

Agent-based Mobile Middleware Architecture (AMMA) for Clinical Data Transmission using Wireless Networks

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Associate Professor

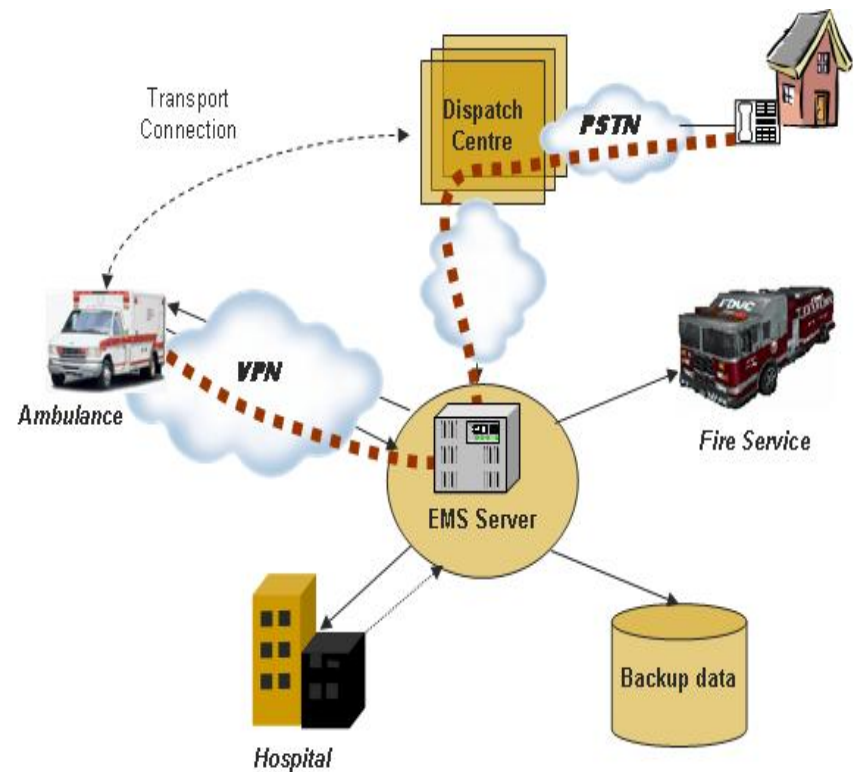
Dept of Computer Science & Applied Statistics

University of New Brunswick (Saint John)

Canada

911 EMS Communication Project

- ❖ To replace the time consuming paper-pen entry
 - ❖ Availability of operational & patient care data real-time
 - ❖ Improve overall performance and response time
- ❖ Significant suite of software for electronic patient care reporting (ePCR) was developed
 - Real-time data capture tool for collection of patient care data at point-of-service
 - Mobile data communication software for transmission of the captured data to the hospital/ EMS servers
 - Added intelligence, security and conformance checks with middleware AMMA to the clinical data transmitted to the hospital
 - 2-way communication to enable remote access to historical patient information database



911-Emergency Medical Services (EMS)

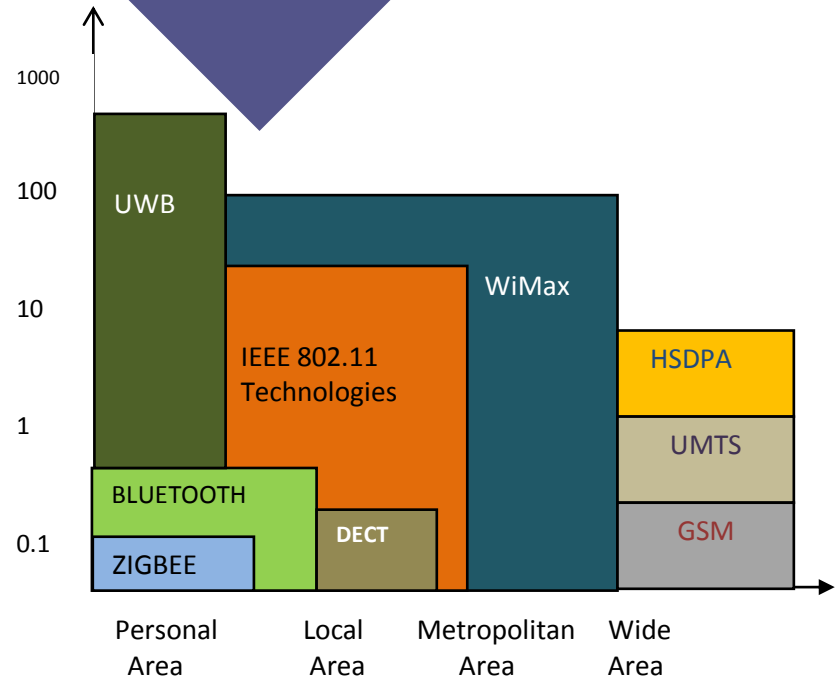
Software suite:

- Data Capturing tool
- Communication Protocol
- Middleware AMMA

Goal

Real-time capture and wireless transmission of operational/patient care data

Transmit patient care clinical data captured from incident scene to the hospital in HL7.



Involved Parties

- Janet Light
 - Associate Professor, UNB Saint John
- Ian Watson
 - Regional Manager, AHSC EMS
- Tom Raithby
 - Data management & system level research, Mobile Health Services Quality Agency



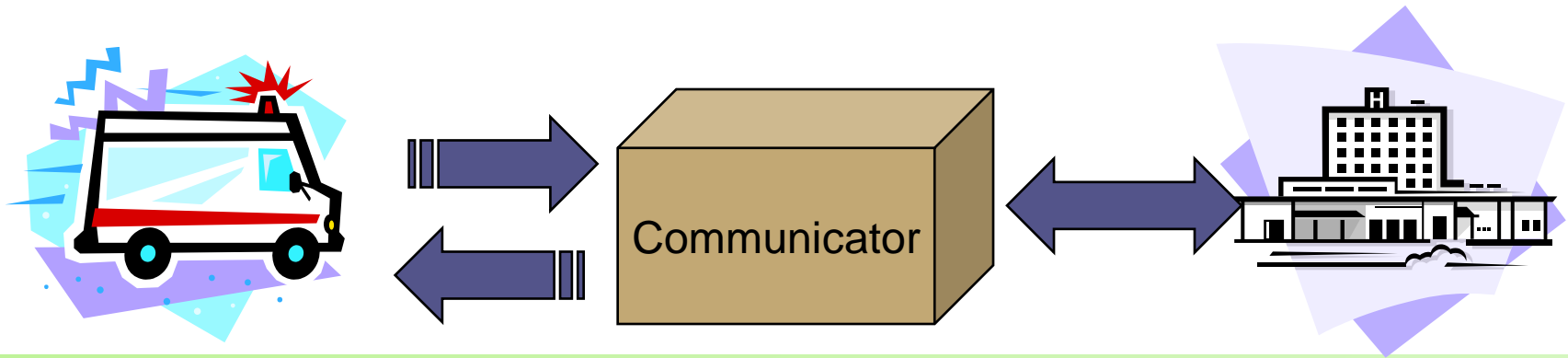
Atlantic Health Sciences Corporation
Corporation des sciences de la santé de l'Atlantique



The Power of Passionate Minds



Medical data transmission challenges



Communication stages:

1. Ambulance – Communicator : Wireless
2. Communicator – Hospital : Wired network

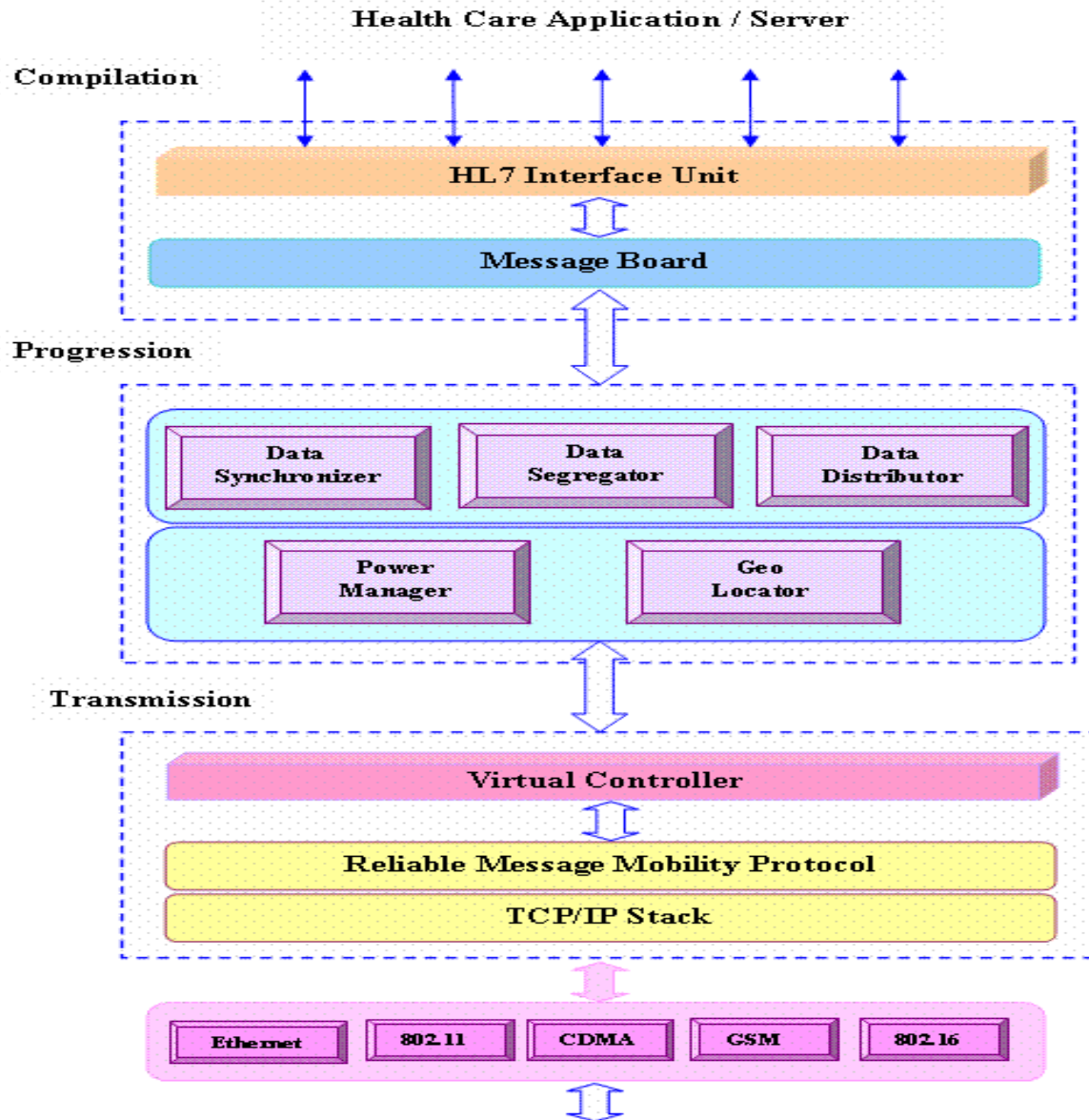
Challenges addressed by AMMA:

1. Reliability
2. Authentication
3. Security
4. Connectivity
5. HL7 standard format to share patient data between pre-hospital services & hospital

Agent-based Mobile Middleware Architecture (AMMA)

- Mobile Agents are used for moving data from client to server & vice versa.
- Mobile agents use HL7 protocol specifics for the message composition and ACK generation for EHR adaptation.
- Events are related to real-time incidents & Triggers are raised when events occur
- Adds additional intelligence to the application such as location info (GPS) & battery power
- Proof-of-concept testing in Saint John area was done in December 2006 with 300 test samples





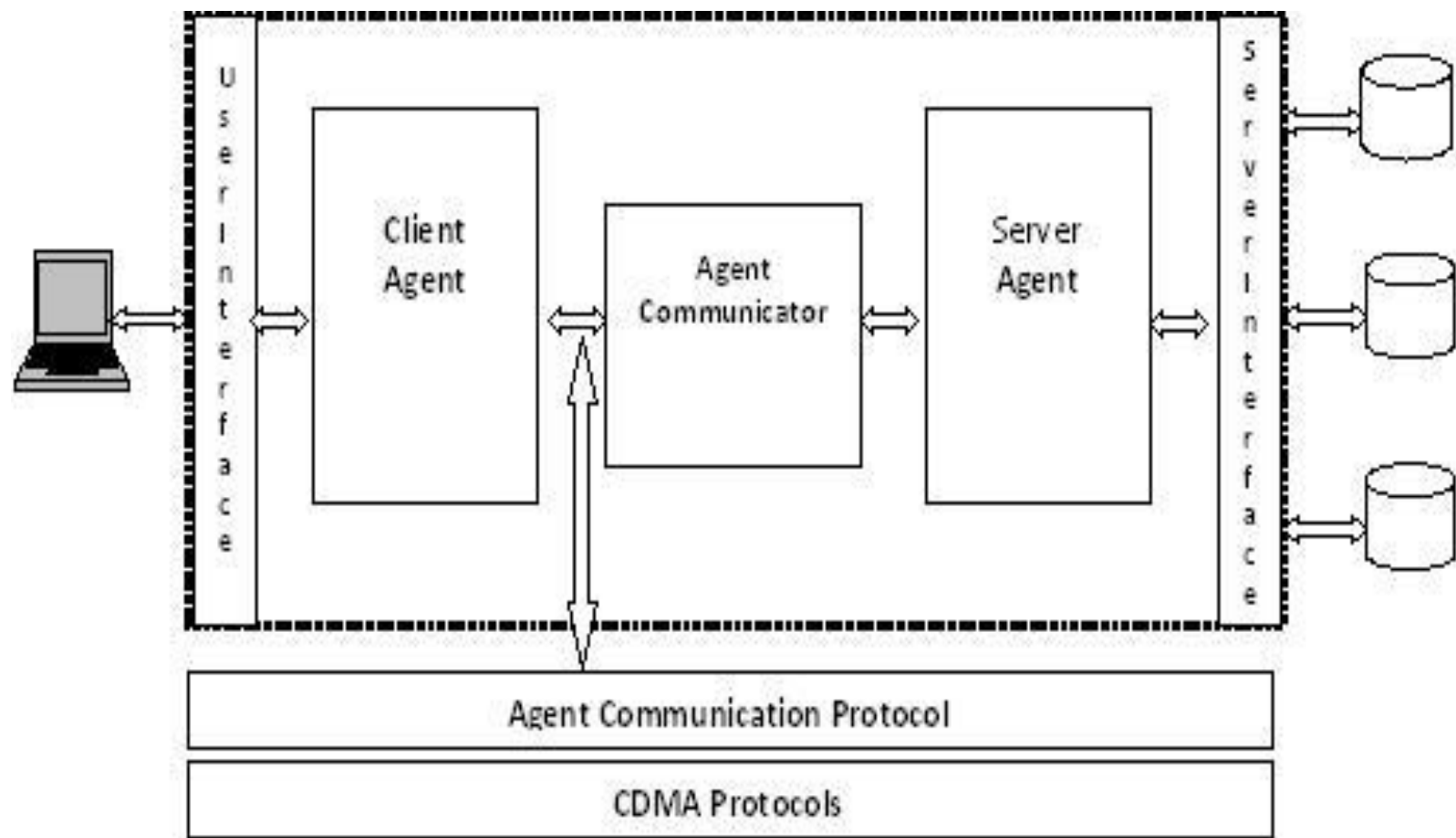
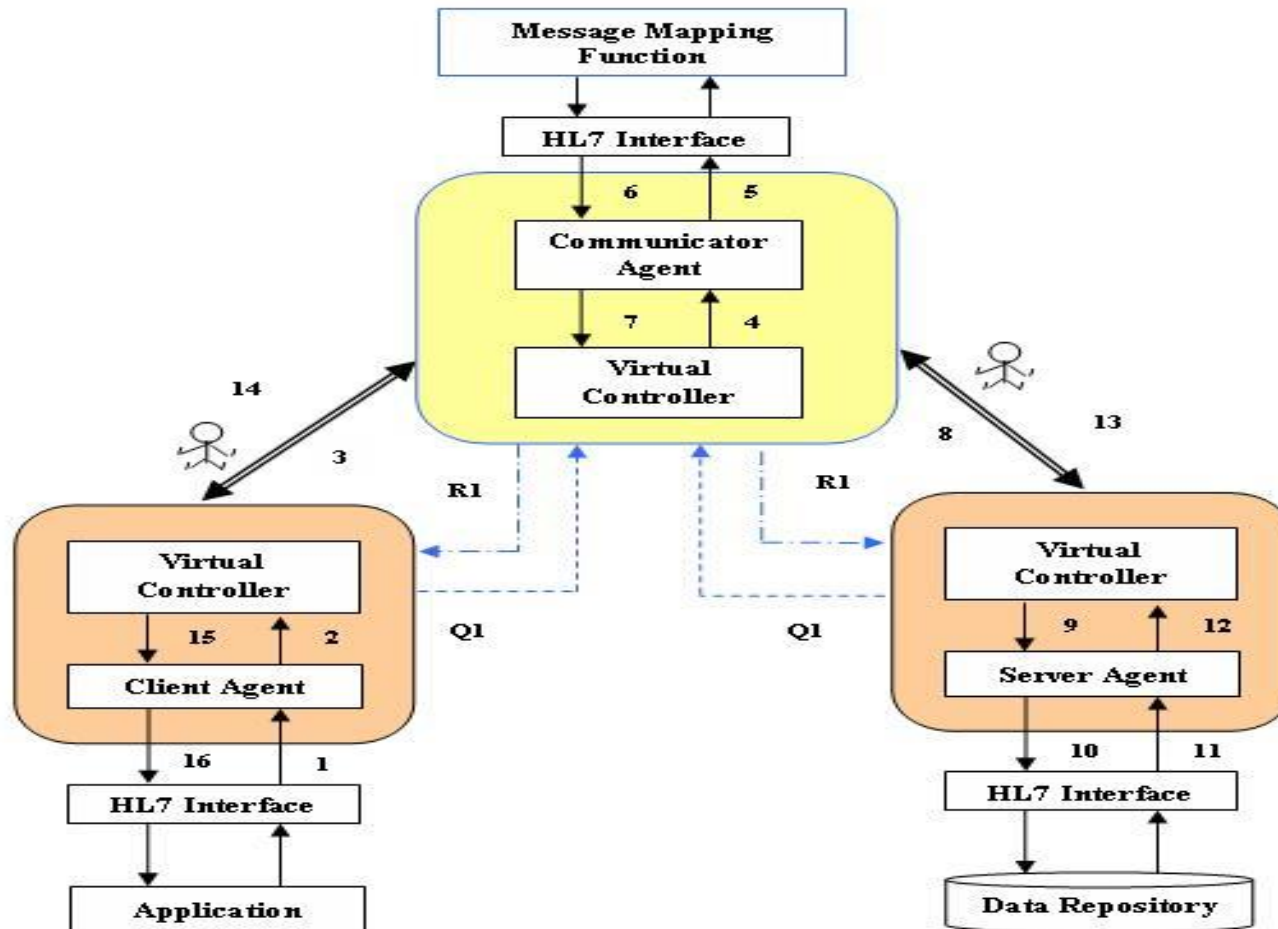
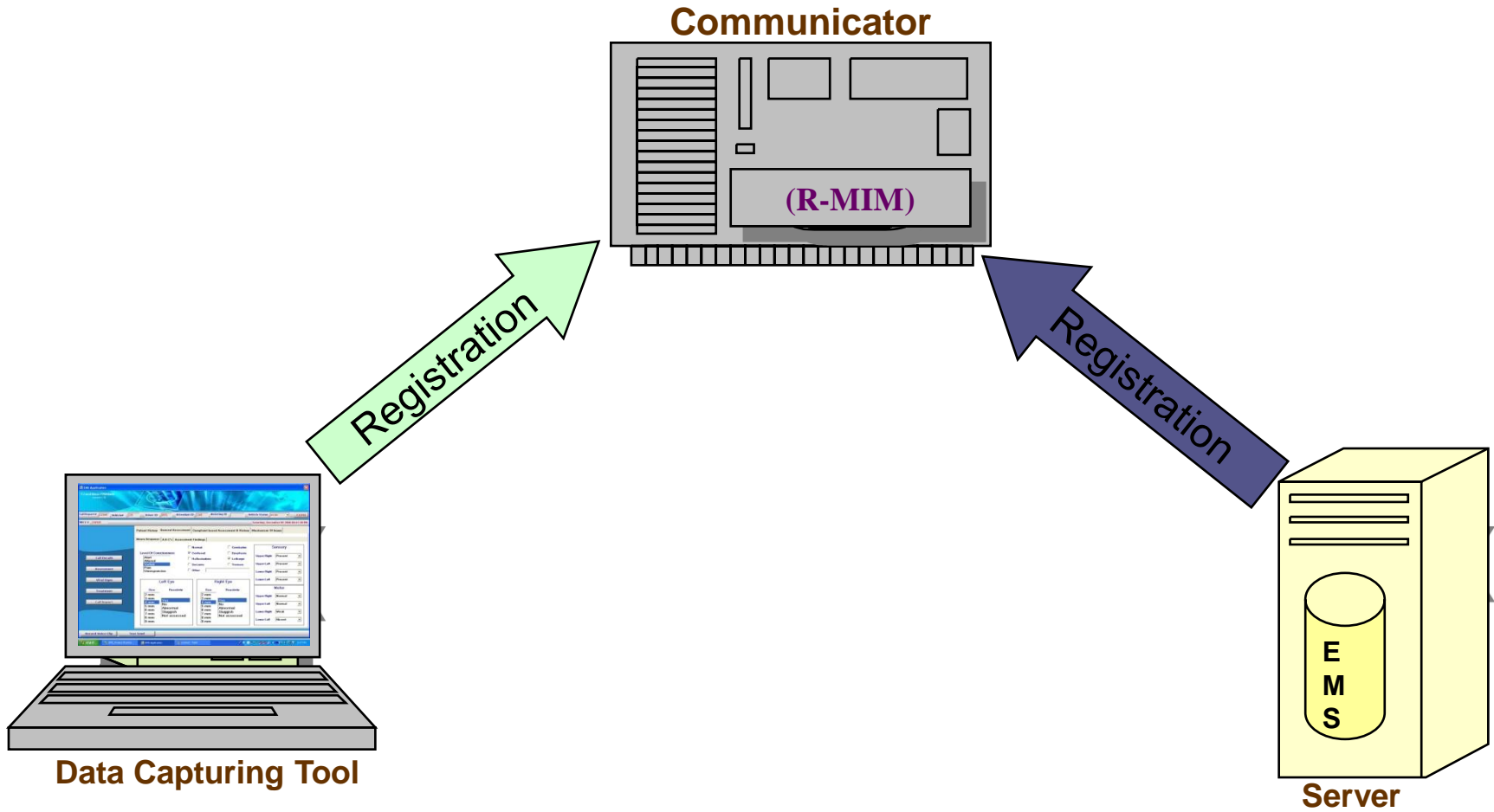


Figure 2 AMMA Framework

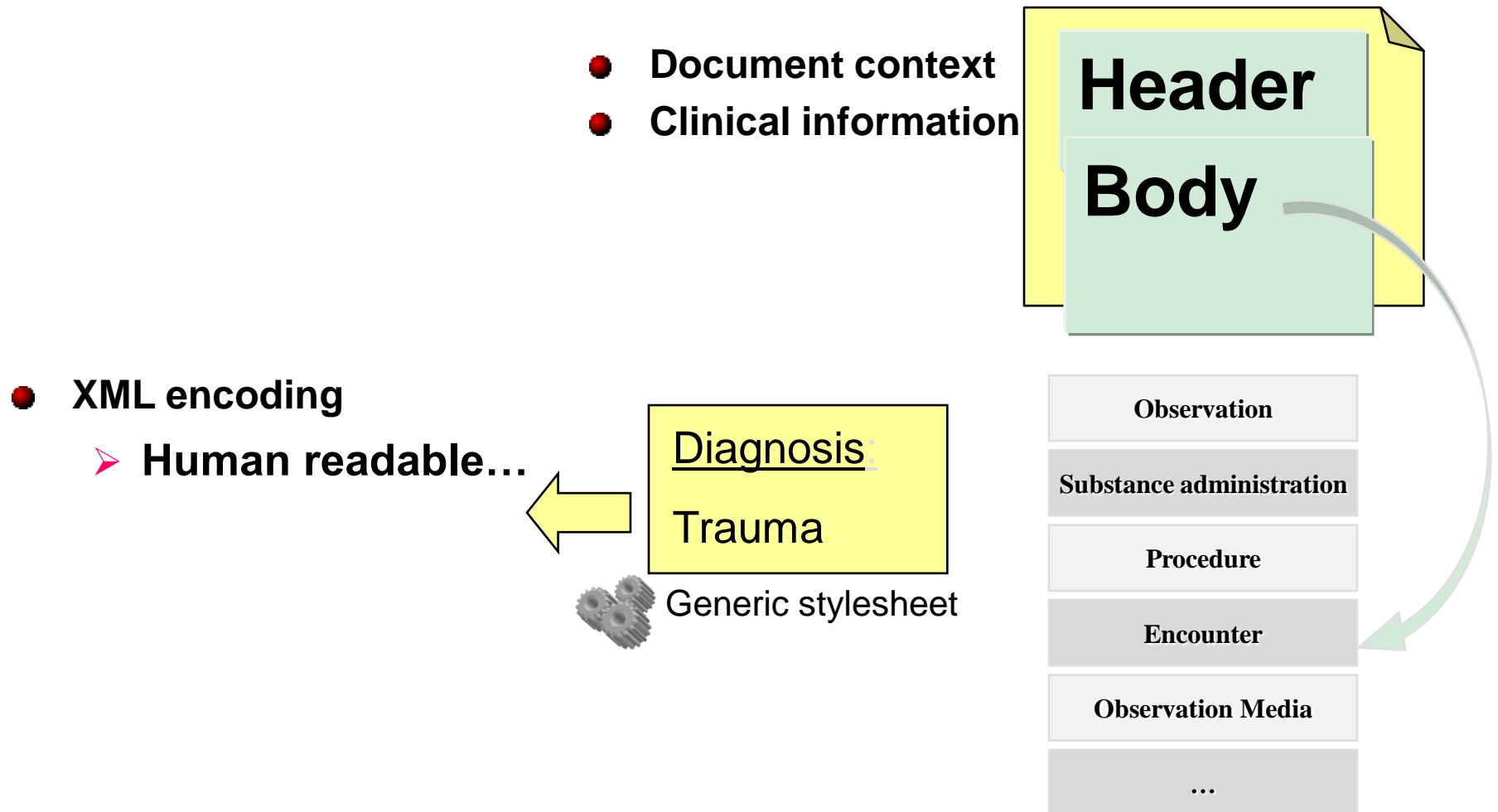
Agent Communication Protocol



Agent-based Mobile Middleware Architecture (AMMA)



Structure of AMMA document



CDA Structure

Sample Message

<ClinicalDocument>

<!--CDA Header-->

<structuredBody>

<component>

<section>

<text>...</text>

<entry>

<observation>

<reference>

</reference>

</observation>

</entry>

</section>

</component>

</structuredBody>

</ClinicalDocument>

```
<?xml version="1.0" ?>
```

```
  <AMMA MsgType="EMS01" RoleID="15069843263880"
```

```
  DestinationID="138.119.33.157" Location="120,30,45,90"
```

```
  Msgcode="MSH012PID01"ActionCode="1">
```

```
  <MsgContent>
```

```
  <EMS01 ITSVersion="XML_1.0" xmlns="urn:hl7-org:v3"
```

```
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

```
  xsi:schemaLocation="urn:hl7-org:v3 ../schemas/EMS01.xsd">
```

```
    <id extension="3948375" root="2.16.840.1.113883.19.10.700363.2288" />
```

```
    <creationTime value="20080222140010" />
```

```
    <versionCode code="10" />
```

```
    <interactionId extension="01" root="2.16.840.1.113883.1.6" />
```

```
    <processingCode code="P" />
```

```
    <processingModeCode code="T" />
```

```
    <acceptAckCode code="ER" />
```

```
  <receiver>
```

```
  <device>
```

```
    <id extension="922" root="2.16.840.1.113883.19.9" />
```

```
    <name>MHSQA</name>
```

```
  <asAgent>
```

```
  <representedOrganization>
```

```
    <id extension="1002003" root="2.16.840.1.113883.19.200" />
```

```
    <name>AHSC</name>
```

```
  </representedOrganization>
```

```
  </asAgent>
```

```
  </device>
```

```
  </receiver>
```

CDA

HL7-Clinical Document Architecture (CDA)

- Header Attributes

- typeId

- <typeId root = "12.334.55521.34.23" extension = "21133.54" />

- Id – Unique document identifier

- code – kind of document

- <code code = "23423.23" codeSystem = "23.456.4564.23.4" codeSystemName = "LINOC" displayName = "Call Report" />

- effectiveTime – document creation time

- Confidentiality code

- Record target – patient

- Author

- Custodian

- Documentation of serviceEvent

- LocationInfo – Physical coordinates

- Actioncode – Type of message process

Unique attributes
proposed for mobile
messaging

For EMS - CDA requirements

- [Demo](#)
- Data Capturing using e-PCR tool
- HL7 messaging schema
- Messaging mechanism

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Paramedic saves Llangefni man's life with clotbusting injection

Published Date: 16 May 2008
PAUL Walsh doesn't remember very much about his heart attack - but he will never forget the Llangefni paramedic who saved his life.

Dylan Thomas Jones' decision to administer the clotbusting thrombolysing drug to the 51-year old, saved his life, doctors say.

Paul, a senior team manager from Llangefni, was at work at the town's Peboc Eastman Industrial Estate when the attack happened on March 13.

"I'd had chest pains on and off for about three years but nothing had been found and I'd got used to them," he says.



Paramedic Dylan Thomas Jones saved Paul Walsh's life with an injection

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