Mobility and Cross-Layer Design

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Background

- Mobility on the Internet is being driven by the emergence of multi-radio devices and networks (WiFi, Cellular, Wimax) that support them
- Variety of applications envisioned: VoIP, Mobile IPTV, Turn-by-turn navigation, peer - peer gaming and more
- What constraints are placed by these applications on the Mobile Internet design?

Requirements on Internet Mobility

- An application must persist
- Performance must meet user expectations for the particular application
- Applications should make use of network diversity

When a Handover happens, a Mobile Node has to

- Acquire a new link
  - Scanning, synchronization and attachment
  - Access control and key exchange
- Acquire new IP
  - Router discovery
  - DHCP, DAD
- Update Route
  - Inform an agent
  - Inform correspondents
- Update Flow
  - Provide new network flavor
  - Affect flow rate?

Access Network operations

end - end operations

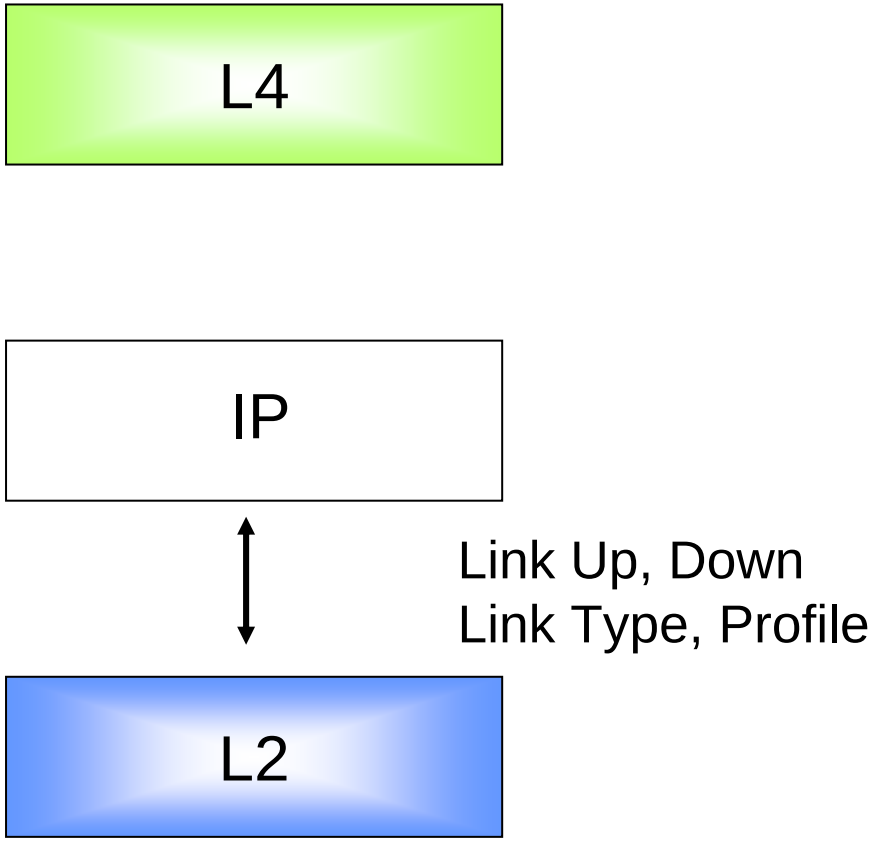
Layer Interaction

What do you get?

- Fast Link Status delivery
- Link Flavor information
- Link switching from IP

Considerations:

- Reliability of information
- What to do with Link Flavor?

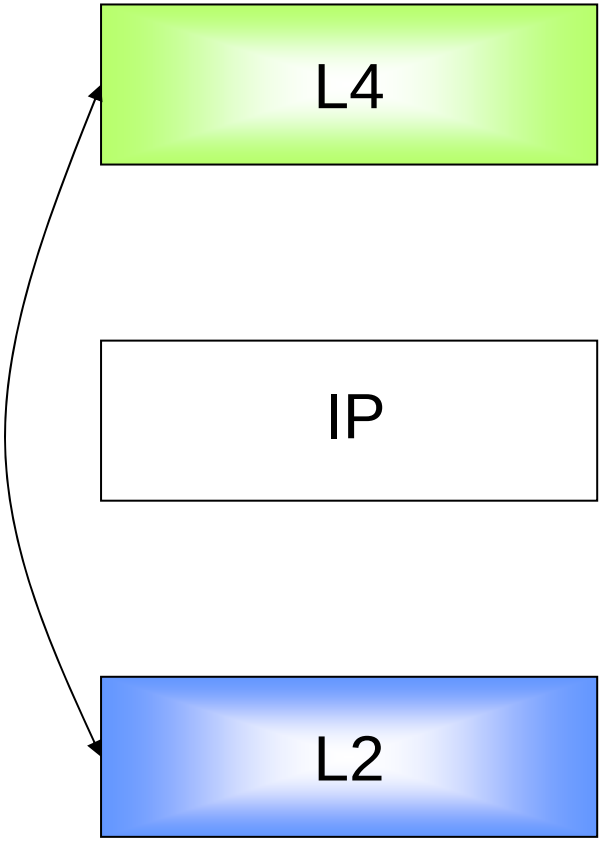


QuickTime™ and a
YUV420 codec decompressor
are needed to see this picture.

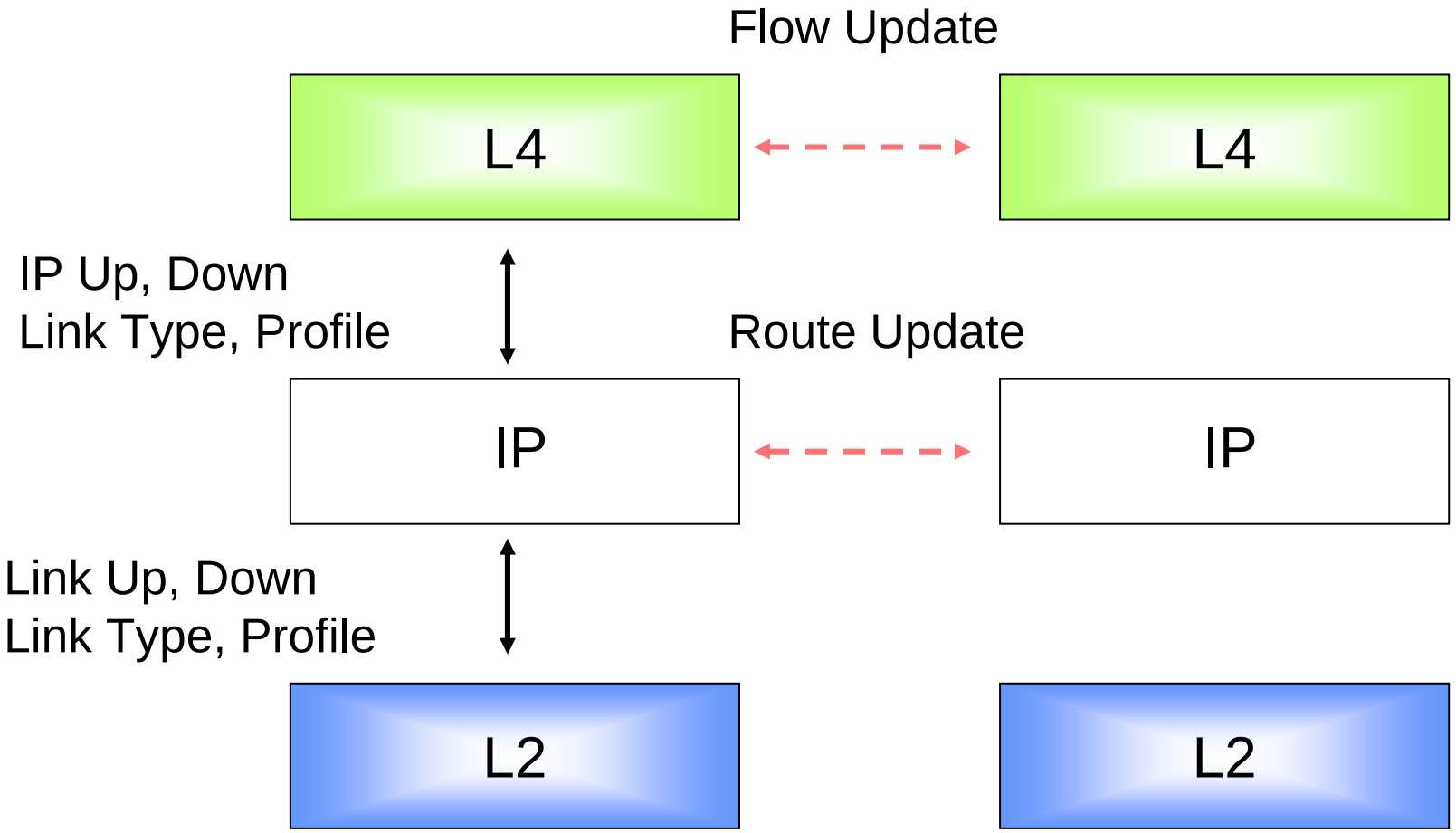
Layer Interaction

What do you get?
- Direct Link Status Information
- Transmit rate control
- draft-iab-link-indications
- Microsoft Windows media sensing

Considerations:
- L4 still depends on IP Up
- Receive rate adaptation
  needs new end-end signaling
- Could L4 directly affect L2 state?
- draft-iab-link-indications
- draft-sarolahti-tsvwg-crosslayer

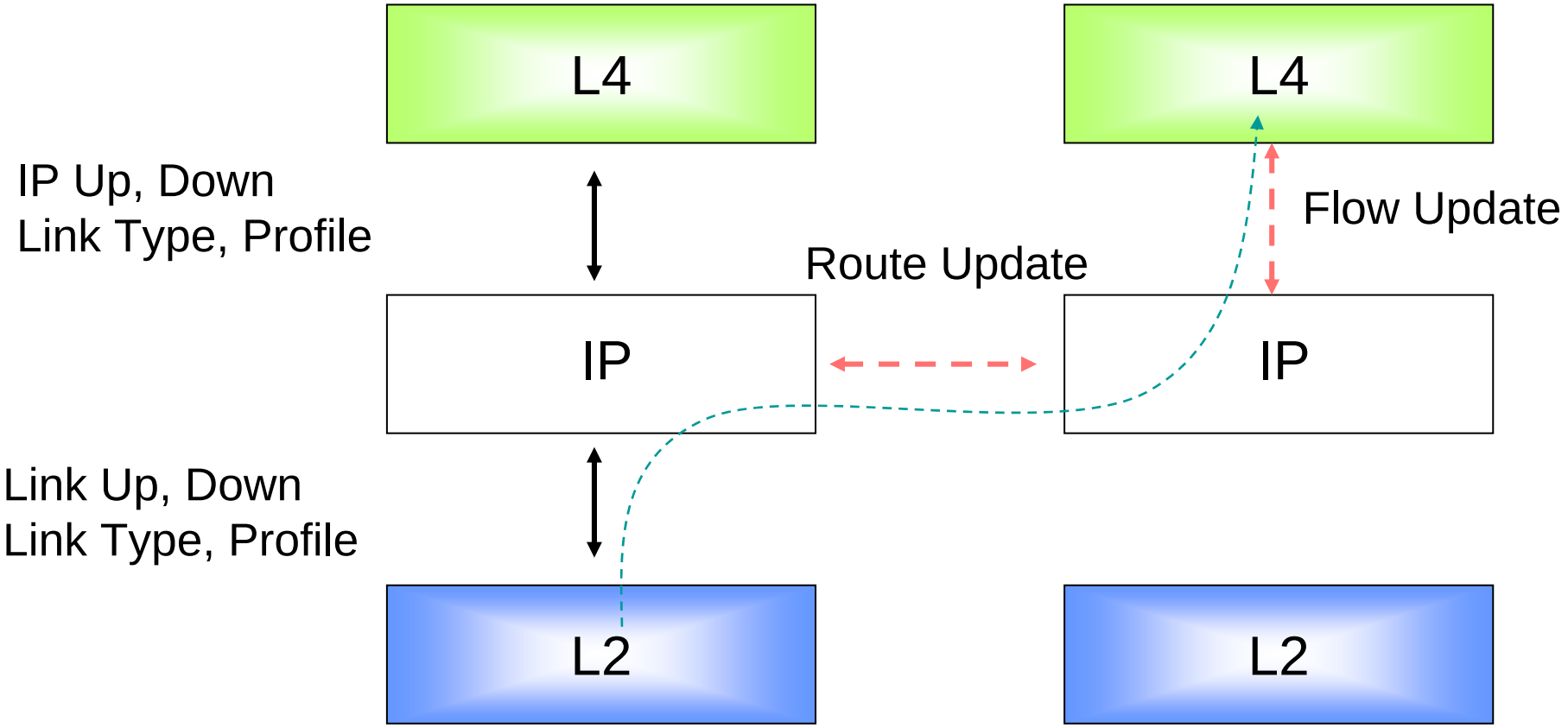


Layer Interaction



Clear layer separation. However..
IP delay dominates RTT

Layer Interaction



Movement Detection, IP Configuration and Route Update become the bottleneck. Need Fast Access Operations.

Closing

- What are the node requirements for congestion control and fairness with cross-layer design?
- In a multi-radio environment, do we need to standardize a shim layer to interact with L2 (e.g., when to switch)?
- Revisit L4 behavior with “access-link-only” changes?