Integrating Assisted Living with Primary/Secondary Health Care

Cloud4Health

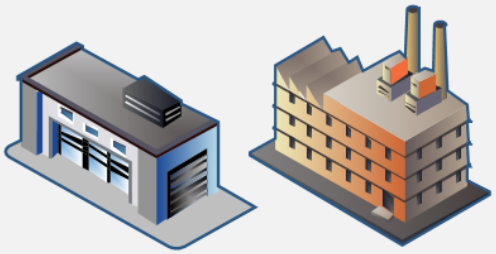
Prof Bill Buchanan, Dr Lu Fan, Prof Christoph Thuemmler, Dr Elias Ekonomou, Owen Lo, Omair Uthmani, Richard Lewis, and Alistair Lawson, Edinburgh Napier University.

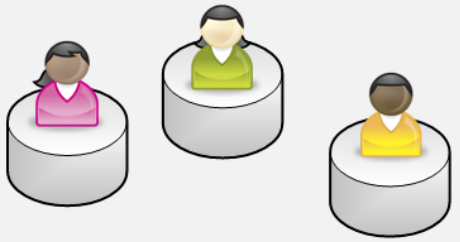
Contact: w.buchanan@napier.ac.uk
Web: cloud4health.com

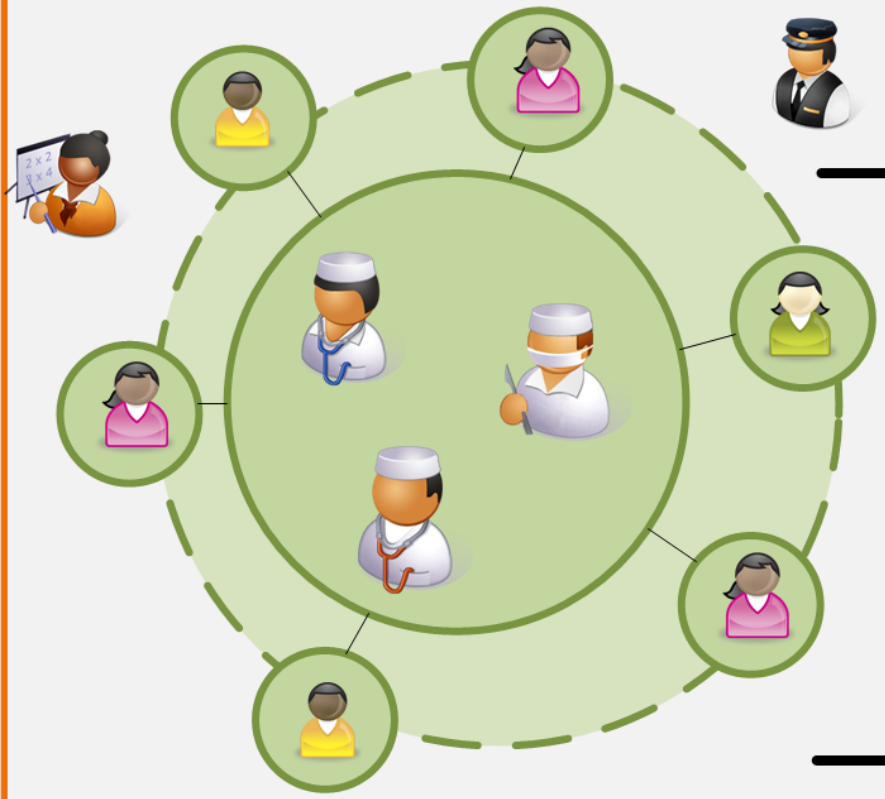
Cloud4health

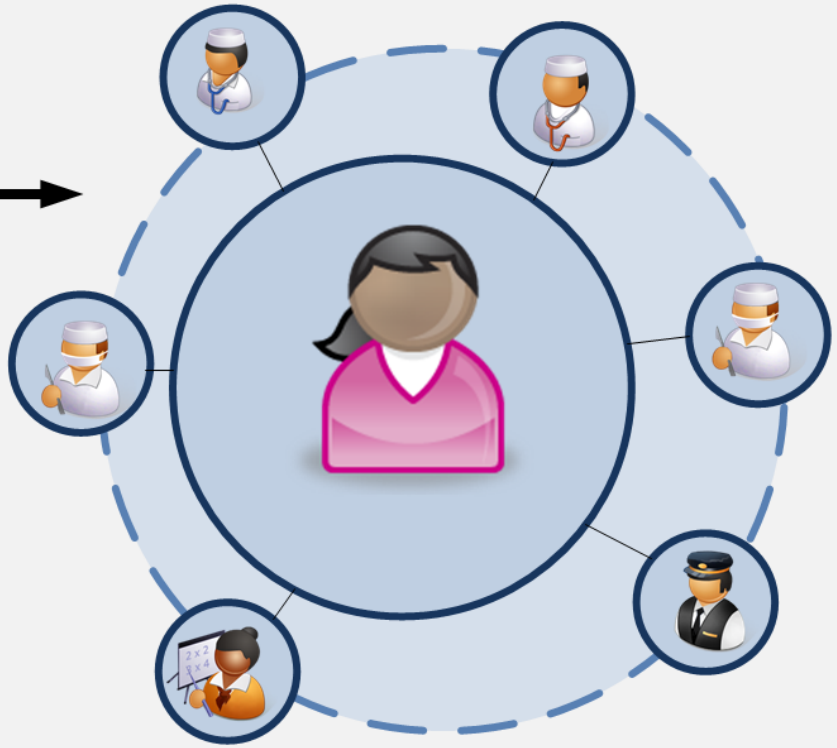
Industry Age

Information Age









Centralised, Non-integrated,
Ad-hoc, Clinician Focused, Reactive,
Clinician Control of Records

Distributed Patient Care, Holistic,
Patient Focused, Pre-emptive,
More Patient Control of Health

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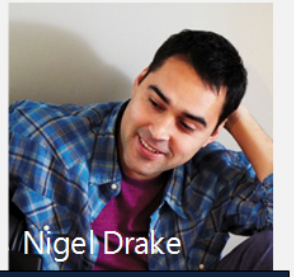
- Healthcare Professional.
- Invited user

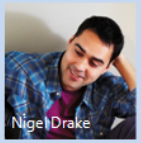
- Care Subject
- 82 years old
- House bound
- COPD (Chronic Obstructive Pulmonary Disease)



- Invited user

- GP.
- Invited user

- Site Creator
- Primary Carer



Assisted Living (Informal and Trust based)

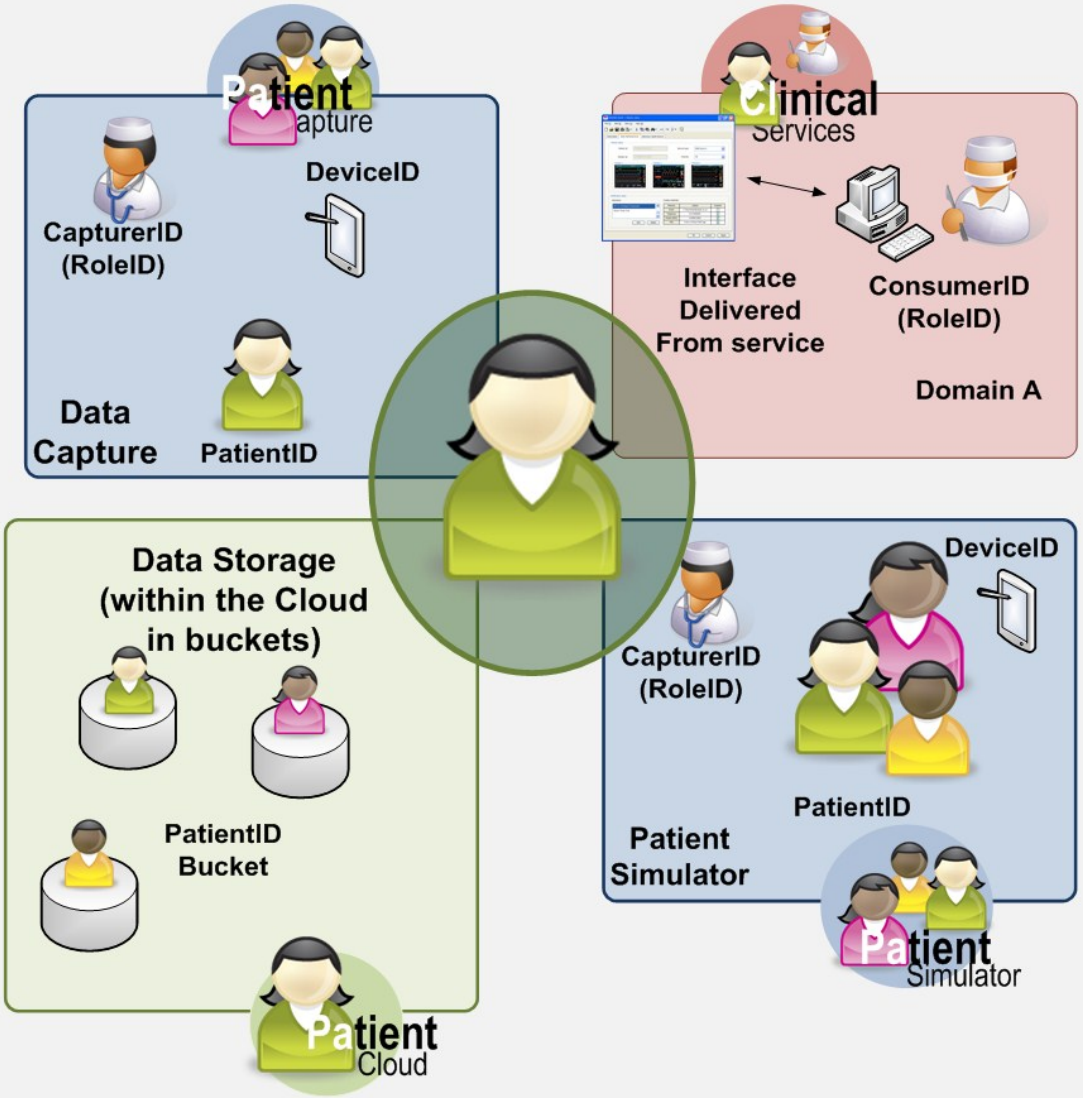
Primary Health Care (Formal and role-oriented) - GP

Secondary Health Care (Formal and role-oriented) - Hospitals/A&E

Social Care/Health/etc

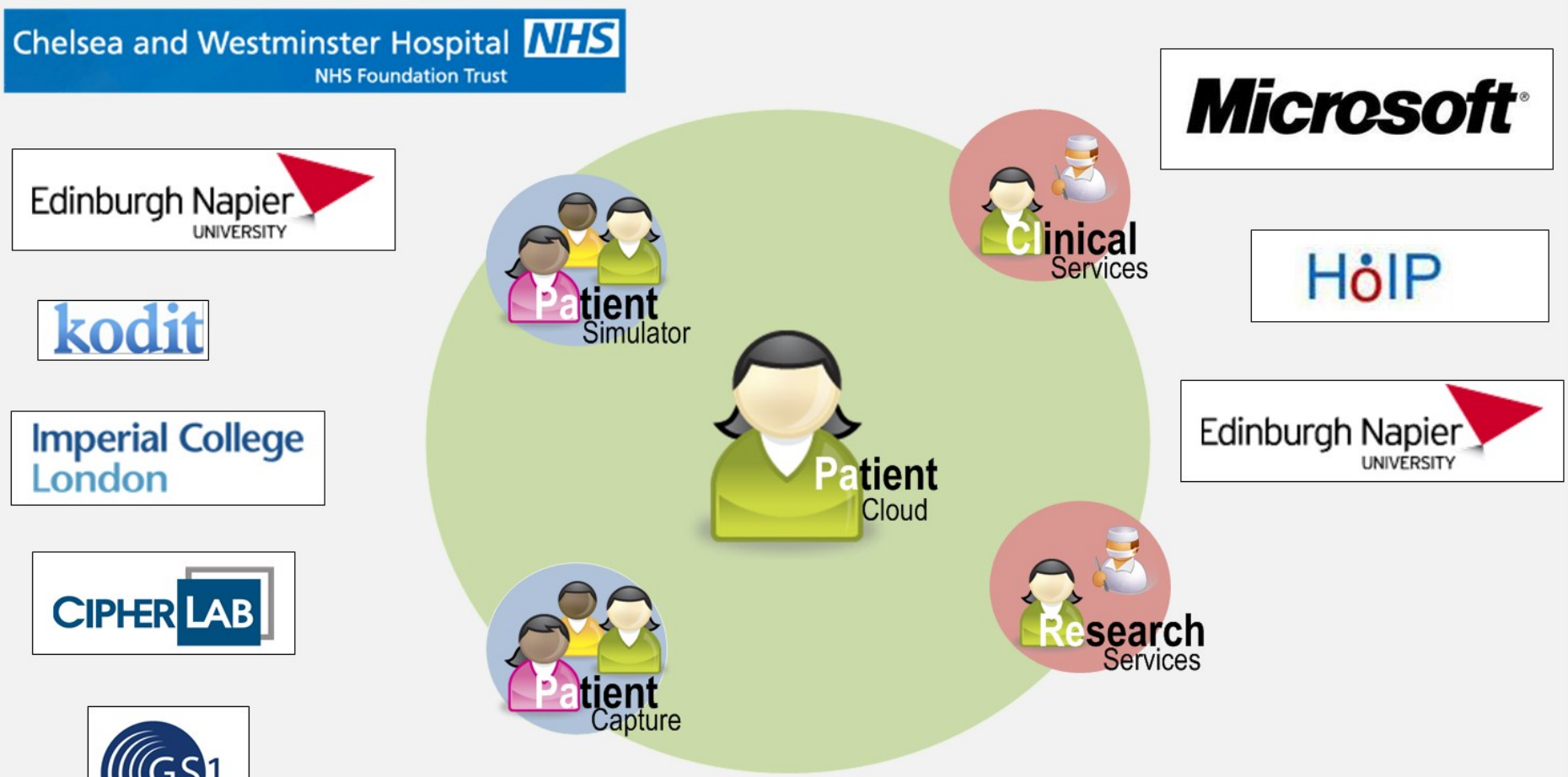
PatientCloud:
Funded by EPSRC and TSB, and is a collaboration between C&W, Imperial College, Edinburgh Napier University, Kodit, GS1 and Ciperlab

Introduction/ Context



DACAR e-Health Platform

Trusted Services



Chelsea and Westminster Hospital NHS
NHS Foundation Trust

Microsoft

Edinburgh Napier
UNIVERSITY

HoIP

kodit

Imperial College
London

Edinburgh Napier
UNIVERSITY

CIPHER LAB

GS1
UK

Technology Strategy Board
Driving Innovation

EPSRC
Pioneering research
and skills

Societal

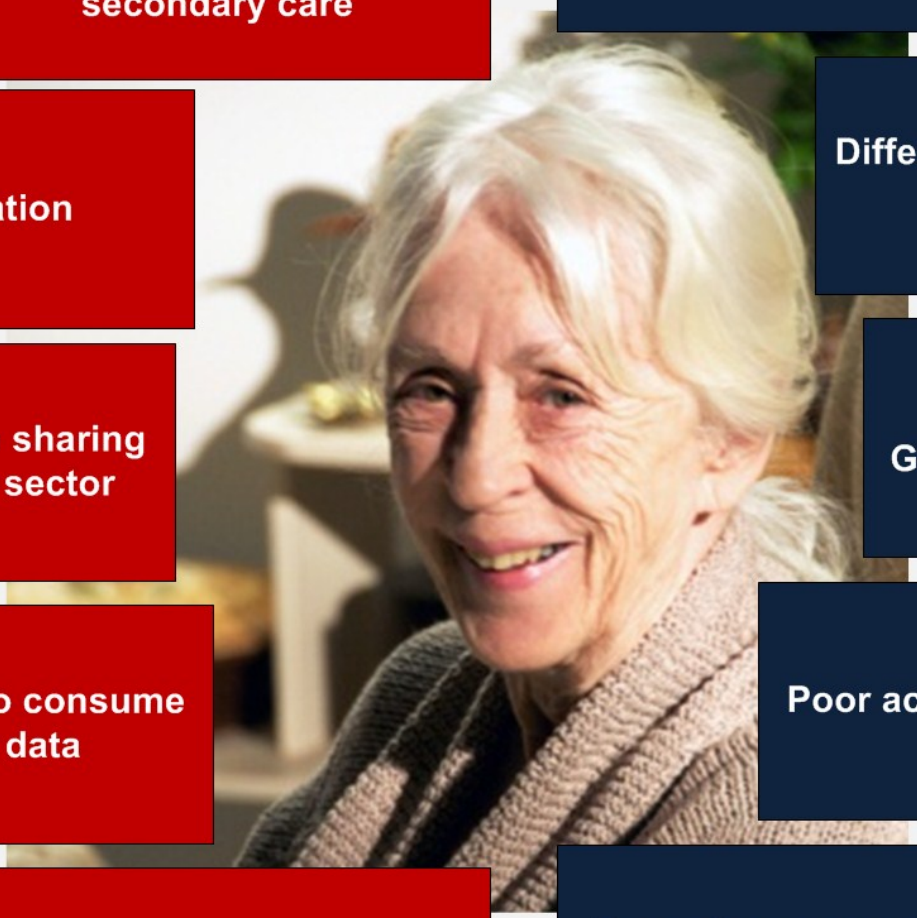
Technical

Lack of integration between assisted living, primary and secondary care

Patient records are often static

Aging population

Different systems/formatting used for data



Lack of information sharing across the public sector

Limited/difficult access methods … typically Government infrastructures … lack of trust

Strong demand to consume health care data

Poor access control to data

Lack of integration with careers and trusted people

Data often aggregated and context is often lost

Some Key Issues

Rights

Clinical Services

Digital Trust

Human Trust

Strong Governance

Identity

Infinite possiblities

Translation of rights
Translation of identities

Strong Governance
Policy

Assisted Living (Informal and Trust based)

Primary Health Care (Formal and role-oriented)

Secondary Health Care (Formal and role-oriented)

Manager might ask: What's difference in length-of-stay between different age categories for June?

Consultant might ask: How does the Early Warning Score affect the length-of-stay?

Family friend might ask: In which ward is Deirdre?

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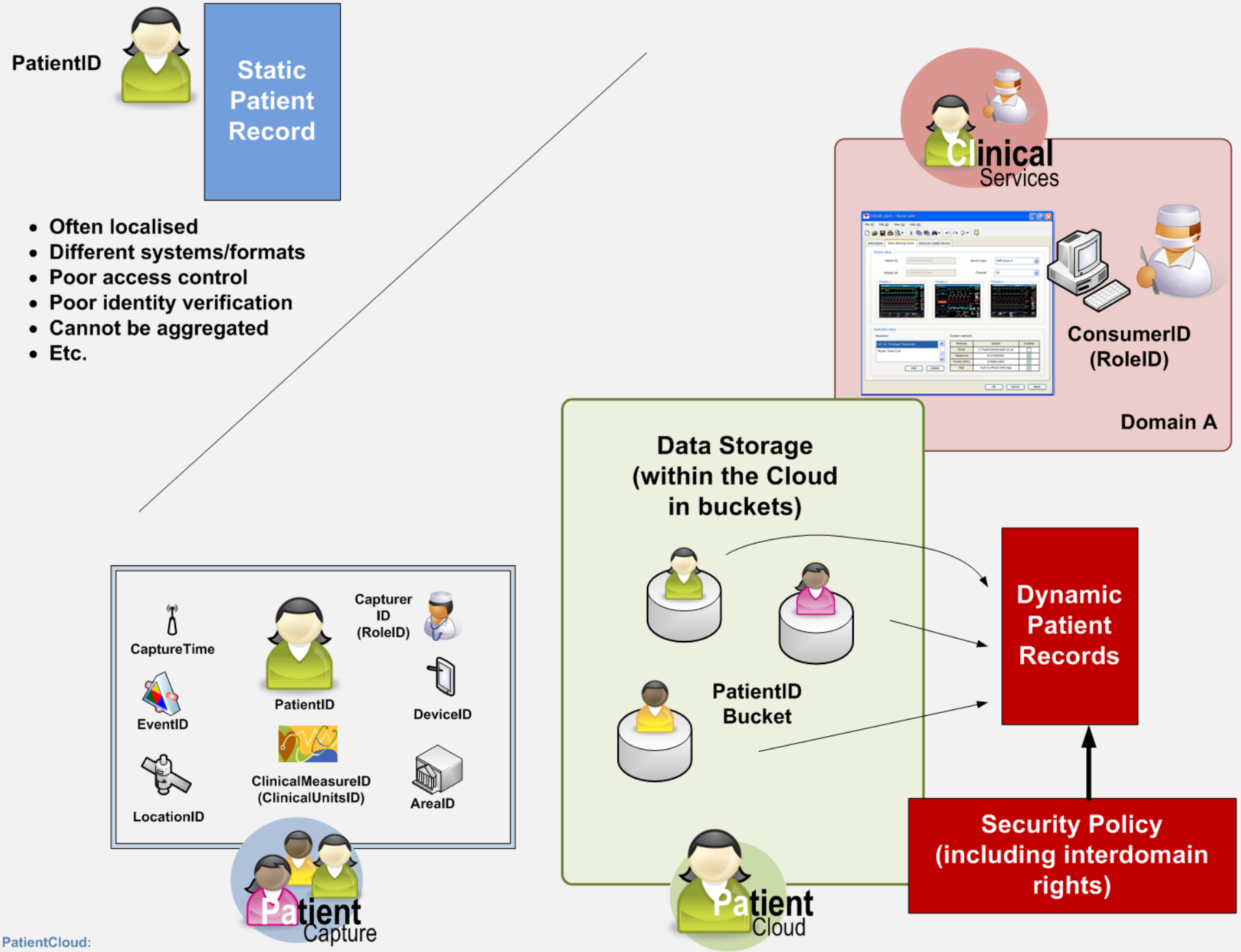

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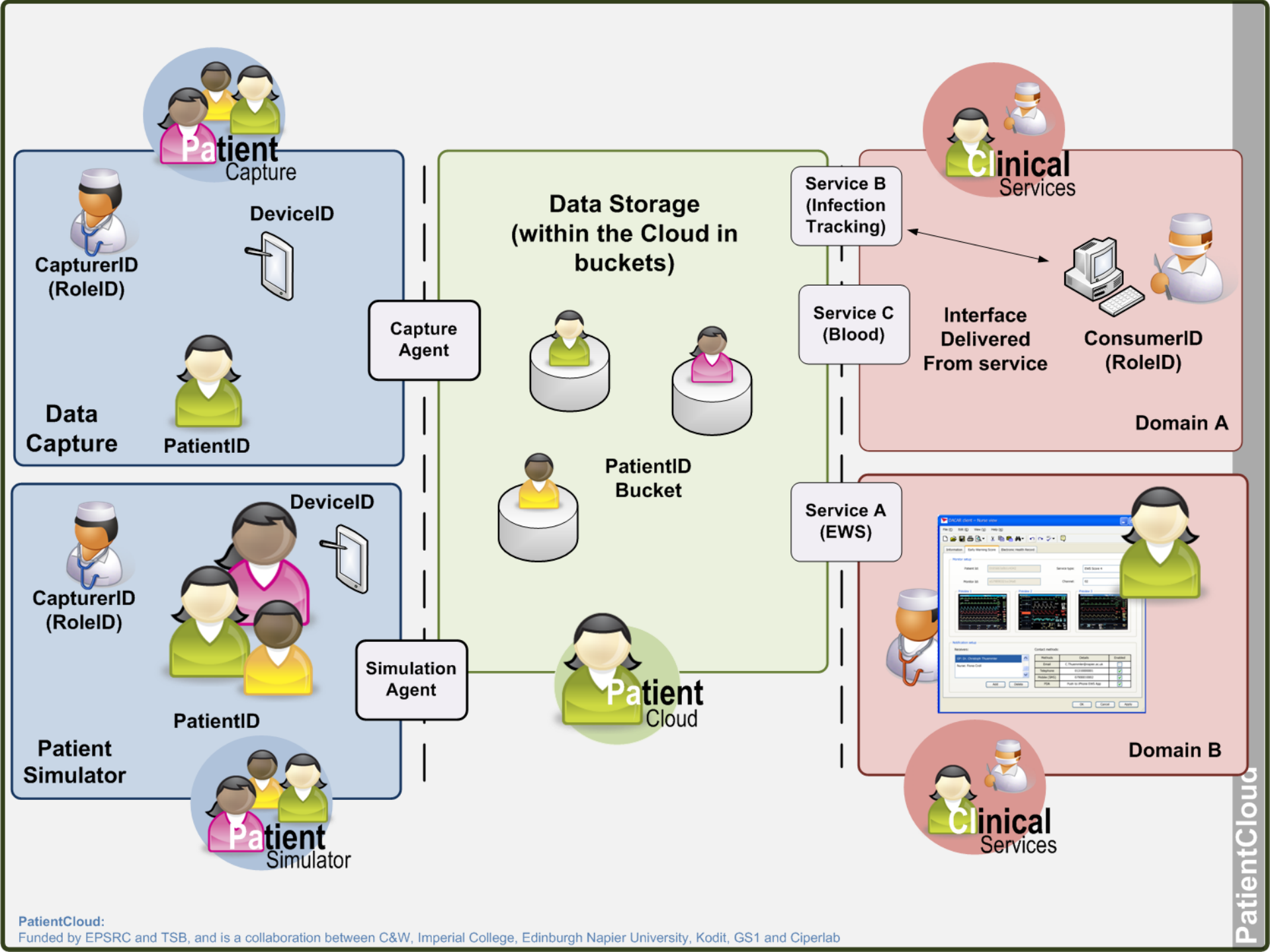

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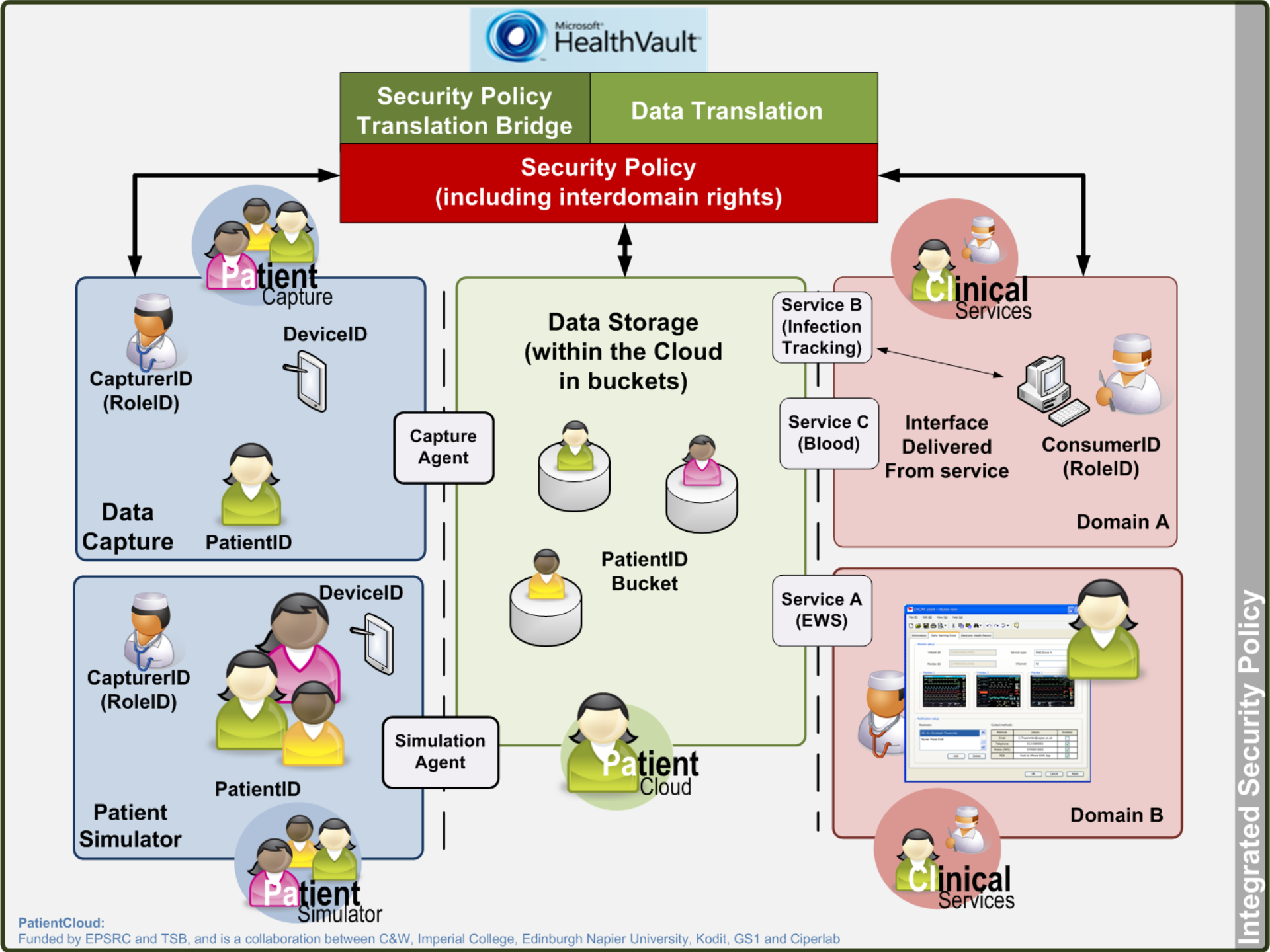

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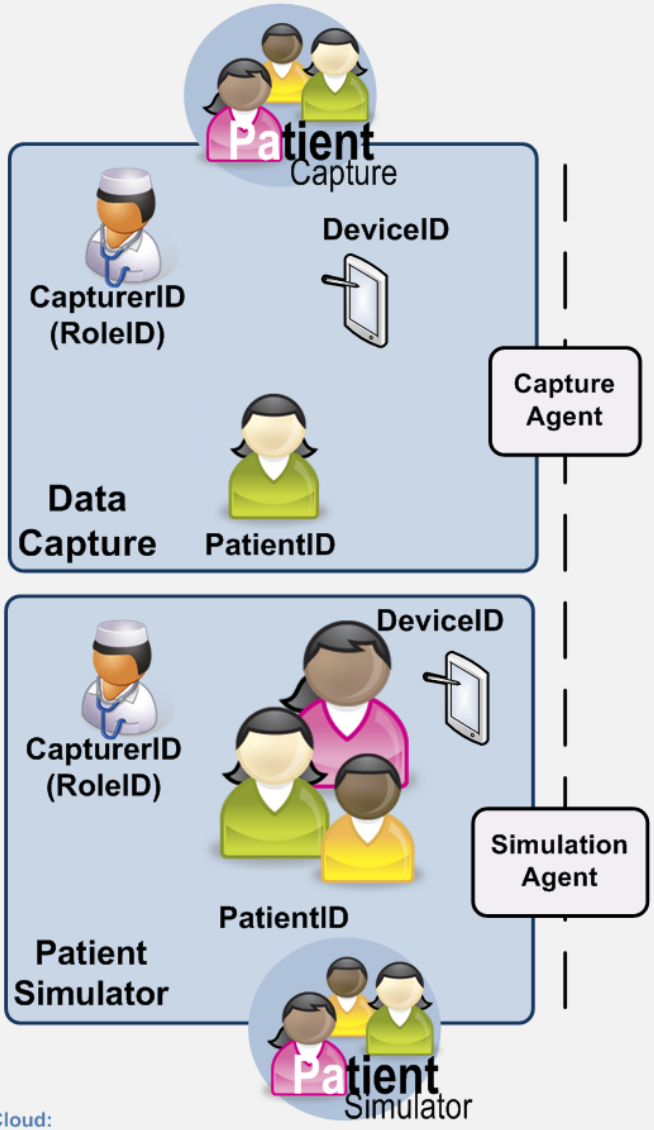

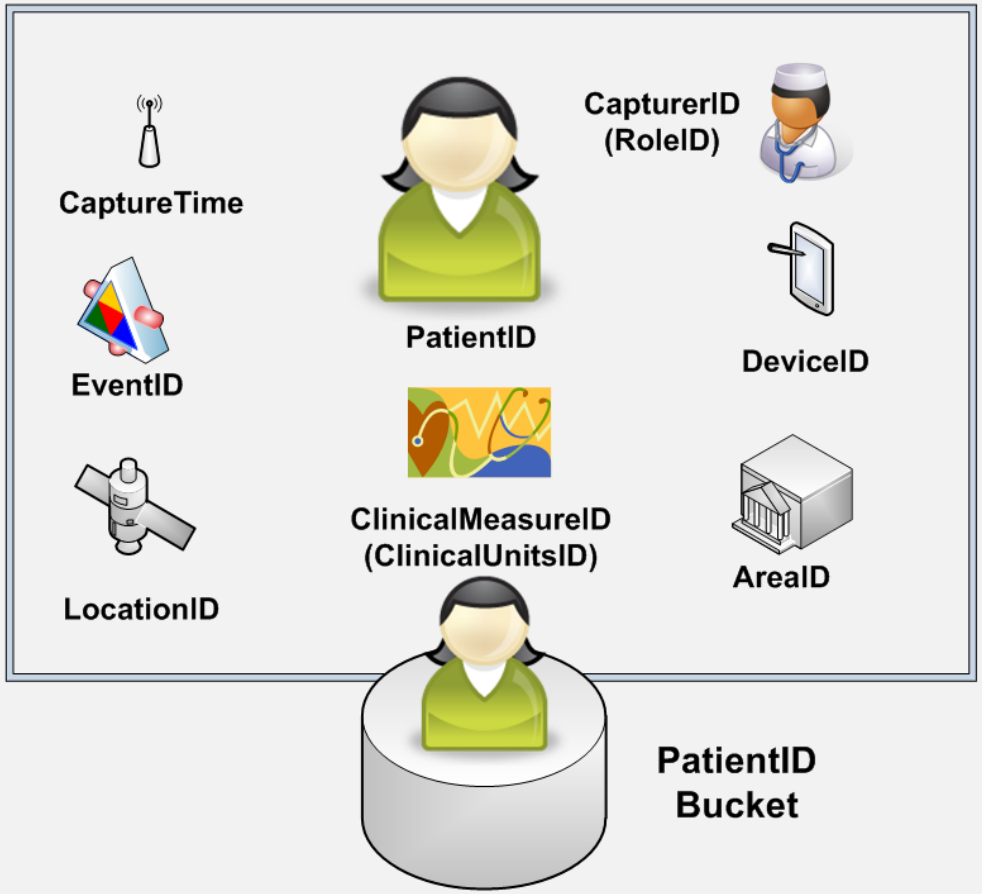

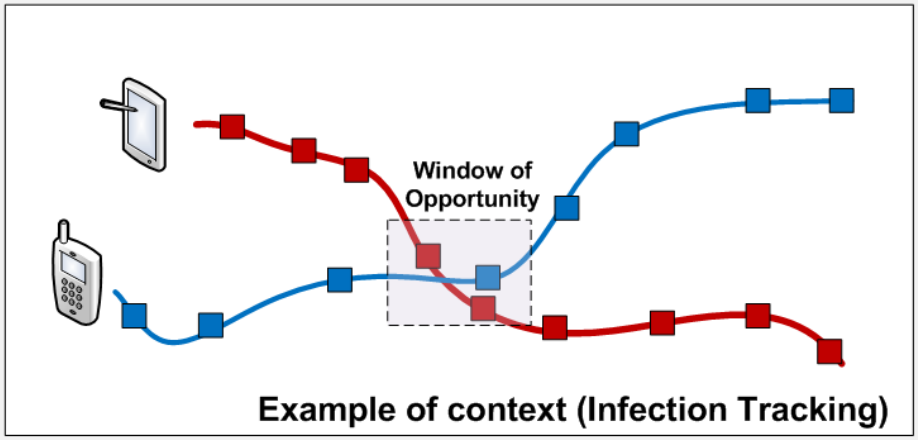

Data Capture Element

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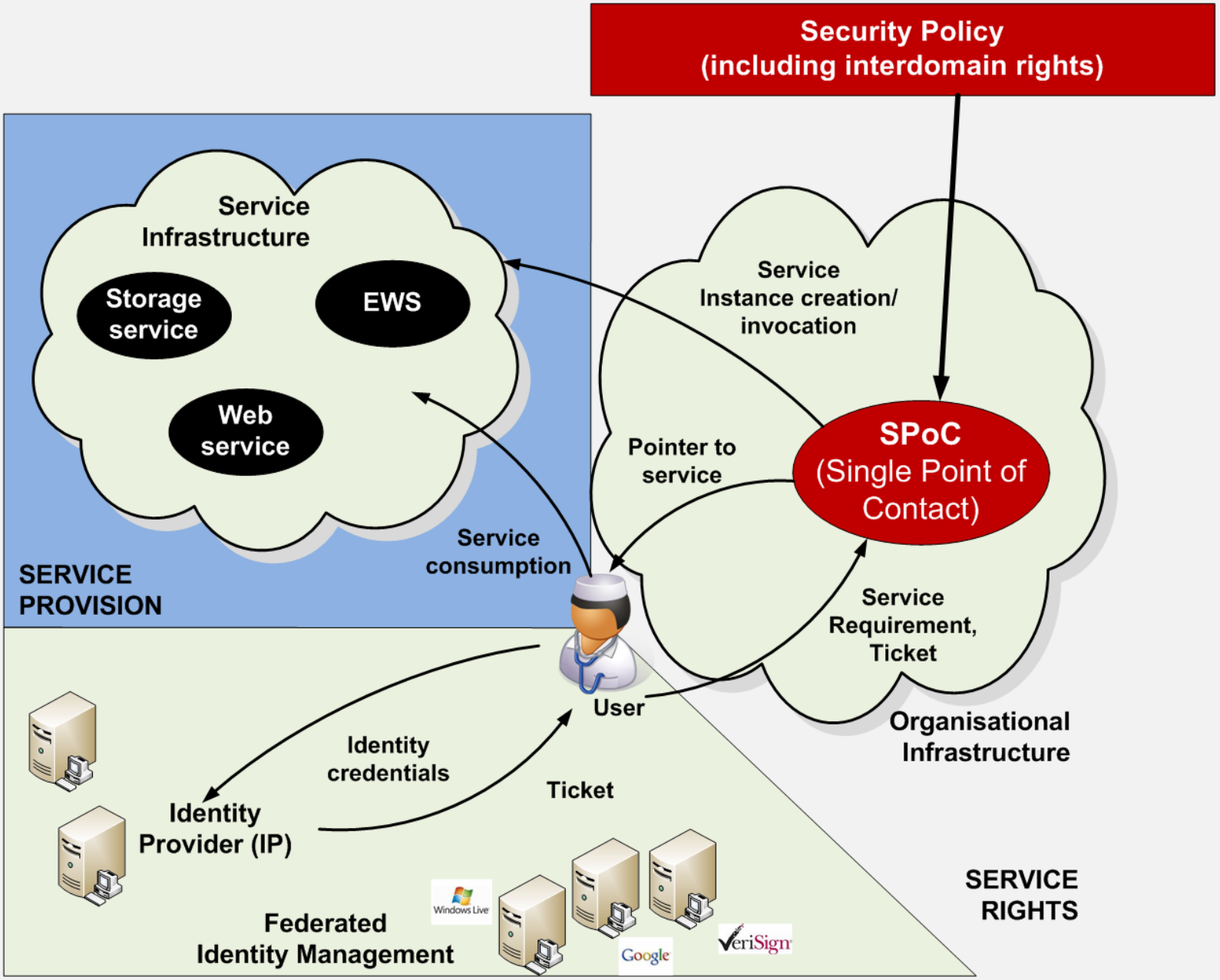

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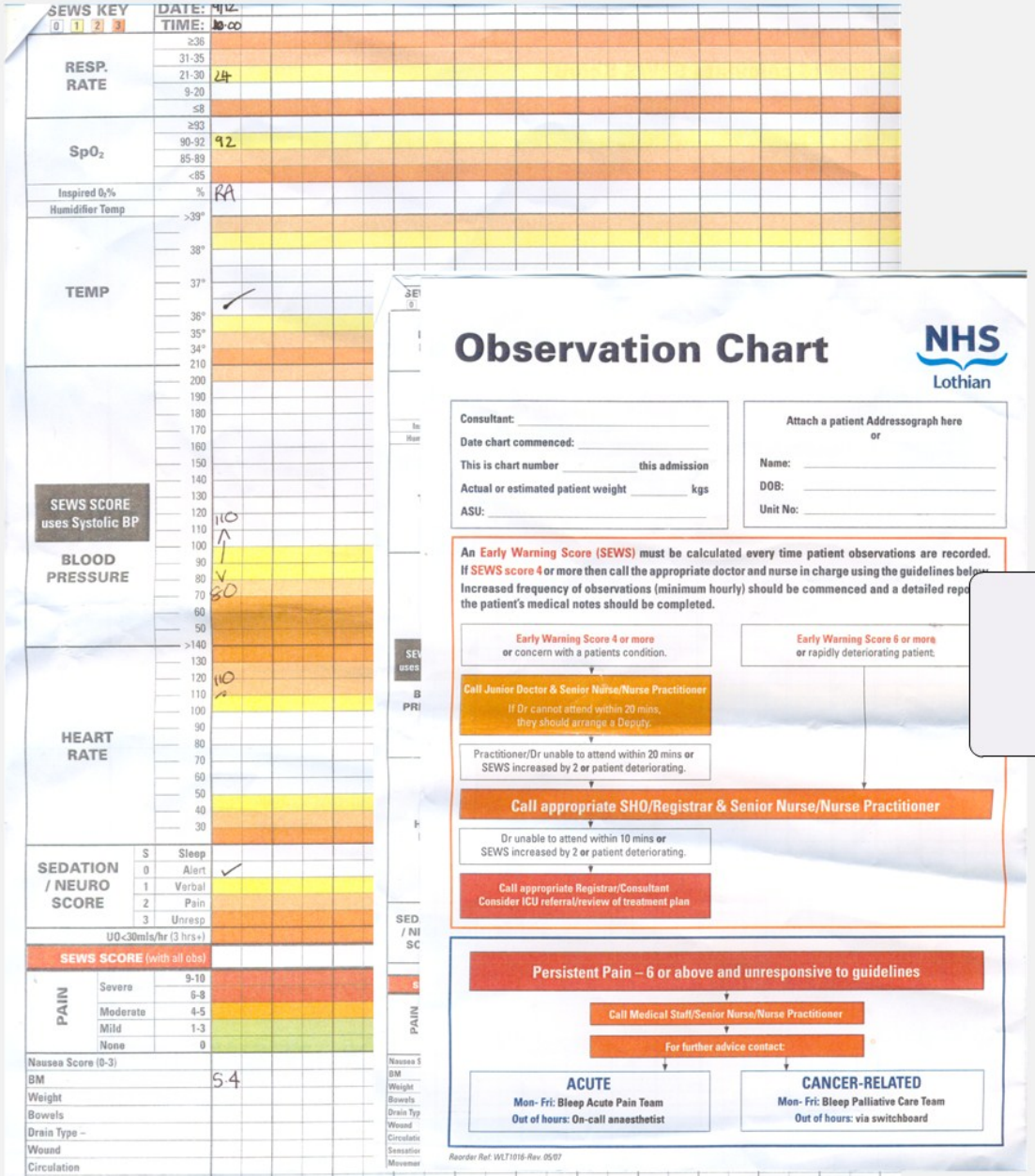

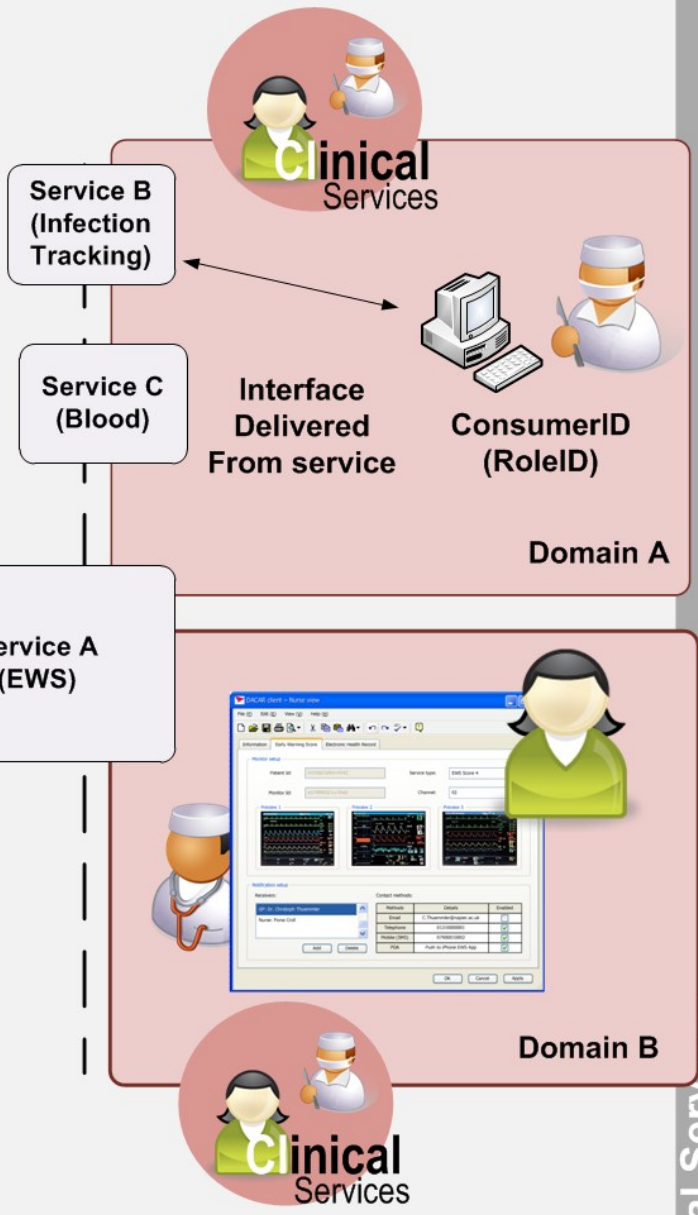

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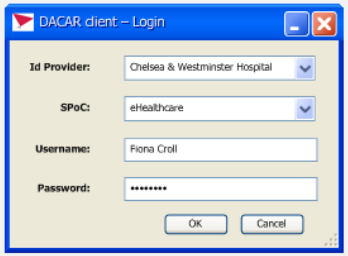

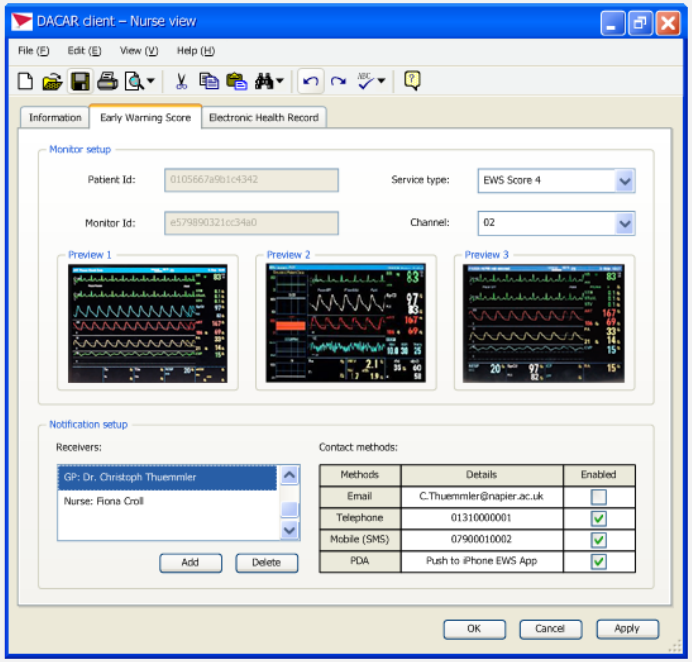

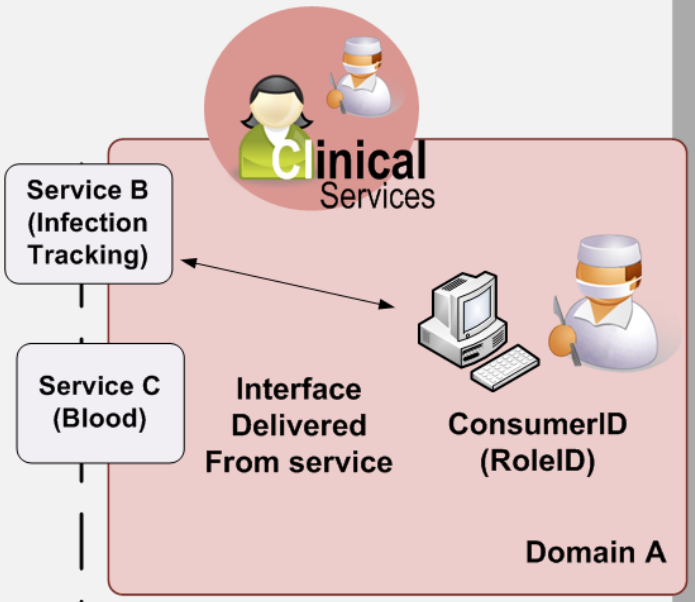

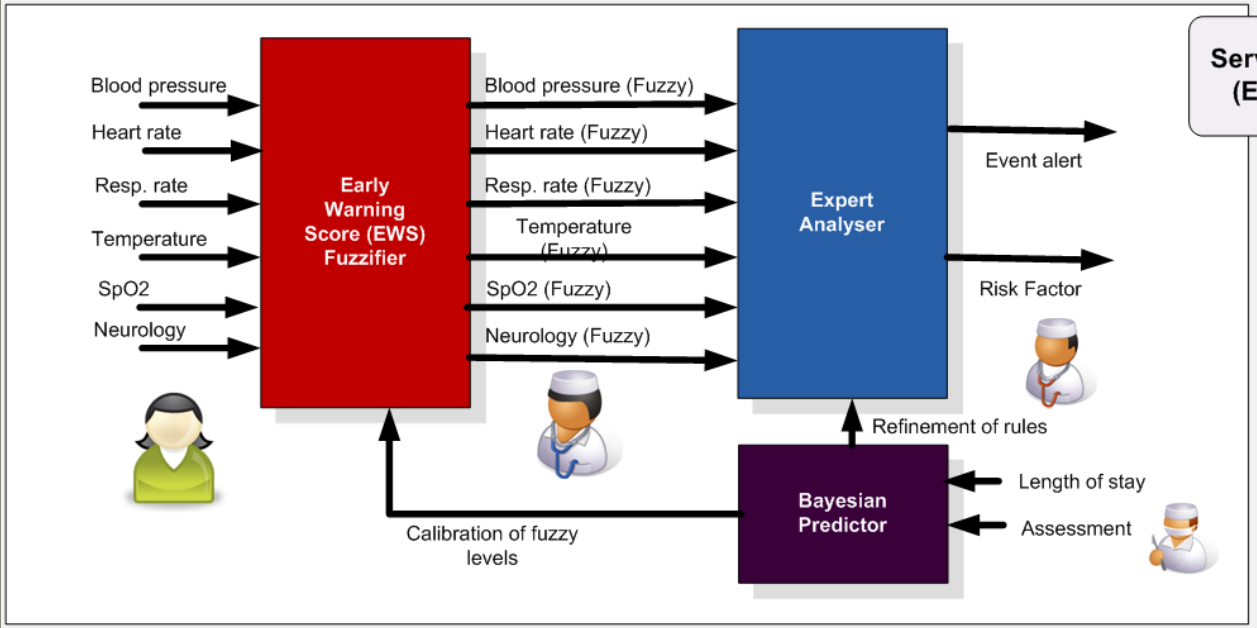

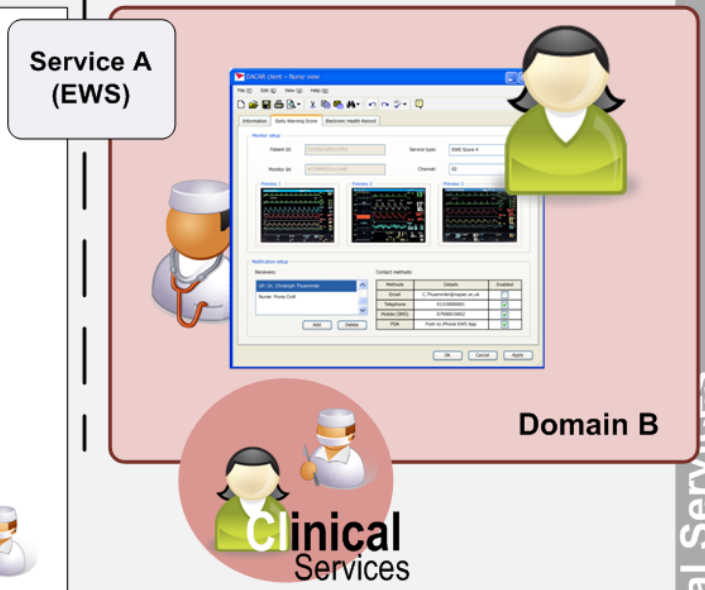

Clinical Services

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Patient Simulator

Clinical Services

Service B (Infection Tracking)

Service C (Blood)

Interface Delivered From service

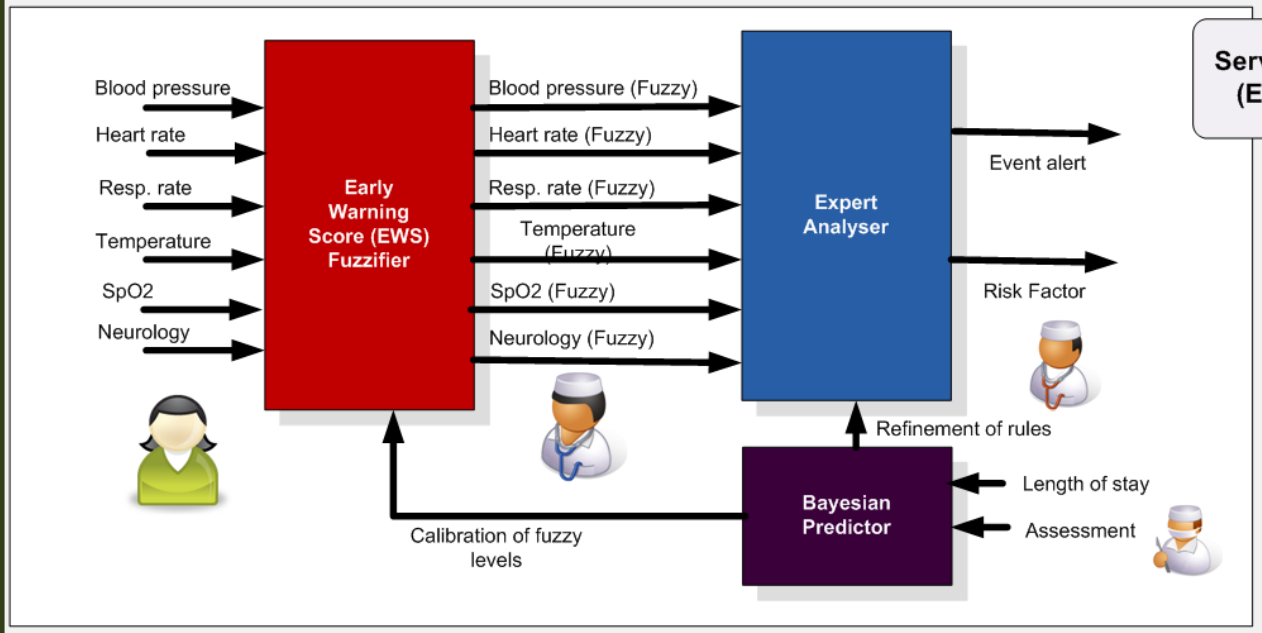
ConsumerID (RoleID)

Domain A

Service A (EWS)

Domain B

Clinical Services



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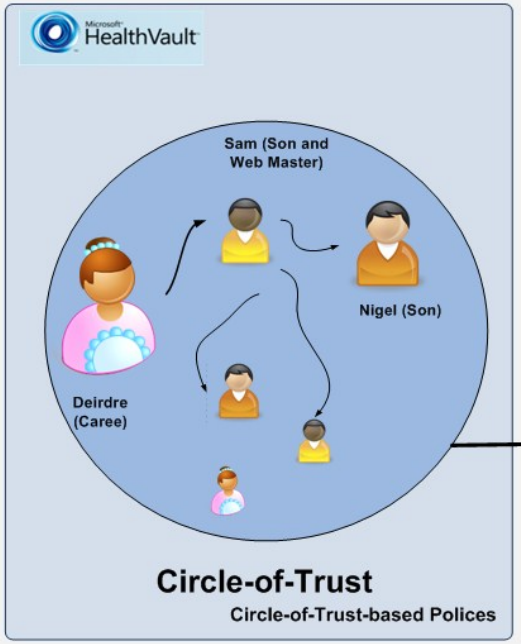
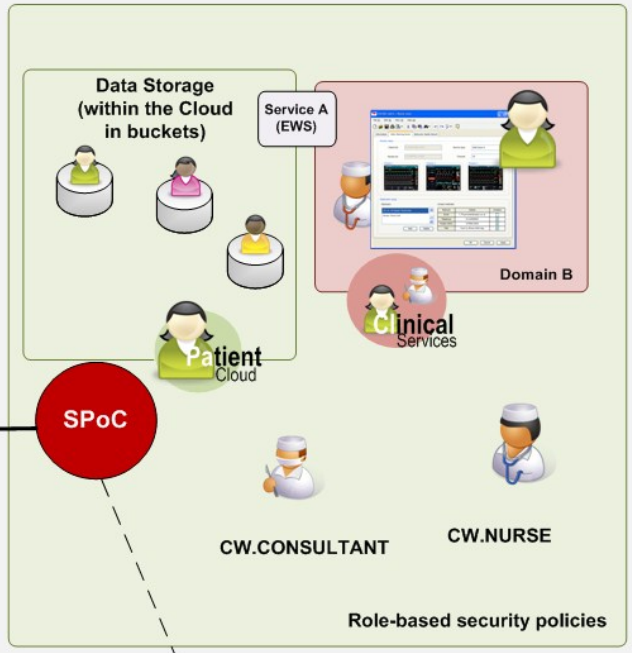
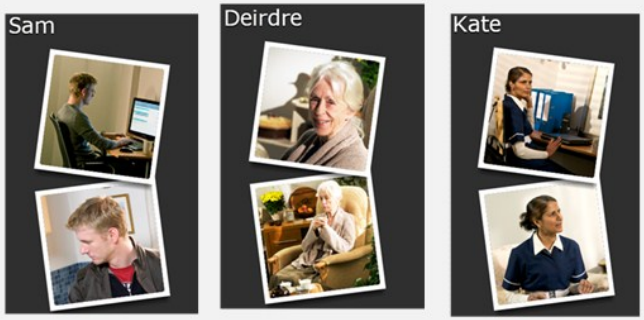
Assisted Living



Translation Gateway (Security Policy/ ID Mapping)

Primary/Secondary Care






```
[permit] [C&W.NURSE] [C | R] [Temp | SpO2 | HR | BP | RR |
Pain] of [Patient26078] with [EWS] from [Chelsea &
Westminster Hospital] for [*] records in [P2010-12-
30T00:00:00] using [Data Protection Act]

[permit | deny] [Requester] [C | R | U | D] [Attribute] of
[Object] with [Context] from [Owner] for [N] records in
[Time Window] using [Compliance]
```

Governance Policy

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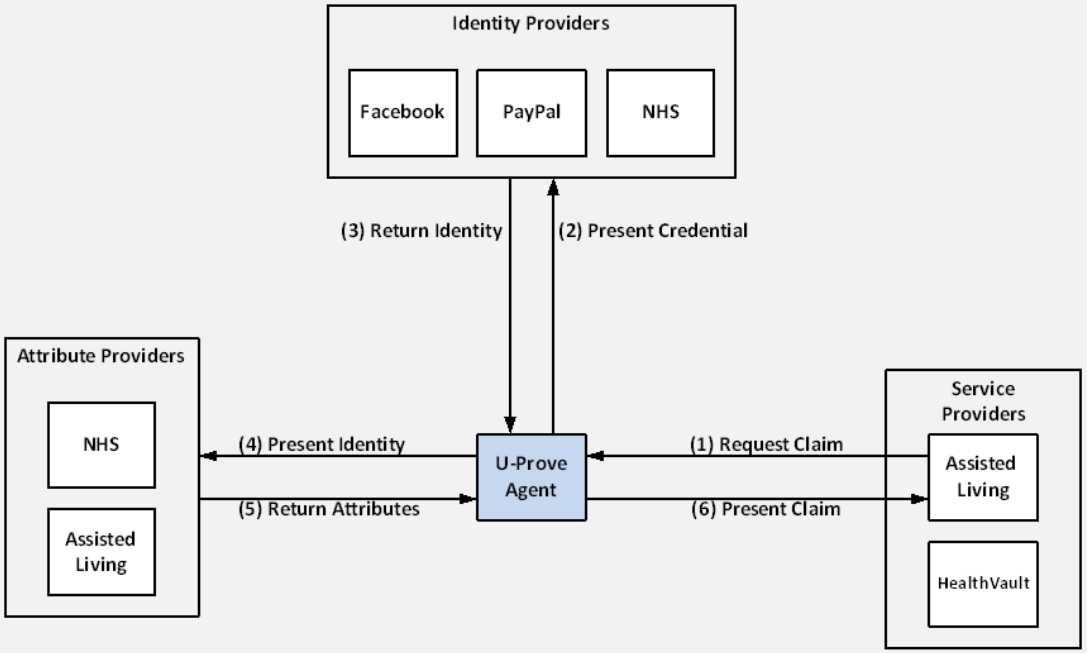

HealthVault

E-Health Platform

CW.CONSULTANT

CW.NURSE

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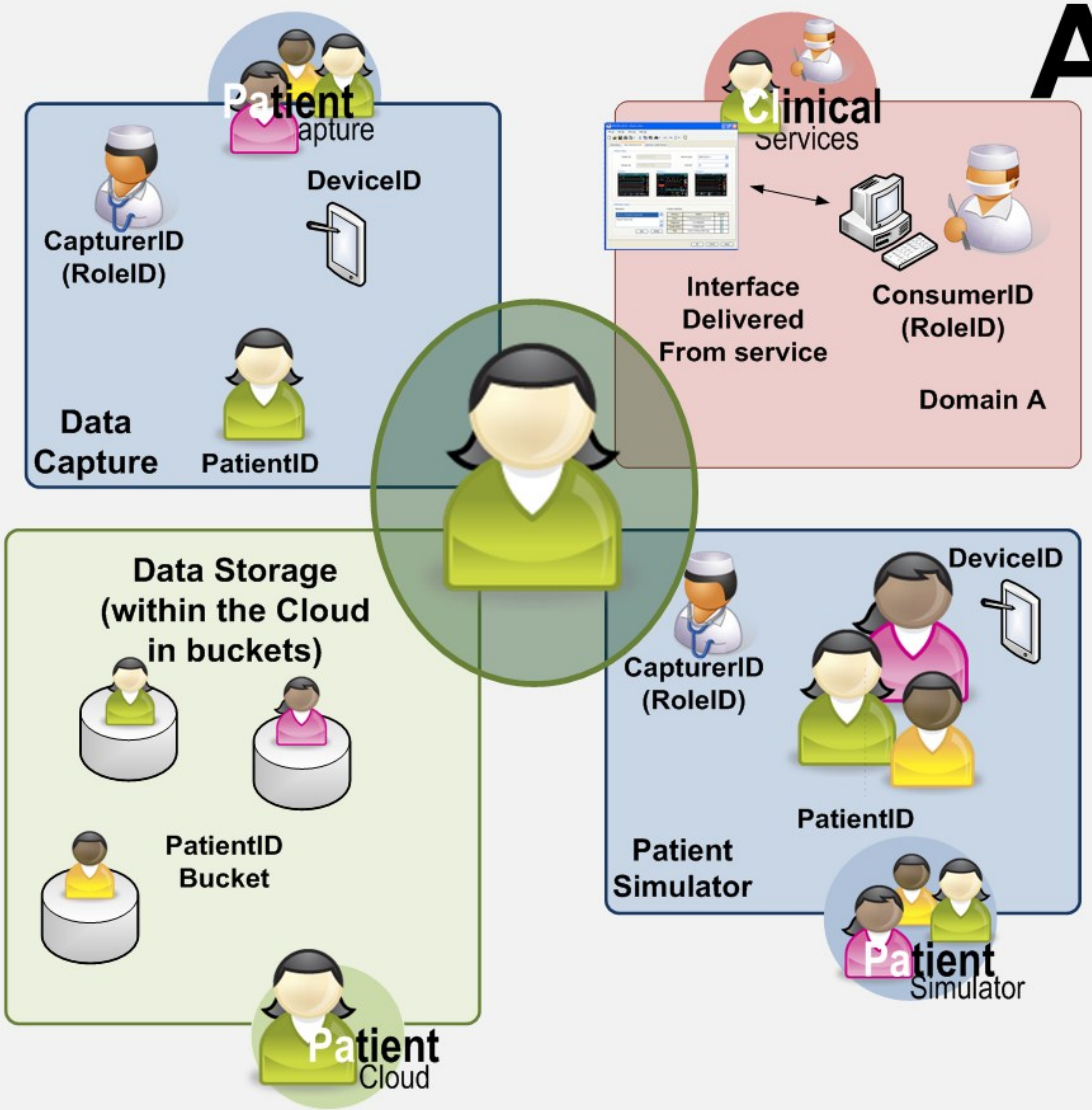
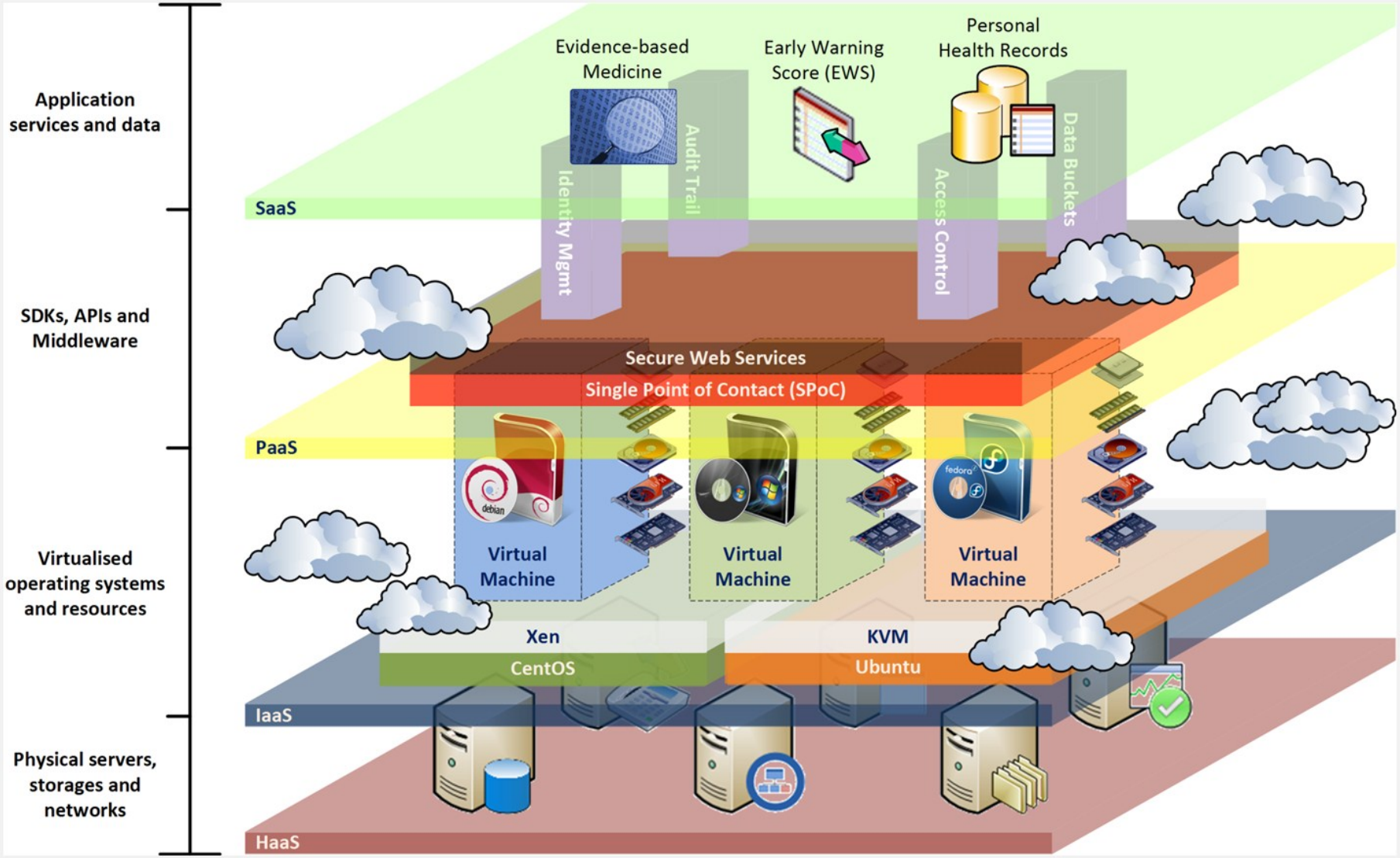
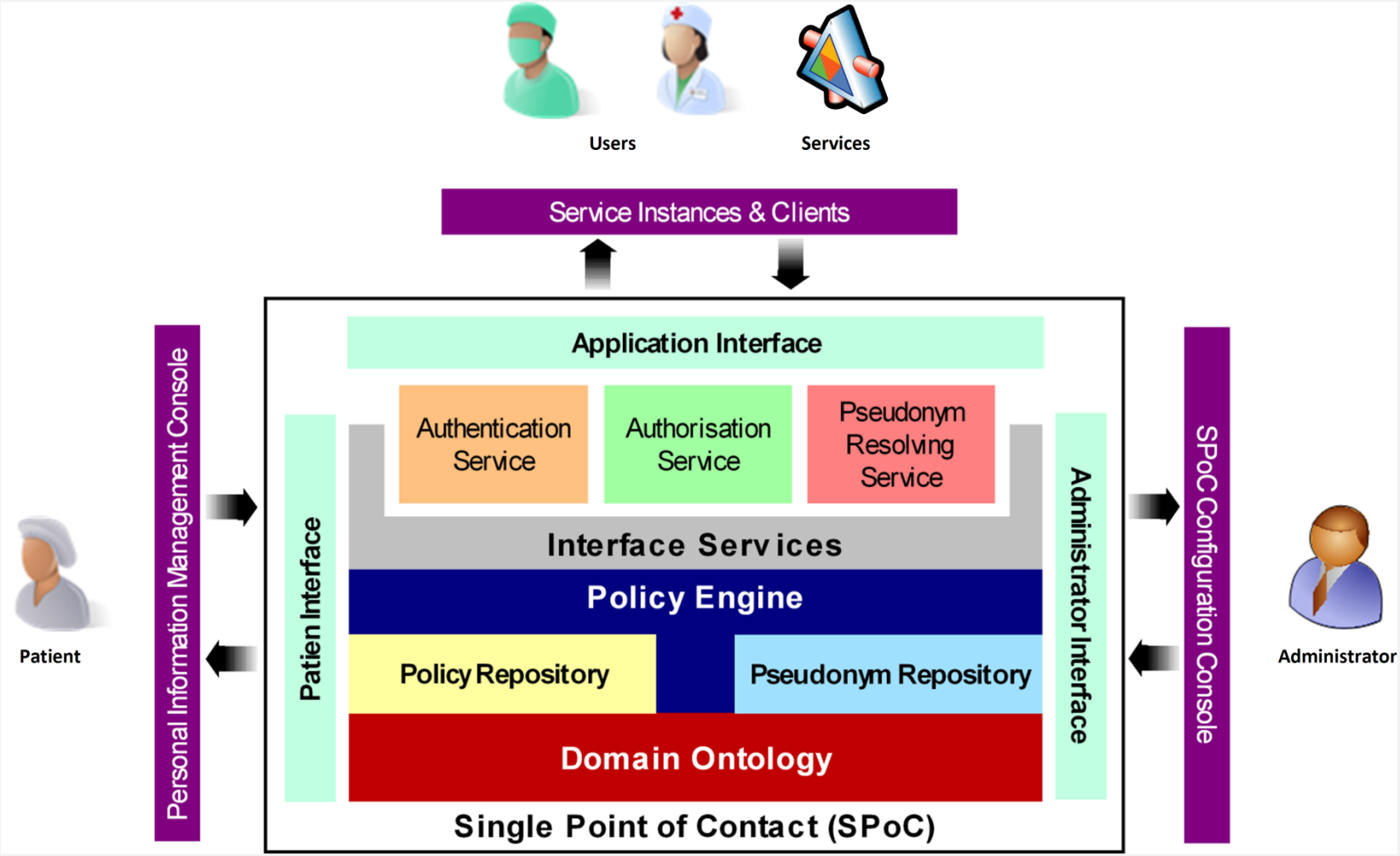
SPoC Architecture





E-Health Platform Architecture

SPoC Architecture



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Policy Syntax

```
[permit] [Medical Staff] [C | R] [Temp | SpO2 | HR | BP | RR | Pain] of
[Patient26078] with [EWS] from [Chelsea & Westminster Hospital] for [*] records
in [P2010-12-30T00:00:00] using [Data Protection Act]

[permit | deny] [Requester] [C | R | U | D] [Attribute] of [Object] with
[Context] from [Owner] for [N] records in [Time Window] using [Compliance].
```

A similar syntax is also applied to the request messages:

```
[Requester] [C | R | U | D] [Attribute] of [Object] with [Context] from [Owner]
within [Start] to [End]
```

- { [permit | deny] This is part of the rule syntax which indicates the action of the rule. This defines whether a request meeting the rule criteria will be permitted or denied access.
- { [Requester] This identifies a request sender's role, e.g. GP, or pseudonym, e.g. 10420, or a combination of the two, e.g. GP10420.
- { [C | R | U | D] This defines detailed permissions for a requester to create, read, update and delete certain information.
- { [Attribute] This is a unit of information describing an object. An attribute may be a primitive data type, e.g. the pseudonym of an object as a string, or a complex data type, e.g. a person's ECG record for 45 seconds.
- { [Object] This is part of DACAR's system model. It refers to any entities in a healthcare scenario, about which information is held.
- { [Context] This identifies the reason why the information is being shared. The context governs the level of access and permissions associated with information exchange, and hence defines the priority accorded to information requests.
- { [Owner] This species a role with sufficient privileges to manage all aspects of an information source. The owner has the authority to allow or deny access to an information element, as required by legislation and defines responsibilities.
- { [N] records in [Time Window] This defines the number of records permitted over a period of time, where N can be any positive integer.
- { [Compliance] This refers to legislative requirements that support the exchange of information, such as the Data Protection Act, the Human Rights Act, the Freedom of Information Act and so on.
- { [Start] and [End] These identify the start and end of the date/time period over which information shown.

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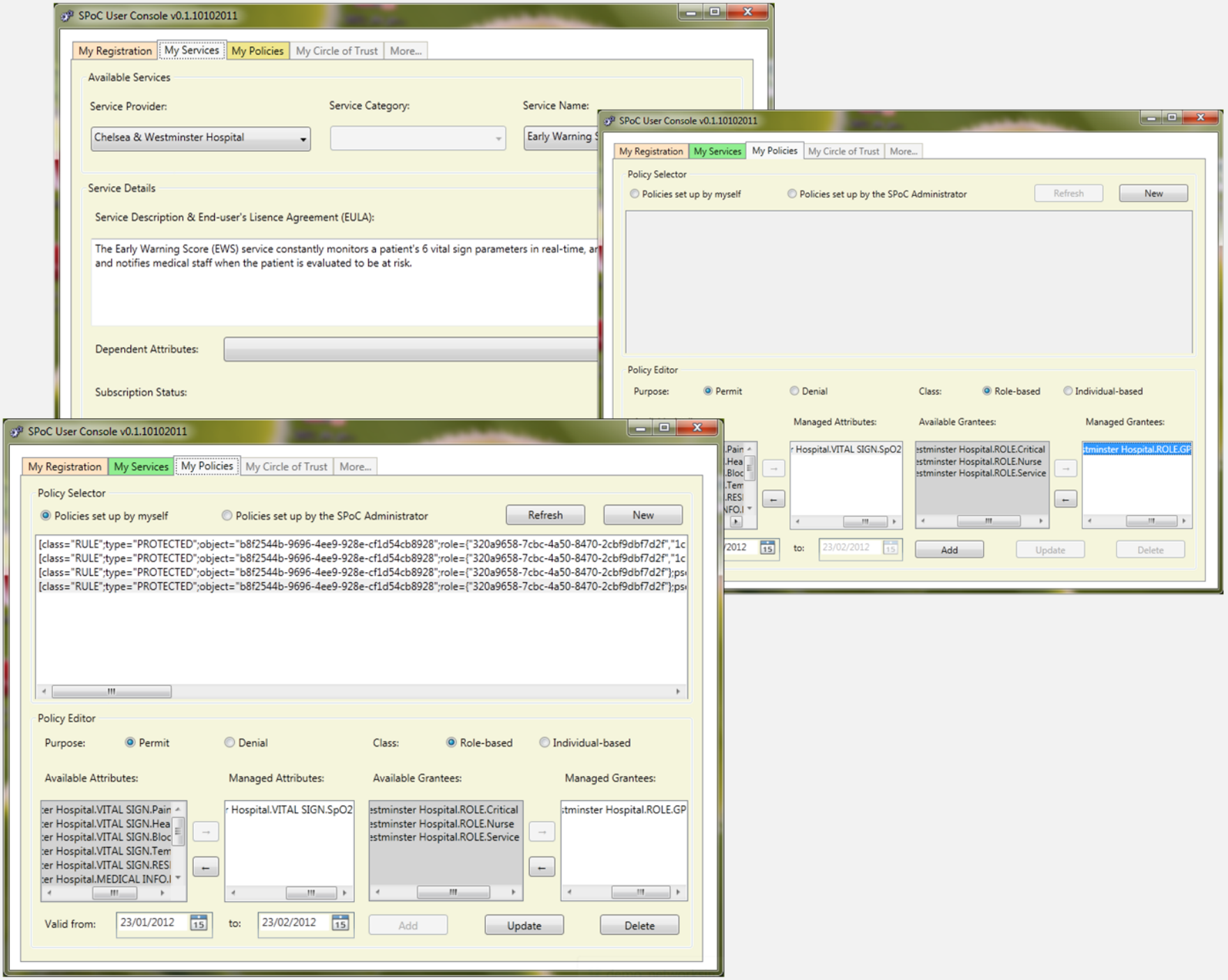
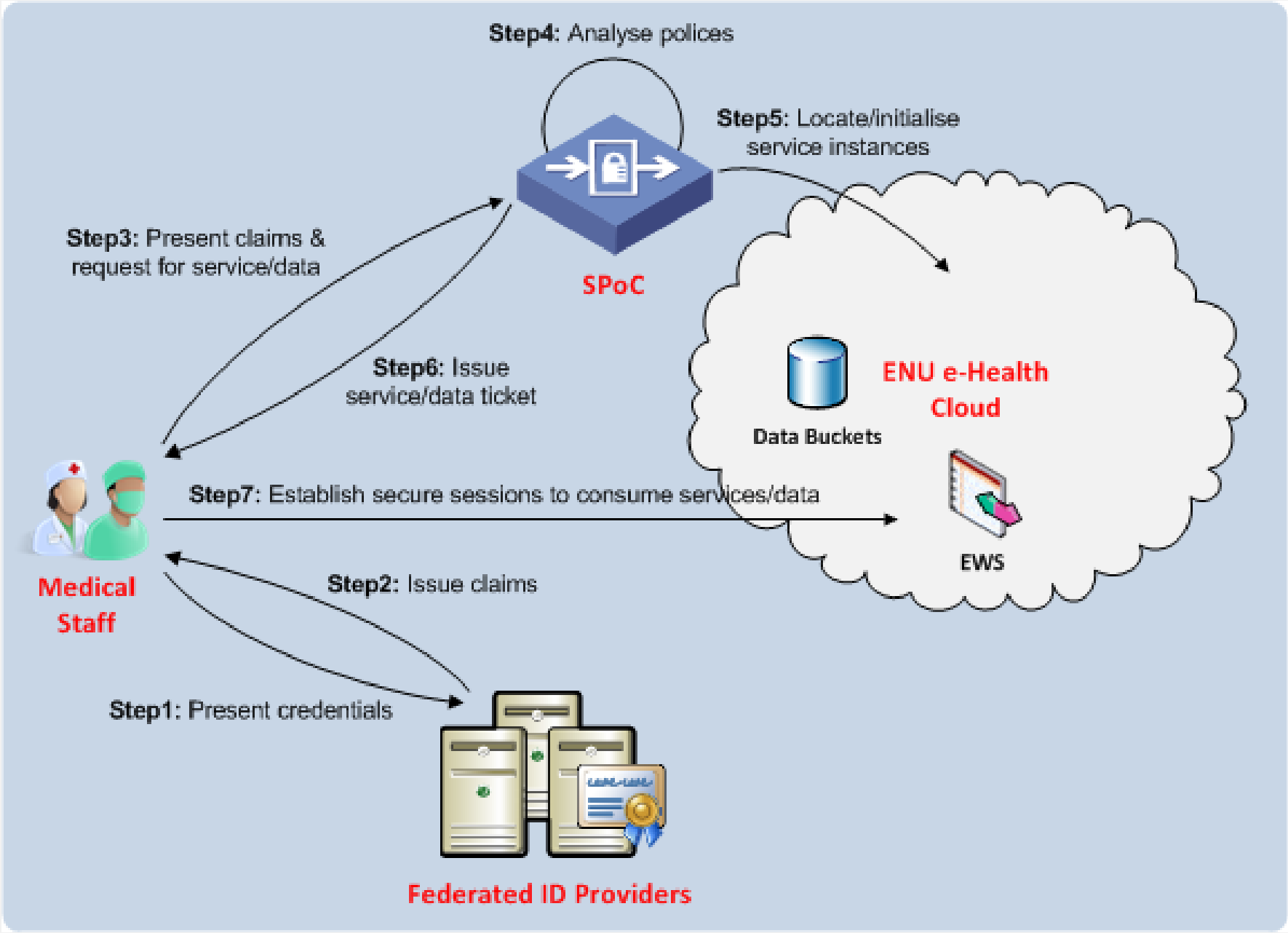


Rights Definition



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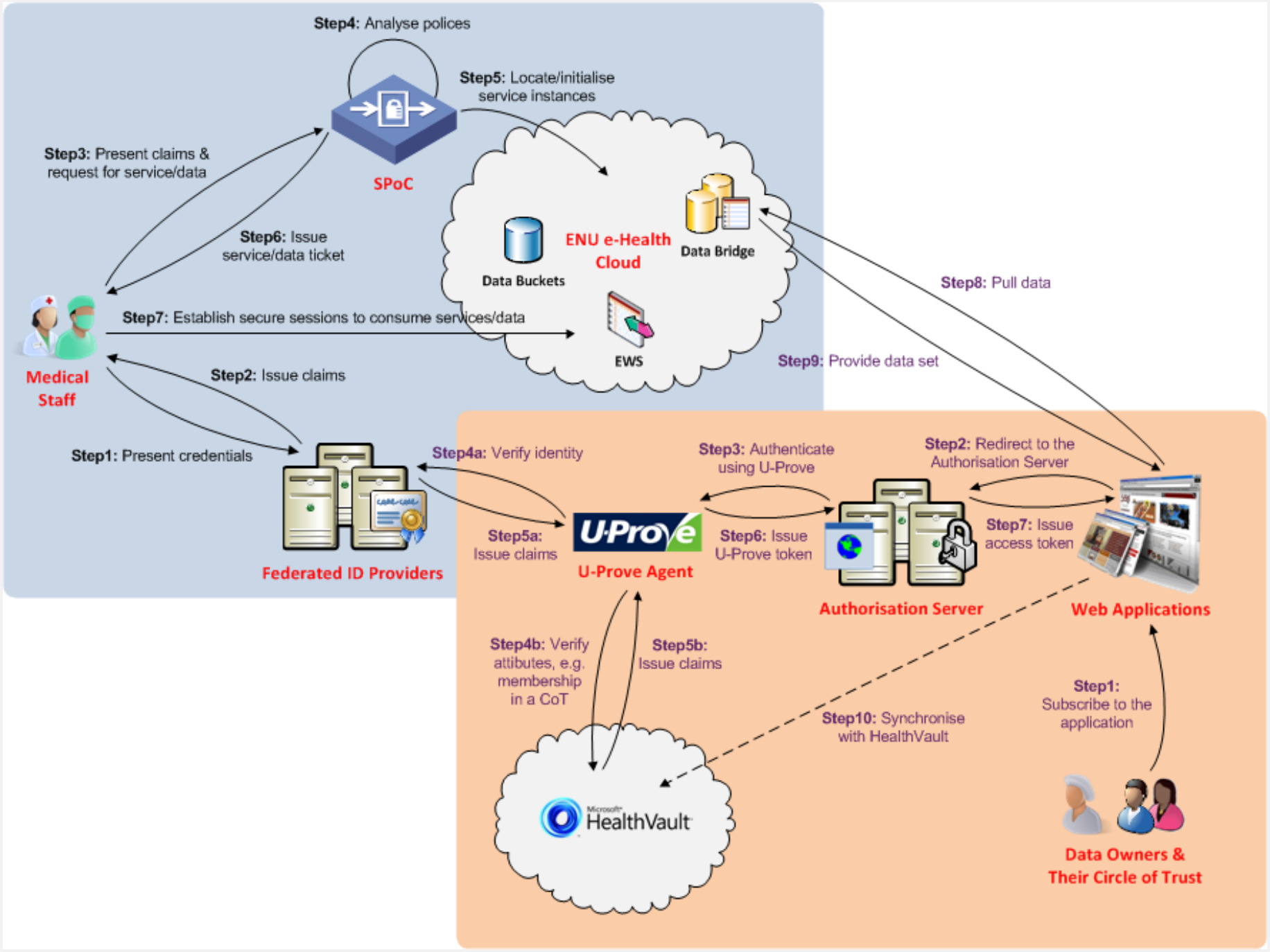
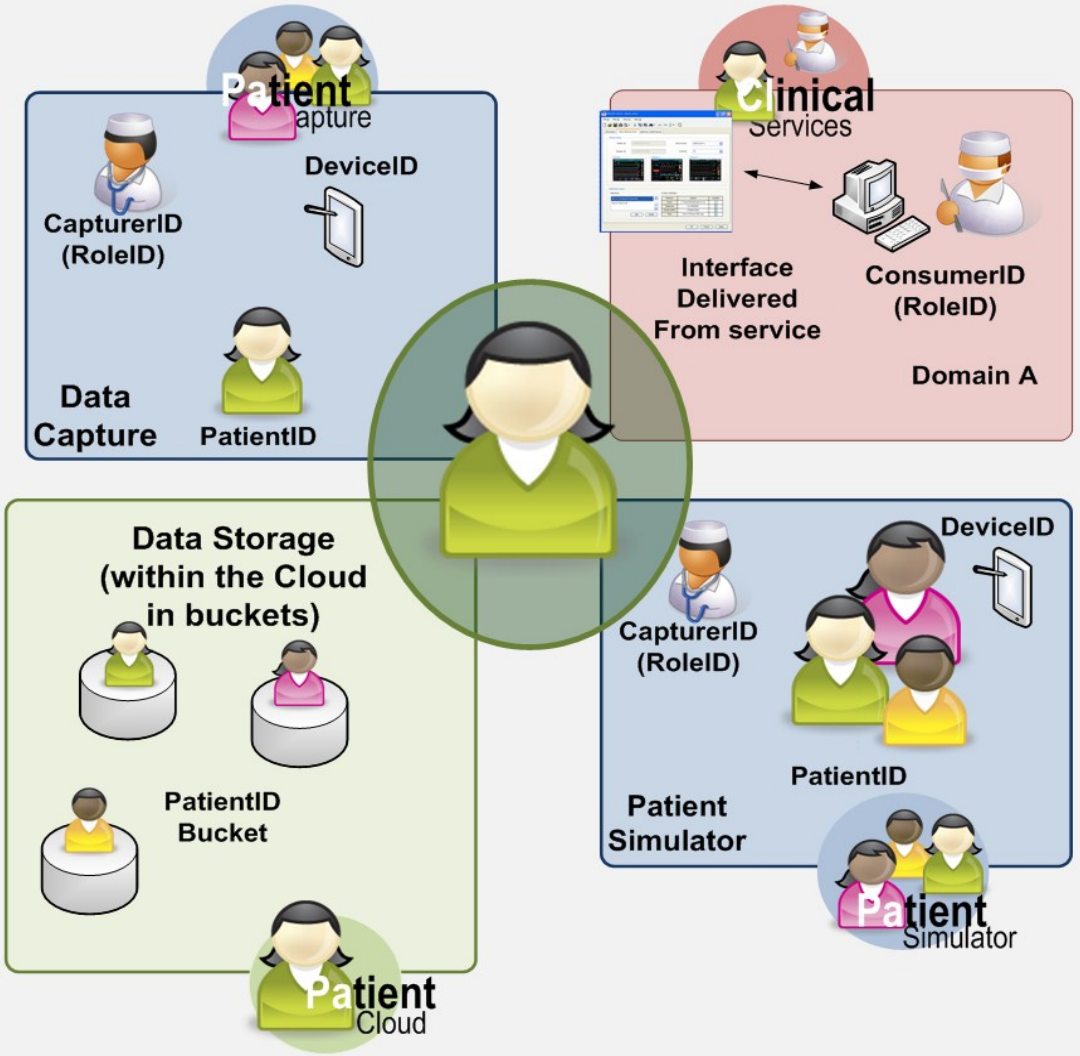

Step4: Analyse polices
Step5: Locate/initialise service instances
Step3: Present claims & request for service/data
Step6: Issue service/data ticket
SPoC
ENU e-Health Cloud
Data Buckets
Data Bridge
EWS
Step8: Pull data
Step7: Establish secure sessions to consume services/data
Step9: Provide data set
Medical Staff
Step2: Issue claims
Step1: Present credentials
Federated ID Providers
Step4a: Verify identity
Step5a: Issue claims
U-Prove
U-Prove Agent
Step3: Authenticate using U-Prove
Step6: Issue U-Prove token
Step2: Redirect to the Authorisation Server
Step7: Issue access token
Authorisation Server
Web Applications
Step4b: Verify attibutes, e.g. membership in a CoT
Step5b: Issue claims
Step10: Synchronise with HealthVault
Step1: Subscribe to the application
HealthVault
Data Owners & Their Circle of Trust
Cloud4health

Patient Simulator



Patient Simulator
Edinburgh Napier UNIVERSITY
Patient Simulator
Patient List
1 :Daniel Smith (61980f5d-e9cc-4a9f-b7b6-7fb8ffc17140)
2 :James Mondella (12616ff5-fbe4-4665-bca6-dcf0f0defef3)
3 :Scott Freeman (b8f2544b-9696-4ee9-928e-cf1d54cb8928)
61980f5d-e9cc-4a9f-b7b6-7fb8ffc17140
Patient Details
Update Details
Date of Birth:
23/06/1978
Gender:
Female
Title:
Miss
Blood Type:
AB
Fornname(s):
Daniel
Address:
Edinburgh
Surname:
Smith
Simulation Visualisation
ECG
BP (Plot)
TEMP (Plot)
RR (Plot)
SpO2 (Plot)
Vital Sign Parameters
HR:
80
Temp:
36.8
BP (Systolic):
120
Respiration:
12
SpO2:
98
Scenario:
Stroke
Simulation Output
HR
79
BPM
BP
120
mmHG
TEMP
36.8
°C
RR
11.9
BF
SpO2
98
%
Simulation Control
Start:
23/01/2012
08:36:42
Stop:
24/01/2012
08:36:42
Simulating...
Stop Simulation
Simulating...
Early Warning Score Service
Edinburgh Napier UNIVERSITY
Early Warning Score Service
Patient List
1 :Daniel Smith (61980f5d-e9cc-4a9f-b7b6-7fb8ffc17140)
2 :James Mondella (12616ff5-fbe4-4665-bca6-dcf0f0defef3)
3 :Scott Freeman (b8f2544b-9696-4ee9-928e-cf1d54cb8928)
61980f5d-e9cc-4a9f-b7b6-7fb8ffc17140
Patient Details
Title:
Miss
Fornname(s):
Daniel
Surname:
Smith
Controls
Monitoring...
Stop Monitoring
Patient Status:
DATE
TIME
STATUS
23/01/2012 08:37:36
No Risk Detected
23/01/2012 08:37:42
No Risk Detected
Normal
Early Warning Score:
HR
BP
TEMP
RR
SPO2
Value:
79
118
36.8
11.7
98
EWS:
0
0
0
0
0
RISK SCORE:
0
Monitoring...
61980f5d-e9cc-4a9f-b7b6-7fb8ffc17140
Patient Details
Title:
Miss
Fornname(s):
Daniel
Surname:
Smith
Controls
Monitoring...
Stop Monitoring
Patient Status:
DATE
TIME
STATUS
23/01/2012 08:37:57
Low Risk Detected
23/01/2012 08:38:02
Low Risk Detected
23/01/2012 08:38:04
Low Risk Detected
23/01/2012 08:38:06
Low Risk Detected
23/01/2012 08:38:09
Low Risk Detected
23/01/2012 08:38:11
Low Risk Detected
23/01/2012 08:38:15
Low Risk Detected
Observe
Early Warning Score:
HR
BP
TEMP
RR
SPO2
Value:
118
157
37.0
11.6
96
EWS:
2
0
0
0
0
RISK SCORE:
2
Monitoring...
Patient Simulator

Integrating Assisted Living with Primary/Secondary Health Care

Cloud4Health

Prof Bill Buchanan, Dr Lu Fan, Prof Christoph Thuemmler, Dr Elias Ekonomou, Owen Lo, Omair Uthmani, Richard Lewis, and Alistair Lawson, Edinburgh Napier University.

Contact: w.buchanan@napier.ac.uk
Web: cloud4health.com

Cloud4health