Six/One

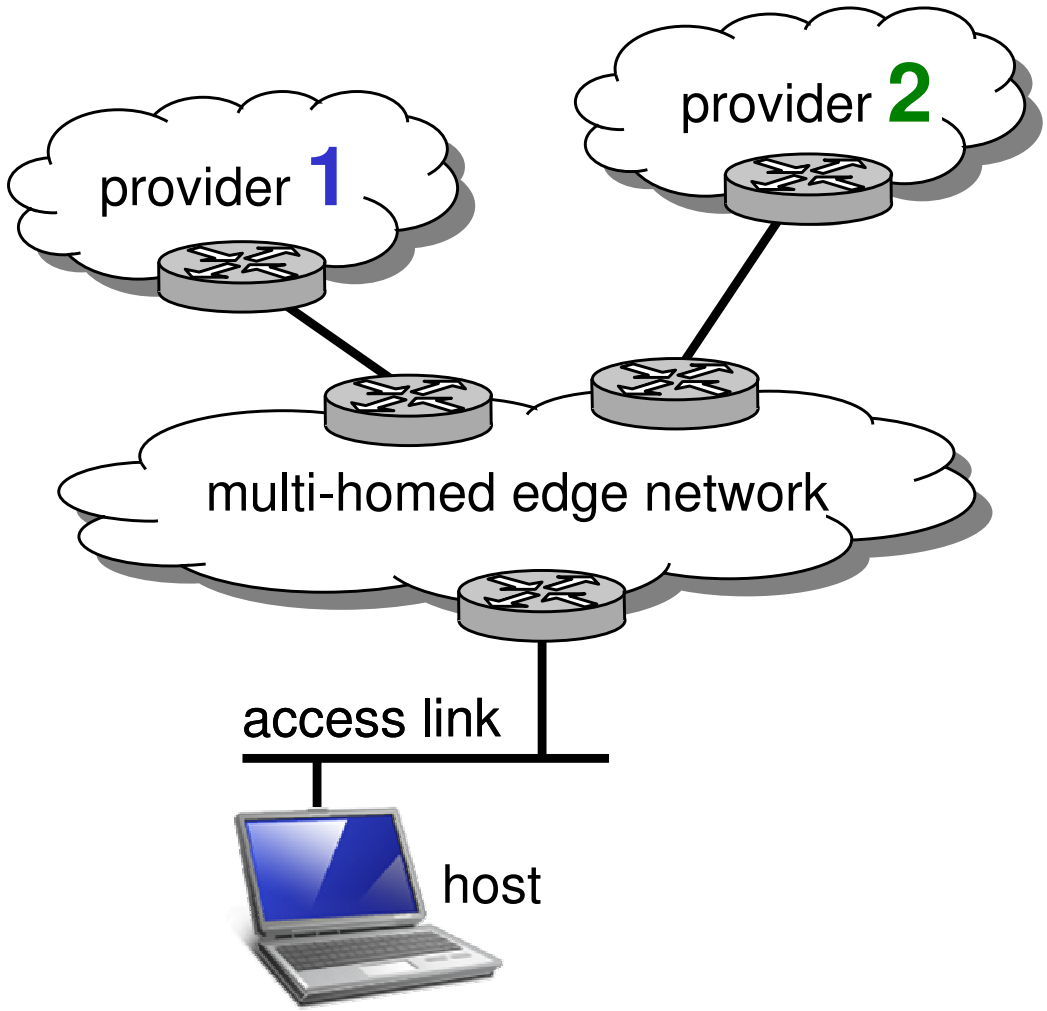
A combined host/network-based solution
for edge network multi-homing

draft-vogt-rrg-six-one-00

Christian Vogt

Routing Research Group meeting, Chicago, July 27, 2007

Towards Edge Network Multi-Homing



Edge network connects to multiple providers (increased bandwidth, provider services, fault-tolerance)

Provider goals

- Routing table without entry per edge network

Edge network goals

- Ability to select provider
- Rehoming without reconfiguration

Host goals

- Ability to suggest provider
- Ability to adapt to provider changes

Existing Solutions

Current practice

- **provider-independent** edge network addresses
- globally visible

Shim6

- provider-dependent edge network addresses
- **host-based** address selection/**mapping**

Recent proposals

- provider-independent edge network addresses
- **network-based** address selection/**mapping**

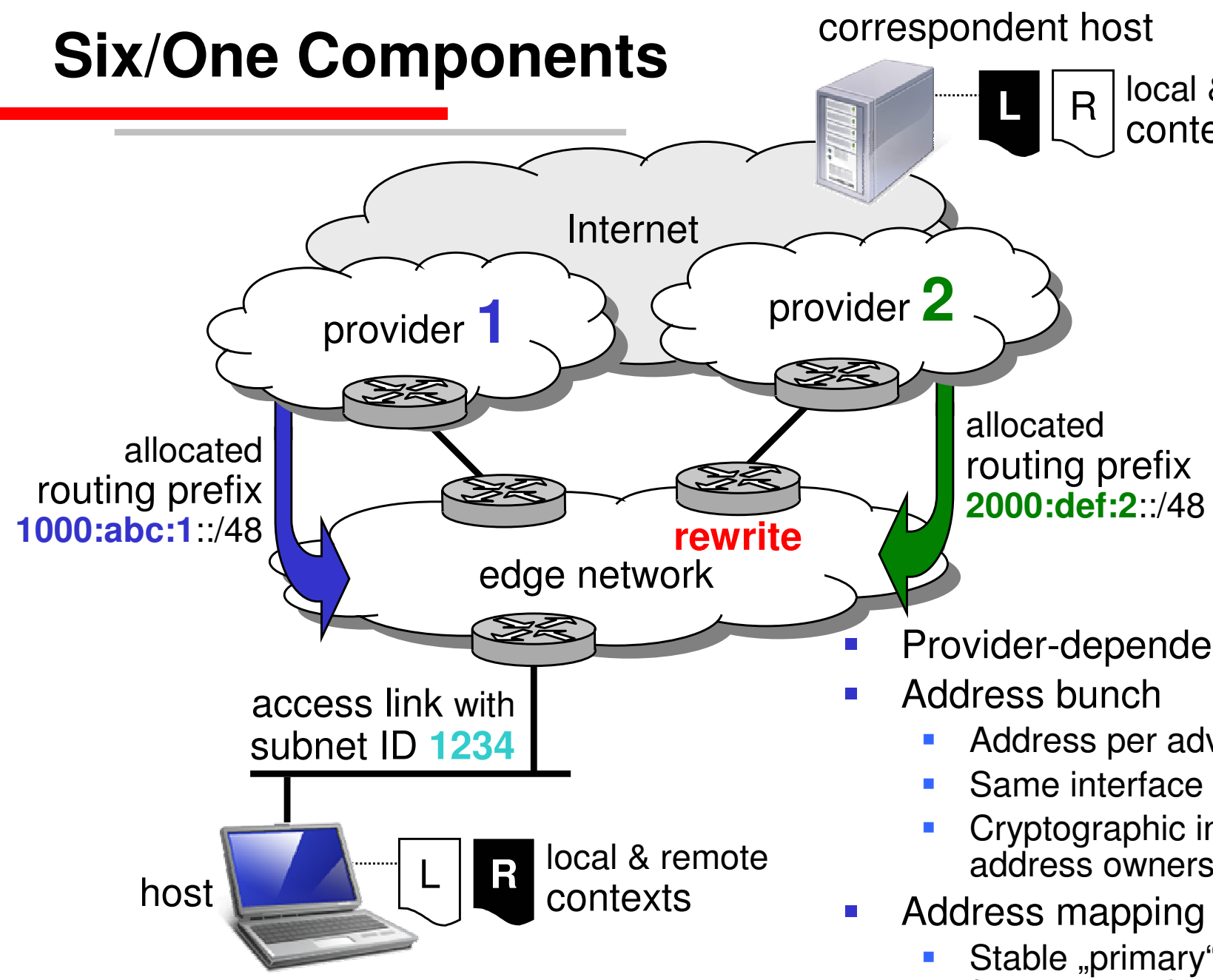
	provider-independent	host-based mapping	network-based mapping
routing table without entry per edge network	✗	✓	✓
edge network can select provider	✓	✗	✓
rehoming without reconfiguration	✓	✗	✓
host can suggest provider	✗	✓	✗
host can adapt to provider changes	✗	✓	✗

- Existing solutions do not satisfy all stakeholders‘ objectives

Contributions of Six/One

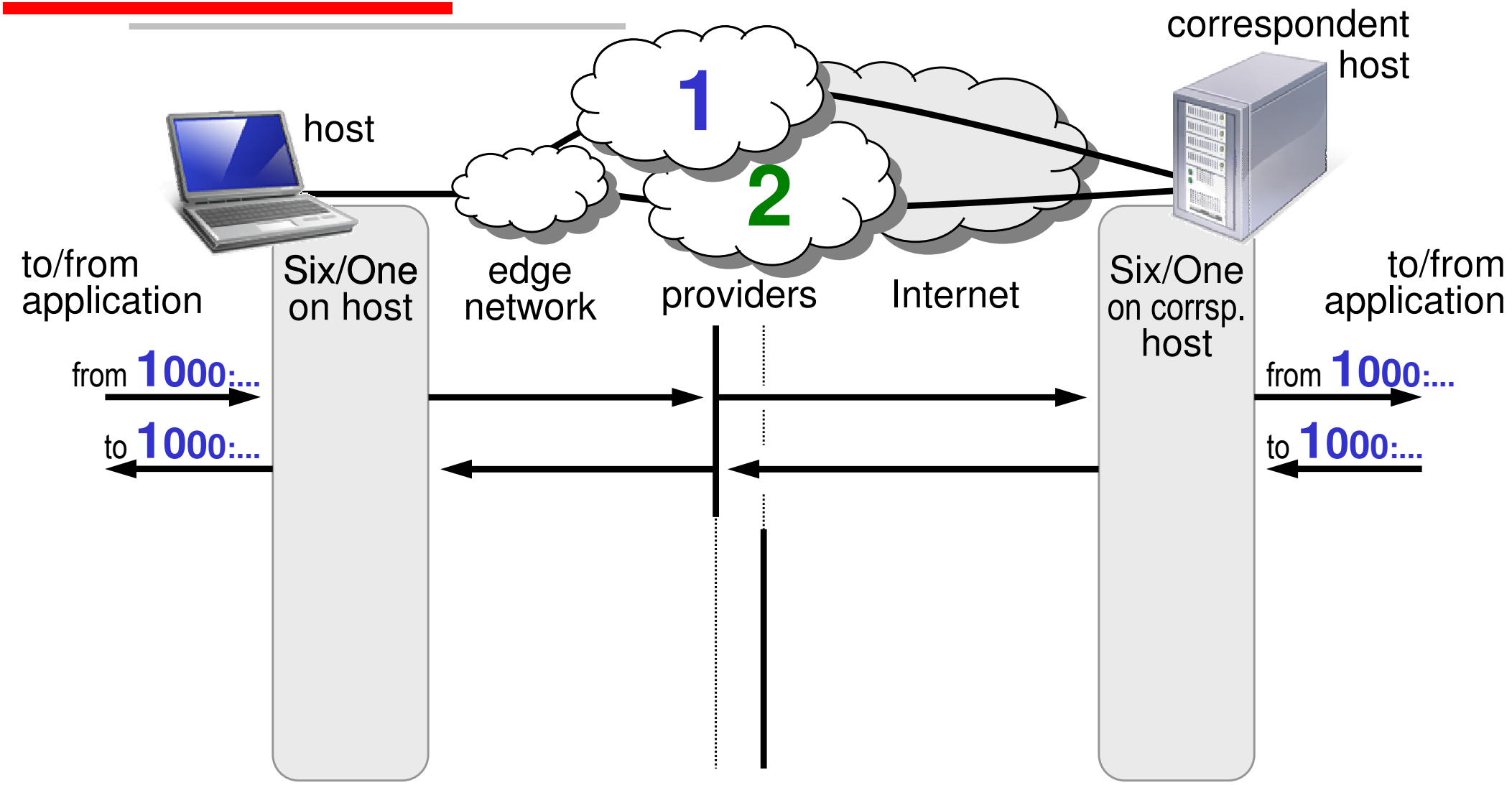
- „Combination of Shim6 and 8+8“
  - Address mapping as in Shim6
  - Address rewriting like in 8+8 and draft-nordmark-shim6-esd
- Novelty in synthesis

Six/One Components



- Provider-dependent addressing
- Address bunch
  - Address per advertised subnet prefix
  - Same interface ID across bunch
  - Cryptographic interface ID for address ownership proof
- Address mapping on host
  - Stable „primary“ address in bunch for transport layer and applications
  - Variable „active“ address on the wire
- Address rewriting in edge network
- Context pair for each host pair

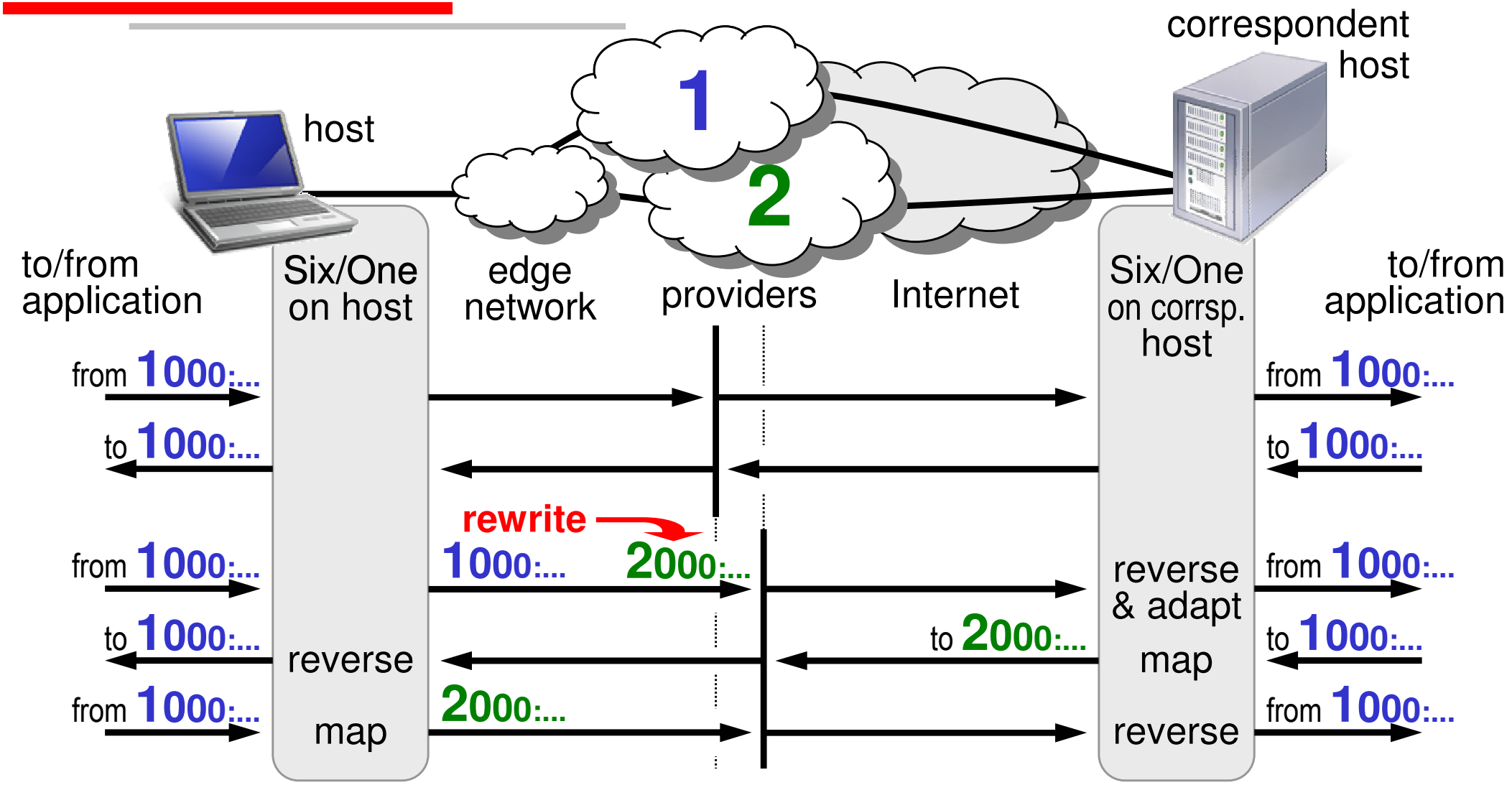
Address Mapping and Rewriting



Case 1: no rewriting

- Host selects source address
- It thereby ***suggests*** provider
- Edge network ***accepts*** host selection

Address Mapping and Rewriting



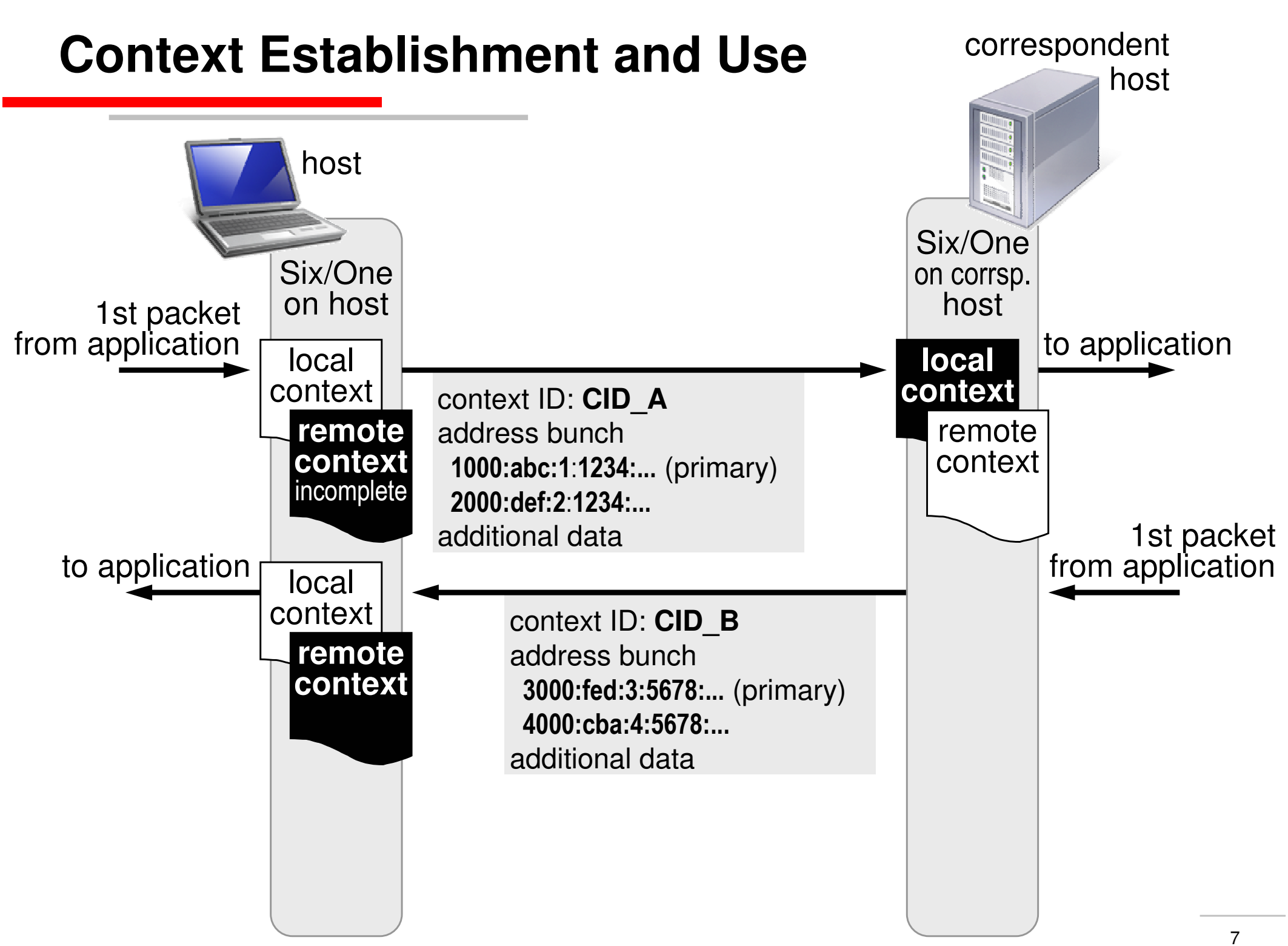
Case 1: no rewriting

- Host selects source address
- It thereby ***suggests*** provider
- Edge network ***accepts*** host selection

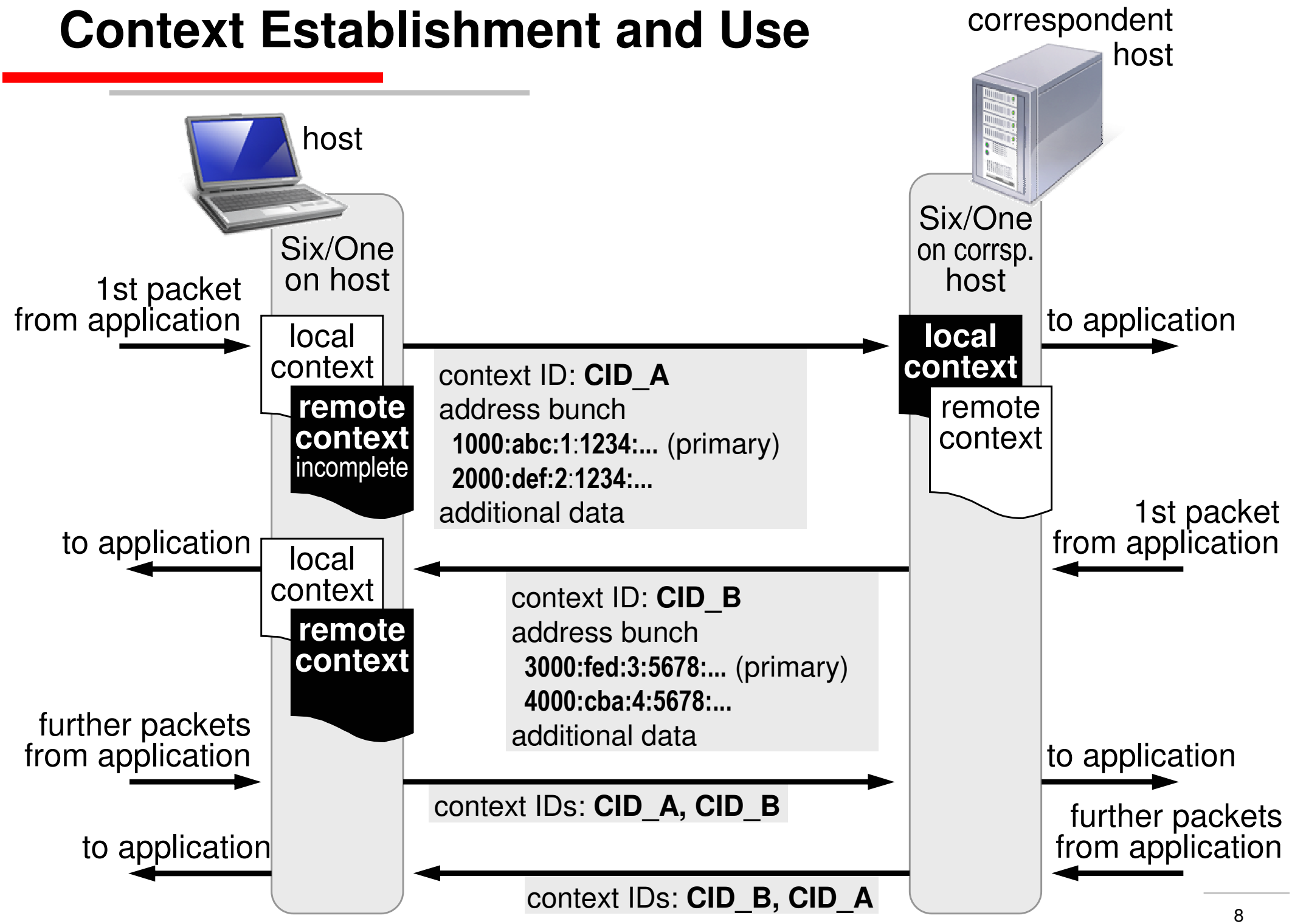
Case 2: rewriting in edge network

- Edge network ***rewrites*** source address
- Six/One learns new address, ***adopts*** it
- Application don‘t see address change

Context Establishment and Use



Context Establishment and Use



Reducing Edge Network (Re-)Configuration

- Isolate routing prefixes from subnet IDs in routers
  - 1 subnet ID per link
  - Common set of routing prefixes
- On rehoming: Update only routing prefixes
- On rewriting: Rewrite only routing prefix

Changing an Address Bunch

- Six/One handles switching ***within*** address bunch
- Separate protocol for switches ***between*** bunches
  - Host mobility
  - Host multi-homing (multiple interfaces on host)
  - Renumbering
- Can be integrated with Six/One
  - Mobile IPv6 home and care-of address bunches
  - HIP locator bunch

Middlebox Interoperability

- Middleboxes inside edge network
  must identify hosts despite address changes
  - E.g., in firewalls, intrusion detection systems…

- Identification of hosts in local edge network
  - Use subnet ID + interface ID
  - Configure middleboxes with “routing prefix mask” (like in 8+8)

- Identification of remote correspondent hosts
  - Use subnet ID + interface ID + context ID
    of host in local edge network

Summary

Combined host/network-based edge network multi-homing

- Provider-dependent edge network addressing
- Hosts are provider-***aware*** – know their full addresses
- Hosts can ***suggest*** provider
- Network can ***enforce*** provider
- Host can ***adapt*** to provider changes
- ***Reduced*** edge network ***(re-)configuration*** overhead
- Hosts ***identifiable*** by middleboxes despite address changes