Counting Platforms

StatCounter Global Stats
Comparison from Dec 2008 to July 2015
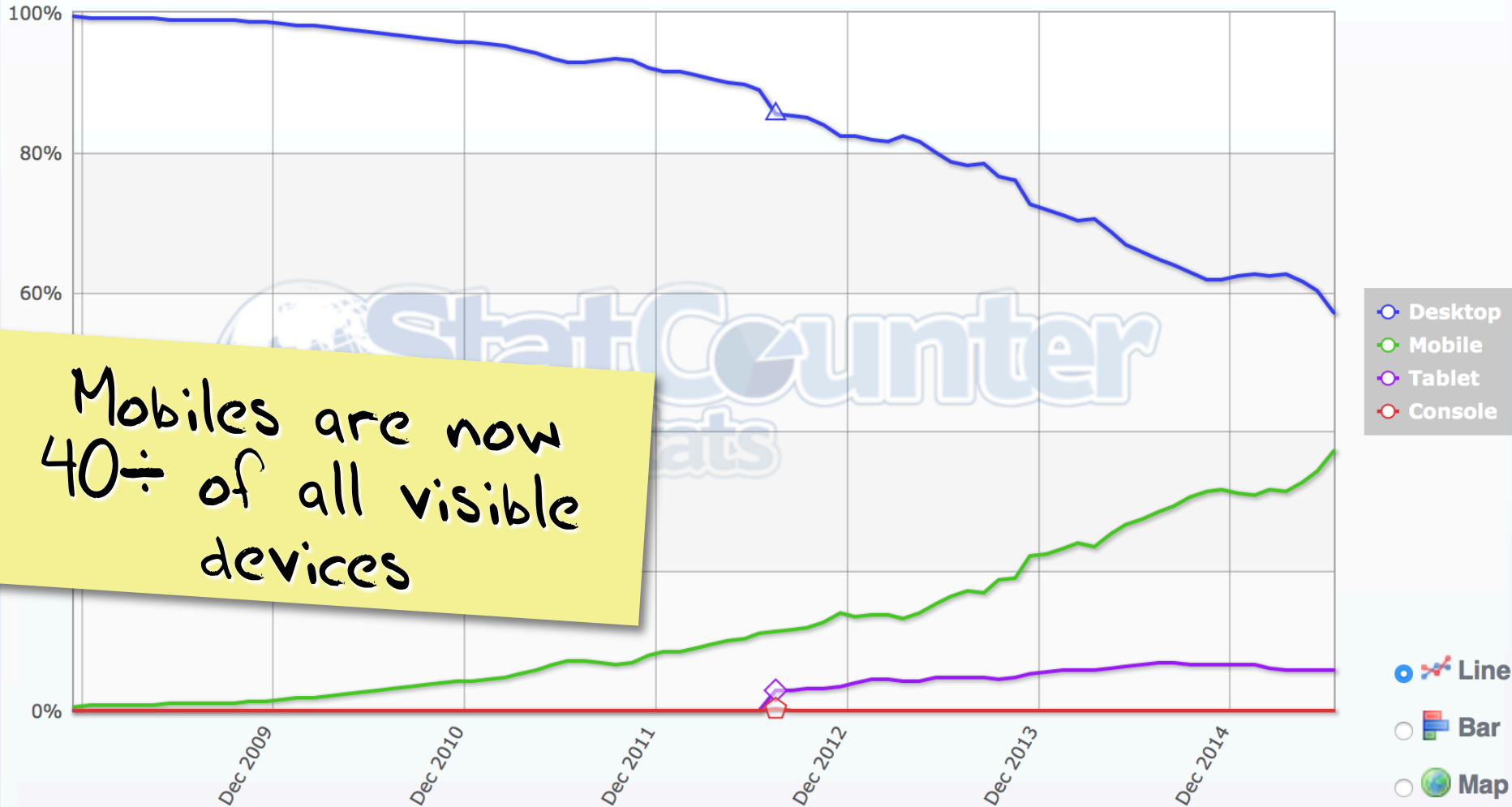
Mobiles are now 40÷ of all visible devices

Legend:
- Desktop
- Mobile
- Tablet
- Console

- Line
- Bar
- Map

Counting the Money

StatCounter Global Stats
Comparison from Dec 2008 to July 2015

- Desktop
- Mobile
- Tablet
- Console

Line
Bar
Map

Mobiles are now 40% of all

Mobile access services represent 75% of all Access Provider revenue

Mobile Production Numbers

2014: 1.5 billion units shipped

Factors:

- Production volumes are bringing down component unit cost
- Android is bringing down software unit cost
- No need for new content - leverage off the the existing web universe of content
- Shift away from the desktop and the laptop by the production industry seeking new markets for their production capability

Who's playing

Android
- 84% of all smartphone shipments in 2014
- Multi-vendor adoption
- Android also extending into tablets and large screens

Apple iPhone / iPad
- 12% of all smartphone shipments in 2014
- Revenues for Apple: $182B in 2014

Windows
- 3% market share
- Mostly Lumia models with Nokia

We used to think…

- That the mobile market was the market "driver" for the Internet
  - Mobiles represent the highest revenue sector, and show the highest growth numbers
  - And this is still true today

- That the true driver for IPv6 adoption in the Internet was in the mobile sector
  - If mobile platforms went to IPv6 then everyone else would be forced to follow
  - But maybe this is not so true today.

One Mobile Technology?

- GSM revolutionised the mobile industry by offering a single technology standard and a single business model across a large part of the mobile market

- Roaming just worked in the GSM world

- Has the mobile industry managed to stay in lock step as it moves into the 4G world?

One Mobile Technology? Not!

The mobile industry is now **very** heterogeneous
- – Various spectrum allocations and regulatory constraints
- – Various service objectives
- – Various operator business objectives (incumbent vs challenger)
- – Radically different objectives from handset suppliers vs network carriage operators
- – 3G is the LCD for roaming – 4G is more random!

The Mobile IPv6 Story

- The result is that the approach to IPv6 transition is highly fragmented across the operators and across handsets

- The result is the deployment of various permutations of transitional IPv4 and IPv6 support in the mobile environment:
  - Native mode dual stack over LTE: e.g. Verizon
  - IPv4 layered over native IPv6, 464 XLAT: e.g. T-Mobile
  - IPv4 synthesized over native IPv6 with NAT64 support
  - IPv6 tunnelled over IPv4

The Mobile IPv6 Story

- The result is that the approach to IPv6 ~~is~~ fragmented across th~~e~~

This diversity implies that many operators have unique requirements for network and device capabilities

Which implies the imposition of cost and complexity for the service operators through customization of technologies

Which all adds to the cost of service to consumers

Nobody wins from this fragmented transition scenario!

... NAT64 support

... over IPv4

Dual Stack vs Mono Stack

- IPv6 only access network
  - Single NAT64 at the network edge to map external IPv4 services to local IPv6 addresses

    or

  - 4-to-6 mapping in the handset and 6-to-4 mapping at the network edge to provide a NAT+XLATE based IPv4 service

- Dual Stack access
  - Pass IPv6 and IPv4 all the way through to the handset

Mobile Devices and IPv6

iOS

- No OS preference for IPv6 – uses a mechanism that should result in an approximate 50/50 split between IPv6 and IPv4 for dual stack

- Browsers may add their own IPv6 selection bias

- We saw in August 2015 1,216,594 iOS devices

    64,740 responded in IPv6 (5%)

    46,784 preferred to use IPv6 (72%)

- iOS 9 beta changes this behaviour to prefer IPv6 in dual stack contexts

- No currently planned support for 464XLAT – proposes a NAT64 solution to single protocol access networks

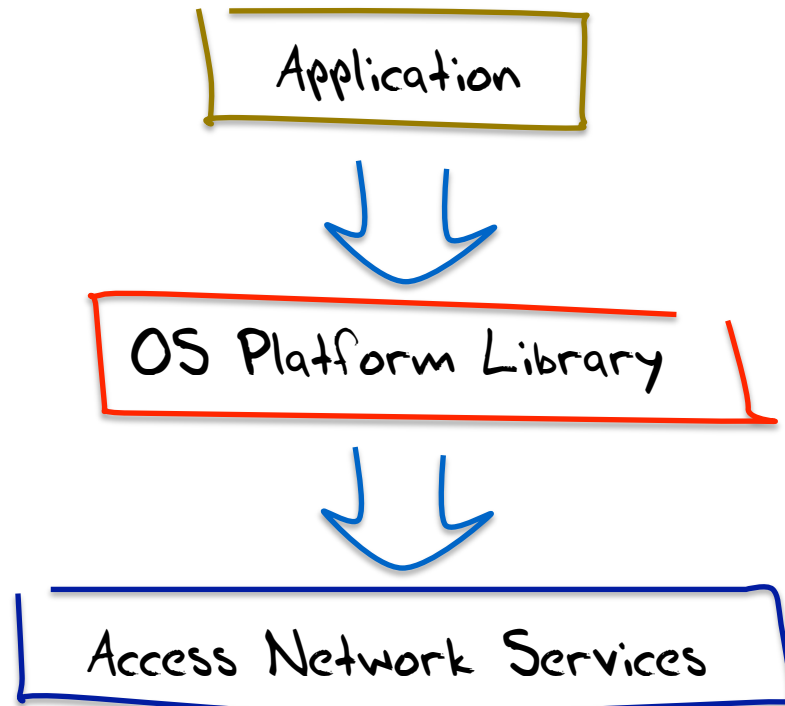# Mobile Devices and IPv6

Android

- – No preference for IPv6 – uses a mechanism that should result in an approximate 50/50 split between IPv6 and IPv4 for dual stack

- – Browsers may add their own IPv6 selection bias

- – We saw in August 2015 3,353,463 iOS devices

  175,922 responded in IPv6 (5%)

  151,754 preferred to use IPv6 (86%)

- – No current plans to add any bias to use IPv6

- – Has support for 464XLAT

- – Does not support DHCPv6 (prefers RA and PD framework)

It's not just Transitional Complexities

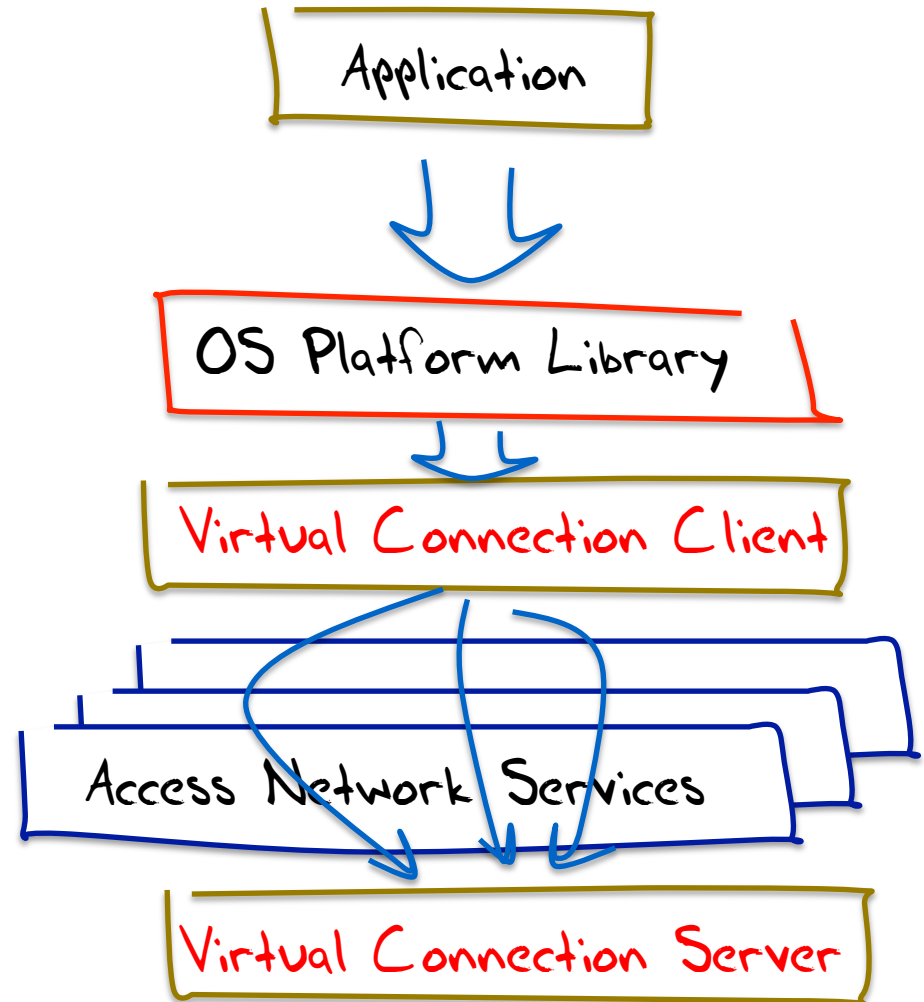It's also the issue of Wifi Handoff and/or multi-path support

– The traditional mobile providers operate with exclusive access to spectrum within defined locales (with associated license costs)

– Alternate access competitors can operate in unlicensed spectrum with WiFi network services

– Handsets are also entering the space with platform services that support connection agility across diverse access networks

– Mobile incumbents are being forced to chase this alternate access market or risk losing market share

– And here there are visible cracks in the protocol stack!

The Mobile Stack Model

Application

OS Platform Library

Access Network Services

APNIC 40

Cracks in the Stack

The Google Fi Approach:

OS-Controlled Seamless Handoff Agility


```
Application
    ↓
OS Platform Library
    ↓
Virtual Connection Client
    ↓
Access Network Services
    ↓
Virtual Connection Server
```

Cracks in the Stack

The MP-TCP Approach:
Apple's Siri

Application-Controlled
Handoff Agility

Application

MP-TCP

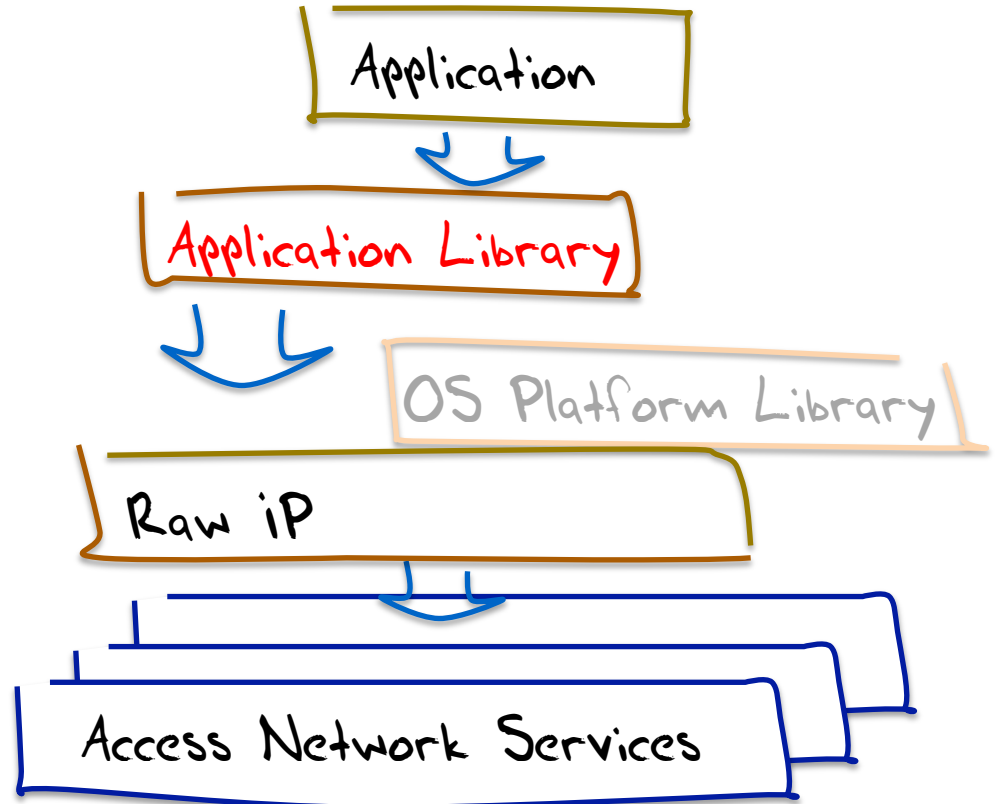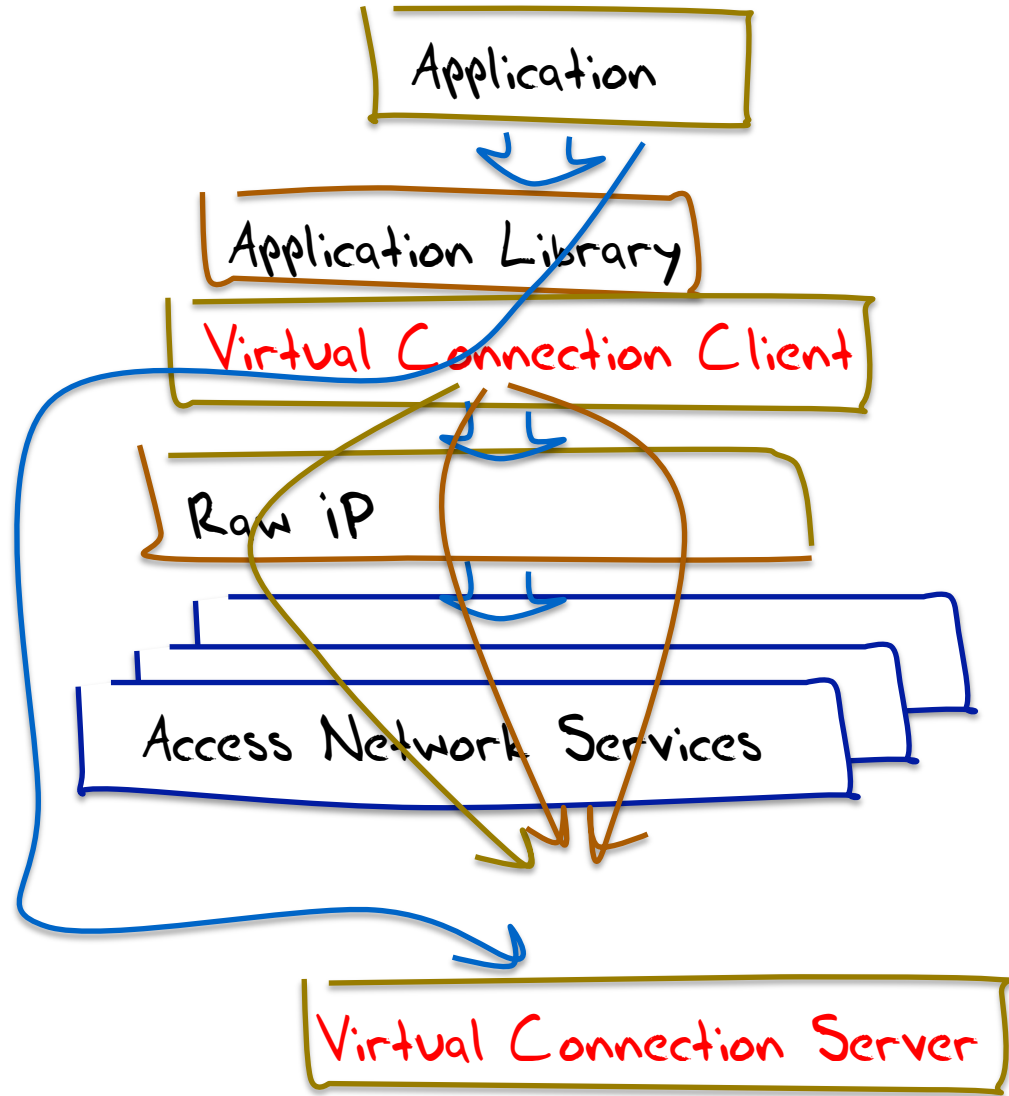OS Platform Library

Access Network Services

internet

MP-TCP Server
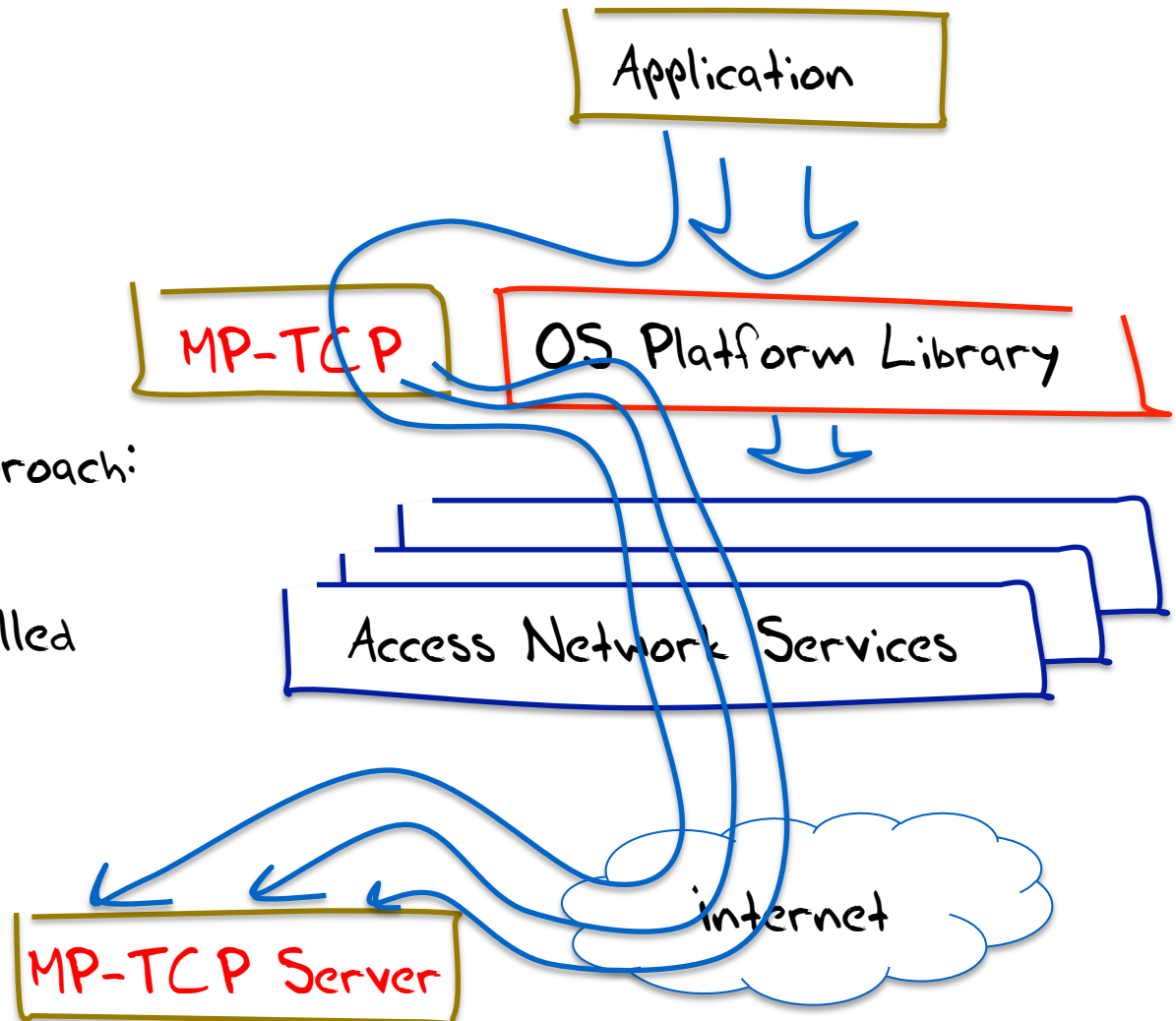
Cracks in the Stack

The Application Approach: Facebook

Fold the entire transport session control into the application

Application

Application Library

OS Platform Library

Raw iP

Access Network Services

Cracks in the Stack

The VPN Application Approach:

Hide the application traffic from both the local platform as well as the local network

Application

Application Library

Virtual Connection Client

Raw iP

Access Network Services

Virtual Connection Server

Where now for Mobiles?

- Mobile Carriage Operators are being pushed into undistinguished utility roles
  - No more voice premiums
  - Erosive pressure on data service margins
  - OS and App providers splitting away from carrier constraints

- Mobile Device manufacturers are being squeezed (except Apple)

- Google and Apple now control the platform space

- So apps are now turning on their over versions of paranoia!

Where now for Mobiles?

- Consumers want more for less
  - The rise of the Streamers
  - (much) higher download speeds
  - (much) larger data caps
  - Lower premiums

  Competitive pressure on providers to response to this consumer pressure

Where now for Mobiles?

- Exclusive Use radio spectrum is too expensive
  - Are they pricing themselves out of the consumer market?
  - WiFi access and application handover approaches are placing pressure on the traditional mobile operator's margins
  - If the cellular providers want cheaper carriage then they need to look at augmenting their offering with WiFi base station handoff infrastructure

Where now for Mobiles?

- The underlying observation here is that the mobile network operator has lost control of the mobile access device and the services offered across the mobile network
  - And after losing that control there is no way back!
  - The device vendor and its applications are charting a course that is in direct conflict with the mobile network operator's desires, and managing to monetize this far more efficiently than the mobile network operator
  - Which means that there is increasing pressure to increased shared unregulated spectrum and increasing discontent with the behaviour of the exclusive spectrum holders
  - Mobile operators are trying to seize the initiative with WiFi handoff, while OS platforms and Apps are trying to place themselves in control and constrain the mobile providers into limited cellular data role

Thank You!

Questions?