

# Wireless Sensor Networks and Observation satellites

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# Outline

- 1 Context
  - Motivation
  - DTN
- 2 Satellite Study
  - Carreau
- 3 WSN Study
  - FREAK
  - BACK
- 4 Conclusion
  - Perspectives

- French Space Agency (CNES) project
- Wireless Sensor Networks (WSN)
  - In-situ, autonomous
  - Large lifetime
- Observation Satellites
  - Large scale
  - Long link disruptions



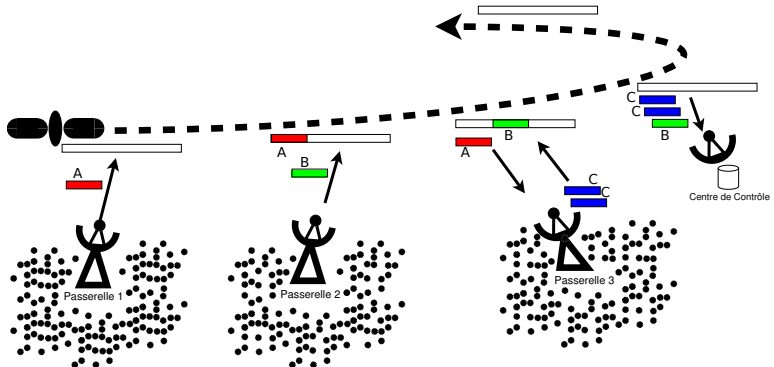
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# Delay/Disruption Tolerant Networking

- Interplanetary networking
- IRTF DTN Research Group
- Overlay protocol
- RFC 5050 *Bundle Protocol Specification*, K. Scott and S. Burleigh, IRTF DTN Research Group, November 2007





# Frequency Routing, Encounters And Keenness

- Mobility is not random
- Predicting the future from past events
- Metric : Frequency of encounters with the base station



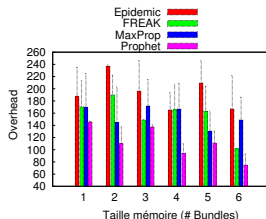
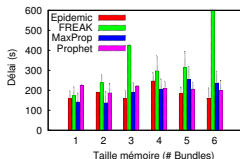
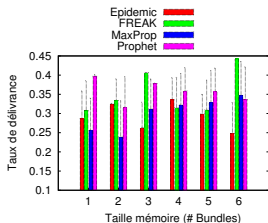


Figure : Delivery for SF cabs with limited Ack

Figure : Delay for SF cabs with limited Ack

Figure : Overhead for SF cabs with limited Ack

# Assumptions

Broadcasting ACKs is simple and provides better performance.

- Exponential Inter-Contacts Time Distribution
- Infinite / Small memory for Model / Simulations
- Mobile Nodes and Static Sink





# Sojourn Time

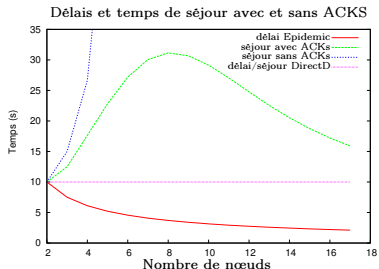


Figure : Delivery and Sojourn Delays for Epidemic with and without ACKs for  $\lambda = 0.1$

# Results

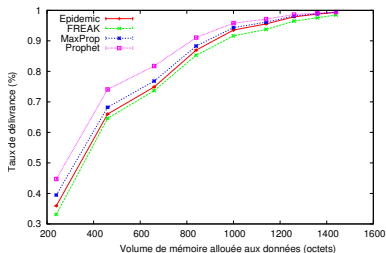


Figure : Delivery Ratio with 16 Bundles slots in memory

- Implementation on a testbed
- Adaptable to non-deterministic scenarios
- Other solutions to remove useless Bundles (modifying lifetime with mean delivery delay)

# Thank you

## Questions ?

