Ninux.org GSoC 2010

UDP Generic Encapsulation Kernel Module
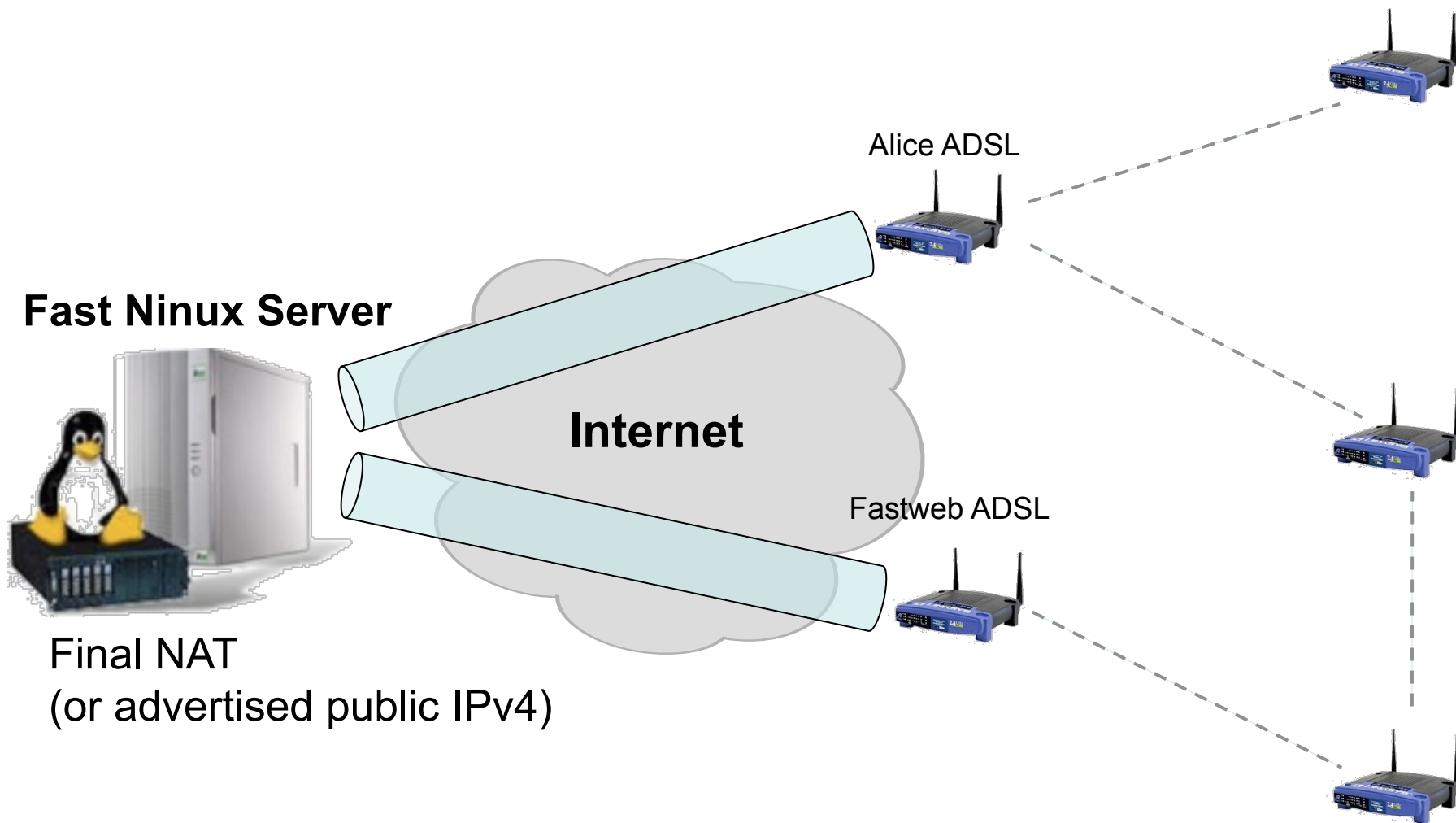
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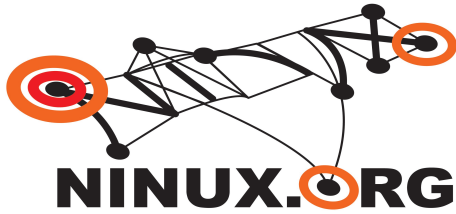
- **Cool things about IP/UDP encapsulation**
  - Universal Nat Traversal
  - Multi-protocol encapsulation
  - Mobility

- **Why not IPinIP? Why not GRE ?**
  - Not good compatibility with legacy and SoHo NAT
  - More versatility then IPinIP (tunnel multiplexing)
  - Less overhead then GRE (key option not needed)

- **UDP encapsulation in Linux**
  - XFRM (IPSEC)
  - Ad-hoc solutions not in the official tree
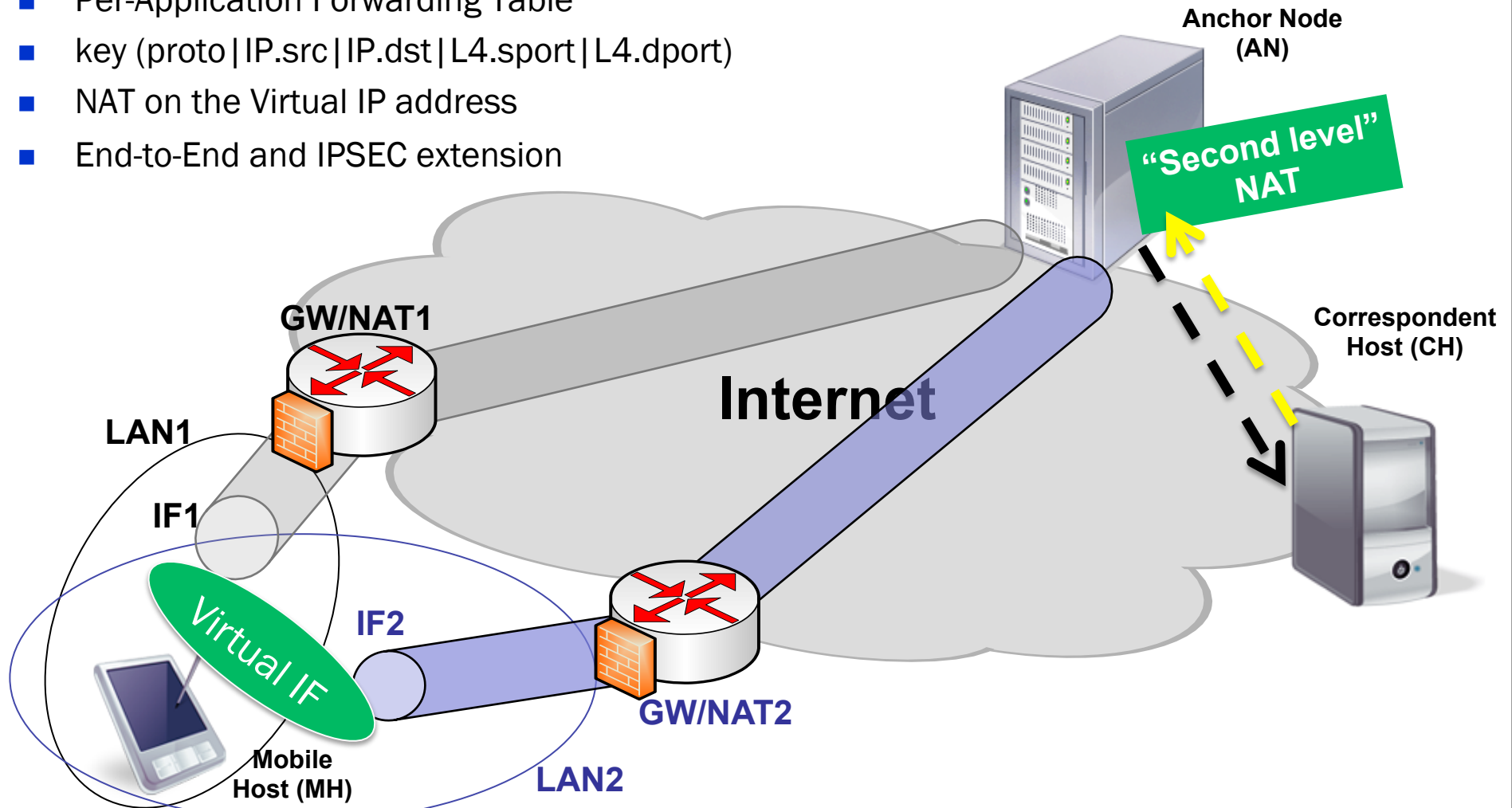 - Generic (and extensible) Kernel module missing
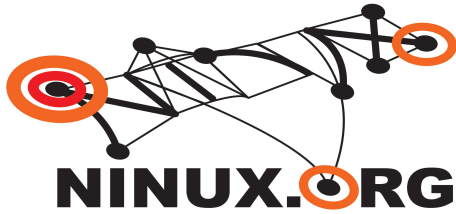
- Basic protocol independent NAT traversal solutions

- Mesh networks
  - No problem with route flapping (to use more uplinks, more details later)
  - Give public IP addresses to nodes in the mesh

- IP Mobility management over multiple heterogeneous access networks
  - Universal Per-Application Mobility Management using Tunnels – UPMT

Fast Ninux Server

Final NAT
(or advertised public IPv4)

Internet

Alice ADSL

Fastweb ADSL

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- Per-Application Forwarding Table
- key (proto|IP.src|IP.dst|L4.sport|L4.dport)
- NAT on the Virtual IP address
- End-to-End and IPSEC extension

Anchor Node (AN)

"Second level" NAT

Correspondent Host (CH)

Internet

GW/NAT1

LAN1

IF1

Virtual IF

IF2

GW/NAT2

Mobile Host (MH)

LAN2

- **Virtual network device**
  - Easy integration of legacy applications

- **Incoming Packets**
  - NETFILTER hook in `NF_INET_PRE_ROUTING`
  - priority `NF_IP_PRI_FIRST`

- **Outgoing Packets**
  - Network Device ops `ndo_start_xmit`

- **Forwarding Policies**
  - Fixed binding to tunnel parameters (IP.src, IP.dst, UDP.sport, UDP.dport)
    - 1 virtual device per tunnel
  - Dynamic Forwarding based on hash tables
    - 1 virtual device - N tunnels

- **Configuration**
  - standard SYSCALL for basic configuration (IP address, MTU, etc..)
  - NETLINK Generic socket for ad-hoc configuration (possible IPROUTE2 patch)

IP	UDP	Ethernet	whatever..

Encapsulation Header
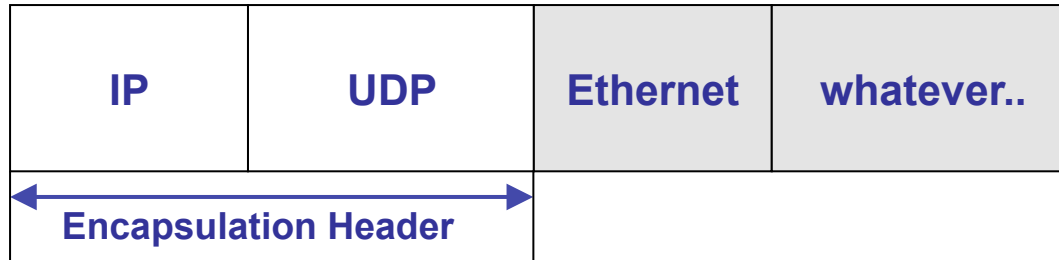
- No need to directly handle different protocol (IPv4, IPv6, or whatever)
- Less code
- More overhead
- Right approach?
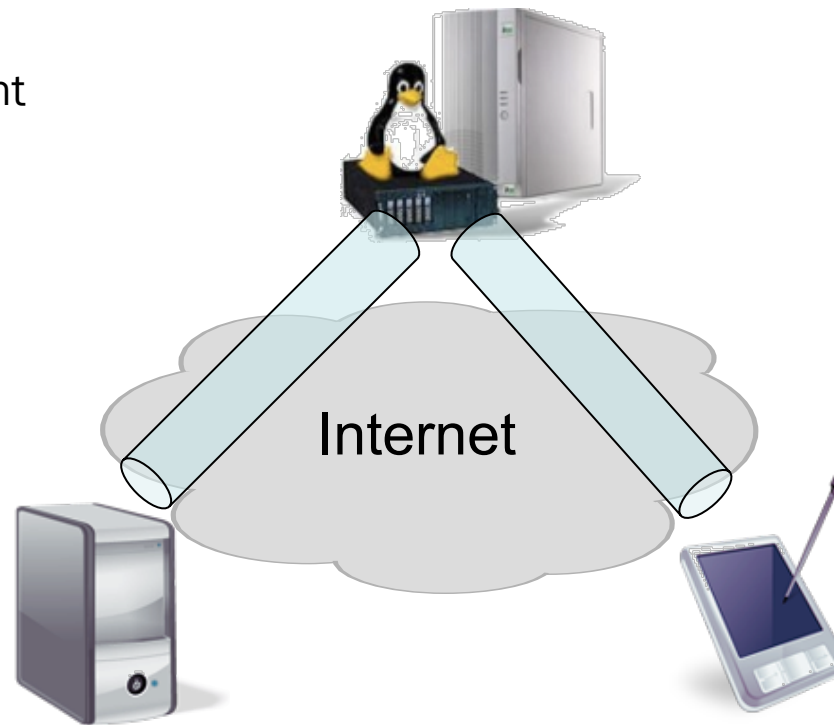
Internet

- **Roadmap**
  - 24 May: Kick off
  - 26 June: first working version with basic features
  - 12 July: mid term evaluation
  - 16 August: GSoC End

- **After GSoC**
  - September: Kernel tree integration
  - Future works
    - Ethernet encapsulation
    - Dynamic Forwarding policy and Table registration through external module

- **For info, status, docs, source code and more...**
  - `http://wiki.ninux.org/GSoC`
  - `https://svn.ninux.org/ninuxdeveloping`

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Wireless Battle Of The Mesh

- 2-6 June 2010, BRACCIANO (Italy)
- http://battlemesh.org
- HACKER CAMP on wireless topics with international guests

Hackmeeting

- 2-4 July2010 ROMA
- http://www.hackmeeting.org