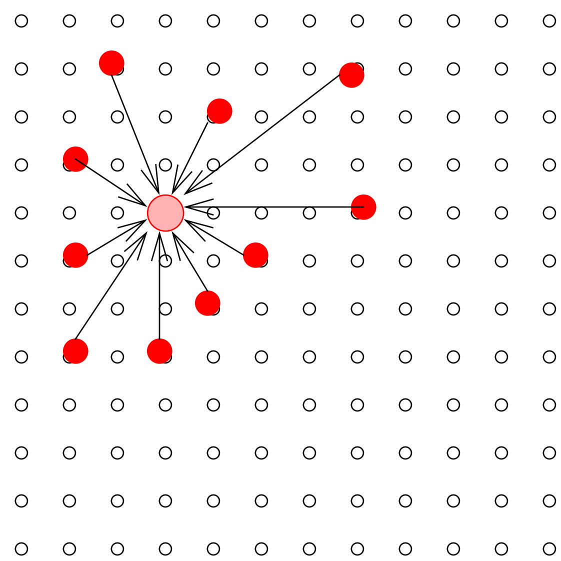
General batch problems



Time needed:

$L = \Omega(n^2)$

"Hard" problem instances: $L = \Omega(n)$

L: lower bound

Our bounds: multi-bend algorithm

Busch, Herlihy, Wattenhofer STOC '00

Any "hard" general problem instance:

$$O(L \cdot \log^3 n)$$

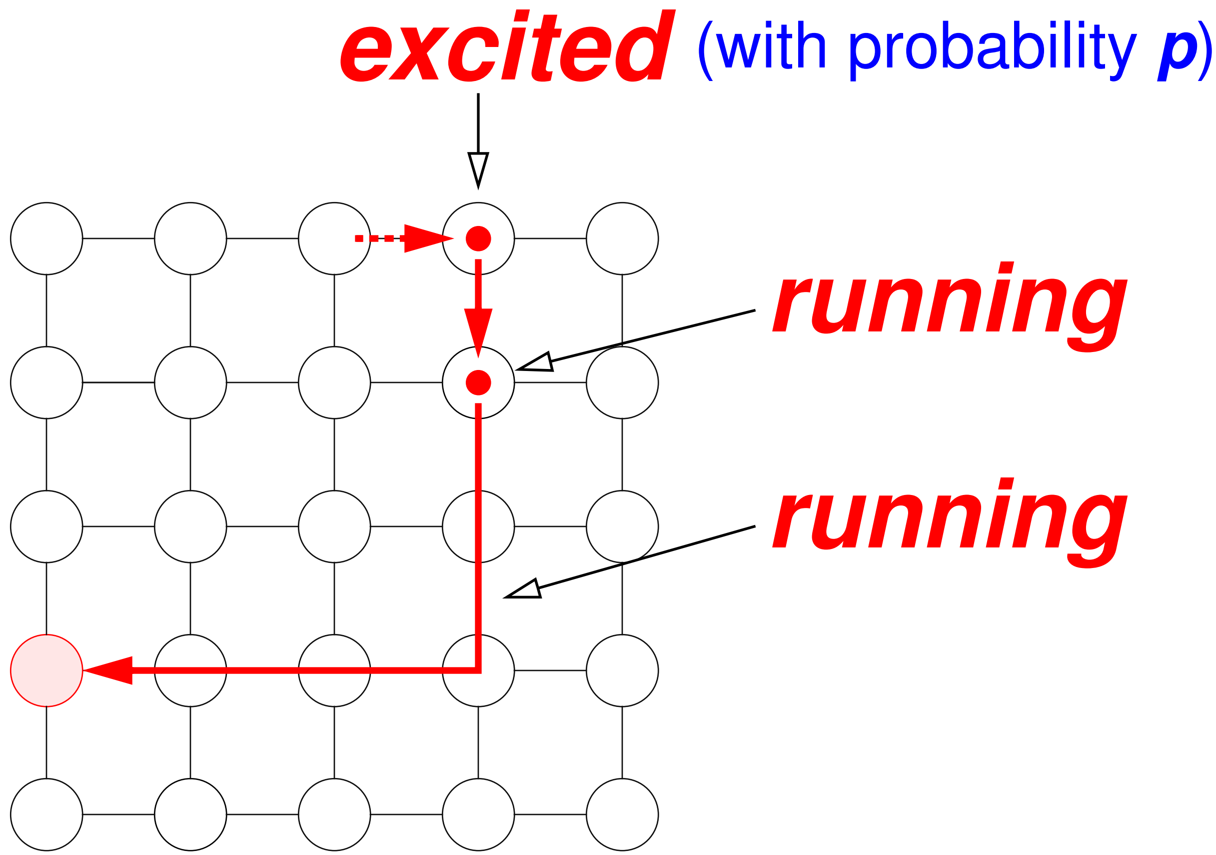
L: lower bound

First competitive hot-potato algorithm

One-Bend Algorithm

Packet States	Priority
running	higher
excited	
normal	lower

Home run



If interrupted it becomes ***normal***

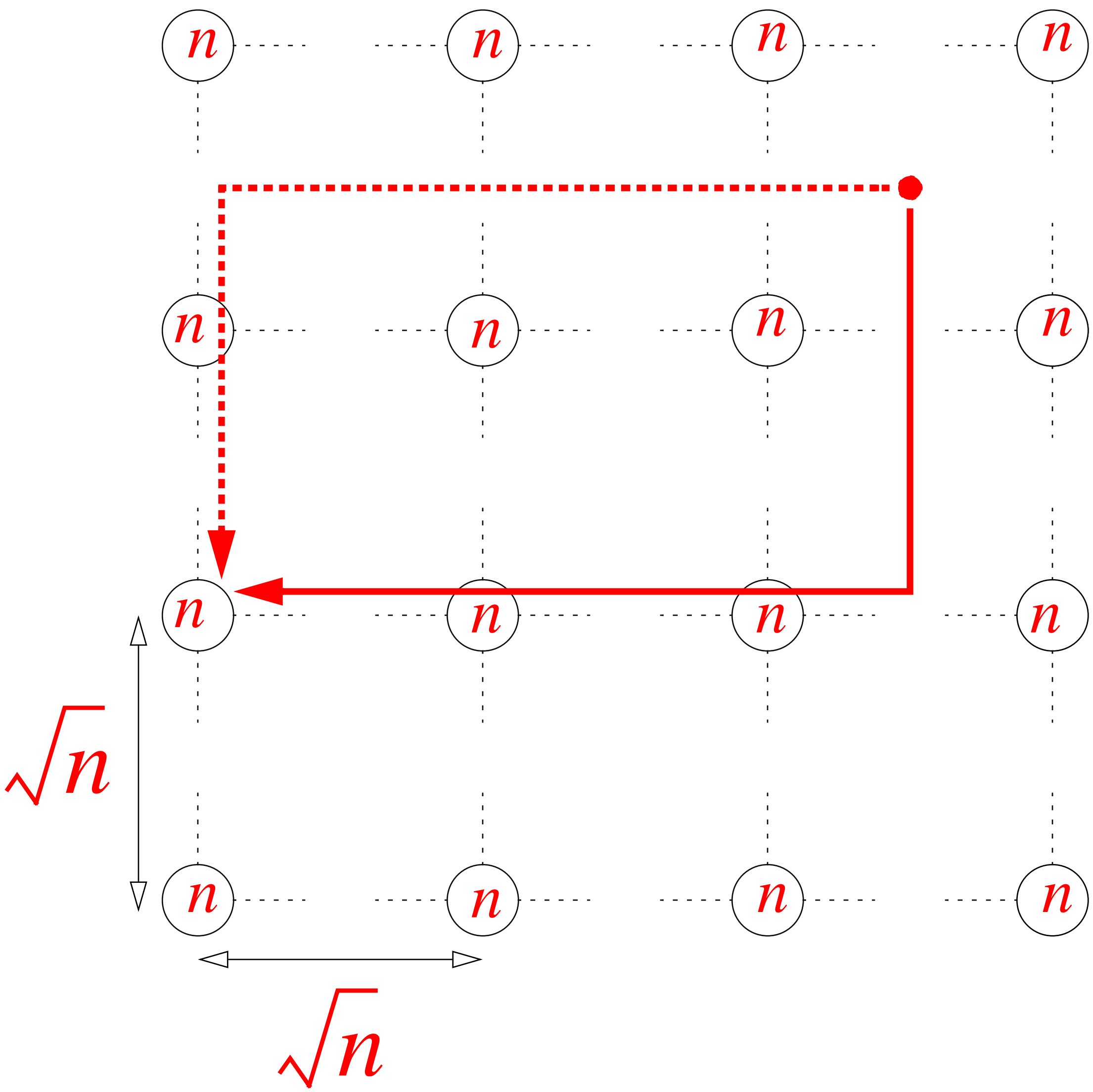
General Batch Problems

Time for all packets:

$$O(m \cdot \log n)$$

m = maximum number of destinations in any row

A pathological case



$$m = n\sqrt{n}$$

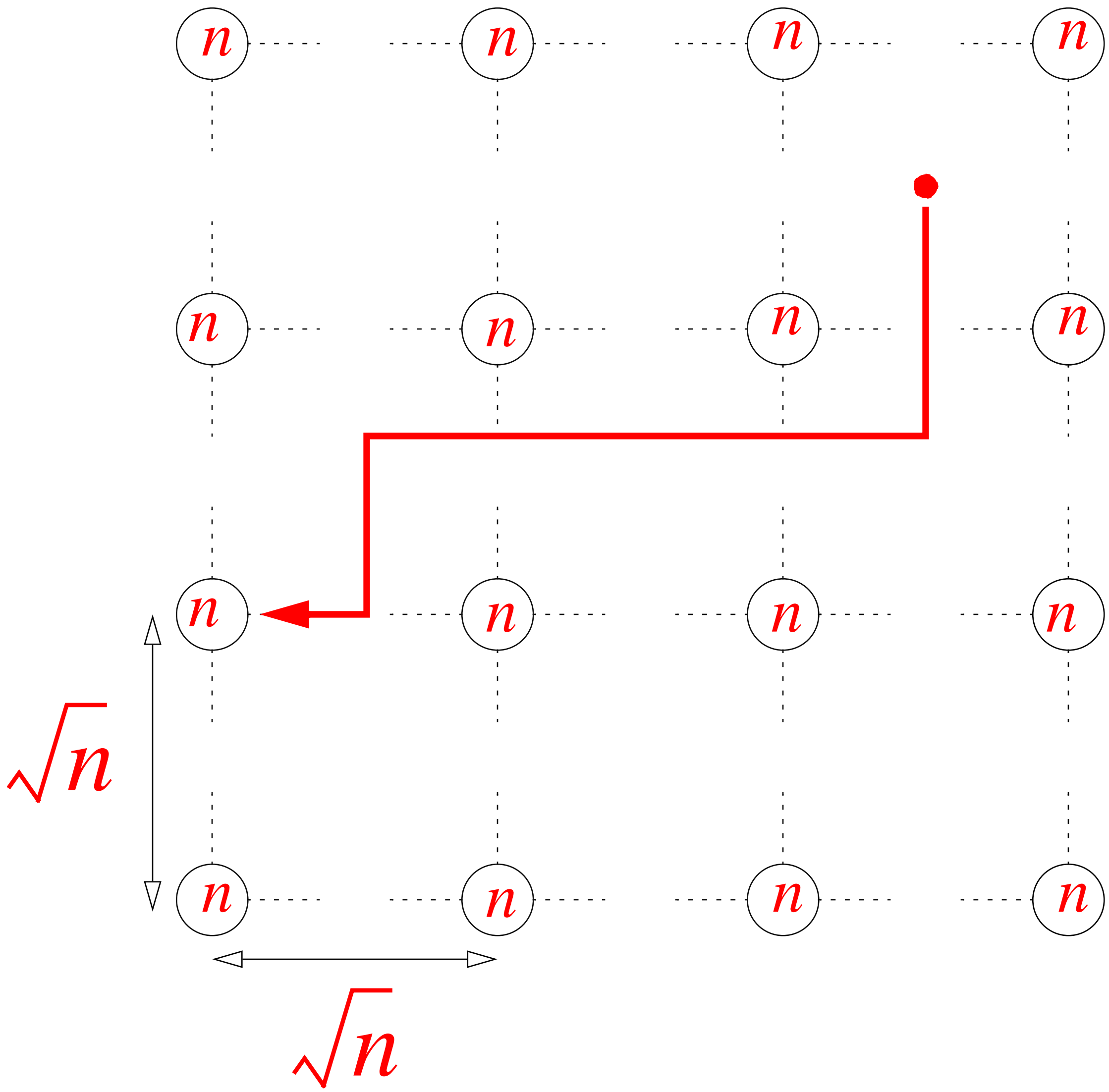
Total time

$$O(n\sqrt{n} \cdot \log n)$$

Far from

$$\Omega(n)$$

We need more bends



Total time closer to

$\Omega(n)$

Talk Outline

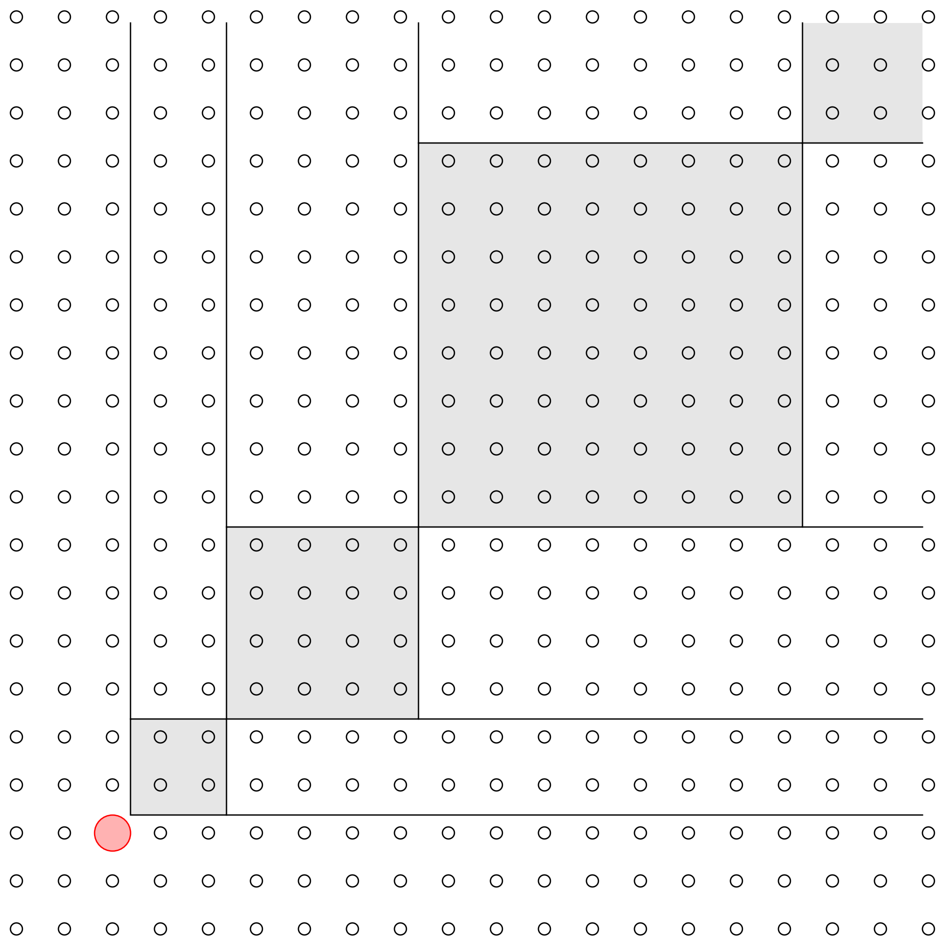
Greedy Hot-Potato Routing

One-Bend Algorithm

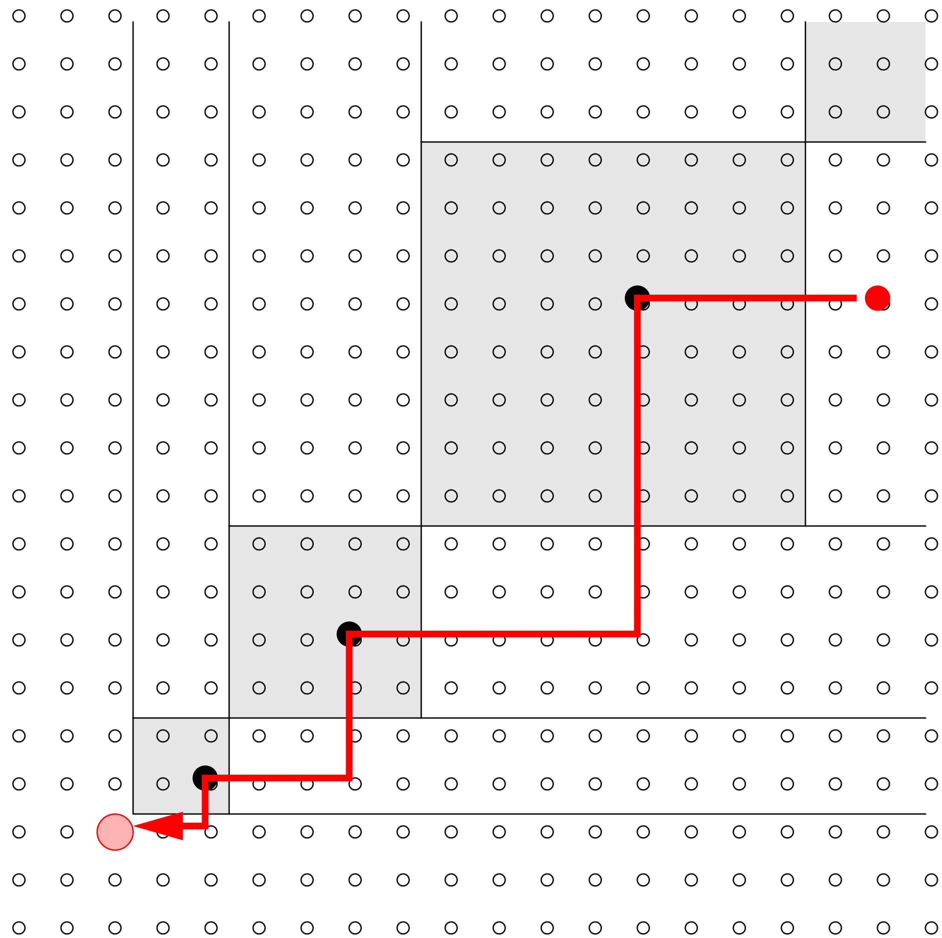
Multi-Bend Algorithm

Future Research

Multi-Bend Algorithm



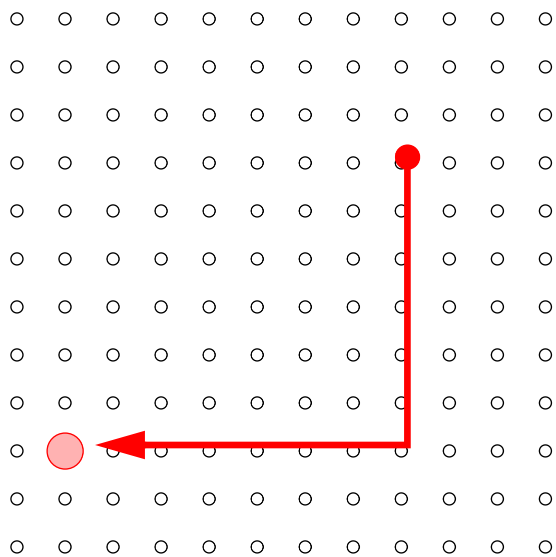
Home Run



Random intermediate nodes

Lower bound
for general batch problems

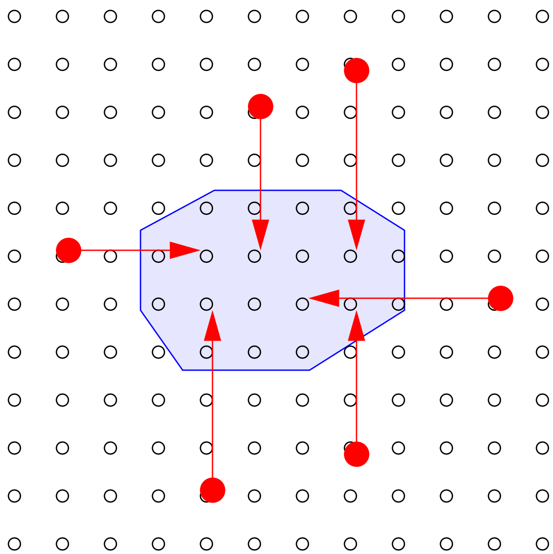
Initial distance from destination



MAX

D

Lower bound: bandwidth



$$\text{MAX} \quad W = \frac{\text{incoming packets}}{\text{incoming links}}$$

Lower bound

$$L = \Omega(D + W)$$

initial distance from destination

bandwidth

"Hard" general problem instances:

$$L = \Omega(n)$$

Total time: $O(L \cdot \log^3 n)$

Talk Outline

Greedy Hot-Potato Routing

One-Bend Algorithm

Multi-Bend Algorithm

Future Research

Future Research

More dimensions

"Easy" general problem instances: $o(n)$

Dynamic analysis

Arbitrary network topologies