



Dopo un periodo
di pausa,
gli inventori italiani
hanno di nuovo
idee rivoluzionarie.

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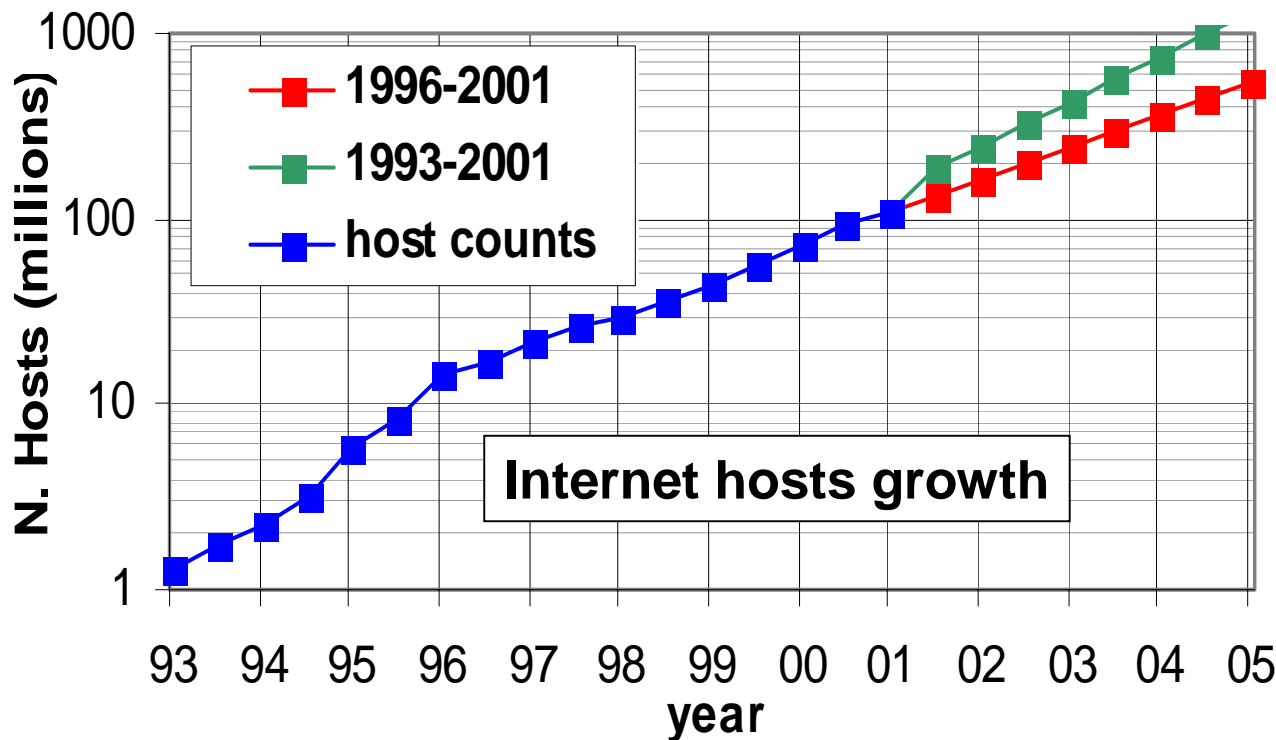
March 2002



Developing IPv6 ISPs

Why IPv6?

- The real reason for IPv6 is that the IPv4 addresses are rapidly running out
 - assigned IPv4 addresses: **~110 millions** (Jan 01)



Address space
depletion
in progress

Source: Internet Software Consortium
(<http://www.isc.org>)

Why IPv6? (cont.)

- **IPv6 provides new features**
 - virtually unlimited addressing space
 - native support for mobility, security, multicast, etc.
 - plug & play
- **The cost of a “non-transition”**
 - the use of private addresses and NATs breaks end-to-end transparency (failure of some applications & loss of flexibility)
 - enhancing IPv4 to make it IPv6-like is costly

But...

- **IPv4 and IPv6 do not interoperate**
 - IPv4 applications do not work with IPv6
 - IPv4 nodes cannot communicate with IPv6 nodes
- **The applications have to be modified**
 - a lot of work still has to be done.....
- **It is likely that IPv4 and IPv6 will coexist for a long period of time**
 - how to enable communications among IPv6 islands isolated in the IPv4 world?
 - how to enable communications between the existing IPv4 world and the new IPv6 world?

Managing the transition

- **Several transition mechanisms are already available**
 - Dual stack hosts, routers, Application Level Gateways and NATs to allow IPv4 and IPv6 co-existence
 - Automatic tunnel management tools to carry IPv6 on top of the IPv4 Internet
- **Different combinations of the available tools can be used to cope with a wide range of transition needs**
- **The transition can be an opportunity for all kind of Internet Providers**

ISP motivations

- **Backbone ISPs in the international market:**
 - plan to expand within developing countries where the lack of IP addresses is a big issue
 - want to offer transit services to local and regional ISPs which already started IPv6 experiments and deployment
 - wish to increase their relationships with other peer or upstream providers which decided to start with IPv6 experiments and deployment
 - have interest in participating to the creation of the new Internet since the beginning

ISP motivations (Cont.)

- **Wired ISPs addressing the corporate market:**
 - see a growing number of customers which cannot get all the global addresses they need
 - do not like the growing number of NATs within their own networks, that is making any new service design and offering more and more complex
 - have interest to cooperate in R&D with customers sensible to innovation – looking at actual customers as well as to potential customers

ISP motivations (Cont.)

- **Wired ISPs addressing the residential market:**
 - foresee an impressive growth in the always-on services demand, that is a growing number of global IP addresses
 - envision new service opportunities that they want to explore since the beginning
 - take care of user communities that are computer experts, Internet specialist and innovation oriented

ISP motivations (Cont.)

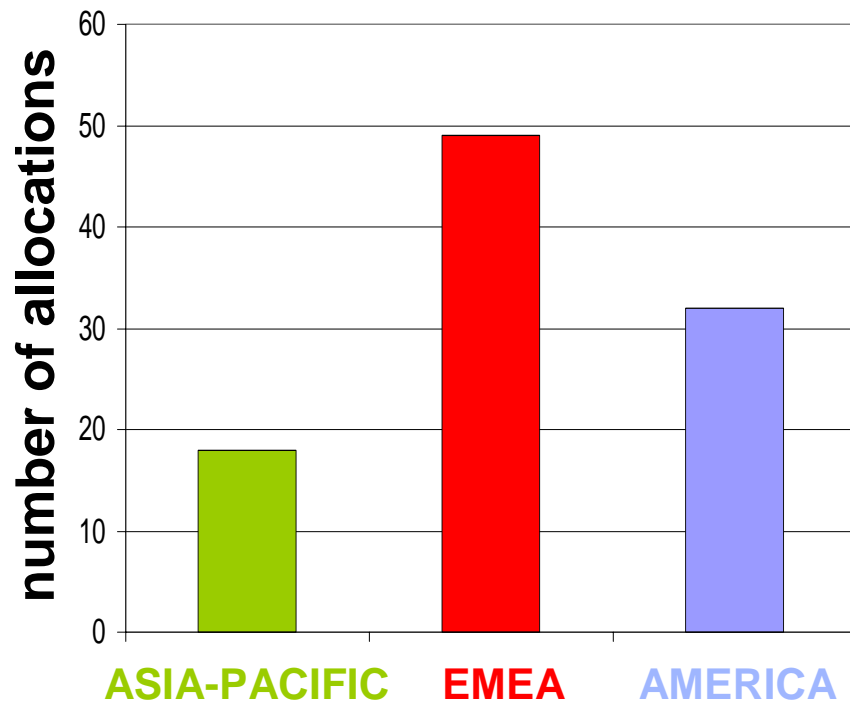
- **Wireless ISPs:**

- care more than any other ISP about the scarcity of global IP addresses
- can support easily and effectively mobile terminated calls, always on applications (alerting, urgent notifications, push services, location-based based services, etc.) and transparent roaming
- have unique opportunities with the 3rd generation and beyond perspectives
- can benefit of optimized Mobile IPv6 features

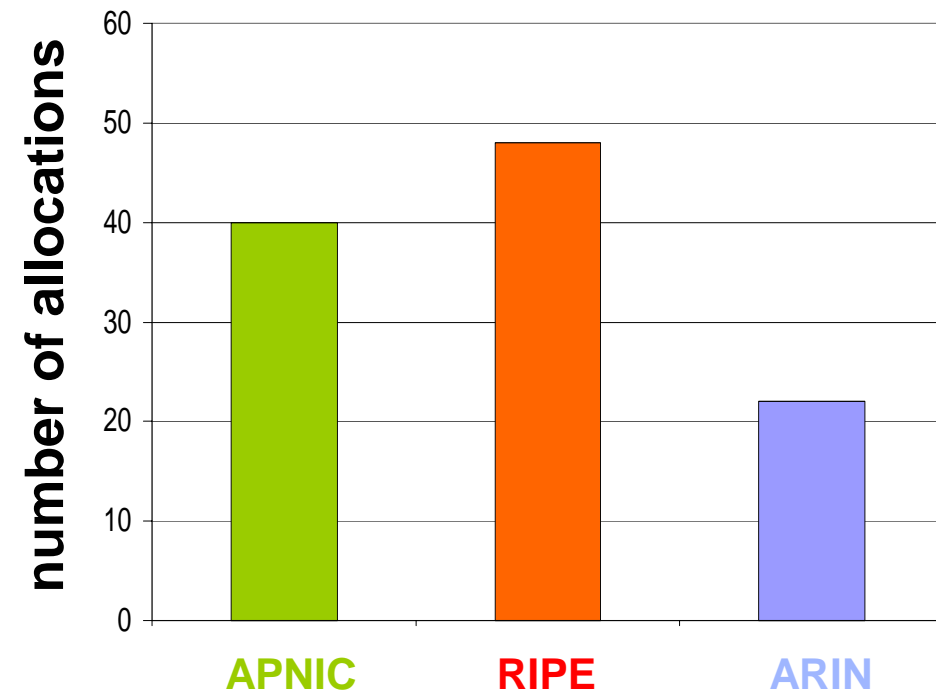
Who cares about IPv6

IPv6 address allocation
updated at 29th October 2001

6Bone pTLAs



official sTLAs

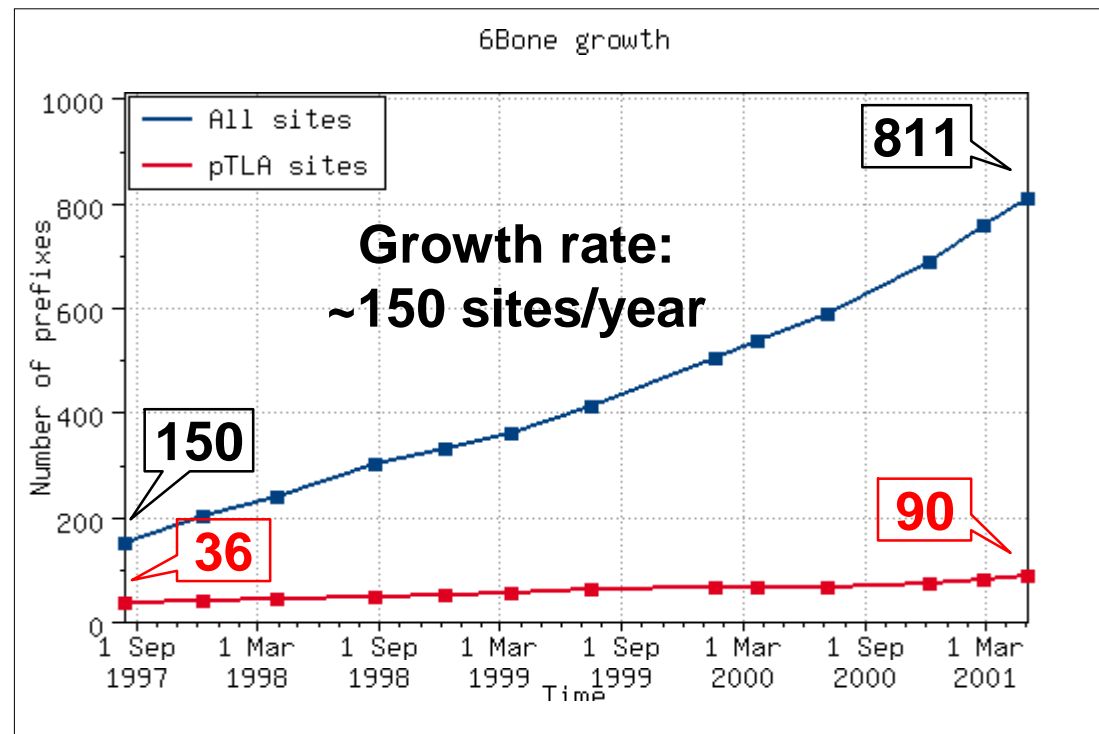
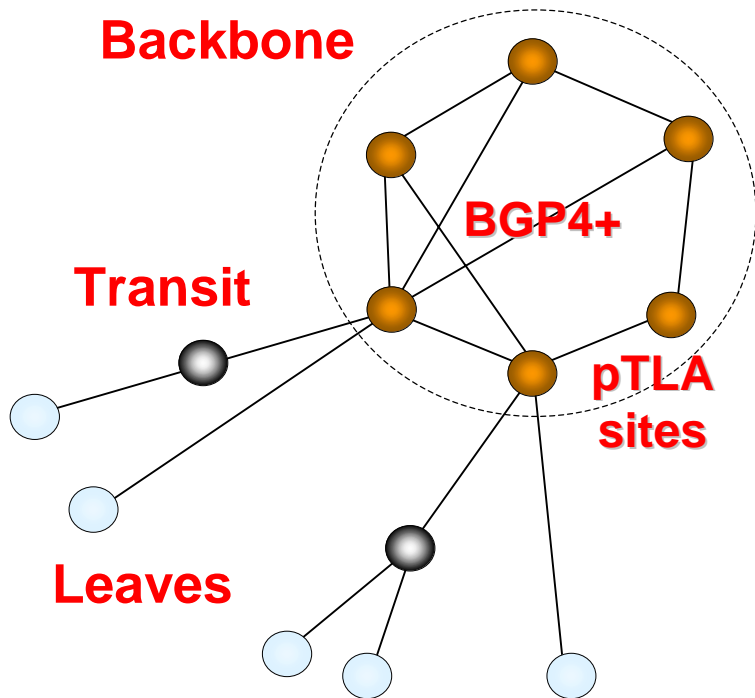


TILAB approach

- **Started with the 6bone experiments since the beginning**
- **Continuing the R&D activities, to build IPv6 native networks (IST project Euro6IX)**
- **Supporting all IPv6 activities within the Telecom Italia Group**
 - IPv6 sTLA management for all the Group
- **Offering IPv6 services to enterprise and residential users**

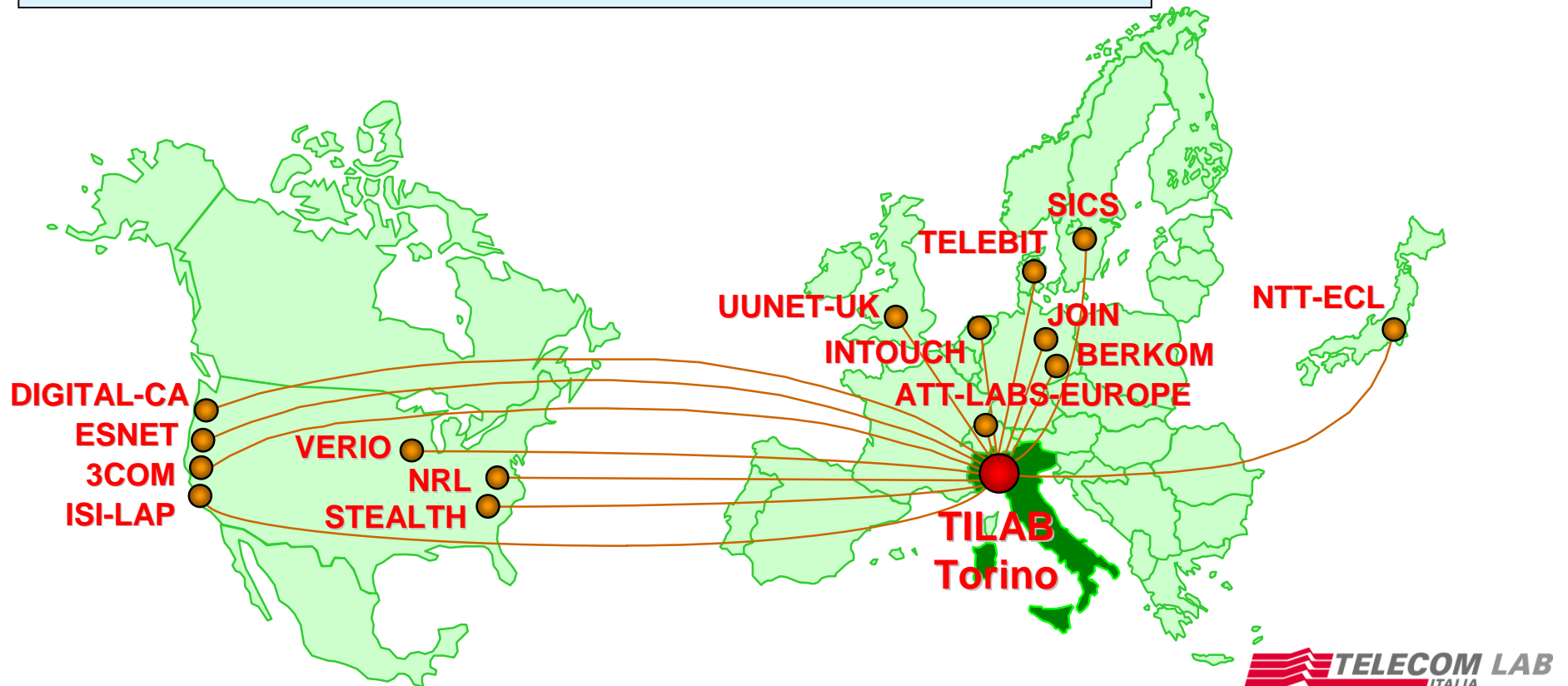
The 6bone network

- **6bone is a worldwide experimental IPv6 network**
 - mainly built on top of the Internet (**tunnelling**)
 - to provide feedback to the IETF and IPv6 product developers based on test bed experience



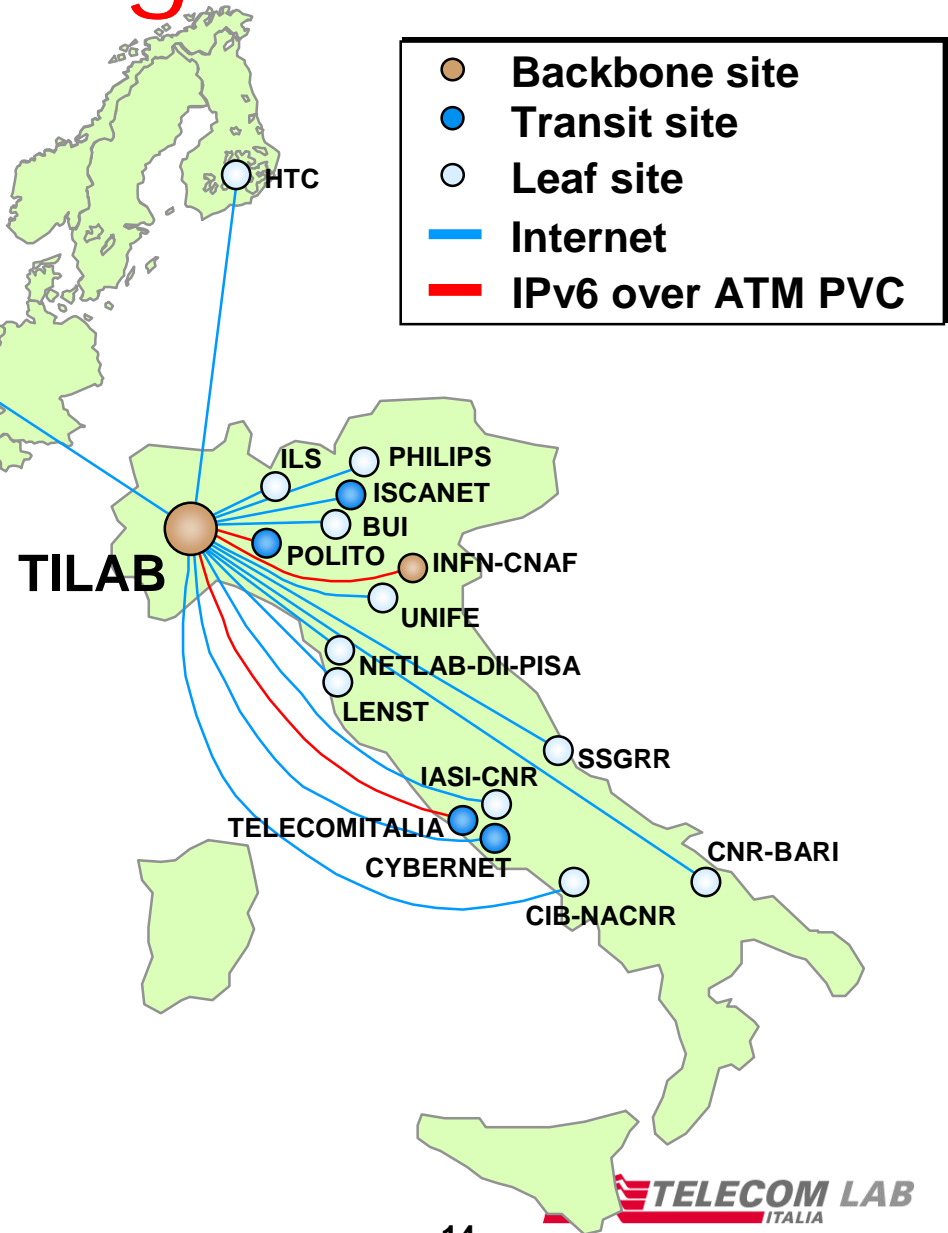
TILAB's 6bone site

- **TILAB is connected to the 6bone as a backbone node since 1997**
 - <http://carmen.cselt.it/ipv6>



6bone access through TILAB

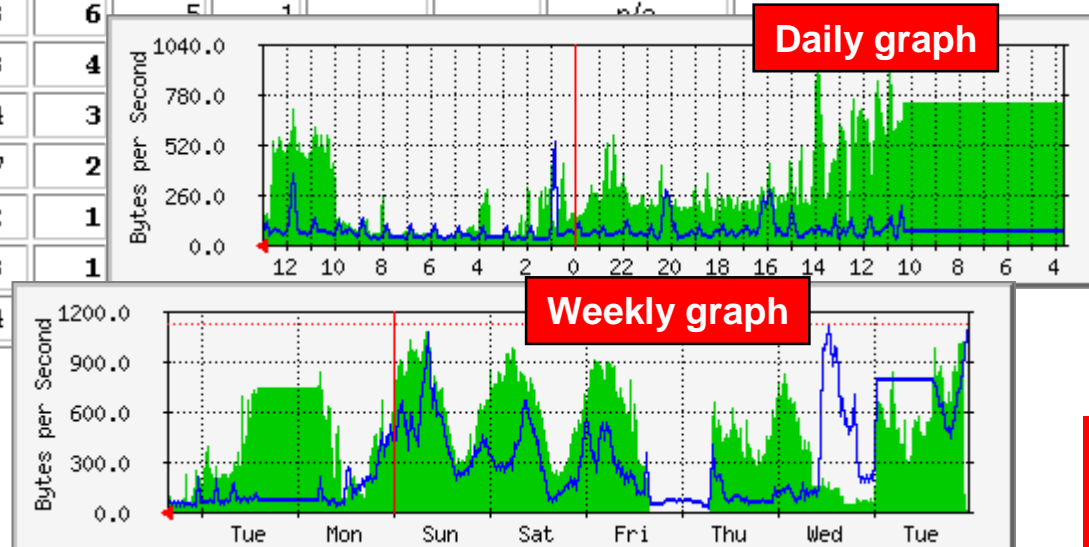
- TILAB provides 6bone access to several sites in Italy and abroad
- Three kinds of connections
 - tunnelling over the Internet
 - native IPv6 over ATM PVC (Politecnico di Torino, Telecom Italia, INFN-CNAF)
- An IPv6 Tunnel Broker service is available for residential users
- Routing
 - static towards the leaf sites
 - dynamic (RIPng) towards the transit nodes (e.g. Politecnico di Torino)
- Addressing
 - TILAB manages its own IPv6 addressing space as an ISP



TILAB IPv6 tools

BGP4+ peering status

Name	local end-point	remote end-point	ASn	received Route Entries					Traffic Stats
				total	pTLA	sTLA	unaggr.	invalid	
UUNET-UK	6bone-gw1	158.43.133.254	1849	61	24	25	12		Click Here
6COM	6bone-gw1	129.213.128.90	561	22	2	11	9		Click Here
VERIO	6bone-gw1	192.220.249.249	2914	18	5	2	11		Click Here
JOIN	6bone-gw1	128.176.191.66	1275	13	8	3	2		Click Here
SICS	6bone-gw2	193.10.66.219	2839	8	6		2		n/a
ATT-LABS-EUROPE	6bone-gw1	195.33.32.1	5623	8	6	2			Click Here
BERKOM	6bone-gw1	141.39.66.3	3320	6	2	2	2		Click Here
ESNET	6bone-gw2	198.128.2.27	293	6	5	1			n/a
DIGITAL-CA	6bone-gw2	204.123.2.236	33	4					
INTOUCH	6bone-gw1	212.19.192.218	8954	3					
NTT-ECL	6bone-gw2	192.68.245.69	4697	2					
STEALTH	6bone-gw2	206.252.222.79	8002	1					
JENS	6bone-gw1	165.76.8.67	2713	1					
ISI-LAP	6bone-gw2	198.32.146.11	4554						



TILAB IPv6 tools (cont.)

ASpath-tree,
BGP4+ routing monitor

The screenshot displays the ASpath-tree tool interface, which is a BGP4+ routing monitor. It consists of three main windows:

- The whole BGP4+ table - Netscape:** This window shows a hierarchical tree of BGP4+ routes. The root is **TILAB**, which branches into **DIGITAL CA**, **ESNET**, **SICS**, and **UUNET UK**. **DIGITAL CA** further branches into **DISN LES**, **CHTTL TW**, and **MIBH**. **ESNET** branches into **6TAP IO!**. **SICS** branches into **UNINETT**, **AS1257**, **SMS**, **ITESM**, **STEALTH**, and **AS8213**. **UUNET UK** branches into **ABILENE** (highlighted with a red circle), **APAN JP**, **KOREN**, **AS1741**, and **BME FSZ**. A red dashed arrow points from the **ABILENE** node to the right-hand window.
- Routing entry detail: Sun AUG 19 2001, h.22:50 - Netscape:** This window shows the details for the selected route. It displays the **AS Path:** **DIGITAL-CA (33) - DISN-LES (22) - ABILENE (11537)** and the **Routing entry(es):** **3FFE:3700::/24 (ABILENE)**. It also shows the **BGP status** as **valid**.
- Last 24h ABILENE history: Sun AUG 19 2001, h.22:50 - Netscape:** This window shows the history of the selected route. It displays the **Current status:** **route present** and the **Current AS Path:** **DIGITAL-CA (33) - DISN-LES (22) - ABILENE (11537)**. It also shows the **Last 24 hour report** with the following statistics:
 - Unavailability** (n_path_unavailable_detections/n_samples): **0.3% (1/289)**
 - Unstability** (n_path_changes/n_samples): **0.7% (2/289)**The **Route distribution:** table shows the following data:

Frequency	AS path
90.3% (261 / 289)	DIGITAL-CA - DISN-LES - ABILENE
9.3% (27 / 289)	ESNET - 6TAP - ABILENE
0.3% (1 / 289)	Unavailable

The bottom of the interface shows the status bar with the text **Document: Done**.

TILAB IPv6 tools (cont.)






- “ping-view”, to collect and display IPv6 reachability statistics
 - Geographical aggregated views and historical views





Backbone sites reachability

Last update: 22/06/2000 h. 12:00:01

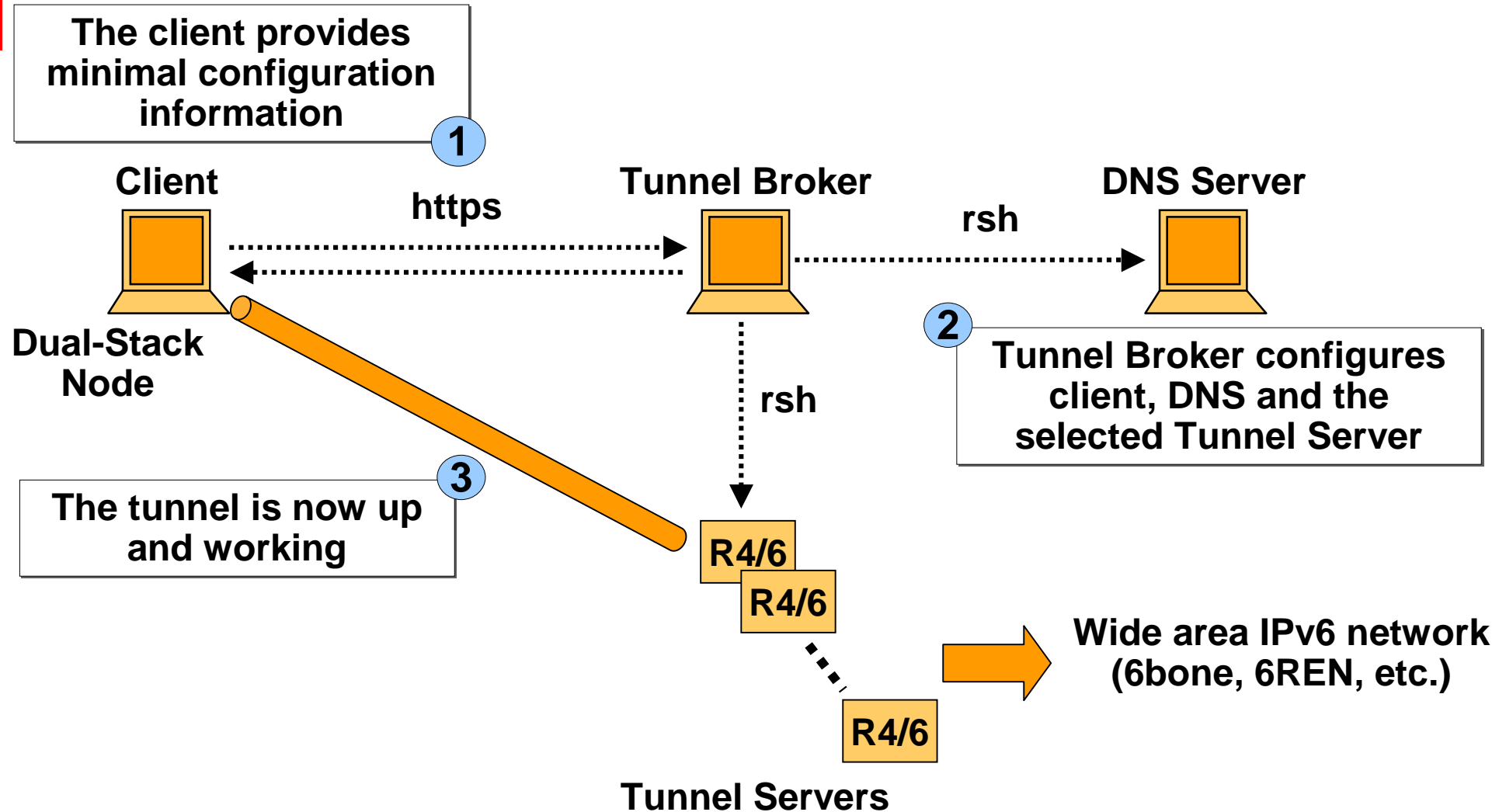
[reachability table | [FAQ](#) | [back](#)]

Aggregate quality parameters

Group	RTT _{70%} - last 7 days (ms)	Trend	Graphs
AMERICA-NORTH	553	↓	
AMERICA-SOUTH	2544	↑	
ASIA-PACIFIC	1007	=	
EUROPE-EAST			
EUROPE-WEST			

	Node	Loss	RTT _{avg} (ms)	RTT _{70%} 7 days (ms)	Trend	Graphs
	6TAP , Joint effort between ESnet and CANARIE (US) Ping address: 3FFE:3900:1::1	0%	725	726	↓	
	AMS-IX , Amsterdam Internet Exchange (NL) Ping address: routeserver.ipv6.ams-ix.net	5%	236	402	↓	
	APAN-KR , Asia Pacific Advanced Network (Korea) (KR) Ping address: daemon.kaist.kr.apan.net	0%	1122	1105	↓	

IPv6 Tunnel Broker

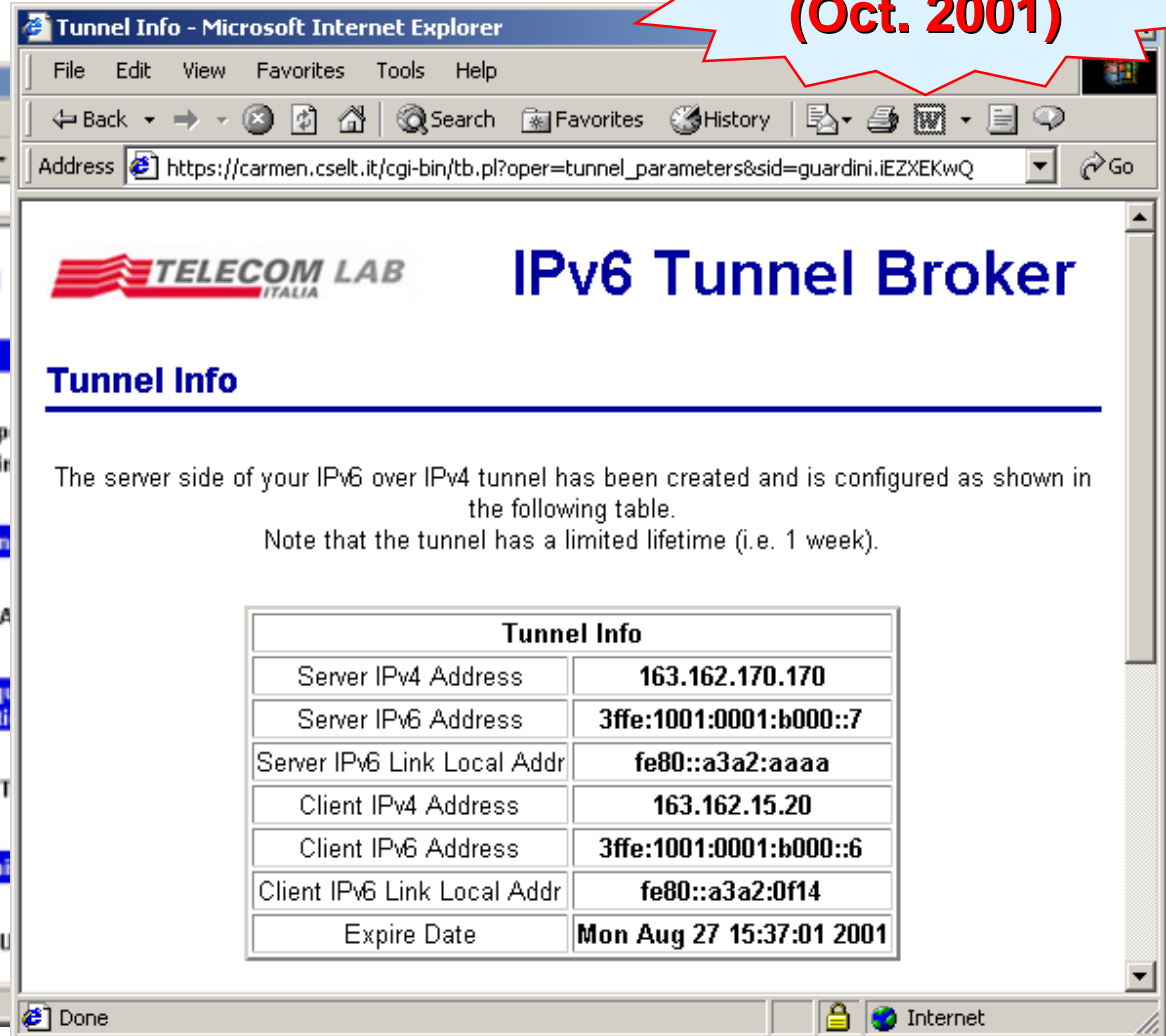


Service model developed within IETF by TILAB

IPv6 Tunnel Broker (Cont.)

First implementation developed
By TILAB (Feb. 1999)

> 6700 users
(Oct. 2001)



Service available at: <https://carmen.cselt.it/ipv6tb>

Moving to commercial offerings

- **Early to forget IPv4...**
- **... but several enterprises, ISPs and even “smart” residential users are beginning to ask about IPv6**
- **Space for actions to**
 - stimulate a growing IPv6 usage and demand
 - contact the first potential “IPv6 customers”
- **TILAB launched the ngnet.it initiative to offer:**
 - free trials of basic IPv6 services
 - consultancy, support and tools for organizations approaching IPv6 deployment

The ngnet.it initiative



Based on 2001:06b8::/35

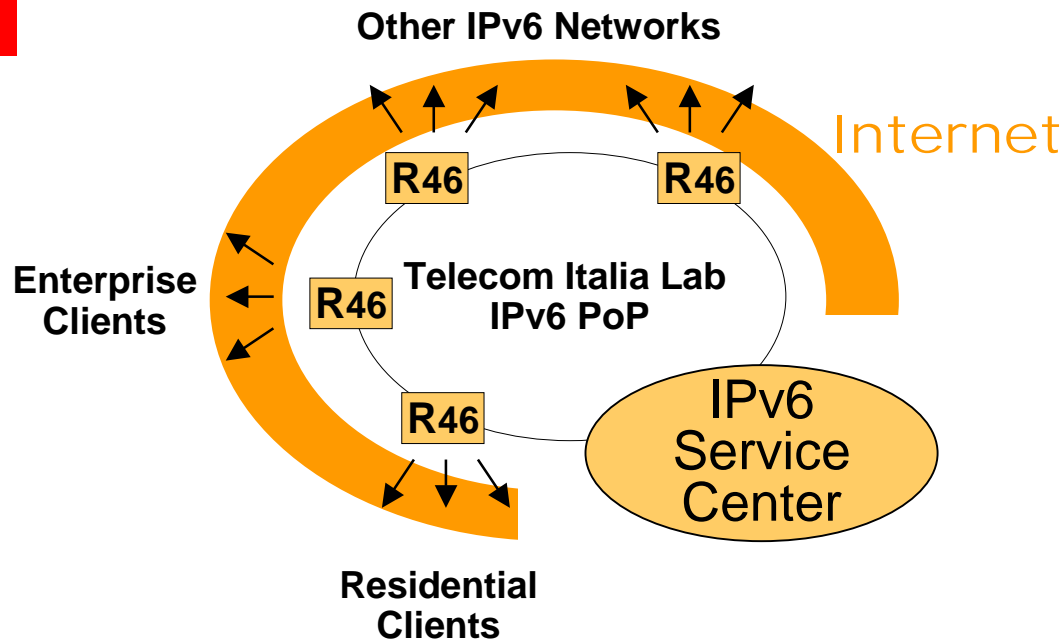
to residential clients:

Networking services:

- IPv6 Tunnel Broker
- IPv6 DNS

Application services

- WWW, ftp
- Chat (connected to IRCnet)
- News
- E-mail, games on-line (coming soon)

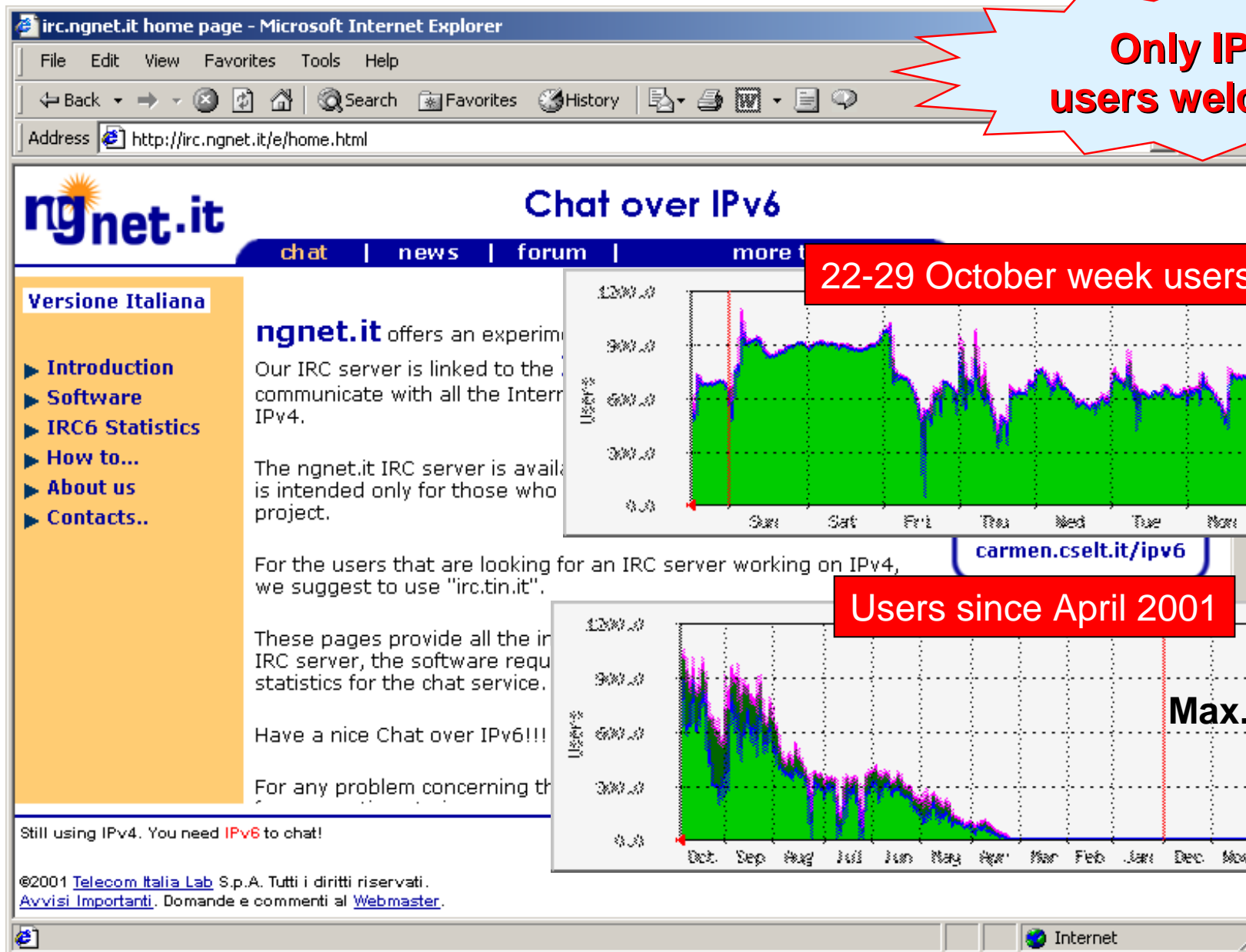


to enterprise clients:

- IPv6 Address space assignment and reverse DNS delegation
- Managed IPv6 connectivity
- Consultancy on IPv6 address plan, transition strategy and network development
- Cooperation in IPv6 R&D projects
- Network and service monitoring tools

ngnet.it: IPv6 chat service

**Only IPv6
users welcome!**



22-29 October week users

Users since April 2001

Max. Users 1094

ELECOM LAB
ITALIA

Market demand for IPv6

- **More than 40 companies have applied with TILAB for IPv6 services since the launch of the ngnet.it web site**
- **Mainly Italian enterprises and ISPs**
 - willing to make available on IPv6 their commercial IPv4 services
 - willing to envisage the maturity of the available IPv6 technology for the deployment within their organization
- **A few public organizations**
 - needing support to experiment IPv6 in national and international R&D projects

For further information....

- **IETF ngtrans working group**
 - <http://www.ietf.org/html.charters/ngtrans-charter.html>
- **6bone**
 - <http://www.6bone.net>
- **IPv6 Forum**
 - <http://www.ipv6forum.com>
- **Telecom Italia Lab Official IPv6 Site**
 - <http://carmen.cselt.it/ipv6> (IPv4)
 - <http://carmen.ipv6.cselt.it/ipv6> (IPv4 & IPv6)
- **ngnet.it**
 - <http://www.ngnet.it>