1. Research in Networking at University of Canterbury
2. Experimental Networking Facilities in Japan

Harsha Sirisena
Krys Pawlikowski

University of Canterbury
Evaluation of search algorithms in structured and unstructured P2P networks

*Masters Project: Adam Chang*

- Efficiency issues with file lookups
  - P2P network architecture/protocol design/network scaling
- Survey of P2P simulators
- Exhaustive Simulations
  - Quantitative analysis with Akaroa2
- Experiments on Planetlab
Optimized Handoff in Mobile IPv6

Masters Project: Tim Hong

- **Handoff process** (or handover: transferring and ongoing call or data session from one channel connected to the core network to another.)

- **MIPv6 Extensions**: HMIPv6, FMIPv6, FHMIPv6 and PMIPv6

- Currently working on a combination of FMIPv6 (Fast Handoff MIPv6) and PMIPv6 (Proxy MIPv6) with optimized candidate router selection algorithm and movement detection

- The research results will be validated using PlanetLab to perform handoffs to correspondent nodes overseas.
Mobility Management in IEEE 802.16e-based Wireless Metropolitan Area Networks

Ph.D. Project: Sayan Ray

(A) Focus is on enhancing both Base Station and Mobile Station controlled fast handovers in order to:

1. Reduce the Excessive Scanning Activities
2. Reduce the Prolonged Ranging Activities
3. Reduce the Lengthy Network Re-Entry Phase

(B) Researching the performances of HMIPv6 and PMIPv6-based WiMAX HO mechanisms

(C) Using Planet Lab to access existing WiMAX test-beds (if any) to validate our simulation results
Resiliency and Service Availability Modelling in Next Generation Networks (NGNs)

*Ph.D project: William Liu*

- **Working and spare capacity allocation strategies**
  - Shared Backup Path Protection
  - ILP exact solution and scalable heuristic Ant Colony Optimization
- **Capacity-aware distributed routing algorithm**
  - Smart routing based on the bandwidth usage information
  - Distributed routing using ant agent
- **Quality of resiliency and service availability modeling**
  - Propose new resiliency metric to integrate recovery time and capacity efficiency
- **Simulation Tools**: OMNeT++ and AMPL/CPLEX
- **Algorithm verification and validation in real testbed, i.e., PlanetLab**
PlanetLab Federation in Japan

Public

- Operate public nodes
- Federation with PLC/PLE/PLA
- Boost PlanetLab community

Production

- JGN2plus official service
- Private PlanetLab
- Promote PlanetLab in Japan

Research (Beta)

- GENI-like test-bed
- Network virtualization research
- Prototype of virtual routers
Xen Enabled Private PlanetLab

Public, Two kinds of Privates

Public PlanetLab to develop Services
- Local
- Richer Resources
- Less Restricted Policy
- Small Business

Private PlanetLab to develop Infrastructure

CORE: Private PlanetLab

Current:

- 10 sites, 52 servers
- Multi-Homed

Collaborative Overlay Research Environment
- Overlay test-bed based on “Private PlanetLab”
- Provision resources for mission critical services

Features we would like to have…
- Custom hardware to optimize overlay forwarding
- PoP/Core collocation (nodes “inside” network)
- Custom hardware to optimize overlay forwarding

Federation (e.g. PlanetLab, OneLab)

Target overlay research
- Not just on distributed system apps
- More on network core architectures

Utilize both private & public environments
- Local v.s. Global / Provisioned v.s. Best-Effort

New Generation Perspectives to Overlay Network

- Testbed for prototype and evaluate a new generation network design
- Evolutive nature of overlay network to incorporate into the design

• www.asiafi.net/meeting/2008-summer/tutorial/Tutorial_0825/Nakao-open-AFI2008summer.ppt
Research Activities wrt PL/GENI

• Network Virtualization Research Lab
• Private PlanetLab Infrastructure
  – GENI / VINI / PlanetLab
  – JGN2+ and JGN3
• Federation of Test-Beds
  – Within Japan and Asia
  – With U.S. and Europe (OneLab2)
• AKARI
  – New Generation Network Research
  – Virtualization as an Architecture

•www.asiafi.net/meeting/2008-summer/tutorial/Tutorial_0825/Nakao-open-AFI2008summer.ppt
Research Activities in New Generation Network

Network Virtualization Lab (CoE on Net Virt)

AKARI Architecture Project

AKARI 2nd Phase

NV Lab 2nd Phase

Service Platform Advanced Research Center

New Generation NW (NWGN)

International Coopetition

US (FIND, GENI)
EU (FP7, FIRE)
Asia

Collaboration of Industry, Academia and Government

NWGN Forum

Next Generation NW (NXGN)

AKARI 2nd Phase

Data NW
Cellular
PSTN

Internet
Cellular
PSTN

JGN
JGN2
JGN2plus

Toward the New Testbed

Before
Now
Y2010 (Next Generation)
Y2015 (New Generation)
NVLab Research Topics

Infrastructure

- Test-Bed Enhancement / Federation
  [CoreLab: An Emerging Testbed Through Hosted-Virtualization, ACM ROADS 2008]

- OS and Network Virtualization
  [Hosted L2 Virtualization Performance (Ozaki, Nakao) IPSJ, 2008]
  [Hosted L2 Virtualization Scalability (Ozaki, Nakao) Springer, under submission 2008]

- Virtual Router Construction

Applications

- Routing
  [AIRONE: One-Hop Source Router (Khor, Nakao) IEEE GlobeCom 2008]
  [SORA: Path Selection, (Lane, Nakao) CFI 2008 and IEEE GlobeCom 2008]

- Robust / Efficient Communication via Net.Virt.
  [Overfort (Khor, Nakao) IEEE IPDPS 2008]
  [Burrows (Khor, Nakao) ACM SIGCOMM LSAD 2007]

- Business Model/ Economic Incentives
  [Path Brokering : ACM ReArch 2008]
  [AS Alliance : ACM ROADS 2008]