WIDE updates

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WIDE

Understanding Internet Dynamics from a Global View

the Internet is an evolving open system

- ▶ no central point, no typical network or user
- ▶ complexity everywhere: topology, usage distribution, etc
- ▶ interferences among various components at different layers
- ▶ local optimizations often lead to a negative impact to the global system
- ▶ importance of global views
  - ▶ still, details matter (global impact of local mechanisms)

we still don't have real science!

WIDE Project

WIDE: Widely Integrated Distributed Environment

- ▶ a research consortium in Japan since 1988 that has been leading the Internet development in Japan
  - ▶ about 100 sponsor companies, 200 active members
  - ▶ 40 universities, 5 national research institutions
- ▶ motto: research on our left hand, operation on our right hand. supporting social infrastructure with both hands. paving a way for us and others
- ▶ main funding from sponsors
  - ▶ trying not to rely on government funds
  - ▶ be global (and stay away from domestic politics)

Founder Jun Murai and Director Hiroshi Esaki

WIDE in the 3rd decade

- 1st decade (1988-1997): building the Internet
  - deployment, internationalization
- 2nd decade (1998-2007): for everyone, anytime, anywhere
  - IPv6, mobility, multimedia
- 3rd decade (2008-2017): beyond Internet
  - real-space networking, sensors, broadcasting
  - globalization (official language: English, researcher exchange)
  - hand-made initiative (back to DIY)

Research at WIDE

- protocols and middleware
  - KAME/USAGI, NEMO, MANET, DVTS
- testbeds and operation
  - WIDE-Cloud, AI3, StarBED, JGN2plus, GLIF, WiMAX, two, DNS, MAWI
- real space Internet
  - AutoID, Live E!, Locky, InternetCAR
- security
  - CYBEX, traceback, SWAN, Moca
- social interaction
  - SOI/SOI-Asia, Lens, Medcri, GRIP

What's new

- IPv6 deployment (fallback problems)
- GreenICT (University of Tokyo, container data centers at IIJ)
- smart meters (SmartGrid)
- wide-cloud (distributed inter-university cloud)
- hand-made initiative

- Jun Murai back to the IT Strategic Headquarters

security research

Cybersecurity information exhange framework (CYBEX)

- ▶ lead by Youki Kadobayashi (NICT/NAIST)
- ▶ a framework for sharing cybersecurity information worldwide
- ▶ active in standardization
    - ▶ ITU-T SG17 (e.g., X.1500 CYBEX)

other activities

- ▶ NISC (National Security Information Center)
    - ▶ Yoichi Shinoda (JAIST)
- ▶ FIRST (the global Forum for Incident Response and Security Teams)
    - ▶ Suguru Yamaguchi (NAIST, JPCERT/CC)
    - ▶ IIJ-SECT

characteristics of WIDE traffic

- ▶ WIDE
  - ▶ internet research through live network
- ▶ WIDE has its own backbone operated by members
  - ▶ backbone includes
    - ▶ international links
    - ▶ IXes
    - ▶ root name servers
    - ▶ various link types up to 10GbE
  - ▶ carrying both commodity traffic and experiments
    - ▶ commodity: university traffic, WIDE members
    - ▶ experiments: new products, our technologies under development
    - ▶ IPv6 everywhere
    - ▶ events (including firedrills)
  - ▶ not a typical internet but a showcase

traffic measurement and analysis in WIDE

- ▶ measurement activities across research groups
- ▶ broad perspectives
  - ▶ tracking long-term trends
  - ▶ analysis (with wide range of granularity)
  - ▶ operational tools (trouble-detection/shooting)
  - ▶ evaluation of new technologies
- ▶ emphasis on
  - ▶ wide-area
  - ▶ multi-point
    - ▶ measurement on backbone
  - ▶ long-term
    - ▶ continuation by group effort

traffic measurement activities within WIDE

1. MAWI traffic repository
2. Residential Broadband Traffic Study
3. IX Traffic Study
4. Regional AS Topology Structures
5. Anomaly Detection and Flow Classification
6. Longitudinal Statistical Analysis (wavelet, PCA, EMD, etc)
7. Host Clustering by Communication Patterns
8. DNS behavior analysis
9. smartphone traffic analysis

international collaboration

- ▶ CAIDA (the Cooperative Association for Internet Data Analysis)
    - ▶ collaboration since 2003 on DNS, topology, routing, etc
- ▶ CASFI (Korean measurement project)
    - ▶ joint-workshops, data sharing
- ▶ CNRS (ENS-Lyon, UPMC/LIP-6)
    - ▶ measurement and modeling
- ▶ other collaboration
    - ▶ ISC OARC, USC/ISI, routeviews, RIPE, INRIA, AIT
- ▶ A day in the life of the Internet
    - ▶ simultaneous measurement worldwide to promote research based on re-examinable data
    - ▶ CAIDA, CASFI, WIDE, DNS root ops, etc.

MAWI Traffic Repository

- ▶ pcap packet traces from WIDE backbones
- ▶ daily anonymized traces publicly available since 1999
- ▶ many papers used MAWI traces

http://mawi.wide.ad.jp/mawi/

Summary

measurement actitivies at WIDE

- ▶ operational support
- ▶ tool development
- ▶ data sharing
- ▶ modeling and analysis
- ▶ visualization
- ▶ many more measurement related activities

WIDE is interested in open research collaboration

http://www.wide.ad.jp/