E-Procurement Business Architecture

Supply Chain

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Final

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1 Introduction

This document provides the business architecture for health e-procurement.

1.1 Intended Audience

This document is intended for stakeholders in the Australian Health Supply Chain, including state and territory health departments, hospitals, suppliers to the health departments, and e-procurement hub service providers. The audience is assumed to be IT literate, have knowledge of the "Order to Payment" cycle in procurement processes, and it would be useful to have read the Australian Standard for Health Supply Chain Messaging [HSCM2004].

1.2 Purpose

This business architecture provides the high level solution for the implementation of e-procurement in the Health supply chain. It explains the roles in the e-procurement community, and the shared processes that they use to achieve procurement using electronic document exchange. The purpose of the architecture is to define a NEHTA standard mechanism for replacement of the current fax and email based communication of procurement documents within the health sector. NEHTA and the jurisdictions will not implement a new e-procurement hub service, as the architecture is designed to reuse the existing Business to Business (B2B) Hub services in the marketplace.

The benefits of implementing electronic document exchange between trading partners is explained in full in the E-Procurement Business Case. The primary goal of electronic document exchange is the introduction of uniform identifiers from the National Product Catalogue to eliminate ordering errors, and allow for improved Business Intelligence. However, there are several other benefits to be gained directly or indirectly from E-Procurement:

- **Reduced cost.** The report "Health and Industry. Collaboration: The PeCC Story" [MORE2000] by Macquarie University academics in 2000 estimates that the cost to all parties of paper processes is $75 per order, whereas electronic trading can bring this down to $5 per order.
- **Quicker order fulfilment.** Direct integration of business documents into backend systems can allow for immediate processing and fulfilment of orders.
- **Automated order tracking.** This will eliminate human (telephone) and paper-based communications to track progress.
- **Lower disputed invoice rate.** Additional savings can be gained through lower error rates, and elimination of most of the disputed invoices that currently cost hours in employee time to resolve.
- **Logistics systems integration.** Depending on the level of sophistication within trading partners, the decision to integrate purchasing with inventory systems may be taken to gain second order efficiencies that do not flow from implementing e-procurement alone.
- **Better demand and supply matching.** With the uniform product and supplier identification provided by GTINs and GLNs from the National Product Catalogue, the quantity of goods ordered can be more easily analysed, and this improved information can act as good demand forecasting to suppliers and wholesalers, enabling them to more efficiently manufacture or warehouse products supplied.

1.3 Document Context

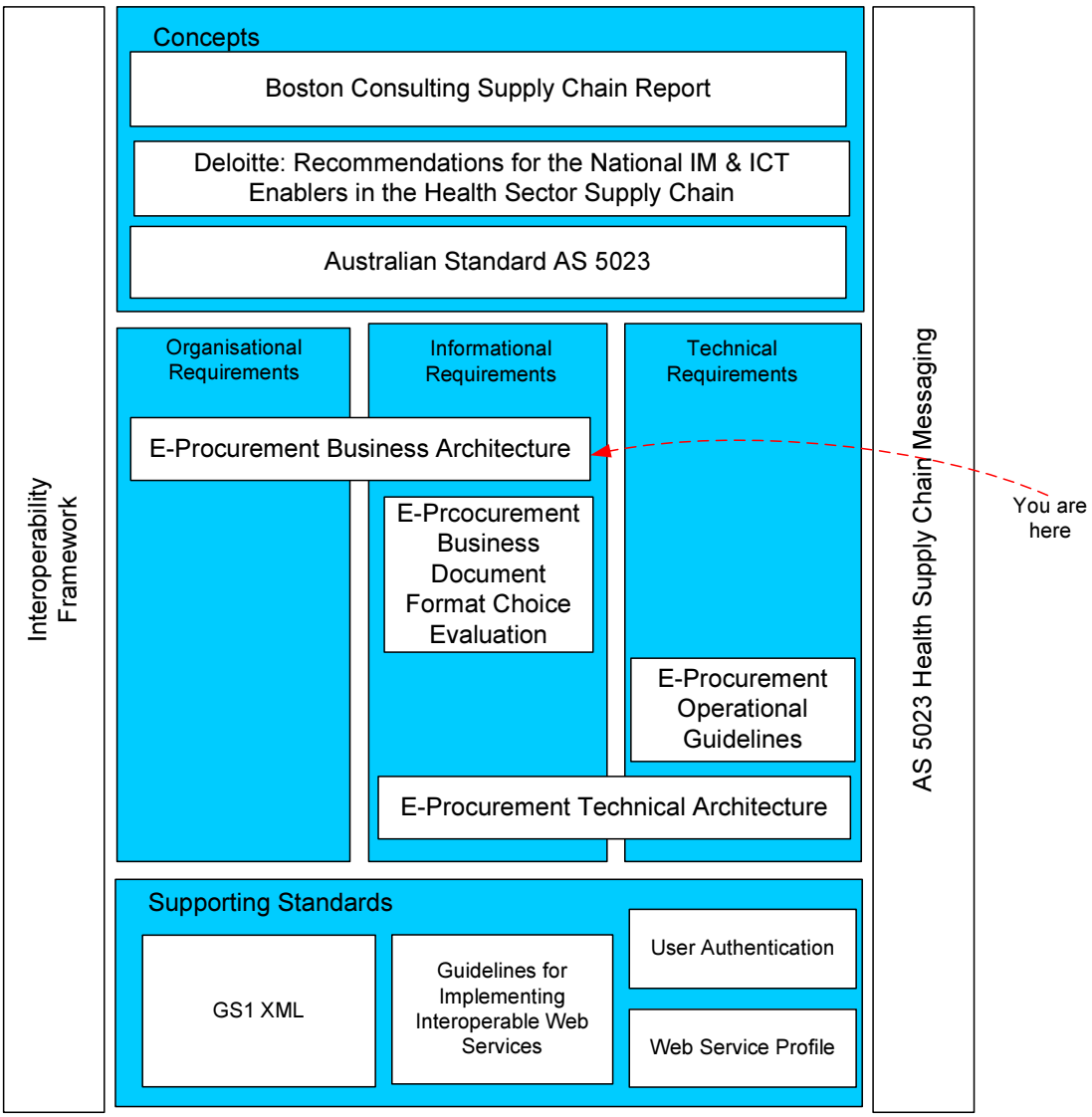

Figure 1: Document Roadmap

The documents shown in Figure 1 are being produced in top to bottom order, with the Australian Standard for Health Supply Chain Messaging [HSCM2004] underpinning all of the technical documents.

E-Procurement Business Architecture is this document.

E-Procurement Technical Architecture specifies the implementation of Web Services to support the exchange of business documents in the XML formats selected in the *Business Document Format Choices for Health E-Procurement* [BDFCEP2007].

The *E-Procurement Operational Guidelines* [EPOG2007] defines the non-functional characteristics required of services provided by e-procurement hub service providers, and may form the basis of Service Level Agreements between jurisdictions and hubs. It will be published shortly.

1.4 Document Overview

The three perspectives on a software architecture suggested by the NEHTA Interoperability Framework [NIF2006] are *Organisational*, *Informational*, and *Technical*. We use these perspectives as the major sections of this document.

The document starts with the Organisational Perspective, which shows the roles that various parties play in the proposed e-procurement architecture.

For ease of comprehension, an overview of the Technical Perspective is presented next, and an introduction to the Informational Perspective is shown last. The part of the Technical Perspective presented here explains the workings of e-procurement hubs, and relates closely to the Organisational Perspective, whereas the Informational Perspective overview relates mostly to documents which can be considered "payload" for the technical architecture. These documents are already well understood in the health procurement domain, and are derived from the relevant Australian Standard. The completion of the Technical Perspective is provided in the *E-Procurement Technical Architecture* [EPTA2007] and the Informational Perspective is completed by the formal specifications of the XML documents selected in the *E-Procurement Business Document Format Choice Evaluation* [BDFCHP2007].

2 Executive Summary

The goal of E-Procurement is to replace existing paper-based documents used in purchasing goods for the Australian Health sector by the exchange of electronic documents in the context of business processes shared between buyers and their suppliers, and facilitated in some cases by hub service providers.

The architecture identifies three major roles in e-procurement: buyer, supplier and hub. Buyers and suppliers may exchange documents directly by invoking Web Services that the other party implements. However, in many cases hubs will be used between the two parties exchanging documents. Hubs provide the following primary services: store and forward, and document translation. Store and forward allows for the case where suppliers are not continuously connected to the internet, and wish to retrieve documents in batches from time to time. Document translation allows suppliers to receive documents in a format different from the standard format sent by a buyer. This may be for compatibility with existing B2B documents received from other trading partners, or for ease of integration with backend systems.

The architecture allows for multiple hubs to be used, and it assumes that each buyer and supplier have their own single connection to an internal hub or an external hub provider for exchanging all documents that are sent directly to trading partners. Each buyer and supplier bears the cost of their own internal hub or external hub provider. If a buyer wishes to trade with a supplier connected to a different hub from itself, the two hubs will forward messages between one another in what is known as a *hub interconnect*. All hubs that wish to provide services to the health procurement community must be capable of implementing the standard interfaces and message types specified in the *E-Procurement Technical Architecture* [EPTA2007], and they must agree to use this mechanism to interconnect with other hubs free of charge.

Of the set of document types identified in the Australian Standard for Health Supply Chain Messaging [HSCM2004], the following subset has been identified as important to the jurisdictions: Purchase Order, Purchase Order Response, Purchase Order Change, Despatch Advice and Invoice.

3 Organisational Perspective

3.1 Scope

The scope of the this architecture is limited to the exchange of a small number of documents, within the context of a specified public process. The logistics of goods delivery and receipt, and financial transactions are explicitly out of scope; however documents indicating that these actions have taken place may be included in the public process. Public processes are defined as templates for actual interactions that take place, and when implemented, any given public process definition may be instantiated multiple times, with each instance having specific actors playing the roles of the public process. So a given organisation (like a hospital or area health service) may be involved as the buyer in many simultaneous public process instances, in the same way that some other organisation (such as an importer or manufacturer) may play the supplier role in multiple simultaneous public process instances.

The scope of NEHTA standards for e-procurement is the interactions between the buyer and the supplier of goods. Processes that are purely internal to a buyer or supplier are explicitly out of scope. A number of public processes by which procurement occurs in the Health Domain in Australia are specified in Australian Standard 5023 *Heath Supply Chain Messaging* [HSCM2004]. All catalogue, order fulfilment logistics and payment related parts of these processes have been deemed out of scope for the first version of the NEHTA e-procurement architecture. Section 3.4 of this document identifies a single public process derived from the AS 5023 standard, and consultation with key stakeholders, which NEHTA endorses.

The solution proposed here will not include the development of new E-Procurement Hubs, as there are already many in the marketplace. The intention of this architecture is to provide a framework for standard communication between jurisdictional buyers and their suppliers that hubs will also implement in cases where they act as intermediaries between the trading partners.

3.2 The E-Procurement Community

The concept of a *community* is used in the Organisational Perspective to discuss the collection of entities (e.g. individuals, organisations, information systems, resources, or various combination of these) established to meet some objective. A community is specified in terms of community roles and a community contract.

In the case of procurement, the objective to be achieved is the exchange of documents in order to affect the purchase of goods or services. The community consists of several community roles. In this case the most important of these are a buyer and a supplier, and other roles can include e-procurement hubs, banks, shippings agents and others. The way in which these roles relate to one another is known as a *community contract*, and it is well understood by all parties involved in procurement, and specified in Australian Standard 5023 [HSCM2004].

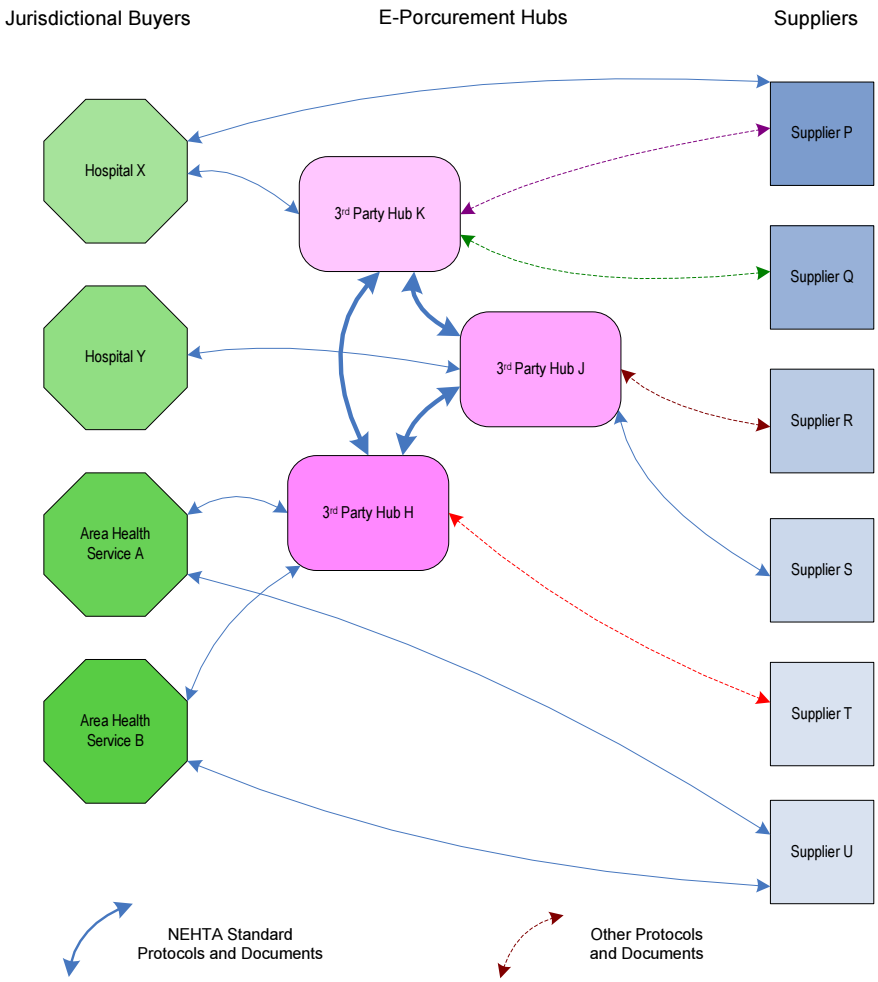

Figure 2: E-Procurement Community

3.2.1 Buyers and Suppliers

Procurement is an inter-enterprise process that is conducted with two main roles: a *buyer* and a *supplier* with the purpose of the buyer purchasing goods (including services) from the supplier. This is done by the exchange of various documents, followed by the exchange of goods and money.

In the NEHTA context, the buyer role is usually played by a hospital, area health service, or central procurement agency, which is funded directly or indirectly by a state or territory government. The supplier role is usually played by a manufacturer or wholesaler.

Figure 3 depicts two example public process instances by which e-procurement takes place. The scope of interactions for this version of the architecture is limited to the Order-to-Invoice cycle of procurement. We define only one public process in section 3.4 which meets the needs of the jurisdictions and their suppliers for this subset of their procurement activities.

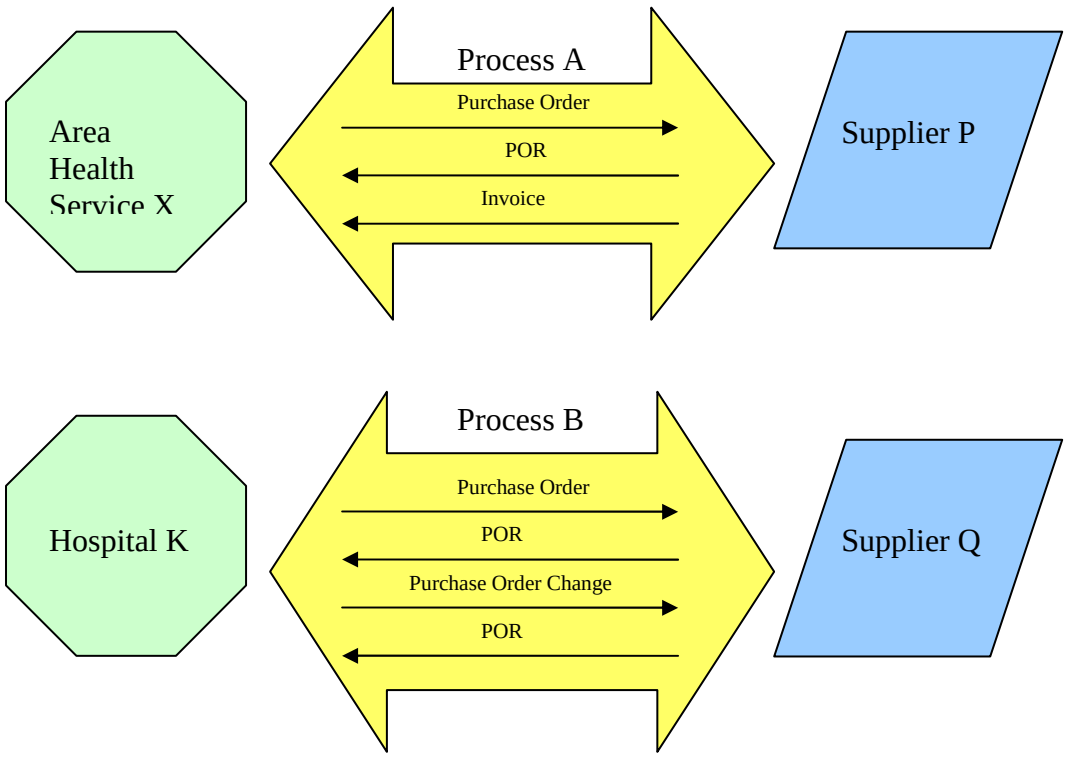

Figure 3. Example public processes in which buyers interact with suppliers

3.2.2 E-Procurement Hub

In some cases, the technical infrastructure supported by a buyer and one of its suppliers may facilitate the direct exchange of documents in the public procurement process instances that they share. However, there are many circumstances in which a trusted third party may manage the transmission of these documents on behalf of the buyer and supplier. This third party role in the community is called an *e-procurement hub*, or *business to business (B2B) hub*.

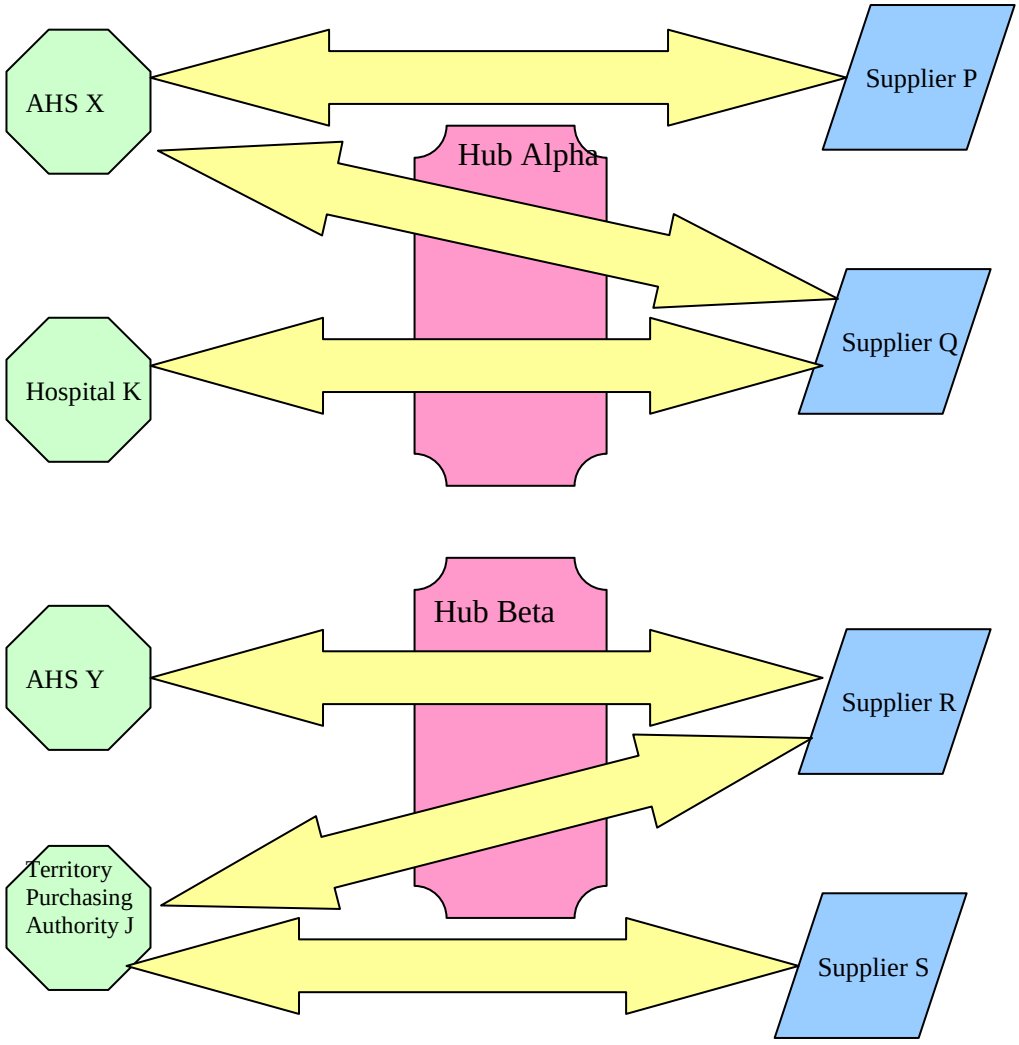

Figure 4. The use of hubs for e-procurement

Figure 4 shows that despite some buyers connecting directly with some suppliers, many procurement processes will be conducted by sending messages via a hub. There may be many hubs, and each hub can connect a number of buyers with a number of suppliers.

3.3 Hub Interconnect

As we saw in Figure 4, there are multiple possible hubs connecting various buyers and their suppliers. In fact these hubs act as pre-existing marketplaces for goods, as each hub already has a number of suppliers who are subscribed. The quickest way in which buyers can connect to several pre-existing groups of suppliers is for the buyer's hub to interconnect with other hubs to which the suppliers are already connected. In this way each party need only connect to a single hub, and the hubs will route documents between one another to allow connection of any buyer to any supplier.

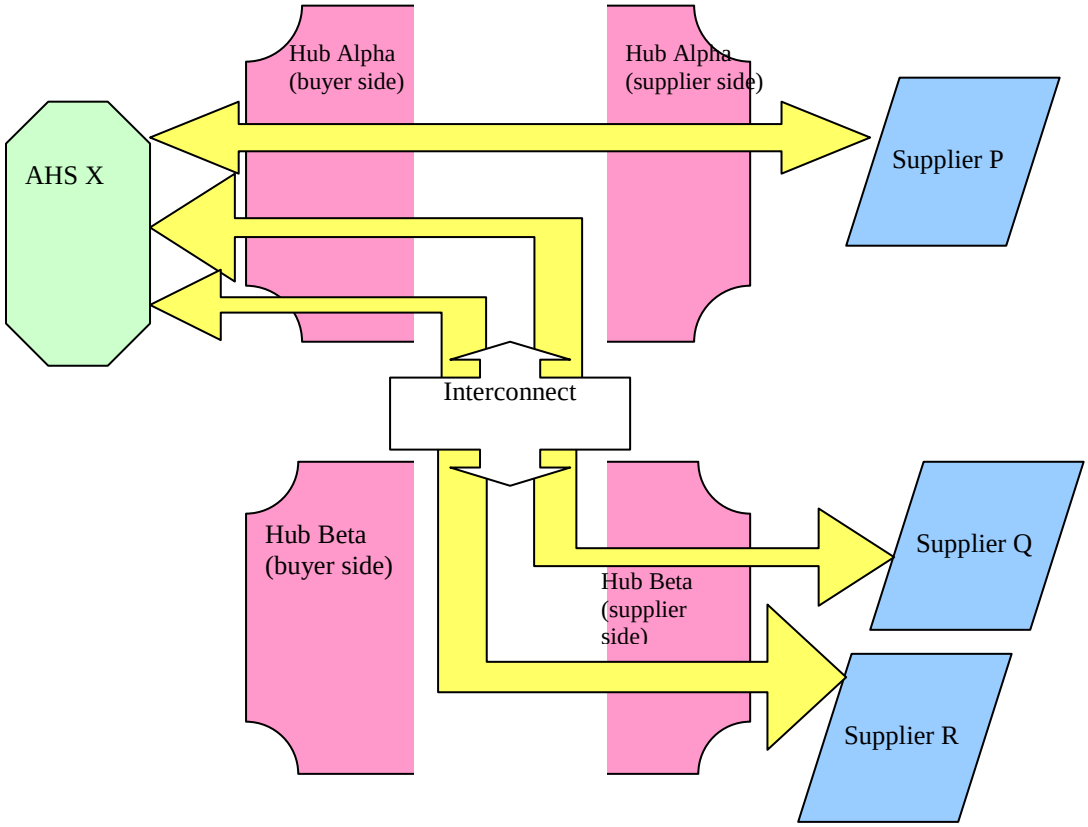

Figure 5. Hub interconnection

Figure 5 shows a single buyer, connected only to a single hub, which is conducting e-procurement processes with a number of suppliers, each of which also only connects to a single hub. The buyer is connected to an internal hub or external hub provider (buyer side) and bears the costs for the single connectivity to the hub, transportation of messages and optionally any message transformation costs applicable if the buyer is not using NEHTA messaging specifications. The supplier is connected to an internal hub or external hub provider (supplier side) and bears the costs for the single connectivity to the hub, transportation of messages and optionally any message transformation costs that are applicable if the supplier is not using NEHTA messaging specifications.

However, two of the suppliers are connected to a different hub from the one the buyer connects to. In this case the hubs involved provide one another an interconnect service, which routes the documents in the public process back and forward between the right buyer and supplier, regardless of which hubs they use and they must agree to use this mechanism to interconnect with other hubs free of charge.This model can be expanded to any number of hubs. (See Figure 11 for a more complete example.) This arrangement is called a *federated marketplace*.

3.4 Public Process Model

Australian Standard 5023, *Health Supply Chain Messaging* [HSCM2004], describes three generic public processes for electronic procurement, from synchronisation of catalogue data, through purchase order, to order fulfilment, and includes two variations on payment. These processes have been narrowed down here to a core set of interactions involving documents starting with Purchase Order and ending with Invoice.

Note: The process model includes only two roles: Buyer and Supplier. The services provided by E-Procurement Hubs are not relevant to the process being conducted by the Buyer and Seller. As shown in Figure 5, the end-to-end process can be conducted the same whether documents are transferred directly between Buyer and Supplier, or whether a Hub, or multiple Hubs are used to transfer the documents between them. See Section 4.2 for an explanation of *hub transparency* from the technical perspective.

It is important when exchanging actual e-procurement documents that the process context of the documents is understood, so that correct error handling can be in place when expected interactions defined by the public process do not occur. Fortunately, all of the documents selected for use in this public process relate to a purchase order, and some traceability information in each subsequent documents allows the original purchase order to be identified. The purchase order number, when taken in concert with the unique identifier (Global Location Number, or GLN) for the initiating buyer uniquely identifies the process, and avoids the need for explicit process management conducted using wrappers in the messaging model.

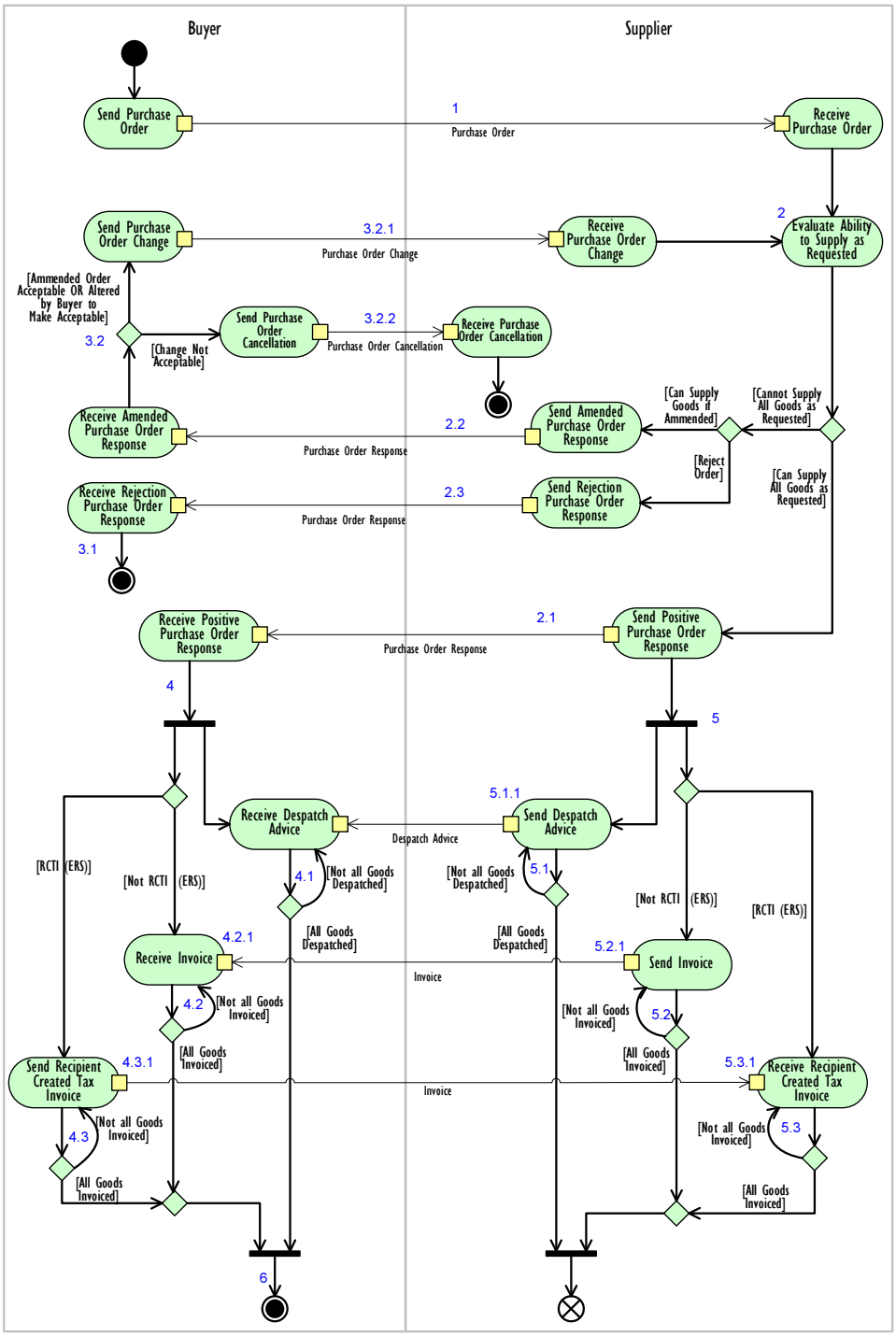

Figure 6. Public Process for Procurement

This section shows the public process for exchange of all documents that have been identified as important by the jurisdictions (Figure 6). The formal specification of the public process is done using UML 2.0 Activity Diagrams. The use of the documents within the public processes is also modelled, and then the interfaces for communication, and the document types can be derived from the models. The approach to this modelling and document derivation is discussed in more detail in Section 5.3.

A textual description of the public process in Figure 6 is as follows:

1. The Buyer sends a completed Purchase Order to the Supplier.
2. The Supplier determines whether all ordered items are available within the specified timeframes at the specified prices, for delivery to the specified location(s).

2.1 If the Supplier can supply the goods requested by the Purchase Order as is, then a "positive" Purchase Order Response (POR) is sent from Supplier to Buyer. Go to steps 4 and 5.

2.2 If the Supplier cannot supply the goods as specified in the Purchase Order, then the Supplier modifies the Purchase Order line items to reflect their actual ability to supply, and returns the amended line items as part of an "amended" POR.

2.3 If the order cannot be fulfilled at all, then a "rejection" POR indicating inability to supply is sent.

3. Either (3.1) or (3.2) is chosen by the Buyer depending whether an amended POR, or a rejected POR is received.

3.1 If the Purchase Order Response indicates that none of the ordered goods can be supplied (the order is rejected) then process terminates.

3.2 If the Purchase Order Response indicates that an amended order can be fulfilled then the Buyer can either:

3.2.1 accept the amendments by returning the altered line items from the POR in a Purchase Order Change (POC), or make some additional amendments, and send a POC. Now repeat step 2 using the POC document as the new Purchase Order

3.2.2 OR reject the amendments by cancelling the order.

4. Actions of the Buyer: The Buyer receives the "positive" Purchase Order Response, and the following steps occur in parallel (i.e. if Despatch Advice and RCTI are both to be sent, they can go out in any order):

4.1 The Buyer must wait for (possibly multiple) Despatch Advice documents until all goods associated with the Purchase Order that initiated this process have been despatched.

4.2 If the Supplier will send an Invoice, then repeat the following step until all goods associated with the Purchase Order that initiated this process have been invoiced:

4.2.1 Receive an Invoice.

4.3 If the trading arrangement with the Supplier requires a Recipient Created Tax Invoice (RCTI), also known as Evaluated Receipts Settlement (ERS), then repeat the following step until all goods associated with the Purchase Order that initiated this process have been invoiced:

4.3.1 An RCTI is transmitted for any goods received that are associated with the initiating PO.

5. Actions of the Supplier: the next step (5.1) and either of 5.2 or 5.3 that applies happen in parallel (i.e. if Despatch Advice and Invoice are both to be sent by the Supplier, they can go out in any order)

5.1 Until all goods associated with the Purchase Order that initiated this process have been despatched repeat the following:

5.1.1 The Supplier sends a Despatch Advice to the Buyer at the point that the delivery arrangements for a subset of the ordered goods are known.

5.2 If the Supplier's trading agreement with the Buyer is for normal invoicing the following step is repeated until all goods associated with the originating PO are invoiced:

5.2.1 An Invoice is sent to the Buyer for any goods despatched

5.3 If the Supplier's trading agreement with the Buyer includes RCTI (ERS) the following step is repeated until all goods associated with the originating PO have been invoiced:

5.3.1 An RCTI is received from the buyer

6. Once Despatch Advice and Invoice documents that reference goods matching all of the Purchase Order line items have been transmitted the process terminates.

3.5 Security Policy

Although there are fewer privacy concerns about procurement data than clinical patient data, there is still the possibility that some items that may be procured will be directly identified with a patient. An example of this is that patient names are associated with orders for some prosthetic devices. In any case, some purchasing data is commercially sensitive and should not be allowed to be exposed to potential eavesdropping that can occur when transmitting unprotected data on the internet.

The potential for sensitive data to be included in procurement documents necessitates that a policy of communication privacy be adopted for e-procurement document transmissions. The mechanism for privacy will be determined by the Web Services standards chosen in the *Web Services Standards Profile* [WSSP2006], and ensured by the application of the *Guidelines for Implementation of Interoperable Web Services* [GIIWS2007].

4 Technical Perspective

4.1 Introduction

This section explains the correspondences between the Organisational Perspective and the Technical Perspective at a business level. The details of the Technical Perspective can be found in the *E-Procurement Technical Architecture* [EPTA2007], which specifies the semantics of the Web Services which support the process definition in Section 3.4.

This section discusses the technical functionality provided by e-procurement hubs, including the ability to communicate with suppliers by a variety of mechanisms which are outside the scope of this architecture. It then goes on to specify the messaging infrastructure which will be used for communications between the buyers and hubs, and in some cases between buyers and suppliers directly, and in other cases between hubs and suppliers.

Finally, a number of other technical considerations are discussed.

4.2 Direct Connection and Hub Transparency

The architecture explicitly allows for a buyer to directly connect to interfaces implemented for e-procurement messaging by a supplier (and vice versa). In Figure 7 the green (dotted) and red (solid line) "T pieces" represent the interfaces through which the messages are sent.

This architecture treats any procurement hub (or hubs) that are used as agents to deliver a business document to a trading partner as a proxy for that trading partner. In other words the interfaces and messages supported by the hub are the same as those supported by buyers and suppliers that are interacting directly. Figure 7 shows a messages being sent from a buyer to a supplier and back using web services invocations in three different ways, each of which uses the same interfaces and messages. The diagram shows the same invocations, being made from Buyer to Supplier directly, indirectly via a hub, and indirectly via two interconnected hubs.

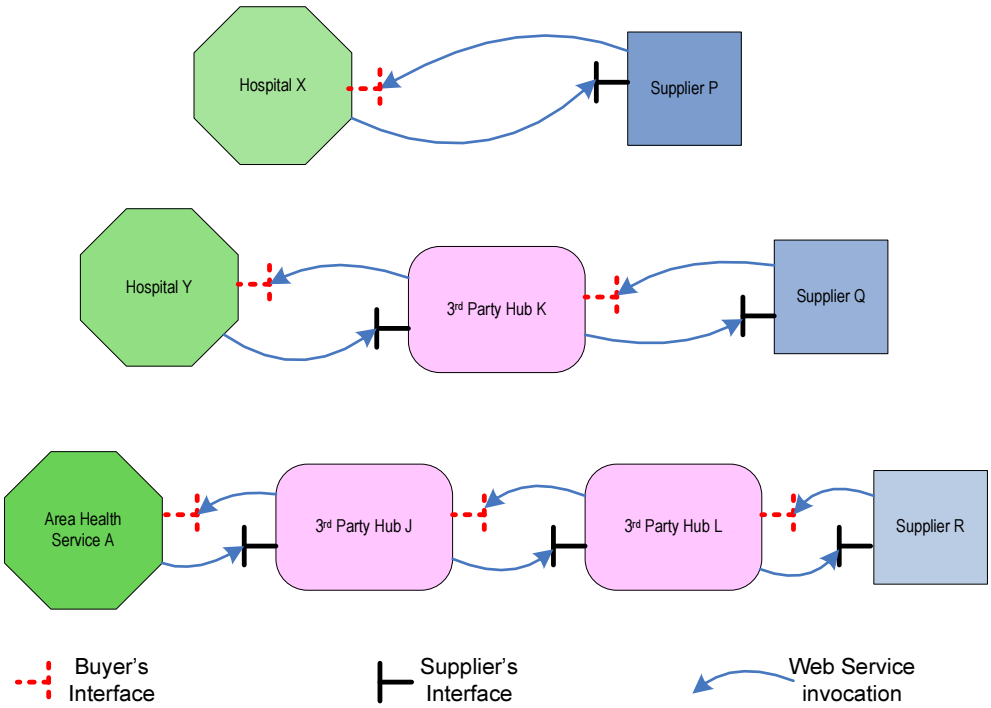

Figure 7: Hub Transparency

The hubs support the same kind of interface as the supplier and the buyer, and so buyers and suppliers are making the same kind of invocation on the interface regardless of whether it is communicating with the other party or with a hub. Likewise, hubs can pass on procurement documents to other hubs using the same interfaces as they would use to communicate with the end recipient. This is what is known in distributed systems as *transparency*.

Note, however, that when secure messaging is used for the invocations, the messages must be encrypted specifically for the party supporting the service being invoked, rather than for the ultimate addressee. e.g. If a buyer invokes the service interface at a hub, the message must be encrypted for that hub so that the hub can open the contents of the message to look at who the ultimate addressee is. The message will then be re-encrypted and forwarded to the addressee, or the hub connected to the addressee, once again using the security credentials of the party hosting the service being invoked, not the credentials of the ultimate addressee. So even though the type of interface being invoked will be the same regardless of whether an end-user role (buyer or supplier) or hub is being called, the security identity of the party being called must be taken into account.

The diagram in Figure 7 also shows how the hub interconnect model works. That is, each hub acts toward the next caller down the line as if it were the end recipient of the message. Each participating hub will have knowledge of which parties use which hubs for their messaging, and so in practice messages will never need to be sent via more than two hubs – the one contracted for messaging by the buyer, and the one contracted by the supplier (as in the bottom row of the diagram). If both parties are connected to the same hub, then the middle row in the diagram represents the message passing scenario.

4.3 Hub Functionality

4.3.1 Store and Forward

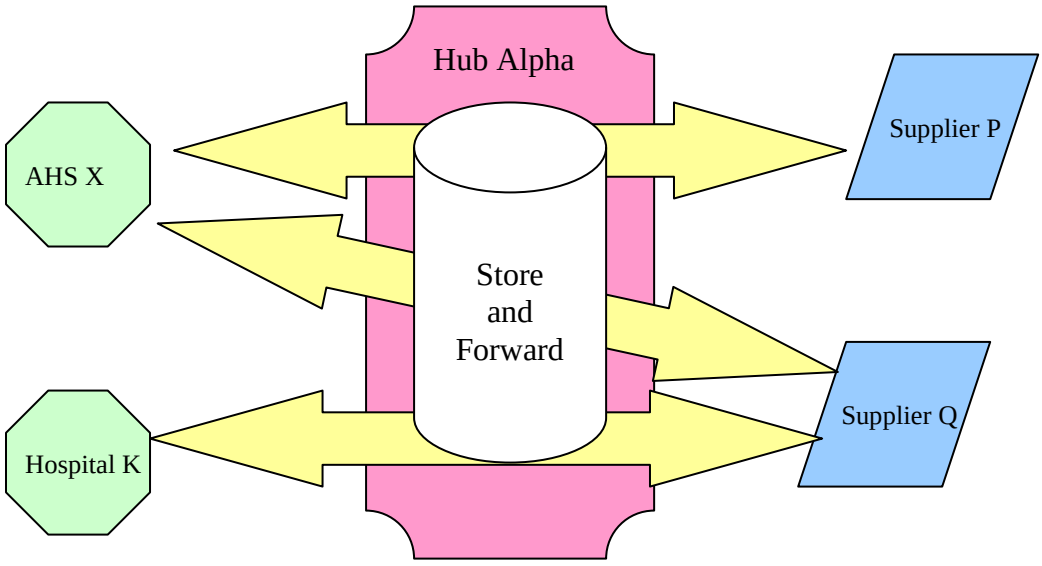

Figure 8. Store and forward capability

One of the primary properties of an e-procurement hub is its high availability to both buyers and suppliers, even if buyers and suppliers are only infrequently connected. The hub has the role of a post office with mailboxes for all interacting parties, and it reliably stores the documents that are transmitted during the e-procurement public process instances that are being conducted by the buyers and suppliers. It stores messages on behalf of both

parties, and forwards them when either party connects to it. This has been the traditional role of EDI Value Added Network (VAN) providers.

4.3.2 Message Transformation

In addition to store-and-forward functionality, hubs also provide the ability to transform documents from one syntax to another, and to allow different technical messaging protocols to be used by different subscribers.

The range of communication types between e-procurement hubs and suppliers varies in two aspects: channel (communications protocols) and message format. Message formats include legacy EDI formats, and older XML standards, as well as proprietary formats and CSV files. The hubs use the term "channel" to mean the technical messaging protocol stack used to convey messages to and from a client of the hub. Technically it is possible for most formats to be communicated over most channels, but in actual usage these tend to come in particular combinations. In Figure 9 the different coloured arrows represent a number of example format and channel combinations. An example from the figure is EDIFACT [EDIFACT-UN] over AS2. In this case the message format is defined by UN/EDIFACT, and AS2 is a protocol stack standardised by the IETF that uses HTTP and MIME over TCP/IP or SSL.

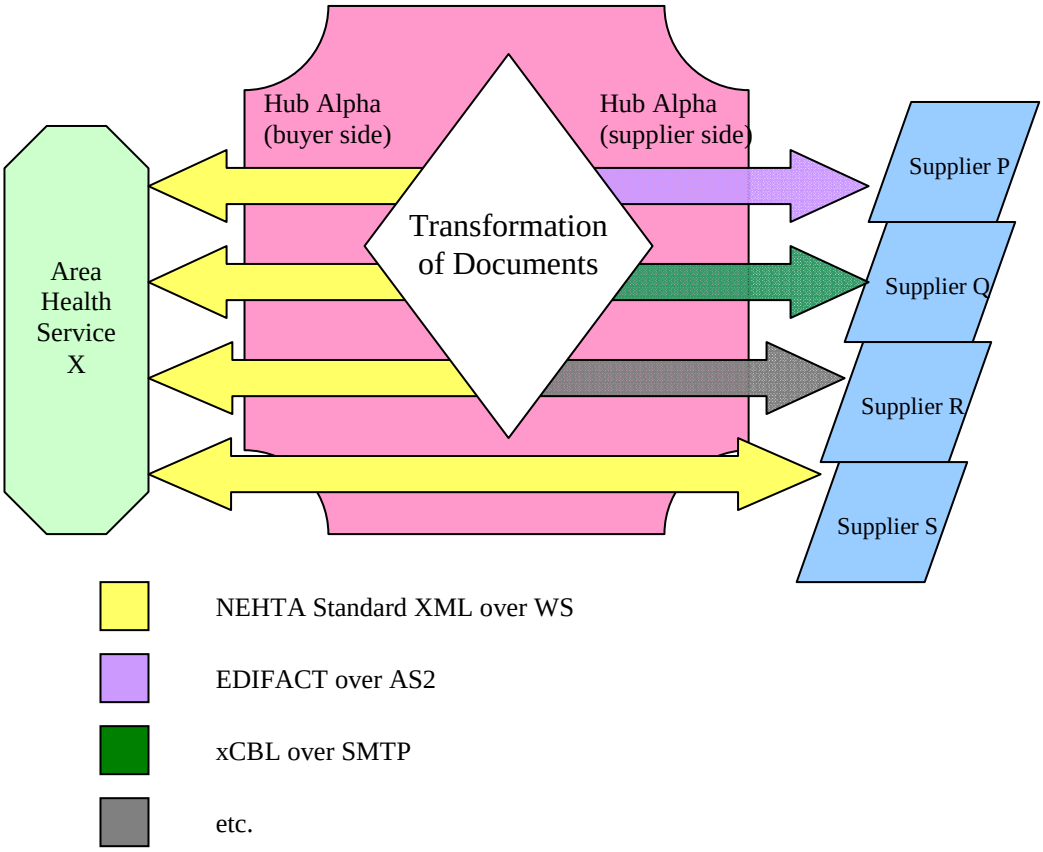

Figure 9. Message Transformation

In Figure 9 there is a buyer (Area Health Service X) which is engaged in several public e-procurement process instances with different suppliers. The buyer will use the same NEHTA standard technical messaging protocols to send documents formatted using the same NEHTA XML standard for use by all of the suppliers (indicated by yellow [uniform pale shade in black & white] arrows in the figure). The hub then transforms the documents into a format preferred by the supplier and connects to the supplier using their preferred channel. Documents sent back from the supplier are also transformed back

into the NEHTA format used by the buyer, and the hub connects to the buyer using the NEHTA Secure Messaging protocols.

4.4 Secure Messaging

This section refers to the secure messaging work done in NEHTA. The approach taken for secure messaging is to use Web Services for messaging, and a service oriented architecture to relate these services to the business requirements. The high level architecture for secure messaging is given in the *Technical Architecture for Implementing Services* [TAIS2006].

The profile of W3C standards to implement the Web Services stack includes HHTP for transport, WSDL for service definitions, SOAP for transporting requests on service interfaces, and WS-Security for security. WS-Addressing may be used to provide the addressing information required by hubs to route messages between buyers and suppliers. The exact profile of Web Services standards mandated for use by NEHTA is specified in the *Web Services Standards Profile* [WSSP2006]. The guidelines for implementation of Web Services to achieve maximum possible interoperability are given in *Guidelines for Implementation of Interoperable Web Services* [GIIWS2007].

4.4.1 Protocol Layers

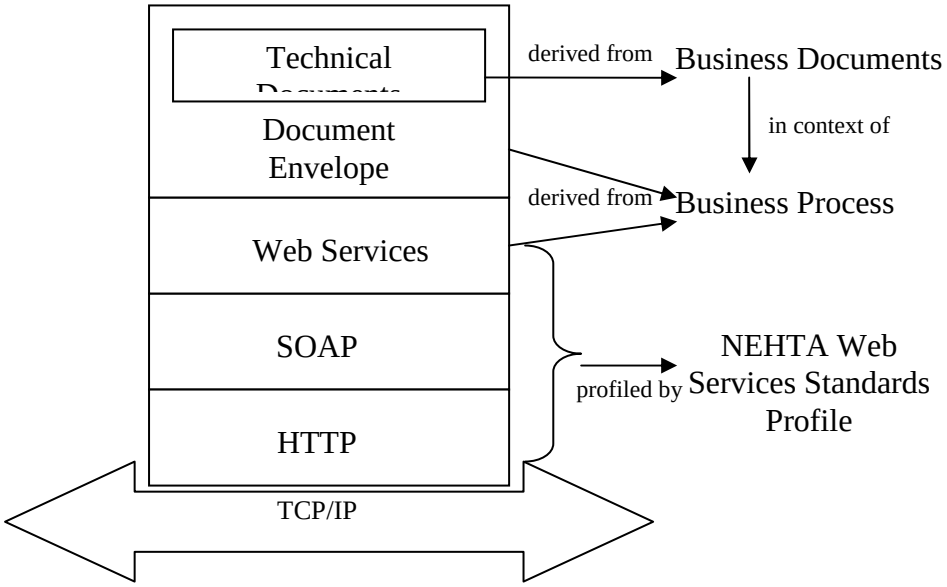

Figure 10. Protocol Layers and their Derivation

Figure 10 shows the protocol stack to be used for e-procurement messaging, and some relationships to other parts of this architecture, and the NEHTA Secure Messaging Protocol. The *Technical Documents* will be XML that conforms to the XML Schemas which represent the *Business Document* specifications in [HSCM2004]. The *Document Envelope* consists of two parts:

1. An application-level document header which contains indentification of the trading partners, and some process information
2. A technical SOAP wrapper that contains web services headers for security, addressing and reliability information, some of which will be generated from the WSDL service definitions, as determined by [GIIWS2007].

The *Web Services* will be interfaces defined in WSDL, derived from the document exchanges in the business process.

The standards to be used for the lower layers of the protocol are specified by the *Web Services Standards Profile v2.0* [WSSP2006].

4.4.2 Quality of Service

Quality of Service characteristics of interactions with an E-Procurement Hub Service are suggested in the *E-Procurement Operational Guidelines* [EPOG2007] document. This document specifies guidelines for:

- Performance
- Scalability
- Availability

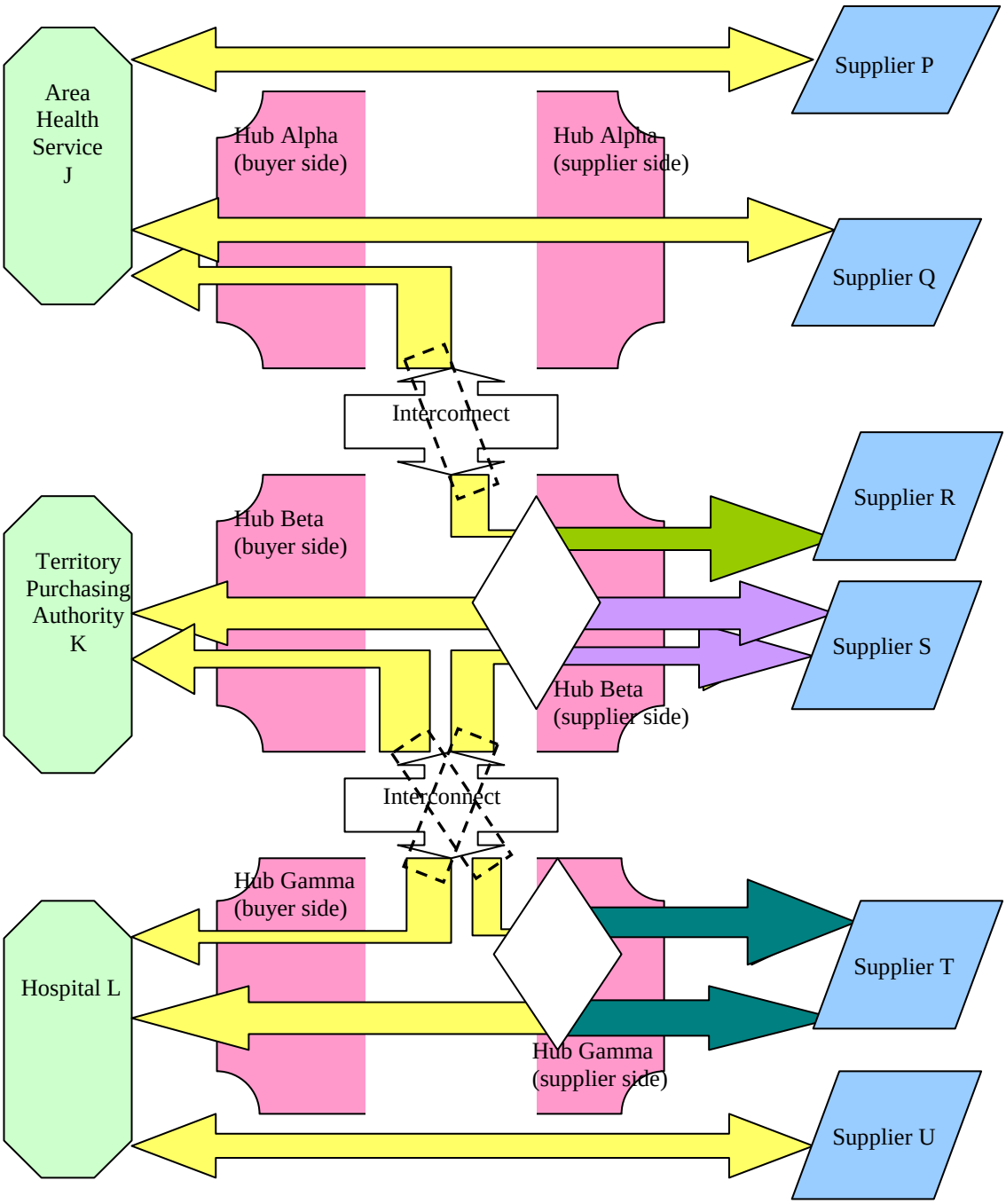

Figure 11. The Overall Architecture

4.5 Additional Technical Considerations

Figure 11 shows all of the aspects of Organisational and Technical Perspectives in a single diagram. Aside from the processes and documents, and the derived Web Service definitions that will be used to interchange e-procurement data, there are a number of additional constraints that this architecture imposes.

4.5.1 NEHTA Protocols for Interconnect

The transformation part of the hub's role is logically placed at the supplier side of the hub. All messages must be interchanged between the hubs using the NEHTA standard messages and protocols specified in [EPTA2007]. This allows each hub to choose which kinds of messages and protocols, over and above the NEHTA standard, they will offer to their suppliers, and does not presume that any hub supports any particular non-NEHTA-standard set of messages and protocols.

4.5.2 Party to Web Services End-Point Mapping

The trading partners in e-procurement will be uniquely identified in the technical perspective using Global Location Numbers (GLNs). A service or information directory which maps the GLN of a trading partner to a URI for use in Web Services invocation will be defined. It will make the following information available:

GLN	Web Service URI for direct connect to GLN owner	Web Service URI for GLN owner's hub

By looking up entries in this directory, a hub which receives a document for a party unknown to it may look up which hub to forward the document to.

4.6 Enabling Suppliers with Low Technical Capabilities

In addition to the ability for transmission of machine readable documents over various channels to a supplier, e-procurement hubs provide other possible enabling technologies for suppliers who do not have the capability to implement computer manipulations of electronic documents.

4.6.1 Web-based applications

Most e-procurement hub providers implement a suite of web-based applications that allow suppliers (or buyers) to view human-readable forms of electronic documents using a web browser. In addition, the applications allow the user to create new documents based on the ones that they are viewing. For example, a supplier can log on to the application at the hub provider's web site, and view a new Purchase Order which has been received. They can then create a Purchase Order Response by clicking on a button, which causes a new document to be created using the incoming Purchase Order as a template. Then the supplier can use the web interface to edit line items that cannot be supplied as requested. The Purchase Order Response can then be sent to the buyer, and the buyer can receive it via a standard NEHTA XML message over Web Services.

This kind of web application service is usually coupled with email messages alerting a supplier that they have new documents waiting to be processed at the web site, and provision of printable versions of the documents. These

web-based applications place a relatively low degree of technical burden on a supplier, and the costs of having an internet connection and maintaining a computer that can receive email and browse the web are usually covered by other aspects of the supplier's business in any case.

4.6.2 Fax and Document Processing Services

The lowest technological capability currently required in order to supply goods to the Health Sector is telephone line and fax machine. The ability of many hubs to create PDF documents from XML messages is already in place. These can be automatically faxed by an application and no human intervention is required. However, in order to receive replies to these faxes, while maintaining all of the efficiencies of e-procurement for the buyer, a document processing service is required where a human re-keys information on faxed documents received from suppliers, potentially with the aid of OCR technology. This could be facilitated by the kind of web application described in Section 4.6.1. Any reasonable volume of document processing will result in costs that probably exceed that of establishing an internet capability.

This kind of service exists in Denmark to assist business to comply with the government's requirement to receive all invoices in electronic form.

5 Informational Perspective

5.1 Document Types

There are sixteen kinds of document identified by IT-014-10-01 in Australian Standard 5023. This architecture selects a subset of these. The standard then goes on to describe these as *data sets* which represent the business documents using a tabular form of fields to be contained in the documents, and business rules for validating the correct formatting of any given document instance. These rules include fields being optional/mandatory, repeating, and having dependencies on other fields.

5.2 The Standard Messages

The following *italic text* is an extract from AS 5023, briefly describing the five messages chosen for Health e-procurement in consultation with the jurisdictions. These are specified in parts 2 and 4 of the standard (italic text is quoted from the standard):

1. Purchase order

   Purchase order message including stand-alone order, release against standing offer arrangement.

2. Purchase order response

   Response to purchase order, indicating ability to supply.

3. Despatch advice/Advance shipping notice

   Identification and advice of shipment(s) that have been or will be imminently sent to the customer. Customer receipt of the despatch advice message shall precede the arrival of the physical shipment.

4. Invoice

   Invoice for goods or services.

5. Purchase order change

The Purchase order change message serves two purposes in the standard:

a. Cancellation of a previously sent purchase order message

b. Change to a previously sent purchase order message.

The technical document types used to represent the above messages may have a separate Purchase Order Cancellation message, which could be used instead of Purchase Order Change to cancel orders. In this case there would be six document types to represent the six purposes above.

The AS 5023 standard states (in Part 1-2003, Section 5.7.1, article (j)) that a Remittance Advice message should be used to transmit a Recipient Created Tax Invoice. This does not match conventions used with Technical Documents, which use either an Invoice message type for RCTI, or have a self-created invoice type specially for this purpose. This may result in seven technical messages being used. The use of Invoice rather Remittance Advice technical message types for RCTI will be a deviation from AS 5023 that is endorsed by NEHTA.

5.3 Technical Document Specifications

5.3.1 Buyer Perspective

The data sets (document types) described in AS 5023 are at the business level, and specified independently of any technological framework. The format

favoured by NEHTA for technical document specifications is XML Schema (XSD format). This follows the requirement by the jurisdictions for a single format in which procurement business documents can be encoded for transmission to all suppliers. In addition, the XML Schema format is required in order for documents to be validated when transmitted in Web Services invocations.

5.3.2 Supplier Perspective

There are a number of large suppliers to the health domain which have long standing implementations of EDI messaging. Other suppliers are already enabled with older XML-based messaging implementations. E-Procurement hubs are capable of transforming between NEHTA standard XML and EDI or other XML formatted messages, and will do so for a set of additional charges. Depending on the hub's business model, these include a charge for implementing the transformation, and/or a charge to transform each document.

5.4 Choosing the XML Document Formats

The choice has been made to adopt an existing set of international standard technical documents (e.g. GS1 [GS1-XML] or UBL [UBL-FAQ] XML Schema). The choice of format for technical documents was made using an evaluation process detailed in *Business Document Format Choices for Health E-Procurement – A Final Evaluation* [BDFCEP2007].

6 Glossary

Activity Diagram	A UML model and diagramming standard for representing processes and data flows.
AS2	Applicability Statement 2 is a specification about how to transport data securely and reliably over the Internet. It is specified by IETF in RFC 4130. It supports encryption and digital signing, and non-repudiation. It uses HTTP over TCP/IP or SSL.
CSV	Comma Separated Value. A text file format where table column entries are separated by commas, and rows by newlines. This format is often exported from spreadsheets and databases.
EDI	Electronic Data Interchange. A late 1970s initiative to interchange documents between business partners in electronic formats.
GS1	Global Standards 1. A not-for-profit global standards body for bar codes, product data synchronisation and RFID technologies.
HTTP	Hypertext Transfer Protocol. A standard protocol for transferring documents – used in the World Wide Web, and Web Services.
IETF	Internet Engineering Task Force. The body that standardises much of the protocol infrastructure for the internet.
MIME	Multipurpose Internet Mail Extensions
SOAP	Simple Object Access Protocol. A protocol for exchanging XML-based messages over computer network. A fundamental part of Web Services.
SSL	Secure Sockets Layer. A cryptographic protocol for private communications over the internet.
TCP/IP	The fundamental transport protocols of the internet, over which all other application layer protocols (such as SSL and HTTP) are transmitted.
UBL	Universal Business Language. A set of XML documents designed at OASIS

	for business interchange. Includes all of the e-procurement documents.
UMM	UN/CEFACT Modelling Methodology.
UML	Unified Modelling Language.
VAN	Value Added Network. A store and forward service for transmitting EDI messages between business partners. Historically this was done with modems or leased lines, but now VANs operate over the internet.
WSDL	Web Services Description Language.
XML	eXtensible Markup Language.
XML Schema	A language used to prescribe formatting rules for XML documents.
XSD	XML Schema Description. The file type for XML Schema documents.
UN/EDIFACT	United Nations/Electronic Data Interchange For Administration, Commerce, and Transport. A set of standards established by the UN Centre for Trade Facilitation and Electronic Business.

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