UbuCon Korea 2023

Bird를 활용하여 나만의 ISP 및 CDN 구축하기

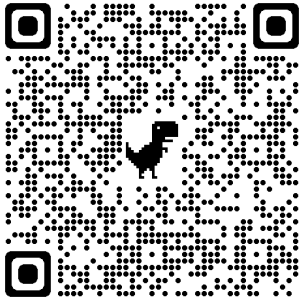
김경택(Gyeongtaek Kim)

발표자 소개

김경택 / kwabang@yuki.net.uk

- Backend & Network Engineer
- Operating Public Linux Mirror (Yuki Network Mirror)
- Operating Hosting ISP (Yuki Network, AS151349)

QnA ->



왜 ISP를 직접 운영하나요?

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리눅스 미러 운영 시작
2020.05

BYOIP, IPv6 지원 시작
2021.05

AS203979 ASN 발급
2022.07

Yuki Network설립
2023.04

AS151349 ASN 발급
2023.05

Joined KCIX (Kansas City Internet Exchange)
Peering with Cloudflare, Akamai, etc..

왜 ISP를 직접 운영하나요?

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```
root@ip-172-26-4-37:~# ping kwabang.net
PING kwabang.net(2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005)) 56 data bytes
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=1 ttl=63 time=6.38 ms
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=2 ttl=63 time=6.35 ms
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=3 ttl=63 time=6.43 ms
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=4 ttl=63 time=6.39 ms
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=5 ttl=63 time=6.35 ms
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=6 ttl=63 time=6.44 ms
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=7 ttl=63 time=6.41 ms
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=8 ttl=63 time=6.25 ms
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=9 ttl=63 time=6.37 ms
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=10 ttl=63 time=6.31 ms
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=11 ttl=63 time=6.51 ms
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=12 ttl=63 time=6.54 ms
64 bytes from 2a06:1287:5611:cafe:cafe:cafe:cafe:1005 (2a06:1287:5611:cafe:cafe:cafe:cafe:1005): icmp_seq=13 ttl=63 time=6.40 ms
```

IP 주소

IP 주소

사설 IP	공인 IP
공유기에서 할당	인터넷 사업자(ISP)에서 할당
외부에서 접근 불가능	외부에서 접근 가능
다른 네트워크와 중복 가능	인터넷에서 고유한 주소

ASN과 BGP는 무엇인가?

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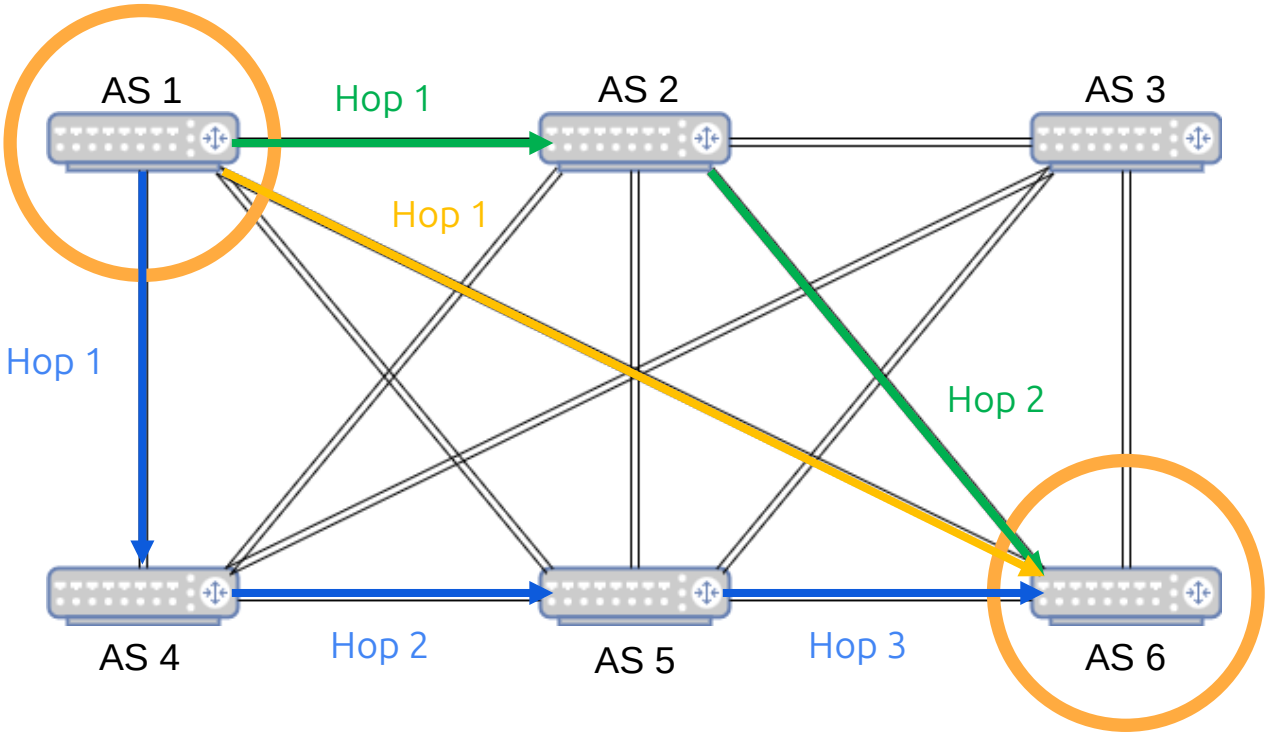
ASN

Autonomous System Number
망식별번호

BGP

Border Gateway Protocol
경계 경로 프로토콜

ASN과 BGP는 무엇인가?



물리 장비

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IPv4 Routing table						
	Jan 2018	**Jan 2019**	**Jan 2020**	**Jan 2021**	**Jan 2022**	**Jan 2023**
Prefix Count	699,000	760,000	814,000	860,000	906,000	940,000
Root Prefixes	328,000	353,000	387,000	400,000	420,000	445,000

IPv6 Routing table						
	Jan 2018	**Jan 2019**	**Jan 2020**	**Jan 2021**	**Jan 2022**	**Jan 2023**
Prefix Count	45,700	62,400	79,400	105,500	146,500	172,400
Root Prefixes	28,200	35,400	42,300	49,200	57,800	69,400

Source: BGP in 2022 – the routing table, APNIC Blog

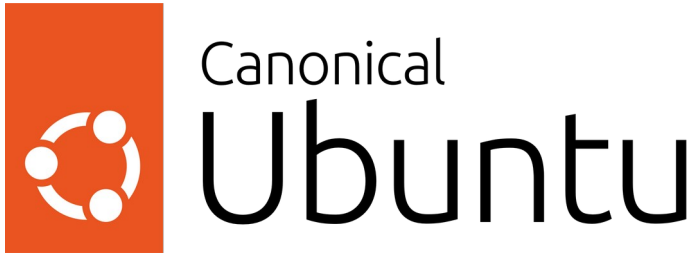
물리 장비

$23,000 ~ $26,000

물리 장비

$11,000 ~ $15,000

물리 장비

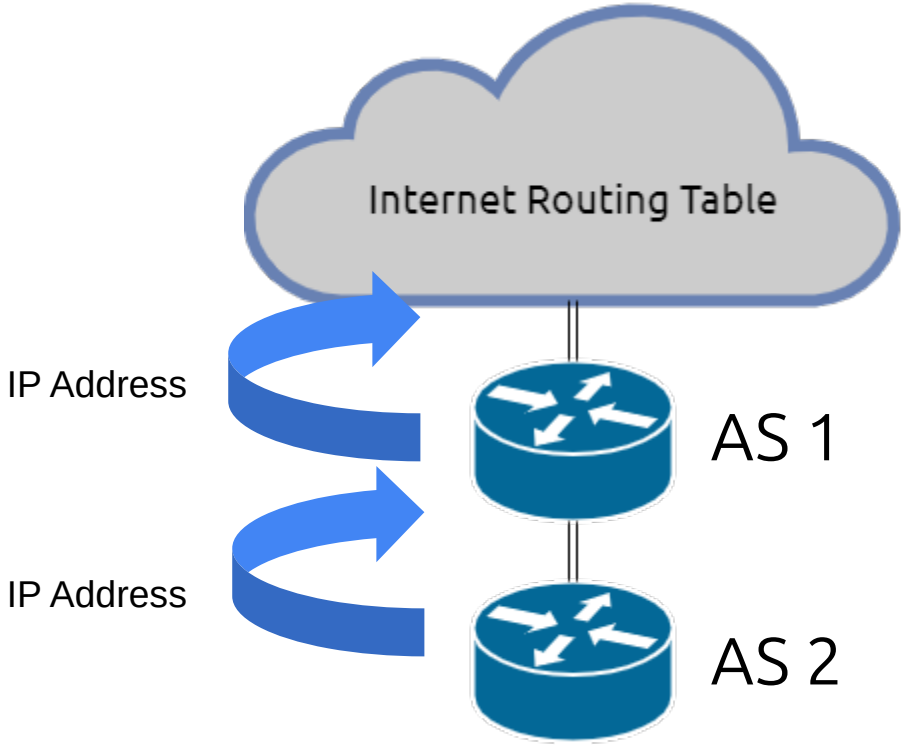


클라우드에서 IP 주소 발표하기

클라우드에서 IP 주소 발표하기

- IP Address
- ASN
- Upstream BGP

클라우드에서 IP 주소 발표하기



클라우드에서 IP 주소 발표하기

	Upstream Yuki Network	AWS Lightsail
ASN	AS151349	AS203979
GRE Address	fd34:5966:9679::0	fd34:5966:9679::1
OS	Debian 11	Ubuntu 22.04.3
Package	Bird 2.0.7	Bird 2.0.8

Prefix	**2a0e:b107:1fe5::/48**

클라우드에서 IP 주소 발표하기

- apt install bird2 // Bird2 설치
- /etc/bird/bird.conf // 설정파일 수정
- birdc configure // 설정파일 적용

https://github.com/Kwabang/UbuCon-Korea-2023-Example-Conf

BGP 하이재킹

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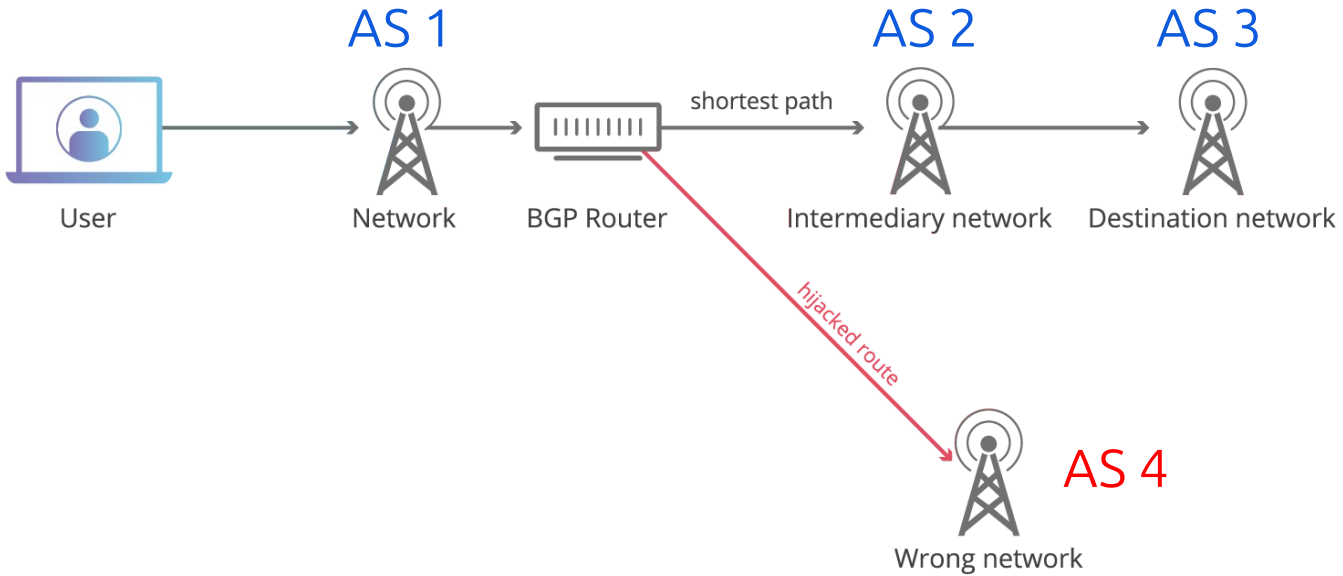
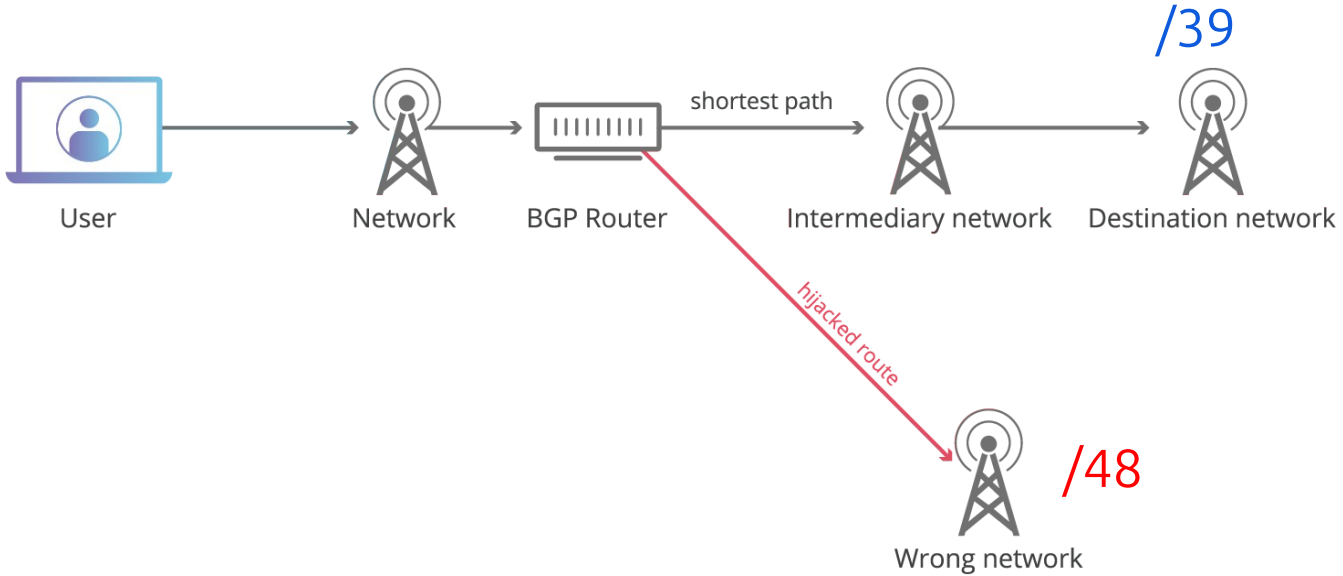


Source: What is BGP hijacking?, Cloudflare

BGP 하이재킹



Source: What is BGP hijacking?, Cloudflare

RPKI

Resource Public Key Infrastructure

BGP 하이재킹

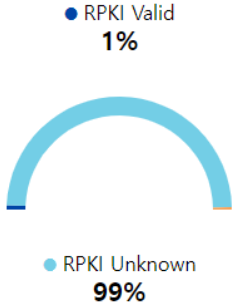
Routing Information in South Korea

Routing Statistics

Statistics about relevant global routing table entries

ASes	Prefixes	Routes	RPKI Valid	RPKI Invalid	RPKI Unknown
884 IPv4 838 IPv6 46	**25k** IPv4 24,012 IPv6 940	**25k** IPv4 24,034 IPv6 940	**159 (1%)** IPv4 113 IPv6 46	**13 (0%)** IPv4 13 IPv6 0	**24.8k (99%)** IPv4 23,908 IPv6 894

Data generated at 2023-09-08T10:00:00 UTC



Source: Cloudflare Radar

BGP 하이재킹

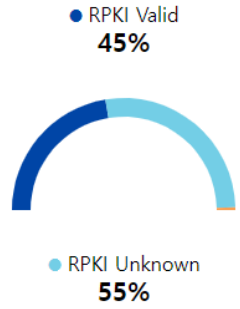
Routing Information in Japan

Routing Statistics

Statistics about relevant global routing table entries

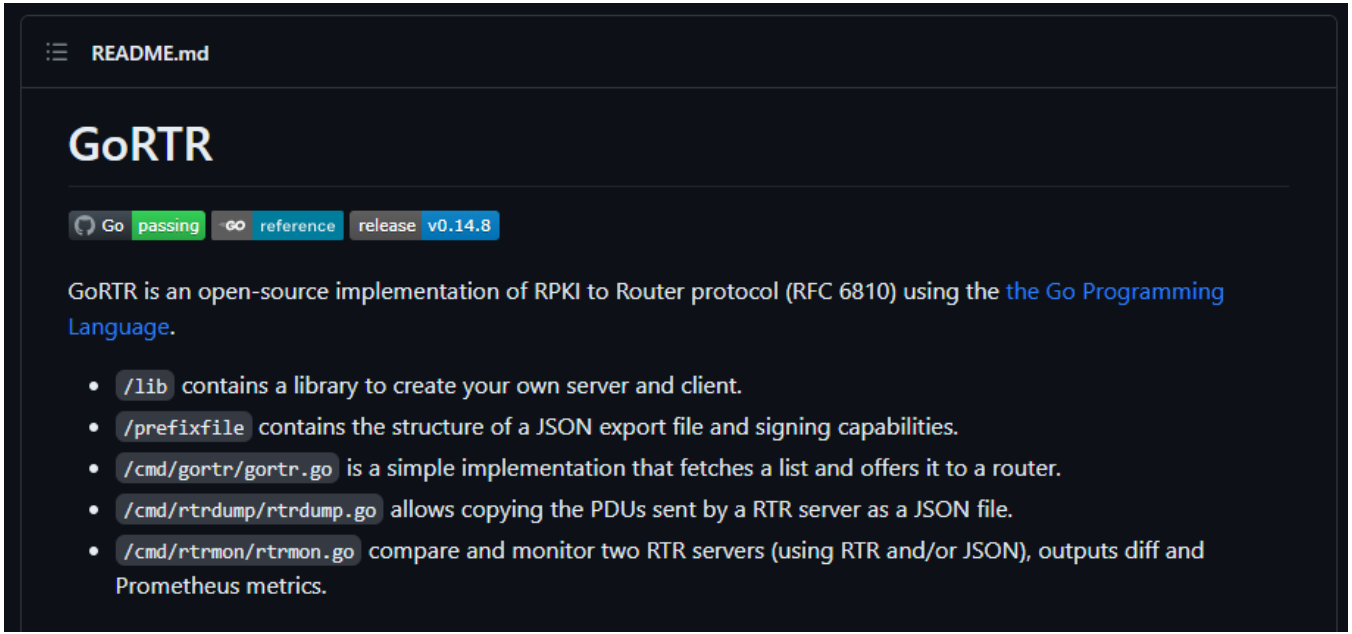
ASes	Prefixes	Routes	RPKI Valid	RPKI Invalid	RPKI Unknown
1.1k	**12.5k**	**12.5k**	**5.6k (45%)**	**20 (0%)**	**6.8k (55%)**
IPv4 690 IPv6 407	IPv4 11,202 IPv6 1,251	IPv4 11,203 IPv6 1,251	IPv4 4,780 IPv6 821	IPv4 15 IPv6 5	IPv4 6,408 IPv6 425

Data generated at 2023-09-08T10:00:00 UTC



Source: Cloudflare Radar

BGP 하이재킹



README.md

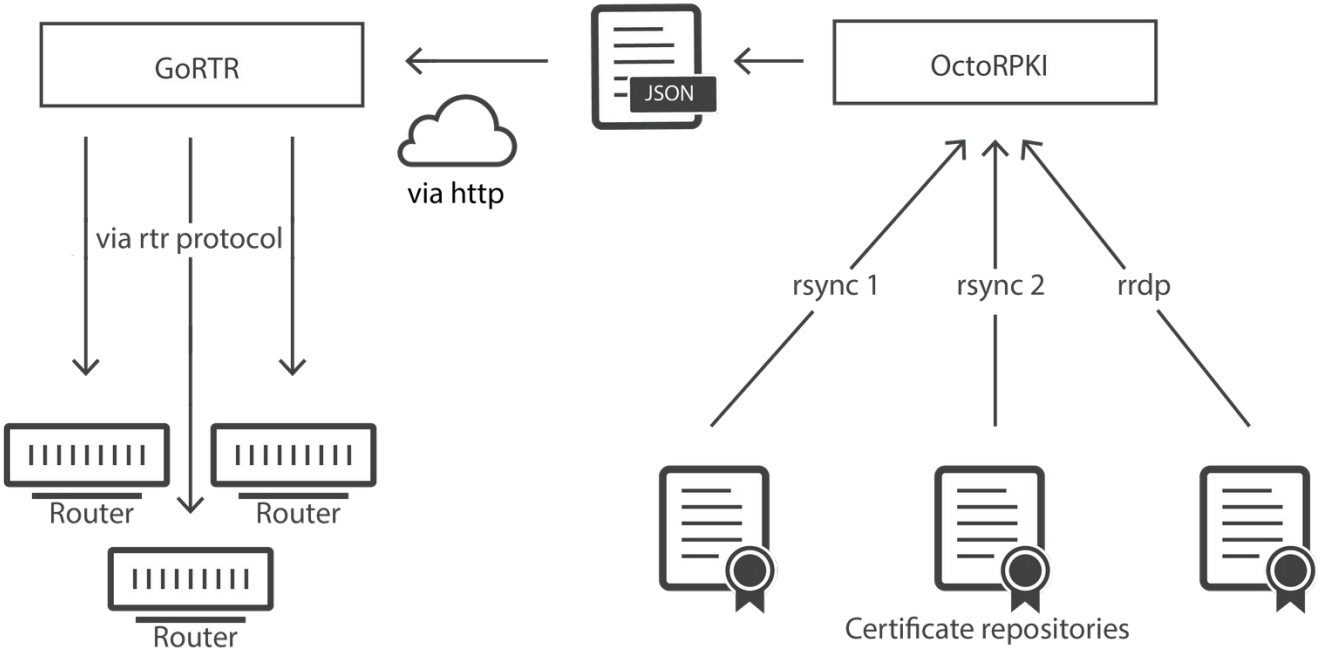
GoRTR

Go passing | reference | release v0.14.8

GoRTR is an open-source implementation of RPKI to Router protocol (RFC 6810) using the the Go Programming Language.

- `/lib` contains a library to create your own server and client.
- `/prefixfile` contains the structure of a JSON export file and signing capabilities.
- `/cmd/gortr/gortr.go` is a simple implementation that fetches a list and offers it to a router.
- `/cmd/rtrdump/rtrdump.go` allows copying the PDUs sent by a RTR server as a JSON file.
- `/cmd/rtrmon/rtrmon.go` compare and monitor two RTR servers (using RTR and/or JSON), outputs diff and Prometheus metrics.

BGP 하이재킹



Source: RPKI and the RTR protocol, Cloudflare Blog

BGP 하이재킹

- GoRTR 설치
- /etc/bird/bird.conf // 설정파일 수정
- birdc configure // 설정파일 적용
- birdc reload all

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Unicast & Anycast

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Unicast, Anycast

QnA