

20 October 2023

# Critical Services Availability Community Consultation Report

DRAFT 7.0

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## Executive Summary

In 2022, APNIC began assessing the technical and process improvements required to increase availability of its critical services to a high level, beyond 99.99%.

APNIC currently operates its critical services with minimal downtime, on a best-effort basis, within existing budgets. Moving to a guaranteed high availability environment will require significant investment by APNIC and higher ongoing costs.

The APNIC community was consulted to help APNIC determine the scope, feasibility and appetite for further investments in critical service availability. The consultation aimed to provide insight into community needs and desires from APNIC in terms of availability of services; whether reaching and maintaining very high availability of critical services was important to stakeholders; and if those affected by cost increases would be willing to fund improvements.

Key findings include:

- Overall, organizations appear satisfied with current best-effort availability.
  - Almost three-quarters of online respondents (and nine of 11 organizations interviewed) agreed that their network operations were rarely disrupted by an APNIC service outage. Two interviewed organizations had experienced disruption in the past to RDNS services.
- If an outage was to occur, respondents believe the loss of RDNS services or ROA publication would be the most impactful.
  - 37% of respondents said ROA publication unavailability would have a high impact or worse on their operations, while 21% said it would have no impact at all.
  - For RDNS, 33% of respondents said publication of an invalid zone state for 15 minutes would have a high impact or worse on their operations, while 26% said it would have no impact at all.
  - 36% said loss of publication of the zone for 15 minutes would have a high impact or worse on their operations, while 24% said it would have no impact at all.
  - 34% said loss of a name server for 15 minutes would have a high impact or worse on their operations, while 21% said it would have no impact at all.
- The majority of respondents' organizations commit to 99.95% availability or less in their own service provision.
  - 55% of respondents' organizations committed to 99.95% service availability or less for network-related services. Ten of the eleven organizations interviewed also operated at 99.95% or less for their services.
  - Conversely, 16% of respondents' organizations committed to 99.999% service availability. Only one of the interviewed organizations (a global cloud provider) operated some critical services at 99.999%.
- Most smaller Member organizations oppose increased fee investment in APNIC service availability, while larger Member organizations are more in favour.
  - Overall, 40% of Members strongly oppose or oppose increased ongoing Member fee investment, with 31% of respondents supporting (or strongly supporting) an increased ongoing Member fee investment in critical service availability.
  - Opposition was higher in smaller Member organizations, with 54% of organizations with 100 employees or less against increased investment, while 29% of Member organizations with 101+ employees were opposed.
  - 40% of larger organizations (101+ employees) were in support of further investment, while only 19% of smaller organizations were in favour.
- Accuracy of APNIC data is seen as more important than increased availability by the majority of respondents (64%).

## 1 Scope and definitions

For this community consultation, APNIC defined the scope of services and terms as follows:

Critical APNIC services:

- Whois/IRR
- RDAP
- RPKI
- RDNS

A 'high availability' level is greater than 99.99%.

In this report, percentages are rounded to the nearest whole number.

*See table in Appendix for full breakdown of availability levels.*

## 2 Methodology

The community consultation comprised an online consultation form open to Members and the community (quantitative feedback) and interviews with selected Members and stakeholders (qualitative feedback).

### Interviews

Members and other stakeholders were approached to take part in an hour-long zoom interview with two or more APNIC staff. Eleven organizations from nine economies were interviewed, covering service providers, a root operator, an RIR, National Internet Registries (NIRs), and a government agency (LEA).

The interviews followed an interview guide (Appendix C) but intentionally allowed participants to influence the scope of discussion in order to get a detailed understanding of their issues and concerns.

The sample of organizations interviewed is not representative of the entire membership or stakeholder base. Potential interview organizations were approached as they operate at a larger scale or in a complex context with operational expertise. Excluding the NIRs, most were large organizations.

### Online Consultation Form

The aim of the online consultation form was to collect a valid, representative sample of the needs and expectations of the APNIC community about the high availability of critical services. The online form can be found in Appendix B.

- The form was open for feedback from 1 to 21 June 2023.
- 118 respondents completed the form with an additional 91 partial completions. Respondents were drawn from 32 Asia Pacific economies and 16 industries; 84% were APNIC Members.
- 51% of Member respondents were from organizations with more than 101 employees; 42% of Member respondents had 50 or less employees.
- The results confidence level is 95%, with a 7 to 9% margin of error.

### 3 Consultation Findings

#### 3.1 Views on APNIC’s critical services

The APNIC services most used or relied on for respondents’ network operations were Whois/IRR (79%) and RPKI (55%) (Figure 1).

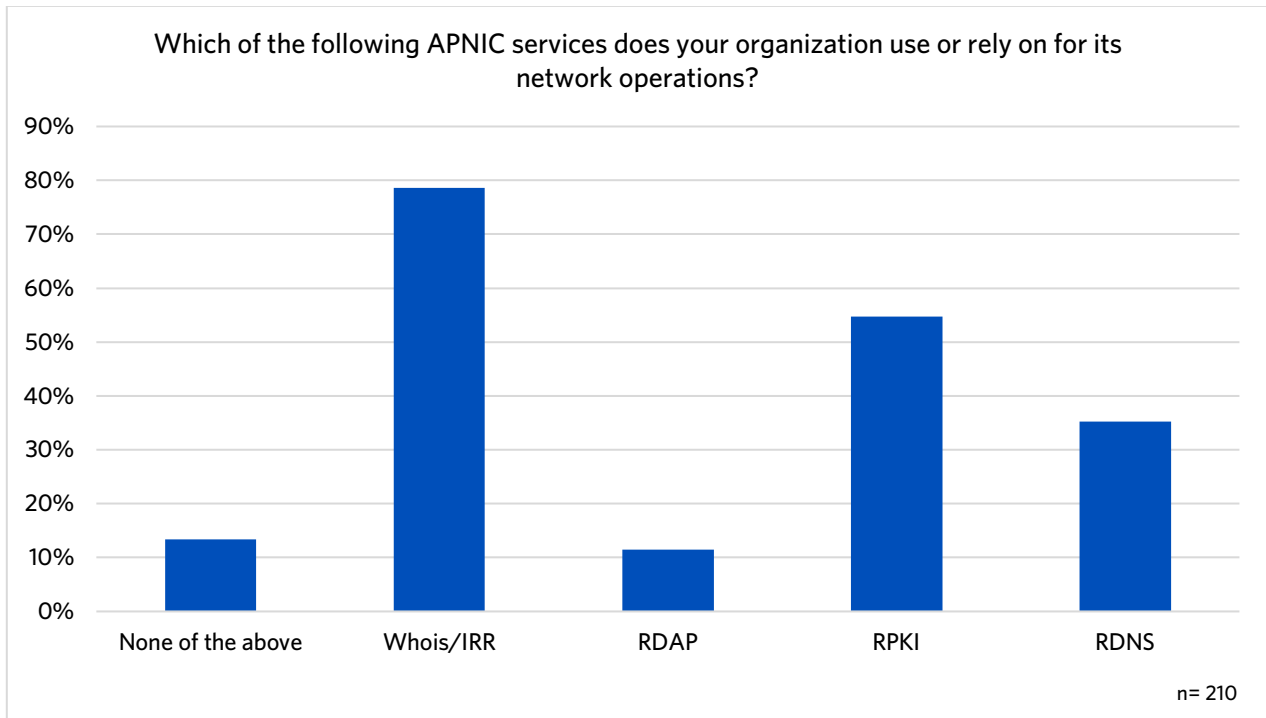


Figure 1: Use of APNIC critical services

Almost two-thirds of respondents (65%) agreed that APNIC should commit to a minimum level of availability determined by Members (Figure 2). However, responses were mixed in the interviews, with five organizations saying the current best-effort model is working well and is suitable for APNIC as an RIR. Four were in favour of an SLA and the remainder couldn’t comment on this.

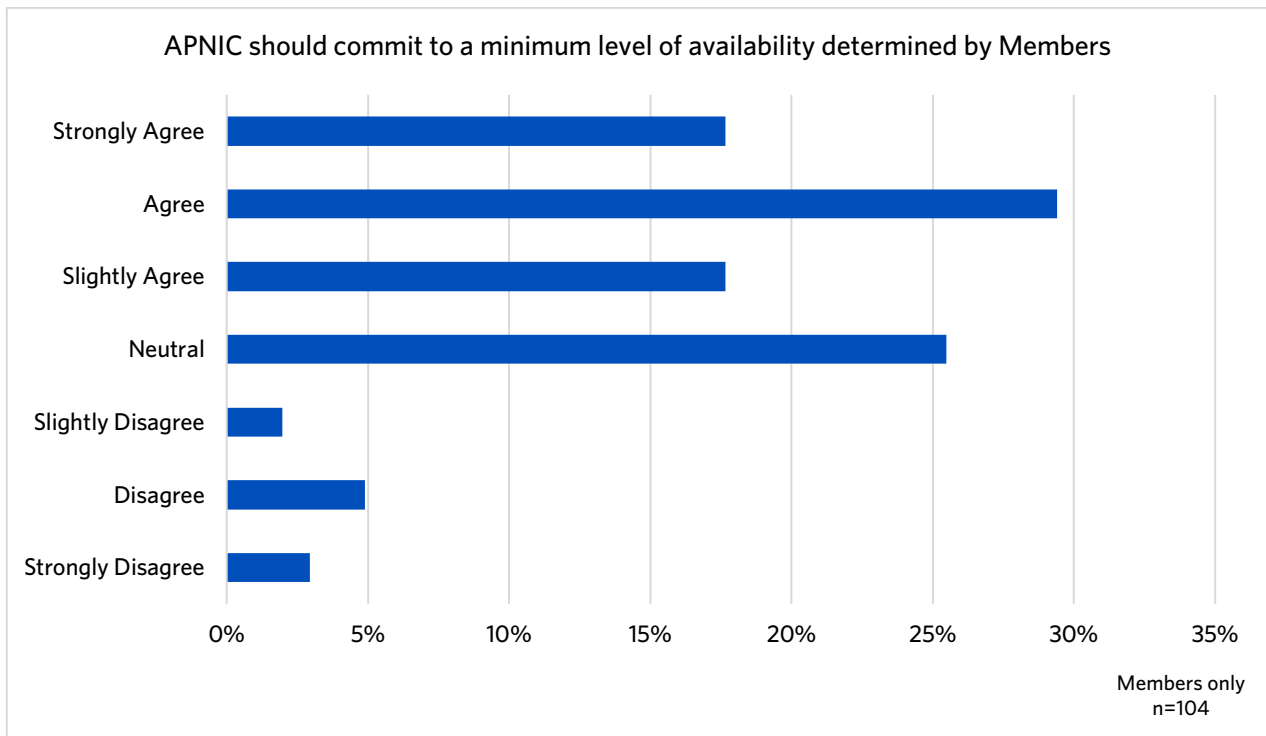


Figure 2: Views on minimum service availability

“I don't think it will benefit, because the service is already so good.” *Oceania ISP*

“We consider your infrastructure to be mission critical, that being the case we expect the highest levels of availability for that...Certainly the ones that impact global routing.” *Root operator*

“For not-for-profit organisation, what if you can't reach your SLA, what does that mean?” *RIR*

“Possibly yes...maybe 2 or 3 days a year or something like that. I don't think you need to go to that (high) level of availability.” *Global Cloud provider*

Of the four interviewed NIRs:

- One thought APNIC should commit to a minimum level of availability.
- Three did not think there was a need to commit to any level of availability.
- One had concerns that if APNIC commits to minimum SLA levels then their members would expect the same from the NIR. One also voiced concerns around setting minimum SLA levels, citing difficulties in defining criteria and guarantees.

Comments from online respondents and interviewees indicated general satisfaction with APNIC's current best-effort service availability.

“Very satisfied. Best-effort at the moment is very good.” *Oceania ISP*

“Yes, very satisfied. Unanimous.” *NIR*

“Yes, totally fine.” *Global Cloud provider*

“APNIC services are good.” *Online respondent*

“APNIC service availability has never been a problem for us.” *Online respondent*

“As a member of many years, I am satisfied with the current level of availability.” *Online respondent*

“Web portal access to account has been great and any issues haven’t impacted us so far.” *Online respondent*

“I think that people should build their networks so they don't go down if a service is unavailable for a short time.” *Online respondent*

While there appeared to be general satisfaction with current availability levels, more than half (58%) of respondents agreed that 24/7 APNIC technical support was important to them (Figure 3).

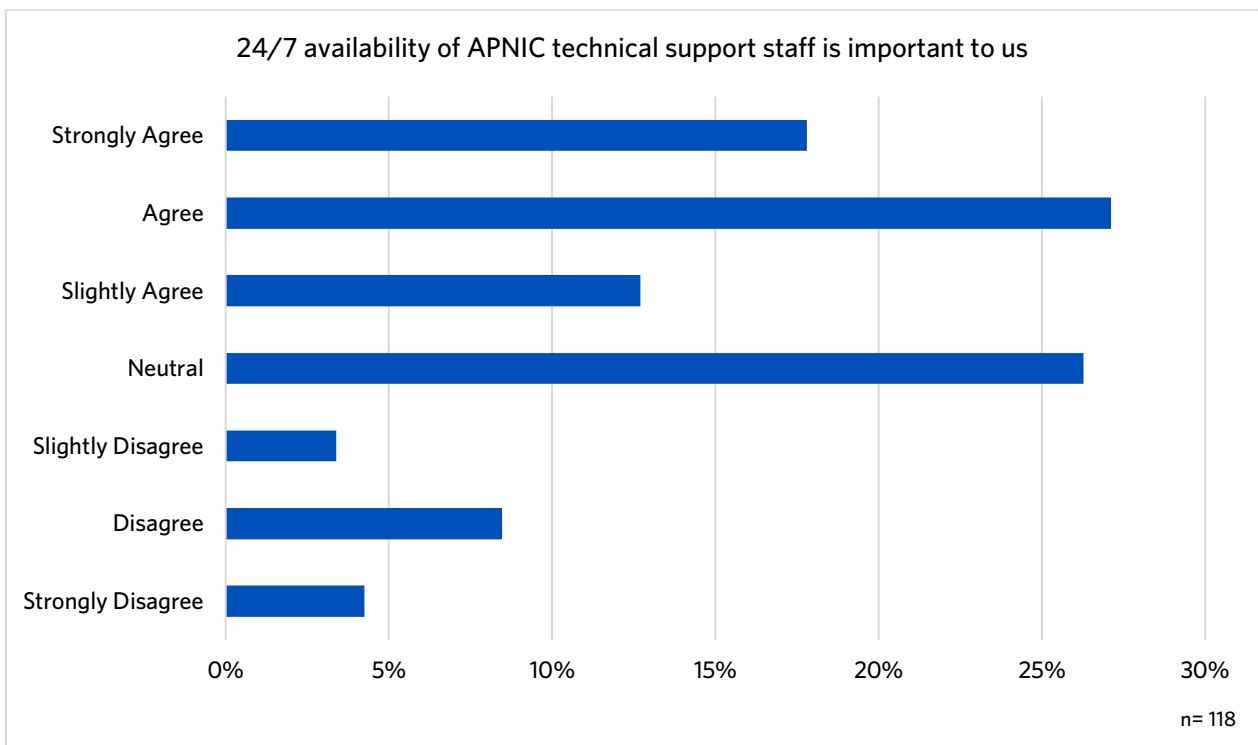


Figure 3: Views on 24/7 support

### 3.2 Loss of service impacts

Almost three-quarters of online respondents (and nine of 11 organizations interviewed) agreed that their network operations are rarely disrupted by an APNIC service outage (Figure 4). Two interviewed organizations had experienced disruption in the past to RDNS services.

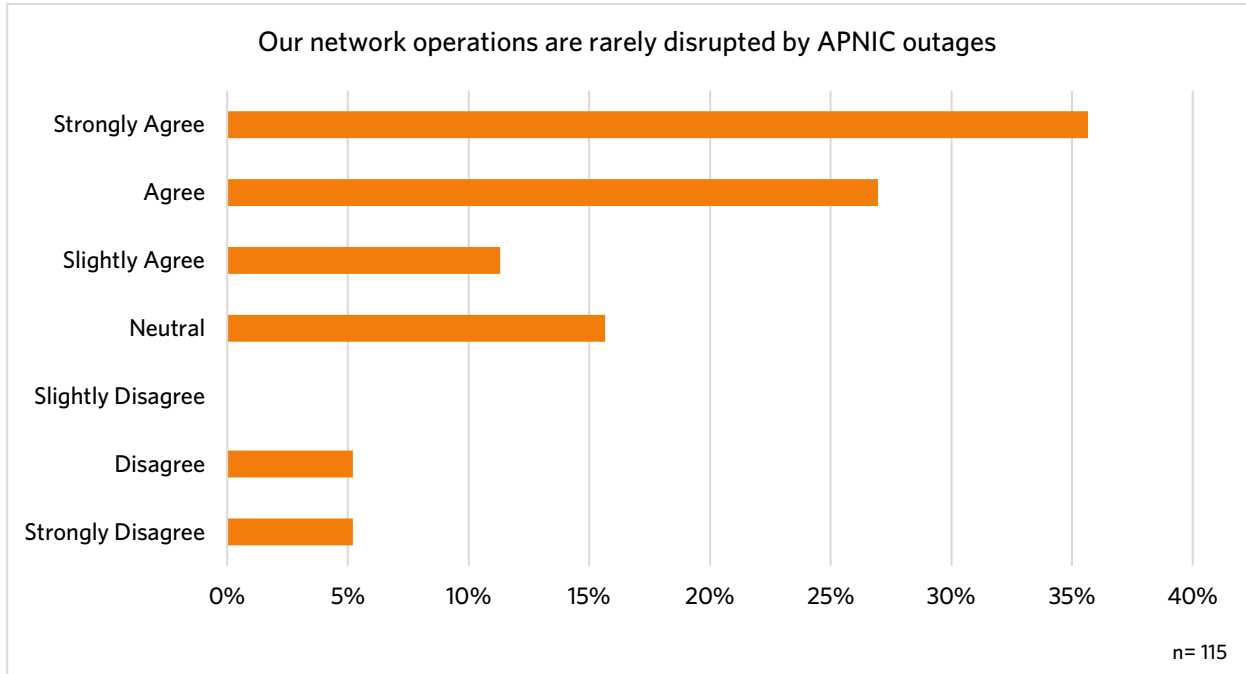


Figure 4: Frequency of disruption

Respondents selected an RDNS or RPKI outage as the most likely service interruptions to negatively impact their network operations. Unavailability of RDAP would cause the least impact. The level of impact to respondents from a 15-minute outage of APNIC services can be seen below in Figure 5.



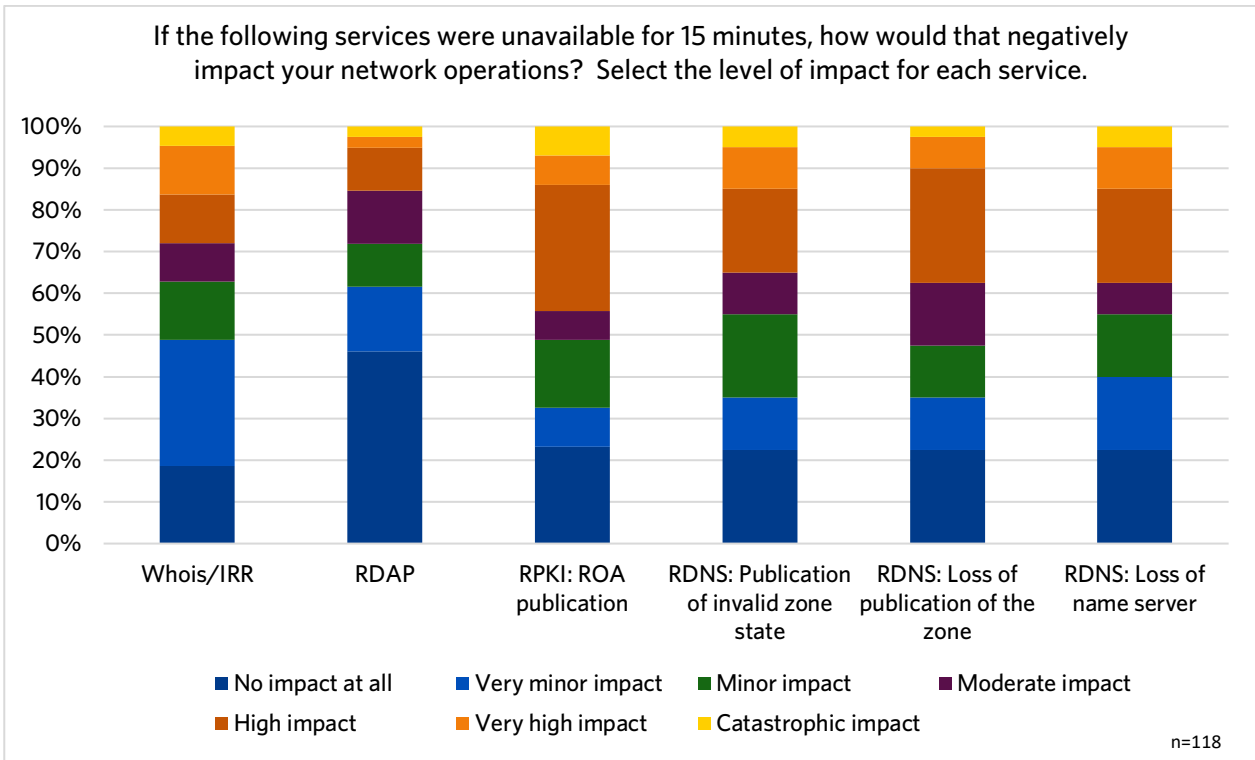


Figure 5: Level of impact due to a 15-minute outage

When asked how long an outage of each of APNIC’s critical services could last before degradation of network operations began, between 4-10% of Members said they would be impacted in under five minutes, with the amount of Members impacted increasing to up to 45% in an hour of service unavailability (Table 1).

	1 hour or less	30 mins or less	10 mins or less	5 mins or less
Whois/IRR	29%	16%	10%	6%
RDAP	22%	12%	9%	4%
RPKI: ROA publication	45%	27%	17%	10%
RDNS: Publication of invalid zone state	38%	21%	13%	8%
RDNS: Loss of publication of the zone	40%	23%	14%	7%
RDNS: Loss of name server	36%	24%	17%	8%

Table 1: Q8: If one of these APNIC services suffered an outage and became unavailable, how long could the outage last before it began degrading your organization’s network operations? (Members only, n=103)

Multiple organizations interviewed said that RPKI being unavailable for multiple hours was less of a problem because of local caching, but should RPKI be unavailable for an extended period (days) it would be more of a problem.

Forty-six percent of respondents agreed their organization has some degree of processes and technology in place to mitigate any unavailability of APNIC services (Figure 6).

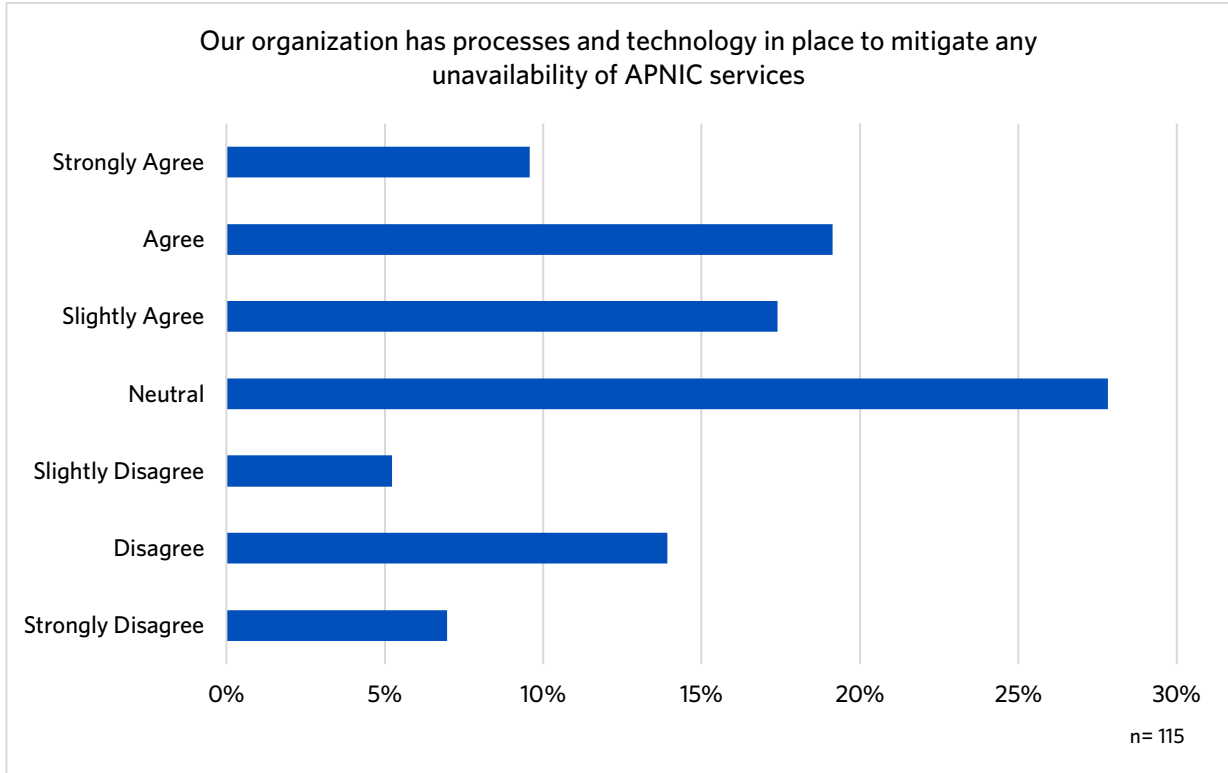


Figure 6: Respondents’ mitigations for APNIC service outages

### 3.3 Availability commitments by network operators

Fifty-five percent of respondents’ organizations committed to 99.95% service availability or less for network-related services. Ten of the eleven organizations interviewed operated at 99.95% or less for their services (Figure 10).

Conversely, 16% of respondents’ organizations committed to 99.999% service availability. Only one of the interviewed organizations operated some services at 99.999% (the Cloud operator for selected critical services).

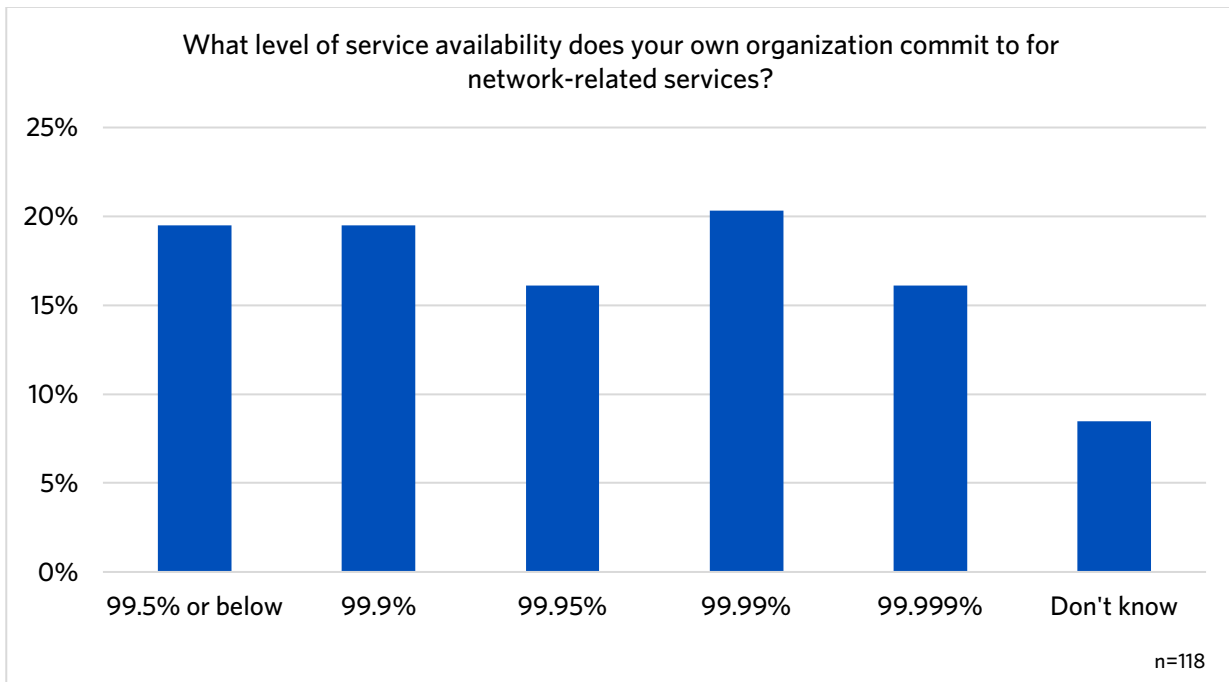


Figure 7: Operators’ own service availability (all organizations)

Availability levels were higher in Member organizations with 500 or more employees (Figure 8).

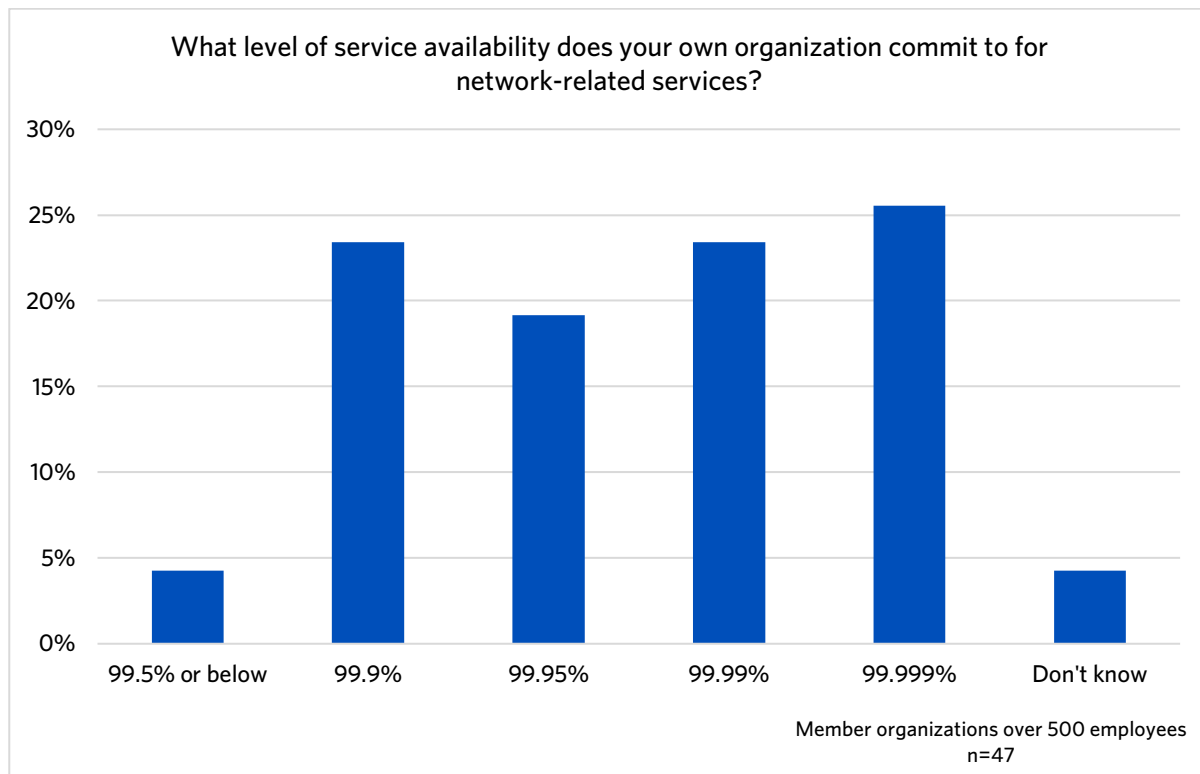


Figure 8: Operators' own service availability (organizations with 500+ employees)

### 3.4 Larger organizations view further investment more favourably than smaller organizations

A majority of Members oppose increased fee investment by APNIC to improve the availability of its critical online services to a very high level (Figure 9). However, size matters; larger organizations are more in favour than smaller organizations (Figure 10).

- Overall, 40% of Members strongly oppose or oppose increased ongoing Member fee investment, with 31% of respondents supporting (or strongly supporting) an increased ongoing Member fee investment in critical service availability.
- Opposition was higher in smaller Member organizations, with 54% of organizations with 100 employees or less against increased investment, while 29% of Member organizations with 101+ employees were opposed.
- Forty percent of larger organizations (101+ employees) were in support of further investment, while only 19% of smaller organizations were in favour.
- Just under a third of respondents were neutral.

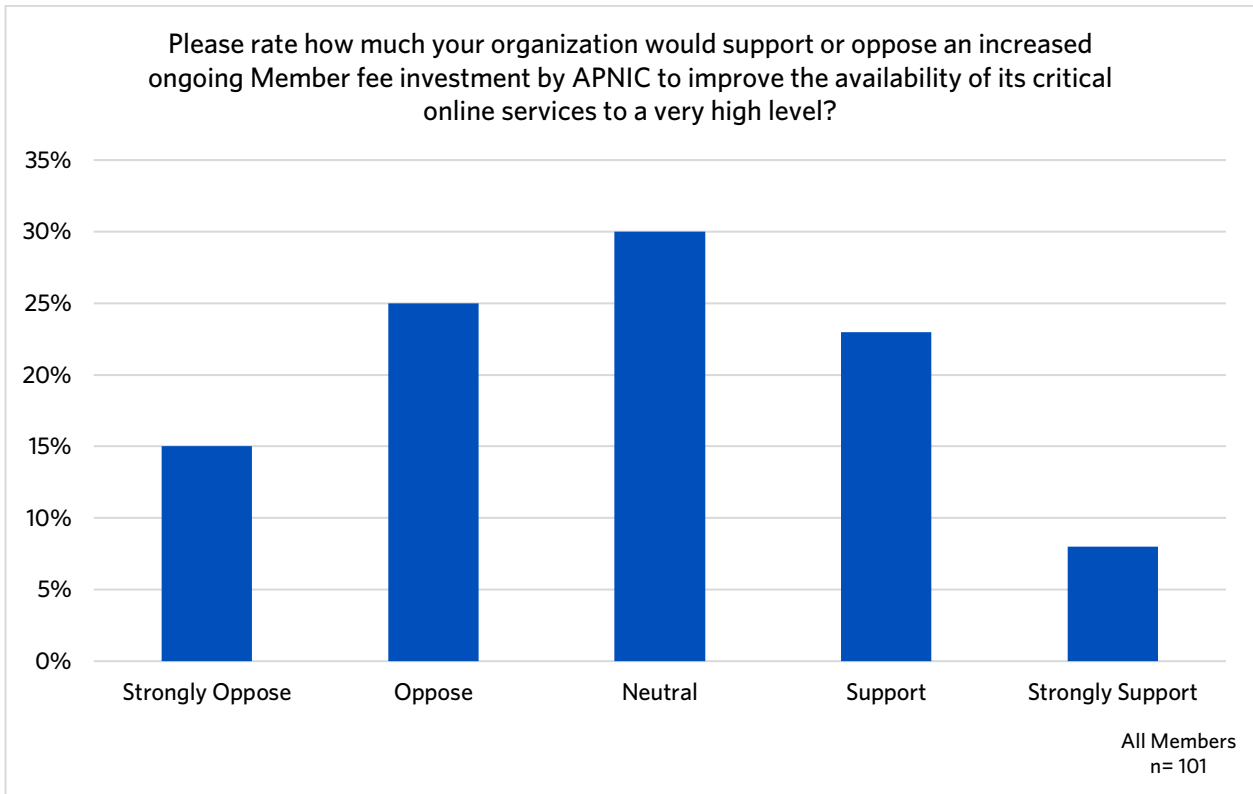


Figure 9: Attitudes to increased Member fee investment in availability improvements (all Member responses)

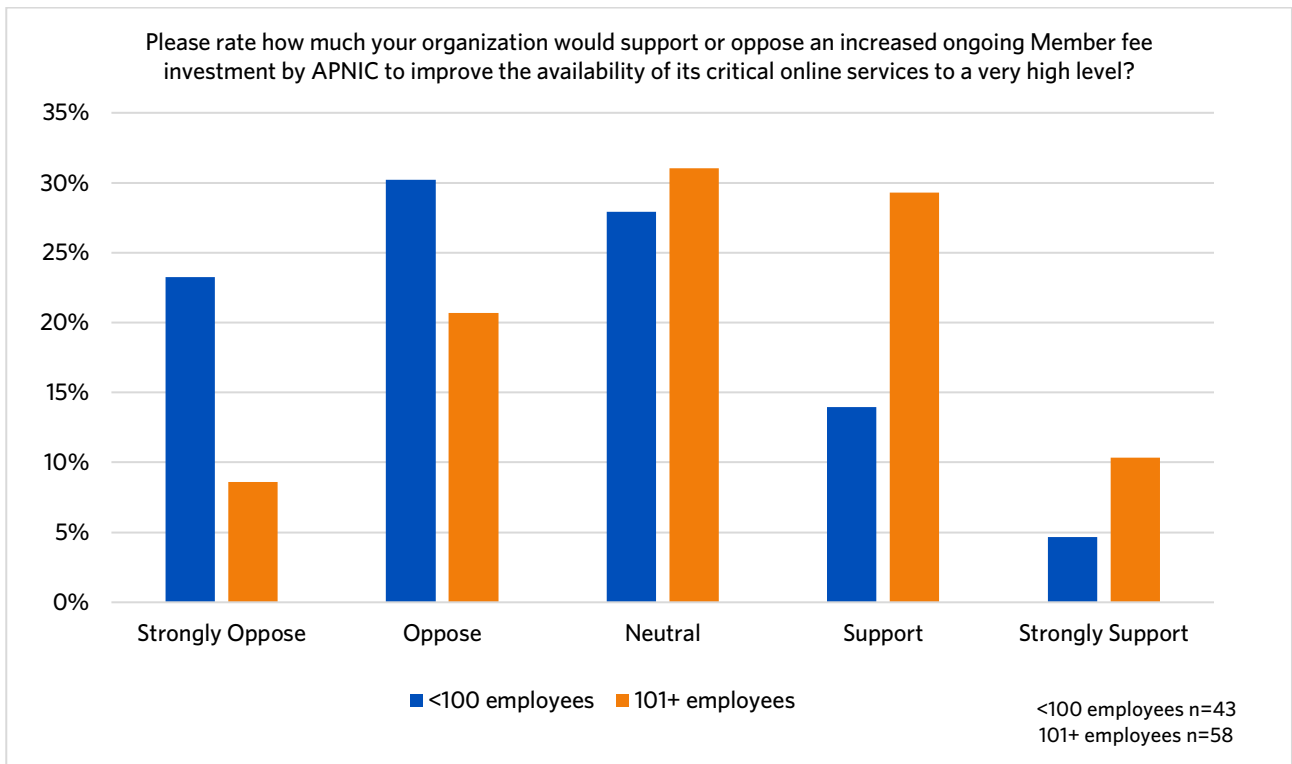


Figure 10: Attitudes to increased Member fee investment in availability improvements (comparison of Member size)

“We don’t think you should over complicate the setup for higher availability, it is not required for us.” *Online respondent*

“It is highly concerning that APNIC continues to allocate significant funds towards services readily accessible for free elsewhere on the Internet. Their fee structure, which already stands as one of the highest amongst similar organizations, exacerbates these concerns. As Members, we must advocate for a more judicious and responsible utilization of our contributions.” *Online respondent*

As noted previously, the interviewees were mostly larger organizations. Their responses in the interviews were mostly in line with the quantitative feedback received:

- Two Members interviewed would accept a slight increase in fees to improve availability, but one did not see a need to improve availability.
- Overall, the NIRs would accept a related fee increase if justified.
- The root operator and the LEA encourage more spending to improve availability as they would directly benefit.
- For the Cloud provider, a fee increase (to invest in availability improvements) would be insignificant to them.

The root operator suggested APNIC seeks sponsorship from organizations such as themselves to be better funded around critical infrastructure.

“We believe the RIRs need to be better funded, overall, given the fact you are now, what we feel, are running critical infrastructure...We are warm and open to a dialogue (to improve funding).” *Root operator*

“Perhaps it is a better way if APNIC propose a fee change on a scientific and reasonable calculation...we can evaluate if it is reasonable and acceptable.” *NIR*

“No, I don’t think there needs to be more investment [in availability].” *Oceania ISP*

### 3.5 Attitudes on other areas of potential investment

Respondents in both the online form and interviews were given the opportunity to provide further comments. Although technically outside the scope of this community consultation, there were a range of valuable comments on where APNIC should be investing Member fees, and not just on availability of critical services.

“In my opinion, APNIC can fund some IPv6 innovation projects, and continue to fund IPv6 and network security training” *NIR*

“Fight the fight, push IPv6, push RPKI, get the Internet secure” *Oceania ISP*

“I would prefer APNIC spends our fees on other things like security or the registry interface rather than chasing very high availability which is very costly for marginal benefit. Availability seems fine as it is.” *Online respondent*

“If you can run some public RPKI/ROA servers running the RTR protocol, that would greatly benefit members. Some APNIC members are less technically inclined or able to to setup their own Routinator 3000 servers. Having APNIC run 3 x servers serving ROA/RPKI records to RTR-speaking network routers (usually our eBGP speakers too) would be very helpful and a good pool of resourcing in the region.” *Online respondent*

“APNIC's core role is running the address and ASN registries. Those need to be available all the time and accurate. These registries need working whois, working ROA publication, and working reverse DNS. These also need to be available and accurate. This is where membership expect their fees to be used, as these services keep the Internet working. Everything else APNIC does is a "nice to have" but is NOT a critical service. If more money is needed to make these critical services more reliable, cut the "nice to have" and fund what APNIC is meant to be doing.” *Online respondent*

### 3.6 Accuracy remains core

Sixty-four percent of all respondents agreed that their organization valued higher accuracy of APNIC data more than higher availability of APNIC services (Figure 11).

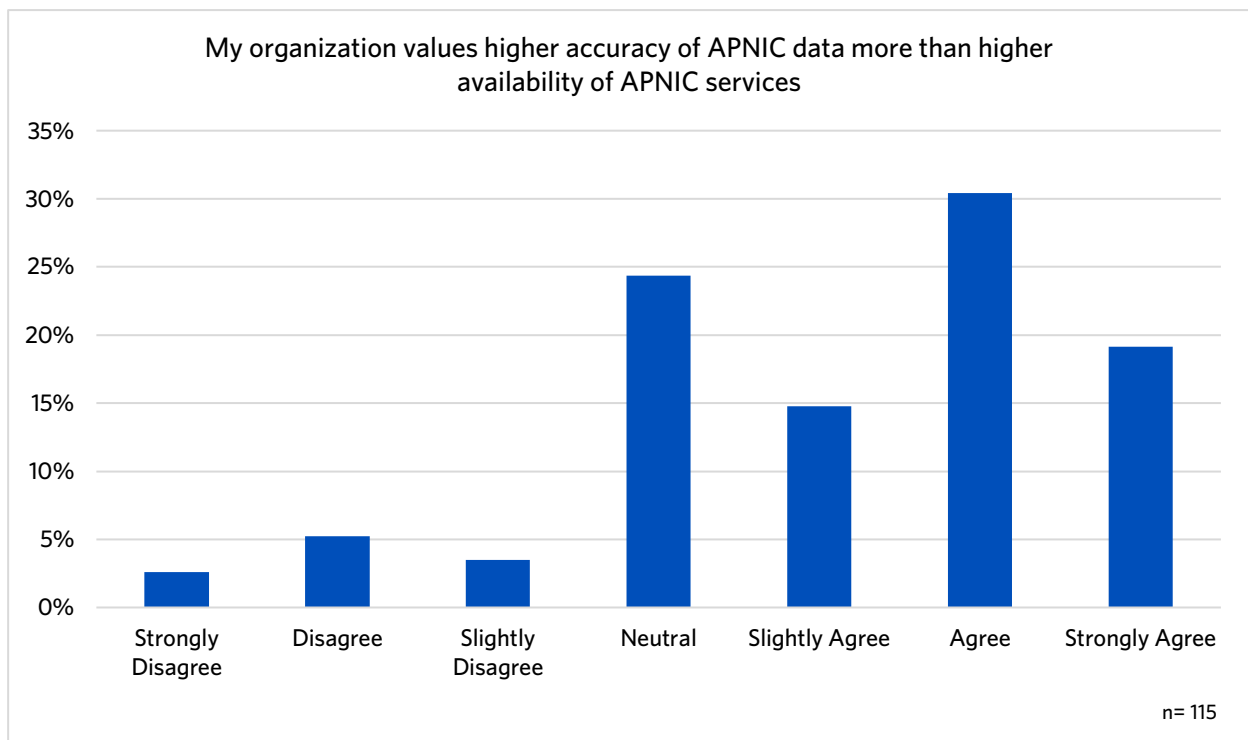


Figure 11: Attitudes on importance of accuracy of APNIC data

“Of course, higher (availability) is better for us, but we need some balance. Availability is important, but the accuracy or up-to-date data publication is more important.” *NIR*

## Appendix A

### A-1 High availability percentages

Availability %	Downtime per year	Downtime per day (24 hours)
99.5% ("two nines five")	1.83 days	7.20 minutes
99.9% ("three nines")	8.77 hours	1.44 minutes
99.95% ("three nines five")	4.38 hours	43.20 seconds
99.99% ("four nines")	52.60 minutes	8.64 seconds
99.999% ("five nines")	5.26 minutes	864 milliseconds
99.9999999% ("nine nines")	31.56 milliseconds	microseconds

### A-2 Demographic breakdown of online respondents

#### Respondents by Economy

Economy	%	Total responses	Economy	%	Total responses
Australia	28.71%	60	Myanmar	1.44%	3
Bangladesh	9.09%	19	Sri Lanka	1.44%	3
New Zealand	8.13%	17	Bhutan	0.96%	3
India	7.66%	16	Fiji	0.96%	2
Singapore	4.78%	10	Papua New Guinea	0.96%	2
Hong Kong Special Administrative Region of China	4.31%	9	Viet Nam	0.96%	2
Thailand	3.83%	8	Afghanistan	0.48%	2
China	3.35%		American Samoa	0.48%	1
Malaysia	3.35%	7	British Indian Ocean Territory	0.48%	1
Pakistan	2.87%	7	Maldives	0.48%	1
Philippines	2.87%	6	Marshall Islands	0.48%	1
Indonesia	1.91%	6	Palau	0.48%	1
Nepal	1.91%	4	Samoa	0.48%	1
Taiwan	1.91%	4	Solomon Islands	0.48%	1
Japan	1.44%	4	Tuvalu	0.48%	1
Lao People's Democratic Republic	1.44%	3	Brunei Darussalam	0.48%	1
Mongolia	1.44%	3			

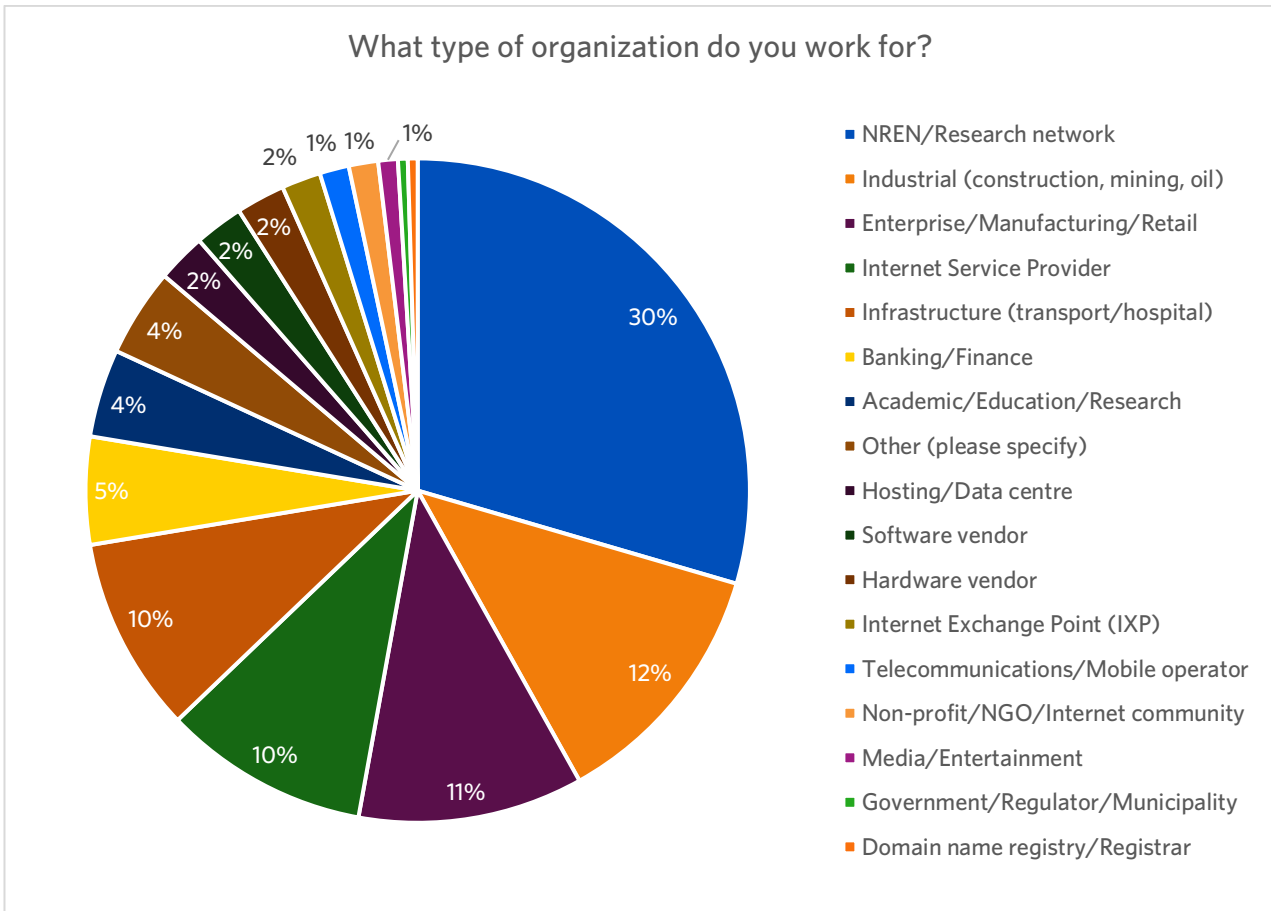


Figure 16: Self-identified industries of online form respondents

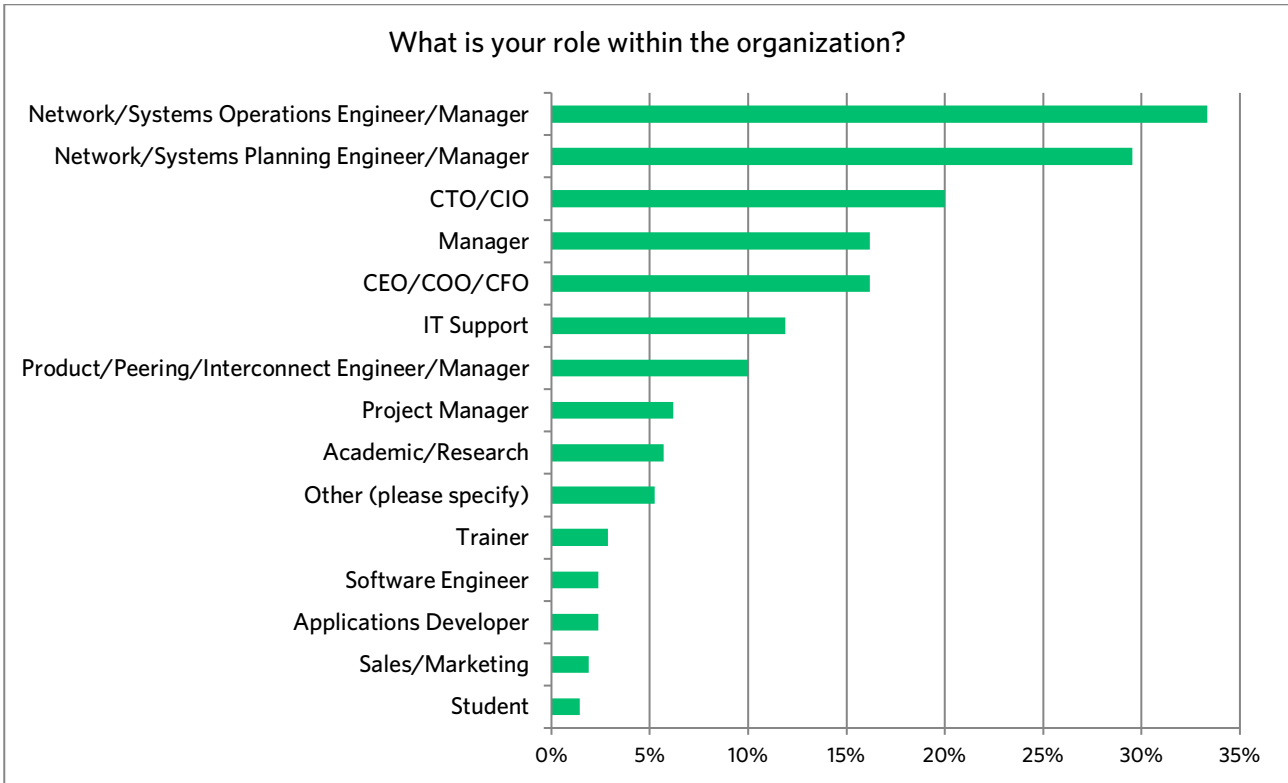


Figure 17: Self-identified roles of online form respondents



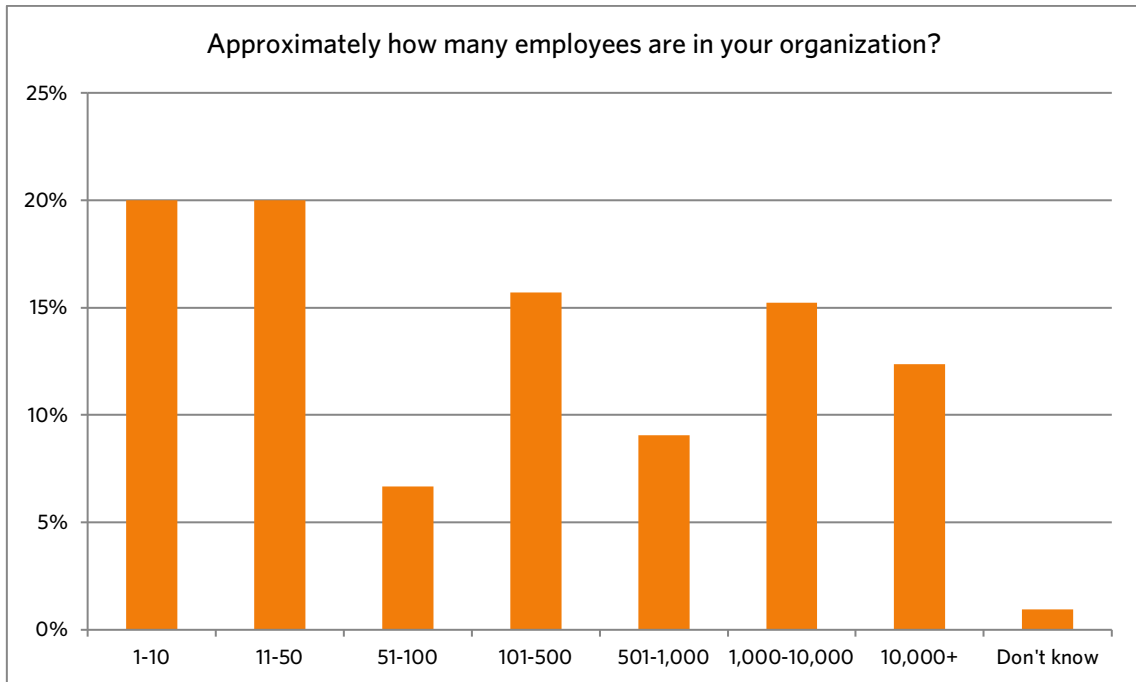


Figure 18: Number of employees at online form respondents organizations

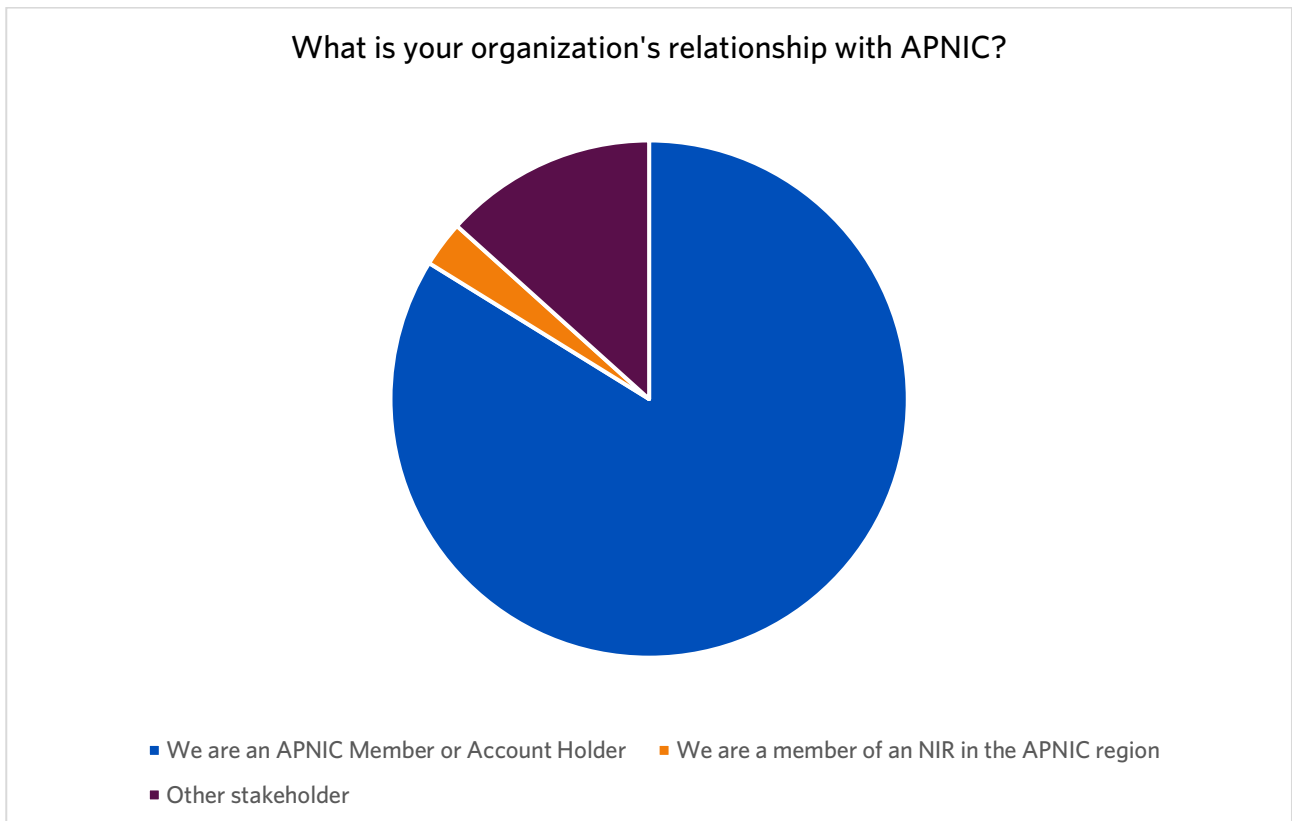


Figure 19: Online form respondents relationship with APNIC

## Appendix B- Critical services reliability interview guide

1. Please can you identify yourself.
2. Please can you identify your role in your organization.
3. Please can you identify your “type” of organization: what sector you place yourself in.
4. Can you tell us about what kind of online services your organization offers.

### Topic A: APNIC Services

5. Does your organization rely on any APNIC services for its network operations?
6. How would loss of any of those services impact your organization?
7. How long would it take for a disrupted APNIC service to impact your network operations?
8. To date, has your organization’s network operations ever been disrupted by APNIC outages? What happened?
9. What level of service availability does your organization operate at for its own network-related services?
10. Do you think APNIC should commit to a minimum level of availability determined by Members? If so, what level of availability should be guaranteed? For what service/s?
11. Are you satisfied or dissatisfied with the current level of APNIC service availability?
12. Do you have any other thoughts on APNIC’s service availability and what’s important to your organization?

### Topic B: Costs and Fee impacts

APNIC currently operates its critical services with minimal downtime, on a best-effort basis, within existing budgets. Moving to a guaranteed high availability environment will require significant investment by APNIC and higher ongoing costs. These costs would be passed on to Members.

13. Would your organization be prepared to pay more in Member fees for a guaranteed high level availability of APNIC critical services? How much?
14. How would you suggest that APNIC funds any investment in guaranteed service availability?
15. Do you think that APNIC investing in a high level of service availability is a good use of Member funds? Where would you like to see member funds invested?

### Follow up questions — specifics on services used — not mandatory

#### RPKI

1. Is your organization using RPKI as an allowlist, (similar to IRR or LOA, as a proof of authority), for your customers who “bring their own IP” to you for BGP routing?
2. Does your organization currently create and sign ROAs about its own routes?
3. Does your organization perform Route Origin Validation (ROV) in its own network?
4. Are you aware of any instance of disruption to your organization’s routing which your ROA, or use of ROV, avoided?
5. Has your organization been affected by the use of RPKI by other networks?
6. Currently, changes to ROAs become globally visible and can take effect in BGP after approximately 30 minutes. Does your organization have any requirements for new or changed announcements in BGP, or for resources that have been recently delegated or transferred to your organization’s account?

7. If your organization relies on RPKI, or will soon implement and rely on RPKI, what sort of business continuity measures does your organization have to take into account for outages or mistakes? For example, if APNIC inadvertently/mistakenly registered a ROA that invalidated one of Facebook's IP address ranges, how would your organization deal with that?

### **Whois and RDAP**

8. How quickly do you expect Whois updates to take effect in RDAP?
9. Do you currently make use of IRR objects as part of your network operations?
10. Has your organization been affected by the use of IRR objects by other networks?
11. Does your organization have any requirements for new or changed announcements in BGP, or for resources that have been recently delegated or transferred to your organization's account?
12. If your organization relies on IRR objects, what sort of business continuity measures does your organization have to take into account for outages or deletions or similar? For example, if APNIC accidentally deleted an object that your organization depended on, how would you deal with that?

### **Reverse DNS**

13. Does your organization rely on reverse DNS delegations or (RDNS) about your ranges, or use filters for global addresses based on reverse DNS?
14. If yes, would the publication of incorrect or incomplete reverse DNS impact your operations? How quickly would you be exposed to this?
15. If yes, would the absence of any reverse DNS delegation impact your services?

## Appendix C- Online Consultation form

APNIC is always looking to maintain the highest possible level of availability of its services to Members and the community.

Last year, APNIC began assessing the technical and process improvements required to increase availability of its critical services to a high level, beyond 99.99%. Significant financial and resource investments in people and infrastructure would need to be made to achieve this.

We would appreciate your input into this work, and would encourage you discuss this with colleagues in your organization to capture their thoughts (or have them complete this consultation form as well). Your feedback will help APNIC determine the scope, feasibility and appetite for further investments in critical service availability.

### About you

**1. Where do you live?**

<Economy list selection – all economies>

**2. What type of organization do you work for?**

	Academic/Educational/Research
	Banking/Financial
	Domain name registry/Registrar
	Enterprise/Manufacturing/Retail
	Government/Regulator/Municipality
	Hardware vendor
	Hosting/Data centre
	Industrial (construction, mining, oil)
	Infrastructure (transport/hospital)
	Internet Exchange Point (IXP)
	Internet Service Provider (ISP)
	Media/Entertainment
	NREN/Research network
	Non-profit/NGO/Internet community
	Software vendor
	Telecommunications/Mobile operator
	Other (please specify)

**3. What is your role within the organization?**

*(Please select all that apply)*

	Academic/Research
	Applications Developer
	CEO/COO/CFO
	CTO/CIO
	IT Support
	Manager
	Network/Systems Planning Engineer/Manager
	Network/Systems Operations Engineer/Manager

	Product/Peering/Interconnect Engineer/Manager
	Project Manager
	Sales/Marketing
	Software Engineer
	Student
	Trainer
	Other (Please specify)

**4. Approximately how many employees are in your organization?**

	1-10
	11-50
	51 – 100
	101 – 500
	501 – 1,000
	1,000 – 10,000
	10,000+
	Don't know

**5. What is your organization's relationship with APNIC?**

	We are an APNIC Member or Account Holder
	We are a member of an NIR in the APNIC region
	Other stakeholder

**Services**

**6. Which of the following APNIC services does your organization use or rely on for its network operations? Usage can include making updates to the service or querying the service. Select all services used.**

	Whois / IRR
	RDAP
	RPKI
	RDNS
	None of the above [Exclusive - Go to end of Survey]

7. If the following services were unavailable for 15 minutes, how would that negatively impact your network operations? Select the level of impact for each service.

	No impact at all	Very minor impact	Minor impact	Moderate impact	High impact	Very high impact	Catastrophic impact
Whois / IRR							
RDAP							
RPKI: ROA Publication							
RDNS: Publication of invalid zone state							
RDNS: Loss of publication of the zone							
RDNS: Loss of Name Server							

8. If one of these APNIC services suffered an outage and became unavailable, how long could the outage last before it began degrading your organization's network operations? Select one option per service.

	No impact	More than 7 days	Up to 7 days	Up to 2 days	Up to 24 hours	Up to 12 hours	Up to 1 hour	30 minutes	10 minutes	5 minutes	1 minute
Whois / IRR											
RDAP											
RPKI: ROA Publication											
RDNS: Publication of invalid zone state											
RDNS: Loss of publication of the zone											
RDNS: Loss of Name Server											

9. Are there other APNIC services not covered here that are critical to your network operations?

<Free text answer>

**10. What level of service availability does your own organization commit to for network-related services?**

	99.5% or below
	99.9%
	99.95%
	99.99%
	99.999%
	Don't know

**11. Please indicate how much do you agree with the following statements:**

1 = Strongly disagree 4 = Neutral 7 =

Strongly agree

24/7 availability of APNIC technical support staff is important to us	1	2	3	4	5	6	7
Our network operations are rarely disrupted by APNIC outages	1	2	3	4	5	6	7
Our organization has processes and technology in place to mitigate any unavailability of APNIC services	1	2	3	4	5	6	7
My organization values higher accuracy of APNIC data more than higher availability of APNIC services	1	2	3	4	5	6	7
APNIC should commit to a minimum level of availability determined by Members	1	2	3	4	5	6	7

**12. Do you have any other comments on how the availability of APNIC services influences your network operations?**

<Free text answer>

**Costs and Fee impacts**

APNIC currently operates its critical services with minimal downtime, on a best-effort basis, within existing budgets.

Moving to a very high availability environment will require significant additional investment by APNIC and higher ongoing costs, potentially millions of dollars. This investment would be funded by future fees APNIC receives from its Members.

**13. Please rate how much your organization would support or oppose an increased ongoing Member fee investment by APNIC to improve the availability of its critical online services to a very high level?**

1 Strongly Oppose	2 Oppose	3 Neutral	4 Support	5 Strongly Support
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**14. Please let us know if you have any other comments on APNIC's service availability and what's important to your organization.**

<Free text answer>

Thank you for taking the time to provide APNIC with your feedback. The results of the community consultation around APNIC's critical service availability project will be shared publicly in the coming months.