IANA:
3 Years since the Transition

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Director, IANA Operations

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Three years ago

- From 2000 until 2016, ICANN performed the IANA functions under a contract with the US Government
  - Prior to ICANN, IANA functions were activities under other US Government programs
- The **IANA stewardship transition** ended that contractual oversight role and replaced it with a model where the ICANN community oversees the functions
- The formal model the community designed creates a new non-profit that operates the IANA functions called **Public Technical Identifiers** (PTI), a backronym for *post-transition IANA*.

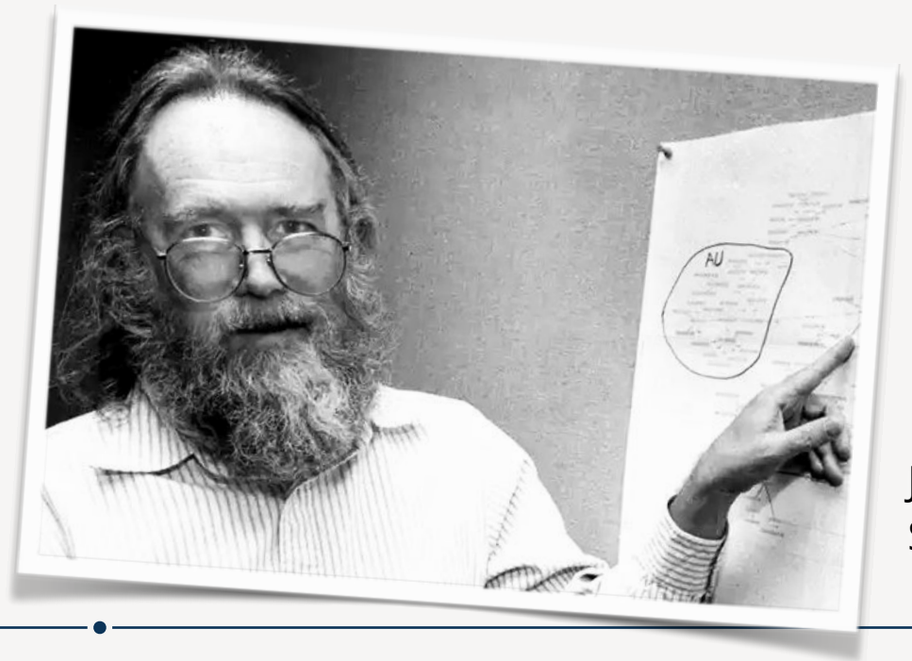
12am 1 October 2016
The IANA contract ends

It is a good time to recap

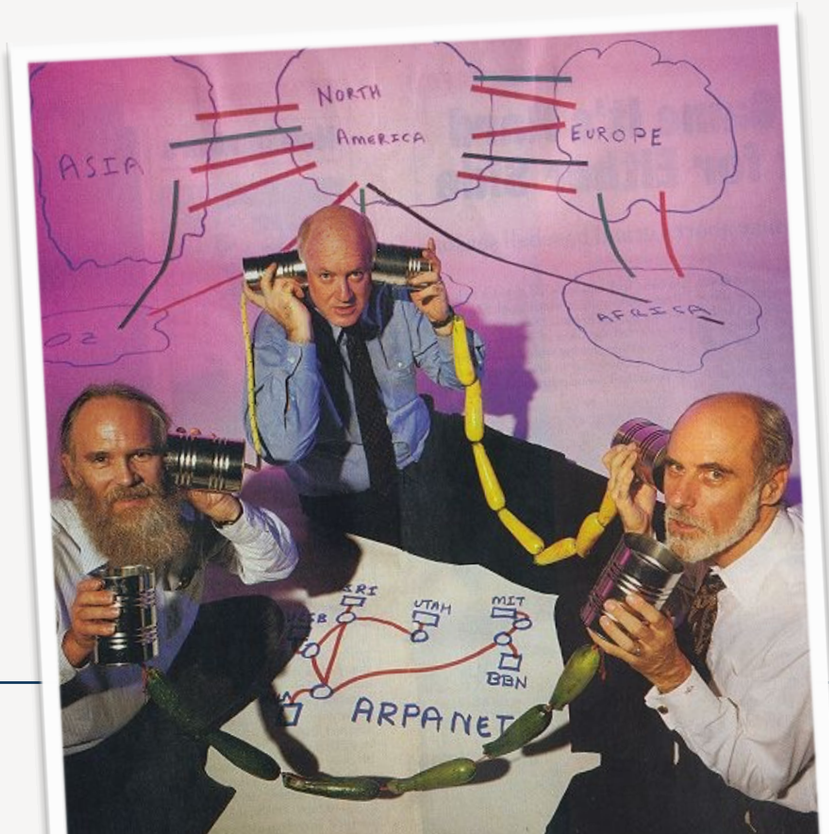
- What has changed?
- What stays the same?
- This is a review of the IANA functions, how they work and the ultimate impact of the transition

What are the IANA functions?

- The record keeper for the unique names and numbers used by Internet technologies to interoperate
- The IANA functions pre-date ICANN. In 1998, ICANN was established to be the home of the IANA functions
- The unique identifiers include protocol parameters, Internet numbers and domain names
- The IANA team maintains these records according to policies adopted by Internet names, numbers and protocol standards communities

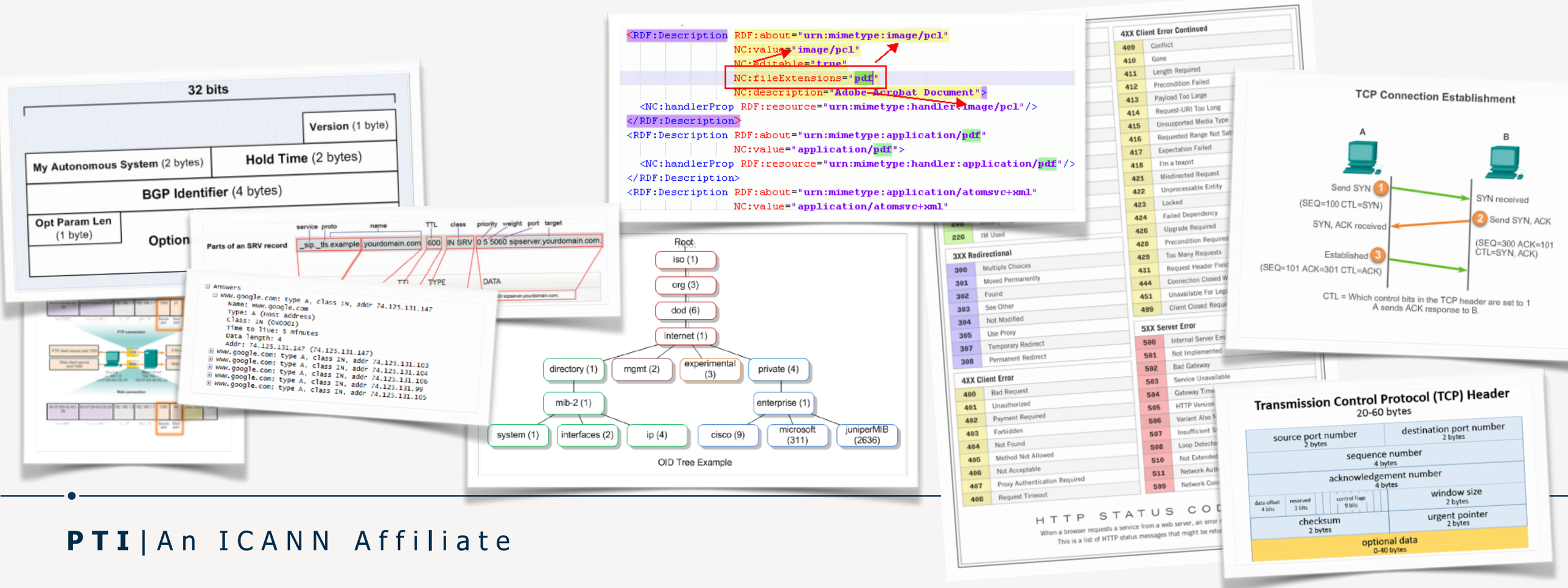


Jon Postel (L) started the IANA; with Steve Crocker and Vint Cerf (R)

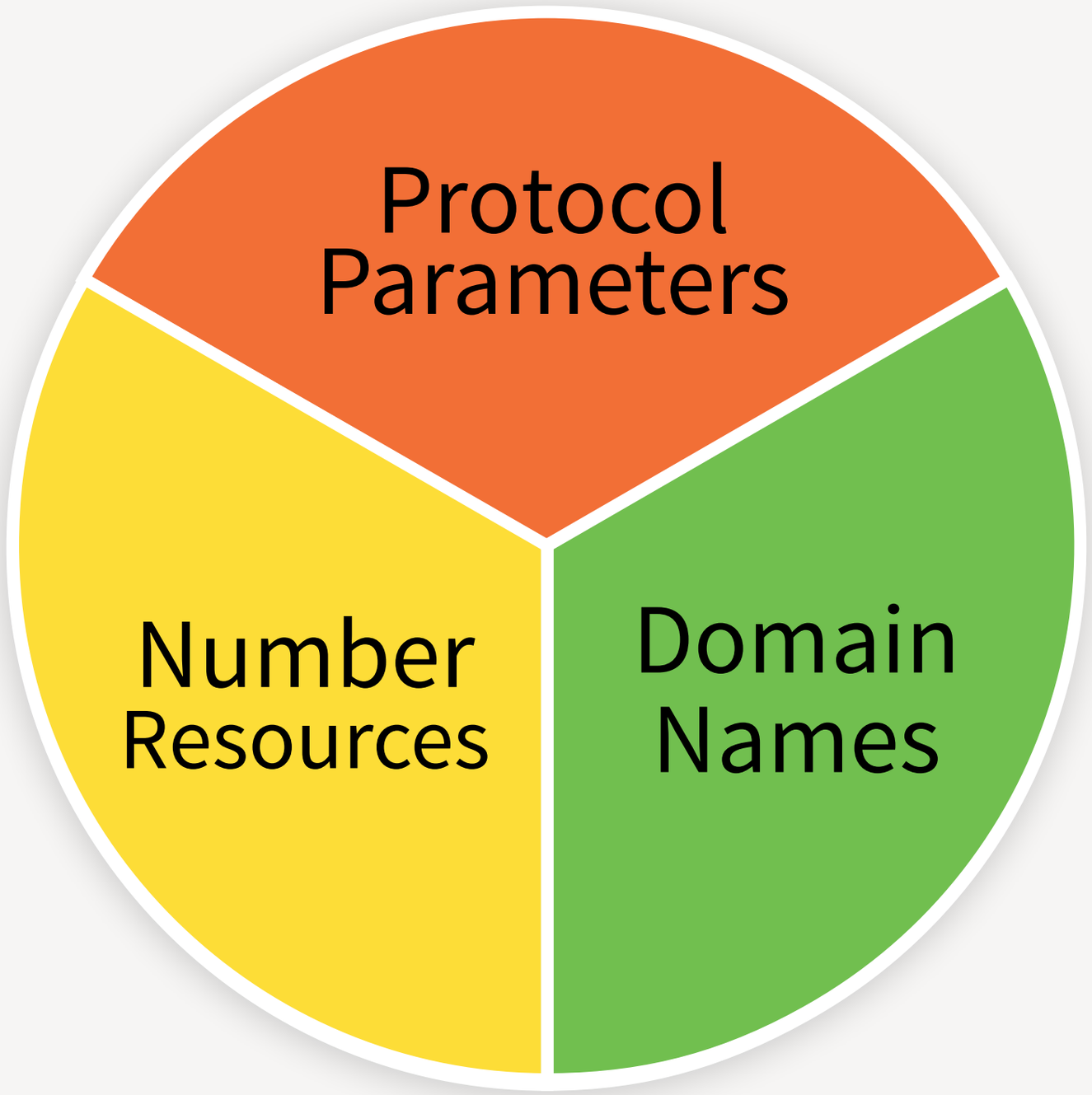


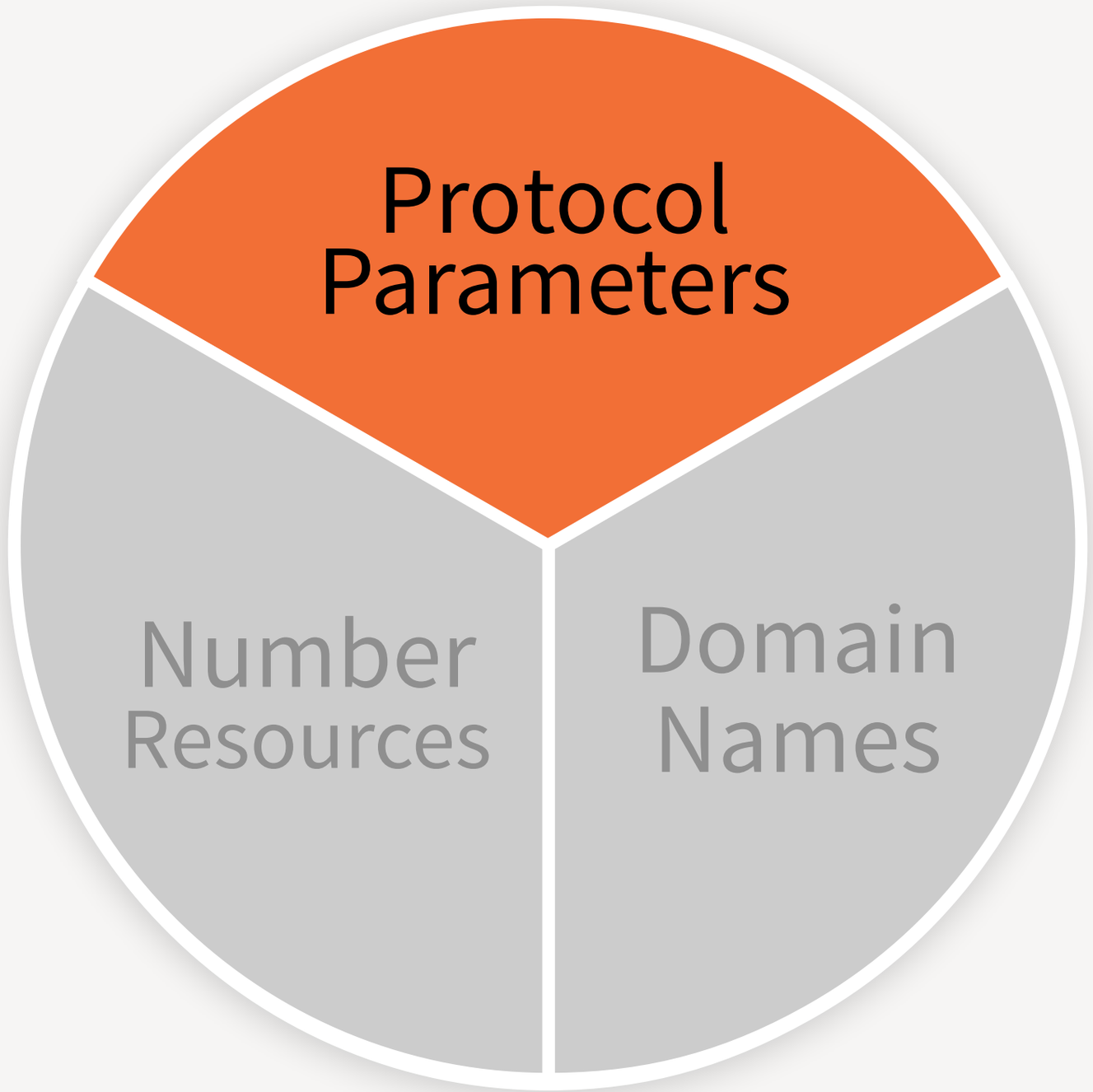
Why do the IANA functions exist?

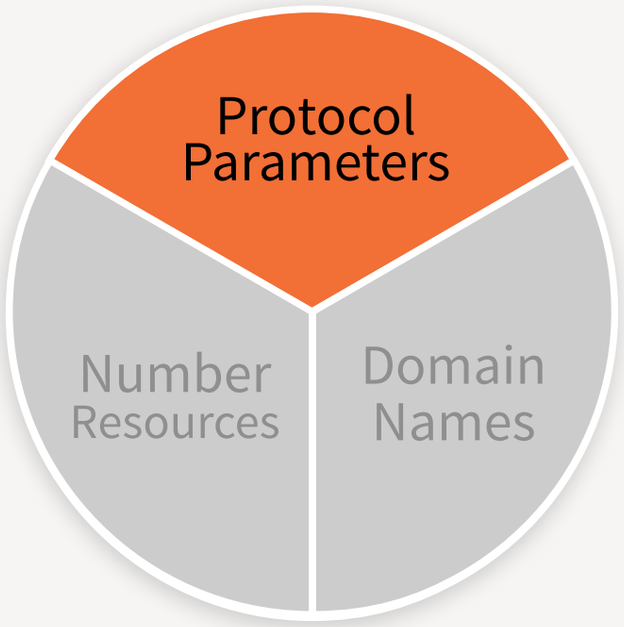
- Coordinating the Internet unique identifier systems is needed to ensure the Internet interoperates globally
- If Internet-connected devices do not use the same system of identifiers and numbers to talk to one another, the system will not interoperate (i.e. speak a common language)
- The authoritative registries are used by vendors, service providers, businesses, application developers and others to innovate and expand the use of the Internet



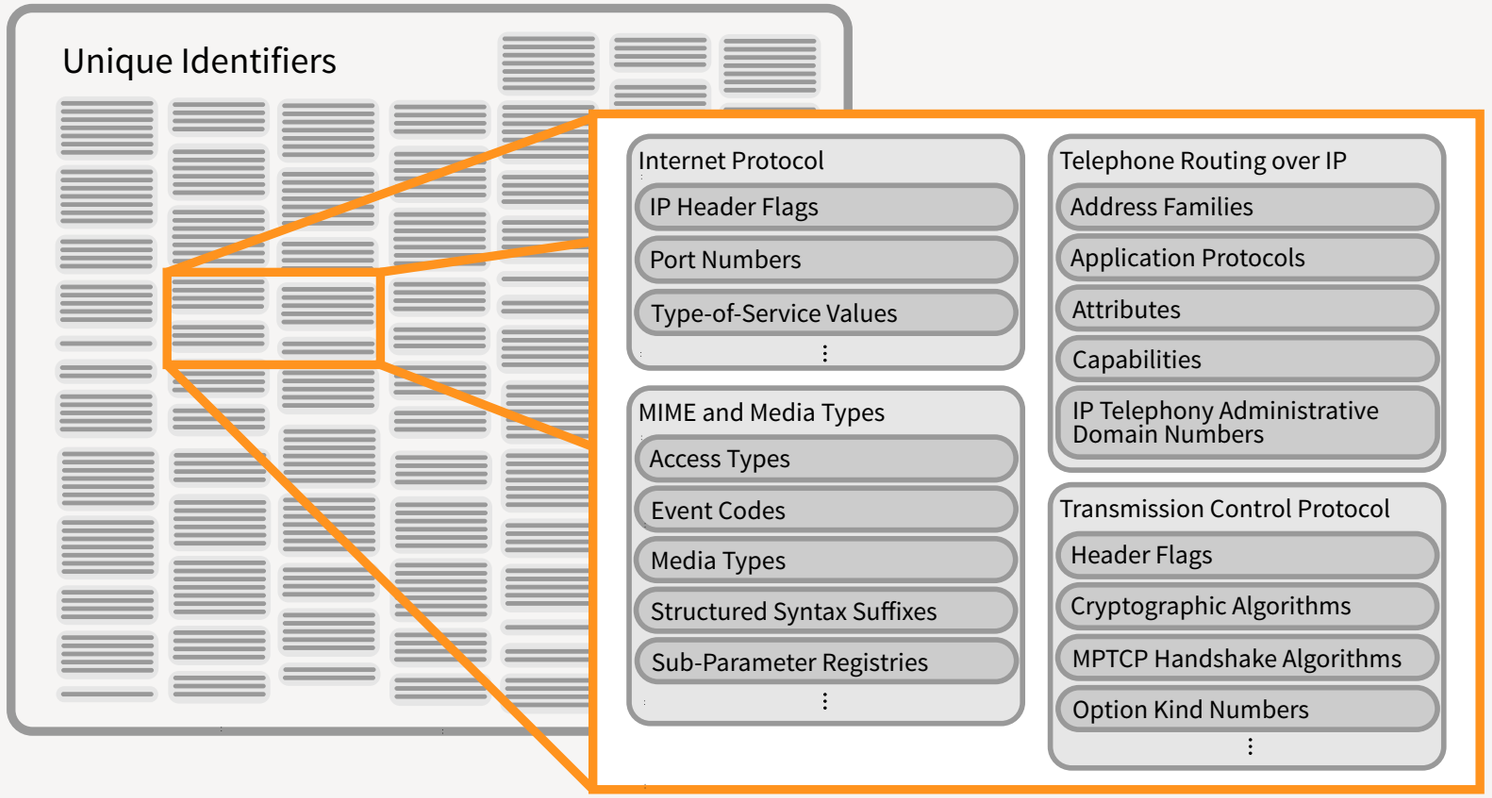
The core IANA functions areas

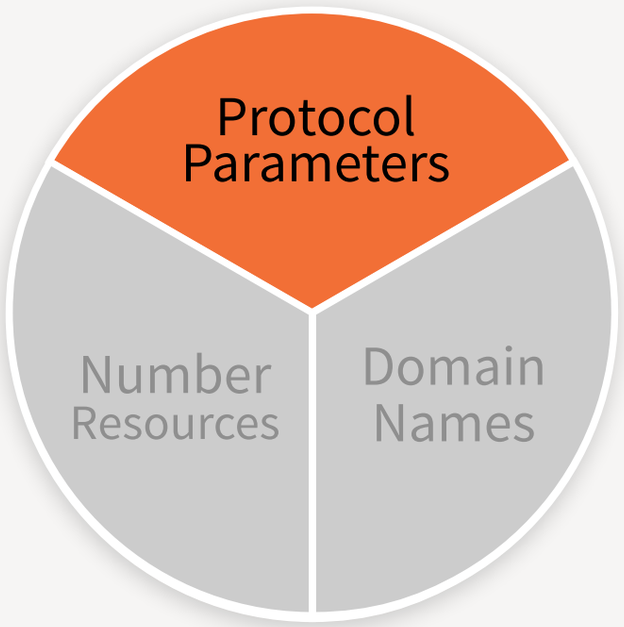



Protocol Parameters
Number Resources
Domain Names

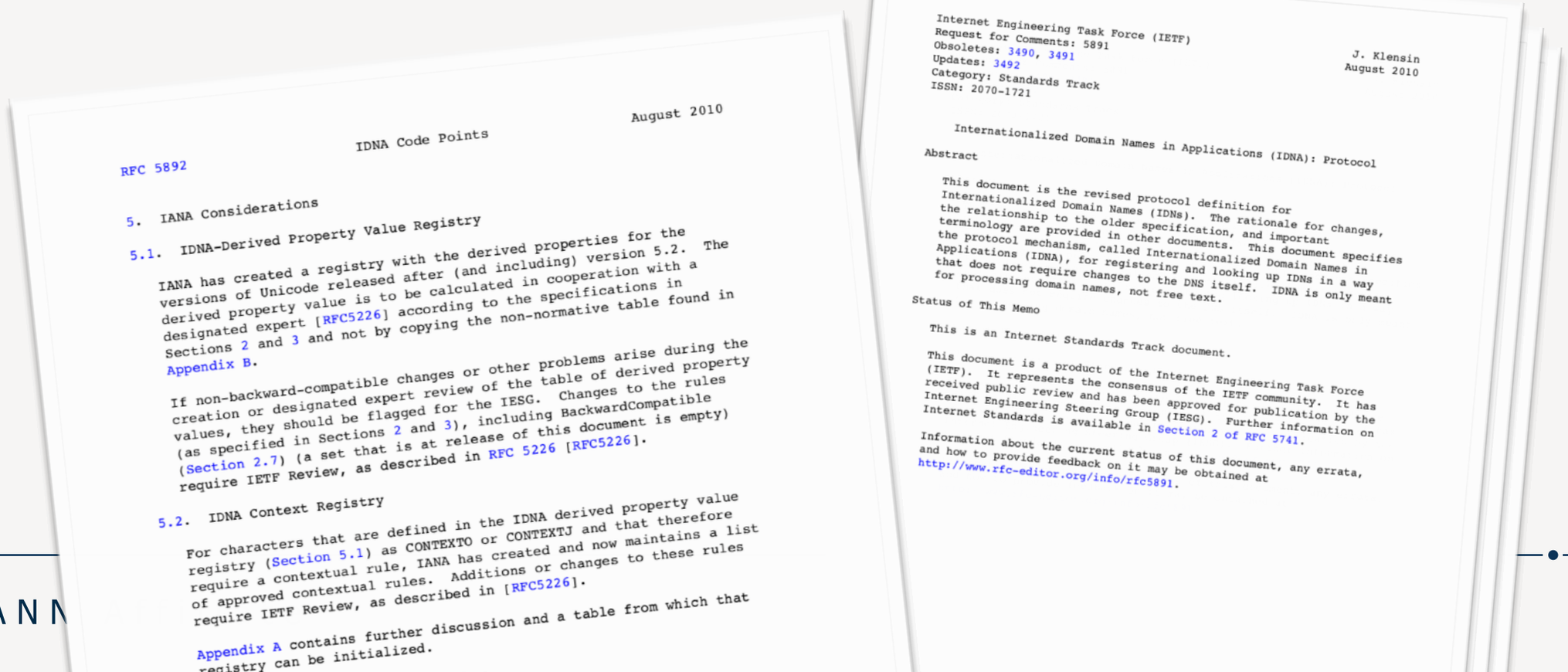


- **Protocol Parameters** are used everywhere and are directly issued by IANA. Rules differ for the qualifying criteria for each type. Applications are evaluated by IANA according to the set criteria.
- Most protocol parameters' visibility is limited to software implementors (i.e. inside software code).





- The **Internet Engineering Task Force** (IETF) develops the Internet standards that define protocol parameter systems. These documents include guidance on unique identifiers that IANA most implement, referred to as “IANA Considerations”:
  - Instructions on the creation of a unique registry for protocol parameters
  - Registration policy
  - Initial registrations and reserved values



RFC 5892 IDNA Code Points August 2010

5. IANA Considerations

5.1. IDNA-Derived Property Value Registry

IANA has created a registry with the derived properties for the versions of Unicode released after (and including) version 5.2. The derived property value is to be calculated in cooperation with a designated expert [RFC5226] according to the specifications in Sections 2 and 3 and not by copying the non-normative table found in Appendix B.

If non-backward-compatible changes or other problems arise during the creation or designated expert review of the table of derived property values, they should be flagged for the IESG. Changes to the rules (as specified in Sections 2 and 3), including BackwardCompatible (Section 2.7) (a set that is at release of this document is empty) require IETF Review, as described in RFC 5226 [RFC5226].

5.2. IDNA Context Registry

For characters that are defined in the IDNA derived property value registry (Section 5.1) as CONTEXTO or CONTEXTJ and that therefore require a contextual rule, IANA has created and now maintains a list of approved contextual rules. Additions or changes to these rules require IETF Review, as described in [RFC5226].

Appendix A contains further discussion and a table from which that registry can be initialized.

Internet Engineering Task Force (IETF)
Request for Comments: 5891
Obsoletes: 3490, 3491
Updates: 3492
Category: Standards Track
ISSN: 2070-1721

J. Klensin
August 2010

Internationalized Domain Names in Applications (IDNA): Protocol

Abstract

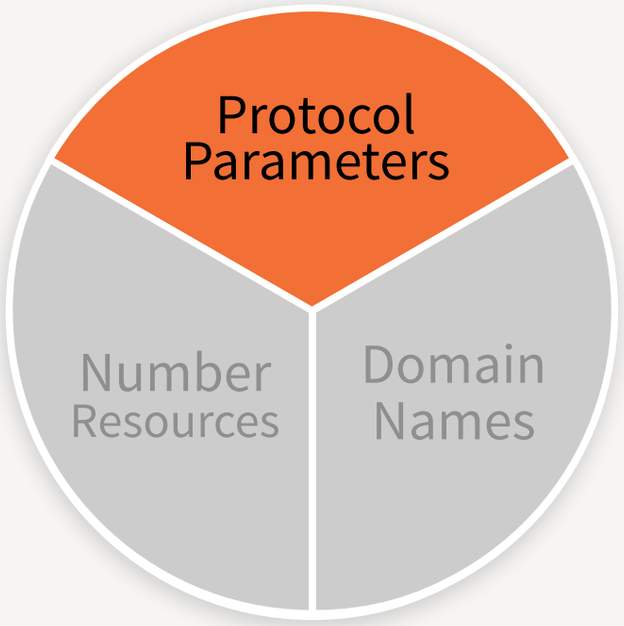
This document is the revised protocol definition for Internationalized Domain Names (IDNs). The rationale for changes, the relationship to the older specification, and important terminology are provided in other documents. This document specifies the protocol mechanism, called Internationalized Domain Names in Applications (IDNA), for registering and looking up IDNs in a way that does not require changes to the DNS itself. IDNA is only meant for processing domain names, not free text.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc5891.



- There are thousands of protocol parameter registries spanning many different technologies

around **3,000** protocol parameter registries

iana
Internet Assigned Numbers Authority

DOMAINS NUMBERS PROT

Protocol Registries

Protocol Registries
Time Zone Database
IANA's Performance
IETF Draft Status

Protocol Registries

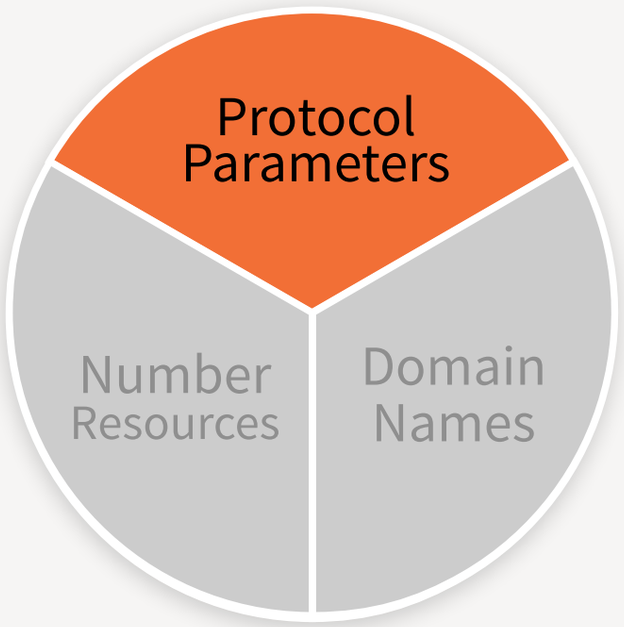
IANA is responsible for maintaining many of the codes and numbers contained in a variety of Internet protocols, enumerated below. We provide this service in coordination with the Internet Engineering Task Force (IETF).

For more information on how to create registries, please see RFC 5226, Section 4. This document also covers the requirements for IANA Considerations in RFCs.

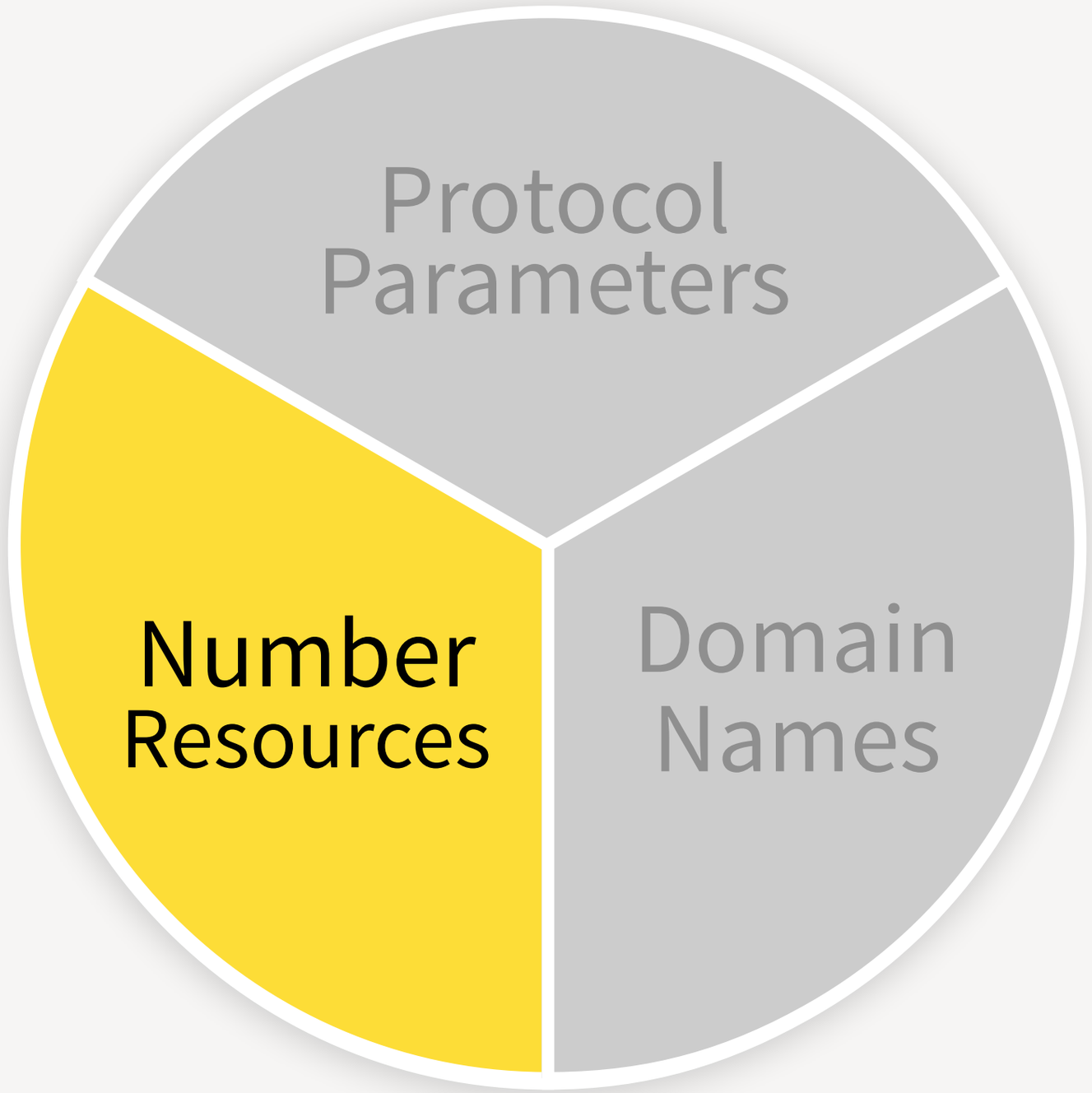
To view the various protocol registries, just click on their titles. To apply to modify a registry, use the relevant form. The qualifications for changing a protocol vary depending on the governing standards documents.

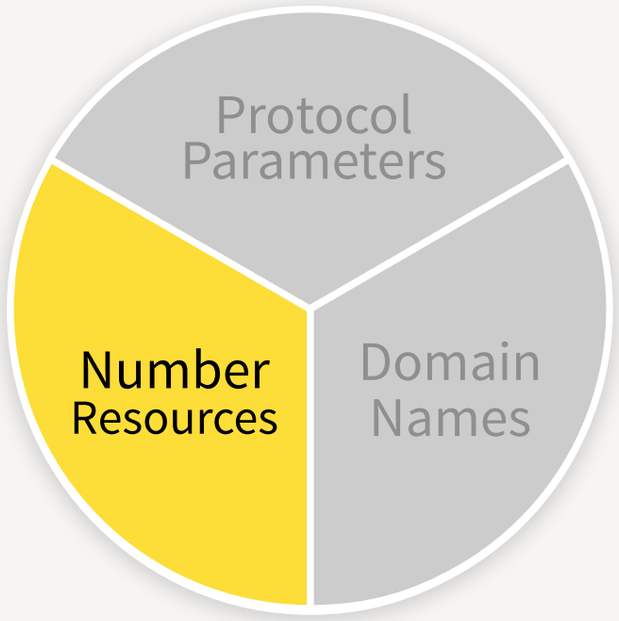
A B C D E F G H I J K L M N O P Q R S T U V W X Y

Protocol/Registry	Defining Document/Comments
A	
Access Node Control Protocol (ANCP)	
ANCP Capability Types	RFC 6320 Standards Action
ANCP Command Codes	RFC 6320 Standards Action
ANCP Message Types	RFC 6320 Standards Action
ANCP Port Management Functions	RFC 6320 Standards Action
ANCP Result Codes	RFC 6320 0x0-0xFFF: IETF Review. 0x1000-0xFFFFFF: Specification Required.
ANCP Technology Types	RFC 6320



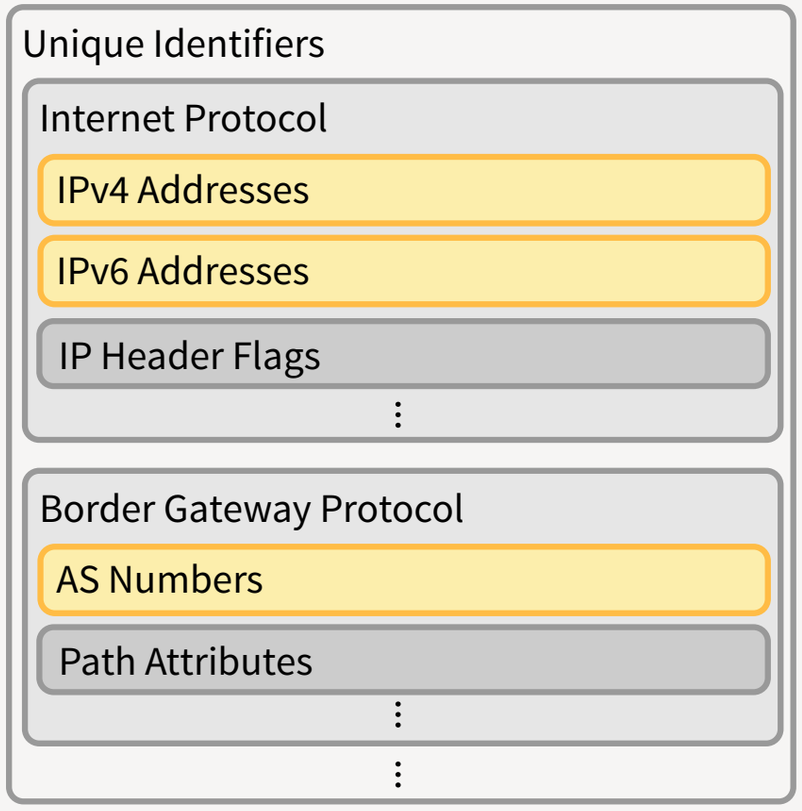
- IANA role includes:
  - Maintaining and publishing registry data
  - Receiving and evaluating requests to create new registries and to add new values to registries
  - Providing advice on upcoming standards efforts on how it would be implemented as part of the IANA functions

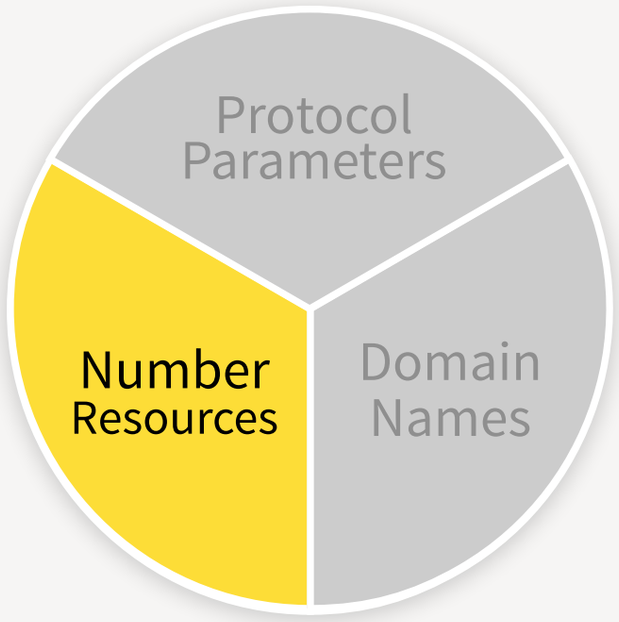

Protocol Parameters
Number Resources
Domain Names



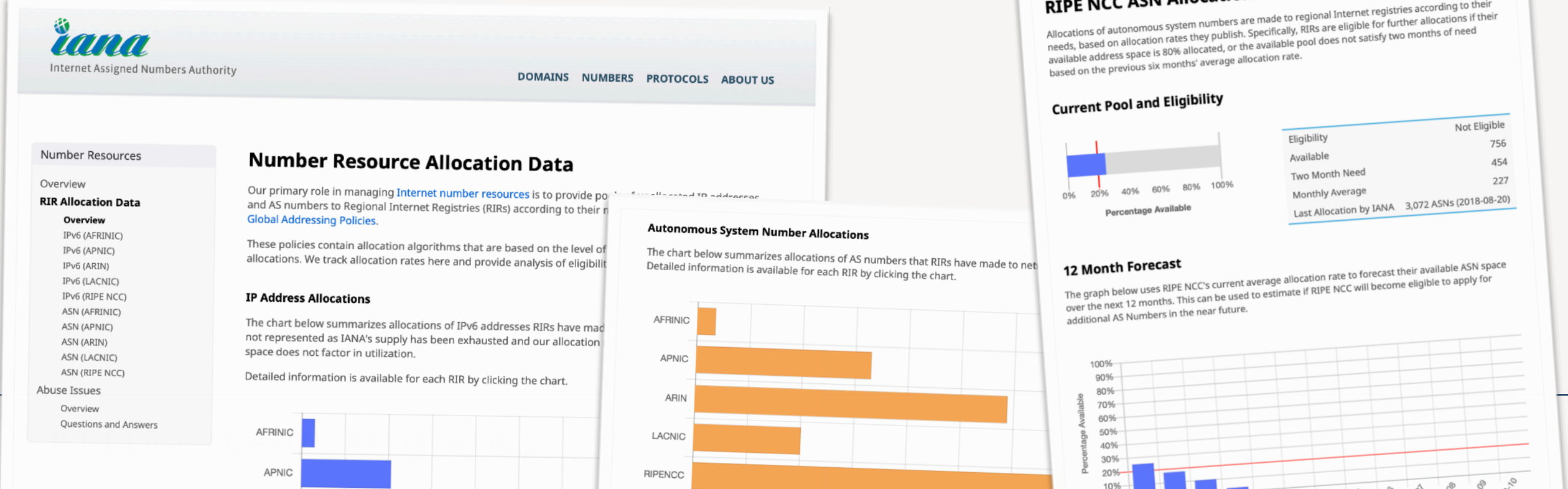
Number Resources are specialized forms of protocol parameters:

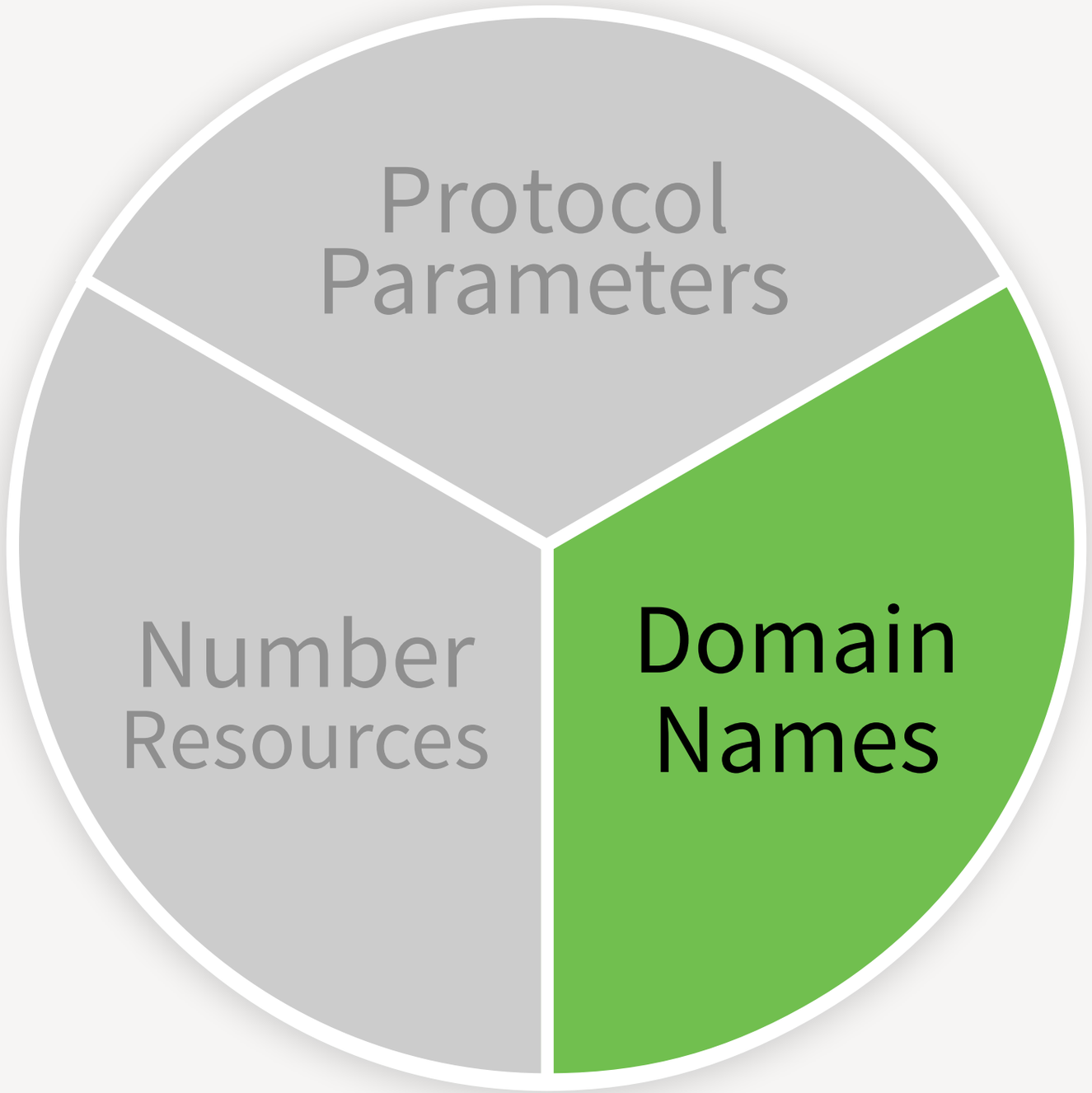
- IP Addresses: unique identifiers for devices on the Internet
- Autonomous System (AS) numbers: unique identifiers that group networks on the Internet





- Number Resources are predominantly hierarchically delegated through five Regional Internet Registries
  - RIRs in turn delegate them to ISPs and network operators in their region
  - Some specialized allocations are made directly by IANA (e.g. multicast)
- Deterministic decision making is used. Recently we launched an RIR Dashboard to show calculations against eligibility requirements




Protocol Parameters
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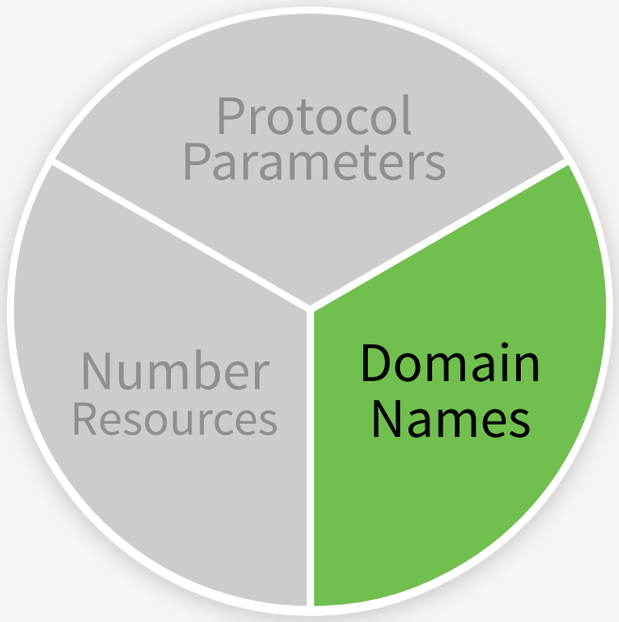
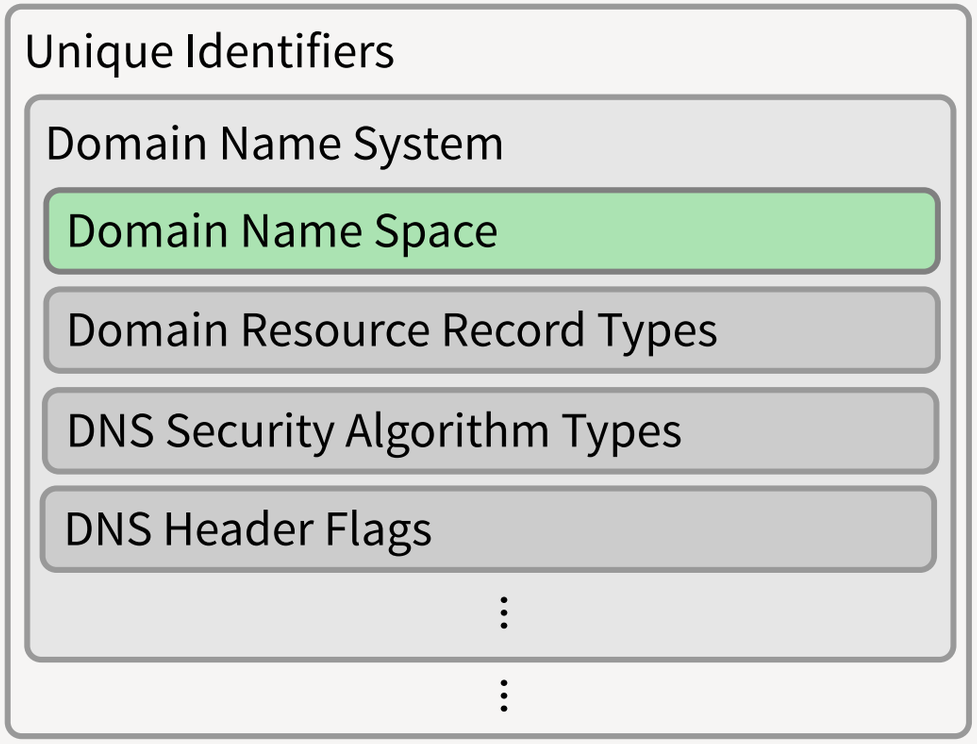
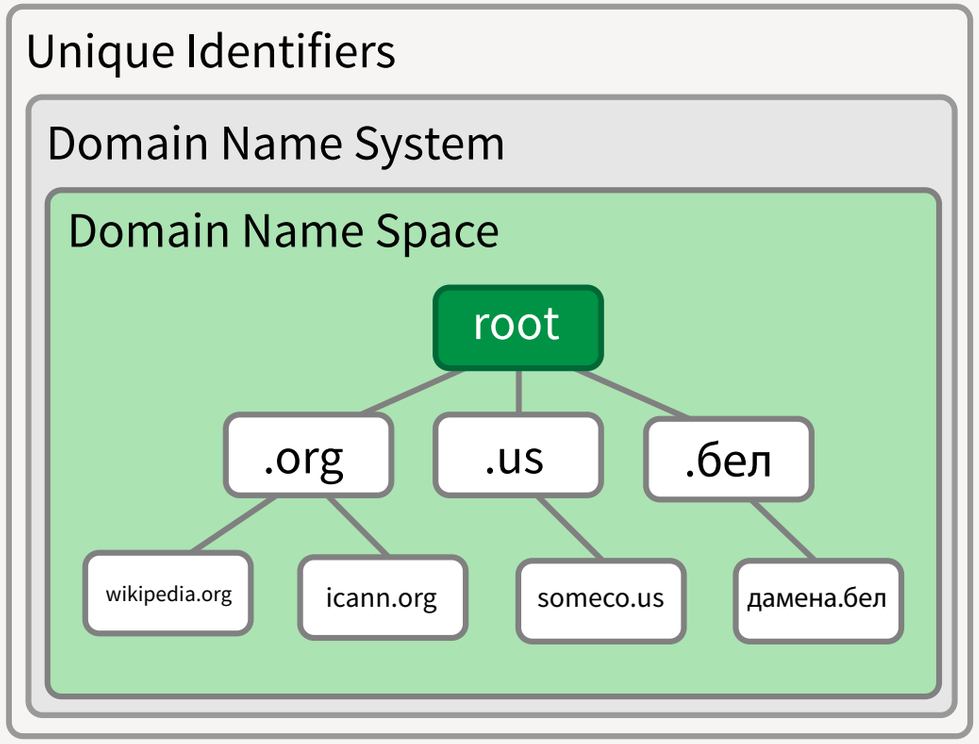
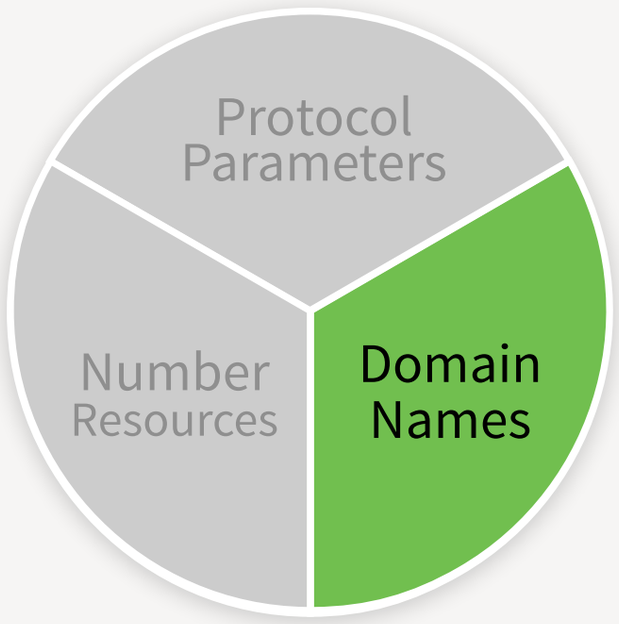


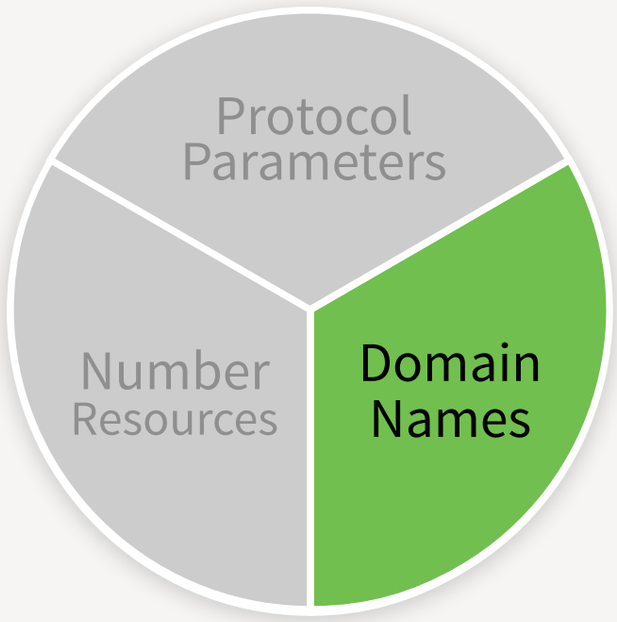
- Most notable IANA function is managing the DNS root zone, which defines top-level domains
- Like number resources, the domain name space is hierarchically delegated, with IANA responsible for the upper-most level of allocations



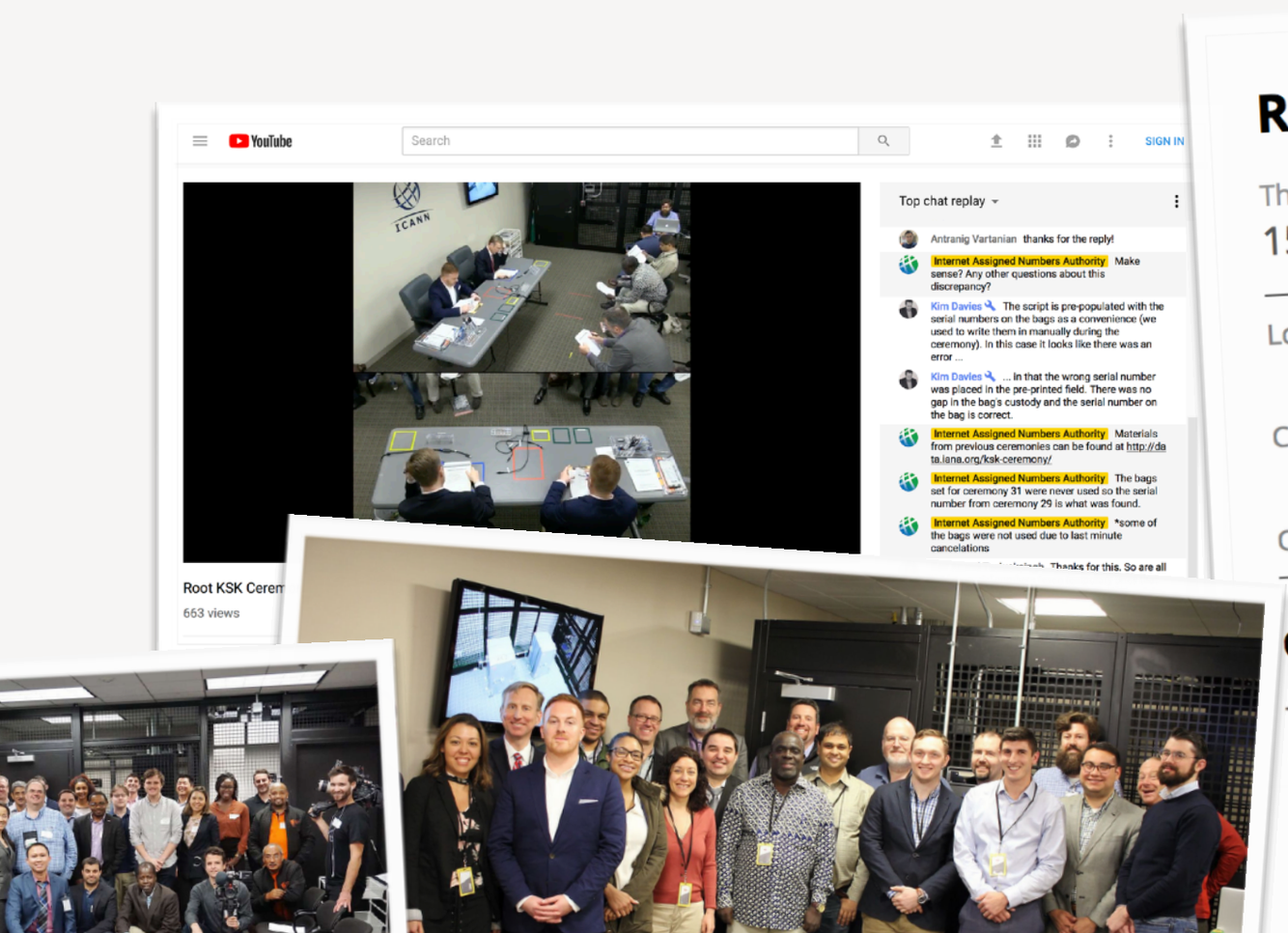


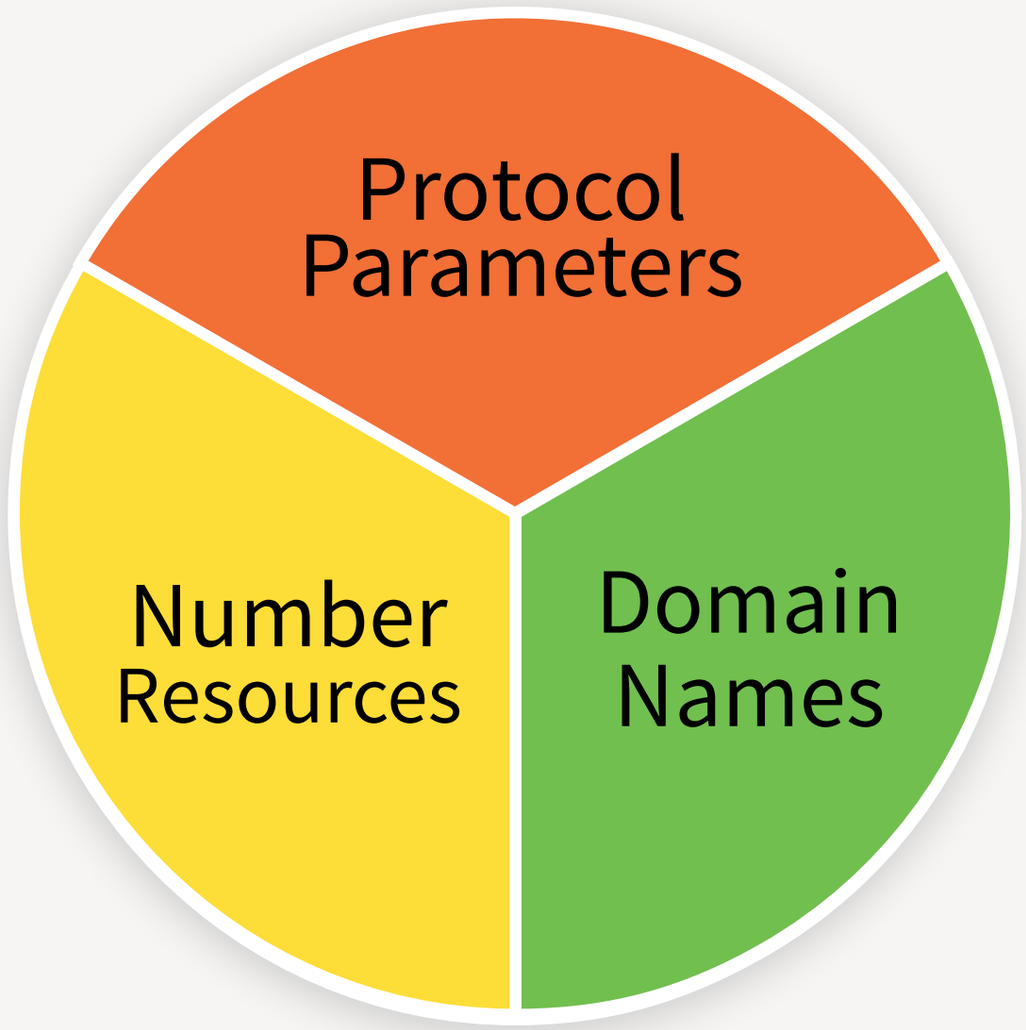


- The IANA tasks include:
  - Receiving and evaluating root zone changes requests against policies and operational requirements:
    - Assignment and transfer of TLDs
    - Routine maintenance of name servers and other technical elements
    - Points of Contact
  - Transmitting vetted changes for implementation in the root zone and root servers
  - Operating the .INT domain for intergovernmental treaty organizations
  - IDN table/LGR repository maintenance

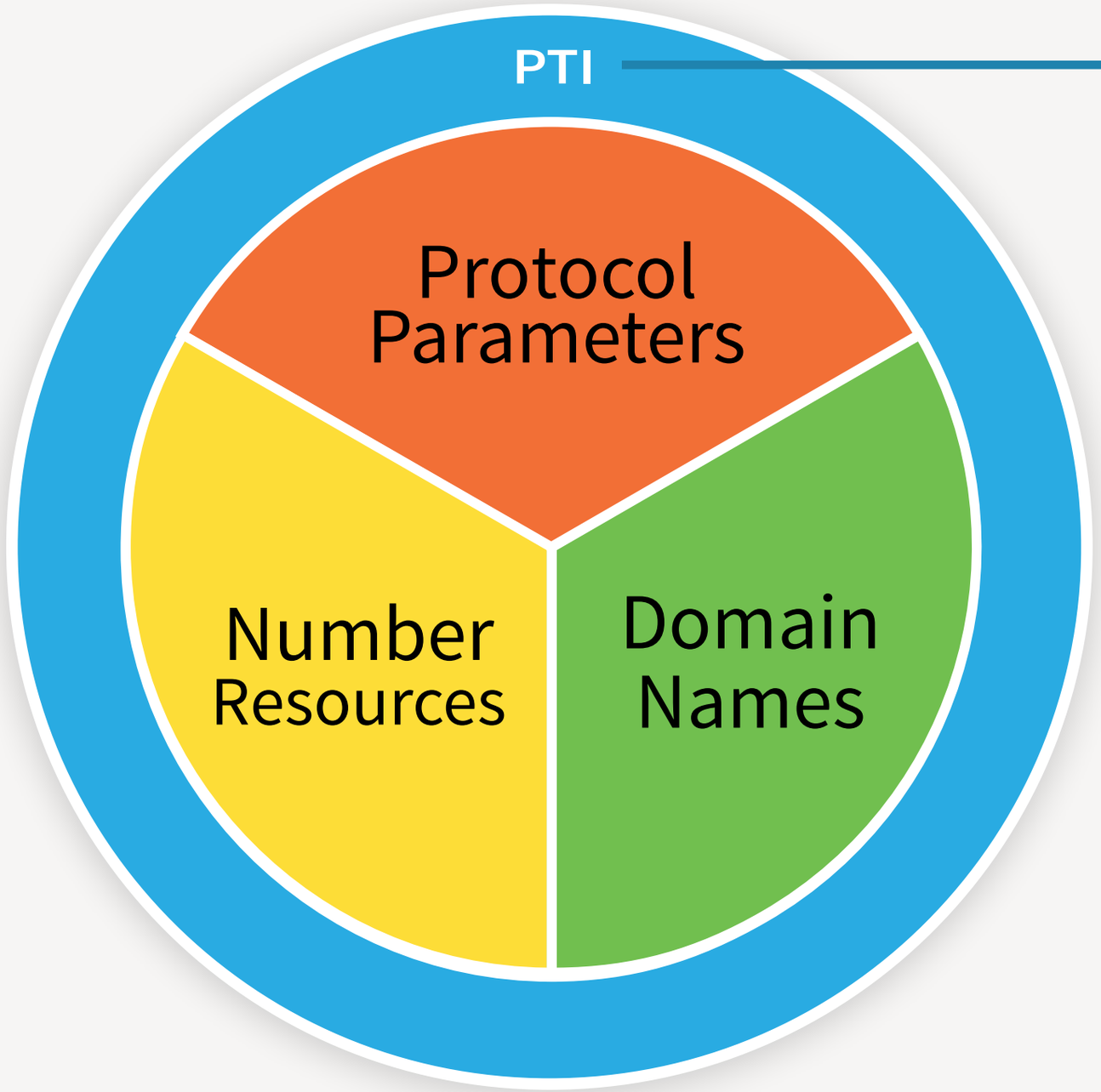


- Managing the trust anchor for the DNS (the “Root Zone Key Signing Key”)
  - Using the key happens in public “key signing ceremonies”, involving trusted community representatives and other oversight.
  - Includes managing the lifecycle of the key, including when it is replaced (a “rollover”)



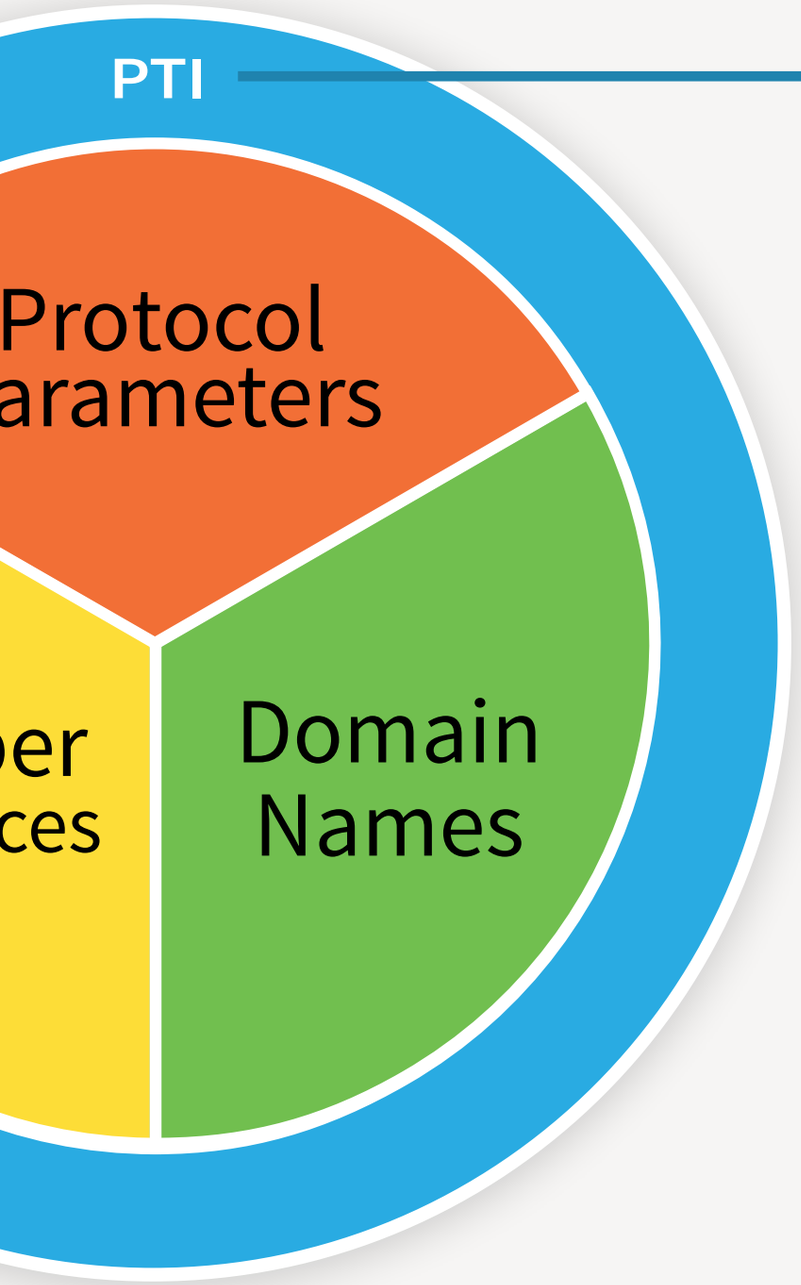


- Together, protocol parameters, number resources and domain names comprise the IANA functions
- These divisions also represent the three different accountability mechanisms for these functions



Public Technical Identifiers

- Performs the IANA functions
- Hires the IANA staff
- Is a non-profit organization created in 2016
- ICANN is its sole member (i.e. affiliate of ICANN)



IANA Staff

Alan Akahoshi
PRODUCT MGMT

Shaunte Anderson
AUDIT

Amanda Baber
REQUEST SPECIALIST

Michelle Cotton
IETF RELATIONS

Kim Davies
PRESIDENT

Aaron Foley
CRYPTOGRAPHY

Selina Harrington
REQUEST SPECIALIST

Marilia Hirano
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Jennifer Johnson
EXECUTIVE ASSISTANT

Ali Mohammadi
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Andres Pavez
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Seman Said
SOFTWARE

George Sarkisyan
REQUEST SPECIALIST

Naela Sarras
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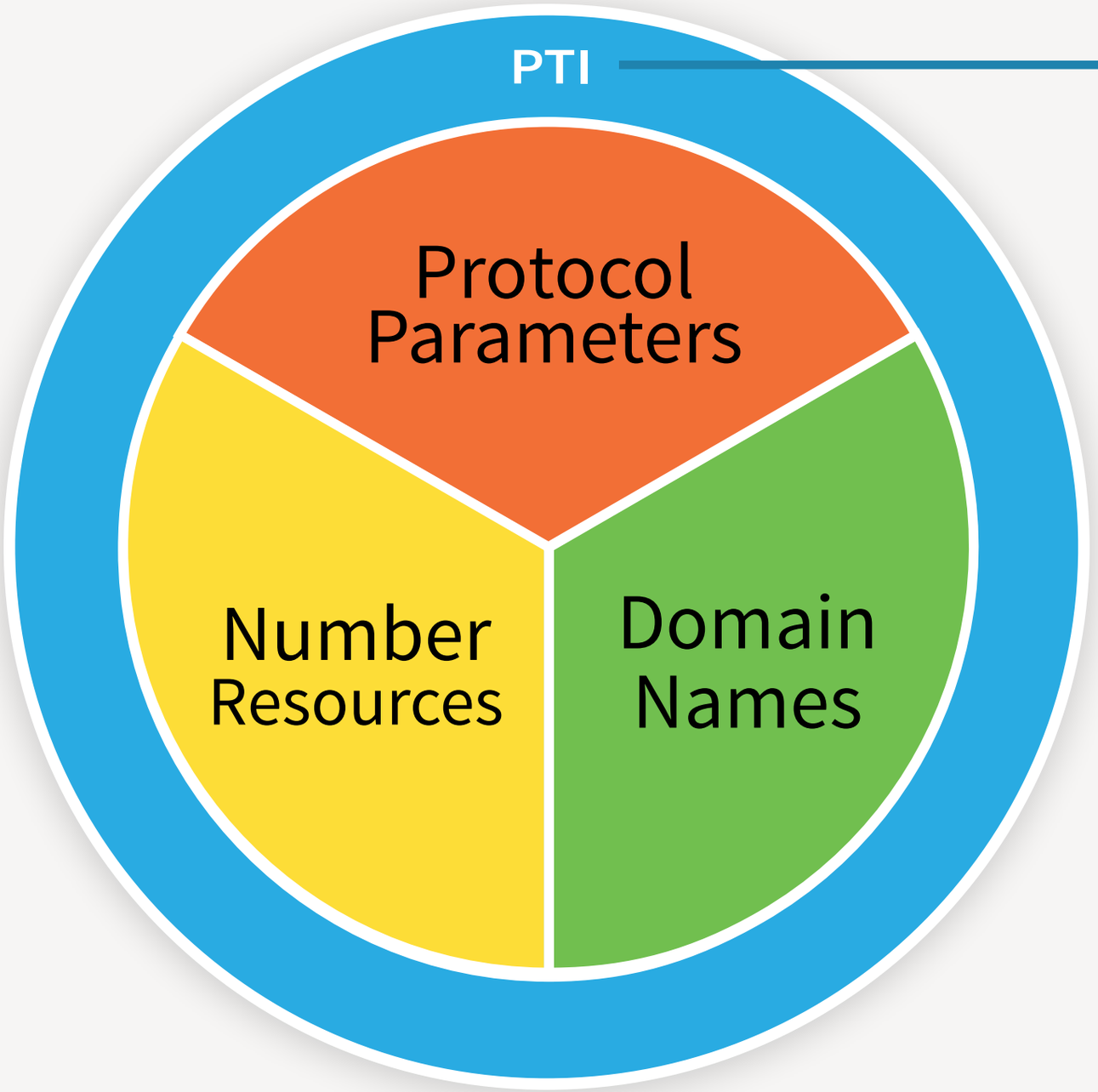
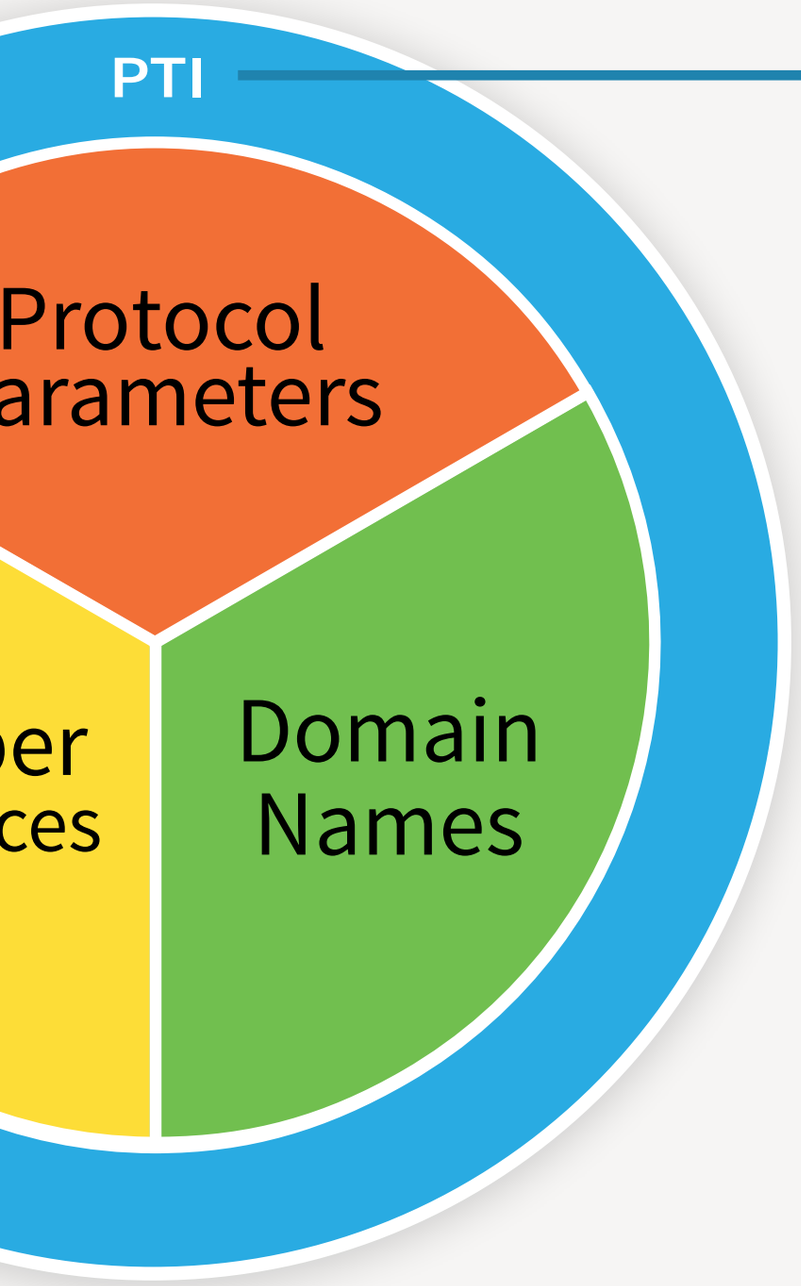
Sabrina Tanamal
REQUEST SPECIALIST



Public Technical Identifiers

- Five-member board of directors including 2 Nomcom appointees



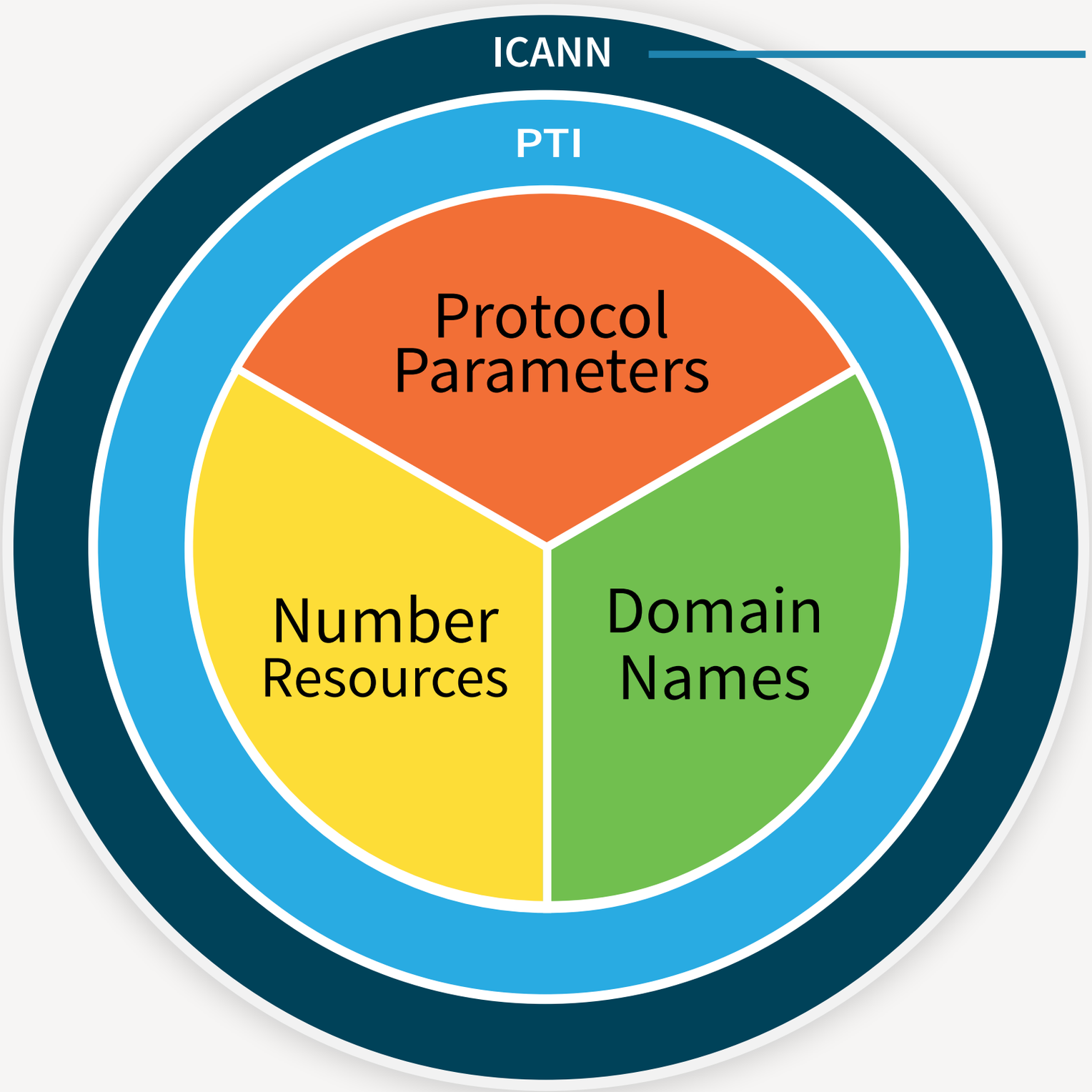
PTI Board

Lise Fuhr
CHAIR
NOMCOM APPTEE

Wei Wang
NOMCOM APPTEE

Kim Davies
PTI PRESIDENT

David Conrad
ICANN CTO



ICANN

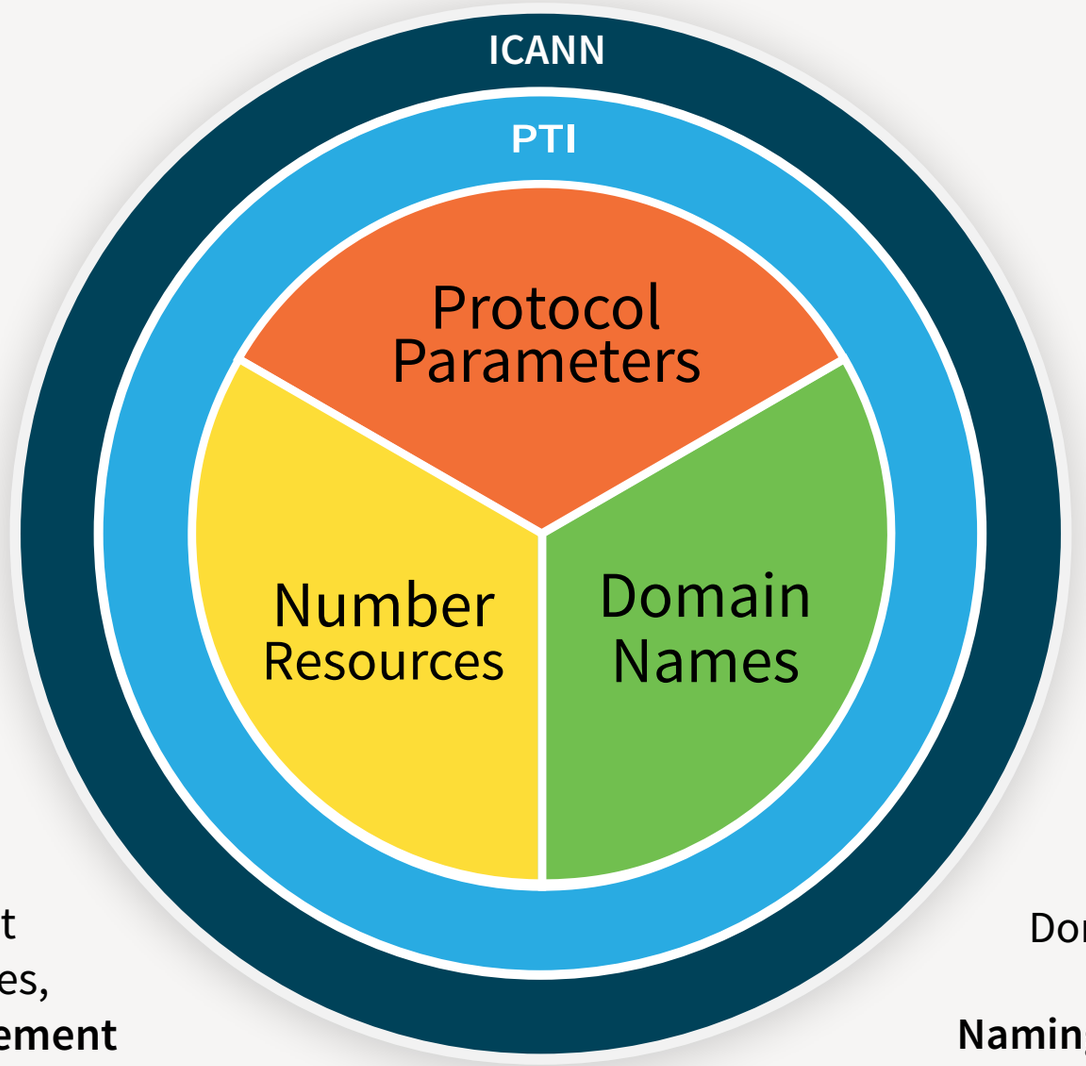
- Responsible for the IANA functions
- Contracts PTI to perform the IANA functions
- Oversees PTI's performance
- Provides shared and dedicated resources (Legal, IT, HR, Finance and many others)
- Provides all funding to PTI
- Operates additional accountability mechanisms such as Customer Standing Committee, IANA Naming Function Reviews

Accountability and Performance

Naela Sarras

Accountability

Protocol Parameter oversight
through **Memorandum of Understanding**
between **IETF** and ICANN,
subcontracted from ICANN to PTI

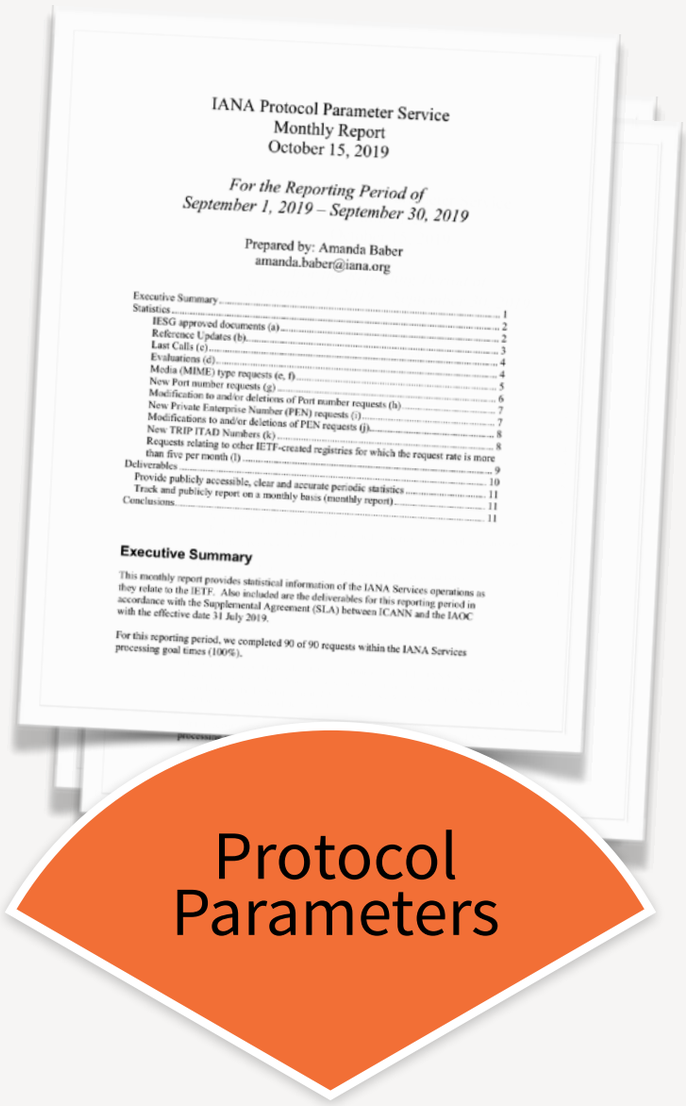


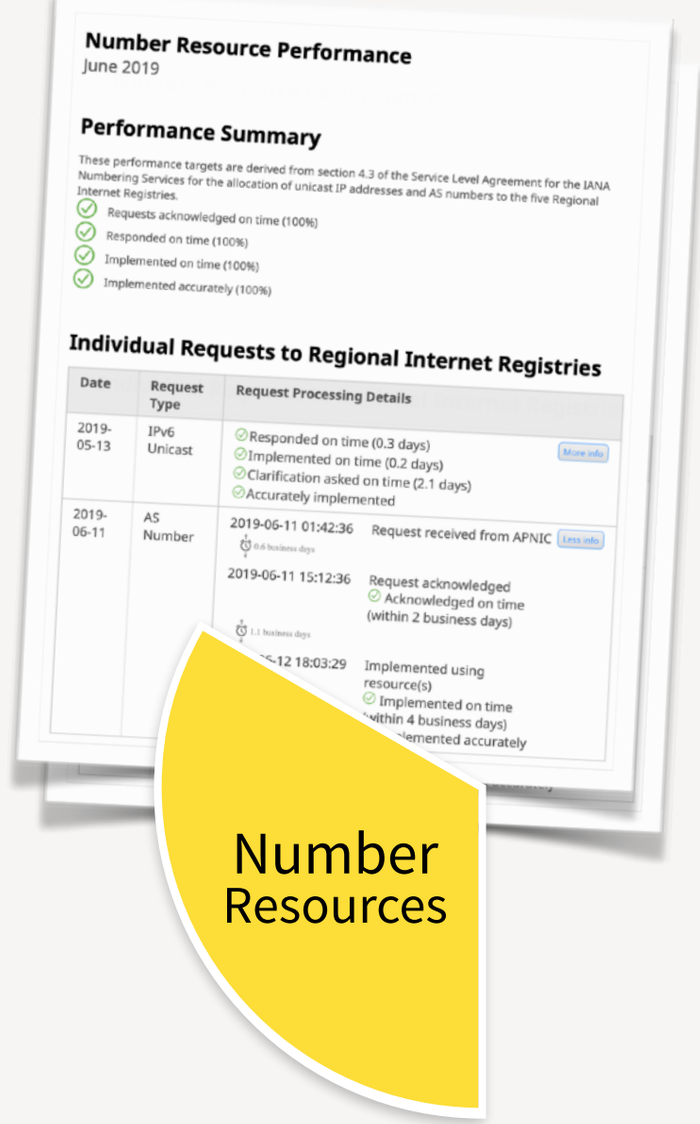
Number resource oversight
by Regional Internet Registries,
governed by **Service Level Agreement**
between ICANN and RIRs,
subcontracted from ICANN to PTI

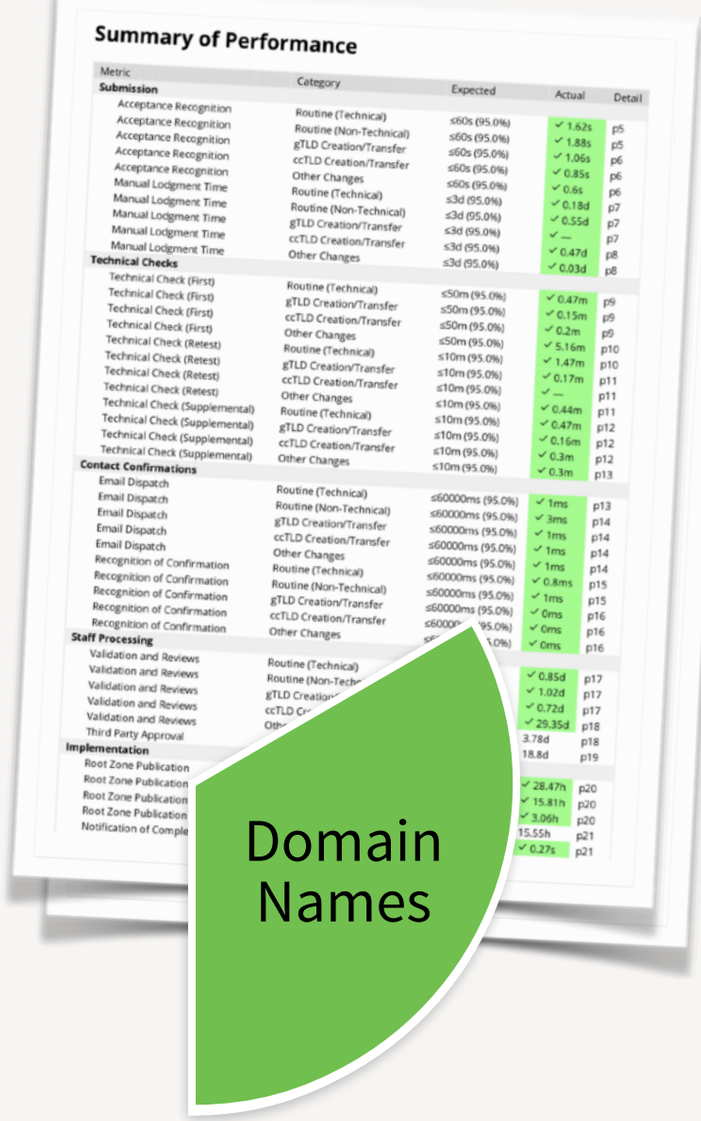
Domain Name oversight by ICANN;
governed by
Naming Contract between ICANN and PTI;
performance oversight by
ICANN Customer Standing Committee

Performance Reporting

- Monthly reporting for each of the three areas



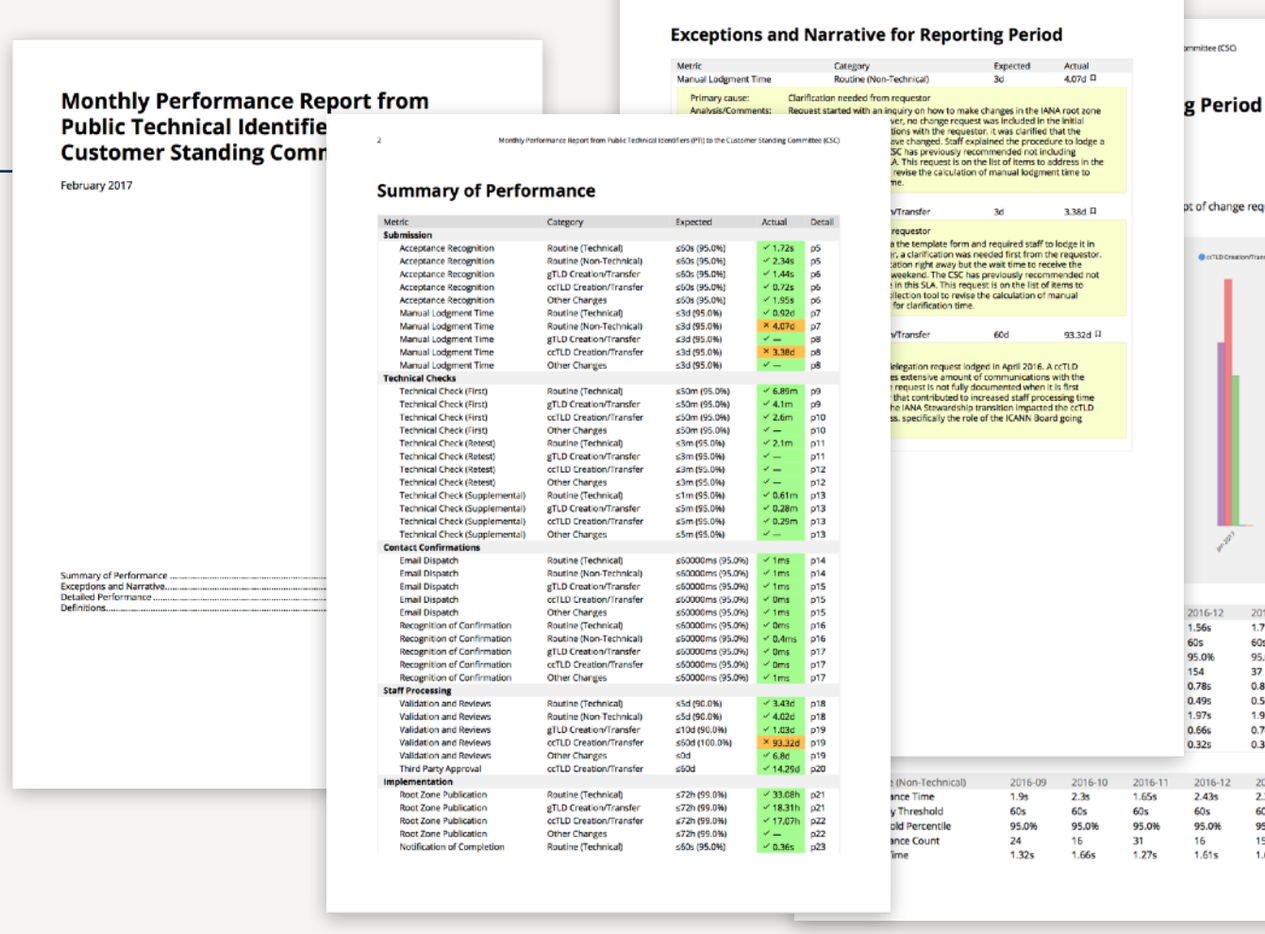




Performance Reporting

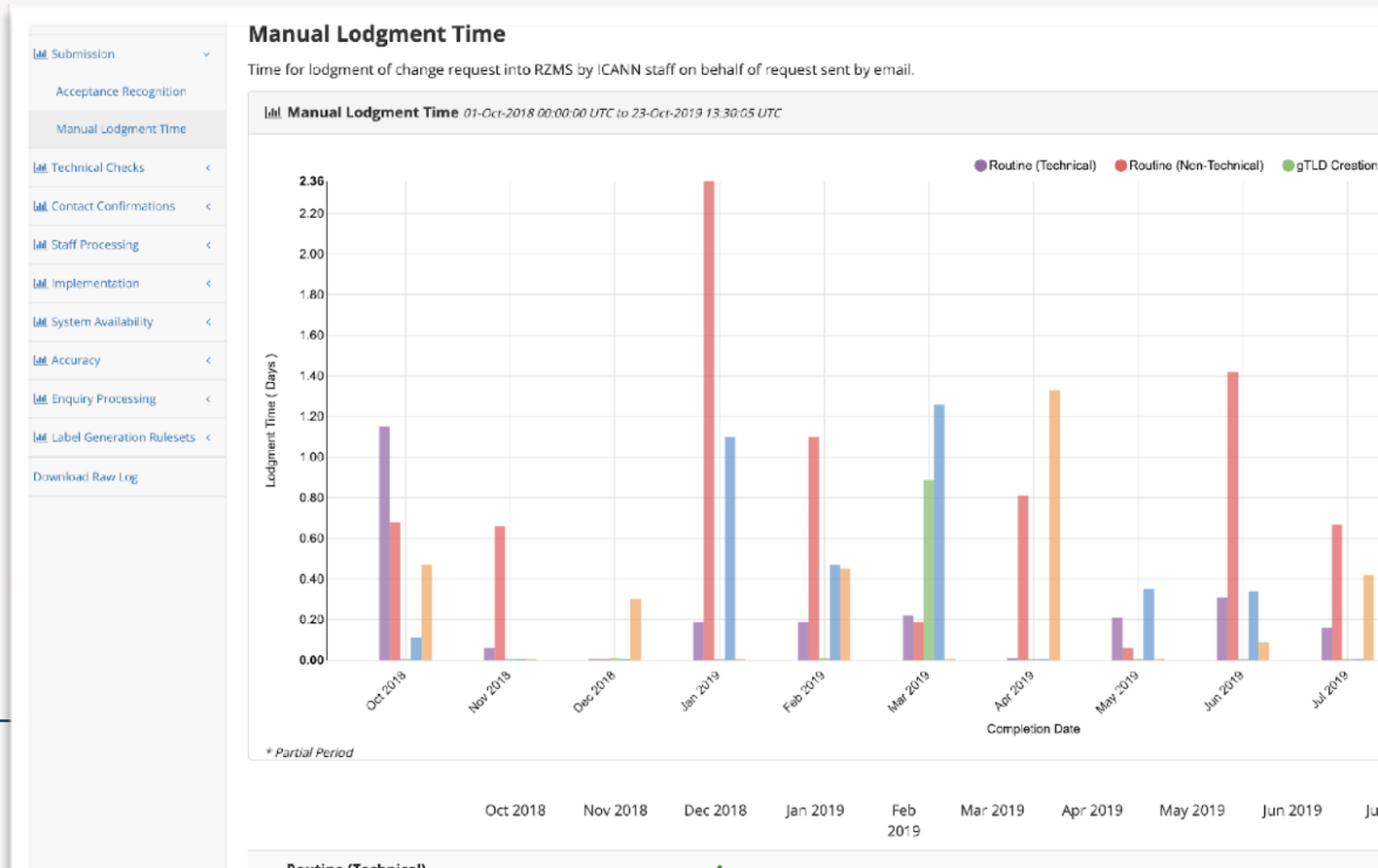
PTI produces monthly reports on its performance for its three functional areas.

iana.org/performance



Dashboard providing real-time reporting of performance metrics defined by the naming community for root zone management performance.

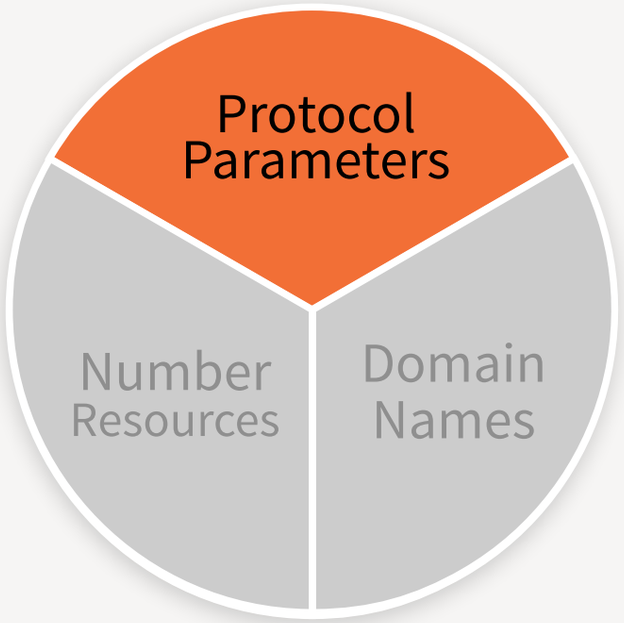
sle-dashboard.iana.org



PTI | An ICANN Affiliate

Service Level Agreements

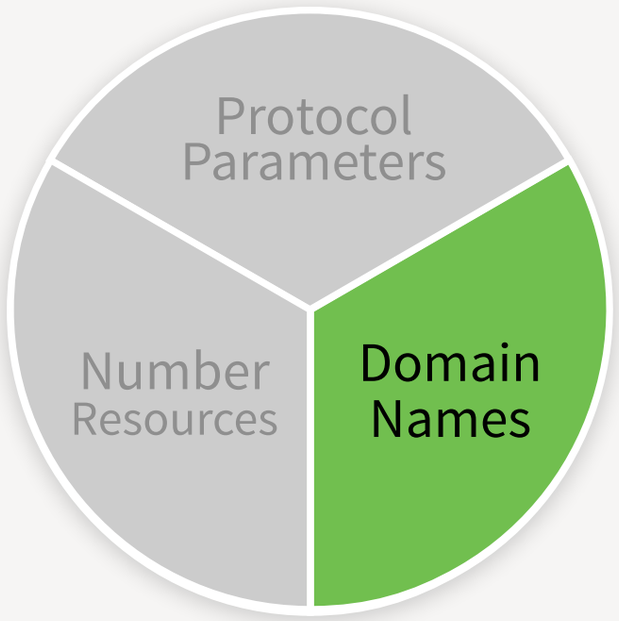
- Each three functions has service level expectations defined and reported against
  - Reports against KPIs to the IETF for protocol parameters
  - Around 70 measurement categories to the Customer Standing Committee for naming functions
  - Performance reporting to the numbering community for IP address and AS number allocations
- These figures are reviewed through various processes
  - Monthly Customer Standing Committee meetings, plus IANA Naming Function Reviews
  - Regular meetings and dialogue with IETF leadership
  - Reports to RIRs and an annual IANA Review Committee process



- SLAs are defined through an annual amendment to an MOU between ICANN and the IETF

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Number of requests	118	112	95	86	103	117	118	118	96	100	157	90
KPIs Met	100%	98%	99%	100%	100%	100%	100%	100%	99%	99%	100%	100%
Satisfactory	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

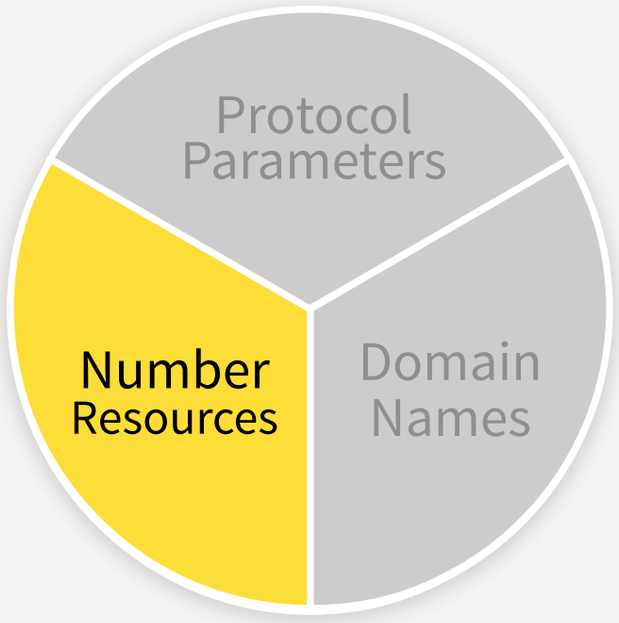
KPIs Met refers to the percentage of KPIs that met their performance target for the period.
Satisfactory means the KPIs were met to the level required by the IETF MOU



- SLAs are amended and overseen by the Customer Standing Committee

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Number of requests	30	243	37	91	307	365	254	262	259	307	1017	198
SLAs Met	100%	98%	100%	98%	100%	98%	100%	100%	100%	100%	98%	100%
Satisfactory	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

SLAs Met refers to the percentage of SLA categories that met their performance target for the period.
Satisfactory means the CSC rated performance Satisfactory or higher for the period.



- SLAs are defined by the contract between ICANN and the five RIRs

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Number of requests		1				1			2			
SLAs Met	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Satisfactory	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

SLAs Met refers to the percentage of SLA categories that met their performance target for the period.

Continuous Improvement

Marilia Hirano

Beyond service level reporting

- Audit processes
- Monitoring customer satisfaction
- Business Excellence
- Strategic and Operational planning

Information Security Audit Programs

- The system controls used for delivering the IANA functions are independently audited, with controls a big part of the team's culture.
- These audits help us constantly monitor and improve our systems.

Root Zone KSK
Since 2010, issued without exception annually. Audits the security controls that govern the Root Zone Key Singing Key.

Registry assignment & maintenance systems

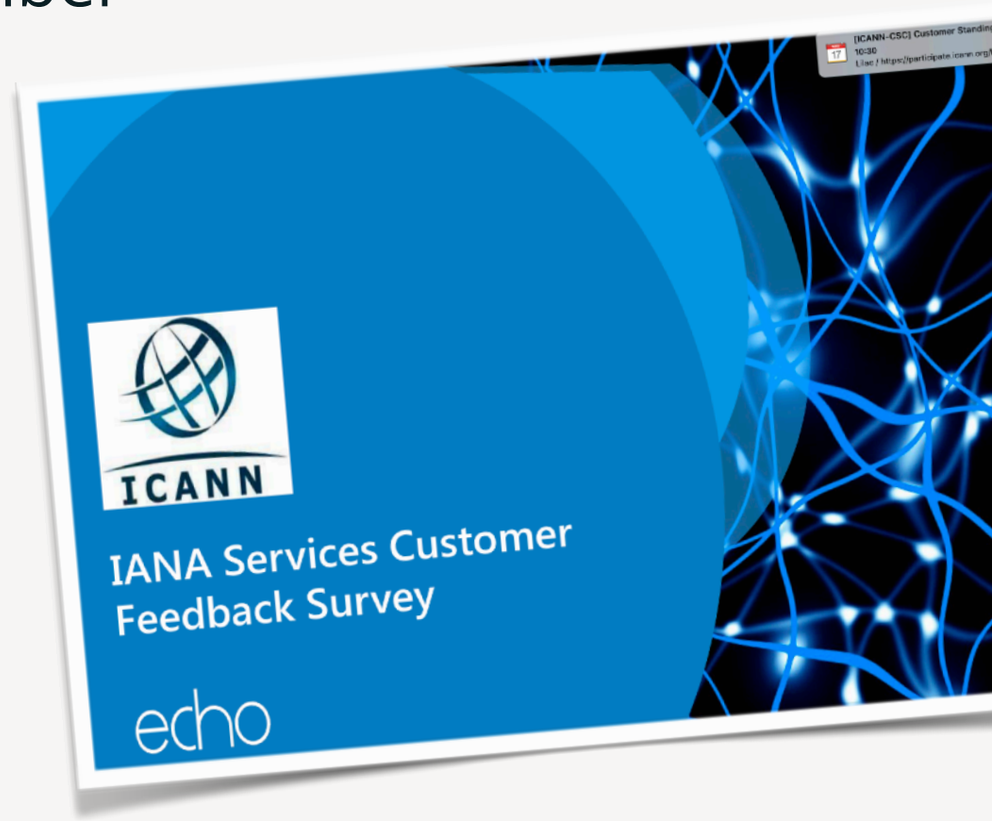
Since 2013. Covers the systems we use to process change requests, covering all three areas. Provides detailed assessment provided to our community partners.

https://iana.org/audits

Measuring customer satisfaction

Annual Survey

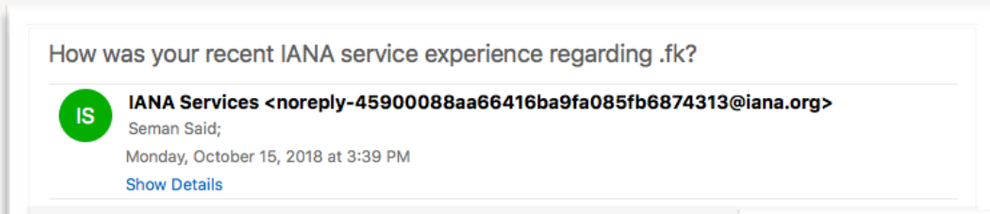
- Administered by a third party vendor since 2013
- Refined approach in 2019 to focus on engagement
  - Response Rate: 3%
  - Overall Satisfaction: 3.6 (1-5 scale)
- Detailed report to be published in December

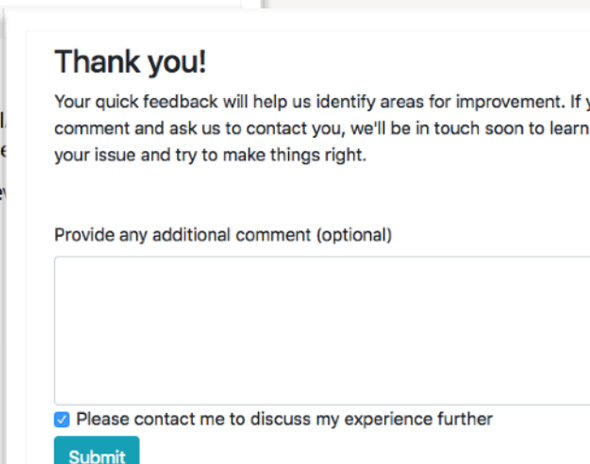


Measuring customer satisfaction

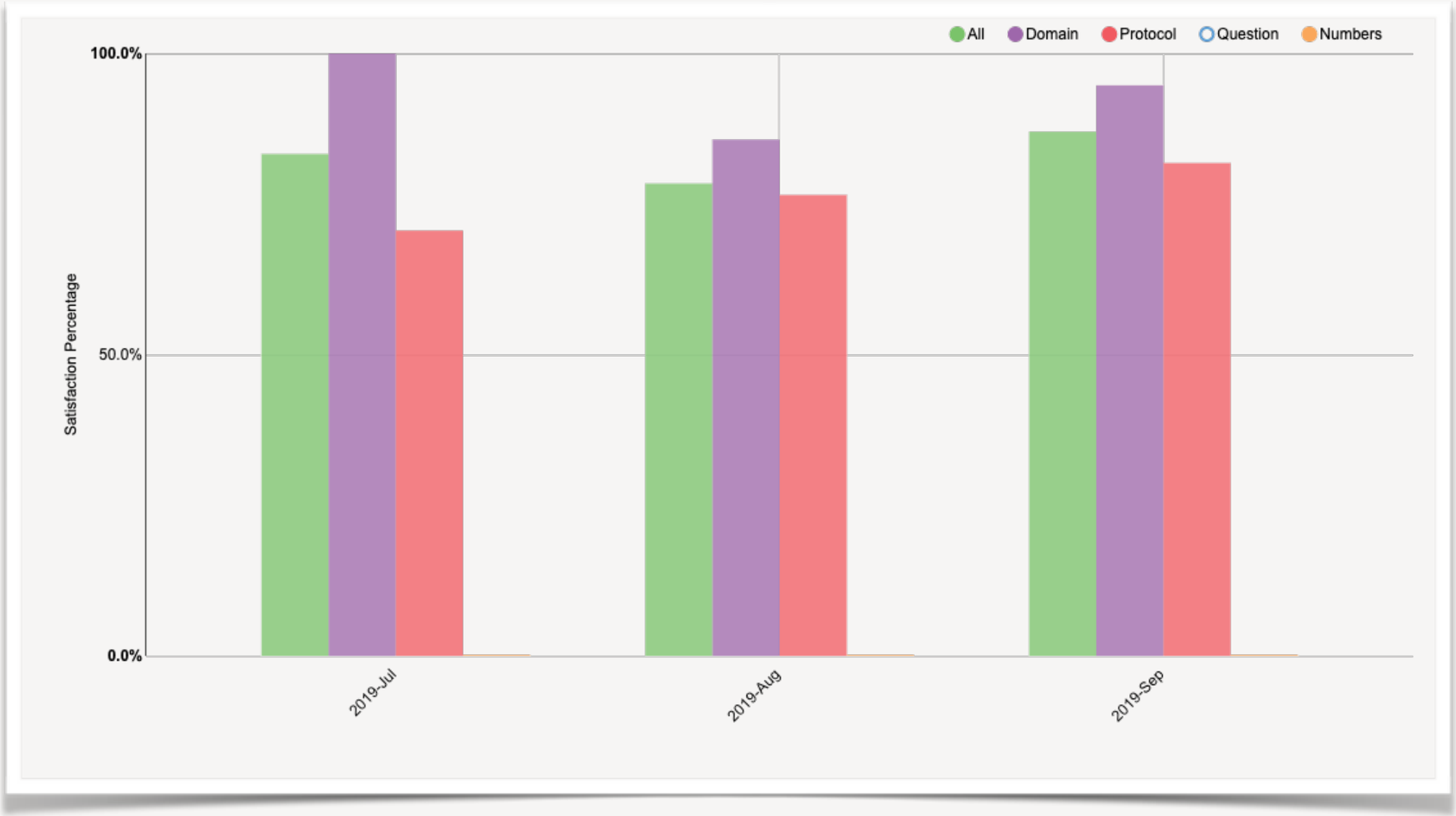
“How did we do?”

- Launched this year
- Survey sent to customer after request is resolved
- Feedback addressed or escalated within days
- Average monthly satisfaction rate: 86%
- Average monthly response rate: 36%
- Improvements:
  - Distinguish dissatisfaction with policy versus service
  - Tools still being enhanced





Customer Satisfaction in recent months

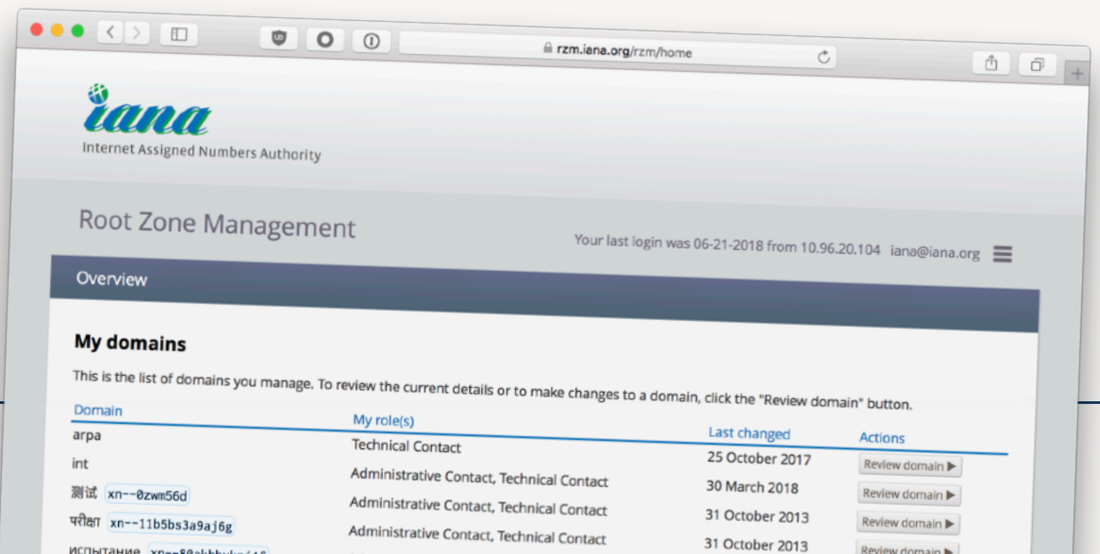


	2019-Jul	2019-Aug	2019-Sep
+ Satisfaction Rate (all)	83.3%	78.4%	87.0%
+ Satisfaction Rate (domain)	100.0%	85.7%	94.7%
+ Satisfaction Rate (protocol)	70.6%	76.5%	81.8%
+ Satisfaction Rate (number)	0%	0%	0%

Constant Improvement

- We are constantly working on ways to improve our service
- We have had SLAs with the community since 2007.
- We've been implementing business excellence and quality management since 2009, achieving certification in 2013 in the EFQM model.
  https://www.iana.org/about/excellence
- We've conducted annual customer surveys since 2012
- We develop systems and tools to support our work:
  - ticketing systems
  - Root Zone Management System
  - automation
  - a new Protocol Parameter Management System

EFQM®
Committed to excellence
2013



Prioritization and Planning

Kim Davies

Strategic Plan

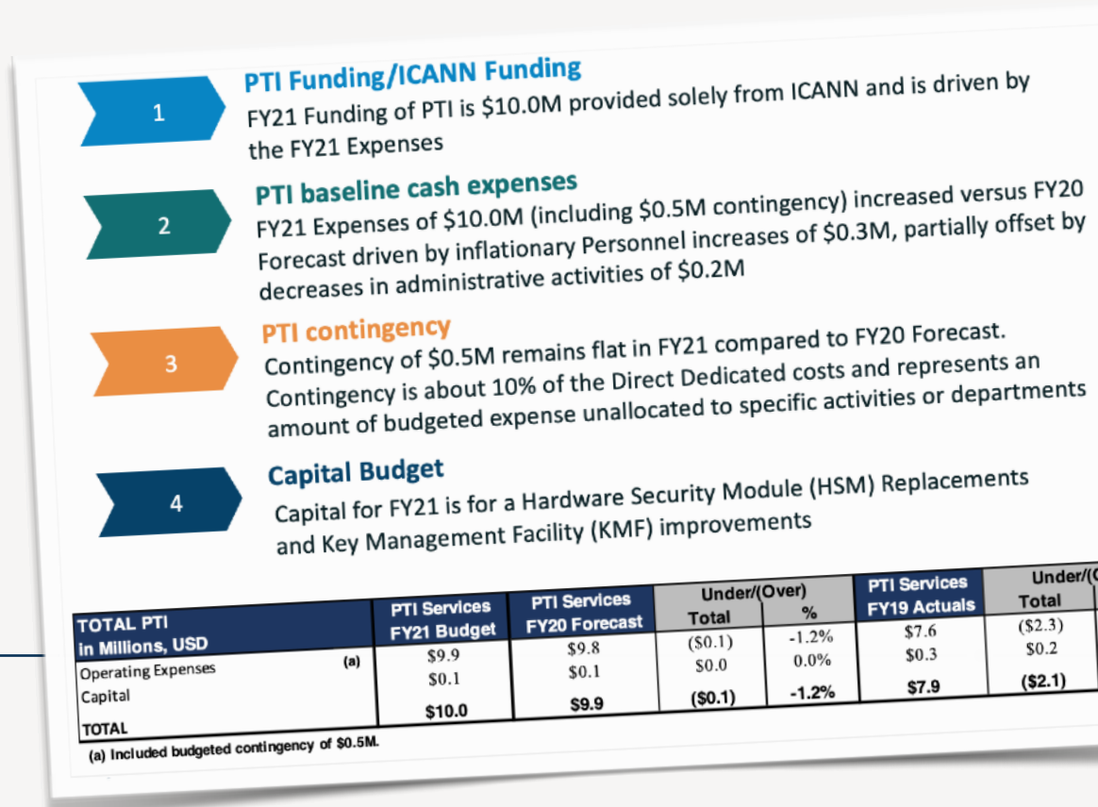
- PTI's Bylaws call for PTI to have its own strategic plan
- For its first three years, the transition proposal has served as the interim strategy
- The PTI Board is now leading an effort to develop a PTI strategy
- Key objective areas identified
  - Continued focus on customer needs
  - Maintaining culture of operational excellence
  - Maintain trust and demonstrate value and usability
  - Ongoing focus on meeting evolving security requirements
  - Take steps to align with ICANN processes and annual budget

Strategic Plan

- Also identified need for a clarified vision statement
- Key milestones
  - Publish draft for public comment: March 2020
  - Aiming to be effective July 2020

Budget Development

- A PTI Budget and IANA Budget are developed prior to the ICANN Budget each year
  - PTI budget represents the costs of delivering the IANA functions
  - IANA budget is those costs, plus the costs of enabling the IANA functions (such as oversight, contract management, community reviews, etc.)
  - Draft is due 9 months prior to the start of the fiscal year
- The PTI and IANA budgets are currently in public comment
  - Based on priorities discussion held with stakeholder groups in the middle of the year
- This year we are proposing a budget that is roughly consistent with the previous year
- PTI Board will be asked to approve budget at end of the year, and it will be rolled up into ICANN budget process



1 **PTI Funding/ICANN Funding**
FY21 Funding of PTI is $10.0M provided solely from ICANN and is driven by the FY21 Expenses

2 **PTI baseline cash expenses**
FY21 Expenses of $10.0M (including $0.5M contingency) increased versus FY20 Forecast driven by inflationary Personnel increases of $0.3M, partially offset by decreases in administrative activities of $0.2M

3 **PTI contingency**
Contingency of $0.5M remains flat in FY21 compared to FY20 Forecast. Contingency is about 10% of the Direct Dedicated costs and represents an amount of budgeted expense unallocated to specific activities or departments

4 **Capital Budget**
Capital for FY21 is for a Hardware Security Module (HSM) Replacements and Key Management Facility (KMF) improvements

TOTAL PTI in Millions, USD		PTI Services FY21 Budget	PTI Services FY20 Forecast	Under/(Over) Total	Under/(Over) %	PTI Services FY19 Actuals	Under/(Total
Operating Expenses	(a)	$9.9	$9.8	($0.1)	-1.2%	$7.6	($2.3)
Capital		$0.1	$0.1	$0.0	0.0%	$0.3	$0.2
TOTAL		$10.0	$9.9	($0.1)	-1.2%	$7.9	($2.1)

(a) Included budgeted contingency of $0.5M.

Development Projects

Development activity

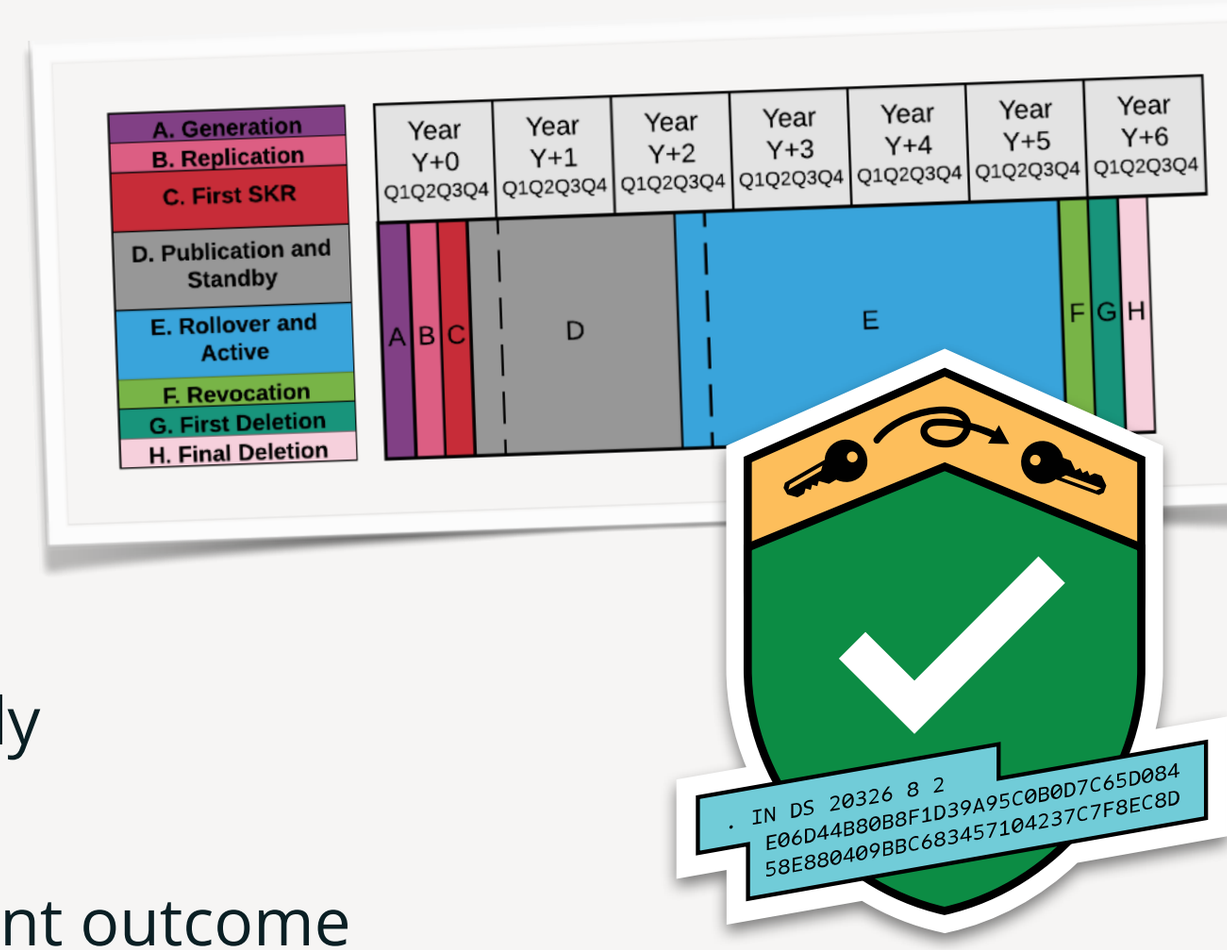
- Technical projects
  - Tools and System Enhancements by internal DevOps team
  - Shared projects with ICANN E&IT
  - Continuous improvement of key management facilities and key ceremonies by Cryptographic Business Operations
- Operational projects
  - Review and refinement of core business processes such as request processing
  - Implementing outcomes of audits and other reviews
- Strategic projects

A taste of current Projects

- INR Dashboard (recently launched)
- **Future KSK Rollover planning**
- KMF smart card and safe improvements
- **Next-gen Root Zone Management System**
- New KSK key management tools
- **Design a new authorization model for root zone changes**
- RDAP Server for IANA resources
- Improve initial release of HDWD
- **TCR Replacements**
- .INT Zone Inventory
- Platform upgrades for Reverse DNS
- **Registry Workflow System**
- Staff tools improvements
- Replan CA configuration
- Website evolution
- KMF monitoring/dashboard
- Improve ccTLD transfer process
- Strategic Plan Development
- Next-gen protocol parameter reporting
- Enhance internal QA review process
- Root Zone download service
- Improve Root Server Operator request process

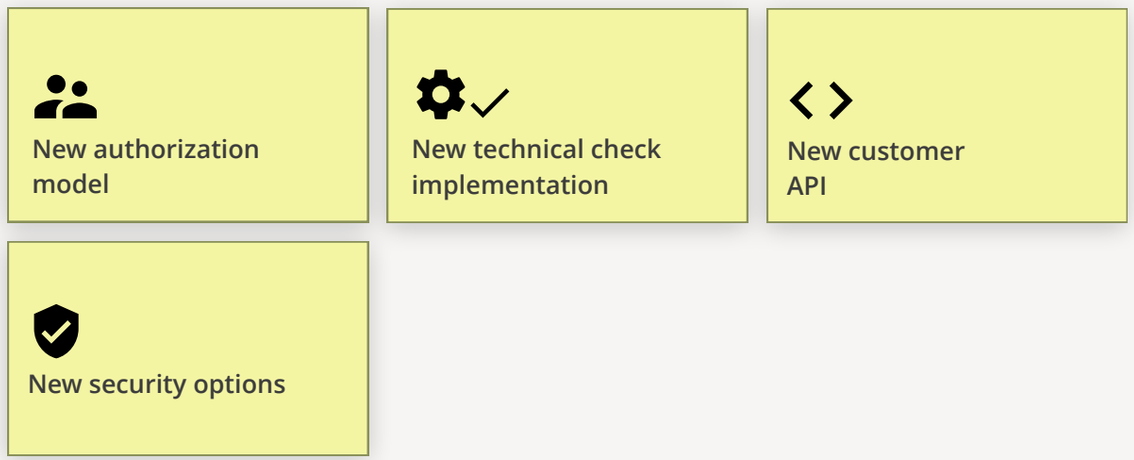
Future KSK Rollovers

- The first KSK rollover project concluded in August 2019 with the final destruction of the original KSK
  - The cut-over to the new KSK happened 11 October 2018
- Widely considered successful
- We are now proposing a future normalized method of doings these rollovers
  - Regular cadence
  - Increased use as a standby key
  - Tweaks to the process but generally the same approach
- Put for public comment, will implement outcome starting next year



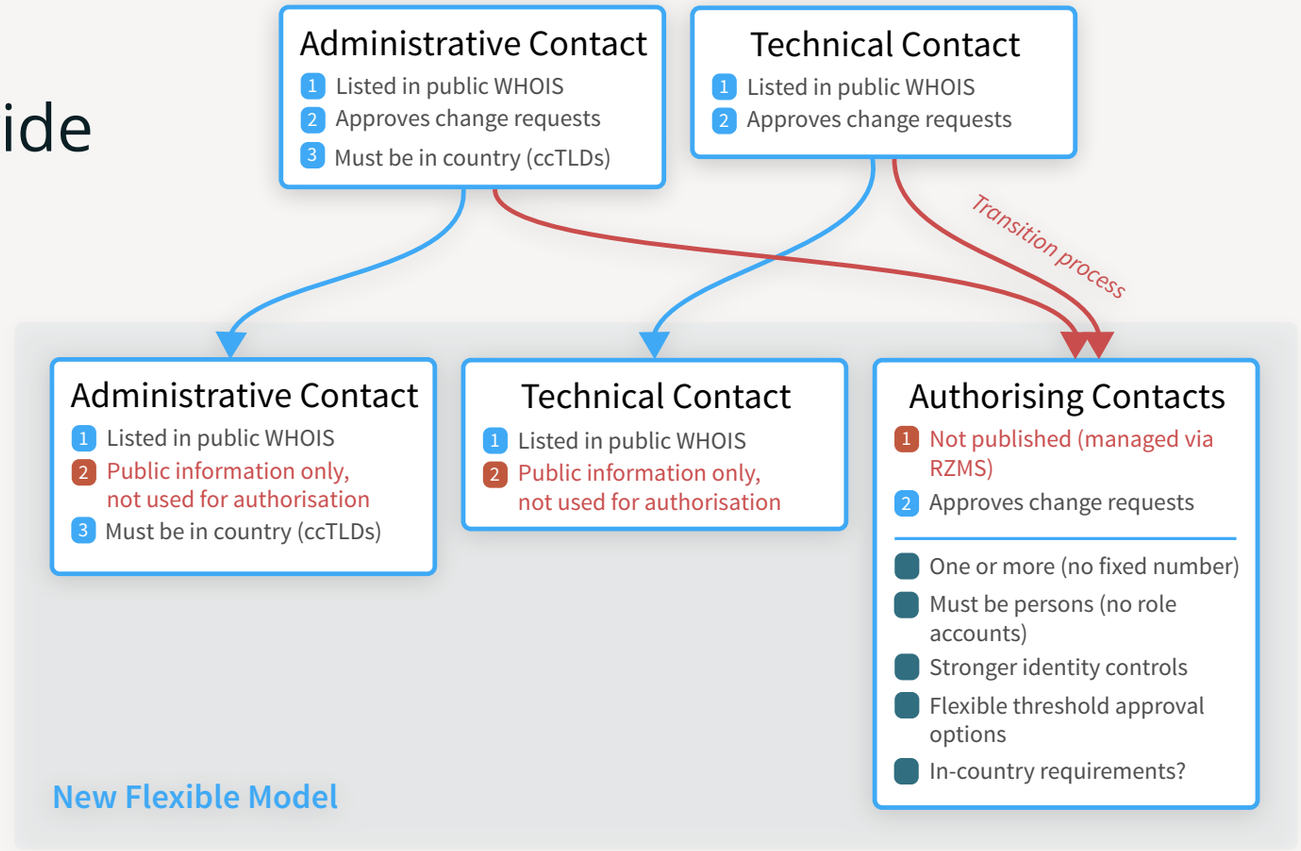
Root Zone Management System

- We continue to make minor updates to our current platform
  - Latest release: RDAP service improvements in July 2019
- Fundamental rewrite of the system ongoing
- Key new features
  - New user model, including 2FA and other improvements
  - Separate the technical check component
  - Better support for bulk updates through API functionality
  - Refreshed UI with better mobile support



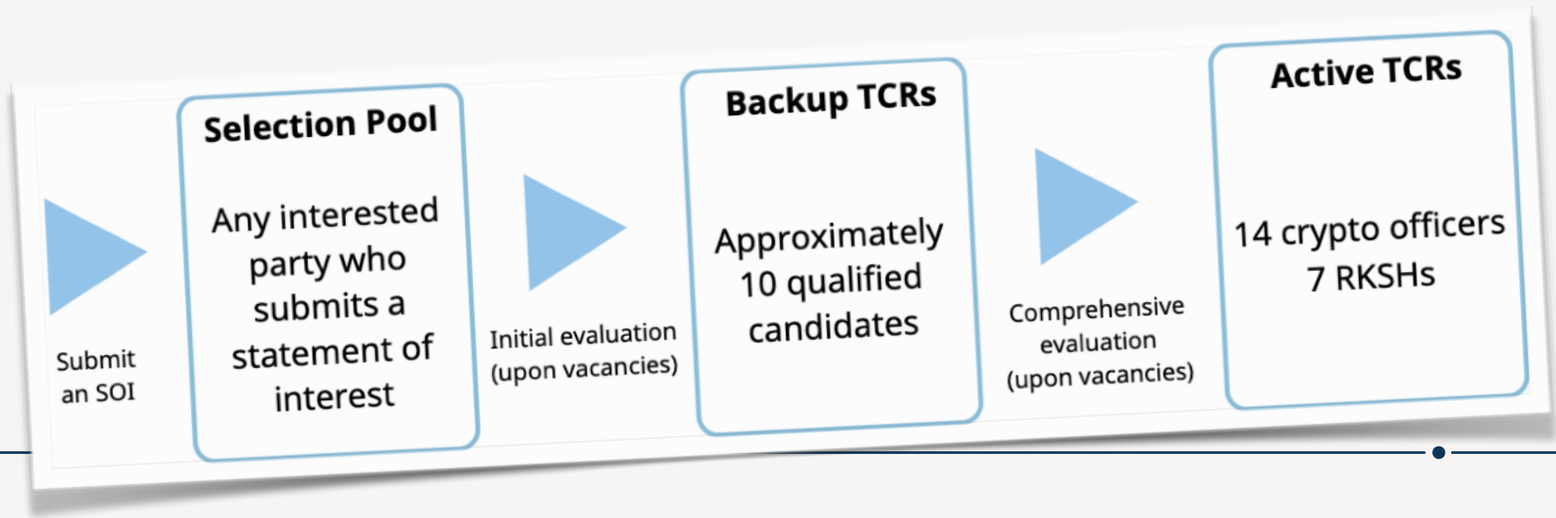
Authorization Model

- Design a modern, flexible mechanism for approving root zone changes
- Allow for custom configurations that meets most needs expressed by current customers
- Change consent mechanism for “shared glue”
  - No longer require each impacted party to explicitly consent
  - Require normal consent, provide a brief opt-out period before proceeding



TCR Replacement

- Trusted Community Representatives are an essential part of the Key Signing Ceremonies
  - Sometimes popularized as the “seven key-holders”
- Most TCRs have served since 2010 and anticipated increasing need to replace existing volunteers
- New evergreen process was launched
  - Over a 100 community members submitted an SOI
- Selection criteria seeks diversity in geography, culture, skills, experience, along with reputation and standing in the community
- First selections under new process recently made



Registry Workflow System

- Developing a comprehensive system that can support our ~3,000 protocol parameter registries
  - Take learnings from the IETF Datatracker and RZMS
- Early work has focussed on normalization
  - No common standards for registries until now
  - Massive data harmonization effort and inventory
- Now all registry data is normalized, building the UI and workflow components
- Aim: To launch Private Enterprise Numbers as the premier registry on this platform next year
  - Highest volume registry
  - Low complexity
  - Can retire an ancient system

Post-Transition

What has changed?

What stays the same?

The changes

- More direct accountability to the community
- Streamlined processing of root zone change requests, that no longer require additional authorization steps to be implemented
- SLAs across all three areas of operation, mutually agreed with those communities
- A separate legal entity, with separately defined budget, Board, and other governance mechanisms
- More public accounting for performance with transparent monthly, and in some times real-time, reporting
- IANA staff now employed by PTI rather than ICANN

The same

- The same staff team in the same office is still providing the same functions to the same customers
- Continue to work closely with colleagues in other ICANN departments (e.g. GSE)
- No adverse changes to core request processing and customer experience
- The scope of the IANA functions remains unchanged

In practice

- The IANA functions continue to be provided dependably to the community.
- The transition process has tailored many aspects of governance and accountability to be a greater fit for the community
- IANA rates high levels of satisfaction and high levels of adherence to the SLAs defined by the community

Thank you!

Website	**iana.org**
Service level reporting	**iana.org/performance**
Functional areas	**iana.org/protocols** **iana.org/numbers** **iana.org/domains**
More background	**iana.org/about**
PTI website	**pti.icann.org**