

Report for ELEXON – BSC Panel

Report on best practice and level of
choice for communication services in
other markets

16 January 2009

YGTA001B



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B		Final issue including client comments				
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	NAME	O. Fouere	G. Metcalf	A. Sowerby		16 January 2009
A		'Early sight' final draft for client comments				
	SIGNATURE					
	NAME	O. Fouere	G. Metcalf	L. Allcroft		15 January 2009
O		Draft report for client review				
	SIGNATURE					
	NAME	O. Fouere	G. Metcalf	L. Allcroft		9 January 2009
		PREPARED BY	REVIEWED BY	CHECKED BY	APPROVED BY	DATE
REV		Reference number YGTA001B		Number of pages: 36		

1 Executive summary

Introduction

This document is the final report of a project carried out by Analysys Mason on behalf of ELEXON Ltd (ELEXON) to examine the current communication service model utilised in the delivery of the Energy Contract Volume Aggregation Agent (ECVAA) system to remote Parties. In addition, Analysys Mason was requested to ascertain whether this service model should be modified in order to better allow users to utilise alternate communication providers, and to provide an expert evaluation of any risks associated with the options presented.

Methodology

Analysys Mason studied a number of examples of transaction management systems from a variety of industry sectors, comparing the service requirements of each with ELEXON's ECVAA transaction management system. Subsequently, after consultation with ELEXON, the four most appropriate models were selected for deeper comparison and analysis. Each model was assessed in respect of the critical requirements of the ECVAA system, which included: service level, openness to competition, reliability and resilience, risk management and security.

Conclusions

In assessing the suitability of the current ECVAA system from an availability perspective, Analysys Mason considers that the service levels currently offered are equivalent to the alternative service models used for the comparison. Accepting that there is no such thing as 100% availability, it is our opinion that the current ECVAA system meets the general availability and redundancy requirements of a transaction management service (TMS) as represented by the other models assessed in this report.

When compared to an overseas electricity TMS, we found that the ELEXON service model provides the end user with substantially more choice in relation to its high grade offerings to its end users, the overseas model being closer in nature to ELEXON's low grade service.

Recommendation

Should ELEXON decide to implement a service model whereby multiple service providers might be allowed to connect to the central ECVAA networks, Analysys Mason considers that the communication service model provided by the stock exchange trading platform would be most appropriate. This solution would allow diverse service offerings to the end user by providing a public gateway interface for any service provider or end user to connect to. However, it should be noted that this may potentially have a service level impact, placing the onus on the end user to carry out adequate due diligence on its own potential communication service provider, and to protect itself with adequate service level agreements.

2 Introduction

Like most commodities, electricity is produced, sold into a wholesale market, and then resold to consumers. Contracts are made for each half hour between Generators who produce the electricity and Suppliers who sell it on to commercial and domestic consumers. These contracts are notified into central systems so that any difference between the amount of electricity contracted for, and delivered by Generators, or sold on by Suppliers, is cashed out according to the BSC rules. ELEXON manages this process and arranges for debts and credits to be cleared for each day.

As the Balancing and Settlement Code Company (BSCCo) for Great Britain, ELEXON's role is to procure, manage and operate the services and systems which enable the balancing and imbalance settlement of the wholesale electricity market and retail competition in electricity supply. These services and systems include the BSC systems and a managed data network for High Grade users (Low Grade users access the systems over an Internet Virtual Private Network (VPN). This data network is currently a frame relay based service from Cable & Wireless (C&W), managed by Logica. In April 2009, this network is scheduled to be replaced by a Multi-Protocol Label System (MPLS) service, again provided by C&W and managed by Logica.

One of the centrally managed systems in question is the Energy Contract Volume Aggregation Agent ('ECVAA'), a system for receipt and processing of contract information regarding contracts that have been agreed outside of the BSC systems.

Within the current environment, if a transaction fails due to problems related to the ECVAA, a mechanism exists to prevent charges being applied to parties due to any imbalance caused. However, should a transaction fail as a result of a network failure, the Party could be exposed to imbalance charges.

One of the Parties has filed a modification request to the ECVAA system, suggesting that any imbalance between supply and demand caused due to a failure of the communications network be treated in the same way as one caused by a failure of central systems.

As a result of this modification request, the industry regulator, OFGEM, has become concerned about the level of competition and choice offered to Parties within the system, and has requested ELEXON to investigate best practice and level of choice for communication services in other markets as an alternative way of managing the risk associated with communications failure.

ELEXON has requested Analysys Mason to provide a proposal to conduct this investigation on its behalf.

Analysys Mason's brief was to provide recommendations relating to the current ECVAA communication service model with relation to its suitability for purpose and its ability to allow competitor communication service offerings to be utilised as an alternative in future.

The remainder of this document is laid out as follows:

Section 3 will provide an analysis of communication service provision models from a variety of related business sectors which implement transaction management and settlement systems.

In section 4, Analysys Mason selects the most relevant service models and provides an in depth analysis of these, incorporating benefits and drawbacks to each model relative to the ECVAAs model.

Section 6 will provide the conclusions and recommendations as to which model would be most appropriate to the ECVAAs system, while considering the suitability of the model to both openness to competition, in addition to any risk management or assurance requirements. In addition, suitability for purpose will be assessed in relation to a service model appropriate for a critical national infrastructure transaction management system.

Finally, the report includes a number of annexes containing supplementary financial and technical material:

- Annex A provides current service structures for the provision of the high grade services.
- Annex B includes the communication and network service model for the current ECVAAs system.
- Annex C includes the communication and network service model for the overseas electricity transaction management system.
- Annex D includes the communication and network service model for the online gambling transaction management system.
- Annex E includes the communication and network service model for the foreign exchange transaction management system.
- Annex F includes the communication and network service model for the stock exchange transaction management system
- Annex G includes a high-level view of a possible communication and network service model for the ECVAAs system should an ‘open access’ network infrastructure be deemed a requirement.
- Annex H includes the analysis of the service models which were not selected for comparison and in-depth analysis.

3 Communication service models

3.1 ECVAA service model

As part of the ECVAA system, two communication service models are currently provided to ELEXON's end users:

High Grade System

This system operates over dedicated communication links, such as leased lines, to communicate with, and access, the ELEXON electricity balancing and settlement system.

The high grade offering is provided as a number of turn-key services to end users currently managed by Logica and provided by Cable & Wireless. While the potential end user has a choice in terms of the level of service offered (resilience, connection speed and disaster recovery options), there is no choice available to the end user in terms of the communication provider, as the end-to-end solution is managed by Logica.

The current service offering structure for the high grade service is provided in Annex A.

Low Grade System

This service operates over the public Internet, and allows end users to access a web portal to communicate with, and access, the ECVAA system as part of a centrally provided service.

The low grade offering allows end users to select their own respective provider of communication services..

3.2 Comparative service models

In compiling this report, Analysys Mason leveraged case studies from its client base and its deep knowledge of the Information and Communications Technology (ICT) sector to present ELEXON with various applications that could potentially meet the criteria of ELEXON's ECVAA transaction management system, as listed in 3.3 below, and thus provide a valid comparison. The following transactional management systems (TMS) were suggested to ELEXON as potential comparators, and selected for preliminary analysis:

- an overseas electricity market TMS
- an online gambling system

- a foreign exchange (FOREX) TMS
- a stock market TMS
- a consumer electricity porting system
- gas industry transaction processing
- a credit card TMS
- a defence communications TMS.

Following the preliminary analysis and agreement with ELEXON, the four systems considered the best matches to ECVAAs system were selected for deeper study.

3.3 Assessment criteria

Each industry application was assessed according to the following criteria:

Time critical

The nature of the transaction is such that it must be registered and processed in a timeframe immediate to the initiation of the transaction.

High volume

The service may need to handle large volumes of data, for example, in excess of 5GB per day.

Security

There is a critical requirement for high grade security to protect the confidentiality, integrity and availability of the data being processed by the service.

Low latency¹

The communication medium needs to transport data with very low latency speeds, for example less than 16ms latency.

¹

Latency is the measure of relative time taken for data to be communicated by the physical communication medium, in most instances, latency measurements must account for processing equipment involved in the communication, for example, routers and switches as well as the communications lines themselves.

Transactional nature

The transaction requires the two-way, or more, exchange of information between the end user and the processing system.

Irregular volumes

The system handles irregular volumes of data, for example, large peaks of traffic occurring at unpredictable times.

Time stamped

The data being processed requires high resolution timing information to be included in the data set, for example, to ensure that the complete transaction can be audited.

3.4 Current ECVAA services

To provide an indicative reference point, the current ECVAA system has been described to summarise the key requirements of the service with respect to the evaluation criteria.

Time critical

The current ECVAA system requires the near real-time processing of electricity trading contracts. This is critical at times close to ‘gate’ closures for when a heightened level of trading will occur as Parties rush to close transactions.

High volume

The current ECVAA system currently is known to process in excess of 5GB of data per day, providing the benchmark for volumes within this study.

Security

The current system implements various security measures to provide availability and confidentiality of the data being processed. High grade users are provided with dedicated communication channels, which provide boundary separation in addition to the authentication measures required.

Low latency

As the current system utilises a dedicated Cable & Wireless communications network service provision, the current system has relatively low latency.

Transactional nature

The current ECVAA system handles and records the exchange of data between the Parties and the central trading and settlement system, and is therefore considered of a transactional nature.

Irregular volumes

The current ECVAA system experiences irregular volumes, most notably during the final few minutes approaching gate closures and cut-off times, when the traffic processed can reach 50% of the total processed traffic within the 30 minute time window.

Time stamped

Due to the transactional nature of the trading, and the associated financial implication, it is imperative that all transactions are fully auditable, and therefore all data processed is time stamped.

3.5 Preliminary analysis

The objective of the preliminary analysis was to filter out the four closest examples to the ECVAA system (in terms of their conformance to the assessment criteria), in order that the communications aspects of these systems could be studied in greater depth. The table at Figure 3.1 represents a high-level summary of the preliminary analysis, with the four selected systems highlighted.

	<i>Time Critical</i>	<i>High Volume</i>	<i>Security</i>	<i>Low Latency</i>	<i>Transactional Nature</i>	<i>Irregular Volumes</i>	<i>Time Stamped</i>
ECVAA system	✓	✓	✓	✓	✓	✓	✓
Overseas Electricity TMS	X	✓	✓	X	✓	✓	✓
Online gambling TMS	✓	✓	✓	✓	✓	✓	✓
FOREX TMS	✓	✓	✓	✓	✓	✓	✓
Stock exchange TMS	✓	✓	✓	✓	✓	✓	✓
Consumer electricity TMS	X	X	X	X	✓	X	✓
Gas settlement TMS	X	X	✓	X	✓	X	✓
Credit card TMS	X	✓	✓	X	✓	✓	✓
Defence comms TMS	✓	X	✓	X	✓	✓	X

Figure 3.1: Service Compatibility Assessment Table [Source: Analysys Mason 2008]

3.6 Outputs

As a result of this analysis, the four TMS deemed to be closest in nature to the ECVAA, and thus selected for further study, were:

- the overseas electricity market
- the online gambling system
- the FOREX system
- the stock exchange system.

These four examples have been highlighted in the table at Figure 3.1, are studied in greater depth in Section 4, and schematic representations of each are provided in the Annexes to this document.

4 Selected service models

This section describes the communications service models selected for further analysis and explains the reasons why each was selected.

4.1 Overseas electricity settlement transaction service

In order to provide a comparison that is equivalent to ELEXON's service provision, it was decided to select a model from an overseas organisation that operates a similar electricity settlement and transaction management service within the same industry sector. In this instance, a continental organisation providing these services was selected as a communications model comparison.

Time critical

This service provision allows the buying and selling of electricity supplies through an auction style system on an hourly basis. While this system does not require real time processing, order confirmation is usually confirmed in near real time responses.

High volume

As with other utility services, high volumes of transactions can occur, and increased trade in volumes can often occur during peak hours, often resulting in an increased volume during the winter periods.

Security

A moderate level of security is required to ensure the confidentiality and integrity of both the associated transactions financial information (bidding data) but also to ensure the integrity and protection of the critical infrastructure.

Low latency

This service implements a near real time processing time window, but this is not a critical requirement, as in the instances of live system failures, transactions can be carried out manually, and therefore there is no driving requirement to provide low latency services.

Transactional nature

Due to the nature of the data exchange between the electricity vendors and the settlement company this service is considered a transactional transfer.

Irregular volumes

Large peaks in volume occur during periods approaching time gates or settlement periods. These peaks in transaction processing often comprise the large majority of the total trading volume.

Time stamped

To ensure the integrity of all trading processes, including the handling of consecutive and sequential trades, all operations must be time stamped. This consequentially allows all operations to be fully auditable for operations monitoring and auditing.

Conclusion

This communication service model meets the critical service requirements of ELEXON's ECVAA system, and therefore is analysed in further detail in section 5 to provide a comparison to the existing ECVAA service model. Furthermore, the service model analysed is comparable solely to the low grade service provided by the current ECVAA system.

4.2 Online gambling transaction service

This service model is utilised by certain providers of online gambling hosting and management services to retail sports betting and gambling companies. These institutions provide online hosting and payment management systems designed to handle transactions undertaken by consumers on behalf of the online Casino or 'virtual' gambling establishment.

Time critical

To ensure user satisfaction and maintain the integrity of the betting systems, both in terms of financial and result-based assurance, there is a high requirement for real time service provision. especially in this highly competitive sector where users will rapidly migrate to an alternative platform if bets cannot be placed on a particular game.

High volume

In geographies where it is permitted, the popularity of online gambling ensures that virtual gambling establishments experience a very high level of transaction volumes, with high levels of growth.

Security

There is a high level of security required, both in terms of guaranteeing revenue, and preventing fraud, but also in terms of protecting consumer payment information. It is therefore seen as a service with a high level of security.

Low latency

To assure the time critical nature of the transactions, for example, ensuring bets are placed before close of betting, real time processing and responses are required, and therefore multiple measures are utilised to ensure low latency.

Transactional nature

Betting and gambling requires the exchange of information between the consumer, the gambling management system, and any additional third party payment processing organisation, and therefore constitutes a transactional process.

Irregular volumes

Online gambling and sport betting services have a high level of exposure to irregular volumes of traffic and transaction processing. These occur in the lead up periods to popular sporting and public entertainment events. Due to this requirement, the service model must be robust and extremely scalable to cope with sudden changes in demand of service.

Time stamped

To ensure the integrity of the betting mechanism, both from a payment traceability perspective, but additionally from a service integrity and fraud prevention perspective, all transactions must be fully processed and coupled with the relevant timing information.

Conclusion

This communication service model meets the critical service requirements of ELEXON's ECVAAs system, and therefore is analysed in further detail in section 5 to provide a comparison to the existing ECVAAs service model.

4.3 Foreign exchange transaction service

The processing and settlement of foreign exchange (FOREX) is handled by third party institutions to reduce the settlement risk associated with multi currency transactions for various members of the financial services industry by implementing a 'payment versus payment' transaction management process. Payment versus payment is a method of dealing securities or currency trades by processing an exchange at the moment that the equivalent buying and selling price is accepted by the trading parties. As an example, when Party A decides to sell US\$100 in exchange for UK£60, the time taken to process the actual exchange means there is no alteration to the value of the original transaction, hence protecting the trading system from being exposed to any settlement risk. This settlement and balancing system ensures that currency exchanges are processed in real time to ensure that buy and sell prices are equally matched to avoid any imbalances.

Time critical

Due to the nature of the balancing system, coupled with the volatility of the global currency markets, it is a critical requirement that all processing and transactions occur in real time to minimise the risk of any imbalances to the transaction parties.

High volume

By their very nature, currency exchange markets can experience, at times, very high volumes. In this instance, the service model we have reviewed has been known to handle in excess of 1.5 million trades per day, while ensuring a high level of assurance and resilience to sporadic volumes.

Security

Due to the financial value of the currency exchanges occurring, there is a critical requirement to ensure a broad range of security assurance. Confidentiality levels must be high to protect the strategic nature of the transaction, integrity levels must also be high to ensure the accuracy of the transaction, and finally a high level of availability and resilience must be provided to ensure near continuous levels of service.

Low latency

To ensure that the payment versus payment process is executed at precisely the same moment in time there is a critical requirement to ensure that all communication services provide minimal levels of latency. Any delay to the receiving, processing and acknowledgement of a transaction can potentially lead to a transaction imbalance, causing a financial loss to one of the settlement parties.

Transactional nature

As currency exchange is a process between the seller of the held currency, the clearing and settlement organisation, and the buyer of the currency, this process is considered transactional.

Irregular volumes

Due to the nature of the global currency markets, the system is designed to handle highly irregular volumes of transactions. Certain periods of market inactivity may have very low or negligible volumes of transactions, followed by increased and high volume trading during peak times of business activity, or during public occurrences or events, such as national budget declarations.

Time stamped

To ensure the accurate balancing of all data, each transaction must be time stamped to a high resolution. This is to ensure the integrity of the process, and ensure the transaction is handled at the appropriate moment in time. Furthermore, as a financial institution it has a regulatory and supervisory authority requirement to ensure the traceability of the process.

Conclusion

This communication service model meets the critical service requirements of ELEXON's ECVAAs system, and therefore is analysed in further detail in section 5 to provide a comparison to the existing ECVAAs service model. Due to its use of dedicated communication lines, this service model is comparable to the current ECVAAs high grade service.

4.4 Stock exchange settlement and transaction management service

Primary stock exchanges have a high requirement to ensure that transaction and settlement management systems are capable of handling large volumes of operations. In addition, the communications model utilised must be extremely resilient to highly volatile market conditions that can result in unprecedented numbers of requested and settled trades during certain periods.

Time critical

Due to the highly dynamic nature of the global securities market, it is imperative that trades are carried out in real time. Transactions are often pre-scheduled to occur on market opening or closing periods, and therefore require a high level of responsiveness.

High volume

Global securities experience the highest levels of transactions experienced by the selected communication service models in this report. It is for this reason that the stock exchange transaction management system must be adequately designed to allow dynamic load balancing across its transaction management infrastructure.

Security

The high financial value of the global stocks and securities market means that security is a critical factor in ensuring the integrity and availability of its communication services. This model is defined to allow high levels of resilience through the use of redundancy and robust communication architectures.

Low latency

Due to the precise nature of securities and stock exchange systems, it is a critical requirement that trades are processed and acknowledged in real time to ensure that selling and buying occurs concurrently, ensuring there is no discrepancy in the transaction settlement.

Transactional nature

This model represents a three-way exchange of information, between the primary party and the exchange system, and between the trading system and the counter party.

Irregular volumes

Due to the nature of the global markets and their respective economies, the system is designed to handle highly irregular volumes of transactions. Certain periods of market inactivity may have very low or negligible volumes of transactions, followed by increased and high volume trading during peak times of business activity or during public occurrences or events, such as financial reporting dates.

Time stamped

All transactions must be fully transparent and auditable, both to ensure the integrity of the transaction from a business perspective, but, additionally, to provide any evidence of process to regulatory or supervisory authorities.

Conclusion

This communication service model meets the critical service requirements of ELEXON's ECVAAs system, and therefore is analysed in further detail in section 5 to provide a comparison to the existing ECVAAs service model. Furthermore, the model analysed provides a level of service that is comparable to both the high grade and low grade service offerings of the current EVCAAs system.

4.5 Discarded service models

The analysis of the discarded service models and the reasons why they were discarded has been provided for reference in Annex H.

5 Communication service model analysis

This section compares the communication service models employed by the top four comparators against the requirements of the ECVAAs system.

A schematic of the ECVAAs system's communications service model is provided in Annex B.

5.1 Overseas electricity transaction management service model

Summary

The overseas electricity transaction management service model utilises a similar approach to the low grade service, or ECVAAs Web Service (EWS). This model utilises the public Internet to carry the communications from the end user to the electricity transaction management system.

Service level

The service level provided by the transaction management service is not offered to the end user as a multi-level service. The service is provided as a 'best effort' service to the end user, however the system incorporates multiple levels of redundancy and communication channels to ensure that the host systems provide a high level of availability and resilience to the end user. The passing of communications over the Internet can prove a highly resilient medium, due to the mesh connectivity of the Internet. However, availability concerns do appear on international links, as large amounts of traffic can be channelled via underwater cables, which have, in the past, been prone to failure or degradation of service due to physical damage. In this instance, the vast majority of traffic between the end user and the host system is national traffic, therefore there is little, or negligible, risk attached.

Openness to competition

As each end user is free to select their own Internet service provider, this example demonstrates the high availability and ease of use of any number of competing service providers. The end user is responsible for the provision and maintenance of their own internal user terminals, and, in addition, must select at least one Internet service provider. The service provided can be selected from any number of suppliers, region dependent, and a service level agreement can be contractually entered into by both parties to provide a level of assured Internet connectivity at all times. This ensures that the end user can access the host systems with no onus on the transaction management system to assure this aspect of the communication chain.

Reliability and resilience

Responsibility for the reliability and resilience of the communication services is distinctively split into two areas of responsibility. The end user data services and Internet connection services are the responsibility of the end user. This results in the situation that the end user must select a service provider which provides a level of reliability and resilience that is proportionate and adequate for the level of service required by the end user. The second area of responsibility lies with the transaction management organisation, whose responsibility it is to maintain their corporate data connectivity to the Internet, and to ensure that their system includes adequate levels of resilience and communication redundancy to ensure that the end user systems can access the requirement host on a constant basis.

In this instance, the end user is free to select a communication provider of its choice, while defining its own internal service level requirements in accordance with its Internet service provider. As an example, the end user will purchase an ISP service with a reliability factor of 99.6% uptime. In addition to this, the end user purchases two physical connections from their service provider of choice, for example, a primary ADSL connection, coupled with a separate secondary ISDN link in case of failure.

In instances of data communications failures where there is total loss to these two redundant links, the end user can contact the transaction management company via telephone or fax to manually register and process their transaction.

Risk management and security

The main security measure implemented in this transaction has a divided scope of responsibility similar to the service level resilience and reliability structure. The main difference, in terms of security implications, is the requirement to protect the confidentiality and integrity of the data traffic passing over an unsecured Internet medium. To achieve this, all communication with the web portal handling the end user transactions is secured by utilising the publicly available Transport Layer Security mechanism. This provides a level of confidentiality and authentication by utilising public key infrastructure already in use across the majority of online based transaction mechanisms.

Communication service model

The communication service model utilised by this organisation is provided in Annex C. This model provides a visual representation of the data channels and communication equipment architecture.

Benefits

The key benefit of this service model is the **freedom provided to the end user to select and implement the communication service provider** of choice. This allows the end user to define and **agree its own service level agreements with its service provider**, independent of the transaction management organisation. This solution uses mass accepted commercial off the shelf technology to provide an acceptable level of security and resilience to the end user, which most business organisations can **incorporate into their existing information technology infrastructure with minimal cost and disruption**.

Drawbacks

Providing a fragmented service provision to meet a turn-key requirement means that there is a devolved level of responsibility. The **end user has the responsibility of ensuring that its service provider is meeting its contractual obligations**, and to ensure that the service meets its business and operational requirements.

5.2 Online gambling transaction management service model

Summary

The online gambling transaction management service model is a highly redundant, geographically dispersed, low latency model that utilises the public Internet as a communication medium. Due to the gambling service being directed to Internet users it should be pointed out that the use of dedicated communication links for end users in this instance is not relevant.

Service level

Service level agreements for the provision of this service form a critical requirement, both from a business and operational perspective. Due to the large financial turnover from the operational availability of the system (service failure will result in clients simply utilising another service provider) it is critical that the business implements very stringent reliability and resilience requirements. With this in mind, the service has been both designed and operated to ensure a service level availability of 99.9%.

Openness to competition

This Internet based model is open to competition, in that end users are free to select an ISP of their choice. The operator, in this instance, utilises a dedicated back end high speed network to mimic a close proximity to the Internet backbone while retaining a physical offshore location.

Reliability and resilience

Due to the operational requirements stated above, the key business requirements result in the primary need for a service model that has comparatively high levels of both reliability and resilience to both service degradation and failure. To achieve the high levels of uptime and service availability, the network model has been designed to provide multiple levels of redundancy, both while operating over terrestrial and submarine networks. In addition, the service provider has secured several redundant ultra high speed network links to the critical Internet backbone structure to ensure very low levels of latency in its communications network.

Risk management and security

Due to the financial value of online gambling and gaming transaction, security is a critical requirement for the implemented service model while operating over a public communications network, such as the Internet. To assure the confidentiality and integrity of the data being transported and processed, several layers of security are applied at various points throughout the network. Most notably, all communications between the end user and the hosted web service are carried out encrypted with transport layer security mechanisms to protect any financial transaction data, but additionally to authenticate any users with their previously supplied payment details. Furthermore, the service model incorporates many of the industry best practice measures for network security, such as application firewalls and intrusion detection mechanisms.

Communication service model

The communication service model utilised by this organisation is provided in Annex D. This model provides a visual representation of the data channels and communication equipment architecture.

Benefits

The key benefit of this style of service model is the **high levels of service that could potentially be provided to the system end users**. While this service far exceeds the current requirements met by the high grade ECVAA service, this service model allows for an extremely high speed connection to the Internet backbone. Furthermore, the **multiple levels of redundant and resilient network lines allow for any failure to be promptly detected and mitigated without any loss or degradation of service to the end user**.

Drawbacks

The primary drawback of deploying such a system is the **relative high cost in providing the service** due to the high expectations of the user and the level of competition in the market. This

results in this service model exceeding the actual business requirements of the current ECVAAs system.

5.3 Foreign exchange settlement and transaction management service model

Summary

The foreign currency exchange transaction management communication service model we have reviewed utilises a dedicated MPLS communication service provision to handle all communications between its central processing servers and its national and international client user systems. This model has been structured to provide a more validated network structure to provide near real time processing and a high level of resilience and security using redundant links in addition to communication link security.

Service level

The service levels mandated in this service model are of critical importance, and very stringent service level agreements exist between the transaction management organisation and the communication service provider, which defines and lays out the key service agreements, in association with any penalty schemes for failing to meet agreed service levels. This, combined with redundant communication links, real time support and failure analysis and monitoring, all contribute to ensuring that the central processing mechanism achieves near 100% uptime.

Openness to competition

This service model does not provide a mechanism to enable a high level of selection in terms of competing service provision from third party communication providers. This is mostly due to critical security requirements, in addition to the scale and geographic requirements of this service model to handle point to point international data traffic on dedicated low latency circuits. Due to this reason, competition in this area, in terms of communication services, is only available from a small number of global communication service providers. In addition, due to the resilience and redundancy requirements, only a small number of global service providers are in a position to meet these requirements, due to the obligation to own and maintain large high cost physical infrastructures.

Reliability and resilience

This service model provides a high level of resilience and reliability. All intra-site communication links are doubly redundant, both physically and logically. In addition, though not illustrated in the

network model, each user site has inter-network redundant links to allow a high level of continued service, even in times of severe communication failure. This allows for a very robust network model, which allows a single point of accountability (the service provider) to identify and remediate any network failure or service degradation.

Risk management and security

Due to the nature and value of the currency exchanges taking place via the transaction management system (daily exchanges can occur to a value in excess of one billion pounds) there is a very high level of security required, both internally from a business risk management perspective, but additionally from a regulatory and supervisory authority perspective to ensure market integrity and confidence. This model utilises high grade cryptographic link hardware devices to provide a high level of confidentiality, authentication and integrity to the communication flows. These, combined with the resilience mechanism and redundant communication lines, ensure the availability of the required transaction management systems.

Communication service model

The communication service model utilised by this organisation is provided in Annex E. This model provides a visual representation of the data channels and communication equipment architecture.

Benefits

This model is **highly resilient and robust**, which provides an **extremely low latency** and dedicated service to the transaction management system. In addition, this service model allows **scalability** and deployment across national and international locations. The key business process benefit is the **ability to calculate and predict the exact latencies of the communications**, as it is a dedicated network, and to have the ability to implement precisely timed payment versus payment transaction to minimise any settlement risk.

Drawbacks

The largest drawback of this model, in relation to ELEXON's service requirements, is the **cost of such a service provision**. This level of dedicated and low latency network communications would place higher cost levels on ELEXON, which, in turn, would have to be passed onto the BSC end users. This, **in addition to the cost of the dedicated high grade security layer**, would prove this model as non cost effective, and would far exceed the current service requirements.

5.4 Stock exchange settlement and transaction management service model

Summary

The stock exchange and securities trading platform service model we have reviewed utilises a service model which allows both the use of dedicated communication networks, such as in the instance of the current ECVAAs high grade service, in addition to a public communication network model which utilises the public Internet, as in the instance of the current ECVAAs low grade service. We have specifically selected the transaction management system utilised by a European low volume (relative to the US/UK trading volumes) stock exchange to better act as a relative comparison to the volumes experienced on the ECVAAs system.

Service level

The service level agreements for this transaction management system and its public interfaces (utilising dedicated lines or public networks as carriers) transfers all service level responsibilities beyond the provider's boundary to the end user and their respective network service providers. As such, while the transaction management service provides a high level of availability through the use of redundant servers and internally resilient network connections, there is no guarantee of service to the end user from the transaction management service provider. It is, therefore, not possible to ascertain the exact levels of service provision in this model, as each respective section of the network will have different contractual requirements specific to each communication service provider utilised by the end user.

Openness to competition

In comparison to the other assessed models this service provides the highest level of openness to competition. However, it should be noted that this is achieved by potentially reducing the level of end to end service available to the user, in addition to the loss of a single point of responsibility for the end user. This model allows the end user the option of selecting any respective provider of communication services, but stipulates that the end user is responsible for selecting a product or service that is appropriate to their business needs. In this model, the user is free to select either a dedicated communication service (such as a leased line product) to connect to the trading systems or, alternatively, to use an Internet service provider of choice by using a virtual private network service to communicate with the trading systems.

Reliability and resilience

The reliability and resilience of this model was not possible to assess with any level of granularity, as the end user is free to select any number of products or services offered on the open market. However, this model does provide the potential for a high level of reliability and resilience to occur, as the system provider recommends that end users use a dual connection system to implement redundancy and resilience. This has been achieved by most end users by implementing both the dedicated line and Internet connection service to achieve a failover mechanism in case of any failure or service degradation.

Risk management and security

A high level of security is provided by the service model utilised. In this instance, a combination of both network segregation and encryption services are utilised to provide a high level of assurance to the confidentiality and integrity of the data being transported and processed. At the client network, general end users will operate on segregated networks and connect through a firewall into their own internal trading servers. Subsequently, these trading servers operate on an independent network, which is firewalled from the communication medium. Once data leaves the end user trading servers, all data is encrypted (irrespective of dedicated or public network utilisation) until it arrives within the trading exchange servers, where it is decrypted and routed appropriately. Additionally, this security measure allows all parties to securely authenticate each other on a mutual basis.

Communication service model

The communication service model utilised by this organisation is provided in Annex F. This model provides a visual representation of the data channels and communication equipment architecture.

Benefits

The key benefit to the end user is the **ability to select any number of communication service providers** to achieve a required level of connection to the exchange platform. This allows the end user to achieve the **highest level of value for money with respect to their vendor selection**, provided that competitive services do, in fact, exist in the respective market. In addition, **this model provides a positive balance of availability and resilience** of the service by encouraging end users to implement resilient network models to achieve a high level of robustness and security.

Drawbacks

The drawback associated with implementing this service model is the **shift of responsibility** from the trading management organisation **to the end user and their respective communication service providers**. While this mitigates the risk to the transaction management system of any degradation or failure of communication service, it does introduce devolved responsibility providing an end to end service level guarantee for the end user. However, it should be noted that, with careful analysis and selection of an appropriate service, the risk can be reduced to an acceptable level similar to that provided by a turn key end to end service model.

6 Conclusions

The actual service differentiation between the high grade and low grade service differs in only minimal respects. The service level agreements for availability of the high grade and low grade services are the same. The only key differentiator between the two service models is the availability of the streamed BMRA data via the high grade service. The low grade interface allows end users a comparable freedom of choice in respect to their Internet service provider (ISP).

The analysis of a comparable service model utilised by an overseas electricity transaction management organisation demonstrated that the current ELEXON service model provides the end user with substantially more choice in relation to its high grade offerings to its end users. The actual service level offerings detailed are included in Annex A. In the instances of the low grade offerings, the comparison of service model was equivalent to that of the overseas operator.

In relation to assessing the suitability of the current ECVAAs system from an availability perspective, it is considered that the current service levels are equivalent to the alternate service models used for comparison. While there is no such system that provides complete availability, it is our opinion that the current ECVAAs system meets the general availability and redundancy requirements of such a service when compared to the models assessed in this report.

In relation to providing a service model whereby multiple service providers might be allowed to connect to the central ECVAAs networks, it would appear that the communication service model provided by the stock exchange trading platform would be most appropriate. This would allow diverse service offerings to the end user by providing a public gateway interface for any service provider or end user to connect to. However, it should be noted that this may potentially have a service level impact, placing the onus on the end user to carry out adequate due diligence on its potential communication service provider and protect itself with adequate service level agreements.

Such a solution would have cost implications for both the users and ELEXON, depending upon the user's existing Internet service provision and ICT infrastructure. As this solution negates the need for a dedicated ECVAAs connection, there may be less equipment required on the user's premises. However, the user would require a reliable, high availability Internet connection, which if already in place would not require further expenditure. We would expect CAPEX implications at the ELEXON end of the link to be minimal, being limited to the re-configuration of firewalls and routers, although OPEX would inevitably increase due to the higher level of support calls fielded by operations personnel.

Analysys Mason is aware that there are some 67 users of the ECVAAs system, due to this fact, it may not be cost effective to implement these recommendations. However, this should be confirmed by canvassing the existing users to gauge their appetite for change.

6.1 Recommendation

Based on the outputs of the research carried out, it is Analysys Mason's view that, should it be deemed a requirement to offer choice of communication provider to the ECVAA users, **a solution based on the stock exchange model is the only one that would satisfy all the criteria as stated in section 5.4, in addition to an open platform, whereby multiple service providers might be allowed to connect to the ECVAA central systems.** A suggested model for this solution, providing a high-level view of a possible design, is illustrated at Annex G.

The key benefits are an **openness to competition**, providing the users the ability to attain a **higher level of value for money**, while providing an **efficient and resilient network solution** which means both the **security and availability requirements of the ECVAA system are met.**

The drawbacks associated with this model are that, due to the loss of end-to-end control (currently provided by Logica), **a higher level of technical sophistication at the user's end of the link would be required.** In addition, **this solution potentially places higher costs on Logica for the processing and handling of support and fault queries,** however, it is felt that these risks can be sufficiently minimised by providing adequate guidance on the selection and purchasing of communication services that are technically fit for purpose, along with fault finding guidelines and user documentation.

Annex A: High and low grade service structures

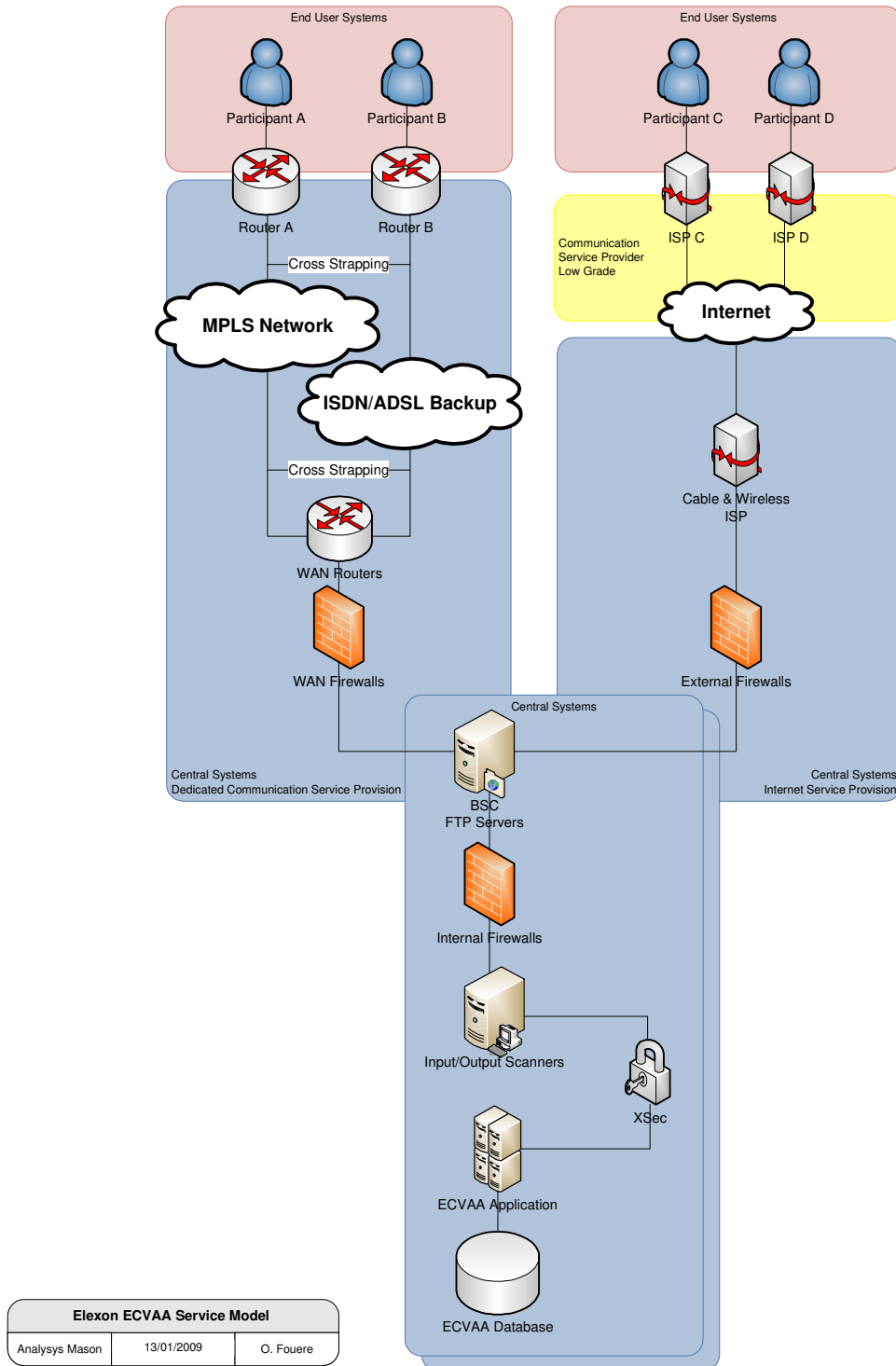
The current service structure for the high grade service is detailed below.

Technical Specification	Line Options								
	HG1a	HG1b	HG2a	HG2b	HG3a	HG3b	HG4	DR1	DR2
Primary Line Rental:									
256Kb Lease Line	✓	✓	✗	✗	✗	✗	✗	✗	✓
512Kb Lease Line	✗	✗	✓	✓	✗	✗	✗	✗	✗
1Mb Lease Line	✗	✗	✗	✗	✓	✓	✗	✗	✗
2Mb ADSL	✗	✗	✗	✗	✗	✗	✓	✓	✗
Backup Line Rental:									
ISDN Backup	✗	✓	✗	✓	✗	✓	✓	✗	✗
2Mb ADSL Backup	✓	✗	✓	✗	✓	✗	✗	✗	✗
Support:									
5 Hour Fix on Primary Line	✓	✓	✓	✓	✓	✓	✗	✗	✓
24 Hour Fix on Primary Line	✗	✗	✗	✗	✗	✗	✓	✓	✗
1-1 Contention Ratio ²	✓	✓	✓	✓	✓	✓	✗	✗	✓
20-1 Contention Ratio	✗	✗	✗	✗	✗	✗	✓	✓	✗

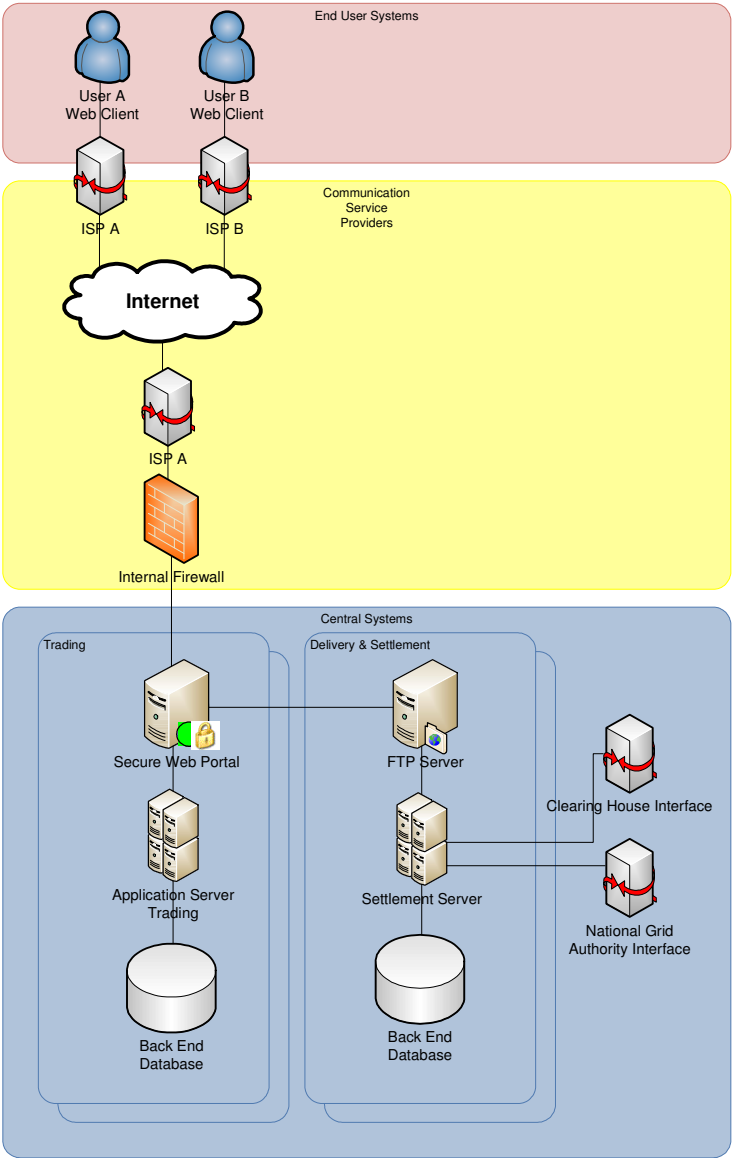
Figure A.1: High grade service structure [Source: ELEXON]

² Contention Ratio – means the ratio of the potential maximum demand to the actual bandwidth. The higher the contention ratio, the greater the number of users that may be trying to use the actual bandwidth at any one time and, therefore, the lower the effective bandwidth offered, especially at peak times.

Annex B: ELEXON ECVAA service model

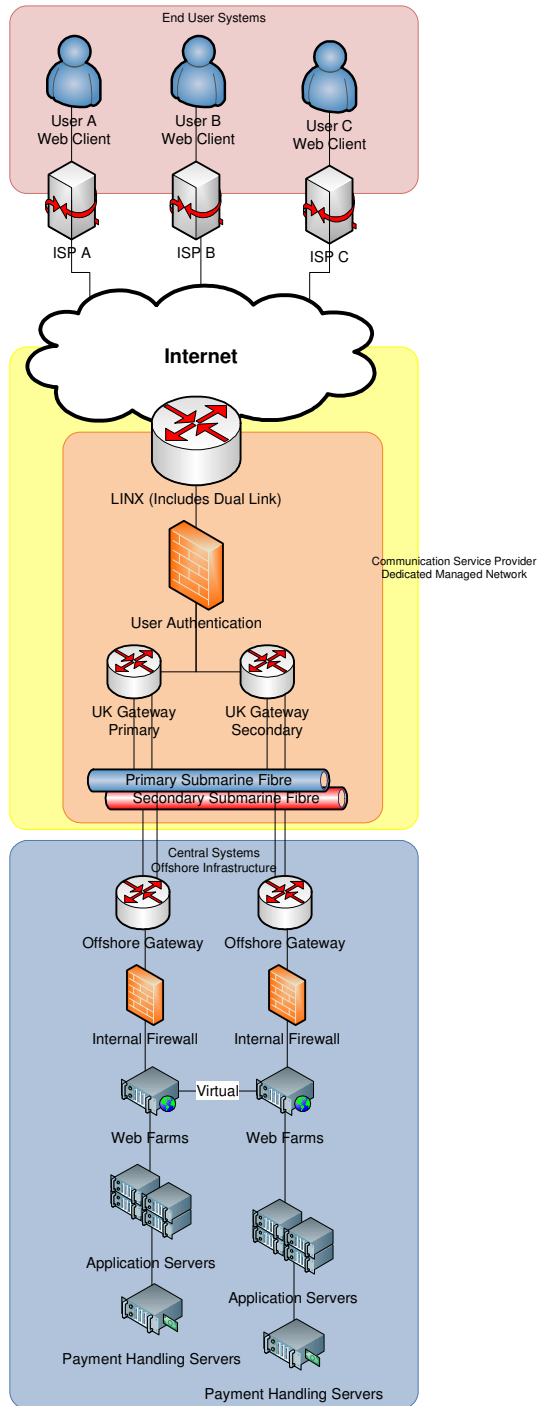


Annex C: Overseas electricity transaction management communication service model



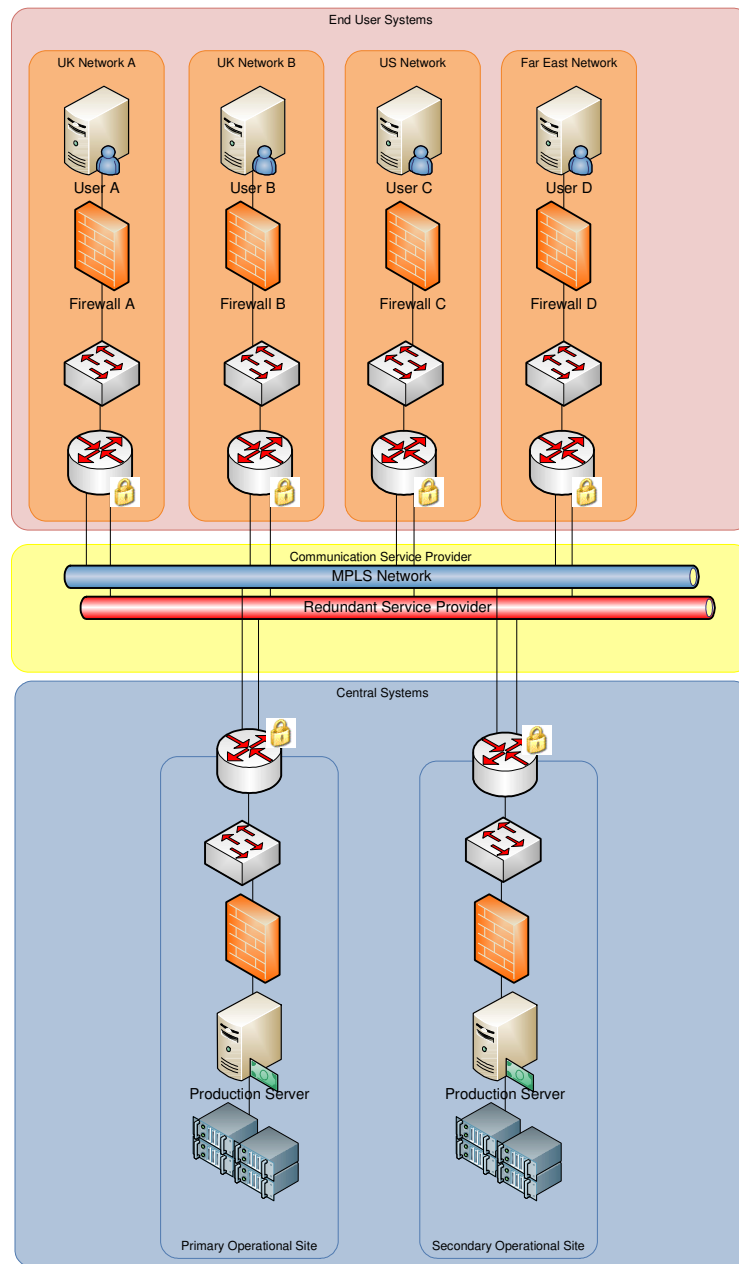
Overseas Utilities Transaction Management Service Model		
Analysys Mason	1/13/2009	O. Fouere

Annex D: Online gambling communication service model



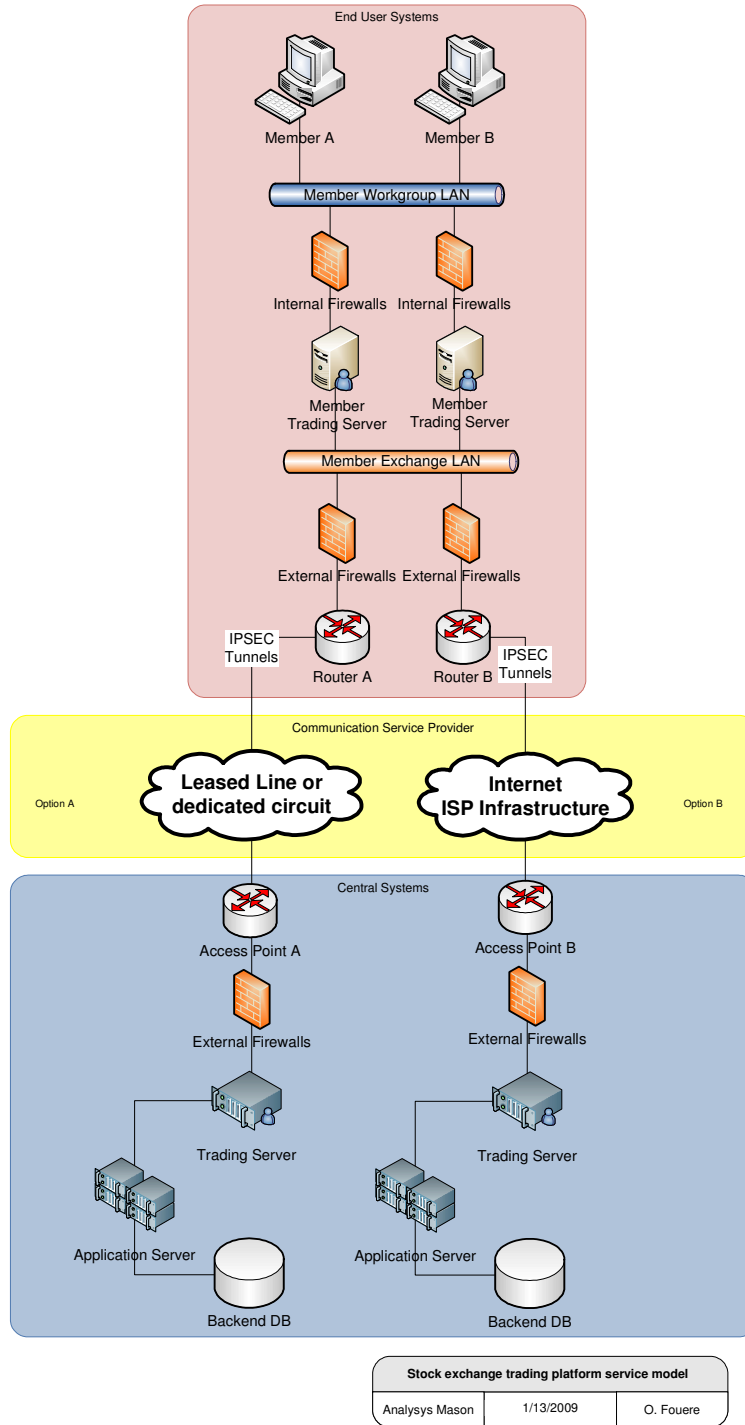
Online gambling service model		
Analysis Mason	1/13/2009	O. Fouere

Annex E: Foreign exchange transaction management communication service model

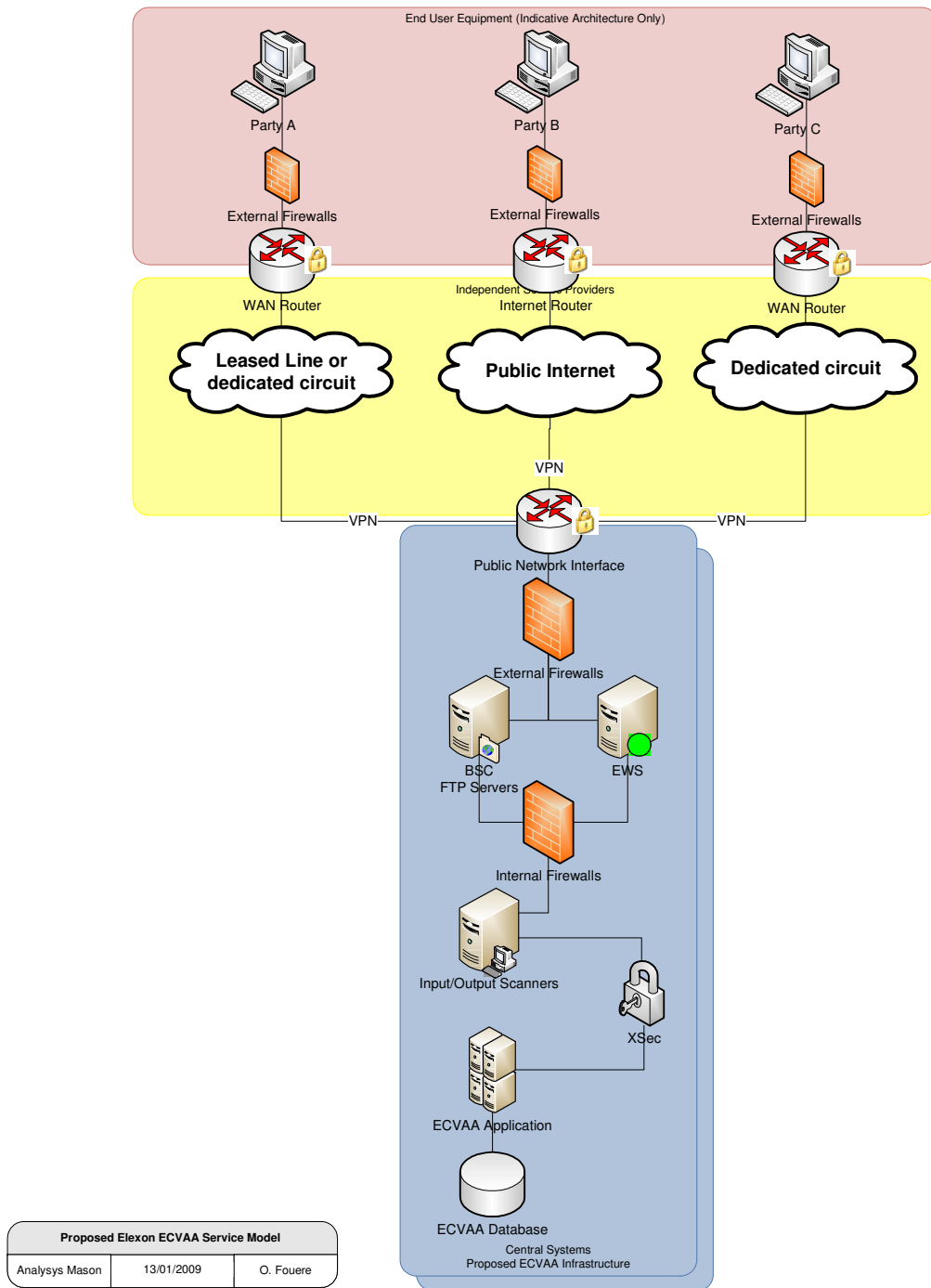


Foreign Currency Exchange Service Model		
Analysys Mason	1/13/2009	O.Fouere

Annex F: Stock exchange communication service model



Annex G: Suggested ELEXON ECVAA communication service model



Annex H: Discarded service models

This section describes the communications service models discarded at the preliminary analysis phase and explains why each was not selected for further analysis.

H.1 Consumer electricity transfer transaction management service

As part of deregulation of the consumer electricity market, domestic consumers are free to select an electricity supplier of choice. To ensure the integrity of the electricity and billing information, a third party is utilised to facilitate the handover of the consumer service from an existing provider to a new provider.

Time critical

This service is not time critical. The transaction or transfer process is transparent to the consumer, and therefore there is no requirement for real time transaction processing. Transactions are handled on a first come first served basis, with any excess or forward load being handled consecutively.

High volume

In general, this service does not experience high levels of transactions. While there may be instances, such as public awareness campaigns for utility switching or comparison services, the average amount of transactions remains broadly static.

Security

There are no critical confidentiality requirements on the transaction process itself. This is not to be confused with the associated personal or financial information that is stored as part of the business process.

Low latency

There is no requirement for low latency in processing portability transactions, these are carried out on a first come first served basis, with no guarantee on service levels. As a matter of course these transfers can occur any time within a 2-4 week window.

Transactional nature

This system is a transaction based service, receiving an order from a new utility provider and processing the order by transferring the service offering from the existing provider to the new service provider.

Irregular volumes

This service does not encounter acute sporadic data volumes, while there will be periods of increased data activity, for example, during peak working hours or peak home working times, this service receives a relatively steady number of transactions.

Time stamped

As this service has a financial impact due to the transfer of billing services, it is very important that transactions are time stamped, and that the integrity of the time stamp is assured.

Conclusion

Due to the long processing times involved in the transfer of consumer electricity connections there is no requirement for the transaction management system to operate in near real time. This, combined with the fact that there are no comparable security or high volume capability requirements associated with this service, has resulted in this service model not being appropriate for comparison to the ELEXON ECVAA balancing and settlement system.

H.2 Gas transaction management system

As is the case with the deregulation of the utility market, consumers are also exposed to deregulation in the gas supply market. In the same manner, the relationship between gas wholesaler and retail gas vendor must be based on a similar transaction and settlement system to control the supply and demand factors effecting the transport and supply of gas supplies.

Time critical

As is the case with the majority of utility companies, the provision of services can have a very serious impact on the potential end user, therefore gas transaction management can have time critical dependencies. However, these criteria are less so than for electricity supply, as gas can be compressed and buffered in the transmission medium. Electricity, however, is a real time utility, and therefore has higher real time dependencies associated with any transaction processing.

High volume

Gas supply transactions incur high volumes of sales and purchasing, as with electricity this major utility commodity is subject to increased consumption levels in the winter months. However, due to the distributed nature of the current gas trading structure (currently three alternate trading organisations in the UK), and the lower trading levels compared to electricity supplies, the level of data volume being processed by a single system does not attain the defined value of high volume.

Security

Security is an important issue when dealing with any critical infrastructure, and gas transaction management systems implement authentication and integrity assurance measures to meet the level of assessed risk.

Low latency

Due to the buffered nature of gas supplies there is no critical requirement to have low latency or real time transactions. Transactions are generally submitted and acknowledged within a 15 to 30 minute window.

Transactional nature

The management and settlement of gas exchanges is a transactional process that requires a balanced level of supply and demand.

Irregular volumes

Gas distribution and control is subject to irregular volumes. This can occur due to the sudden lack of supply from a particular source, which requires large increases from other supply routes and similar other occurrences.

Time stamped

As gas transaction management entails a financial billing aspect, it is imperative that a properly auditable and time stamped mechanism is in operation. It must also implement a mechanism to assure the integrity of the stamped data.

Conclusion

Due to the buffered nature of the national gas supply, which allows for delays and imbalances in the supply (in comparison to the real time requirement of the electrical supply) it was felt that the critical service requirements of this service model were not appropriate for comparison to the ECVA transaction management system.

H.3 Credit card transaction management system

The processing of credit card transactions is a critical function within the financial services sector. With the increases in online sales and purchasing, credit cards are an integral payment mechanism. Users provide their credit card details to merchants, through a variety of communication interfaces, which allows the merchant to use those credit card details to mandate payment for goods or services. To ensure that a payment is both legitimate and authorised, merchants utilise a credit card processing service provided from third party companies which allows payments to be verified and authorised.

Time critical

There are various functions within the credit card transaction system that require different levels of time criticality. Authorisation and fraud detection functions require processing within a 2-5 second window to allow the merchant to either accept or decline the payment. Billing functions do not have this near real time requirement, and payments take 24-48 hours to be processed by the back office billing system.

High volume

Credit card transaction systems experience extremely high volumes of data processing. Due to the nature of the volume, the architecture of the system requires a high level of data and network redundancy and resilience.

Security

Due to the perceived high value of credit card information, and the large volume of fraud and crime in this area of the consumer financial sector, security is considered a critical requirement of ensuring the confidentiality and integrity of the payment information.

Low latency

While levels of service provision are assured between merchants and processing parties, credit card transactions do not have a requirement for real time responses. With the exception of the authorisation function (near real time), there are no critical low latency requirements.

Transactional nature

By its very nature, credit card processing is a transactional process, and requires the exchange, processing and output of data between merchants, credit card processing organisations and the actual credit card companies.

Irregular volumes

As credit card transaction processing is inherently linked to consumer usage, irregular volumes of transaction occur. These can be experienced during peak shopping periods, holiday periods and during potential popular public events or occurrences.

Time stamped

To ensure the integrity and traceability of credit card transactions, all processing of data is uniquely time stamped according to the function carried out.

Conclusion

Due to the comparably long timeframe associated with the credit card transaction and billing cycles, it was felt that this model was not appropriate to the more time critical processing associated with the ECVA system, and therefore was not selected for further analysis.

H.4 Defence communications transaction management service

The management of bandwidth transactions for defence or government applications over satellite communications is a relatively new concept that has evolved out of increased business perception of cost reduction and private sector procurement initiatives. To allow end users the ability to dynamically request and identify satellite bandwidth, a transaction management organisation exists to handle service requests and source appropriate bandwidth in the appropriate location.

Time critical

Due to the nature of tactical communications, strategic communication resources are usually planned in advanced timeframes. Therefore, the transaction management system is not subject to real time operations.

High volume

Due to the nature of satellite communications, only low levels of actual transaction occur. While high levels of communication bandwidth will be utilised by the end users, these are handled by single bulk transactions.

Security

Due to the tactical nature of the communications, all advanced planning and transaction requests are subject to a high level of security to protect both the confidentiality and integrity of the system.

Low latency

As bandwidth planning occurs in advance timescales there is minimal, or no, requirement for low latency communications.

Transactional nature

This service model is composed of a transactional exchange between the end user, transaction management system and the third party satellite communication operators.

Irregular volumes

This service will normally operate with relatively static volumes of transaction; however, irregular volumes can occur during lead up times to tactical deployments, or similar operational situation periods.

Time stamped

While time stamping information is required for the management of the communication services to ensure precise availability and bandwidth, the actual service request transaction is handled on a first come first served basis, and therefore does not need to contain precise timing data.

Conclusion

Due to the comparably long timeframe and manual processing system associated with the ordering of satellite bandwidth it was felt that this model was not appropriate to the more time critical processing associated with the ECVAAs system, and therefore was not selected for further analysis.