Future State Architecture Guide

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1 System Architecture

Developing a system architecture for the future state CRVS is a fundamental part of the digitisation process. When considering system architecture, there are a number of integration models that can be employed and this guide provides an indicative overview of three such models. Although not exhaustive, this list should be used to support further investigation and decision making regarding CRVS systems architecture.

1.1 Modular CRVS Architecture

A simple modular CRVS architecture is shown in Figure One, below. This architecture is typified by a system where births and deaths are managed by one system in one ministry (typically ministry of the interior or home affairs) while marriages and divorces are managed by a separate system in a different ministry (typically ministry of justice). Data from both systems are exported separately to a vital statistics database, for the purposes of compiling vital statistics and the creation of statistical reports. Data may also be exported, separately, at defined intervals to the population register.

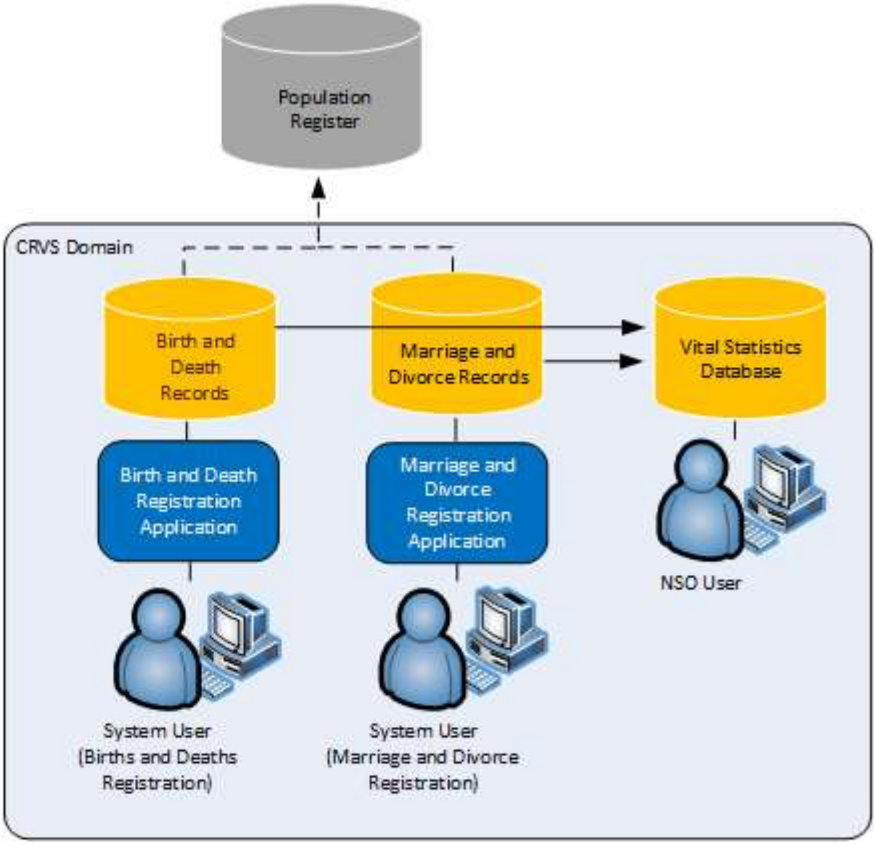

Figure One. Simple Future State Architecture

A modular CRVS architecture has the following characteristics:

- The registration of vital events (e.g. for data capture, processing, validation and certificate issuance) is handled by separate applications.
- Records of respective vital event are held within separate databases.
- Data is exported independently from each application to the vital statistics database and other systems e.g. population register.

1.2 Integrated CRVS Architecture

A simple example of an integrated architecture is shown in Figure Two, below. In this example, a single CRVS application and associated database supports registration of a number of vital events, including births, deaths, marriages and divorces. The CRVS database is also used to support the generation of vital statistics.

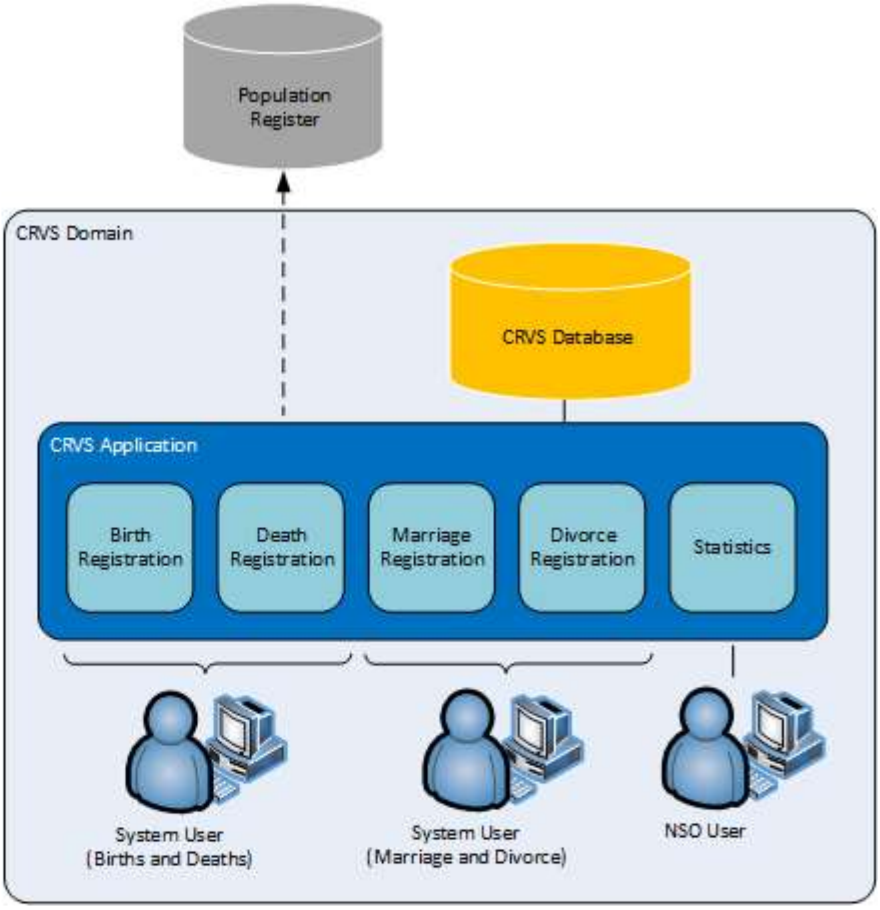

Figure Two. Integrated CRVS System Architecture

The integrated architecture has the following characteristics:

- The registration of vital events (e.g. for data capture, processing, validation and certificate issuance) is handled within one central application.
- Records of respective vital events are held within the same database and are linked using a common, unique identifier.
- The central CRVS database is used to provide the data for vital statistics reporting.
- All data exported to other systems (e.g. population register) uses a common interface.

1.3 Interoperable CRVS Architecture

A more advanced, interoperable, CRVS system architecture is shown in Figure Three, below. This architecture makes the different application components of the CRVS system interoperable among themselves and importantly with other services e.g. health. This approach provides the opportunity to harmonize core CRVS processes with core health processes and has the potential to improve the outcomes of each. For example, immunization records of infants can be used as a source of data for the birth registration process, taking advantage of high immunisation rates.

The CRVS and Health Interoperability and Data Exchange Architecture, described below, shows one way of achieving this (other, more elaborate variations of this architecture are available but many use the same basic pattern). The basic Architecture uses a combination of three layers:

- **Points of Service (PoS)**, comprising of CRVS and eHealth application software at various offices and locations.
- **Centralised Registries and Shared Record Services** including a Vital Event Registry for CRVS and additional registries and repositories serving health and other domains (e.g. the population registry).
- **Interoperability and Data Exchange**, comprising of a single middleware application facilitating communication between the PoS applications and the centralised registries and shared record services, using standards-based messaging for different PoS applications to send and receive data.

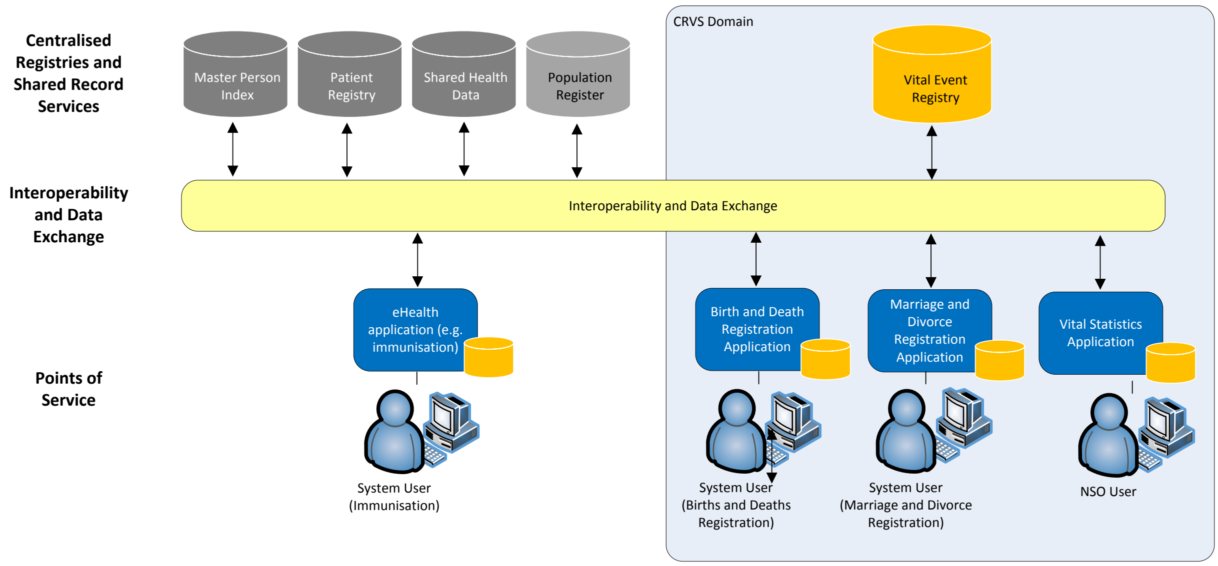

Figure Three. CRVS and Health Interoperability and Data Exchange Architecture

This architecture may typically have the following components:

- An **Interoperability and Data Exchange Application** that facilitates communication between software applications and data at the point of service level and the central registries, index and data reporting applications. The application relies on standards to receive and route individual data elements through the interoperability and data exchange, checking identifiers and populating registries.
- A **Vital Event Registry** that can be used to track vital events during a person's life, e.g. birth, death, marriage and divorce. In each case, the vital event record is associated with a unique identifier stored in the Master Person Index.

- A **Master Person Index (MPI)** that is used to manage multiple identifiers for particular individuals, including a national person identifier, a patient identifier, birth and death registration identifiers. All the identifiers can be linked together using a central internal master person (unique) identifier following best practices for creating identifiers.
- A **Patient Registry** that serves as a repository of unique patient identifiers (where applicable and separate from the MPI). In many cases, this is managed together with the MPI.
- A **Shared Health Data** repository that stores selected longitudinal health-related events collected from the PoS applications.
- **Point of Service Applications**, that collect data in digital format at various points of service for local use as well as for transmission to a central point for information management and reporting.

The interoperable architecture has the following characteristics:

- Separation of applications and their databases into defined application domains.
- Central interoperability layer for data exchange and facilitating interoperability between different applications.
- Centralised common services e.g. identity and access management, which can be used by multiple PoS applications.

1.4 Strengths and Weaknesses of Architecture Models

Some of the strengths and weaknesses of above architectural models are listed in Table One, below:

	Strengths	**Weaknesses**
Modular	Simple architecture to implement and easy to manage and secure data Ownership of each system is in the hands of the respective authority with corresponding responsibility for the data Can be efficient and flexible in serving the needs of specific CRVS services	Difficult to integrate data and produce integrated reports Duplication of key information may compromise maintenance of data and quality More difficult to reuse data across different applications More likely to result in duplication of infrastructure and resources
Integrated	Moderately easy system to implement	Greater dependency on online systems for data rationalisation

	Effective trade-off between simplicity and addressing data management issues Effective at managing the issue of data duplication	Challenges implementing in remote areas and integrating external applications
Interoperable	Powerful system that integrates all CRVS systems as well as providing the opportunity to integrate systems from other departments, e.g. health and justice Flexible architecture that allows for the addition of related applications over time Can potentially support integrated workflow between different applications, e.g. CRVS and health Supports external access from other applications, including citizen-centric applications	Complex to implement requiring advanced IT skills and planning Even greater dependency than the integrated system on online access to realize the full potential of the system Increased requirement for cooperation and governance between government departments May require specialist systems and software

Table One. Integrated versus Interoperable CRVS System Architectures

2 Case Study – Namibia CRVS System

The Namibia CRVS systems is an example of an integrated architecture that will be moving to an interoperable architecture in the future. The logical architecture of the present CRVS system in Namibia is shown in Figure Five and the future state architecture in Figure Six, below.

The current CRVS system comprises of a central integrated database system that integrates data from the different civil registration services. These services include the population registry, hence a demographic profile is created for all people resident in the country. For citizens, the demographic profile is linked to the other civil registration systems, including births and deaths. IDs are also linked to the demographic profile and linked to parents. Details of marriages and divorces are received from the courts and linked to the demographic profile.

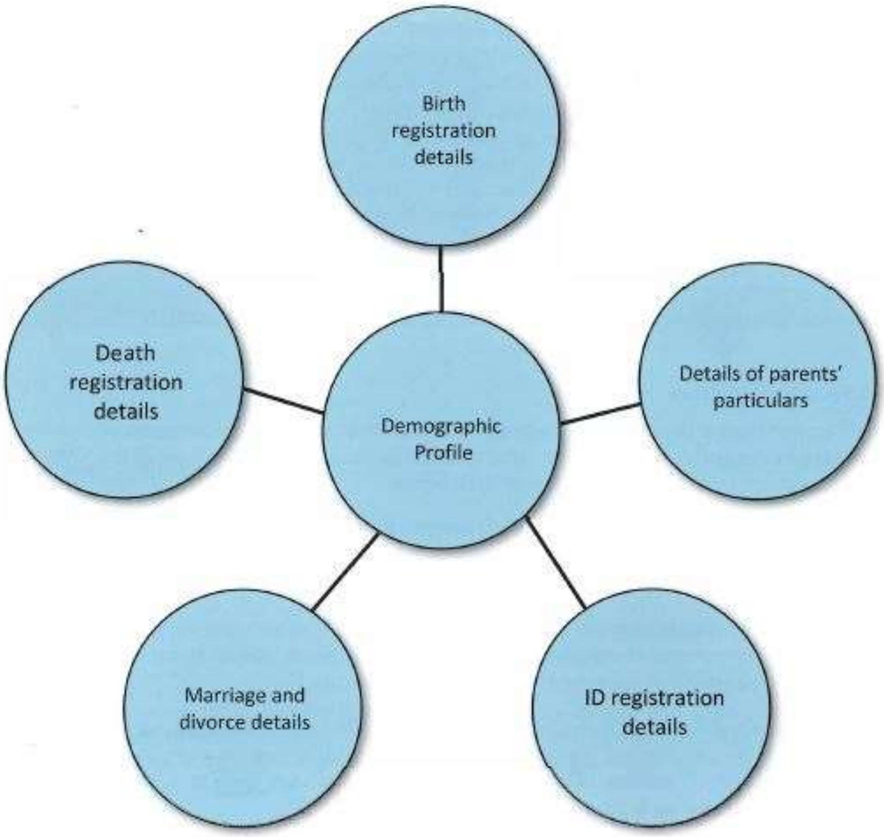

Figure Five. Current Structure of the Namibia Integrated CRVS Database System

The future state architecture that is currently being planned for Namibia (Figure Six, below) is an example of an interoperable, service-oriented architecture, and comprises of the following key features:

- Population Register and Business Process Management database
- Middleware interoperability layer providing the following two functions:
    - Business process engine that will supplement the existing database function with a workflow function to manage the processing of information through different components of the system.
    - Data exchange services to move data securely between the different web applications
- Web applications, including the following:
    - Codes/Parameter maintenance
    - Security maintenance
    - Back office operations
    - Front office operations
    - Report and business intelligence

- General web services, supporting SMS services

- Portal services for public client and external stakeholder access

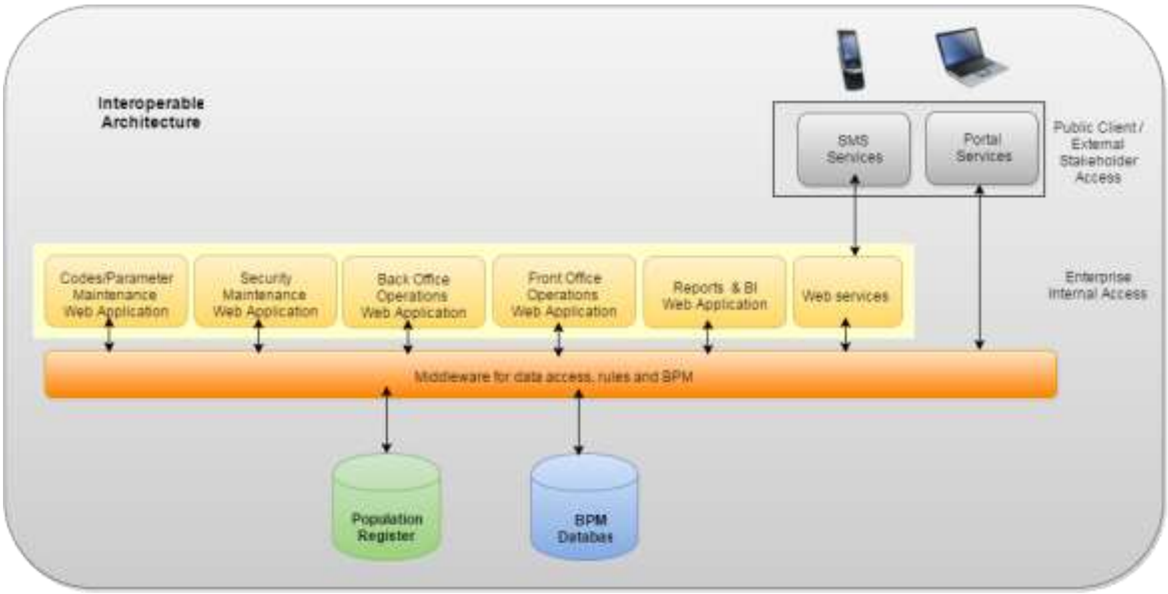

Figure Six. Future State Architecture for Namibia