Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: [PAC Service and Requirements Corresponding to Call for Application]
Date Submitted: [13 May 2012]
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Re: [.]

Abstract: [Service and requirements for Peer Aware Communication (PAC)]

Purpose: [To discuss PAC service and requirements corresponding to call for application]

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PAC
Service and Requirements

May 14, 2012

Samsung

Characteristics of Use Cases

Category	Data Rate	Range	Latency	Robustness
Game	Medium	Short	Low	Low ~ Medium
SNS	Medium	Long	Medium	Low
Advertisement	Medium ~ High	Short ~ Medium	Low	Low
Convergence (CE connectivity)	Medium ~ High	Short	High	Low ~ Medium
Public safety	Low	Long	Medium ~ High	High

Service Requirements

Service Class	Applications	Data Rate	Delay (Interactivity)	BER
Multimedia services	VoIP [2)]	8 - 64kbps	conversational (100-200ms)	10^{-4} [5)]
	N-Screen video Streaming[1)]	Up to 5 Mbps	few seconds (>200ms)	10^{-6}~10^{-9}
	Personal contents [1)]	2-5Mbps	conversational (100-200ms)	10^{-3} ~10^{-6}
Data service	File Sharing[1)]	Up to 5 Mbps	few seconds (>200ms)	10^{-6}
Interactive services	Video games [4)]	64-512kbps	conversational (100-200ms)	10^{-3} - 10^{-6}
Proximity services	SNS[1)]	8-512Kbps	few seconds (>200ms)	10^{-6} - 10^{-9}
	Advertisement[1)]	8-512Kbps	few seconds (>200ms)	10^{-6} - 10^{-9}
	Queue (Interactive)[1)]	64-512kbps	conversational (100-200ms)	10^{-6}
Public safety services	Unicast Service [3)]	64 - 512Kbps (option: 1Mbps)	conversational (100-200ms)	10^{-6}
	MS relay at emergency [3)]	64 - 512Kbps (option: 1Mbps)	interactive / control (20 – 100 ms)	10^{-6} – 10^{-9}
	Broadcast at emergency [3)]	64 - 512Kbps (option: 1Mbps)	few seconds (>200ms)	10^{-3} – 10^{-6}
CE device control services	Remote Control [2)]	8- 64Kbps	interactive / control (20 – 100 ms)	10^{-3} – 10^{-6}
	Monitoring & repairing(water, gas)[2)]	8- 64Kbps	interactive / control (20 – 100 ms)	10^{-3} – 10^{-6}

1. IST-4-027756 WINNER II D6.11.2 v1.0 Key Scenarios and Implications (WINNER II)
2. D1.1 Scenarios and Requirements Specification (Seventh Framework Program)
3. Radio communication objectives and requirements for public protection and disaster relief ITU-R M.2033
4. HyoJoo Park, TaeYong Kim, and SaJoong Kim "Network Traffic Analysis and Modeling for Games" in proc. WINE 2005.
5. “Functional Requirements for the 802.16.3 Interoperability Standard”, IEEE 802.16.3-00/02r4, September 22, 2000.

Functional Requirements

- **Protocol**
  - PHY/MAC/Link layer
  - Network layer support : open
  - Application layer support
- **Scalable system**
  - Easily adapt to increased devices with minimum configuration change
- **QoS support**
  - Best effort service:
    - instant messaging, file sharing
  - Near real time:
    - video and audio streaming, multiplayer gaming, proximity based service
  - Real time service :
    - VoIP
- **Decentralized operation**
  - No centralized controller
  - Operation based on mutual interaction
- **Synchronous operation**
  - Periodic wake up and sleep operation for low power consumption
  - Efficient resource management
- **Security**
  - Authentication

Desired Features

PHY

- Duplex
  - TDD
- OFDM Modulation
- Bandwidth
  - 1.25, 5, 10, 20MHz
- Modulation
  - BPSK, QPSK, 16QAM, 64QAM
- Link Adaptation
  - Adaptive Coding Modulation
- Power control
  - Interference management
- Synchronization
  - Initial synchronization
  - Resynchronization

MAC

- Multiple access
  - TDMA
- Distributed operation
  - Scheduling
  - Interference management
- Identification
  - Device ID and Link ID
  - Multiple Link ID support
- Multi-hop
  - Discovery
  - Data transmission
- Security
  - Mutual authentication or
  - External authentication center

Performance Requirements

		Performance	Notes
Data rate	Peak spectral efficiency	Up to 3 bps/Hz	1tx Ant, 64QAM
	Areal spectral efficiency	X bps/Hz/km^2 (TBD)	Outdoor, indoor
Error rate	PER	10^{-4} ~ 10^{-2}	HARQ or ARQ
Latency	Link setup time	Less than 10ms	After discovery
Mobility	Stationary (no mobility) Pedestrian (up to 10 km/h) Vehicular (up to 100 km/h)	Best performance Best effort Support	
Data transmission range	~ 100m 100~500m 500m ~	Best performance Best effort Support	
Discovery	Capacity	hundreds of device/service	Scalable parameter
	Range	hundreds of meter	Single hop, Scalable
	Time	Less than 10s	

Guideline Documents

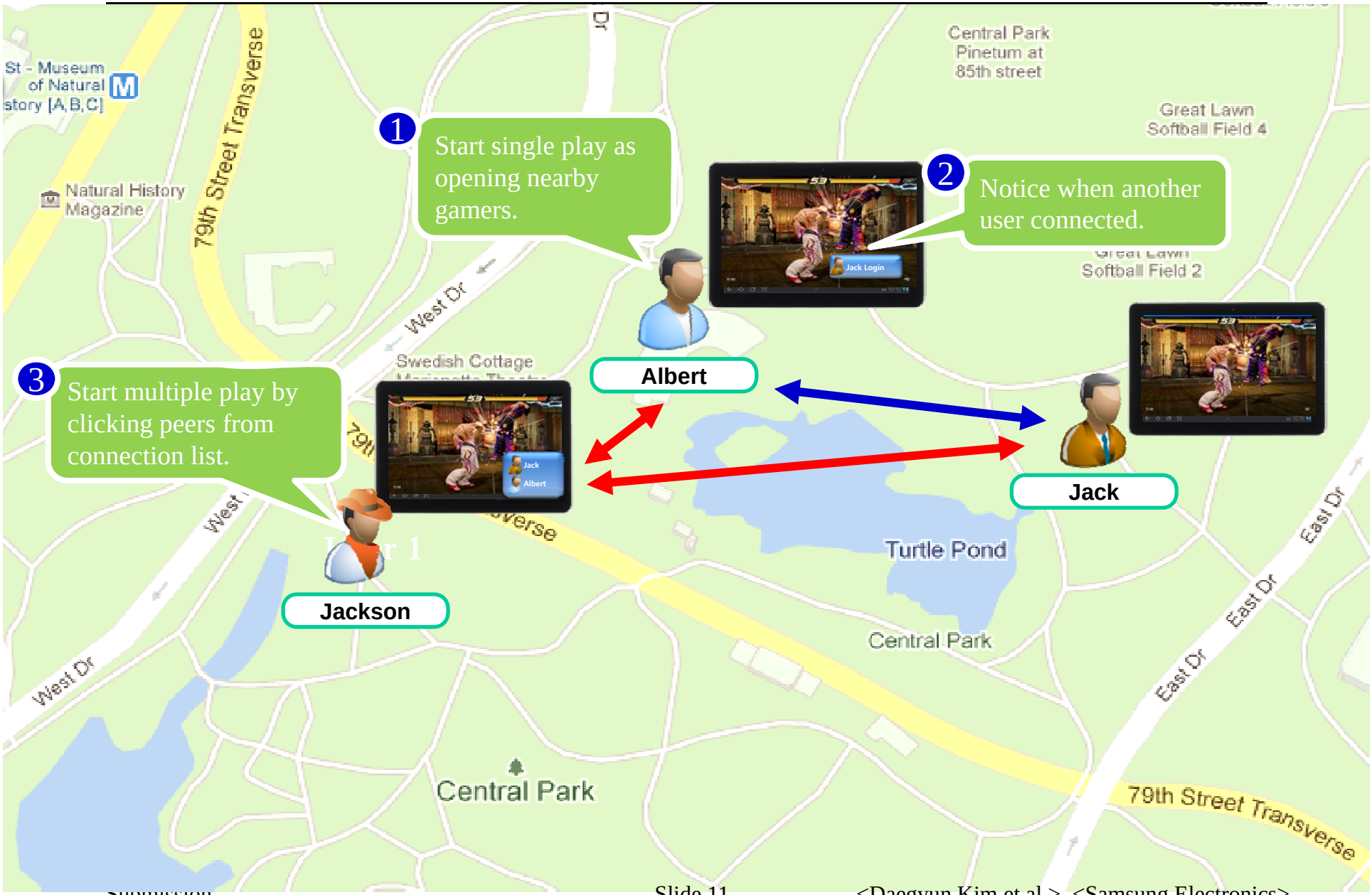
- **Application matrix**
- **Technical requirements document**
  - Operation frequency
  - QoS Class
  - Peak spectral efficiency, latency, BER/PER
  - Transmission range, mobility
  - Power consumption
  - Complexity, co-existence, etc.
- **Functional description document**
  - Operation procedure
  - Discovery information (user, application, device ID etc.)
- **Evaluation methodology & Channel model**
  - Areal spectral efficiency, delay, fairness etc.
  - Traffic model: full buffer, ftp traffic, voip, gaming
  - Indoor, outdoor, etc.

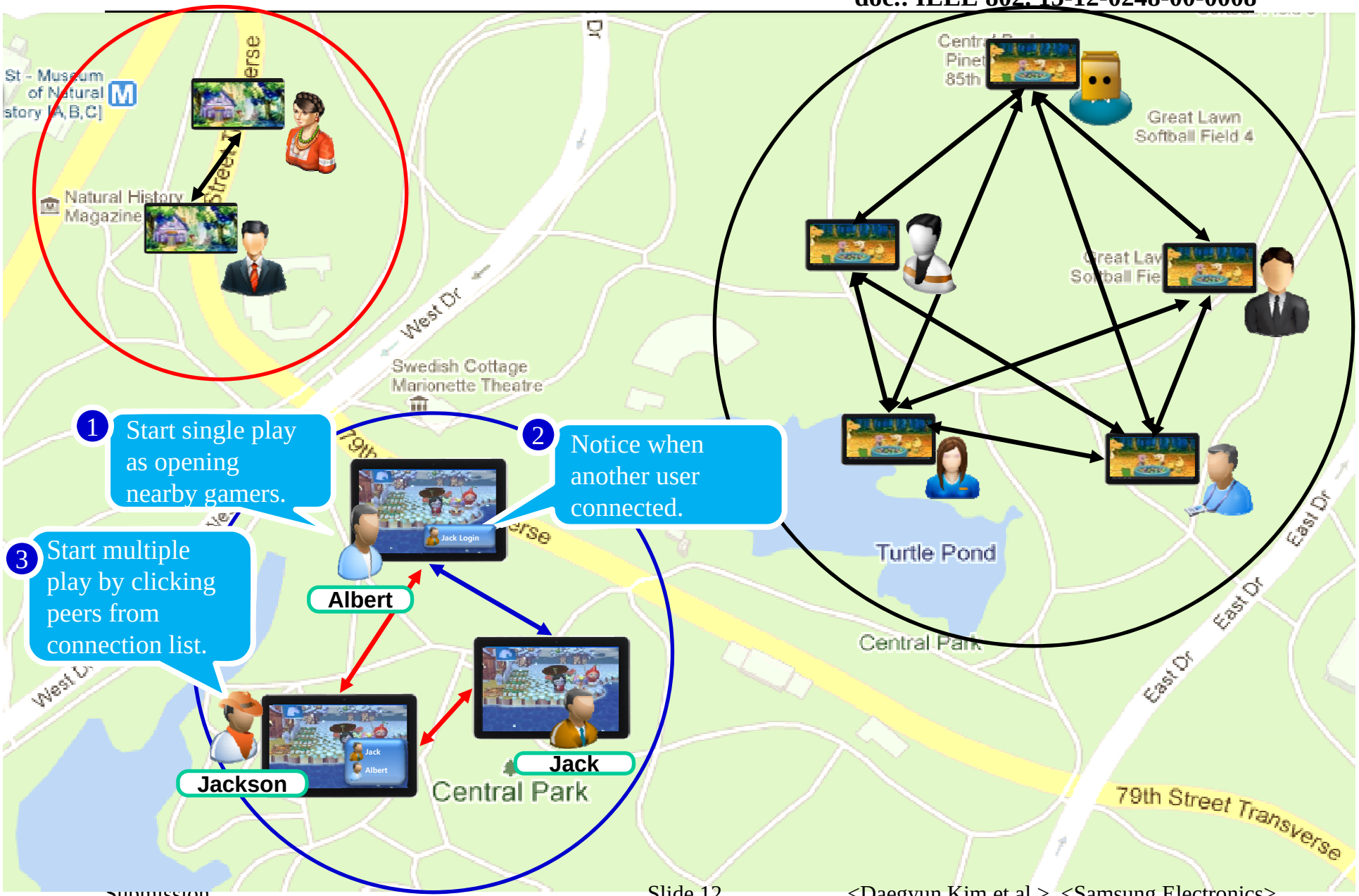
Schedule

- May 2012 ~ Nov 2012 : Guideline documents discussion
- Jan 2013 : Guideline documents approval
- Mar 2013 : Proposal submission
- Jul 2013 : Merger process
- Sep 2013 ~ Jan 2015 : Letter ballot
- Mar 2015 ~ Jul 2015 : Sponsor ballot
- Aug 2015 : RevCom submission

Appendix: Use cases

1. Gaming


1
Start single play as opening nearby gamers.
2
Notice when another user connected.
3
Start multiple play by clicking peers from connection list.
Albert
Jack
Jackson
Jack Login
Jack
Albert
Central Park
Pinetum at
85th street
Great Lawn
Softball Field 4
Softball Field 2
Natural History
Magazine
79th Street Transverse
West Dr
Swedish Cottage
Turtle Pond
Central Park
East Dr
79th Street Transverse


Natural History Magazine
Swedish Cottage Marionette Theatre
West Dr
79th
Great Lawn Softball Field 4
Turtle Pond
Central Park
East Dr
79th Street Transverse
1 Start single play as opening nearby gamers.
2 Notice when another user connected.
3 Start multiple play by clicking peers from connection list.
Albert
Jack
Jackson
Central Park

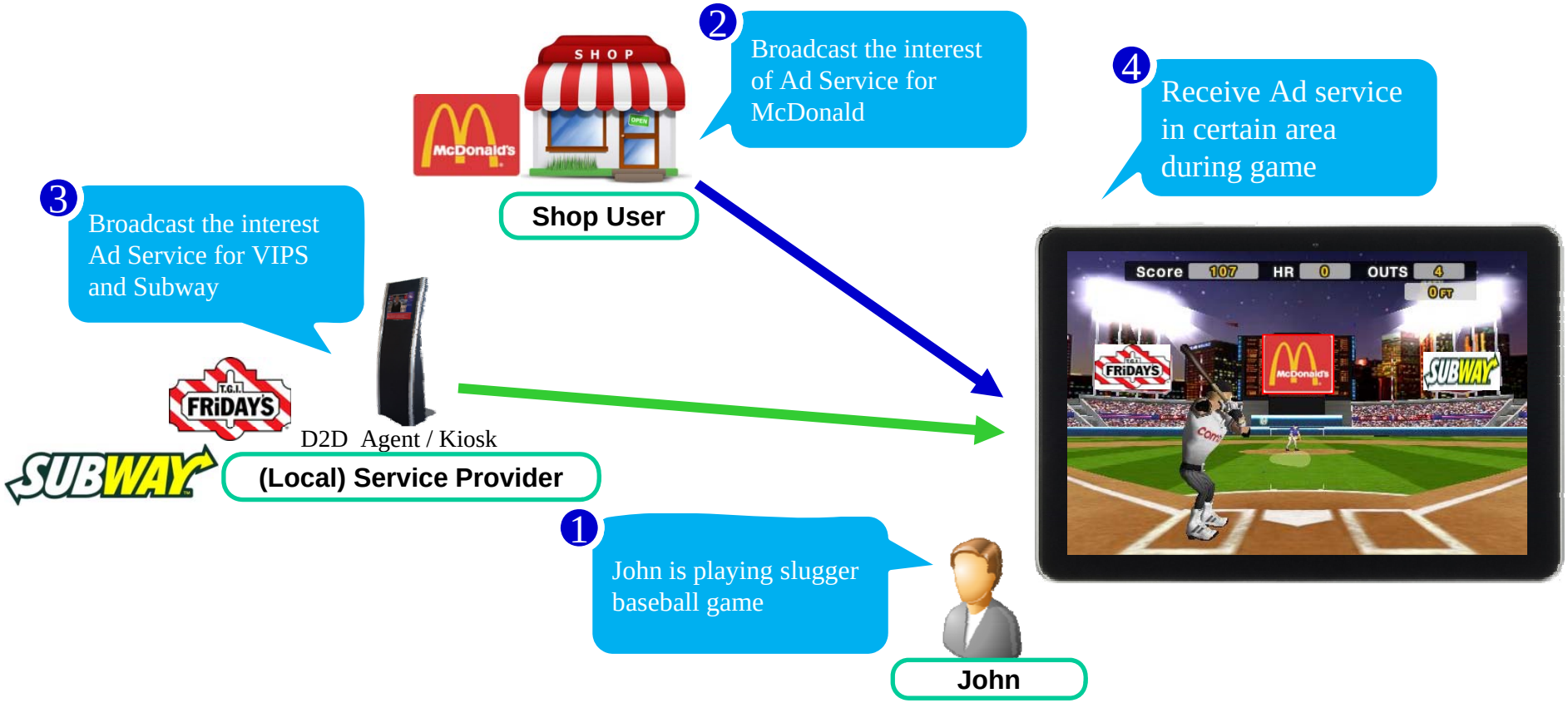
1. Gaming

Game with Ad Marketing

1. Gaming

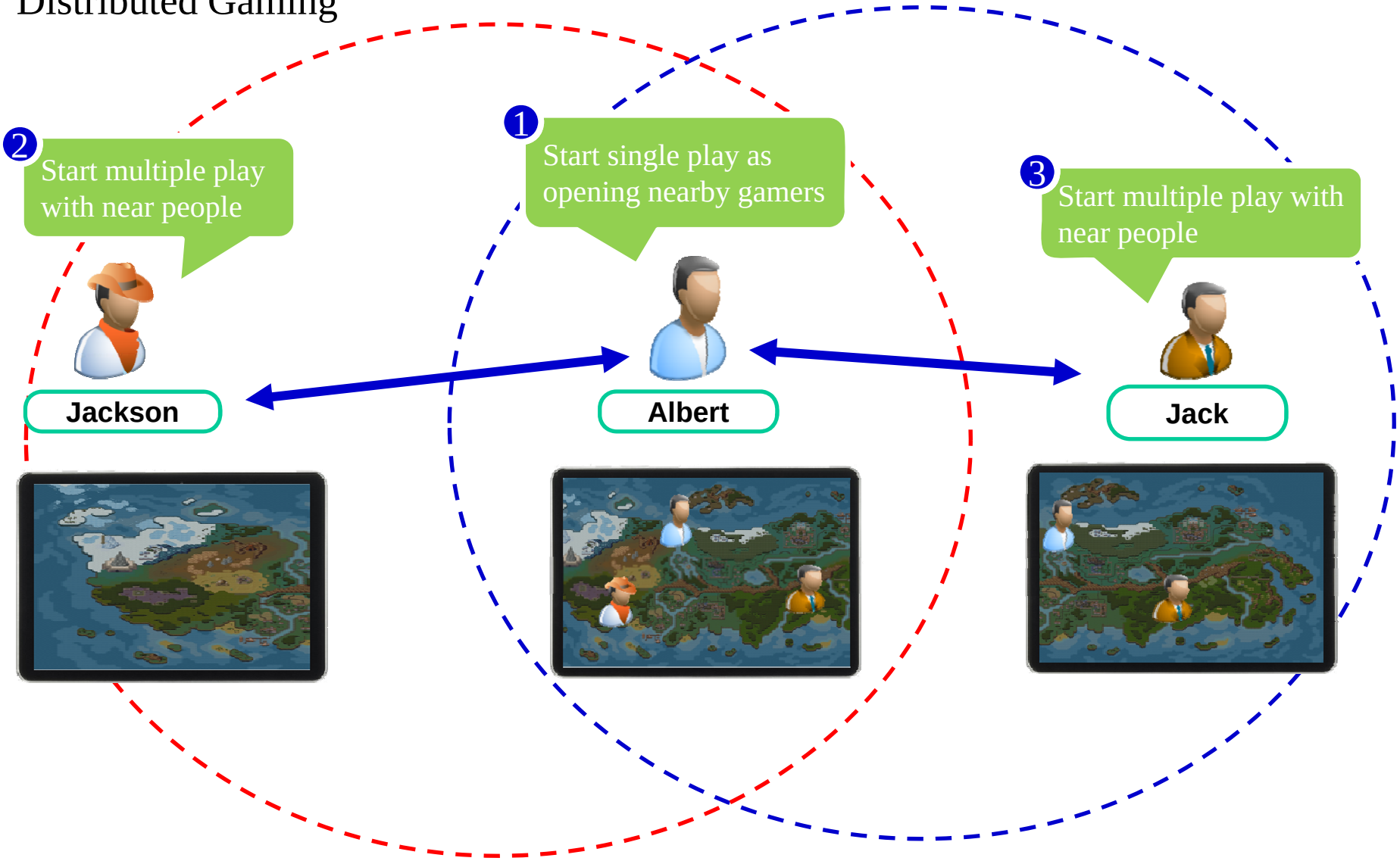
Game with Ad Marketing

PM 12:30



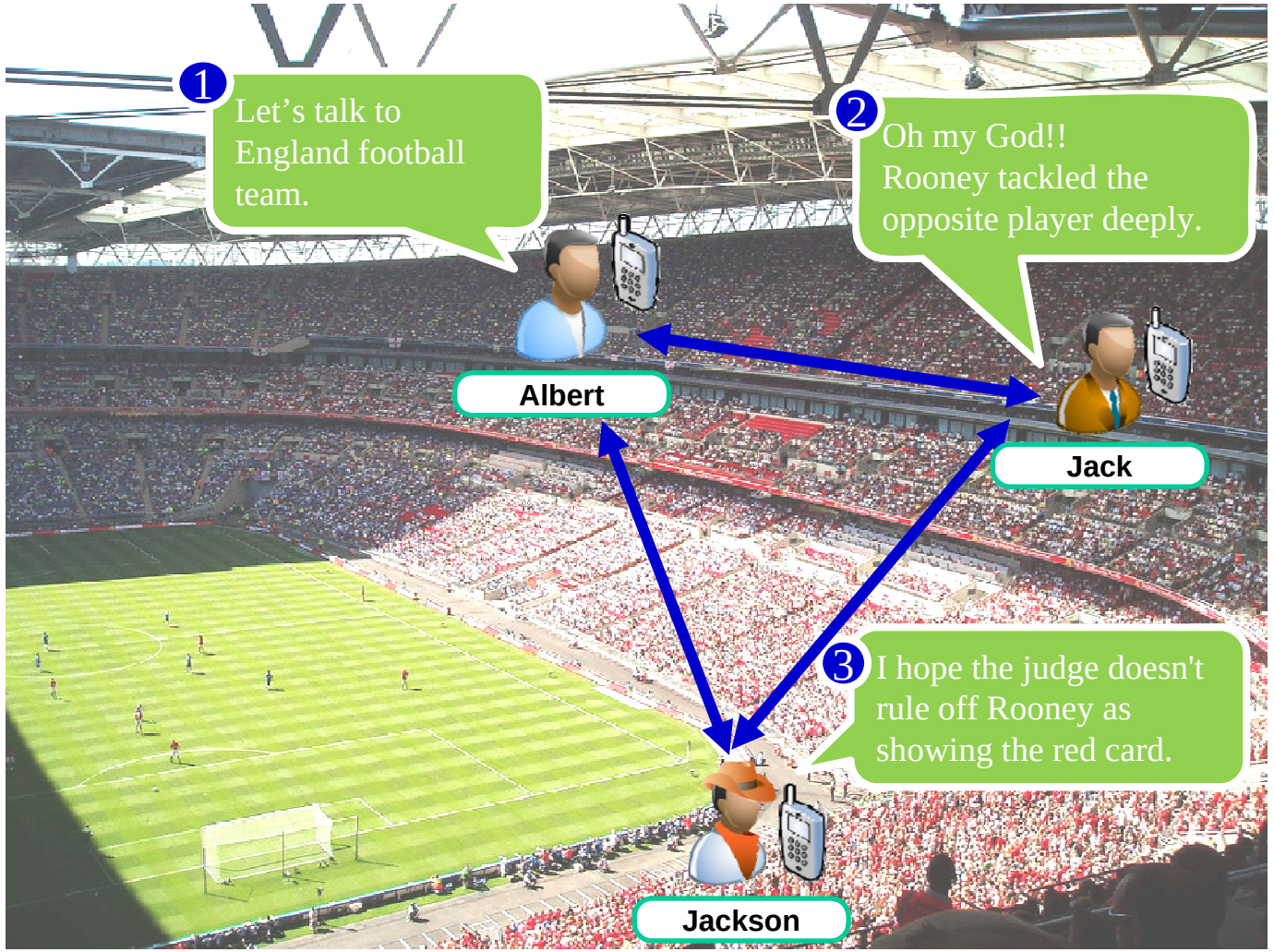
1. Gaming

Distributed Gaming



2. Social Networking

Push to Talk

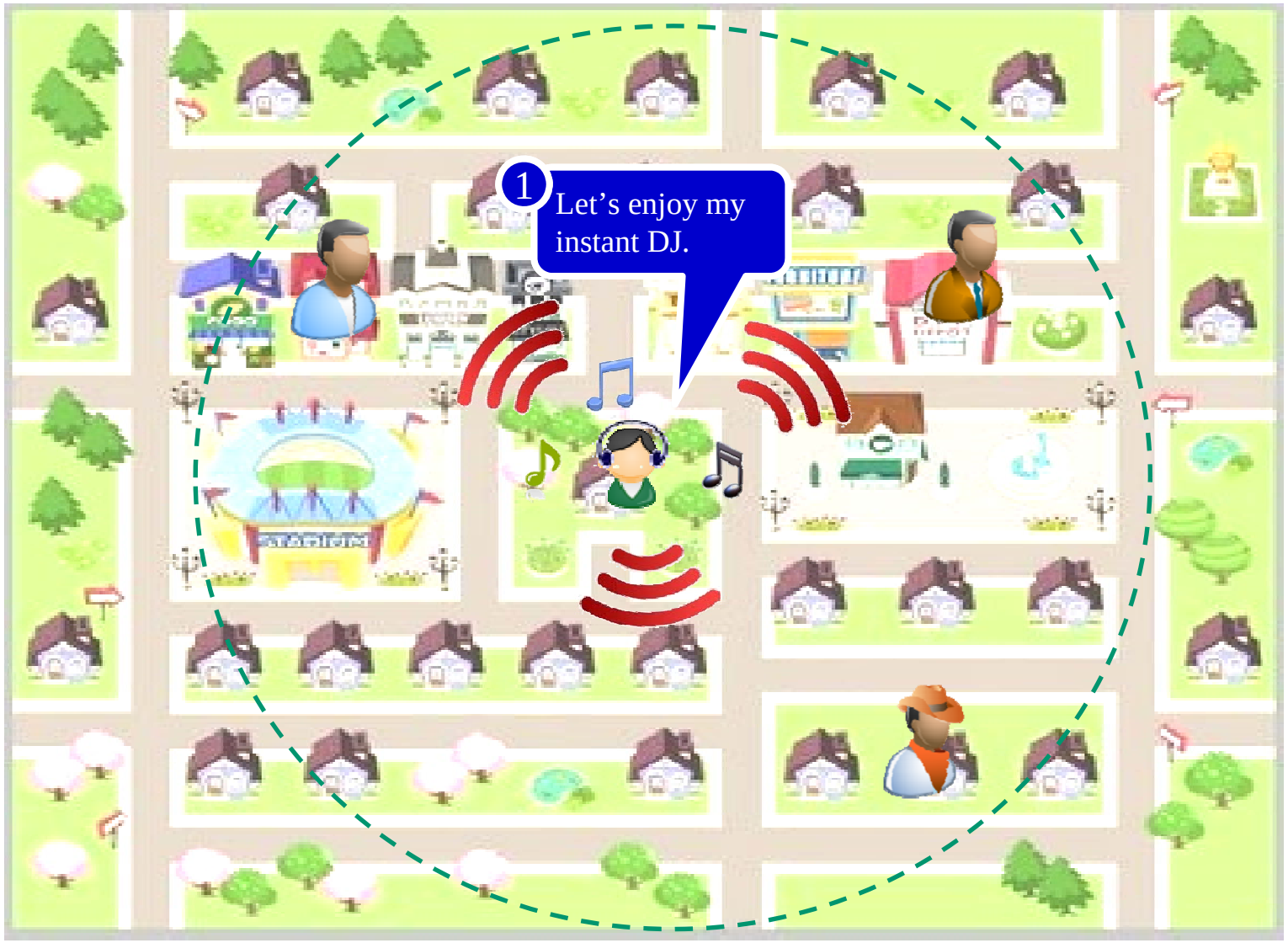


2. Social Networking

Personal Broadcasting

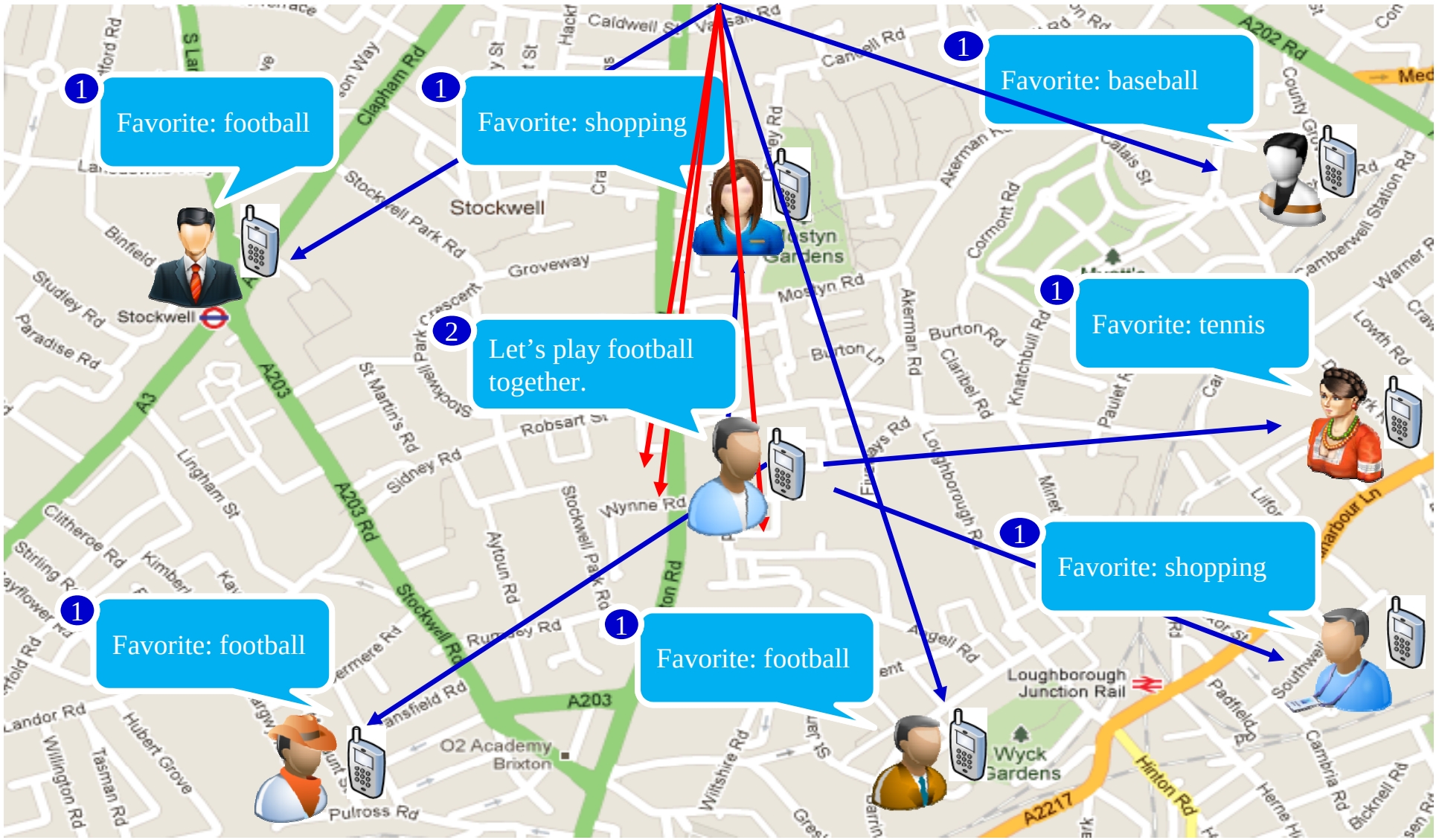
2. Social Networking

Instant DJ



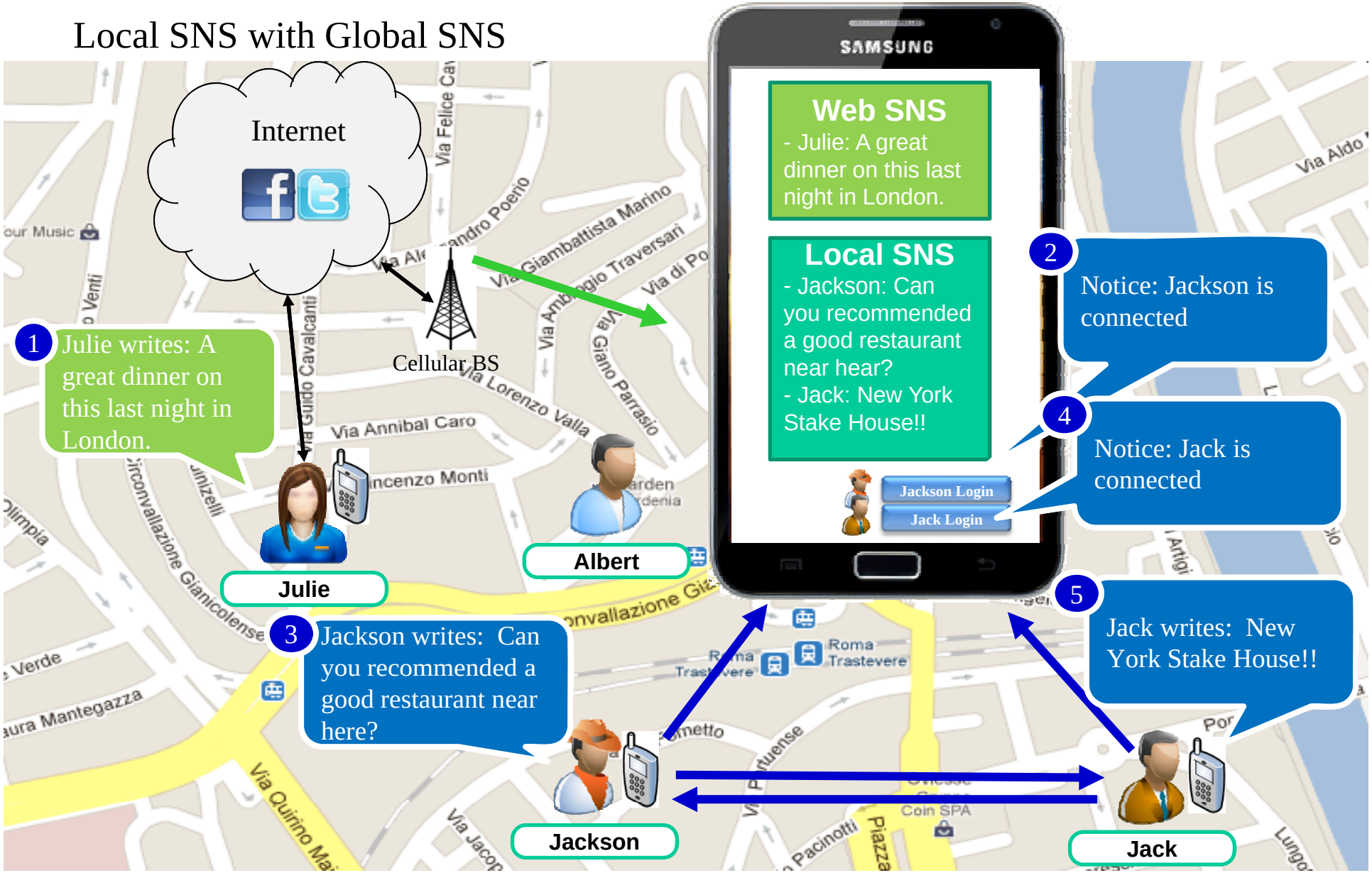
2. Social Networking

Profile Matching



2. Social Networking

Local SNS with Global SNS

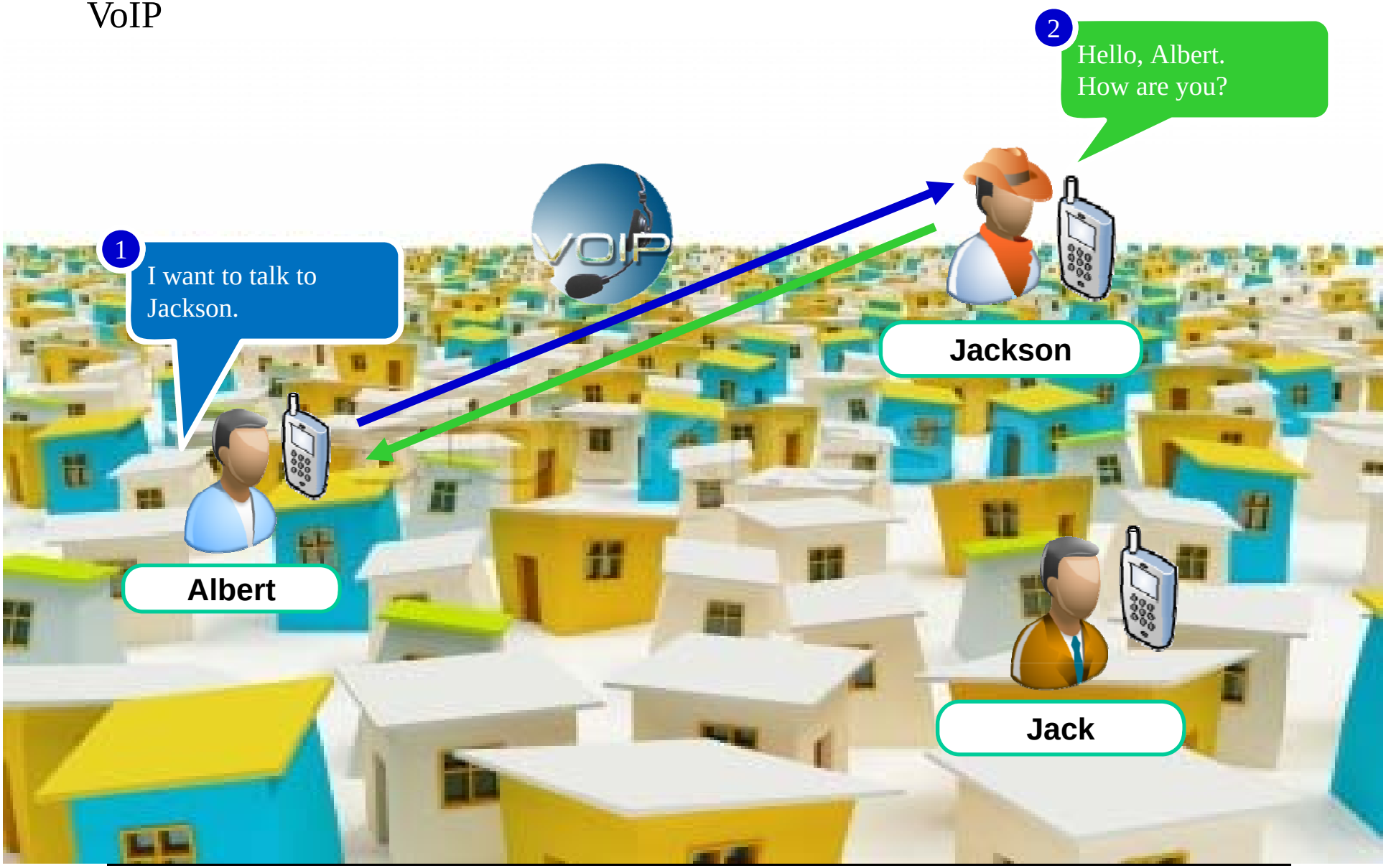


2. Social Networking

Real Time Local Twitting

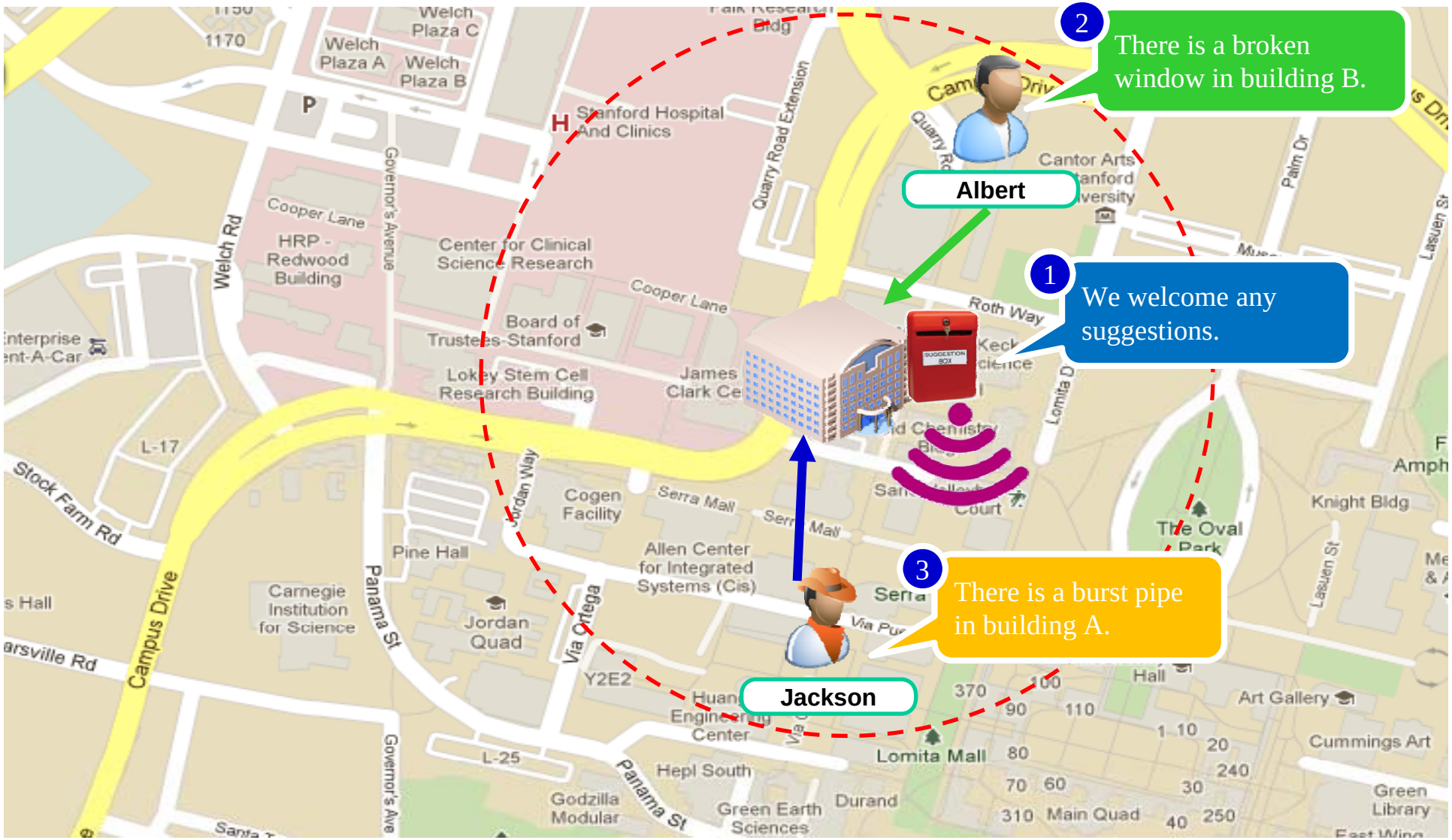
2. Social Networking

VoIP



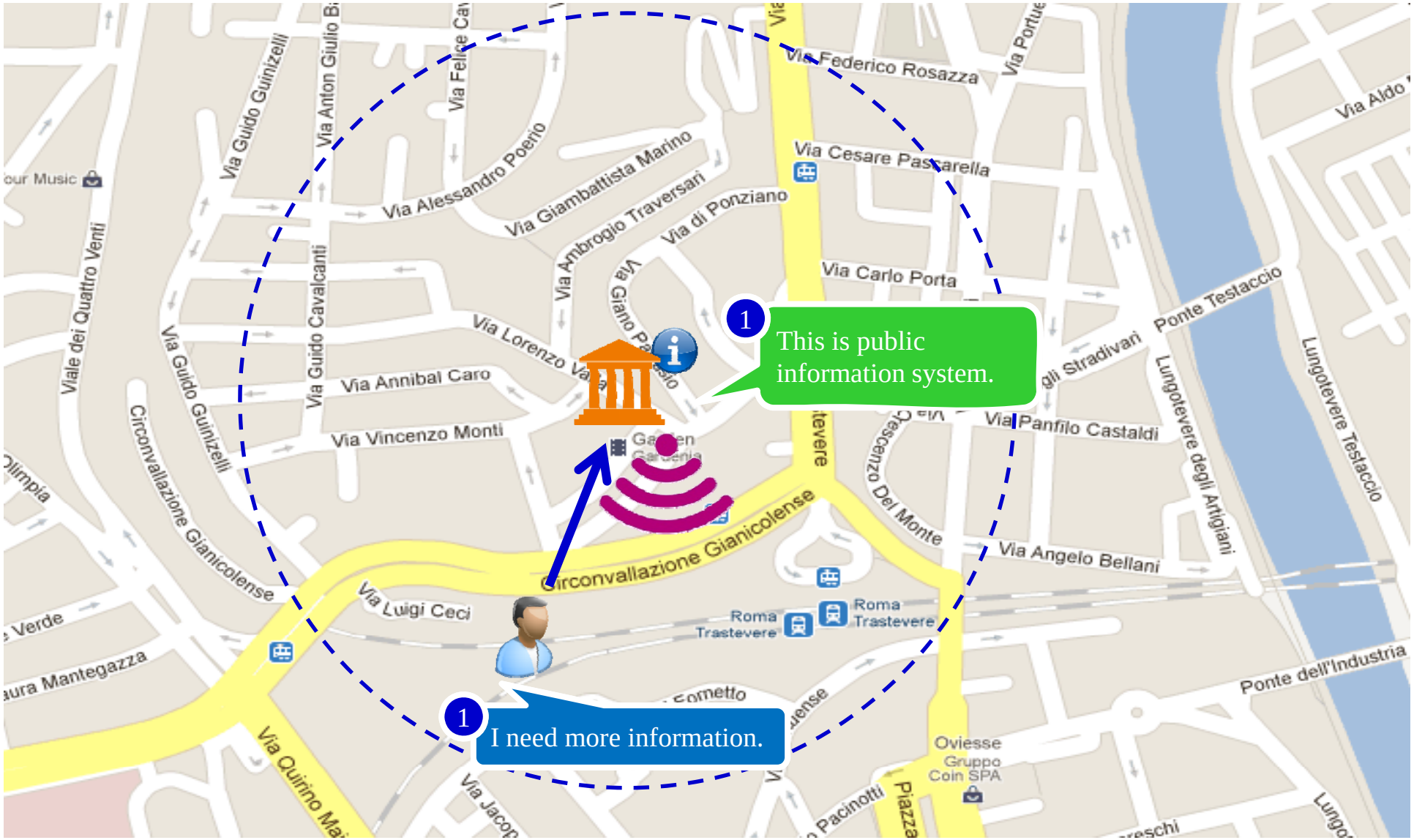
2. Social Networking

E-Suggestion Box



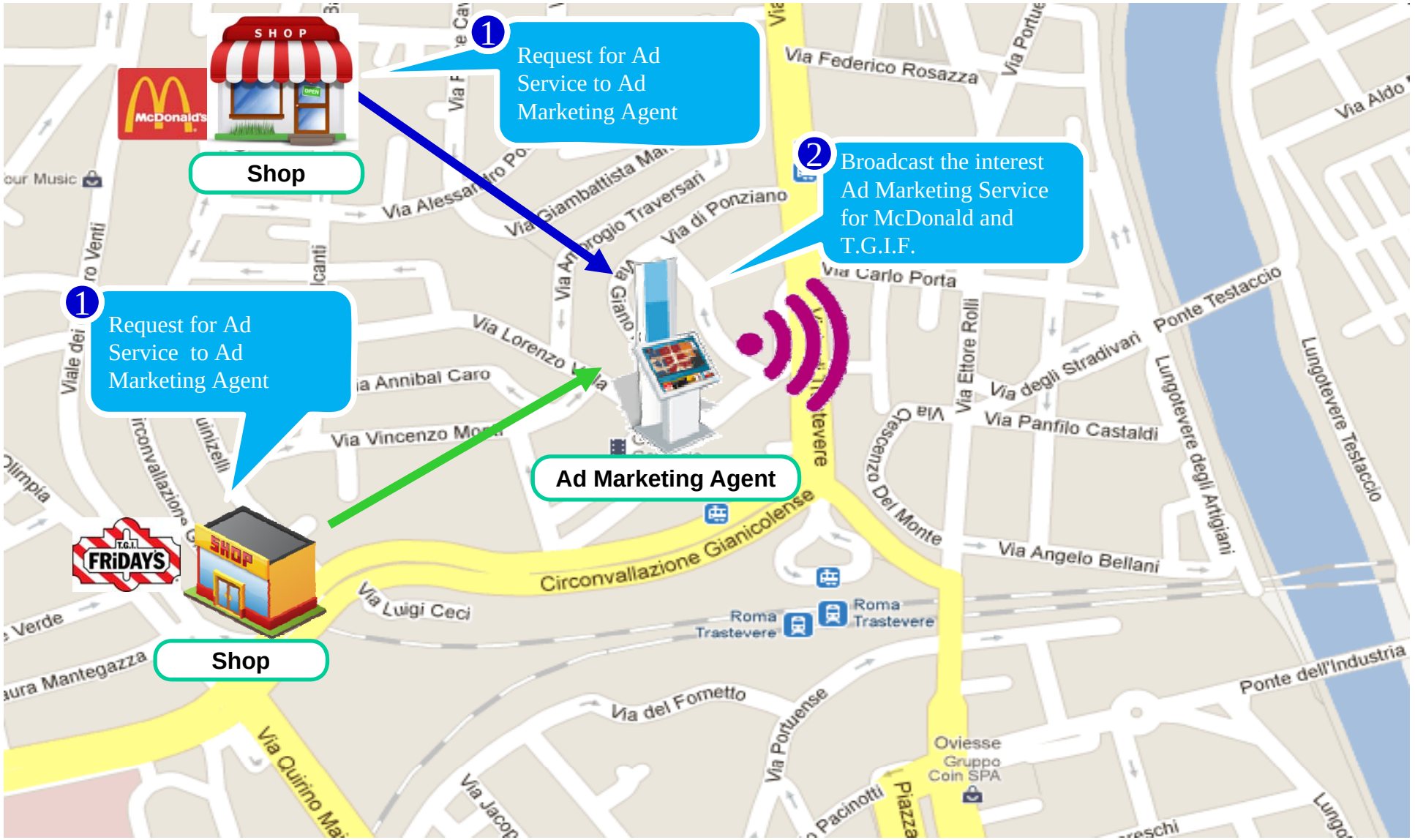
2. Social Networking

Public Information Service



3. Advertisement Marketing

Ad Marketing Agent

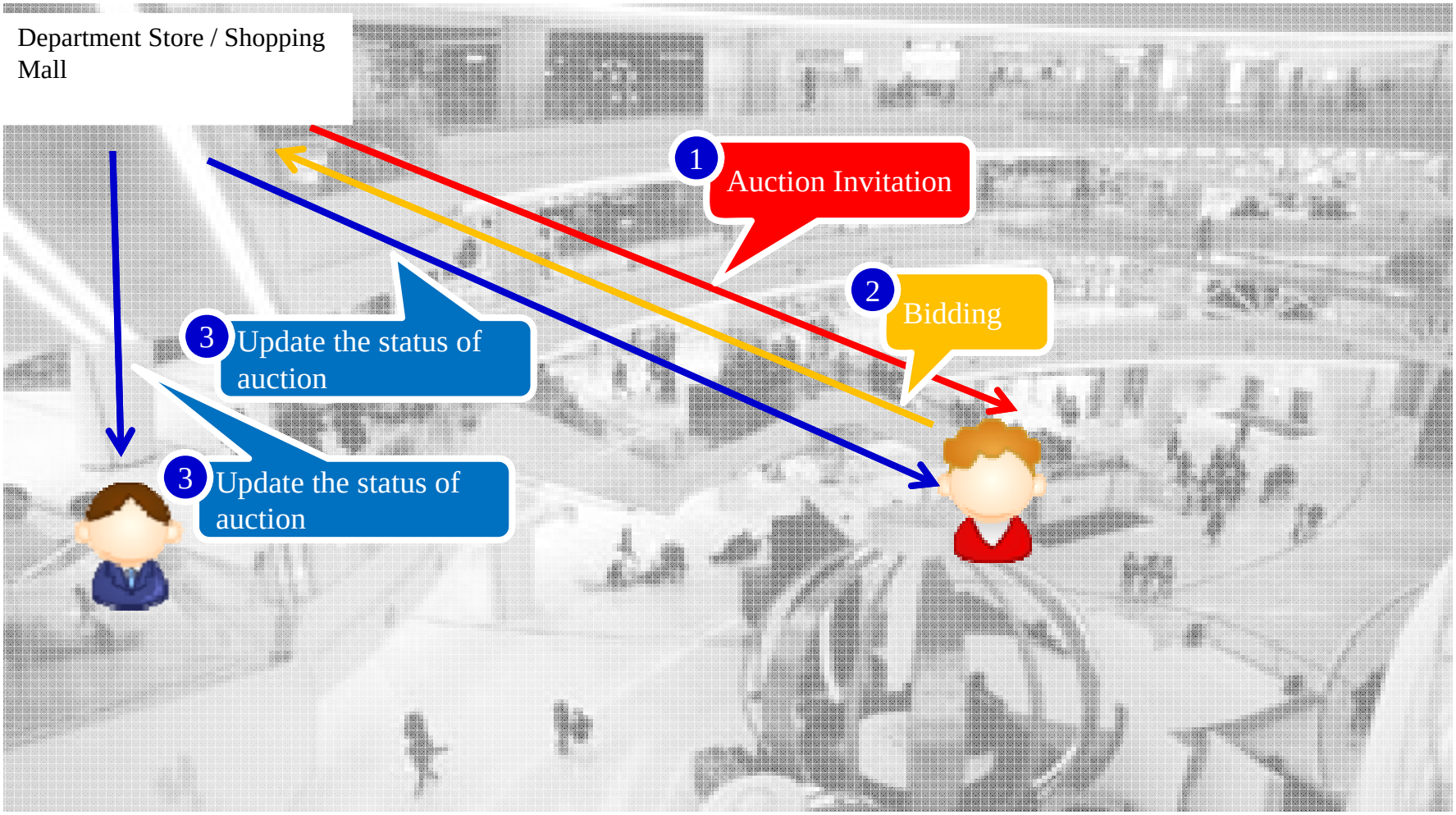


3. Advertisement Marketing

Ad Agent in Mobile Device

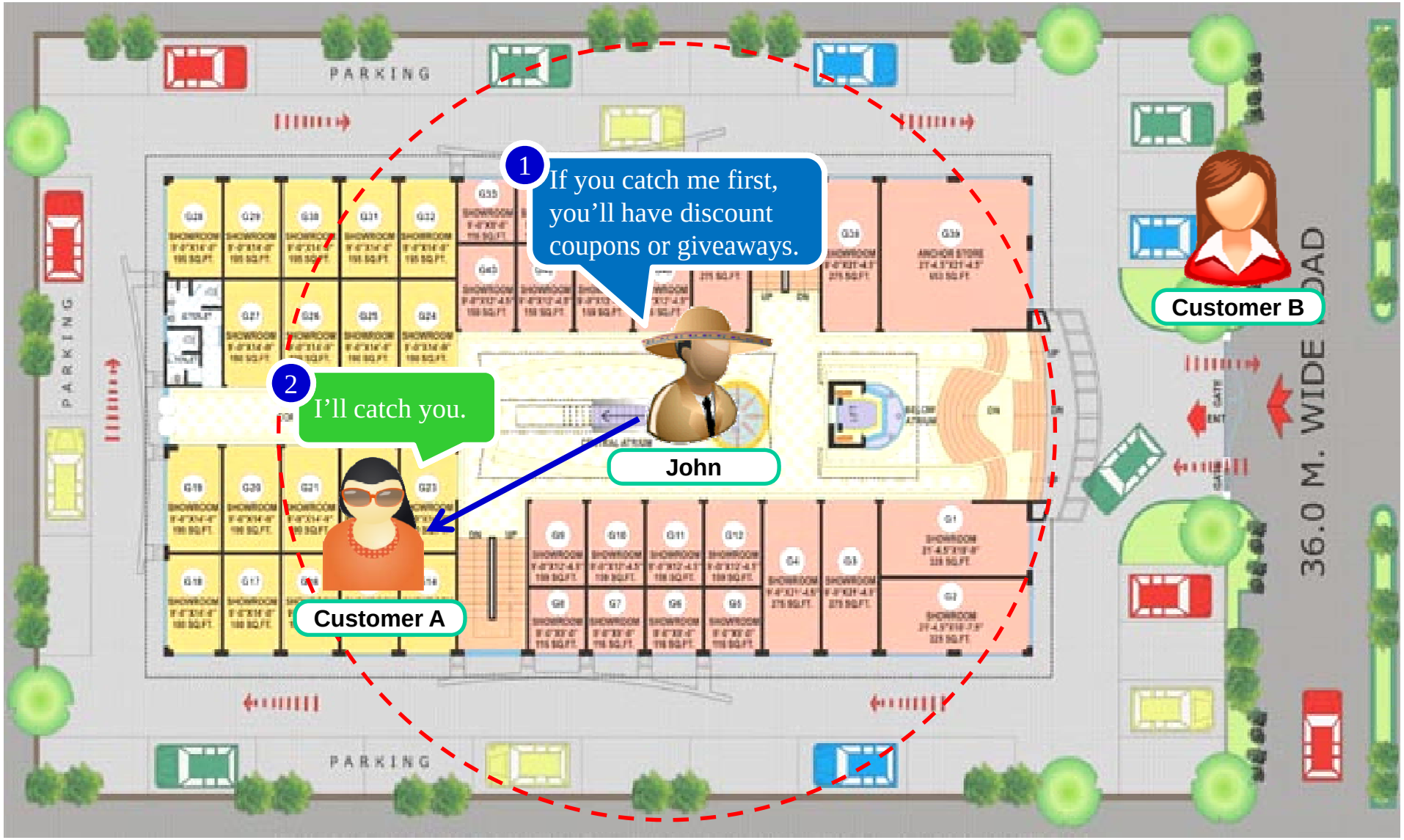
3. Advertisement Marketing

Auction



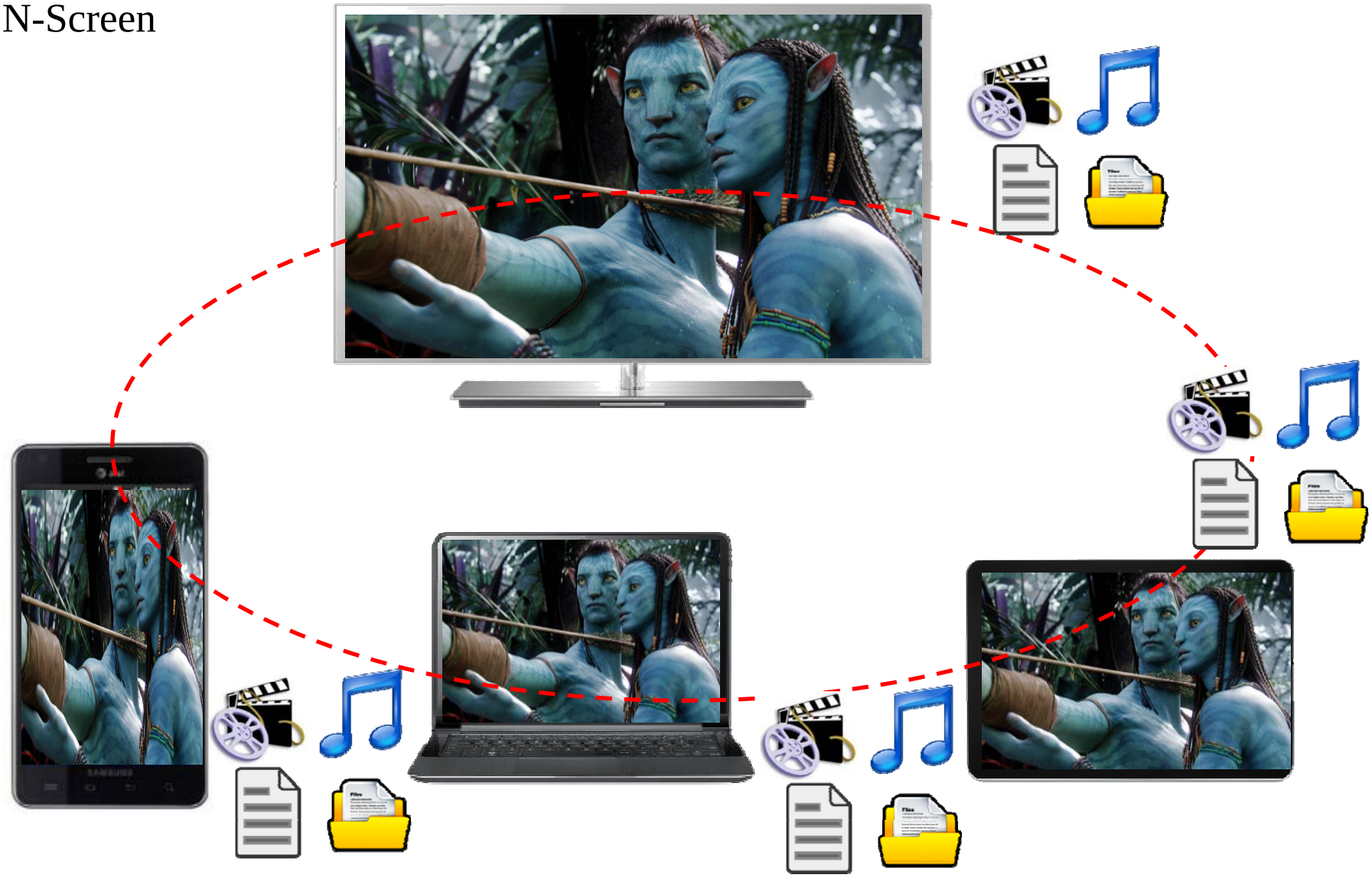
3. Advertisement Marketing

Hide and Seek in Market



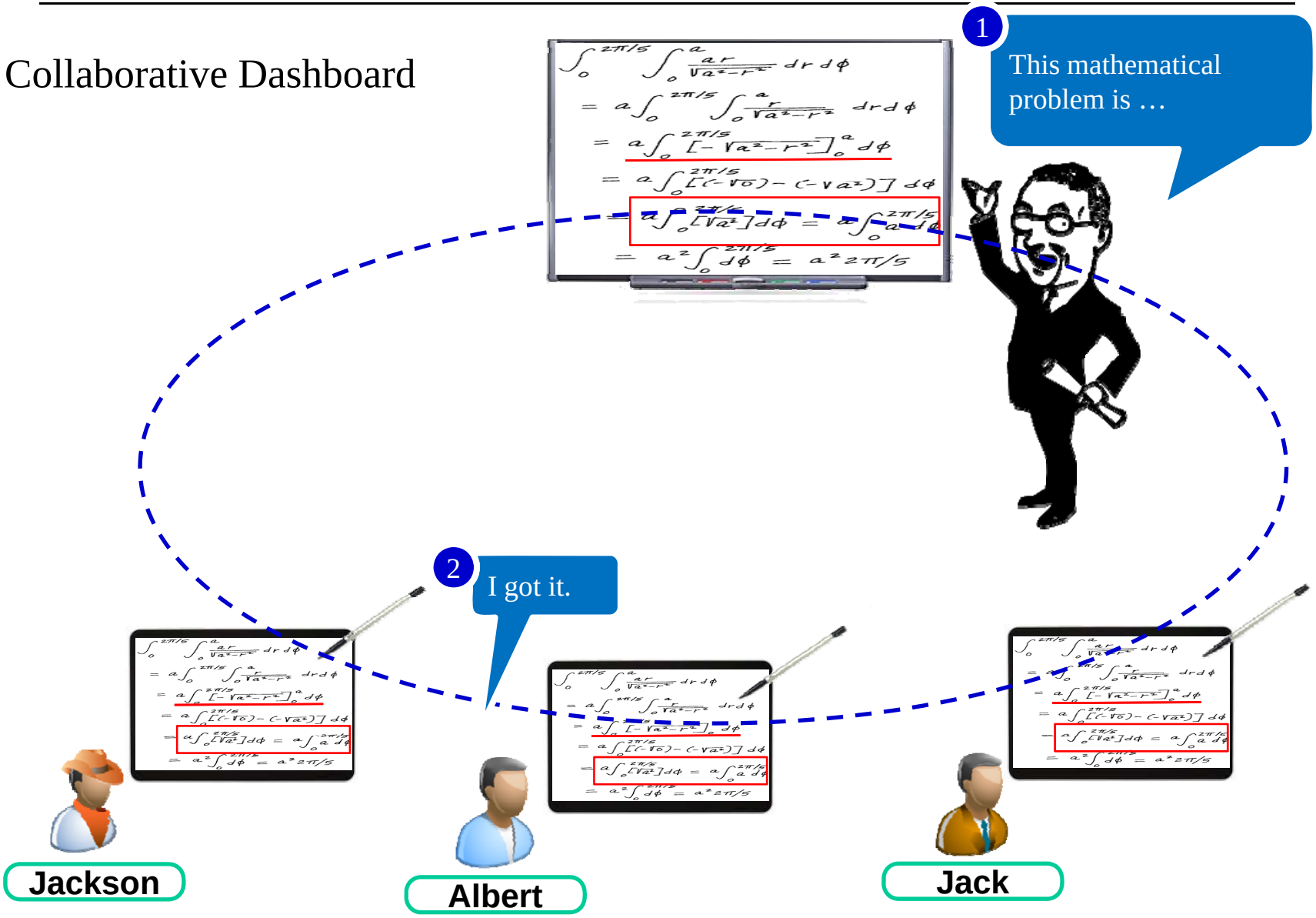
4. Convergence

N-Screen



4. Convergence

Collaborative Dashboard

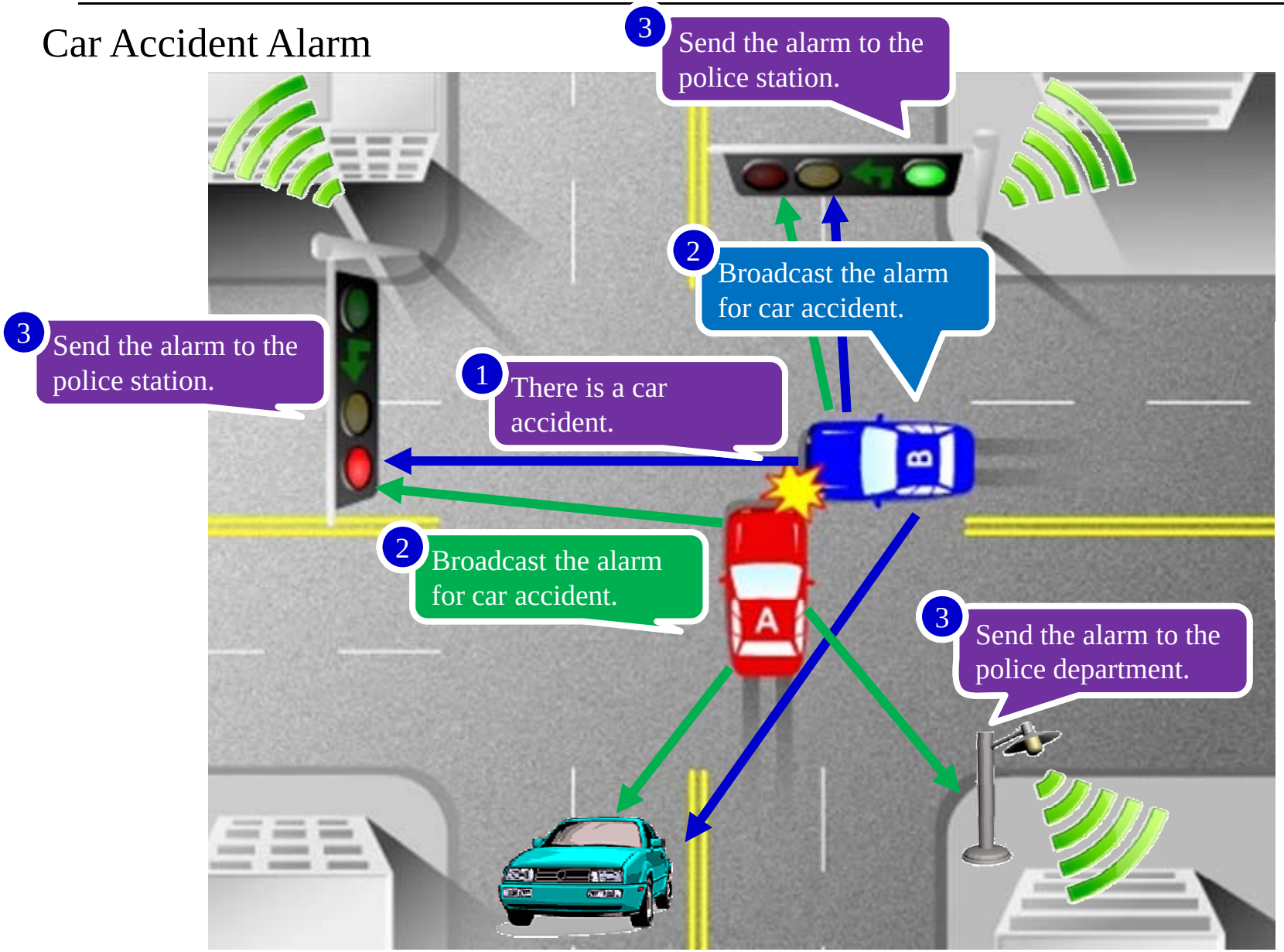


4. Convergence

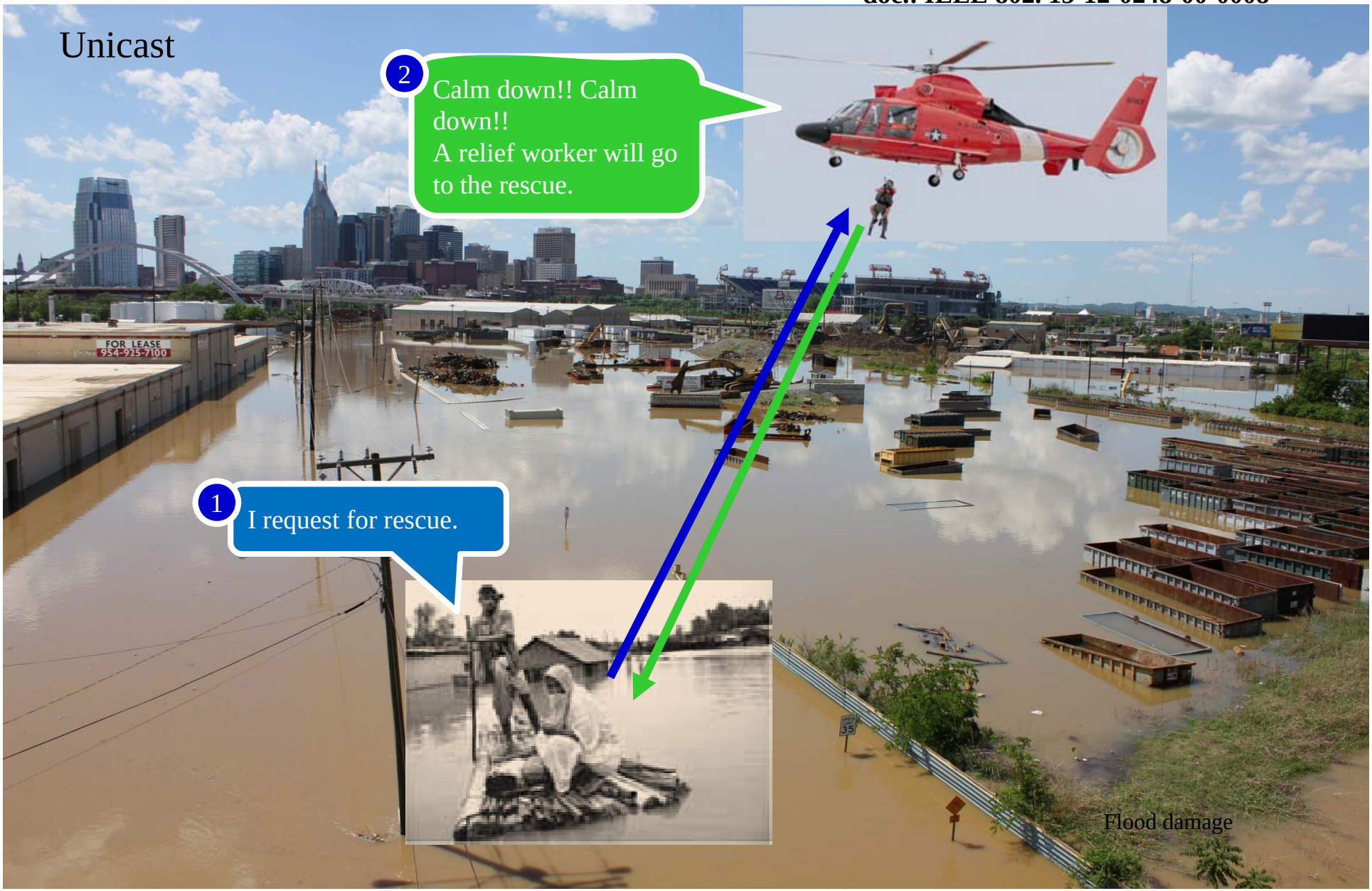
Multiple Streaming (1:N)

5. Public Safety

Car Accident Alarm

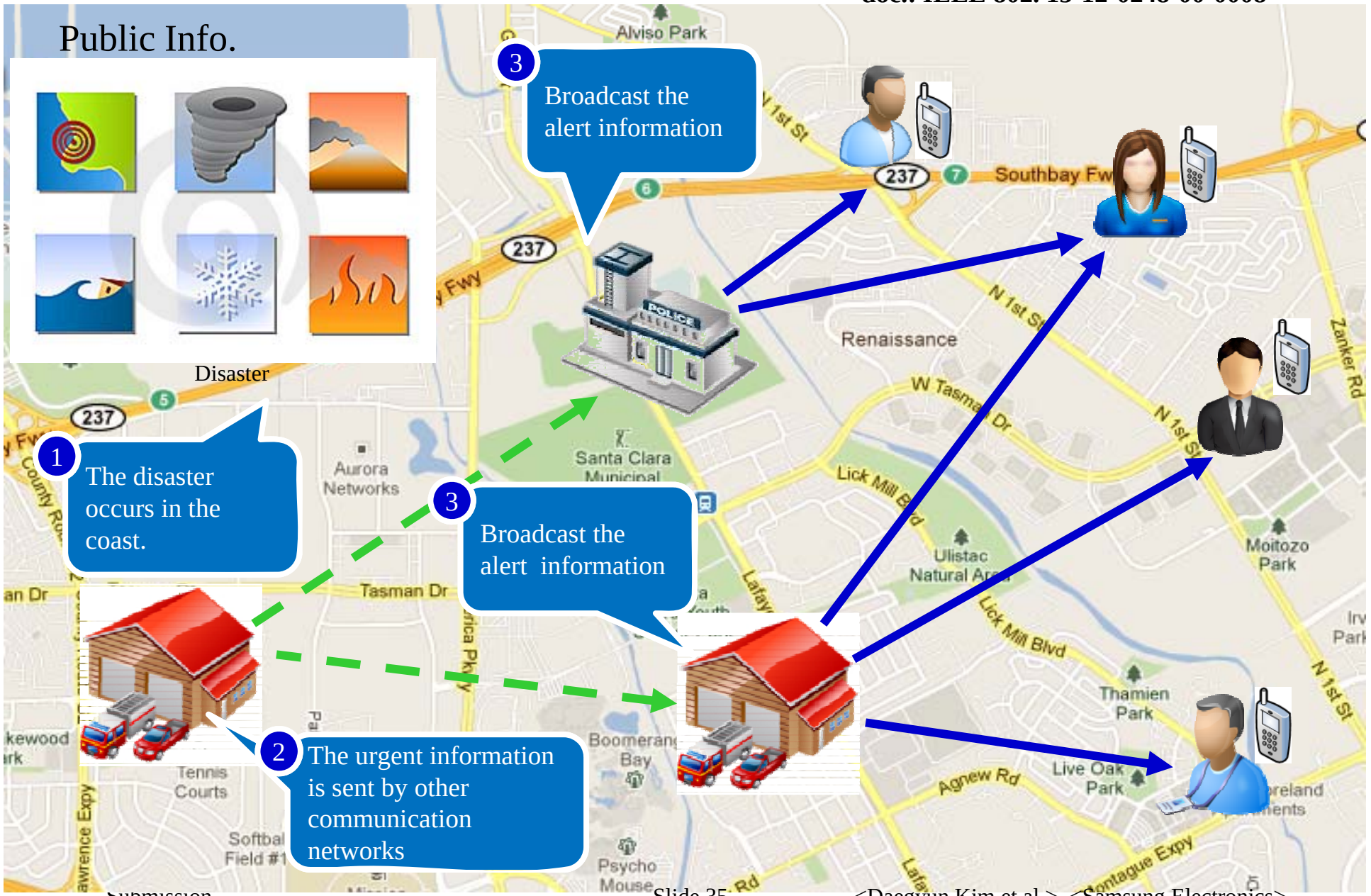


5. Public Safety



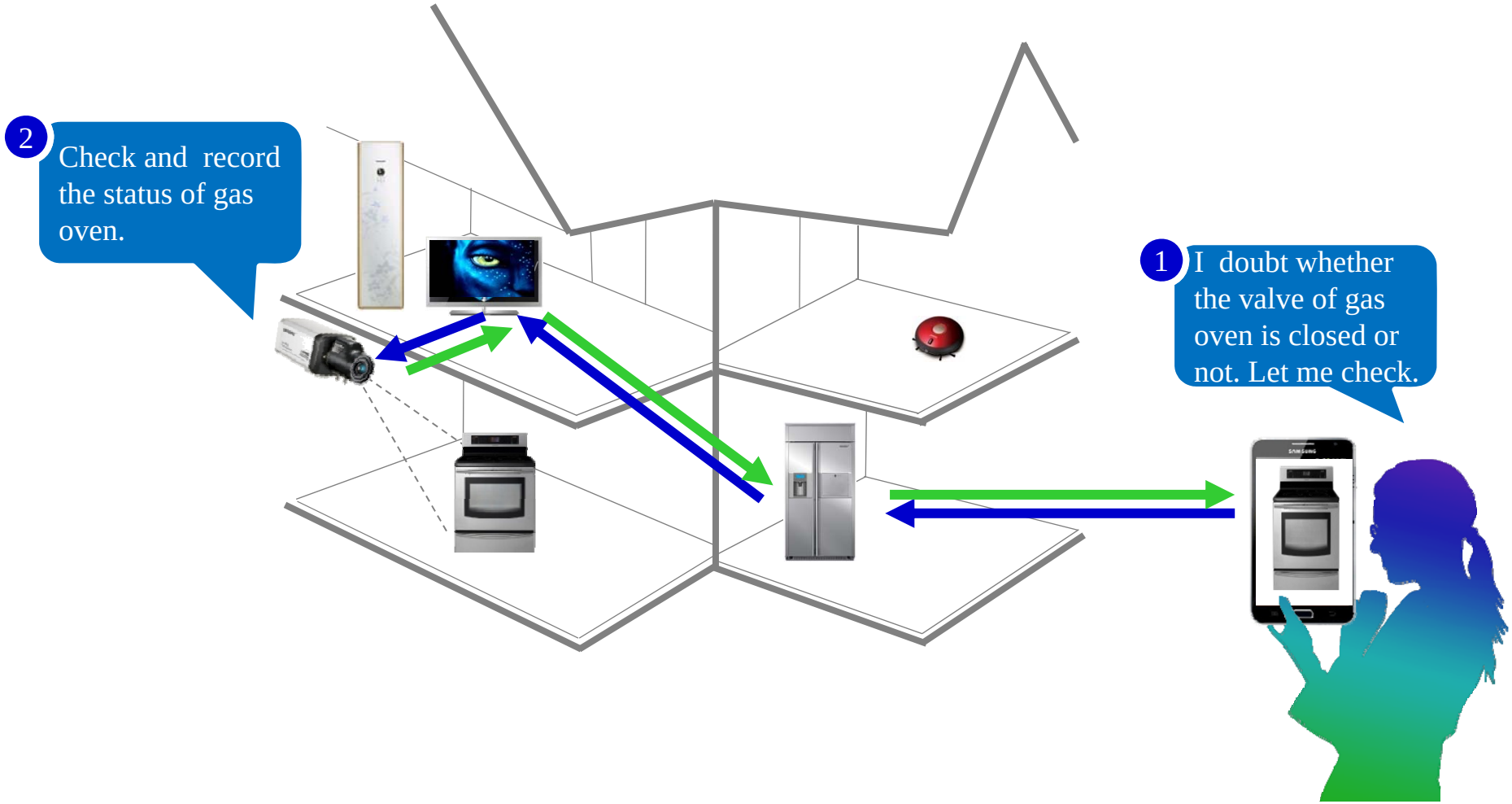
5. Public Safety

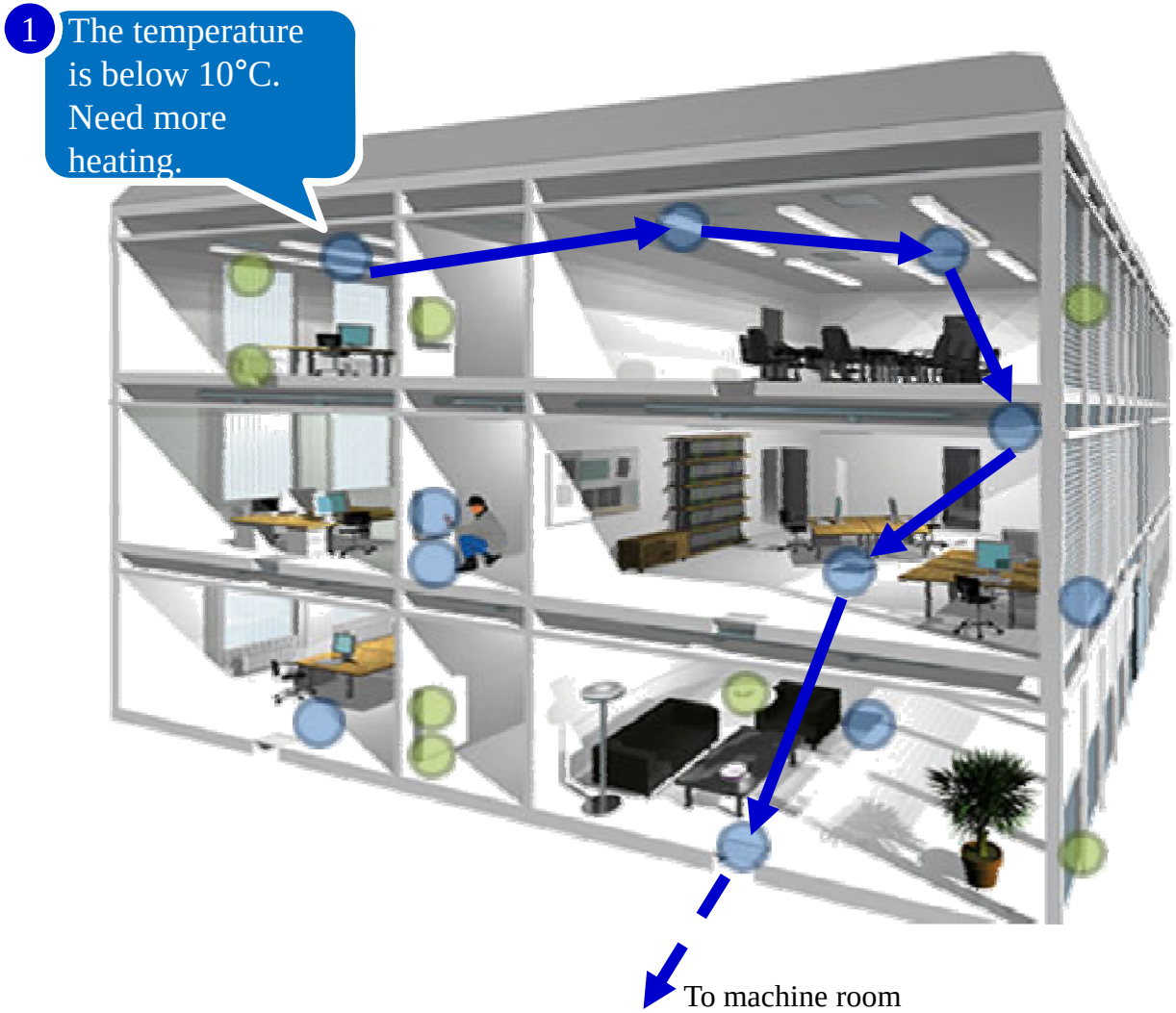
5. Public Safety



6. Automation

Home Automation



6. Automation

Building Automation