The Health Intranet of Things

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Triple Aim for Health

Derived from the Institute for Healthcare Improvement, the NZ Triple Aim has been embraced by the sector through the leadership by the Health Quality and Safety Commission.

In order to deliver on these aims simultaneously, improvements in ICT implementation across the healthcare system are essential:

- Data must be converted into useful information and
- Be available in the right form, at the right time, in any care setting.
To achieve high quality health care and improve patient safety, by 2014 New Zealanders will have a core set of personal health information available electronically to them and their treatment providers regardless of the setting as they access health services.
NZ Population
4,495,712 as on Sunday, 17 November 2013 at 09:45:54pm

Core Health Information - Health Identity, demographics, allergies and alerts, register of health information

Long Term Conditions - Shared Care Record
Comprehensive Clinical Assessment (InterRAI)
Maternity - Shared Record of Care
Well Child - Shared Record of Care
Mental Health - Shared Record of Care

Common Clinical Results (Laboratory results, Medications, Referrals, Discharges and other clinical documents)

Telehealth - In-home monitoring

Four Regional IT Platforms
- Continuum of Care
- Clinical Information
- Imaging/Picture Archive
- Clinical Systems Support
- Patient Administration
- National minimum dataset
- Nat. immunisation register
- Cancer register
- B4 Schools dataset
- Maternity, Pharm warehouses etc.

Patient Portal
Clinical Information
Patient Administration and billing

Connected Health

Home Settings
Primary/Integrated Family Health Centres
Specialist/Tertiary/Secondary Hospital
Public Health
Health Identity Underpins Safe Sharing of Information

- National Health Index uniquely identifies the patient
- Health Practitioner Index uniquely identifies every health practitioner
- Normal patient consent relates to a specific set of HPIs
- Authorization to access any NHI record is based on HPI association with NHI
- “Break Glass” feature can enable any HPI to access any patient record
- Audit processes apply to every patient record access and especially under “break glass” conditions
Health Private Cloud

- The Clinical Data Repository lies at the heart of the Health IT Plan
- This repository is not located within one physical Data Centre
- Rather it consists of data spread across a small number of geographically distributed Data Centres
- All the Data Centres and Health facilities are interconnected using Connected Health forming a **Private Cloud**
Many Parts of the Health Private Cloud

- Personal Health Records
- Shared Care Record
  - Public Health Information
  - Medical Information: Primary/Community
  - Medical Information: Specialist/Emergency
  - Clinical Specialty Information
- Clinical Data Repositories (National and Regional)
- Patient Vitals (Medical Warnings) / Register of Information
- Health Identity / Connected Health
**DHBs: One Data Centre Per Region**

- 40+ Data Centres reduces to four Physical Data Centres and one Logical Data Repository
- One Data Centre per region
- Each physical Data Centre supports around 1 million people
- Each Repository has a mirror in at least one other Data Centre for Disaster Recovery
- All Data is within 10 milliseconds of any user under normal operation
Different DHB Applications Distributed Across Four Physical Data Centres

- Radiology Information Services
- Clinical Workstation and Clinical Data Repository
- Patient Administration System
- ePharmacy
- Finance Procurement and Supply Chain
Integrated Care Models: Better Sooner More Convenient

Model 1: Primary Care Common Information (Rotorua General Practice Group)

PMS
GP Practice

Emergency/After Hours View

Common P/H Information

Research
Integrated Care Models / Better Sooner More Convenient

Model 2: Primary Care Patient Portal – Medtech & Manage My Health (East Tamaki, Midland Health Network, Wairarapa)
My List of Medicines

- A list of a person’s prescription medication is maintained at every contact with the health system.
- Accessible across the continuum of care, subject to strict privacy and security controls.
Wellness
Screening, immunisation, maternity prevention of illness, public health

Community information
Health information from your GP, pharmacists, midwives, community nurses

Shared Care Plan
Multiple people involved in your care e.g. long-term conditions, aged care

Common Clinical Information
Including laboratory results, medications, referrals, discharges

Foundation Health Information
e.g. your name and address, ethnicity, allergies, GP details

Hospital information
Health information related to care in hospitals and by specialists

Continuum of Care
Community information
Health information from your GP, pharmacists, midwives, community nurses

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ConnectedHealth
My information. Better care.
Health Intranet of Things

- Many devices looking after many patients
- Many devices per patient
- Supplementing health practitioner care
- Enabling clinicians to collaborate better to deliver improved care
- Operating within any care setting for the patient
- All connected to the Health Cloud using Connected Health
Within the Hospital

- All clinical instruments having wired or wireless connections to the Clinical Data Repository
- Recorded results readily visible to care team using Clinical Workstation
- Alerts for selected measurements
 Within the Community

Collaborative working with hospital specialists and other health practitioners

Remote diagnostic and treatment capabilities
- From Skin Treatment to Dialysis
Within the Home

- Using TeleHealth capabilities to care for people in the home
  - Blood pressure monitoring,
  - Heart monitoring
  - Diabeties monitoring
  - Urine and feces monitoring
  - Activity monitoring
- Alarm based on exceptional indications/trends
- Requires an intelligent home with full remote monitoring with voice and video intervention
On The Move

Mobile Surgical Services

Mobile Ambulatory Services
Example of Emerging TeleMonitoring Solution

Source: Vsat Communications Ltd
Health Intranet of Things Built on UFB and RBI

- Connectivity is the key to delivering the Health Intranet of Things
- The Government initiatives delivering the Ultrafast Broadband and Rural Broad are critical enablers for the Health Intranet of Things
- Both are required to deliver the full coverage and capability required to support the Health Intranet of Things for all New Zealanders
- Predictable and reliable performance are key parameters required to deliver the Health Intranet of Things including guaranteed:
  - Committed Information Rates
  - Availability and Resiliency
  - Access diversity where required
  - Service level Agreements
A Fragmented Health Sector

- ~12,000 Health Provider Entities
- ~123,000 health workers
- ~15,000 premises located throughout NZ
- Broad mix of public and private businesses
- 4.5M potential customers
- Cities, towns and rural

INTEGRATED INTEROPERABLE
Access to applications & communication capability

Creates incredible complexity for ICT delivery
Connected Health: A Network of Networks

Based on accreditation of service providers and certification of services
UFB and RBI as part of Connected Health

- Ultrafast Broadband (UFB) initiative delivers much improved broadband services at low cost to URBAN areas
  - 75% of NZ homes and businesses
  - 33 Candidate urban areas

- Rural Broadband Initiative (RBI) delivers much improved broadband services to RURAL areas
  - 24.8% of homes and business in rural NZ
  - From 75% coverage to 99.8% coverage

- Combination can deliver greatly enhanced capability for the support of emerging models of Healthcare within the Umbrella of Connected Health
UFB Candidate Areas

• 75% population - end 2019
• Priority Users - end 2015
• ~4m pop, 1.3m dwellings/business premises
UFB: Access Aggregation within Candidate Areas

Candidate Area 1

Retail Service Provider A

Candidate Area 2

Retail Service Provider B

Candidate Area 3

Retail Service Provider C

Candidate Area 4

UFB Points of Interconnect (Two in all areas over 50,000 premises)
The RBI Outcome At A Glance

- 154 Towers
  - 5Mbps over 3G
  - LTE Improves speed 2014/5

- 4,500KM new road coverage

- 100Mbps to schools
  - c. 500 first year
  - c. 750 in total

- DSL
  - >5Mbps 57%
  - >10Mbps 50%
  - >20Mbps 34%
UFB and RBI Integration within Candidate Areas

For some but not all Candidate areas

Common UFB and RBI Points of Interconnect
For some but not all Candidate areas
Connected Health Delivering a Virtual Private Cloud Using UFB and RBI

Northern Region

Central Region

Midland Region

Southern Region

Clinical Data Repository

Clinical Data Repository

Clinical Data Repository

Clinical Data Repository

Connected Health Delivering a Virtual Private Cloud Using UFB and RBI

Northern Region

Central Region

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Southern Region

Clinical Data Repository

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Clinical Data Repository

Clinical Data Repository

CH Accredited TSP A

CH POI

CH POI

CH POI

CH POI

CH POI

CH POI

UNI-4/5

NNI-1
UFB: Within a Candidate Area

UFB = Government Ultra-fast broadband initiatives. Diagram courtesy of Crown Fibre Holdings
Example UFB Business Products

- In the Business market, UFB offers symmetric services at much lower than current market prices, with flexible service characteristics.

- For Health these will enable:
  - Private Health Cloud computing
  - Improved Connected Health performance and cost effectiveness (particularly in smaller towns)
  - Health Intranet of Things

- A lower cost and with improved end to end performance

Note: Wholesale prices per month ex GST.
UFB Service Characteristics

**Typical Broadband Traffic Profile**

- **Speed Mbps**
- **Time**

**Service Parameters**

- **EIR**
- **CIR**
- **PIR**
- **Time**

**Traffic Class** | **Frame Delay** | **Frame Delay Variation** | **Frame Loss**
---|---|---|---
CIR | <= 5 ms | <= 1 ms | <= 0.1%
EIR | n/a | n/a | <= 2%
# UFB Service Characteristics

<table>
<thead>
<tr>
<th>Service</th>
<th>PIR Up (Mbps)</th>
<th>PIR Down (Mbps)</th>
<th>CIR (Mbps)</th>
<th>EIR (Mbps)</th>
<th>Wholesale Data Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPON Res.</td>
<td>10</td>
<td>30</td>
<td>2.5 min/10 max</td>
<td>PIR-CIR</td>
<td>No</td>
</tr>
<tr>
<td>GPON Bus &amp; Res</td>
<td>50 or 100</td>
<td>100</td>
<td>2.5 min/10 max</td>
<td>PIR-CIR</td>
<td>No</td>
</tr>
<tr>
<td>P2P 100M</td>
<td>100</td>
<td>100</td>
<td>10 min/100 max</td>
<td>PIR-CIR</td>
<td>No</td>
</tr>
<tr>
<td>Bitstream 3</td>
<td>2.5 min to 100 max</td>
<td>2.5 min to 100 max</td>
<td>CIR = PIR</td>
<td>EIR = 0</td>
<td>No</td>
</tr>
<tr>
<td>P2P 1G</td>
<td>1G</td>
<td>1G</td>
<td>100 min/1G max</td>
<td>PIR-CIR</td>
<td>No</td>
</tr>
<tr>
<td>P2P 10G</td>
<td>10G</td>
<td>10G</td>
<td>1G min/10G max</td>
<td>PIR-CIR</td>
<td>No</td>
</tr>
<tr>
<td>Bitstream 4</td>
<td>100 min/1G max</td>
<td>100 min/1G max</td>
<td>CIR = PIR</td>
<td>EIR = 0</td>
<td>No</td>
</tr>
<tr>
<td>Dark Fibre</td>
<td>User defined</td>
<td>User defined</td>
<td>User defined</td>
<td>User defined</td>
<td>No</td>
</tr>
</tbody>
</table>

**Notes:**
- Dark fibre POIs can be different to Layer 2 POIs
- Access Diversity available for P2P services upon request
UFB Performance Characteristics

- SLAs for Provisioning, Availability, Traffic
- Eg. Availability
  - Layer 1 and 2 SLAs
  - Maximum and Average targets
  - Default and Enhanced Service Level Agreements (SLAs) suitable for hospitals and medical centres
  - Geographically diverse access available on request

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Default</th>
<th>Enhanced 1</th>
<th>Enhanced 2</th>
<th>Enhanced 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layer 1 Maximum Downtime</td>
<td>&lt;= 48 hrs</td>
<td>&lt;= 24 hrs</td>
<td>&lt;= 12 hrs</td>
<td>&lt;= 8 hrs</td>
</tr>
<tr>
<td>Layer 1 Average Downtime</td>
<td>&lt;= 2 hrs</td>
<td>&lt;= 2 hrs</td>
<td>&lt;= 2 hrs</td>
<td>&lt;= 2 hrs</td>
</tr>
<tr>
<td>Layer 2 Maximum Downtime</td>
<td>&lt;= 12 hrs (excl. ONT)</td>
<td>&lt;= 12 hrs (incl. ONT)</td>
<td>&lt;= 8 hrs (incl. ONT)</td>
<td>n/a</td>
</tr>
<tr>
<td>Layer 2 Average Downtime</td>
<td>&lt;= 30 mins</td>
<td>&lt;= 30 mins</td>
<td>&lt;= 30 mins</td>
<td>&lt;= 30 mins</td>
</tr>
</tbody>
</table>
RBI Service Characteristics

Similar to UFB but with subtle differences

<table>
<thead>
<tr>
<th>Media</th>
<th>Service</th>
<th>PIR Up (Mbps)</th>
<th>PIR Down (Mbps)</th>
<th>CIR</th>
<th>EIR</th>
<th>Wholesale Data Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTTN</td>
<td>UBA</td>
<td>1.5 max</td>
<td>24 max</td>
<td>50 kbps max</td>
<td>PIR-CIR</td>
<td>No</td>
</tr>
<tr>
<td>FTTN</td>
<td>E-UBA</td>
<td>1.5 max</td>
<td>24 max</td>
<td>200 kbps max</td>
<td>PIR-CIR</td>
<td>No</td>
</tr>
<tr>
<td>FTTN</td>
<td>VDSL2</td>
<td>10 max</td>
<td>50 max</td>
<td>200 kbps max</td>
<td>PIR-CIR</td>
<td>No</td>
</tr>
<tr>
<td>Fibre</td>
<td>Bitstream 3</td>
<td>2.5 min to 100 max</td>
<td>2.5 min to 100 max</td>
<td>CIR = PIR</td>
<td>EIR = 0</td>
<td>No</td>
</tr>
<tr>
<td>Fibre</td>
<td>Bitstream 4</td>
<td>100 min/1G max</td>
<td>100 min/1G max</td>
<td>CIR = PIR</td>
<td>EIR = 0</td>
<td>No</td>
</tr>
<tr>
<td>Fibre</td>
<td>Dark</td>
<td>User defined</td>
<td>User defined</td>
<td>User defined</td>
<td>User defined</td>
<td>No</td>
</tr>
<tr>
<td>Wireless</td>
<td>HSPA</td>
<td>5 max</td>
<td>5 min</td>
<td>CIR = 0</td>
<td>EIR = PIR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes:  
- Dark fibre POIs can be different to Layer 2 POIs  
- Access diversity not widely available
RBI: Performance Characteristics

☐ Lack of enhanced wholesale SLAs
  ▪ RBI wholesale services only offer a single SLA
    • Maximum 48 hour restoration time -> 99.4% availability for one event in 12 months
    • Cf. Options of 24, 12 and 8 hour maximum restoration time -> 99.7%, 99.86% and 99.9% availability respectively
  ▪ No requirement for average downtime < 2 hours per premise per 12 months per candidate area

☐ Some sites will require diverse access protection
  ▪ Most RBI locations can only be provided with “best efforts” wireless
When?

- **UFB**
  - Priority premises including health to be passed by YE 2015
  - Many health premises will be configured to this architecture from 2012/13

- **RBI**
  - Rollout across most of rural NZ by YE 2015
  - Fibre and FTTN will be early deliverables
  - Covers many rural health facilities

Networks being designed today need to take this architecture into account
The Good News for Health

- The Health Regions are beginning to take advantage of these capabilities eg. Midland and Southern
  - Central is specifying its regional network requirements currently
  - HBL is defining requirements to support FPSC
- GPNZ has selected SNAP as a preferred provider to supply services for their community
  - SNAP is Connected Health Accredited and supports both the UFB and RBI products
- Many Health facilities in rural NZ are located close to schools and so can access fibre based RBI capability
  - Most other sites will be able to use the UBA and VDSL2 based services via FTTN
  - Few health sites will be connected via wireless only (Wireless access will be an important resilience capability)
Many Combinations of UFB and RBI in Health

Examples:

- Base hospital in UFB, remote hospital or IFHC in RBI (eg. Northland)
- Base hospital located in UFB delivering Telehealth services into RBI (eg. West Coast)
- One part of a shared services virtual hospital in UFB and another part in RBI (eg. Central Otago)
- Parts of a virtual IFHC in UFB with satellite GP and other services located in RBI (eg. North Auckland)
- Parts of Whanau Ora in UFB and parts in RBI (eg. Taranaki)
- IFHC in UFB with patients in UFB and RBI using Telemonitoring
There is some Networking complexity introduced through working across UFB and RBI boundaries.
Conclusions

- Health is developing a Private Cloud based Intranet of Things in order to help deliver the Triple Aim for Health
  - Providing an improved continuum of care across all health facilities with electronic information collected at source
  - Consistent and comprehensive patient information for all authorised health practitioners and the patients themselves
  - Leading to Safer delivery of care across the health system and Increased financial sustainability for the Health Sector

- Requires greatly enhanced connectivity across the sector
  - UFB and RBI provide a new paradigm for the delivery of the required connectivity wherever that care may be required
  - Available widely today and increasingly through to YE 2015
Thanks for your Attention
Your Questions are Welcome

Dr Murray Milner
Chair, National Health IT Board