



# IPv6 Development in China

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# Outline

- A brief history
- Experience
- CNGI project
- CERNET2 design



# Telephone Users

中华人民共和国信息产业部 - 新闻速递 - Netscape

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Bookmarks Location: ov.cn/Mii/homepage.nsf/documentview/2002-08-16-22-88D20F426C44303248256C17000E46C6?OpenDocument

  报道所发生的一切

当前位置：新闻速递

### 我国通信业继续保持快速增长，固定电话用户突破2亿户

到7月底，全国通信业务总量完成3079.91亿元，比上年同期增长28.69%。其中，邮政完成272.33亿元，增长6.13%；电信完成2807.58亿元，增长31.39%。

电话用户在基数不断扩大的基础上保持快速增长。今年以来全国固定电话与移动电话用户共计新增5575.2万户，用户总数达到3.8亿户。其中，固定电话新增2065.5万户，达到2.01亿户，只用了3年的时间就完成了从1999年的1亿户到2亿户的跨越；移动电话新增3509.7万户，达到1.8亿户。互联网上网人数达到4173.5万人。全国电话普及率达到30.22%，其中，固定电话主线普及率达到15.65%，移动电话普及率达到13.86%；通电话的行政村比重达到85.3%。

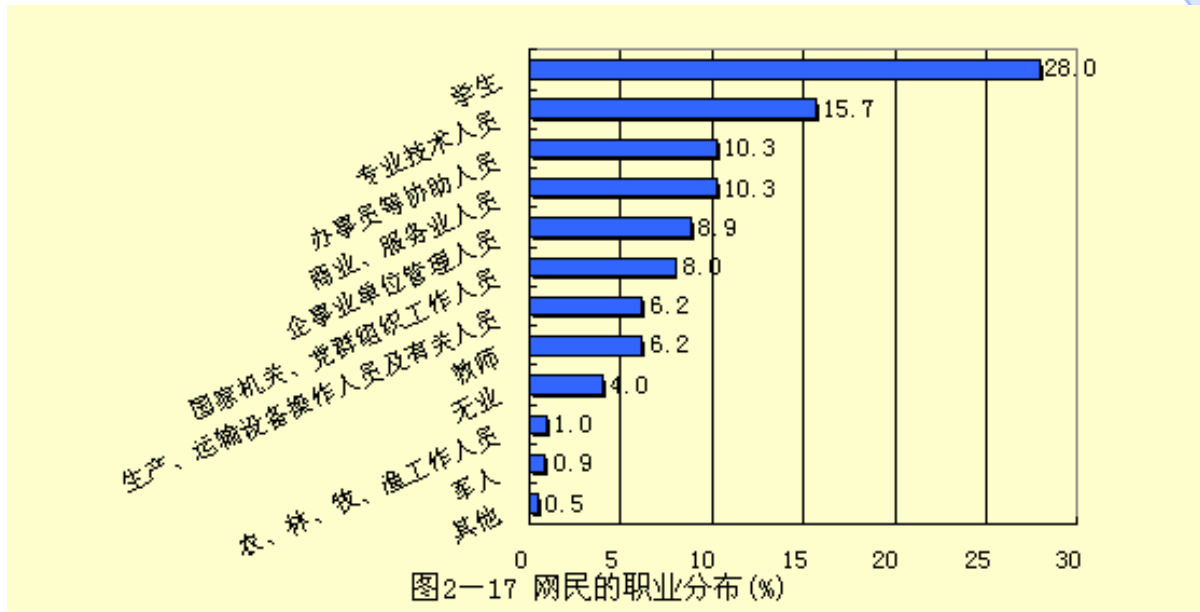
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# Internet population

● Global	rank	655M	%
● US	1		
● CN	2	59.10M	4.6%





# China Internet Estimation

- Population in mainland China 1,200,000,000
  - 1 IP per person
    - **72 class A IP addresses**
  - 1 hour on line (28.8kbps) per person per day
    - **1.68T/s**
  - 1 MB homepage per person
    - **1200TB**



# China IPv6 Efforts

- 1998, CERNET-IPv6 Testbed
- 1999, IPv6 demo system funded by MST 863
- 1999, CERNET-Nokia joint IPv6 project
- 2000, NSFCNET funded by NSFC
- 2001, IPv6 Router funded by MST 863
- 2001, IPv6 MAN demo system funded by CAS
- 2002, 6TNET by MII
- 2002, IPv6-CJ funded by Chinese government and Japanese government started
- 2003, CNGI project
- 2004, CERNET2



# CERNET IPv6 Testbed

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Location: <http://www.ipv6.net.edu.cn/>

## 中国教育和科研计算机网 IPv6 试验床

CERNET IPv6 试验床是在1998年12月拟议的。其目标是在CERNET现有的网络设施的基础上建立一个全国范围广泛连接的IPv6（或称为IPng）试验网络，为正在致力于IPv6和未来Internet研究开发的科研人员和组织提供实践的平台。

CERNET国家网络中心的IPv6试验网络已经加入6bone的骨干网。6bone是国际的IPv6试验床的简称。6bone已经为CERNET IPv6 试验床分配了一个pTLA (pseudo Top-Level Aggregation)的地址空间。

注：以下若非特别指出，“试验床”特指“CERNET IPv6 试验床”。

[关于CERNET IPv6试验床](#)

[加入试验床](#)

[试验床邮件组-Mail List](#)

[申请IPv6地址](#)

[建立IPv6试验网络](#)

[IPv6工具](#)

[Traceroute](#)

[Whois](#)

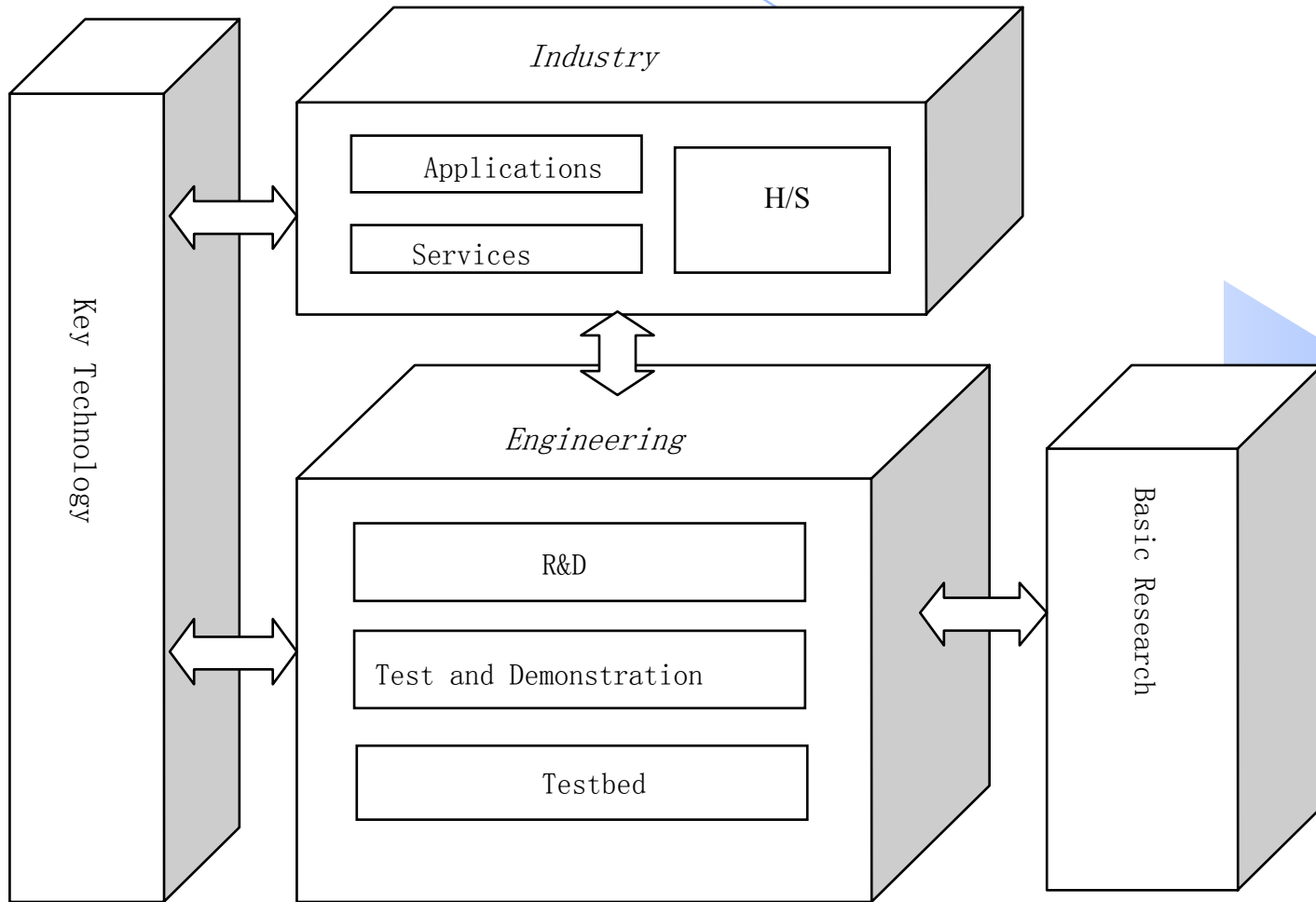
[与IPv6有关的RFC文档](#)

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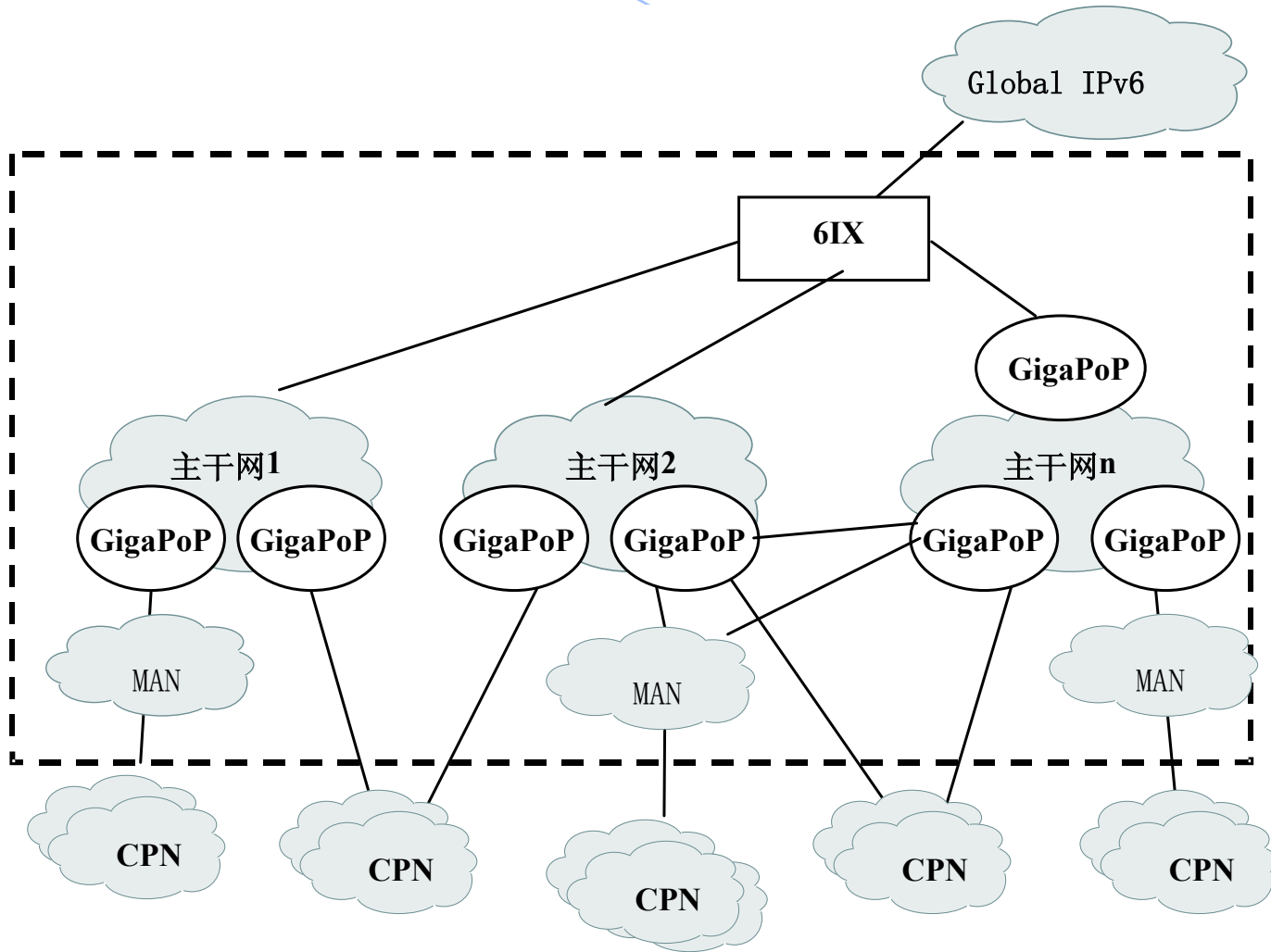
# CNGI Structure







# CNGI Backbone





# CNGI Backbone Members

Member	Pops
CERNET	12
CHINA TELECOM	7
CHINA UNICOM	7
CNC—CST	7
CHINA mobile	4
CHINA RAILCOM	1
sum	38



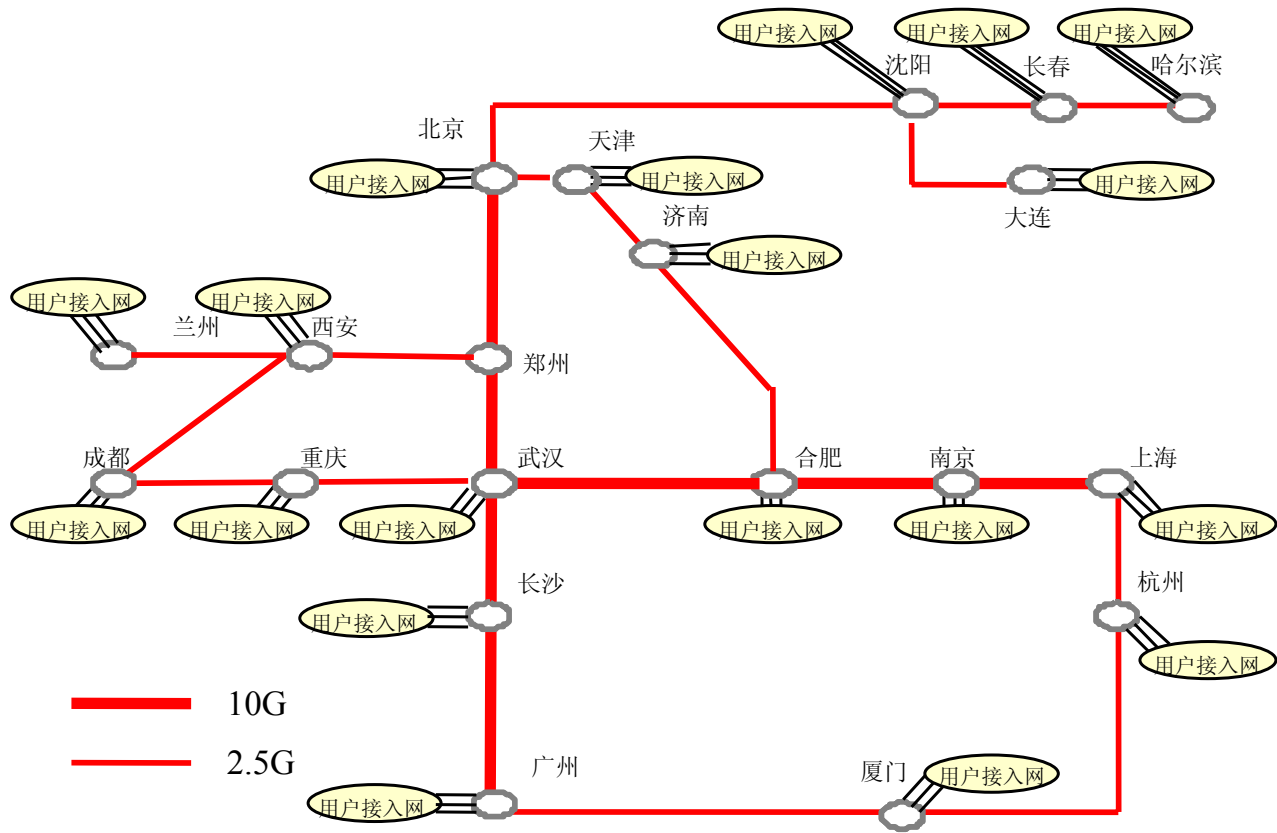
# CERNET IP Backbone





# CERNET2 plan

- 10 Gbps to 5 cities, 2.5Gbps to 20 cities





# IPv6 Challenges

- Scalability
  - Routing
- Functionality
  - High performance
  - Mobility
  - Multicast
  - Security
- Service
  - Smart Device World
  - Charging Model
- Transition



# CERNET and CERNET2 Comparison

	<b>CERNET</b>	<b>CERNET2</b>
protocol	<b>IPv4</b>	<b>IPv6</b>
# of PoPs	36cities	20cities
Constitution	Membership	Consortium
Routing	Global	Research network + global IPv6
Topology	Hierarchical (Regional + provincial)	Flat
IGP	OSPFv2 iBGP4	OSPFv3 iBGP4+
EGP	BGP4	BGP4+
Customer connection speed	2M and above	1G and above (except tunnel)
Customer routing	Static/default	BGP4+



# IPv6 BGP Analysis

**CERNET BGP View: 6Bone BGP Routing Table Statistics**

[\[HOME\]](#) [\[China IPv4\]](#) [\[Global IPv4\]](#) [\[Global IPv6\]](#) [\[Query BGP\]](#) [\[DownLoad\]](#) [\[Links\]](#) [\[Utilities\]](#)

- [3D AS Topology](#) written in VRML(click [here](#) to download VRML client)
- [ASes and Routes Statistics](#)
- [More specific routes statistics](#)
- [Routes stability statistics](#)

**Date: Fri Dec 5 07:46:00 2003**

- [AS Information](#)
- [Route Table Information](#)
- [Problematic Route Entry](#)
- [Outdegree Order List](#)
- [Path Number per AS Order List](#)

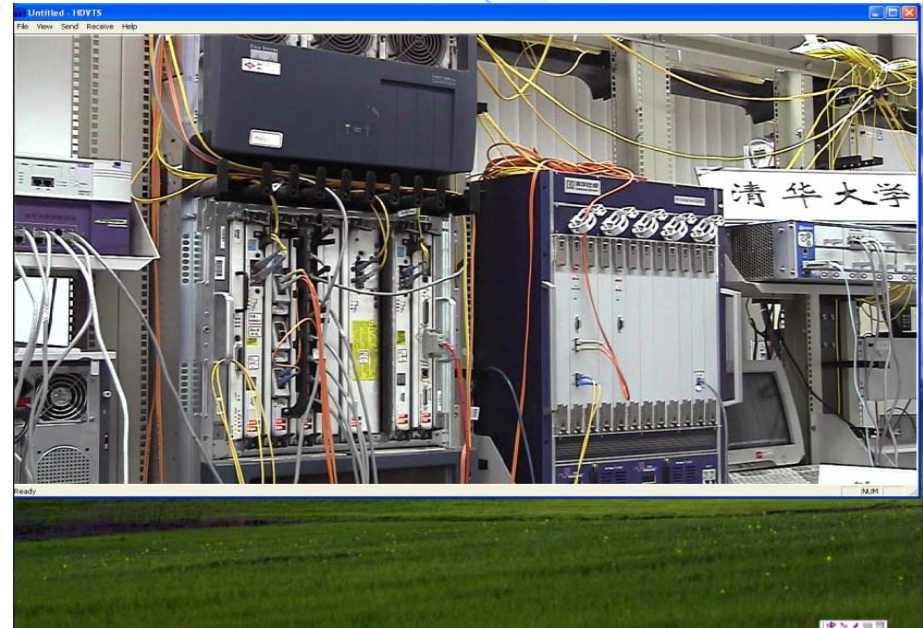
AS Statistical Informationi	
<a href="#">AS Number</a>	389
Transit AS	16
Max Route Entres per AS	17
Average Route Entries per AS	1.282776
The AS that has Max Route Entries	23910
<a href="#">Average Outdegree</a>	1.275065
<a href="#">Max Outdegree</a>	37
The AS that has Max Outdegree	3257
Max AS-Distance	8

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# IPv6 Video







# IPv6 Search Engine

Compass IPv6 Search Engine [中文](#)

IPv4 Sites	Inward Link	IPv6 Sites	Inward Link
www.microsoft.com	176	www.kame.net	143
www.apache.org	175	www.6bone.net	114
www.freebsd.org	161	www.new.org	69
www.ietf.org	161	www.wide.ad.jp	63
validator.w3.org	145	www.jp.freebsd.org	61
www.gnu.org	143	www.bieringer.de	53
www.google.com	129	www.linux-ipv6.org	44
www.netbsd.org	118	www.hitachi.co.jp	38
www.openbsd.org	118	www.siemens.de	38
www.cisco.com	112	www.surfnnet.nl	38

*Top 10 IPv4 Sites*  
(Referenced by 1183 IPv6 sites)

**Country distribution of IPv6 sites**

Country	Percentage
Japan	24%
Germany	13%
United States	12%
Others	9%
Ireland	5%
Denmark	4%
Spain	3%
United Kingdom	3%
Canada	3%
Netherlands	3%

[More Countries...](#)

*Top 10 IPv6 Sites*  
(Referenced by 1183 IPv6 sites)

**Type distribution of IPv6 sites**

Type	Percentage
org	39%
net	34%
com	23%
cc&info & mil	3%
edu	1%

[More types...](#)



# Q&A