# Transition plan for

~~TUBA~~

~~SIPP~~

~~IPng~~

IP-6

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# Techniques for transition

## Dual Internet Protocol environment

- IPv4 and IPng run “side-by-side” in hosts and routers
- not dual stack (implies support of two upper layer protocol envronments and applications)

## Tunnels

- encapsulating IPng in IPv4 and IPv4 in IPng

## Network protocol, network address translators

- they are evil but inevitable

# Transition to IPng: speculation

## It will be gradual

- no flag day (installed base is too large, autonomous, and likely to be uncooperative)
- insufficient features in IPng to dissuade folks from using IPv4 for a very long time if ever

## Both IPv4 and IPng will be updated to respond to new requirements

- attempts to stilt introduction of new features into IPv4 will fail ("greed and fear" are powerful drivers)

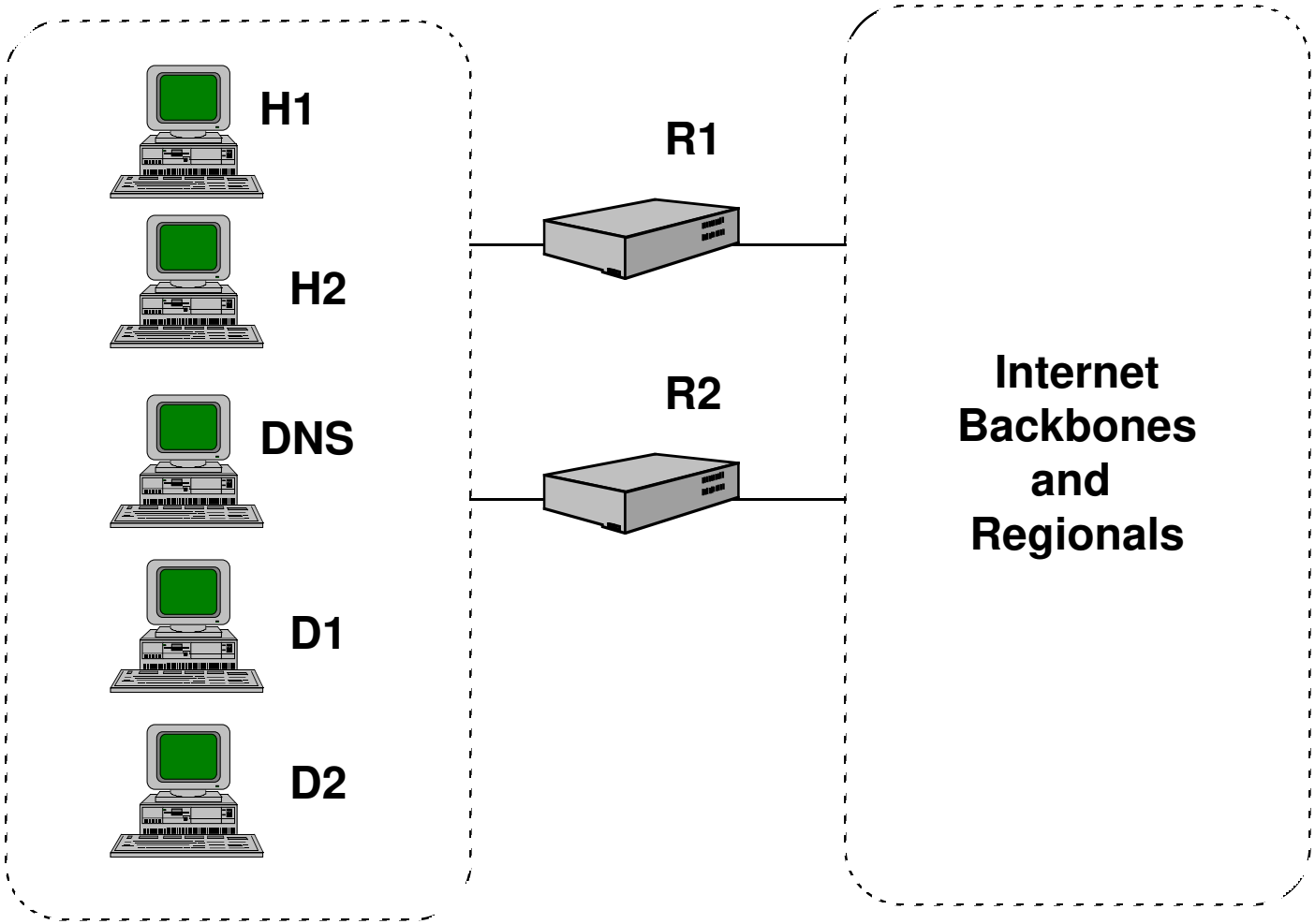
## Conclusion:

- minimize complexity
- minimize interdependencies (esp. w/r/t addressing)
- do not attempt to establish a timeframe for IPv4 shutdown

# Deployment plan (not a chronology)

1) Upgrade routed infrastructure to support IPng
2) Extend DNS servers to return IPng addresses
   - Initially, DNS operates over IPv4
   - DNS continues to return IPv4 addresses
3) Begin operating Internet applications over IPng as new host software is deployed
   - new software is IPng & IPv4 capable
4) Provide IPng connectivity to all sites
5) Support DNS over IPng infrastructure

# IPng transition example



# Establishing communications

**Dual hosts (D1, D2) query DNS for**

- **IPv4 address**
- **IPng address**
- **both address forms**

**for target host**

**Address form(s) for query governed by local host controls**

- **“knob” abstraction in draft-ietf-tuba-transition-01.txt**

# Use of DNS as IPng “enabler”

- **Introduce a host to IPng infrastructure as follows:**
  - **install IPng software on host**
  - **assign IPng address to host**
  - **connect host to IPng infrastructure**
  - **register IPng address in DNS**
- **Inquiring hosts want to know...**
  - **if DNS returns both address forms when queried, requesting host concludes that target host is another dual internet protocol host**

# “Knobs”

**Host (or each application on a host) has 4 settings**

**1) IPv4 only**

- **host requests “A” records, DNS returns same**

**2) Prefer IPv4**

- **host requests both address families, but expects to use IPv4 connectivity to majority of target hosts**
- **DNS returns both address families**

**3) Prefer IPng**

- **host requests both address families, but expects to use IPng connectivity to majority of target hosts**
- **DNS returns both address families**

**4) IPng only**

- **host requests “IPng” records, DNS returns same**

# Tunnels, protocol translators, and NATs — oh my!

## Tunnels

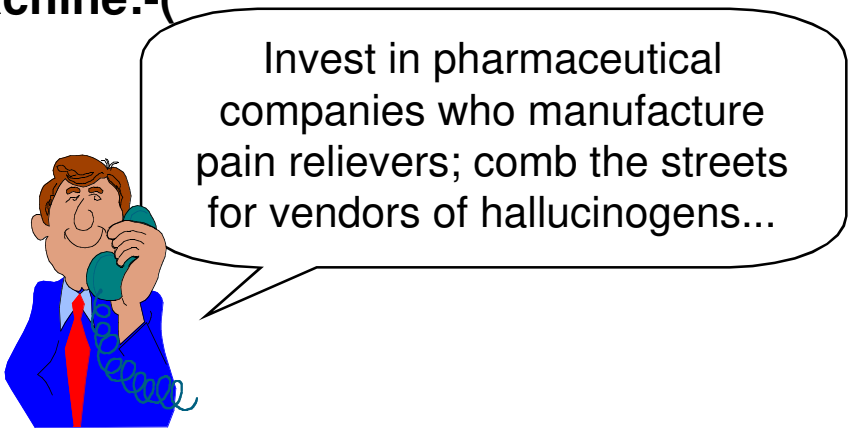
- IPng over IPv4 (to extend experimentation with IPng)
- IPv4 over IPng (to extend lifetime of IPv4 for as long as desirable)

## Protocol translators

- IPv4-IPng network gateways:-(

## NAT boxes

- extend lifetime of IPv4 enterprises by using private addressing behind a translating machine:-(



# Other Issues...

- **Operational infrastructure**
  - route coordination, “interconnects”
- **Registries**
  - IPng addresses, routes
- **Changes to application protocols**
  - FTP via FOOBAR
- **Management of dual internet environments**
  - ping, snmp, NOC tools
- **Multicast groups of both IPv4 and IPng hosts**
- **API’s**
- **Error messages**
- **Security**