



hSITE Research Progress

Theme 3

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Tho Le Ngoc

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McGill



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NSERC Strategic Research Network

Theme 3



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NSERC Strategic Research Network

Enabling Networks and Technologies

Theme Leader

Mark Coates

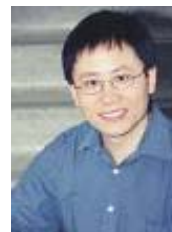
Associate Professor

Electrical and Computer Engineering

Leslie Rusch



Peter Liu



Mark Coates



David Plant



Tho Le-Ngoc

hSITE Overview: Theme 3

Clinical Interface

Clinical Context &
Requirements

Protocols, Middleware
and SW Architecture

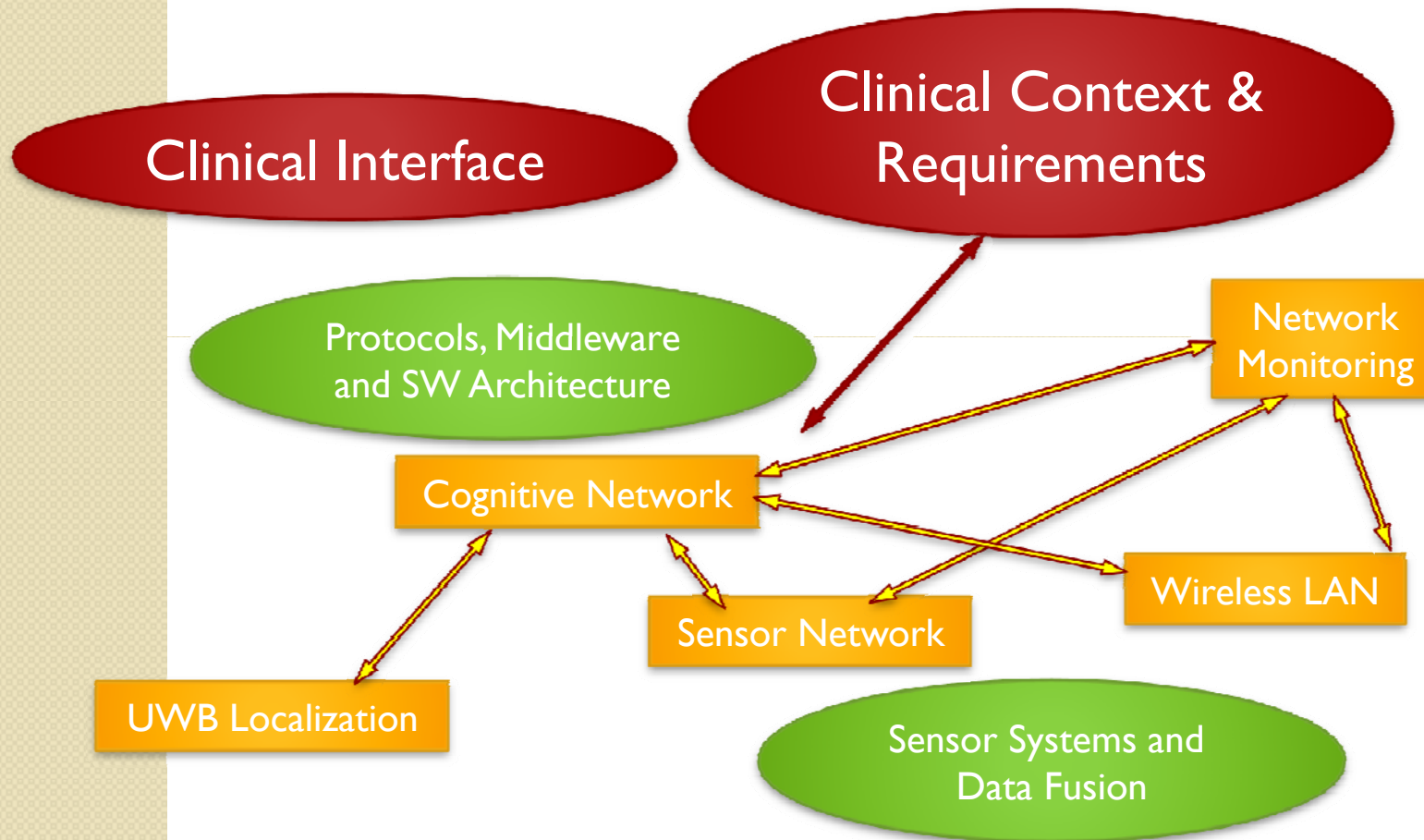
Cognitive Network
Sensor Network and Wireless LAN

UWB Localization

Sensor Systems and
Data Fusion

-  Theme 1
-  Theme 2
-  Theme 3

hSITE Overview: Theme 3



- Theme 1
- Theme 2
- Theme 3

Main Objectives

- Theme 3 conducts research into advanced networks, and transmission and location technologies.
- Theme 3 focuses on the following research topics
 - Network Architecture and Monitoring
 - Cognitive Networks (Coates)
 - Sensor and Wireless Access Networks (Le Ngoc)
 - Wireless Systems
 - Cooperative and EMI-Aware Transmission (Le Ngoc)
 - Precise Location Identification
 - Ultrawideband Localization (Plant)
 - Powerline Localization (Rusch)
 - Radio-frequency Tomography (Coates)
 - RFID Systems and Tracking (Le Ngoc)



hSITE Research Progress

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Research Activities

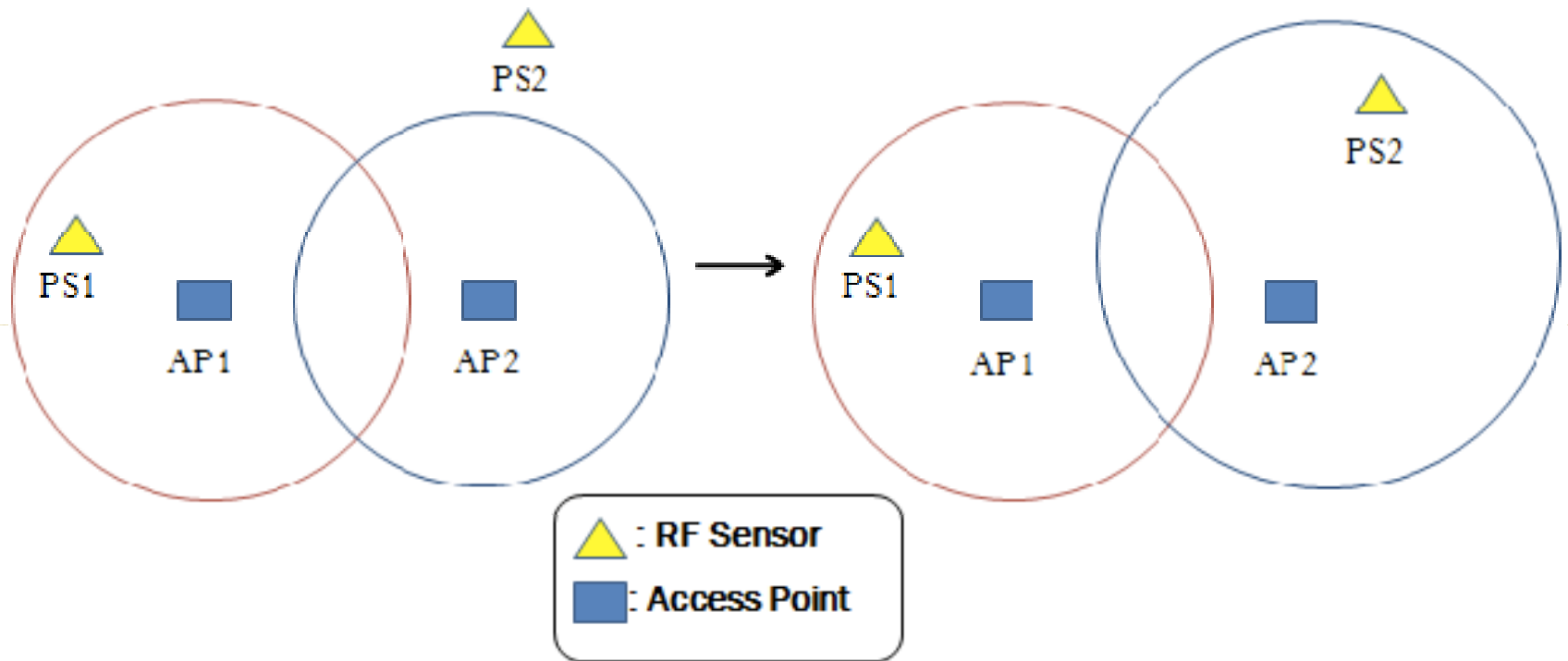
- **Wireless Network Optimization**
- **Opportunistic Communication through Social Interactions**
- **Localization: RF Tomography**



Wireless Network Optimization

- Joint configuration of wireless sensor networks and access networks
- Choose and adapt network parameter settings to optimize performance
 - Access point user affiliations
 - Transmission powers
 - Channels
- Performance Criteria
 - Coverage, throughput, latency
 - Delay requirements of sensor data
 - Respect RF safety limits for electromagnetic interference

Wireless Network Optimization

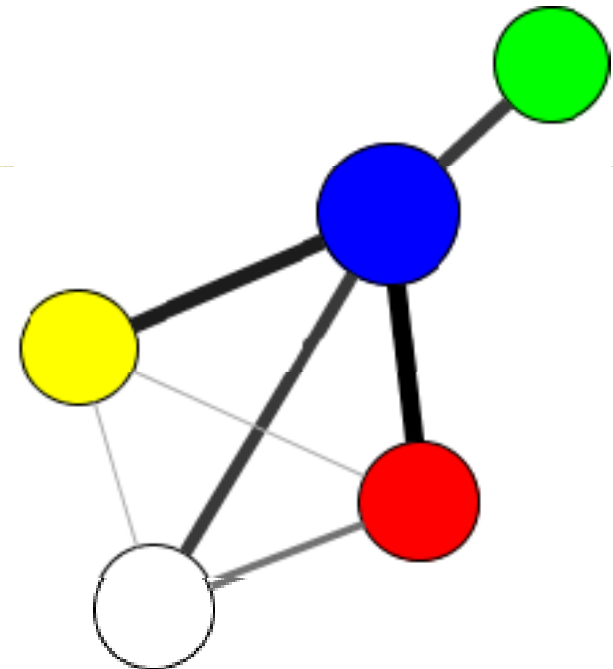
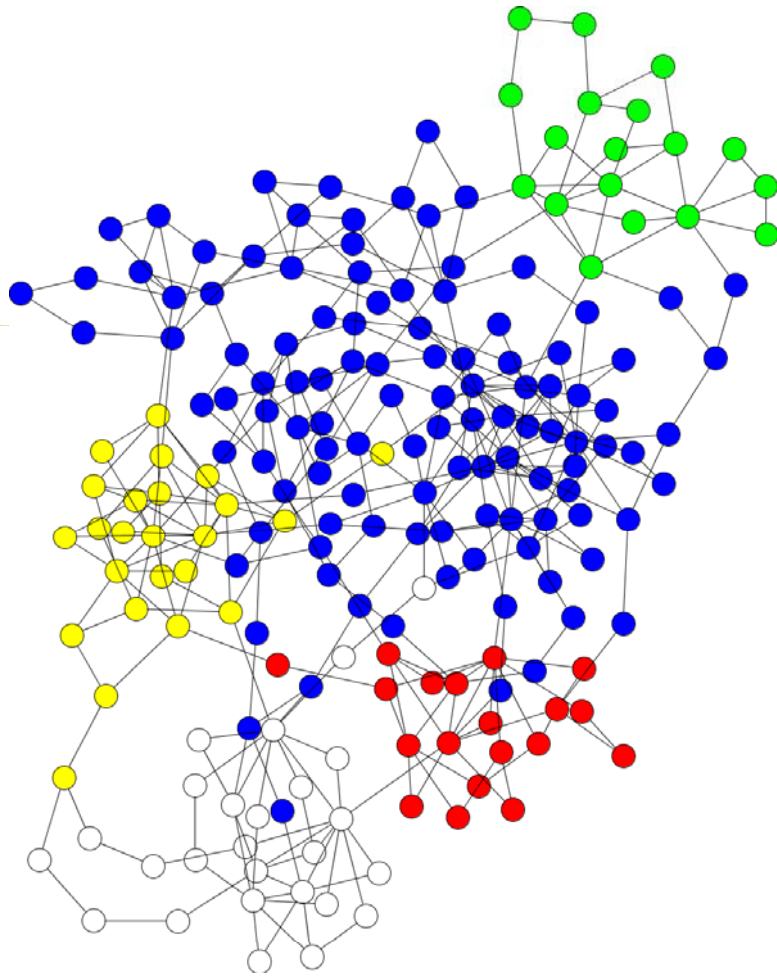




Opportunistic Communication

- Under-utilized point-to-point bandwidth for delay-tolerant applications
- Example applications: distribute software/firmware updates; disseminate database information.
- Interactions are governed by social behaviour (no direct network control)
- **Challenge:** where should we seed the network with the new content? How many seeds to plant?

Opportunistic Clustering



Localization: RF Tomography

- Detect and track individuals based on interference they cause to wireless signals
- Particle filtering algorithm to track multiple targets
- Conducted preliminary experiments

