

CS 525M – Mobile and Ubiquitous Computing Seminar

Context-Aware Mobile Communication
in Hospitals

presented by
Jeffrey R. Bacon

Background Info

- Published in 2003
- Locations:
 - Center of Scientific Research and Higher Education of Ensenada Mexico
 - University of California, Irvine
- Authors:
 - Miguel A Muñoz
 - Marcela Rodríguez
 - Jesus Favela
 - Ana I. Martinez-Garcia
 - Victor M. González

The Problem

- Hospitals are tough to manage
 - Staff rotates
 - Multiple locations
 - Varied communication paths
- Existing solutions are inadequate:
 - Video conferencing
 - Two-way pagers

The Solution

- Context-aware communication devices
- Context is:
 - Role (not just identity)
 - Location
 - Timing

Instant Messaging

- Extends instant messaging paradigm to add context-awareness
 - Devices can communicate
 - “The X-Ray results are complete”
 - Roles incorporated
 - “The nurse on duty”
 - “The doctor on the next shift”
 - Location-sensing added
 - “Tell the next doctor to visit this room to...”
 - Map of nearby users
 - Time-sensitive data
 - “In 24 hours, give the patient more drugs”

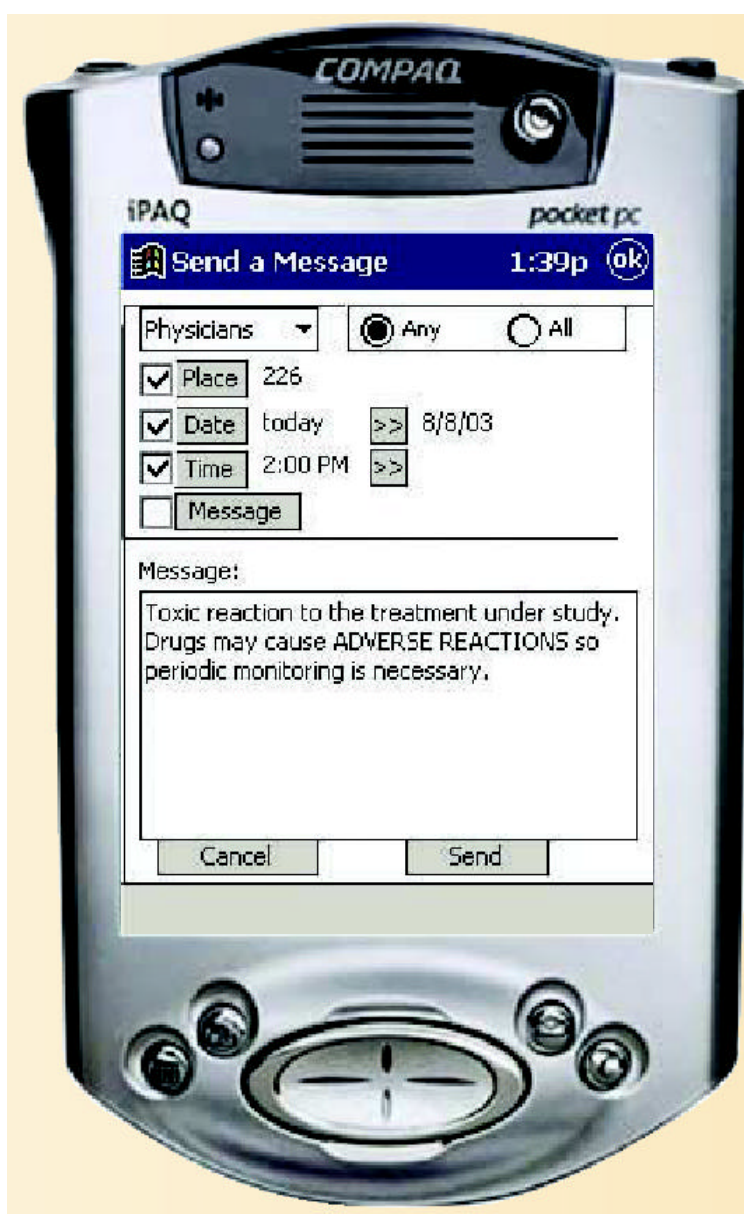
“Buddy Lists”

- Keeps track of users who are online and offline
- Additions to normal buddy lists:
 - Devices as buddies
 - Roles as buddies
 - User *location*



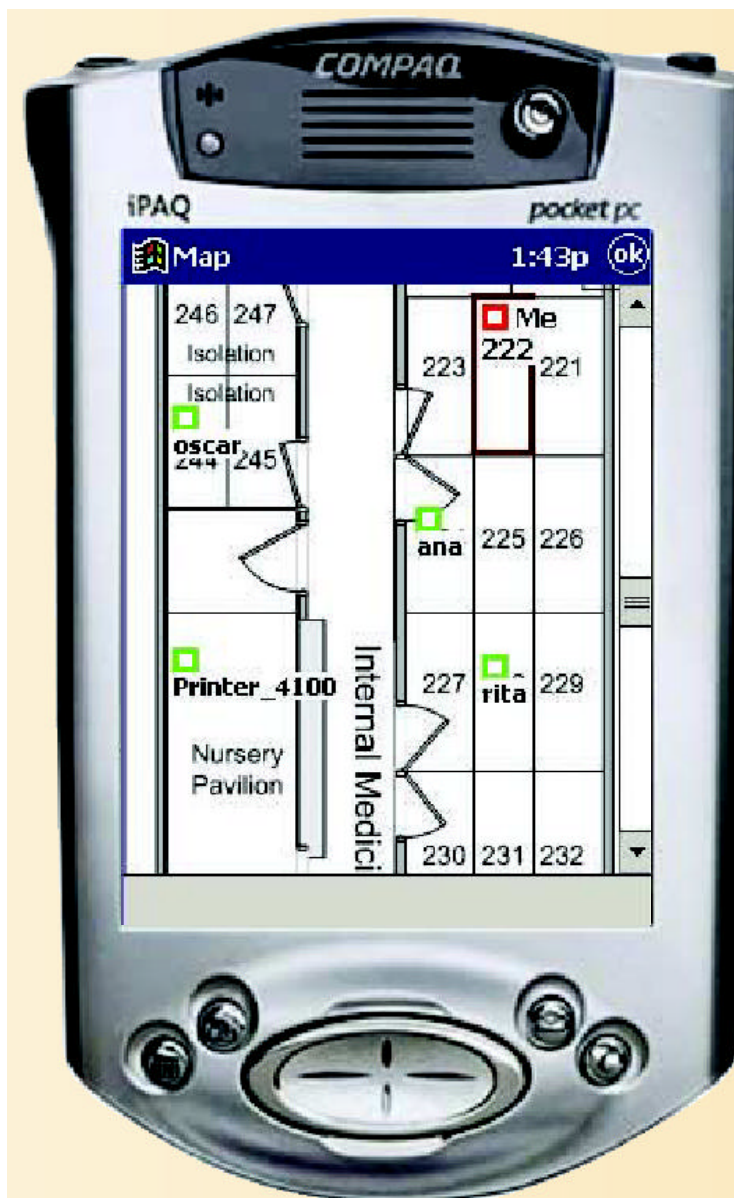
Messages

- Can send IMs to other users
- Additions to normal paradigm:
 - Send at date/time
 - Send to an abstract role
 - “All” or “Any”
 - Send to a specific place



Map

- Shows where available resources are
 - People
 - Printers
 - Displays

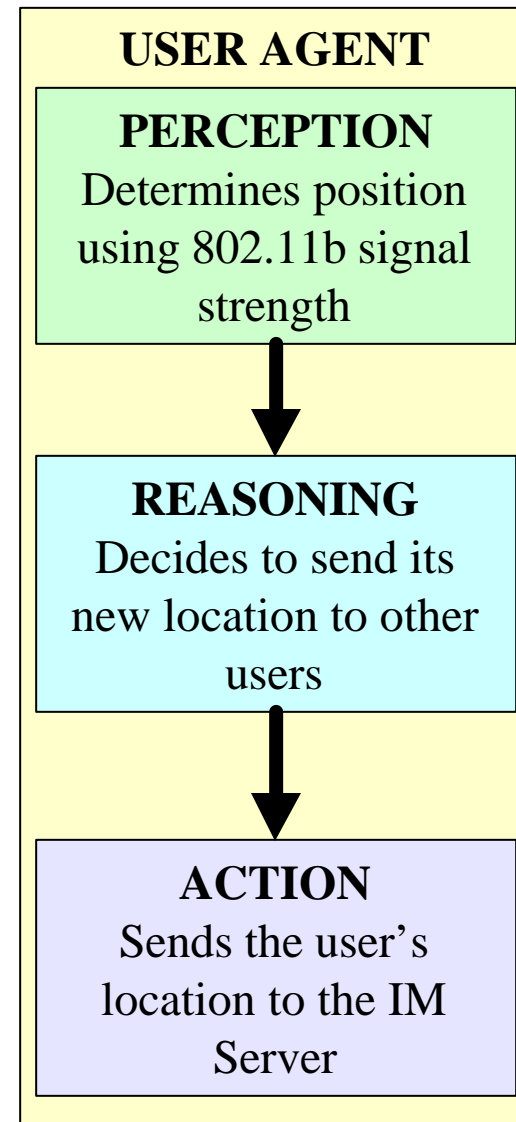


Agents

- Agents
 - Purpose:
 - Act on the user's behalf,
 - Represent devices,
 - Wrap the functionality of a system
 - Registered with Agent Directory
 - Sends IMs using XML
 - Not related to The Matrix

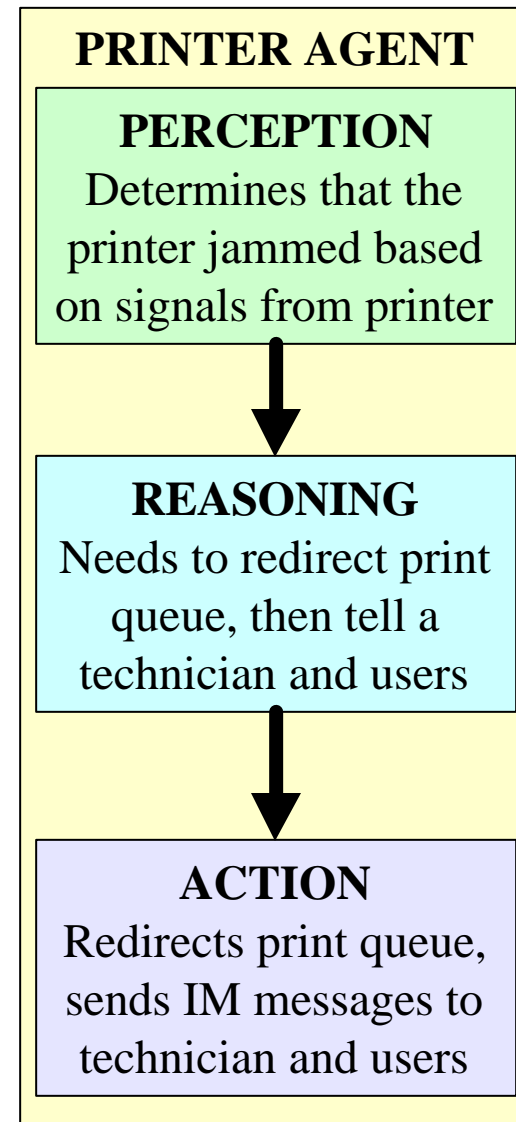
Agent Modules

- Modules
 - Perception
 - Data from sensors or users
 - Reasoning
 - Determines actions
 - Action
 - Triggers events



Agent Modules

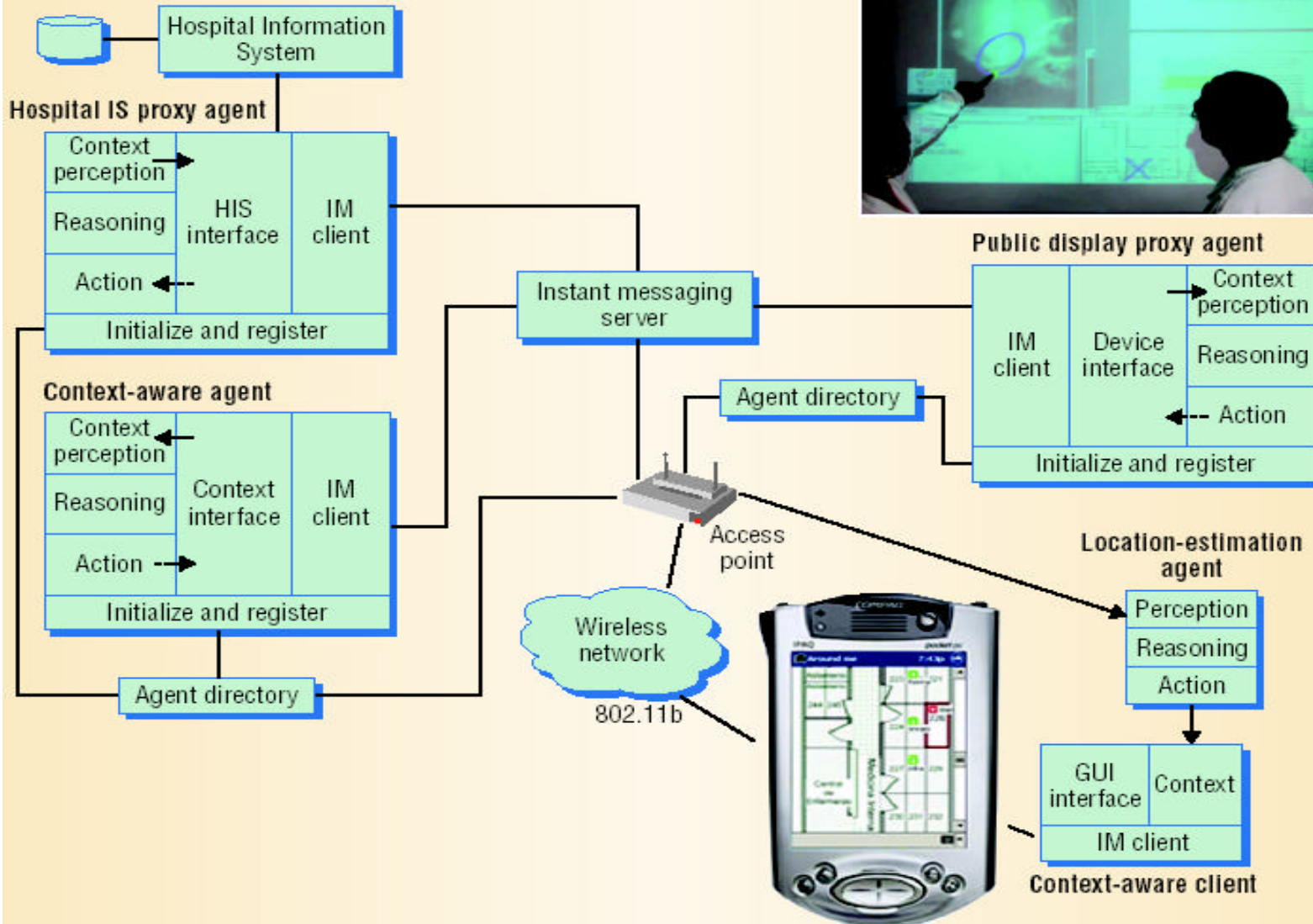
- Modules
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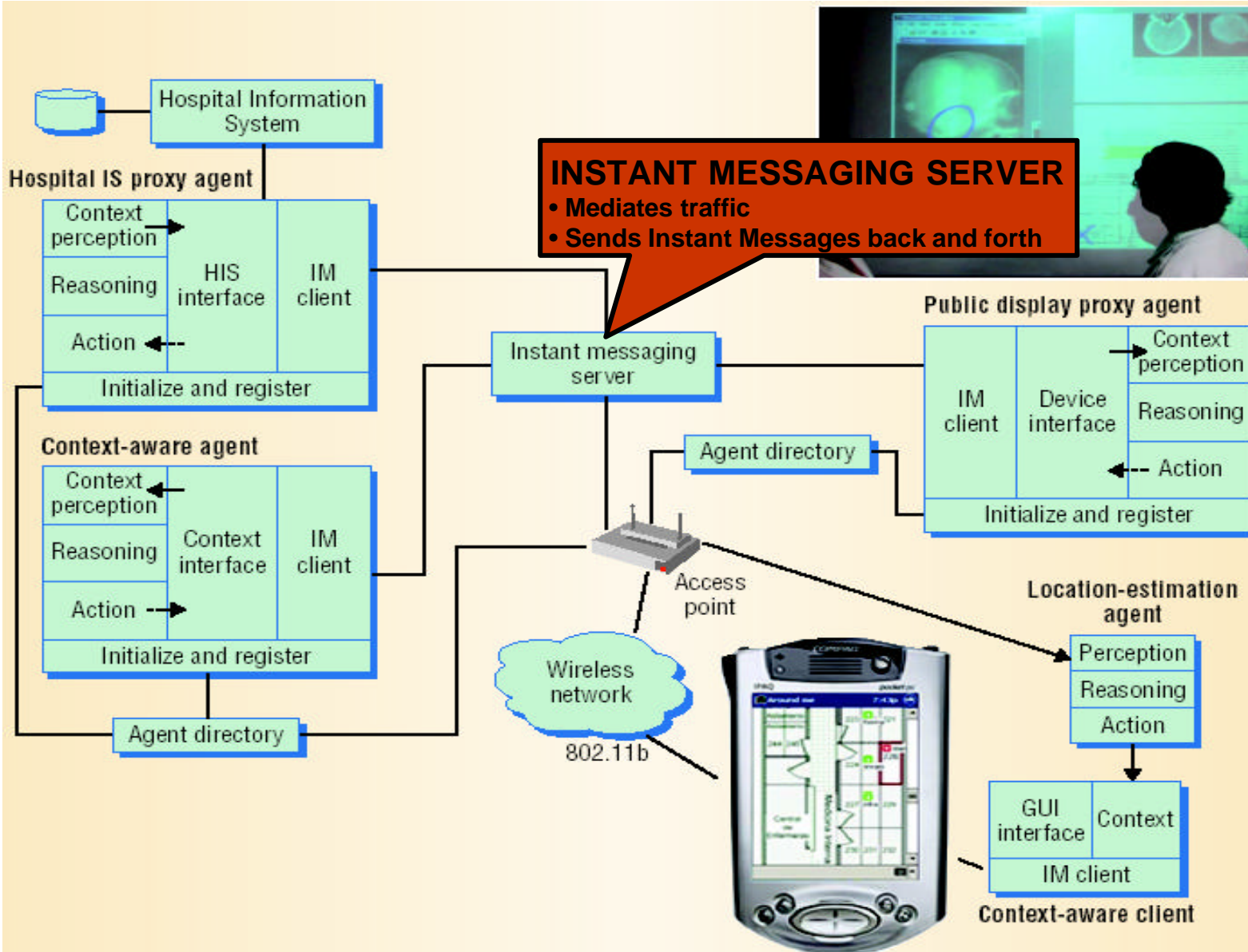


Technology

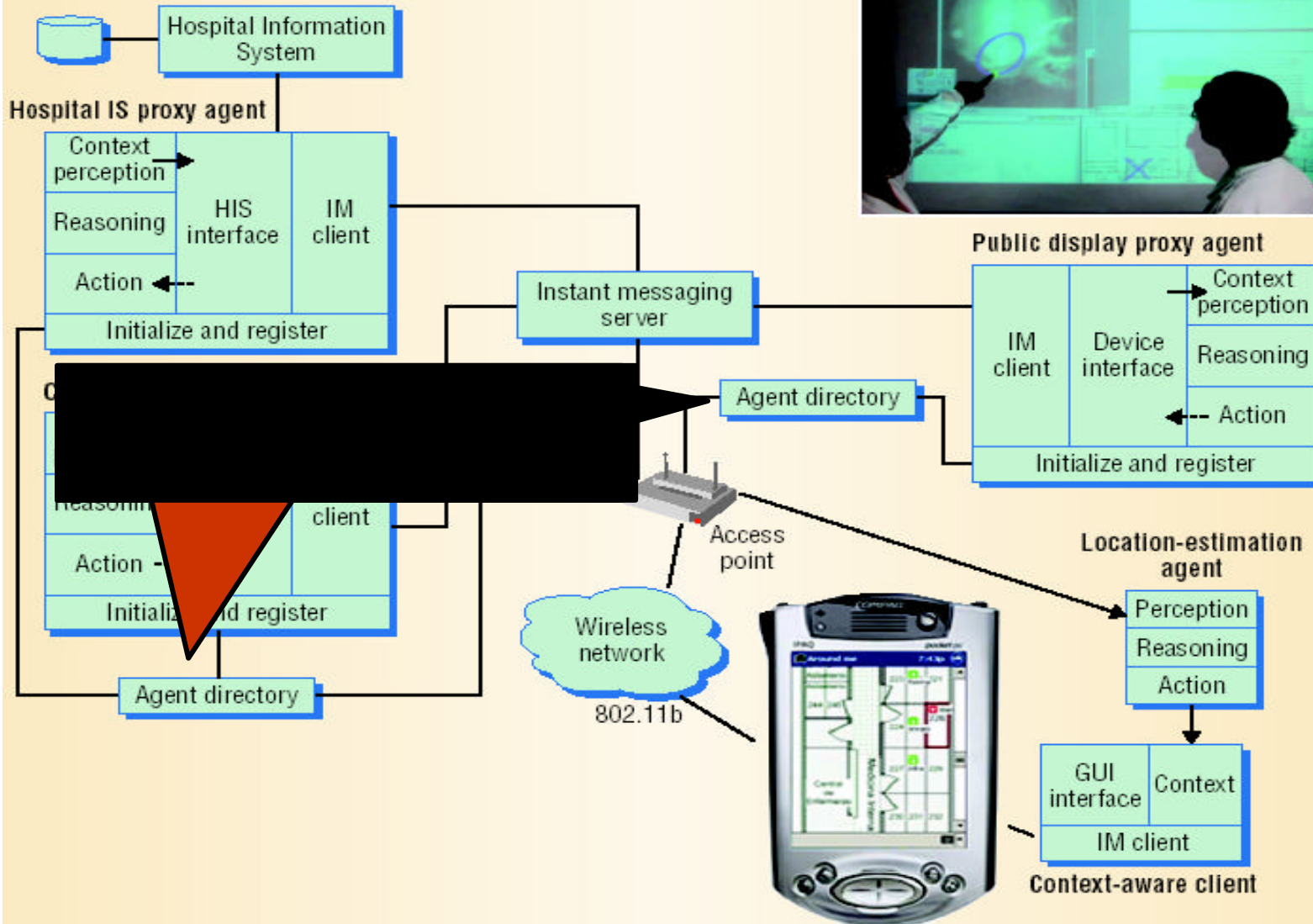
- Jabber
Open-source IM client/server
- XMPP
Extensible Messaging and Presence Protocol
- Salsa
Simple Agent Library for Seamless Applications
- 802.11b
Wireless communication protocol
- PDA
Compaq iPAQ

System Diagram

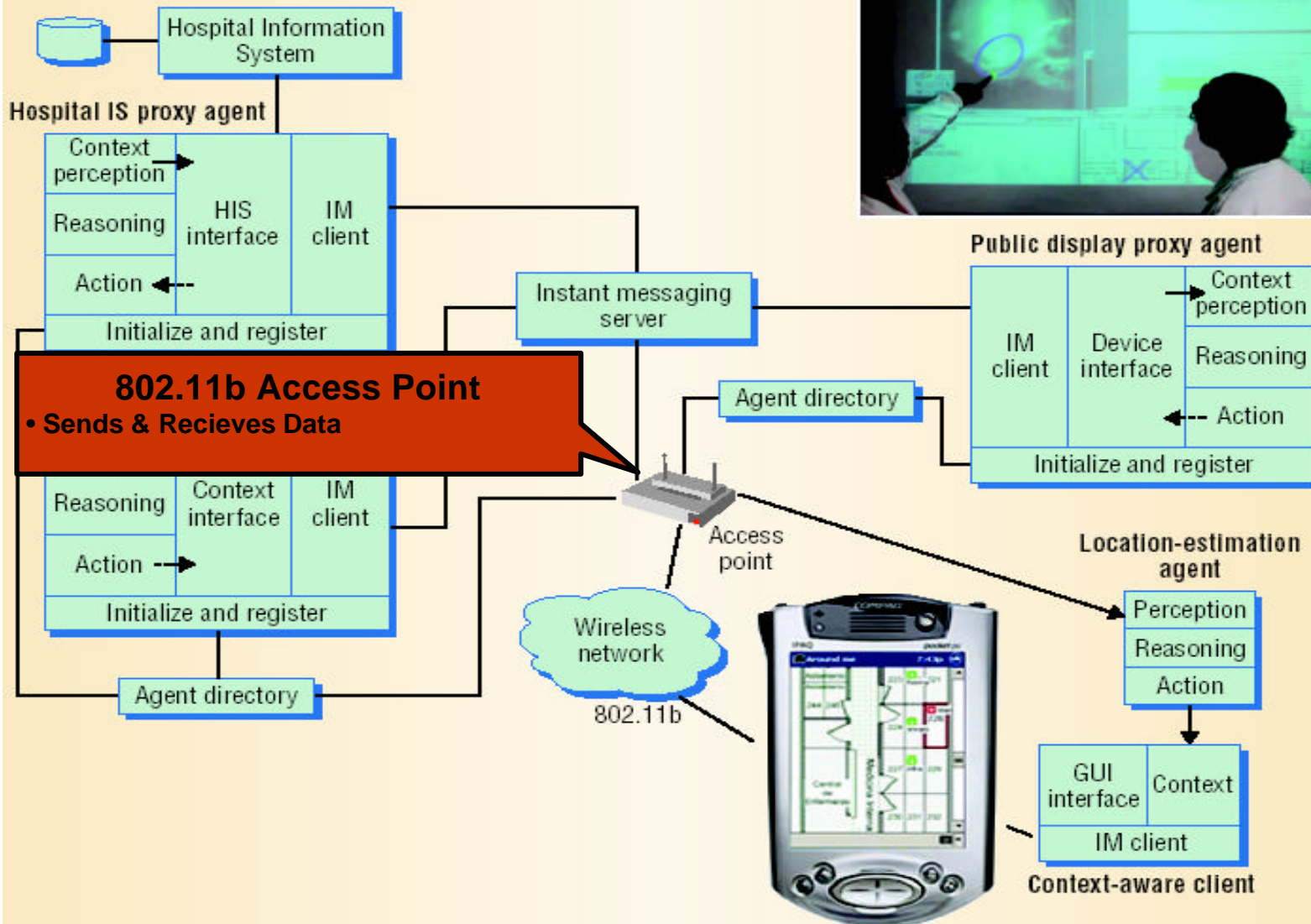




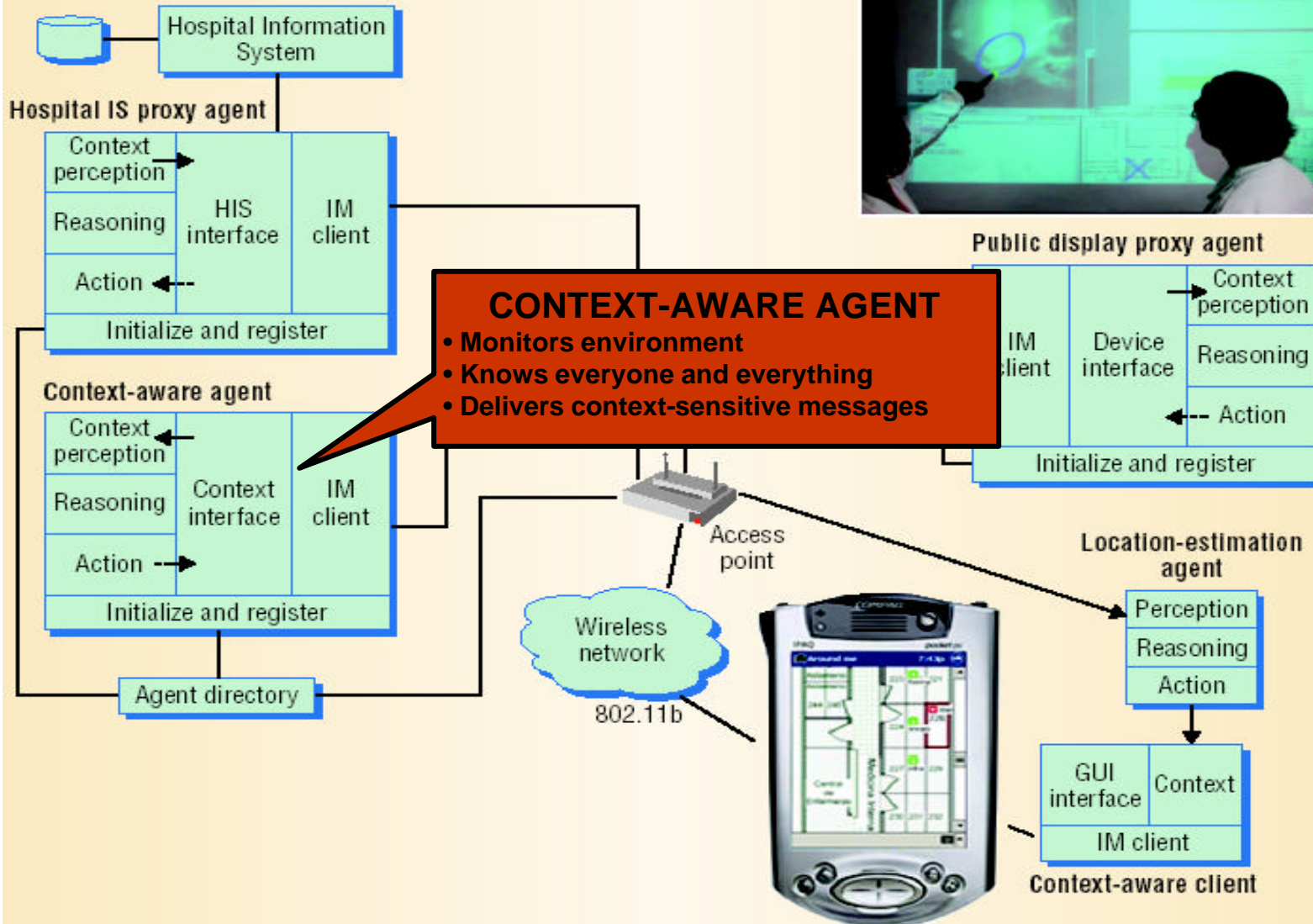
System Diagram



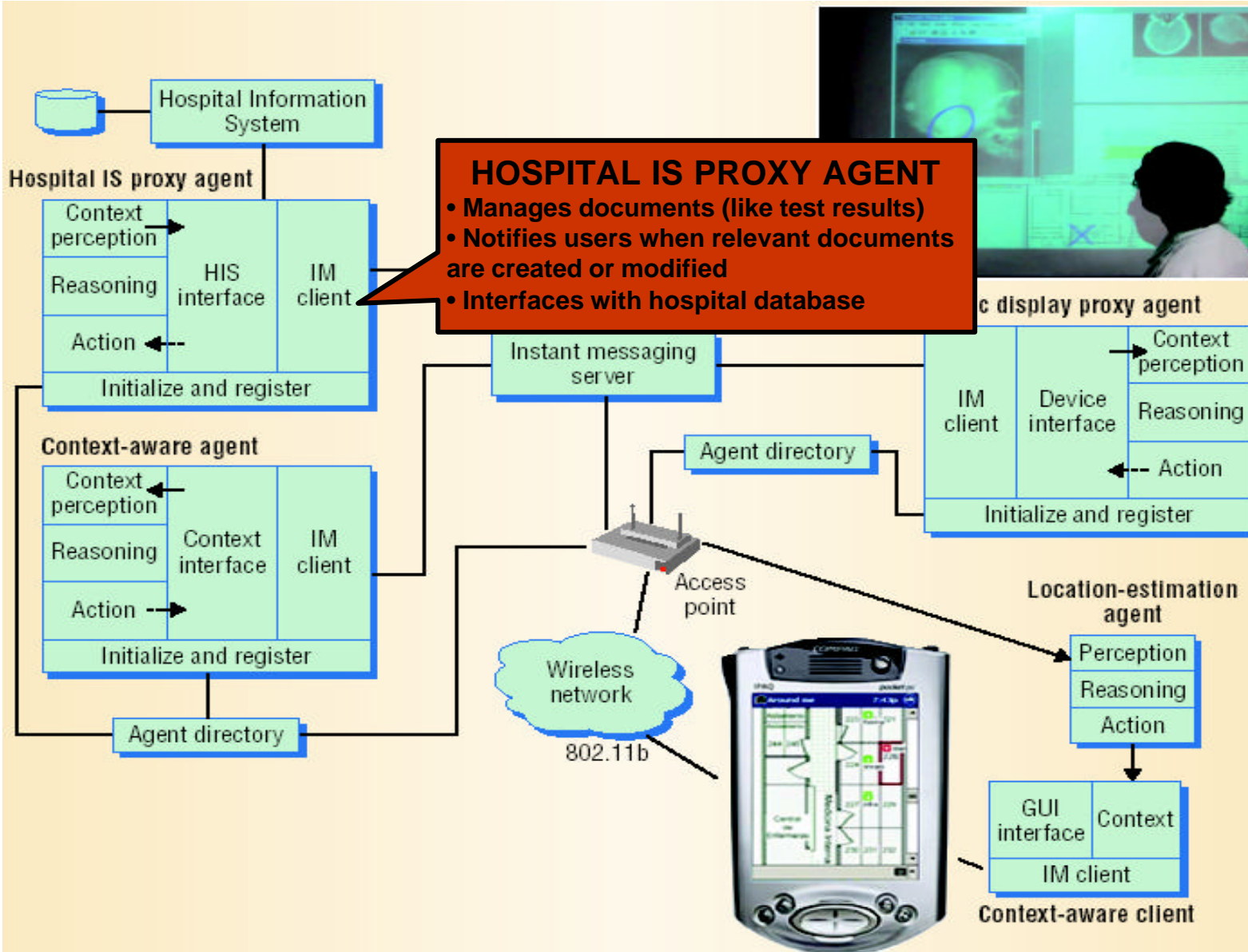
System Diagram



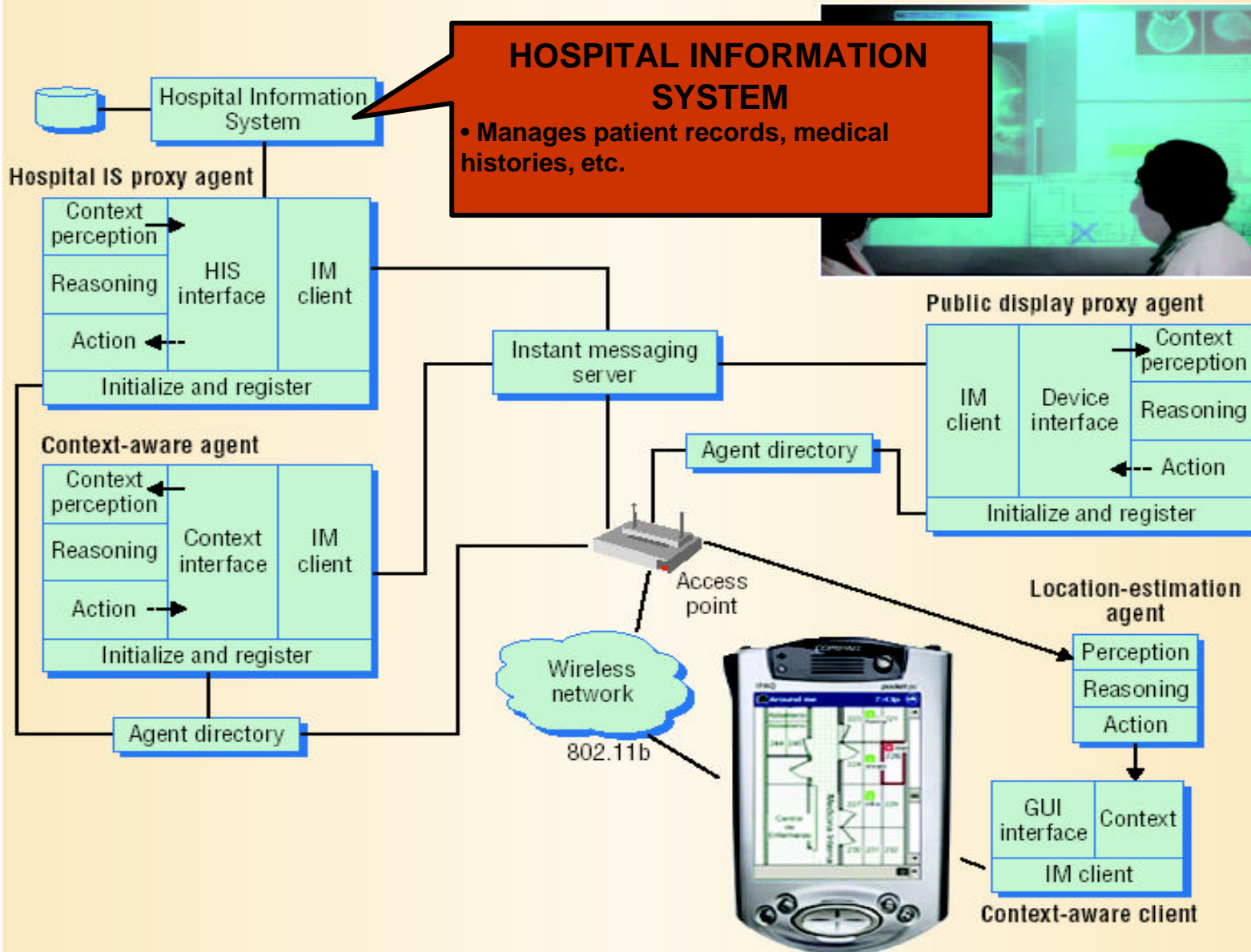
System Diagram



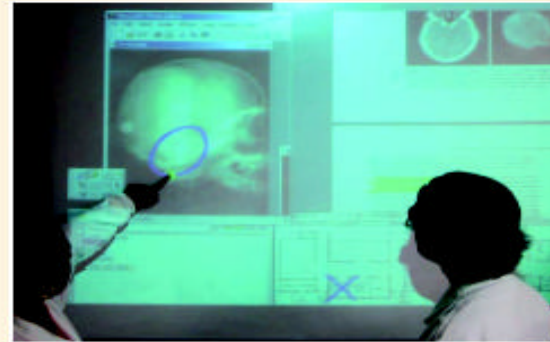
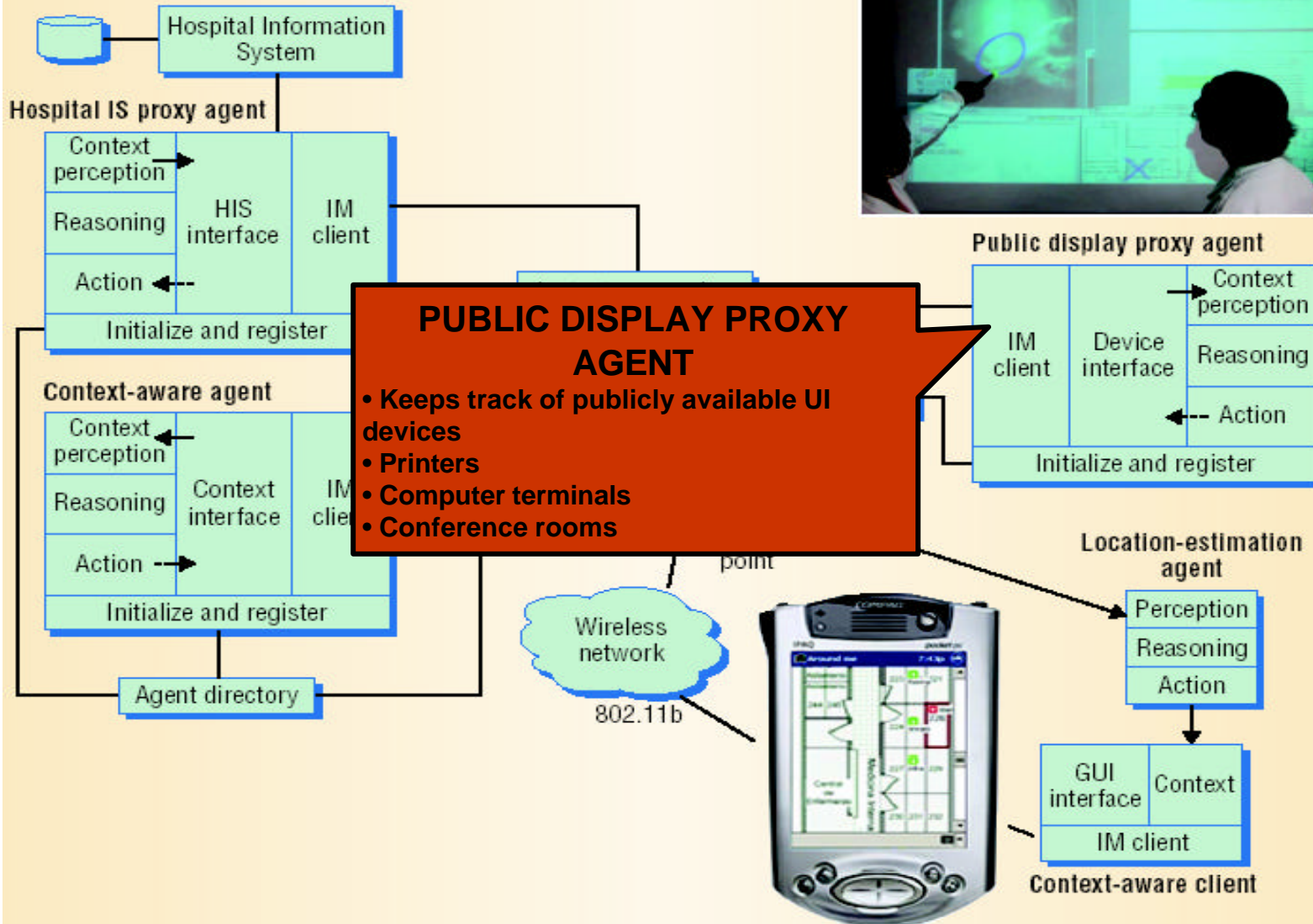
System Diagram



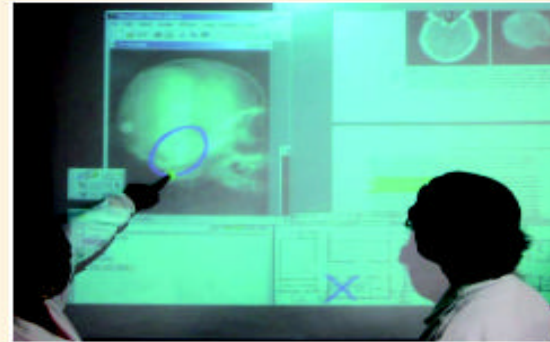
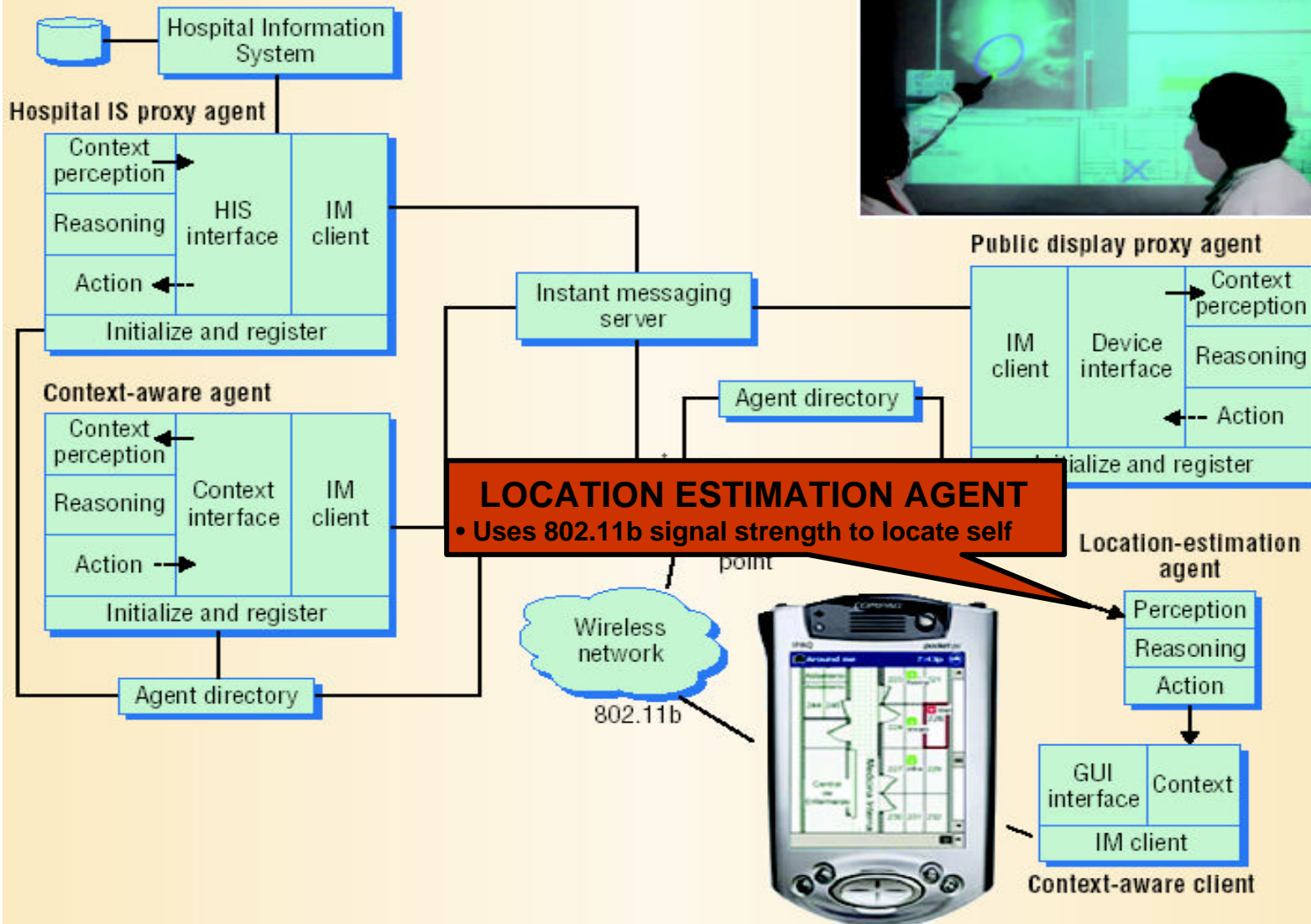
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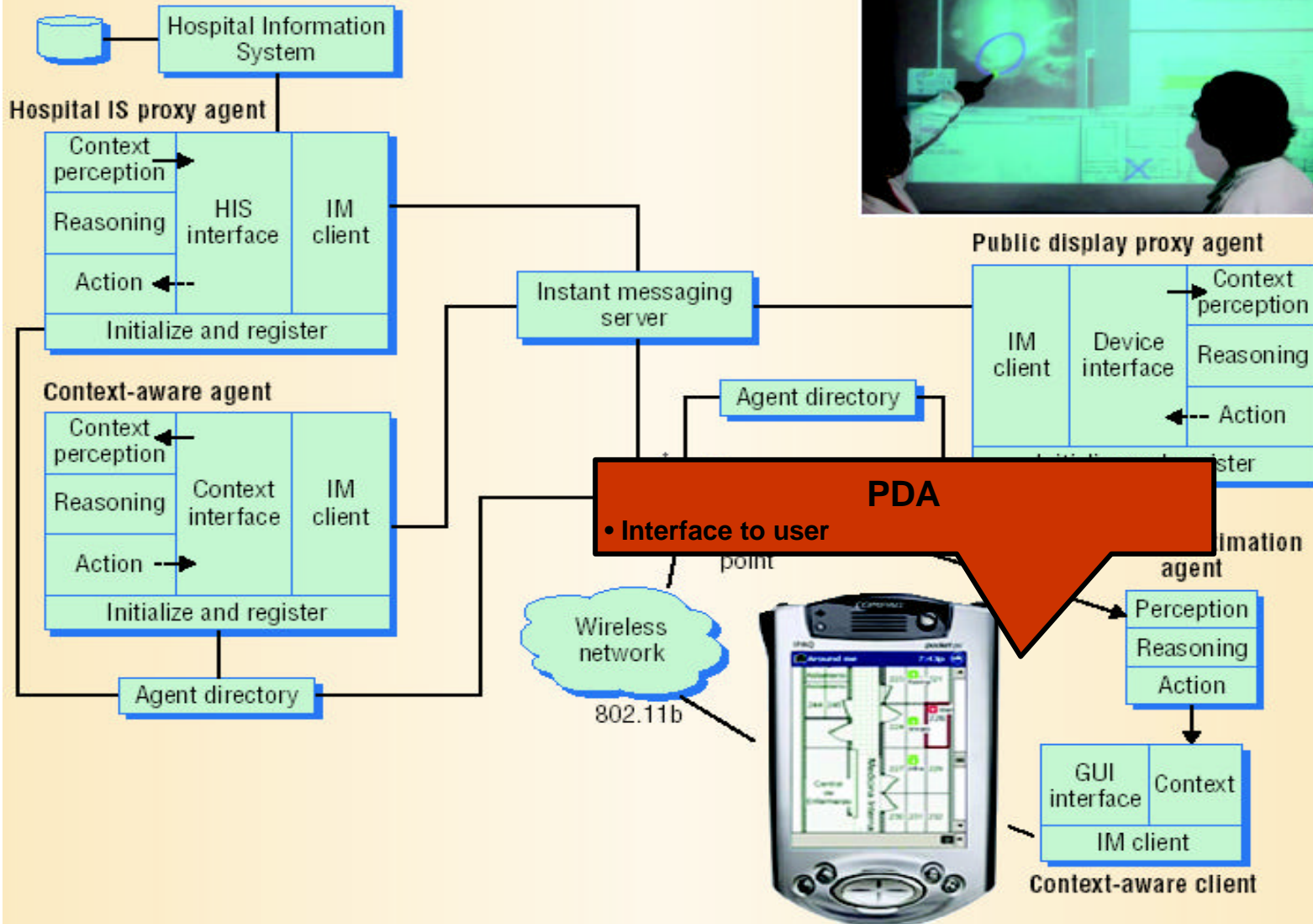
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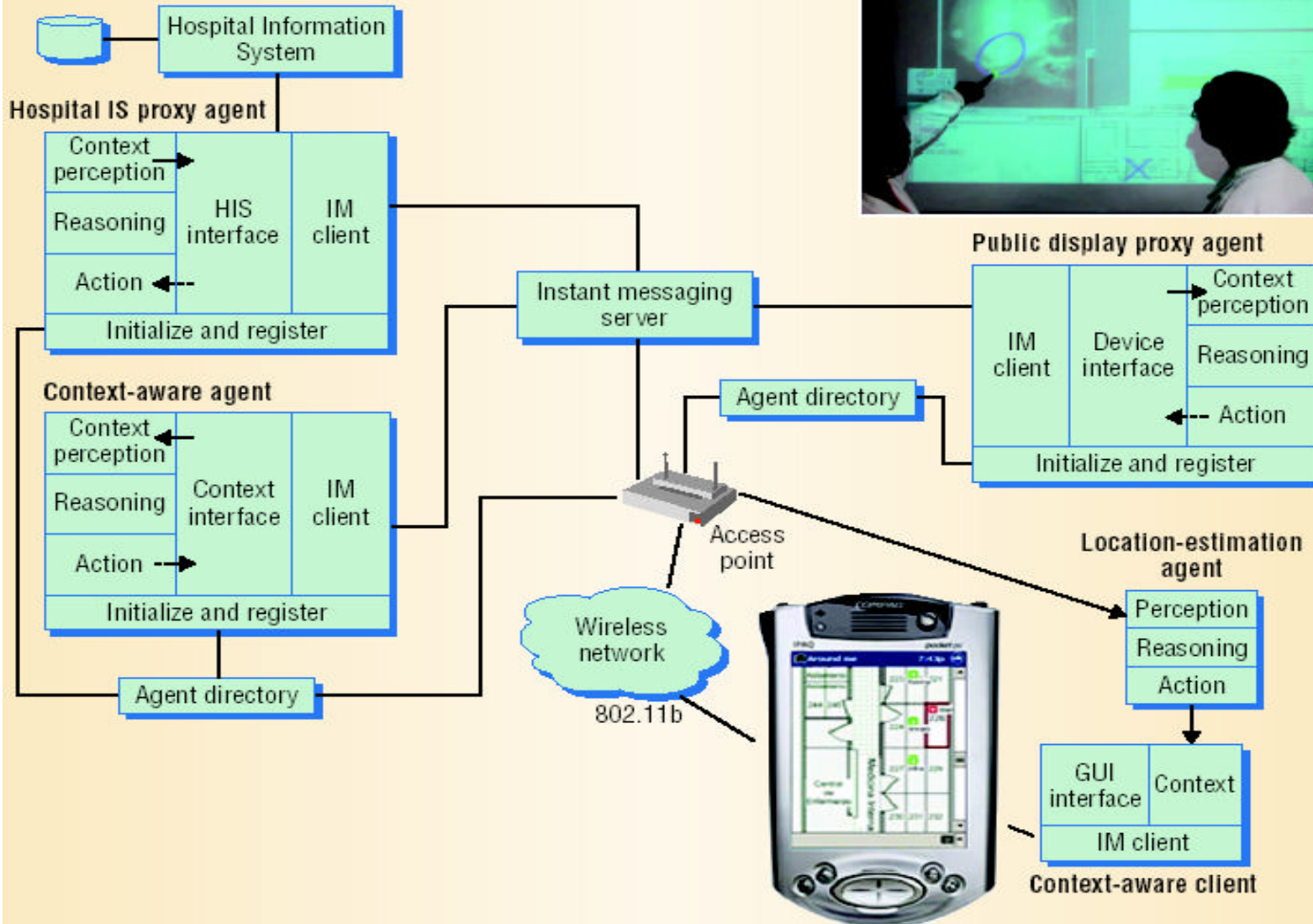
System Diagram



System Diagram



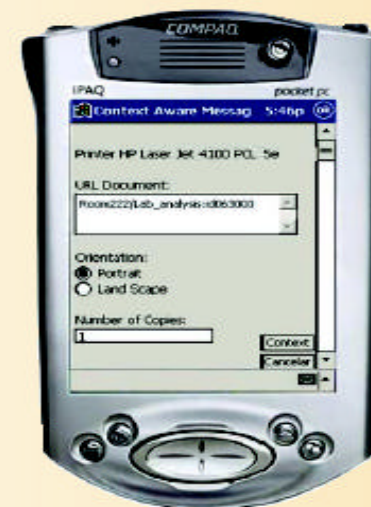
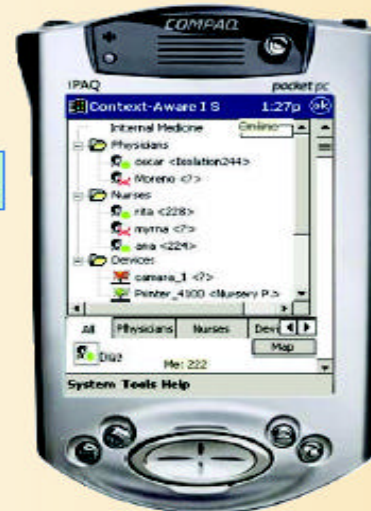
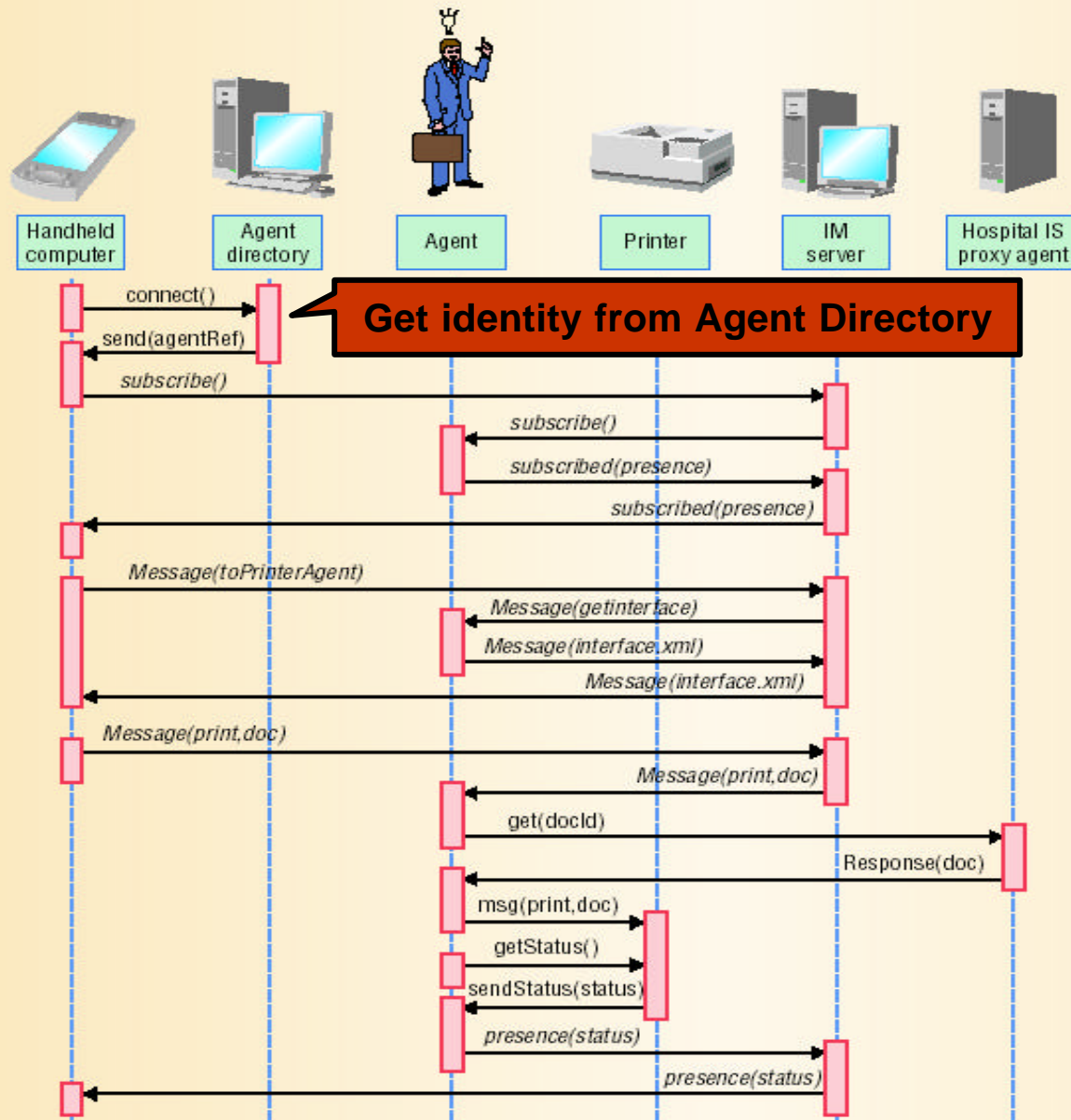
System Diagram



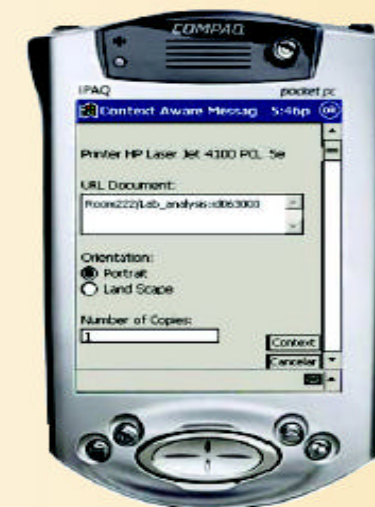
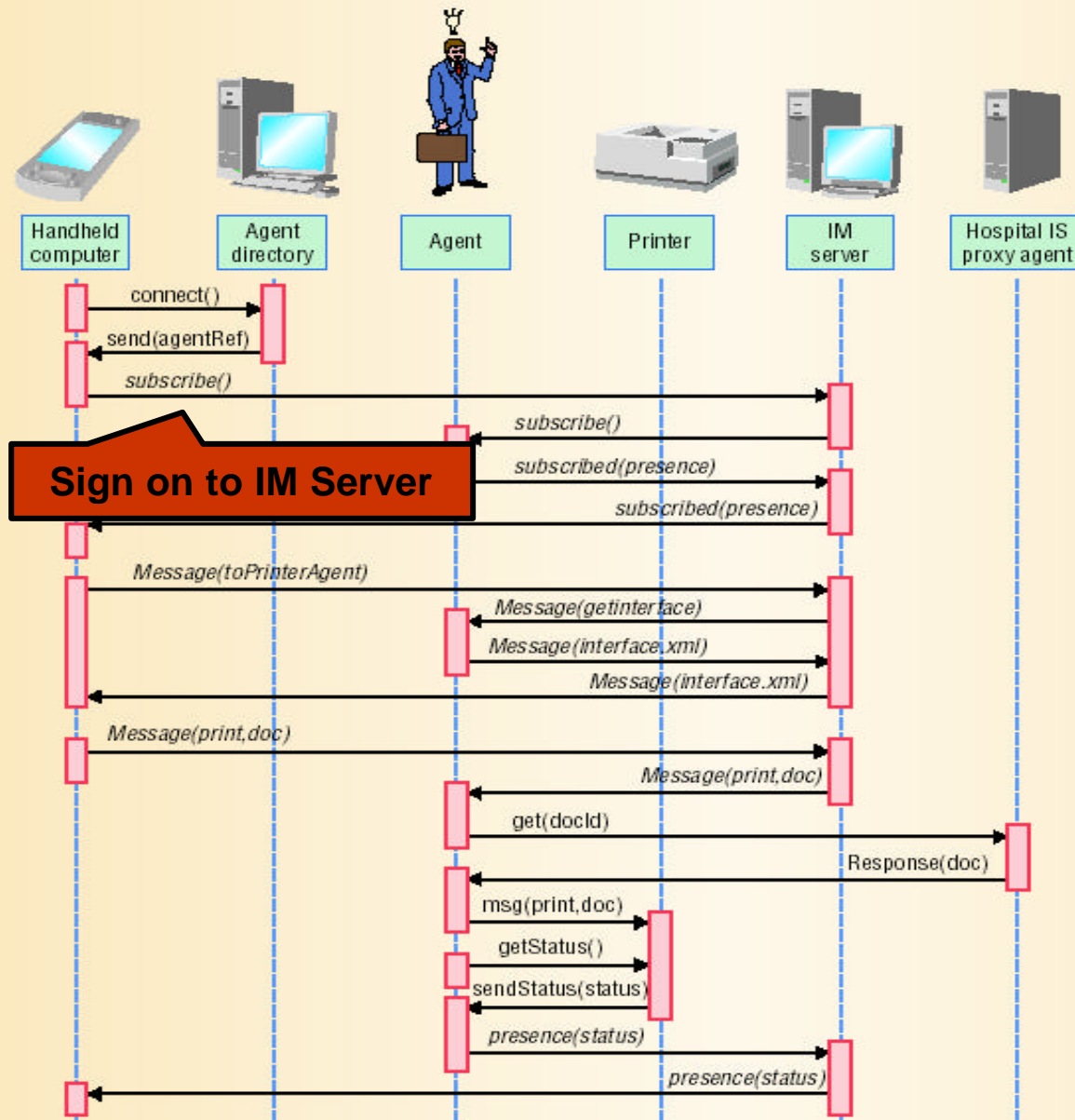
Scenario – Printing

A user wants to print a set of patient's records at a nearby printer

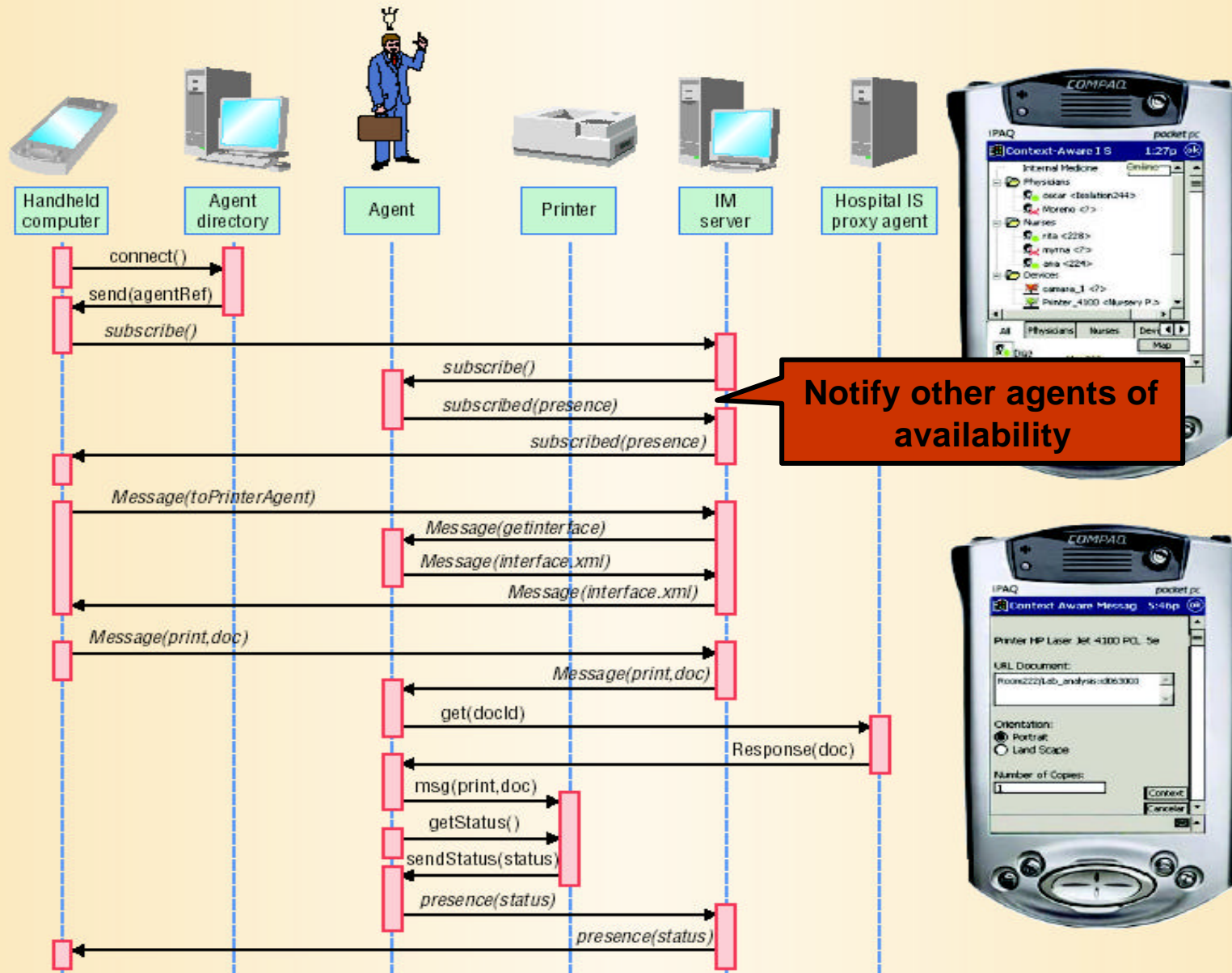
Process – Printing



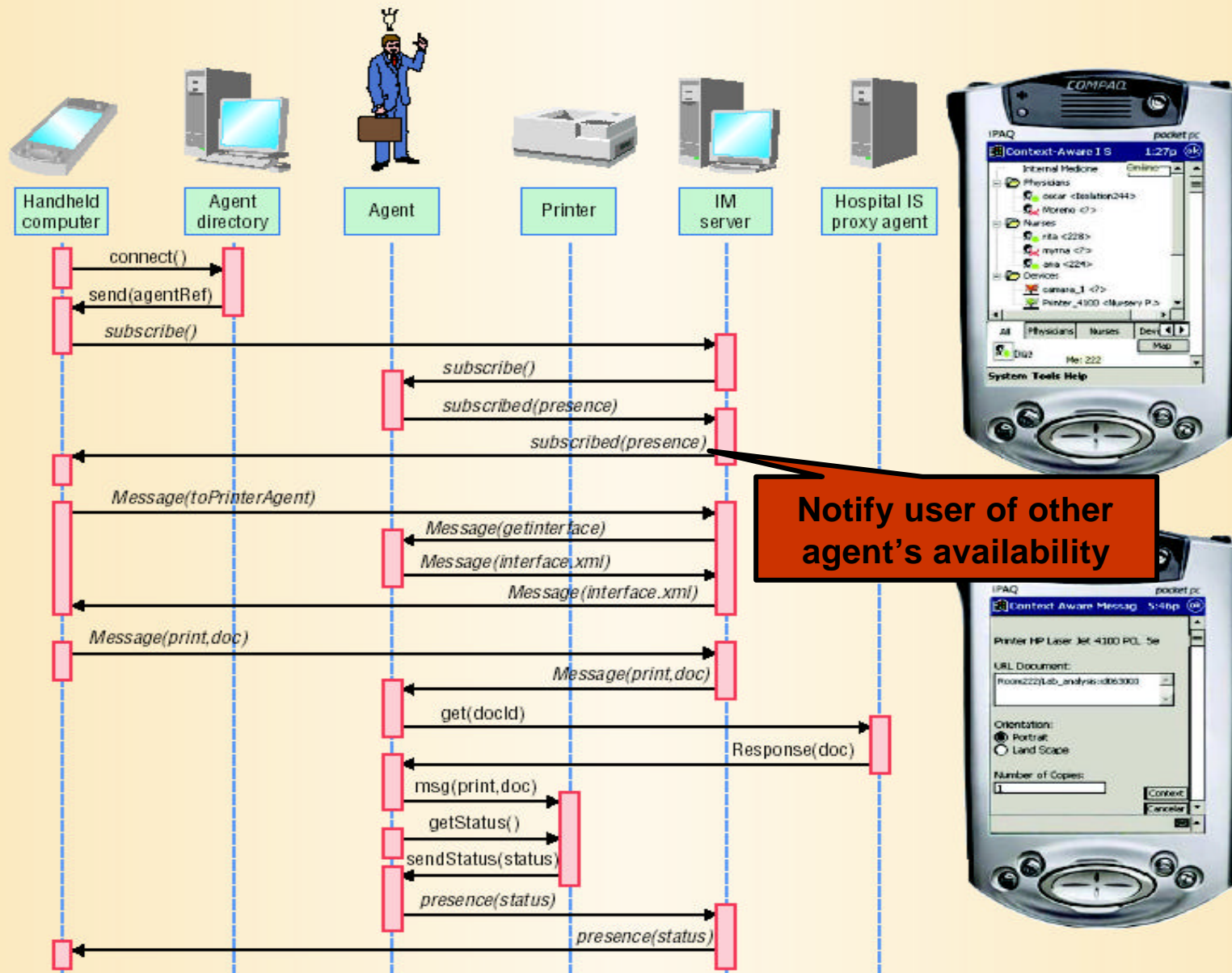
Process – Printing



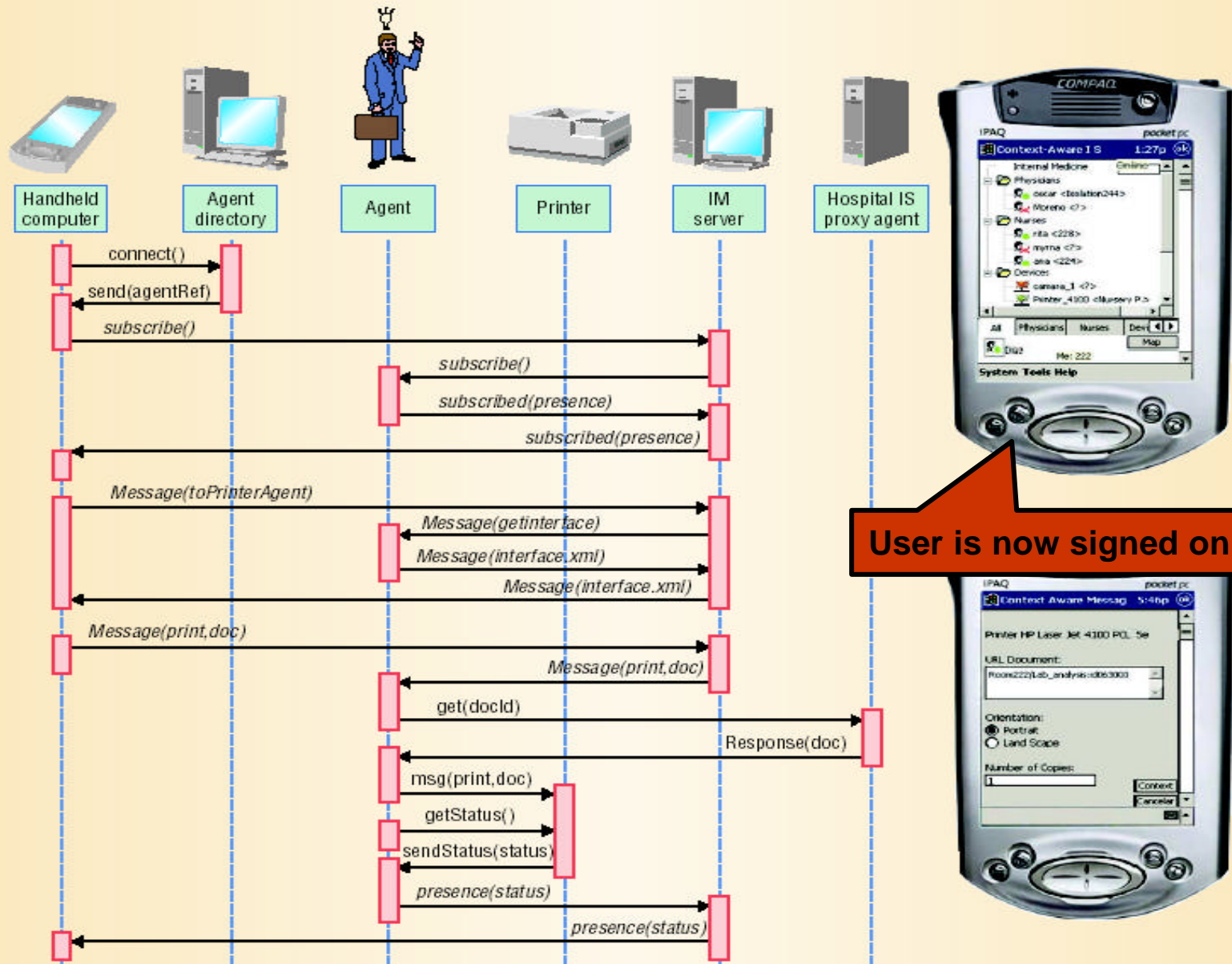
Process – Printing



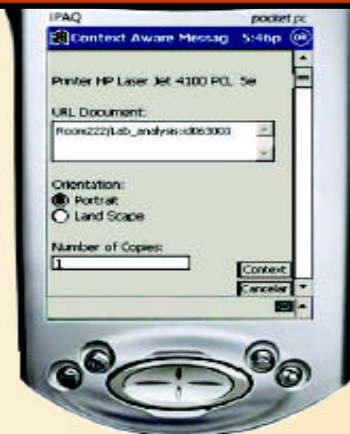
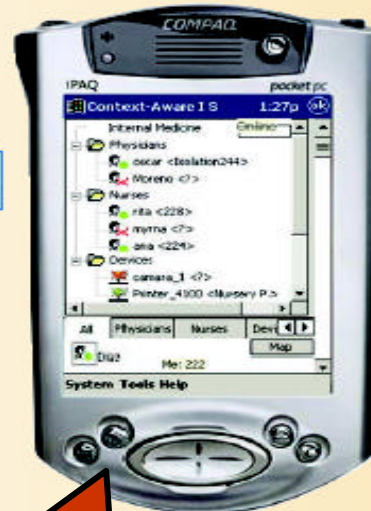
Process – Printing



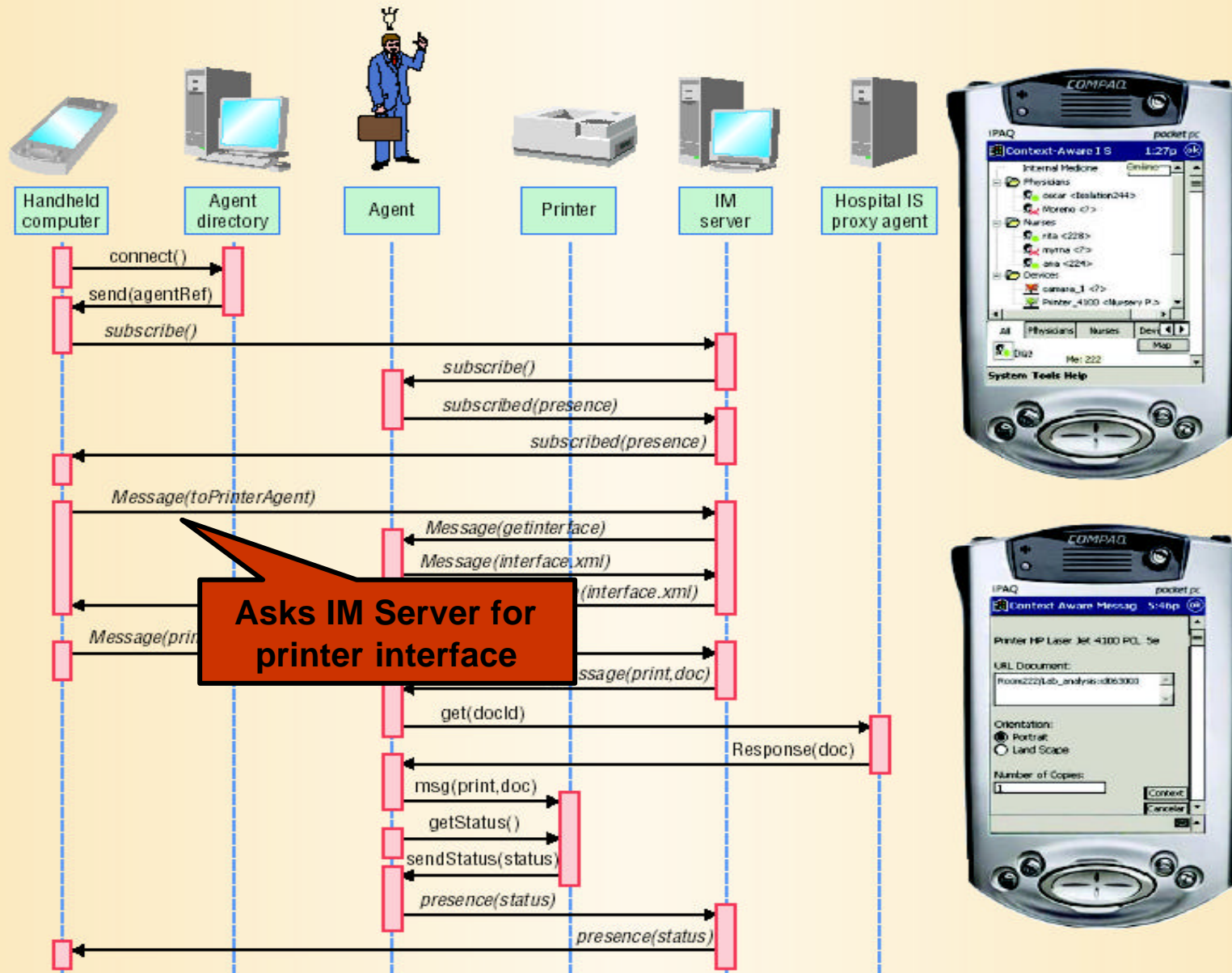
Process – Printing



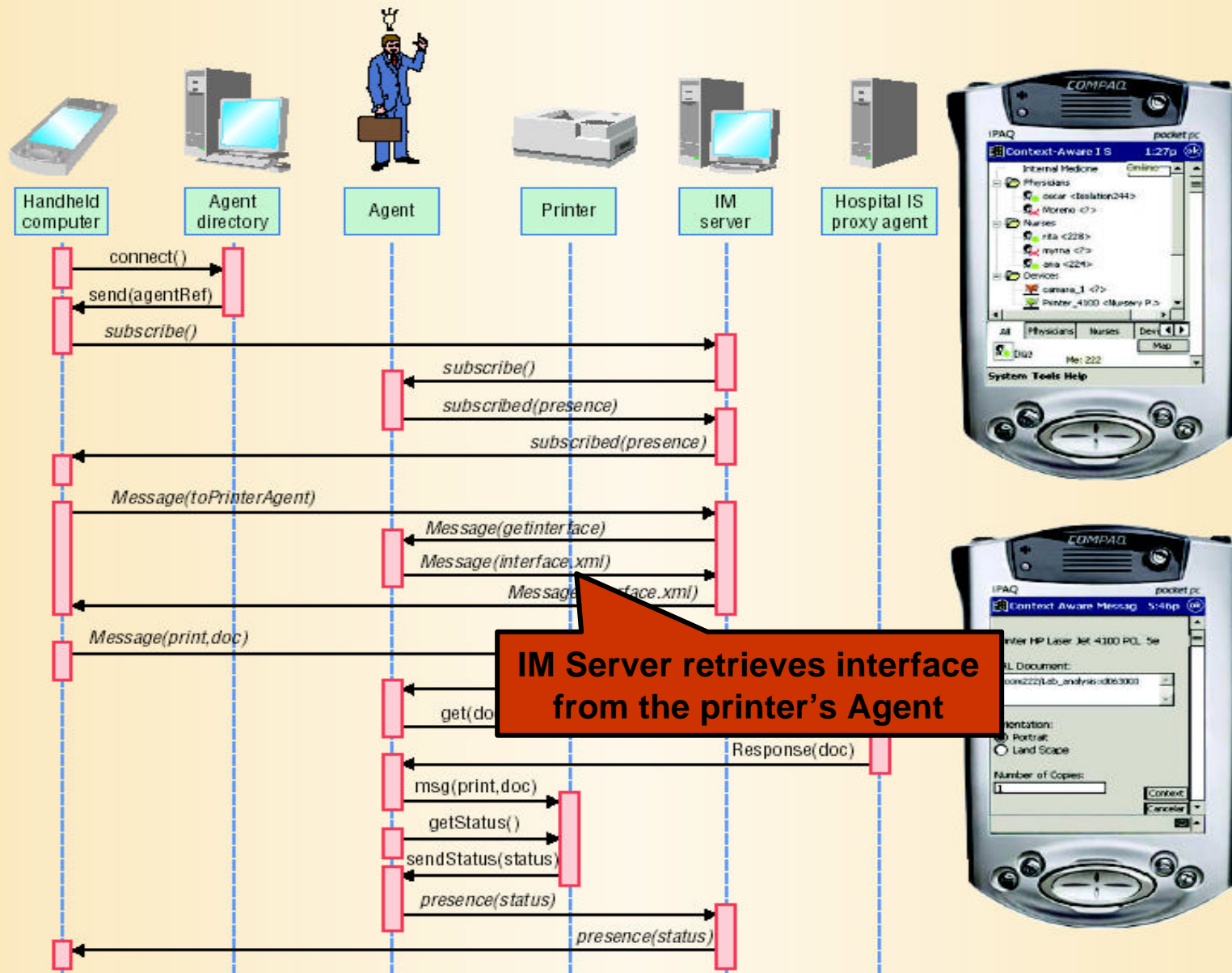
User is now signed on



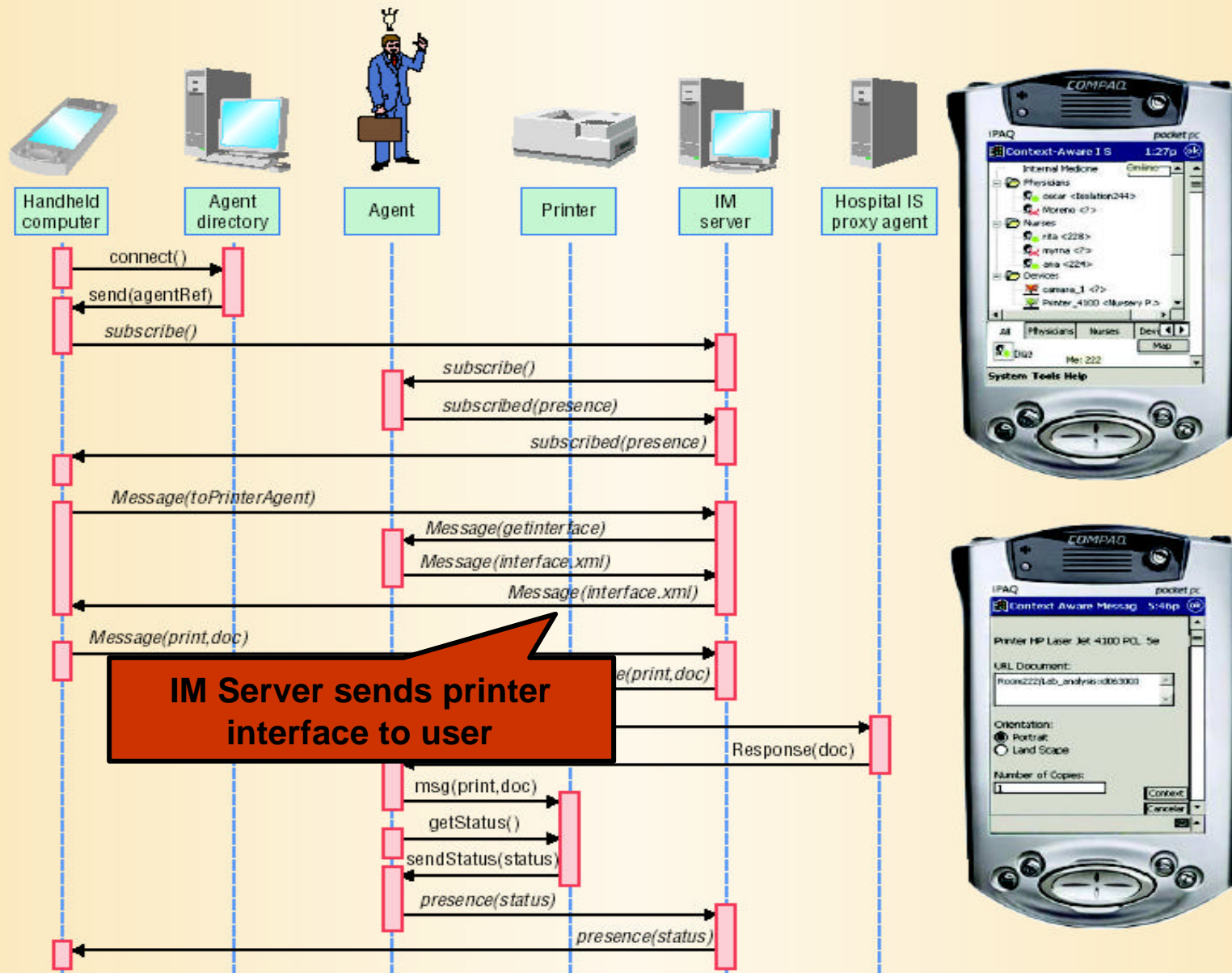
Process – Printing



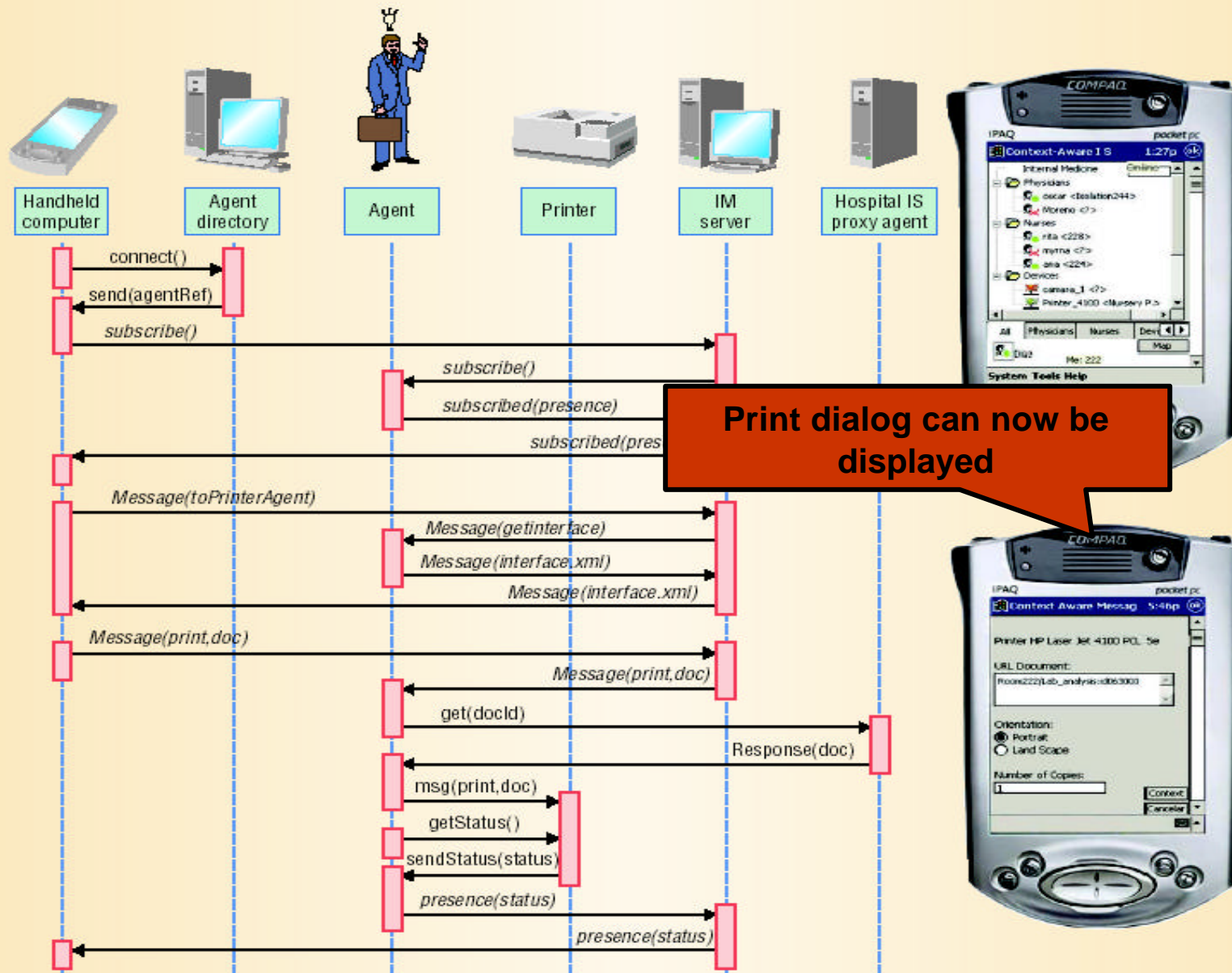
Process – Printing



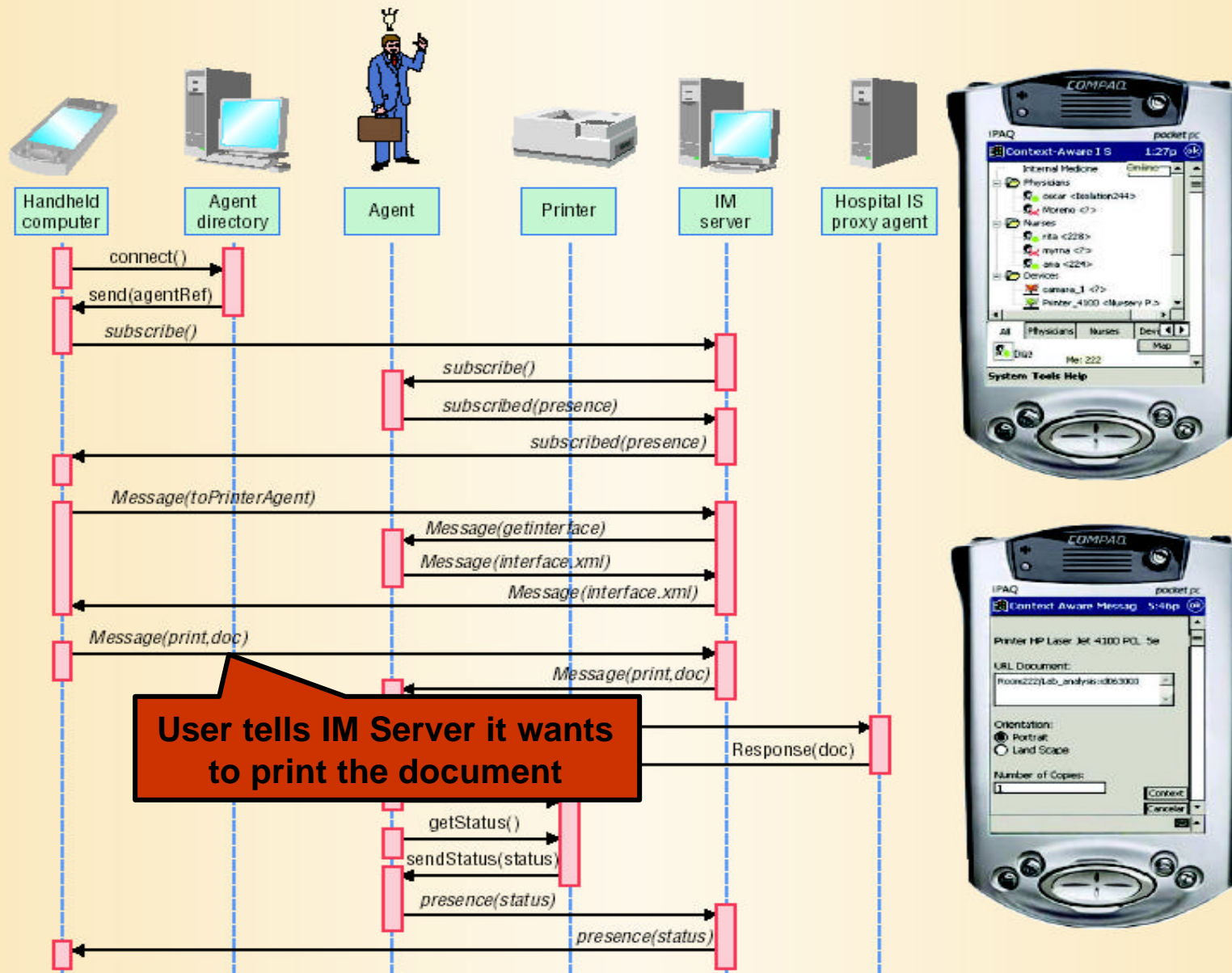
Process – Printing



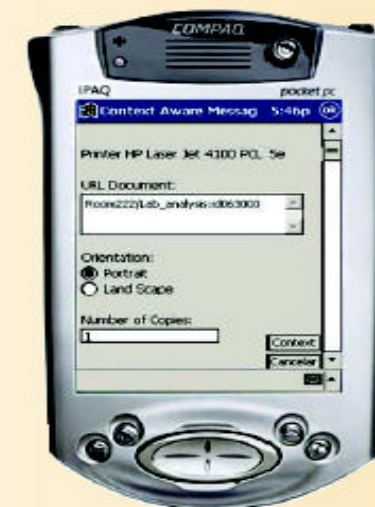
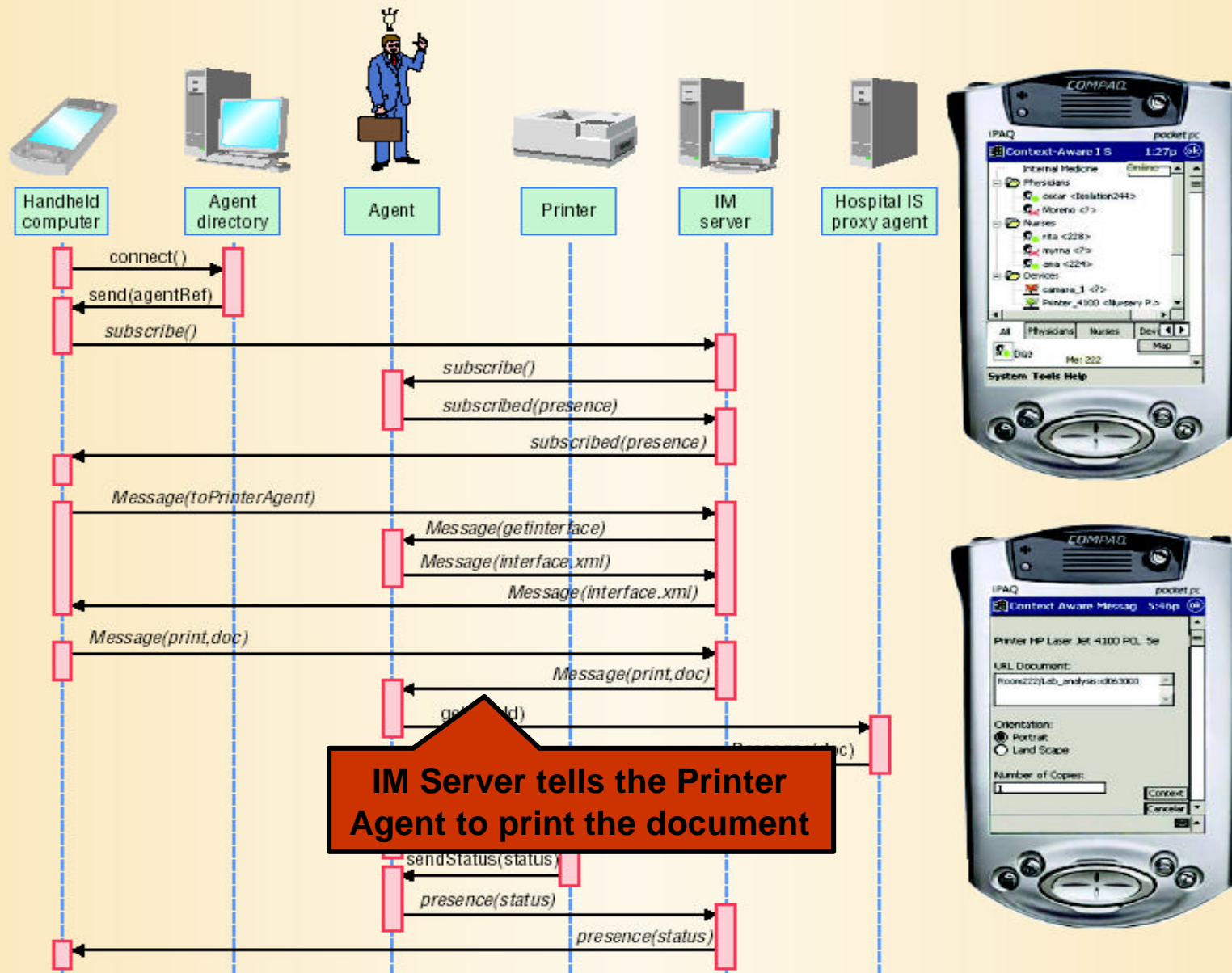
Process – Printing



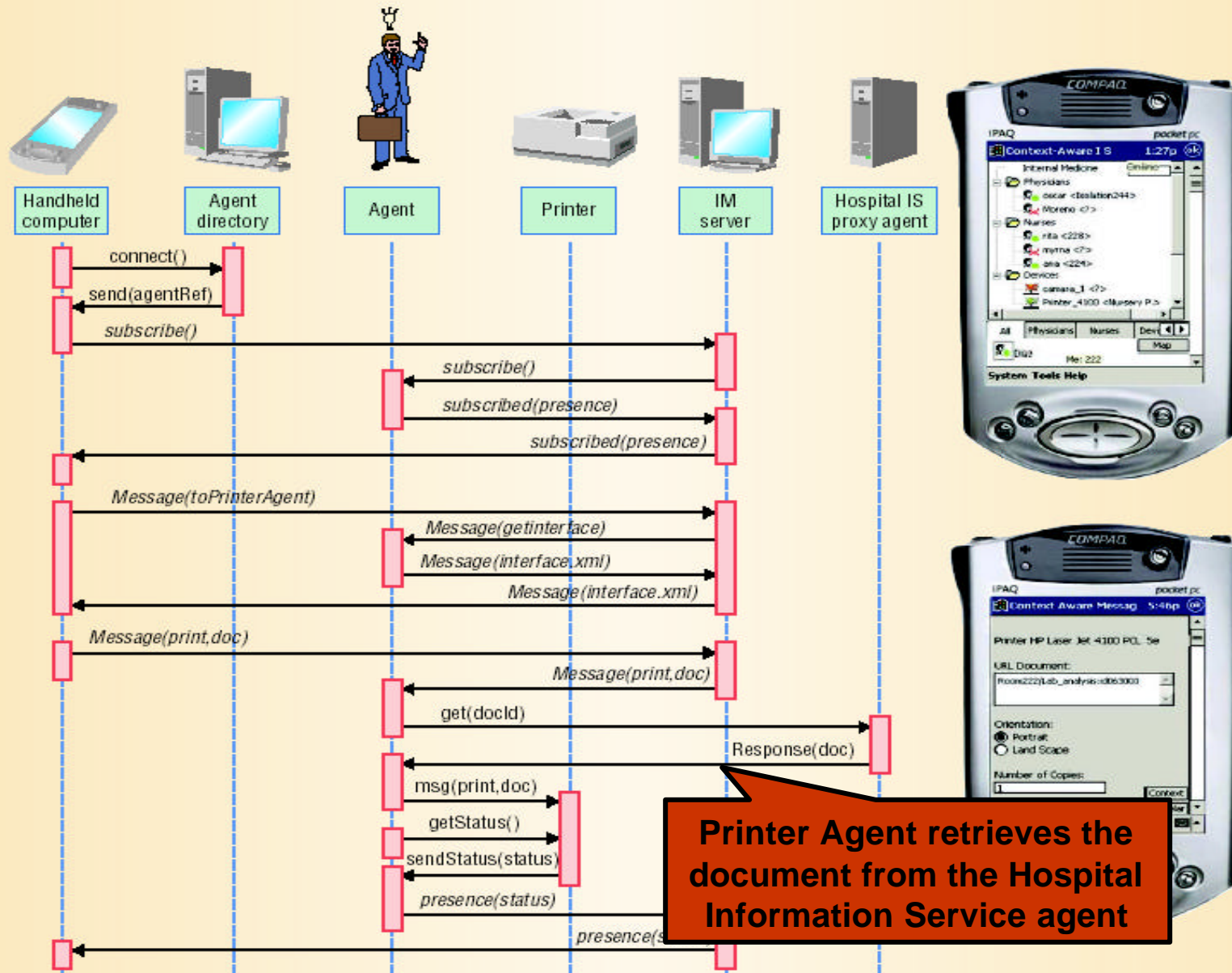
Process – Printing



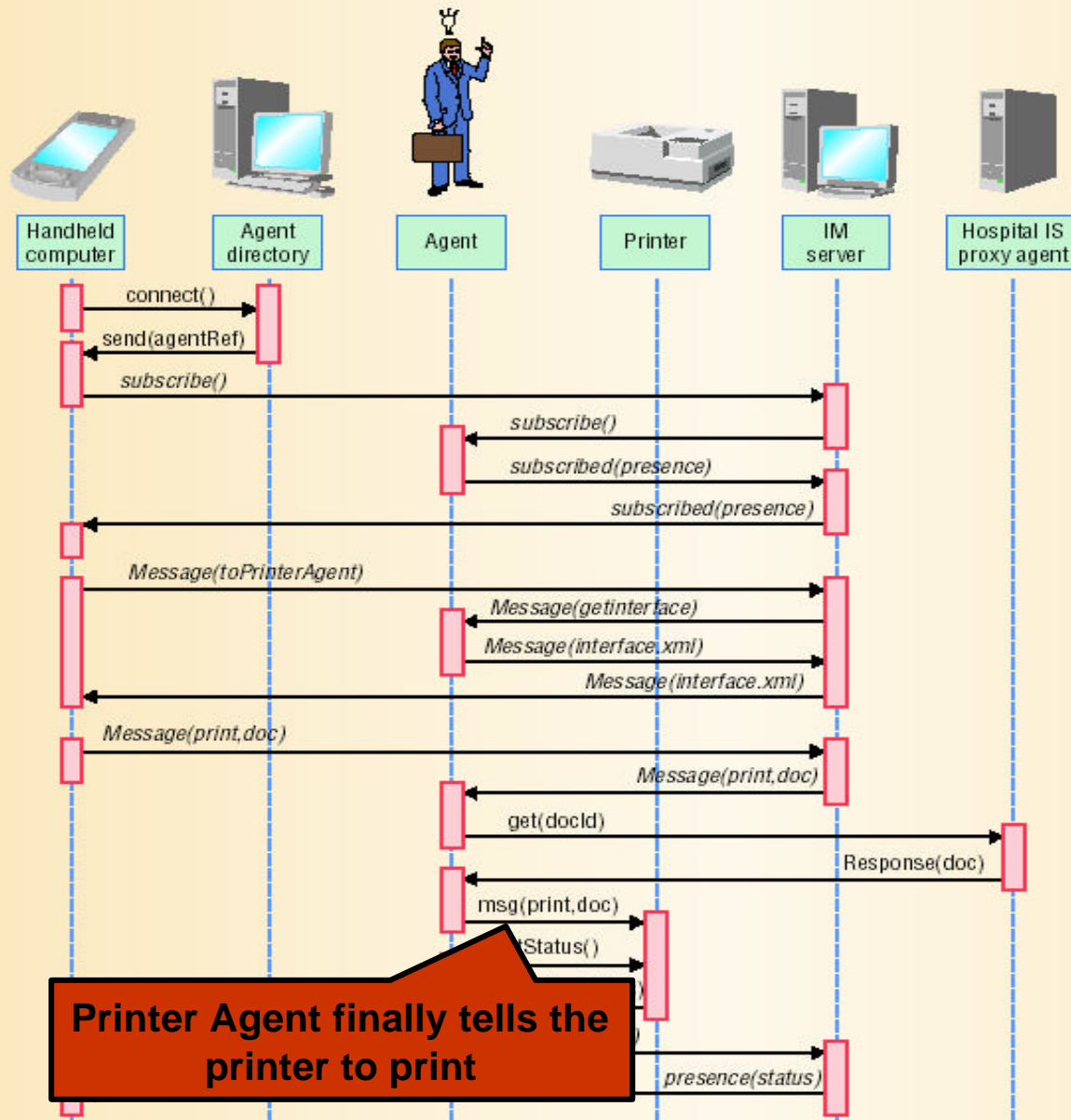
Process – Printing



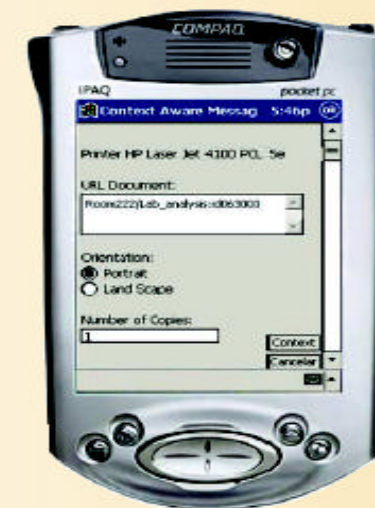
Process – Printing



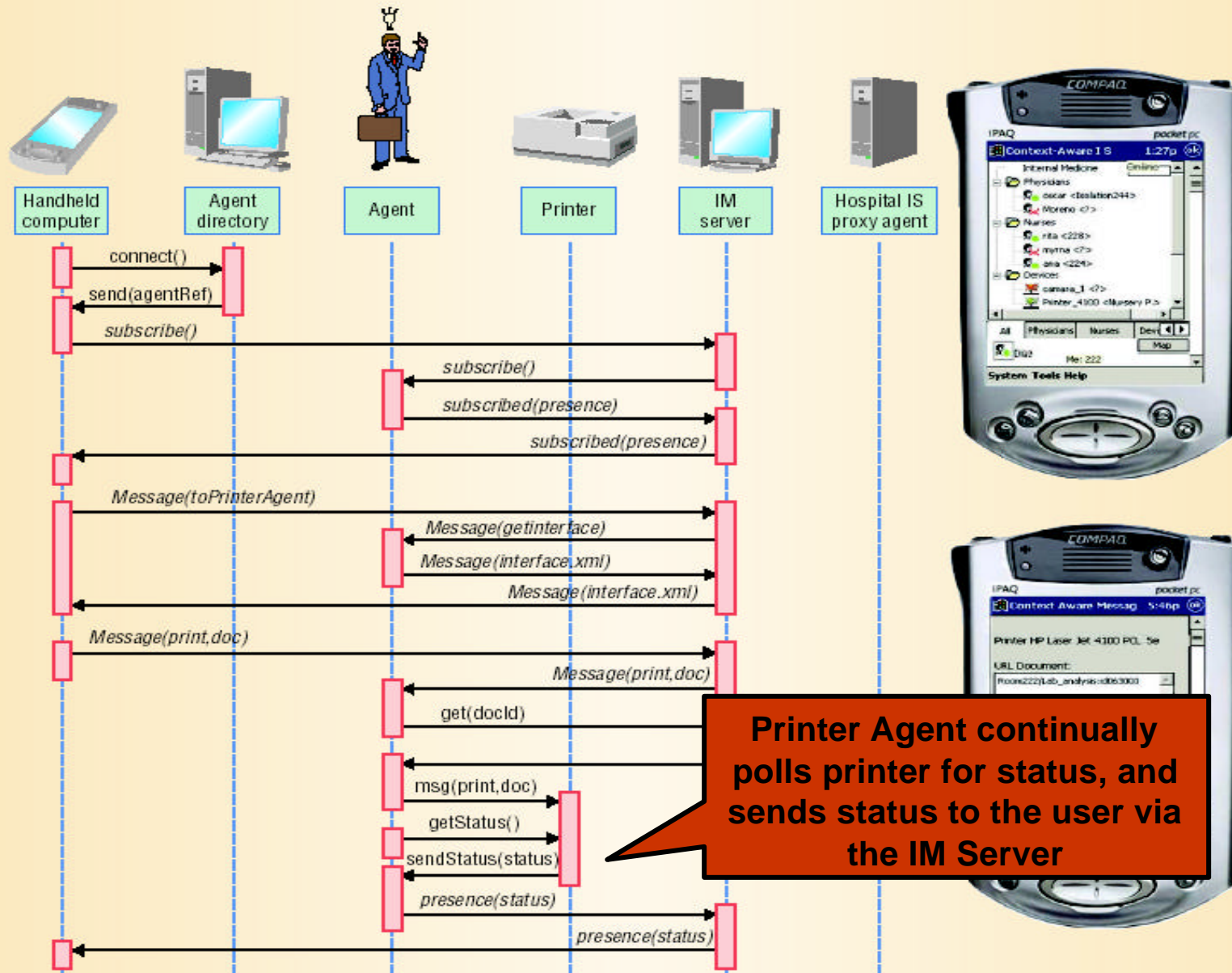
Process – Printing



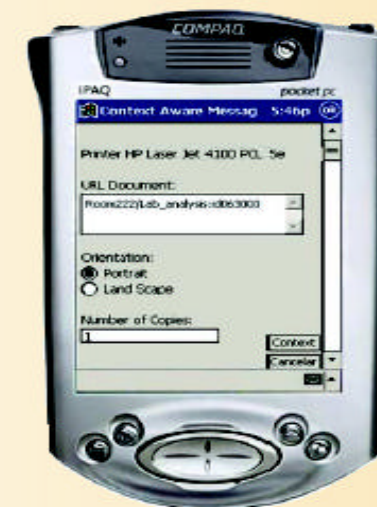
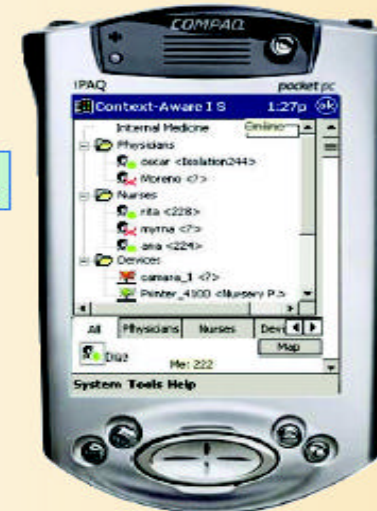
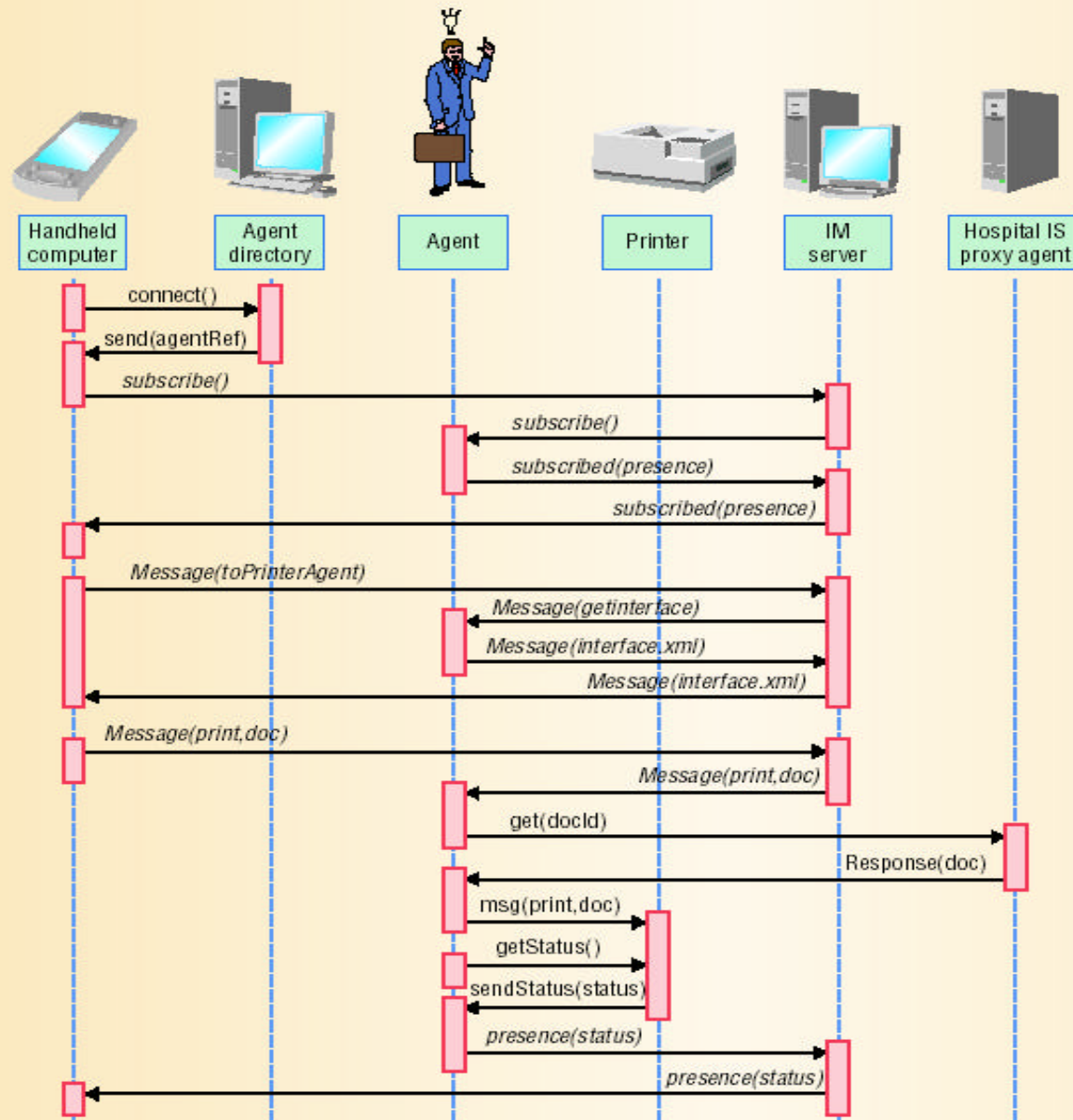
Printer Agent finally tells the printer to print



Process – Printing



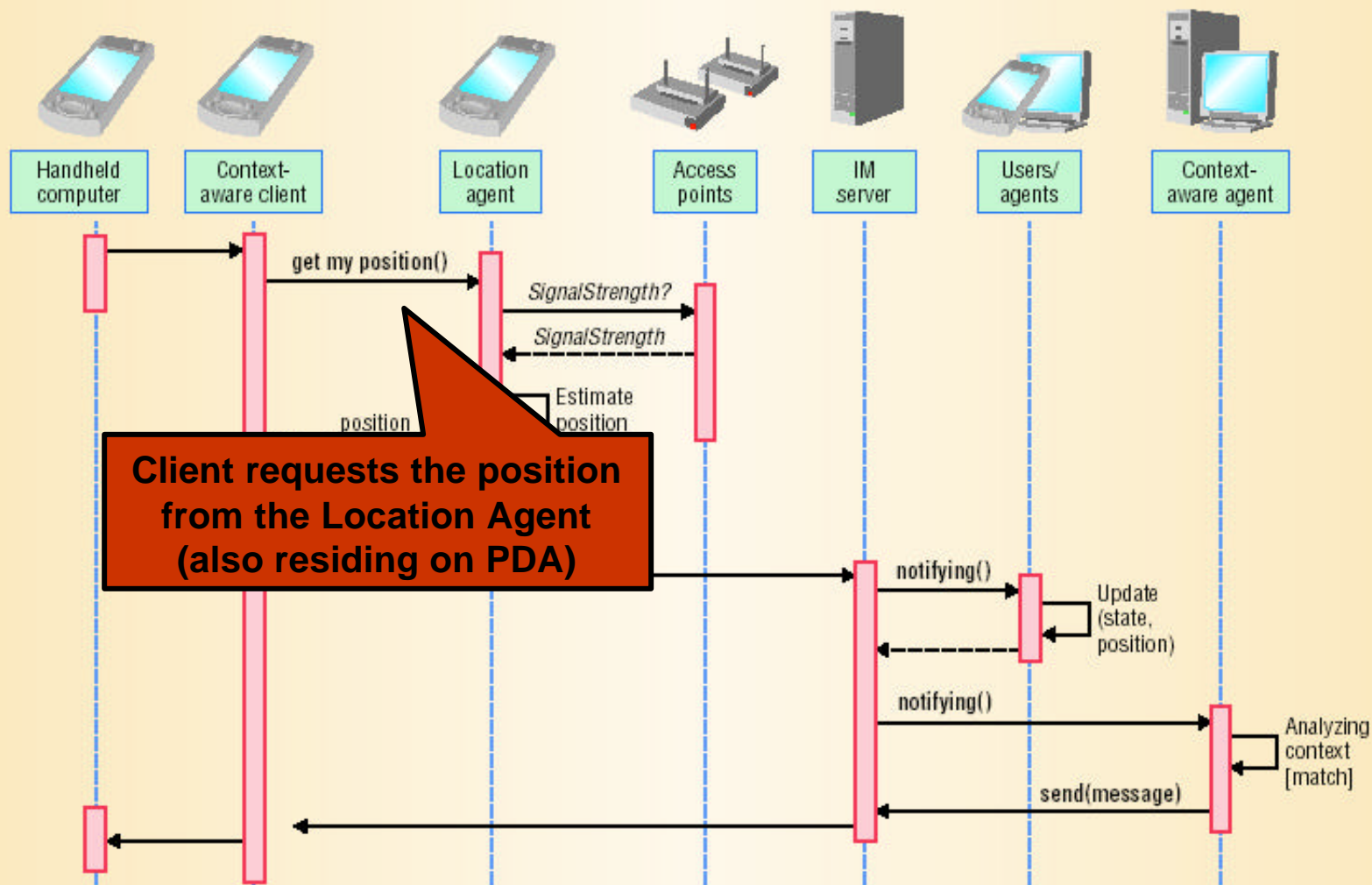
Process – Printing



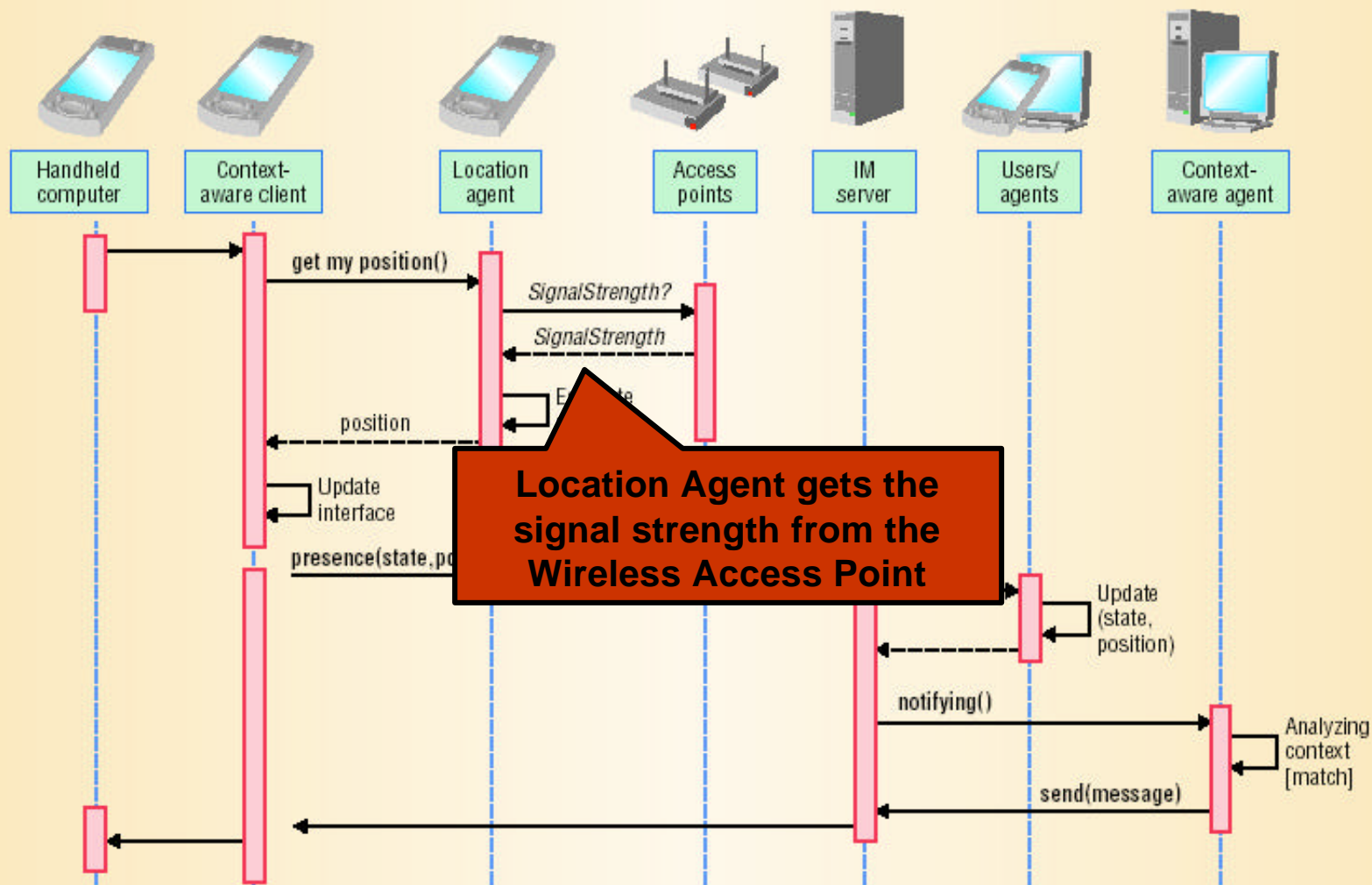
Scenario – Messages

A user is walking around the building, and is updated with information about particular rooms/patients nearby.

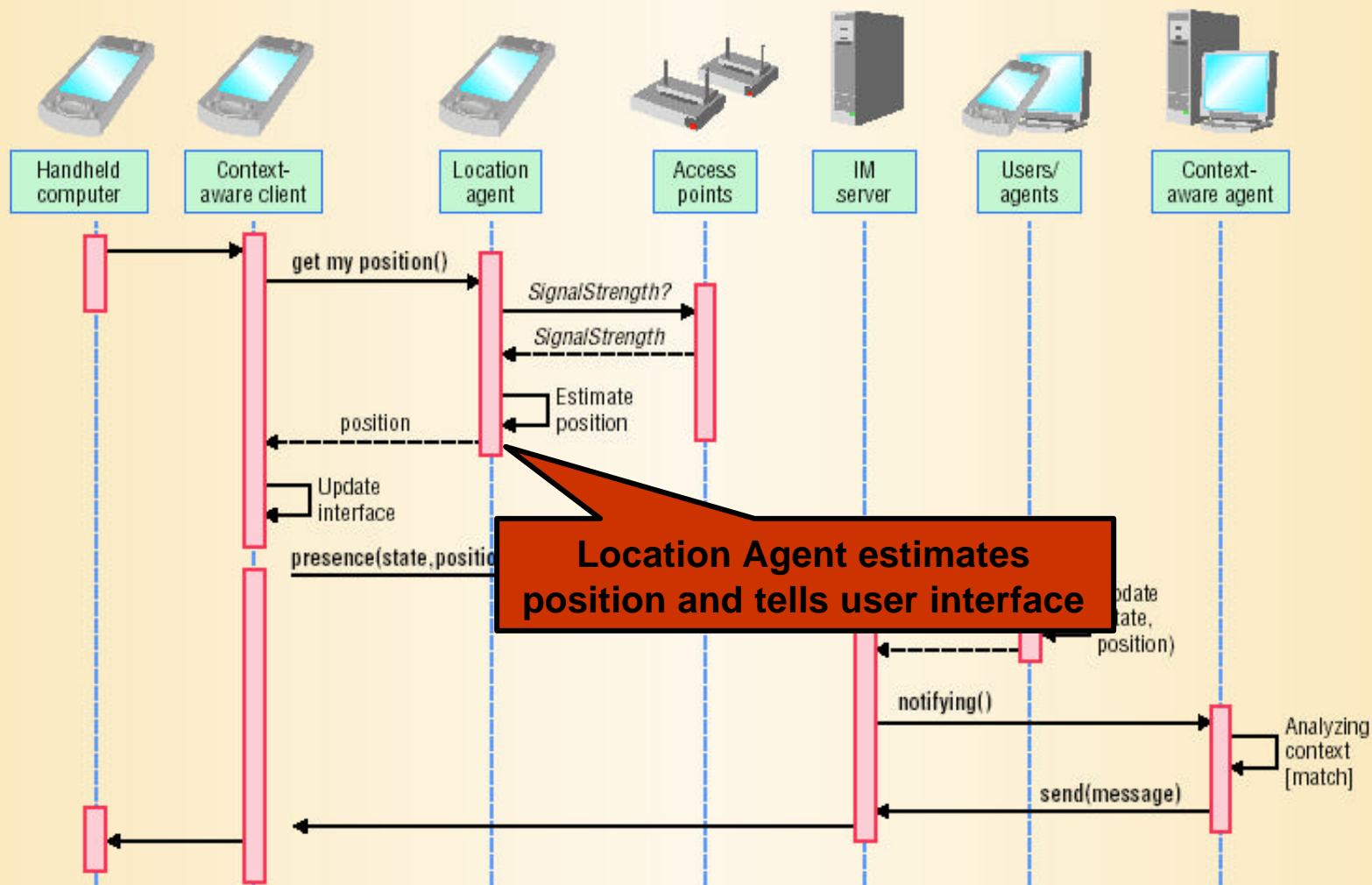
Process – Messages



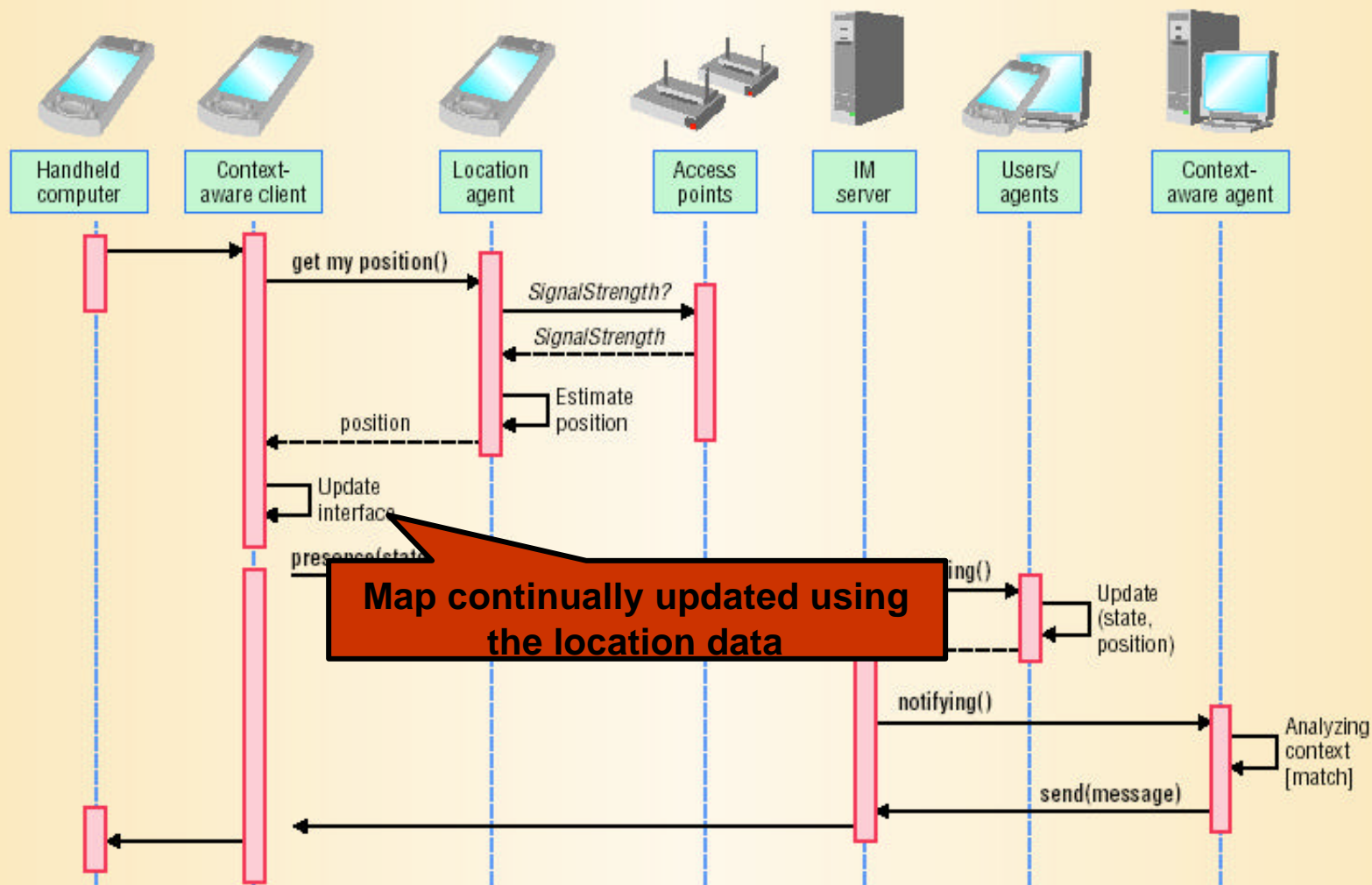
Process – Messages



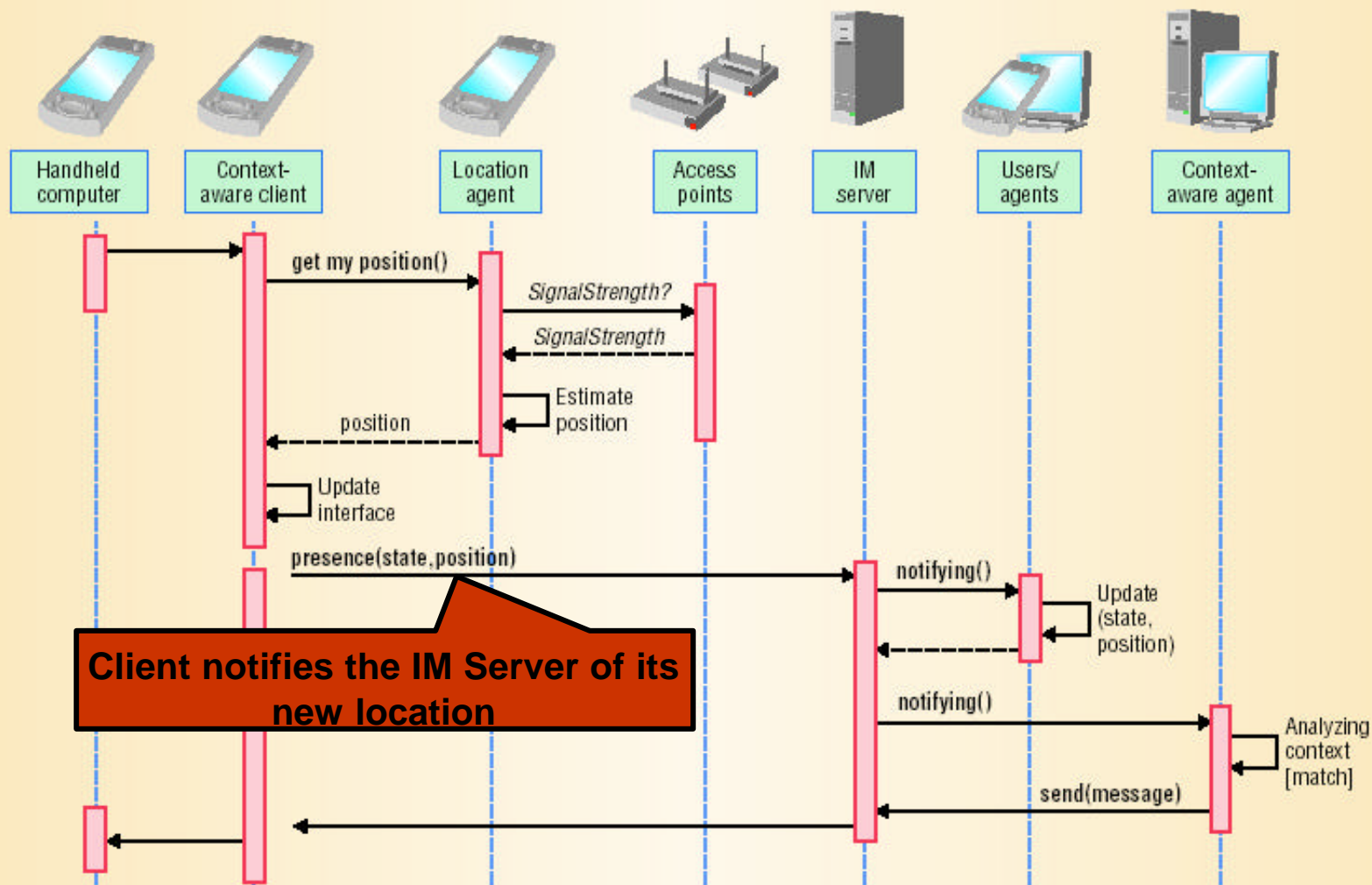
Process – Messages



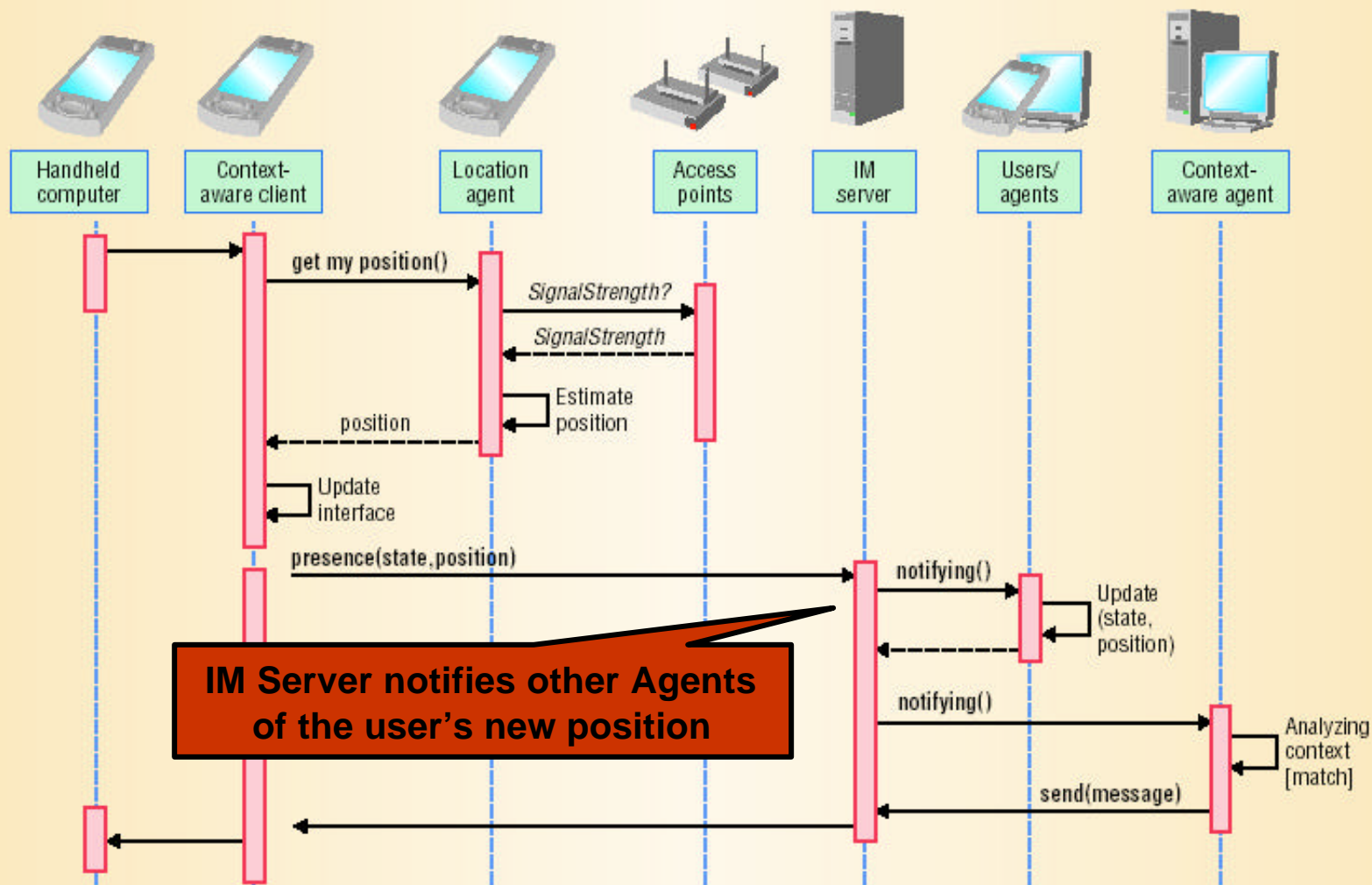
Process – Messages



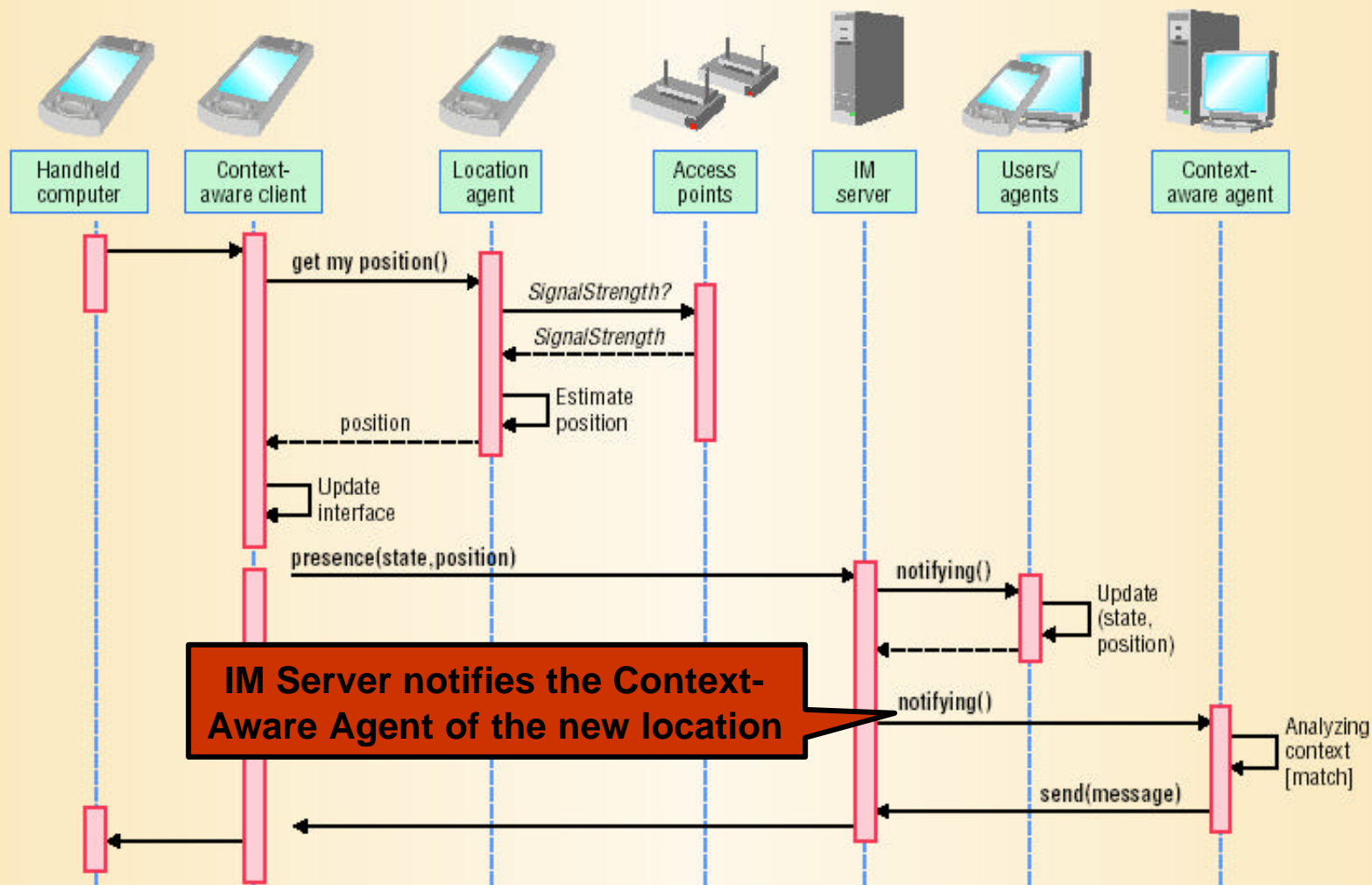
Process – Messages



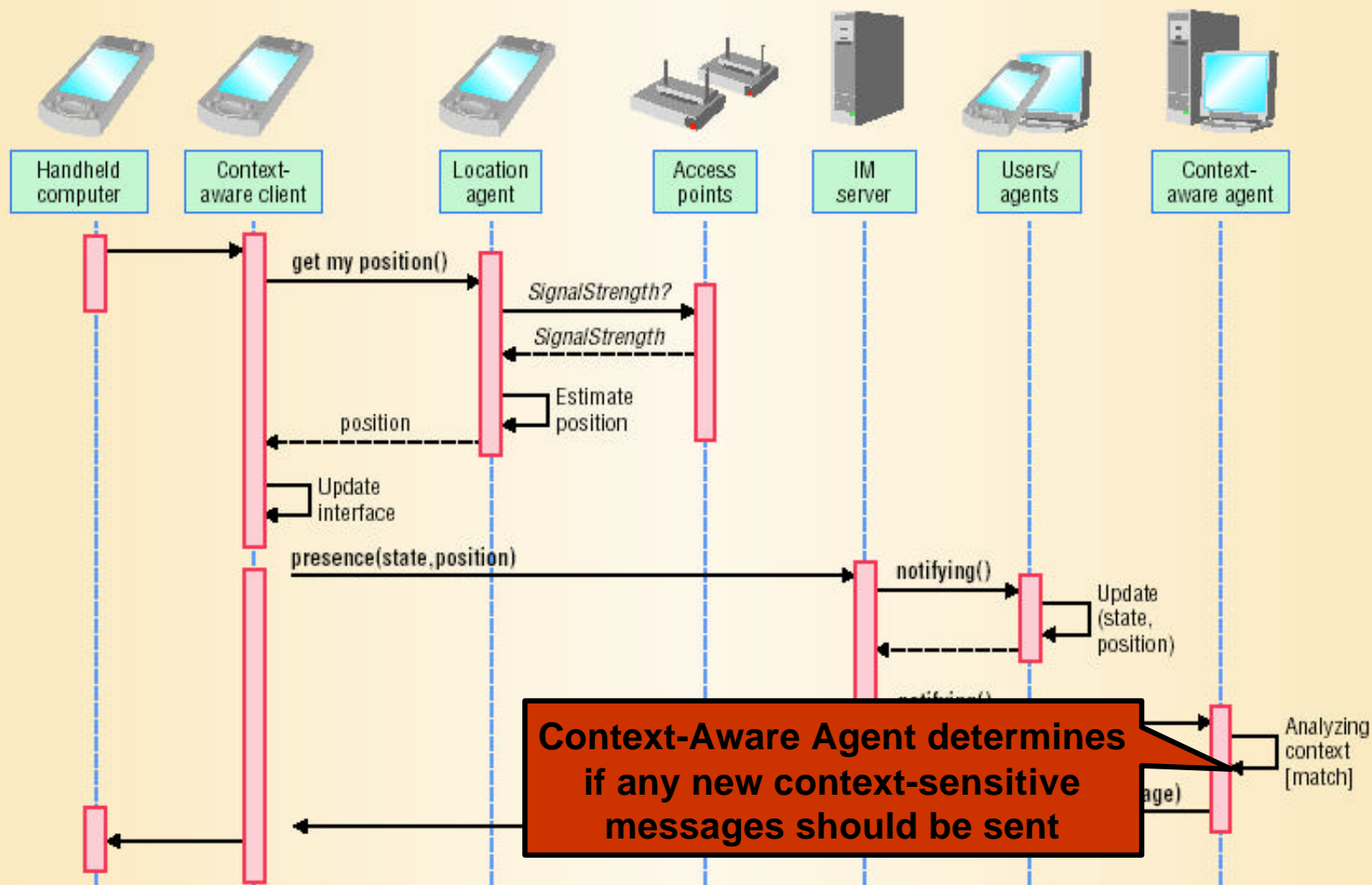
Process – Messages



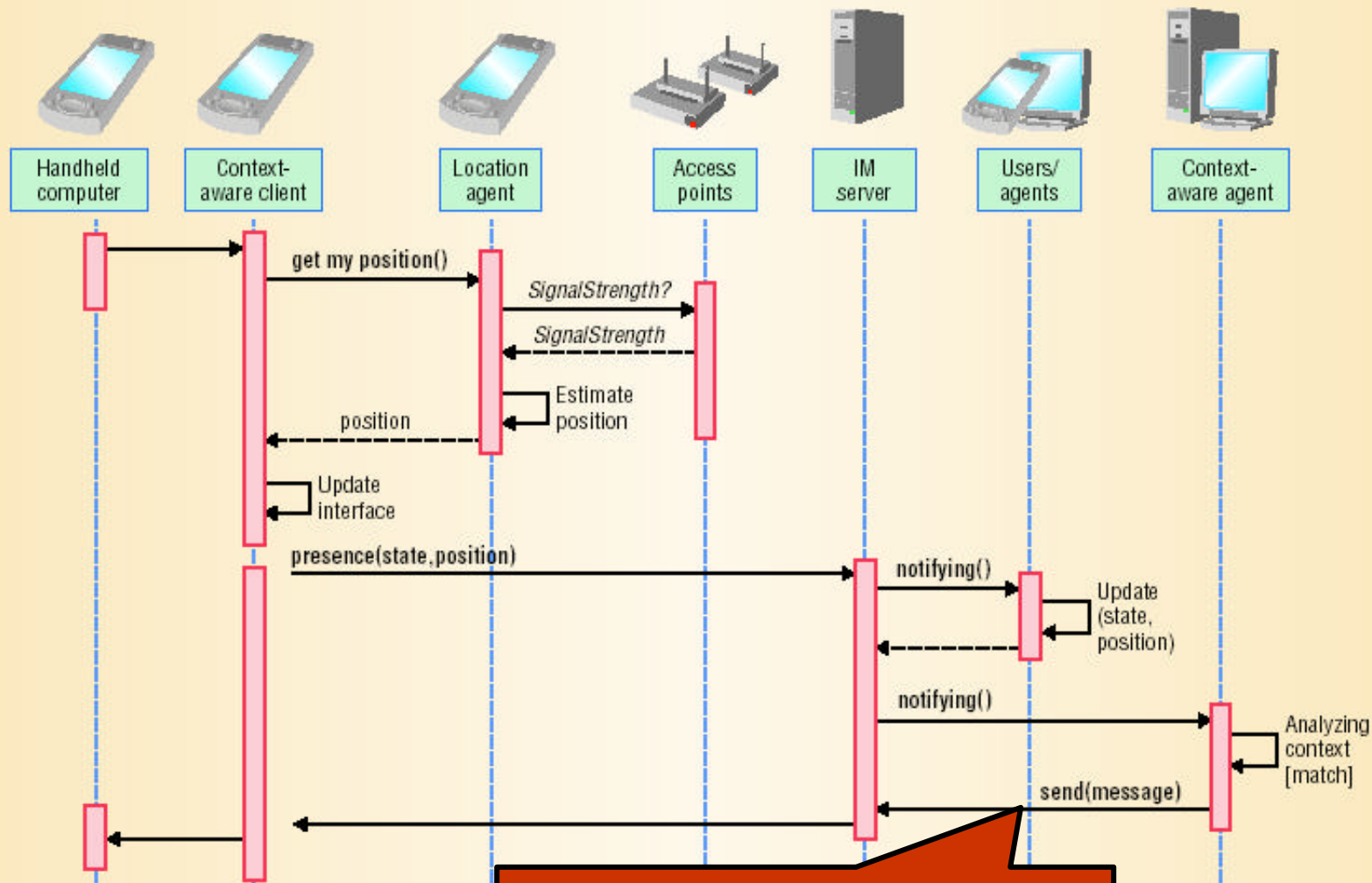
Process – Messages



Process – Messages

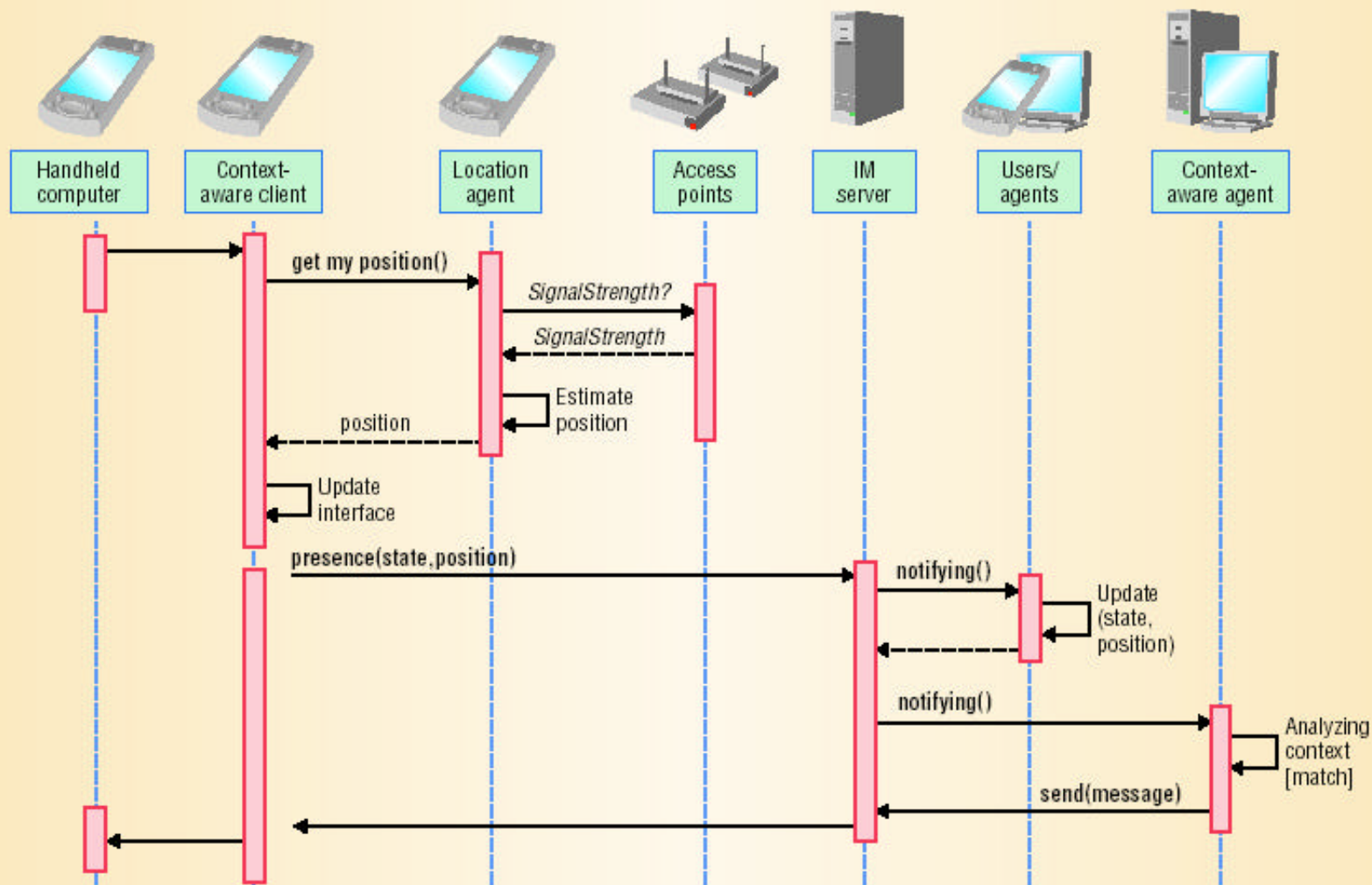


Process – Messages



If there are context-sensitive messages, they are sent via the IM Server to the user

Process – Messages



Evaluation

- Tested at a public hospital
 - Methods:
 - Observations
 - Interviews
 - Analysis
 - NO actual field use
 - Users:
 - 28 hospital members

Table 1. Results of a questionnaire measuring user acceptance of scenarios and the system's context-aware features.

	Strongly Disagree	Disagree	Slightly Disagree	Neither	Slightly Agree	Agree	Strongly Agree
It is useful to know who is in the hospital and where they are in relation to me	1	0	0	0	0	7	20
It is useful to send messages that depend on context for their delivery	1	0	0	0	1	7	19
It is useful to have access to the patient's medical records through a handheld computer	1	0	0	0	0	8	19
Receiving messages can distract me from my daily work*	9	9	2	3	3	0	1

*One person did not respond to this question.

Results

- 91% would use the system
- 84% believe it would enhance their job performance
- 78% perceived it easy to use
- No actual field use to test if it actually work
- No analysis to determine if technology is capable of handling the requirements
- No mention of battery life concerns
- No discussion of fault tolerance & reliability

Questions?

My thoughts

- Major contributions:
 - Shows how context-aware systems can be applied to specific areas to solve problems
 - Good extensions of IM paradigm
- Likes:
 - Good user interfaces
 - Extensive study *before* designing system
 - Well-written and easy to read
 - Very nice diagrams
 - Appropriate solution for the problem
- Dislikes:
 - Only simulations performed
 - Missing discussion of system's faults
 - Some parts (like Agent Directory) poorly explained
 - Sequence diagrams were not explained at all
 - Evaluation details were a bit sketchy