Route Bazaar:
Automatic Interdomain Contract Negotiation

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How to achieve end-to-end reachability?

• Physical connectivity is not enough
• Economic compensations are necessary
Current solution: bilateral contracts + BGP

- **Bilateral contracts**: provide economic compensations
- **BGP**: local decisions on routing
Current solution gives trust and scalability

Rigid bilateral interconnection contracts

Local routing decisions via BGP

Trust
- Secure economic rewards
- Ensure accountability
- Preserve privacy

Scalability
- Support growth in terms of networks and end users
Scalability comes at the price of flexibility

- Rigid bilateral interconnection contracts
- Local routing decisions via BGP

Routing is inflexible and suboptimal

- Contract formation is not dynamic
- Routing policies are insufficiently rich
Negotiation takes more than time
Delivery around failures can be slow
The Internet struggles to assure end-to-end Quality of Service (QoS)
Prior fixes for each separate component

Rigid bilateral interconnection contracts

Local routing decisions via BGP

More flexible interconnections
- Partial transit
- Remote peering

Routing improvements
- Faster BGP convergence
Fixing only one component is not enough

“We never learned how to route money”
David D. Clark

Routing is bound to interconnection contracts
Is there a better solution?
Tackle contracts and routing jointly

bind interconnection contracts to routing
(instead of binding routing to interconnection contracts)
How? Inspiration from cryptocurrencies

Public ledger (or blockchain) in cryptocurrencies

- records transactions
- enables checking of the account balance for each user

provides decentralized trust
Public ledger for contracts & routing

- Automatic multilateral contracts
- External routing decisions

Use a public ledger

- Similarly to blockchains in cryptocurrencies
- Registers agreements and its implementation
- Provides trust and scalability
Route Bazaar: in a nutshell

- An end-to-end path is composed
- The public ledger registers
  - Path contract
  - Forwarding & payment proofs
Route Bazaar: path selection

ASes announce pathlets

Public ledger

End-to-end path is composed
Route Bazaar: contract formation

- Path contract is registered
  - Forwarding and payment commitments
- Each contracted pathlet is anonymized
Route Bazaar: verification

- Conformance of forwarding to routing
- Conformance to payment commitments

All involved networks register proofs of forwarding & payment in the public ledger.
Route Bazaar: privacy

Paths are private but providers and customers have a history.
Route Bazaar contributions

Binding interconnection contracts to routing
(instead of binding routing to interconnection contracts)

• Dynamic contract formation
• Support of flexible routing
• Backwards compatibility