



Research Consortium in Speckled Computing

Co-simulation : mixing simulation and reality

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Co-simulation : Predicting the behaviour of large network deployments by combining simulation and reality

- Why not just deploy/simulate it?
- How's that going to work then?
- What are you doing on this right now?

The problem

Experimental large scale sensor network deployments are:

- Expensive - node costs \times a large number of nodes = worried financial overseers
- Risky - If it doesn't work, *enraged* financial overseers

So what to do?

- Small scale test deployment?
- Large scale simulation?

Small scale test deployment

Deploy a small section of the full network, and see how it goes. Sounds good, but critical scaling issues are not captured.

- Network traffic volume
 - Channel contention
 - Battery life

It becomes difficult to assert that small-scale performance will scale up

Large scale simulation

Captures large-network issues, but simulation accuracy can be questionable

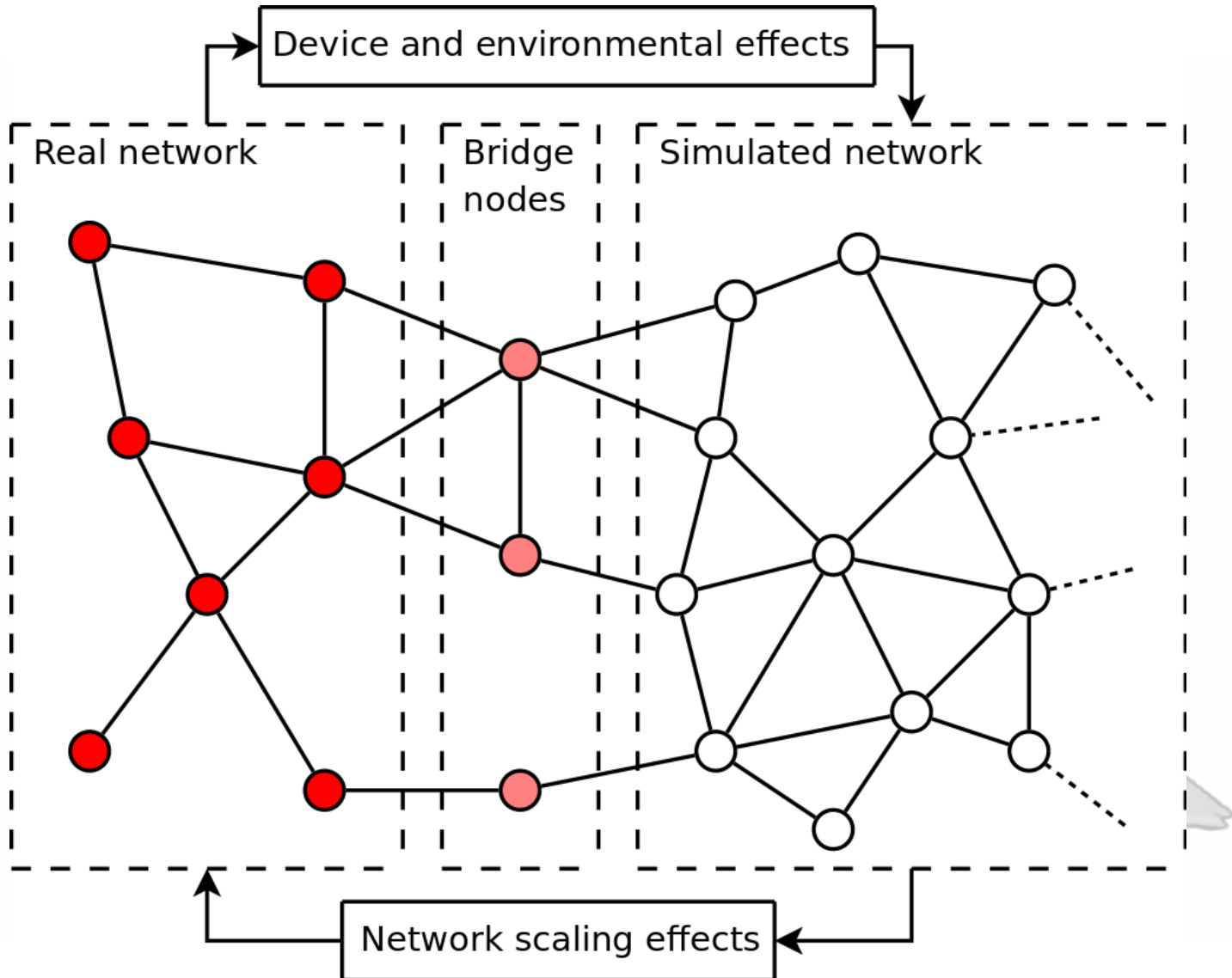
- Environment and communication models are typically generic
- Device modelling complexity trade-offs
- Accuracy is important : speckled networks are constrained environments, little room for error.

So what to do?

Combine the approaches

- Deploy a small section of the network
 - Instrumented to measure performance
- Simulate the rest of the network
 - Simulation informed by measured performance
- Bridge the two with synthetic nodes
 - Physical hardware, controlled by the simulation
- Simulation is made more accurate by using non-generic performance measuring
- Real network is stressed by large-network effects

Inevitable block diagram



Implementation issues

- Bridge nodes
 - Exist in the simulation and in the real world
 - Conflicts between the two require careful management
- Simulation performance
 - Must be maintained at real-time
 - Hence parallelisation required
 - Real network can be treated as just another part of the parallel simulation

Current work

- In time-honoured academic fashion, has been farmed out to a student

