SNIF: Sensor Network Inspection Framework

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Passive Observation of WSNs

Mission statement:

“Monitor & debug WSNs by passive observation of radio communication without instrumentation of WSN nodes.”
What is is good for?

- Observation of newly developed and lab-tested WSN applications in the wild

- Verify absence or existence of common problems:
  - node reboots / node crashes
  - routing loops / routing bugs / network partitions
  - asymmetric link detection
Distributed Sniffer

Generic MAC listening

- Frequency, data rate
- Start-Of-Packet symbol
- Packet size
Generic Packet Decoding

- New Approach: “Attributed C Structs”
  - Most WSN apps are developed in C
  - Structs are easy to understand/parse
  - Extensions allow for encapsulated packets
  - Variable size arrays supported

```c
/** TinyOS message */
struct TOS_Msg {
    uint16_t addr;
    uint8_t  type;
    uint8_t  group;
    uint8_t  length;
    int8_t   [data length];
    uint16_t crc;
};

struct RoutingPacket:
    TOS_Msg.data (type == 1) {
        u_int8 nrHops;
        u_int16 nextHop;
    };
```
Data Stream Processing

- Output of DSN is stream of overheard packets
  => Data Stream Processing model is natural
- Data Stream Processing Components
  - Source - Operator - Sink
- Basic Operators
  - Filter - Union - Mapper
  - ArrayIterator
  - TimeWindowAggregator

Typical WSN Debugger
Data Stream Processing

- **WSN specific operators**
  - SeqNrReset
  - PacketTracer (src addr missing in packet)
  - PathAnalyzer (valid path to sink?)
  - TopologyAnalyzer (partition detection)
  - Binary Decision Tree

- **WSN Debugger construction**
  - reusable stream operators
  - reusable sub-graphs

Decision Tree for Multi-Hop Routing App

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Summary

• SNIF is..
  • Distributed Sniffer
  • Generic Packet Decoder
  • Data Stream Processing

• Availability...
  • on demand :)

Thanks!

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Overview

- Passive Observation of WSNs
- Distributed Sniffer
- Packet Decoding
- Data Stream Processing
- Summary