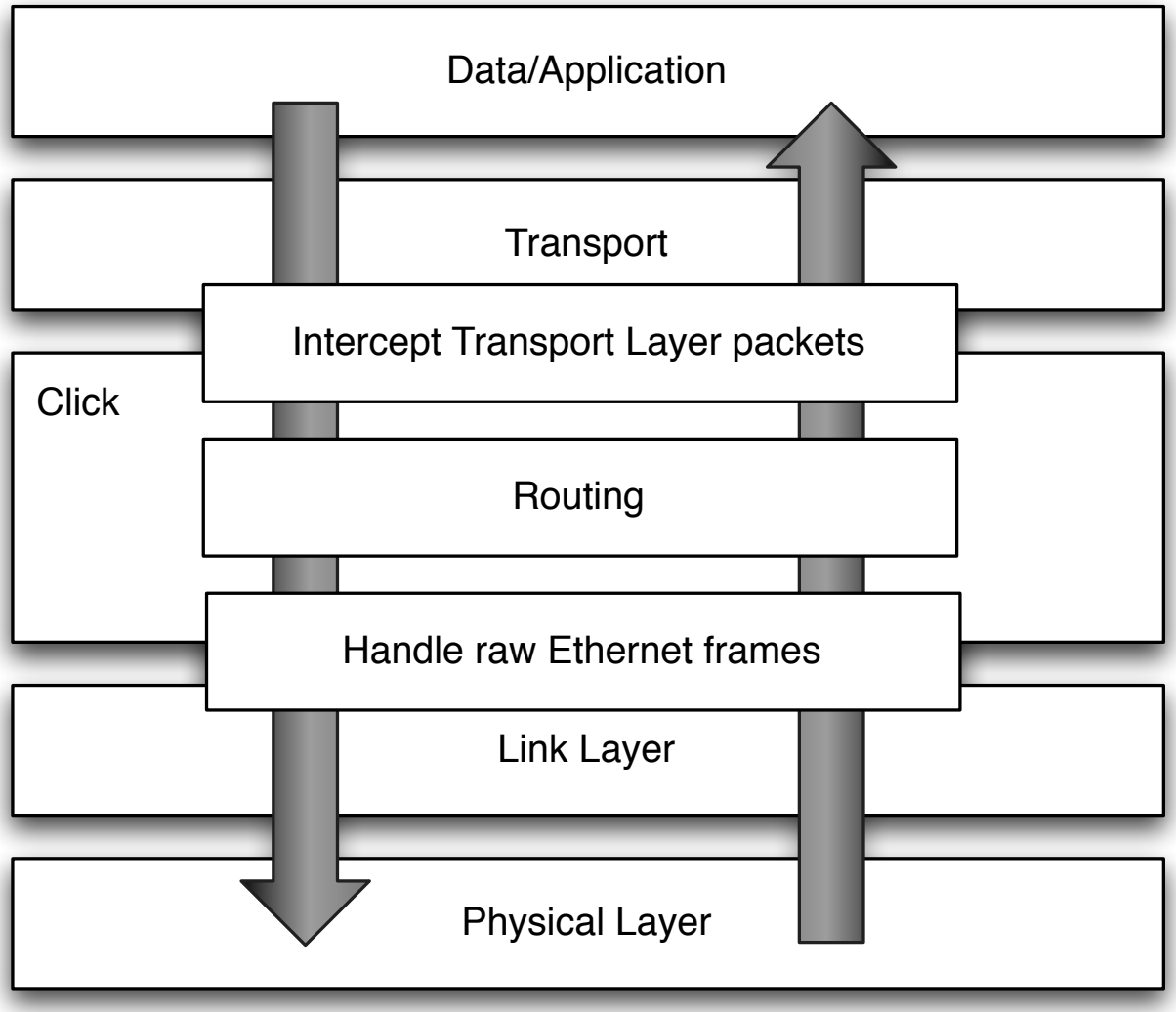
Layered Protocols in Click

Implementation of Layered Protocols with Click Modular Router

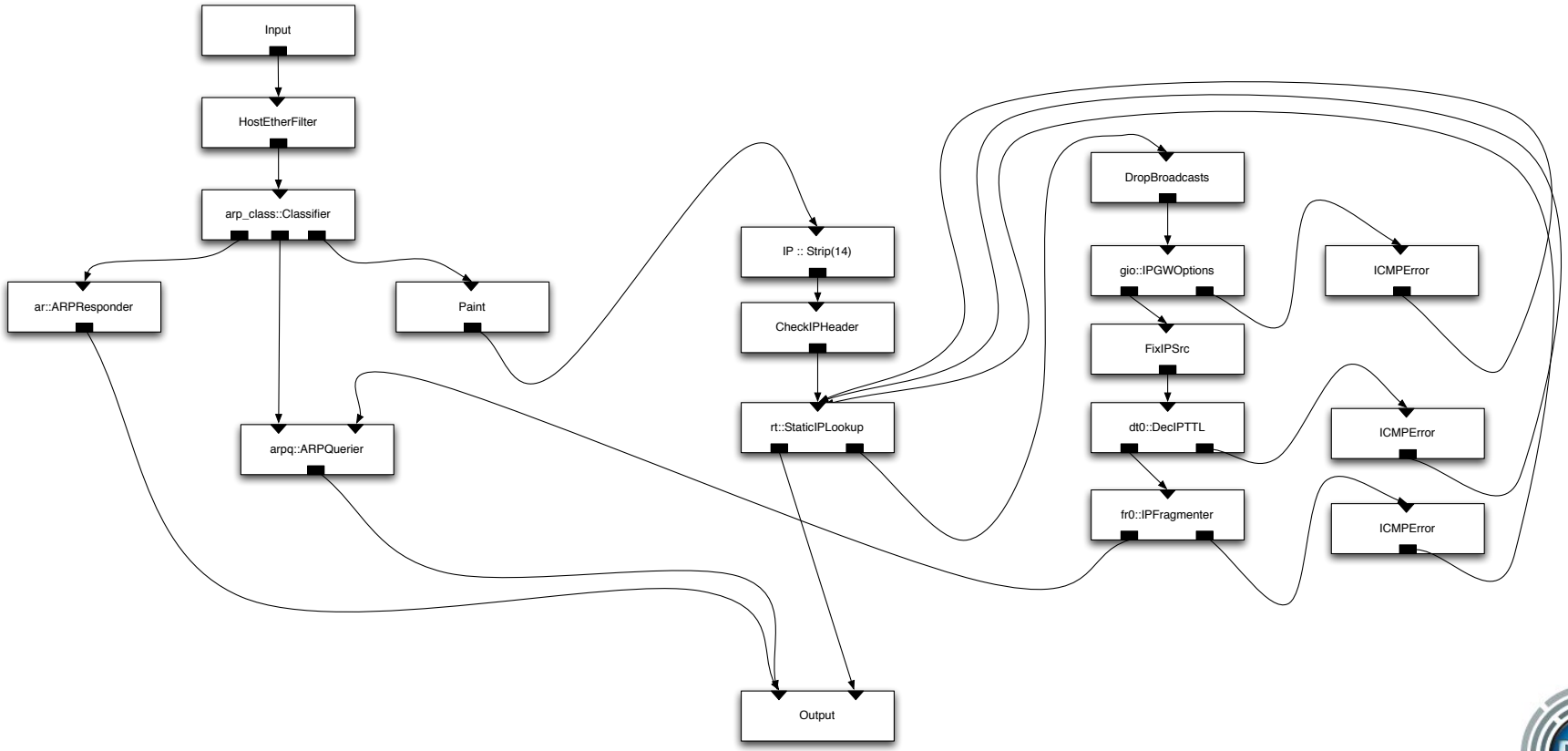
Bart Braem — Johan Bergs

University of Antwerp
iMinds - PATS Research Group

Click in ISO/OSI Reference Model

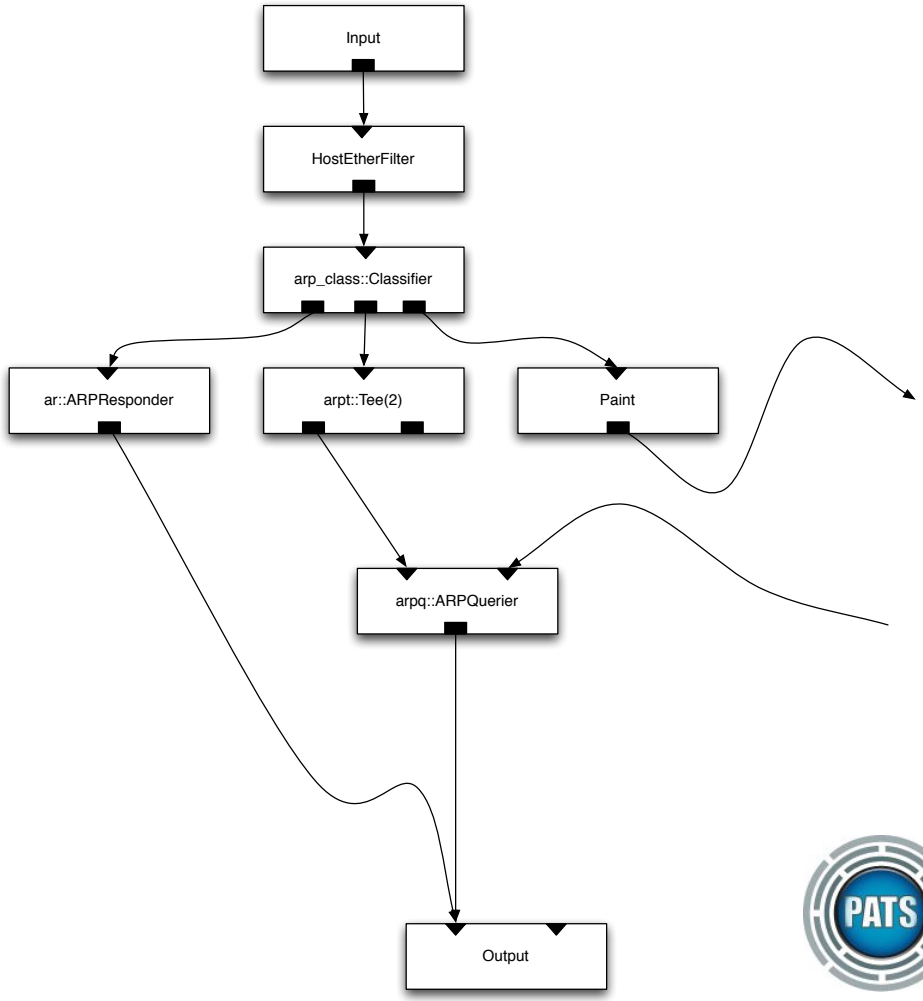


IP Router


Input
HostEtherFilter
arp_class::Classifier
ar::ARPResponder
Paint
arpq::ARPQuerier
IP :: Strip(14)
CheckIPHeader
rt::StaticIPLookup
DropBroadcasts
gio::IPGWOptions
FixIPSrc
dt0::DecIPTTL
fr0::IPFragmenter
ICMPError
ICMPError
ICMPError
Output

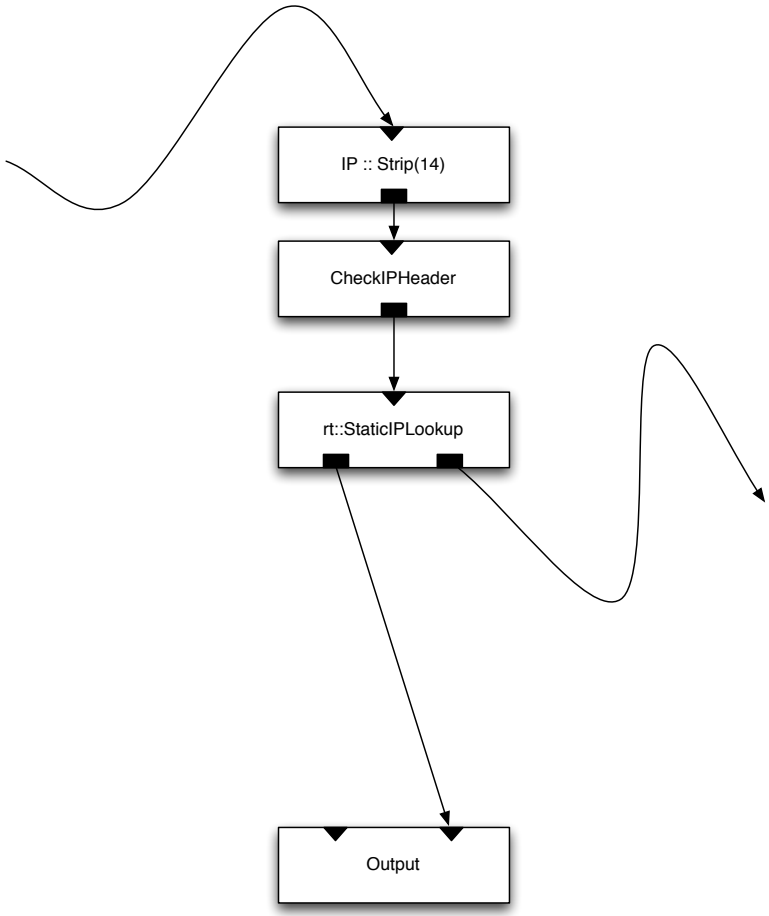
Input Path

- Handles ARP
- Classifies
  - ARP Requests
  - ARP Replies
  - Data



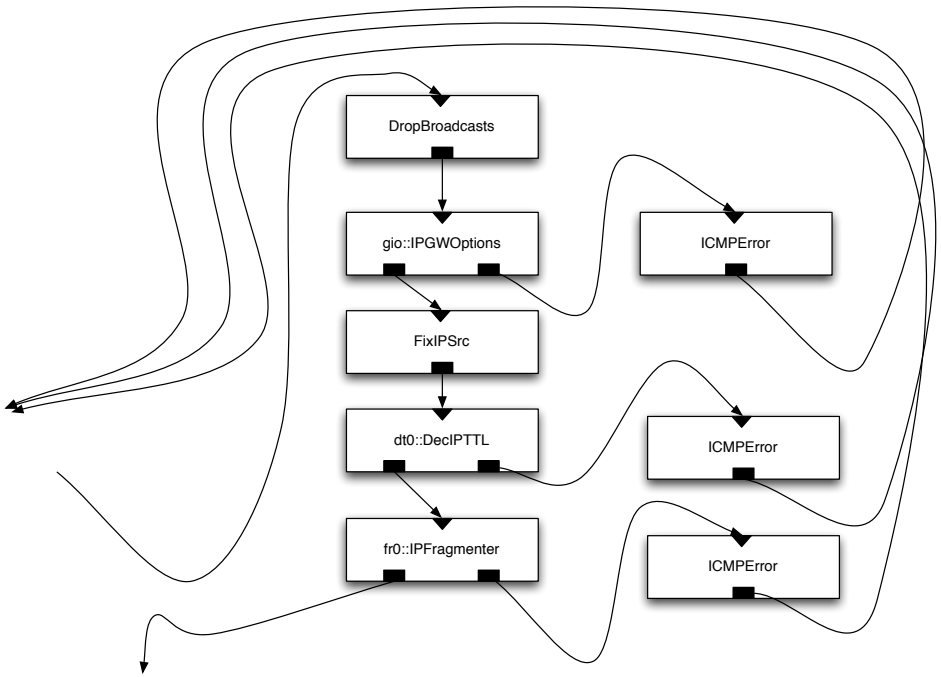
Routing Path

- Remove Ethernet Header
- Check if the IP header is correct
- Routes the packet
  - local
  - forwarding path

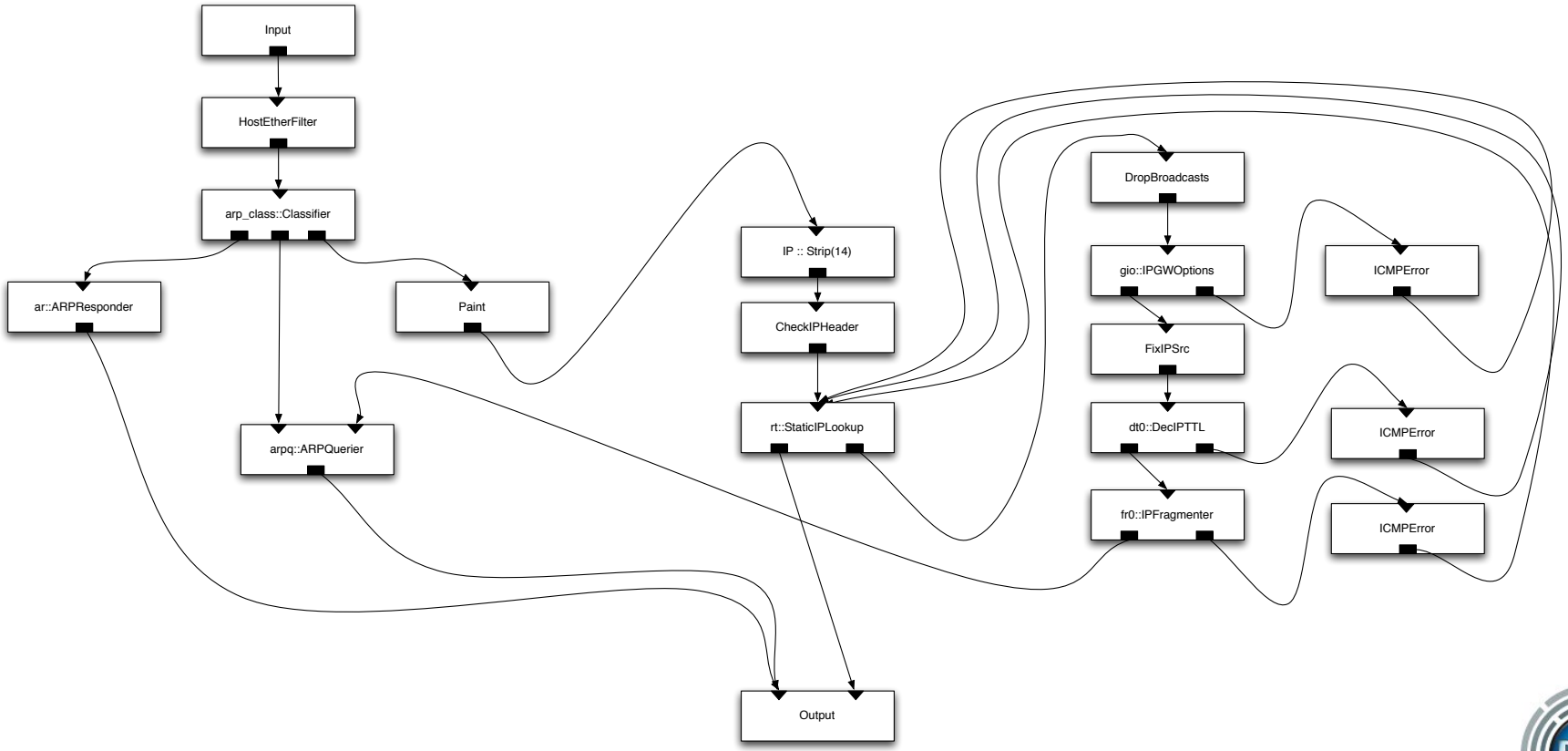


Output Path

- Check if the packet should be forwarded
- If not send an ICMP error
- Routes the packet
  - GW
  - TTL exceeded
  - Fragmentation
- else forward the packet
- via ARPQuerier



IP Router


Input
HostEtherFilter
arp_class::Classifier
ar::ARPResponder
Paint
arpq::ARPQuerier
IP :: Strip(14)
CheckIPHeader
rt::StaticIPLookup
DropBroadcasts
gio::IPGWOptions
FixIPSrc
dt0::DecIPTTL
fr0::IPFragmenter
ICMPError
ICMPError
ICMPError
Output

Layered Moded in Click

"With great power comes great responsibility."

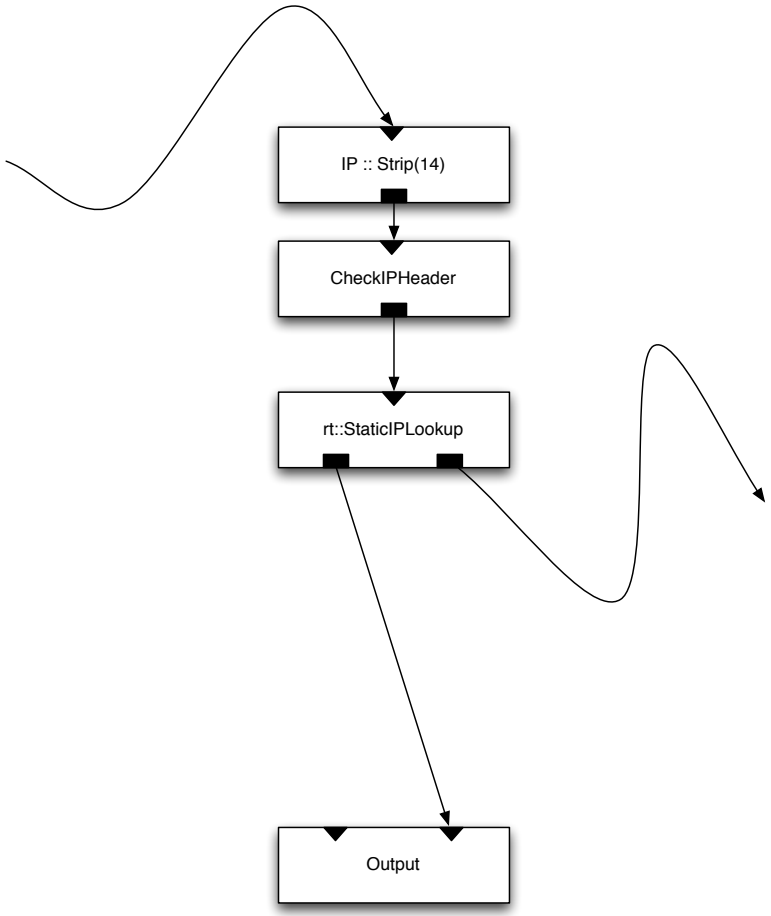
- Click receives raw ethernet frames from Layer 2 and handles all the processing up until it is handed to the higher layers.
- Click can also handle Transport layer headers such as intercepting UDP and TCP packets making it possible to implement daemons inside Click.
- The user is in charge of respecting the layered model, not Click.

Try to adhere to the ISO/OSI reference layer as much as possible. This makes sure that the packets you handle are what you expect.

Following the Layered Model

e.g. What if you need to capture UDP packets on port 7.

- Capturing them after the Routing Path decides the packet has reached its destination.
- This ensures that you capture valid IP packets with the correct destination.



Breaking the Layered Model

If you would capture the packet directly from the input (interface):

- You could be processing the wrong packet the wrong way (e.g. treat an ARP message as UDP).
- You would have to add all these checks yourself in Click or even worse inside your own element.