Computer Networking

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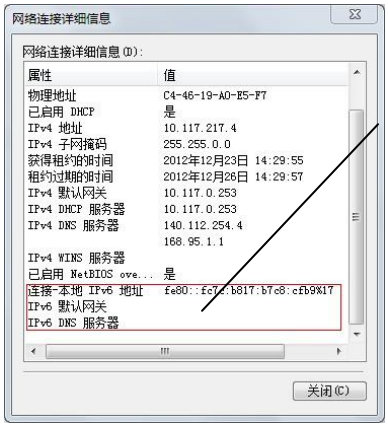
IPv6

IPv6 is the latest version of the IP, which is intended to replace the older version IPv4 gradually. We are already familiar with the IPv4, the fourth revision of IP but the first version been widely deployed till now. IPv4 uses four-byte addresses, which limits the address space to 2^{32}, which apparently doesn't satisfy the exploding Internet users. Aiming to handling this problem, Internet Engineering Task Force(IETF) develops the IPv6[RFC 2460][6], which uses 16-byte addresses, allowing 2^{128} ($\approx 3.4\times10^{38}$)addresses to be allocated. The large number of addresses ensures the world won't run out of the IP addresses. It also provides the address space for the internet of Things, making the communication between objects possible.

In the buildings IPv6 covered, we can connect it easily and enjoy the wide bandwidth. And you can check the router from the web setting. Under win7, the system has already installed the IPv6 and run it, while other systems have to install it in advance via command window to run it. I check my IPv6 address via my laptop in the library B1 studying room. And it shows as follows(*FIG1*), apparently the B1 studying room doesn't cover the IPv6 network.

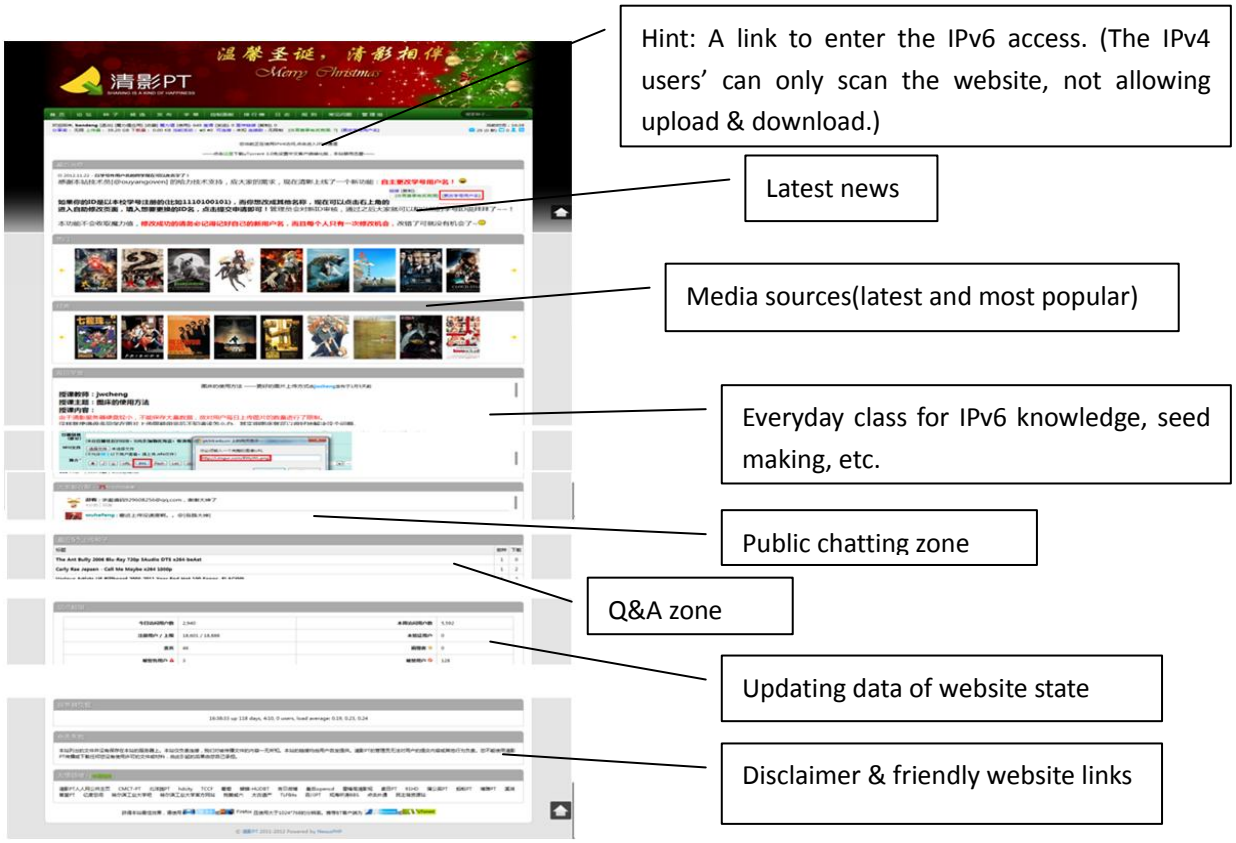


Wireless Network Adapter
Connection - local IPv6 Address: fe80 :: fc7c: b817: b7c8: cfb9% 17
IPv6 default gateway:
IPv6 DNS server:

(*FIG1. From my laptop*)

The first time I knew the term “IPv6” was from my university’s website, our computer center announced that most buildings have covered IPv6 network and we can apply for an account to share the sources, though most of the sources are media sources.

In 2004, the project “CERNET2 Backbone” is developing to allocate and share more sources among colleges and universities in China.[1] Thus, lots of universities have their own IPv6 network, putting sources university has already bought on there, like NTU’s some workstation. And these websites are majorly maintained by students(*FIG2*), making the popularity rising rapidly. The sources are always related with BT seeds but the Xunlei is forbidden there. Below is my university HIT’s IPv6 website PT(Private Tracker).

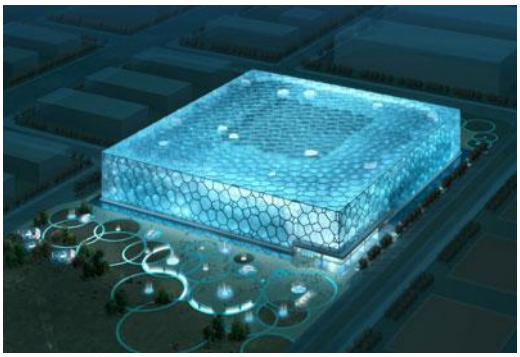


(*FIG2. From* http://pt.hit.edu.cn)

Recently the website administrator clarifies that some students accuse the P2P mechanism of PT constrain their network traffic. PT’s majority of traffic occupies the network traffic within the campus network and the Education Network IPv6 traffic. For Chinese

Netcom or Telecom, the impact of PT's speed is almost negligible. And in my view, some users abandoned some P2P software like Xunlei after using PT. It improves the external network environment to some extent, kind of a double-win.

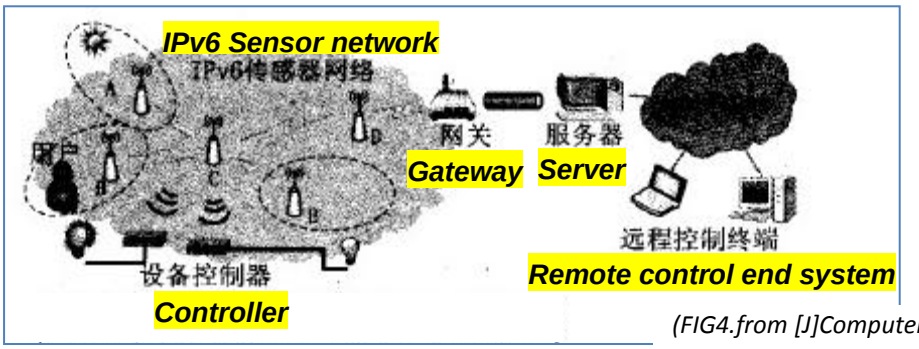
Another aspect of the IPv6 application which is interesting is that people can utilized the IPv6 addresses allocating to implement the Internet of things and control them remotely. For example, in 2008 Olympic Games, engineers design and implement the Bird's nest and Water Cube light control system based on the IPv6 wireless sensor network.(*FIG3.*)

(*FIG3.From*http://news.watchstor.com/industry-138074.htm)

How do they implement it?[3]

After I read the paper "IPv6 for Wireless Sensor Networks(Lars Schor)" [3], I realize implementing IPv6 on sensor nodes can simplify the task of connecting a huge amount of nodes together and realize the idea of the Internet of Things. But it seems to be not possible to write a simple network layer with all nodes supporting IPv6,though the basic idea is the same.



(FIG4.from [J]Computer Technology and Development, Vol 21, NO.12,Dec.2011,page237-Pic 1.[4])

Roughly to see, it has no big difference between IPv4 and IPv6 in the network layer. But IPv6 has the IETF 6LoWPAN(IPv6 over Low power Wireless Personal Area Network)[5] group, which can realize low power wireless devices can participate in the network together with Ethernet, wiFi, etc. Designers of the indoor lighting control system[4] use socket programming to let server communicate with gateway and classify the receiving data to store in the MySQL database, sort of like our PA but more complicated. All the wireless storing & forwarding follows the IEEE803.15.4 protocol[4,5] , and authors[4] give the example of source address as well as destination of one of the simulated nodes.

Source address：**3F FE 32 40 8O 07 12 09 41 19 63 92 47 00 00 00**

Destination： **3F FE 3 40 80 07 12 09 19 79 95 22 47 00 00 00**

From the format, we can see the gateway and nodes utilize the 128-bit IPv6 address. After designing whole system with corresponding hardware and software, the system can realize people use the web page to control the indoor light. I suppose the Bird Nest and Water Cube have similar approach. But the entire wireless sensor network is too complicated for me to conclude its whole main idea. It still interests me a lot, I hope one day I can design something useful like that.

Reference:

[1] http://ipv6.sjtu.edu.cn/news/040701.php
[2] http://news.watchstor.com/industry-138074.htm
[3] ftp://ftp.tik.ee.ethz.ch/pub/students/2009-FS/SA-2009-01.pdf
[4] http://lib.cqvip.com/qk/97969A/201112/40261776.html
[5] http://en.wikipedia.org/wiki/6LoWPAN
[6]http://en.wikipedia.org/wiki/IPv6]