Message Protocols for Enabling Digital Services:

A Report for the

Australian Government

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CSIRO

Message Protocols for Enabling Digital Government Services

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1. Executive Summary

Purpose of paper

- To identify standard industrial information exchange patterns, messaging requirements (including quality requirements) and messaging solutions to support the enhancement of automated and wholesale-level data exchange between businesses and government in a single environment.
- To provide expert advice and recommendations in relation to developing a set of digital Message Protocols for use in Australia.
- To develop a framework for ensuring ongoing interoperability between the protocols.
- To provide recommendations to encourage industry and government adoption and a viable ongoing governance framework for the set of Message Protocols.

Recommendations

The report makes the following recommendations to encourage industry and government to adopt a more modern approach around the use of Message Protocols in the digital exchange of data:

- A range of information exchange patterns needs to be supported. These include both information query/retrieval and transactional types. It is noted that batch processing systems are slowly moving towards real-time utilisation. This needs to be accommodated in any adoption programme.
- Message Protocols need to support a spectrum of information/message exchange patterns. Whilst ebMS3/AS4 is capable of supporting most information and message exchange patterns, it comes with some (necessary) complexity. ebMS3/AS4 should be considered the preferred standard messaging protocol for most services.
- REST tends to couple the message and application layers but only does quality guarantee at the application layer. Standards or profiling are still to be developed for RESTful approaches.
- Clear business scenarios and values are required to adopt a decoupled messaging layer and quality support on the layer.
- Use of a lightweight interoperability and governance approach (by using profiles of existing standards) is most likely to encourage industry to take an active role in co-development and management of standards, resulting in outcomes that are more widely adopted.
- A compliance test-suite is required to ensure the interoperability of required messaging profiles.

- Establish reference architectures and implementation examples to improve adoption.
- Support diverse protocols, QoS, and deployments to meet different application requirements:
  - e.g., P2P & Intermediary Gateway;
  - support diverse ICT capabilities.
- To speed up adoption and industry buy-in, the government should sponsor a number of early pilot initiatives to educate government agencies, industry organisations and software communities as well as showcase the process and value of adoption.

Key issues

There is a need for an updated framework for business-to-government interactions that is consistent with the emerging business-to-business practices associated with digital services and data exchange patterns that utilise a common message protocol.

New approaches needs to be articulated at different levels;

- at a policy level through a series of service delivery principles;
- at strategic technology level through guidelines and standards; and
- at an implementation level through directories, technical documentation, tool sets, testing, etc .

This framework should inform the future policies and standards for the Standard Business Reporting (SBR) program as well as broader government policies regarding the establishment of agile methodologies to adopt ever emerging exchange patterns to enhance the inter-operability of digital business activity.

The framework should also set out the components that are required to create the appropriate level of assurance and confidence that information can be exchanged easily, reliably, accurately and securely. The framework should be flexible to promote modern service oriented interactions and use of international approaches such as ebMS3/AS4 standards while recognising the need for legacy and bespoke systems.

Background

As enterprise business and expertise become more specialised and focused, there is an increasing demand for more efficient business to business (B2B) collaboration and automation of transactions. Similarly, government's role as a participant in the broader economy and in monitoring and regulating various business activities (e.g., tax, legislative compliance) also requires business-to-government (B2G) interactions.

As recommended by the Government 2.0 taskforce [1] and Government Digital Policy Reform [2], the Australian Government has committed to achieving a more open, accountable, responsive and efficient government by: (a) making more public data open, accessible and reusable; and (b) encouraging G2G & B2G collaborations to more effectively and efficiently deliver government services.

The Australian Government, through the SBR initiative, is working on improving and extending digital service delivery by considering standardised B2B messaging protocols and profiles with the aim of building an open, standardised and domain-independent messaging infrastructure to support Australian B2B/B2G/G2G communications.

Stakeholder consultation

Broad stakeholder consultation was undertaken with a set of government and industry-based participants to identify the current digital interaction trends being pursued, the speed at which adoption is occurring and their expectations of engaging with government.

All stakeholders surveyed acknowledged the benefits possible in moving to a digital interaction model for the exchange of data. Notably, there was consensus regarding the importance of government being part of a single system for data exchange rather than running separate message protocol interaction processes.

It was also widely agreed that the evolution of new processes is still evolving and that an agile approach to Message Protocols and data exchange patterns will need to be adopted so that inefficient processes do not become embedded in business dealings.

2. Introduction

As enterprise business and expertise become more specialised and focused, there is an increasing demand for more efficient business to business (B2B) collaboration and automation of transactions. Similarly, government's role as a participant in the broader economy and in monitoring and regulating various business activities (e.g., tax, legislative compliance) also requires business-to-government (B2G) interactions. In addition, different government agencies create and hold separate citizen and enterprise datasets to support the provision of different services. It is now recognised that they often need to work together for the delivery of comprehensive and better servicing of industries and individuals, thus requiring more efficient government-to-government (G2G) interactions. The Australian Government has recognised these business and technology trends. As recommended by the Government 2.0 taskforce [1] and Government Digital Policy Reform [2], the Australian Government has committed to achieving a more open, accountable, responsive and efficient government by: (a) making more public data open, accessible and reusable; and (b) encouraging G2G & B2G collaborations to more effectively and efficiently deliver government services. This requires both effective ways of sharing data and conducting business/government service transactions.

As an Australian e-Government initiative, Standard Business Reporting, "SBR", was introduced by the Australian Government in 2010 to modernise digital interactions and reduce the reporting burden [3]. SBR incorporates standard terms that are used in government legislation and reporting, whose corresponding information is distributed and embedded in various enterprise business software systems. SBR automatically extracts this information as part of running a business and prefills it into the relevant government reports. The report can then be checked for accuracy and submitted directly and securely to government via SBR messaging infrastructure without the need to manually log into a separate portal. This technology has the potential to be used not only for B2G communication, but also for G2G and B2B collaborations as well as offering significant productivity savings for businesses and governments (Federal and State).

SBR has achieved its initial success with considerable adoptions in taxation lodgements and more broadly in the finance industry, creating improvement around the efficiency of companies' finance regulation reporting. However, in seeking to extend SBR to a wider range of sectors and applications, some inherent shortcomings of the current SBR messaging protocol were observed, such as non-standard SBR message packaging, limited SBR message exchange patterns and domain-specific APIs. [4]. For example, some information exchange involves updating information and is part of a legal transaction. Other information exchanges require significant two-way communication with one smaller party being less IT-infrastructure capable, while additional scenarios involve only one-way data publication and sharing. These were not part of the original SBR design goals. In the meantime, cross-organisation integration mechanisms have also evolved. Traditional Web Service-based integration approach, new pure (RESTful) Web API-based approaches and standard solutions around decoupling the upper

application layer from the messaging infrastructure are changing how organisations share data and perform collaborative transactions. These capabilities enable broader and more complex digital interactions and the creation of a more efficient wholesaling service-broker model to be established in the economy.

The limitations of the original SBR have considerable impacts on the development and maintenance costs of adopting SBR in a wider range of sectors, as well as added complexity in building new capabilities into SBR.

As a result, the Australian Government is working on improving and extending SBR by considering standardised B2B messaging protocols and profiles with the aim of building an open, standardised and domain-independent messaging infrastructure to support Australian B2B/B2G/G2G communications. The messaging protocols and infrastructure will support a wide range of information and message exchange patterns with guidance on how to choose the best implementation approaches for different exchange patterns.

This report is a joint effort of NICTA and CSIRO to provide expert advice and recommendations in relation to developing a set of messaging protocols and profiles for use in Australia. The advice and recommendations are based on a wide range of industry surveys and literature reviews of the existing information/message patterns, protocols and profiles for different business transactions. The set of protocols/profiles will incorporate multiple transaction types, characteristics and traits so that these standards satisfy a wide range of needs in Australia.

3. Scope and Methodology

3.1. Scope of This Work

As shown above, SBR's key role is to facilitate organisation-to-organisation messaging. Therefore, this report will focus on cross-organisation information exchange patterns, although some common patterns widely used inside organisations may also be mentioned for comparison and reference purposes.

Figure 1 illustrates the scope of the messaging protocols and their relationships.

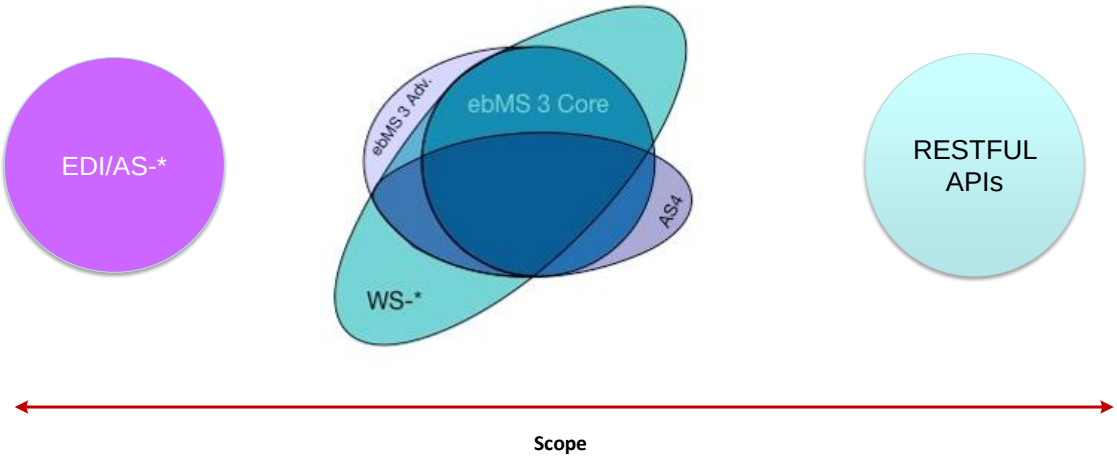

Figure 1. The scope of the messaging protocols considered in this report

Electronic data interchange (EDI) was intended to provide a standard means to exchange data electronically. It existed for more than 30 years and many standards were developed around it (e.g. X12, EDIFACT). With the extensive use of Internet for B2B communications, additional profiles called Applicability Statements (AS) were developed to transport EDI messages over the Internet. However, they are now being replaced with newer messaging/integration standards such as SOAP-based web services (WS-*).

As WS-* standards consist of a large set of standards supporting a wide range of quality assurance needs such as reliability, security and ad-hoc policies, there has been a strong need to develop additional profiles for selecting a subset of the WS-* standards, including version selection, to promote better interoperability during standard implementation. One such standard/profile is ebMS3/AS4 developed by OASIS [7]. There is a reasonable amount of ICT industry tooling and expertise support available and past successes using ebMS3/AS4.

In the EDI, WS-*, and ebMS3/AS4 cases, the Internet or the basic Web layer is only used as a black-box transportation layer to transport standard messages packaged using EDI/AS-* or WS-*/ebMS3/AS4 standards.

More recently, there is also a significant trend to use the basic Web itself to directly transport business documents and messages in XML or JSON format. The basic Web uses the HTTP protocol which includes some standard ways, named REpresentational State Transfer (REST), for exchanging messages. This has some support for reliability and security but is often considered less standardised with more limited assurance on quality of service (QoS) compared to WS-*/ebMS3/AS4.

We have more detailed reviews of these standards in Section 5 of this report, focusing on WS-*/ebMS3/AS4 and RESTful approaches.

3.2. Our Methodology

Following an evidence-based approach in our technology reviews and recommendations, we have used the following methodology in developing this report:

- Business requirements and evidence-driven approach

  The ultimate goal is to improve Australian government and industry productivity by facilitating efficient collaboration and communication between parties. Therefore, the overall architecture design and messaging protocols must reflect real industry requirements (data exchange patterns, messages sizes, required QoS), existing IT capabilities and adopted technologies and future technology moves. To collect these business requirements as evidence to guide our technology reviews, we conducted a comprehensive industry survey by interviewing government agencies and private companies. Details of this survey are presented in Section 4.

- Standards, profiles and cross-organisational message exchange-focused

  Over time, the software architecture, academic and practitioner communities have accumulated a large number of design patterns, including data exchange patterns, to address the functional and quality needs of various applications [17][18][19]. On the other hand, there are a number of standard messaging protocols capable of supporting one or more specific data exchange patterns [7][10][11][12]. Since SBR is dedicated to facilitating organisation-to-organisation documentation exchange, our technology review focuses on cross-organisational data exchange and the corresponding technology standards/specifications. Details of the technology review are provided in Section 5.

- Diversity support and extension for the future

  When providing advice and recommendations, we have aimed to keep the messaging layer open and adaptable, based on the following considerations:

  - *Diverse IT capability* – While some large organisations have dedicated data centres and/or strong teams to undertake independent software development, some small and medium enterprises (SMEs) and agencies have very limited IT capabilities. Therefore, the messaging layer must recognise the diversity of organisations with different IT capabilities.

- *Diverse software & hardware* – For historical reasons, software and hardware used in organisations may be different. An open and adaptable messaging system should support as many protocols as possible to leverage existing investments of Australian enterprises.
- *Emerging businesses and new requirements* – Widely adopting a standard messaging layer can encourage and speed up the emergence of various innovations and new business models. On the other hand, these new businesses may raise additional new messaging requirements. Therefore, the messaging architecture, including its messaging protocols and profiles, must be capable and adaptable enough to allow extensions to meet new requirements.
- *Technology advance and evolution* – Technology is always advancing and changing in nature, including messaging protocols and profiles. As a result, the messaging layer should be ready to adopt and/or accommodate these emerging technologies whenever required.

4. Industry Survey

This section provides details about the industry survey as the first step of this investigation. Feedback received from the survey was used to guide the technology review and recommendation development. The survey was semi-structured [15] to allow us to collect information in response to specific questions as well as explore in detail topics and issues with interviewees to gain deeper insights.

4.1. Questions Design

Initially, we designed a set of questions with the intention to collect answers that reflect industry needs regarding information exchange, as listed in Table 1.

4.2. Participant List

Secondly, we identified a list of candidates to be interviewed spanning a representative range of organisations in type (e.g., government, industry) and size (e.g., large business, SMEs).

We undertook more than 20 interviews with representatives from the following areas:

- Federal Government (large and small agencies);
- State Government (large and small agencies);
- Large industry players with significant inter- and intra-business activity;
- SME organisations with high B2G interactions but with limited IT capacity;
- Larger not-for profit organisations with extended B2G interactions and substantial IT capability;
- Software development participants providing IT capability and applications to large numbers of customers with B2B and B2G interaction requirements; and
- Professional advisory groups and peak industry bodies.

Catalogue	Questions
General requirements for business	Q1. With whom does your organisation need to exchange business documentation/data? (e.g., i-invoicing, orders, valuations, referrals) Q2. How frequent are the exchanges currently? Q3. What is the documentation sizes/volumes currently exchanged? Q4. How do you see this changing over the next: (a) 12 mths; (b) 3-5 yrs? Q5. What reporting/documents do you exchange currently with government? (e.g., BAS, ABS, APRA, etc.) Q6. Does your organisation have experience in electronic data exchange in other jurisdictions? If so, how effective is it for business? Q7. What are the major roadblocks to be overcome in making electronic data exchange ubiquitous? What are your views on the effect that acceptance of initiatives such as "Single Touch Payroll" will have on the industry view of a move to Standard Business Reporting approaches to B2B and B2G interactions (eg is industry ready to embrace this style of approach to achieve productivity savings)?
General requirements for document exchanges	Q1. What messaging products are you using at present? Q2. How do you do the documentation exchange (i.e. what information exchange patterns)? Q3. What messaging protocols are they using for the above B2B/B2G information exchange? Do you believe a mixed regime of messaging protocols (e.g., REST, SOAP) is preferred to enable faster adoption of standard messaging protocols?
Expectations for new messaging QoS	Q1. What are the limitations of the current messaging technologies? Q2. What new features/QoS would you like to have/add on? Q3. What is your ideal messaging architecture for B2B/B2G information exchange? Q4. To what level of inspection should messaging protocols extend to confirm interoperability (e.g., message received v action taken at app level)?
Awareness and Adoption of ebMS2/AS4	Q1. What are the roadblocks to a fast uptake of messaging protocols utilising the principles of ebMS3/AS4? Q2. To what level should standards be set around messaging protocols?
Governance	Q1. What are the most successful governance models you have worked with to gain broad industry acceptance/adoption? Q2. What are the approaches that create the most difficulty ?(e.g., open source, government mandated approaches) Q3. Would moving to an agreed registered Standards approach be effective?

Table 1. Pre-designed questions for the industry interview

4.3. Summary of Feedback

From the interviews, we made the following observations:

Multiple information and message exchange patterns are widely used and required in industry.

- **Strong needs for both information query/retrieval and transactional types.** The latter is much more complex in QoS assurance especially involving multiple parties and brokers/gateways/intermediaries. There are legal and contractual concerns about who would be responsible for the full transaction across organisations and

during a QoS breach. The traditional approach for managing contracts and remediation may not scale well for an increasing amount of cross-organisational collaboration and transactions.

- **Strong needs for moving to more real-time or near real-time processing but may take 3~5 years for the transition.** The duration of business transactions are significantly shortening. For example, home loan approval processes involving multiple organisations (e.g., lender, mortgage insurer, property valuer and credit assessment agencies) are shortening from weeks to days or even hours. Making personalised offers to customers requires immediate identification of the customer visiting a website or making a call. Identification of the customer, retrieval of her relevant recent actions and analytics to enable personalising an offer come from multiple organisations in real-time (as in a matter of seconds). Real-time processing not only involves typical enterprise processing but also real-time (big) data analytics processing. Another often mentioned case is the Real-Time Payments initiative by Australian Payments and Clearing Association and its potential impact on real-time security analysis and even tax enforcement.
- **Batch processing is still required in some cases, especially in the finance industry.** One example case is of small vendors who have very limited IT capabilities and also need to move around to sell products. They are often offline and accumulate transactions to be synchronised and processed later by a central server. Another example is the existing batch processing system architecture and integrated business model around batch processing in many banks. There is some strong desire to move to a more real-time based system but the barriers are not only in technical architecture migration but also in changing some business models.
- **Within an organisation, the messaging protocols and solutions are still very diverse.** There is a potential for mismatches between the internal solutions and the external B2B solutions. Some workarounds and best practices are being used. There is a need to share these to overcome some of the mismatches for successful adoption of B2B messaging standards to occur.

Service bus and P2P based approaches co-exist.

- **Within most organisations we interviewed, integration through some centralised enterprise service bus (ESB) still plays an important role.** Each service endpoint just sends messages to the enterprise service bus, and the bus can help ensure durability, auditability, security, delivery reliability and monitoring of the messages. Importantly, technology infrastructure differences, firewalls and other security barriers between the divisions of the same organisation can be non-trivial for the developers of a service endpoint to navigate. The centralised service bus resolves all the issues and provides a unified messaging layer to endpoints. However, this mechanism is not very suitable to B2B transactions as we cannot assume the existence of a centralised entity acting like the ESB within an organisation. There is a clear need for a B2B messaging solution that supports P2P collaborations but also allows the organic growth of gateways and intermediaries.

- **Increasingly, with the rise of REST-based approaches, organisations are starting to allow P2P-based approaches using REST.** This is attributed to a number of factors. First, REST is becoming the primary out-of-the-box solution, driving organisations to use it. Second, REST directly uses the Web which universally exists and Web traffic is allowed in most firewall configurations, making some of the ESB needs mentioned above less critical. Third, REST is relatively simple to use compared with WS-* and ESB solutions. Finally, some modern REST API management solutions or enhanced service management solutions have some support of the ESB features around durability, auditability and monitoring. However, REST-based P2P approaches are still lacking standards in messaging QoS, discovery, coordination and uniform ways of implementing gateways and intermediaries. With no intermediaries and message multi-hops, some organisations argue against the need of having a separate messaging layer. However, with the possibility of having complex, value-adding intermediaries in the picture, many organisations agree with the benefits of a decoupled messaging layer. Some organisations are using the ESB layer even for REST-based messaging exchanges to benefit from the features that a decoupled ESB layer provides.

Interoperability is a key issue for both internal and external message exchange

- Standards are very complex and often require some selection and interpretation during implementation. This has caused significant interoperability issues, even though all parties claim to support the standards. There is a strong need for profiling standards for better interoperability and to mandate these profiles. Interoperability compliance test suites are also considered essential for good interoperability.
- Some large organisations have an internal governance board to develop internal standards and profiles to enable better interoperability. There is a strong need to justify many of the decisions on profiles in terms of technical trade-offs, rather than just prescribing a profile.
- All organisations interviewed expressed support for industry-wide effort in terms of interoperability standards and profiles. Some organisations prefer a lightweight, industry-consultation driven approach with clear/open justification of decisions as opposed to a heavyweight design with a vote-by-committee approach, as used in traditional standard organisations, at least in the initial phase. After significant adoption, the de facto standard can be formalised by some standard committee.

Lack of awareness of ebMS3/AS4 in industry

- There is a general lack of awareness of ebMS3/AS4 in the industry. However, the motivation and goals behind ebMS3/AS4 are generally supported.
- As mentioned above, there is some disagreement around the need for a separate messaging layer. There are several reasons for this. Some organisations think strong and defensive application-level message quality assurance is always needed anyway and repeating some of the assurance at the messaging layer adds limited additional

value. Others are concerned that limited initial adoption of the messaging layer may impact overall adoption of more effective B2B communication approaches.

- Further clarification revealed that organisations that questioned the need for a separate messaging layer were not thinking of some of the key scenarios involving intermediaries/gateways, multi-hops or SMEs with limited IT capabilities. If these scenarios are well-justified with clear value propositions, they are willing to support a standard-based messaging layer.

5. Technology Review

Based on the observations derived from the industry interviews, we reviewed and compared a set of common information exchange patterns and messaging protocols/profiles. In particular, we examined how well ebMS3/AS4 can support the common information exchange patterns observed in Australia. The findings of this review are detailed below.

5.1. Abstract Model for Business Interoperation

To better understand the role of messaging protocols/profiles, we propose an abstract model of business interoperability based on the OSI (Open Systems Interconnection) model [16], as shown in Figure 2.

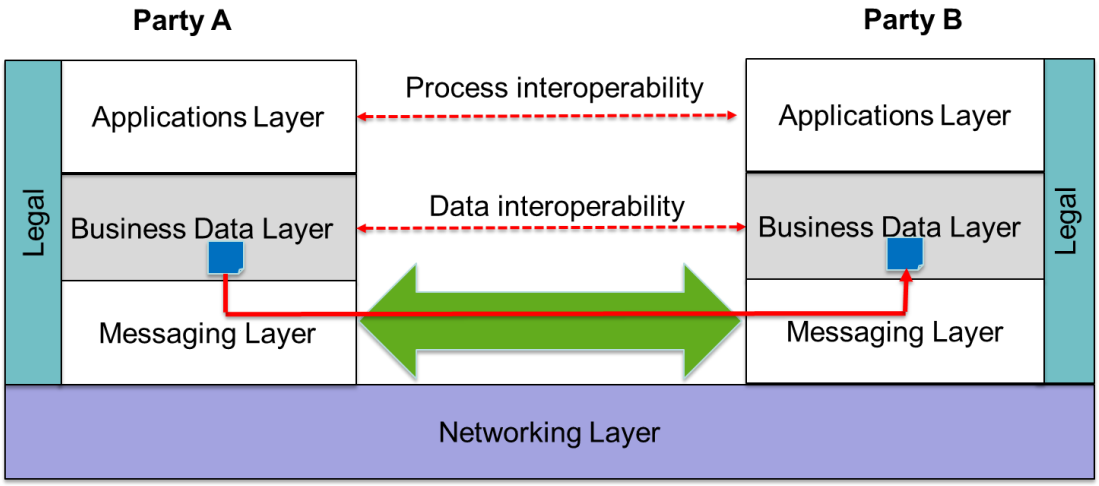

Figure 2. An abstract model of Business Interoperation

As can be seen in the above model, the interoperations between two organisations can be abstracted into four levels, as described in Table 2.

Layer Name	Role	Concerns
Application Layer	Business process/interface interoperations	• Business logics
Business Data Layer	Unambiguous business data shared/exchanged across organisations	• Domain ontology • Business syntax, semantics, and taxonomy • Legal implication of using this taxonomy
Messaging Layer	How to package business data and post to its destination	• Package/unpackage • Addressing/routing • Data security
Networking Layer	Physically transfer data from one end to one or more ends	• Network protocols • Bandwidth

Table 2. The four layer model of business interoperations

There is a cross-cutting layer we labelled “Legal” across the messaging, business data and application layers. When multiple organisations involving intermediaries/gateways share data or conduct business transactions, there are always legal contracts or regulatory compliance requirements to be negotiated and implemented. This should be taken into account when designing each layer.

For example, when an important transaction occurs between organisation A and B, the two business partners should be well aware of the consequences of this particular transaction and the corresponding compliance obligations that they should conduct, e.g., need to immediately notify ASIC (Australian Securities & Investments Commission) to comply with related regulations.

At the business data layer, the legal implication may refer to a specific well-defined ontology and/or taxonomy agreed to be used for cross-organisation documentation exchange, whose syntax and semantics may bind to legal liability and obligations.

The legal implication at the messaging layer likely focuses on data security and legal responsibilities related to messaging QoS. For example, different contents in a document require different levels of data protection. As a result, a regulation or a contract may require a particular configuration to enforce a particular set of security protections for a specific class of data contents.

The traditional, often human-intensive, approaches to handling contracts and compliance may not scale well if an organisation needs to collaborate with a large number of counter-parties, even in an on-demand basis. Latest technologies in smart contracts and automated regulation compliance using business process analysis can be integrated to scale up the contract/compliance aspects of B2B collaborations.

Note that while Figure 2 uses a direct line to represent messaging between two parties, one or more intermediary gateways can exist between Party A and Party B. A dedicated messaging layer can decouple applications across organisations and provide a variety of qualities for messaging services to meet different business requirements without having impact on the application layer.

Next, we look more closely at the messaging layer to examine the basic functionalities of the layer and the additional qualities of service (QoS) functions it can offer. Although we are focusing on the messaging layer, the QoS functions can also be built into the application layer, as also noted in some of the interviews. The advantage of having this functionality in the messaging layer, however, is that it only needs to be implemented once and can be used by different applications, making it a more effective solution than implementing it in each application.

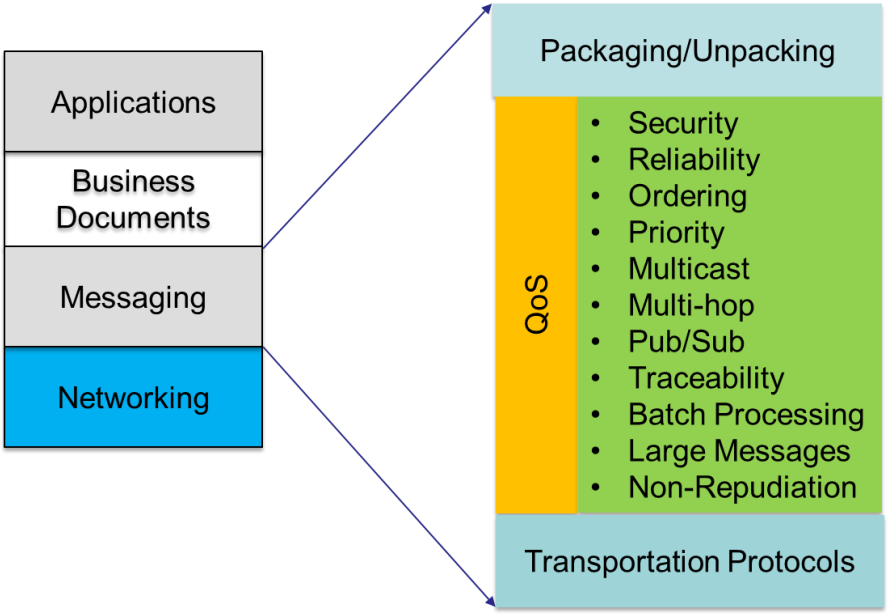

Figure 3. A closer look into the message layer: Functionalities vs. QoS

As shown in Figure 3, the messaging layer conducts cross-organisation information exchanges in the following steps:

1) Package a message using a standard pre-agreed format
2) Send the message to its destination either directly or via an intermediary gateway using one or more standard transportation protocols
3) Receive and unpack the message using the same pre-agreed format
4) Conduct the extra operations to provide a set of particular QoS required by the collaborative business applications

5.2. Common Messaging QoS

QoS	Description	Business Driver examples
Security	Capabilities to provide data protection, such as confidentiality and integrity (often built into the messaging layer)	Some sensitive business data needs to be encrypted before being put onto a network
Reliability	A capability of guaranteeing to deliver a message to its destination	An organisation may require this QoS to ensure that an important document is received by its business partner
Non-Repudiation	A capability of verifying if a sender or receiver really sent (non-repudiation of origin) or received (non-repudiation of receipt) a particular message.	Company A and Company B have a dispute about a message, where Company B claims to have received the message from A, but Company A denies sending the message. Using the non-repudiation QoS it is possible to resolve such disputes.
Ordering	A capability of guaranteeing a set of messages to be received according to their sending order	A collaboration may need to exchange a set of documents, whose orders are vital and depend on each other
Priority	A capability that the messaging layer can classify messages into different groups and deliver these groups in different ways; e.g., with different resources and in different orders	Some organisations will pay extra money to access a priority messaging service, such as faster delivery than regular messages
Multi-cast	A capability of sending one message to multiple destinations	An organisation may want to send a new product catalogue to all of its business partners
Multi-hop	A capability of routing a message to its ultimate destination(s) via one or more intermediary nodes.	A message contains multiple documents, each of which needs to be processed by different organisations.
Pub/Sub	A capability of sending a message to a number of parties who have subscribed to the topic/subject of the message	An organisation may want to broadcast a document to any parties who are interested in the topic of the document
Traceability	A capability of allowing the sender to query and view the current state of its messages during posting	An organisation may want to check the progress of a particular document during transportation to its destination
Batch Processing	A capability of sending a message that can trigger a batch process on the destination side	A company payroll sends a pay request to a bank to process the request as a batch process at midnight
Large Message	A capability of sending very large amounts of data	A hospital sends an X-ray scan from the laboratory to the doctor's office to include in a patient's file.

Table 3. Common qualities of messaging services

5.3. Common Information Exchange Patterns in Australia

In this section, we review a set of common information exchange patterns widely used in Australian industry. It should be noted that the interactions described in this section are business interactions, i.e. interactions between two or more organisations. This means they do not necessarily map directly to one exchange on the messaging layer. For example, when a document must be sent to multiple business partners this is a multi-cast exchange but it can be implemented using several independent one-way exchanges at the messaging layer, one for each partner. In section 5.5 we look how these exchange patterns are supported by the different messaging standards.

One-Way Pattern

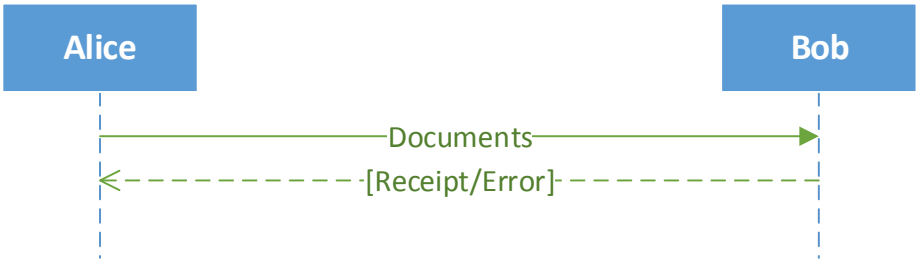

Figure 4. One-Way Push

How it works

- Alice sends a document to Bob
- Optionally, Bob may return a receipt or an error signal (if any)

Comments

This is the simplest messaging pattern. The sender can send a document to a destination with a one-way call. This pattern can be implemented in asynchronous fashion so that the sender does not have to wait for anything.

If this exchange is implemented using a pulling mechanism where the receiver (Bob) actively retrieves the message from the sender (Alice), it is a lightweight messaging solution very suitable for small and medium enterprises that have limited IT capability and resources.

Two-Way Request-Response Pattern

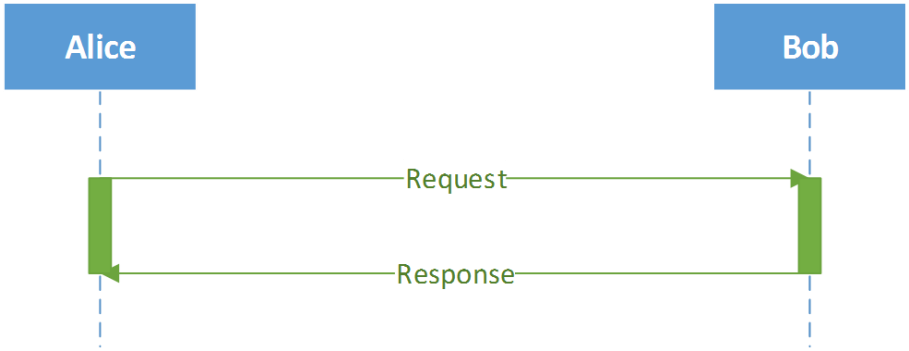

Figure 5. Request-Response Pattern

How it works

- Alice sends a request to Bob.
- Bob sends back a response to Alice, which contains either data requested by Alice, or an error message.

Comments

This is the most common messaging pattern, also called request-reply. It has good support from a large amount of middleware. It is the equivalent of a one way pull and two way message exchange pattern (MEP) in terms of functionality and capability. It can be implemented either synchronously or asynchronously. When implemented asynchronously if the time between the request and response is significant, a separate signal message can be used to confirm the receipt of the request message.

Multi-cast Pattern

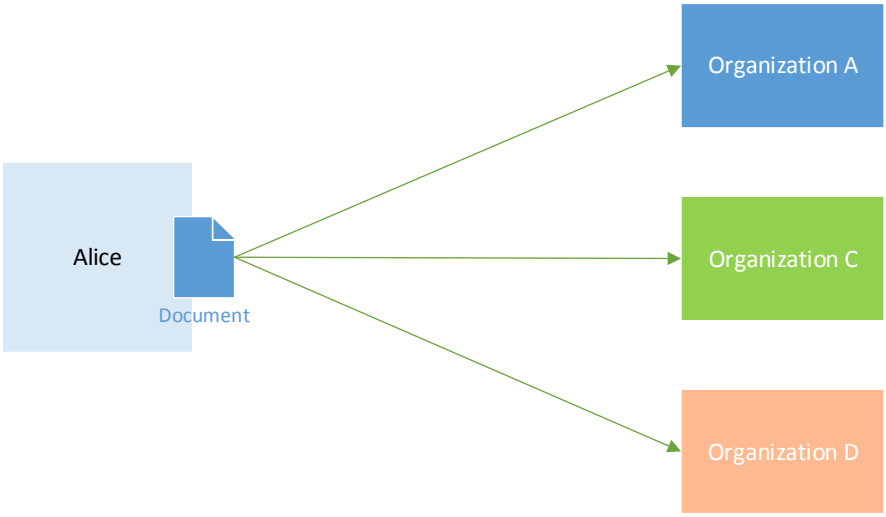

Figure 6. Multi-cast pattern

How it works

- Alice sends a document to multiple endpoints altogether, e.g. Organisations A, C and D as shown in the above figure.
- Alice knows who should receive her document.

Comments

This pattern is useful for an organisation that often needs to distribute the same information to a large number of business partners at once. An example is a request for proposal in a tender procedure. Through this pattern, the organisation can send documents within a particular group of organisations with little extra effort and resources. This pattern gets more complicated if the overall outcome depends on the results of the individual exchanges.

Multi-hop Pattern

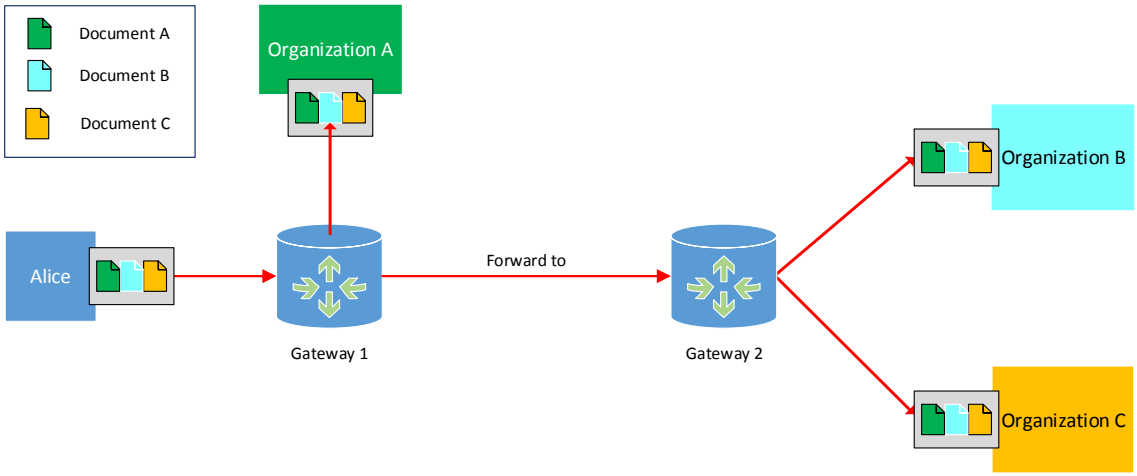

Figure 7. Multi-hop pattern

How it works

- Alice sends a message consisting of a set of documents to Gateway 1.
- Based on information in the message, Gateway 1 can forward the message to the other organisations, say Organisation A and Gateway 2, for further distribution to this organisation and other agencies.

Comments

This pattern can simplify implementation and execution of relatively complex business processes that need to involve multiple organisations, and/or comply with government regulations by automatically forwarding and notifying something to relevant organisations or government agencies. This pattern is already deployed in Superstream, Payroll and Tax Agent applications.

It should be noted that the multi-hop pattern defined here is quite different from the multi-hop model used in the ebMS and SOAP specifications, where the intermediary nodes are simply routers that forward the message to a single next node. Therefore, the pattern as defined here is sometimes also called a four corner model because the gateways play an active role in the message exchange.

Implementing the above exchange in the ebMS/SOAP model would require Alice to send three separate messages which would then be forwarded to their destinations by the gateways.

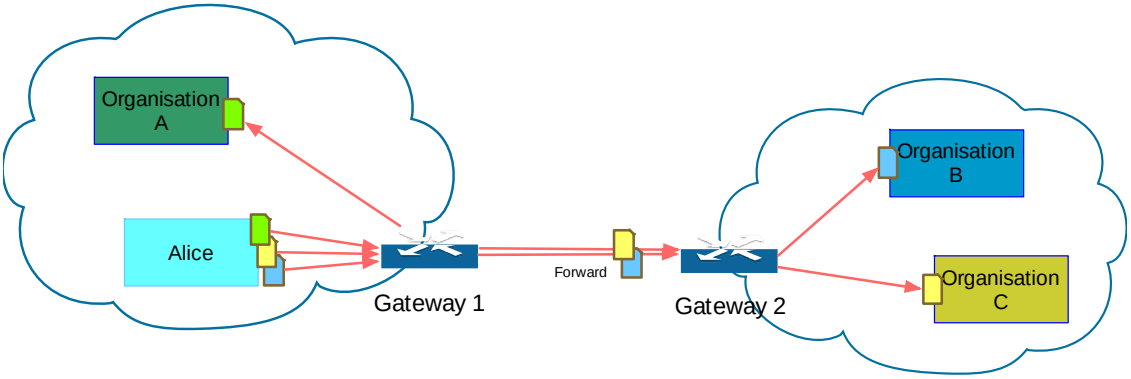

Figure 8. The multi-hop model as used in ebMS and SOAP

Pub/Sub Pattern

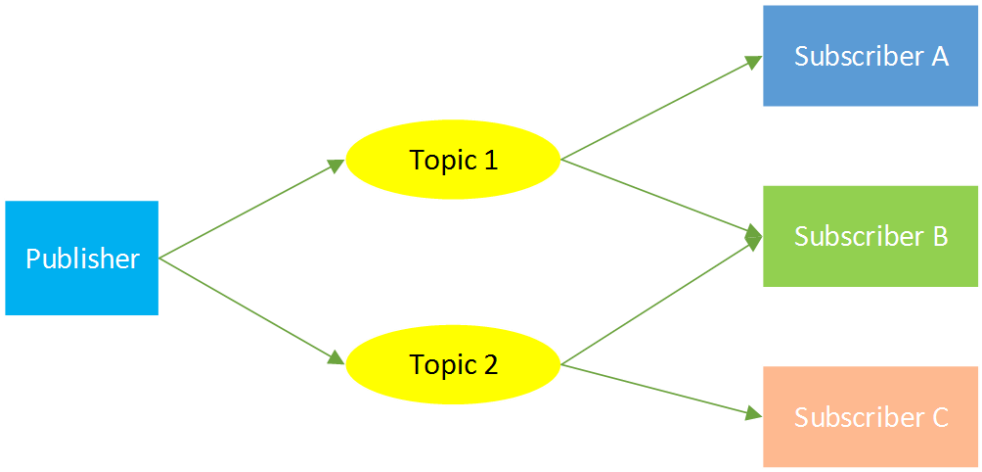

Figure 9. Pub/Sub Pattern

How it works

- The publisher sends documents to a topic that is relevant to the documents.
- Subscribers who have subscribed to the topic will automatically receive the documents sent to the topic.
- Usually, the publisher does not know who will receive its documents because subscription is dynamic in nature.

Comments

This pattern is useful for an organisation to publish company information (e.g., company news, events, new product release, etc.) to its existing and potential customers/partners. It is a well-known pattern in the enterprise integration

community and well-supported by industry middleware for internal integration, instead of cross-organisation interoperations.

Batch Processing Pattern

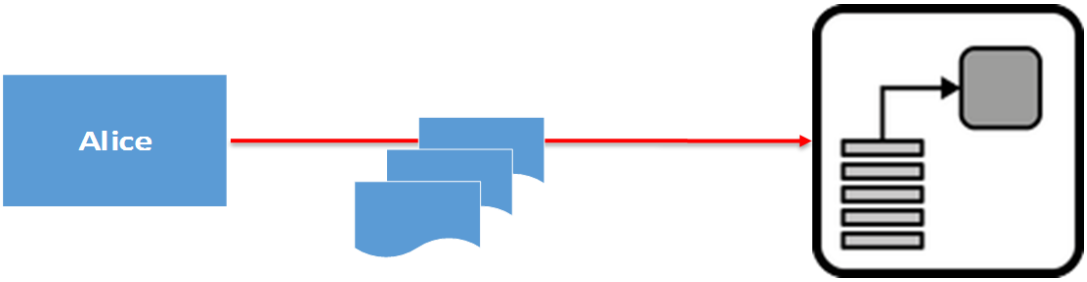

Figure 10. Batch Processing Pattern

How it works

- Alice sends a set of documents (or a very large document) to Organisation A.
- These documents are processed according to Organisation A's schedule, e.g., at a particular time or when Organisation A's environmental conditions make the processing feasible.

Comments

This is a classic pattern, which has been widely used in industry for a long time. It is suitable for application scenarios where the endpoints cannot process the request in real time, due to having too many jobs or jobs being too big. The jobs may require many computing resources (CPU, memory) and thus may slow down the whole system. Note that rather than sending a large amount of documents to Organisation A directly, Alice can store the documents somewhere and send its reference instead. Then Organisation A can retrieve the documents when required. The problem described here can also be solved using asynchronous exchange of messages and/or custom delivery policies (how messages are handed over to the business application by the messaging layer).

Priority Queuing Pattern

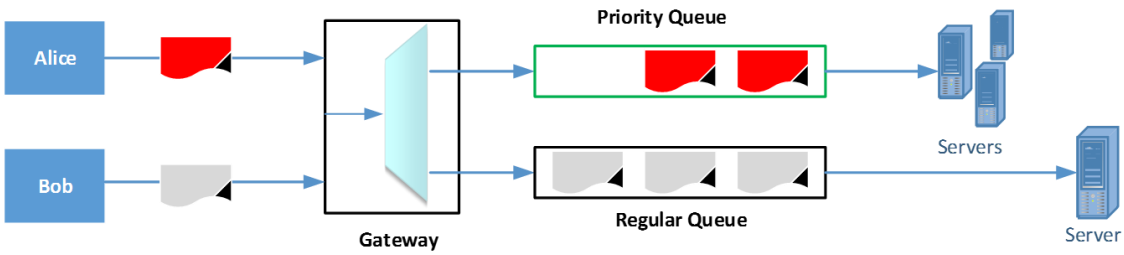

Figure 11. Priority queuing pattern

How it works

- Alice and Bob send messages to a gateway that supports priority queuing.
- Since Alice's messages are marked as "high priority", they are routed to the priority queue. At the same time, Bob's and other senders' normal messages are routed to the regular queue.
- Usually, the documents in the priority queue will be processed with more resources (e.g., high-end servers and/or faster networks), and/or scheduled to be processed in advance

Comments

This pattern is also a QoS, which offers fast-track and/or more secure services with some extra cost. It is suitable for sensitive and/or urgent documents to be delivered faster and more securely.

5.4. Common Message Protocols for Cross-organisational Messaging

In this section, we review and compare ebMS3/AS4 with its predecessors (AS1, AS2 and AS3) and other relevant protocols (SOAP and RESTful Web Services) in response to Question 2 in the contract. First, based on [20], we put all these protocols into

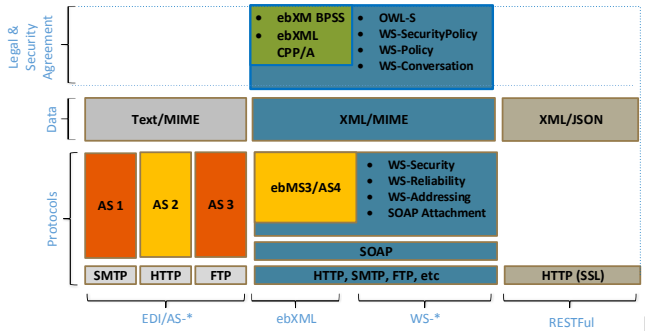

Figure *12* to show their positions and relationships with each other.

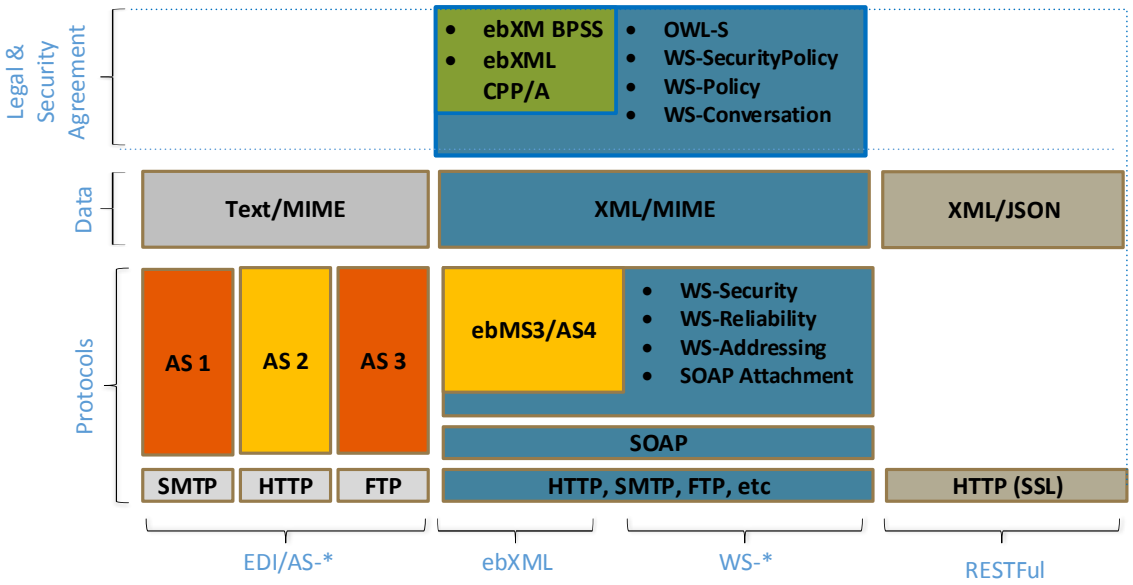

Figure 12. Messaging protocols for organisation-to-organisation messaging

Second, we provide a brief introduction to each of the above messaging protocols with a focus on their key features and capabilities:

- **AS1** refers to Applicability Statement 1, which is the 1st specification for Electronic Data Interchange (EDI) communications between businesses [10]. AS1 uses S/MIME (Secure Multi-Purpose Internet Mail Extensions) to format the business data and uses Simple Mail Transfer Protocol (SMTP; i.e., email) to transmit business data.
- **AS2** is a follow-up specification of AS1. Instead of using SMTP, AS2 uses HTTP (Hypertext Transfer Protocol) to transfer the EDI data [11]. It supports both EDI and XML (eXtensible Markup Language) data formats, as well as both synchronous and asynchronous messaging using HTTP non-block I/O. It has been widely adopted in industry compared to AS1 and AS3.
- **AS3** is a standard for business partners to exchange EDI documents using File Transfer Protocol (FTP) [12]. The basic structure of AS3 messages comprises MIME encapsulated data with both customary MIME headers and a few additional AS3-specific attributes. The most important ones are AS3-From and AS3-To headers, which are used for automatically sending messages between two business partners. AS3 also supports sending large documents using compression.
- **WS-*** refers to a collection of web services specifications developed for standardising aspects of building Web services. The well-known ones include SOAP for defining message formats and WSDL for describing the contract between a web service and its clients. SOAP, with Attachments, is a specification for sending non-XML data (such as pdf, audio, video) with SOAP messages. In addition to SOAP and WSDL, a number of other Web service specifications are developed to enhance the capabilities and QoS of Web services. For example, WS-Security is a specification for building end-to-end security into SOAP messages, including authentication of message senders, confidentiality of message payloads, and XML signature for data

integrity. WS-Reliability and WS-ReliableMessaging were developed to address the same issues for reliable messaging, respectively.

- **ebMS3** consists of two parts: (a) ebMS3 Core [5]; and (b) ebMS3 Part 2 - Advanced Features [7]. ebMS3 Core leverages a subset of the Web Services specifications to define the ebMS3 messaging protocol. While supporting classical (One-Way and Two-Way) push, it adds a pull mechanism in the form of both One-Way and Two-Way pull, which is not defined in the WS-* specifications. ebMS3 Part 2 extends the base functionality of the Core Specification by adding multi-hop messaging, bundling of ebMS messages and a split-and-join function for transferring large messages.
- **AS4** further profiles the features and options specified in the ebMS3 core and advanced features specifications to simplify implementation [7]. From the advanced features specification, the multi-hop functionality is included as an optional function. Part of the simplification is the introduction of a reliability mechanism using the ebMS3 Receipt message instead of the WS-RM or WS-Reliability specification. WS specifications are known to create interoperability issues and they also need special handling when multi-hop is used.
- **REST** refers to REpresentational State Transfer. It is a software architecture style, as well as a lightweight messaging protocol, for machine-to-machine (M2M) communication. In a REST system, everything is abstracted as web resources. The interactions between clients and servers are stateful and can be classified into four standard HTTP operations (GET, POST, PUT and DELETE) applied to the (Web) resources like CRUD operations (Create, Read, Update and Delete). While REST can support XML as a message format, JSON is usually used as the format to package REST messages. Since the REST system uses HTTP directly, the system is performant, scalable and easy to deploy. There are ways of supporting reliability and security in REST but they are not standardised, creating significant risks for interoperability.

5.5. Protocol Suitability for Information Exchange Patterns in Australia

In this section, we examine how the different messaging protocols support the information exchange patterns observed in our industry survey. Firstly, we have summarised our examination results in the following table:

Pattern	EDI/AS-*	AS4	ebMS3	WS-*	RESTful
One-Way Push	√	√	√	√	√
One-Way Pull	×	√	√	×	×
Two-Way Sync	×	×	√	√	√
Two-Way Async	×	(√)	√	√	×
Multi-cast	×	×	×	×	×
Multi-hop	×	√	√	(√)	×
Pub/Sub	×	×	×	×	×
Batch Processing	×	×	√	×	×
Priority Queuing	×	(√)	(√)	×	×

Table 4. Messaging patterns supported by messaging protocols

As shown in Table 4, ebMS3 supports most of the messaging patterns except for Pub/Sub, One Way Pull and multi-cast. In fact, none of these protocols has native support for multi-cast and pub/sub. This is because they only support direct communication (standard WS-* and REST) or only support a single destination for a message (EDI, ebMS and WS-* with WS-addressing). ebMS3 and AS4 have the concept of a message partition channel (MPC). Each message can be assigned to an MPC creating something that could call a 'topic'. But there is no standard way to handle the automatic publication of a message, with each message still being addressed to a specific receiver.

Although the ebMS3 and AS4 specifications do not specify priority handling of messages, the MPC concept can be used to indicate the priority of a message. As explained in the previous section, different delivery policies, reflecting the priorities, can be used for each MPC.

Since AS4 is a subset of ebMS3, it does not support as many patterns as ebMS3. However, it defines support for two basic information exchange patterns: One-Way Push, One-Way-Pull. Although only one-way patterns are defined, AS4 allows for asynchronous request-response messaging as a message reference (refToMessageId) to the request message and can be included in the ebMS response message.

AS4 defines three conformance profiles of decreasing complexity; ebHandler, Light Client and Minimal Client making AS4 more suitable for use by SMEs that do not require the full set of features and also have limited resources.

AS4 also defines optional complementary conformance profiles to support multi-hop. This means it is up to a specific AS4 implementation if it supports the optional CP.

In addition, AS4 defines a usage profile to use an AS4-compliant implementation to achieve similar functions as specified in AS2, whose features make AS4 back-compatible with AS2 at the functionality level.

As described in the previous section, WS-* represents a set of specifications. Therefore, support for a pattern or feature often requires use of multiple specifications. To ensure interoperability between implementations, the WS-I consortium created three conformance profiles that specify how the specifications should be used for Basic, Security and Reliability functionality. These profiles, however, are much less strict than the ebMS3 and AS4 specifications and, therefore, more prone to interoperability issues.

EDI/AS-* refers to a collection of AS1, AS2 and AS3. They all support One-Way Push but via different mechanisms: SMTP send, HTTP post, and FTP put respectively. AS1 can support multi-cast by leveraging SMTP native multi-cast function, i.e., by sending an email to multi-parties. However, they do not have native support for the other patterns.

Since REST is an alternative solution to web service invocation, it only supports basic messaging patterns: (a) One-Way Push; (b) Synchronous Request-Response. There are many recent developments in using HTTP to support other patterns, such as long running transactions and server-driven notifications to clients, but they are not widely standardised yet. However, it is possible to use HTTP just as a transport layer for the other protocols mentioned.

6. Recommendations

6.1. Managing Message Protocol Types and Traits (D2)

As shown in the previous section, different business collaborations may need different QoS characteristics to meet their specific business requirements. On the other hand, different messaging protocols/profiles provide different capabilities/QoS, due to their architecture and design principles. So it is important to understand and manage the strength and limitations of these common messaging protocols so that we can better architect the messaging layer to meet specific requirements.

In section 5.5 we looked at how the different messaging protocols compare to the identified information exchange patterns. The table below provides a summary of how the protocols support the different QoS aspects.

QoS	EID/AS-*	AS4	ebMS3	WS-*	REST
Authentication	√	√	√	√	HTTPS/SSL
Encryption	√	√	√	√	×
Signing	√	√	√	√	×
Non-Repudiation	√	√	×	×	×
Reliability	×	√	√	√	×
Ordering	×	×	√	√	×
Traceability	×	×	×	×	×
Large Message	√	×	√	×	×

Table 5. QoS vs. Messaging Protocols

Messaging security usually refers to three aspects: authentication, encryption and signing. As shown in Table 5, most of the messaging protocols have native built-in support for message security, except for REST, which only supports authentication. Like WS-*, AS4 and ebMS3 use WS-Security for their messaging authentication but its use is by default restricted to username tokens and X.509 certificates. An additional profile to support SAML with AS4 and ebMS3 for using third party authentication services has been defined but is currently not widely implemented.

Encryption and decryption are supported by most messaging protocols (EDI/AS-*, AS4, ebMS3 and WS-*) except for REST. REST has no built-in encryption/decryption to protect messaging confidentiality. The inclusion of a signature is an important QoS to prove who generated the message. It is well supported by EDI/AS-*, ebMS3, AS4 and WS-* using digital signature standards.

Closely related to message security is non-repudiation. It is used to provide evidence that a message is sent or received by a party. Only EDI/AS-* and AS4 support non-repudiation of receipt by issuing a signed receipt, which contains a digest of the received message.

Although it is arguable which layer should ensure the messaging delivery, there are still three messaging protocols (AS4, ebMS3 and WS-*) that support messaging reliability. While WS-* supports messaging reliability using WS-RM, ebMS3 and AS4 use ebMS3 Receipt message as an acknowledgment for ensuring message delivery. REST does not provide strong mechanisms for messaging reliability.

When business partners exchange documents that are logically related to each other, there is often a requirement for those documents to be delivered and processed in order. When related documents are sent in separate SOAP messages, the message ordering capabilities of Web Services' reliable messaging specifications [27]0 can be used to specify the order in which they are delivered. In other words, WS-* can support ordering QoS. In addition, ebMS3 also supports message ordering in the following ways:

a) using WS-Reliability or WS-RM by setting *InOrder* reliable messaging;
b) using the ordered delivery of the bundling feature defined in part 2 of the ebMS3 specification.

No message protocol supports *traceability*. This provides an opportunity to research and develop technologies and messaging profiles which support the missing QoS when needed by the industry, with no side-effects on the existing messaging architecture and protocols.

As only ebMS3 supports Batch Process via its message bundling functionality it is important that this capability be retained to feed legacy batch business systems that are not easily replaced by industry and handle high volume exchanges.

Most of the protocols in Table 5 (EDI/AS-*, AS4, ebMS3, WS-*) support large messages but in different ways. With support from their underlying transportation protocols, AS1 and AS3 can easily support large files (10MB~10GB). WS-*, AS4 and ebMS3 use SOAP with Attachments to send large MIME data (1MB~5GB). In addition, ebMS3 also defines the split and join feature to support exchange of very large files (>10GB). Again, REST does not support large messages.

An important consideration in managing the message protocols should also be the availability of implementations,especially when standards include optional features.. An example of this is the advanced features of the ebMS3 specification which are currently not widely implemented. When developing profiles for general and widespread use, features without support in products should be avoided unless implementers assure support will be developed.

Based on the above comparison on QoS aspects and the suitability of the protocols for the different exchange patterns, we conclude that ebMS3 and AS4 can support most exchanges and, therefore, are good candidates for a general messaging protocol. Note that current implementations only offer support for AS4 and not for the advanced features of ebMS3. Therefore, we recommended to carefully assess whether these features are really needed on the messaging layer before including them in a messaging profile.

For some lightweight exchanges that do not require QoS, REST may be considered as the messaging protocol.

6.2. Assurance Framework for Interoperability between the Protocols (D3)

We recommend the following assurance framework for interoperability:

- Assurance of messaging protocols and profiles is one of the important roles of the proposed governance framework. Section 6.4 provides details on the governance recommendations including how assurance should be administered. Furthermore, within the proposed governance framework, the following must also be accommodated:
- Different dimensions of interoperability assurance must be supported:
  - Messaging layer, business document layer and application layer inter-operability assurance must all be considered at each layer.
  - Cross-layer interoperability must be considered, e.g., for legal-compliance.
  - Interoperability with other parallel existing protocols (e.g. SuperStream and existing SBR protocols) must be considered.
- Both performance assurance and outcome assurance should be considered:
  - There should be ongoing performance assurance which includes monitoring, auditing and reporting of interoperability compliance and official channels to escalate interoperability disputes.
  - There should be outcome assurances which include business efficiency outcomes achieved through better interoperability.
- At the technical level, conformance testing should be undertaken and a set of test suites created to be made available for both testing purposes and, potentially, compliance purposes to support assurance considerations. Test suites should include not only functional level testing but also error handling and other QoS related interoperability

6.3. Plan for Co-developing with ICT Industry (D4)

Our recommendations on co-developing with ICT industry are as follows:

The proposed governance framework has a fundamental role in enabling co-development and co-creation with industry organisations such as ICT software systems developers. This role is described in detail in the next subsection. In addition to this overarching responsibility, the following specific considerations are relevant to highlight:

- First, identify strategic industry partners who have both the market power and are positioned at transaction hubs to adopt the messaging profiles. For example, in the

lending industry, major lenders have both the market power and act as the linchpin connecting borrowers, valuers, mortgage insurers and legal professionals. Their support and adoption of the Lending Industry XML Initiative (LIXI), for example, was fundamental in enabling wider industry co-development. A similar example can be found in the sea freight industry in Australia where only a few stevedores are in a strategic position to adopt messaging standards and enforce wider adoption.

- Develop reference architectures and implementation examples to improve adoption. Standards and profiles without reference processes, architectures and implementations still leave some space for misinterpretation and are difficult to adopt, especially for businesses that have limited IT capabilities. Most previous successful cases provided concrete reference examples. It is vital that these reference examples are technology and vendor neutral.
- Engineer incentives for early industry adopters. For example, there were strong incentives in the lending industry for technology companies to build intermediaries and gateways to connect major lenders with sole-traders. Intermediaries were supported by major lenders because they were saving the cost of a lender interacting with technology-constrained sole traders.
- Sponsor pilot projects to demonstrate the values and benefits to a wider industry. For example, the full end-to-end lending process and related ecosystem in Australia is very complex. Two sub-processes were selected to build demonstrations which attracted wider interests. A similar approach can be adopted here.

6.4. Governance Arrangement of Message Protocols (D5)

This section lays out our recommendations and underlying rationale for the proposed end-state governance arrangements. They are based on inputs from our industry consultations, experience, academic research and recognised best practice.

Governance has important roles to play in overseeing the adoption, utilisation and lifecycle management of messaging protocols, profiles and information/message exchange patterns used in digital interactions within government (both within and between agencies) and between government and industry sector enterprises. Consequently, many aspects of the governance framework recommended here are common to this consultancy and to the digital interactions consultancy particularly relating to structures and processes. The purpose of governance here is to ensure that good order is maintained in the adoption and use of suitable messaging protocols, profiles and information and message exchange patterns, within and between participating parties, particularly relating to relevant policies, practices, structures and technologies.

There is a need for governance mechanisms to build and maintain both agency and business support for the adoption of standard approaches for digital interactions. The general principle should be to align government solutions to emerging practises and standards adopted by business while also directing business practices towards more open, generalised solutions and standards

Australian business stakeholders are not ready for highly structured governance models. There is a need to build awareness and support for a more interoperable environment, both for business-to-business and business-to-government digital interactions. This will requires that a supportive ecosystem be nurtured on a collaborative basis with industry associations, business software companies and end user businesses and non-government organisations.

The recommended end-state governance arrangements draw on the following design principles:

- **Inclusiveness** – open participation is encouraged and fostered within industry and government organisations.
- **Open service interactions** – limitations on types of business/government service interactions and/or information exchange supported are avoided (outside of agreed policies and standards that may apply limitations).
- **Open standards orientation** – proprietary, partisan and single-use interaction patterns, protocols and quality of service arrangements are avoided.
- **Full exchange pattern lifecycle management scope** – from design to development, testing, adoption, use, maintenance and retirement/replacement.
- **Decision transparency** – openness in policy making, standardisation and decision making.
- **Self-determination** – the opportunity to agree together rather than be forced to adopt a particular service interaction or information exchange mechanisms.
- **Accessibility** – open/managed access to the agreed upon protocols, profiles and exchange patterns and technologies by all participating agencies and organisations as agreed by the governing body.
- **Simplicity and agility** – complex, bureaucratic, partisan, rigid, and/or inefficient designs are avoided.

These principles aim to respond to the feedback from our industry consultations which indicated that an acceptable governance arrangement must foster participation, cooperation, collaboration, co-creation and innovation between co-dependent industry and government organisations and ecosystems. Its operations should be

transparent and decision-making open. Adoption of standards should be by agreement of the body rather than mandated from outside. In turn, the principles inform the recommended structural and operational design of the recommended governance arrangements.

The recommended governance structure follows the dominant pattern used globally. It comprises a single peak governing body with a single persistent technical group and optional project-oriented working parties to do detailed work as required. Each recommended entity is described following (note that the name used for each body is indicative and may be changed):

- **Australian Digital Interactions Coordination Association.** This is the peak governance body responsible for overseeing and delivering the requirements of the message protocols and digital interactions contracts recommended as an ultimate oversight body. This is a permanent organisation that integrates government agency and industry organisations as members. Membership is not open to individuals. Membership attracts an annual fee to fund operating costs (no payments are made to members or officers of the association). Member organisations are represented by a nominated representative (changes of member representation must be advised in writing). Only member organisations have voting rights; one vote per organisation. Other member representatives and invited technical specialists may attend scheduled meetings but may not vote. Executive positions (at least a Chairperson and Secretary) are held for a fixed term only. Executive position holders are alternated between government agency and industry organisation member representatives (concurrent appointments from the same sector are to be avoided). The Association is responsible for information exchange and digital interactions policy, strategy, direction, coordination, standardisation, communication and control. The Association oversees the operations of the Digital Interactions Technical Group and any Digital Interactions Working Groups that are initiated (each group is described following).
- **Digital Interactions Technical Group.** This is a persistent group that is operated by the Association to: provide technical advice and recommendations relating to the Association's objectives (such as on technology lifecycle management); establish, maintain and/or oversee any technology infrastructure required by (or for) the Association; and provide other technical services for the Association as required. The group is headed by a Technical Lead appointed by the Association (as a secondment, contract or permanent position) who reports to the Association Chairperson. The group is the Association's technical knowledge repository and provides advice on technical quality, security and compliance. The Digital

Interactions Technical Group may also provide support to working groups as directed by the Association.

- **Digital Interactions Working Groups.** The Association may establish working groups from time to time to conduct projects on its behalf. These are temporary teams staffed by nominated member representatives, specialists or recognised experts in a particular field. Working Groups act on specific briefs and/or directions from the Association and are coordinated by a Group Leader who also reports to the Association. They operate and are managed by the Association as projects. They report progress to the Association as required in the brief/direction. A mandatory review must be held of any working group that has existed for more than twelve months. Following this review, any extension must be formally approved by the Association. Participation in working groups is voluntary (unfunded by the Association), although external experts and specialists may be engaged under special arrangements by the Association to also participate. Working groups typically have a domain-specific focus. They develop, change or maintain specific information exchange and/or digital interaction artefacts for recommendation to the Association.

This structure is summarised in Figure 12.

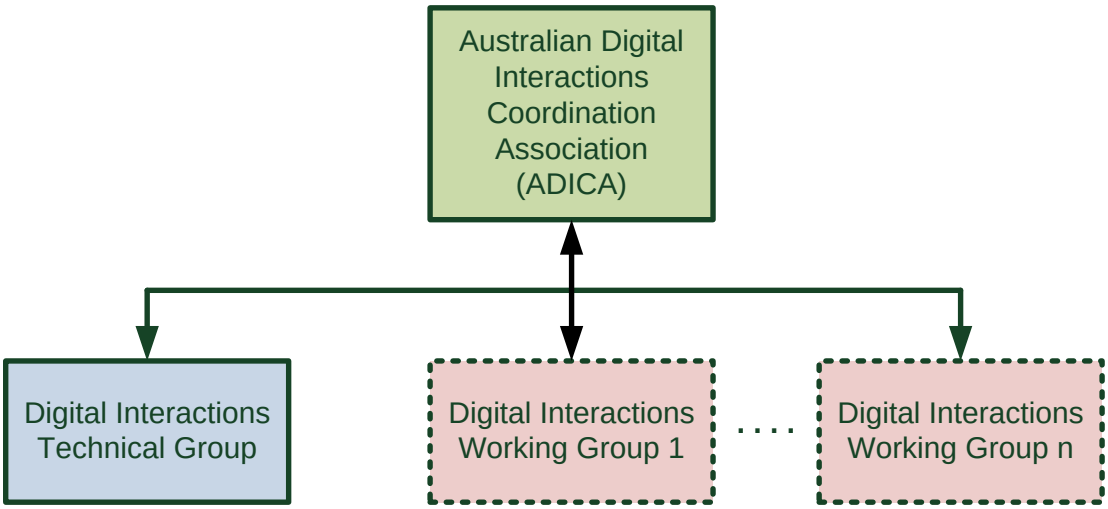

Figure 12. Governance Framework

Governance activities will mostly be domain-specific, focused within one or more of the following domains (the list is indicative rather than complete):

- web interactions (B2B, B2G, G2B, G2G, C2G, G2C)
- whole of federal government
- agencies
- corporates

- industries
- intermediaries
- small and medium enterprises
- supply chains
- cross-industry applications
- technologies
- architectures
- platforms
- standards
- processes
- special interests

This domain-specificity means that not all governance activities will be relevant to all member organisations at all times. Consequently, the design principles of inclusiveness, decision transparency and self-determination are critical to solicit participation and retain engagement. The alternative design of structuring the governance according to domain-specific interests is not recommended because it is likely to result in fragmentation, inconsistent decisions and conflict.

Specific governance activities required in relation to Message Protocols, performed by the Digital Interactions Technical Group under the direction and supervision of the Association, may include the following:

- Maintain the sets of recommended information exchange patterns, message protocols, ebMS3/AS4 profile and quality of service features as they change and develop over time.
- Develop recommended preferences and/or agreed standards for configurations of information exchange patterns and message protocols for common service types.
- Prepare, publish and maintain guidance documentation for managing, choosing and using information exchange patterns and message protocols to meet specific service and quality requirements.
- Develop and maintain an assurance framework to ensure ongoing compatibility and inter-operability of protocols by tracking and qualifying artefact versions and version combinations as well as developing and maintaining test suites.
- Agree on conformance testing basis and testing suite/harness for compliance.
- Develop and maintain technology- and vendor-neutral reference processes, architectures and implementations to aid assurance and minimise misinterpretation.
- Monitor and measure adoption and utilisation of information exchange patterns and message protocols within the Association membership (and community at large, if appropriate).
- Resolve escalated interoperability disputes.

The recommendations are based on the feedback from the industry consultation which universally supported a staged adoption of formal standards whilst core trends emerge over time. The recommendations propose a staged implementation as being more likely to be successful in building a coalition of support for the work of the ultimate formal Association and adoption of recommended information exchange pattern/messaging protocol configurations for particular digital service types as opposed to a 'big bang' approach. We recommend that the Association is formed from the steering committee at an appropriate point in the future through supporting a series of pilot projects that are conducted to 'prove' the feasibility of the recommendations in the joint reports and that also demonstrate the value of such arrangements to the wider industry.

A number of pilot projects have been identified that could be initiated at a modest level and scaled at a latter stage based on perceive benefits and willingness to invest further by the relevant stakeholders. Potential subjects for pilot projects could include:

a) Digital commerce project for driving greater standardisation and efficiencies for digital information exchange Australian online retailers and their suppliers. The National Online Retailers Association (NORA) is currently championing such an initiative and an expanded project with SBR would deliver early success.
b) Childcare where there are multiple touch points across government, business and non-government organisations and with duplication of processes and key information gaps.
c) Birth of a child where there is potential to remove unnecessary duplication of information requests across health, state and federal agencies.
d) Homelessness where there are multiple touch points across government and non-government organisations to track and support clients that use multiple service providers.
e) Trade and supply chain logistics which is currently a largely paper based information exchange system involving multiple businesses and some government agencies. An example is the Port Botany logistics transfer Hub for handover of data for import requirements and shipping to other hubs;
f) Agriculture where provenance information for supply chains could be better shared to support the growth in international trade, brand promotion & biosecurity.
g) Identity Assurance where there is a growing need to accept shared identity assurance services from government agencies and the private sector. The UK Government is implementing a federated approach to identity assurance using third party services.
h) Open Innovation events such as hackdays and competitions to encourage agile innovation around new uses for government API data services.

Key demonstrator projects which could also be supported and would involve a

greater level of investment and/or regulatory change and deliver sustainable benefits include:

a) E-invoicing to encourage greater automation and efficiency of invoicing between business and government, and potentially for broader business-to-business adoption.
b) E-Payroll to encourage greater automation and efficiency of payroll processing and associated reporting to government in terms of taxation and related information.

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