

# ICANN Tutorial

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Andrew

McLaughlin

V.P., ICANN

Berkman Fellow, Harvard Law School



# ICANN: The Basic Idea

**ICANN =**

An Experiment in  
Technical Self-Management  
by the global Internet  
community

# ICANN: The Basic Bargain

**ICANN =**

Internationalization  
of Policy & Management Functions  
for DNS and IP Addressing  
systems

+

Private Sector  
(non-governmental) Management

# What does ICANN do?

Coordinates policies relating to the unique assignment of:

- Internet domain names
- Numerical IP Addresses
- Protocol Port and Parameter Numbers

Coordinates the DNS Root Name Server System

- through Root Server System Advisory Committee

# Says *The Economist*:

- “ICANN is in many ways a completely new institutional animal.”
- “It is a hybrid between an online community and a real-world governance structure, an untested combination.”
- “It is also a new type of international organisation: an industry trying to regulate part of itself, across the globe, with little or no input from national governments.”

*(10 June 2000)*

# Domain names & IP addresses

- **Domain names** are the familiar, easy-to-remember names for computers on the Internet
  - e.g., amazon.com, icann.org, nic.org.gh
- Domain names correlate to **Internet Protocol numbers** (IP numbers) (e.g., 98.37.241.130) that serve as routing addresses on the Internet
- The **domain name system** (DNS) translates domain names into IP numbers needed for routing packets of information over the Internet

# Types of Internet Domains

- **Generic Top Level Domains (gTLDs)**
  - `<.com>`, `<.net>`, `<.org>` open to all persons and entities on a global basis
  - `<.int>` for international treaty organizations
  - `<.arpa>` for Internet Infrastructure purposes
  - `<.gov>`, `<.mil>` for U.S. government, military
  - `<.edu>` for US universities
  - *New:* `<.info>`, `<.biz>`, `<.name>`, `<.areo>`, `<.coop>`, `<.museum>`, `<.pro>`

# More Types of Internet Domains

- **Country Code Top Level Domains (ccTLDs)**
  - <.gh>, <.hk>, <.jp>, <.ca>, <.br>, <.de>, <.tv>, <.cc> . . .
  - Imprecise name: ccTLD includes *countries* and *geographically distinct territories*
  - Derived from ISO 3166-1 list
  - Key feature: Service to local Internet community, which is responsible for making decisions
  - Registration requirements vary by domain:
    - Residency requirement
    - Price (or no charge)
    - Ability to transfer
    - Dispute resolution policy



# Basic DNS Registry Structure

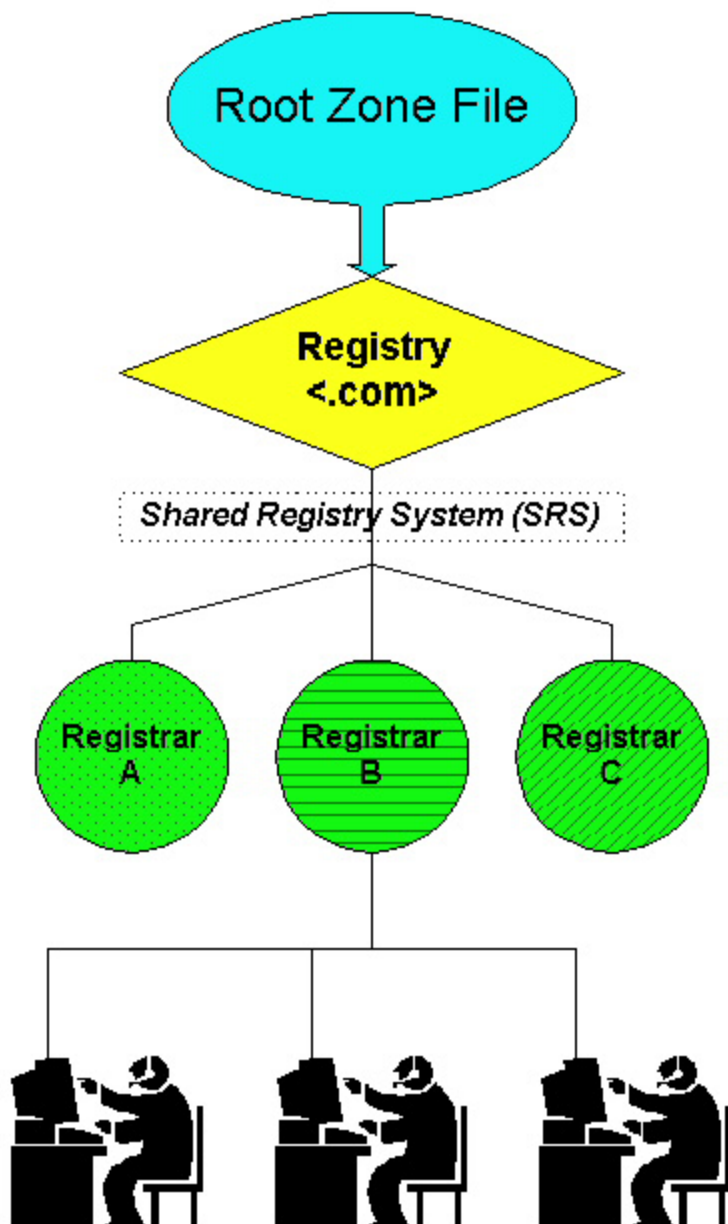
*Example: <.com>*

**ICANN**  
(= overall coordinator)

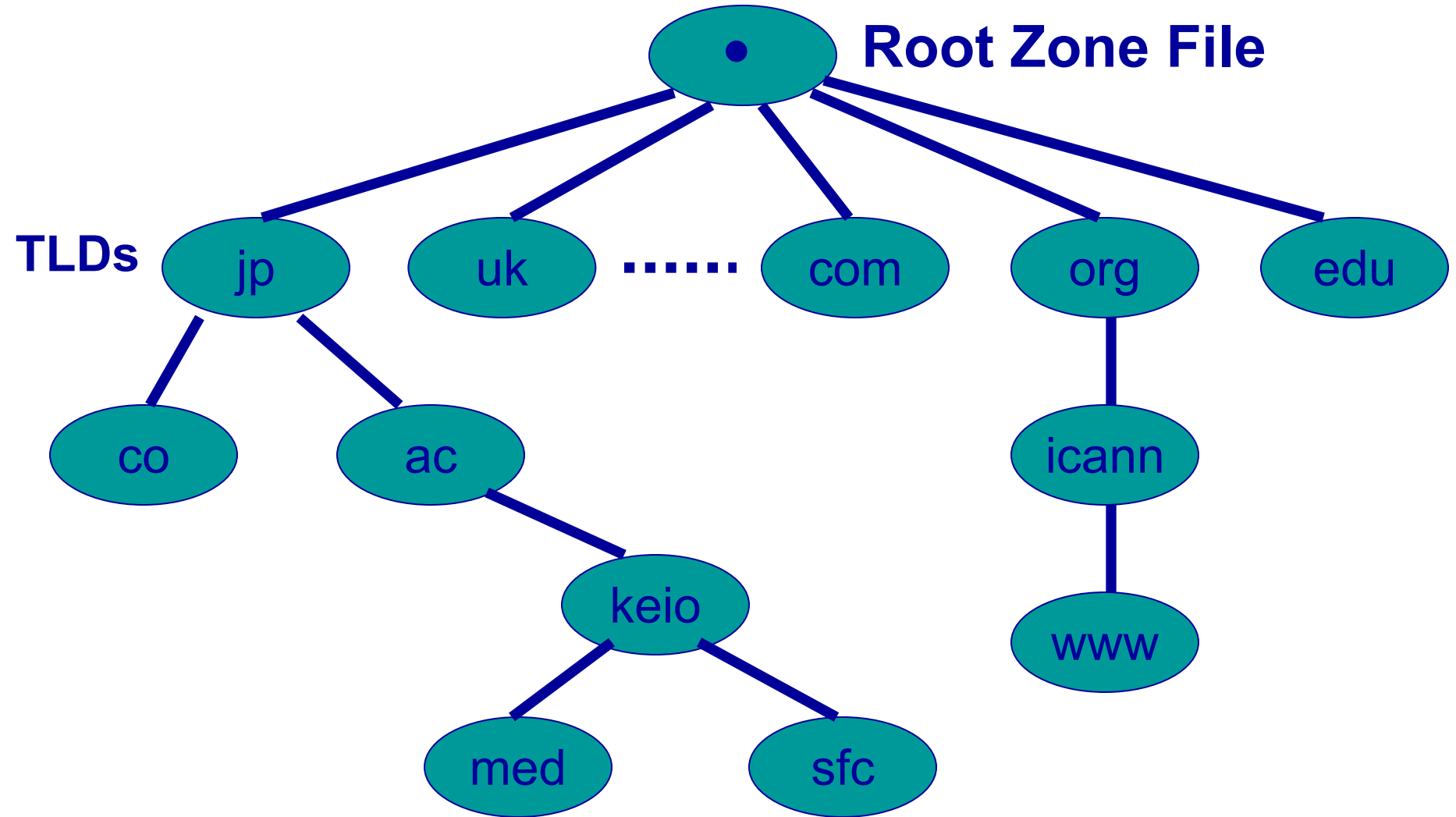
**Registry**  
(= authoritative database of domain names and corresponding IP addresses)

**Registrars**  
(= interact with customers/registrants; handle billing; place data in registry database; provide WHOIS service)

**Registrants**  
(= domain name holders)



# The DNS Tree



# List of DNS Root Name Servers

name	org	city
a	NSI	Herndon,VA, US
b	USC-ISI	Marina del Rey,CA, US
c	PSInet	Herndon,VA, US
d	U of Maryland	College Park,MD, US
e	NASA	Mt View, CA, US
f	Internet Software C.	Palo Alto, CA, US
g	DISA	Vienna, VA, US
h	ARL	Aberdeen, MD, US
i	NORDUnet	Stockholm, SE
j	NSI (TBD)	Herndon,VA, US
k	RIPE	London, UK
l	ICANN	Marina del Rey,CA, US
m	WIDE	Tokyo, JP

# Map of DNS Root Name Servers



# Root server architecture of today

- Change decision
  - ICANN/IANA
- Verification/approval
  - US Department of Commerce
- Update of the zone file:
  - Zone file management (currently, via A)
  - Synchronized with the database
- Distribution of the zone information
  - To the rest of root servers

# Internet Addressing - IPv4

- IP address = unique identifier for a node or host connection on an IP network
- IPv4 = 32 bit binary number
  - Usually represented as 4 decimal values, each representing 8 bits, in the range 0 to 255 (known as octets) and separated by decimal points ("dotted decimal" notation)
  - Example: 192.0.34.64

In binary form:

192 . 0 . 34 . 64  
11000000.00000000.00100010.01000000

# IPv 4 addressing: Classes

- Every IP address consists of two parts, one identifying the network and one identifying the node.
- Initially, 256 networks, then mix of 5 classes:
  - Class A (1-126)
    - 8 bits of network address, 24 bits of host address
    - 126 with 16M+ hosts
  - Class B (128-191)
    - 16 bits of network address, 16 bits of host address
    - 16,324 with 65K+ hosts
  - Class C <192-223>
    - 24 bits of network address, 8 bits of host address
    - 2M+ with 254 hosts
  - Class D <224-239> = multicast
  - Class E <240-255> = reserved for future use

# IPv4 addressing: Classes

The Class determines which part of the IP address belongs to the network (N) and which part belongs to the node (n).

Class A (ex: 10.x.x.x):

NNNNNNNN.nnnnnnnn.nnnnnnnn.nnnnnnnn

Class B (ex: 130.1.x.x):

NNNNNNNN.NNNNNNNN.nnnnnnnn.nnnnnnnn

Class C (ex: 200.1.20.x)

NNNNNNNN.NNNNNNNN.NNNNNNNN.nnnnnnnn



# Classes vs. CIDR

- Problem: Classful assignment can waste huge amounts of space
  - Anyone who could reasonably show a need for more than 254 host addresses got a Class B address block of 65,533 host addresses
- Solution: Classless Inter-Domain Routing (CIDR)
  - Basic idea: Accurately allocate only the amount of address space that is actually needed
  - CIDR allows variable-length network prefixes
  - Hierarchical allocation via ISPs enables more efficient routing – allocate & route in terms of address blocks
- Theoretically, up to 4 Billion hosts, hundreds of thousands of networks

# Next Generation Internet - IPv6

- IPv6 = 128 bits of addressing
- Theoretically,  $10^{38}$  hosts
- Significant transition effort needed
- Regional Internet Registries are now allocating IPv6

# Regional Internet Registries (RIR)

- **ARIN**

- North America
- Latin America
- Caribbean Islands
- Sub-Saharan Africa

- **RIPE NCC**

- Europe
- Middle East
- North Africa
- Parts of Asia

- **APNIC**

- Most of Asia
- Australia/New Zealand
- Pacific Islands

# Emerging RIRs

## **AfriNIC** → Africa

Status: Actively organizing, interim Board of Trustees, plans to co-locate staff at RIPE

## **LACNIC** → Latin America/Caribbean

Status: Provisional recognition by ICANN, executing transition plan, HQ in São Paulo, currently handling assignments for the region

# Basic Address Policy

- Availability + conservation + aggregation
- RIRs allocate based on demonstrated need
  - Generally, RIRs allocate address blocks on the basis of immediate need and projected utilization rate within one year.

# Status Quo Ante ICANN

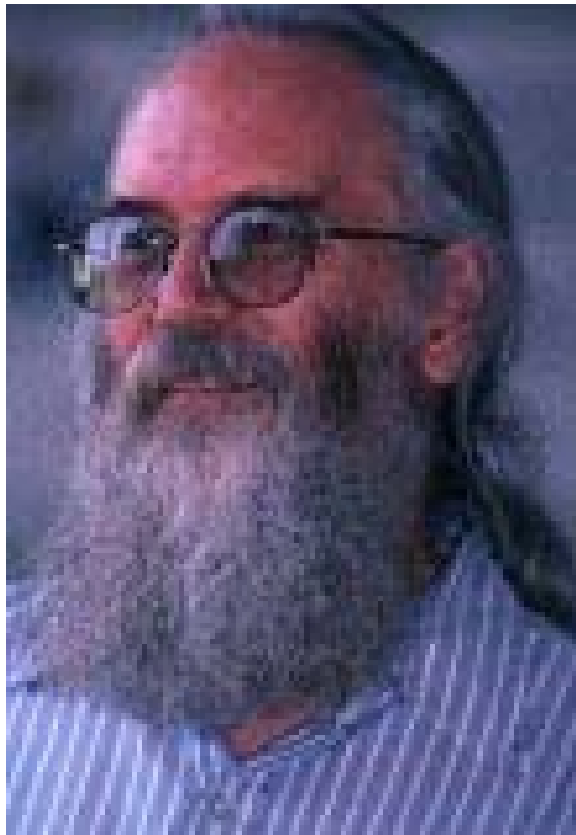
Most Internet DNS and IP Address coordination functions performed by, or on behalf of, the US government:

- **Defense Advanced Research Projects Agency (DARPA)**
  - Stanford Research Institute (SRI)
  - Information Sciences Institute (ISI) of University of Southern California
- **National Science Foundation (NSF)**
  - IBM, MCI, and Merit
  - AT&T, General Atomics, Network Solutions, Inc. (NSI)
- **National Aeronautics and Space Administration (NASA)**
- **US Department of Energy**

# IANA

- “Internet Assigned Numbers Authority”
- A set of technical management functions (root management; IP address bloc allocations) previously performed by the Information Sciences Institute (ISI) at the University of Southern California, under a contract with the U.S. Government
- Also: Protocol parameter and port number assignment functions defined by the Internet Engineering Task Force (IETF)
- Now performed by ICANN

# IANA



*Jon Postel*  
*1943-1998*



# The Need for Change Circa 1996/97

- ◆ Globalization of Internet
- ◆ Commercialization of Internet
- ◆ Need for accountability
- ◆ Need for more formalized management structure
- ◆ Dissatisfaction with lack of competition
- ◆ Trademark/domain name conflicts

# White Paper Principles

USG White Paper: new DNS policy & management structure must promote 4 goals:

- ◆ Stability
- ◆ Competition
- ◆ Private, bottom-up coordination
- ◆ Representation

# White Paper Implementation

- ◆ Internet community to form non-profit corporation meeting White Paper's 4 criteria
- ◆ US Government (through Commerce Department) to transition centralized coordination functions
- ◆ Amendment of Network Solutions agreement to require competitive registrars in gTLD registries
- ◆ Request to WIPO to study & recommend solutions for trademark/domain-name conflicts

# ICANN's Job: Technical + Policy

## USG White Paper:

- Why? “The development of policies for the addition, allocation, and management of gTLDs and the establishment of domain name registries and domain name registrars to host gTLDs should be coordinated.”
- ICANN “should have the authority to manage and perform a specific set of functions related to coordination of the domain name system, including the authority necessary to:
  - “1) **set policy for** and direct allocation of IP number blocks to regional Internet number registries;
  - “2) **oversee operation** of the authoritative Internet root server system;
  - “3) **oversee policy for** determining the circumstances under which new TLDs are added to the root system; and
  - “4) **coordinate** the assignment of other Internet technical parameters as needed to maintain universal connectivity on the Internet. “

# Status of Transition from USG

- ✓ 1998
  - ✓ November - ICANN recognized in MoU
- ✓ 1999
  - ✓ June - Cooperative agreement among ICANN, US Government, root server operators
  - ✓ November - ICANN and Network Solutions (NSI) sign gTLD registry and registrar agreements; USG transfers root authority over gTLDs to ICANN
- ✓ 2000
  - ✓ February - Contract with US Government to complete transfer of IANA functions
  - ✓ November - Selection of 7 new Top-Level Domains
- ✓ 2001
  - ✓ January - Transfer of InterNIC functions from NSI to ICANN
  - ✓ September – Agreement with .au Registry
- ✓ 2002
  - ✓ Agreements with .jp, .bi registries

# What are the IANA functions?

- Protocol parameter assignments
  - Under March 1, 2000 IETF/IAB/ICANN MOU
  - Documented through IETF's RFC series
  - Types of numbers range from unique port assignments to the registration of character sets.
  - List of IANA Protocol Numbers and Assignment services: <<http://www.iana.org/numbers.html>>
- IP Address Allocations
- DNS root zone file management

# ICANN and ccTLDs

- Basic organizing principle: Local Internet communities make decisions about country code TLD Registries (ccTLDs)
- ICANN's role
  - Very hands-off on policy
  - Basic responsibility to delegate ccTLD so as to serve the interests of the local and global Internet communities
  - Coordinate stable root server system
- ccTLD managers' role
  - Technically competent registry and nameserver operations
  - Commitment to administer as trustee for the local community (local laws, culture, customs, preferences, etc.)
- Local government's role
  - Depends on the local situation

# ICANN and Global TLDs

- For the global TLDs (such as .com, .net, .org), ICANN serves as the vehicle for consensus policy development
- Examples of policies:
  - Competitive registrars (more than 200 accredited)
  - Uniform Dispute Resolution Policy (UDRP)
  - Data Escrow
  - Whois
  - Redemption Grace Period for Deleted Names



# gTLD Policy: Registrar Competition

- Smashing success
- Over 200 registrars accredited globally
- Prices → lower (\$10, compared to \$50)
- Service → better
- Choices → more

# gTLD Policy: UDRP

- Applies to: aero, .biz, .com, .coop, .info, .museum, .name, .net, and .org.
  - Not country-code TLDs, generally
- UDRP: domain name disputes to be resolved by courts, except for narrow band of abusive, bad-faith cybersquatting of trademarks
  - Registrars can't cancel, suspend, or transfer a domain name without a court order, except:
  - For bad-faith cybersquatting, a speedy (45-60 days), low-cost (\$1000-2000), global administrative procedure is available (UDRP)

# UDRP – Part II

In order to have a challenged domain name transferred or cancelled, a trademark holder must establish:

(1) that he has a legally recognized trademark in a name that is identical or confusingly similar to the domain name;

(2) that the current registrant of the domain name has no legitimate rights in the name; and

(3) that there has been some evidence of bad faith or abuse (ex: extortion)

# UDRP – Part III

- Enabled globally effective, speedy, relatively inexpensive resolution of the most egregious domain name registration abuses
- Over 4000 decisions rendered by 4 dispute resolution service providers
- Personal view: A small number of wrong decisions, but on the whole a very successful system

# New Top-Level Domains

- First group chosen in November 2000
  - Global Open: <.info>, <.biz>
  - Individuals: <.name>, <.pro>
  - Specialized: <.museum>, <.aero>, <.coop>
- Proof of Concept - Launch with caution, observe carefully, learn from experience
  - Selection process was transparent & predictable
- If these are successful, there will be future rounds
  - Goal: Less burdensome, less expensive, more objective
- Biggest challenge: Launch phase
  - *Intellectual Property & cybersquatting fears*
  - *Opening day rush; fairness to everyone*

# Top Policy Objectives for Year 2002

- **ICANN Reform & Restructuring!**
- Progress toward agreements:
  - ccTLD registry agreements
  - IP Address registry agreements
  - Root server operator agreements
- Mechanism(s) for Individual Participation & Representation of Public Interest
- gTLD Policies
  - UDRP Review
  - Whois Requirements
  - Handling of deleted domain names
- Support LACNIC and AfriNIC
- Redelegating of .org registry

# Internationalized Domain Names

- Very tough problem
- Goal: make DNS accessible to those who use non-ASCII characters
- Technical issues
  - ASCII (or “LDH”) restriction embedded in Internet protocols
- Policy issues
  - Types of non-ASCII TLDs
  - Registry selection
- Better done other than through DNS?

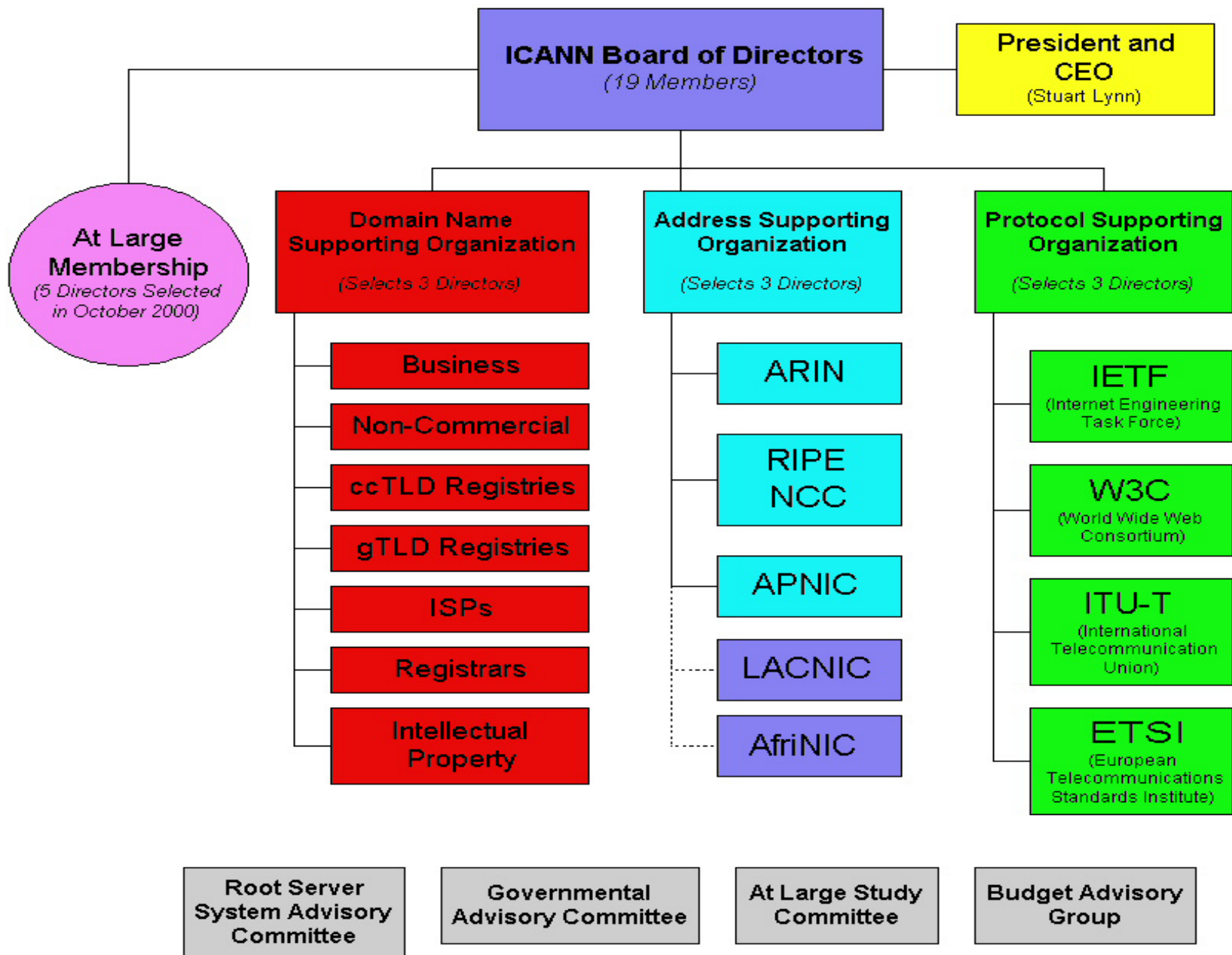


# Structure of ICANN





# ICANN Organizational Chart



# ICANN Board of Directors

## At Large Directors:

- Karl Auerbach (USA)
- Ivan Moura Campos (Brazil)
- Frank Fitzsimmons (USA)
- Masanobu Katoh (Japan)
- Hans Kraaijenbrink (Netherlands)
- Andy Mueller-Maguhn (Germany)
- Jun Murai (Japan)
- Nii Quaynor (Ghana)
- Linda S. Wilson (USA)

## ASO Directors:

- Rob Blokzijl (Netherlands)
- Ken Fockler (Canada)
- Sang-Hyon Kyong (South Korea)

## DNSO Directors:

- Amadeu Abril i Abril (Spain)
- Jonathan Cohen (Canada)
- Alejandro Pisanty (Mexico)

## PSO Directors:

- Vint Cerf (USA) – *Chairman*
- Helmut Schink (Germany)
- [Vacant]

# ICANN Staff

## Lightweight Model

(minimal staff = minimal bureaucracy)

## Current Staff (17):

- ◆ President and CEO (Dr. Stuart Lynn)
- ◆ V.P./General Counsel (Louis Touton)
- ◆ V.P./Chief Policy Officer (Andrew McLaughlin)
- ◆ Counsel for Int'l Legal Affairs (Theresa Swinehart)
- ◆ C.F.O. (Diane Schroeder)
- ◆ Manager, Technical Operations (John Crain)
- ◆ Manager, Technical Systems (Kent Crispin)
- ◆ Director of Communications (Mary Hewitt)
- ◆ IANA staff (Michelle Cotton, Bill Huang)
- ◆ Registrar Liaison (Dan Halloran & Ellen Sondheim)
- ◆ ccTLD Liaison (Herbert Vitzthum)
- ◆ Network Administrator (Jim Villaruz)

# Funding

- ICANN Budget 2001-02 = ~\$4.5 million US
- Sources of funding: Registry & Registrar agreements
  - gTLD Registries (com, net, org, info, biz, etc.)
  - gTLD Registrars (accreditation fees)
  - ccTLD Registries (voluntary contributions, pending formal agreements)
  - Regional Internet Registries (voluntary contributions pending finalization of agreements)
- No funding from governments

# At Large Membership

- Goal: Enable meaningful, informed participation in ICANN by individual Internet users
- At Large Study Committee (chaired by Carl Bildt) proposed a set of mechanisms for meaningful, informed participation
- ICANN Board endorsed them in March
- Now needed: Self-organization

# Membership Elections in 2000

- Problems:
  - Highly distorted registration distribution
    - Ex: More from Brazil than rest of Latin America combined
  - Voting patterns closely matched nationality
  - Anemic levels of interest
  - Fears of fraud and capture
  - Expensive to verify physical address
  - Difficulties for non-English speakers
- Successes:
  - Free, open & transparent process
  - Increased awareness and participation
  - Used online voting mechanism
  - ~158,000 registered to vote; ~70,000 activated memberships; ~34,000 voted

# Representation of Public Interest

## USG White Paper:

- ICANN to “establish a system for electing a Board of Directors for the new corporation that insures that the new corporation's Board of Directors reflects the geographical and functional diversity of the Internet, and is sufficiently flexible to permit evolution to reflect changes in the constituency of Internet stakeholders.”
- “Nominations to the Board of Directors should preserve, as much as possible, the tradition of bottom-up governance of the Internet, and Board Members should be elected from membership or other associations open to all or through other mechanisms that ensure broad representation and participation in the election process.”
- Translation: We don't know – you figure it out.
- (Not mandated: Global online elections.)

# ICANN Reform

- Hot topic in recent months
- Launched by CEO Stuart Lynn in February
- Generated tons of input from all over
- Goal: Effective ICANN, focused on a well-defined mission, representative of the global Internet's diversity
  - ICANN as technical coordinating body, not a market regulator or an experiment in global online democracy.



# Stuart Lynn's Critique

- Lack of *full participation* by key stakeholders
  - Only *real* measure of legitimacy
- Overburdened by process
  - At expense of *effectiveness*
  - Government-like layers of process
    - Without government legitimacy, resources
  - Too many distractions
- Inadequate, unreliable, US-centric funding
  - With no clear path to solution
- Not seen as credible by key stakeholders
  - Instead: A (*loud*) debating society

# Needed: Fundamental Reform

- Not tinkering - Requires *radical* change
- Requires *new* mindset
- *Effectiveness* as key goal
  - Accomplishment
  - Credibility
  - Confidence
  - Participation
- *A public/private* partnership
  - Ask governments to help represent public interest
  - Only other workable alternative: International treaty organization

# Elements of Reform

- Structure
  - Board composition & selection
  - Nominating committee
- Policy-development process
  - Generic TLDs & Country-code TLDs
  - Address Supporting Organization
  - Advisory Committees: Technical, Root Name Server, Governmental, Security
- Funding
- Participation
  - Manager of Public Participation
  - Membership
- Openness and Transparency
  - Ombudsman
  - Independent Review
- Governments & The Public Interest

# ICANN = CyberGovernment?

- **A: NO!**
- ICANN has no inherent coercive power, only the ability to enter into contractual relationships through a process of consensus & consent
- Objectives: Network of agreements, that formalize and make transparent
- ICANN is not a substitute for the powers of governments (i.e., courts and laws)

# ICANN = CyberGovernment?

- No: ICANN coordinates unique identifiers.
- **But:** Technical coordination of unique values sometimes entails non-technical policy issues:
  - Data privacy protection
    - (WHOIS database)
  - Intellectual property/trademark law
    - (UDRP)
  - Competition law
    - (Registrar accreditation for .com, .net, .org)

# What ICANN doesn't do

- Network security
- Financial transactions
- Data Privacy
- Internet Content
  - Pornography; hate speech
  - Copyright violations
  - Deceptive business practices / consumer protection
- Multi-national commercial disputes
- Definition of technical standards
  - Network surveillance and traceability
- Internet gambling
- Spam

# What ICANN is NOT

- Technical Standard-Setting Body
- Internet Police Force
- Consumer Protection Agency
- Economic Development Agency
- Legislature or Court

# What ICANN does do:

- Coordinate the Internet's systems of unique identifiers
  - And address **directly** related policy issues
- Plus: Set policies for the gTLD registries
  - (Thank-you, US government!)





# Message to You:

(and to all Internet communities)

# GET INVOLVED!!!

[www.icann.org](http://www.icann.org)



# For Further Information:

Andrew McLaughlin  
<ajm@icann.org>

<http://www.icann.org>