Six/One Router

A Scalable and Backwards-Compatible Solution for Provider-Independent Addressing

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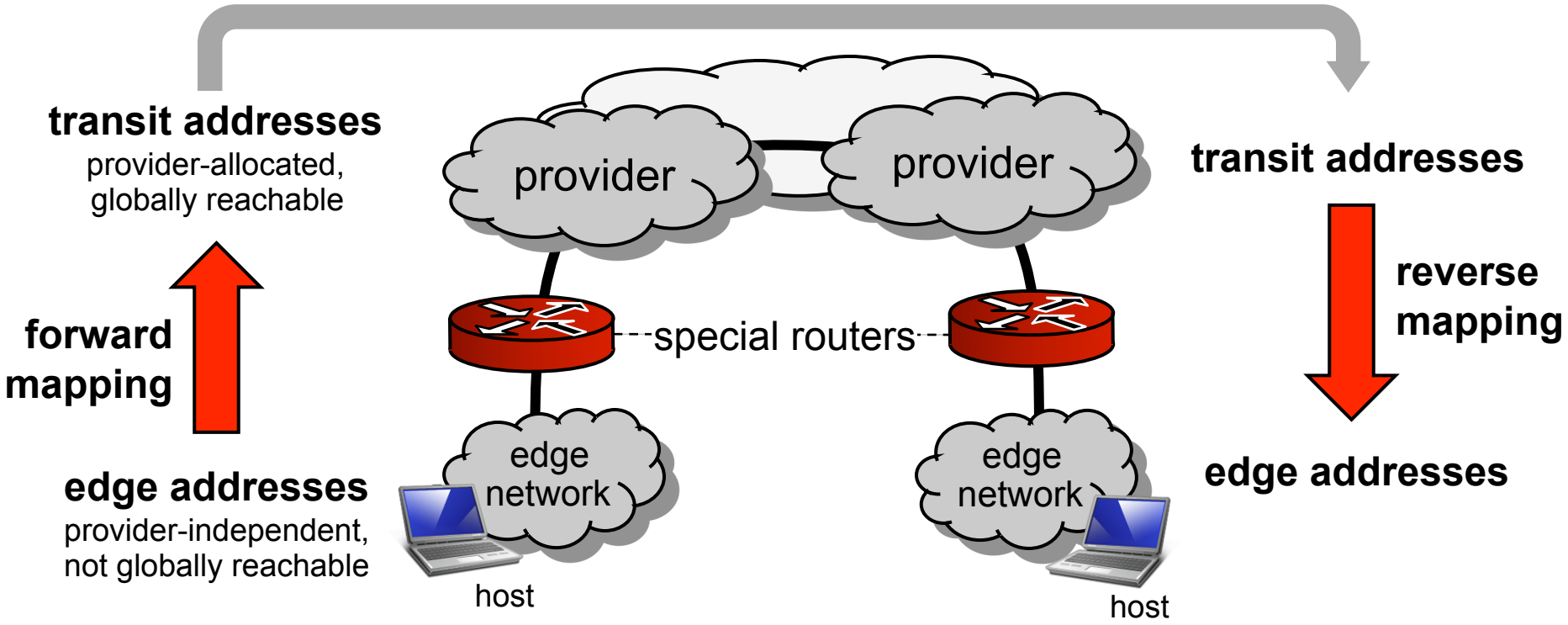
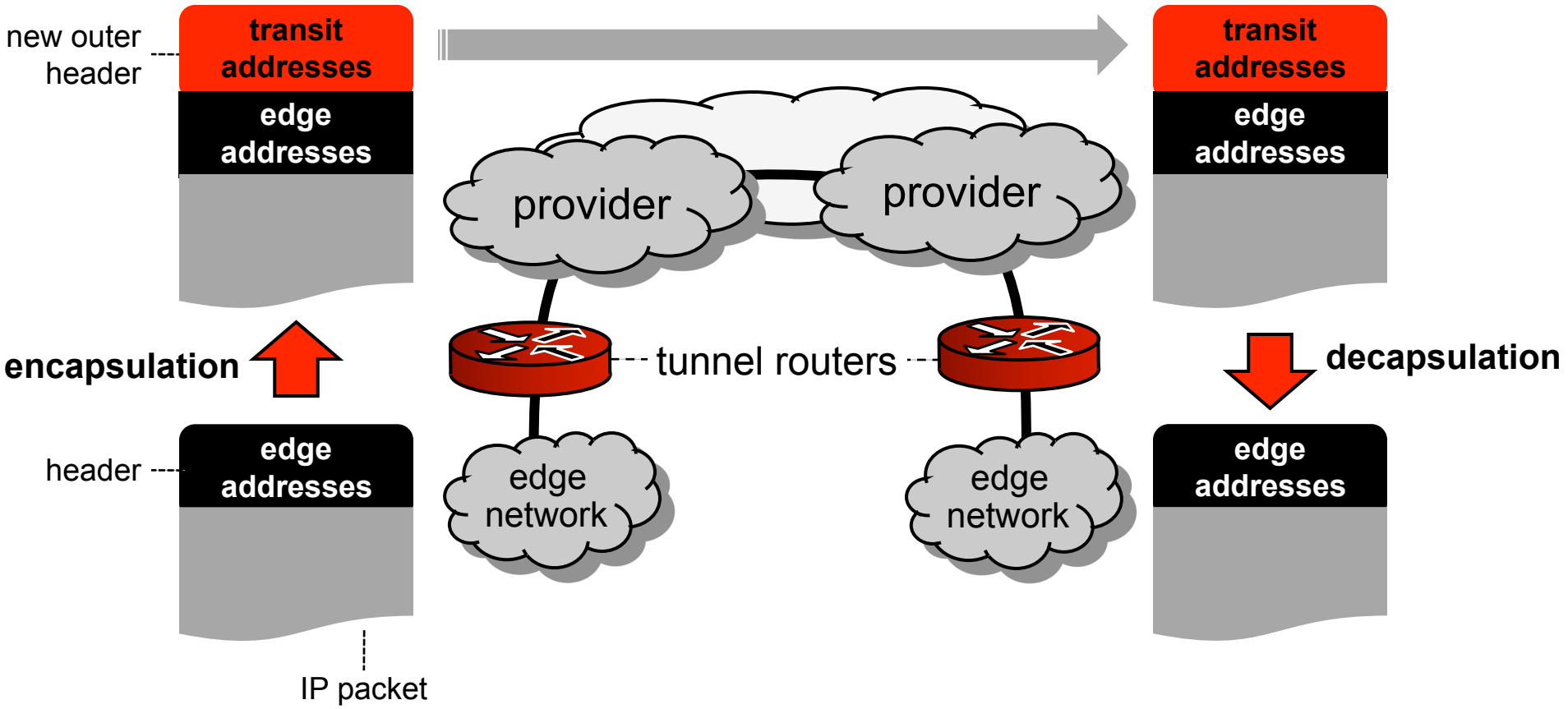
IRTF Routing research group meeting at IETF 71
Philadelphia, March 14, 2008

Address Indirection for More Scalable Routing



- Decouples addressing at edge from addressing in Internet core
- Global mapping resolution system for remote edge addresses

Address Indirection via Tunneling

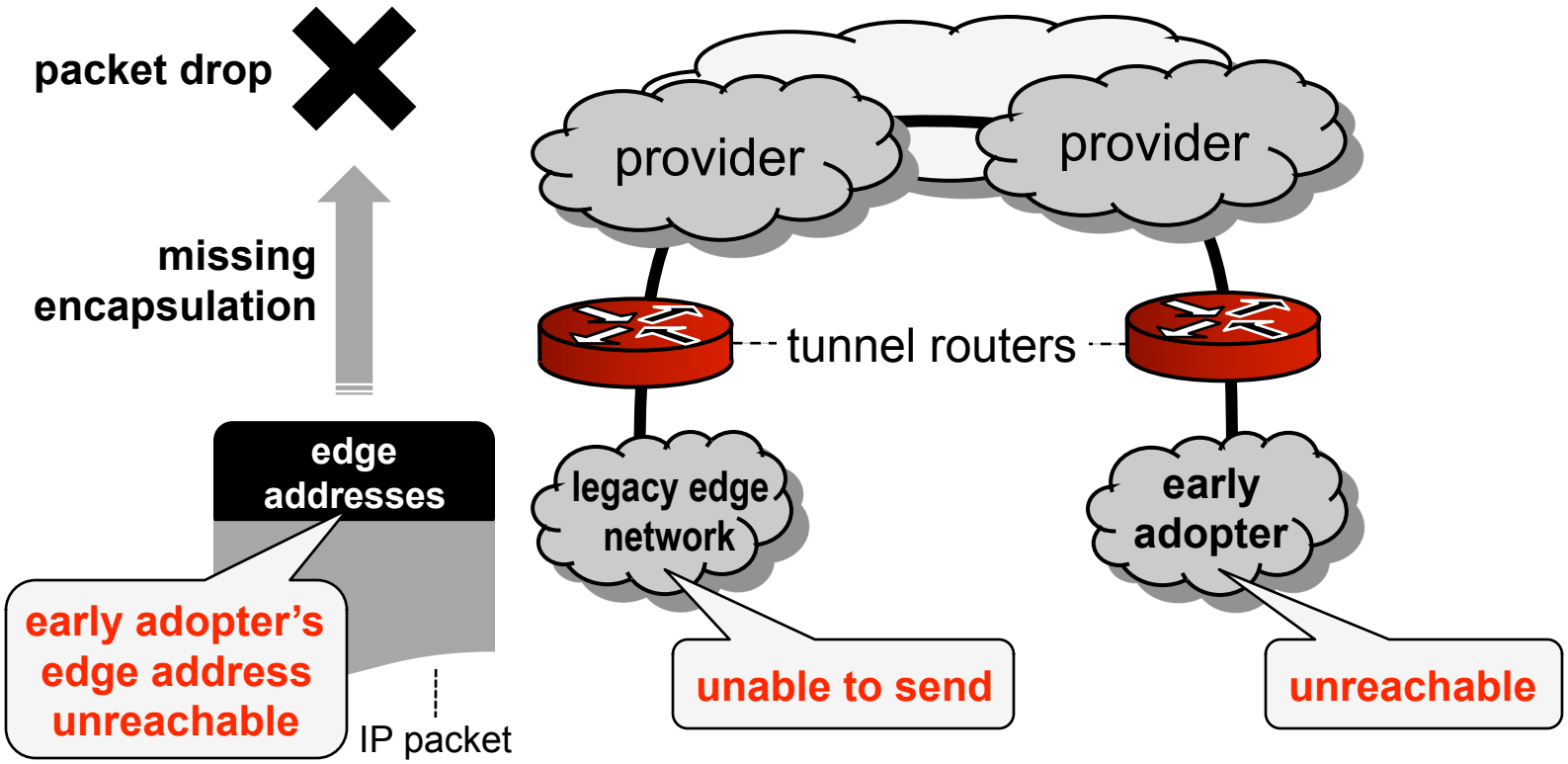


- Encapsulation at sending side
- Decapsulation at receiving side

Shortfall: Not backwards-compatible

- Requires bilateral support
  ⇒ Early adopters unreachable
- Proxy infrastructure expensive

Address Indirection via Tunneling



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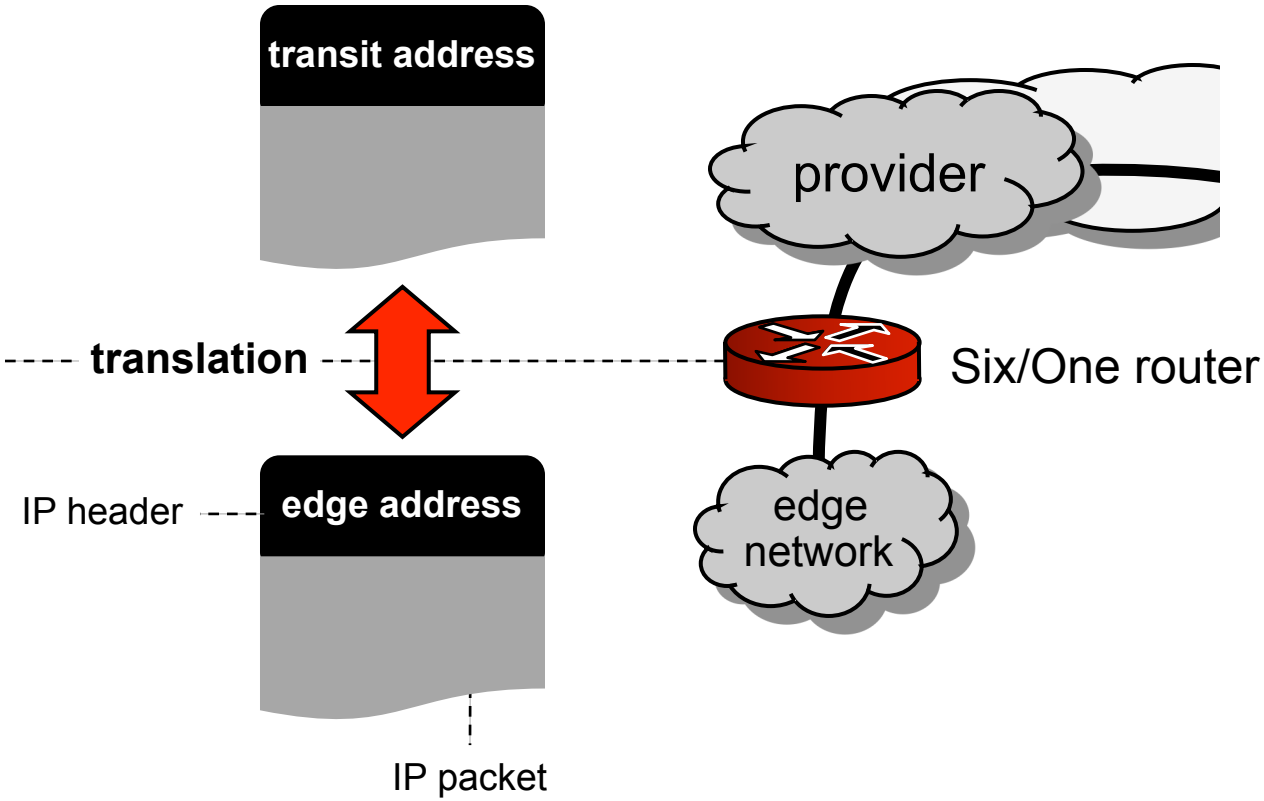
Six/One Router: Address Indirection via Translation



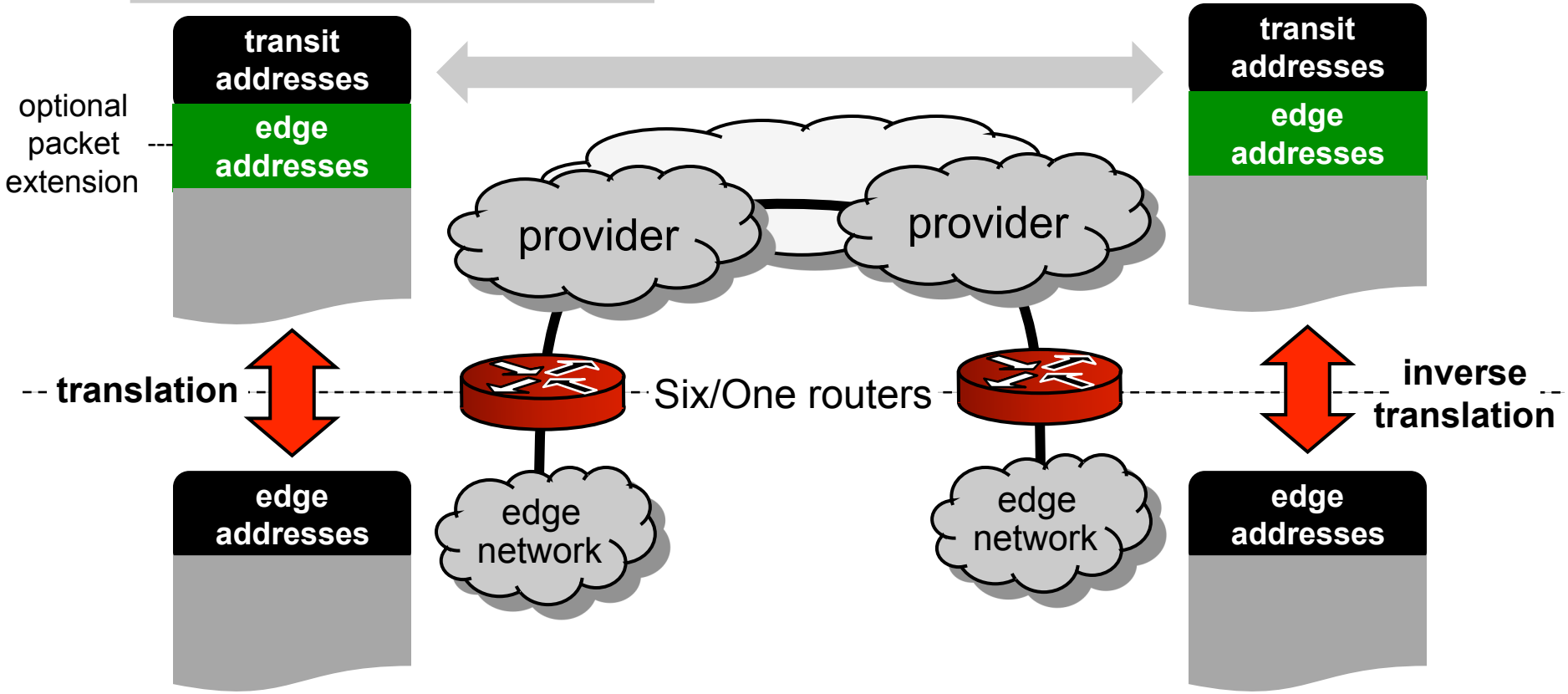
Idea

- Address translation (maybe IPv4/v6)
- Hosts reachable at transit address in addition to edge address
- Optional inverse translation

Components

- Translators (Six/One routers)
- Adaptive domain name resolution
- Mapping resolution system

Six/One Router: Address Indirection via Translation



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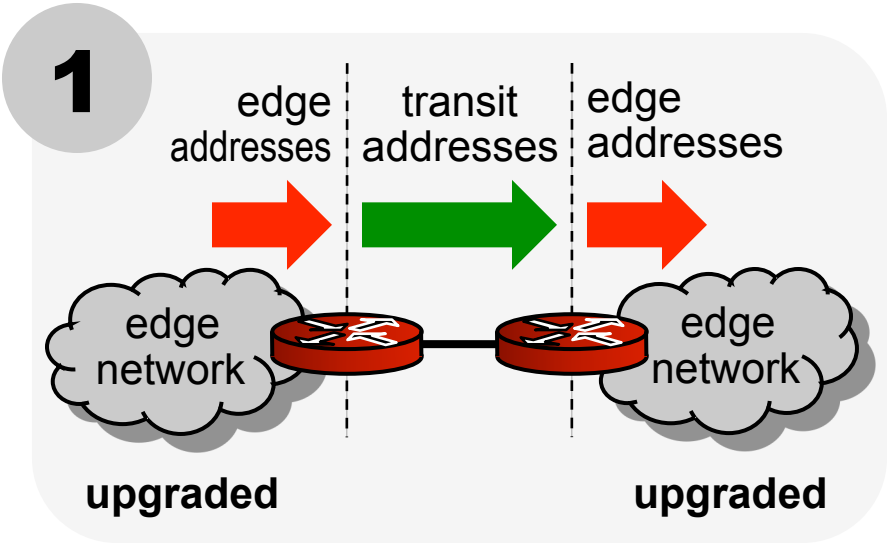
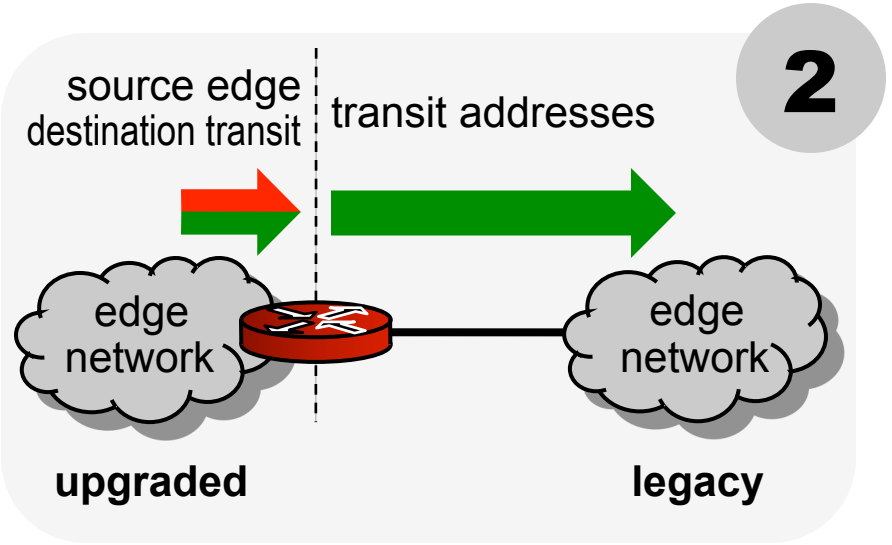
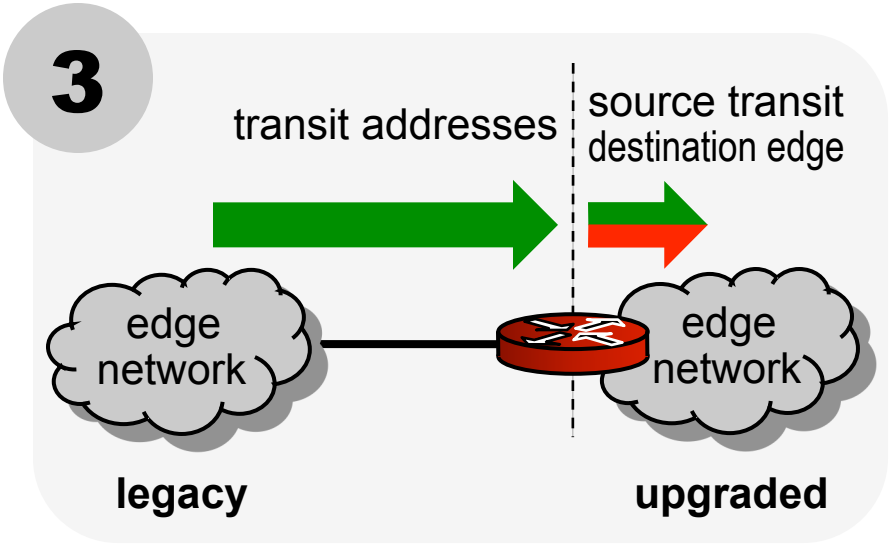
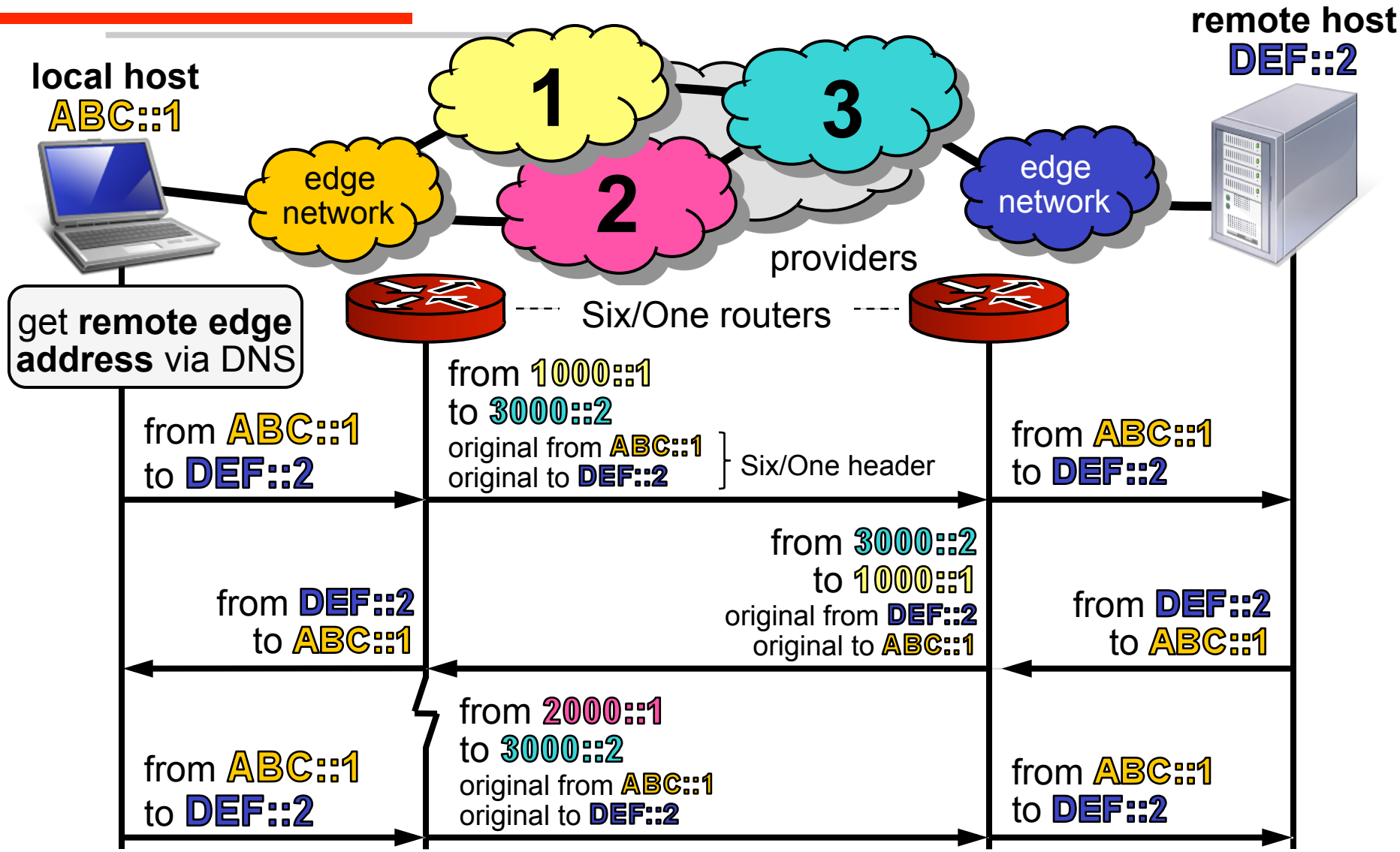
Full Backwards-Compatibility





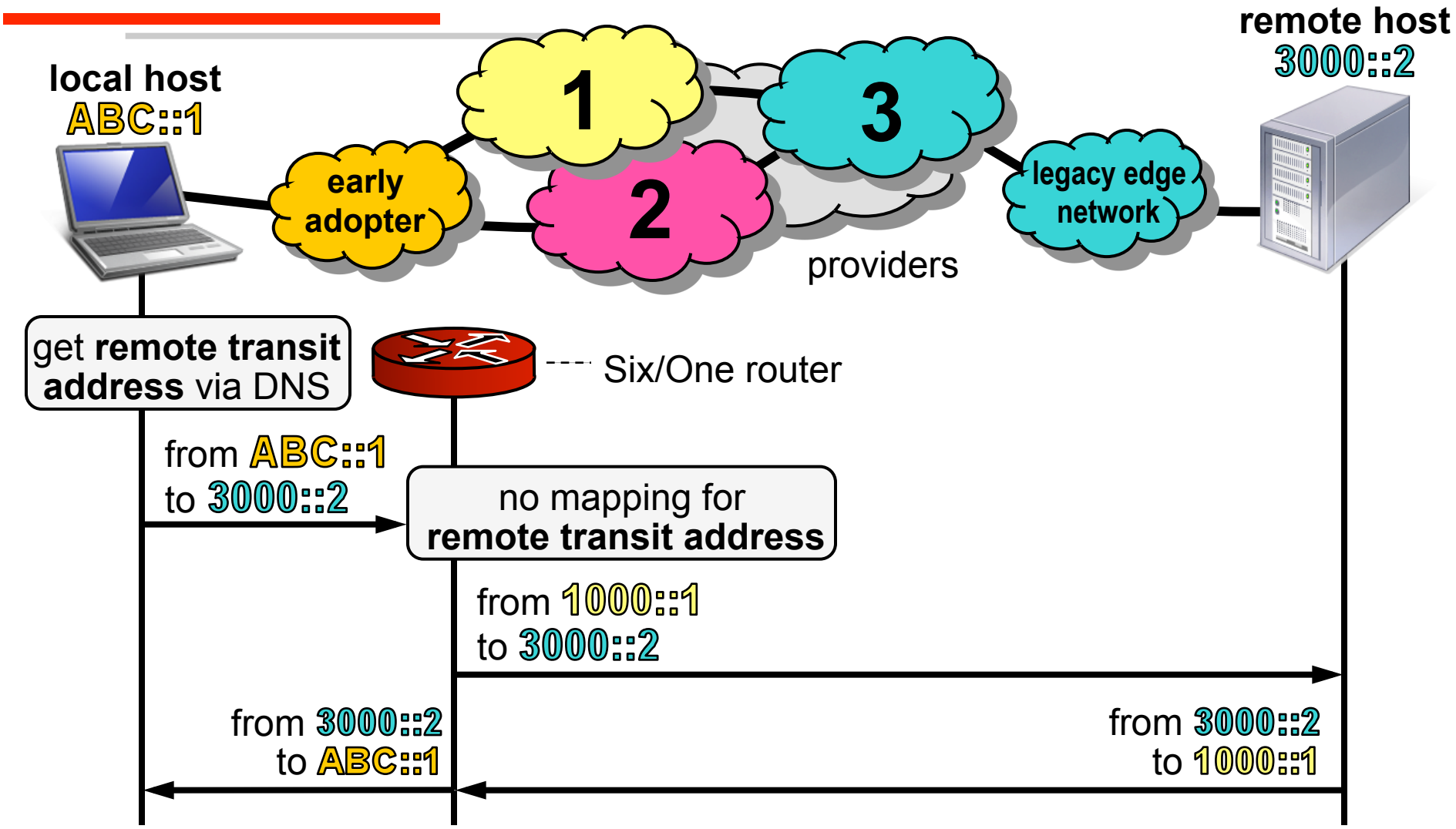


Bilaterally Upgraded (Scenario 1)



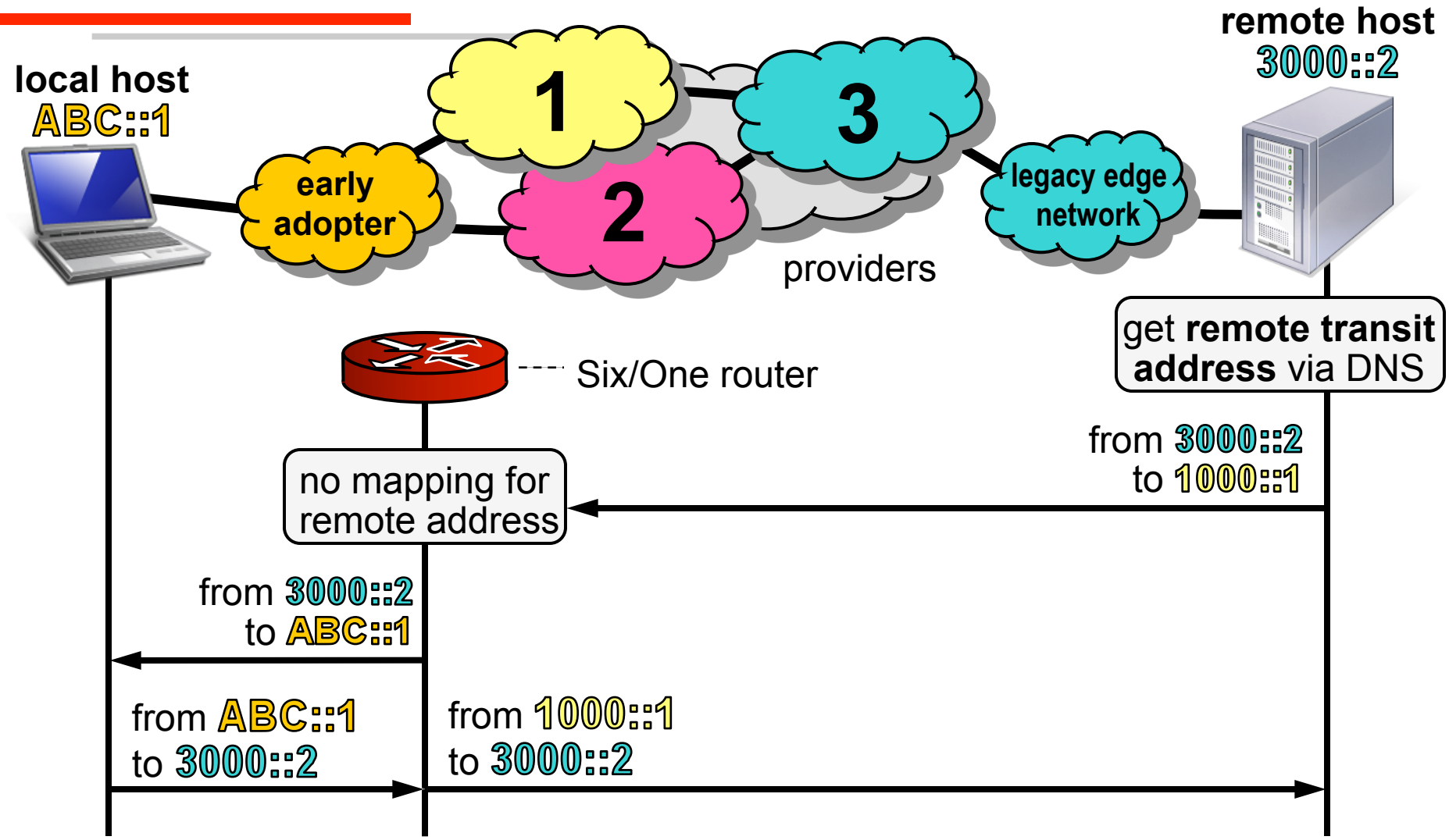
- Edge addresses end-to-end
- Translation in IP headers only
- Dynamic provider changes possible

Upgraded to Legacy (Scenario 2)



- Local address translated unilaterally
- No translation of remote address
- Translation across payloads
- No dynamic provider changes

Legacy to Upgraded (Scenario 3)



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- No translation of remote address
- Translation across payloads
- No dynamic provider changes

Adaptive Domain Name Resolution

Components

- New E/EEEE records in DNS for edge addresses
- DNS proxies

} required only in upgraded edge networks

DNS proxy operation

- Initiate extra E/EEEE query for every A/AAAA query
- E/EEEE records exist? – Return as A/AAAA records
- Otherwise, return A/AAAA records

- Six/One router may act as DNS proxy

Deployment Path

today

Pro

- provider-independent edge addresses
- end-to-end use of edge addresses

Con

- little scalable
- traffic engineering slow and coarse-granular

early adoption

Pro

- provider-independent edge addresses
- Scalable
- improved traffic engineering
- IPv4/v6 interworking

Con

- translated edge addresses when communicating with legacy edge networks

widely deployed

Pro

- provider-independent edge addresses
- Scalable
- dynamic traffic engineering
- IPv4/v6 interworking
- end-to-end use of edge addresses

Conclusions

- Scalable and flexible routing system
  - Backwards-compatible
- Idea
  - Address translation
  - Hosts reachable at edge and transit addresses
- Based on this
  - IPv4/v6 interworking
- Next step: Implementation & experimentation