to enhance the system with required functionality. Implementing IDE therefore requires a substantive effort (amount of time and money). Since IDE is a more technical module, implementers with more technical knowledge are required than in a regular implementation of the system. Because workflow is interconnected with IDE, skills in this area are also necessary.

Since billing is the core of this system it is not surprising to conclude that IDE heavily depends on billing. It is therefore also not surprising that it will fit better in markets where consumption is exchanged than in markets where meter readings and technical meter data are exchanged.

Both market types can be supported as can be seen from implementations in the Nordic, the US, Germany and the UK. The latter market type however will need more development and the integration with billing will be less straightforward. In both cases a high level of expertise is required in the areas of billing and meter data processing.

This Point of View also touched on implications of an organizational nature. The interdependencies between processes as a result of the exchange of messages lead to higher requirements on the skills and competences of employees. Also the responsibilities of departments can increase or shift as was described in the case of a billing department becoming responsible vfor managing meter read and consumption messages. These are topics for change management during system implementation.

With IDE, SAP delivers a consistent set of functionalities. It is up to the customer to determine how well it fits with the market rules and regulations for which the system is to be implemented. The decision between using a conglomerate of best-of-breed packages or using a single integrated system is not easily made.

For some markets, packages are available focused on message processing for that market. However these packages still require integration with the processes that use or generate those messages. They will not solve the problems caused by market rules having different requirements for meter reading processing, billing and data aggregation/reconciliation.

Our view on possible future developments in the IDE area, is to focus on reducing the dependency on billing and improving the meter reading functionality. It would be a benefit if meter reads could be sent out independently from billing and if audit trails for changes were available.

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