Australian Government

Department of Defence

SOLUTION
REFERENCE ARCHITECTURE

2016.05.24
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Introduction

1. Defence operates a range of business systems that fall into many categories of ICT application and involve many forms of interaction. It can be difficult to understand and clearly communicate exactly what aspects of ICT systems' functionality are repeating or overlapping with other systems, or where a solution fits within the enterprise. A clear and simple taxonomy is needed.

2. This Reference Architecture introduces the high level taxonomies to be used to describe the logical interactions of systems and people. These will provide a reference for comparison with other systems and the application of other patterns and constraints in other subject area Reference Architectures.

Definition

3. In relation to ICT Architecture, a *solution* is: 'one or more ICT components that fit together to achieve an outcome'. The outcome may be specifically for end users to achieve a Defence business outcome, it may be for an enabling outcome, or it may form part of an enterprise wide solution that is primarily focused on delivering infrastructure services. Components of the solution may exist in different location within and outside Defence.

Scope

4. This reference architecture applies across all of Defence, including fixed and deployed environments, interfaces to partners and all security domains.

Audience

5. This intended audience for this document is Defence solution architects and capability planners. It provides guidance to ensure ICT solutions fit seamlessly within the overall Defence enterprise architecture. The capability planning function should also apply consistent language and concepts.

Concepts and terminology

6. Taxonomy is needed to understand and communicate how an ICT system fits into the enterprise. This will:

   a. Reduce issues arising from misunderstandings as to a solution's place in the enterprise.

   b. Provide a common reference system that can be used in other architectures and patterns that simplify defining how the patterns and architectures apply to any solution.

   c. Provide a common language that is easy to apply across domains and different experience levels.

7. Solutions typically involve combinations of interactions between people and systems. To attribute guidelines, patterns and standards it is necessary to define categories for these. The nature of **who** (*parties*) interacts; **how** they interact with systems (*interaction types*); **where** they interact (*interaction locations*) and the way those interactions occur (*interaction modes*) are the basis for many design decisions across the enterprise.

8. This Reference Architecture will introduce the following taxonomies:

   a. Parties,

   b. Interaction Types,

   c. Interaction Locations, and

   d. Interaction Modes.

Reference Model

Parties

9. There are different parties, sometimes known as actors when conducting business analysis, who interact with Defence. The parties are individual humans and systems; they are classified here based on the nature of their identity, specifically who established it. Therefore in showing *who* interacts we have the following categories:

   a. **Defence.** Any entity for which their *Identity* is established by Defence and the authentication is against that *Identity*.

   b. **Partner.** Is any non-Defence entity such as coalition members, OGOs, NGOs, business partners or service providers that establish their own separate *Identity* and provides services to, for, or is a peer of Defence. It is expected that Defence can establish a level of trust with partners to work with their identities. These partners can be subcategorised by the level of trust Defence is willing to establish:

      (1) High,

      (2) Medium, or

      (3) Low.

      Individual members of a partner organisation may be allocated a Defence *Identity* to meet specific business requirements. This would be typical if no organisational trust can be established.

   c. **Public.** Any other type of entity; but is specifically meant to cover users who may not need to authenticate or their authentication is incidental to the activity and a personal authentication provider such as Facebook, Linked-in, Google or Microsoft may suffice. Any relationship with them is as an individual and not via an association with Defence or a Partner.

10. Entities can be person or non-person. The main non-person entity of interest will be running code on systems – Agents.

11. In developing any solution, these parties would be considered the top level organisational types. In any business analysis, actors must be classified as one of the top level party types defined above.

12. The parties define what is important from an identity point of view; however, it is also important to understand how a party and a system interact.

Interaction Types

13. ICT solutions facilitate human interaction, as ultimately at least one end of a solution will be a human. This observation alone does not help to classify solutions in a way that

shows any behavioural differences. Instead systems themselves will be considered, along with people in their own right.

14. Looking at the permutations of how ICT solutions let humans and systems (aka machines) interact provides a useful breakdown. The following matrix defines the permutations and therefore shows *how* interaction can occur.

▼Interacts with►	Human	Machine
Human	H2H – Collaboration	H2M – Application
Machine	M2H – Notification	M2M – System

Figure 1: The Human–Machine Interaction Types

15. The above interactions as defined as:

a. **H2H – Collaboration.** When an ICT solution is used to facilitate humans communicating or working together.

b. **H2M – Application.** When an ICT solution lets humans achieve an outcome with a machine.

c. **M2H – Notification.** When an ICT solution's primary focus is about machines delivering data/information to a person.

d. **M2M – System.** Systems often exchange data with each other – ultimately to archive a human interaction – but in terms of ICT Architecture there are aspects that can be considered independently.

16. In addition to the types of interaction it is useful to look at where the interaction can occur.

Interaction Locations

17. When understanding and articulating the generic patterns or modes that a solution can take it is useful to identify *where* humans and machines interact. There are three Interaction Locations to consider:

a. **Defence.** An interaction that happens within Defence's boundary. Examples are:

(1) Objective. Where Defence users use the application to store files.

(2) Defence Online Services Domain (DOSD). The services bus for integration of Defence systems with external ones.

b. **Partner.** Where the *Partner* is hosting a solution that Defence and the Partner interact with. Examples are:

(1) Travel management. Travel management provided externally by a partner that requires Defence and Partner identities to function.

(2) Secret Internet Protocol Router Network (SIPRNet). The United States offers an identity for Defence parties to interact with their command and control network.

c. **Intermediary.** Where the solution is hosted by a third party that enables Defence and/or others to interact. However, the intermediary is not involved in the business activity. A typical example is a cloud service provider.

18. Now that the Parties, their Interaction Types and Locations have been defined it is useful to define the ways the combinations of these can occur.

Interaction Modes

19. Parties, Interaction Types and Locations engage via Interaction Modes. These Interaction Modes provide the basis for guidelines and constraints in other architectural and solution work.

20. A base set of Interaction Modes can be defined with only the Parties and Interaction Locations. A generic Interaction Mode consists of two parties, one always being Defence, which can interact at any of the three defined locations. This generic mode is shown in Figure 2, where the left hand party is Defence and where an interaction can also be hosted (the box); the middle interaction location is an intermediary (not a party to the solution); and at the right there is any party, also where an interaction can occur.

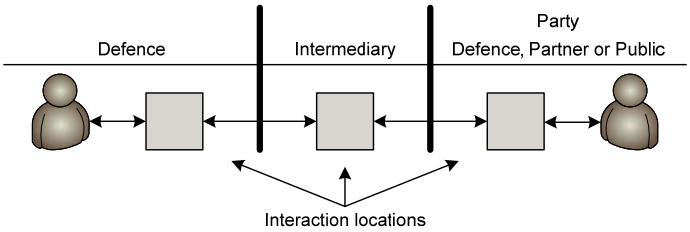

Figure 2: The basic Interaction Modes template.

21. Given the three locations for the interaction the full decomposition of combinations results in eight rows[1]. From row zero where no interaction location is used so the Parties interact directly, through to row seven where all three locations are used.

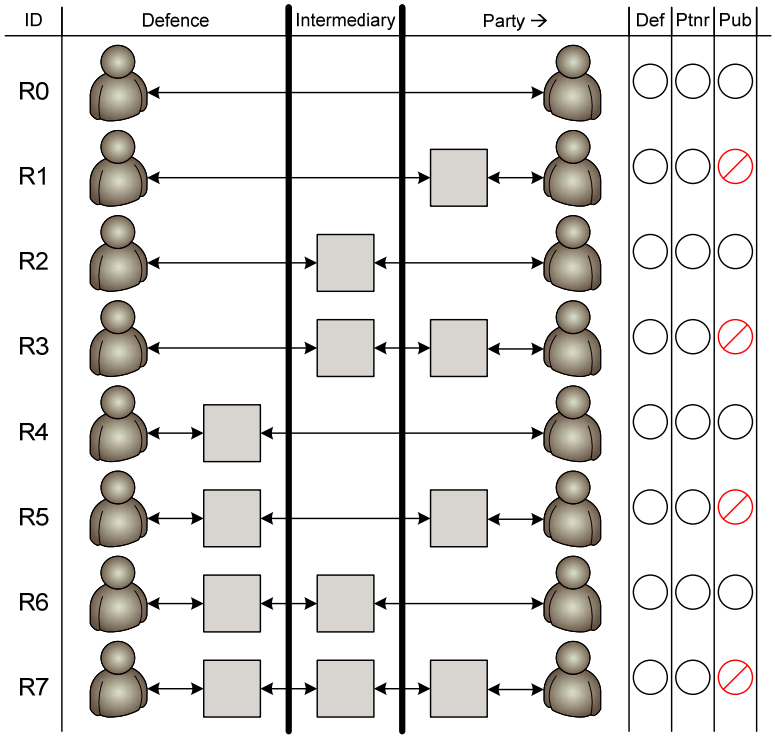

Figure 3: Generic Interaction Modes – all possible points of interaction.

[1] This is a three bit binary sequence.

22. To keep the diagram simple the columns represent both Parties and Interaction Locations; however, whenever the *Party* is the *Public*, a row with an interaction point in the Party column is invalid (Rows 1, 3, 5 & 7). The Public are not Interaction Locations as they are individuals and cannot host an interaction point that Defence can establish a relationship with.

23. This generic set of modes has been defined with out reference to the Interaction Types. The following sections modify these generic modes by applying the Interaction Types; thereby defining the 'Interaction Type Modes'.

Collaboration Interaction Modes

24. For the *Collaboration Interaction Type* the Interaction Modes can be further refined by the idea that people do not typically collaborate across multiple interaction points. For example, a person does not join a chat room that joins a chat room to chat with someone else, they both just join the one chat room; or use the one document sharing site; or indeed collaborate directly as per a telephone conversation.

25. Therefore, any row that contains more than one interaction point has been removed from the generic model. The result is shown at Figure 4, where the arrows have also been adjusted to indicate that the intent is for the parties to interact with each other.

26. The row numbers have been maintained from the generic modes so it is clear which row they were sourced from. The 'R' for Row prefix has been replaced with 'C' for Collaboration.

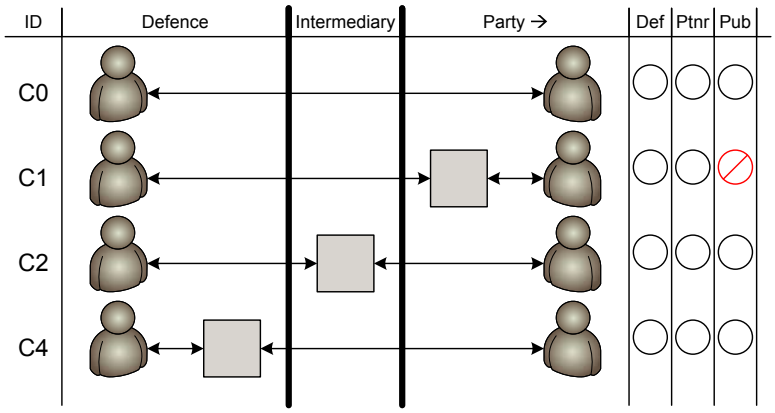

Figure 4: Collaboration Interaction Modes – the locations to collaborate

Application Interaction Modes

27. For the Interaction Type *Application Interaction Type*, the Interaction Modes can be refined by the idea that a party interacts with a single point (an Application). Multiple different parties can use the application concurrently, but their interactions are independent and not formally collaborative. In these interaction modes a Defence party is only required to be represented once and only rows with a single interaction point have been kept. This is shown in Figure 5 below where the prefix 'A' for Application has been used with the original rows numbers.

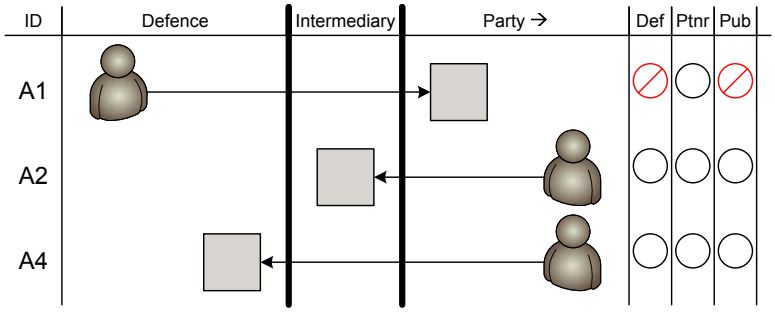

Figure 5: Application Interaction Modes – points to interact with an application

28. The direction of the arrows indicates that the party is using the application. No specific inference about the direction of data or information flow is intended.

29. For these Application Interaction Modes, row A1 is not relevant when the party is a Partner, as it represents a partner using an application under their control, in which case Defence has no architectural interest.

Notification Interaction Modes

30. For the *Notification Interaction Type* the Interaction Modes, shown in Figure 6, are similar to the Application modes above, with the primary difference being the arrows in Figure 5 above are reversed to indicate the interaction is to the party.

31. The same numbering has been applied but with a prefix of 'N' for Notification.

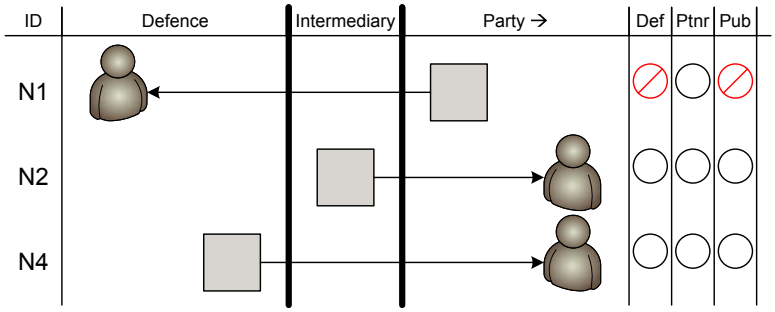

Figure 6: Notification Interaction Modes – points to be notified from

System Interaction Modes

32. For the *System Interaction Types*, the Interaction Modes can be reduced by the idea that at least two interaction points must be involved. The modes shown in Figure 7 are further modified as no human parties are involved.

33. Row S3 has been marked invalid when Party is Defence as it is effectively the same as Row S6.

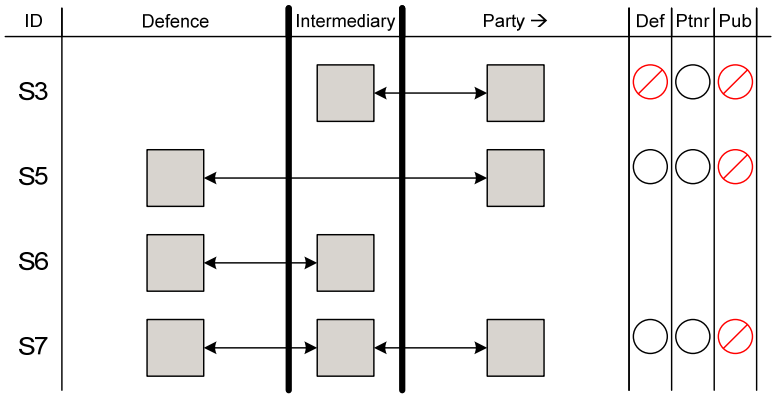

Figure 7: System Interaction Modes

Further Work

34. The Interaction Types defined in this document will each be further expanded in separate Reference Architecture documents covering more specific topic areas.

Conclusion

35. The introduction of Party and Interaction Type, Location and Mode Taxonomies provides a mechanism to communicate clearly and consistently about the nature of Defence solutions.

36. Use of these in solutions and other architectural artefacts will assist in all aspects of the capability lifecycle.