

A Community Testbed for Repeatable, Easy to Control Wireless Networking Experiments

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intel.

XILINX®



Broader Impacts For Research and Discovery Summit



Evaluating Wireless Networking Technologies is Hard

- Lack of isolation from environment
 - ➔ Lack of repeatability
- Difficulty of control
 - ➔ Limited experimental range, e.g. mobility
- High degree of diversity in environments, devices
 - ➔ Narrow focus experiment

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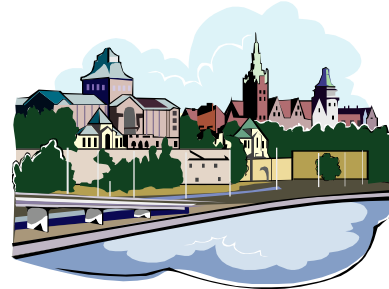
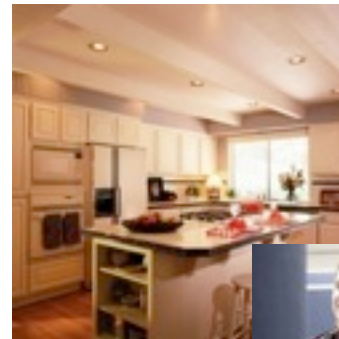
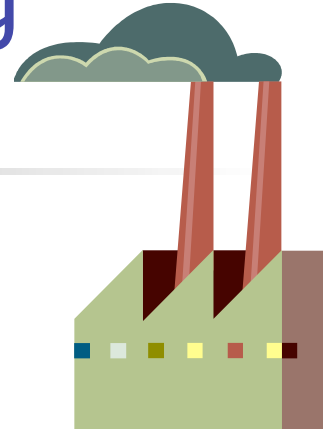
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Testbeds Simulation

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Testbeds Simulation

Challenge

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Evaluating Wireless Networking Technologies is Hard

- Lack of isolation from environment
 - ➔ Lack of repeatability
- Difficulty in replicating real world conditions
 - ➔ Limited experimental range, e.g. mobility
- High degree of diversity in environments, devices
 - ➔ Narrow focus experiment
- **Level of Realism**

Testbeds Simulation

Challenge

OK

**How to
Combine
Benefits?**

OK

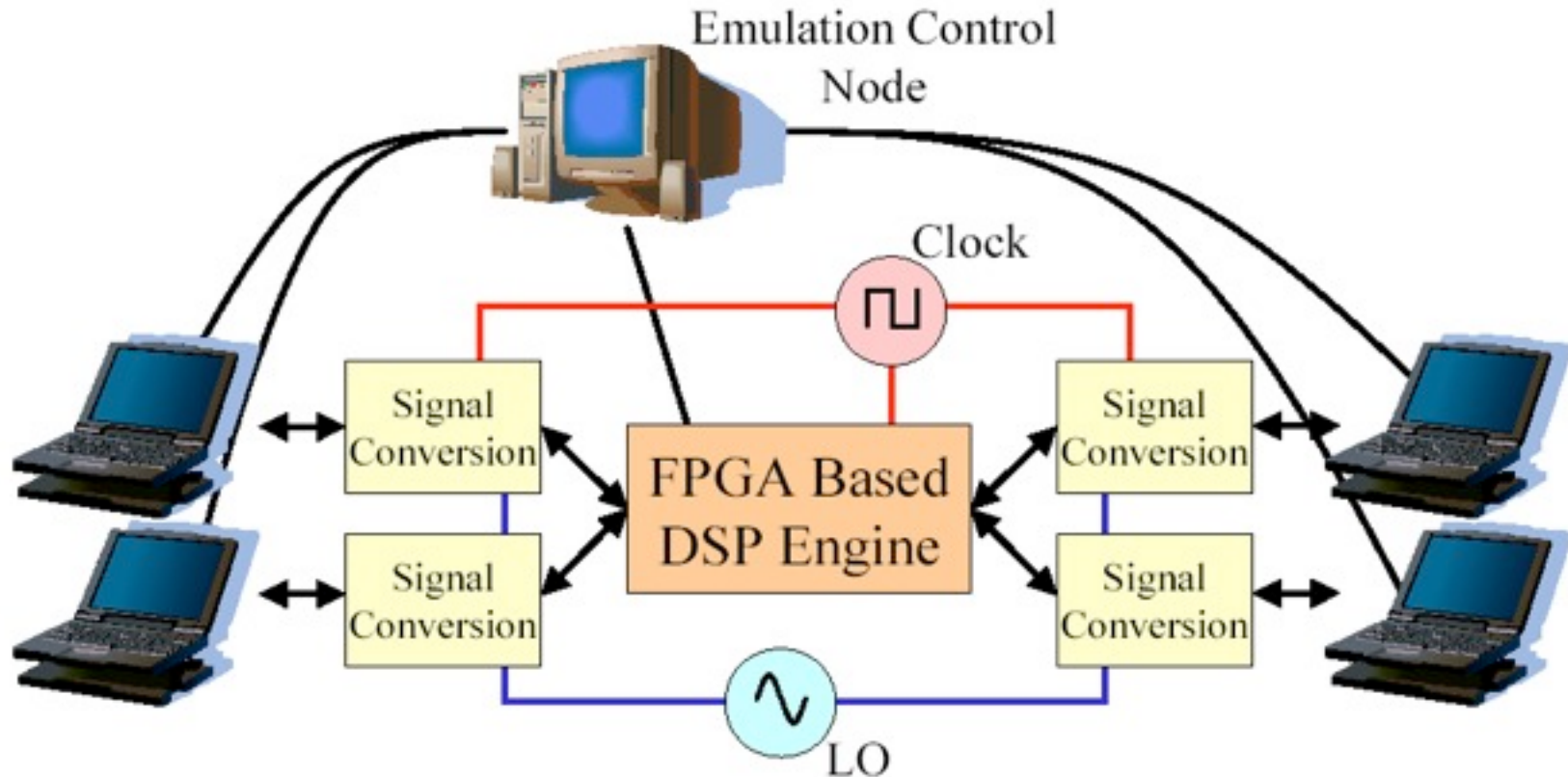
Challenge

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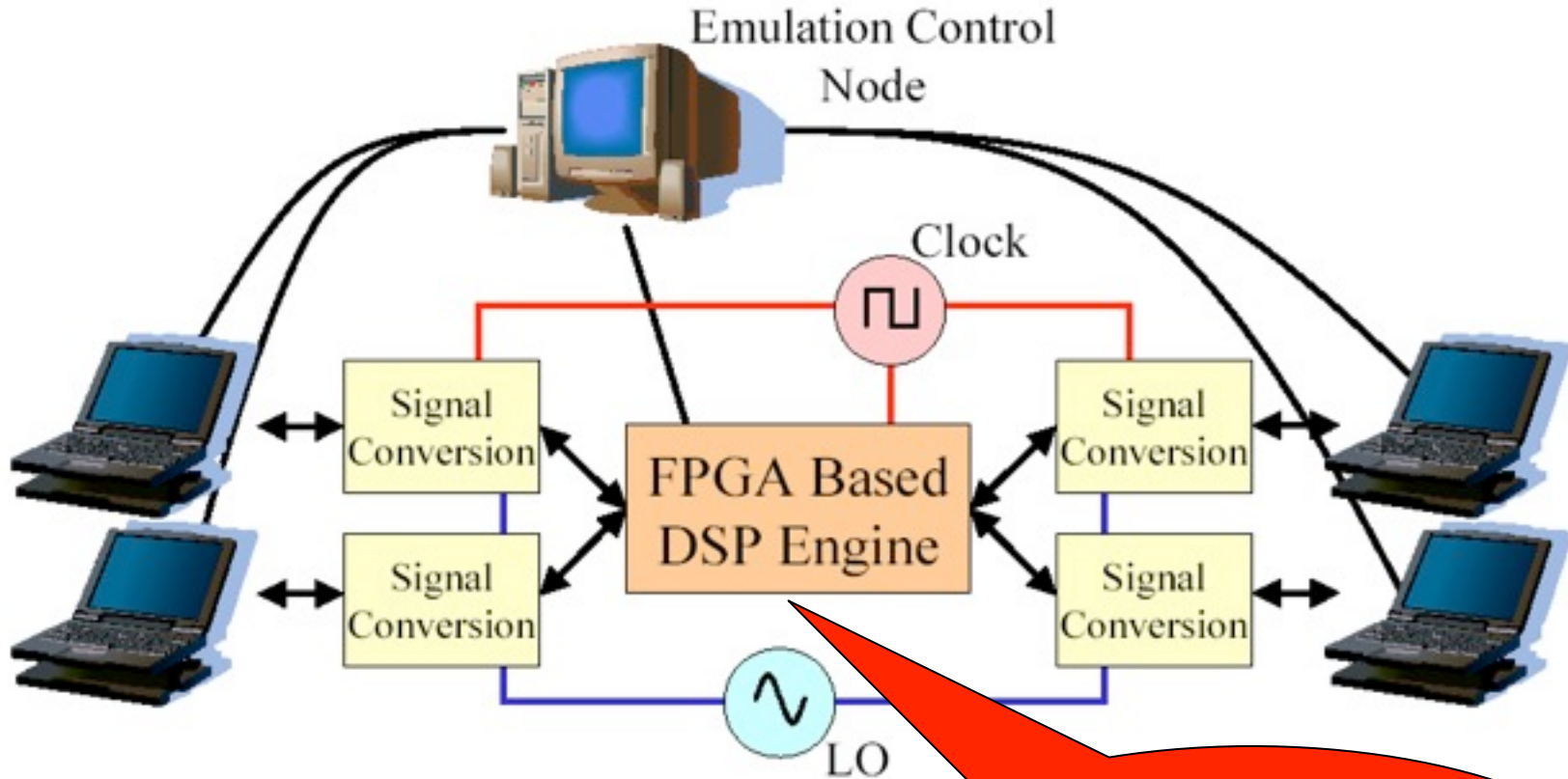
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Signal Propagation Emulation

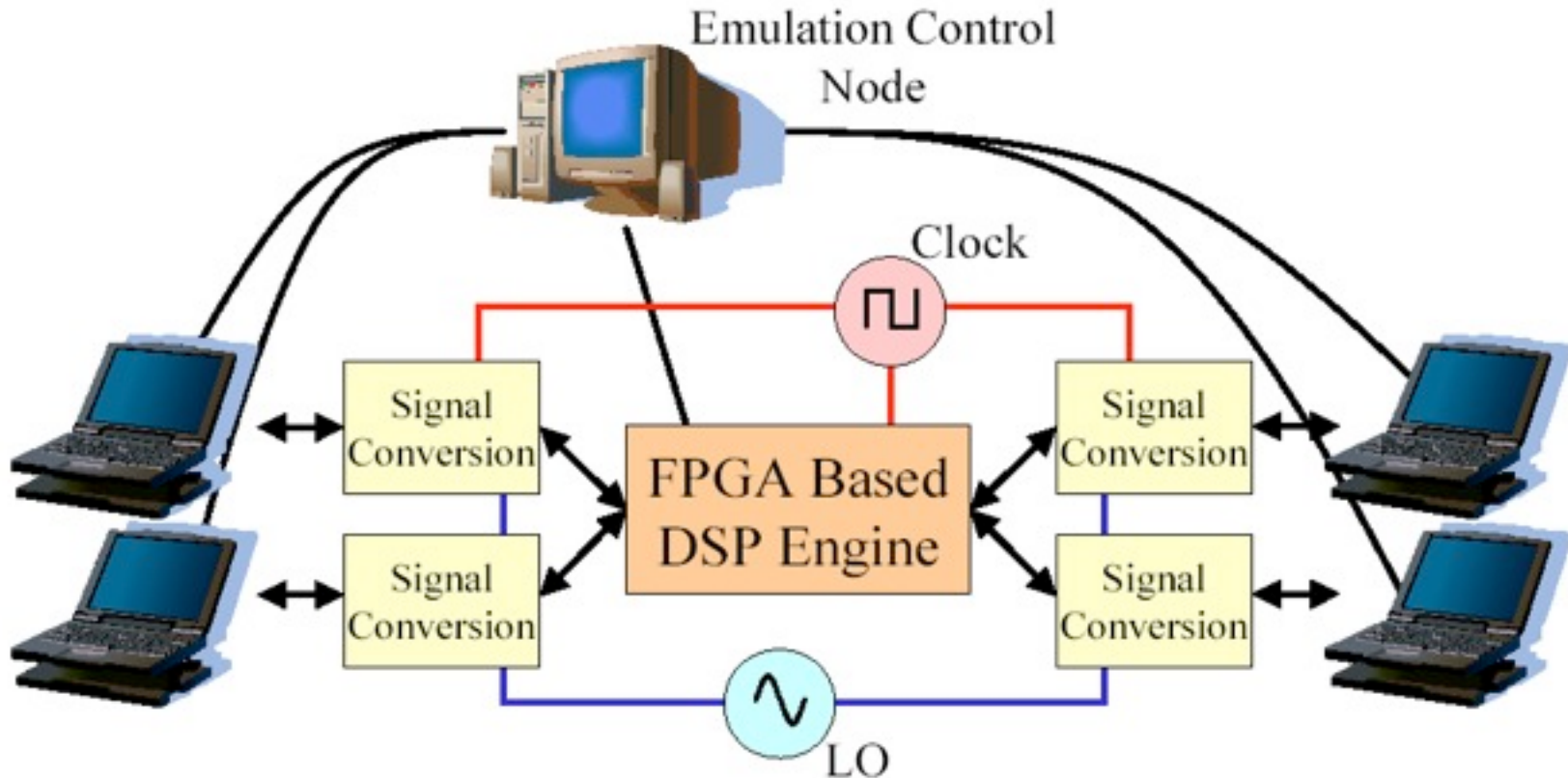


Signal Propagation Emulation



“Programmable
Ether”

Signal Propagation Emulation



- Real hardware → high degree of **realism**
- Digital emulation of channels → full **control**
- Isolated from environment → fully **repeatability**
- Programmable → very **diverse experiments**



The Emulator Project and Broader Impact

- External users since 2007
 - Research and courses
 - Lower bar for wireless experiments
 - Unique testbed capabilities
- Broad “big systems” research
 - RF, custom hw, FPGAs, networking,
distr comp., GUIs, sys admin, ...
 - From simple idea to operational system
 - Exceptional educational experience (e.g. REUs)
- Add scientific basis to wireless research
 - Systematic experiments that explore when technology does and does not work, and why

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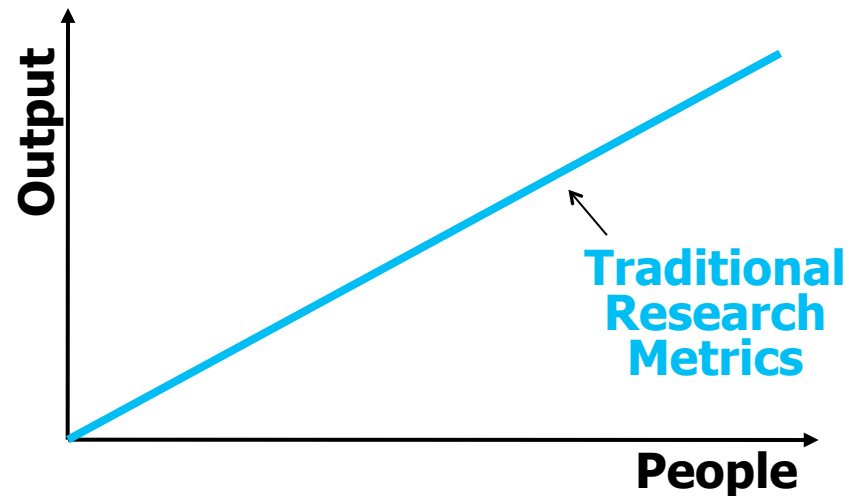
Challenges

- Impact on PhD student education and career
 - How much student credit for broader impact?
 - User support, bug fixes, documentation, ...
- Student turn over
 - Loss of significant project expertise every few years (intentionally!)
- Project size needed to achieve substantial broader impact
 - Systems need to be reasonably mature



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