Cumulus Humilis: Wireless Mesh-networking for Gliders

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Wireless Mesh Network
Outline

- Status quo
- Motivation
- Analysis
- Related work
- Cumulus Humilis
- Performance evaluation
- Conclusion
Status quo

- No up-to-date information during flight
- Mobile computers readily available in cockpit
Motivation

- Exchange positional information
- Quickly find crashed gliders
- Inform the pilot of weather developments
- Exchange measurements
Problem statement

• Wireless transmission

• Challenges:
  – Hidden terminal problem
  – Changing network topology
  – Quality of Service
Hardware used

- X-Bee PRO 868
- 868 MHz ISM
- 40 km range
- 500 mW
- 24kbps, 10% duty cycle
- RS232
Analysis

- Logfiles downloaded from Online Contest
- Group flights based on weather
- File with gliding clubs in The Netherlands
- Write KML-file for Google Earth visualization
Google Earth
Google Earth
Related work

- Routing protocols for wireless mesh networks
- Dissemination protocols for wireless mesh networks
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Problem:
- Hidden terminal problem
- Changes in connectivity and topology
- Quality of Service

Solution:
- Desynchronize hosts with random timers
- Store-and-forward to physically carry packets
- Assign traffic a priority and deadline
Cumulus Humilis

- Basic dissemination
- Remove expired packets
- Remove low-priority packets when memory is full
- Spread transmissions
Performance evaluation

- Discrete-time simulator
- Logfiles from Online Contest
- Radio model

- Two scenarios:
  - Scenario 1: Dutch Nationals, with Airfields
  - Scenario 2: October, without Airfields

- Metrics
Scenario 1: Dutch Nationals
Scenario 1: Dutch Nationals
Scenario 2: Poor conditions
Scenario 2: Poor conditions
Conclusion and future work

- Opportunistic dissemination
- Store-and-forward

- Network
  - Hidden terminal problem
  - Publish/subscribe
- Information representation
Questions

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