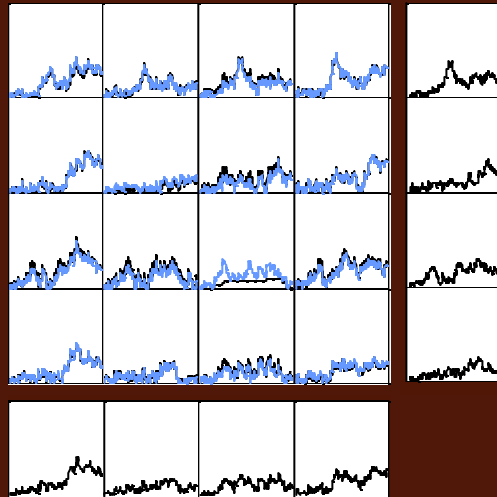
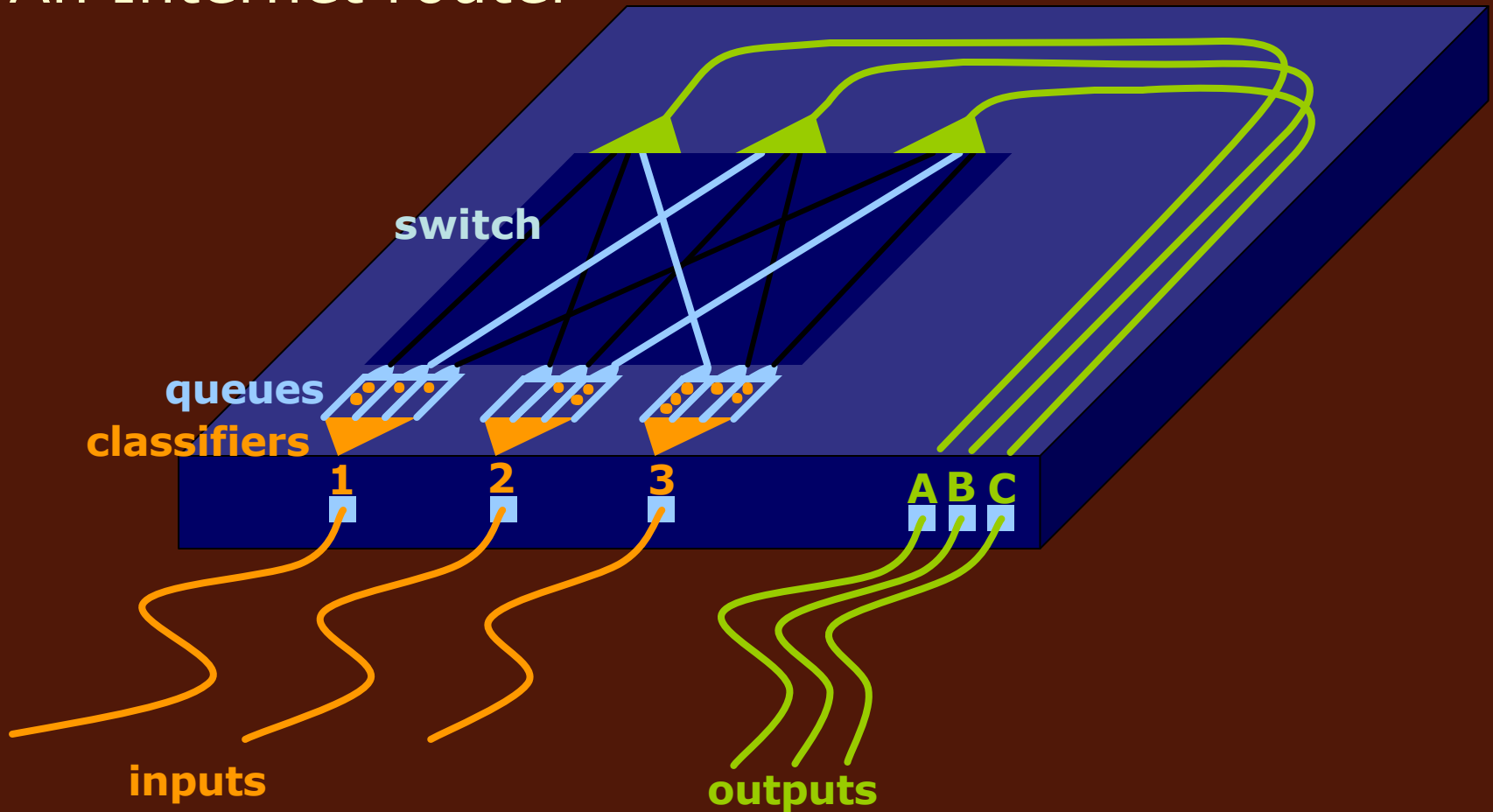


Input-queued switches: queueing theory & algorithm design



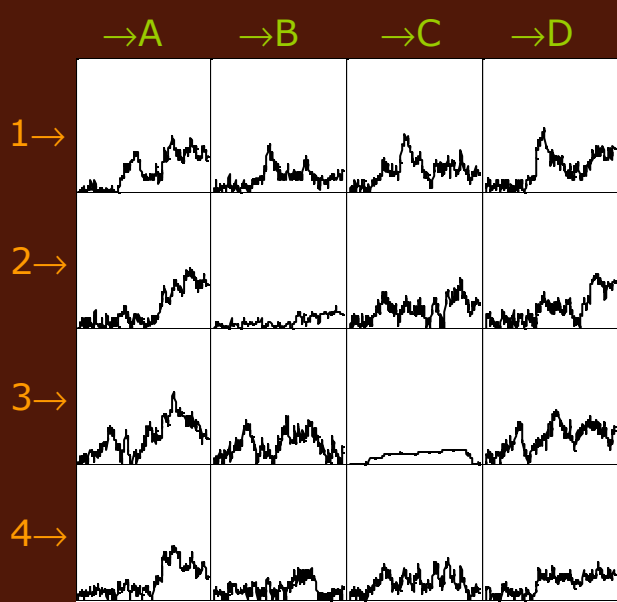
Damon Wischik
Statistical Laboratory, Cambridge
December 2003

An Internet router—



- the **switch** has to choose how to match **inputs** to **outputs**
- in such a way to give desired quality of service, ...

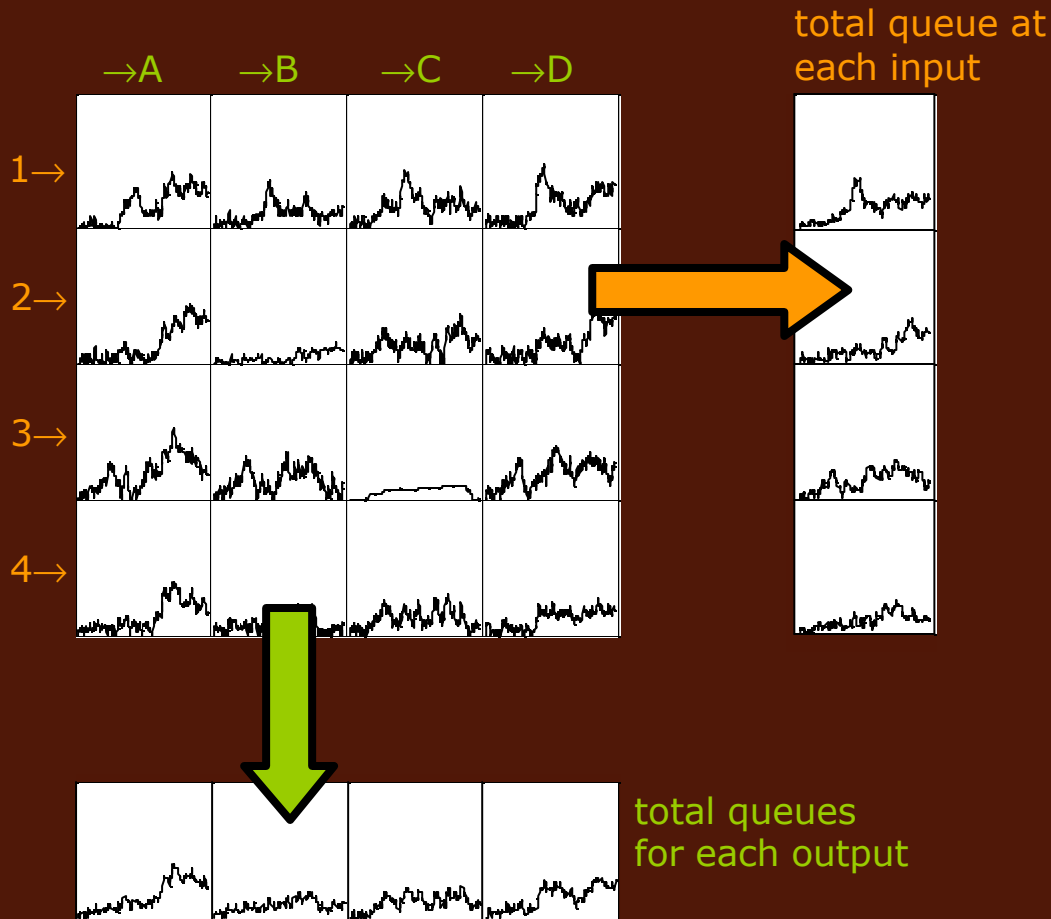
How many packets are waiting at each queue, at each point in time?



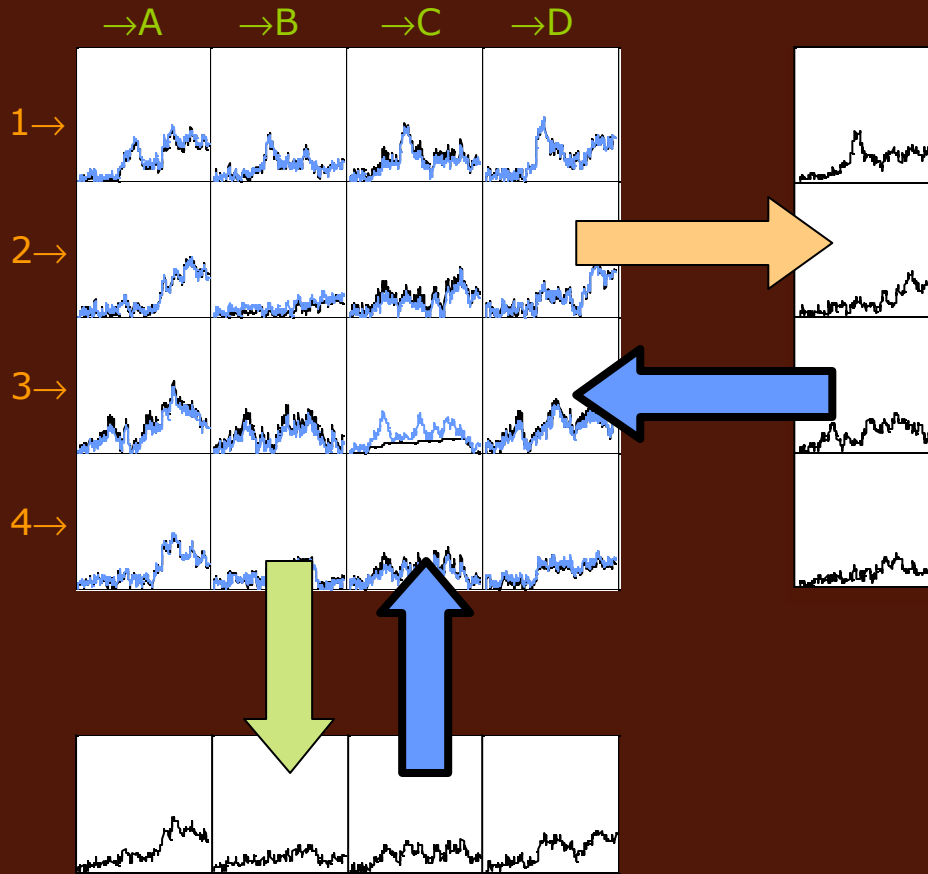
which output
wire it's going
to ...

which input
wire it came
on ...

How many packets are waiting *in total*?



Surprisingly, it is sufficient to know the totals
and also the *inverse function*:



The totals obey conventional queueing theory.

The inverse function \rightarrow is *equivalent* to the switching algorithm. (Choose a nice function, get the algorithm automatically.)

This is useful for designing switches. E.g.

- We have discovered a function \rightarrow which minimizes loss (better than existing algorithms!)
- If e.g. **input 1** is given priority, we can *predict* how this affects the others.

