

GENI Wireless Subnets

System Engineering Status

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Outline

- System Engineering overview
 - Goals
 - Current status
- Details for specific wireless subnets
 - Current system definitions
 - Key components and interfaces
- Open issues at present

Types of GENI Wireless Subnets

- ✓ Urban Mesh Subnets
- Suburban Wide Area Subnet
- ✓ Application-Specific Sensor Subnets
- ✓ Cognitive Radio Subnets
- ✓ Wireless Emulation Subnets

✓ = First cut now written up in System Engineering Document

General Approach

- Work in parallel with “top down” GENI design
- Identify all subsystems & interfaces
- Strive for maximum commonality to reduce development effort & risk of incompatibility
 - Across GENI wireless subnets
 - Across all of GENI
- Perform “bottom up” estimates for BOE even in the earliest stages, as a sanity check

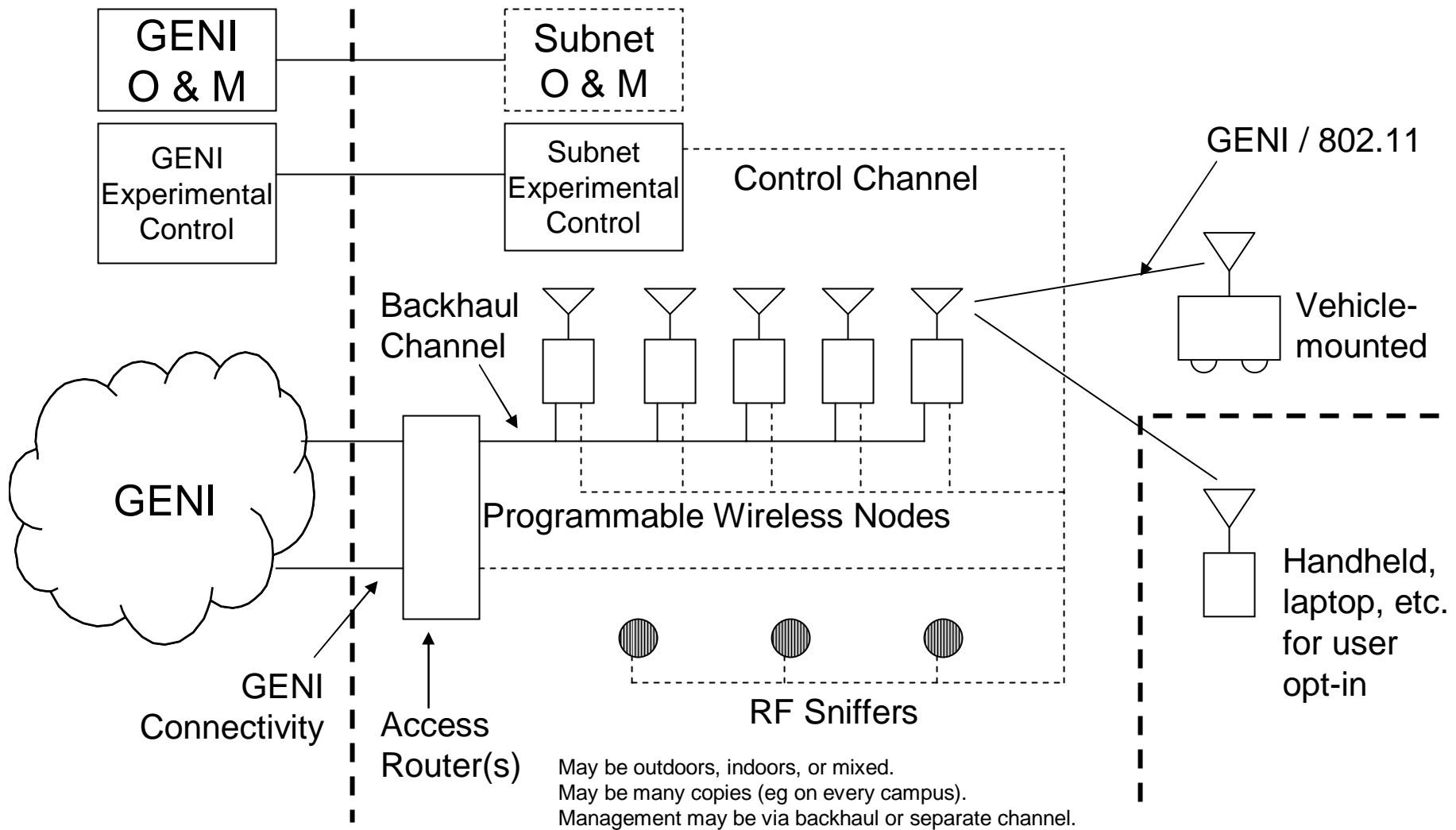
From Components to Full-Scale Systems

- Kits
 - Individual wireless nodes; building blocks for larger systems
- Laboratory subnets
 - A collection of kits and associated GENI systems that can federate with GENI
- Emulation Facilities
 - GENI wireless subnets (kits & other GENI systems) that can be used for repeatable “end to end” experiments, i.e., in RF isolation
- Field Deployments
 - Large-scale GENI wireless subnets (kits & other GENI systems) that can be used for end-to-end experiments “in the wild”

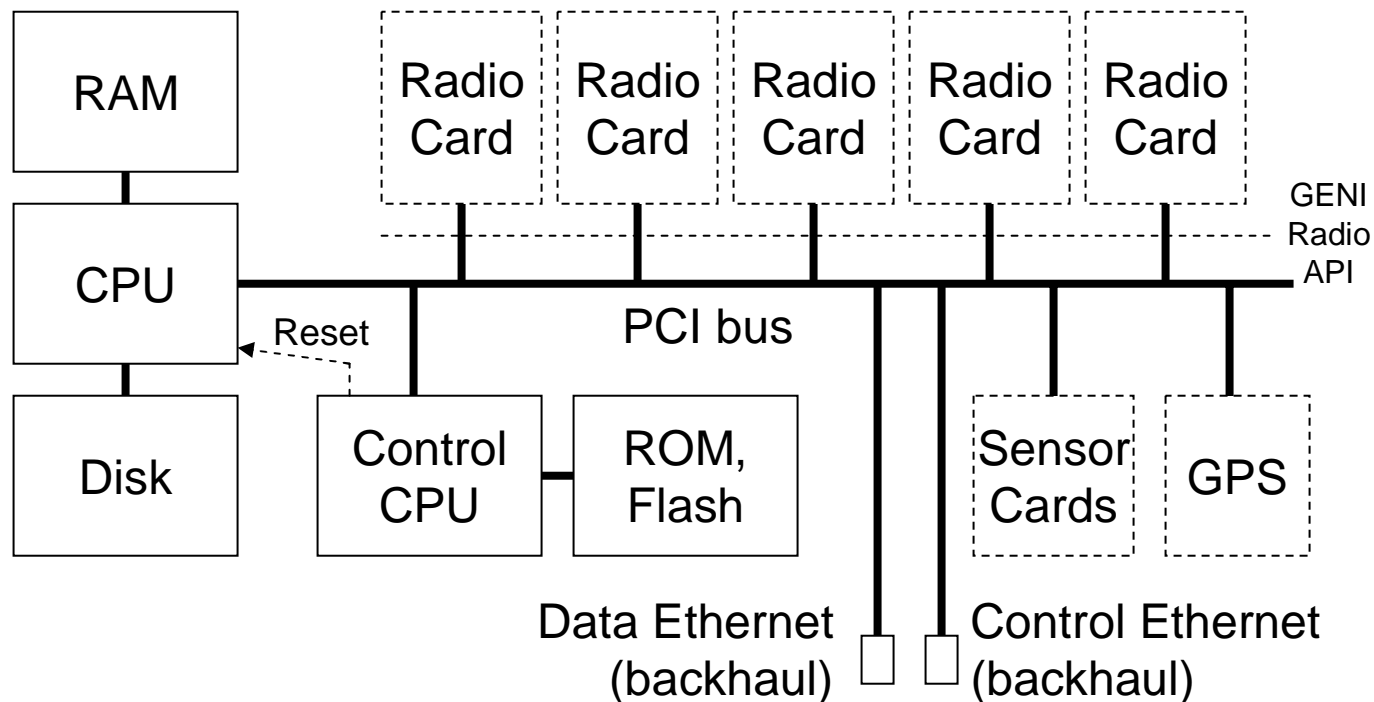
System Engineering Document for Wireless Subnets

- Provides the following descriptions for each of the GENI Wireless Subnets:
 - Reference designs for each type of wireless subnet
 - Functional decomposition into subsystems and components
 - Requirements for each subsystem and component, which are ultimately derived from the experimental needs of the research community for the GENI wireless subnets
 - External interfaces for each subsystem and component
 - Hardware definition for each subsystem and component
 - Software definition for each subsystem and component
- Intended to be used for the following purposes:
 - Provide concrete details to spur discussion within the GENI Wireless Working Group
 - Help identify those parts of the GENI Architecture that require further definition
 - Provide Basis of Estimate (BOE) inputs to the GENI Statement of Work (SOW)

A) Urban Mesh Subnets

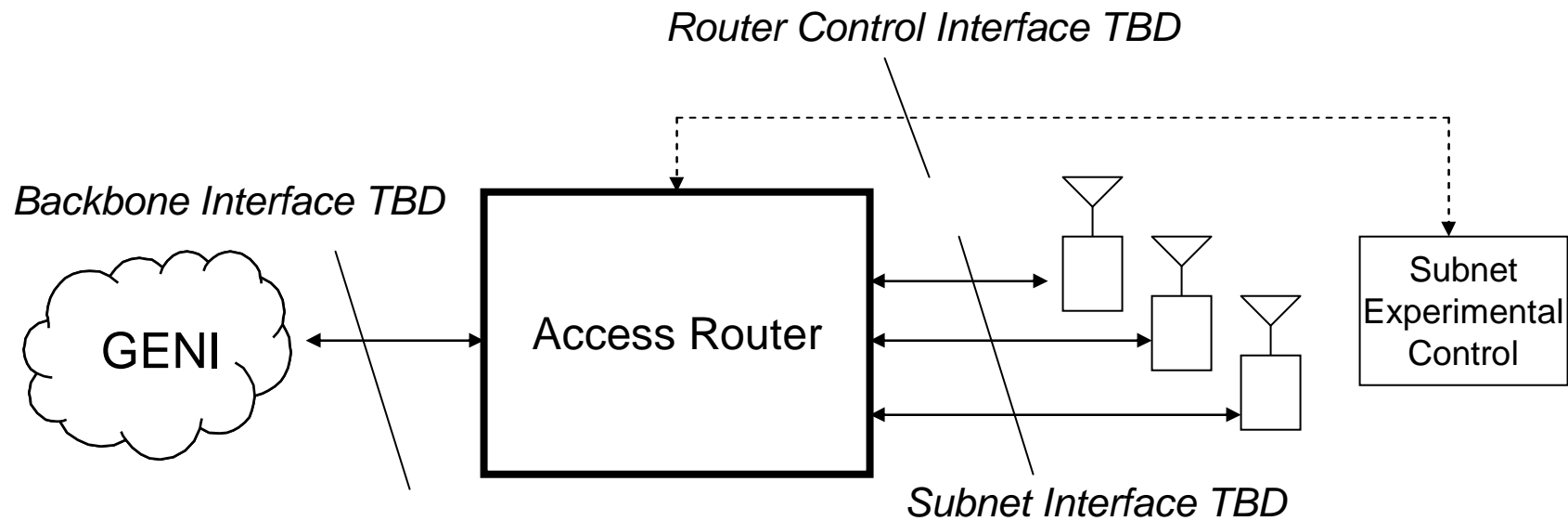


Programmable Wireless Node (Strawman)

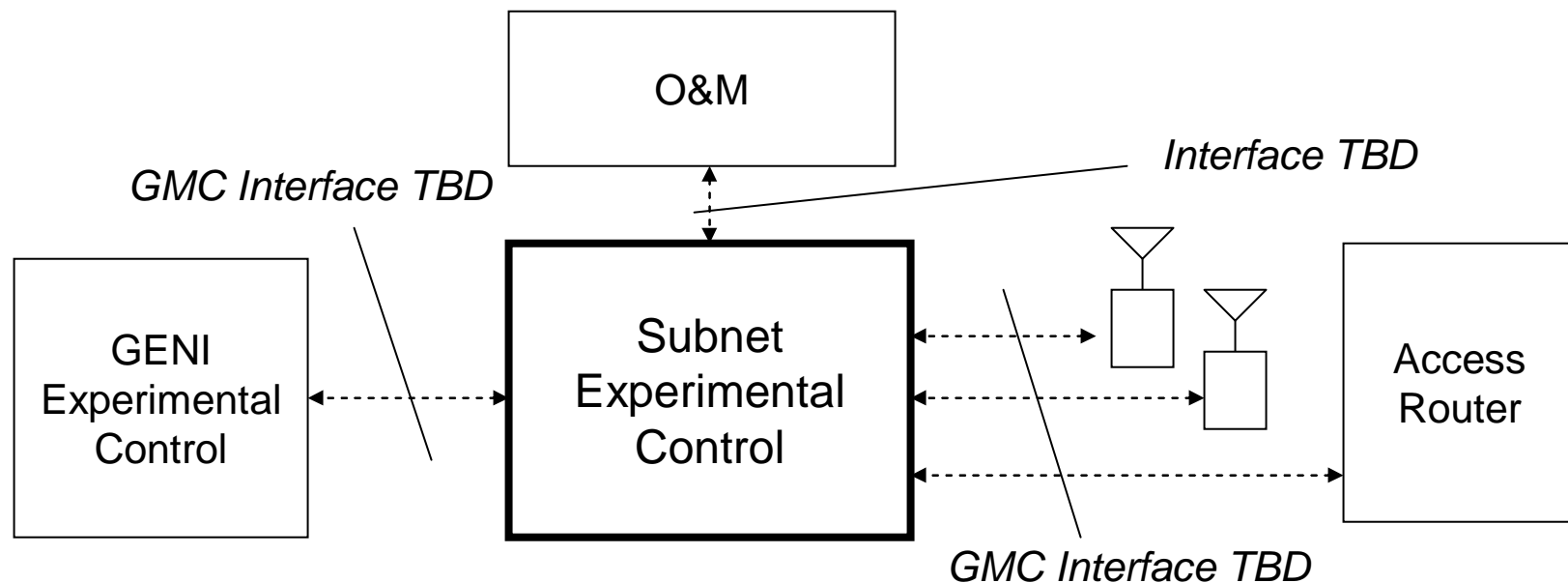


Goals: a) Run standard GENI component software without modification;
b) Provide many radio upgrade paths; c) Use as core for Cognitive Radio kit

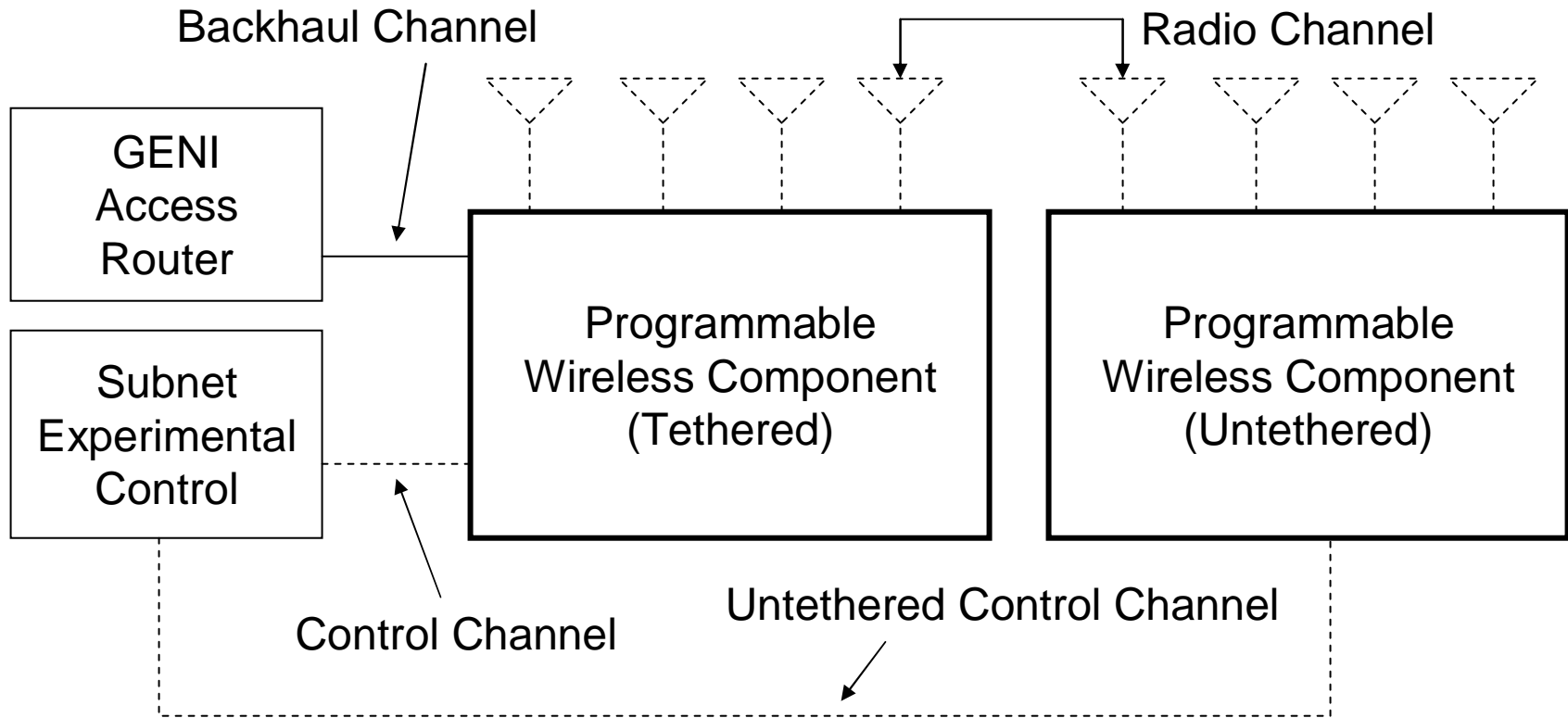
Interfaces – Access Router



Interfaces – Subnet Experimental Control

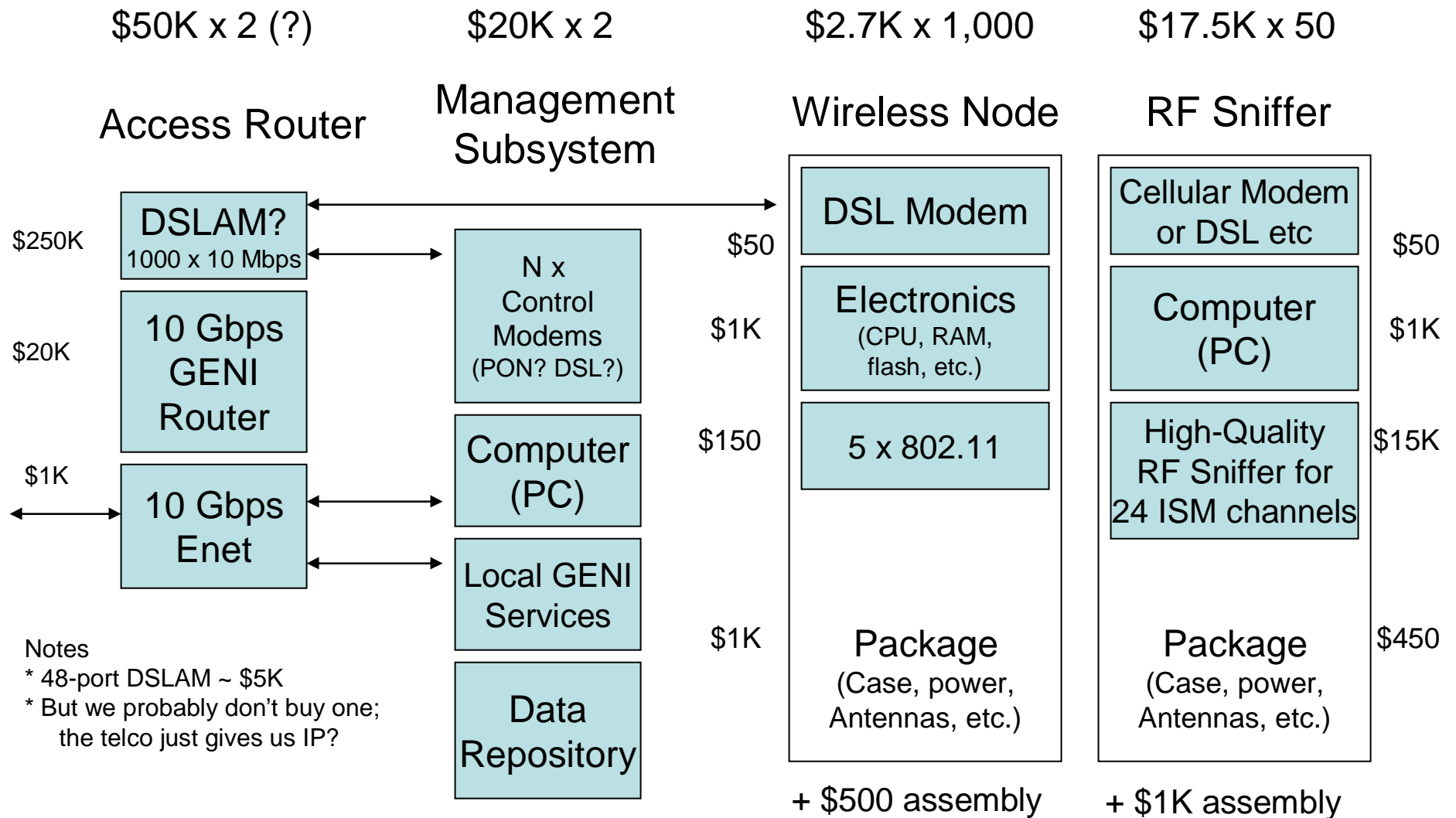


Interfaces – Wireless Nodes



Notional Hardware Elements for Costing

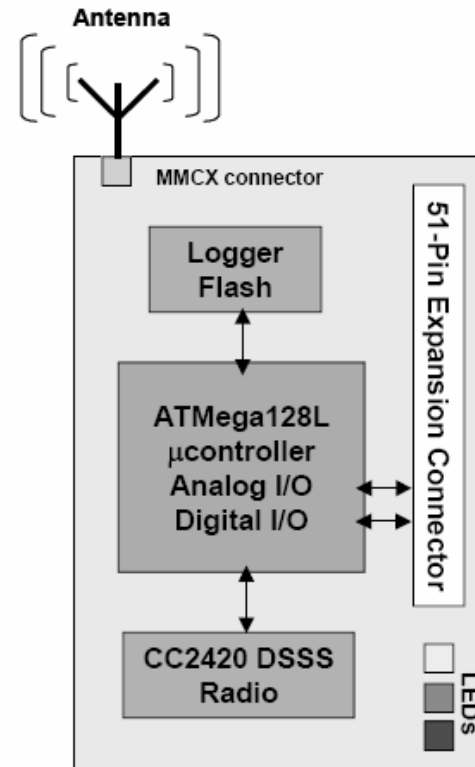
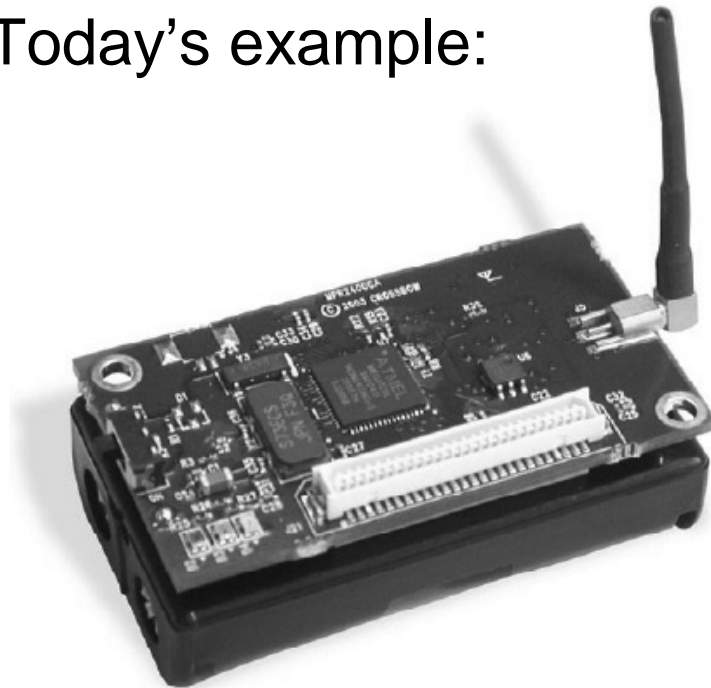
All prices are wild guesses, as is the hardware shown!



B) Application-Specific Sensor Subnets

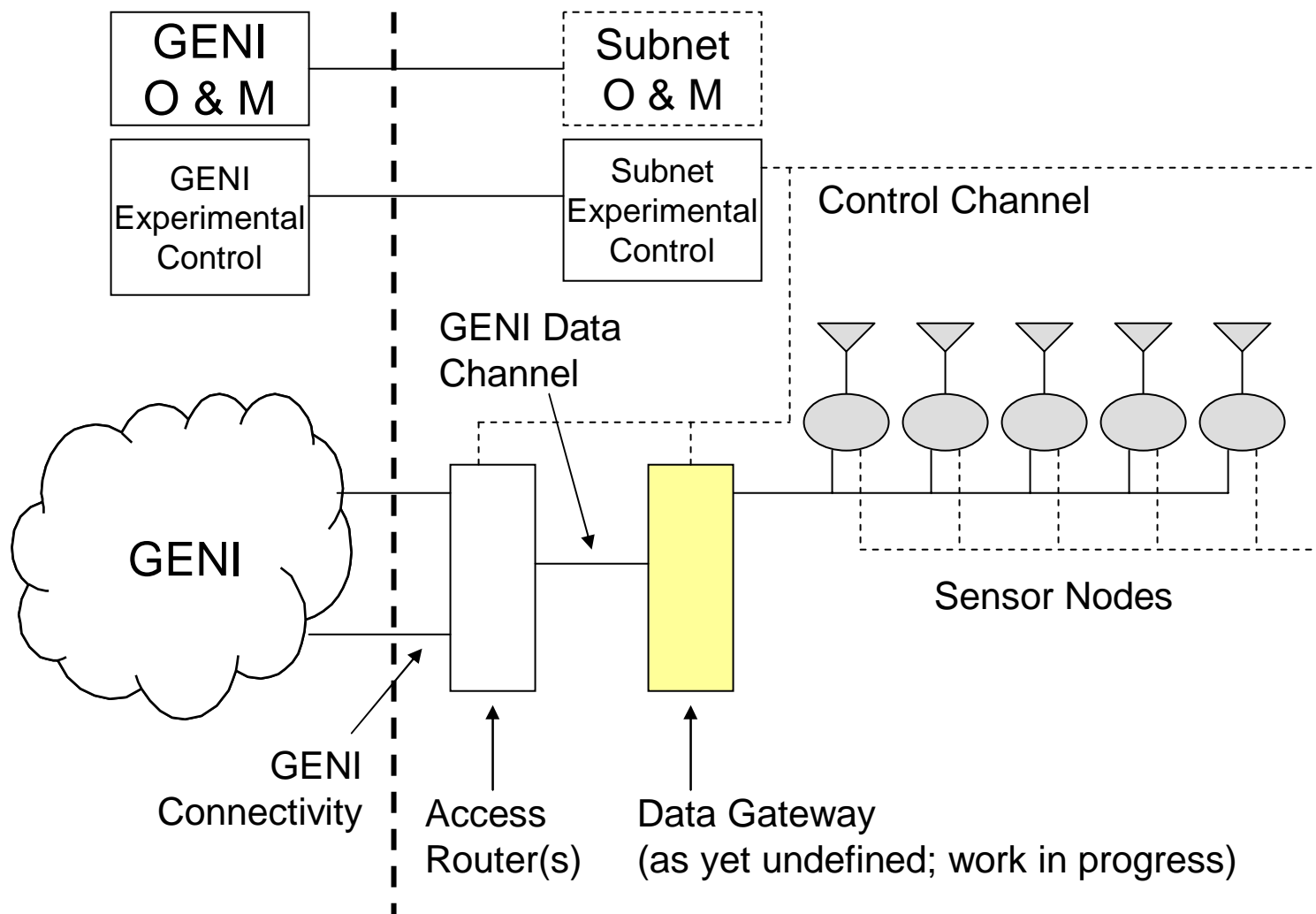
Design Driven by Very Small Devices

Today's example:

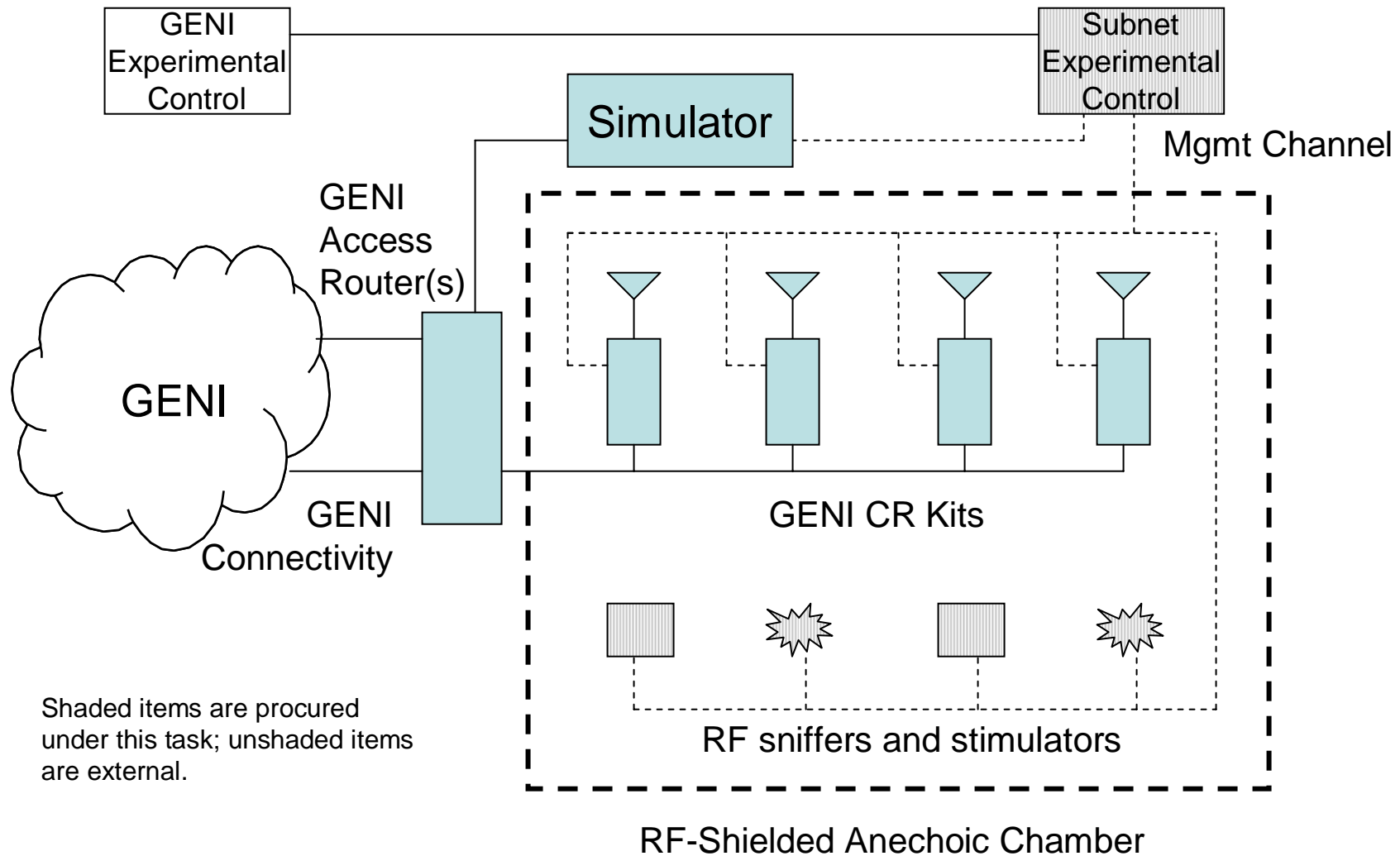


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(from MPR-MIB Users Manual Revision B, June 2006 PN: 7430-0021-07)

Sensor Subnet Architecture (Strawman)

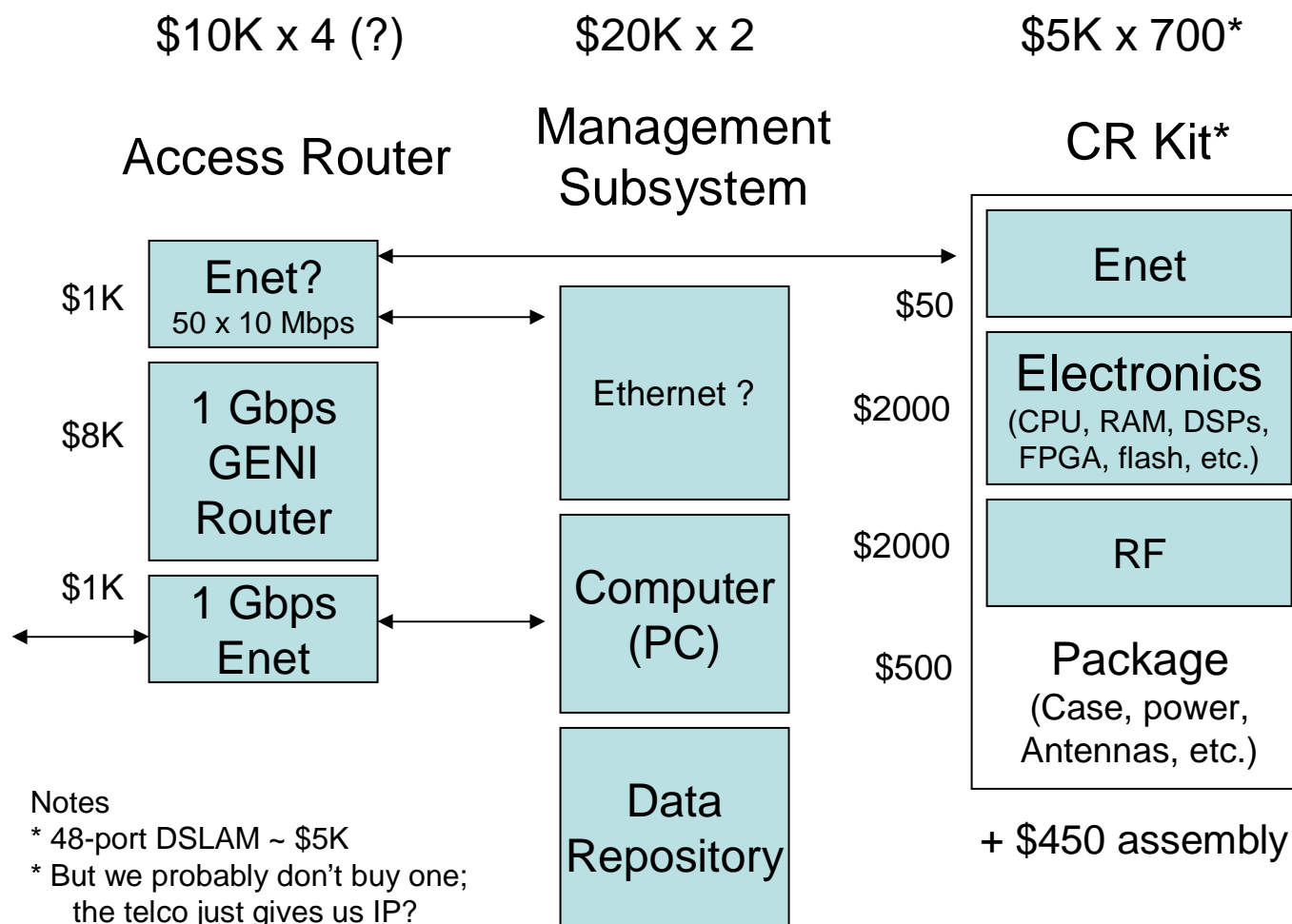


C) Cognitive Radio Subnets



Notional Hardware Elements for Costing (1/2)

All prices are wild guesses, as is the hardware shown!



* Assumptions:

CR Router is same hardware as CR terminal. Purchase 50 routers, 500 terminals, and 150 more for test environment / spares.

Notes

* 48-port DSLAM ~ \$5K

* But we probably don't buy one; the telco just gives us IP?

Notional Hardware Elements for Costing (2/2)

All prices are wild guesses, as is the hardware shown!

\$50K x 5

RF Sniffer

| | |
|---------------------------------------|----------|
| Ethernet | \$0 |
| Computer (PC) | \$2000 |
| High-Quality RF Sniffer | \$50,000 |
| Package (Case, power, Antennas, etc.) | \$300 |

+ \$550 assembly

\$6K x 25

RF Stimulator

| | |
|---------------------------------------|---------|
| Ethernet | \$0 |
| Computer (PC) | \$2000 |
| Fair-Quality RF Transmitter | \$3,000 |
| Package (Case, power, Antennas, etc.) | \$300 |

+ \$550 assembly

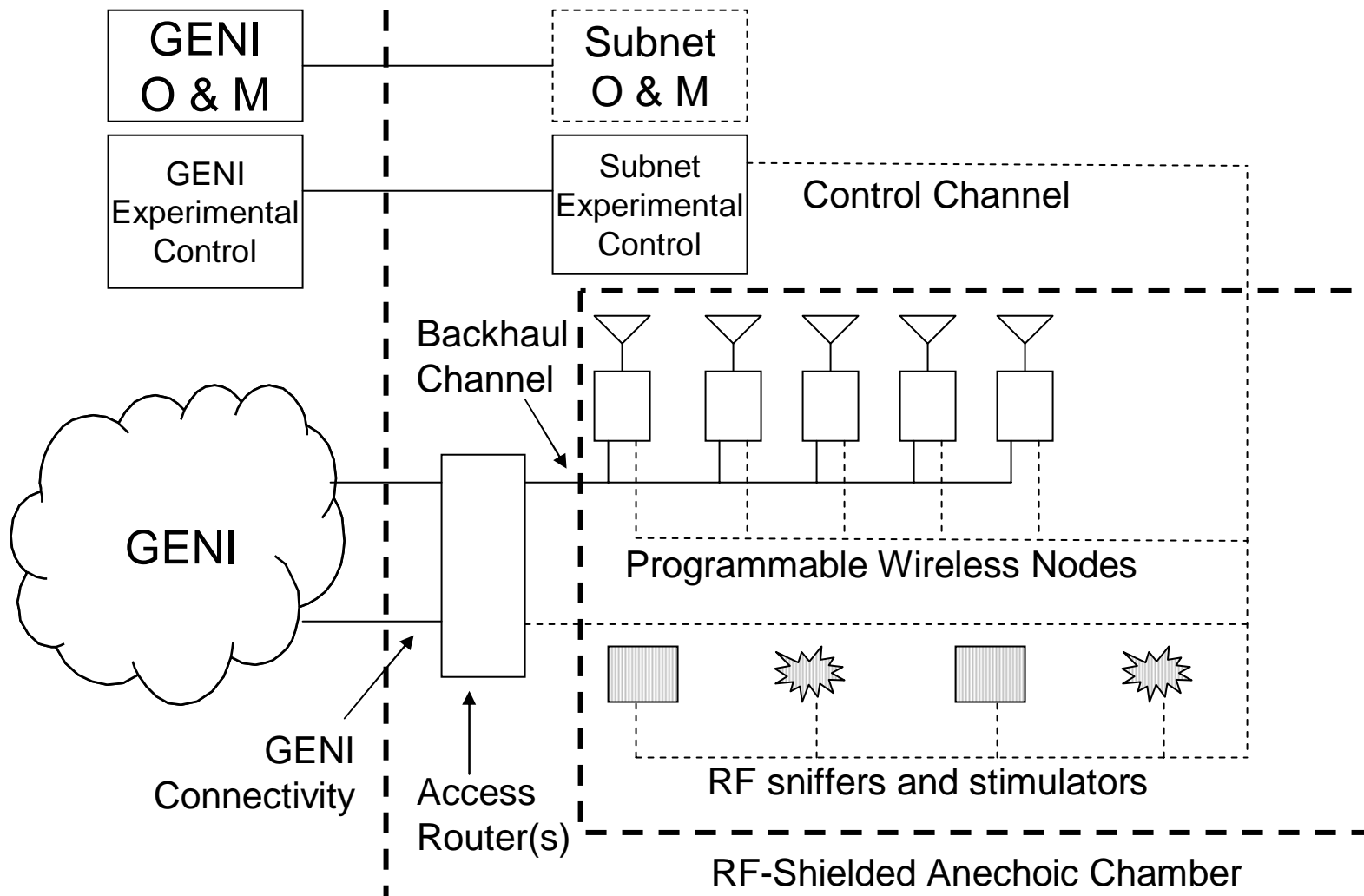
\$125K x 2

Simulation Cluster

| | |
|---------------------------|--------|
| Ethernet | \$0 |
| PC Cluster (100 CPUs) | \$100K |
| Storage (RAID drives?) | \$20K |
| Package (Rack, UPS, etc.) | |

+ \$5K assembly

D) Wireless Emulation Subnets



Open Issues

- End-to-end context
 - Experiment set-up and control
 - Instrumentation and data archival
 - Relationship of subnet control to GENI control
- Status of “disadvantaged” GENI nodes within the broader GENI architecture
 - Sensor nodes (too small for GENI software)
 - Mobile nodes (not always in contact)
- Access Routers (who builds them?)