Measuring the impact of BGPsec in a BGP testbed

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Summary

- BGP (Border Gateway Protocol) is the inter-domain routing protocol of the Internet, however, it is vulnerable to AS path forgery and prefix hijacking attacks
- BGPsec is a BGP extension that can mitigate these attacks, but it has not seen any production deployment since its standardisation
- We evaluated existing router implementations with BGPsec support and conclude that existing implementations are not functional and interoperable enough to be run in production
- We share the Docker images we created and our docker-compose based BGPsec testbed topologies to encourage further research into BGPsec

BGPsec testbed blogpost and source code

For more information on the testbed please refer to our blogpost and repository:

Blogpost

Code repository

Our BGPsec testbed topologies

We evaluated 5 router implementations with BGPsec support with regards to their **functional capabilities** and **interoperability** by setting up small topologies.

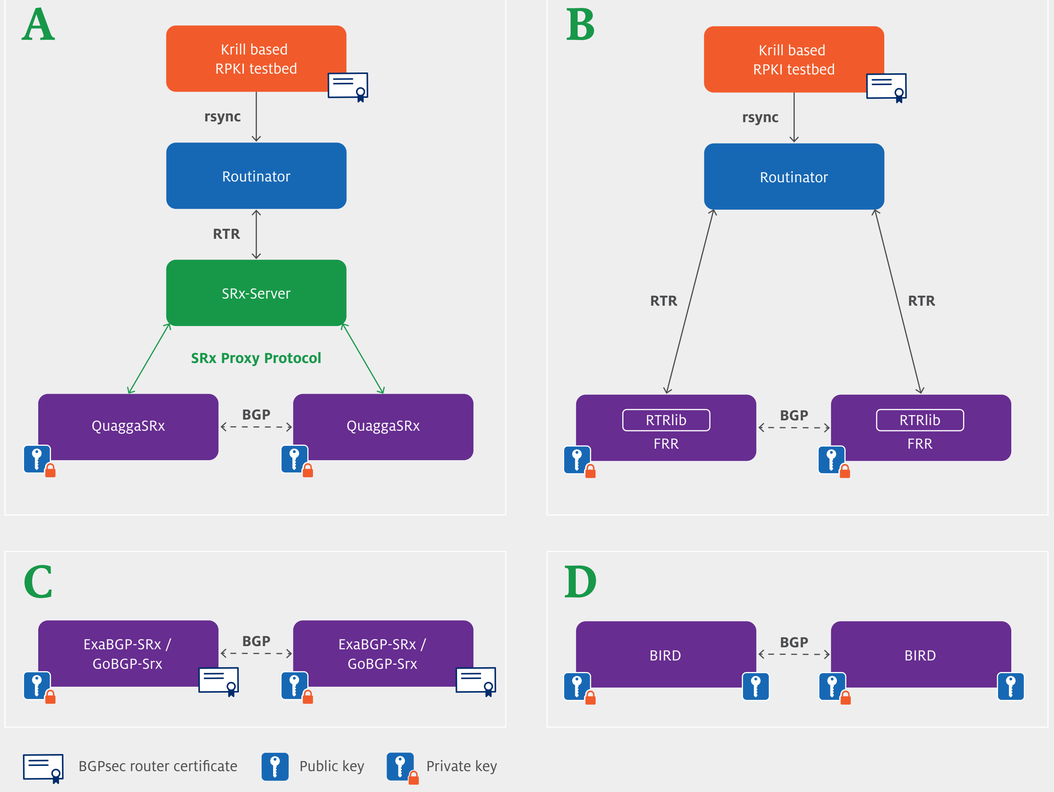


Figure 1. Overview of our setups to run the 5 router implementations in our testbed.

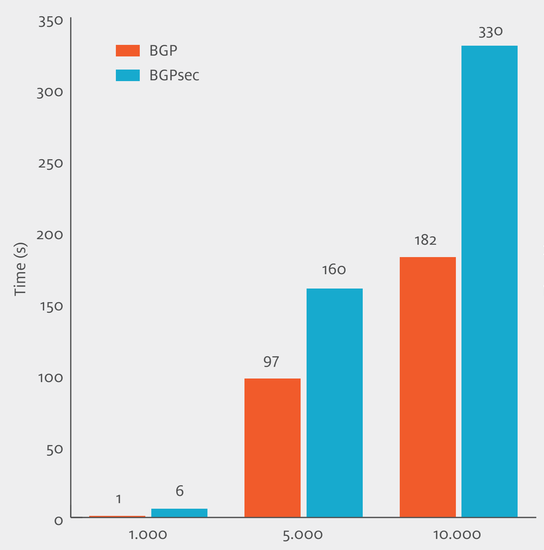
What can you do with this testbed?

The topologies can be used to observe BGPsec traffic between the routers by

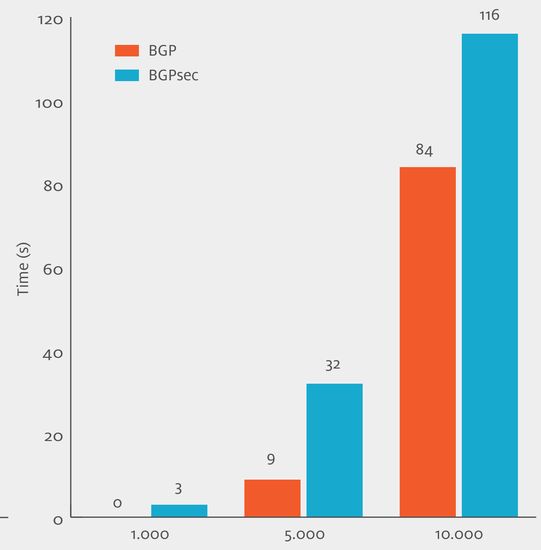
- configuring the routers to announce prefixes
- replaying BGP updates by setting up a peering session with a BGPsec traffic generator like BGPsec-IO from NIST

Example: Comparison of processing/validation times between BGP and BGPsec

Setting up a peering session between BGPsec-IO and one of the router implementations to replay real-world BGP updates and their BGPsec equivalents.



BIRD Processing/Validation time by count of updates



FRR Processing/Validation time by count of updates

Evaluation results

Supported router functions

	QuaggaSRx	ExaBGP-SRx	GoBGP-SRx	FRR	BIRD
Signing	✔	✔	✔	✔	✔
Validating	✔	✘	●	✘	✔
Connection to validating cache	✔	✘	✘	✔	✘

Table 1. BGPsec functions of each evaluated implementation.

Router interoperability

	QuaggaSRx	ExaBGP-SRx	GoBGP-SRx	FRR	BIRD
QuaggaSRx	✔	✔	✔	✔	✔
ExaBGP-SRx	✔	✔	✔	✔	✘
GoBGP-SRx	✔	✔	✔	✔	✘
FRR	✔	✔	✔	✔	✘
BIRD	✔	✘	✘	✘	✔

Table 2. Interoperability of each evaluated BGPsec implementation.

Future work

- Improve router implementations and identify causes of interoperability issues
- Analyse processing/validation time of all router implementations to evaluate the potential impact on BGP operation
- Examine the impact of BGPsec on convergence times in larger network topologies

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