



Challenge for Innovation



Performance Analysis of Next Generation Mobility Protocols for IMS/MMD Networks

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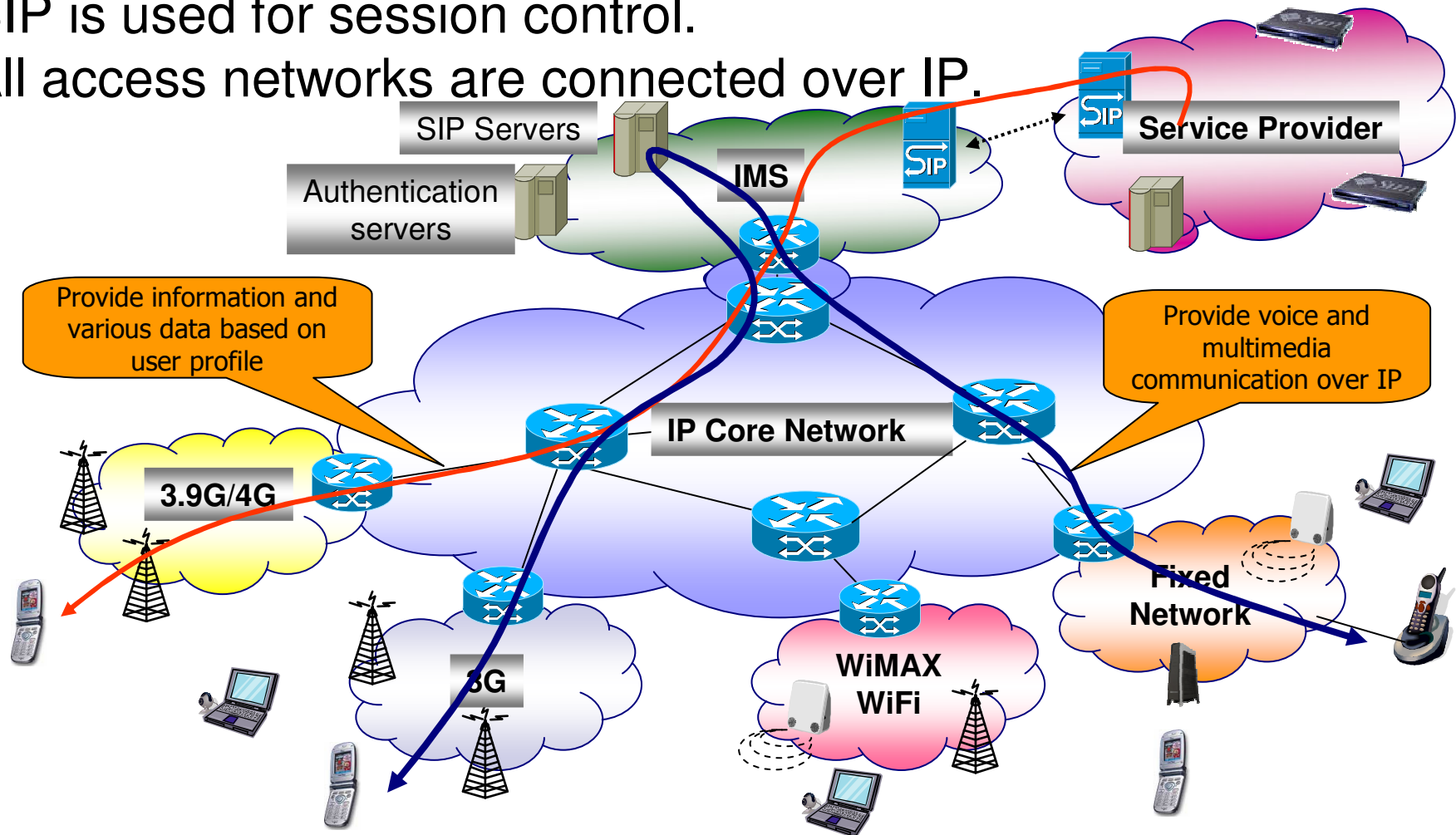
Originally presented at IWCMC2008 by Tsunehiko Chiba
(Presented at MOBOPTS Working Group by Ashutosh Dutta)

Outline

- IMS network
- Mobility protocols
 - SIP-based mobility
 - Mobile IPv6
 - Proxy Mobile IPv6
- Handoff experiment in IMS network
- Analysis of mobility protocols in IMS network
- Conclusions

All-IP Network

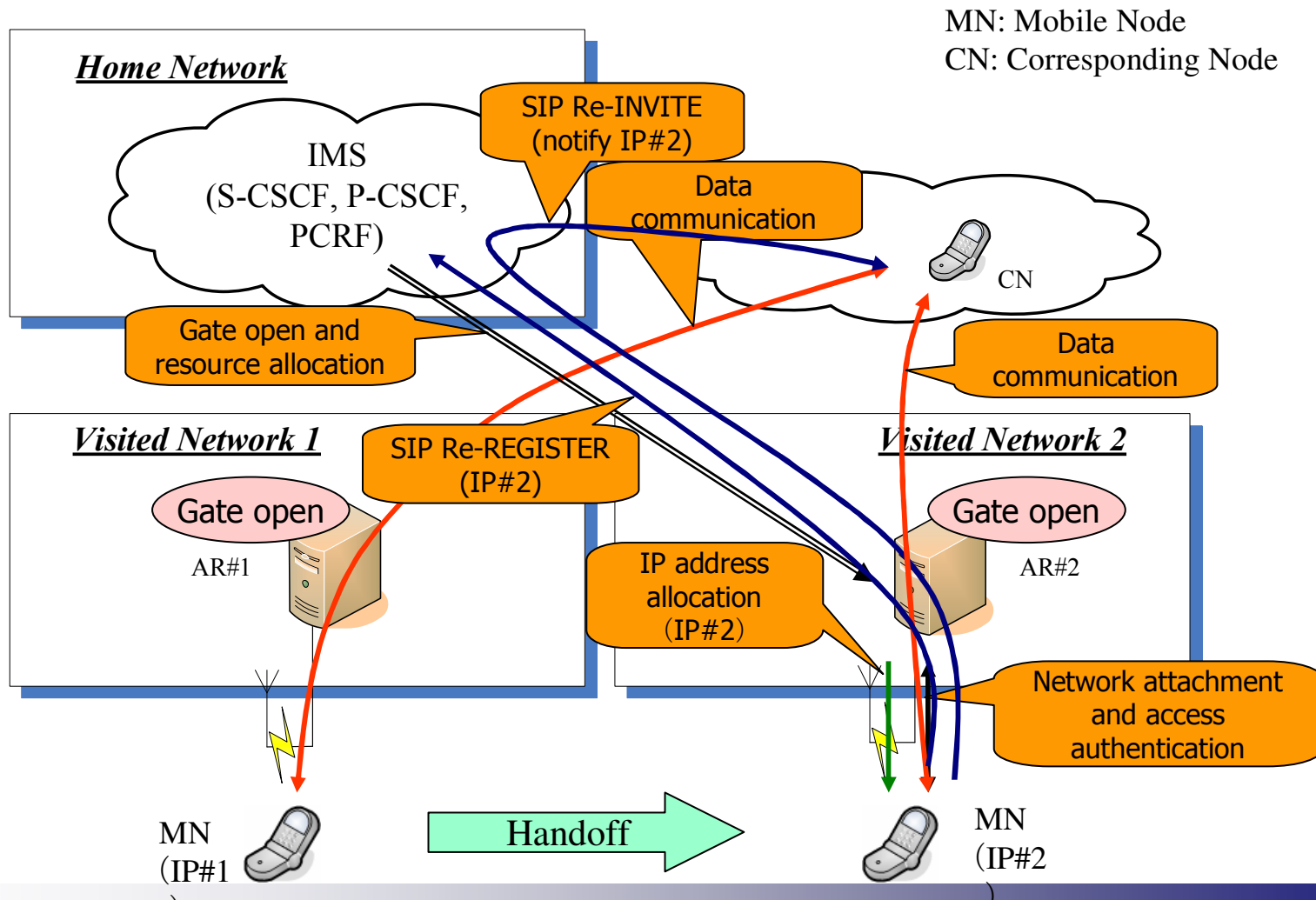
- SIP is used for session control.
- All access networks are connected over IP.



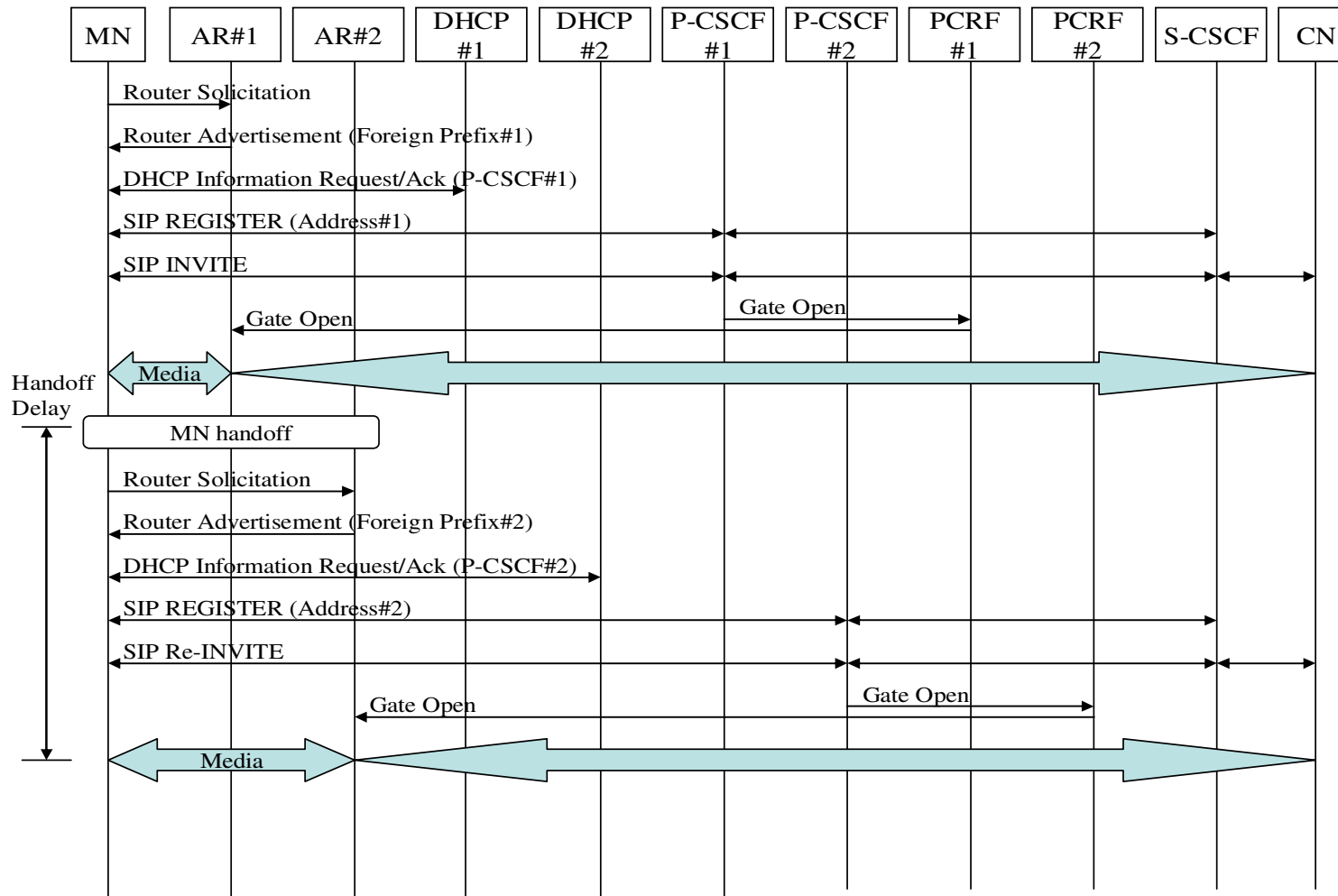
Mobility Protocols in IMS

- IMS and mobility protocols have been studied and standardized well.
- Analysis of mobility protocols in IMS is not enough.
 - SIP-based mobility
 - Mobile IPv6
 - Proxy Mobile IPv6

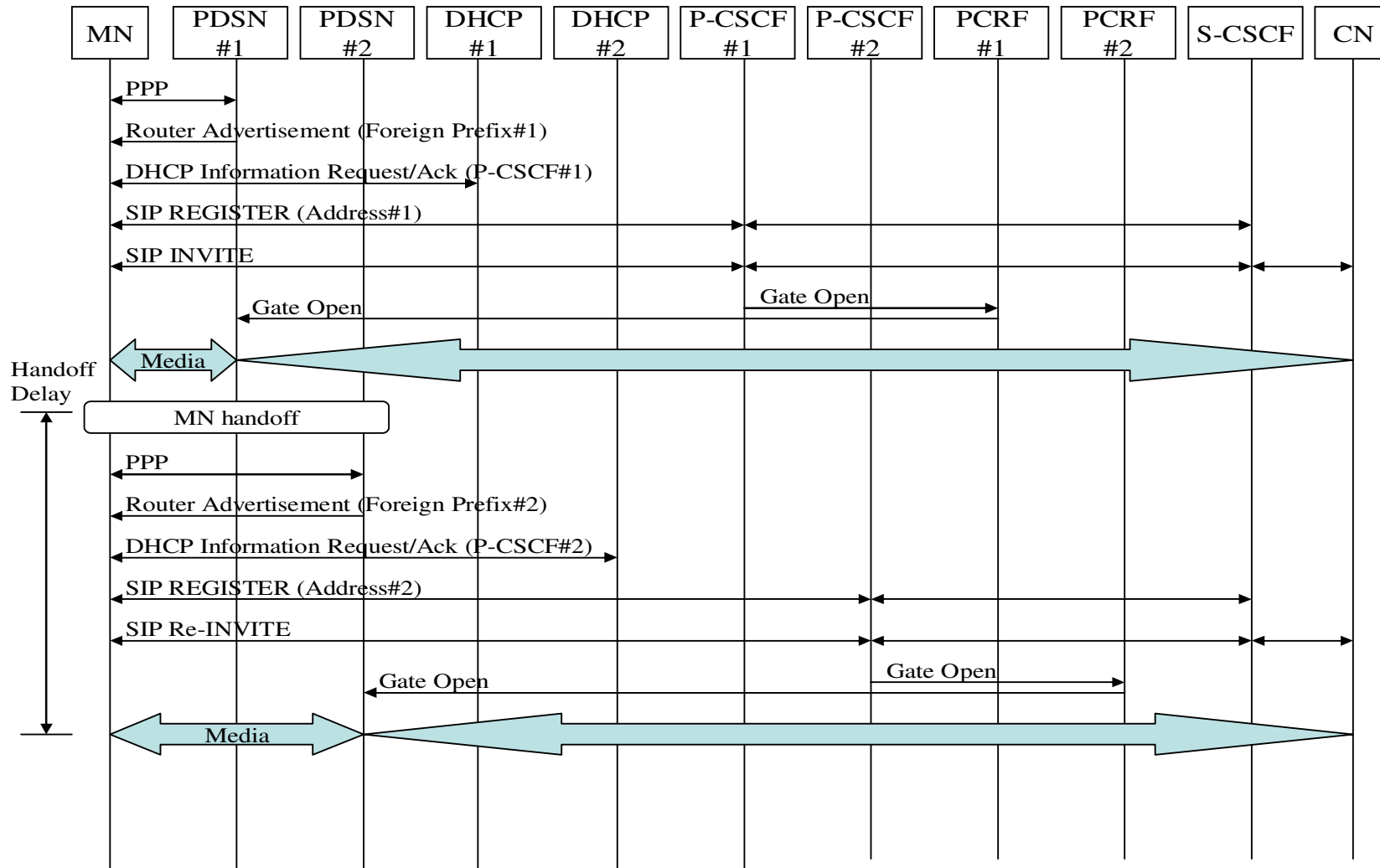
SIP-based Mobility



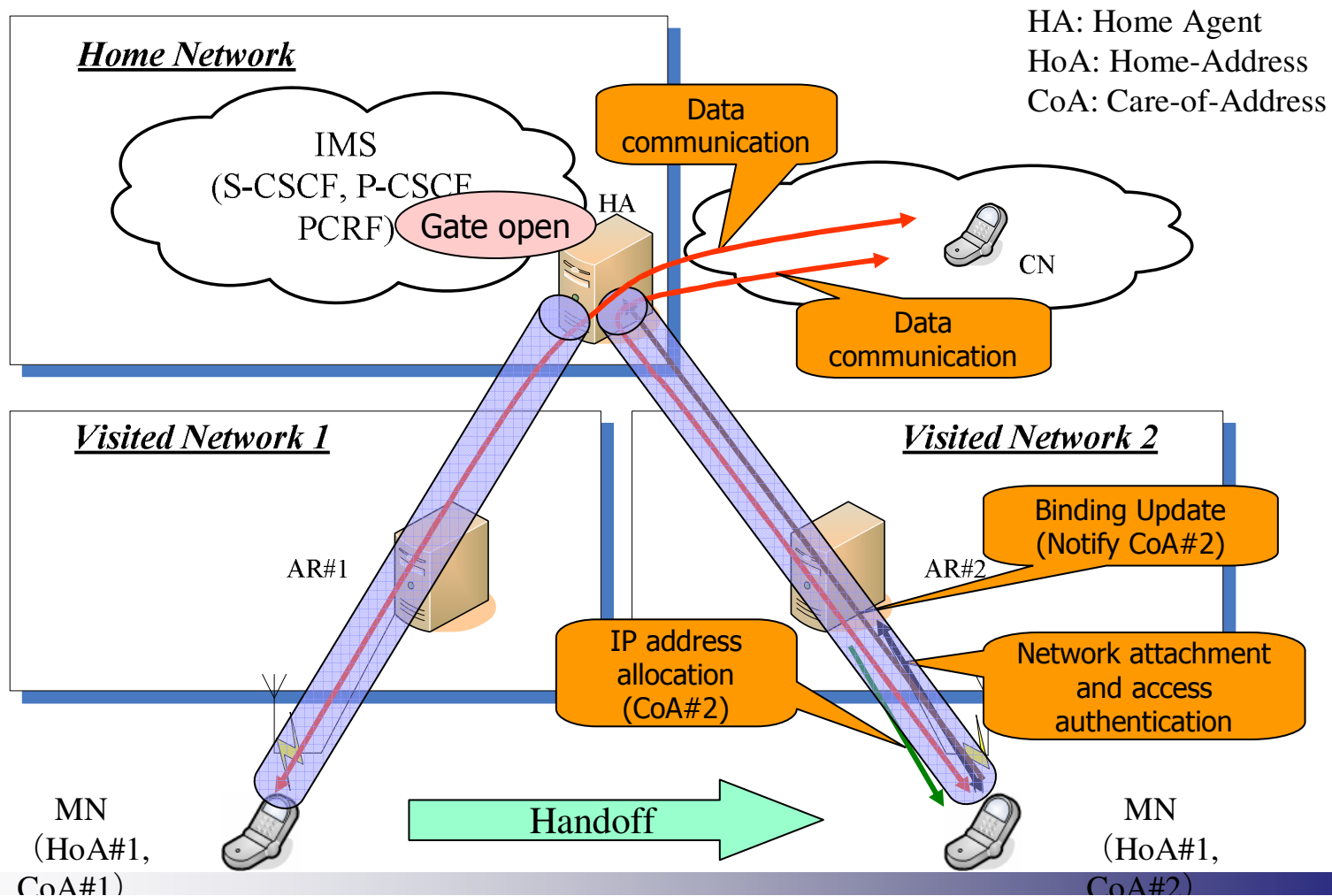
SIP-mobility in Wi-Fi network



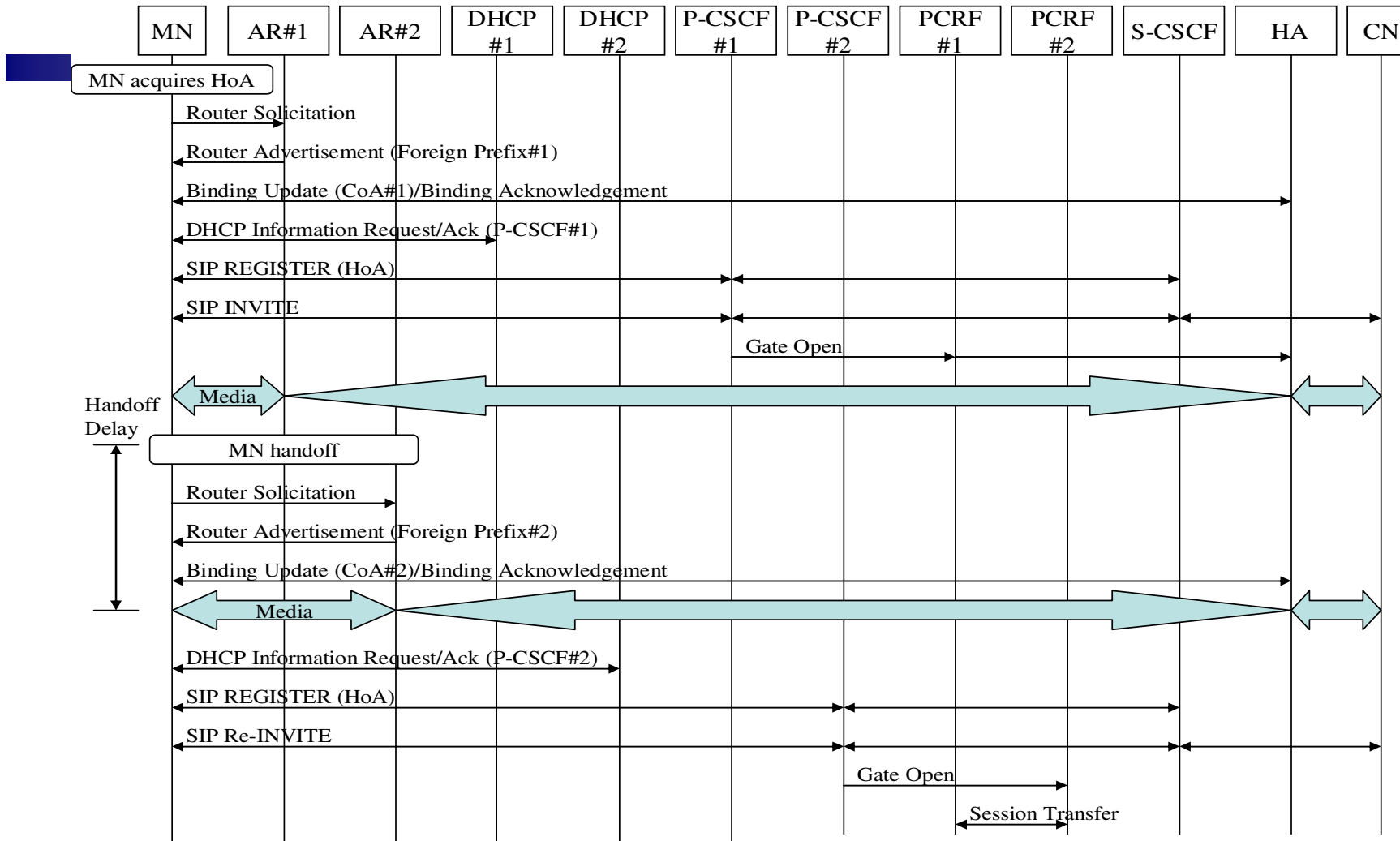
SIP-mobility in emulated CDMA network



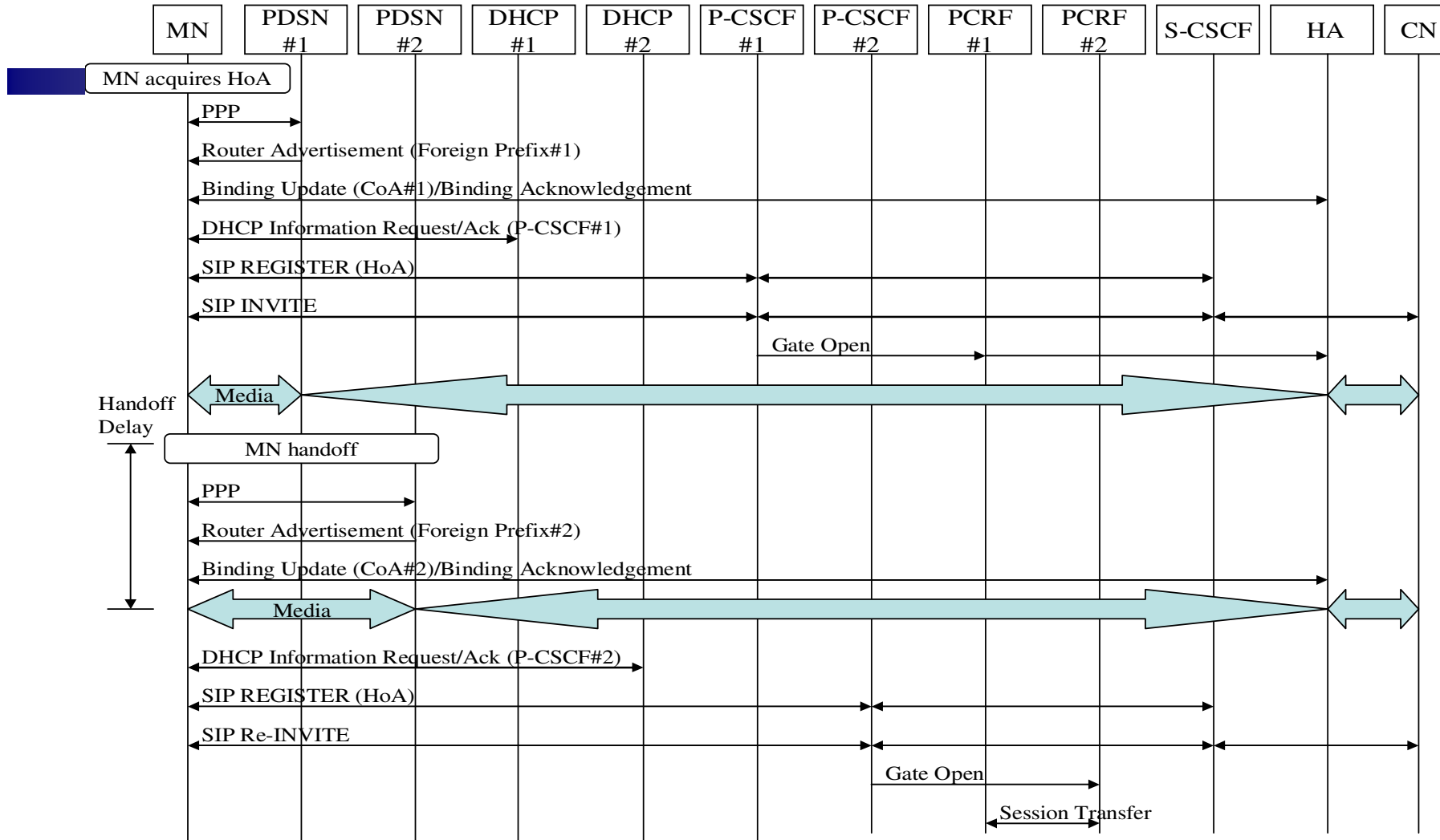
Mobile IPv6



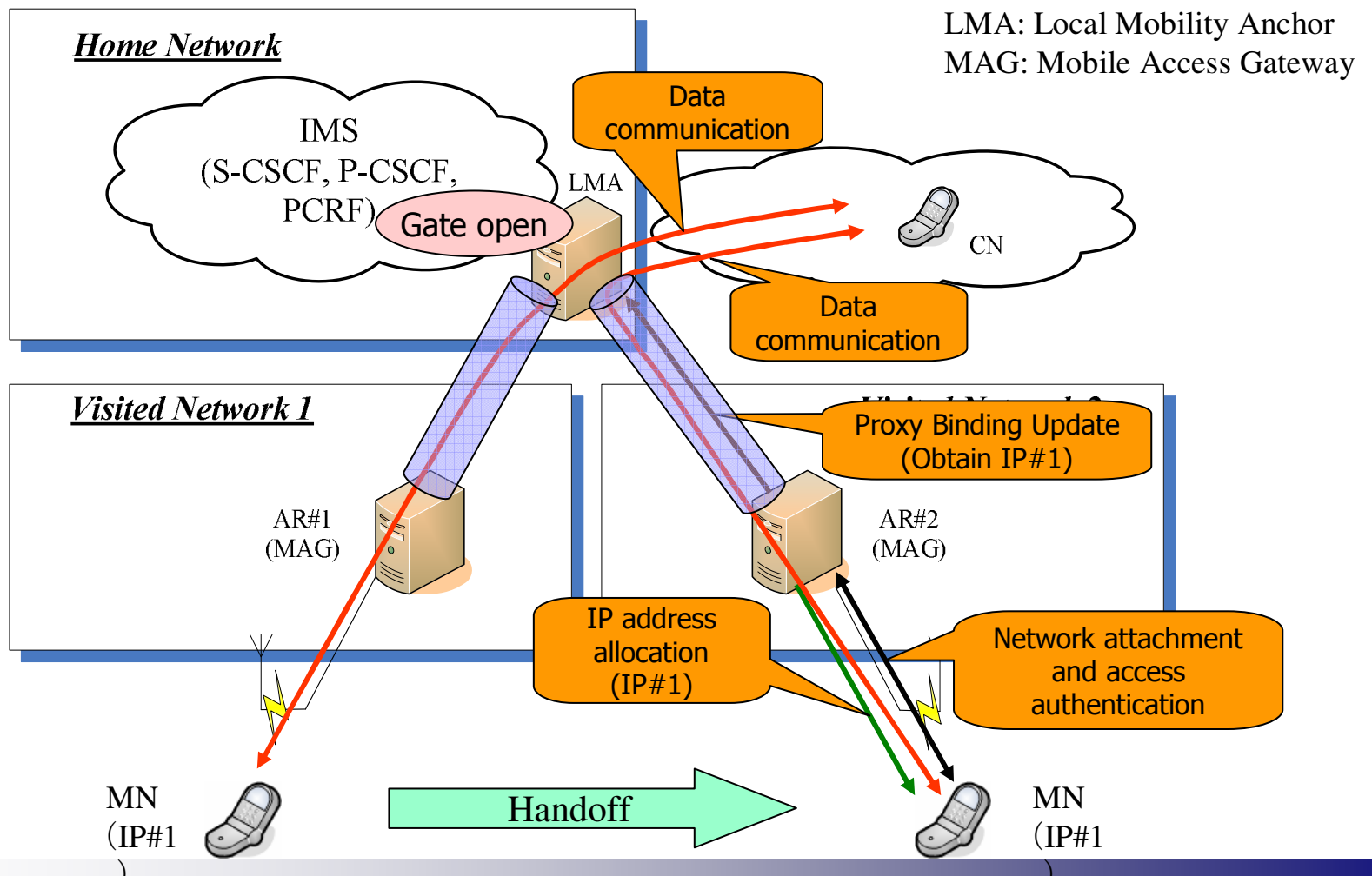
MIPv6 in WiFi Network



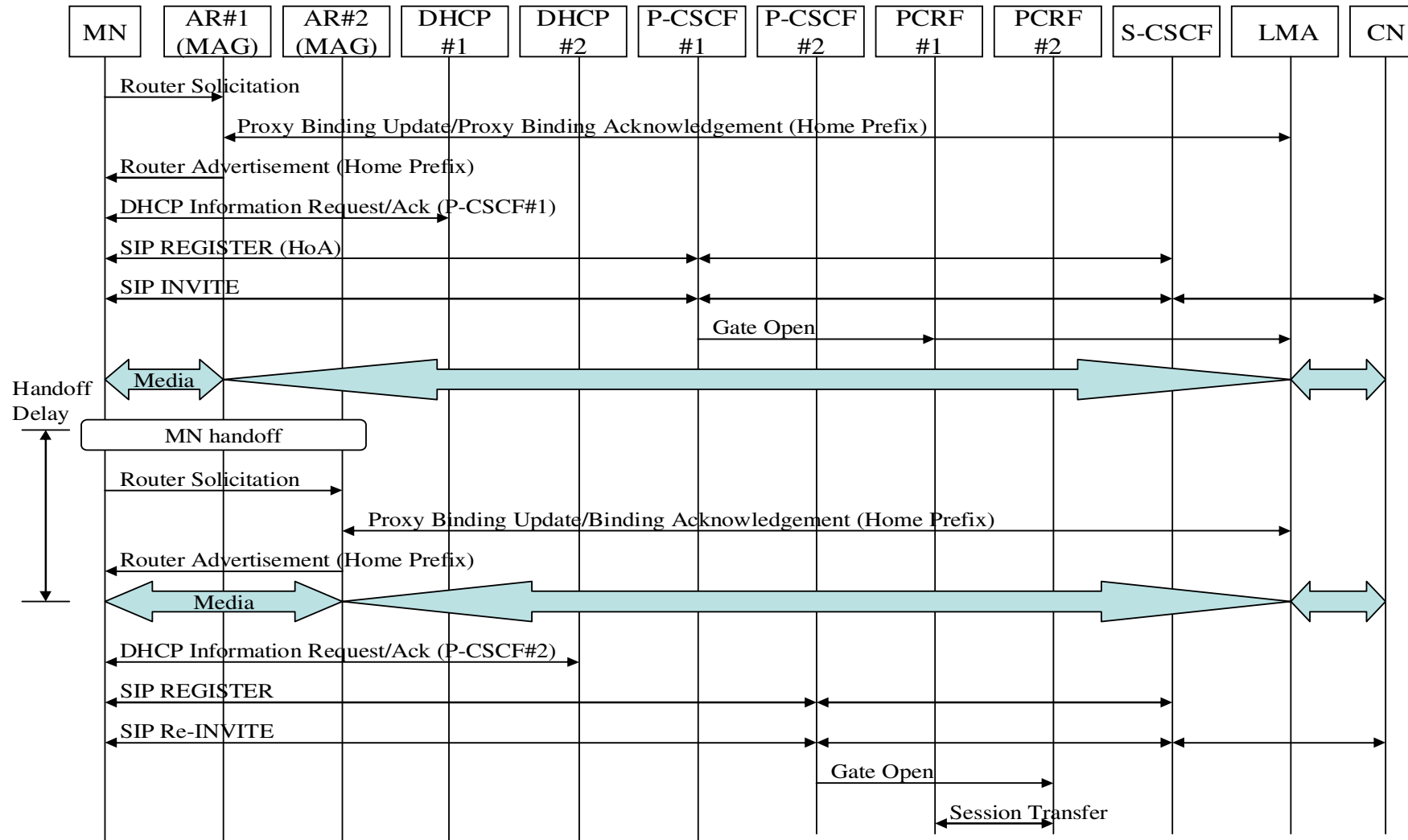
MIPv6 in CDMA emulated network



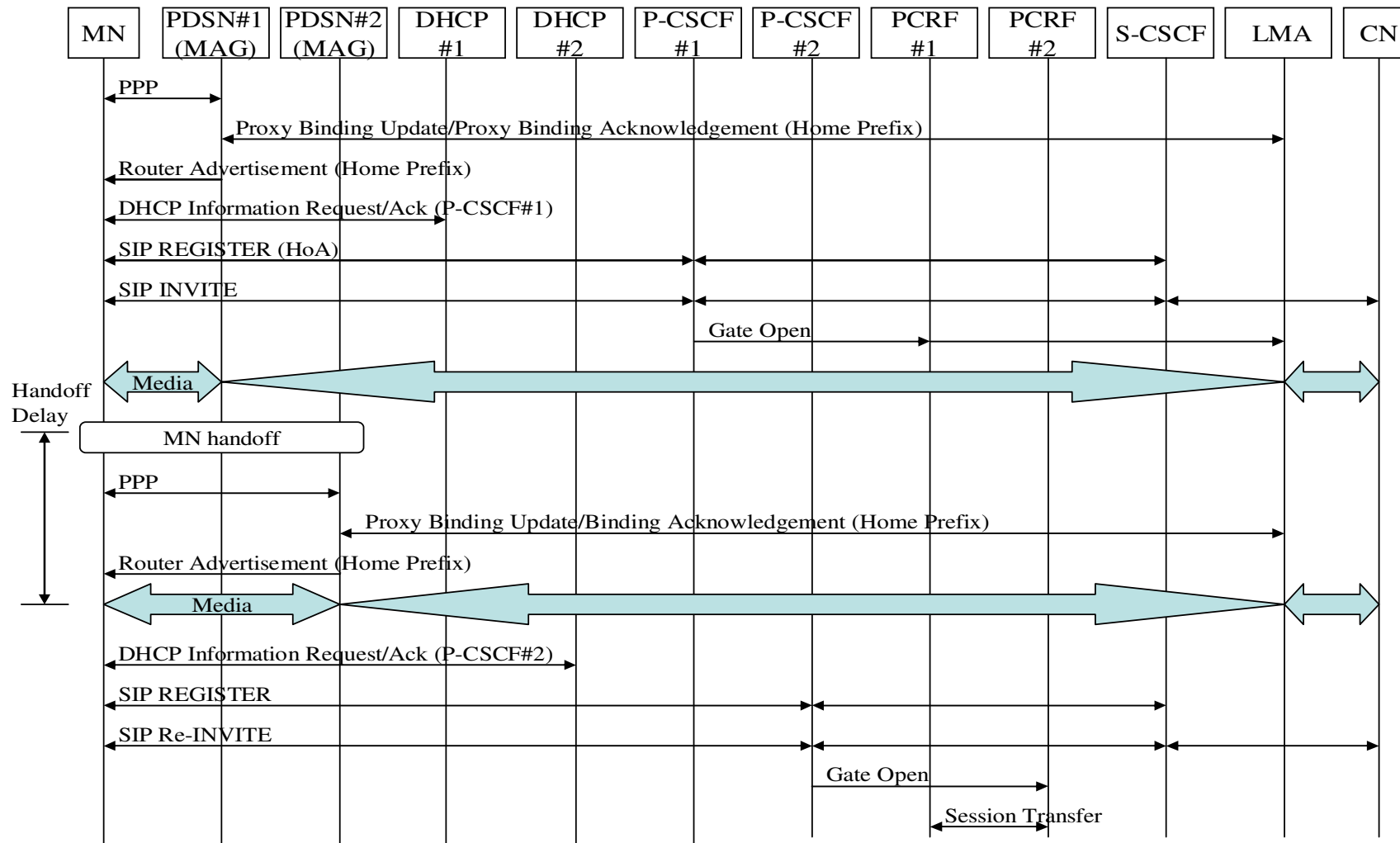
Proxy Mobile IPv6



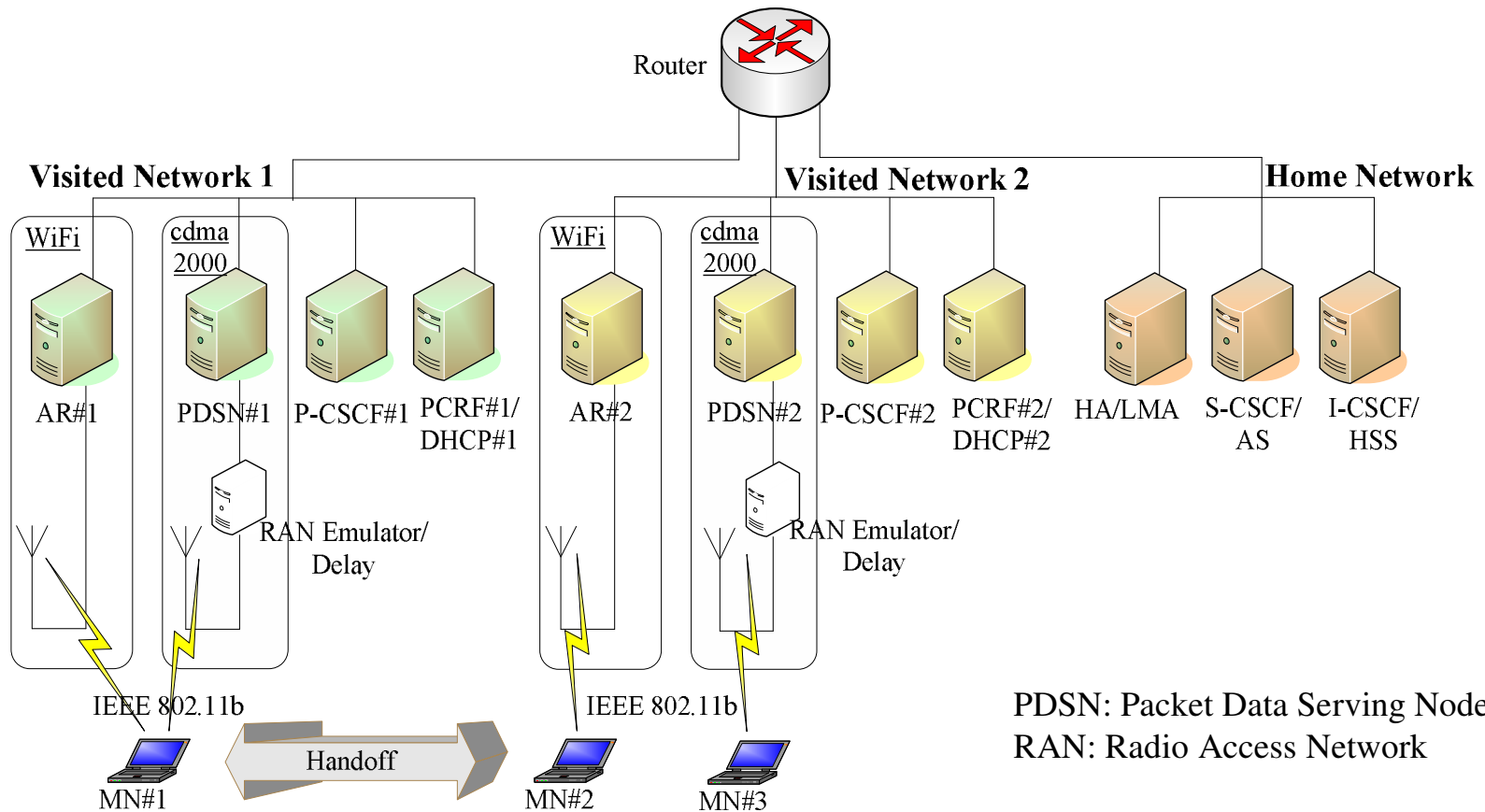
Proxy MIPv6 in Wi-Fi Network



Proxy MIPv6 in CDMA Network



Handoff experiment in IMS testbed

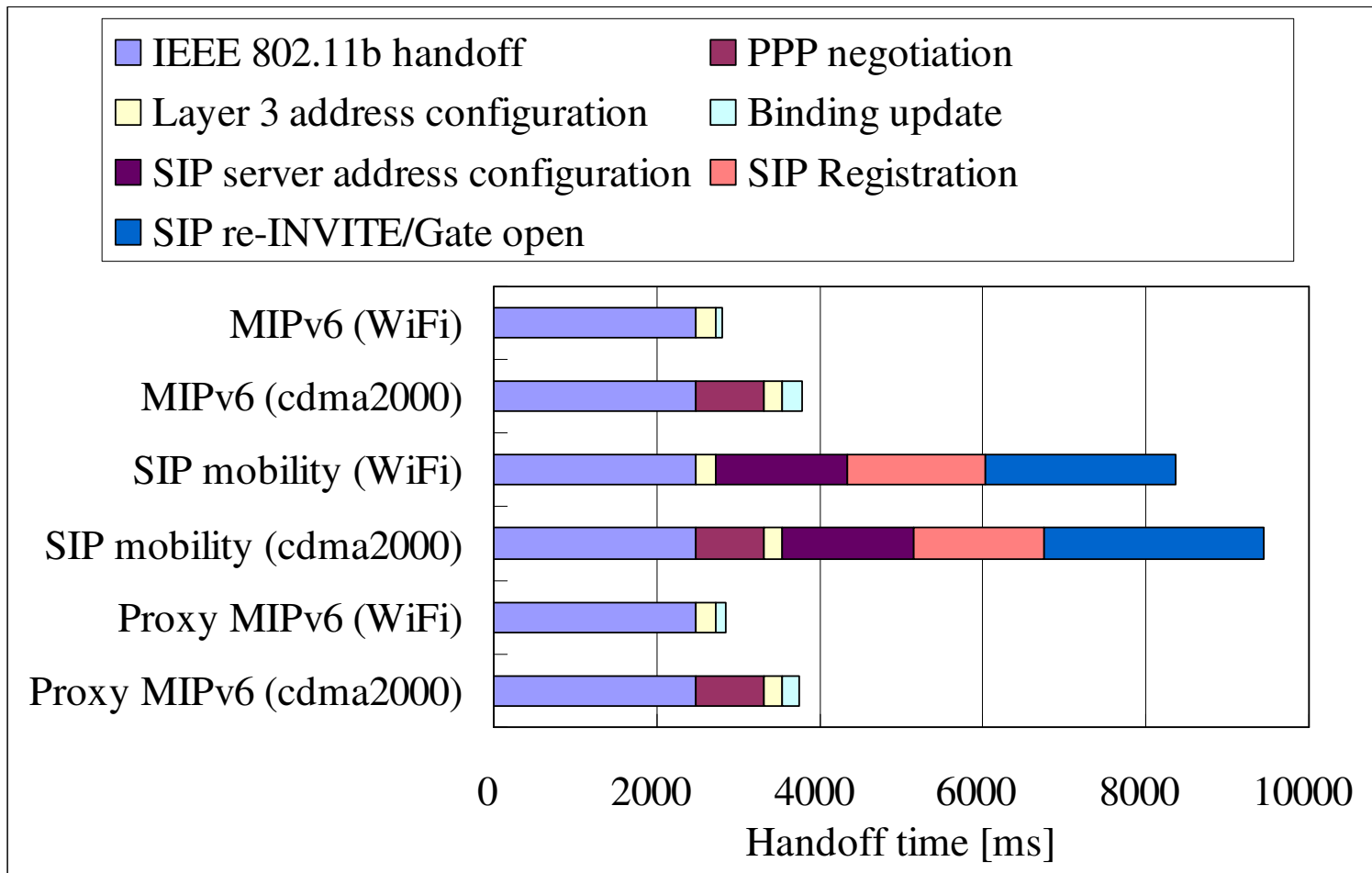


Specification of components

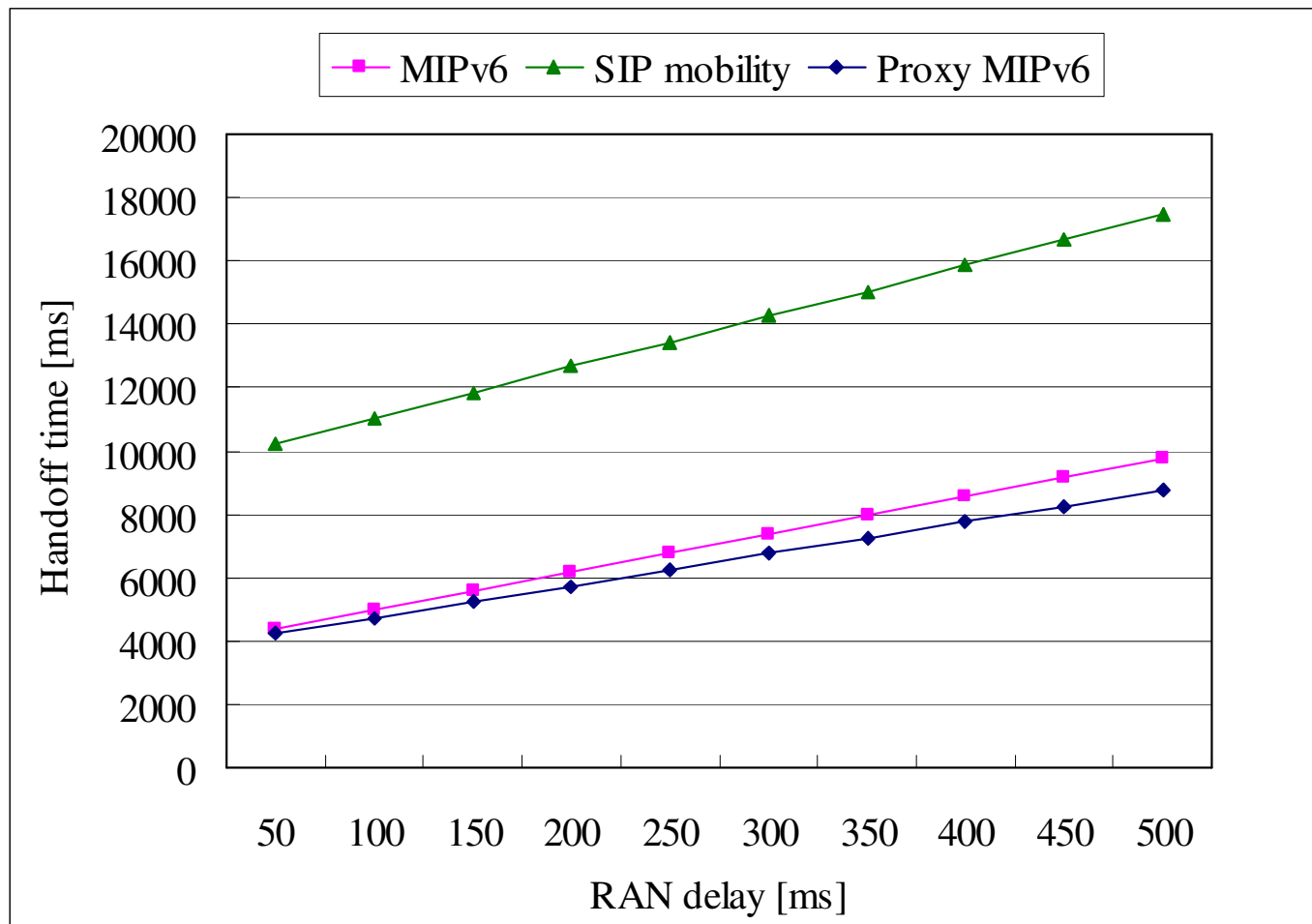
Components Spec.	MN	RAN emulator/ Delay	Other servers/ routers
OS	Fedora Core 4	Free BSD 4.11	Fedora Core 4
CPU	Pentium M 1.4 GHz	Pentium IV 2.8 GHz	Pentium IV 2.8 GHz
Memory	1 GB	2 GB	2 GB
Network adapter	IO-DATA WN-AG/CB2 (Mode: 802.11b)	Intel PRO/1000MT	Intel PRO/1000MT

- MN, AR/PDSN, HA/LMA: Mobile IPv6 and Proxy Mobile IPv6 (<http://www.mobile-ipv6.org/>)
- MN, PDSN: PPP-based access authentication
- MN, CSCFs: NIST-SIP (<http://snad.ncsl.nist.gov/proj/iptel/>)
- PCRF: DIAMETER (<http://i1.dk/JavaDiameter/>)

Handoff time

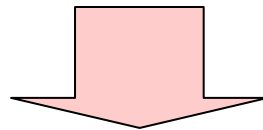


Handoff time with increasing RAN delay



Requirement for Mobility Protocols in IMS (1)

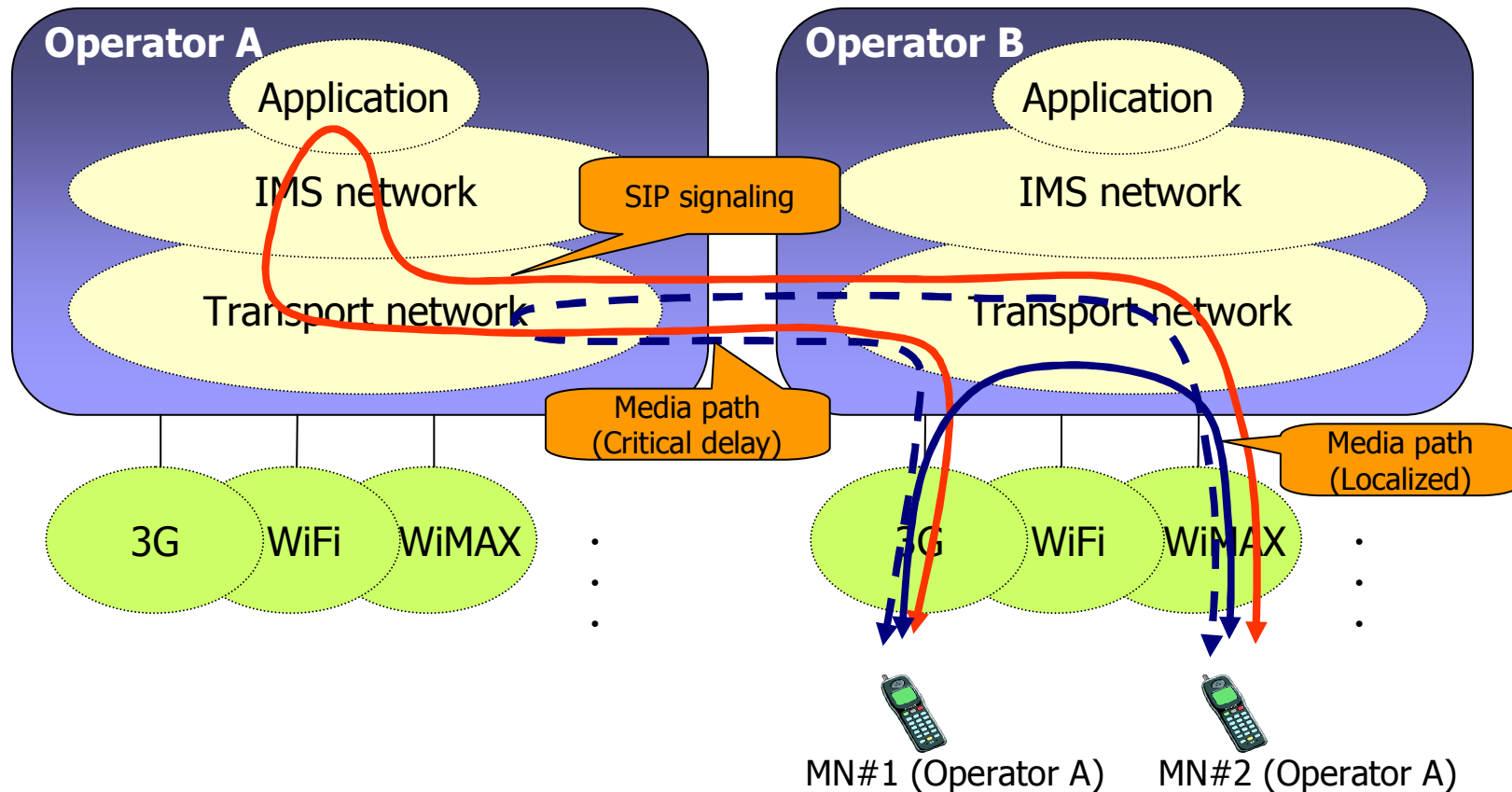
- SIP signaling address anonymity
 - MN has to keep SIP Signaling address registered and does not change it.
 - SIP signaling address is one of the user privacy information.
 - Need to protect MN from DoS attack in IPv6 case



- **CSCF changes SIP signaling address.**
- **Temporary IPv6 address is used for media data.**

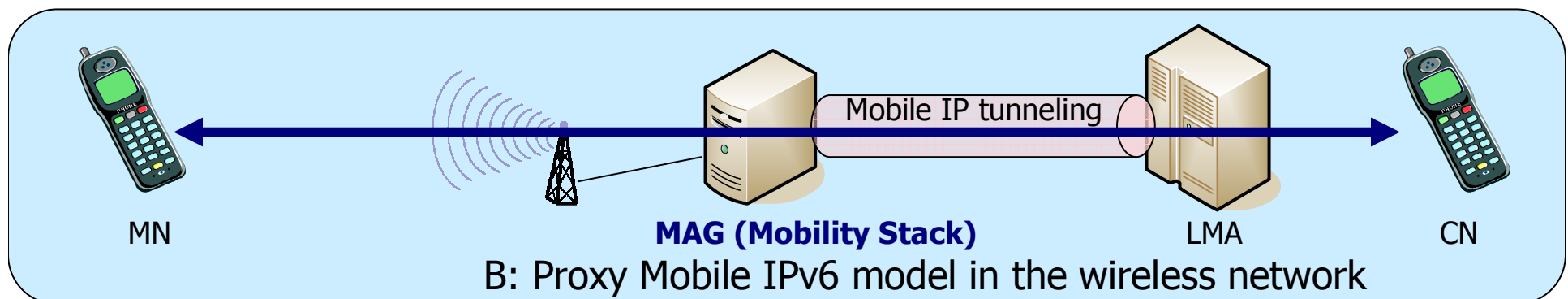
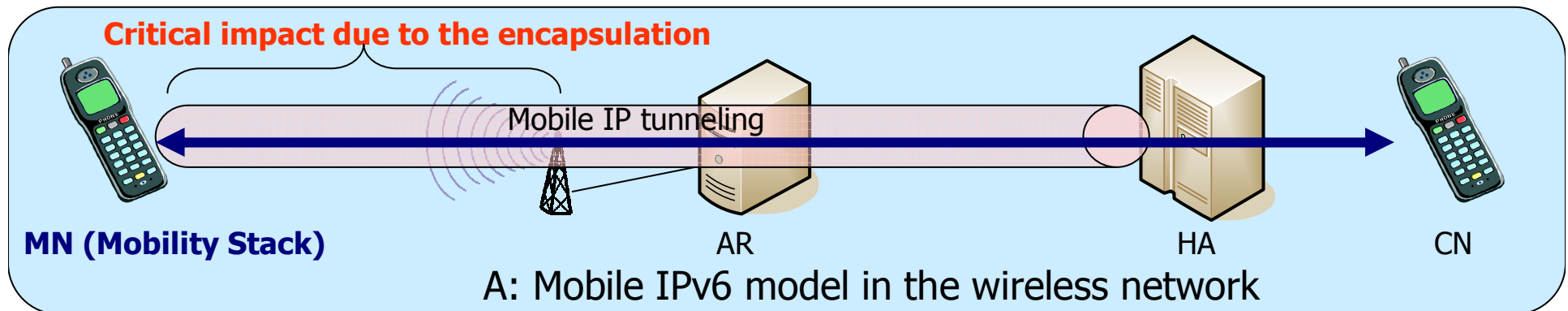
Requirement for Mobility Protocols in IMS (2)

- Low-latency media delivery



Requirement for Mobility Protocols in IMS (3)

- Avoidance of media packet encapsulation over the air



Requirement for Mobility Protocols in IMS (4)

- Reducing the processing of mobility protocol on MN
 - Limited memory, CPU, power, etc.
 - SIP-based mobility: SIP Re-INVITE on MN
 - Each handoff mechanism is required for non-SIP applications
 - Mobile IPv6: Mobility stack on MN
 - Proxy Mobile IPv6: Mobility stack on AR (MAG)

Comparison of Mobility Protocols

Requirement Mobility protocol	SIP signaling address anonymity	Low-latency media delivery	Avoidance of media packet encapsulation over the air	MN processing	Handoff time
SIP-based mobility	× One IPv6 prefix	☐ HA/LMA is not needed	☐ No encapsulation	☐ SIP Re-INVITE support	× SIP Re-REGISTER and Re-INVITE
Mobile IPv6	☐ Two prefixes (HoA, CoA) can be used, however CoA is changed during handoff.	× Triangular routing via HA.	× IP encapsulation over the air	× Mobile IPv6 stack	☐ IP layer
Proxy Mobile IPv6	× One IPv6 prefix	× Triangular routing via LMA.	☐ IP encapsulation in the network	☐ No mobility stack	☐ IP layer



Need to be enhanced.

Consideration of Proxy Mobile IPv6 enhancement

- SIP signaling address anonymity
 - Multiple IPv6 prefixes
 - SIP signaling => Home LMA, Media data => Local LMA
- Low-latency media delivery
 - Local Break Out (LBO) for media data
 - Route Optimization (RO) without having packets to go through LMA

Conclusions and future work

- Analysis of Mobility Protocols in IMS

- SIP-based Mobility
 - Need no tunneling protocol
 - Critical handoff delay
 - Non-SIP support
- Mobile IPv6
 - Encapsulation over the air
 - Delay due to triangular path
- Proxy Mobile IPv6
 - Delay due to triangular path

=>PMIPv6 is suitable as a mobility protocol in IMS

- Consideration of Proxy Mobile IPv6 enhancement

- Multiple IPv6 prefixes associated with multiple LMAs
- Local Break out for media data
 - Route Optimization between MAGs



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Questions?
