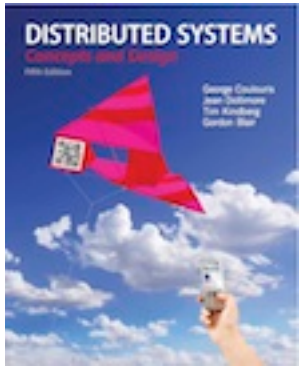
Slides for Chapter 8:
Mobile and Ubiquitous Computing



From Coulouris, Dollimore, Kindberg and Blair

Distributed Systems:

Concepts and Design

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Figure 8.1
A room responding to a user wearing an active badge

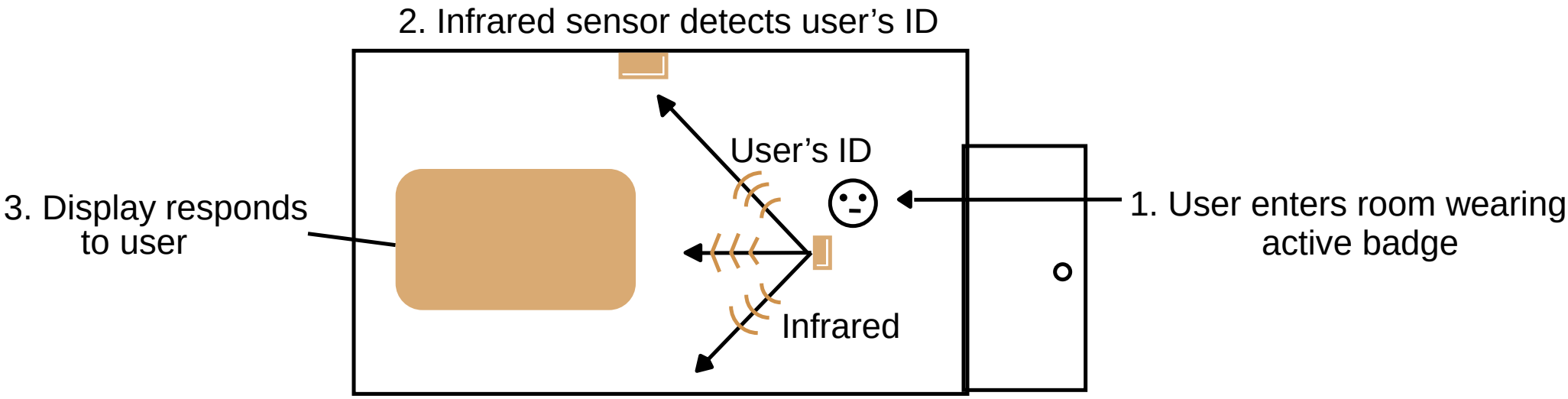


Figure 8.2
Examples of pre-configured versus spontaneous association

Pre-configured	Spontaneous
Service-driven: *email client and server*	Human-driven: *web browser and web servers* Data-driven: *P2P file-sharing applications* Physically-driven: *mobile and ubiquitous systems*

Figure 8.3
The interface to a discovery service

Methods for service de/registration	Explanation
lease := register(address, attributes)	Register the service at the given address with the given attributes; a lease is returned
refresh(lease)	Refresh the lease returned at registration
deregister(lease)	Remove the service record registered under the given lease
Method invoked to look up a service	
serviceSet := query(attributeSpecification)	Return a set of registered services whose attributes match the given specification

Figure 8.4
Service discovery in Jini

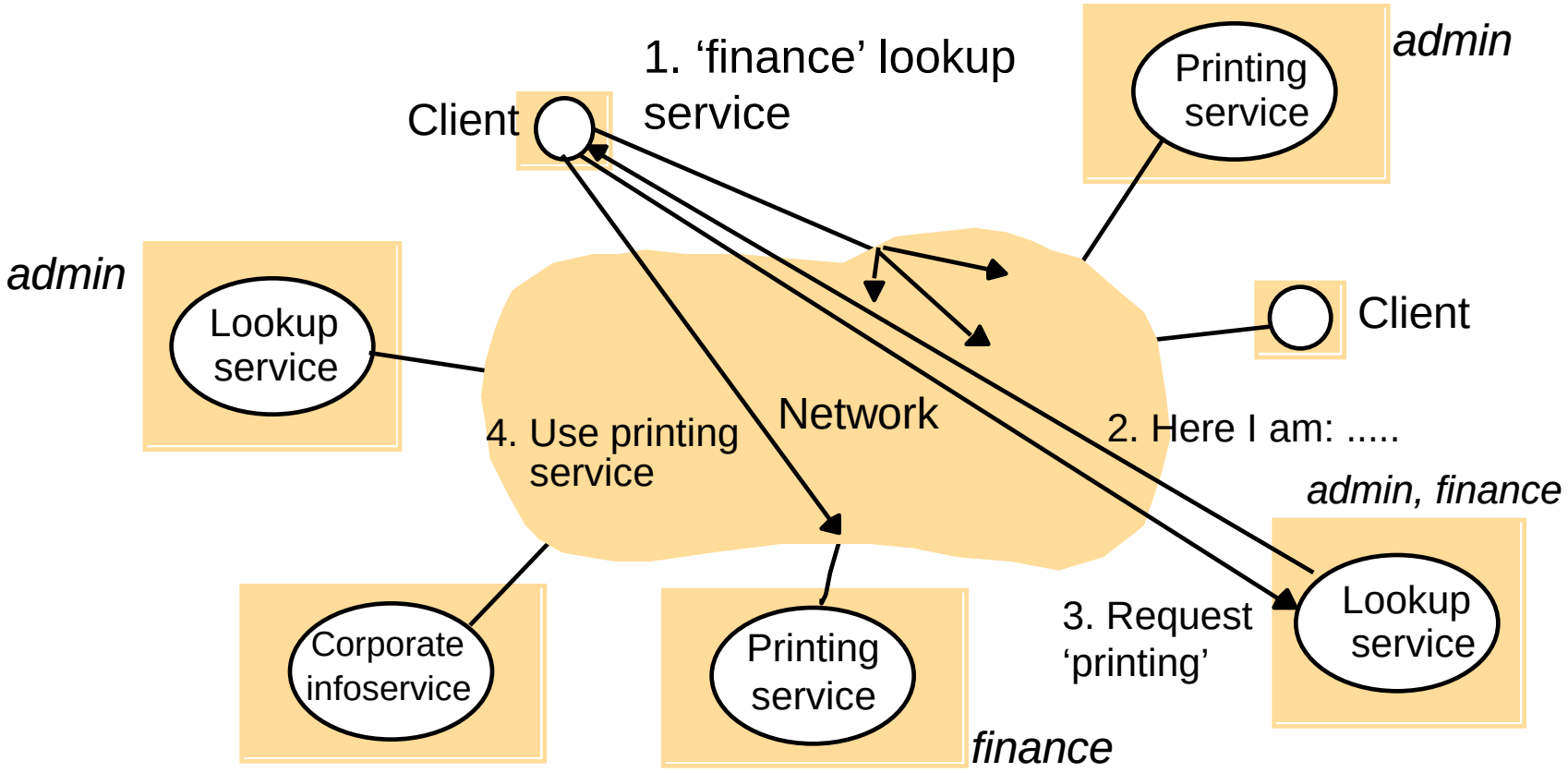


Figure 8.5
The *IdentityPresence* widget class of the Context Toolkit

Attributes (accessible by polling)	Explanation
Location	Location the widget is monitoring
Identity	ID of the last user sensed
Timestamp	Time of the last arrival
Callbacks	
PersonArrives(location, identity, timestamp)	Triggered when a user arrives
PersonLeaves(location, identity, timestamp)	Triggered when a user leaves

Figure 8.6
A *PersonFinder* widget constructed using IdentityPresence widgets

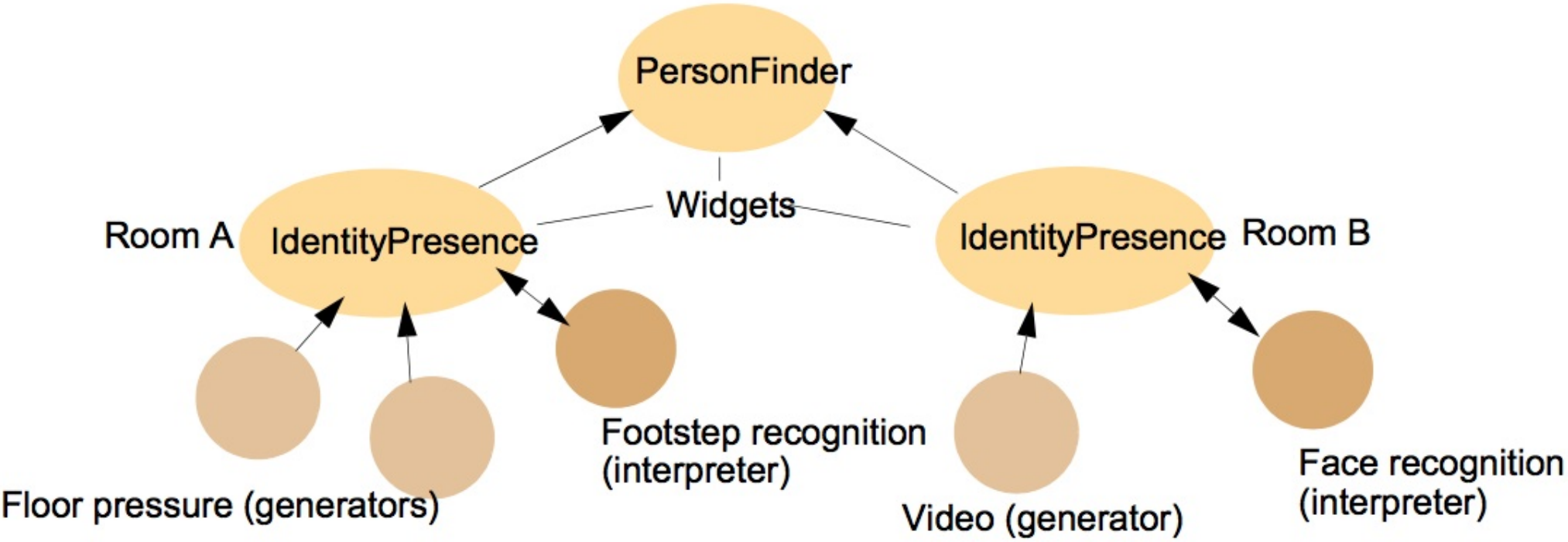


Figure 8.7
Directed diffusion

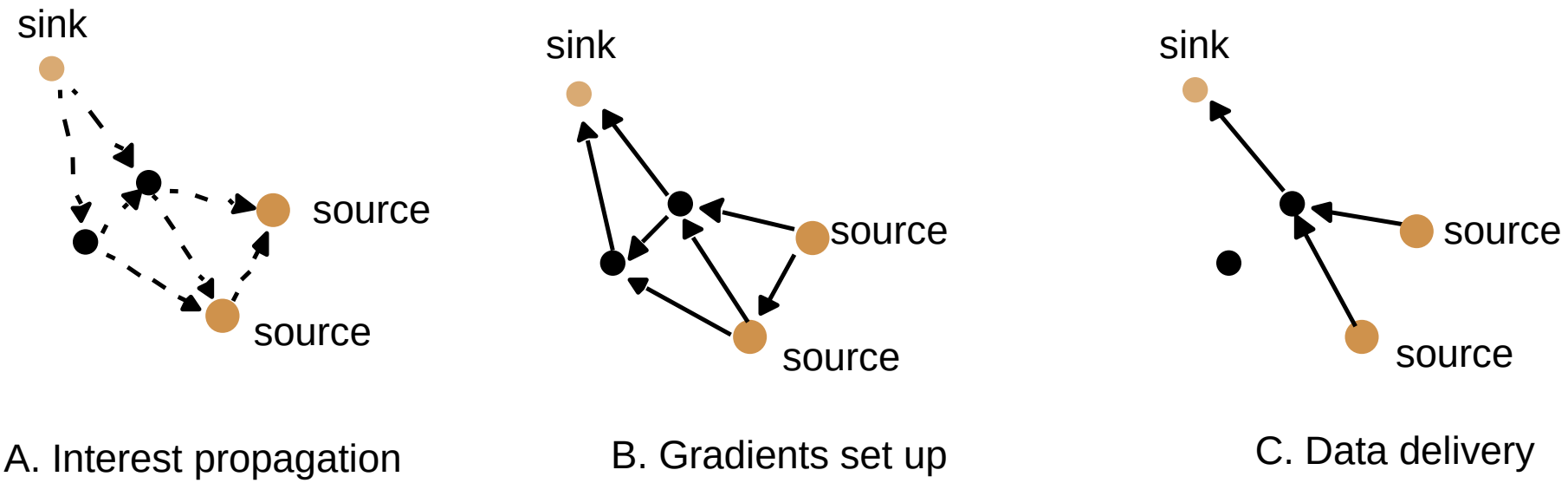


Figure 8.8 Some location-sensing technologies

Type	*Mechanism*	*Limitations*	*Accuracy*	*Type of location data*	*Privacy*
GPS	Multilateration from satellite radio sources	Outdoors only (satellite visibility)	1–10m	Absolute geographic coordinates (latitude, longitude, altitude)	Yes
Radio beaconing	Broadcasts from wireless base stations (GSM, 802.11, Bluetooth)	Areas with wireless coverage	10m–1km	Proximity to known entity (usually semantic)	Yes
Active Bat	Multilateration from radio and ultrasound	Ceiling mounted sensors	10cm	Relative (room) coordinates.	Bat identity disclosed
Ultra Wide Band	Multilateration from reception of radio pulses	Receiver installations	15cm	Relative (room) coordinates	Tag identity disclosed
Active badge	Infrared sensing	Sunlight or fluorescent light	Room size	Proximity to known entity (usually semantic)	Badge identity disclosed
Automatic identification tag	RFID, Near Field Communication, visual tag (e.g. barcode)	Reader installations	1cm–10m	Proximity to known entity (usually semantic)	Tag identity disclosed
Easy Living	Vision, triangulation	Camera installations	Variable	Relative (room) coordinates	No

Figure 8.9
Locating an active bat within a room

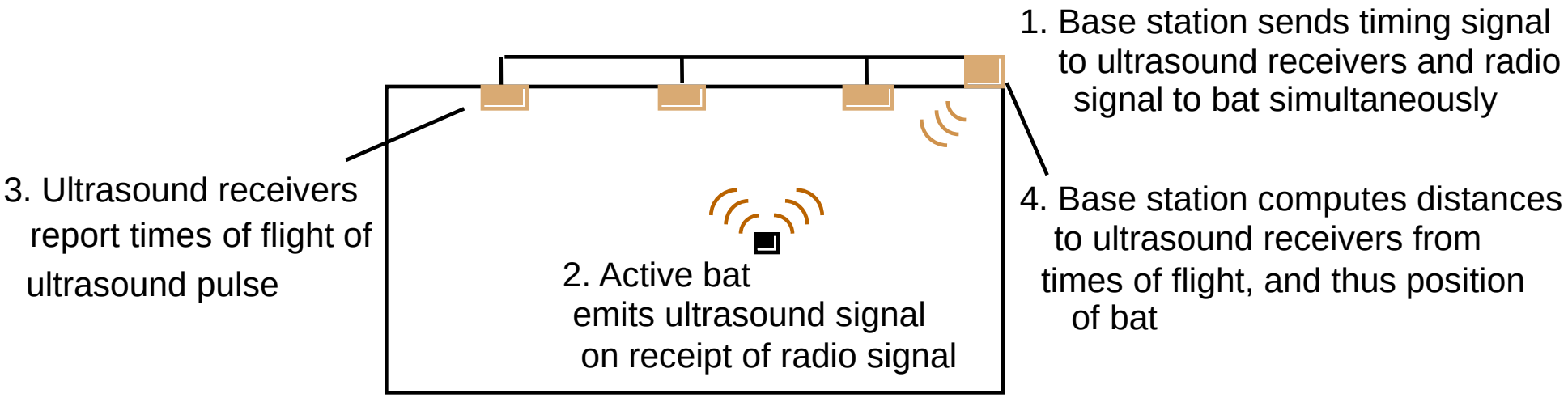
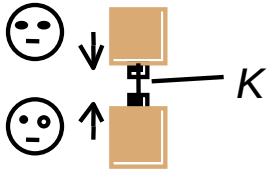
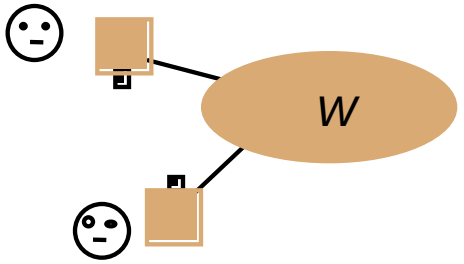


Figure 8.10
Secure device association using physical contact

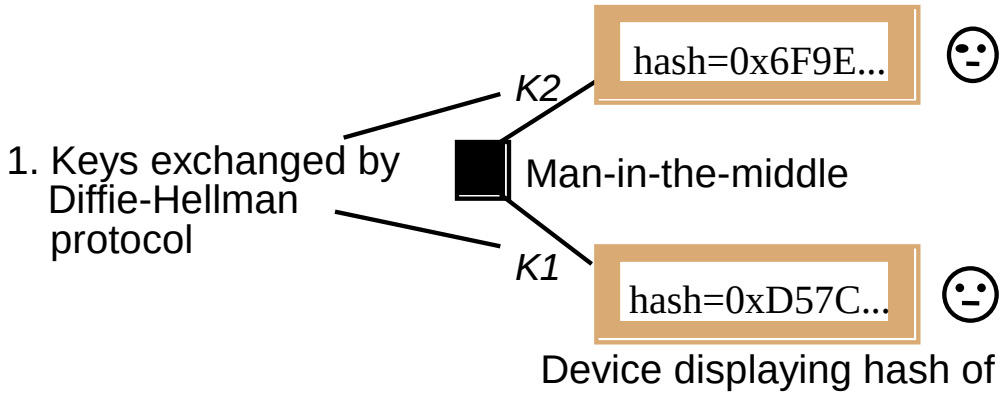


1. Fresh secret key K exchanged by physical contact



2. Devices communicate using secure channel constructed over *W* using *K*

Figure 8.11
Detecting a man-in-the-middle



2. User(s) compare hashes of keys displayed on devices – by sight or with an integrated imaging device. Since they differ, they conclude that there is a man-in-the-middle or that accidental mis-association has occurred

Figure 8.12
Cooltown layers

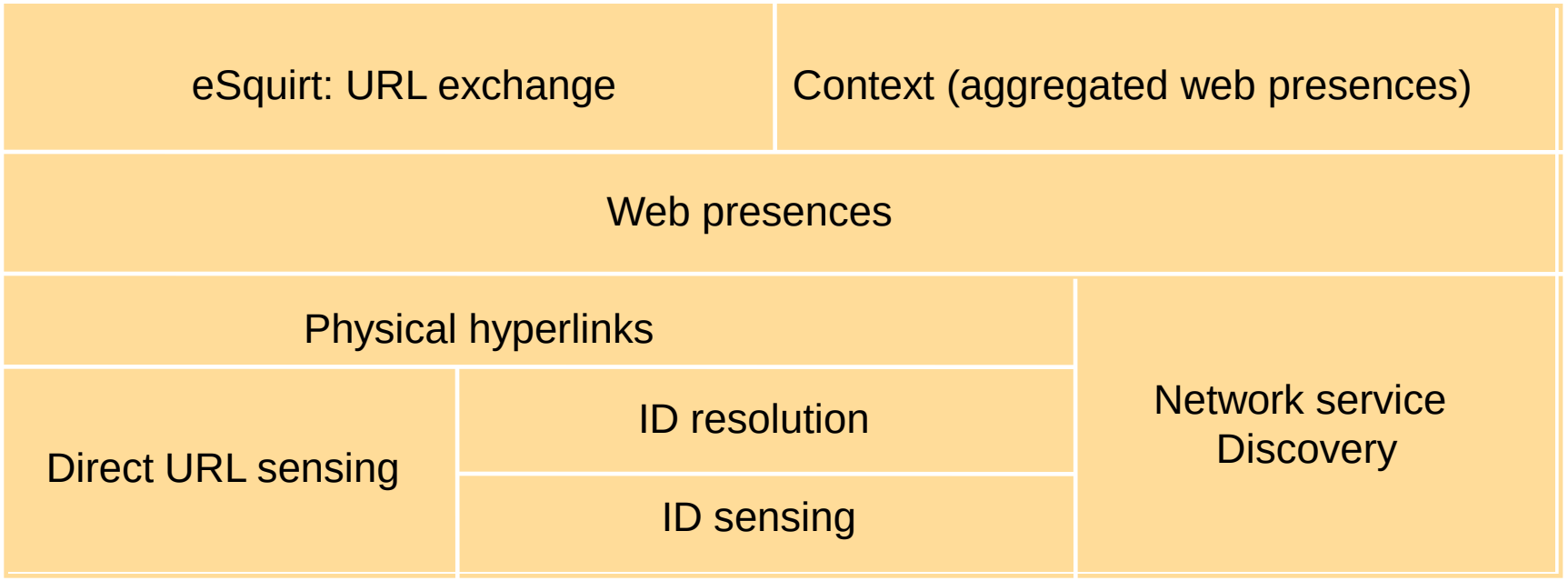


Figure 8.13
Capturing and printing the web presence of a painting