

IPv6 Network Construction and Operation in CNGI-CERNET2 member universities

APRICOT-APAN

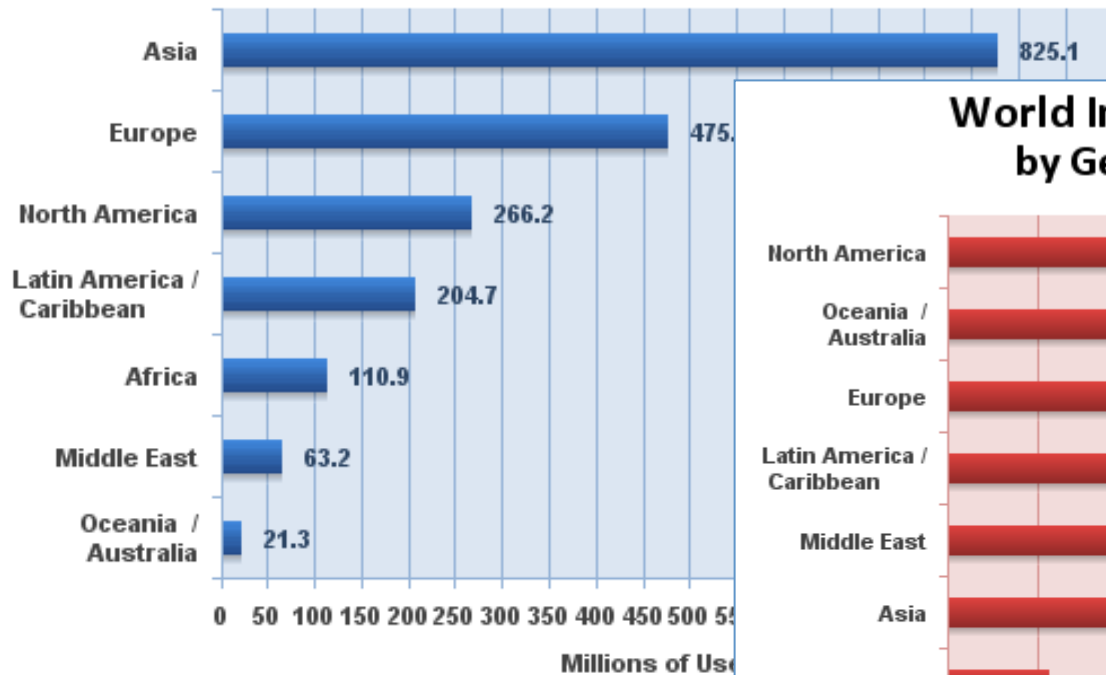
Hong Kong, 23Feb.2011

Agenda

- Internet growth and the requirement for IP address
- CNGI in China
- CNGI-CERNET2 construction and campus network operation

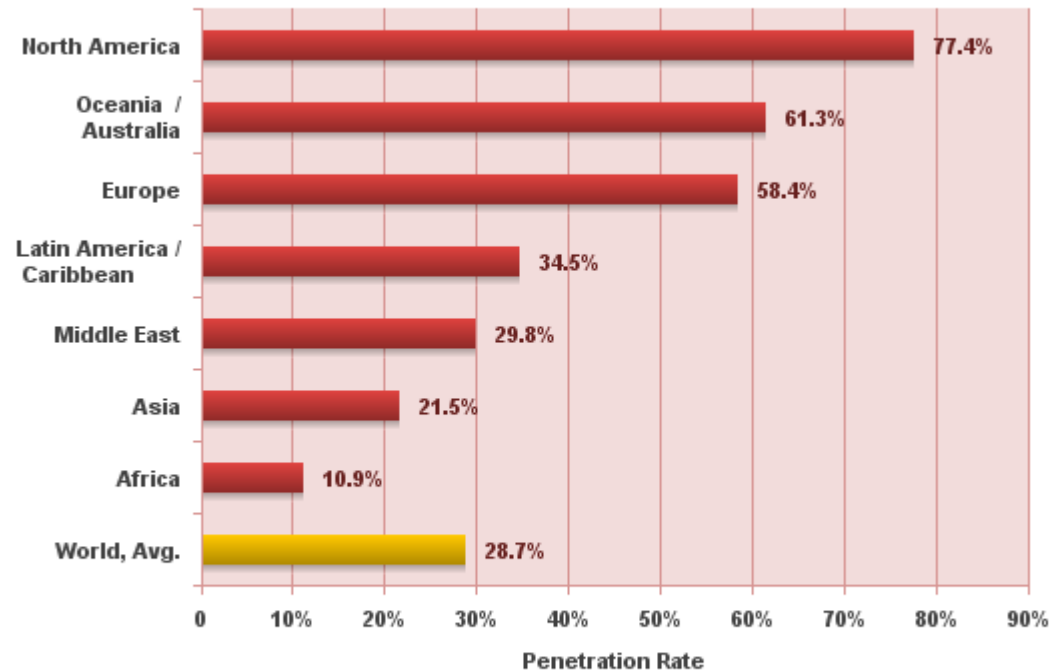
Asia Internet users compared with other region

Internet Users in the World by Geographic Regions - 2010



Source: Internet World Stats - www.internetworldstats.com/
 Estimated Internet users are 1,966,514,816 on June 31, 2010.
 Copyright © 2010, Miniwatts Marketing Group

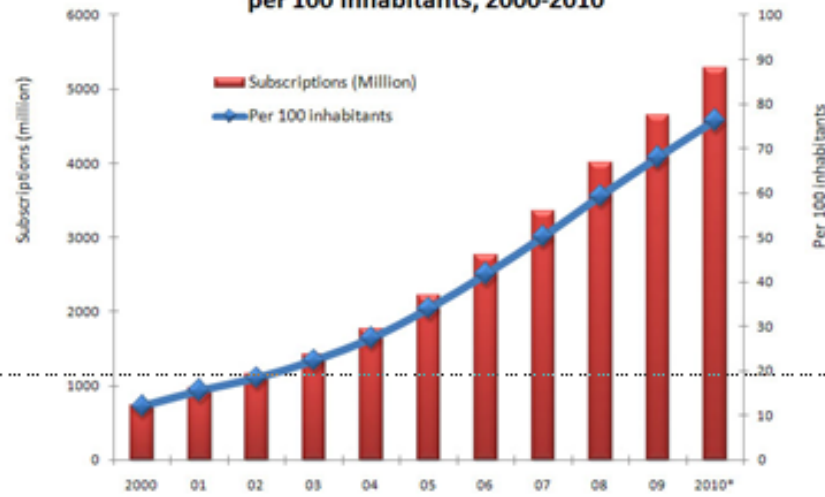
World Internet Penetration Rates by Geographic Regions - 2010



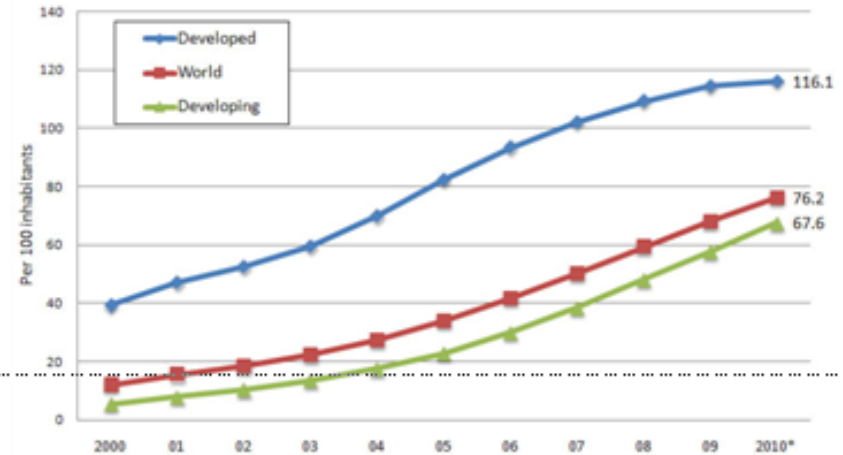
Source: Internet World Stats - www.internetworldstats.com/stats.htm
 Penetration Rates are based on a world population of 6,845,609,960 and 1,966,514,816 estimated Internet users on June 30, 2010.
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Mobile Subscriber

Global mobile cellular subscriptions, total and per 100 inhabitants, 2000-2010

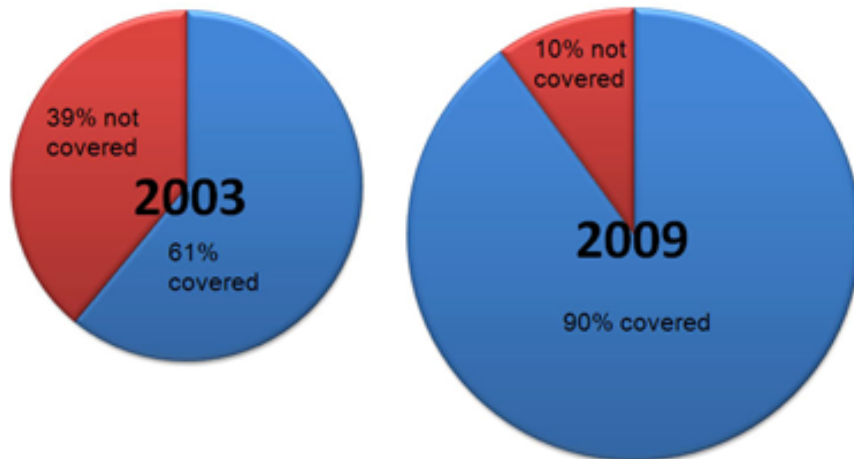


Mobile cellular subscriptions per 100 inhabitants, 2000-2010

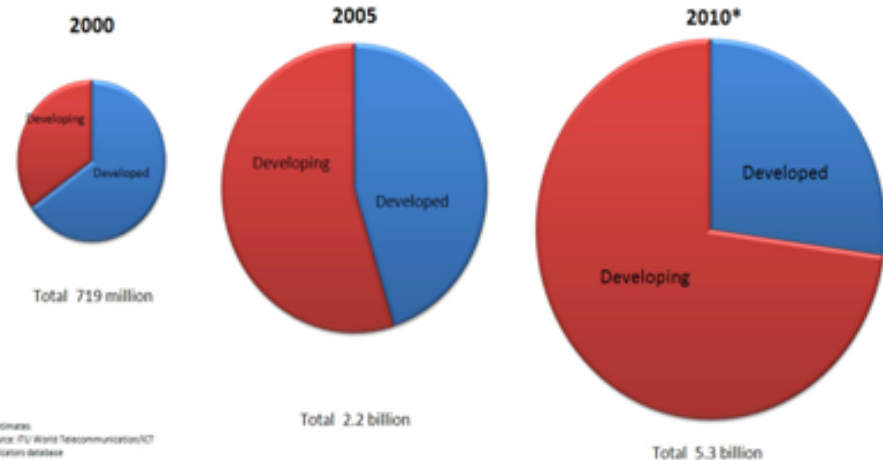


*Estimates
Source: ITU World Telecommunication /ICT Indicators database

Percentage of the world's population covered by a mobile cellular signal, 2003 compared to 2009

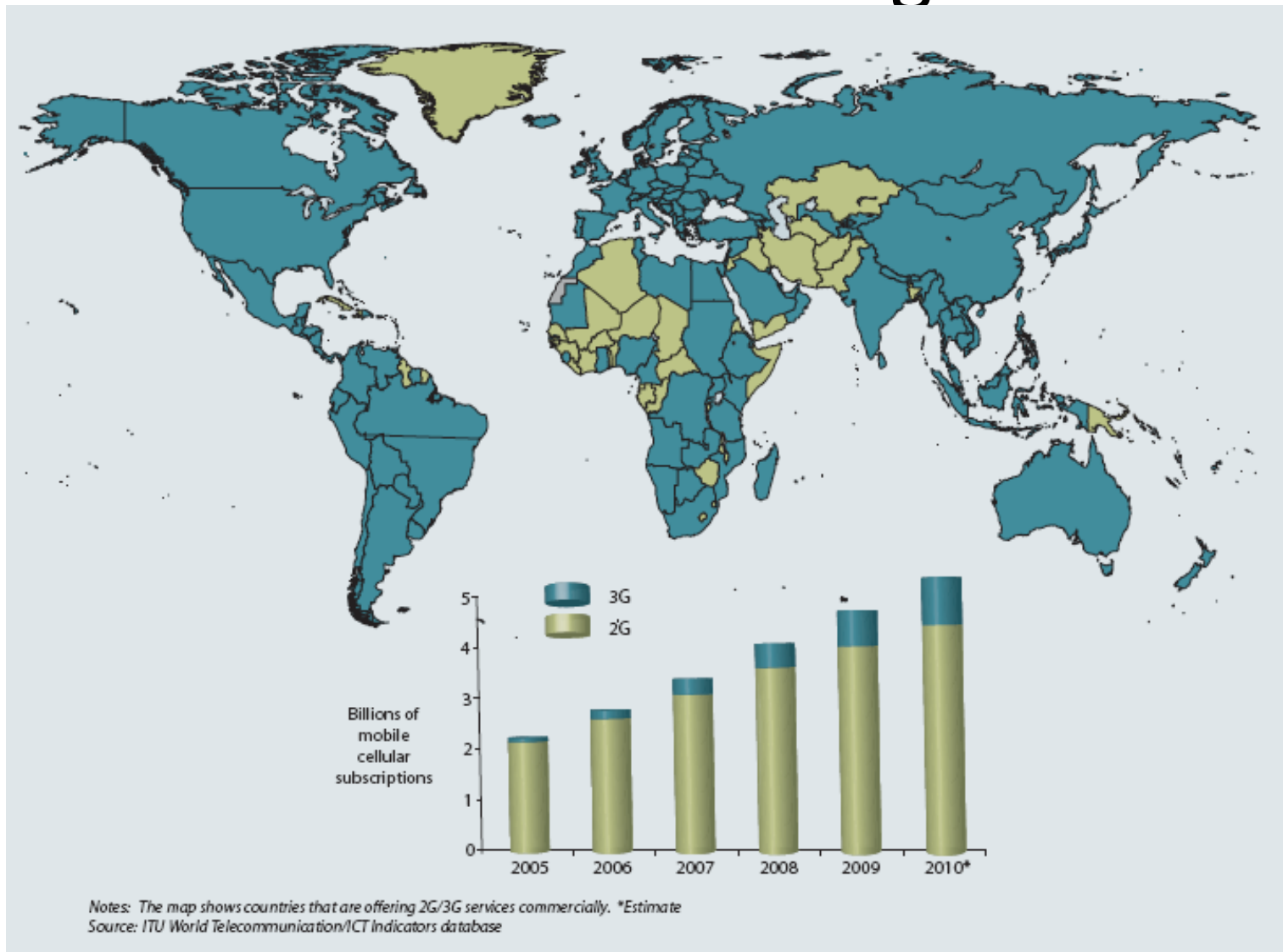


Mobile cellular subscriptions, by level of development



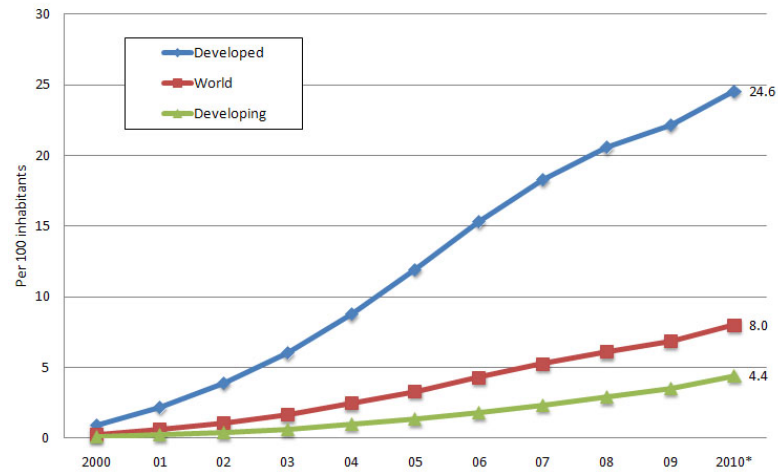
*Estimates
Source: ITU World Telecommunication/ICT Indicators database

Who need IP address: Global 3G subscriber growth



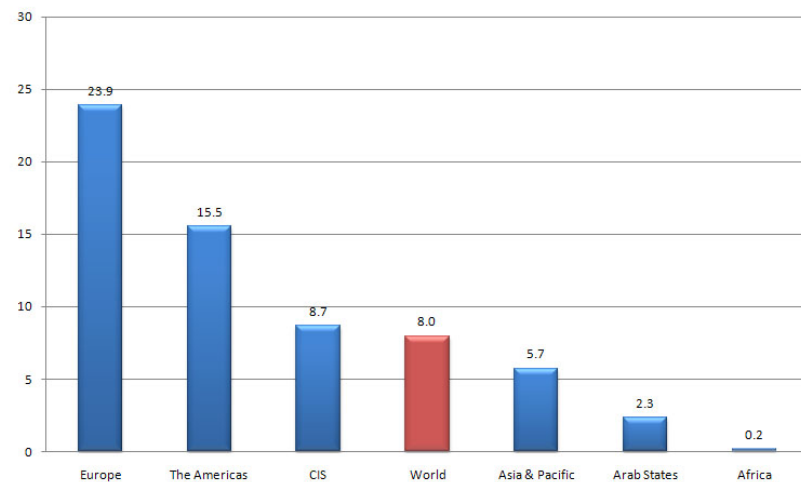
Growth of Broadband Subscribers

Fixed broadband subscriptions per 100 inhabitants, 2000-2010



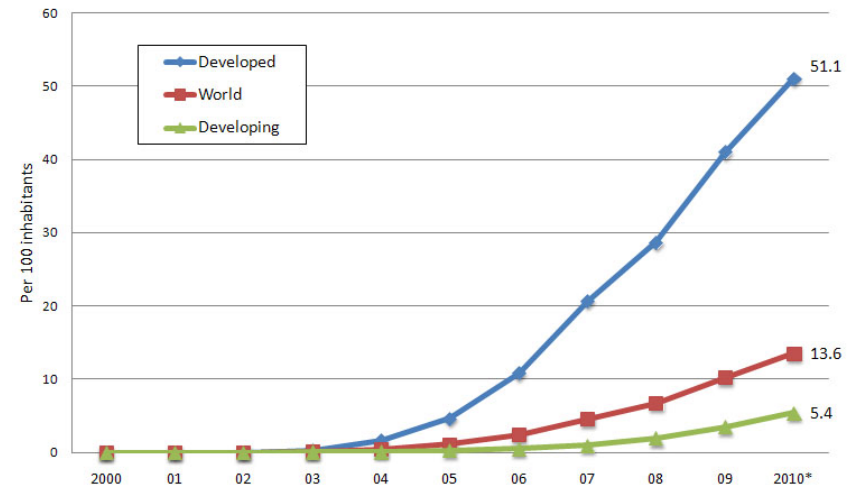
*Estimates
Source: ITU World Telecommunication /ICT Indicators database

Fixed broadband per 100 inhabitants 2010*



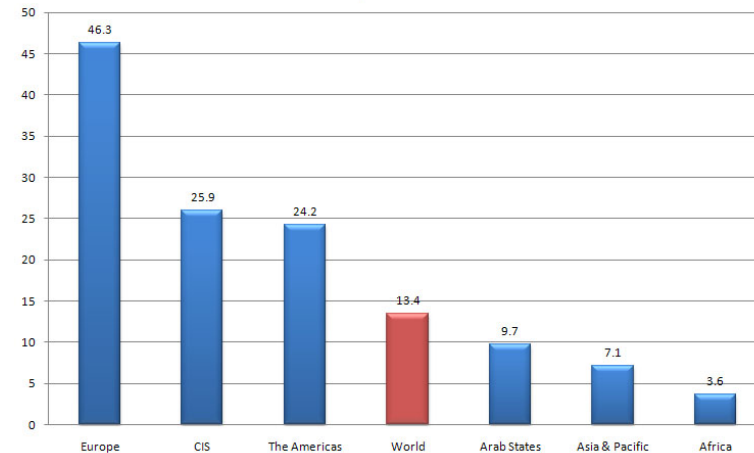
* Estimate
Source: ITU World Telecommunication /ICT Indicators database

Mobile broadband subscriptions per 100 inhabitants 2000-2010



*Estimates
Source: ITU World Telecommunication /ICT Indicators database

Mobile broadband per 100 inhabitants 2010*



* Estimate
Source: ITU World Telecommunication /ICT Indicators database

Internet in Mainland China

- CNNIC releases Internet survey every half-year
- By Jan. 2011, 457 million network users
- 203 million users use mobile phone to visit Internet
- The largest Internet user community
- We also meet many challenges

Source: CNNIC, July, 2010

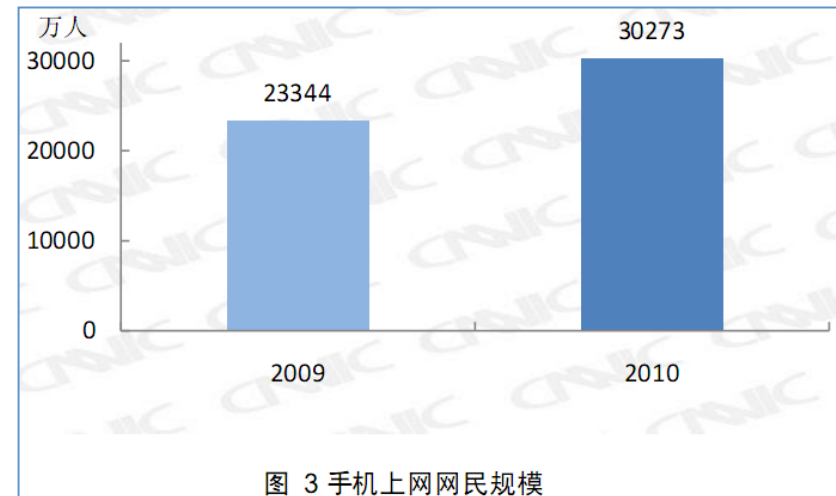
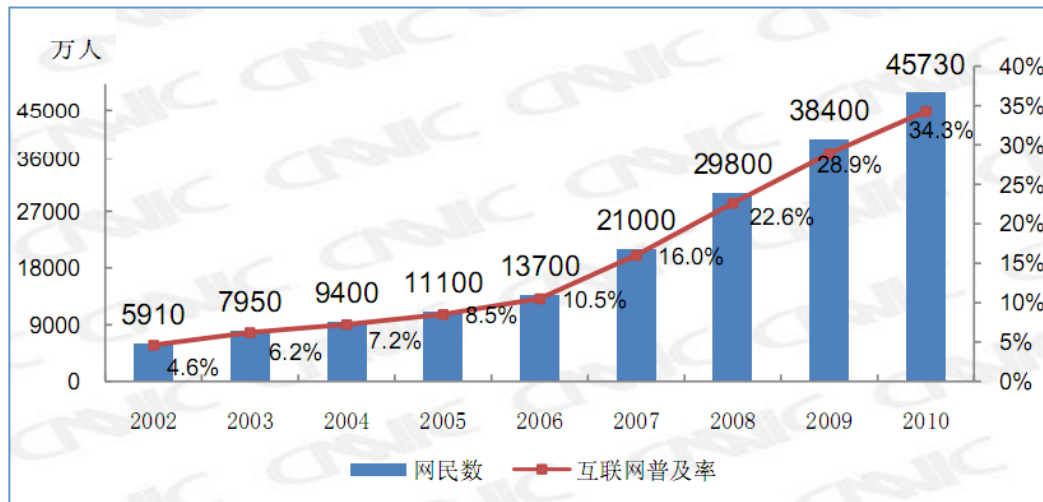


图 3 手机上网网民规模

penetration rate of Internet

- 34% penetration rate
- Due to infrastructure and economic condition
- Still big diversity
- More IP addresses needed
- Also opportunity

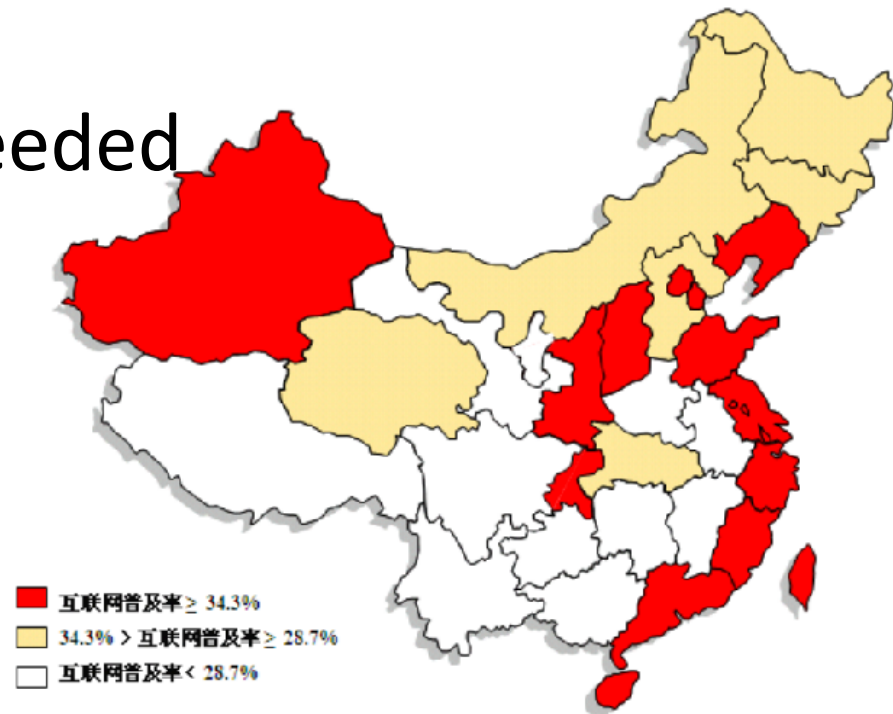
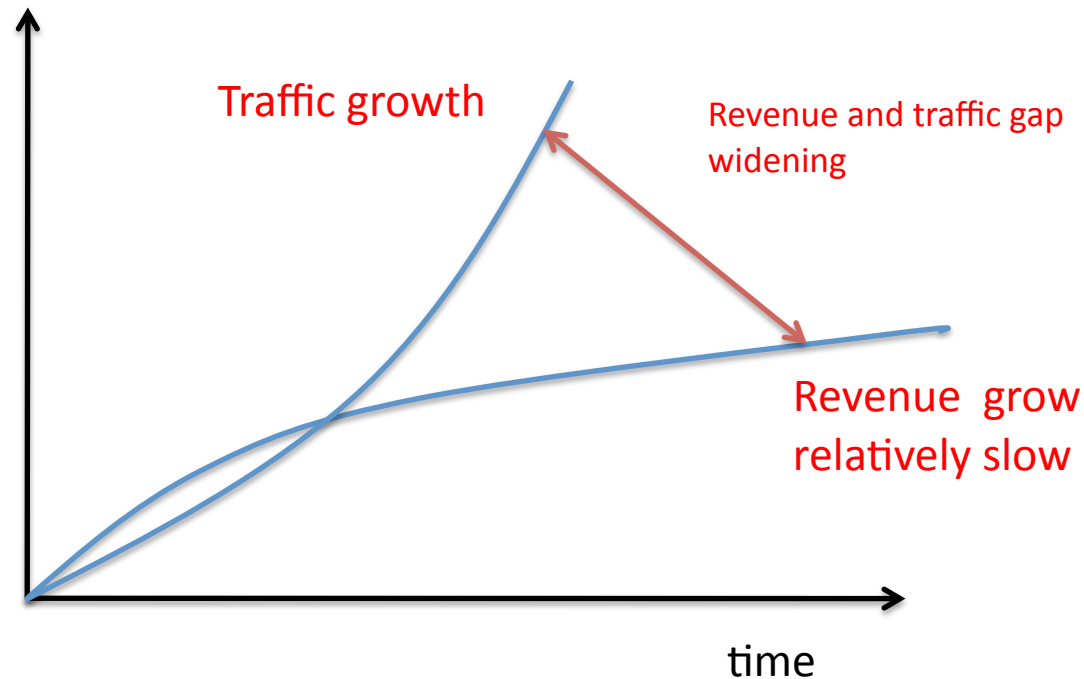


图 4 2010 年中国各省互联网发展状况 Source: CNNIC, July, 2010

Concern of service providers: Traffic vs. Revenue

- Traffic: Increasing 10 times in next 5 years
- Revenue: Increasing 100% in next 5 years
- What will happen in the IPv6 era? More investment?
- Operator still consider the point when to start v6 deployment



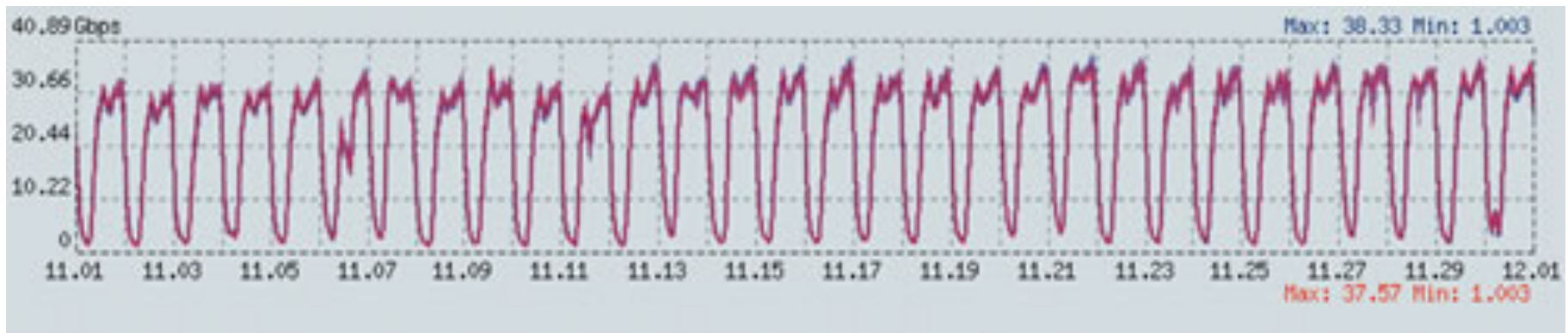
CNGI –

China Next Generation Internet project

- Initiated in 2002, it is one of the efforts to address the sustainable Internet development , approved by government in 2003
- Led by National Reform and Development Committee
- Joint with MST, MOE,CAS, MII ,NSFC,CAE, ...
- Main objectives
 - Research project on next generation technologies
 - CNGI Backbone: nation wide, 40 Giga POPs and 300 campus networks, international network links
 - Build advanced applications
 - Transfer successful results to information industry
- All National Service Providers have involved in this project
 - CERNET, China Telecom and other national Internet service providers
- 2011年2月21日中央政府发布《国务院关于培育和发展战略性新兴产业的决定》，在“十二五”规划中全面推动IPv6的部署，明确指出以IPv6作为下一代互联网首选。

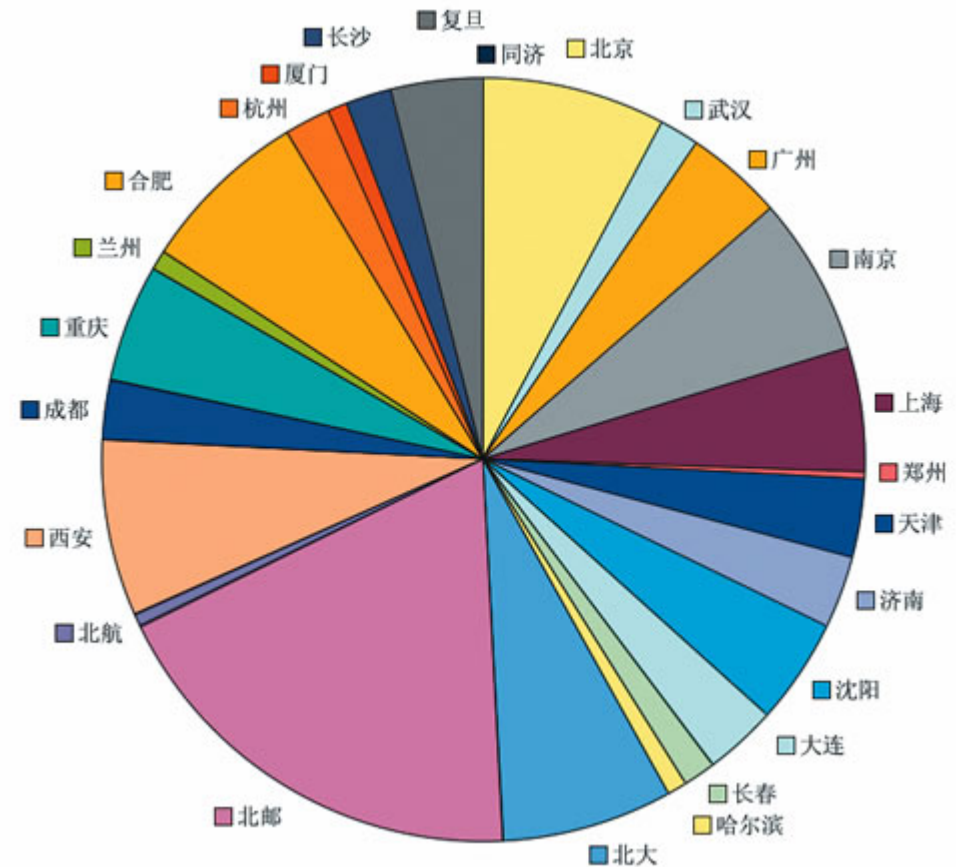
Traffic report from 6NOC of CNGI-CERNET2

- More than 200 Universities built their IPv6 enabled campus network
- CNGI-CERNET2 backbone traffic keeps increasing
- 35Gbps in Peak hour



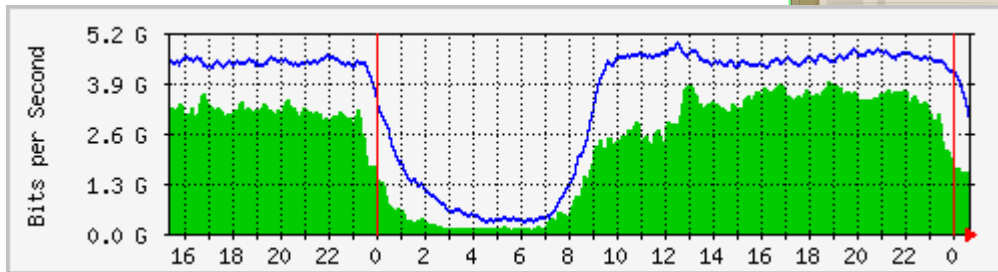
IPv6 Traffic distribution

- Counted by backbone nodes
- BUPT keeps the top one for the last 2 years
- Backbone nodes in Xi'an, PKU, Hehei, BJ and Nanjing follows



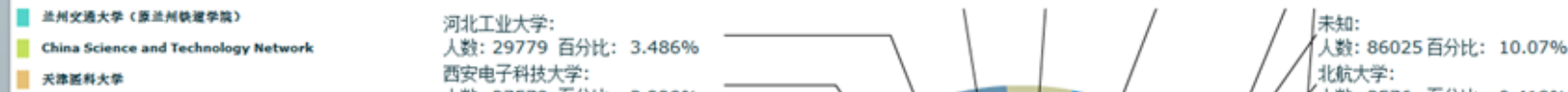
Sample applications: Concert via IPv6 live streaming transmission

- Many applications
- Multicast extended video streaming from backbone into campus networks
- P2P File sharing
- IoT applications
- Virtual reality
- Cloud computing
- ...



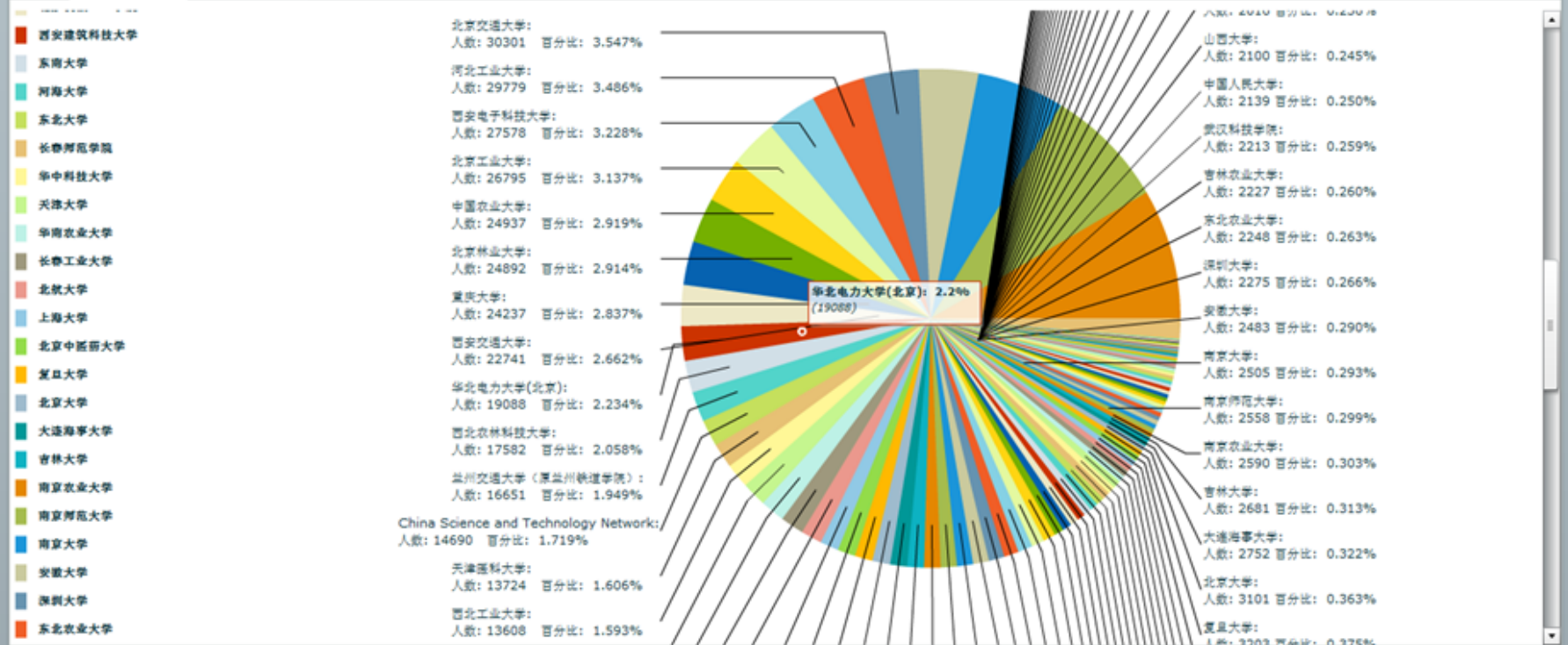
北京邮电大学IPTV日志分析系统

首页 用户来源分布 用户数量统计



北京邮电大学IPTV日志分析系统

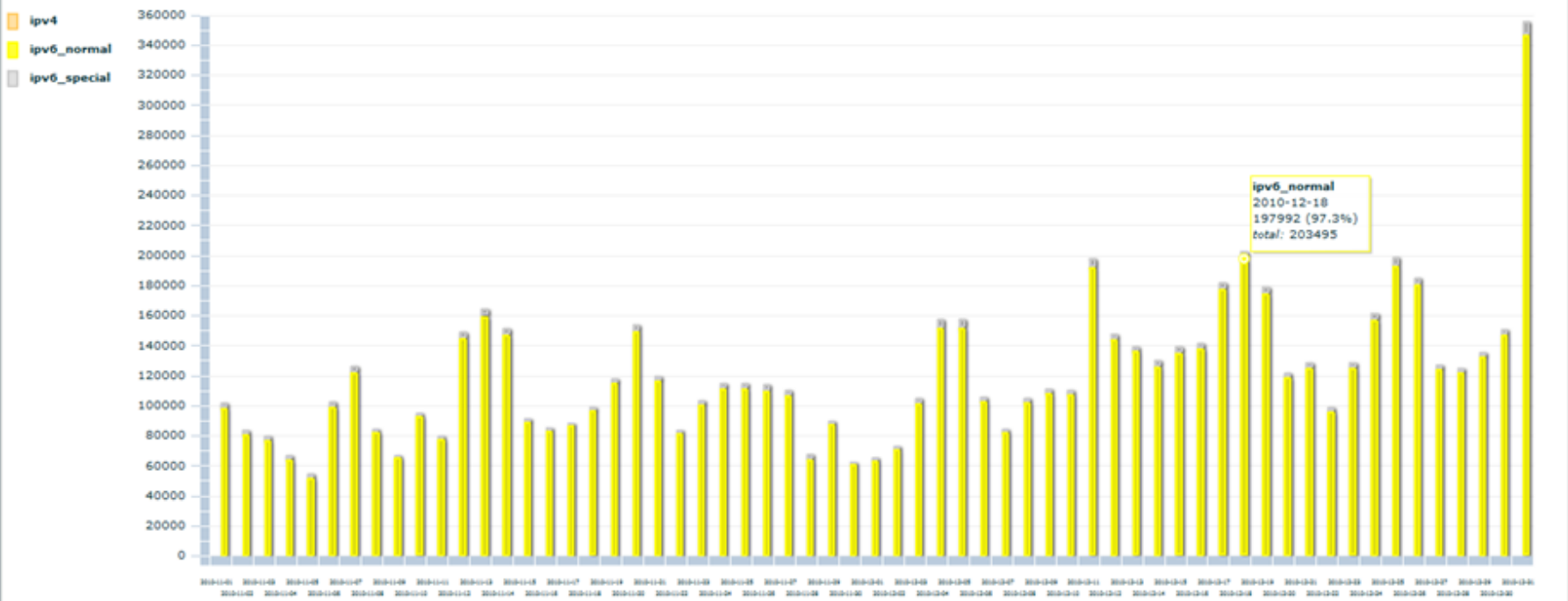
首页 用户来源分布 用户数量统计



开始日期 2010-11-01 结束日期 2010-12-31 提交

北京邮电大学IPTV日志分析系统

首页 用户来源分布 用户数量统计



模式: 人次

开始日期 2010-11-01 结束日期 2010-12-31 提交

Network management system developed

The screenshot displays a web-based network management system interface. The main window is titled "北京邮电大学校园网管理与监控系统" (Beihang University Campus Network Management and Monitoring System). It features several key components:

- 服务器监控 (Server Monitoring):** A table listing various servers with columns for name, IP, and status. The table is organized into four columns, showing a variety of services like email, storage, and database servers.
- 宿舍网拓扑 (Dormitory Network Topology):** A detailed network diagram showing a central hub (IP: 211.68.69.13) connected to numerous peripheral nodes. The nodes are represented by green server icons with their respective IP addresses. A status bar at the bottom of the topology shows "211.68.69.13 CPU: 13%".
- Navigation and Tools:** A sidebar on the left contains navigation options such as "三层设备列表" (3rd Layer Device List), "IP查询" (IP Query), "MAC查询" (MAC Query), "费用查询" (Fee Query), "服务器监控" (Server Monitoring), "ARP监控" (ARP Monitoring), "MAC监控" (MAC Monitoring), and "小包监控" (Small Packet Monitoring). Below this is a "拓扑管理" (Topology Management) section.
- System Information:** The top left corner displays "NGN OSS 下一代网络运维支撑系统" (Next-Generation Network Operation and Maintenance Support System).
- Performance Metrics:** A table in the bottom right corner shows performance data for different server types, including CPU usage and other metrics.

名称	IP	地址	名称	IP	地址	名称	IP	地址	名称	IP	地址
初邮件服务器	211.68.71.2	正常	New服务	211.68.71.73	正常	存储服务器	211.68.71.118	正常	留学生来学系统	211.68.71.197	正常
校域名服务器	211.68.71.4	正常	软件开发服务器	211.68.71.74	正常	存储服务器	211.68.71.119	正常	留学生来学系统	211.68.71.198	正常
校域名服务器	211.68.71.5	正常	软件开发服务器	211.68.71.75	正常	存储服务器	211.68.71.120	正常	留学生来学系统	211.68.71.199	正常
DNS备份服务器	211.68.71.6	正常	软件开发服务器	211.68.71.76	正常	存储服务器	211.68.71.121	正常	清华流媒体	211.68.71.200	正常
邮件服务器	211.68.71.7	正常	软件开发服务器	211.68.71.77	正常	存储服务器	211.68.71.122	正常	移动企业通信平台	211.68.71.201	正常
拨号服务器	211.68.71.16	正常	D2 Server	211.68.71.78	正常	存储服务器	211.68.71.123	正常	团委主页服务器	211.68.71.202	正常
虚拟机服务器	211.68.71.21	正常	VOL开发服务器	211.68.71.79	正常	存储服务器	211.68.71.124	正常	团委FTP服务器	211.68.71.203	正常
虚拟机服务器	211.68.71.22	正常	校FTP服务器	211.68.71.80	正常	存储服务器	211.68.71.125	正常	IPTV服务器	211.68.71.219	1.602
视频点播服务器	211.68.71.23	正常	校FTP服务器	211.68.71.81	正常	存储服务器	211.68.71.126	正常	IPTV服务器	211.68.71.220	1.611

名称	IP	地址	名称	IP	地址
7500E	3	65793	7500E	3	10402
5500	3	7518	5500	3	10604
5500	3	17659	5500	3	29481

Issues be tackled

- More operation efforts involved
 - Maintain two routing tables
 - Maintain two ACLs
 - Maintain dual stacked server
 - Identify the network/service problem caused by IPv4 or IPv6
 - Miss configured DNS, network devices, client and server side
 - Trainings

Future works

- Take actions and Keep eyes closely on security
- Different level of trainings
- Porting and developing applications
- Accounting system
- Migration technology research and deployment
- Collaboration among interested parties
- Looking into future technologies

Let's working together for a
better IPv6 world !