

Security, Stability, Governance and Business Support for the Internet



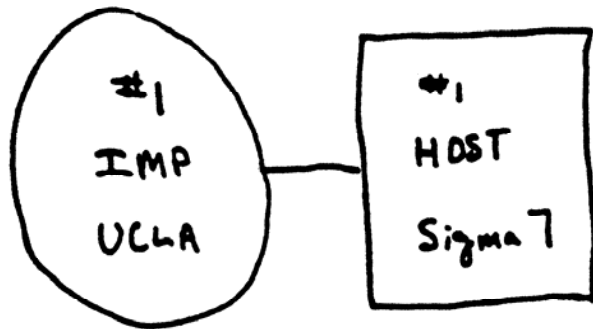
Paul Twomey
President and CEO

1 March 2007

What we want you to do today

- Understand the risks to the Internet as we have known it for over 30 years
 - Security and stability of addressing and routing
 - Governance and attempts at control/regulation
- Become partners in managing these risks
- Understand how your interests are affected by ICANN's policy work
- Get involved in creating the policy that sets how the net connects you to your customers
- Understand the opportunity the upcoming liberalising of gTLDs offers the Financial Sector
- But first...

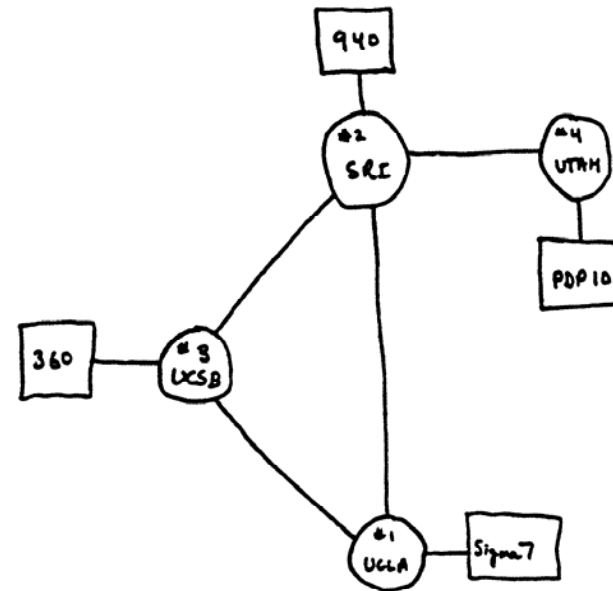
In the beginning . . .



THE ARPA NETWORK

SEPT 1969

1 NODE



THE ARPA NETWORK

DEC 1969

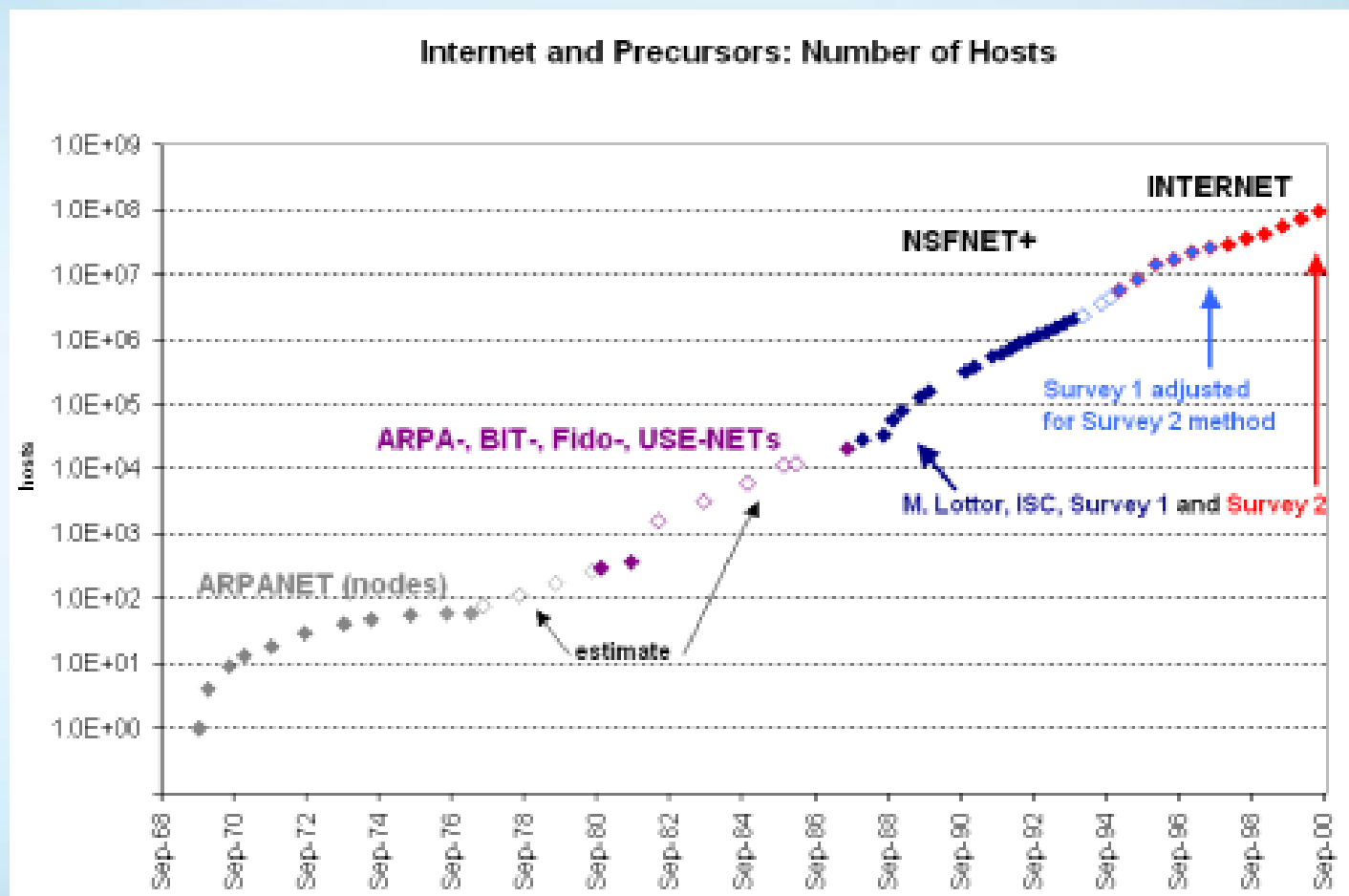
4 NODES



Internet community – a real phenomenon with world changing values

- Ensuring a single, end-to-end interoperable Internet
- Bottom-up technical policy-making and decision-making
- Participation open to all who wish to do so
- Legitimacy determined by open participation and the value of the contribution to the joint effort
- Consensus-based decision making, but not full ‘census-based’ consensus
- Cooperation, coordination and consultation among participants and groups pushing initiatives forward
- Yet, **very** spirited and blunt public debate
- Private agreement or contract approach to creating and managing linkages among and to the network
- Global efficiency in the allocation of resources, such as Internet Protocol addresses
- Encouraging innovation, particularly at the fringe of the network

These values drive logarithmic growth



Internet's unique identifiers were coordinated through the Internet Address Naming Authority



Jon Postel
1943–1998

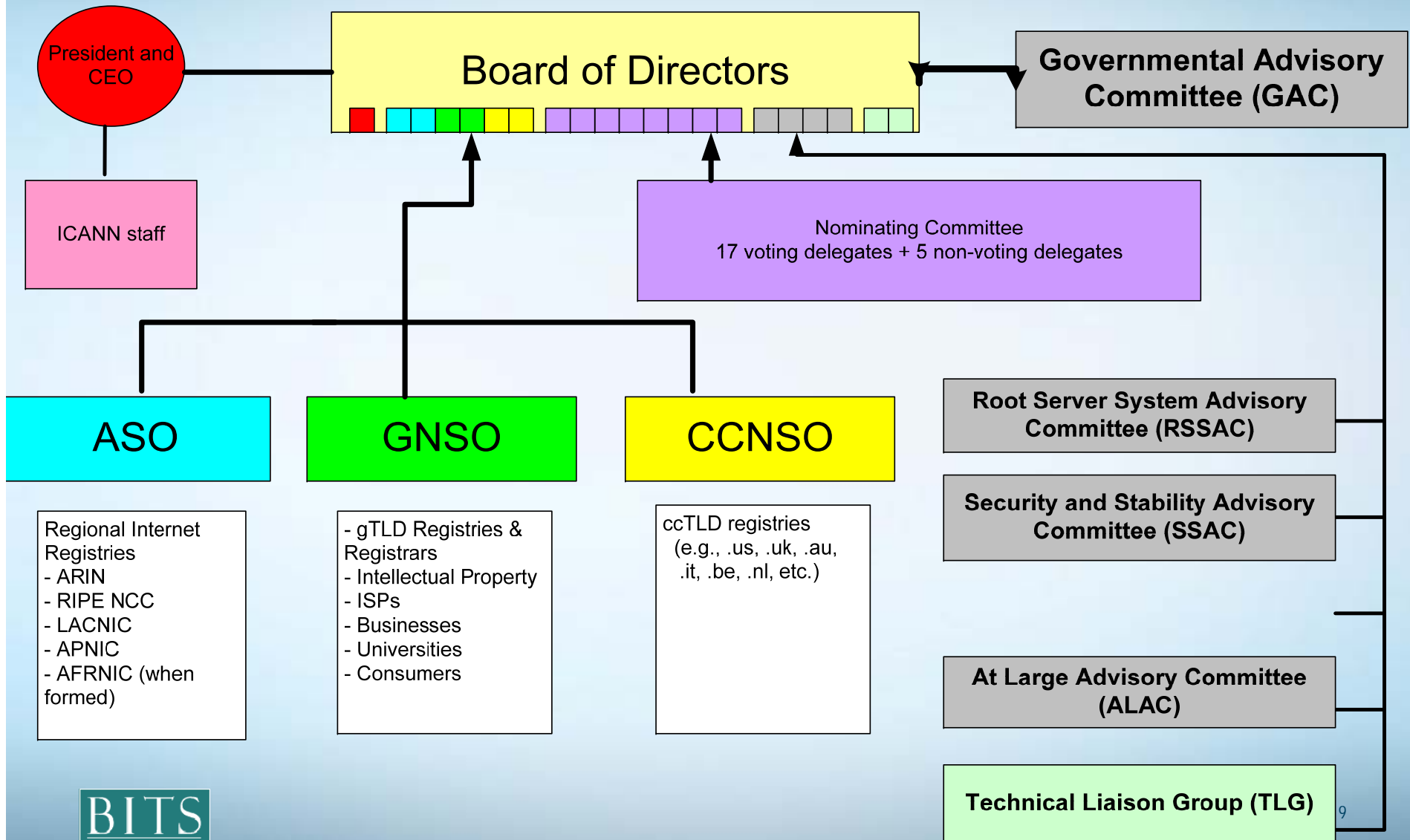
Need for Change Circa 1996–97

- **Globalisation** of Internet
- **Commercialisation** of Internet
- Lack of **competition** in domain name space
- Trademark–domain name **conflicts**
- Need for a new model of **governance**

Various interest groups competing for influence over the Domain Name and Addressing systems put the previous administrative process under breaking strain



Public-private policy forum establishes a bottom-up and balanced mechanism for interest groups to arrive at consensus on issues within a limited technical administrative mandate



ICANN Mission Statement

- To coordinate, overall, the global Internet's system of unique identifiers, and to ensure stable and secure operation of the Internet's unique identifier systems. In particular, ICANN coordinates:
 1. Allocation and assignment of the three sets of unique identifiers for the Internet:
 - Domain names (forming a system called the DNS)
 - Internet protocol (IP) addresses and autonomous system (AS) numbers
 - Protocol port and parameter numbers
 2. Operation and evolution of the DNS root name server system
 3. Policy development reasonably and appropriately related to these technical functions

Principles of operation

1. Contribute to stability and security of the unique identifiers system and root management
2. Promote competition and choice for registrants and other users
3. Forum for multi-stakeholder bottom-up development of related policy
4. Ensuring on a global basis an opportunity for participation by all interested parties

What is it that we stand for?

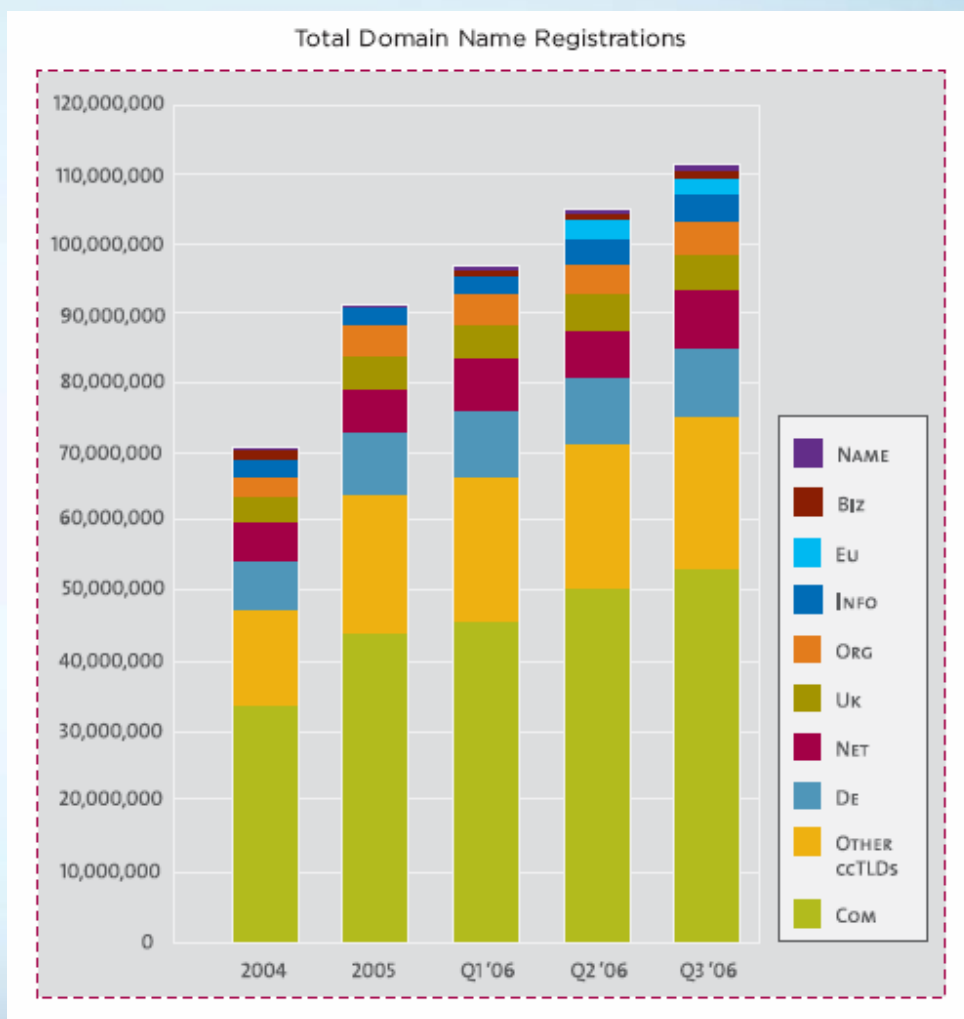
- Single interoperable Internet
- All can express their own language and identity BUT...
- All can access all others
- Creativity and offering development is encouraged for the benefit of consumers
- Security of the network is maintained to ensure confidence in the model
- Stability of the experience for application development and consumer experience
- Growth is encouraged
- Resources are deployed efficiently in support of a global network
- All relevant stakeholders have a voice and role

Snapshot of gTLD growth

Date	Total	.COM	.NET	.ORG	.BIZ	.INFO	.EDU
Nov 2006	78,327,148	58,826,693	8,654,081	5,497,469	1,565,667	3,783,238	6,989
Jan 2006	61,009,983	46,233,988	6,803,911	4,295,174	1,286,313	2,382,992	7,605
Jan 2005	46,412,165	33,351,738	5,324,213	3,307,122	1,087,952	3,333,660	7,480
Jan 2004	35,340,170	26,207,928	4,349,336	2,775,728	914,761	1,085,133	7,284
Jan 2003	30,143,651	22,147,502	3,702,496	2,442,677	829,096	1,014,473	7,407
Jan 2002	30,414,510	22,746,754	3,988,975	2,484,886	499,410	687,473	7,012
Jan 2001	27,969,779	21,387,603	4,038,161	2,537,669	N/A	N/A	6,346
Jan 2000	10,008,475	8,006,100	1,216,750	779,950	N/A	N/A	5,675
Jan 1999	4,038,744	3,425,625	261,375	347,550	N/A	N/A	4,194
Jan 1998	2,292,000	Combined	Combined	Combined	N/A	N/A	Combined
Jan 1997	828,000	Combined	Combined	Combined	N/A	N/A	Combined
Jan 1996	240,000	Combined	Combined	Combined	N/A	N/A	Combined
Jan 1995	71,000	Combined	Combined	Combined	N/A	N/A	Combined
Jan 1994	30,000	Combined	Combined	Combined	N/A	N/A	Combined
Jan 1993	21,000	Combined	Combined	Combined	N/A	N/A	Combined

Snapshot of domain name marketplace

112 million domain names registered globally today





Why do we get out of bed in the morning?

- The Internet is the most powerful and pervasive means of empowering individuals in human history
- Being part of the glue which ensures a rapid unleashing of humanity's knowledge and possibilities for all persons no matter what age, sex, creed, class, ethnicity and (at least some degree) wealth
- Radically reducing transaction costs and barriers to markets across a globalised economy

Agenda

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Internet infrastructure threats

1. Physical disruption of major lines and switching centers
2. Loss of routing infrastructure continuity and/or fidelity
3. Loss of DNS service continuity and/or fidelity
4. Flooding of network or specific sites, i.e., denial of service attack

**Not all Internet-based systems are
Internet infrastructure...**

Routing infrastructure

- Status
 - Routing information is maintained in routing registries
 - These are reasonably well protected against physical attack
 - Inputs to the routing registries can be compromised
 - False routing information can be inserted
- Potential protection
 - Secure BGP has been defined and implemented

Does not look feasible – too much hardware required

Routing security does not fall directly within anyone's charter. What is the financial sector's role in engaging ISPs?

DNS infrastructure root servers – status

- Root servers point to top level domains
 - 20 generic TLDs (gTLDs) – .com, .org, etc.
 - U.S. Government has .gov and .mil
 - 243 country codes (ccTLDs) – .de, .jp, .uk, etc.
- Root servers are heavily replicated
 - 13 independent businesses
 - Many-fold replication and distribution

DNS infrastructure root servers – threats

Threats

- Loss of Service
 - Network outage
 - Machine or site failures
 - Overwhelming traffic (denial of service attack)
 - Business failure
- Hijacking
 - Cache poisoning
 - False registration
 - Fake zone transfer
 - Fake registrar-registry interaction
 - Private roots
- Loss of coherence
 - Unauthorized roots and TLDs
 - Private character set extensions

Countermeasures

- Excess capacity
- Distribution, replication
- Strong connectivity
- Multiplicity of businesses
- DDoS counters (long term)

- Protocol changes, DNSSEC
- Tight registrar controls
- TSIG (crypto)
- Crypto authentication
- DNSSEC

- DNSSEC; policy/political pressure
- DNSSEC; policy/political pressure

Lots of work is under way. But threats are growing and this will take more time and money than many expect

System threats

- Denial of service attacks target high-value sites
 - DNS servers are among the obvious targets
 - These will get more sophisticated
 - Action is required – see later slides
- Domain and address theft is growing
 - Spammers like to hide their identity
 - The legal framework doesn't provide protection

**Address theft, per se, is not actionable(!)
Should the financial sector lobby for this (internationally)?**

The denial of service problem

- Denial of service attacks are increasing
 - This will get worse – probably much worse
- Law enforcement is important but necessarily at the wrong end of the problem
- Technical changes in the Internet would help a lot

Distributed denial of service

- On 6 February 2007 – most visible since 2002 attack but not as comprehensive as amplified DDoS attack on TLDs of 2006
- Six of the 13 root servers that form building blocks of the Internet were affected – two badly
- The attack highlighted the effectiveness of Anycast load balancing technology
- More analysis is needed before a full report on what happened can be drawn up – reasons behind the attack are unclear – a wake-up call
- Root server operators worked together in a fast, effective, and co-ordinated effort
- Recent SSAC recommendations for improving the security of the domain name system still need to be followed through – other measures should also be considered
- Coordination and preparation were key
- Did you notice?

ICANN purview

- ICANN strives to achieve coherence, stability and security
- Almost all of the operational details are carried out by others, but
 - The IANA (Internet Assigned Numbers Authority) function is within ICANN
 - L root
- Join us in both dialogue and new funding mechanisms – security foundation/gold star service, etc.

Illustrative



ICANN

Asia - Pacific

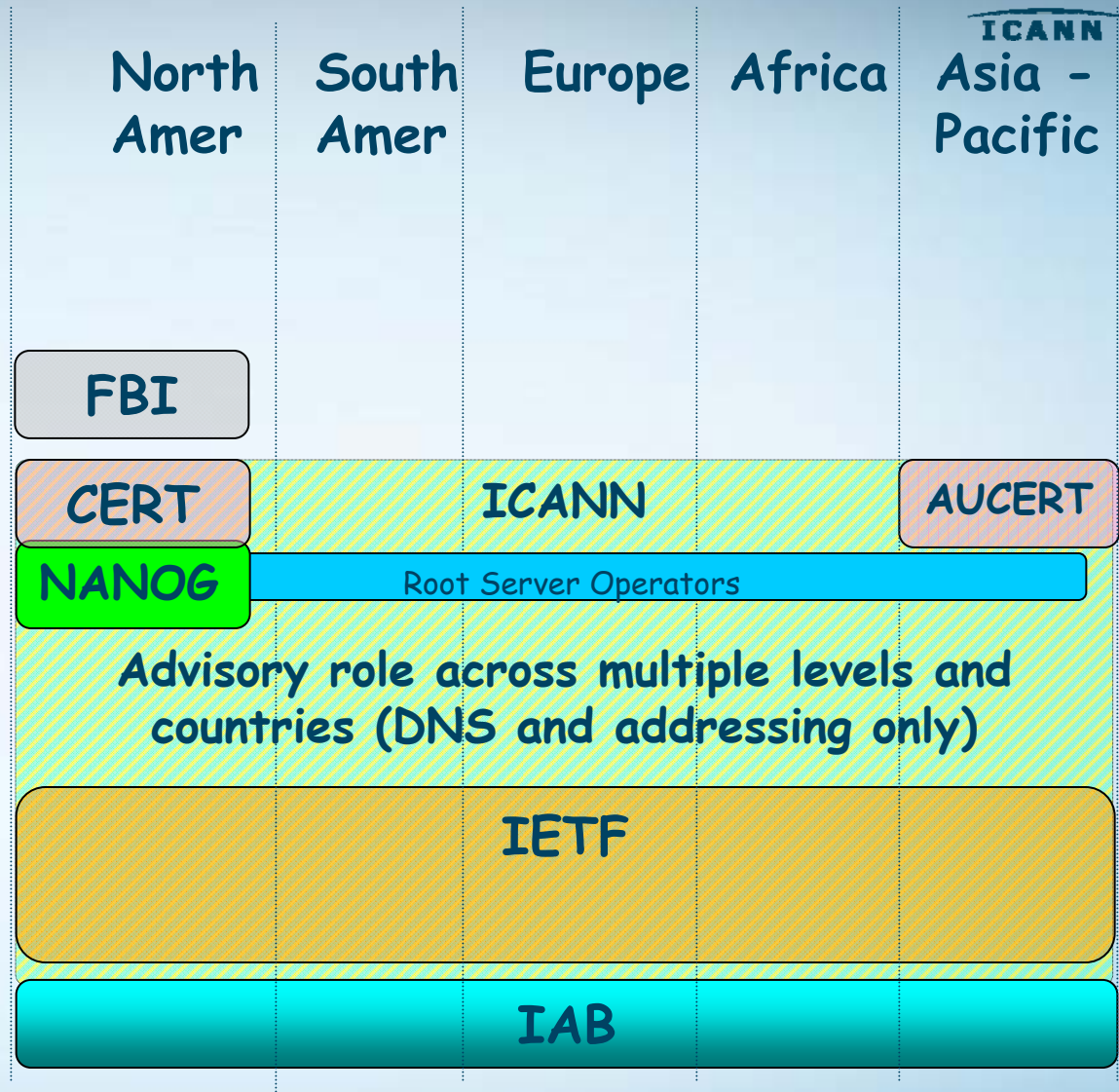
North Amer

South Amer

Europe

Africa

- 8 Policy & Laws
- 7 Law Enforcement
- 6 Response
- 5 Operations
- 4 Products/Networks
- 3 Implementation
- 2 Protocols
- 1 Architecture



DDoS – some technical approaches

- Identification of sources of traffic
 - Tighten the routing security
- Refashion the protocols to know the identity of senders of traffic
- Distinguish between well managed computers on well managed networks vs others
 - “Well managed” means they aren’t zombies and their configuration is checked regularly
- Well managed networks quarantine computers which appear to be infected or misbehaving
- Well managed networks report misbehaviors and accept reports of misbehaviors
- Traffic among well managed networks gets preference

DDoS customer approaches

- Pressure on the vendor to supply machines that are safe out of the box
- Establishment of an ethic that machines should be safe
 - it's the vendor's problem, not the user's

Some ICANN initiatives

- Agreement on formal relationship between Root Server Operators and ICANN
- Tightened procedures for distributing changes to the root zone (CRADA report)
- DNSSEC deployment analysis and road map
- IPv6 transition road map (re DNS)
- DNS service robustness enhancements
- Best practices for ccTLDs

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Internet growth

- Has been coordinated, not managed
- Private-sector led, NOT command and control
- It's phenomenal growth has led to debates at the U.N. World Summit on the Information Society (WSIS)
- These debates have refined international understanding about how best to support Internet growth while maintaining its stability and interoperability
- We now have greater clarity about who does what
- But the debate rages on

Internet governance

What's in an 'i'? Internet governance

UN agency reconsiders its role as countries jockey for influence in industry

International Herald Tribune



Feb. 27, 2007 9:27am

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SEARCH

Stories

International net domains 'risky'

By Darren Waters

Technology editor, BBC News website, Athens

The global inter-operability of the internet needs to be preserved, Vint Cerf, one of the founders of the net, has told a global gathering in Athens.

World Wide (Web) Takeover

NRO: The United Nations Wants To Control The Internet

Sept. 28, 2005

(Page 1 of 2)



(National Review Online) "In my opinion, freedom of speech seems to be a **politically sensitive issue**. A lot of policy matters are behind it." So observed Houlin Zhao, the man who wants to control the greatest forum for free expression in history.

Internet governance



Gee, when did we give away the Internet? (An analysis of news about WSIS)

Wednesday December 10, 2003 10:07AM
by [Andy Oram](#)

'Layers principle' should be respected in internet governance, report recommends

Source: **United Nations Conference on Trade and Development**
Published Monday, 20 November, 2006 - 12:52

New Internet Governance Proposal Would Trim US Role, Boost Private Sector

Filed under: [English Internet and Communication Technology United Nations Access to Knowledge News](#) posted by William New @ 5:03 pm

Has The Internet War Been Declared?



Posted by **Dana Blankenhorn**



The U.S. government has announced *it will continue*

Is this how the Internet War starts?

Until today the U.S. position was that it wanted to tra

Earlier this year, ICANN *hesitated* in extending Verisi

Control was finally given *through 2011*, but Verisi

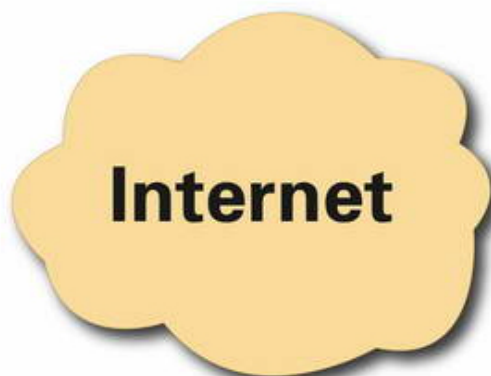
Internet governance

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General Science	Medicine & Health		

Published: 15:22, November 14, 2005

Nations prepare to fight for Internet



You are here: [Home](#) > [Article](#)

Internet should be run by key players: new ITU boss

Fri Jan 12, 2007 1:06pm ET

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GENEVA (Reuters) - The Internet should continue to be overseen by major agencies including ICANN and the ITU, rather than any new "superstructure", the new head of the International Telecommunications Union said on Friday.

Hamadoun Toure, who took up the reins of the United Nations agency this month, said the ITU would focus on tackling cyber-security and in narrowing the "digital divide" between rich and poor countries.

Internet governance

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World

U.S. tells nations hands off Internet

By John Zarocostas
SPECIAL TO THE WASHINGTON TIMES
September 27, 2005

GENEVA -- The United States said at the outset of global talks on information technology yesterday that it will fight attempts to put the United Nations or any international group in charge of

WIRED NEWS

TOP TECHNOLOGY CULTURE POLITICS COLUMNS BLOGS WIRED MAG

Rift Over Global Info Control

PRINT MAIL RANTS + RAVES

By Associated Press | Also by this reporter
11:00 AM Dec, 09, 2003

A U.N. summit aimed at ensuring global access to information technology opens Wednesday in Geneva with rifts between industrialized and developing countries threatening to overshadow the gathering's main goals.

Who's still running the argument?

- Iran and Brazil have made a formal request to return the issue of Internet governance to the table at the next U.N. Secretary General's Internet Governance Forum in Rio de Janeiro in October 2007
- In particular that a U.N. body should coordinate all Internet activity, including the addressing and routing system

Internet governance

- Oversight model –
 - Too few stakeholders allowed to contribute to or influence Internet infrastructure, capabilities, services
 - Everyone pays the price of the overseer's agenda
- Private-sector leadership is key –
 - Has worked since early Internet days
 - Multiple stakeholders from all Internet communities and constituencies have a say in Internet infrastructure, stability, security, interoperability
- Everybody needs a seat at the table

U.S. perspective

John Kneuer, Acting Assistant Secretary for Communications and Information, United States Department of Commerce . . .

“...the Department continues to be supportive of private sector leadership in the coordination of the technical functions related to the management of the DNS as envisioned in the ICANN model. Furthermore, the Department continues to support the work of ICANN as the coordinator for the technical functions related to the management of the Internet DNS.”

But this is a global problem

- We need your CEOs to understand that this is a global regulatory issue
- We need your CEOs to help stand up for some key principles for private sector leadership in Internet governance
- We would like you to help us sell this message and coordinate the voice of the private sector beneficiaries of the Internet as we have it now

Get involved – it's your fight, too!



Your Internet
needs you

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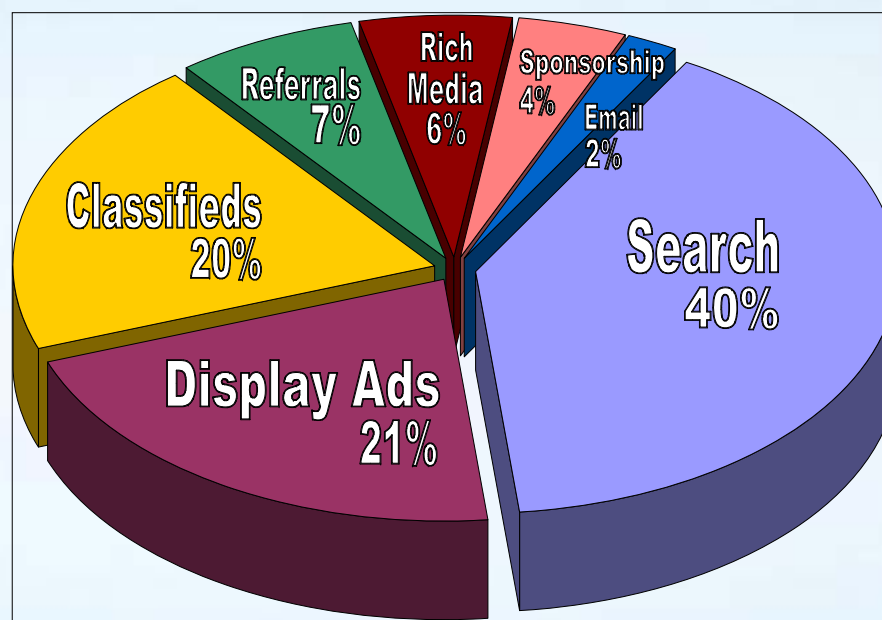


Competition in the domain name space – Money makes the world go round...

- ICANN introduced competition to the domain name space
- Registrars now have a market **and** a business
- Advertising on the Internet linked to domain name sales and per-per-click revenue generation
- Domain name marketplace is even driving how we search – contextually as well as topically – and the scale of sites that can be searched

U.S. online ad revenue distribution

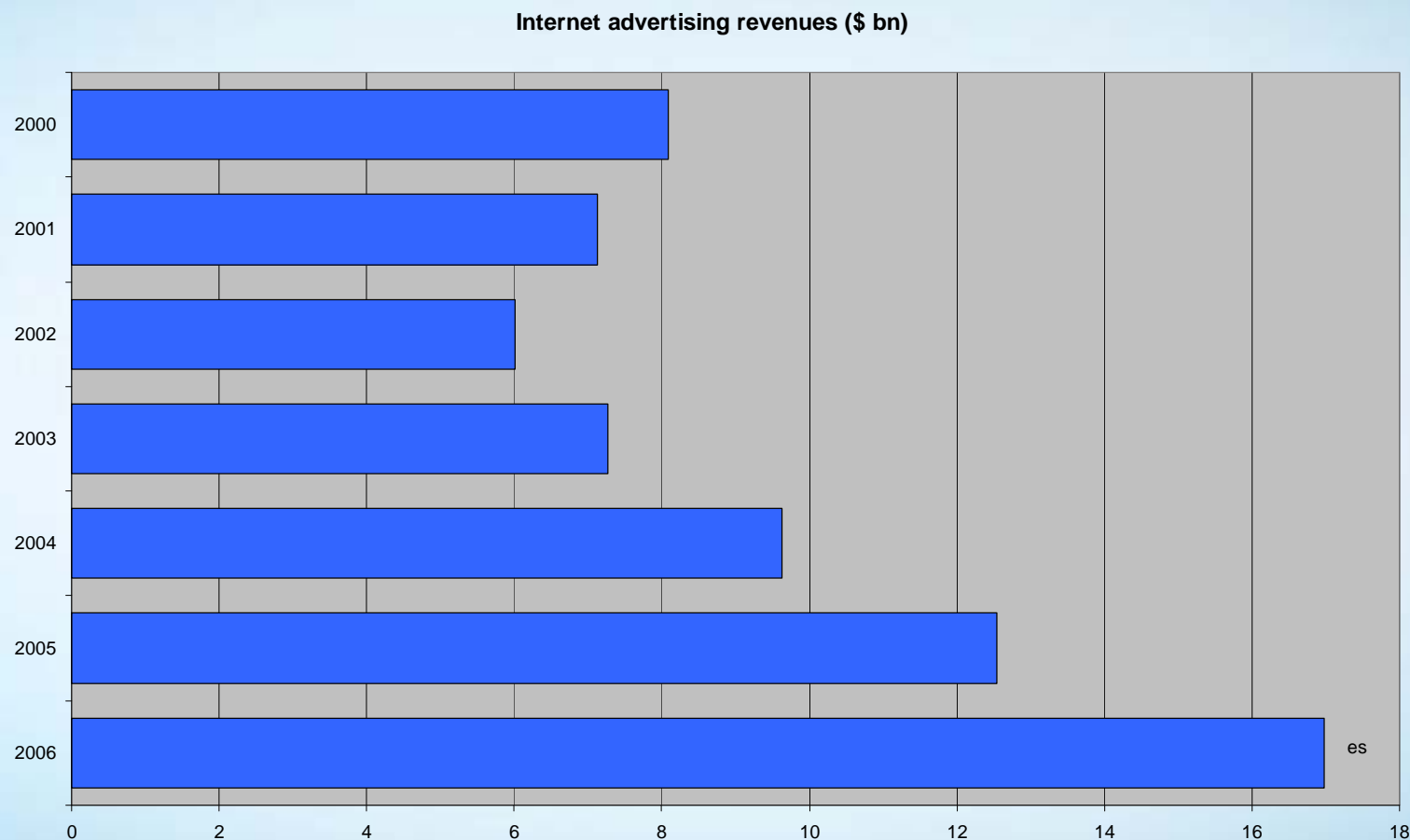
Online ad revenues 2007



100% = \$19.5 billion

Source: e-marketer.com

U.S. Internet advertising revenue, 2000–2006 (in billions)



Source: e-marketer.com

Paid search ad spending 2001–2010

Paid Search Ad Spending in the US, 2000-2008 (in millions)

2000	\$108.5
2001	\$298.7
2002	\$927.4
2003	\$2,543.5
2004	\$3,847.5
2005	\$4,715.0
2006	\$5,561.0
2007	\$6,552.0
2008	\$7,392.0

Note: includes paid search, paid inclusion and contextual search; eMarketer benchmarks its US online ad spending projections against the Interactive Advertising Bureau (IAB) - PricewaterhouseCoopers (PwC) data, for which the last full year measured was 2003

Source: eMarketer, January 2005

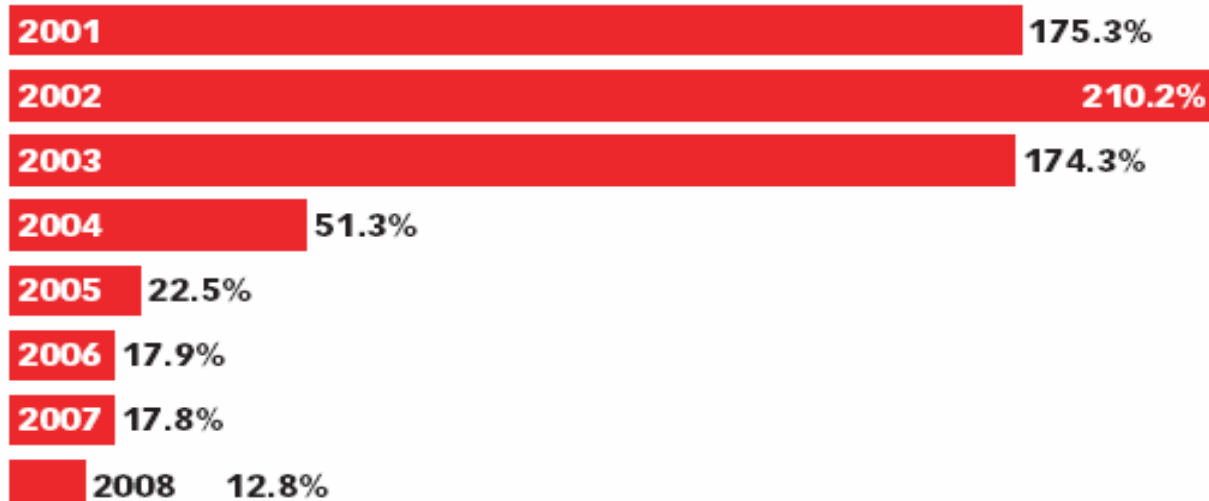
062497 ©2005 eMarketer, Inc.

www.eMarketer.com

Paid search analysts expect the industry to grow to over \$7 billion in 2008

PPC spending growth

Paid Search Ad Spending Growth in the US, 2001-2008 (as a % increase vs. prior year)



Note: includes paid search, paid inclusion and contextual search; eMarketer benchmarks its US online ad spending projections against the Interactive Advertising Bureau (IAB) - PricewaterhouseCoopers (PwC) data, for which the last full year measured was 2003

Source: eMarketer, January 2005

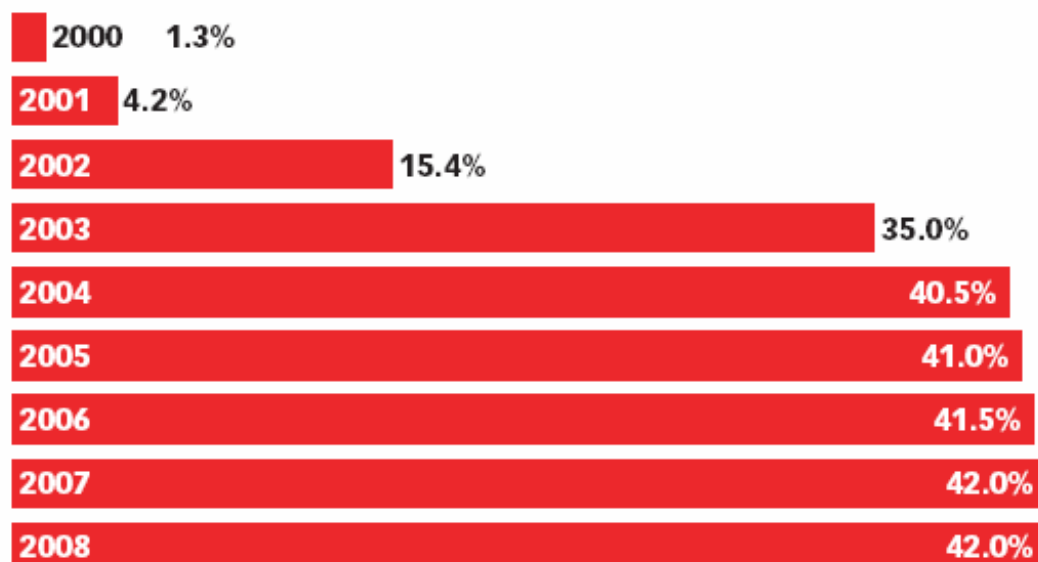
062498 ©2005 eMarketer, Inc.

www.eMarketer.com

The search industry is stabilizing. In the post Bubble-Boom-Bust era, this flattening of the growth rate is considered by analysts to be a very healthy sign.

PPC in the online media mix

Paid Search Ad Spending in the US, 2000-2008 (as a % of total online ad spending)



Note: includes paid search, paid inclusion and contextual search; eMarketer benchmarks its US online ad spending projections against the Interactive Advertising Bureau (IAB) - PricewaterhouseCoopers (PwC) data, for which the last full year measured was 2003
Source: eMarketer, January 2005

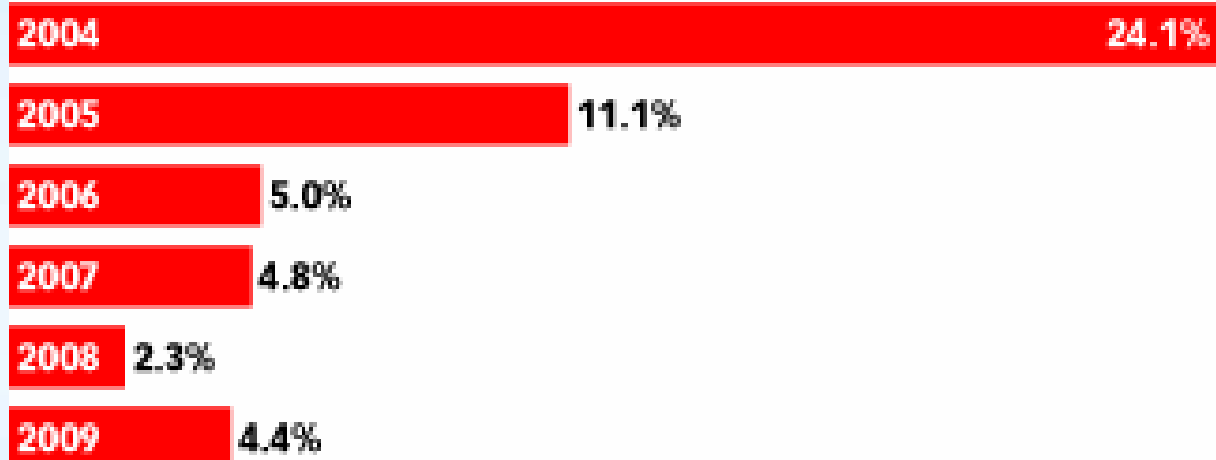
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www.eMarketer.com

Paid search dominates all other forms of interactive marketing, including email, banner ads, rich media.

Average cost-per-click

Average Price per Click for Paid Search in the US, 2004-2009 (as a % increase vs. prior year)



Source: JupiterResearch, August 2004 appeared in Morgan Stanley presentation, September 2004; eMarketer calculations, January 2005

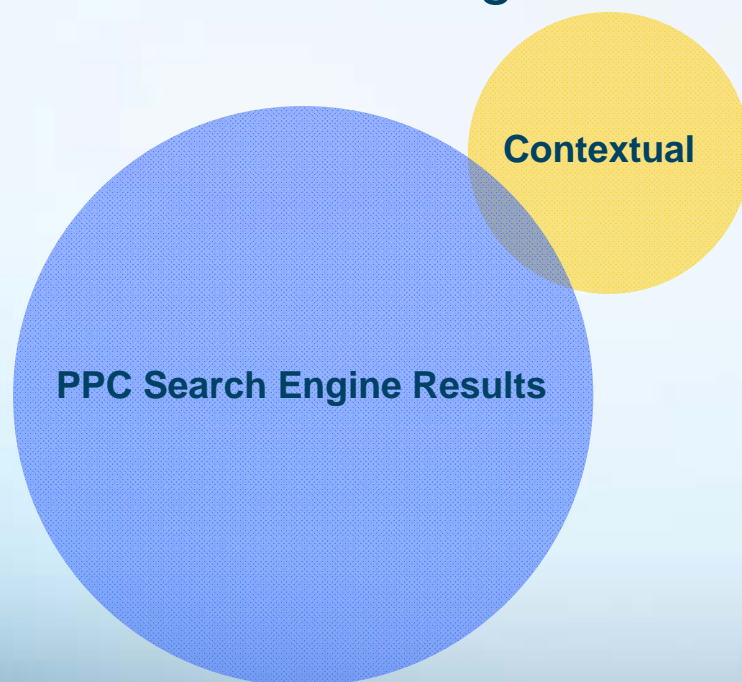
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Average CPCs are stabilizing

What is contextual search?

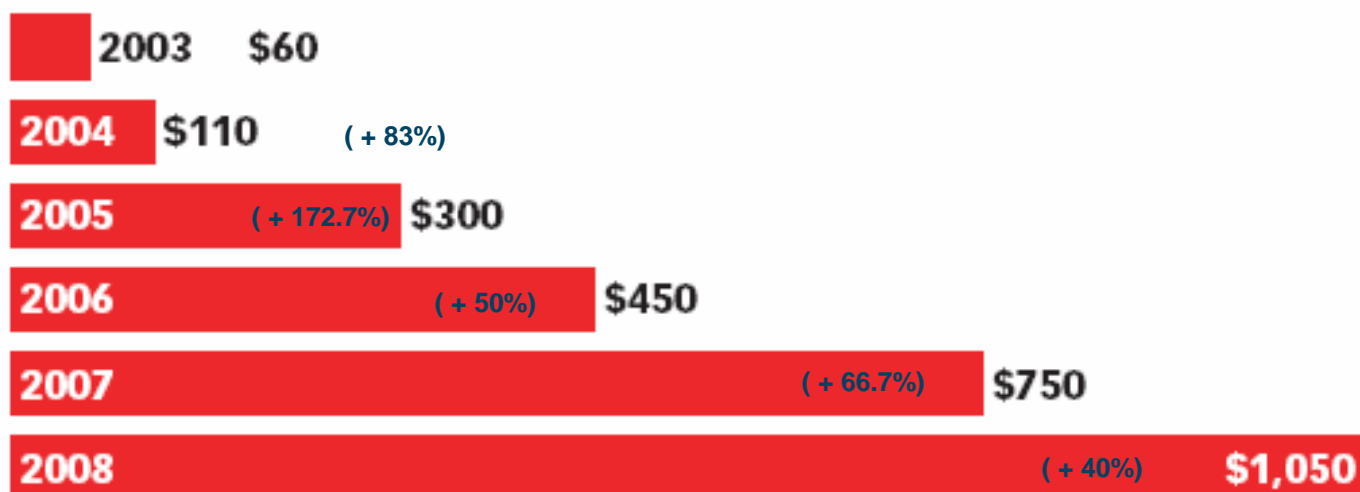
- Contextual search advertising is the syndication of text-based search ads into new channels beyond the search engine
- Contextual advertising is not really searching



Type-in domains are the only true search placement in the contextual channel

U.S. online contextual ad spending, 2002–2008

Online Contextual Ad Spending in the US, 2003-2008 (in millions)



Source: eMarketer, January 2005

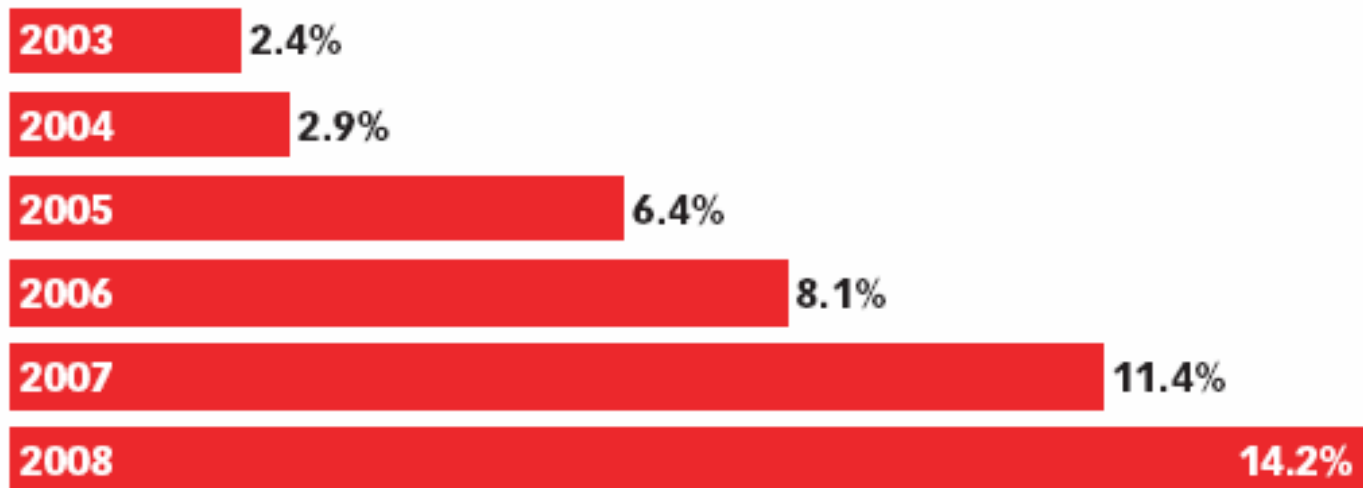
062503 ©2005 eMarketer, Inc.

www.eMarketer.com

Projected to reach over \$1 billion per year in ad spend by 2008

Contextual ad spending (as a % of paid search)

Online Contextual Ad Spending in the US, 2003-2008 (as a % of total paid search ad spending)



Source: eMarketer, January 2005

062505 ©2005 eMarketer, Inc.

www.eMarketer.com

Contextual spending and distribution is still growing by leaps and bounds.
Part of the driving of Domainers

ICANN's policy development role

- Safeguard an open, fair and equitable policy development process
- Be receptive to all stakeholders, public and private
- Be responsive to stakeholders who provide input and communicate next steps
- Communicate timely and useful information about the issue and the policy process

Whois database

- Some businesses see a strong need for unrestricted access to Whois information to
 - Identify cybersquatters and domain infringement
 - Investigate online fraud and phishing
 - Manage domain names and intellectual property
 - Conduct e-commerce by researching other online entities
- One major hotel chain recorded 100-plus new domain names registered in its name – or a version thereof – every day
 - Confusingly similar names led to pay-per-click sites
- Full registration data would help legitimate businesses shut down fraudulent domains

Whois policy process

- Whois issues are being addressed through the General Names Supporting Organisation's (GNSO's) policy development process (PDP)
 - Numerous opportunities for public review and comment
- BITS comments received in April 2006 and January 2007
- Formed part of subsequent Whois Task Force Reports

Recent public comments on Whois

- Many support the BITS position –
 - Businesses and trade organisations
 - Nonprofits engaged in fighting fraud
 - Law enforcement agencies
- Opposition to Whois from other advocacy organisations, some government agencies, some Internet users

Organisations supporting BITS Whois position

- Walt Disney Company
- eBay, Inc.
- Electronic Arts, Inc.
- Coalition Against Unsolicited Commercial E-mail
- Recording Industry Association of America and the International Federation of the Phonographic Industry
- American Society of Composers, Authors and Publishers
- American Intellectual Property Law Association
- International Anti-Counterfeiting Coalition
- Intercontinental Hotels Group
- National Arbitration Forum
- American Red Cross
- American Heart Association
- March of Dimes Birth Defects Foundation

Different views of Whois

- Privacy commissioners in the European Union
- Attention in public comments to restricted access, privacy and accuracy of the data

Enforcement of existing Whois policy

- That will remain the case until the Board approves any new policy, if any

Next steps on Whois

- ICANN staff is preparing notes for the GNSO Council on the Task Force Recommendations to –
 - Identify issues for clarification
 - Identify issues for further discussion
 - Identify potential implementation issues
 - Suggest a framework for further development of the proposal

Task force recommendation (1)

- Nonbinding recommendation to GNSO Council
- Operational Point of Control (OPoC) proposal –
 - Registrants could use an OPoC in place of the current administrative and technical contact details
 - If there was an issue with the domain name, the OPoC would contact the registrant

Task force recommendation (2)

- OPoC includes –
 - Improved procedure for correcting inaccurate Whois data
- OPoC does not include –
 - Procedure for access by rights-holders, law enforcement – suggests use of best practices for dealing with requests

PDP next steps

- GNSO's Whois Task Force presents Final Task Force Report to GNSO Council
March 2007
- Council will send its own recommendations to ICANN Board for consideration and decision.
- ICANN Board will review GNSO recommendations, 2nd/3rd quarter of 2007

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Where stakeholders find common ground

Increasingly, ICANN finds itself one of the few forums in which these issues can be raised so that solutions can be found within the Internet community

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New generic top-level domain timetable

- Next working group report to Lisbon meeting in late March
- Potentially GNSO Policy Development Process may be completed by July meeting in Puerto Rico
- Policy may be concluded by the end of the 3rd Quarter 2007
- Next round of new gTLDs in early 2008?

Consider the impact of –

- Unique financial services TLD
- Industry cross-certified
- DNSSEC
- Other anti-phishing tools?



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