

# Fast Prediction of Network Performance: k-packet Simulation



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#### Introduction

Prediction of performance on supercomputer networks is useful for a variety of what-if analyses:

- How does performance change with task-mappings?
- Identify bottlenecks and explore solution space.
- Study the performance of future networks and algorithms.

Flit-level and packet-level simulators are:

- Useful for prediction of performance on small systems.
- Inefficient and very slow even for moderate-sized networks.

Explore a new simulation methodology that:

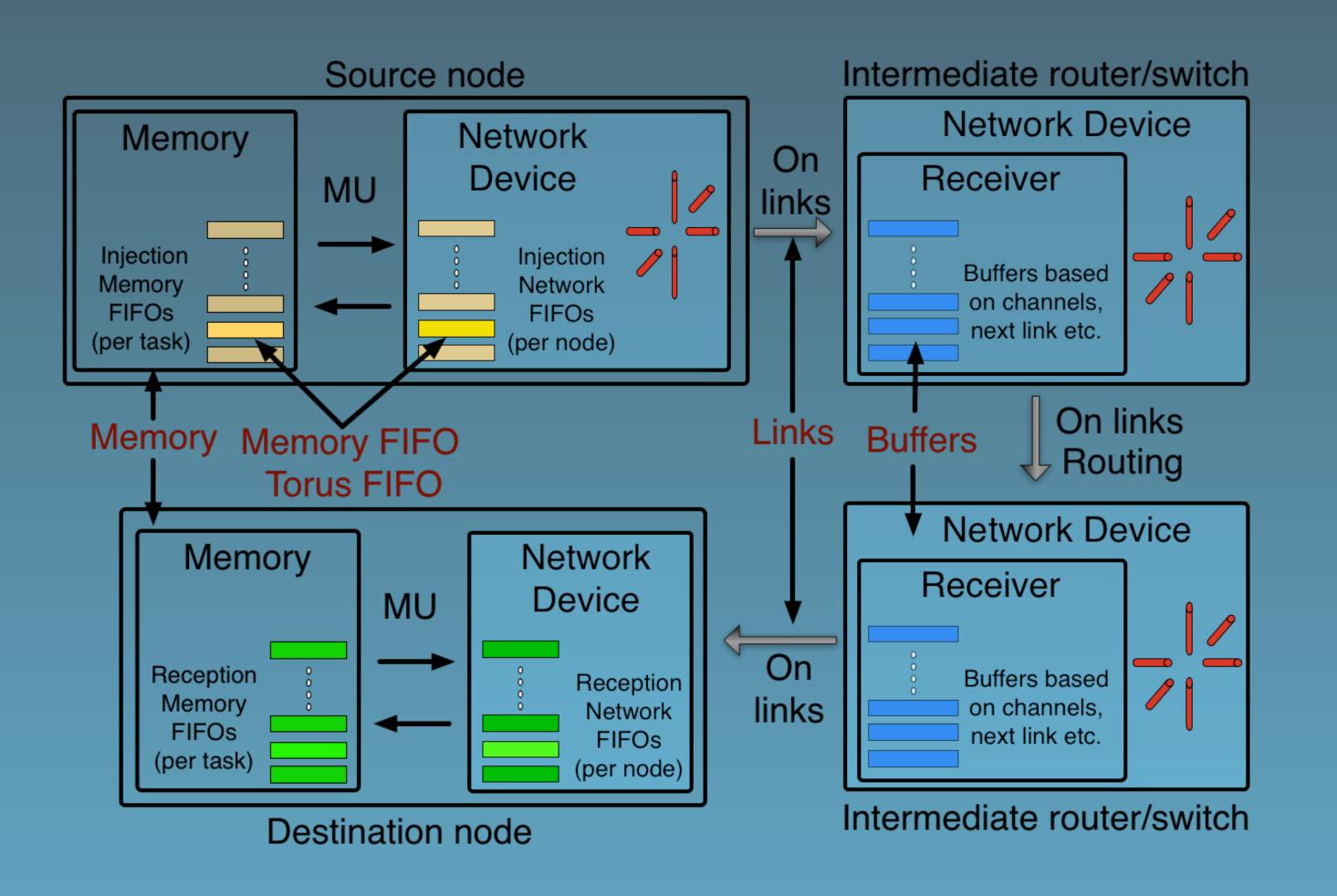
- Decreases the granularity to message level events (k-packets where k is dynamic)
- Simulates different components at different resolutions
- Uses heuristics to estimate the stable state of the network

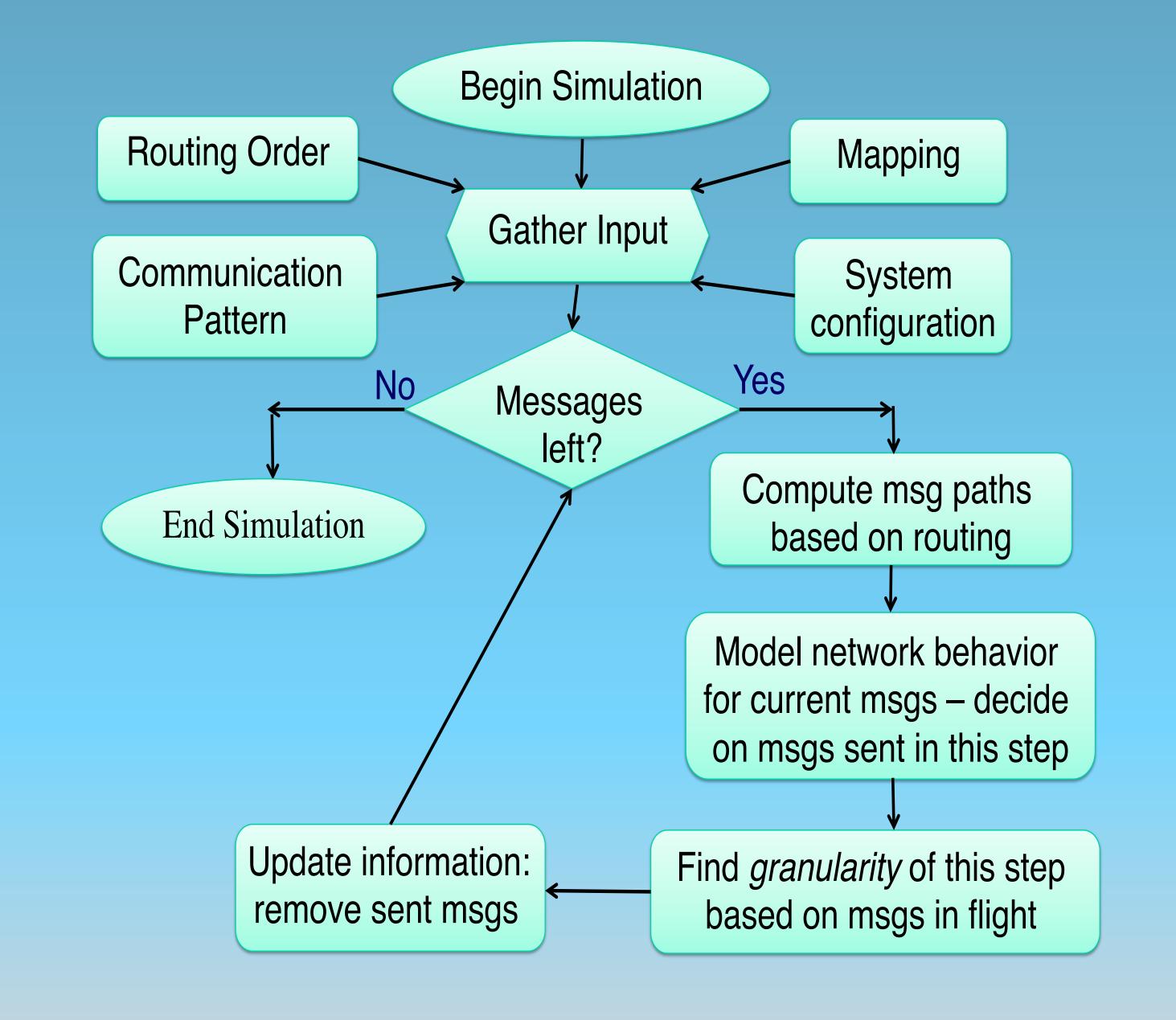
Preliminary results show that the proposed approach can model the network behavior accurately, and is orders of magnitude faster than the previous methods.

#### Basic Principles

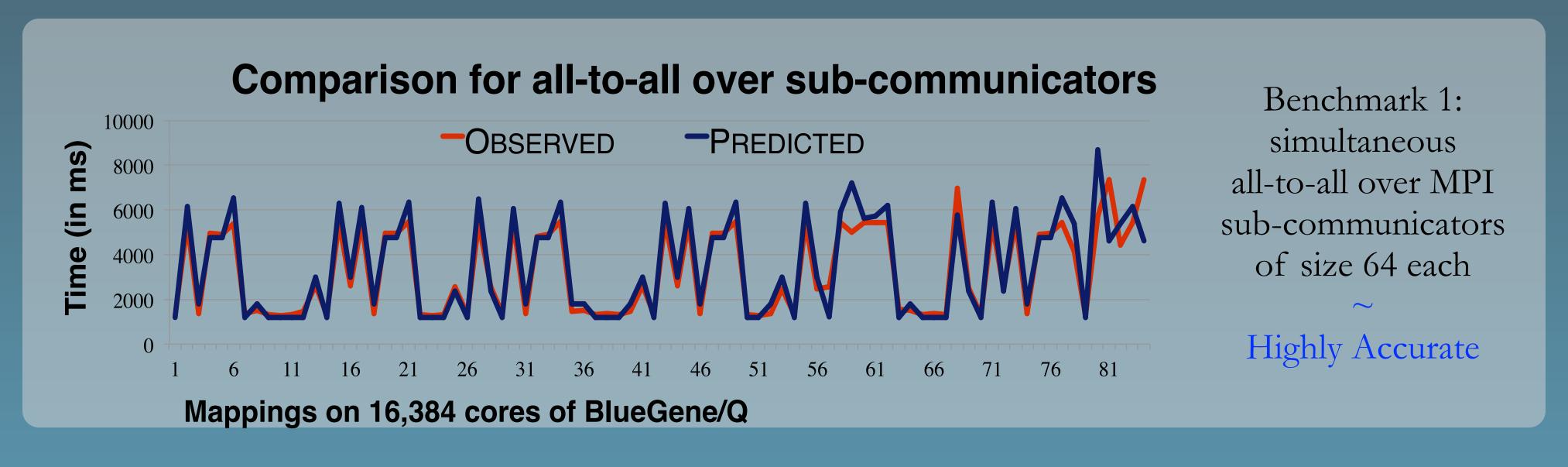
- Use analysis at the level of message events.
- Estimate aspects that affect network behavior using simple mechanisms memory, injection and reception mechanism, link bandwidth, buffer size and schemes, and routing.

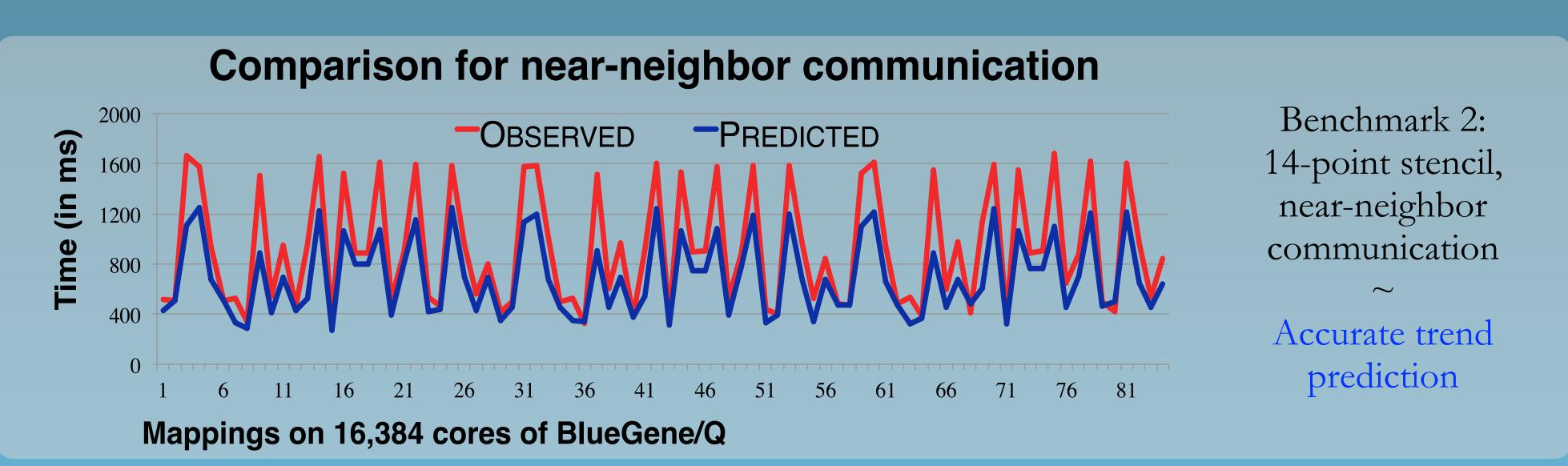
### Proposed Approach

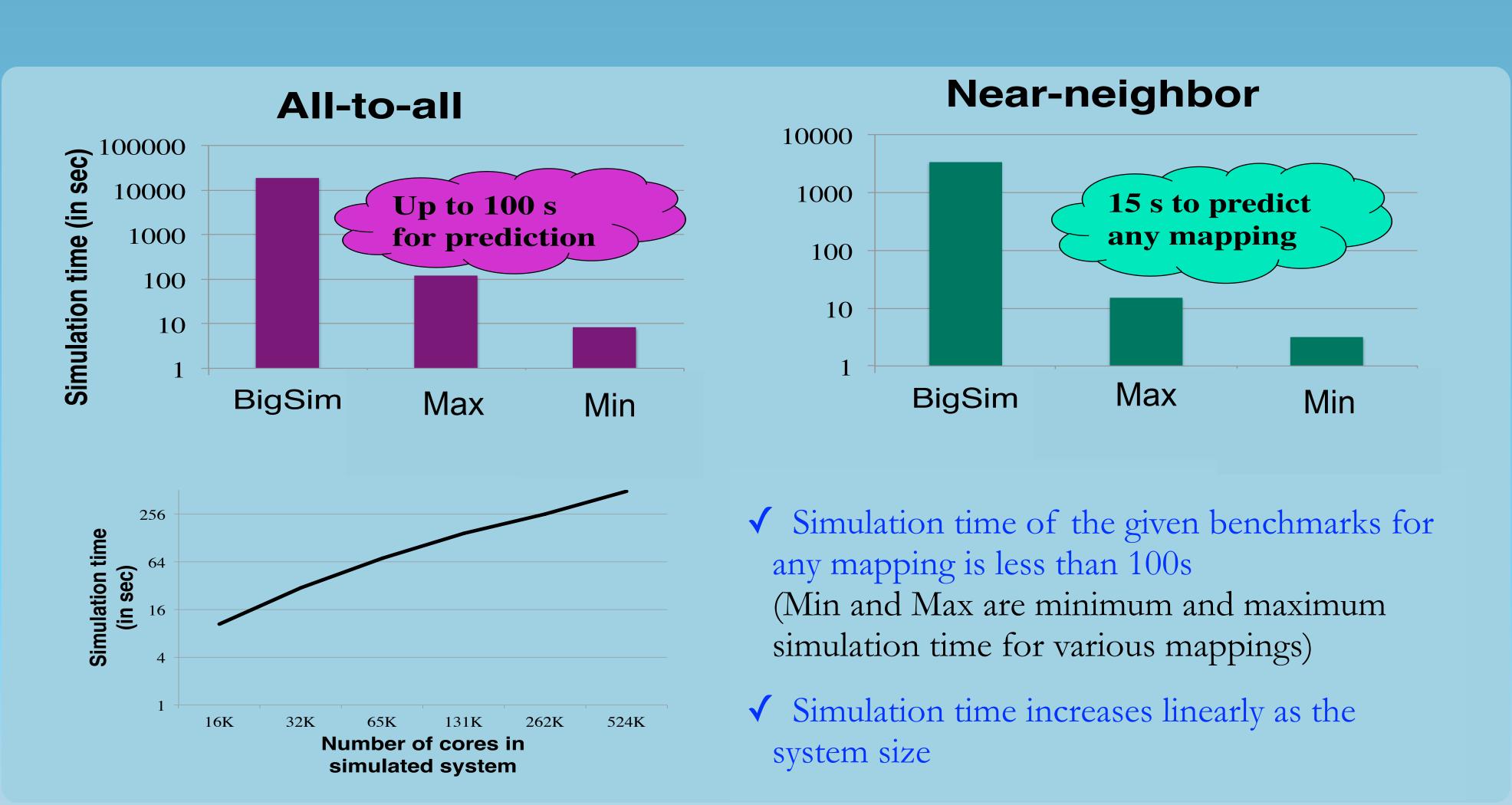


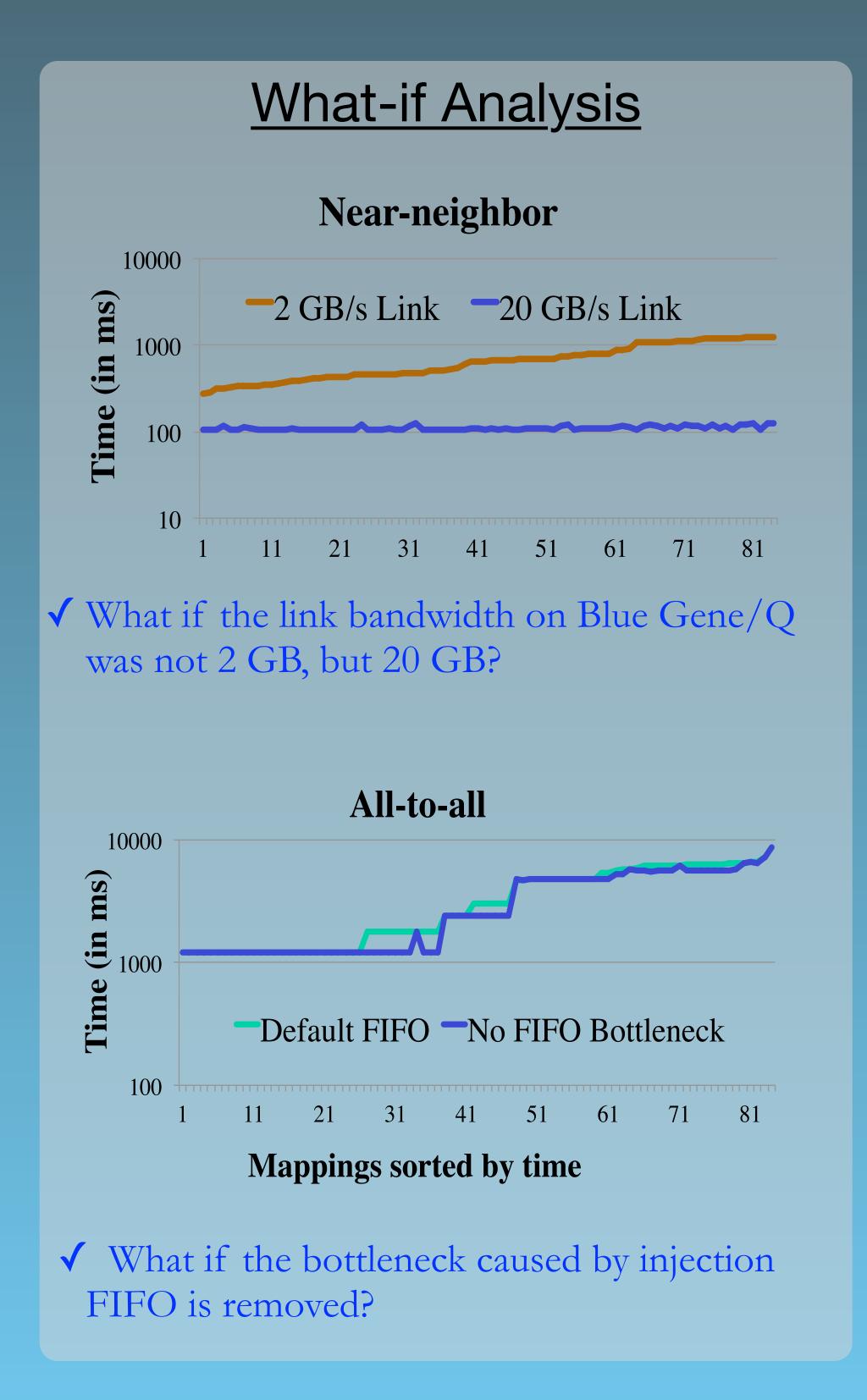


## Preliminary Results









#### Future Enhancements

- Trace-driven simulation.
- Compute state of the network at intermediate time steps.
- Parallelization for shared memory systems.