

# P e e r i n g

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28.3.2008

## Definitionen

- **Peering** – Settlement Free Interconnect – SFI Bill-And-Keep – no money changes hands between the peers
- **Paid Peering** – same routing arrangements as SFI peering, but one provider pays the other for exchanging traffic
- **Transit** – the traffic originating provider pays the transit provider to establish connectivity with nodes outside its network

# Peering and Transit methods

- Circuit based:
  - Two ISPs create a physical connection between their networks, connection cost is shared (peering).
- Exchange based:
  - Both ISPs connect to a switch at the same Internet Exchange Point (IXP). An IXP is a physical infrastructure where several ISPs interconnect with each other – operating costs are shared between the members.

## Joining an IXP

1. **ASN** (Autonomous System Number) - this number is used in both the exchange of exterior routing information (between neighboring ASes), and as an identifier of the AS itself.
2. **BGP-4** (Border Gateway Protocol Version 4) Peering between Members' routers across the IXP will be via BGP-4.
3. The willingness to sign a **connection agreement**. - Each IXP has its own terms and conditions which a prospective customer must be willing to adhere to.

# Vorraussetzungen bei VIX

- **Internationale Anschlussfähigkeit:** Ein VIX Teilnehmer muss ein ISP mit seinem eigenen internationalen Internet Anschluss sein. Diese Anschlussfähigkeit darf nicht lediglich von einem anderen VIX Teilnehmer bereitgestellt werden.
- **"Autonomous System Number":** Ein VIX Teilnehmer muss seine eigene "Autonomous System Number" (AS) besitzen.
- **Internet Anschluss:** Ein VIX Teilnehmer muss seinen Kunden einen Internet Anschluss bereitstellen. Generell qualifiziert eine reine Inhalte Bereitstellung nicht zu einer VIX Teilnahme.
- **Internet Registry:** Ein VIX Teilnehmer hat seine eigene Internet Registry zu besitzen. (z.B. RIPE NCC).



# Tier Hierarchy



A **Tier 1** network is an IP network (typically but not necessarily an Internet Service Provider) which connects to the entire Internet solely via Settlement Free Interconnection, commonly known as peering. Another name for a Tier 1 network is "transit-free", because it does not receive a full transit table from any other network.

- **Tier 1** - A network that peers with every other network to reach the Internet.
- **Tier 2** - A network that peers with some networks, but still purchases IP transit to reach at least some portion of the Internet.
- **Tier 3** - A network that solely purchases transit from other networks to reach the Internet.

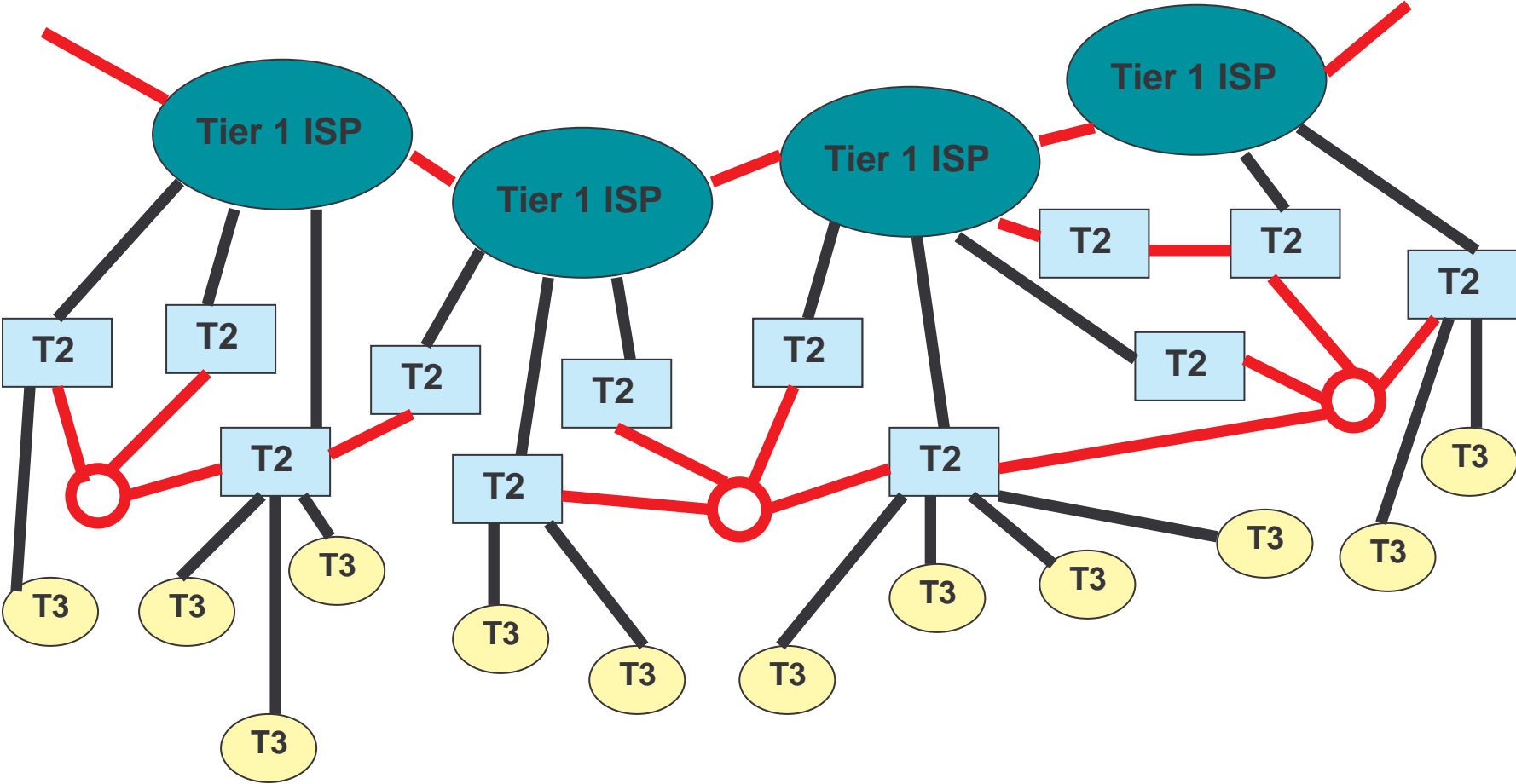
# Tier 1 ISPs

The following nine networks are the only **Tier 1 ISPs**:

Name	AS Number	September, 2007 degree <sup>[1][2]</sup>	Peering policy
AOL Transit Data Network (ATDN)	1668	74	ATDN Peering policy <a href="#">↗</a>
AT&T	7018	1382	
Global Crossing (GBLX)	3549	499	
Level 3	3356	753	
Verizon Business (formerly UUNET)	701	1452	Verizon UUNET Peering policy 701, 702, 703 <a href="#">↗</a>
NTT Communications	2914	254	
Qwest	209	828	North America <a href="#">↗</a> ; International <a href="#">↗</a>
SAVVIS (AS3561 was originally C&W Worldwide network ; merged in 2004 after assets were bought)	3561	295	SAVVIS Peering Policy <a href="#">↗</a>
Sprint	1239	880	



# Peering und Transit



# Peering Prinzipien

- Universelle Erreichbarkeit – Marktdruck
- transit – peering – paid peering Entscheidung
- Es können nicht alle ISPs miteinander peeren (große Anzahl – 10.000e ISPs)
- Marktgetrieben – nicht reguliert
- Etabliertes und funktionierendes System unter ISPs
- win-win situation – game theory

# Peering Probleme

- Asymmetric traffic
- Hot potato routing
- Depeering
- Arbitrage bei teilweiser Einführung
- Auswirkung auf Investitionen
- Change Process

# Peering Vorteile



## Für Sprachtelefonie (nach RTR)

- Marktmacht: Beseitigt Wettbewerbsprobleme, die mit dem Preis in Zusammenhang stehen (überhöhte Preise, Diskriminierung);
- Regulatorische Kosten: beseitigt einen ganz wesentlichen Teil der regulatorischen Transaktionskosten, die Kostenermittlung
- Anrufexternalität: Verteilung der Kosten auf Sender und Empfänger - entspricht eher der Nutzenverteilung
- Flexibilität bei Preismodellen: für Fixkosten-Industrien typische Flatrates werden nicht durch Minutenpreise behindert
- Interne/externe Kosten: Unterschied zwischen internen (SMC) und externen Kostensignalen (LRAIC) verschwindet - Förderung des Wettbewerbs (stärkt kleine Betreiber)
- Transaktionskosten: Reduktion der unternehmerischen Transaktionskosten (zB Interconnection-Billing und Abrechnung)

# Voice Peering Fabric



Imagine that your corporate ethernet LAN-Local Area Network and any other Fortune 500 company LAN can connect via a Voice Peering Facility-Fabric ([www.thevpf.com](http://www.thevpf.com)) at 60 Hudson in New York City, 700 South Federal in Chicago or via the VPF in Beijing, China. Calls from any LAN business or otherwise can be routed through the VPF and then to your LAN and to your desk. Look Ma, no Internet routing hops would be involved. Cable TV operators create a large metropolitan LAN for cable modem service. This concept just extends your LAN to anywhere. The calls would cost nothing per minute, aside from the fixed monthly cost of the digital link.

**Voice Peering Forum  
Summer 2008**

**June 23-24, San Francisco, CA, USA**

**This summer, find your peers.**

VPF Daily Volume Minutes Peered: 784,701,934 ENUM calls: 422,405

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- Jan 04: Peering MashUps
- Dec 08: It's Google vs. the Carriers

VPF Tools



- Calculate bandwidth requirements to support your VoIP network
- Calculate maximum concurrent calls an Ethernet connection can support
- Enterprise: **\$250k/yr spend on LD?** Achieve an annual savings of 50-90%