

Dynam-IX: a Dynamic Interconnection eXchange

website: <https://dynam-ix.github.io>



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(many thanks to the RIPE RACI initiative!)

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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



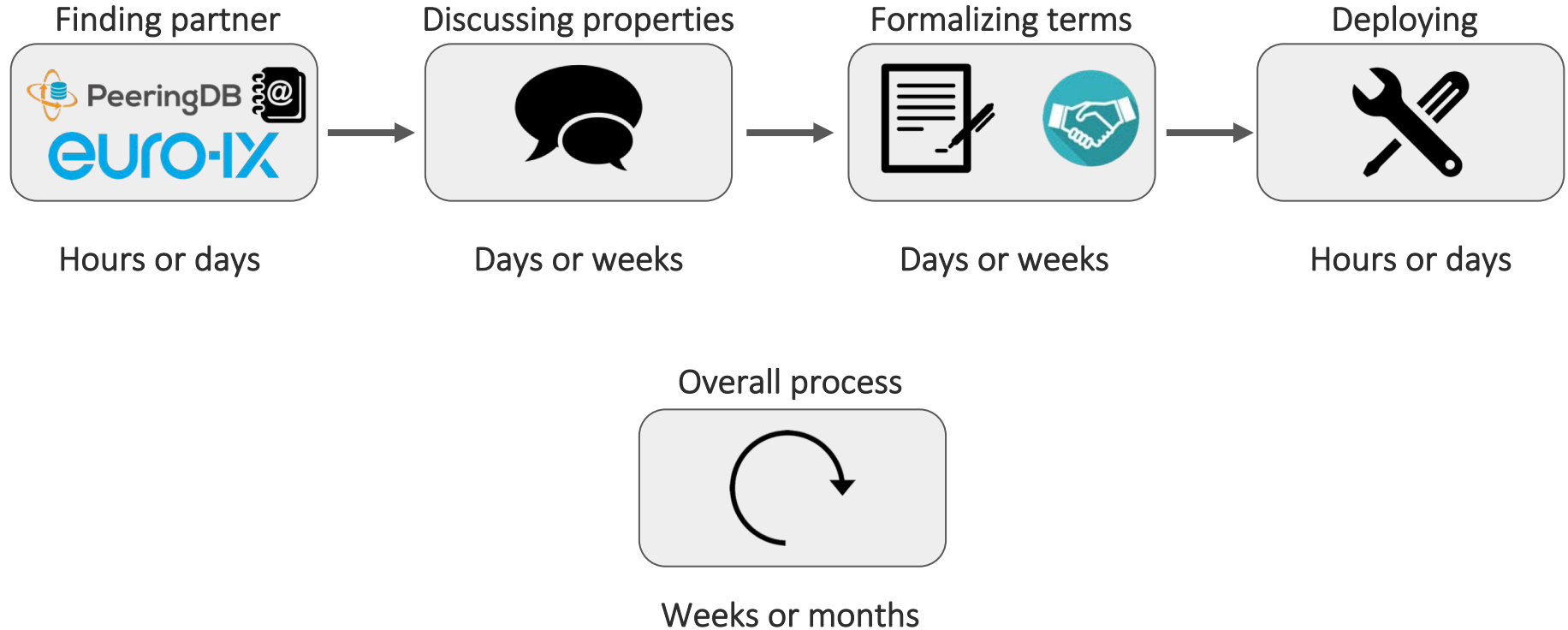
Inefficient utilization of peering ports



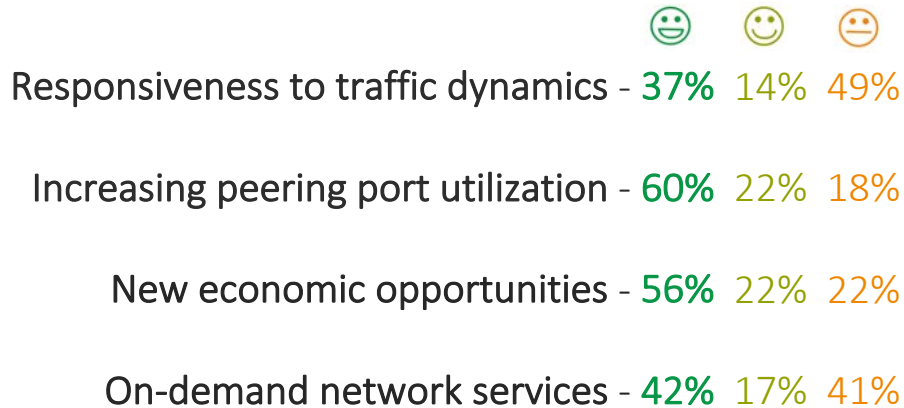
Unoptimized traffic delivery

How long it takes to establish an interconnection?

We surveyed **100+ operators**



Operators' perceptions on reducing interconnection time [survey]



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

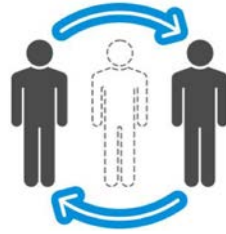
Independence! "I do not want to depend on a middleman to establish my interconnection agreements"

Stability! "What about Internet routing stability?"

Wanted: a **digital protocol** to **facilitate** establishing interconnections



Expressive interface



Independence



Confidentiality



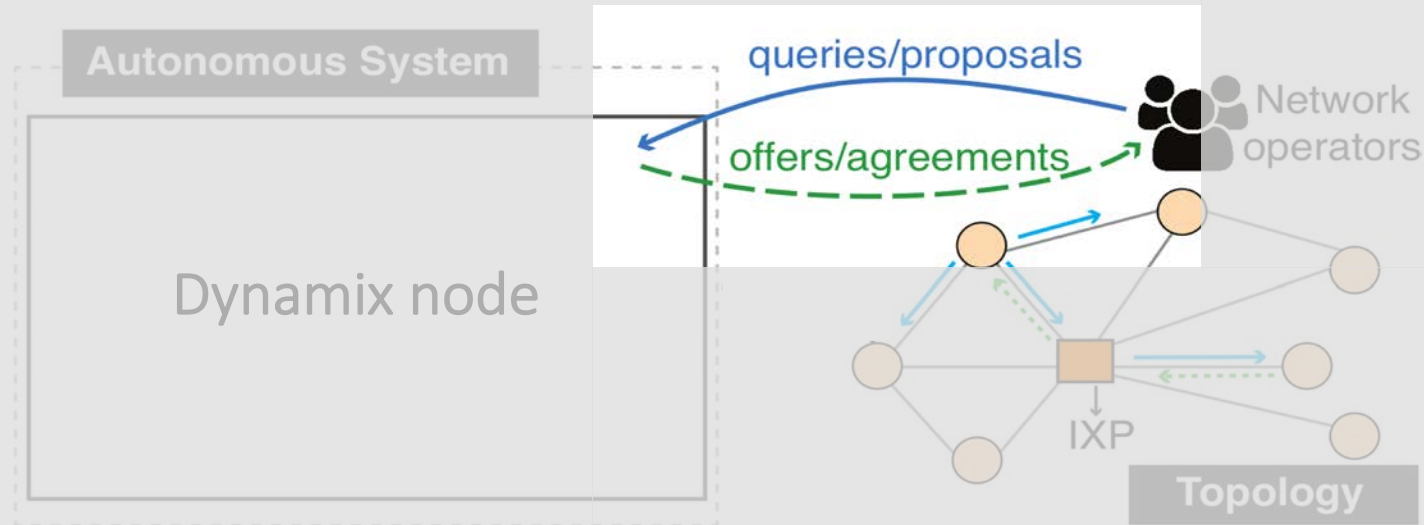
Reputability



Tamper-proof
persistence

Dynam-IX:

a **negotiation protocol** to facilitate interconnection



An **intent** describes **technical** and **business** information



Routing

AS-PATH



SLA

Bandwidth
Latency
Packet loss
Jitter
Repair time
Guarantee
Availability



Pricing

Billing Method
Ingress Price
Egress Price



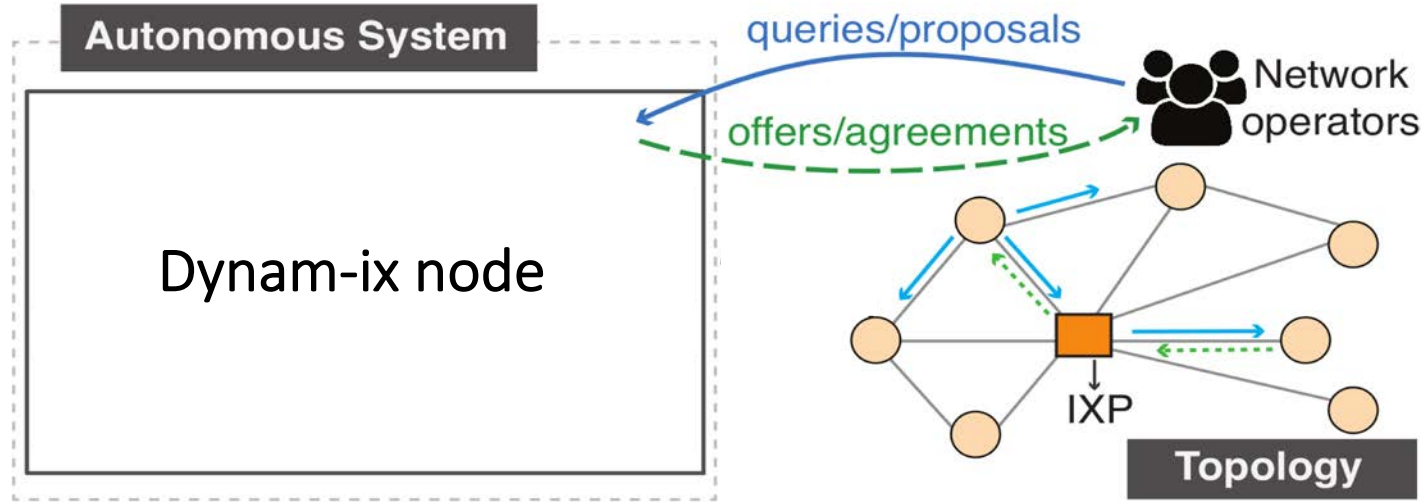
Time

Length

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

```
pricing: {  
  "ingress": e^(1/(sla.bwidth*time.length))-1  
}  
query(ASN, target, [properties])
```

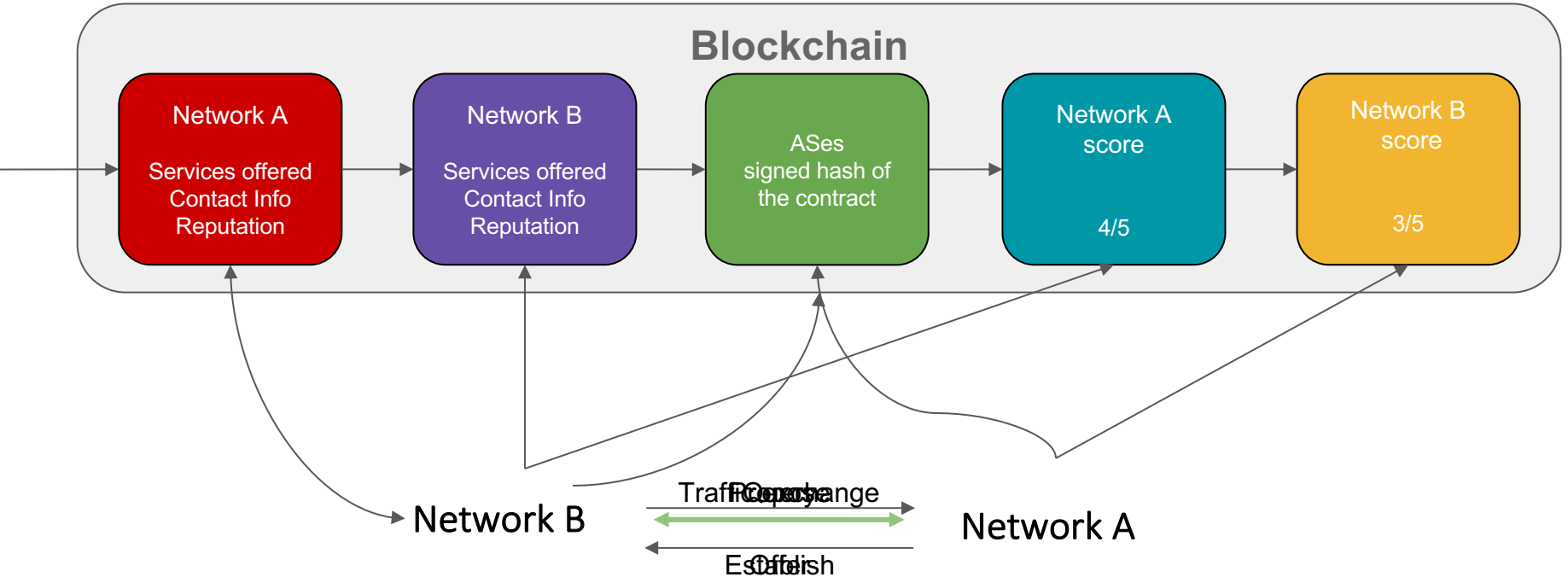

Dynamix local node: third-party independence



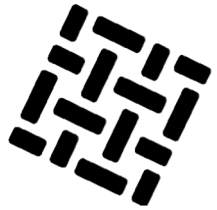
Advantages:

- + **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



Proof-of-concept evaluation



**HYPERLEDGER
FABRIC**



How long does it take to establish an interconnection agreement?

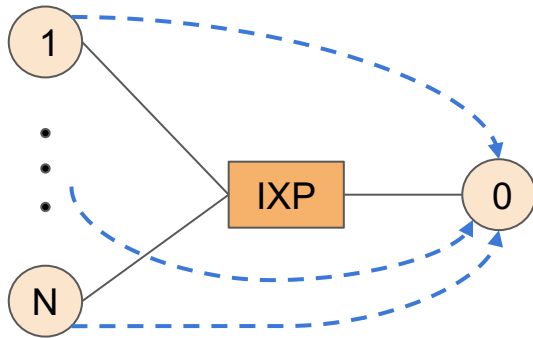


How fast does the blockchain grow?

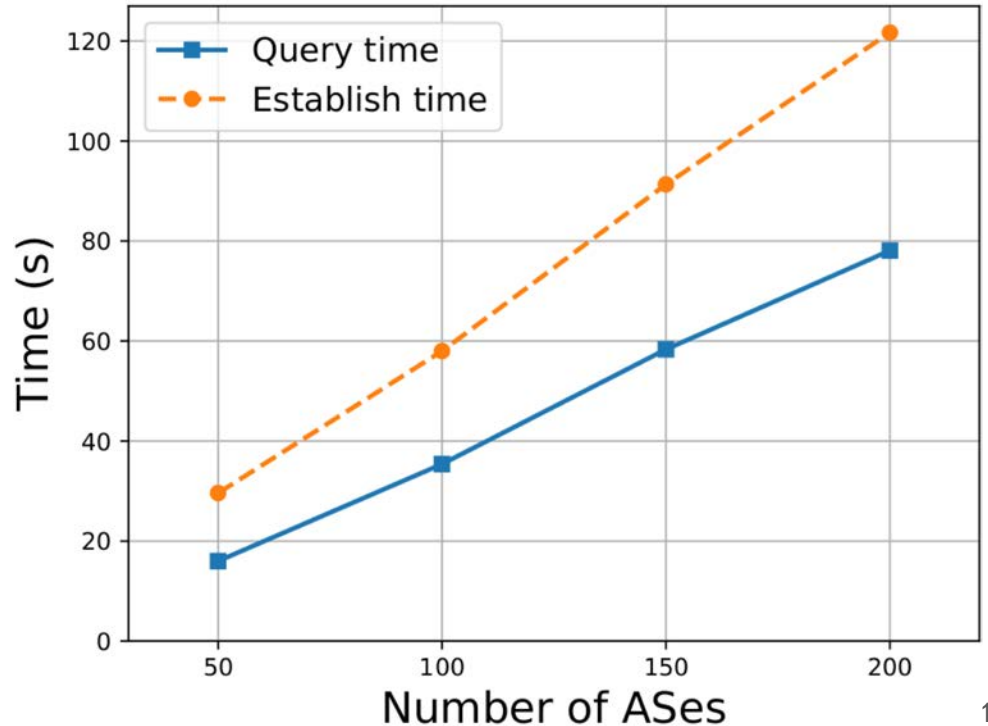


What are the bandwidth requirements?

How long does it take to establish an interconnection agreement?



Regular conditions: interconnection agreements are established in less than 10 seconds



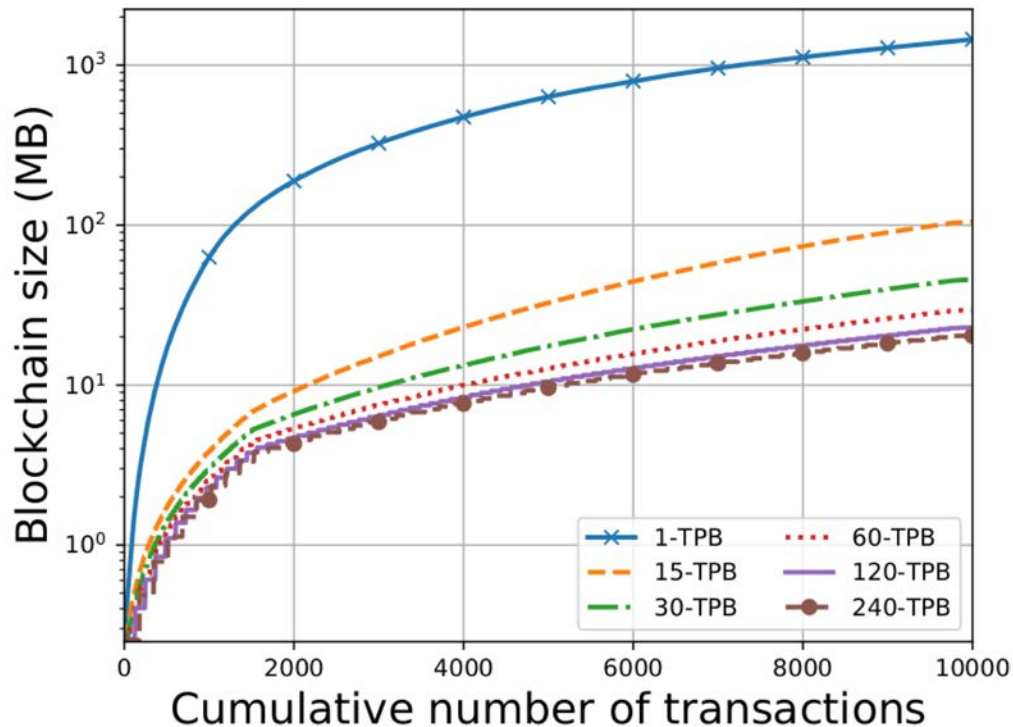
How fast does the blockchain grow?

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**



New economic
opportunities



Increase port
utilization



Enhance
responsiveness

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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