# Distributed Scheduling over Heterogeneous Wireless Sensor Networks

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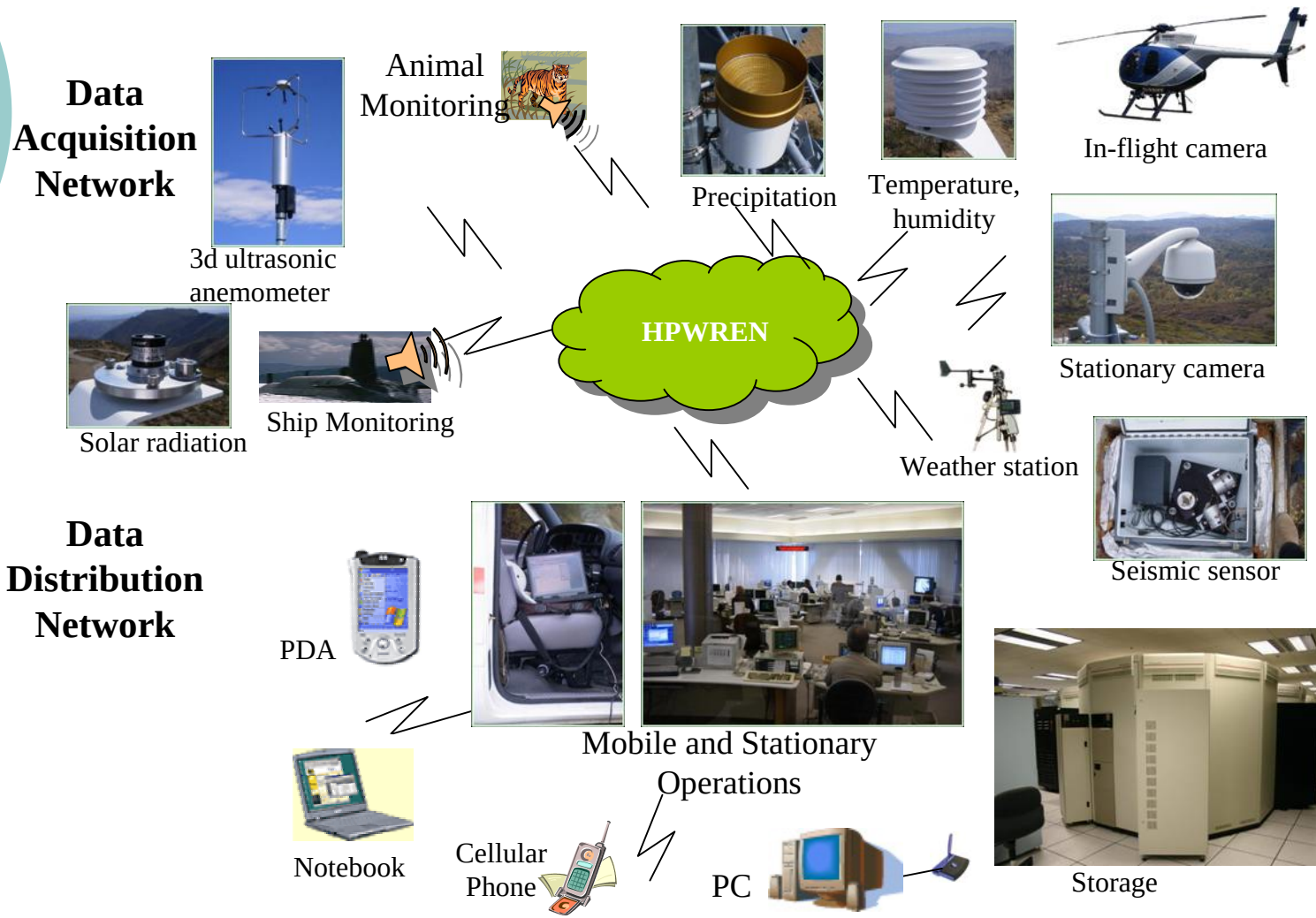
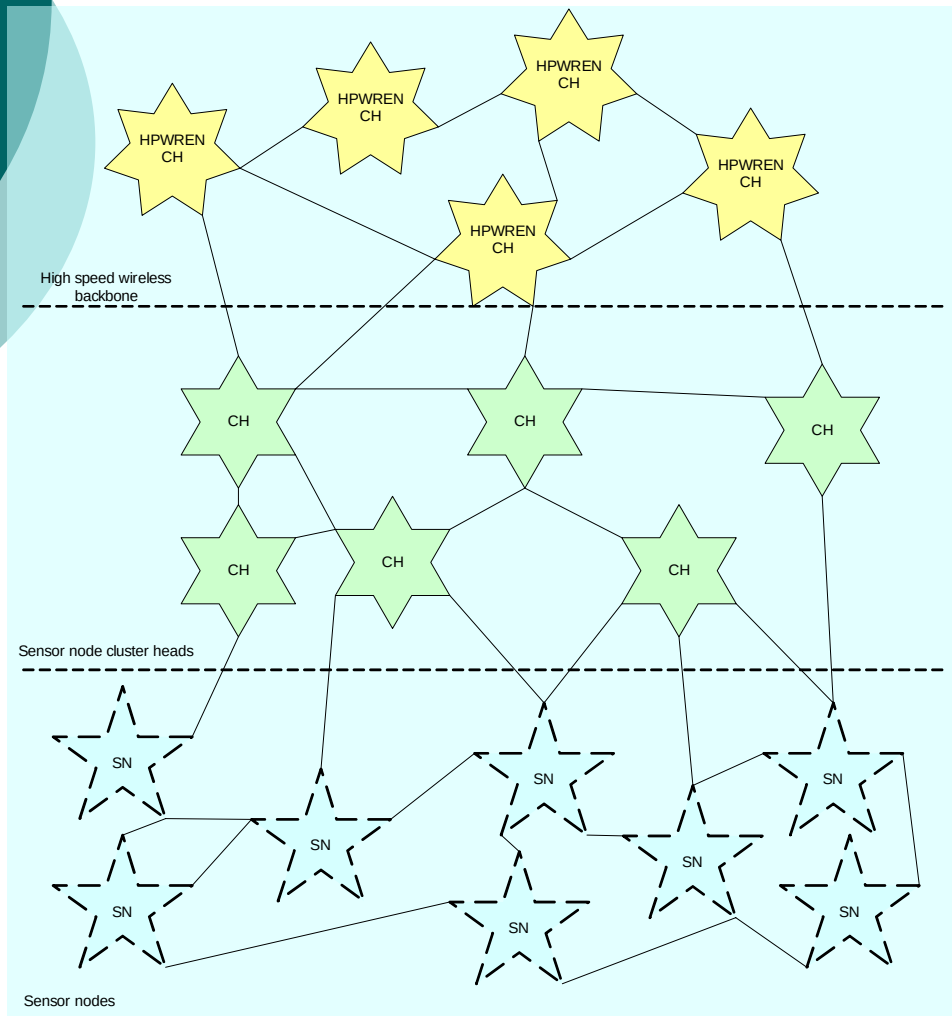
# Wireless Sensor Network



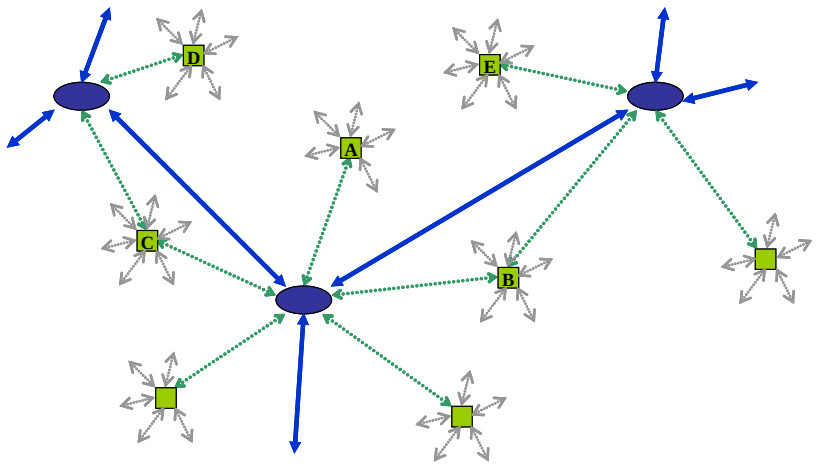
# HPWREN Overview

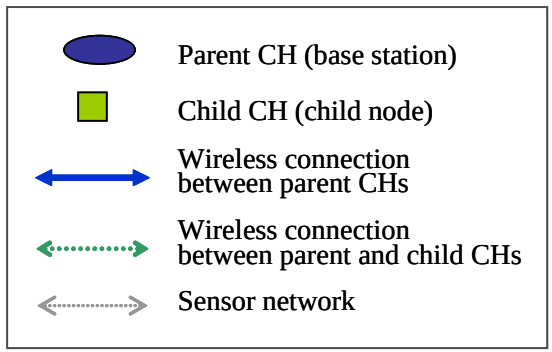



- Wireless MESH
  - QoS scheduling and routing
  - Fast wireless connectivity
- Sensor Cluster Heads
  - Key issue:
    - Delivering good QoS
    - With long battery lifetime
  - Use faster radio to support QoS requirements
- Sensor Network
  - Battery lifetime
  - QoS
    - not considered in traditional sensor network research

# Motivation

- Communication power, high traffic load
- Contention/collisions between child cluster heads
- Interference from neighboring cells

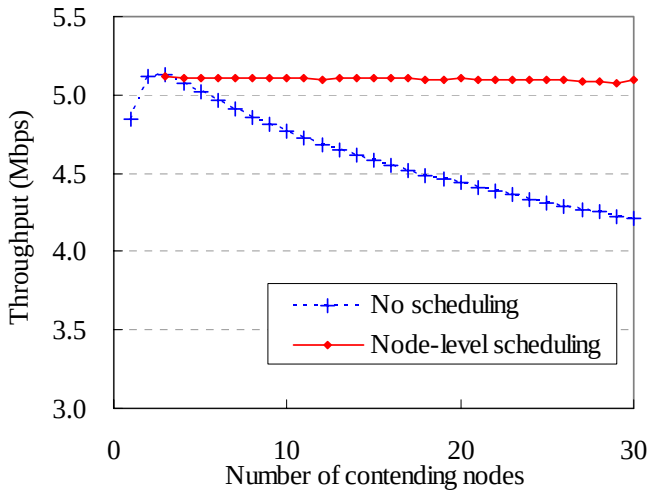


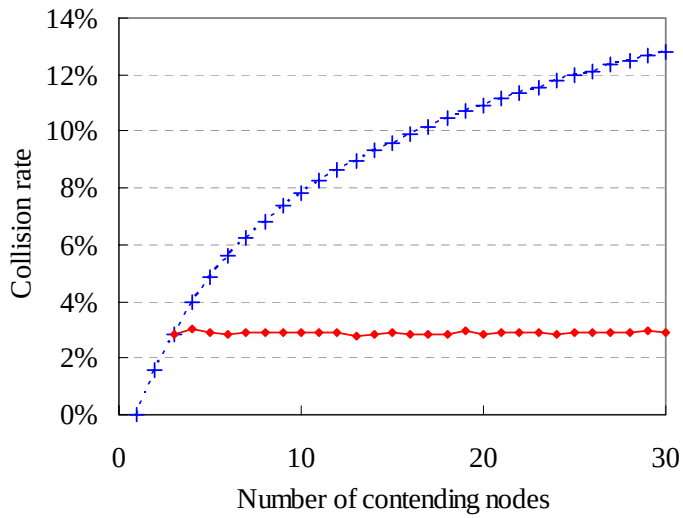




- Manage the number of contending nodes
  - Reduces packet collisions
  - Improves channel utilization

# Node-level scheduling

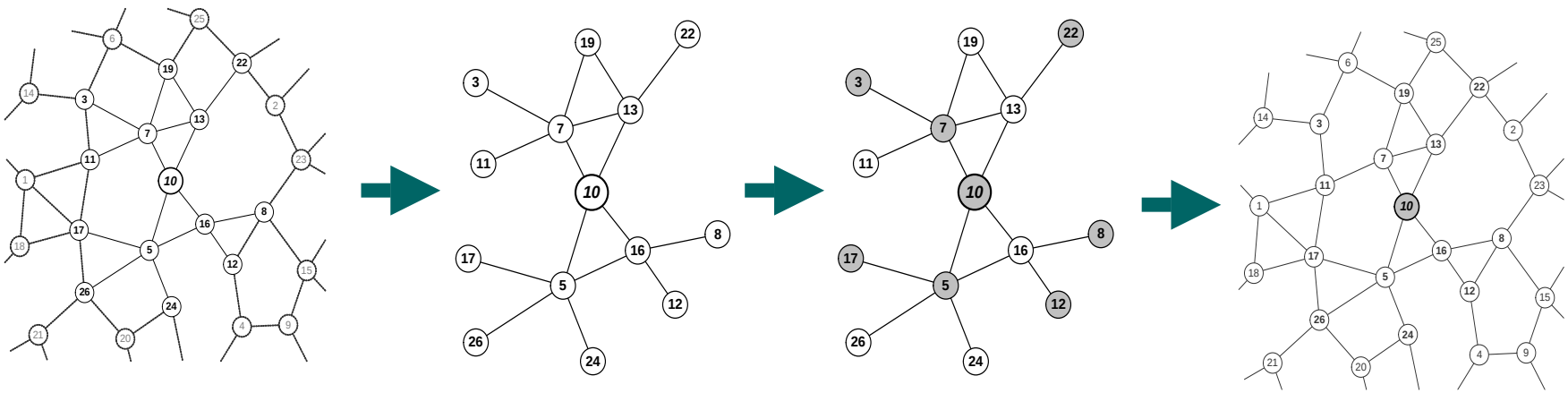
- Manages the number of contending nodes
- Reduces collisions and achieves additional throughput improvement



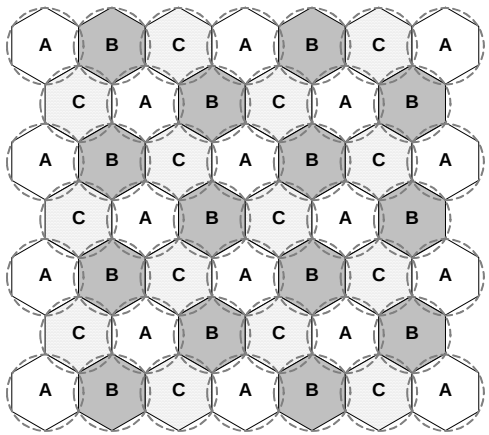
# Distributed node-level scheduling

- Uses the partial knowledge of topology
  - Two-hops distance of connectivity
- Scalable and flexible

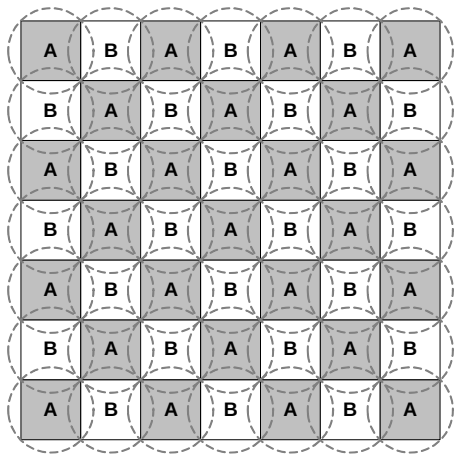


# Cell-level Scheduling

- Reduces interference from neighbor cells
- Does not schedule two neighboring cells in the same time slot



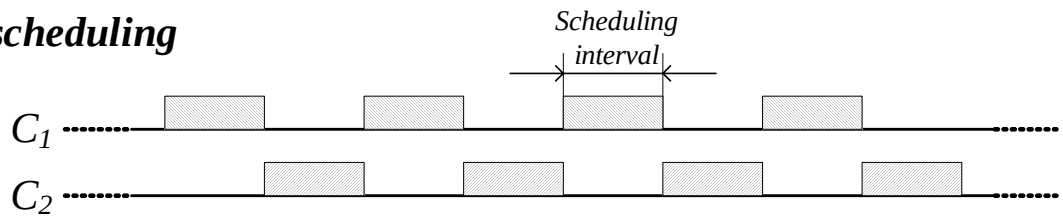

Three-slots cell-level scheduling



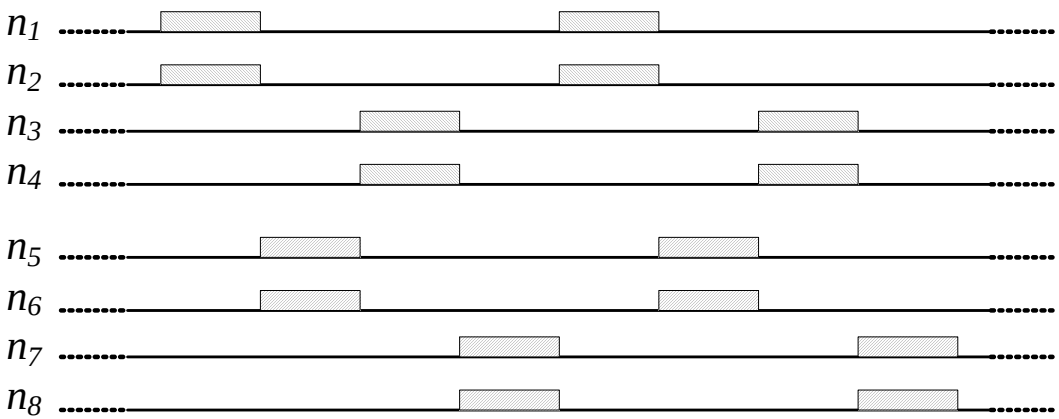

Two-slots cell-level scheduling

# Combining cell-level / node-level scheduling

***Cell-level scheduling***




***Node-level scheduling***



# Simulation Setup

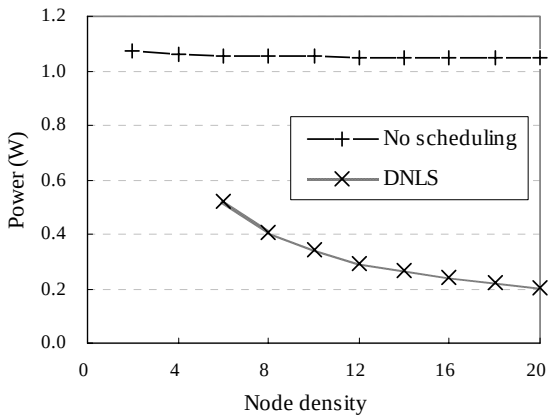
- Power mode parameters
  - *Cisco Aironet* 802.11b Wireless LAN adapter
- Wireless channel model
  - 802.11b model: 11Mbps data rate, 1Mbps control rate
- Two types of multi-cell topology
  - Hexagonal / square topology

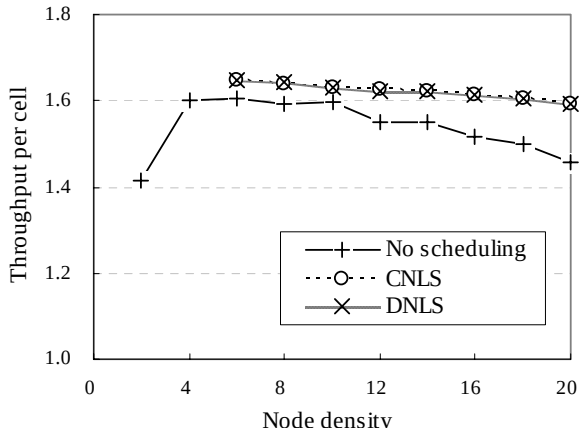
# Results for CBR Traffic in Full MAC Queues

**Communication power**

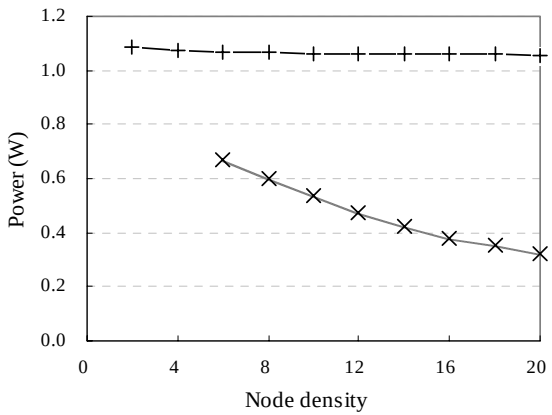
**Average throughput**

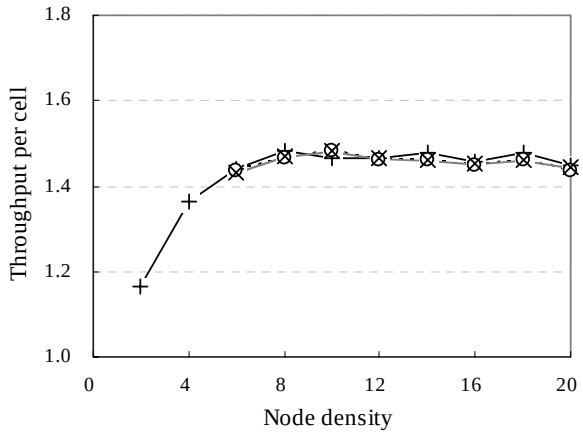
*Hexagonal multi-cell*




*Square multi-cell*



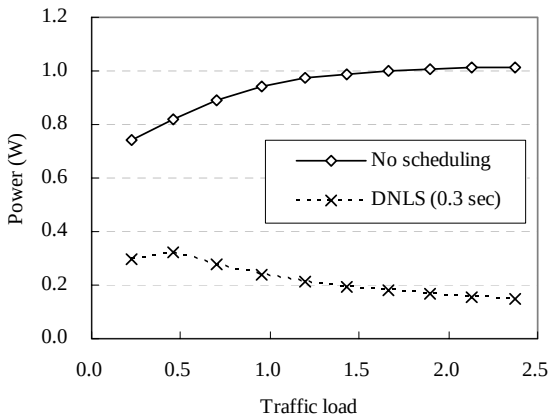



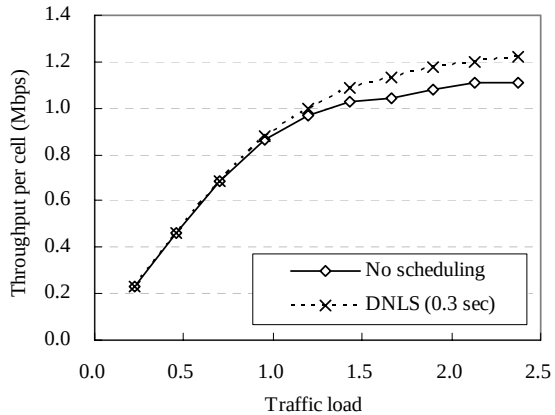
# Results for Real Traffic

**Communication power**

**Average throughput**

*Hexagonal multi-cell*




*Square multi-cell*