Measuring IPv6 Traffic in BitTorrent Networks

draft-defeche-ipv6-traffic-in-p2p-networks-00.txt

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Goal of the Work

- M.S. in Computer Sciences thesis by Martin Defêche
- Since Summer 2008, uTorrent supports IPv6
  - Is IPv6 used in BitTorrent one year later?
  - What kind of connectivity?
  - What is the latency?
  - What is the MTU?

Quick Introduction to BitTorrent

- Open-Source peer-to-peer
- Peer Wire Protocol (PWP)
  - Signaling and data exchange for file transfers
- Tracker HTTP/S Protocol (THP)
  - Central repository of which peer has which part of which file
- Peer Exchange (PEX)
  - Sending list of peers directly to other peer
- Distributed Hash Table (DHT)
  - Based on Kamdelia
  - Also to discover other peers
- Local Service Discovery (LSD)
  - Local multicast of torrent interest

BitTorrent and IPv6

- IPv6 clients
  - uTorrent
  - LibTorrent
- BitTorrent with IPv6 implementation
  - PWP
  - THP
  - PEX
  - LSD
  - Lacking DHT

Methodology

- Dummy BitTorrent client
  1. Based on LibTorrent library
  2. Connecting to ThePirateBay to get some torrents
  3. Connect to the swarm in IPv4 & IPv6
  4. Never download anything
  5. Collect information about addresses & network
- Background testing (tracepath6 & ping6) of
  - TTL vs Hop Limit (hop count)
  - MTU in IPv4 & IPv6
  - Latency IPv4 & IPv6
  - Esp. when IPv6 is transition technique

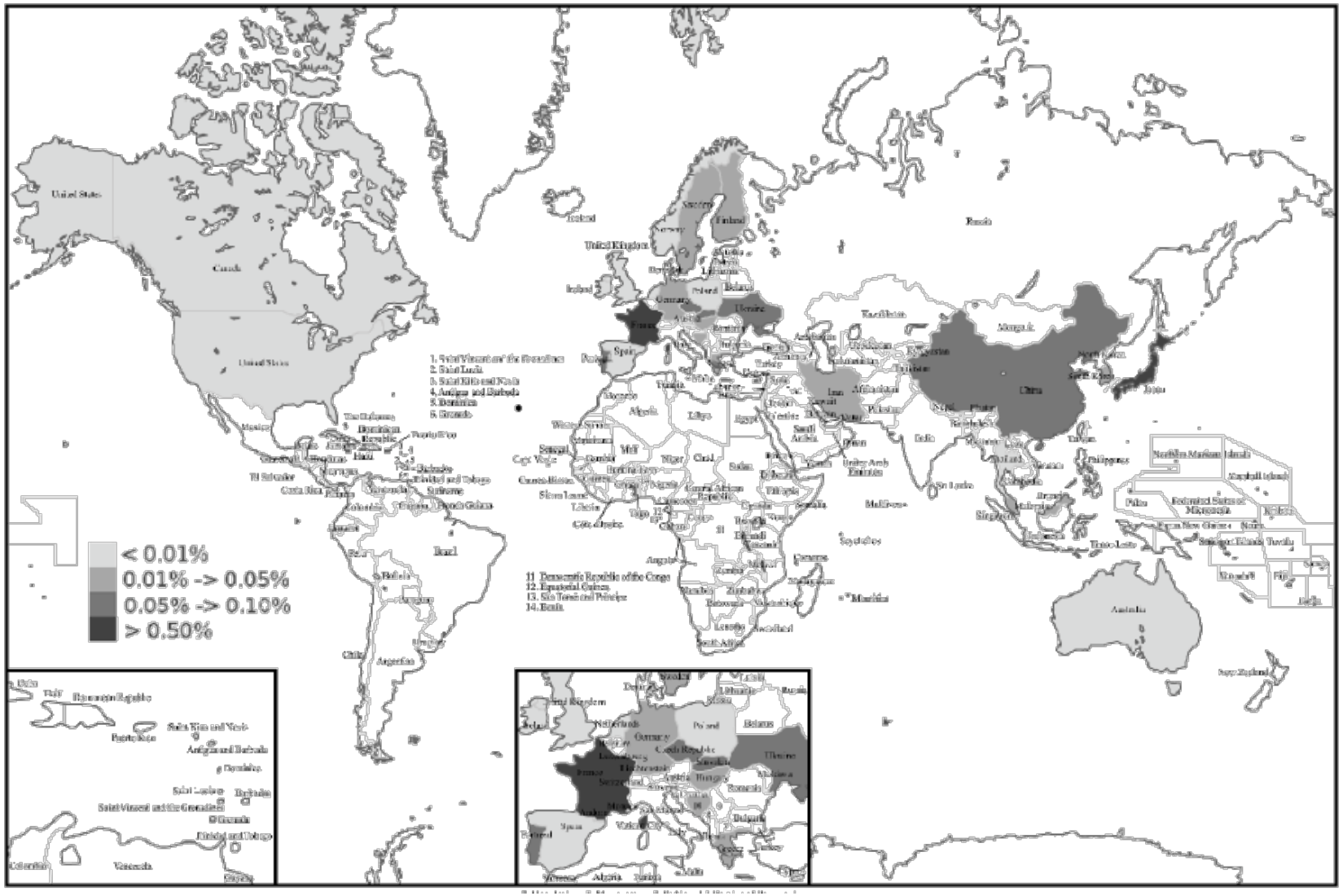
When did it run?

- May to August at University of Liège by Martin
  - About 5 millions peers discovered
  - Only 1.5 millions valid (PEX contains a lot of garbage)
  - 142,904 IPv6 peers
- October & November OVH/France by Eric
  - About 150,000 peers

Which Kind of IPv6 Address?

	Native	*Teredo*	*6to4*	*ISATAP*	*Tunnel Broker*
Number	1,216	99,634	41,425	24	102
Percentage	0.85%	69.72%	28.99%	0.02%	0.08%
	6bone	*Site-Local*	*IPv4-compatible*	*IPv4-mapped*	*Bogon*
Number	436	24	1	94	74
Percentage	0.31%	0.02%	0.00%	0.07%	0.05%

Native IPv6 Traffic



Transition Mechanisms

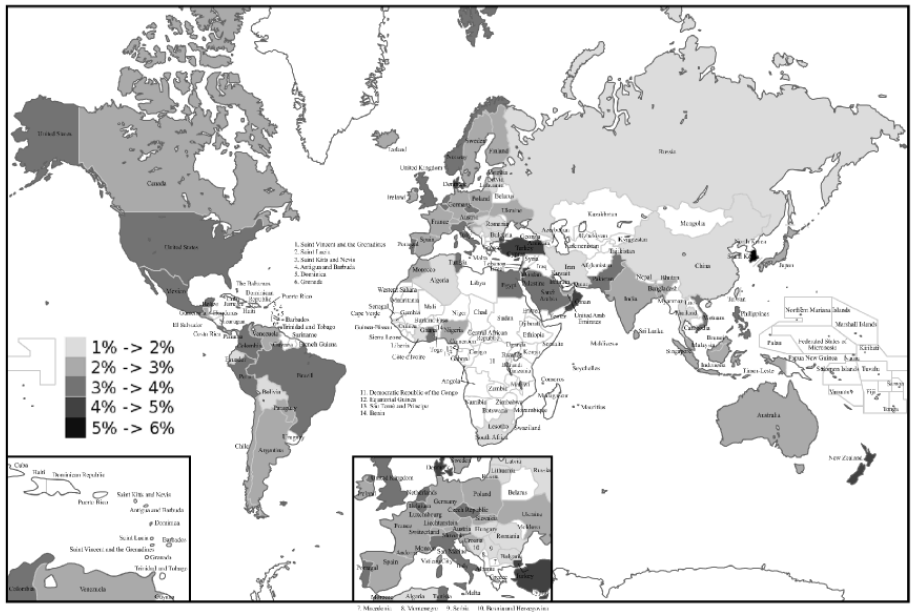


FIG. 19 – Percentage of Teredo traffic

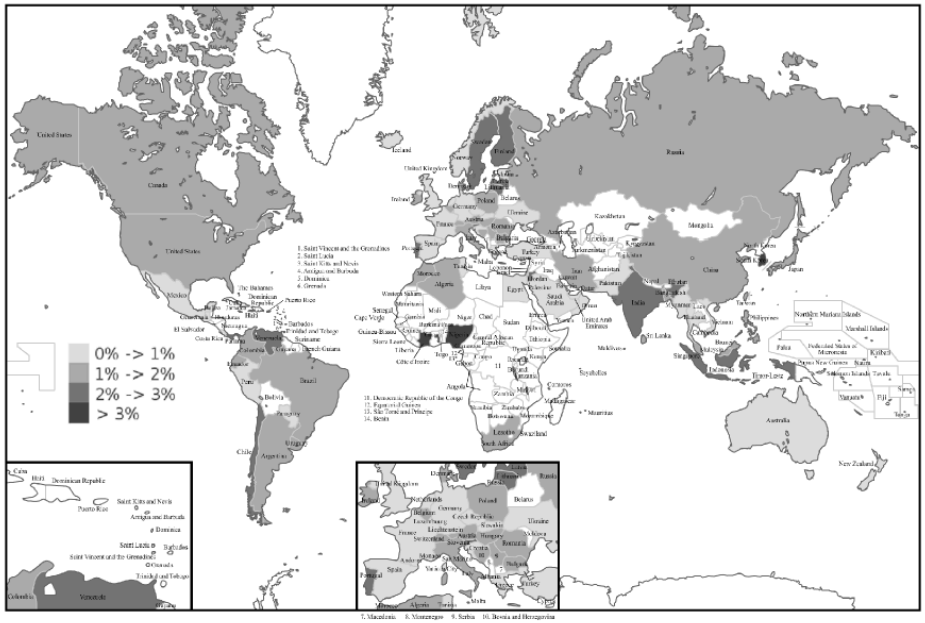
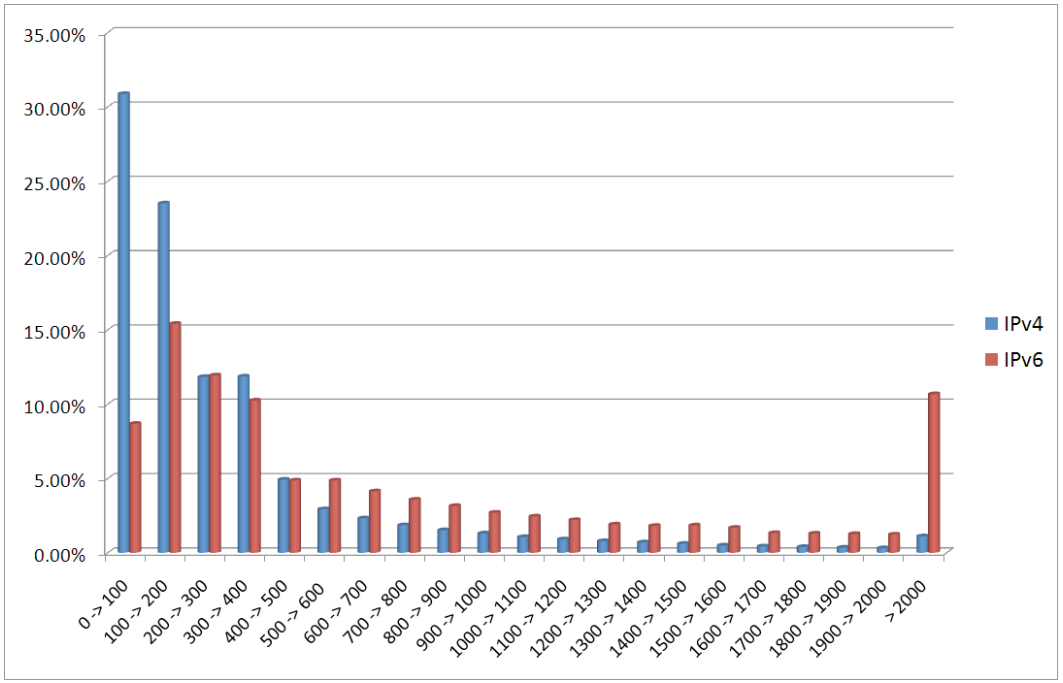


FIG. 20 – Percentage of 6to4 traffic

RTT: IPv4 vs. IPv6



Native	*native IPv6*	*IPv6*	*IPv4*
Average	493.06803	812.77849	324.77849
Standard Deviation	646.27645	890.7601	403.62587
Standard Deviation Average	15.52616	5.39826	3.14049

MTU

MTU	IPv4	IPv6	native IPv6	IPv4 embedded
Incomplete	1497.5720	1292.0226	1473.1690	1497.1316
Complete	1497.2148	1282.6289	1464.0178	1497.6640
Global	1497.5451	1288.8743	1467.9866	1497.6784

- IPv4 embedded = value for the IPv4 address embedded in the IPv6 address (Teredo, 6to4, …)