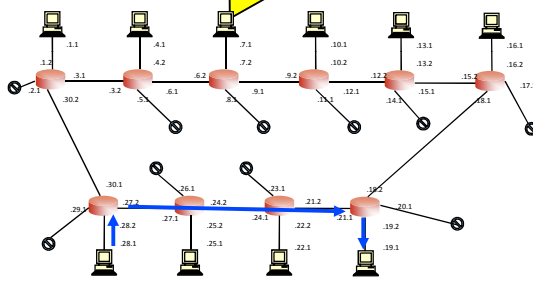# NetFPGA – **Programmable Hardware for high-speed network prototypes**

Internet routing in action – a simple example

The NetFPGA platform provides a flexible teaching and research tool – permitting instrumentation and prototyping of real router functionality at real network speeds.

In this example we demonstrate the router, using OSPF, recovering from a broken link.

Any PC can stream traffic through multiple NetFPGA routers in the ring topology to any other PC

The routing table has converged to the routing path with a minimum number of hops

Here is a small part of that route table

Traceroute shows the path

```
traceroute to 192.168.19.2 (192.168.19.2), 30 hops max, 40 byte packets
 1  192.168.25.2  0.393 ms  0.352 ms  0.387 ms
 2  192.168.24.1  0.380 ms  0.383 ms  0.469 ms
 3  192.168.19.2  0.403 ms  0.443 ms  0.189 ms
```
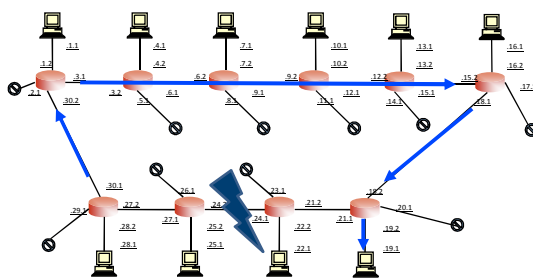
… what do you mean 3 inches, I thought you said 3 feet…
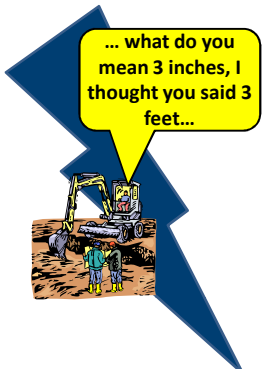
We break the link

More than 90% of physical link failures in the US are caused by *farmers with backhoes*

- Informal survey of nanog 2006

Routers re-route traffic around the broken link and traffic keeps moving

The new path is shown here

```
traceroute to 192.168.19.2 (192.168.19.2), 30 hops max, 40 byte packets
 1  192.168.25.2  0.250 ms  0.241 ms  0.308 ms
 2  192.168.27.2  0.111 ms  0.125 ms  0.127 ms
 3  192.168.30.2  0.123 ms  0.193 ms  0.200 ms
 4  192.168.3.2   0.101 ms  0.173 ms  0.179 ms
 5  192.168.6.2   0.145 ms  0.159 ms  0.160 ms
 6  192.168.9.2   0.140 ms  0.094 ms  0.085 ms
 7  192.168.12.2  0.137 ms  0.136 ms  0.131 ms
 8  192.168.15.2  0.128 ms  0.124 ms  0.160 ms
 9  192.168.19.2  0.103 ms  0.105 ms  0.128 ms
```