Fraunhofer Institut Biomedizinische Technik

Architecting disparate eHealth systems interoperable through Web Services

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Outline

- Research Areas of the Fraunhofer-IBMT
- TOPCARE e-Homecare Platform
- Application of Semantic Web/Web Services/Ontologies in eHealth
- Functionalities to be offered by Health Information Systems for the interoperability
- Suggested Security Framework
- Augmentation of e-Homecare platform with Web Service
- References

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Research Areas of Fraunhofer-IBMT

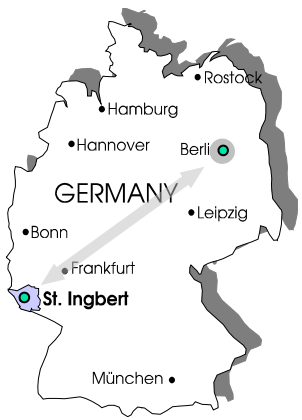
- Health Telematics (Homecare, Telemedicine, Secure medical communication, Semantic Web based applications)

- Microsystems in biology and medicine, microsensors and microintegration, active Implants

- Neuro prosthetics (Nerve-electrode-arrays, functional electro stimulation)
- Ultrasound systems

- Cellular biotechnology & biochips
- Molecular cell-/ tissue engineering

- Stem cell research
- Cryo-biotechnology



EUROCRYO SAAR
Mikrosystembasierte Zellbank im Saarland

Fraunhofer Society

- of non-profit organisations
- applied R&D on contract base
- 56 institutes
- more than 10.000 employees

Main Research Fields of Health Telematics Dept.

Secure Communication in Medical Networks

Development of interoperable and secure communication solutions for the public health system.

e-Homecare, mobile Healthcare, Telemedicine

- Telehealth systems for mobile care and homecare of high risk patients, elderly and care needing people.
- Open telecare platform solutions for telemedicine services.
- Functional and semantic interoperability between eHealth systems

IT solutions for Biosciences

Information systems for Cryo cell banks.

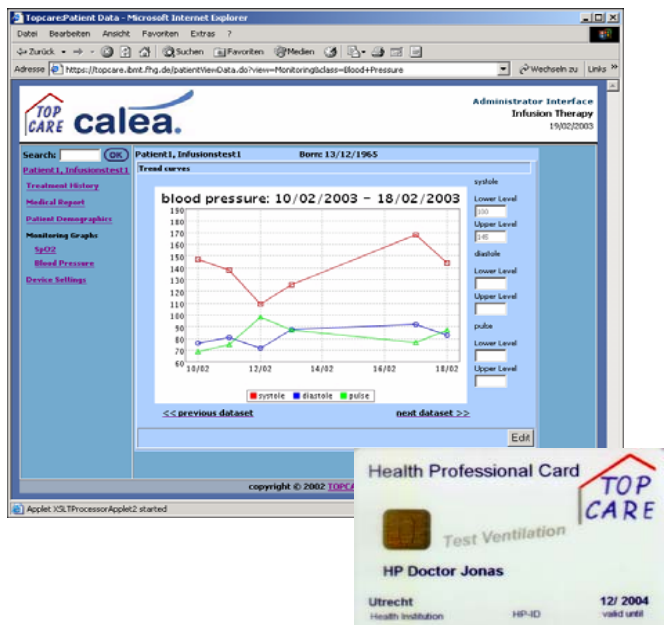
TOPCARE e-Homecare and Telemedicine Platform

Therapy surveillance by telemonitoring vital signs, in vitro parameters and device parameters:

- Home Ventilation
- Endurance Test and Exercises
- Coagulation Therapy
- Stroke Rehabilitation
- Medication Adherence

TOPCARE Box

TOPCARE Telehealth Server



TOPCARE e-Homecare and Telemedicine Platform (cont.)

Roche Diagnostics
Coagucheck S™
Blood Coagulation Testing

RespiCare CV

Dräger Medical
Ventilator

Careousel™
Pill Dispenser

Soehnle S20
Weight Scale

Boso Medicus™
Blood Pressure

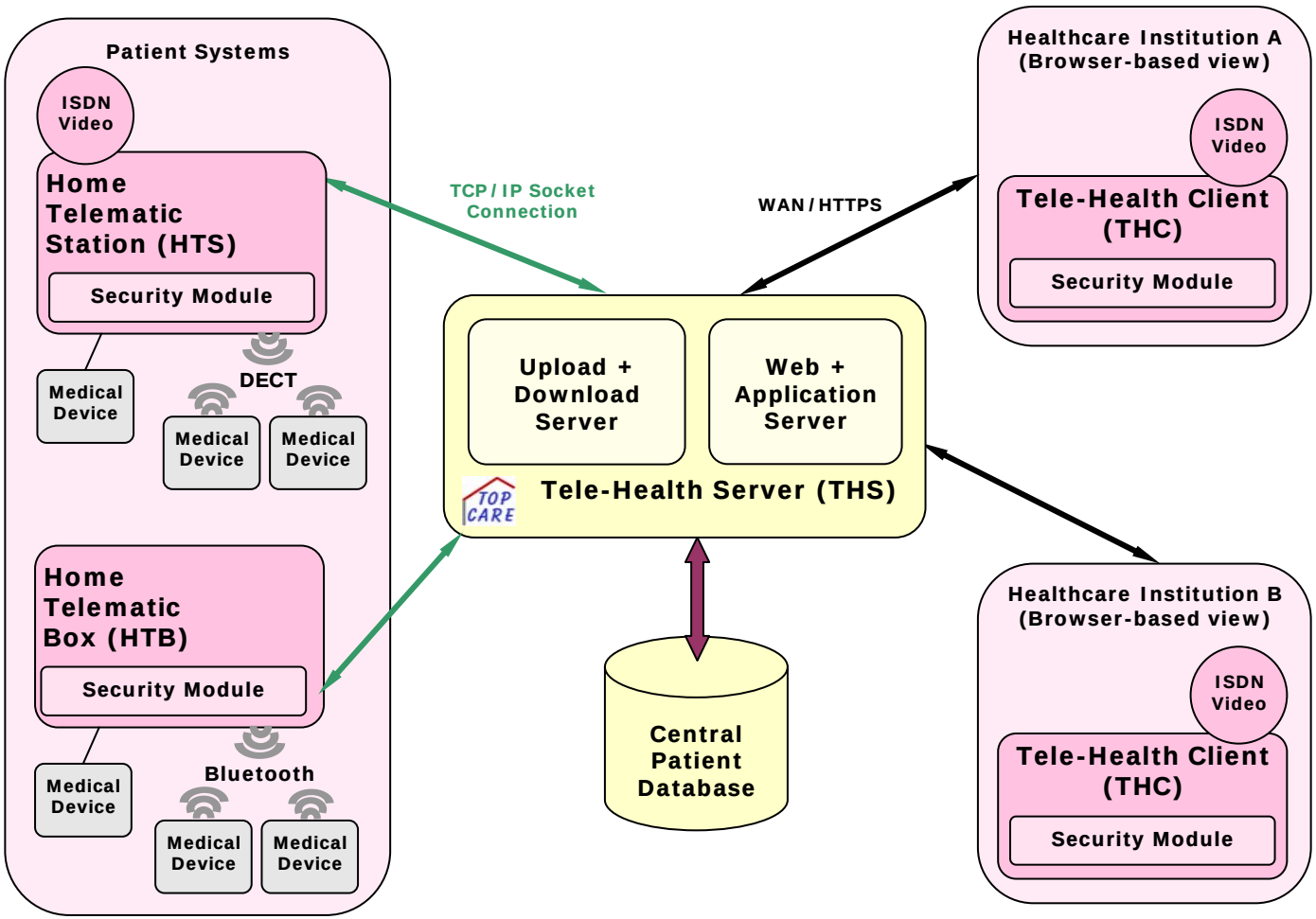
Roche Diagnostics
Accucheck S™
Blood Glucose Testing

Roche Diagnostics
Urisys 1100
Urine Analyzer

Radical™

Dräger Medical
Pulse Oxymeter

TOPCARE e-Homecare and Telemedicine Platform (cont.)



TOPCARE e-Homecare and Telemedicine Platform (cont.)

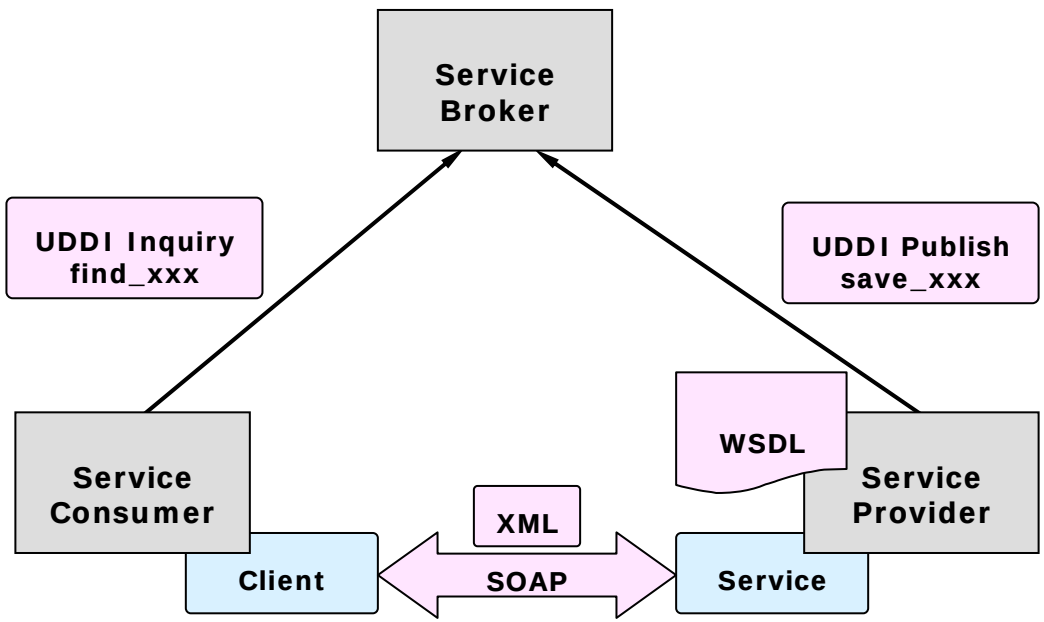
Drawbacks/Limitations

- No interoperability with HL7, xDT etc. compliant systems.
- Interaction is limited to only the clients having Telehealth client (THC) module.
- Interaction is possible only through Web browsers (i.e. Internet Explorer, Netscape)
- No Application Programming Interface (API) is defined.

Semantic Web/ Web Services/ Ontologies

Web Service:

- Interfaces and bindings are capable of being defined, described, and discovered as XML artifacts.
- Supports direct interactions with other software agents.
- XML based message exchanging via internet-based protocols.



Semantic Web/ Web Services/ Ontologies (cont.)

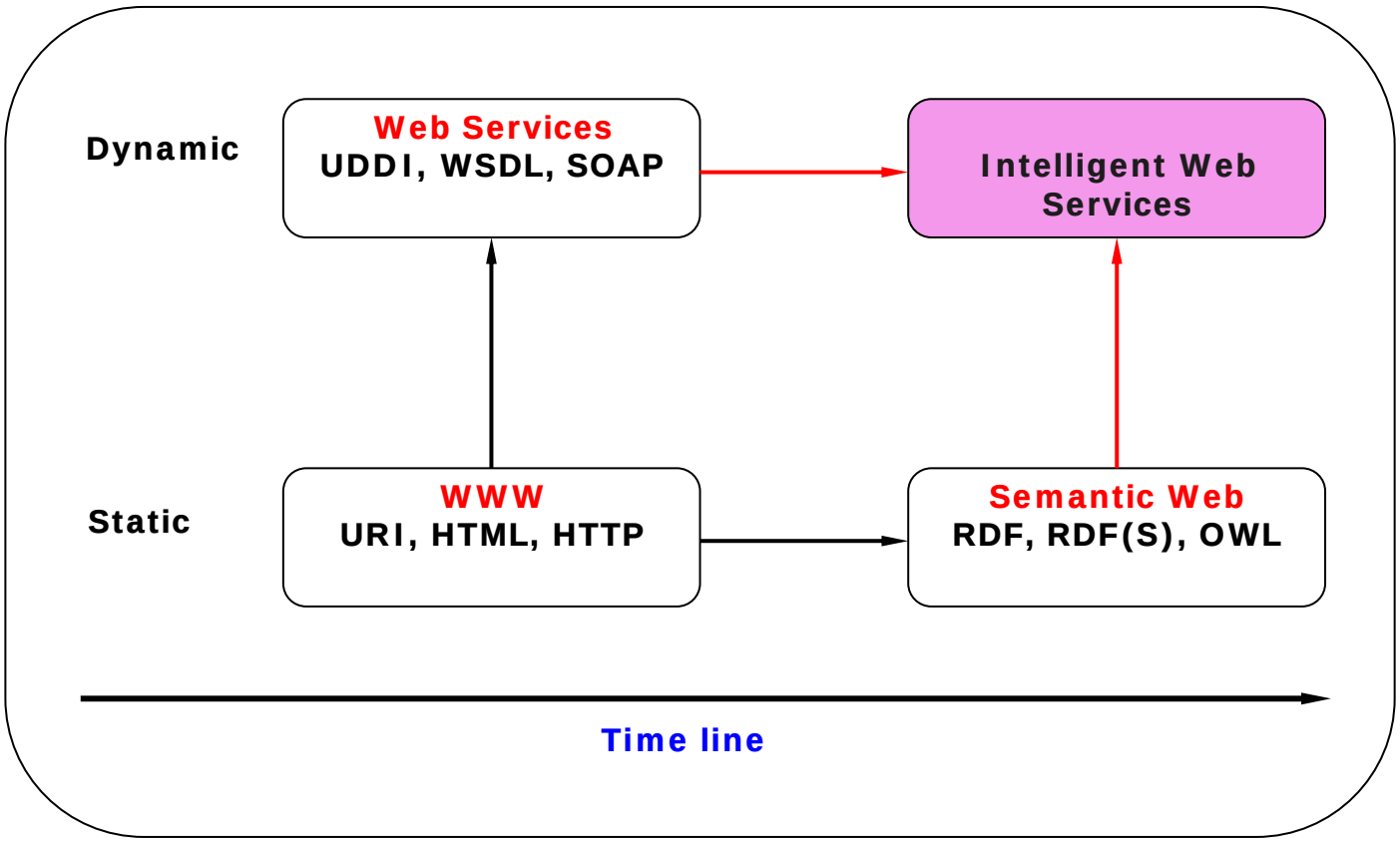
Semantic Web:

- Making WWW contents *machine-processable* and *machine-interpretable*.
- To Achieve
  - Automatic **Discovery** of Web Services
  - Automatic **Composition** of Web Services
  - Automatic **Invocation** of Web Services
  - Automatic **Interoperation** of Web Services
  - Automatic **Selection** of Web Services

Ontology:

- Defines the terms used to describe and represent an area of knowledge.
- Used by people, databases, and applications that need to share domain information.

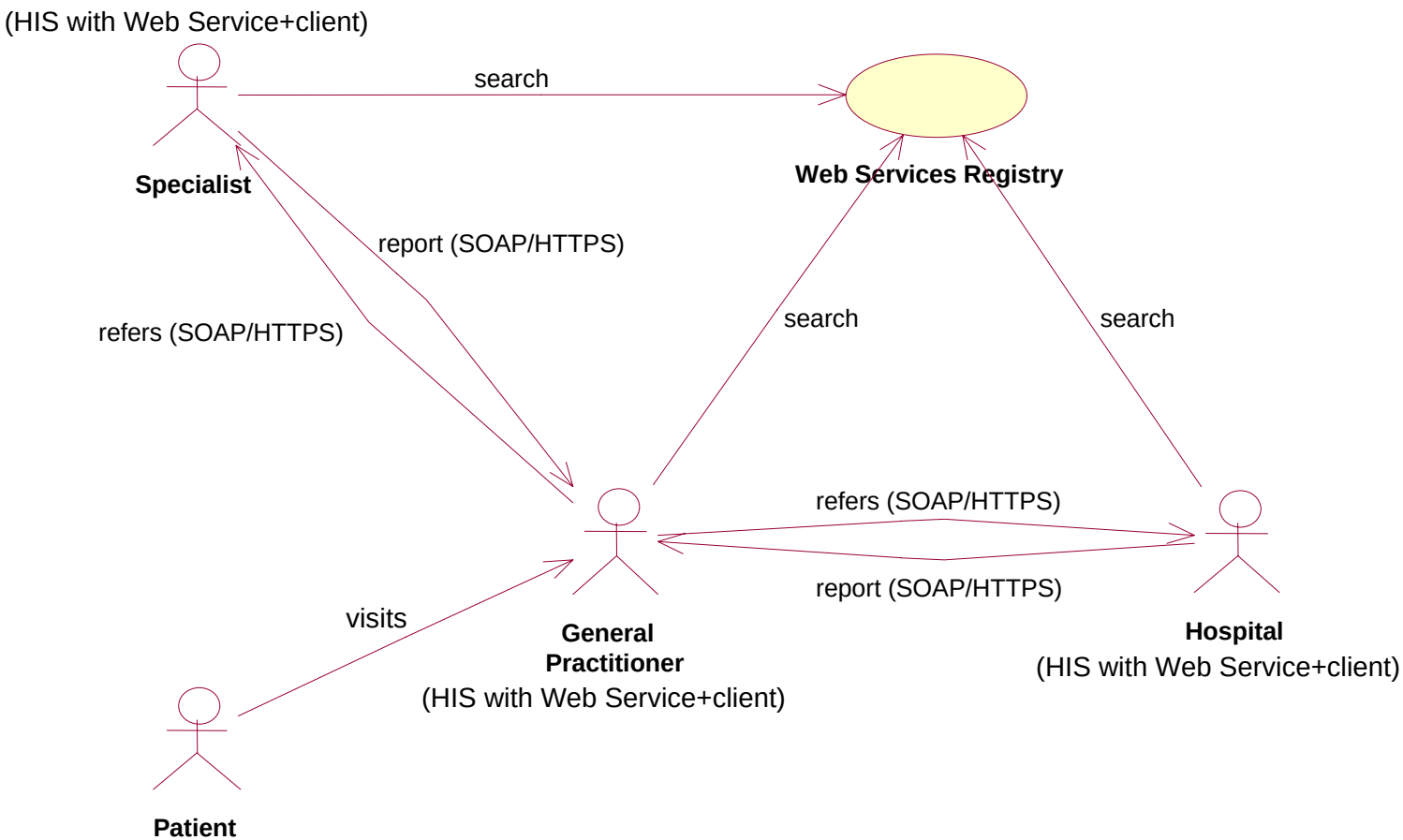
Semantic Web/ Web Services/ Ontologies (cont.)



Some Semantic Web based eHealth projects

- MedCIRCLE/MedCERTAIN
  - To develop and promote technologies able to guide consumers to trustworthy health information on the internet.
  - A collaborative system for assessing health information on the web.
- ARTEMIS
  - To develop a Semantic Web enabled Web Services (SWWS) based interoperability framework for the healthcare domain.
- NOESIS
  - To support health professionals in taking the best possible decision for prevention, diagnosis, and treatment.
  - To generate an adaptable framework capable of reasoning about the patient's situation, preliminary diagnosis and dealing with administered therapies.

Functionalities for the Interoperability



Functionalities for the Interoperability (cont.)

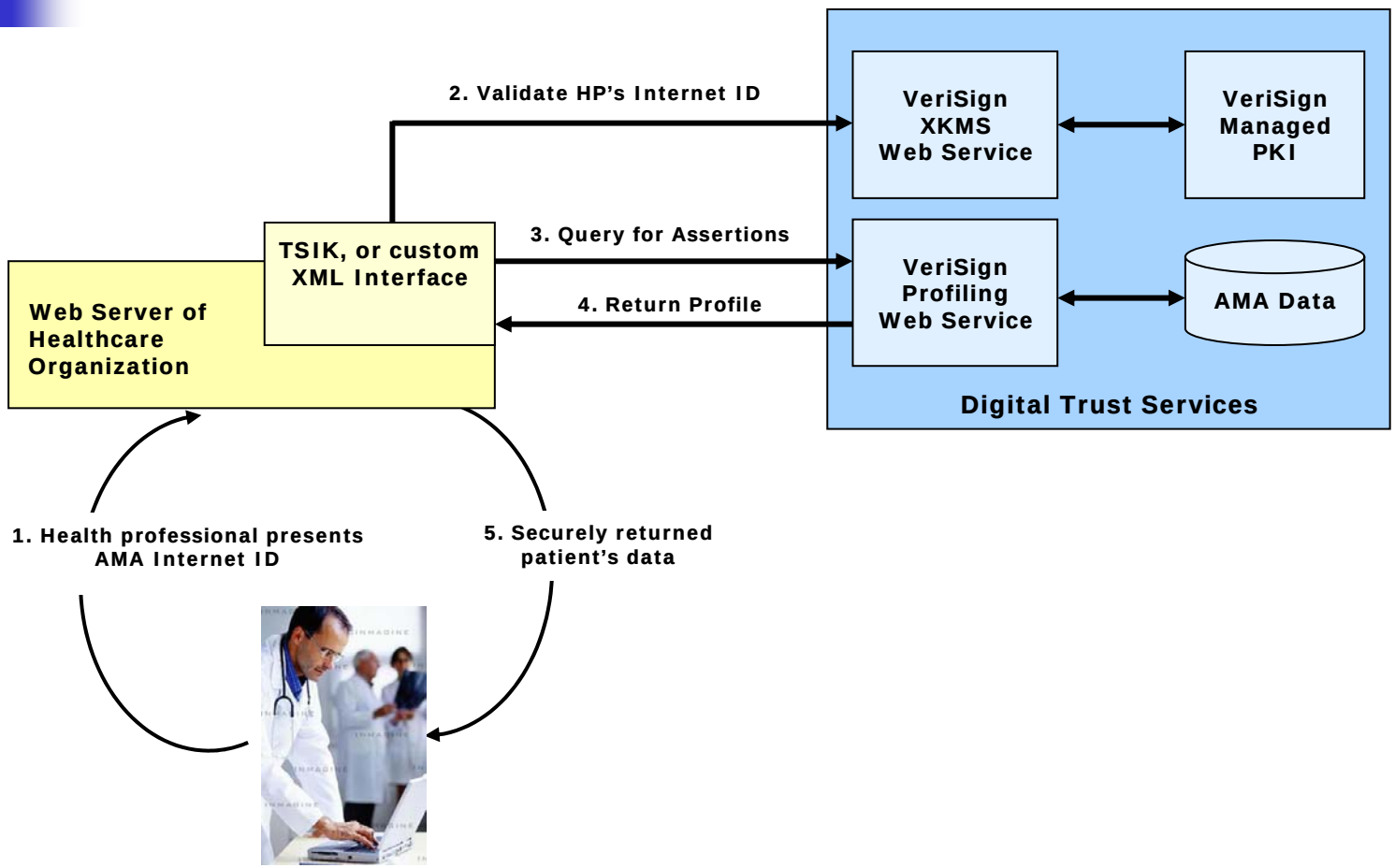
- **Queries:**
  - Who has information about the patient xyz? (Broadcasting)
  - Is patient's information available?
  - What types of information?
  - Get a particular type of information
- **Sending/Receiving Information:**
  - Specific medical information
  - Patient referrals
- **Security:**
- **Storing the received information locally:**
- **Logging:**
  - Health professional's signature with particular method invocation for a particular patient for a particular type of information.

WS Security Framework

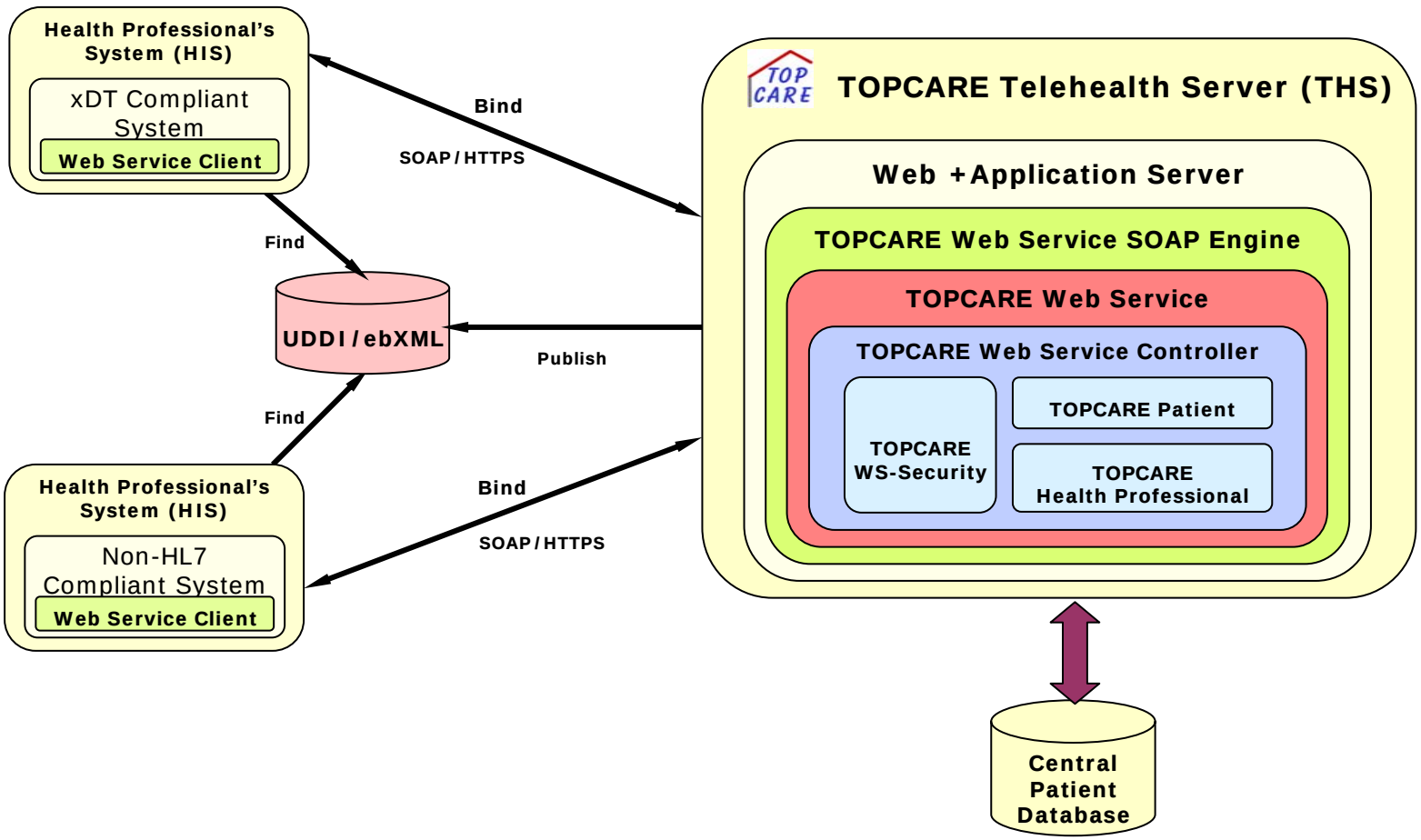
Prominent concerns of a Security Framework

- Authentication – Identity
- Authorization - Access Control
- Confidentiality – Encryption
- Integrity - Tamper Proofing

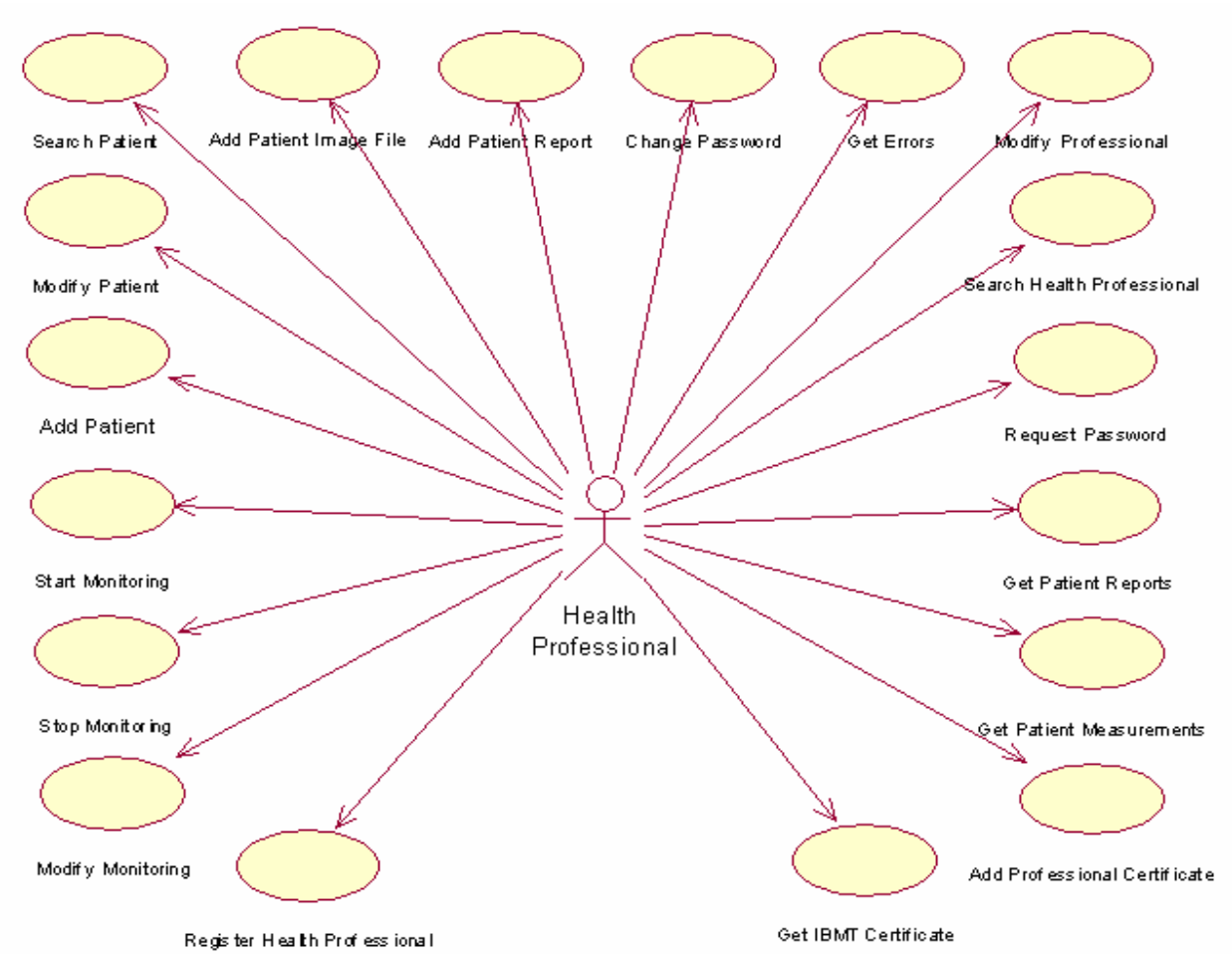
WS Security Framework (cont.)



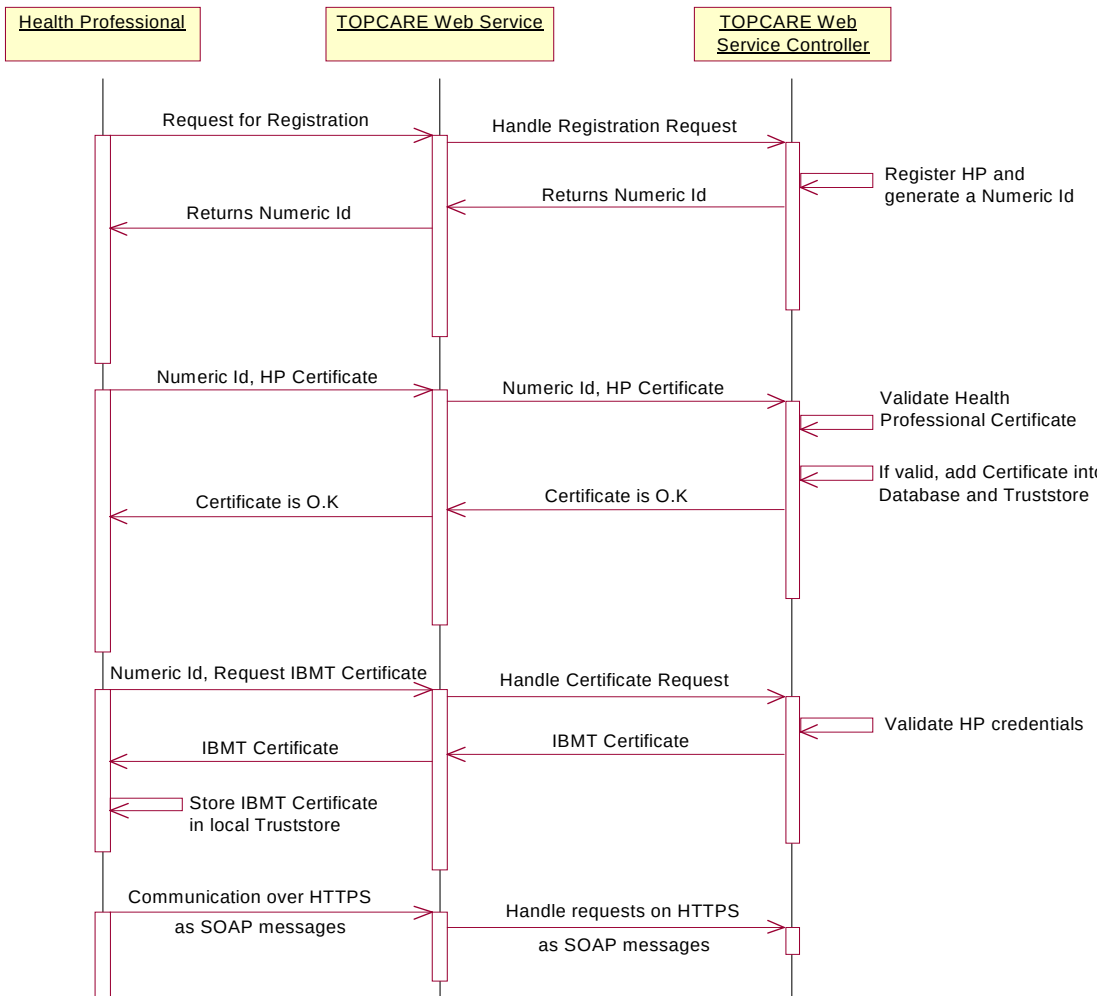
TOPCARE Telehealth Server with Web Service



TOPCARE Telehealth Server with Web Service (cont.)



Security Framework for TOPCARE Web Service



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Any Questions??

Thank you very much for your attention and patience ☺