Tools for Deploying Virtual Networks

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Outline

- **XBone**
  - Automated IP Virtual Private Networks

- **Tethernet**
  - NAT-Buster
Virtual Networks – What & Why

- What is Virtual Network?
  - A network using encapsulation-based links
  - A way to virtualize network topologies

- Why Virtual Network?
  - Test new protocols
  - Share infrastructure
  - Deploy new services incrementally
  - Increase lab & testbed utility

Deploy a Virtual Network

- Select components
  - find, get config., pick subset, coordinate use

- Design
  - determine tunnel, router configuration

- Install
  - exchange keys. configure host, router, DNS

- Monitor

- Dismantle when done
Problems with Current Approaches

- Too Difficult!
  - Manual deployment & management
  - Out-of-band communication
  - Custom protocols – PPTP, L2TP, etc. – Non-IP!

- Not Scalable!
- Commercial Solutions - VPNs
  - Focus on Security & Reachability
  - Virtualized links, not networks
  - $$$

XBone Deployment

- Automation
  - Click in GUI, XBone does the rest.
  - Deployment & Management

- Backward-Compatibility – it’s all IP
  - No OS or Applications mods
  - ping, traceroute, ipfw, tcpdump, existing apps*

- Secure & Safe
  - Encrypted configuration
  - User & Node IDs (X.509 certificates)
  - Secure VPNs – IPsec authenticated and/or encrypted
XBone System View

Web GUI

X-Bone system

Multiviews

Automated monitoring

Request

Result

OM

Internet
Benefits & Opportunities

- It’s available **NOW!** -- FreeBSD & Linux
- Research & Education
  - Testbeds
  - New protocols
  - Distributed Applications & Experiments
  - Network Lab classes
- Current users:
  - Dynabone (ISI), UCL, Aerospace, UPenn

What’s Next ...

- **X-Tend** - extending XBone
  - 3 Year, NSF funded project (Dec. 2002 - )
  - Additional ports:
    - Jaguar (Mac OS X 10.2.*), Cisco, Solaris, *BSD ...
    - Not in the works - WinXP (no layered tunnels)
- **Node Revisitation***
  - 10 nodes emulate 1000 nodes
- IPv6
  - Supporting teaching tools, improved GUI & topology, installations, etc.
Further Information

- http://www.isi.edu/xbone
- xbone-users@isi.edu

- PI: Joe Touch, USC/ISI

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Incomplete Internet

- NATs:
  - Servers on well-known ports
  - Security, e.g., X.509, IPsec
- DNS:
  - Forward for user convenience
  - Reverse for log files (web, FTP, etc.), user feedback (telnet), security (.htaccess)
- Short DHCP leases:
  - Cycle every few hours

Solution – Nat-Buster

- Provide complete Internet IP connectivity
- Works behind NATs
- Works behind short-lease DHCP
Import the Real Internet

- Globally-routable IP addresses
  - Services on well-known ports
  - Services on static IP addresses
- DNS
  - Forward (name → #) for user convenience
  - Reverse (# → name) required or avoids timeouts for some protocols and applications
- Optimizations
  - DHCP, DNS cache, Web caches

Turnkey system

- Web user interface:
  - Setup WAN info
  - Setup LAN
    - Pick rental site
    - Connect
  - Box management
    (time, logging, monitor)
- $350 w/o wireless;
  $600 with
Box installation

Box configuration
Subnet rental

Why you want it

- **Demos**
  - No advance setup on site.
  - “Migrate” lab settings to demo site.

- **Student projects:**
  - Possible to loan a block of IP addresses & reclaim them.
  - Automates deployments & tracking.
Experience at PI meetings

- Supported 20+ demos at each meeting
- Saved $30,000 of net costs each meeting
- Reduced network setup from 1 day to 5 mins
- Reduced demo setup from 2 days to 3 hours
- Zero help desk

- Started to see network hogs

Current state

- Demo units available for loan
- Planned use:
  - DARPA PI, NSF ISAT meetings
  - DISCEX conference demos
  - Conferences, workshops
  - DARPA PM travel VPN
  - USC/ISI-East backup connectivity to ISI-W
  - USC/ISI home VPN
Further information

- http://www.isi.edu/tethernet

- PI: Joe Touch, USC/ISI
- GRAs: Lars Eggert, Yu-Shun Wang
- Based on: X-Bone technology
  - http://www.isi.edu/xbone