draft-mccann-dmm-flatarch-00.txt

March 26, 2012

www.huawei.com

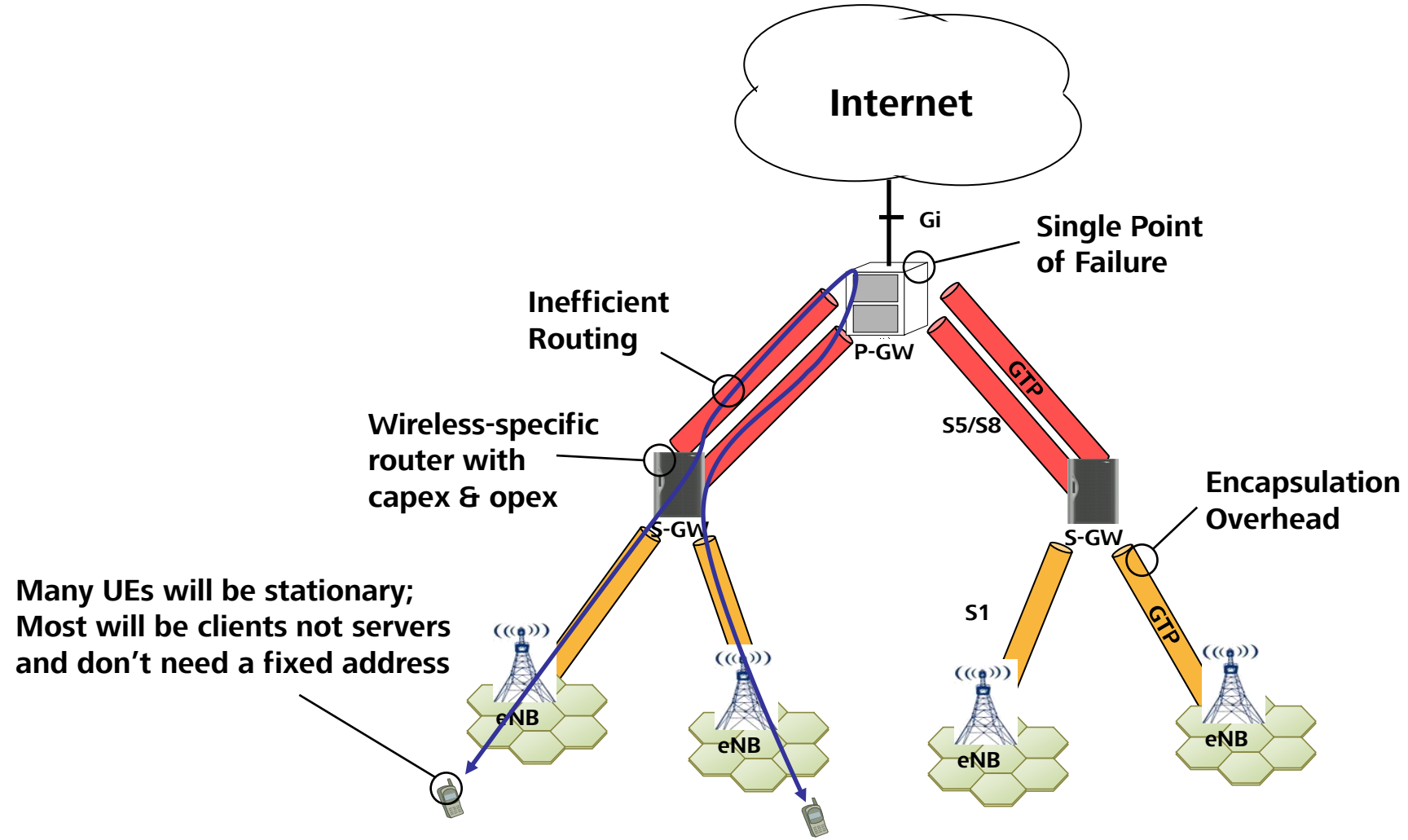
HUAWEI TECHNOLOGIES CO., LTD.

HUAWEI

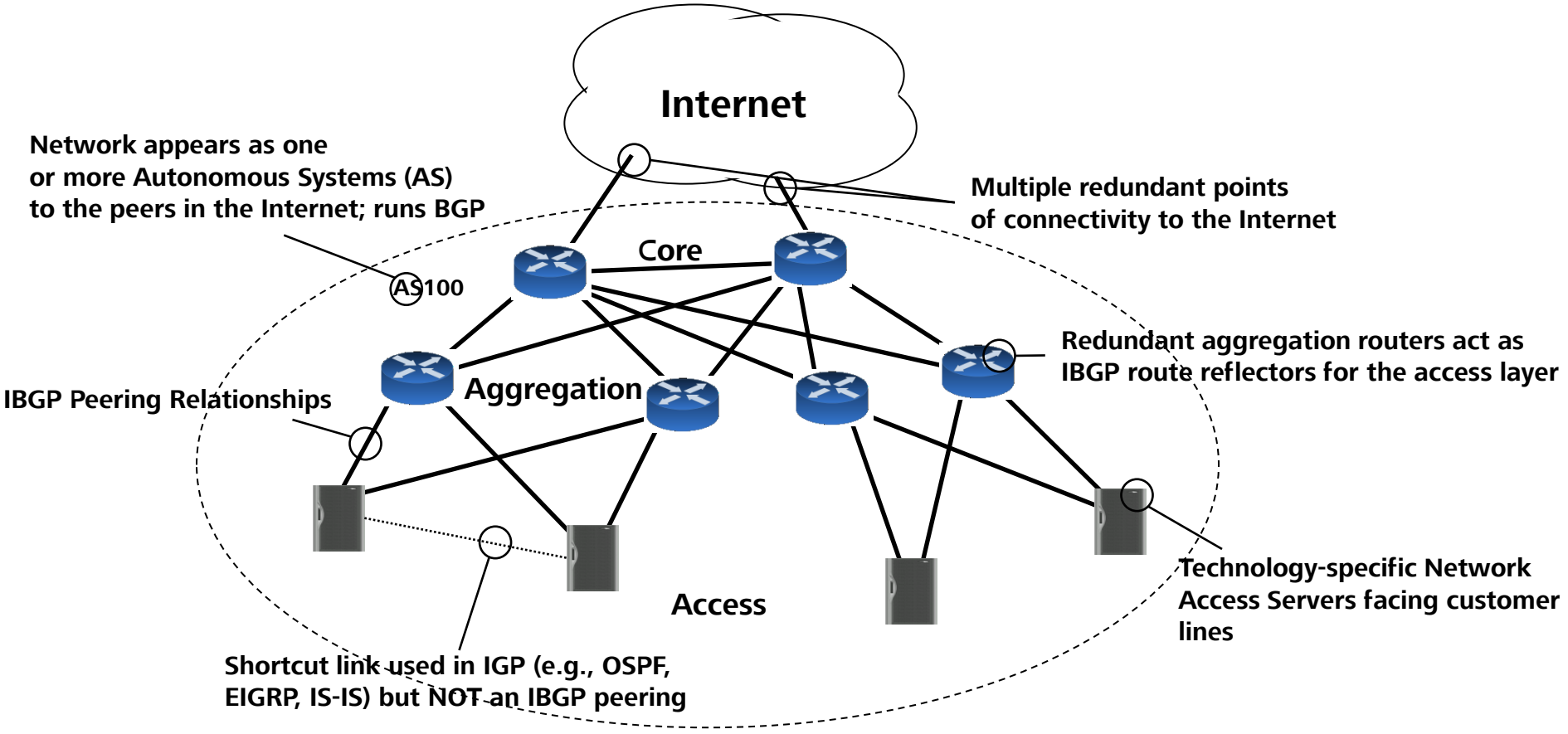
Outline

- Drawbacks of Existing Hierarchical Tunnel Solutions
- Elements of a Flat Wireless Internet Service Provider
- Mobility Management
- Secure Binding of Assigned Address
- Conclusions

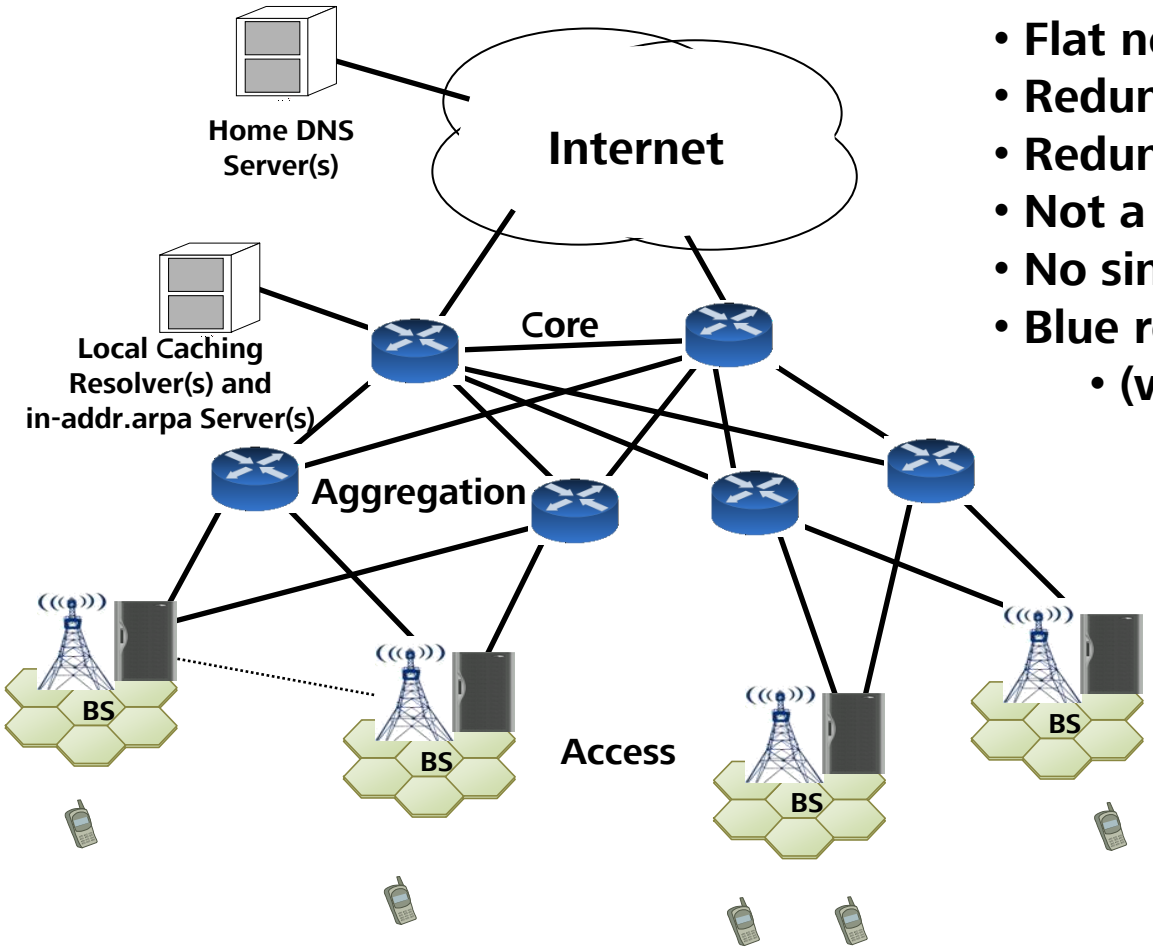
Existing Practice: Hierarchical Tunnels



Typical Wireline Internet Service Provider



Possible Future Wireless ISP

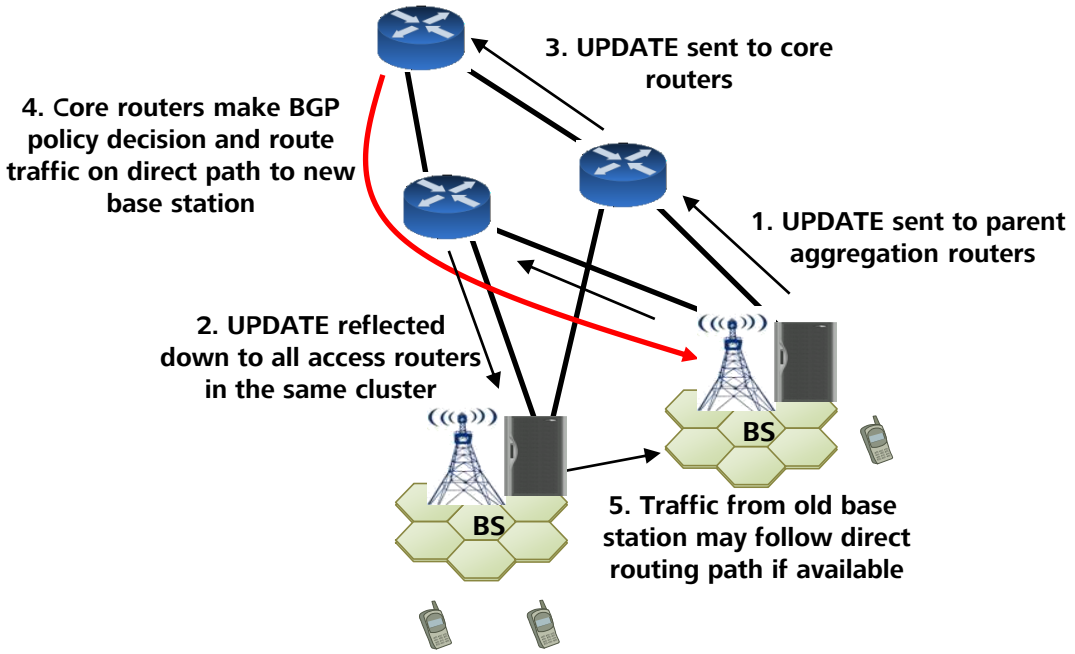


- Flat network of Base Stations
- Redundant upstream ISPs
- Redundant mesh of IP connectivity
- Not a strict hierarchy
- No single point of failure
- Blue routers are COTS
  - (vanilla wireline routers)

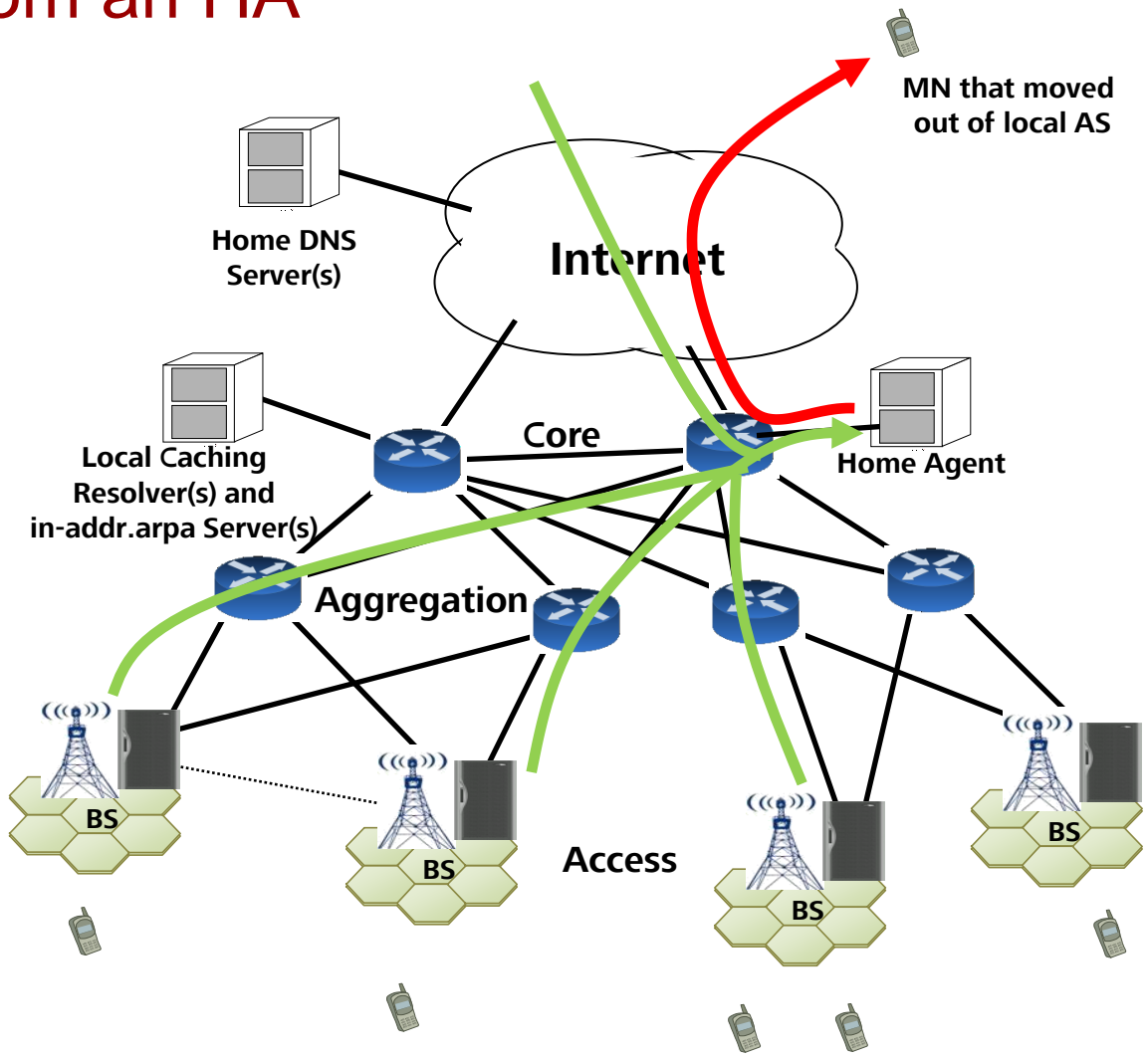
Mobility Management in a Flat Network

- **Each BS owns a pool of addresses**
- **Mobile nodes attach/authenticate, get an address**
- **Upon attachment/authentication to new BS, send iBGP routing update with NLRI set to the already-assigned address**
  - **All iBGP routers will set the new BS as the next hop**
    - Punches a hole in the routing tables
    - Update is limited in scope if movement is within the same route reflector cluster

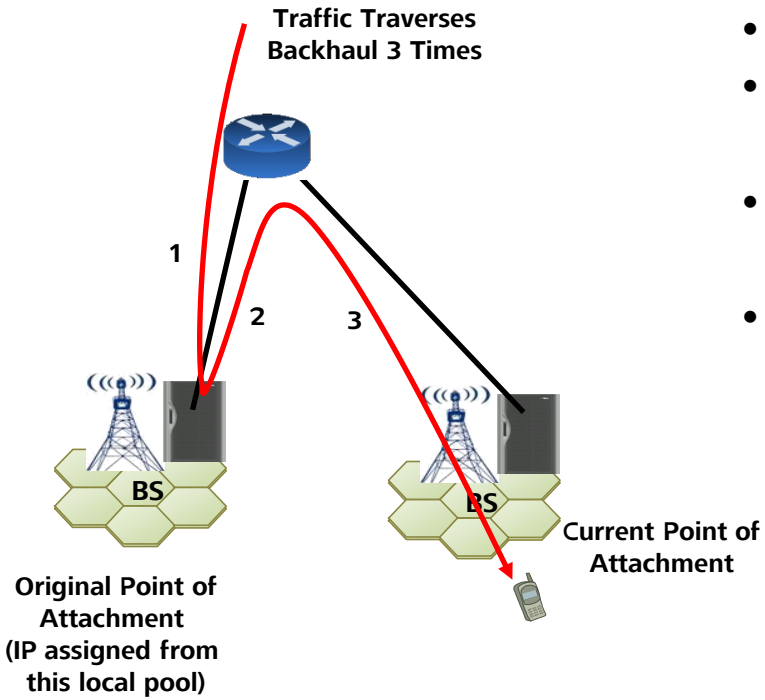
IBGP Routing Update



IBGP from an HA



Alternative Solution: Dynamic HA in the AR

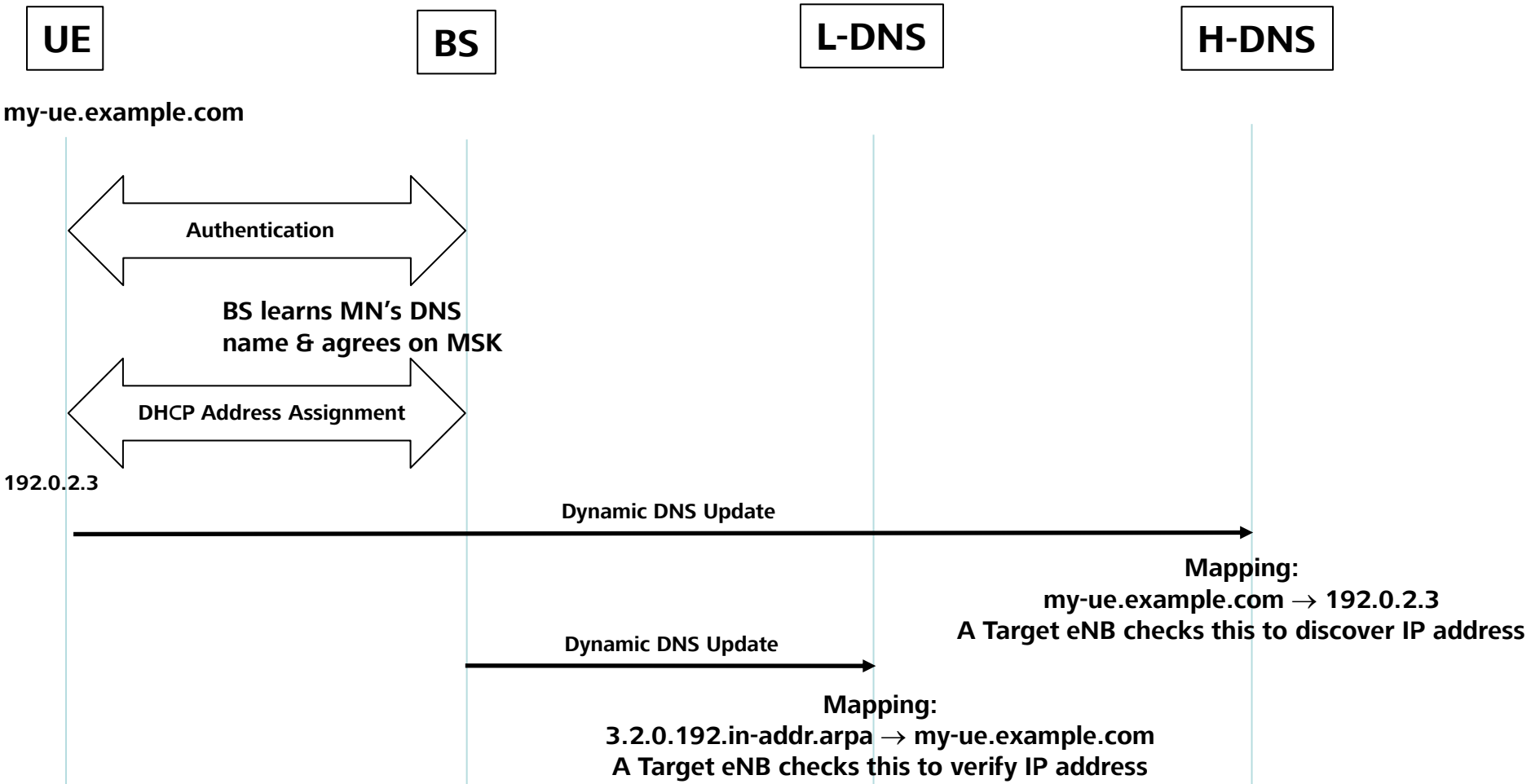


- Assign original BS as a dynamic HA
- Send a Registration Request or Binding Update from the new point of attachment
- Inefficient if backhaul is expensive and scarce
- Requires MN to send IP packets at new BS

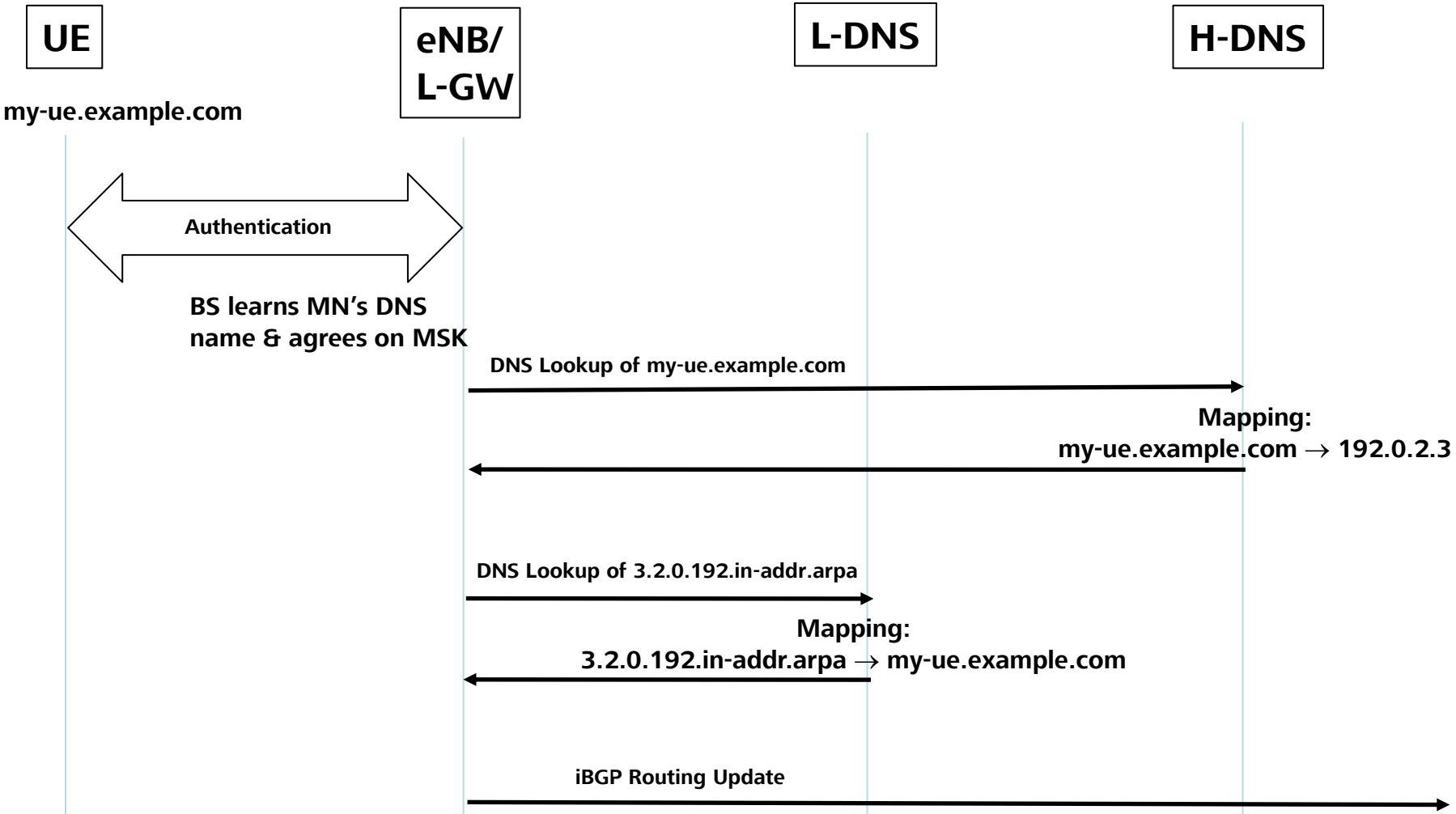
Issues

- **How does new BS learn about the already-assigned address?**
- **How does new BS guarantee the assignment is authentic?**
- **Answer: DNS**

DNS storage of assigned address(es)

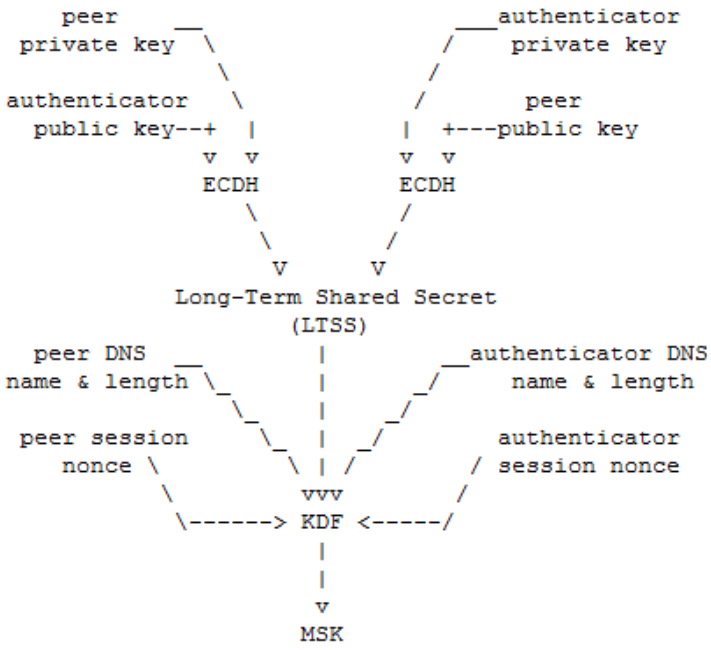


DNS retrieval of assigned address(es) during handoff



Authentication without RADIUS/Diameter

- **Round-trips to the home network add to latency of handover**
- **Leverage DANE work putting public keys into DNS**
  - **Public keys can be cached**
- **Re-run public key based authentication on every new attachment**



Dynamic Re-Binding

- **During quiet periods, MN should re-run DHCP to get a new address that is local to the current BS**
- **MN must keep track of which connections are using which addresses**
  - **Keep renewing the lease of used addresses (unicast DHCPREQUEST)**
    - Remotely from current BS: the BS must add the Agent Remote ID
  - **Garbage collect unused addresses & remove from Home DNS entry**

Data Point: BGP Pass-through Time

- How fast does a BGP Update propagate through the network?
- See "Measuring BGP Pass-Through Times" by Feldman, Kong, Maennel, and Tudor
  http://www.net.t-labs.tu-berlin.de/papers/FKMT-MBPT-04.pdf
- Time for a BGP Update to be processed and resulting Updates to be propagated (MRAI disabled):
  - Best case: 2.4 ms
  - Worst case: 400 ms
  - Variation due to 200ms polling interval in a particular BGP implementation

Conclusions

- Existing tunnel hierarchies are inefficient and unnecessary
- BGP is used in typical wireline ISP environments
- BGP Updates can be used to handle mobility events
  - Must limit the time and scope of mobility for scalability
  - MNs can re-bind to new IP addresses during periods of inactivity
  - Performance studies needed
- DNS names can be used as node identifiers
  - Leverage DNS as a mapping database to find current IP addresses
  - Leverage DANE for storage of public key material
  - Enhance authentication to remove AAA round-trips and eliminate transport of symmetric secret key material