



Guideline For The Development Of Online Vending Clients

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AMENDMENT HISTORY.....	3
DEFINITIONS AND ABBREVIATIONS	4
REFERENCES	4
INTRODUCTION	4
PHILOSOPHY	5
DESIGN GUIDELINES.....	6
1.1 ENVIRONMENTAL CONCERNS.....	6
1.2 OPERATOR INTERFACE	7
1.3 SECURITY	9
1.4 ADDITIONAL FUNCTIONALITY	9
1.4.1 General Functions	9
1.4.2 Non defined Functions.....	10
1.4.3 Encoding of meter cards.....	10
1.4.4 Financial/Credit information and banking.....	11
1.4.5 Magnetic token encoder and converter.....	11
1.4.6 Submitting Track 2 meter data.....	12
1.4.7 Proposed method for detection of missing vend requests	12
1.5 DOCUMENTATION AND TRAINING	14

DEFITIONS AND ABBREVIATIONS

As defined in “Glossary and Definition of Terms” document

REFERENCES

NRS009-6-10	XMLVend specification. The industry standard for communication between the vending Server and any Client. Not all the use cases are mandatory for all types of Clients but some minimum combination of use cases will be mandatory for any specific implementation.
Eskom Specialisation of XMLVend	Eskom specific customisation of XMLVend for Eskom's purposes.
Mandatory requirements for Online Vending Clients	Detailed information for the minimum requirements that must be met by all types of Client devices to ensure they work seamlessly with the Eskom Vending Server
Online Vending Processes	Description of online vending workflow processes on the Server and Client. Also includes the defined error messages. (Does not include Server back-end processes or Client Server processes).
Vend validations spreadsheet	A spreadsheet depicting the online workflow processes as specified in the document “Online Vending Processes”
Online Vending Receipt Formats	Eskom specific receipt format as included in the Server responses
Glossary and Definition of Terms	The abbreviations and definitions as used in the online vending environment. This document can be amended or expanded on request but please refrain from using a defined definition for something other what it is defined for.

INTRODUCTION

While this document is only intended as a guideline to assist developers, there are some Client characteristics that are mandatory if the Client will communicate directly to the Eskom Server via XMLVend.

Such requirements are stipulated in document “Mandatory requirements for Online Vending Clients”. However, all developers are encouraged to still review this document in detail since it is based on many years of actual field experience and will assist developers in producing systems that are suited to the real-life circumstances in the vending environment.

Note that this document is mainly intended for separate Client devices which are often PC based, but there are some specific sections that specifically addresses Gateway vending systems while most of the requirements can also be understood to some degree for handheld, cell phone and other devices.

PHILOSOPHY

Many of the Clients will be installed in scenarios that are hot and dusty, and vending operators are often not computer literate. They want to spend a minimum amount of time with the vending device since vending is usually only one small task of their daily work. All these constraints must be taken into account when developing a Client and vending terminals must therefore be mechanically rugged and simple to use.

The majority of offline vending terminals (CDUs) are PC based and it is foreseen that PC based Clients will remain prominent in Eskom in future.

However, the online vending system provides much more security and control over the vending process which means that a definite market is now opening up for alternative Client platforms in addition to the normal PC based machines; e.g. Portable (handheld) Clients, cell-phone vending, credit card machines, ATMs, internet based vending etc.

In addition, it is foreseen that there will be a need for specialised Client types over and above the existing CDU that does everything - i.e. vending, Key Changes and all Engineering tokens.

Such Client types include functionality like:

- Only Vending
- Only Engineering tokens
- Only key change tokens
- Only FBE issuing
- Any combination of the above
- A magnetic token encoder to encode a numeric STS token on a magnetic paper token. (This is strictly not a Client since it does not communicate to the Server at all but simply converts a numeric token into a magnetic token.)

Note that the type (i.e. capabilities) of the Client is not the only restriction on what a vendor may do, or not do. There are additional settings on the Server that can configure a specific Vendor to allow only certain actions.

For example; a Vendor may be configured to only perform a Vend even though the Client may have full capabilities; or a technician may be configured to only perform key changes etc.

If a Client attempts an XMLVend request for a function that is not enabled, the Server will respond with an appropriate fault (as described in "Online Vending Processes").

Refer to the definitions "Vending Client Type" and "Vendor Role" in the document "Glossary and Definition of Terms" for more detail on these.

We would further encourage developers to approach Eskom if they have specific questions that are not adequately addressed in this document for their specific type of Client solution.

DESIGN GUIDELINES

1.1 ENVIRONMENTAL CONCERNS

Many locations have wide temperature swings where the Clients are installed; especially high temperatures are often prevalent. It is therefore important to provide adequate cooling fans and ventilation inside Clients.

Most environments are very dusty. Special attention must be given to all openings, plug sockets, connectors, fans and air inlets.

The quality of electricity supply is often unreliable in rural areas. It is imperative that Clients are designed or protected against data corruption or lasting failure if they experience power failures, brown-outs, power dips and switching surges/spikes. Uninterruptible Power Supplies or supply filters may be required for some devices while other devices may recover gracefully without it.

While it is very difficult to test this scenario thoroughly, all suppliers of equipment will be required to provide technical support for the Clients for a period of time and they must guarantee a high degree of up-time for the Clients. It may therefore become very costly for suppliers if their Clients often experience problems.

Bear in mind that while vending is 95% of the functionality of a normal Client, it is often only one small additional task for the person that performs the vending. Most of the vendors also have other businesses to run and the Client machine is only one tool for their day-to-day tasks. These Clients do not get any special treatment or consideration and must withstand rough handling on a daily basis.

It is therefore not adequate to design a Client along the general guidelines for domestic use. A Client must, as a minimum be designed to commercial standards and some aspects may even require design to industrial standards.

Vendors often unplug and move equipment around. All connectors, cables and attachments must be rugged enough to withstand such handling over an extended period.

Lack of adequate design in any of the above areas will be frowned on or questioned during Client evaluations.

GSM/GPRS antennas and cabling have some fundamental handling and installation requirements that are not always obvious; e.g. a simple bend in an RF cable may result in reflections and poor reception. Eskom has a highly recommended installation procedure for cabling and antennas. It can be provided free of charge for suppliers and installers but in return we would ask suppliers to advise/assist Client purchasers and installers accordingly. It will in any case result in improved communication and therefore better acceptance of your products.

1.2 OPERATOR INTERFACE

The vending of credit tokens and FBE tokens will make up 95% of the operations on a normal vending Client. It is therefore very important to optimize this process as far as practically possible. The following are some pointers to consider:

- Make vending options the default and easiest to select with FBE a close second.
- Vendors tend to remember the process like a sequence of actions, so keep the interface for the various actions consistent as far as possible
- Implement easy shortcut keys or commands to select functions or actions instead of relying on many key presses or mouse actions
- Vendors seldom work accurately or fast with a mouse. It requires far too much co-ordination and is not fast enough, especially when the work surface is uneven or the operator is standing.
- Do not require unnecessary actions. For example: When doing many of the same requests, a vendor will never pause to read or confirm an action before submitting or requesting a follow-up. They simply press the button the required number of times to complete the action. Therefore a “Confirm” or other similar action does not improve accuracy at all; it only slows down the process.

If a vendor has to press “Enter” three times to jump between fields to perform an action, he will resort to three quick presses without considering or reading anything in-between presses, he simply wants to get to the end and submit the request.

Bear this principle in mind when designing any frequent actions.

- Do proper range checking on the Client as far as possible before submitting a request. The Server will reject most invalid requests in any case but it wastes time and bandwidth. All these checks are defined in XMLVend.
- Do not do unnecessary Server requests; they are slow and cost money. For example; do not use the “Confirm customer request” before submitting a normal vend request to the Server.
- Always do a check digit validation on an STS meter number as soon as possible. (all numbers that are entered manually must be checked for this to identify mistyped numbers). Never show the calculated check digit as it only encourages the vendor to guess the number and end up with a valid but incorrect meter number. Instead only say the meter number is invalid.
- If a vendor must complete many fields for a single request, try to evaluate the fields as entered. Alternatively if validation can only be done when all fields have been completed, show the original information again to allow the vendor to correct if it has failed validation. This method is preferred instead of requiring him to re-enter all the fields again.
- Use a decent receipt printer that can handle large enough volumes. Printers are frequent failure items in the hot dusty environments. Also use printers that can auto-cut the receipts instead of relying on the vendor to tear it manually on a riffled edge (they seldom do it properly)

- Thermal printers are allowed but some printouts last longer than others. Ensure that a thermal printer and paper are used that will provide an acceptable life of the receipt/token.
- Keep the vend receipts that are printed compact. Lengthy receipts take much longer to print and wastes paper.
- The Eskom designed receipts are for 76mm width paper but narrower receipts are also allowed. It is required that the developer contact Eskom to review their specific layout if they deviate from the norm.
- The Server will automatically include an FBE token with the first purchase per month for qualifying customers but the Client must still implement a separate FBE issue function to allow a customer to request an FBE token whenever required (e.g. when the original token was lost)

Always print the STS token in numeric format as well, even when the token is for a magnetic card meter. This will allow a separate token conversion device to simply convert a manually entered numeric token to a magnetic token.

For practical screen layout on PCs, stay away from using unnecessary windows, graphics and fancy fonts as far as possible. They do not add value, consume computer resources, slows update time, and often confuse the vendor. There may be much value in the correct use of specific boxes, colours or lines to highlight areas but make sure they serve a good purpose.

On computer screens, ensure that the vendor can easily read the screen writing when standing one meter away from the screen, and avoid small or cluttered user interfaces, e.g. a standard Windows based dropdown menu is simply too small and must be enlarged to make it usable.

If possible; consider hiding, colouring or disabling irrelevant information on the screen until the items become relevant, e.g. displaying all possible engineering functions on one screen is too cluttered. Instead implement one screen/menu for test (or non-meter specific) functions and another for meter specific functions.

Manufacturers may implement customised title screens and fonts on start-up and on screen savers but try and keep the working screens simple and easy to navigate.

Do not ask for information that is not needed when performing an action. “Just in case” is not a good enough reason. Decide on a process for the operator to follow and stick to it when implementing. This is especially important for actions that are not tightly specified like shift batch handling or report printing.

Always create very specific error messages for a fault and ensure that the message always include information on how to correct the fault; e.g. it is of no use for a vendor to say “GPRS communication failure”. The vendor must get information that he can relate to and help him correct the specific fault condition. Also refer to the “Documentation and Training” section in this guide for more on this.

Ensure there is a relatively easy way for the operator to identify the correct version of the Client software as well as the version of XMLVend that is supported. (You may want to ask him to identify the software over the phone when doing remote support)

A mouse may be supplied and some operators can use them but many operators are not used to using computers and a mouse is difficult to use if you are not used to it or standing when using the device. There is often also not sufficient desk space at vending points to use a mouse. If a mouse is supplied, it must be with optical tracking.

Almost all vendors can use a PC keyboard to some degree and many vendors prefer a touch screen but price is a trade-off and none of these are mandatory. They may be provided as optional features if possible or incorporated as standard if the price warrants it.

Till drawers are not a pre-requisite but vendors often find them useful to keep vending revenue separate from other cash. However, the keyboard is often in the way of the till drawer and there is not always room on the desk to reposition the equipment. Touch screens may be a solution but at higher cost.

Test your specific solution in a real environment before product release, do not guess.

1.3 **SECURITY**

Most of Eskom's risk is now managed on the Server and Client risk is mainly for the vendor, but that does not mean that Client developers can ignore this risk.

Security is mainly encompassed in the security certificate on the Client. While not mandatory, it makes sense to design devices so that the vendor can remove the certificate (where possible) and render the Client inoperable.

When a certificate is removed, consider what the vendor will do with it. Remember the vendor will have to buy a new device if it is lost/damaged and he may lose some or all of his existing credit. If a USB (flash disk type device) is used, it is important to provide a mechanically rugged device that is moisture resistant and supplied with a cap and possibly neck strap etc. Similar requirements would apply for other types of devices.

Keep as few open data files as possible on the Client. In case of data corruption on the Client, it is usually straight forward to restore the operating system and the application but it is often difficult to recover/reconfigure the data and configuration settings.

1.4 **ADDITIONAL FUNCTIONALITY**

1.4.1 **General Functions**

Do not implement vending business rules on the Client. These business rules are defined on the Server as needed; e.g. an FBE token is designed to

be vended as often as needed as it can only be used once in a meter. Do not try to implement an additional rule on a Client to only issue an FBE token once twice or X times. The same principle applies for most other actions on the Client as well. If unsure please ask instead of guessing.

Gateway devices and some Clients may be able to store previously generated tokens and simply reprint them instead of requesting them again from the Eskom server but the Client systems will then be responsible to handle all such scenarios that might arise.

1.4.2 Non defined Functions

XMLVend and the Online vending processes documents specify the requirements for Eskom and the online Server but these documents do not necessarily specify all requirements that may exist for vendors, Gateways or Client operators.

The Eskom online Server will create its own (transparent) Sales Batch Closures and Banking Batch closures, as and when required. The Client must not submit Sales batches or banking batches to the Server.

Client developers are encouraged to investigate the needs that may exist for specific Client implementations. For example; most shop owners will have several employees that can use the same Client to vend and there may be a need to cater for specific/independent sales batches or shift batches. These are now implemented as Client specific functions in the Eskom environment and ignored by the Server. They may however still be a feature of the Clients to be marketed to the users (and therefore influence their choice of a particular Client)

Similarly, custom reports, totals and summaries may also be a factor in selecting a Client.

1.4.3 Encoding of meter cards

Encoding or re-issuing of meter cards are frequent requirements. There is not a dedicated use case in XMLVend for this but the function can be provided via the "Confirm Meter Details" use case.

It is recommended that the Client includes a separate function for the operator to encode a meter card with this use case. When the function is selected, the meter information should be requested from the Server via the "Confirm Meter Details" Use Case. The returned information can then be used to encode a meter card or re-code a damaged card.

The meter cards must always be encoded with information from the vending Server. A card may not be encoded for a meter with information that is entered manually (except when an Engineering Key Change is performed, in which case it is included with the key change process)

1.4.4 **Financial/Credit information and banking**

The most common request from small Client vendors is that they have run out of credit, they want to know their remaining credit; or they are concerned about deposits that have not been applied yet.

This has been specified to a lot of detail in the workflow process document and in XMLVend, but it is still up to the Client developer to make the interface fast, efficient and easy to understand for the vendor if the vendor will be responsible for his own credit and deposits.

The Vending Server will return the remaining credit for the Vendor as part of every response but it is the Client's responsibility to implement a method for managing the remaining credit and low credit levels. It is suggested that low credit warning levels be locally configured on the Client for all Client Vendors. Gateway Vendors may instead manage the credit for all their terminals in a central location that best suit their particular circumstances.

XMLVend version 2 defines a use case for "Create Vendor Deposit" This will be a simple use case that allows the Client Vendor to decide the amount to bank without necessarily closing any sales batches or banking batches. If so desired, the Client can still close these batches locally to allow reconciliation at the Client but they will not be used by the Vending Server. Gateway Vendors may instead manage all deposits from a central location and not on the individual terminals.

When sending the request to "Create Vendor Deposit", the Server will return the recommended amount to be banked in order to return the vendor credit level to the agreed amount. It is recommended that the Client or the Gateway device displays this total but allow the operator to edit it if he wants to deposit a different amount. This modified total can then be included along with the rest of the bank details as the actual deposit slip.

1.4.5 **Magnetic token encoder and converter**

It is envisaged that many Clients may not support magnetic tokens. Therefore all STS tokens must also be printed in numeric format as part of the normal receipt. This will be a useful feature to accommodate some magnetic card meters in the area. This can be done for all types of STS tokens.

It will then be possible to implement a totally separate magnetic token converter/encoder, which does not require any communication to a Server. It must simply accept a numeric token that is entered manually and encode it onto a magnetic token with the same information.

It is not required to print on the magnetic token when encoding it but an accompanying receipt with the numeric token string must be printed, similar format as a normal numeric token.

If a gateway vending solution is developed with terminals that do not print receipts. It must be possible for the Gateway device to produce the previously generated tokens whenever required by the customer.

Swipe card writers have a read-behind-write capability but some have to be implemented specifically in software to confirm that the writing was successful. If a magnetic card programmer is used, ensure this operates effectively; otherwise it may result in unreliable card/token writing in the field. Also ensure it is not affected by noise on the power supply, some encoders may require additional filters on the power supply.

A magnetic card writer (for meter cards and for magnetic tokens) has complex and expensive heads, bearings and rollers. It is not designed for frequent reading of meter cards when vending. Instead, implement a separate card swipe reader for track 2 reading of meter cards for dedicated vending purposes and ensure that the card reader is properly affixed in a comfortable position. (Double sided tape is not sufficient for this purpose)

Eskom envisage that many token conversion devices will be required since several of the future vending Clients will only support numeric tokens. Eskom invites manufacturers to develop such token conversion devices and submit them for basic evaluation and approval.

1.4.6 Submitting Track 2 meter data

XMLVend makes provision for three vending options in the requests:

- Meter Serial number only,
- Include the Meter Serial Number and all the additional vending parameters,
- Use the complete Track 2 meter data from a meter card.

Do not validate the meter card details apart from validating the sum checks to ensure data was read correctly. The Server may implement its own rules for vending which may be changed over time. A good example of this might be a missing, old or invalid date on the card.

Never convert track 2 data into the individual fields for the submission to the Server. Also do not combine individual fields into a simulated track 2 before submitting a request to the Server. Only submit the track 2 data only if the data was read from a meter card. This will allow the Server to identify whether the data was read from a meter card, or entered via manual entry. The information will give the Eskom Regions the ability to apply different rules on the Server when vending via meter card and vending via manual entry

1.4.7 Proposed method for detection of missing vend requests

The online vending system is based on the design philosophy that we will not have control over the Clients and security must reside on the Server. Therefore the Online Server does not accept cancellations or reversals as it creates a window for possible fraud.

There is a possibility that the Client may issue a valid vend request to the Server and is correctly processed, but the response from the Server is not received by the Client.

Since there is no option to cancel/reverse such a transaction, the Client should detect the missing response and automatically initiate an “Issue Advice (last response)” use case. If the original response is then returned for this subsequent request, it will be in the form of an automatic reprint and can be used like the original token.

To be effective, such an automatic reprint request must be initiated under two scenarios:

- When the Client times out waiting for the response after sending the request as explained above.
- When the Client signs into the Server and the last response received from the Server, did not match the last vend request message ID. For example: If the Client was powered down while still waiting for a response or the connection to the server was lost, forcing a new sign-on. The outstanding response should be resolved before normal vending operations continue.

There may be three types of valid responses from the Server for an “Issue Advice (last response)” request:

- A successful response is the processed original response included as an auto reprint which may be used like the original token. If the response is successful, the Client must print the receipt with the “Auto Reprint” header at the top to distinguish it from a normal reprint receipt. Also ensure that the original vend request date and time is printed (as returned by the Server) in addition to the current date and time. The Client may further display suitable error messages as Vendor information. (Refer to the relevant receipt format for this)
- A second possible response may be a fault response that the requested message ID was not received/processed. The Client may simply clear the fault condition and continue vending normally.
- A third possible response is a fault response that the ID is indeterminate. This condition will be rare and will be resolved from the transaction logs via a manual process.

If the Client device is a Gateway with multiple terminals that request tokens, the Gateway may continue to submit vend requests while there are still some responses outstanding but it remains the Gateway’s responsibility to ensure that every vend request is eventually resolved in a similar manner as described above for a normal Client. Note that only the first of multiple requests for the same meter number during a communication failure will be honoured for possible reconciliation on the server.

Transactions that do not have a monetary effect (like FBE, Key Changes or Engineering tokens) can simply be requested again by the vendor and they do not have to be handled in this manner. A suitable Client generated error message can simply inform the vendor that such a request can be done again if required.

Refer to the section “Guaranteed Message Delivery Mechanism” in document “Online Vending Processes” for more detail on this process.

1.5 **DOCUMENTATION AND TRAINING**

Bear in mind that all problems which result in the system not working, will usually be viewed by the vendor as unreliable or broken services, even if it was only finger trouble, loose connectors, poor reception etc. Any of these may result in unnecessary callouts and negative vendor perception if they do not understand the problems.

To address these problems as effectively as possible it is required that every vending Client be supplied with an operator manual to describe every function on the Client for the operator and also how to resolve general error conditions

Further documentation, training and support may be requested or specified when the equipment is purchased.