



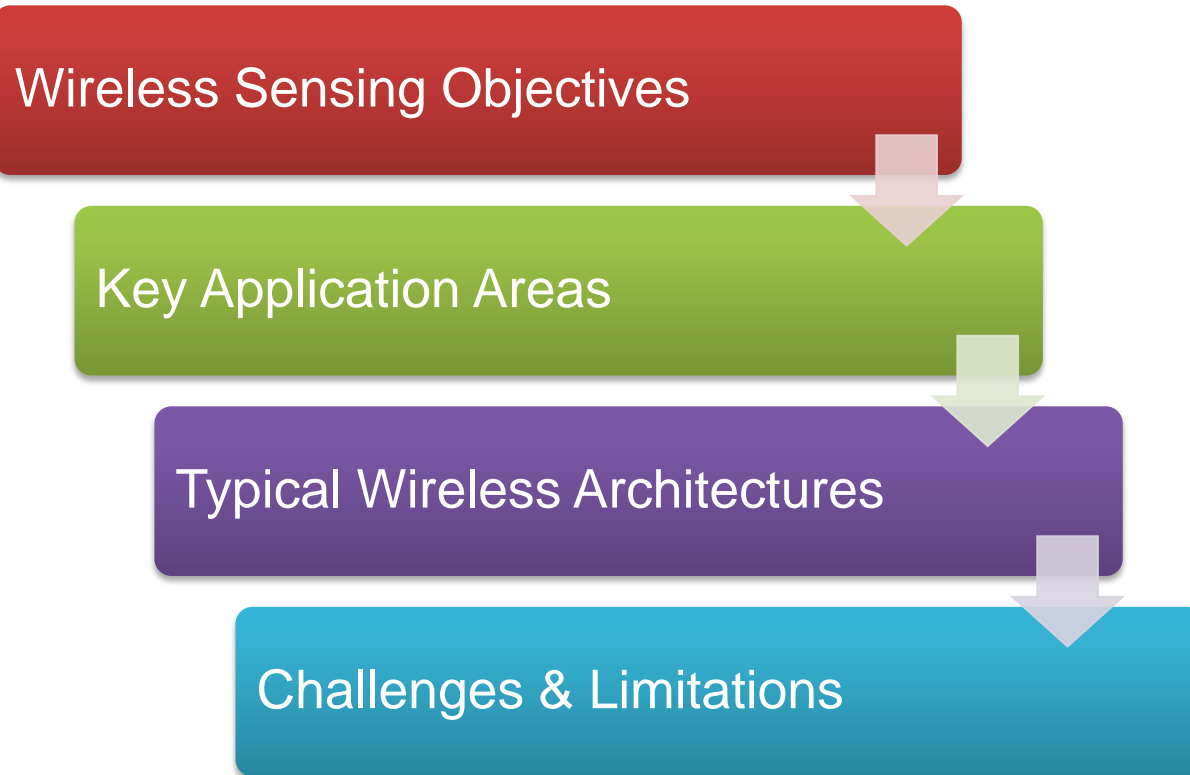
Airplane Wireless Sensor Needs

CANEUS Fly-By-Wireless
August 24th, 2010



Ethan Owyang
Boeing Commercial Airplanes

Outline



Wireless Sensing Objectives

- Reduce cost of installation
 - Reduce weight
 - Improve modularity
 - Enable rapid introduction of new features
 - Enable rapid reconfiguration
-
- With focus on
 - Low data rate applications
 - Eliminating “difficult” wires
 - Non-essential applications

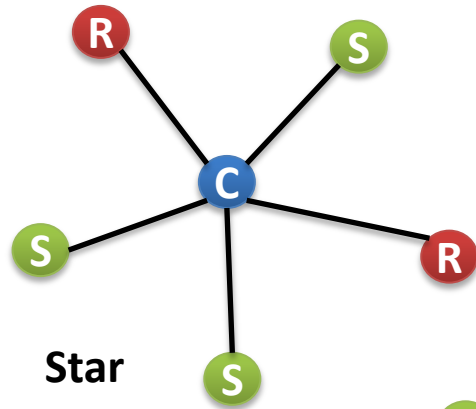


Key Application Areas

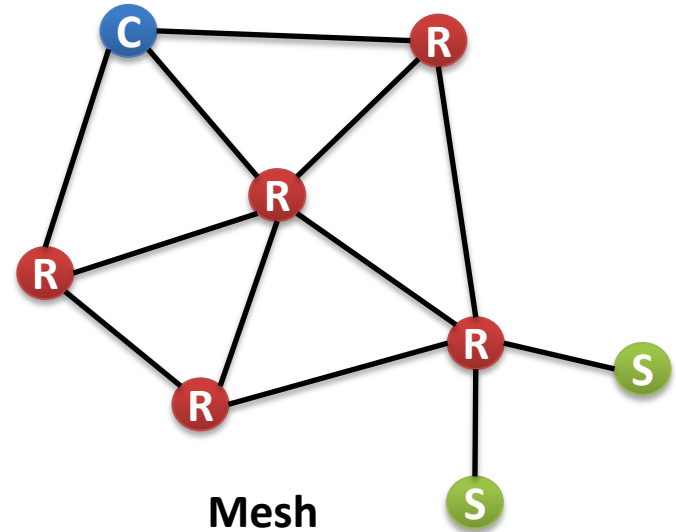
- Airplane systems
- Vehicle health monitoring
- Flight Test



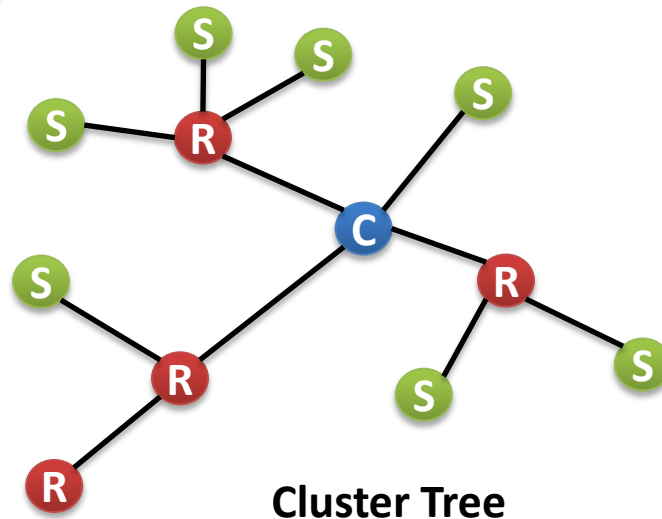
Example Wireless Sensing Architecture



Star



Mesh



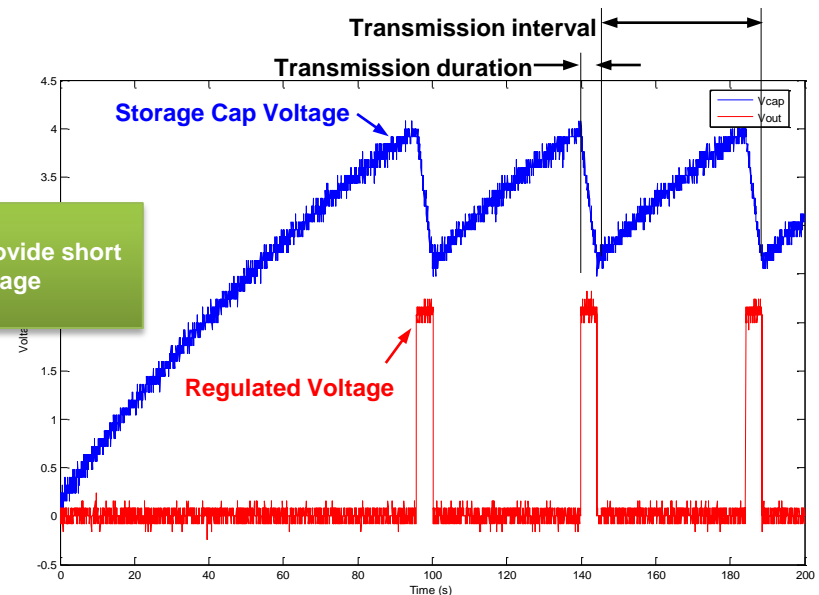
Cluster Tree



Challenges & Limitations


- Power Sources
 - Multi-year primary batteries
 - Energy harvesting
- Sample rate limited by low power requirements
 - Typically combine 10's mW active loads with a few μW sleep modes to achieve 100's μW P_{avg} at 1% duty cycle
- Time correlation between multiple sensors
- Spectrum availability

Stored voltage builds up to provide short bursts of regulated voltage



Sources of Energy Harvesting

- Vibration
- Light
- Thermal
- Mechanical



Mechanically
Powered
Push Button



Multi-
Frequency
Vibration
Harvester



Thermal
Electric
Stringer Clip

U.S. Patent No. 6,858,970

Global Spectrum Allocation

- **239 countries have wildly divergent regulations on**
 - **spectrum allocation**
 - **power levels**
 - **modulations techniques**
 - **testing & registration requirements**
- **2.4 GHz most promising globally, but also crowded**
- **ITU recommendations can take years to implement into law**

