Dynam-IX:
a Dynamic Interconnection eXchange
website: https://dynam-ix.github.io

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(many thanks to the RIPE RACI initiative!)
Higher physical connectivity, more opportunities

Internet topology

- increasingly flatter
- higher connectivity

Rise of Internet eXchange Points

- 600+ members, 200K IPv4 prefixes
- >6 Tbps peak traffic

Yet, IXP members still have to discover and agree to exchange traffic
Establishing an interconnection is mostly a **human-based** and **lengthy** process.

- **Finding partner**
- **Discussing properties**
- **Formalizing terms**
- **Deploying**

**Missed interconnection opportunities**
**Inefficient utilization of peering ports**
**Unoptimized traffic delivery**
How long it takes to establish an interconnection?

We surveyed 100+ operators

Finding partner: Hours or days
Discussing properties: Days or weeks
Formalizing terms: Days or weeks
Deploying: Hours or days

Overall process: Weeks or months
Operators’ perceptions on reducing interconnection time [survey]

- Responsiveness to traffic dynamics - 37% 14% 49%
- Increasing peering port utilization - 60% 22% 18%
- New economic opportunities - 56% 22% 22%
- On-demand network services - 42% 17% 41%

Confidentiality! "I am not willing to disclose my business policy to other networks"

Independence! "I do not want to depend on a middleman to establish my interconnection agreements"

Stability! "What about Internet routing stability?"
Wanted: a digital protocol to facilitate establishing interconnections

Expressive interface

Independence

Confidentiality

Reputability

Tamper-proof persistence
Dynam-IX:

a negotiation protocol to facilitate interconnection
An intent describes technical and business information

target: {
    routing: { attributes }
    sla: { attributes }
    pricing: { attributes }
    time: { attributes }
}

pricing: {
    "ingress": e^{1/(sla.bwidth*time.length)}-1
}

query(ASN, target, [properties])
Dynamix local node: third-party independence

Advantages:
+ **transparency**: information is public within the blockchain (e.g. reputation scores)
+ **auditable**: validate stored information through smart contracts (e.g., reputation scores)
- may not fit everyone’s confidentiality requirements ➔ just one possible approach
Dynam-ix protocol: an example

Blockchain

Network A
Services offered
Contact Info
Reputation

Network B
Services offered
Contact Info
Reputation

ASes signed hash of the contract

Network A score
4/5

Network B score
3/5

Network B

Network A

Traffic exchange

Query
Offer
Propose
Establish

Repay
End
Proof-of-concept evaluation

- How long does it take to establish an interconnection agreement?
- How fast does the blockchain grow?
- What are the bandwidth requirements?
How long does it take to establish an interconnection agreement?

Regular conditions: interconnection agreements are established in less than 10 seconds
How fast does the blockchain grow?

Depends on:
- block creation timeout
- number of agreement per second

100 GB for 10 million interconnection agreements

1500 ASes daily establishing 20 interconnection agreements each during one year

TPB = Transactions per (blockchain) Block
Summary

Dynam-IX facilitates establishing interconnections through an intent abstraction

Proof-of-concept built upon blockchain
- evaluated in practice with promising results
- reputation transparency, verifiability, and tamper-proof
- alternative designs are possible; boils down to trust and privacy requirements
Thank you!

More information available at: dynam-ix.github.io

We would love to get more feedback from you!

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