

- Live explainer · 8-10

Issues in M

Explore why making mobile is hard: routine latency, security, and how modern networks work around them.

[Review this prototype →](#)

- Understand the core roles: Home Agent , Foreign Agent , Mobile Node , Correspondent Node .
- See where Mobile IP breaks routing assumptions and introduces new attack surfaces.
- Connect protocol limitations to everyday scenarios like roaming calls and streaming.

Mobile IP in one picture

Mobile IP lets a device move across networks while keeping a stable IP address, by anchoring traffic at its **Home Agent**.

- **Home address** stays the same; packets always head to the Home Agent first.
- The Mobile Node registers a **Care-of Address (CoA)** in the visited network.
- Home Agent intercepts packets and tunnels them to the current CoA.

Location vs identity

Tunneling

Encapsulation

Agent discovery

Did you know? Mobile IP predates smartphones. It was designed when "mobile" mostly meant laptops moving between campus networks.

Home

network

Home Agent

(HA)

Visited

network

Foreign Agent

(FA)

Internet

CN → HA path

Mobile Node

Home addr: 10.0.0.5 - CoA:
203.0.113.42

Tunnel

HA
encapsulates
→ FA

Where Mobile IP gets tricky

Trying to glue mobility onto an address-based protocol introduces routing detours, state overhead, and new security challenges.

- Triangular routing & latency — CN → HA → MN instead of direct paths.
- Fast handovers — keeping sessions alive while CoA changes frequently.
- Security & signaling overhead — registration, spoofing, DoS risks.

Triangular routing

Routing

Packets detour via HA, even when CN and MN are topologically close.

Latency & handovers

Latency

Handoff between FAs must be fast enough for VoIP/streaming.

Security

Security

Who is allowed to claim a CoA for a home address?

Scalability & QoS

Scale

State at HAs, tunnels, and QoS markings across domains.

Issue cards with impact snapshots

Each card summarizes one problem area and its impact on applications. Imagine tapping a card to expand it in a live version.

Triangular routing

Routing

CN sends to HA, HA tunnels to MN. Great for simplicity, bad for latency and HA load.

Impact

- Extra RTT affects RTT-sensitive flows (VoIP, gaming).
- HA becomes a traffic bottleneck and single point of failure.

CN → HA → FA → MN

Orange: detour path

Grey: expected direct path

Handover latency

Latency

MN changes its CoA as it roams; registration delays can freeze or drop ongoing flows.

Impact

- Packet loss during handover windows.
- Jitter spikes when paths change mid-session.

FA1 ≢ MN ≢ FA2

Orange: handover gap

Grey: steady path

Security & NAT

Security

Spoofed registrations or tunnels can hijack traffic. Firewalls and NATs may break tunneling.

What users feel when Mobile IP struggles

We map technical issues to familiar experiences: dropped calls, buffering icons, and inconsistent quality while moving.

VoIP on the move

Video streaming

Roaming & NAT

VoIP call while walking between cells

Mobile Node

Moves between FAs every ~30s; needs near-seamless CoA updates.

Network

HA sees frequent binding updates; path and latency change per hop.

User experience: short audio gaps or robotic voice when handovers are slow or packets are reordered.

Streaming video

Adaptive bitrate reacts to tunnel jitter.

Roaming data

Carrier-grade NAT + tunnels.

Call control

Signalling may use different path than media.

QoS

Markings may be lost inside tunnels.

Scenario 1 Call continuity across FAs.

Scenario 2 Streaming quality vs route changes.

Timeline concept: On desktop, this section can become a horizontal stepper where each step updates the scenario panel and diagram state.

Key takeaways & how to go deeper

Mobile IP is a powerful idea with practical challenges. Modern networks blend multiple techniques to deliver mobility users barely notice.

Key takeaways

- Mobile IP splits identity and location, but introduces path stretch, state, and security requirements.
- Latency-sensitive apps suffer most from handover delays and triangular routing.
- Today's mobility is often implemented via a mix of tunnels, proxies, and smart application logic.

Next steps

Use this prototype as a storyboard for a richer interactive deck: add real animations, clickable diagrams, and live traffic traces.

[Draft slide notes](#) [Add security deep-dive](#) [Export as PDF](#)

Review this prototype

Clarity of diagrams?

Depth on security issues?

Coverage of real-world scenarios?

Anything missing for teaching?



[Restart tour](#)

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