

Agententechnologien in der Telekommunikation

⇒ **Sommersemester 2009**

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A|O|I|T

Agententechnologien in
betrieblichen Anwendungen
und der Telekommunikation

What is a Telecommunications Standard?

- ⇒ Telecommunications standards (wire and wireless) are the underlying "laws" that govern the emerging Global Information Highway and the existing telephone system.
- ⇒ Without public agreements and the telecommunications standards that codify such agreements, wide-area voice and data communications would not be possible.



Proprietary, Open and De Facto Standards

- ⇒ Networking standards can be classified as *proprietary*, *open* or *de facto*.
- ⇒ **Proprietary** standards are owned by one particular organization.
- ⇒ If that organization has sufficient market share and the industry lacks alternatives to its standard, it may be adopted by the whole industry, becoming a **de facto** standard.
- ⇒ Usually, however, differing proprietary standards compete with each other, resulting in a fragmented market.
- ⇒ In contrast, **open** standards are not owned by anyone—they are created by neutral organizations to ensure that compatible products can be designed and developed by many different companies. This makes life easier for the customer as well as promoting the market as a whole.

Standards Committees

- ⇒ The rise of open standards not owned by any one company has been a great boon to customers of computer and networking products, as well as the manufacturers that sell to them.
- ⇒ In order to facilitate the development of open standards, however, organizations are needed that will coordinate the creation and publishing of these documents.
- ⇒ Generally, these are non-profit organizations that specifically take a neutral stance regarding technologies and work for the betterment of the industry as a whole.

Standards Committees

- ⇒ It is often difficult to tell whether a standards committee is a formal one.
- ⇒ In the US, formal standards committees are accredited by American National Standards Institute (ANSI).
- ⇒ The accreditation process is complex but offers some specific values to potential users and implementers of standards:
 - Standards work is coordinated to avoid two different standards committees creating different standards for the same functions.
 - Standards committees must maintain their standards so long as there is a minimal level of use.
 - The standards process is designed to prevent domination by any group and to allow all reasonable technical input to be heard.

Standards Committees



The PARLAY Group





ITU – International Telecommunications Union



- ⇒ a treaty organization of the United Nations
- ⇒ each country on the planet is a member
- ⇒ oldest telecommunications standards organization - 1865
- ⇒ formerly known as “International Telegraph and Telephone Consultative Committee” (in French the acronym was CCITT)
- ⇒ as an organization of governments, the ITU is the most formal of the formal telecommunications standards organizations
- ⇒ membership includes 191 Member States and more than 700 private Sector Members and Associates, including all the world's major ICT equipment and service providers.



- ⇒ The standards work in the ITU is divided into two sections,
 - ITU-Telecommunications (ITU-T)
 - ITU-Radiocommunications (ITU-R).
- ⇒ Each section is organized into Study Groups
- ⇒ Study Groups are divided in Working Parties, and then further divided into Questions
- ⇒ The work in a Question is led by a Rapporteur (French word meaning facilitator), and the working meetings are termed Rapporteur meetings.



- ⇒ Another recent section of ITU (besides ITU-T & ITU-R), which is mostly not mentioned:
- ⇒ ITU-D - Telecommunication **Development** Sector
- ⇒ ITU-D, and its executive arm, the Telecommunication Development Bureau (BDT), are working to **promote equitable, sustainable and affordable ICT access to drive broader social and economic development.**
- ⇒ the second World Summit on the Information Society (WSIS) in Tunis in 2005
 - prioritize equitable access, with special focus on gender issues, youth access, the disabled, indigenous communities and remote populations.
- ⇒ There's also a special direct aid programme targeting the 50 UN-designated Least Developed Countries, where more than 1 billion people still have virtually no access to any form of modern communications.

ITU-D Tools and Resources



- ⇒ **ITU Global View** – an online mapping application to track and help accelerate the implementation of the World Summit on the Information Society (WSIS) goals, provides a comprehensive view of current telecommunications infrastructure, projects, and statistics.



- ⇒ The ICT Eye website is a one stop-shop for ICT information and provides telecommunication/ICT indicators and statistics, regulatory and policy profiles, national tariff policies and scientific institutions, and much more.

<http://www.itu.int/ITU-D/icteye/>



- ⇒ formed in 1988 and officially recognized by the European Commission as a European Standards Organization.
- ⇒ produces globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and Internet technologies.
- ⇒ ETSI is a not-for-profit organization with almost 700 member organizations drawn from 60 countries world-wide.

<http://www.etsi.org>



ETSI committees and working groups...



- ⇒ ETSI recognizes three types of Technical Body (TB):
 - Technical Committee (TC)
 - ETSI Project (EP)
 - ETSI Partnership Project (EPP).

- ⇒ **A Technical Committee** is a semi-permanent entity organized around a number of standardization activities addressing a specific technology area. The results of a Technical Committee's work may often be used by other Technical Bodies.
 - E.g., TISPAN, or TETRA (Standards for Emergency communications)

- ⇒ **An ETSI Project** is similar to a Technical Committee but is established on the basis of a market sector requirement rather than on a basic technology, is therefore more self-contained, and has a defined duration.
 - E.g., ETSI Standards for Broadband Radio Access Networks (BRAN Project)

- ⇒ **An ETSI Partnership Project** is an activity established when there is a need to co-operate with other organizations to achieve a standardization goal and where that co-operation cannot be accommodated within an ETSI Project or Technical Committee.
 - E.g., 3GPP

ETSI committees and working groups...

- ⇒ For certain urgent items of work, where regular frequency of meetings is not sufficient, ETSI may also convene a *Specialist Task Force (STF)*.
- ⇒ STFs are small groups of technical experts to work intensively over a period of time, typically a few months, to accelerate the drafting work.
- ⇒ Each STF reports to an ETSI technical committee.

- ⇒ TISPAN = “Telecoms & Internet converged Services & Protocols for Advanced Network”
- ⇒ TISPAN in an ETSI technical committee
- ⇒ dealing with fixed networks and migration from circuit switched networks to packet-based networks
- ⇒ focuses on all aspects of standardization for present and future converged networks including NGN
- ⇒ TISPAN produces detailed implementable deliverables that cover NGN services, architectures, protocols, QoS, security, and mobility aspects within fixed networks

<http://www.TISPAN.org>



3GPP – 3rd Generation Partnership Project



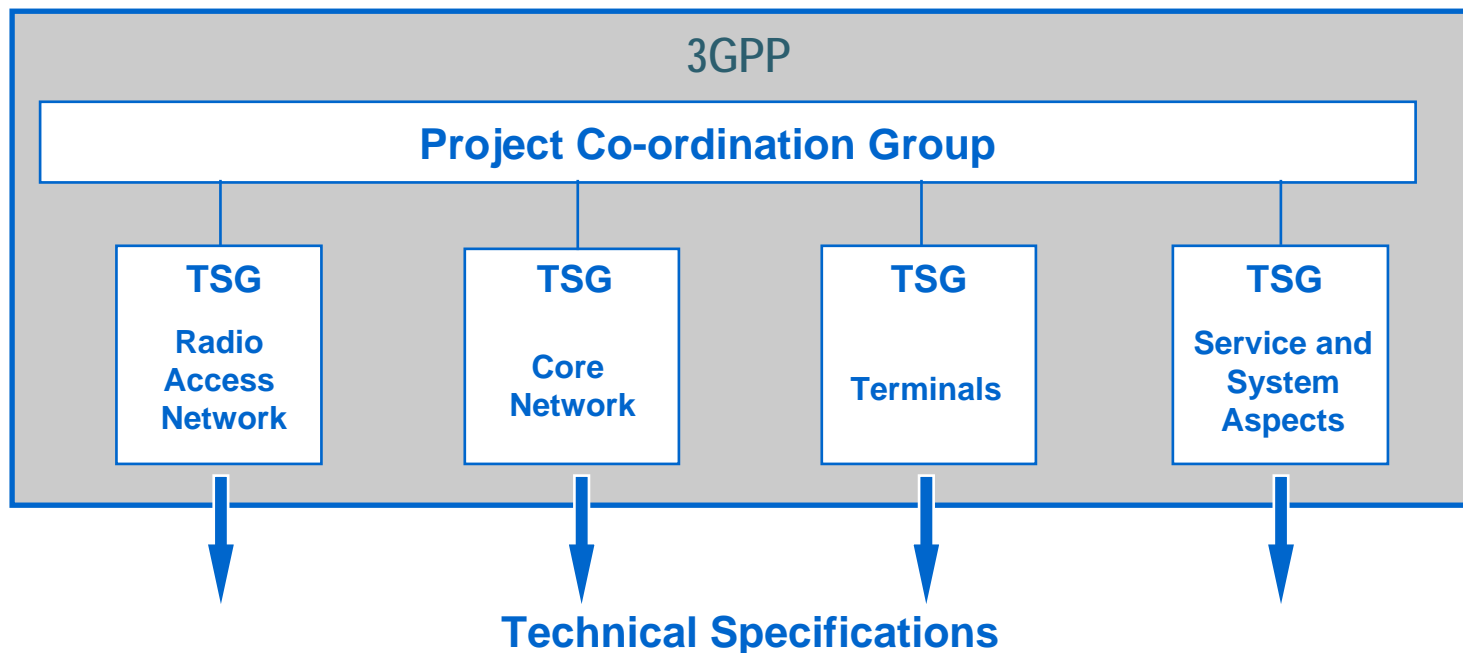
- ⇒ Established in December 1998
- ⇒ Development of 3rd generation cellular systems based on GSM architecture
- ⇒ Brings together several regional standardization bodies:
 - ETSI - European Telecommunications Standards Institute, Europe: <http://www.etsi.org>
 - TTC - Telecommunication Technology Committee (TTC), Japan: <http://www.ttc.or.jp>
 - ARIB - Association of Radio Industries and Businesses (ARIB), Japan: <http://www.arib.or.jp>
 - CWTS - China Wireless Telecommunication Standard, China: <http://www.cwts.org>
 - TTA - Telecommunications Technology Association (TTA), Korea: <http://www.tta.or.kr>
 - T1 Committee, USA: <http://www.t1.org>

<http://www.3gpp.org/>

Internal structure of 3GPP



- ⇒ 3GPP consists of a Project Co-ordination Group (PCG) and Technical Specification Groups (TSGs).
- ⇒ To assist in the co-ordination of the technical activities, the TSGs are encouraged to meet at the same time and place, as and when appropriate (e.g. twice per year).



- ⇒ **IP Multimedia Subsystem (IMS) is defined by 3GPP**
 - IMS standards define a network domain dedicated to the control and integration of multimedia services.
 - Open-systems architecture that supports a range of IP-based services over the PS domain, employing both wireless and fixed access technologies

- ⇒ **IMS builds on IETF* protocols – *we will see**
 - Based upon SIP, SDP, COPs and Diameter protocols
 - 3GPP have enhanced these IETF protocols for mobility

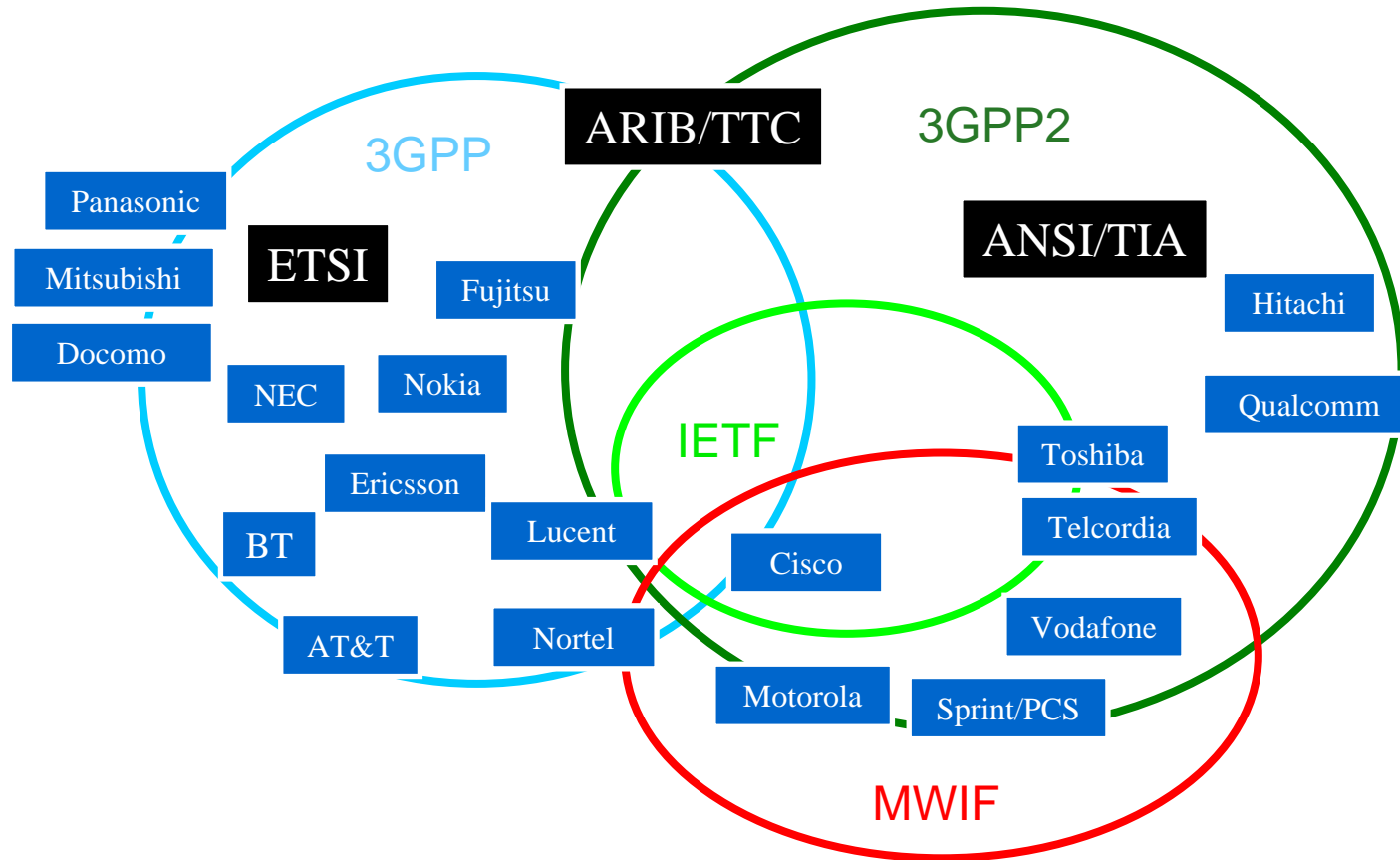
- ⇒ 3GPP2 - 3rd Generation Partnership Project 2
- ⇒ Development of 3rd generation cellular systems based on IS-95 (CDMA), commonly known as CDMA2000.
- ⇒ Supported by several regional standardization bodies:
 - TTA (U.S.)
 - ARIB, TTC (Japan)
 - CWTS (China)
 - TTA (Korea)



- ⇒ **Steering Committee**

- ⇒ **Technical Specification Group**
 - TSG-A (A-Interface System)
 - TSG-C (cdma2000)
 - TSG-P (Wireless Packet Data Interworking)
 - TSG-R (Interface of 3GPP Radio Access Technology to 3G Core Network evolved from ANSI-41)
 - TSG-S (Service and System Aspects)
 - TSG-N (ANS-41/WIN)

ALL IP Network Standardization Efforts



MWIF – Mobile Wireless Internet Forum

- ⇒ **Drive an Open Internet-based architecture that**
 - enables seamless integration of mobile telephony and IP-based Services (voice, data, video, web, etc.) for the mobile wireless networks, and
 - is independent of the Air interface

- ⇒ **Act as driver that is complementary to the existing standards working groups and provide a common voice of global operators**

- ⇒ **Supported by around 50 companies, which includes**
 - Vendors
 - CISCO, Motorola, 3COM, Fujitsu, Hitachi, IBM, Lucent, Nokia, Nortel, Qualcomm, Siemens, Sony, Sun, etc.
 - Providers
 - Vodafone AirTouch, DDI, SprintPCS, IDO, Bell Atlantic Mobile, Telstra, etc.

Some NGN related activities

⇒ ITU-T FGNGN has set the Framework for NGN



⇒ 3GPP members are working in the IETF to ensure that the underlying protocols fit with 3GPP (mobile service) requirements



⇒ 3GPP has developed IMS; stable, and being enhanced



⇒ OMA is defining services based on the 3GPP IMS service platform

⇒ ETSI TISPAN is busy defining the NGN network based on 3GPP IMS



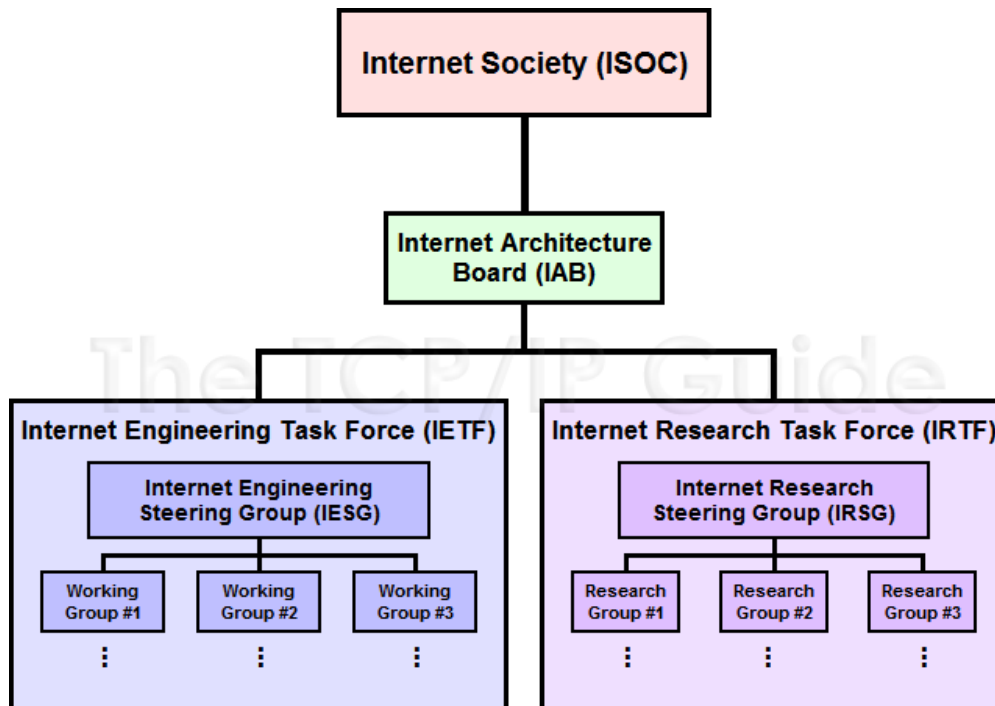
⇒ 3GPP and ETSI TISPAN are meeting jointly to adapt 3GPP IMS to fixed access networks



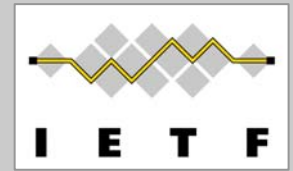
⇒ ETSI TISPAN is feeding back to the ITU-T and creating a set of implementable NGN Rel-1 Specifications



Internet Standards Organizations



- ⇒ The Internet Society (ISOC) oversees the IAB,
- ⇒ IAB directs the IETF and IRTF.
- ⇒ The IETF develops current Internet and TCP/IP standards, and is headed by the IESG, which manages IETF working groups (WGs).
- ⇒ The IRTF is the IETF's research counterpart, containing research groups (RGs) led by the IRSG.



- ⇒ IETF is the standards body that is most directly responsible for the creation of Internet standards.
- ⇒ IETF is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet.
- ⇒ It is open to any interested individual.
- ⇒ The actual technical work of the IETF is done in its working groups, which are organized by topic into several areas (e.g., routing, transport, security, etc.).
 - Active IETF Working groups: <http://www.ietf.org/html.charters/wg-dir.html>
- ⇒ Much of the work is handled via mailing lists. The IETF holds meetings three times per year.



Internet Registration Authorities

- ⇒ **ICANN - Internet Corporation for Assigned Names and Numbers**
 - The mission of ICANN is to coordinate, at the overall level, the global Internet's systems of unique identifiers.

- ⇒ **IANA - The Internet Assigned Numbers Authority**
 - operated by ICANN, performs the main functionality:
 - coordinates the allocation and assignment of the three sets of unique identifiers for the Internet, which are
 - Domain names (forming a system referred to as "DNS");
 - Internet protocol ("IP") addresses and autonomous system ("AS") numbers; and
 - Protocol port and parameter numbers.

Some News...



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ICANN and IANA Sites Hacked, Redirected

By David Kravets  June 27, 2008 | 6:40:14 PM Categories: [Hacks And Cracks](#)

Two of the world's most important internet regulatory web sites – ICANN and IANA -- were hijacked and briefly redirected Friday to another site that screamed this message: "You think that you control the domains but you don't! Everybody knows wrong. We control the domains including ICANN! Don't you believe us?"

A group that monitors internet defacement credited the 20-minute hijacking to a Turkish group calling itself "NetDevilz," according to researchers at [zone-h](#).

The [Internet Assigned Numbers Authority](#) globally coordinates the DNS Root and IP addressing. The [International Corporation for Assigned Names and Numbers](#) supervises the distribution of the world's internet domain names and addresses.



<http://blog.wired.com/27bstroke6/2008/06/icann-and-iana.html>

Mirror of hacked ICANN website

Mirror saved on: 2008/06/26 20:48

Defacer: NetDevilz	Domain: http://icann.com	IP address: 82.197.131.106
System: Linux	Web server: Apache	Attacker stats

NeTDevilz

You think that you control the domains but you don't! Everybody knows wrong. We control the domains including ICANN!

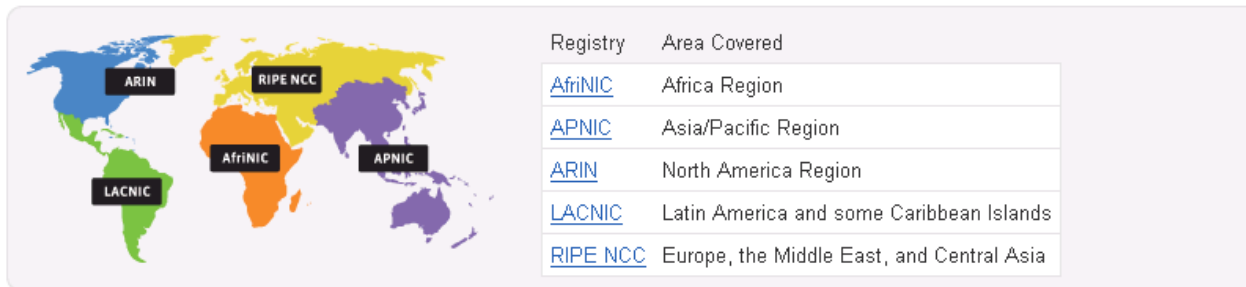
Don't you believe us?

haha :)

(Lovable Turkish hackers group)

IANA

- ⇒ Both IPv4 and IPv6 addresses are generally assigned in a hierarchical manner.
 - Users are assigned IP addresses by Internet service providers (ISPs).
 - ISPs obtain allocations of IP addresses from
 - a local Internet registry (LIR)
 - or national Internet registry (NIR),
 - or from their appropriate Regional Internet Registry (RIR):



- ⇒ IANA's role is to allocate IP addresses from the pools of unallocated addresses to the RIRs according to their established needs.

RIPE NCC

- ⇒ “Réseaux IP Européens Network Coordination Centre” (RIPE NCC)
- ⇒ the Regional Internet Registry (RIR) for Europe, the Middle East and parts of Central Asia,
- ⇒ one of the world’s five RIRs
- ⇒ provides Internet number resources, such as IPv4 and IPv6 address space and Autonomous System Numbers (ASNs), to its members.
- ⇒ also provides other services related to the technical coordination of the Internet.



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Pakistan takes out YouTube

Posted by Richard Stiennon @ 12:16 pm

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Like I said in a recent post, the Internet is a series of tubes. Sometimes that helps route around malicious legislation and regulators, sometimes it causes big problems. Like today at 2 PM eastern when someone in Pakistan announced a more specific BGP route announcement for the block of IP addresses that YouTube uses. Routers default to the more specific route announcement. Now all YouTube traffic is being routed to Pakistan.

Our trusting routers are the BIGGEST security hole. Malicious attackers can easily disrupt the entire Internet by betraying that trust.

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<http://blogs.zdnet.com/threatchaos/?p=546>

What happened...

- ⇒ Packets sent to YouTube were flowing to Pakistan.
- ⇒ What apparently happened is that Pakistan Telecom routed the address block that YouTube's servers are into a "black hole" as a simple measure to filter access to the service.
- ⇒ However, this routing information escaped from Pakistan Telecom to its ISP PCCW in Hong Kong, which propagated the route to the rest of the world.
- ⇒ So any packets for YouTube would end up in Pakistan Telecom's black hole instead.



Some background / review

⇒ IPv4 address classes

- Class A users - 16777216 addresses
- Class B users - 65536 addresses
- Class C users - 256 addresses

⇒ Leads to a lot of waste...

⇒ Early 1990s ... a new system called Classless Inter-Domain Routing (CIDR)

- so that IP addresses could be used much more efficiently.
- CIDR allows address blocks to be given out in power of two blocks, such as 256 (/24), 512 (/23), 1024 (/22), and so on.

Analysis

- ⇒ An interesting side effect of CIDR is that a particular IP address can now fall within multiple address ranges.
- ⇒ For instance, a router could have both 10.0.0.0/8 and 10.10.0.0/16 in its routing table.
- ⇒ *Longest match first*. The smallest address block, with the largest number after the slash, takes precedence.
- ⇒ YouTube injected the address block 208.65.152.0/22 (208.65.152.0 - 208.65.155.255) in the Internet's routing tables,
- ⇒ while Pakistan Telecom advertised the 208.65.153.0/24 (208.65.153.0 - 208.65.153.255) block.
- ⇒ So even though YouTube's routing information was still there, packets would flow towards Pakistan Telecom because of the *longest match first* rule.

Replay with RIPE-NNC tool

⇒ Watch: <http://www.ripe.net/news/study-youtube-hijacking.html>



ISO – International Organization for Standardization



- ⇒ founded in Geneva, 1947
- ⇒ membership extends to more than 100 countries
- ⇒ each member is the national body “most representative of standardization in its country”
- ⇒ members in Western industrial countries usually a private organization, such as
 - American National Standards Institute (ANSI),
 - British Standards Institution (BSI),
 - but in most other countries a governmental organization



IEEE – Institute of Electrical and Electronics Engineers

- ⇒ World's largest technical society with more than 360.000 members in 175 countries
- ⇒ IEEE promotes the engineering process of creating, developing, integrating, sharing, and applying knowledge about electro and information technologies and sciences.
- ⇒ IEEE 802.3 (Ethernet standards)
- ⇒ IEEE 802.11 (wireless standards) ↔ Wi-Fi Alliance
- ⇒ IEEE 802.15.1 (Bluetooth)
- ⇒ IEEE 802.15.4 (low rate UWB) ↔ ZigBee Alliance