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Secure Embedded Wireless Networks

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September 10, 2008

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Product / Service

- Communication protocol that can fit within the constraints of embedded wireless devices
- Secure $\Rightarrow$ No eavesdropping, no masquerading, no compromised nodes

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Advantages

- Based on Advanced Encryption Standard (AES) protocol already widely used and National Security Agency (NSA) approved
- Fastest AES encryption method available
- Provides secure communication; even when a node has been compromised (local monitoring)
- Science novelty:
  - Software optimizations, including compiler
  - Distributed software requiring no central controller
- Cost effective and easily modified since it is software-based

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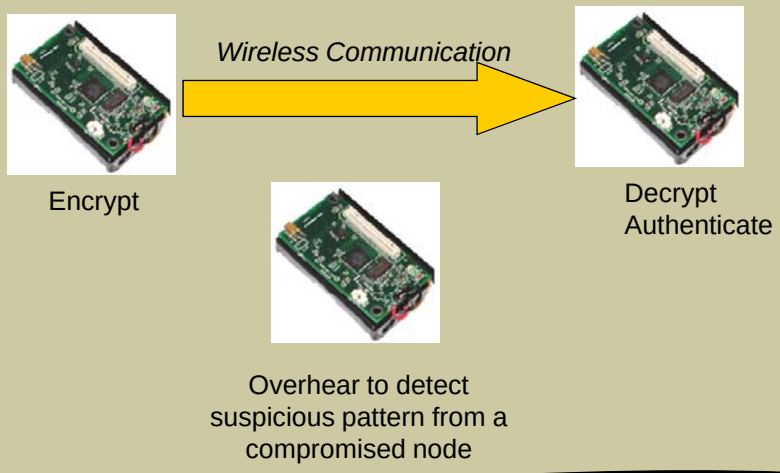
Schematic of Solution



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Experiment

- Softbaugh DZ1611 Zigbee Demo Board
- ROM (Code) Size
  - msp430-objdump
- RAM (Memory) Usage
  - msp430-gdb printing stack pointer
- Execution Time
  - Set I/O line on start, clear on end
  - Measure on oscilloscope

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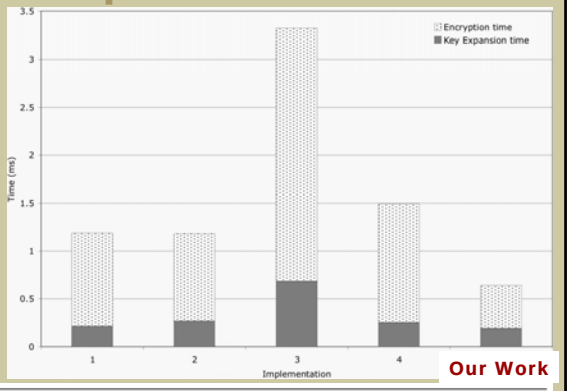
AES Comparison

- Improved both speed and code size (RAM unknown)
- Note that our measurements seem to have varied significantly from published numbers in some cases



Our Work

Implementation	Reference paper	Measured ROM Usage	Published ROM Usage
1	[6]	5968 bytes	n/a
2	[12]	6780 bytes	12616 bytes
3	[14]	6848 bytes	3322 bytes
4	[10]	n/a	n/a
5	Our implementation	5160 bytes	n/a

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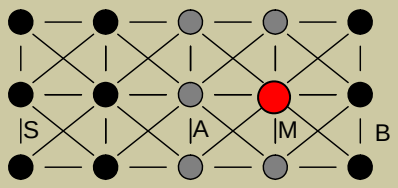
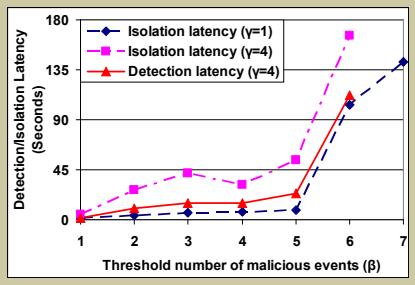
Internal Malicious Node Detection





- Malicious node *M* – has all the cryptographic keys – thwarting communication to base node *B*

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Applications

- Military/Homeland Security
  - Secure ad-hoc networking
  - Secure wide area networking
  - Emergency/disaster communications
- Corporate entities where secure wireless communication is a concern
- Hospitals/pharmacies
- E-commerce

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Team

- Faculty principal investigator:
  Prof. Saurabh Bagchi
- Technical staff: Aaron Ault
- Students: Shammi Didla (undergraduate), Rajesh Panta, Matthew Tan Creti

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Next Steps

- Patents pending
- Development timelines:
  - Prototype developed & tested, including comparative evaluation
  - Commercial viability = ~1 man year
- Future plans for development
  - Software for the two parts (secure communication, detection of compromised nodes) needs to be ported to a common platform

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Summary

- Secure communication between nodes using AES that is faster than the wireless network speed
- Detection and isolation of internal compromised node through decentralized protocol

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Opportunity

- Licensing or start-up opportunity
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