



# Engineering Update

*Mark Kusters*  
**CTO**

# Staffing Summary



- **Operations**
  - Seven engineers + manager
- **Information Systems and Security**
  - Five engineers + manager
- **Development**
  - Ten engineers + manager
  - User Experience Expert
  - User Interface Designer
- **Software Integration**
  - Eight engineers + manager
- **Project Management**
  - One project manager and one part-time project manager
- **CTO**

# Accomplishments since ARIN 41



- Main focus areas
  - Technical Debt
  - Website Improvements
    - Incremental updates to ARIN Online moving to an Angular technology
    - New website (preview #2)
  - ARIN staff tools
  - Whois performance

# Accomplishments since ARIN 41



- Technical Debt Completed
  - Upgraded Postgres
    - Upgraded to 10.4
    - Moved to a different High Availability Scheme
      - Removed the 2004 era Cisco 3750G switches
  - Removed the last remaining CentOS 4 box
    - It has not been shot
    - It is safely stored and quietly unpowered in my office
  - Automated build systems using Ansible
    - One remaining puppet framework is to be moved into Ansible
  - Modernized our virtualization managers

# Accomplishments since ARIN 41



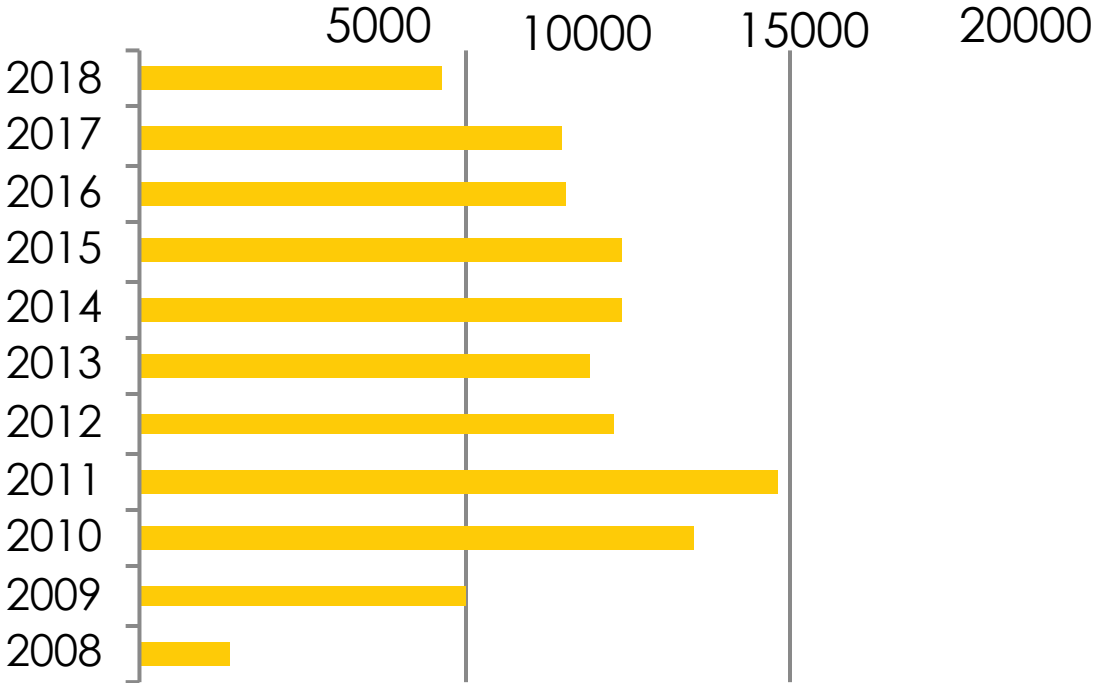
- ACSPs
  - ACSP 2017.11 Mailing List Support of DMARC
  - ACSP 2017.5 - Add Details to Annual Invoices
  - ACSP 2017.18 - Enhancement of Daily ASN Delegation File
  - ACSP 2018.1 - Revision Management System for NRPM
    - Helped CMSD setup the git repository and did testing
- Lots of User Interface (UI) work incrementally placed in ARIN Online
- Lots of whois performance improvements
- RDAP extension for searching networks using Origin AS
- Many improvements for internal customer service
- Support for new website (CMSD continues with content responsibilities)

# ARIN Online Usage



**142,934 accounts activated since inception through Q3 of 2018**

**Number of Accounts Activated**

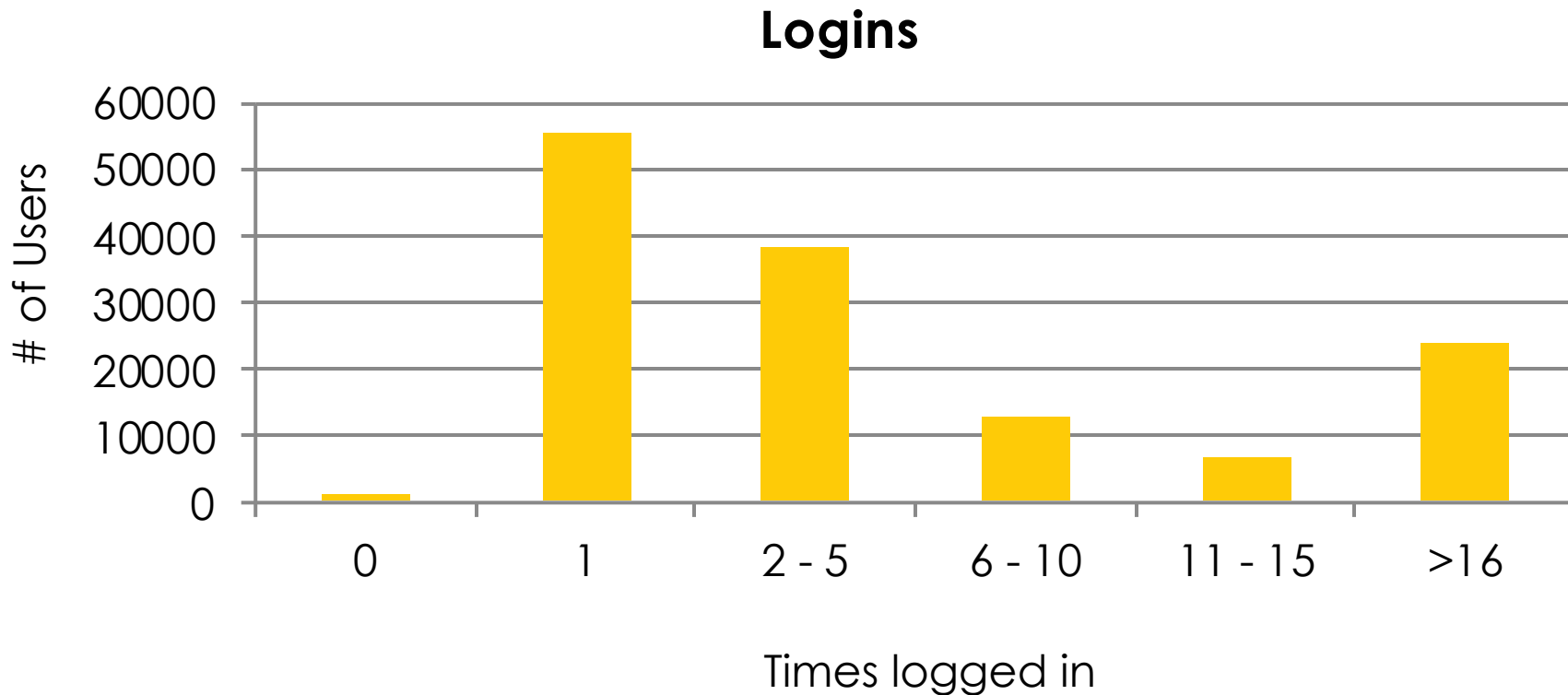


\* Through Q1 of 2018

# Active Usage of ARIN Online

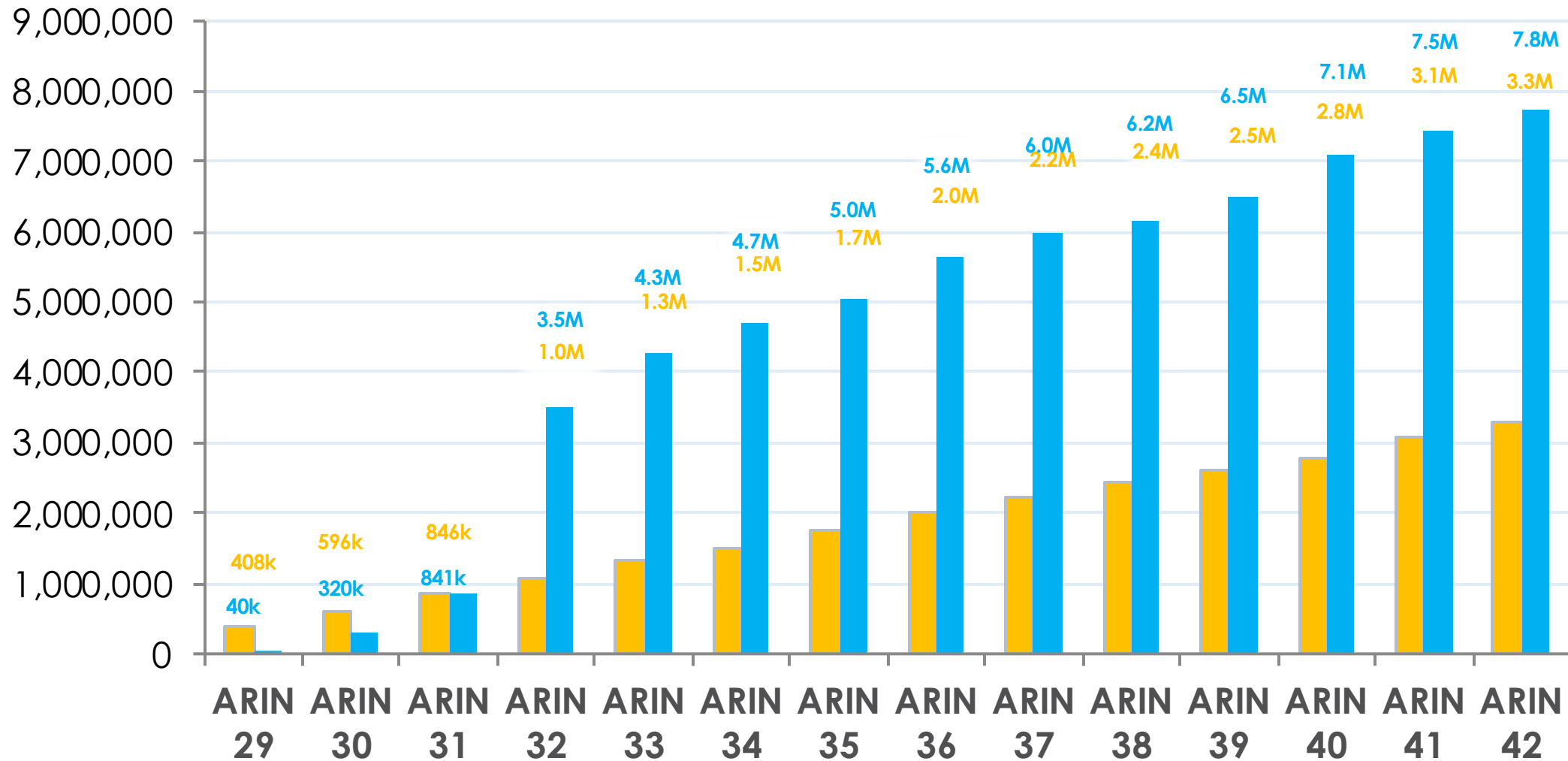


## Logins from inception through Q3 of 2018



# Provisioning Transactions

(cumulative – *RESTful* + *templates*)





# DNSSEC



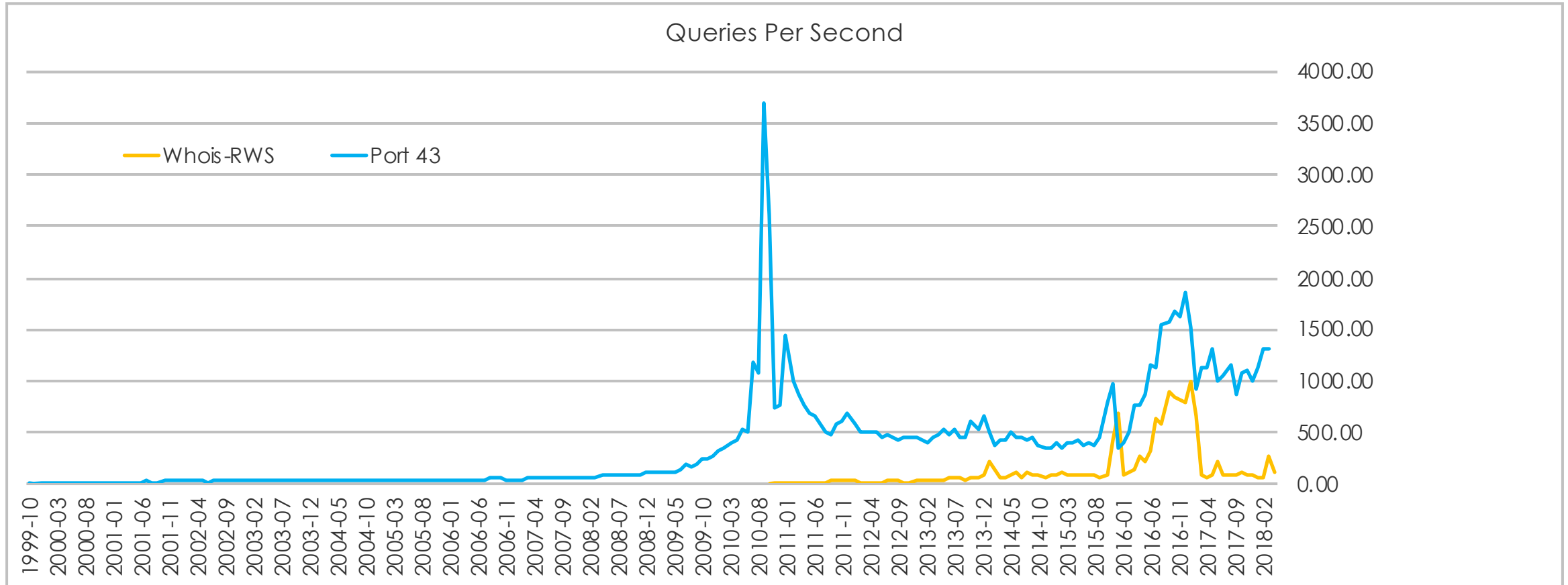
	ARIN 41
Number of Orgs with DNSSEC	173 (+15)
Total Number of Delegations	655,901
DNSSEC Secured Zones	998 (+120)
Percentage Secured	0.15 % (+.01%)



# Resource Public Key Infrastructure (RPKI) Usage

	Oct 2012	Apr 2013	Oct 2013	Apr 2014	Oct 2014	Apr 2015	Oct 2015	Apr 2016	Oct 2016	Apr 2017	Oct 2017	Apr 2018	Sep 2018
Certified Orgs		47	68	108	153	187	220	250	268	292	328	361	434
ROAs	19	60	106	162	239	308	338	370	414	470	538	604	1013
Covered Resources	30	82	147	258	332	430	482	528	577	640	741	825	1953
Up/Down Delegated			0	0	0	1	2	1	2	2	2	1	1

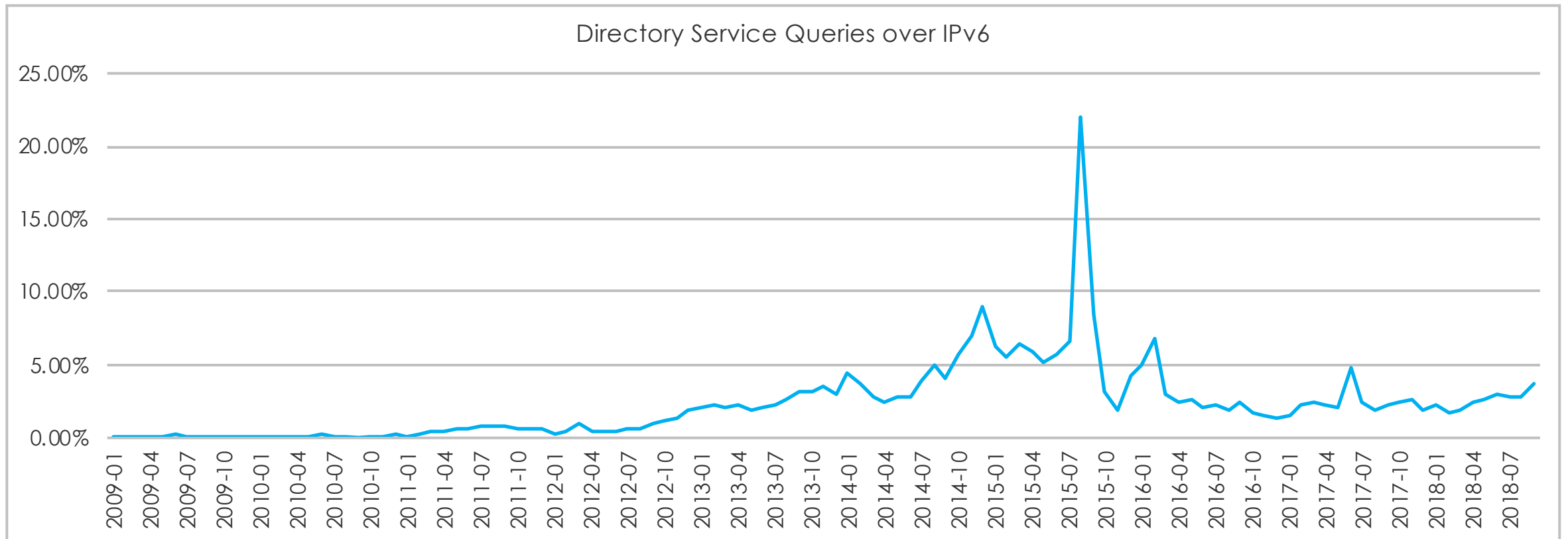
# Whois/Whois-RWS Queries Per Second



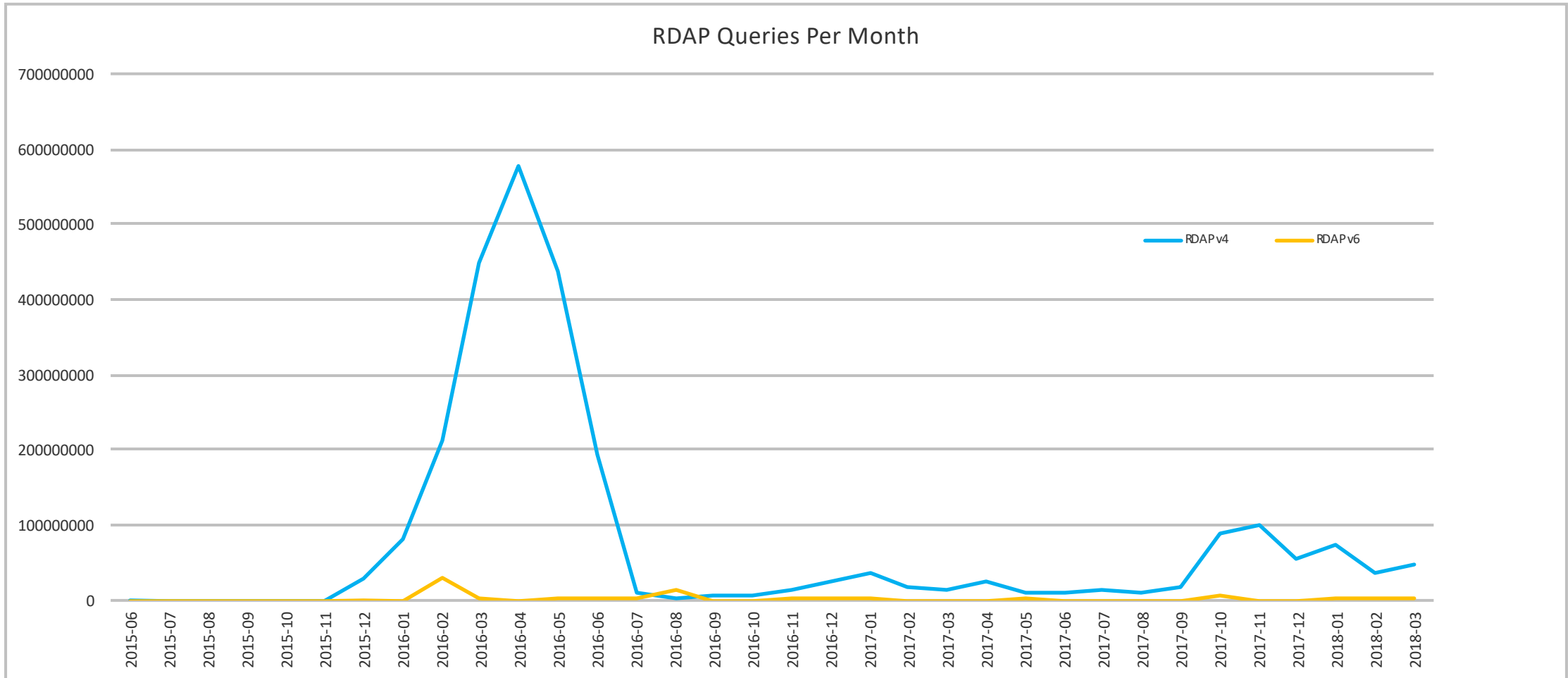
# Whois/Whois-RWS/RDAP Queries over IPv6



Directory Service Queries over IPv6



# Registry Data Access Protocol (RDAP)



# Days in the Life of Whois/Whois-RWS/RDAP



- Goal for directory services is for people to query the service and receive results in a reasonable amount of time while abiding with the Whois Terms of Service
- Some automation is expected
- With automation, if the rate is too high, overuse may lead to tarpitting



# Directory Service Abuse

- Directory service (Whois/Whois-RWS/RDAP) abuse continues
- Talked about this at ARIN 40, 41, and now 42
- Each incident requires a team response to look at the system, identify the abusers, notify the abuser, and potentially deny access to the abuser
  - Interrupts sleep or work (or both if the abuse is over a long duration)
  - Does not scale
- Terms of use talks about what the acceptable reasons why you can use the data ([https://www.arin.net/whois\\_tou.html](https://www.arin.net/whois_tou.html))
  - Does not talk about acceptable query rates

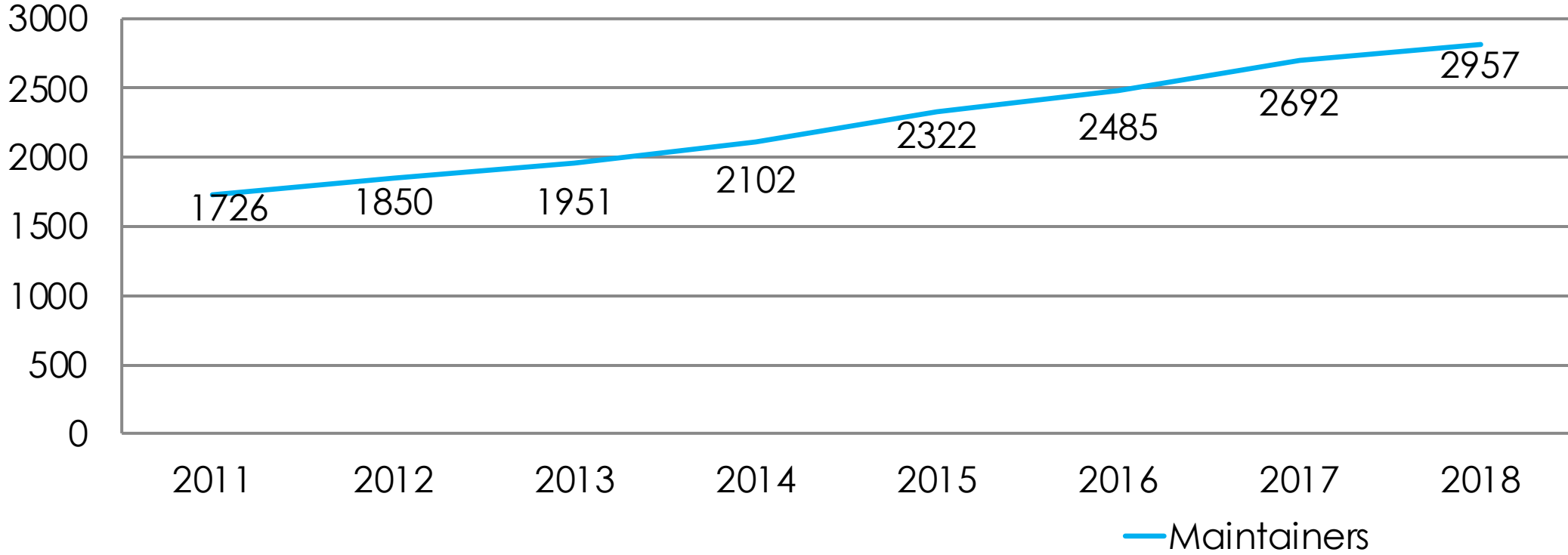
# Slowing Down Abuse



- Automated those who abuse our directory services with a concept called tarpitting
- How tarpitting works:
  - If the rate limit is exceeded, any queries over that rate limit are put on a queue.
  - This queue is looked at every 2 seconds and queries are then allowed to be processed as long as the current queries do not exceed the limit.
  - If the rate is sustained and the queue limit has been met, then the queries on the queue are popped off in a FIFO fashion with a tcp reset back to the source.

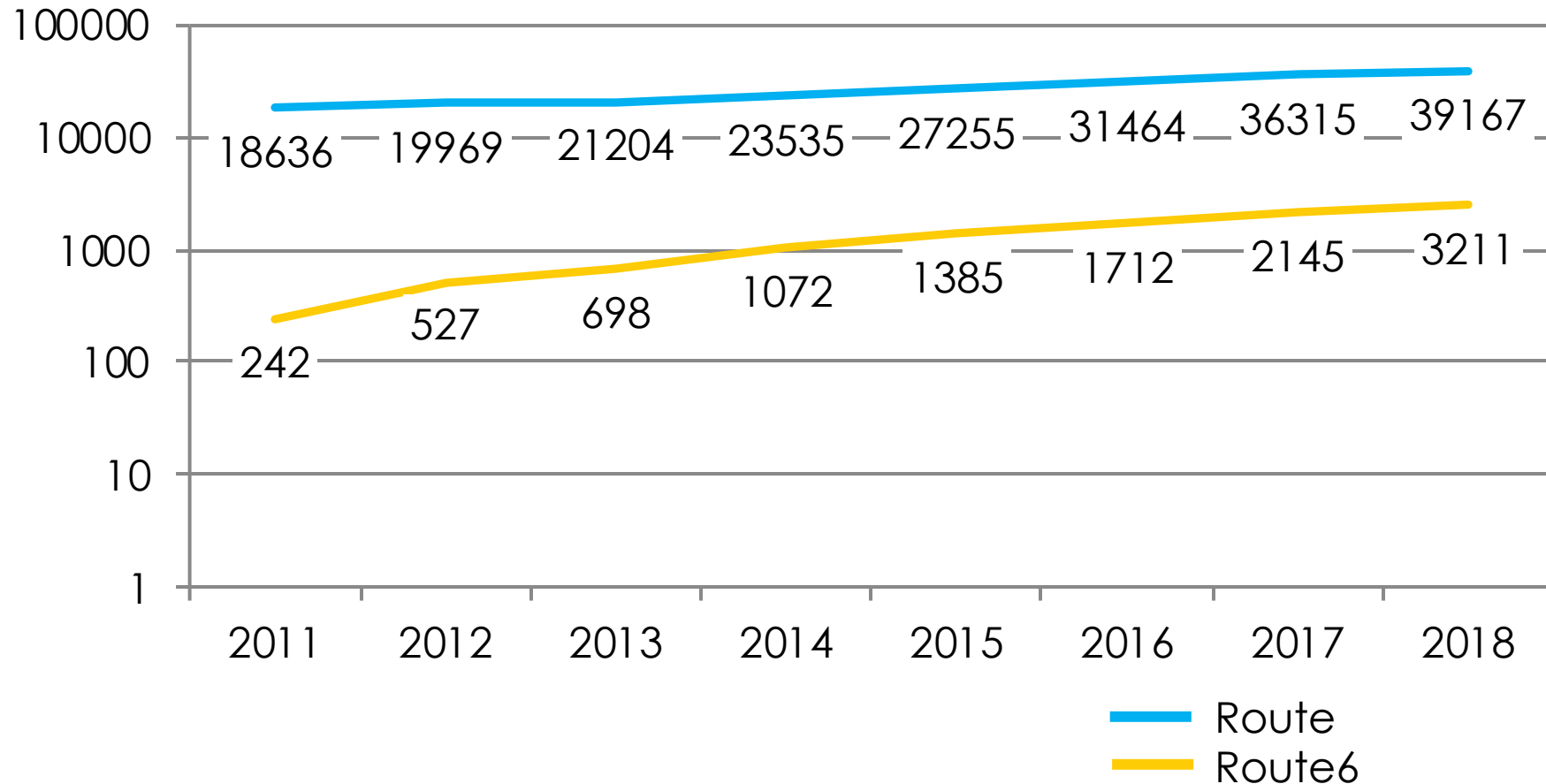


# Internet Routing Registry (IRR) Maintainers



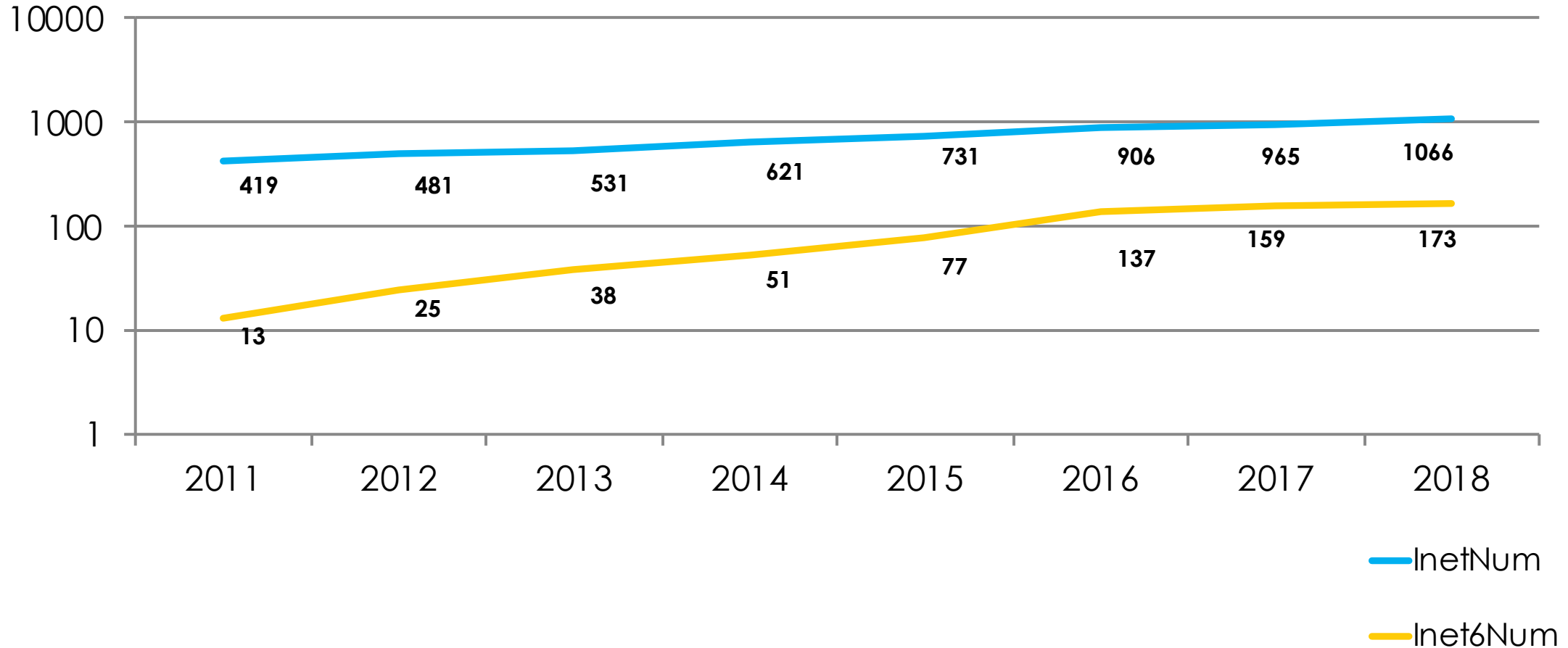
2018 Data through Q3

# IRR Route / Route6 Objects



2018 data through Q3

# IRR InetNum / Inet6Num Objects



2018 data through Q3

# IRR Object Breakout by Organization



Number of Organizations	Number of Objects
5	1001-7082
100	100-1000
13	90-99
14	80-89
34	70-79
25	60-69
53	50-59
1043	10-49
795	5-9
912	1-4

# What we are working on through 2019 Q1

- New Website
  - Lots of UI/UX improvements
  - User Accessibility/Responsive Website (ACSP 2016.2 and 2011.21)
  - NANOG, ARIN, and various ARIN on the Roads for user test drives in progress
- IRR work
  - Will start design work in Q1 2019



# What We are Working on Through 2019 Q1

- Technical backlog
  - Moving to a stateless application service for ARIN Online using Angular technology
  - Automated build systems using Ansible
    - Folding the remaining puppet iterations into Ansible
  - Upgrading backup system
  - Upgrading bump-in-the-wire DNSSEC signer

# Coordination Work with the Other RIRs



- Working out differences on
  - Registration Data Access Protocol (RDAP) implementations
  - Extended statistics file formats
- Internet Technology Health Indicators (ITHI)
  - Working on coordinated reporting between the RIRs
- Resource Public Key Infrastructure (RPKI)
  - Providing operational feedback on various protocol enhancements within Internet Engineering Task Force (IETF)
  - Examples are:
    - RPKI Validation Reconsidered
    - RPKI signed object for Trust Anchor Locators (TALs)
    - RPKI Multiple "All Resources" Trust Anchors Applicability Statement



???

**Thank you.**

Any Questions?