HealthConnect Systems Architecture Project

Phase 2 – Systems Architecture Development

Next Steps for the Architecture

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Requests for copies and inquiries regarding Health*Connect Systems Architecture* can be made to the following address:

Director

Design Section, MDP 25

Department of Health and Ageing

GPO Box 9848

Canberra ACT 2601

Email: healthconnect@health.gov.au

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Health*Connect* Architecture Documents

Phase 1 of the Systems Architecture involved the definition of the requirement for the System Architecture project. This was then used in shaping the Systems Architecture Phase 2. The following listed documents form part of the reporting for this second phase of the Health*Connect* Systems Architecture project and are available at www.healthconnect.gov.au.

If you click on the Systems Architecture link on that web page you will be able to obtain the listed documents.

The Systems Architecture (Phase 2) documents comprise of:

Health*Connect* Architecture Overview	Presents a high-level overview and conceptual model of Health*Connect*.
Health*Connect* Systems Architecture	Defines the Health*Connect* Systems Architecture from the three design viewpoints of Data, Application and Technology. Provides an in-depth description of the Health*Connect* Systems Architecture.
Health*Connect* Implementation Strategy	Describes an implementation strategy for establishing Health*Connect* as a national system of compatible health records systems.

Other System Architecture (Phase 2) documents, available at the above web address, are as follows:

Health*Connect* Architectural Principles	Defines and describes the principles underpinning the architecture.
Health*Connect* Financial Business Model	Describes options for the Health*Connect* financial business model and how the business model might operate. It also explores questions like who might own the assets and data, funding sources for implementation and ongoing operations.
Health*Connect* Business Architecture Models	Documents the business models derived from the Business Architecture (see above). The UML (Universal Modelling Language) models were prepared using Popkin's *System Architect* modelling tool. The document provides instruction on how to navigate the *System Architect* encyclopaedia (see below).
Health*Connect* System Architecture Encyclopaedia	Web browser viewable set of the architectural models built using the Popkin *System Architect* tool.
Health*Connect* Current Systems and Technology	Describes application systems and supporting technology currently in use in the health sector.
Health*Connect* Standards Assessment	Reviews relevant standards that impact/enable Health*Connect*.

Next Steps for the Health*Connect* Systems Architecture (This Document)	Identifies the activities that are required to complete the development of the Health*Connect* architecture to a level of detail sufficient to guide future implementation activities.

The following documents available at the indicated web addresses are referenced in the draft Systems Architecture (Phase 2):

A Health Information Network for Australia	The report of the National Electronic Health Records Taskforce published in July 2000. The recommendations of the taskforce led to the initiation of the Health*Connect* project. This document is available on the internet at: http://www.health.gov.au/healthonline/publications/publications.html#Pub00
Health*Connect* Interim Research Report	The report comprises three volumes: Volume I, which provides an overarching view of the Project achievements and findings to date, and recommends a way forward for this important national project; and Volumes II and III which contain a number of research reports, case studies and evaluation reports as background materials. www.healthconnect.gov.au
Health*Connect* Business Architecture	Describes the business requirements for Health*Connect*. It was the starting point for the development of the Systems Architecture. Version 1.0 is being published in the Health*Connect* Interim Research Report, which is being released at the same time as the Systems Architecture. www.healthconnect.gov.au

PLEASE NOTE

As well as being available on the web site www.healthconnect.gov.au all the Health*Connect* Architecture documents and Health*Connect* Interim Research Report are available on CD.

Printed versions of the Health*Connect* Interim Research Report and Health*Connect* (Phase 2) draft Systems Architecture document are also available.

If you would like a CD or printed document please send your request to healthconnect@health.gov.au or phone 02 6289 7716.

Glossary of Terms

Term	Definition
AEM	Approved EHR Manager
CIS	Clinical information System
CIP	Clinical information Program
EHR	Electronic Health Record
FY	Financial Year
HRS	Health*Connect* Records System
HRSA	Health*Connect* Records System Application
IT	Information Technology
RFT	Request for Tender
UML	Unified Modelling Language
XML	eXtensible Markup Language

1 Introduction

1.1 Purpose of this Document

This document identifies the activities that are require to complete the development of the Health*Connect* Systems Architecture to a level of detail sufficient to guide future implementation activities. The document identifies those elements of the architecture that require further definition and proposes appropriate methods and activities to develop that definition. A program of work over the next 2½ years is present for Phase 3 of the Health*Connect* Systems Architecture Project.

1.2 Document Structure

The main body of the document is structured as follows:

1. **Introduction**, which describes the purpose and structure of this document and its relationship to the other Health*Connect* Systems Architecture documents.
2. **Background,** which describes the current status of the Health*Connect* Systems Architecture and discusses the need for further development.
3. **Architecture Development Activities,** which describes the proposed activities for developing the architecture.
4. **Summary of Activities**, which provides a summary of the proposed activities in a table.
5. **Program of Work**, which presents the sequence of the activities over the next 2½ years in the form of a Gantt Chart.

2 Background

The intent of Health*Connect* is to provide a common capability for health IT systems to exchange electronic health records (EHR). This capability will require the adoption of common policies, standards and architecture across all participating health IT systems, together with the establishment of a national infrastructure for exchanging EHR. This infrastructure is currently envisaged as a peer-to-peer network of data storage and distribution systems known as Health*Connect* Records Systems (HRS) supported, at the national level, by coordination and data recovery systems.

2.1.1 Levels of Realisation

The realisation of the Health*Connect* vision will require a cooperative effort by government, healthcare organisations, providers and vendors to develop and implement Health*Connect* capable systems, establish the national infrastructure and operate those systems under a common governance arrangement managed by an appropriate Health*Connect* Authority. An essential first step is the communication of a common definition of Health*Connect*, sufficient to guide the independent development of interoperable systems. The Health*Connect* Implementation Strategy identified five levels of realisation; these represent increasing levels of precision in the system definition:

1. **Policy,** whereby the Health*Connect* Authority could establish a set of national policies covering key aspects of Health*Connect* operations.
2. **Standards,** whereby the Health*Connect* Authority could establish a set of interoperability standards defining how Health*Connect* compatible IT systems exchange data.
3. **Architecture,** whereby the Health*Connect* Authority could establish a common system architecture for Health*Connect* defining how the overall system will operate.
4. **Reference Implementation,** whereby the Health*Connect* Authority could develop a fully functional reference implementation of a HRS system that would illustrate how the system should work and be made available to system developers and vendors.
5. **Full System Implementation**, whereby the Health*Connect* Authority could implement the full-scale system incorporating one or more HRS and, which may even extend to the provision of special purpose software and/or hardware to participating healthcare providers.

These levels are cumulative with each subsequent level incorporating all of the levels above it. Thus they represent increasing levels of detail and precision in the definition. At the highest level only broad system policies are defined. At the most detailed level the system is fully defined, developed and implemented by the Health*Connect* Authority – removing any possibility of ambiguity in implementation.

The Health*Connect* Implementation Strategy proposes that Health*Connect* should be defined to Level 4, in the form of a fully functional reference implementation of the Health*Connect* system, supported by published policies, standards and system architecture (ie Levels 1-3). The reference implementation will need to incorporate

both the HRS application (HRSA) and the other functionality (National Directory, Data Store, external interfaces and a web browser client) as defined in the Health*Connect* System Architect document. This reference implementation could then be made available to system developers and product vendors in the form of reusable platform independent components that could optionally be incorporated into their systems and/or used for their system interoperability testing.

2.2 Scope of the Current Work

To date the initial releases (Version 1.0) of the Health*Connect* Business Architecture and Systems Architecture have been developed. The initial releases of both architectures have defined Health*Connect* in sufficient detail to contribute to answering the research questions (which is the current focus of the Health*Connect* program). It is noted that the Systems Architecture has established the technical feasibility of implementing HealthConnect, identified a preferred implementation model and has established the likely cost of developing, implementing and operating Health*Connect* over 10 years.

2.2.1 Business Architecture

The Health*Connect* Business Architecture has sought to define Health*Connect* at Realisation Level 1, by describing the scope, policies and the generic business rules. It is noted that the national health information policies that will apply to Health*Connect* are still being developed.

2.2.2 Systems Architecture

Phase 2 of the Health*Connect* Systems Architecture Project has extended this definition of Health*Connect* to cover Realisation Levels 2 and 3 through the development of a conceptual model based on the Federated Enterprise Architecture Framework (FEAF). FEAF defines four layers of abstraction and the Systems Architecture has been divided into two views.

2.2.2.1 Business Level View – FEAF Level II and III

At FEAF Levels II and III the Health*Connect* Systems Architecture comprises a business-level view, known as the Architecture Overview, defining the system objectives and identifying 10 common services, and providing an overview of the characteristics of the system data, application functionality, system topology and technology, implementation strategy and standards.

2.2.2.2 Systems Level View – FEAF Level IV

At Level IV, FEAF defines a matrix of nine perspectives comprising three architectural views (data, applications and technology), which are described from three role based views corresponding to three increasing levels of detail:

- Planners View (objectives/scope)
- Owners View (enterprise model)
- Designers View (systems model).

This matrix is illustrated in Figure 2-1.

The Systems Architecture has defined Health*Connect* down to the Designers View in this matrix. The Business Architecture Models derived from the Health*Connect* Business Architecture (Version 1.0) have been used to complete the top row

(objectives/scope) and partly complete the second row (enterprise model) of the FEAF Level IV matrix. The Systems Architecture document extended this work to complete the second (enterprise model) and third rows (systems model), respectively.

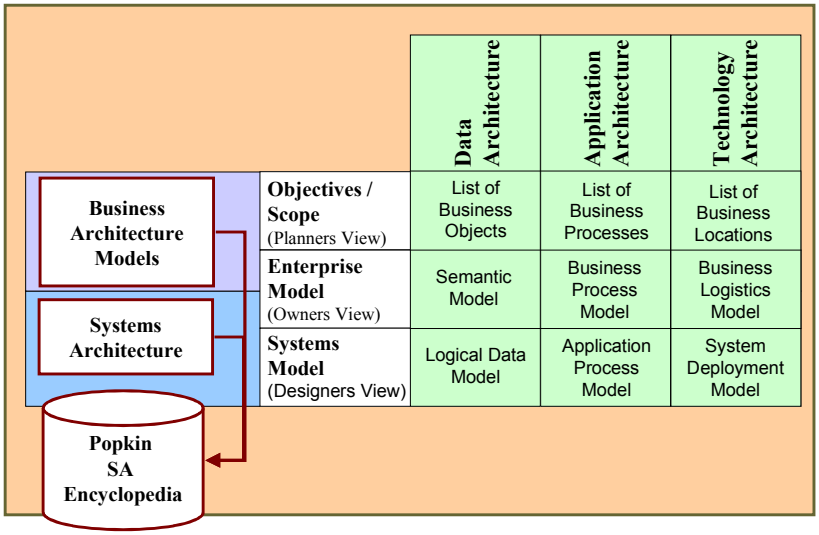


Figure 2-1 FEAF Level IV Perspectives

The Systems Architecture comprises the three architectural views

- The data view, which identifies the top-level components of an EHR and proposes an extensible data structure and associated governance model. It is noted that the definition of the contents of the EHR was outside of the scope of Phase 2 of the Systems Architecture Project and is being addressed separately through the Clinical Information Project (CIP).
- The application view, which includes UML models that decompose the application functionality onto a defined set of application components. This represents one possible system-level design for the core Health*Connect* application. The UML models have been developed in Popkin Sofware's *System Architect* tool and are stored and accessible through the *System Architect* encyclopedia.
- The technology view, which proposes a federated topology and three user access models and identifies relevant standards and technologies suitable for implementation.

Supporting documents in the form of assessments of current systems, and standards and an implementation strategy, business strategy and cost model have been developed.

2.2.3 Developer Perspectives

At Level IV, FEAF identifies two additional perspectives, illustrated in Figure 2-2, that are intended to be completed by the system developer:

- **Builder's View (Technology Model)** - The contractor must redraw the architect's plans to represent the builder's perspective, with sufficient detail to understand the constraints of tools, technology, and materials. The builder's plans correspond to the technology models, which must adapt the information systems model to the details of the programming languages, input/output (I/O)

devices, or other required supporting technology. This corresponds to the Detailed Design for the system.

- **Subcontractor View (Detailed Specifications)** - Subcontractors work from shop plans that specify the details of parts or subsections. These correspond to the detailed specifications that are given to programmers who code individual modules without being concerned with the overall context or structure of the system. Alternatively, they could represent the detailed requirements for various commercial-off-the-shelf (COTS), GOTS, or components of modular systems software being procured and implemented rather that built. This corresponds to the system Component Specifications.

		Data Architecture	Application Architecture	Technology Architecture
(Business) Architectural Descriptions	**Objectives / Scope (Contextual)** ***Planer***	List of Business Objects	List of Business Processes	List of Business Locations
Systems Architecture	**Enterprise Model (Conceptual)** ***Owner***	Semantic Model	Business Process Model	Business Logistics Model
	Systems Model (Logical) *Designer*	Logical Data Model	Application Process Model	System Deployment Model
Detailed Design	**Technology Model (Physical)** *Builder*	Physical Data Model	System Design	Technology Architecture
Component Specifications	**Detailed Representation (Out-of-Context)** *Sub-Contractor*	Data Definition	Programs	Network Architecture

Figure 2-2 FEAF Level IV Developer's Perspectives

Both developer perspectives are technology dependant; they represent a specific approach to implementing the logical requirements contained in the Systems Architecture on a particular technology base (hardware, operating system, database, development toolkit, etc).

The Health*Connect* implementation strategy allows for each vendor, provider or jurisdiction to source and or develop their own Health*Connect* implementations (referred to as the HRS Application) and Health*Connect* compatible end user systems (eg Clinical Information Systems and Patient Administration Systems). The intent is to allow each user group the freedom to implement their systems in the technology environment of their choice. Thus it is expected that there will a number of Health*Connect* implementations produced by different developers. The developers of each Health*Connect* implementation will be responsible for preparing the Detailed Design and Component Specifications for their implementation.

The intent is to select one or more of the early implementations as a reference implementation and to make this available to other vendors and user organisations to use as a guide and or test bed for their own developments.

2.3 Ongoing Architectural Development

Together the Business and Systems Architectures provide important top-level guidance for future implementation, specifically in regards to scope, data

extensibility, the core functionality and the federated topology. However they lack the precision to be used as a specification for a tender or implementation project for the development of a reference implementation. This is due to the current ambiguity regarding the specific policies and business rules that will apply to Health*Connect* and the uncertainty about the full scope of the EHR contents.

Whilst significant work has been undertaken, outside of the Systems Architecture Development Project, to define a set of common policies, this work is immature. It is noted that Health*Connect* requires the development of a harmonised policy, one that accommodates the needs of consumers, providers, governments and other users. It also requires a pragmatic policy, one that does not adversely impact any user group, is scalable and can be implemented within the likely budget. As the policies and EHR data requirements are clarified it will allow for more precision to be incorporated in the System Architecture models.

It is envisaged that the architecture will need to continue to be developed over the next 2½ years leading to a mature architecture defined to a level of detail sufficient to guide a coordinated nation-wide implementation program. In the short term the current architecture documentation may be used as a viable basis on which to garner consensus amongst the major stakeholders on the top-level operating models and concepts. Once this consensus has been established, the lower layers of the architecture should be progressively developed. It is anticipated that the architecture will pass through several iterations and will be subjected to further rounds of stakeholder review over the next 2½ years.

Initially the architecture will need to be updated to accommodate wider stakeholder comment and the learnings from the fast track trials. As the common services policies mature, additional systems architectural work will need to be undertaken to reflect these policies and to further elaborate on the specifications of the HRS services (which implement the common services at the systems level). Similarly, as the State/Territory and relevant private sector projects complete their system design phases there will be a need to harmonise those system designs with the Health*Connect* Systems Architecture. An ongoing capacity modelling activity will be required to verify that the architecture can achieve the performance and scalability targets.

The integrity of the final architecture will be dependent upon a number of factors including the accuracy and completeness of the inputs, particularly the policy work, which will be dependant on a high level of involvement by stakeholders. It is anticipated that considerable input will be required from all States and Territories, vendors and from private healthcare providers. The architectural work must be of sufficient detail to enable a system specification to be prepared that, in the event of a decision to proceed to a product based development or a bespoke development approach, will provide the basis for a RFT.

3 Architecture Development Activities

3.1 Stakeholder Communications

In the first instance the current architecture will need to be communicated to the key stakeholders (H&A, HIC, States and Territories, provider and consumer representatives, and the IT industry). This will require the development of suitable presentation materials followed by a series of consultation activities and the collation of stakeholder comments. The first round of stakeholder communication should be undertaken as soon as practical. Two further rounds of stakeholder communication are proposed at appropriate milestones in the evolution of the architecture over the next two years.

The initial round of stakeholder communication may be aided through the development of more detailed papers discussing the rationale behind the major architectural concepts, specifically the use of extensible data structures, the federated topology and the access models. It is noted that the Health*Connect* Systems Architecture is consistent with current best practices in IT architecture such as the Services Oriented Architecture proposed by Gartner and the IBM, Sun and Microsoft web services architectures. Thus it is expected that experienced systems architects will understand the underlying rationales. However, it is recognised that some stakeholders will benefit from a discussion of the system design issues that led to the evolution of these industry architectures. Such discussion will give participants a better basis for understanding the rationale for the Health*Connect* Systems Architecture.

It is proposed that two background papers be developed: one on the evolution of extensible data structures and their application to health information, the other on the topology models for large-scale multi-user IT systems and their relevance to Health*Connect*. It is recommended that this work should be undertaken during the first month of FY 03/04 so that the papers can be disseminated to stakeholders during the consultation period.

3.2 Policy and Standards for Common Services

During 2002, definitional work commenced to identify and describe the essential elements of Health*Connect*, known as the Common Services. A description supported by principle statements was prepared for each of the Common Services, to guide the development of the business and systems architecture. Further work is now required to complete the definition of the services, which are essential, if Health*Connect* is to reach deployment within four years.

It is recognised that policy will need to continue to evolve during the life of the Health*Connect*, however it is important to establish a common policy baseline as a starting point for the system. This baseline must be practical in order to be readily implementable within the likely financial, business process and technology constraints.

It is recommended that this work, which in many cases is already under way, be fast tracked in order to provide an initial policy baseline within 12 months (the Interim Policy), sufficient to guide the finalisation of the architectural and design work. There will be a further 6 month window in which the policy could be fine tuned to provide a mature policy baseline for the build phase (the Final Policy).

If the policy work cannot reach maturity within this two year period, further delay will have a direct impact on the remaining implementation schedule.

It is proposed that a pragmatic means for completing the Interim Policy is to develop a common definition of each common service at a systems level (as opposed to a business level). With the definition being derived through the harmonisation of the HRS services, as documented within the current systems architecture, with the equivalent services, as implemented in the current Health*Connect* trial systems and Medi*Connect*, and the learnings from those trials. This is best achieved through an intensive architectural workshop involving business and technical stakeholders from each project.

The intent being that the resulting system level definition of the common services will represent a consensus view of how the common services should be implemented and that this will provide clear guidance for establishing practical business level policies for each service. It is envisaged that the systems level description for each common service will be presented as a set of detailed UML models supported by a business process description and rationale. A set of business policies could then be derived for this work, taking account of the initial findings of the business process modelling activity, and taken to stakeholder consultation.

This activity could be extended to address the specific issue of how Medi*Connect* services are best integrated into the Health*Connect* services.

It is proposed this work should be undertaken during the first half of FY 03/04. Stakeholder feedback and legislative developments could then be accommodated into the final policy, which will form the basis for the initial system implementation. This final policy will need to be developed by early FY 04/05.

3.3 Organisational Change Study

An organisational change study has been proposed over three years with the primary objective of understanding how Health*Connect* may best integrate with existing provider work practices. Secondary objectives will include understanding the business and communications process flows between the Health*Connect* Governance Authority, the Approved EHR Managers, who will operate the Health*Connect* Records Services (HRS) and the users community (providers, consumers, researchers, managers and healthcare institutions).

This study will investigate provider workflows and seeks ways to improve provider work processes through the use of the Health*Connect* services. It is expected that the majority of the work will be completed in year 1 with the remaining two years devoted to incremental improvement in the processes, as each Health*Connect* site becomes operational. This study will draw on the common services policy work and seek to understand the impact of the initial policies on the provider work practices.

The study will also examine the management processes associated with providing and governing the HRS services. However processes associated with the operation and support of the underlying IT infrastructure will be excluded (ie operation of the data centre).

The findings and recommendations of the study will be used to finetune the common service policies and supporting processes and to guide the overall change management approach. It is proposed that the study comprise the following activities:

3.3.1 Business Process Modelling

This activity will involve the documentation of the current business processes ("as is" models) of each major category of participant using Business Process Modelling techniques. These models will be used to understand how providers may utilise electronic health records in the delivery of their healthcare services and will clarify the information requirements of all participants, which will assist with the detailed definition of the EHR content.

An assessment of the "as is" models will be undertaken to understand how participant may modify their work practices to take advantage of the services available through Health*Connect.* This will lead to the development of future business process models ("to be" models). The 'to be" models will incorporate the new business process for governing Health*Connect* and for communication between the various categories of participant. It is possible to develop "to be" models variants to assess different policy scenarios. These models will guide the design of Health*Connect* services, interfaces and management policies.

It is recommended that this activity should be commenced during the first half of FY 03/04 so that the initial versions of the models can be used to guide the definition of the common services policies. However, it is envisaged that it may take up to 12 months to complete the modelling of all major provider categories.

3.3.2 Ongoing Business Process Refinement

This activity will seek to refine the Business Process Models as the common services policies and the Health*Connect* architecture mature during year two. It will involve incremental reassessment of the models and where appropriate modification to the models in consultation with provider representatives. The timing of these reviews will be driven by appropriate milestones in the common services and architectural work.

In year three the focus will be on assessing the usability of the developed system functionality deployed during early Health*Connect* Pilot activities. This activity will involve working with providers involved in the trials to review the detailed functional requirements for Health*Connect* particularly in relation to the integration with existing clinical information systems (CIS), clarify the candidate information content for the electronic health records and provide an understanding of provider and consumer issues which will provide a basis for later communications strategies aimed at encouraging provider and consumer participation in Health*Connect*.

3.3.3 Business Benefits Realisation Study

This activity will identify and quantify the expected business benefits for both provider organisations and consumers. It is proposed to undertake this study in mid FY 03/04 with a view to establishing a baseline for assessing future benefits and to identify and quantify the expected benefits. In year four the study will conclude with a benefits realisation activity, which will assess the degree to which the identified benefits have been achieved.

3.3.4 Customer Contact Channel Strategy

Whilst Health*Connect* is intended to be a backend system that providers access via their clinical information systems, it is recognized that many providers will require support and assistance to enable them to effectively use Health*Connect*. Similarly,

consumers who are likely to access Health*Connect* directly (most likely via a web browser) will require some level of interactive support. The requirement for a contact center was identified in the Implementation Strategy. It is envisaged that Health*Connect* will ultimately communicate with customers through a range of channels including television and print media, web, email and telephone.

It is proposed that a customer channel strategy be developed to identify how Health*Connect* should utilize each channel to provide information to customers and handle customer inquiries. This strategy will clarify the requirements for the call center and will provide a foundation for delivering later communications strategies. It is recommended that this work should be commenced during the second quarter of FY 03/04 so that an interim strategy can be developed for incorporation into the interim detailed architecture. The strategy should be reviewed and updated in early FY 04/05 to reflect the final business process and policy decisions.

3.4 Heath Record Data Architecture

The current Health*Connect* architecture has deliberately refrained form defining the detailed structure and content of the EHR as this work falls within the domain of the Clinical Information Project (CIP). Rather, the architecture presents a possible top-level structure for the EHR and describes the desired characteristics of the EHR structure. It has become apparent from feedback from the CIP and other stakeholders that all stakeholders will benefit from further definition of the EHR data structure.

3.4.1 EHR Content and Structure.

It is proposed that a document be prepared to describe in detail how the EHR data may be structured into XML documents and how such XML documents may be processed to generate EHR views, EHR lists EHR reports and notifications. It is recommended that this work should be undertaken during the first two months of FY 03/04 so that the paper can be disseminated to the CIP project and other stakeholders in sufficient time for it to be included in the CIP project deliberations.

3.4.2 EHR Metadata Example

It is proposed that an example set of XML documents (consisting of document structures plus example data) should be developed to describe the Event Summary, EHR List, EHR View, EHR Report and Notification with a view to illustrating to stakeholders how EHR documents may be presented and manipulated. The examples will highlight the possibilities and the difficulties in defining the Health*Connect* metadata. The examples should be derived from the data sets that are being processed within the Health*Connect* trial systems.

The information gathered in creating these example documents will inform:

- The CIP. This group will see concrete examples of how the architecture will implement the structures that they are defining. The experience will, no doubt, inform their future work. Their feedback will provide extremely valuable information regards the viability of the model.
- The trial systems. The Queensland, NSW, Tasmanian, South Australian and Northern Territory trials will gain an appreciation of the central Health*Connect* components and will perhaps be influenced into integrating the Health*Connect* EHR components into their own development work. Their review will also, of course, inform future prototypes and trial health record components.

- Medi*Connect*. A special case of the trial systems, the prototyping effort should include building XML documents that will demonstrate how the Medi*Connect* application and Health*Connect* can be merged at the data level. This information may influence future Health*Connect* and Medi*Connect* development.
- Health*Connect* architecture. Experiences from the development of the examples can be used to inform the development of other aspects of the Health*Connect* architecture.

It is recommended that this work should be undertaken during the first quarter of FY 03/04 so that the examples can be disseminated to the CIP project and other stakeholders in sufficient time for them to be included in the CIP project deliberations.

3.4.3 EHR Metadata System Prototype/Trial

It is proposed that a prototype system for processing XML documents should be developed to demonstrate the processes for registration of document structures (schemas), and the application of schemas for accessing and transforming EHR documents. This system will be designed to process extensible documents with the prototype set of documents (proposed above) being used to establish the initial data set. This system could be developed as a standalone demonstrator or alternatively incorporated into one or more existing Health*Connect* trial systems. In the later case the system will need to be implemented with an appropriately sized XML repository in order to store the trial data set. It is recommended that this work should follow on from the EHR Metadata Prototype activity with view to completing the system in the first half of FY 03/04.

3.4.4 Detailed Data Architecture

It is proposed that the EHR structure and an initial set of EHR documents, EHR Views, EHR lists EHR reports and notifications be specified in detail in order to more precisely guide the initial implementation. It is proposed to develop these specifications in two stages, as an interim detailed data architecture derived from the outcomes of the CIP project and the learnings from the trials, the business process modelling and the harmonisation of the system level services, and a final detailed data architecture incorporating the final policy and stakeholder feedback.

3.5 Application Architecture

The current application architecture maps the common services onto a set of system level services, known as the HRS Services. The application architecture decomposes the HRS Services into a set of top-level system components. The core system component being the HRS application (HRSA), a reusable module that can be used for the HRS, the National Data Store and incorporated into CIS. Each of the components has been modeled in UML.

Currently only very high level business scenarios have been defined for the HRS Services and associated HRSA components. The current definitions do not cover all possible interactions with Health*Connect* and hence do not include all of the functions that will be required of the system and its operators). Of those business scenarios that are covered there is very little consideration of non-normal conditions. It is therefore suggested that further work be undertaken to define a more comprehensive set of use cases.

Two iterations are proposed, the first to product an interim detailed design based on the interim common services policies and business process models. The second iteration will further modify the models to reflect the final policies and further refine the interfaces. Three areas of activity are proposed within each iteration, as follows.

3.5.1 Service Definition

The refinement of the definition of each HRS service to reflect the refined common services policies and elaboration of error handling and system management functions. This will be presented as a series of specific use cases.

3.5.2 HRSA Component Definition

The extra level of detail added to the service model by the previous items will need to be incorporated into the HRSA component definitions. Refined class models should be defined and collaboration diagrams showing how the components will implement the use cases should be developed.

3.5.3 HRSA Interface Definition

In order to allow the independent development of application components within the Health*Connect* domain it is only necessary to define the responsibilities of each component (as per the previous step) and describe the interfaces that will allow the components to communicate with each other. The specification of HRSA interface definitions will allow software developers (for the trial systems and provider and allied systems) to design (and code) compatible interfaces.

3.6 Technology Architecture

The current technology architecture defines the system topology and operating models and the technical infrastructure. It is envisaged that the system topology will remain unchanged, although a discussion document providing background to the rational may be developed, as described in Section 3. Two areas of activity are proposed.

3.6.1 Infrastructure Product Review

Consideration should also be given to identifying products that are suitable for implementation. A survey of products suitable for hosting Health*Connect* should be undertaken. These products will host the communications, the storage and the application that will form Health*Connect*. Because infrastructures are typically comprised of several inter-dependent products it is suggested that three leading infrastructure product sets be compared - each one nominating the key products, perhaps with some products used more than once. Some of these infrastructures may require very little application development work while others may require a considerable effort. The costs and benefits of each infrastructure should be estimated in order to develop a preferred solution.

It is recommended that this review should be undertaken in mid FY 04/05 so that outcomes can be factored into the detailed implementation planning.

3.6.2 Capacity Planning

As the detailed data and application requirements are developed the technology infrastructure requirements will need to be reviewed to ensure that the performance and scalability objectives can be achieved. It is proposed to develop a formal

capacity planning model and to use this model to assess the performance and scalability characteristics of the interim detailed system design and the final detailed system design. Both activities should run in parallel with the development of the respective versions of the detailed data and applications architectures so that the learnings can be immediately incorporated into the designs.

3.6.3 Technology Recommendation Updates

The technology and standards recommendations relating to the technical infrastructure should be reviewed and updated based on the outcomes of product review and capacity modeling activities. Consideration should also be given to any technology learnings arising from the trials and recent technology and standards developments in both the health sector and the IT industry.

It is noted that the intent is to avoid mandating specific technology, and to only mandate technology standards where there is a clear need to. The intent is to allow market forces to determine the preferred technology and standards directions. In cases where there are multiple equivalent standards available it is preferable that Health*Connect* support all standards.

3.7 Implementation

The current implementation strategy has outlined a 10 year timetable of activities required to achieved a mature national Health*Connect* operation. A more detail implementation plan will need to be developed towards the end of the design and development phase. It is proposed to commence this planning in first half of FY 04/05 so that it can be incorporated in the stakeholder consultation of the interim detailed architecture. It is envisaged that the implementation plan will not be finalised until late in FY 04/05.

The selection of one or more reference implementations based on current stakeholder projects or possibly product sets is central to the implementation strategy and this selection is proposed to be undertaken in the second half of FY 04/05.

In the event that no suitable reference implementation can be identified, the fall back implementation strategy is to tender for a bespoke development. It is envisaged that such a tender may be developed, let and evaluated during the first half of FY 05/06 to enable the build and test activities to commence in that FY.

4 Summary of Activities

Table 4-1 summaries the activities that should be undertaken over the next 2½ years as Phase 3 of the Health*Connect* Systems Architecture Project.

Activity	Tasks	Timing
Stakeholder Communications	Preparation of presentation materials. Preparation of two background papers. Presentations to stakeholders and collation of stakeholder feedback.	First month of Qtr 3 of 03. First month of Qtr 3 of 03. Four rounds over Years 03/04.
Policy and Standards for Common Services	Prepare harmonised system level definition of common services business processes. Derive interim policy from system level business process definition and initial business process modeling. Present interim policy to stakeholders. Prepare final policy incorporating stakeholder feedback.	Qtr 3 & 4 of 03 Qtr 1 of 04 Qtr 2 of 04 Qtr 3 of 04
Organisation Change Study	Preparation of business process models of "as is" and "to be" processes for major provider groups and of "to be" processes for governance functions. Refinement of business process models. Prepare benefits realisation baseline. Prepare customer contact channel strategy for providing support to providers and consumers.	Interim models Qtr 3/4 of 03. Final models Qtr 1/2 of 04. Ongoing from Qtr 03 of 04. Qtr 1 of FY 04. Interim strategy in Qtr 4 of 03. Final Strategy in Qtr 3 of 04.
Health Record Data Architecture	Prepare a background document describing how XML may be used to structure and process EHR data. Develop an example set of XML document (metadata and data) including examples covering Medi*Connect* data. Develop a prototype system for processing XML base EHR either as a standalone system or as an extension to an existing trial. Develop the detailed data architecture including specification of the initial EHR documents, EHR views, EHR lists and EHR reports.	Months 1/2 of 03 to enable the document to be considered by the CIP project. Qtr 3 of 03 to enable the examples to be considered by the CIP project. Qtr 4 of 03 Interim architecture in Qtr 2/3 of 04. Final architecture in Qtr 1 of 05.
Application Architecture	Develop additional detailed definition of the functions required to support the low-level business interactions derived from interim and final business policies and business process models.	Interim architecture in Qtr 2/3 of 04. Final architecture in Qtr 1 of 05

Activity	Tasks	Timing
Technology Architecture	Undertake a survey and review of available products for implementation. Undertake capacity planning modeling to assess the performance and scalability of the interim and final system designs. Prepare and issue updated technology and standards recommendations based on outcomes of product review and capacity modeling.	Qtr 01 of 05. Prepare base model in Qtr 1of 03. Model interim system in Qtr 2 of 04. Model final system in Qtr 1 of 05. On completion of each capacity modeling activity.
Implementation	Prepare a detailed implementation plan on completion of the final version of the architecture. Select a reference implementation from current projects or product set. Prepare tender of a bespoke development if no suitable reference implementation can be identified.	Detailed planning in Qtr 3 of 04. Finalise plan in Qtr 2 of 05. Qtr 1 of 05. Qtr 3/4 of 05.

Table 4-1 Summary of Phase 3 Activities

5 Program of Work

ID	Task Name	Duration	Start
41	Interim Customer Channel Strategy	60 days	Wed 12/11/03
42	Final Customer Channel Strategy	60 days	Wed 6/10/04
43	**Health Record Data Architecture**	**435 days**	**Wed 23/07/03**
44	Prepare EHR Content and Structure Document	20 days	Wed 23/07/03
45	EHR Metadata Examples	15 days	Wed 20/08/03
46	**EHR Metadata System Prototype**	**120 days**	**Wed 10/09/03**
47	Develop Prototype System	50 days	Wed 10/09/03
48	Demonstrate/Operate Prototype	60 days	Wed 19/11/03
49	Review Prototype	10 days	Wed 11/02/04
50	**Interim Detailed Architecture**	**90 days**	**Wed 14/04/04**
51	Develop Interim Detailed Data Architecture	90 days	Wed 14/04/04
52	Issue Interim Detailed Data Architecture	0 days	Tue 17/08/04
53	**Final Detailed Architecture**	**60 days**	**Wed 29/12/04**
54	Develop Final Detailed Data Architecture	60 days	Wed 29/12/04
55	Issue Final Detailed Data Architecture	0 days	Tue 22/03/05
56	**Clinical Information Project**	**100 days**	**Wed 25/06/03**
57	CIP Completes	70 days	Wed 25/06/03
58	Review CIP Report	30 days	Wed 1/10/03
59	**Application Architecture**	**225 days**	**Wed 14/04/04**
60	**Interim Detailed Architecture**	**90 days**	**Wed 14/04/04**
61	Services Modelling	30 days	Wed 14/04/04
62	HRSA Component Definition	30 days	Wed 26/05/04
63	HRSA Interface Definition	30 days	Wed 7/07/04
64	**Final Detailed Architecture**	**60 days**	**Wed 1/12/04**
65	Services Modelling	20 days	Wed 1/12/04
66	HRSA Component Definition	20 days	Wed 29/12/04
67	HRSA Interface Definition	20 days	Wed 26/01/05
68	**Technology Architecture**	**355 days**	**Wed 12/11/03**
69	Survey of Products	60 days	Wed 1/12/04
70	**Capacity Planning**	**335 days**	**Wed 12/11/03**
71	Develop Capacity Planning Model	60 days	Wed 12/11/03
72	Model Interim Detailed System Design	60 days	Wed 14/04/04
73	Model Final Detailed System Design	60 days	Wed 1/12/04
74	**Interim Detailed Architecture**	**30 days**	**Wed 7/07/04**
75	Technology Assessment	15 days	Wed 7/07/04
76	Standards Assessment	15 days	Wed 28/07/04
77	Issue Interim Technology Architecture	0 days	Tue 17/08/04
78	**Final Detailed Architecture**	**20 days**	**Wed 23/02/05**
79	Technology Assessment	10 days	Wed 23/02/05
80	Standards Assessment	10 days	Wed 9/03/05
81	Issue Final Technology Architecture	0 days	Tue 22/03/05
82	**Implementation**	**355 days**	**Wed 18/08/04**
83	**Implementation Strategy**	**215 days**	**Wed 18/08/04**
84	Develop Detailed Implementation Plan	30 days	Wed 18/08/04
85	Confirm Final Implementation Strategy	20 days	Wed 18/05/05
86	**Select Reference Implementation**	**40 days**	**Wed 23/03/05**
87	Assess Candidate Projects & Products	20 days	Wed 23/03/05
88	Select Reference Implementation(s)	20 days	Wed 20/04/05
89	**Tender for Full Implementation (if Required)**	**140 days**	**Wed 15/06/05**
90	Prepare and Issue RFT	60 days	Wed 15/06/05
91	Evaluate RFT	60 days	Wed 7/09/05
92	Contract Negotiation	20 days	Wed 30/11/05
93	Announce Successful Tender(s)	0 days	Tue 27/12/05

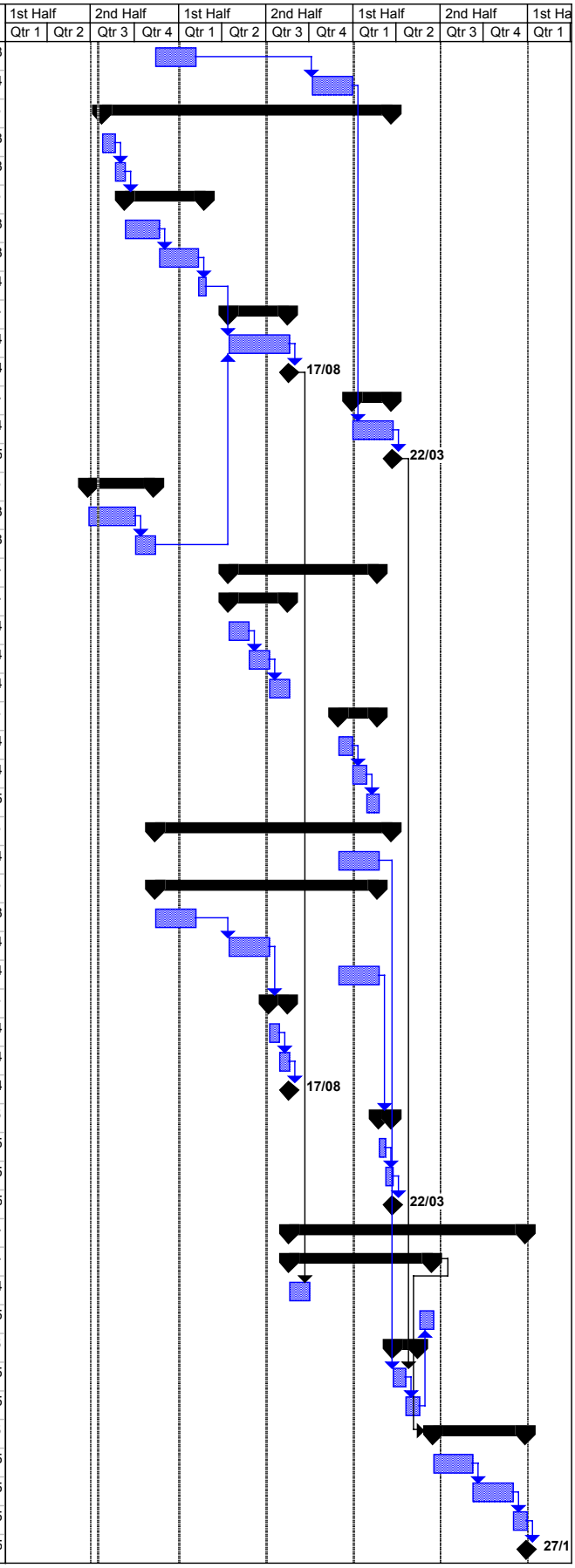
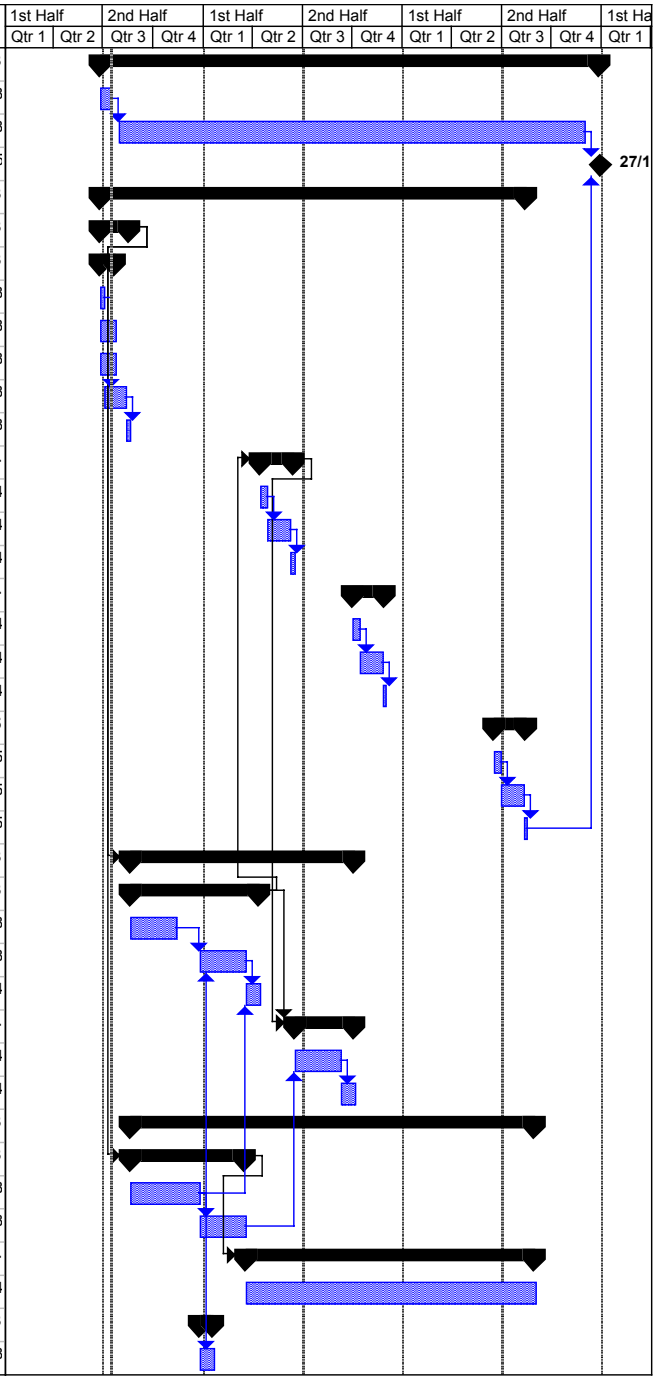


Figure 5-1 presents the activities described above as a detailed program of work that should be undertaken over the next 2½ years as Phase 3 of the Health*Connect* Systems Architecture Project. The program indicates the preferred sequence of work and the major dependencies between the activities. It is noted that it is highly desirable that work on the common services and organisational change studies commences early in FY 03/04 as these activities provide the critical inputs to development of the detail systems architecture.

ID	Task Name	Duration	Start
1	**Project Management Phase 3**	**655 days**	**Wed 25/06/03**
2	Prepare Project Plan	15 days	Wed 25/06/03
3	Ongoing Project Management	610 days	Wed 30/07/03
4	Completion of Phase 3	0 days	Tue 27/12/05
5	**Stakeholder Communications**	**560 days**	**Wed 25/06/03**
6	**Round One Architecture**	**40 days**	**Wed 25/06/03**
7	**Preparation**	**20 days**	**Wed 25/06/03**
8	Develop Presentation	5 days	Wed 25/06/03
9	Develop Data Paper	20 days	Wed 25/06/03
10	Develop Topology Paper	20 days	Wed 25/06/03
11	Conduct Consultations	30 days	Wed 2/07/03
12	Prepare Feedback Report	5 days	Wed 13/08/03
13	**Round Two Interim Policy**	**45 days**	**Wed 14/04/04**
14	Preparation	10 days	Wed 14/04/04
15	Conduct	30 days	Wed 28/04/04
16	Report	5 days	Wed 9/06/04
17	**Round Three Interim Architecture**	**45 days**	**Wed 29/09/04**
18	Preparation	10 days	Wed 29/09/04
19	Conduct	30 days	Wed 13/10/04
20	Report	5 days	Wed 24/11/04
21	**Round Four Final Architecture**	**45 days**	**Wed 15/06/05**
22	Preparation	10 days	Wed 15/06/05
23	Conduct	30 days	Wed 29/06/05
24	Report	5 days	Wed 10/08/05
25	**Common Services Policies**	**295 days**	**Wed 20/08/03**
26	**Interim Policy**	**170 days**	**Wed 20/08/03**
27	System-Level Definition	60 days	Wed 20/08/03
28	Policy Development	60 days	Wed 24/12/03
29	Draft Interim Policy	20 days	Wed 17/03/04
30	**Final Policy**	**80 days**	**Wed 16/06/04**
31	Policy Development	60 days	Wed 16/06/04
32	Draft Final Policy	20 days	Wed 8/09/04
33	**Organisation Change Study**	**530 days**	**Wed 20/08/03**
34	**Business Process Modelling**	**150 days**	**Wed 20/08/03**
35	Interim Models	90 days	Wed 20/08/03
36	Final Models	60 days	Wed 24/12/03
37	**Business Process Refinement**	**380 days**	**Wed 17/03/04**
38	Ongoing refinement	380 days	Wed 17/03/04
39	**Benefits Realisation Study**	**20 days**	**Wed 24/12/03**
40	Potential Benefits Identification	20 days	Wed 24/12/03



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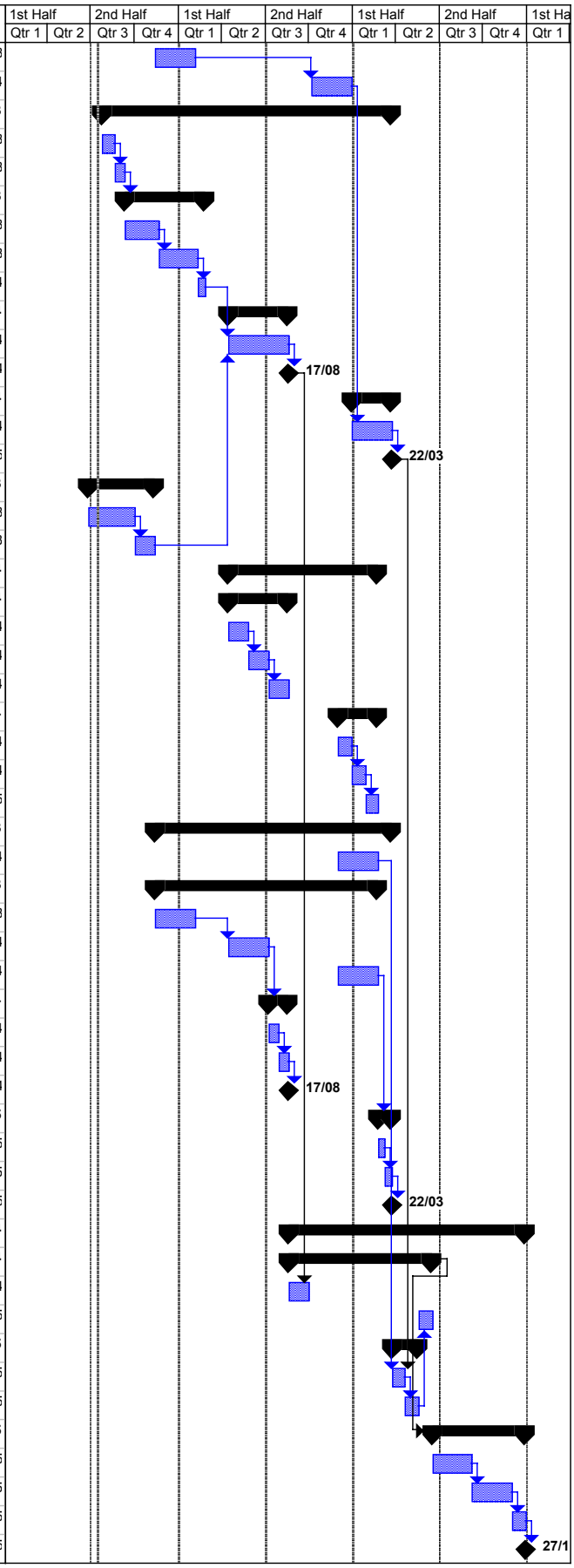

Figure 5-1 Program of Work for Health*Connect* Systems Architecture Project Phase 3