We separate notion of "routing" and "forwarding".
Routing algorithm is what a router does in the "background" to figure out where each prefix should be forwarded:
- Address prefixes, next hops, link costs, distances, etc.
Forwarding is what a router does when a packet arrives:
- Address prefixes, next hops, interface, subnet address.

A simple example (FIB)
Simple (naïve) forwarding rule

- Step through table from top to bottom
- At each step, apply mask to FIB address and packet address. If results match, then use FIB entry to forward packet
  - If (FIB-addr && FIB-mask) == (PK-addr && FIB-mask)
  - then use entry
- FIB = Forwarding Information Base
  - i.e. Forwarding Table
  - Routing Table also called RIB

Simple example with default

But default entry must be last!
A more complex example (a site with 500 hosts)

- How do we assign prefixes (addr and mask) in this case???

One way to assign prefixes...

The view from the global Internet: 6 FIB entries!

We can shrink that to one FIB entry!
1024 addresses to address 500 hosts! What a waste…

What about this prefix assignment approach instead?

Now 500 addresses fit into a 512 address block!

But now our forwarding rules fail (like with the default)
Longest-prefix match

- Since multiple entries may match, we prefer the entry with the longest mask (prefix)
- Two ways:
  1. Go through the whole FIB, remembering the matching entry with the longest prefix
  2. Sort FIB in order of longest prefix first, and select first match

First-match Longest-prefix

```
20.1.0/25  :1
20.1.0.0/27 :2
:           :
20.1.0.55/27:6
```

```
20.1.0.0/27 :2
:           :
20.1.0.55/27:6
20.1.0/25   :1
```