Project Kraken

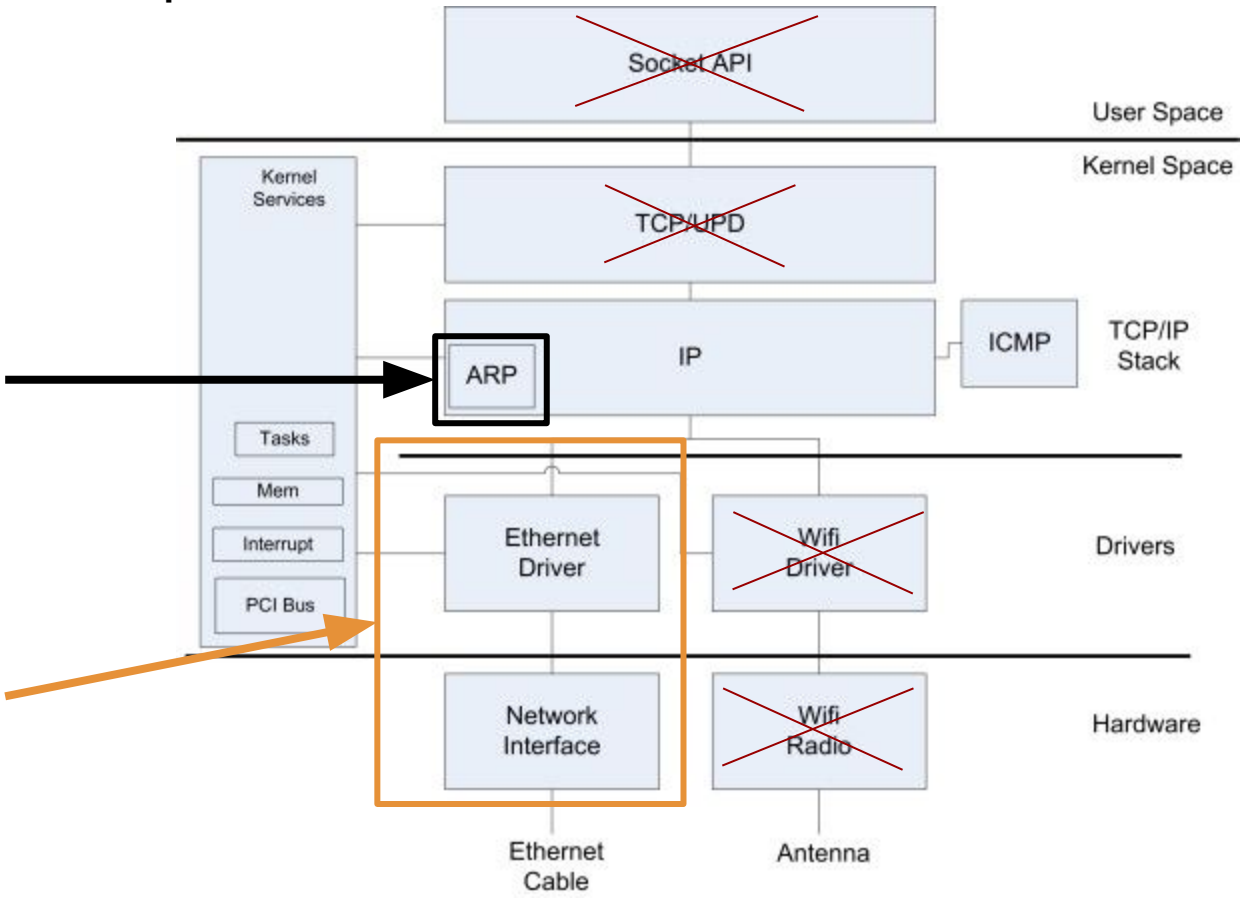
A Network Stack for Ninjastorms OS

Recap - What was the Scope?

Phase 1:
* Let ARP fly

Phase 0:
* Build driver for network hardware

* Support Ethernet

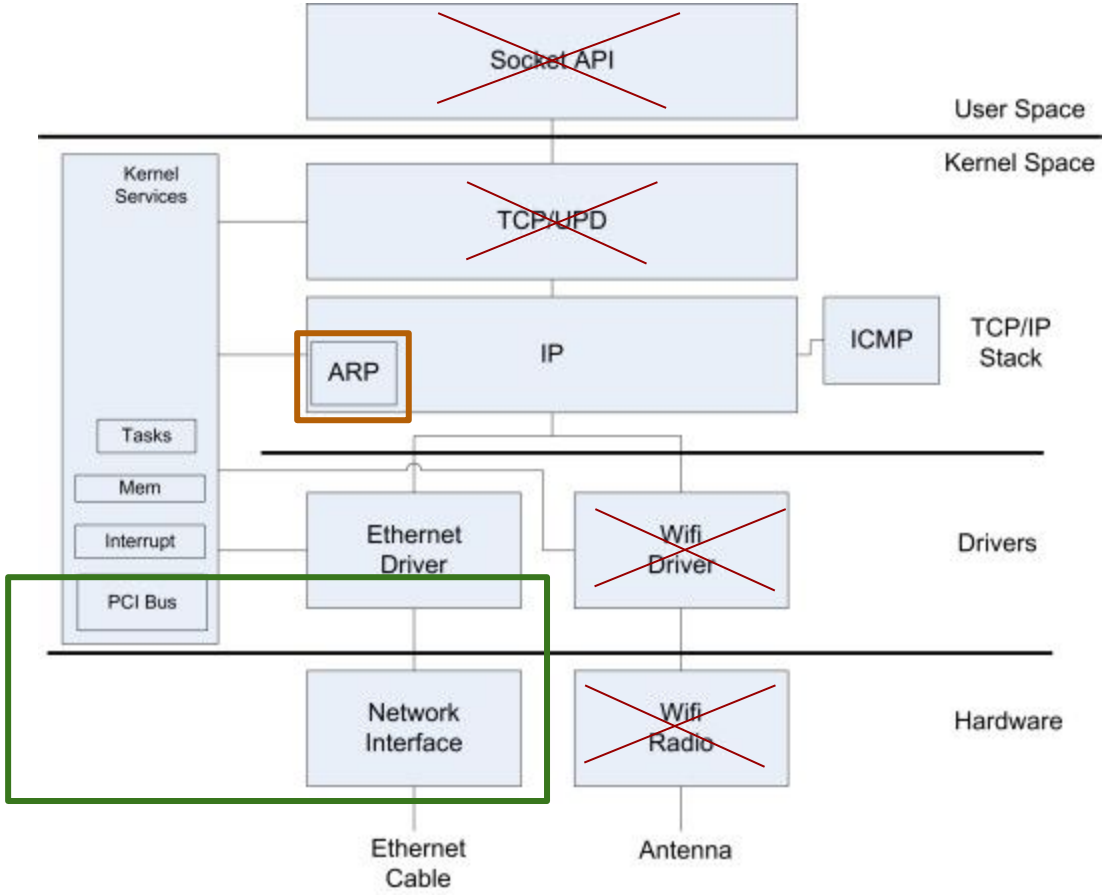


https://www.sciencedirect.com/topics/computer-science/networking-stack

What did we achieve?

- Talk to PCI device
- Talk to network card via PCI
- Give it an address (MAC)
- Send & receive packets via NIC (not yet on layer 2)

- sending <u>rudimentary</u> ARP requests



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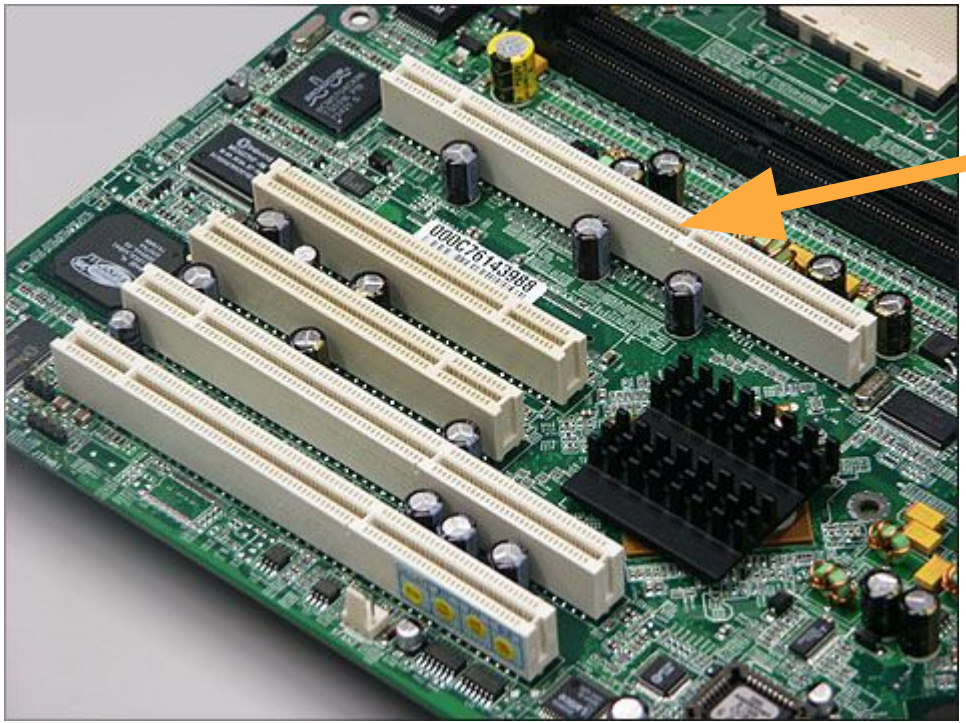
How to talk to a device?

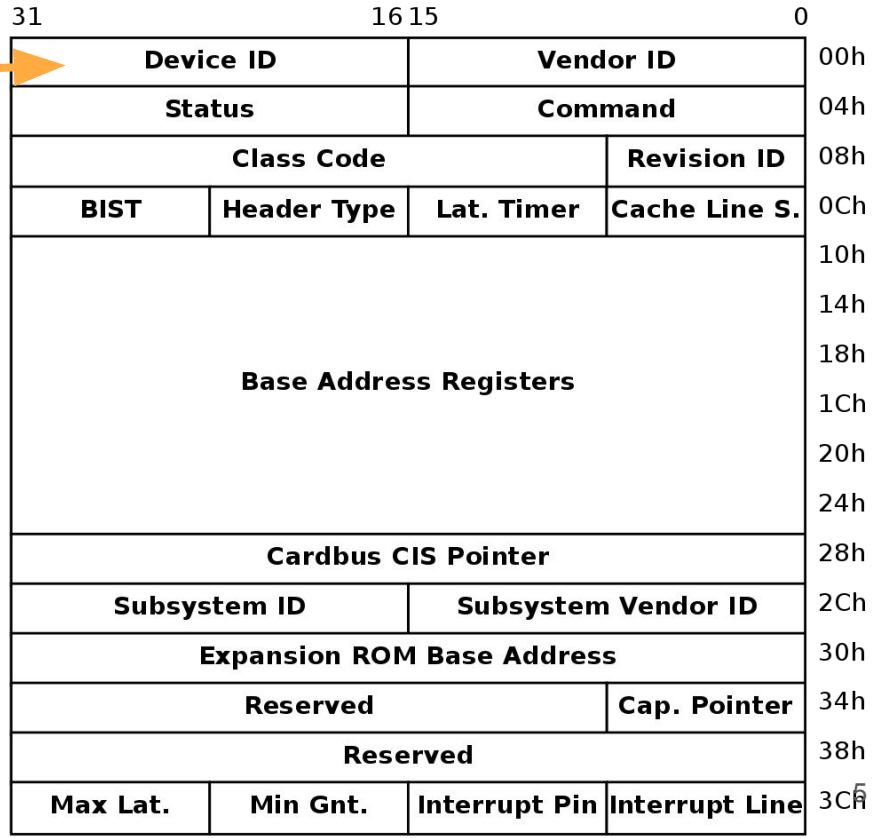


PCI slot

http://blog.ub.ac.id/ucupucup/files/2012/03/pci.jpg

PCI Enumeration

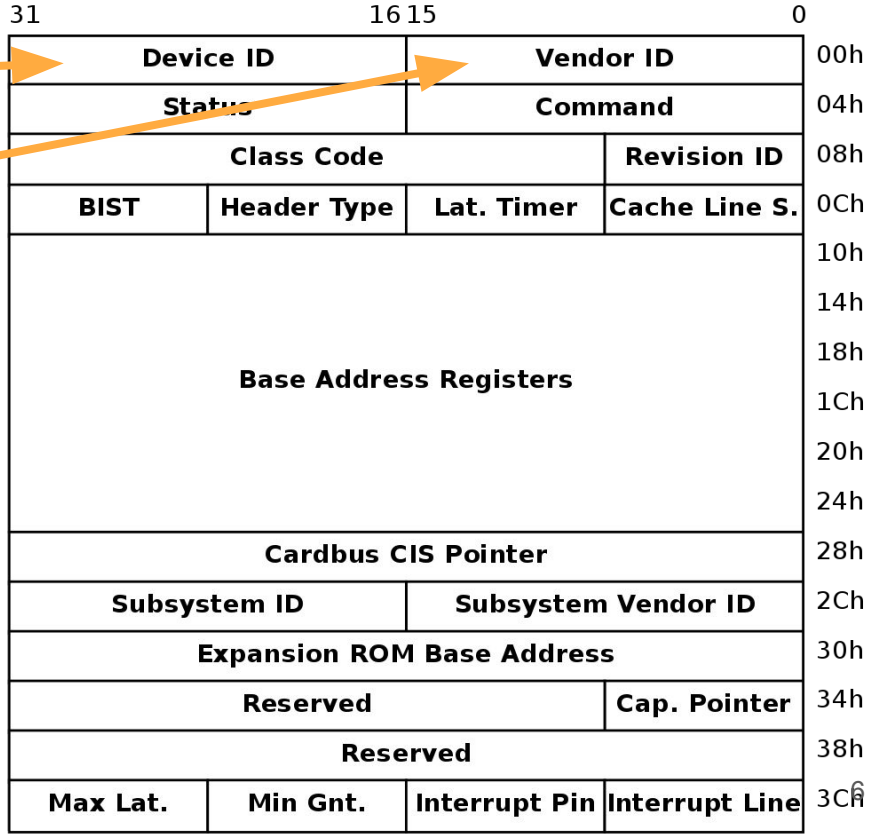
What are you?



PCI Enumeration

What are you?

Who created you?

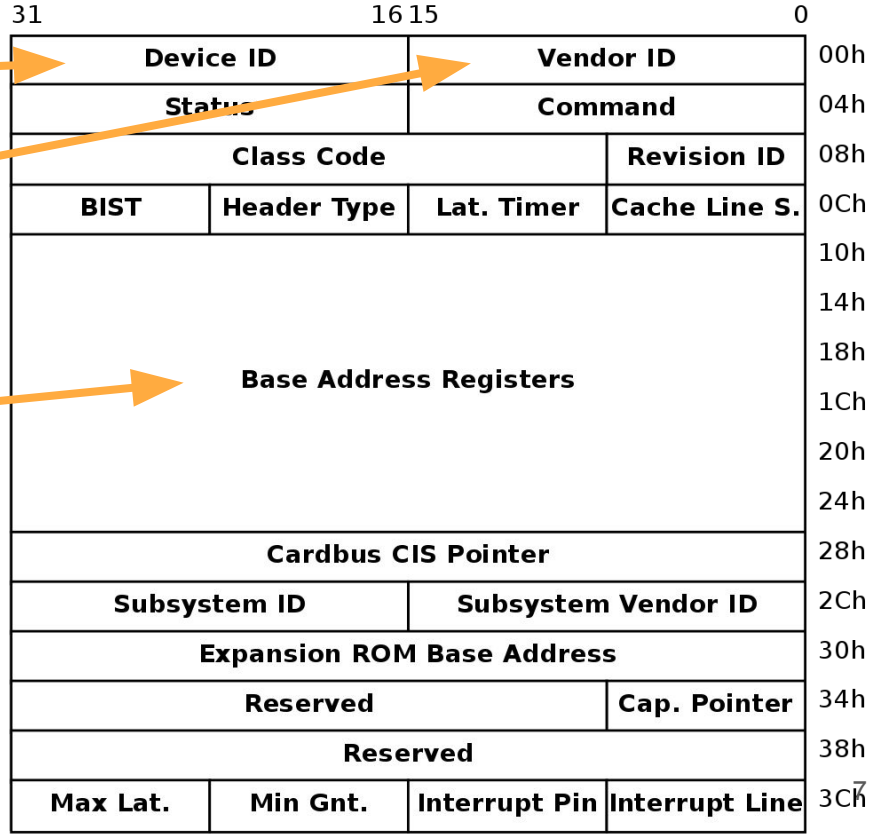


PCI Enumeration

What are you?

Who created you?

Tells the size it needs. Lets us define where that is.



How To: Sending a packet

```
int
send_packet(const void * p_data, uint16_t p_len)
{
  printf("[E1000] Sending packet data <%s> with len %i\n", p_data, p_len);
  e1000_tx_desc_t *curr = &e1000->tx_descs[e1000->tx_cur];
  curr->addr = (uint64_t)p_data;
  curr->length = p_len;
  curr->cmd = CMD_EOP | CMD_IFCS | CMD_RS;
  curr->status = 0;
  uint8_t old_cur = e1000->tx_cur;
  e1000->tx_cur = (e1000->tx_cur + 1) % E1000_NUM_TX_DESC;

  writeCommand(REG_TXDESCTAIL, e1000->tx_cur);

  while(!(curr->status));
  printf("[E1000] Packet send!\n");
  return 0;
}
```

1. Build packet

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1. Build packet

2. Increase ring buffer

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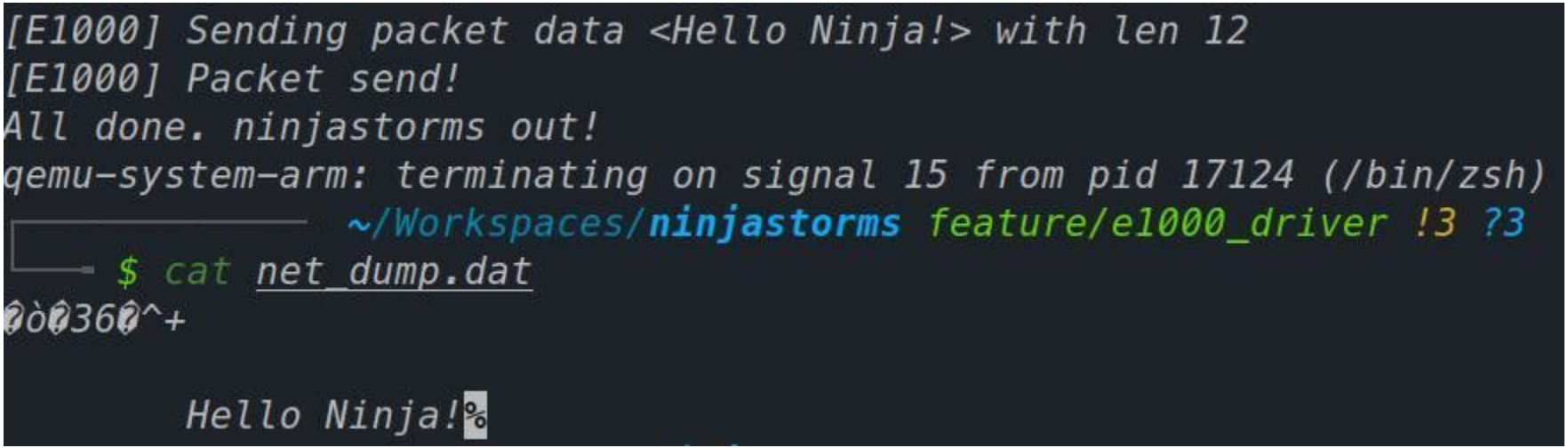
}
```

1. Build packet

2. Increase ring buffer

3. Profit

First packet send!



First ARP request!

```
static void
network_test(void)
{
  // ARP request: Who has 10.0.2.15? Tell 10.0.2.10
  const char * data = "\xff\xff\xff\xff\xff\xff\x52\x54\x00\x12\x34\x56\x08\x06\x00\x01" \
                      "\x08\x00\x06\x04\x00\x01\x52\x54\x00\x12\x34\x56\x0a\x00\x02\x0a" \
                      "\x00\x00\x00\x00\x00\x00\x0a\x00\x02\x0f";
  for(int i = 0; i < 50; i++)
    {
      send_packet(data, 42);
      // wait some time before next packet
      for (int j = 0; j < 100000000; ++j);
    }
}
```

Sender MAC address
52 : 54: 00: 12: 34: 56

10 . 00 .02 . 15
Target IP

10 . 00 .02 . 10
Sender IP

First ARP request!

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network_test(void)
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  // ARP request: Who has 10.0.2.15? Tell 10.0.2.10
  const char * data = "\xff\xff\xff\xff\xff\xff\x52\x54\x00\x12\x34\x56\x08\x06\x00\x01" \
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                      "\x00\x00\x00\x00\x00\x00\x0a\x00\x02\x0f";
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      for (int j = 0; j < 100000000; ++j);
    }
}
```
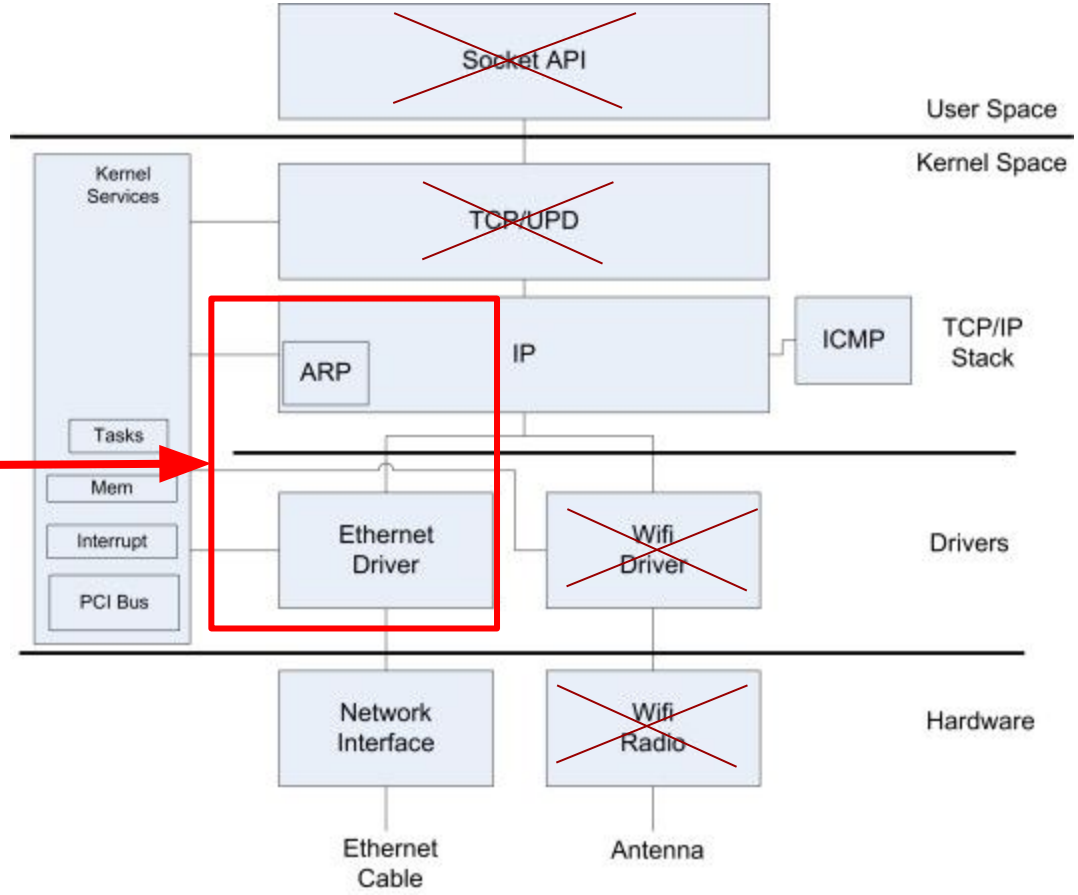

1	0.000000000	RealtekU_12:34:56	Broadcast	ARP	42 Who has 10.0.2.15? Tell 10.0.2.10
2	0.000015835	f6:09:3d:ac:44:46	RealtekU_12:34:56	ARP	42 10.0.2.15 is at f6:09:3d:ac:44:46
3	0.553173395	RealtekU_12:34:56	Broadcast	ARP	42 Who has 10.0.2.15? Tell 10.0.2.10
4	0.553183322	f6:09:3d:ac:44:46	RealtekU_12:34:56	ARP	42 10.0.2.15 is at f6:09:3d:ac:44:46

Next Steps

- Use Ethernet instead of raw PDUs

- Implement ARP with ARP table and extraction of information from frames



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