

The Health Guardian Phone

Mario Gerla

UCLA Network Research Lab

www.cs.ucla.edu/NRL

Guardian Phone

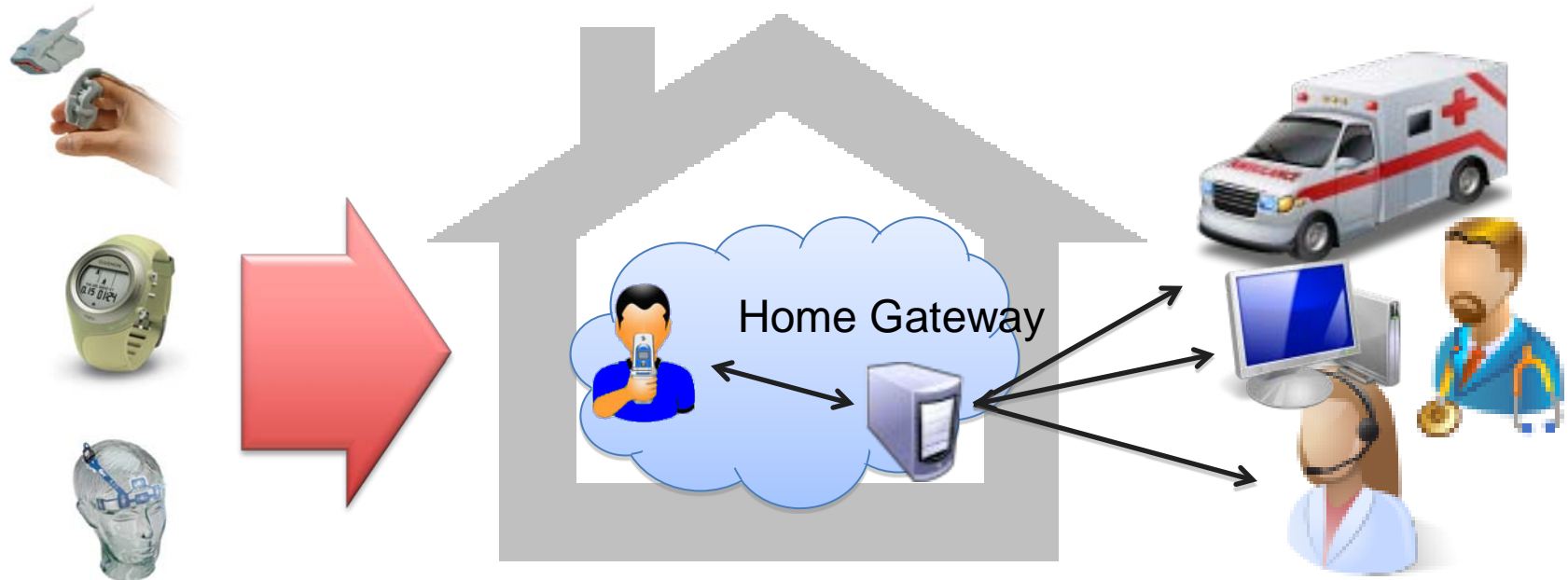
- The Guardian Phone is a “smart” phone designed to support the health care needs of the individual:
 - It interfaces to a variety of “body sensors” and does preliminary screening, compression, diagnosis
 - it constantly searches for the best access to the internet and more generally to health resources
 - for periodic uploading, for more detailed diagnosing or for immediate assistance
 - It networks with neighbors’ phones for emergency assistance



Position Statement

- Patient Monitoring is an important aspect of “pervasive comms and computing”
 - Monitor body vital signs via “body LAN”
 - Monitor environment (for threats)
 - Diagnose medical conditions
- Social networking aspect
 - Peer assistance for emergency intervention
- Privacy:
 - Location; data (when uploading to “friendly” Server)

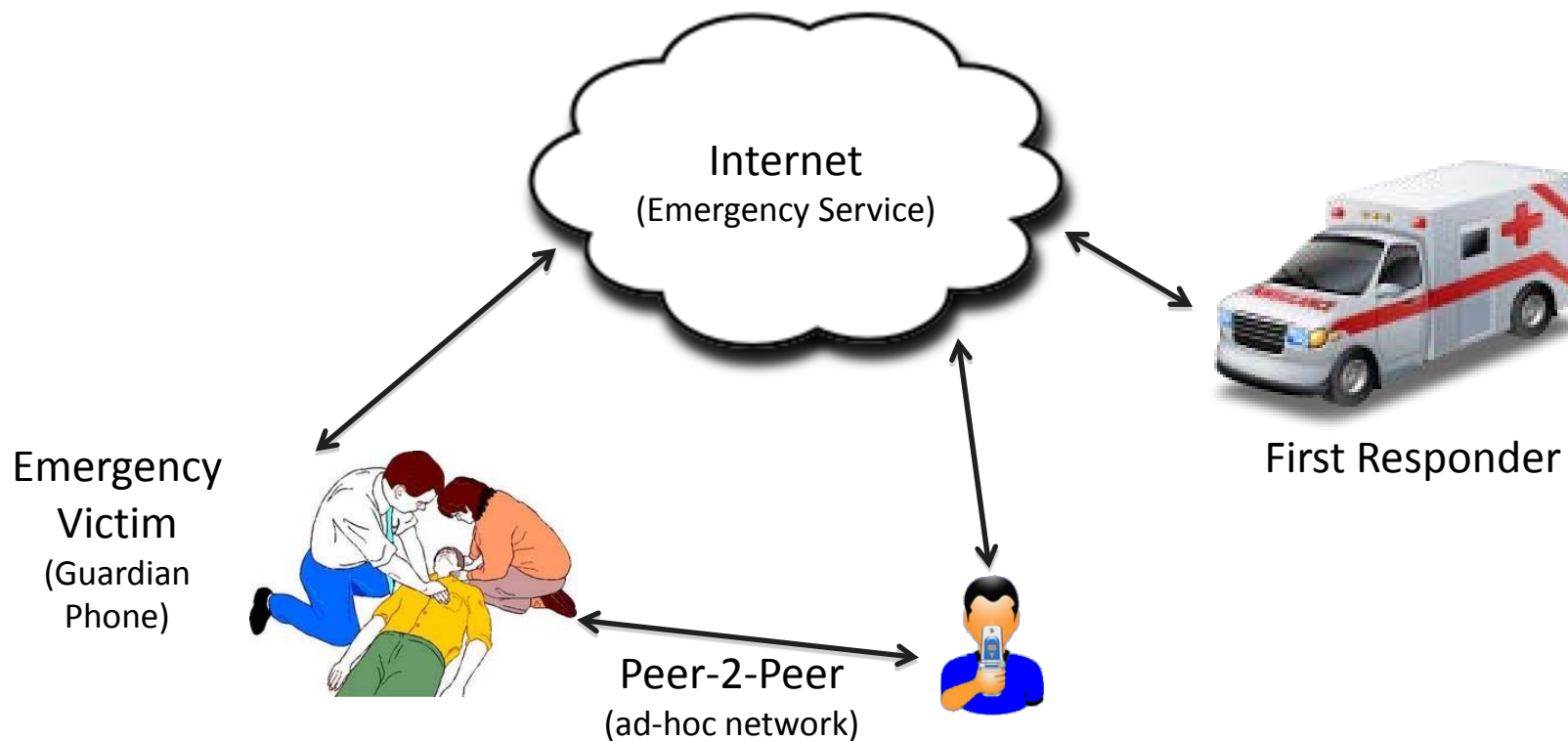
Scenario 1: Home Patient Care



- Patient sensors are connected to Guardian Phone to continuously monitor patient vital signs.
- The Guardian Phone interworks with the Home Gateway to form a “Bubble”.
- Doctor monitors patients through the Home Gateway.
- Home Gateway provides preliminary screening, diagnosis, emergency alarms.

Scenario 2: Disaster Response

- In urban disaster (e.g., earthquake) Guardian Phones interwork to notify emergency services and sends data to first responders
- Cognitive Radio capabilities are required to find the best network access
- Patient GP's interacts with local and remote servers to support triage.

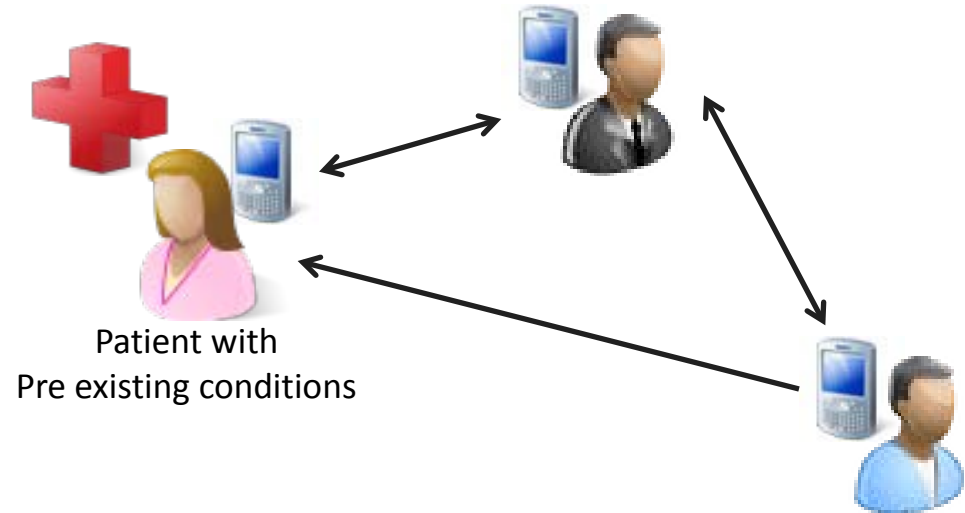


Scenario 3: Social Networking for Health



In Mall, Bus or Subway

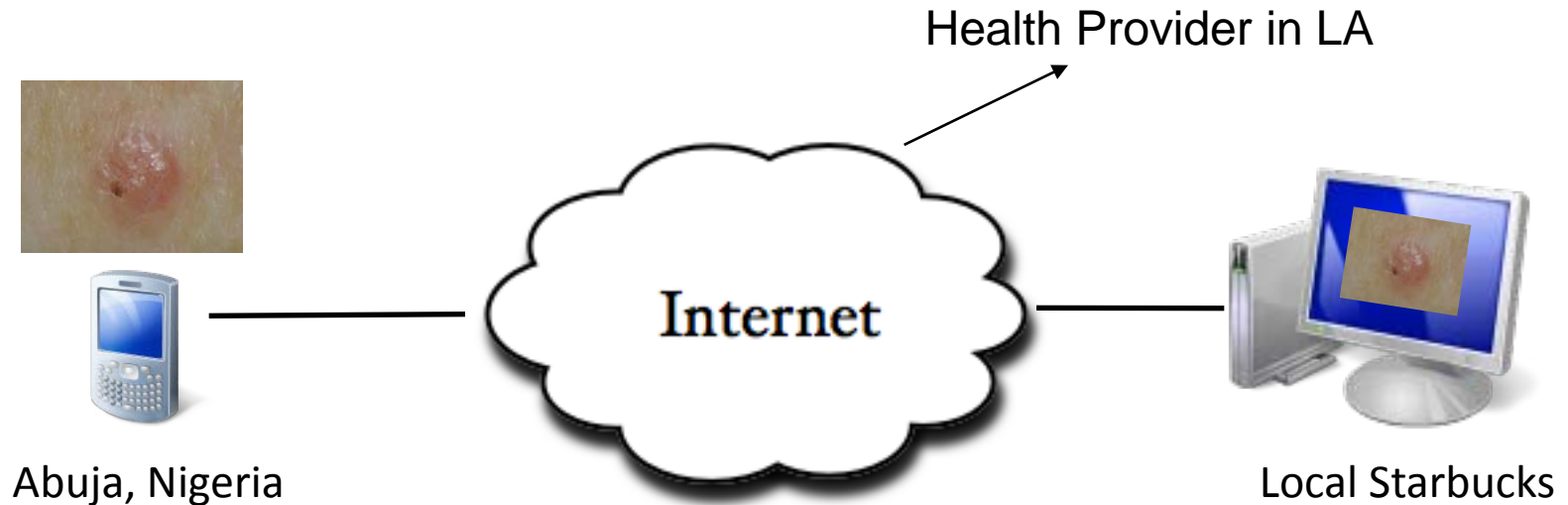
P2P Social Network



1. Would you help if I have an arrhythmia attack? I am asking because I always see you on this bus at 8AM
2. Yes I can help; I noticed you are working at Kaiser. I will also ask include my neighbor, a Kaiser doctor

Proactive discovery of bystanders who can assist in emergencies:
Social Networking and Cog-Radio features are key

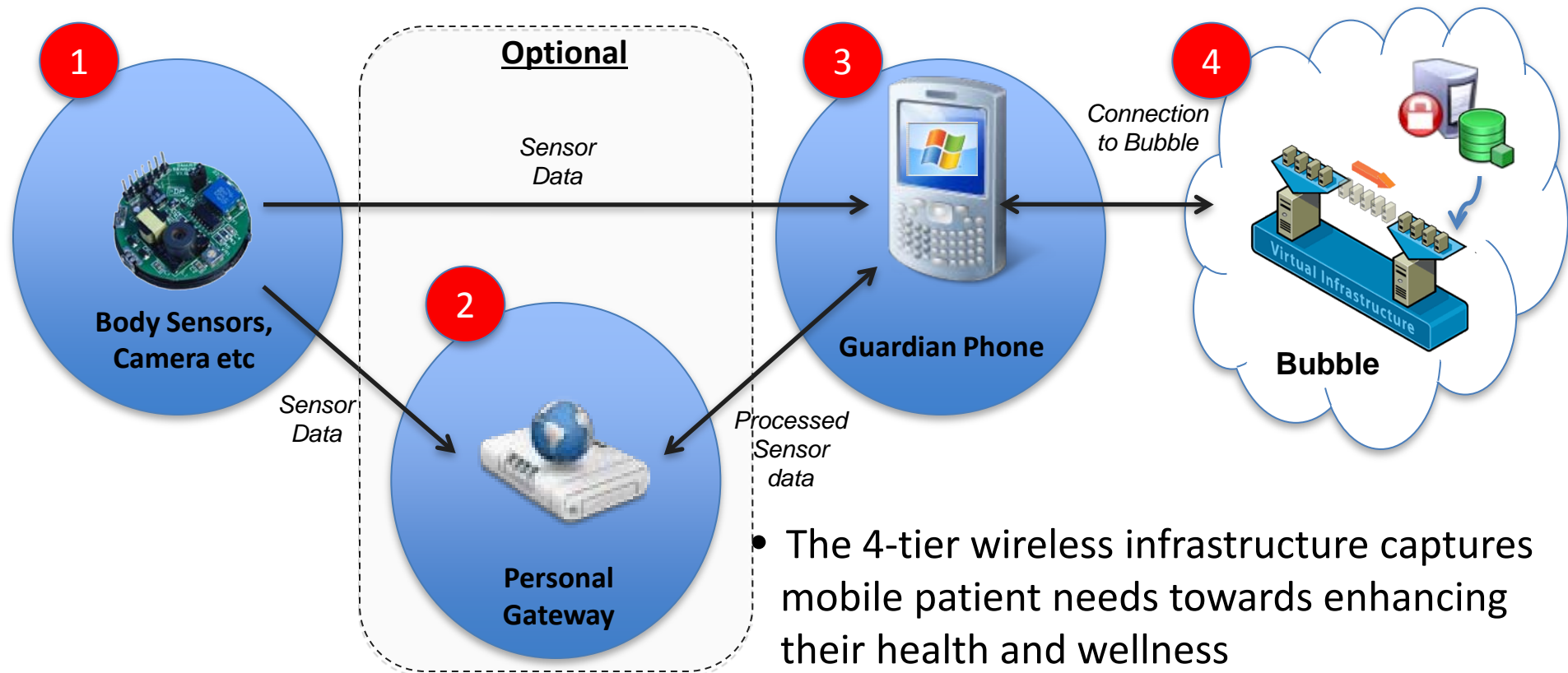
Scenario 4: Traveling Patient



1. While traveling in Africa, you notice an odd rash on your skin - you immediately contact your Health Provider in Los Angeles
2. The provider, aware of previous outbreaks at that location, instructs you to take a picture of the rash and transmit the image to a local Starbucks Server.
3. A Virtual machine ("Bubble") is set up for secure communications/processing between your phone and Starbucks.

"Bubble" guarantees reliable/secure communications between GP and Internet Server

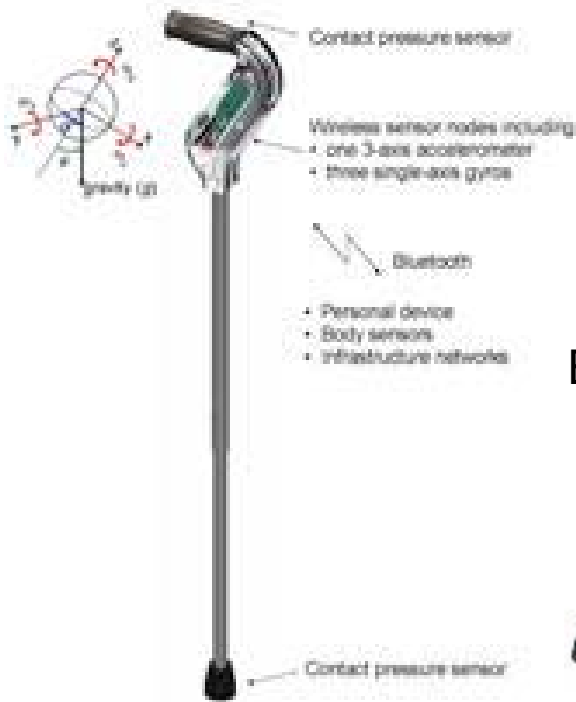
Health Guardian System Diagram



- The 4-tier wireless infrastructure captures mobile patient needs towards enhancing their health and wellness
- 4-tier consists of the embedded body sensors, personal gateway, guardian phone and personal bubble (virtual machine)
- Personal Gateway is an option (NOT mandatory)
 - State 1 and 3 must be interconnected directly or through state 2

Medical Sensors connected to GP

- Wearable body area network (BAN) sensors



UCLA Smart Cane



Electrocardiogram (ECG)



Pulse Oximeter



UCLA Smart Shoe