An Android-Enabled Mobile Framework for Accessing Holistic Emergency Medical Services on the Cloud

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Introduction

- Emergency medical services
  - are concerned with the provision of pre-hospital and in-hospital emergency care
  - typically involve a wide range of interdependent and distributed activities

- Holistic approach to emergency care requires:
  - coupling among multiple health and social care organizations
  - blending emergency and social care activities to address all aspects of patient care needs.

- Virtual holistic emergency healthcare enterprise
  - emergency and social care activities interconnected to form socially-enhanced emergency healthcare processes within and between the participating organizations
Introduction

- Challenges faced by health systems:
  - improve care
  - meet growing demand
  - restrain costs

- Patient centric care is the focus of healthcare reform and initiatives across the healthcare spectrum

- Emergence of the patient-centric care model

- Need for a new generation of applications which facilitate the realization of a patient-centric care model
Patient – centric Care Model

Patient Health Record

HOSPITAL

LABORATORY

PHARMACY

GENERAL PRACTITIONER

PATIENT

CITIZEN

NURSE

PREVENTION

FOLLOW-UP
Benefits of Personal Health Records

**Healthcare System**
- More detailed patient data for clinicians
- Streamlining administrative processes
- Aligning the intensity of care with patient needs
- Enabling research
- Improving public health and reducing the burden on the health system

**Patient**
- Patient access to education and care
- Patient control
- Patient choice in their health
- Improved quality of care
Cloud computing provides a new information delivery and consumption model in which applications and information are accessed from a web browser while software and data are stored on servers.

- wider sharing (sending and receiving),
- storage,
- access and
- manipulation

of data in a cost-effective, secure and user-friendly fashion
Mobile Computing

- Advances in mobile communication networks
- Increasing penetration of smart phones in people’s daily lives are transforming the mobile Internet and empowering end users with rich mobile experience.

Limited computing, energy and information storage capabilities of mobile devices are hampering their ability to support increasingly sophisticated applications required by certain application fields, such as healthcare.
Mobile Cloud Computing (MCC)

MCC has emerged as a new computing paradigm stemming from the amalgamation of mobile and cloud computing, whereby previously infeasible mobile applications are finding their ways into mobile devices.
Our Approach

- Clinical patient data:
  - Diagnosis
  - Medications
  - Lab Tests
Motivating Scenario

- Enter Initial Data
- Select Ambulance
- Enter Arrival at Place of Incid
- Select Hospital
- Enter Medical Data
- Identify Incident Urgency
- Enter Incident Condition
- Enter Depart from Place of Incid
- Provide and Write Medical Instr
- Provide PreHospital Emerg Care
- Enter Depart from Hospital
- Enter Arrival At Hospital
NefeliEMS Cloud Infrastructure

Hybrid Cloud

INFRASTRUCUTRE
- Data Center
- Servers

PLATFORMS
- PHR Platform
- BPEL Engine
- Web/Application Server

APPLICATIONS
- NefeliPortal
- Business Processes
- Web Services

APPLICATIONS
- Google Cloud Messaging

COMMUNITY CLOUD

PUBLIC CLOUD

NefeliMobile

Ambulance Communication Operators
Ambulance Service Physician
Ambulance Paramedics
Emergency Department Nurse
Emergency Department Physician
Conclusions

• Emergence of Mobile Cloud Computing (MCC) which can be used
  ✓ to meet the increased collaboration and coordination requirements
    between emergency healthcare process participants
  ✓ facilitating relevant information access by authorized people where and
    when needed.

• This paper presents
  – a PHR-based EMS in a cloud computing environment and
  – an Android application, namely NefeliMobile, which provides mobile
    access to the proposed EMS and incorporates a messaging mechanism
    that adheres to the push model (medical data acquisition is in some cases
    initiated on the server side on the occurrence of certain events).

• Occasional, time-critical data which must receive immediate attention are
  provided to ambulance center personnel and ED physicians in a way that
  enables them to devote more time on practicing medicine

• Alleviates problems related to the use of mobile devices (e.g. low bandwidth,
  limited battery life).
Thank you for your attention!