Run an OpenStreetMap cache server for Asian Users

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Outline

- Introduction to OSM Taiwan
- Cache server
  - Why?
  - NCHC's capacity
  - Hardware, network
  - OS, services
  - Maintenance
- Q&A
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OpenStreetMap Taiwan

Open Data

Civic Hackers

OSM

VGI & Citizen Science

http://resultmaps.neis-one.org/oooc
2009

osm.kcwu.csie.org/history/index.html
2011

osm.kcwu.csie.org/history/index.html
2012

osm.kcwu.csie.org/history/index.html
The growth of nodes
The growth of ways
The growth of relations
The growth of users

Cum. Contributors
Mapping parties
Mapping Party for local history and culture
Japanese immigrant villages at the period when Taiwan under Japanese rule

http://tools.geofabrik.de/mc/?mt0=mapnik&mt1=googlemap&lon=121.50807&lat=23.84155&zoom=17
OSM Mapping team for aboriginal tribes (Sedek and Taroko)
Mapping for trials’ surface
Taiwan Trail Volunteer x OSM TW
Common values of `tracktype=*` and `surface=*` in OpenStreetMap.

**Purpose**
This map is mainly useful for OpenStreetMap contributors who want to ensure that surfaces are correctly tagged in an area.

- paved etc = surface values of: paved, concrete, asphalt, sealed, tarmac
- dirt, grass etc = surface values of: cobblestone, compacted, dirt, grass, gravel, ground, pebblestone, sand, unpaved

**Key**
- path..., grave 1, surface=paved etc
- road..., surface=paved etc
- Grade 2
- surface=compacted
- Grade 3
- Grade 4
- Grade 5
- surface=dirt, grass etc
- highway=unsurfaced — no other tag
- Other
- Not specified
Damaged houses after the gas explosion
Crisis mapping for Kaohsiung gas explosion
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- Q&A
Why? - Background

- OSC 2013 Aug Kansai@Kyoto
- No any cache server in Asia at that time
  - Long loading time
- Daniel Kastl from Georepublic asked, and mentioned:
  - “Universities here have a terrible administrative overhead with lots of formal requirements. Even community members working at universities seem to try to avoid the paperwork.”
  - “Data center providers we talked to are mostly "scared" about the data traffic. In general internet speed in Japan is super fast, and traffic is unlimited for private users. But it seems the mix of "power-users" and "low-traffic" users, which makes "unlimited traffic" possible. After talking to data center providers it seemed to me, that internet traffic in fact is quite expensive in Japan. Hardware costs were not really an issue for them.”
Background – network bandwidth

- The traffic is distributed by tile.openstreetmap.org using GeoDNS to pick the "local" server. In partnership with the cache provider we (OSM sysadmins) decide which countries are best served by a particular server. See: http://dns.openstreetmap.org/tile.openstreetmap.org.html for current setup.

- Traffic:
  - Using May 2012 statistics, Japan uses around 312 Kilobytes/s (inbound+outbound) of tile traffic (averaged over 7 days)
  - Peak will be around double that, low being around half.
  - The tile rendering server is based in the UK (AS786), normal cache byte hit ratio is around 80%.
  - The servers are constantly monitored, traffic is automatically redistributed if a greater than 5min outage occurs.
  - Expected growth rate is around 3% per month.

* Quoted from OSM systemadm team, provided by Daniel Kastl
Background – network bandwidth in Sep/2013

- Traffic Estimates per country averaged over 24 hours during week:
  - Bangladesh 3.71 KBytes/s outbound
  - Cambodia 4.2 KBytes/s outbound
  - China 169.63 KBytes/s outbound
  - Hong Kong 32.14 KBytes/s outbound
  - India 322.86 KBytes/s outbound
  - Indonesia 72.06 KBytes/s outbound
  - Japan 208.28 KBytes/s outbound
  - Laos 2.31 KBytes/s outbound
  - Malaysia 23.30 KBytes/s outbound
  - Myanmar 3.50 KBytes/s outbound
  - Nepal 7.07 KBytes/s outbound
  - North Korea 0.02 KBytes/s outbound
  - Pakistan 17.01 KBytes/s outbound
  - Philippines 149.40 KBytes/s outbound
  - Singapore 50.94 KBytes/s outbound
  - South Korea 68.06 KBytes/s outbound
  - Taiwan 63.60 KBytes/s outbound
  - Vietnam 42.95 KBytes/s outbound
  - Total: 1241.129 KBytes/s outbound

- Inbound is approximately 10% of outbound.

* Quoted from OSM systemadm team, Grant Slater
OSM Tile CDN

• Tile CDN (Content Delivery Network)
• Cache isn't a file mirror, it is a proxy + caching setup

  – **Not a files mirror only.** Therefore the mechanism is more complicated than an open source/free software mirror site.

  – **Two months** in communication with OSM sysadmin team (Grant Slater).

  – **We spent 4 more months** to find the solution to follow the administration policy at NCHC, prepare and setup the machine.
National Center for High-Performance Computing

- **1988**: Started Planning
- **1991**: Officially Founded
- **1993**: Hsinchu Headquarters Opened
- **1993**: Incorporated
- **2003**: Taichung Office Opened
- **2005**: Tainan Office Opened
- **2008**: Became Incorporated
HPC Services

- Open to academic, research, and Industrial users
- Supporting 700+ research projects per year
  - ALPS system – most recent supercomputer built in 2011
  - $R_{\text{max}}$ 177 TFLOPS sustained, 442.00 MFLOPS/W
  - 25,600 Cores  •  73,728 GB Memory  •  1,074 TB Disk
  - Jun. 2011: Top500 Ranking: No. 42 / Green500 Ranking: No. 25
Research and Education Network

- Providing research network, education network (TANet), and optical lightpath services with 20 Gbps backbone
- Working toward 100Gbps backbone from 2013
- Peering with 35 IPv4 and 24 IPv6 networks worldwide with 5Gbps connection
- Network availability rate up to 99.991%
- Dynamic circuit provisioning enabled
Storage Services

Storage Capacity

- Three-site, 3-tier backup
- Total 5.4 PB Capacity
- Supports 30+ projects from academia and research institutes
- Deploys disk and tape facilities in Hsinchu, Taichung, and Tainan; Interconnected via TWAREN and Storage Area Network (SAN)
Some mirrors@NCHC

• Sourceforge mirror site from 2005
• Major GNU/Linux distribution and OpenSource/Free Software mirrors: http://free.nchc.org.tw
  – CentOS, Debian, Fedora, Gentoo, Linux Mint, Ubuntu, OpenSuSE, VLC, Firefox...

Source: http://sourceforge.net/p/forge/documentation/Mirrors/
About us

- **Free Software Lab, NCHC, Taiwan**
- Developers of the free software DRBL, Clonezilla Partclone, DRBL-Winroll, and more...
- Steven is also the maintainer of GParted live CD
How?

• Procedure to setup a cache server
  – 1) Install a server running Ubuntu 12.04 (AMD64)
  – 2) Create an account for OSM systemadm
  – 3) OSM systemadm logins in and setup management setup (Chef) which installs +configures everything needed.
  – 4) OSM systemadm moves a little traffic for first week and feedback to cache server owner.

• Cache server owner will have login access to machine at all times. Any shutdowns or disconnects will automatically be detected by OSM system and the server will automatically be removed from the pool.

* Quoted from OSM systemadm team, Grant Slater
Basic requirements

  – Basic regional tile delivery server requirements:
    • 16 GB RAM (at least; better 32 GB);
    • Fast network connection with high usage or unlimited traffic; (Traffic is directed by GeoDNS)
    • Full root/sudo access (Remote Management beneficial eg: HP Integrated Lights-Out);
    • Ubuntu 14.04 LTS 64-bit (AMD64);
    • Storage of at least 146GB excluding OS. (10kRPM disk or better preferred)
Tile server@NCHC
Longma 龍馬

- **Hardware**
  - CPU: Intel Xeon CPU E5-2620 v2 @ 2.10GHz, 6 cores
  - RAM: 32 GB
  - Hard drives: 160 GB SATA disk and 400 GB SATA disk
  - Two Gigabits Ethernet cards
- **OS**
  - Ubuntu 12.04 LTS (2014/02-2014/12)
  - Ubuntu 14.04 LTS (2014/12-Now)
- **Proxy server:** Squid 2.7.STABLE9
  - OSM systemadm planned to upgrade to varnish 3.x

Source: [http://design.ubuntu.com](http://design.ubuntu.com); [http://www.squid-cache.org](http://www.squid-cache.org)
1st cache server in Asia

- On Feb/19/2014, the cache server was ready, and some test traffic was redirected.
- It was until Jan/02/2015 OSM.org announced it on the blog:
- https://blog.openstreetmap.org/2015/01/02/four-new-tile-servers/

Four New Tile Servers

Have you noticed faster tiles lately? Browsing the map on openstreetmap.org should now be even more responsive. Three new servers, started providing tiles over the last 2 weeks, joining a server which started earlier in the year.

- Tile server saphira, located in London UK kindly hosted by Jump Networks.
- Tile server viserion, located in Pula Croatia, kindly hosted by CARNet.
- Tile server stormfly-02, Located in Corvallis USA, kindly hosted by OSUOSL.
- Tile server longma, Located in Hsinchu Taiwan, kindly hosted by NCHC.
System Monitoring

- Munin
Contact with OSM Systemadm team

- Email
  - operations@osmfoundation.org
- Jabber
- IRC:
  - #osm-dev on oftc network
  - Also available via http://irc.OpenStreetMap.org

Having problems?

1. Try to fix the issue by ourselves first
2. **Reboot the tile server**
3. Ask OSM systemadm to solve the issue remotely
Before

Source: http://dns.openstreetmap.org/tile.openstreetmap.org.html on 2014/Jan
After

Source: http://dns.openstreetmap.org/tile.openstreetmap.org.html on 2015/May
Longma serves 22 countries/regions

Taiwan, Japan, South Korea, North Korea, Mongolia, Bhudan, Bengal, Myanmar, Laos, Sri Lanka, Vietnam, Thailand, Macao, Hong Kong, Cambodia, Singapore, Cocos (Keeling) islands, Malaysia, Christmas island, Brunei, Indonesia, Philippines

Source: http://dns.openstreetmap.org/tile.openstreetmap.org.html on 2015/May
Stats: System loading

Load average - from Sun May 4 00:33:14 2014 to Mon Jun 8 00:33:14 2015

Load

Cur: 0.31
Min: 0.01
Avg: 0.24
Max: 2.06

Last update: Mon Jun 8 00:31:09 2015

Munin 2.0.19-3
Stats: CPU usage

6 cores + hyper threading, so there are 12 CPUs in Longma
Stats: Memory usage

Memory usage - from Sun May 4 00:33:14 2014 to Mon Jun 8 00:33:14 2015

- Min: 351.43M
- Avg: 19.49G
- Max: 23.71G
- Last update: Mon Jun 8 00:30:23 2015

Bytes

- Cur: 23.44G
- 54.14M
- 25.35M
- 407.17M
- 7.10G
- 17.75M
- 288.91M
- 107.88M
- 334.18M
- 28.79G
- 4.07G
- 20.46G
- 5.91G
- 4.36G
- 0.66
- 107.99M
- 5.15G
- 3.70M
- 215.82M
- 0.00
- 326.20M
- 377.25M
- 8.79M
- 447.85M
- 4.03G
- 14.01G
- 457.97M
- 11.10G
- 20.79M
- 284.93M
- 32.66M
- 330.67M
- 19.55G
- 399.88M
- 22.01G
- 7.70G
- 30.13G
Stats: Network traffic

Average is about 8.7 Mbps (out) / 2.8 Mbps (in)
~0.17% (out)/0.06% (in) of NCHC's total bandwidth
Throughput: 2.8 TB/month (out) / 0.9 TB/month (in)
*There was a firewall configuration issue at NCHC in early Jan 2015
Stats: Squid cache

Squid cache status - from Sun May 4 00:28:14 2014 to Mon Jun 8 00:28:14 2015

cache size

cache used

Munin 2.0.19-3

Last update: Mon Jun 8 00:25:36 2015
Stats: Squid client requests

Squid client requests - from Sun May 4 00:28:14 2014 to Mon Jun 8 00:28:14 2015

<table>
<thead>
<tr>
<th>Month</th>
<th>Hits</th>
<th>Errors</th>
<th>Misses</th>
<th>Total</th>
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Avg: 67.75 0.00 58.40 121.15
Max: 335.57 0.00 292.53 426.93

Last update: Mon Jun 8 00:26:09 2015
Stats: Squid traffic

Squid traffic status - from Sun May 4 00:28:14 2014 to Mon Jun 8 00:28:14 2015

- Received: 280.25k
- Sent: 9.82M
- From cache: 7.53M

Min: 0.00
Max: 28.86M
Avg: 727.68k

Last update: Mon Jun 8 00:30:47 2015
Stats: System uptime

Uptime - from Sun May 4 00:33:14 2014 to Mon Jun 8 00:33:14 2015

Uptime in days

- May: Cur: 51.33
- Jun: Cur: 100.00
- Jul: Cur: 110.00
- Aug: Cur: 150.00
- Sep: Cur: 170.00
- Oct: Cur: 160.00
- Nov: Cur: 140.00
- Dec: Cur: 120.00
- Jan: Cur: 110.00
- Feb: Cur: 100.00
- Mar: Cur: 90.00
- Apr: Cur: 80.00
- May: Cur: 70.00

Min: 0.00
Avg: 58.40
Max: 174.86

Last update: Mon Jun 8 00:30:42 2015
But we are still alone in Asia...

- Asian users need more cache servers
- Each other as a redundant server
Conclusions

• OpenStreetMap systemadm team has a very good mechanism to setup and monitor the tile server. Therefore the efforts we spend on the system maintenance is minimum.

• More cache servers are needed in Asia. The redundant mechanism has to be established.
Acknowledgement

• This work is sponsored by MOST (Ministry of Science and Technology), Taiwan
Reference

- OpenStreetMap: http://www.openstreetmap.org
- OpenStreetMap Taiwan: http://openstreetmap.tw
- Academia Sinica: http://www.sinica.edu.tw
- NCHC: http://www.nchc.org.tw
- OSM Munin: http://openstreetmap.tw
- DRBL: http://drbl.org
- Clonezilla: http://clonezilla.org
- Gparted: http://gparted.org
Questions ?