The future of global telecommunications in view of the growth of OTT services: expected impacts on usage and prices

Simon Forge, SCF Associates Ltd, UK

v3a

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The core question today-

What will be the impact of OTT voice, text messaging and data services on prices for telecommunications – especially international mobile roaming?

AGENDA

- Basics of OTT technology

- Forms of current usage of OTT

- Trends and drivers in telecommunications use

- The promise of OTT

- The OTT business model – today

- MNO responses – today

- Take-up of the mobile channel is both technology and price throttled

- Forms of future use of OTT – 4G, the 5G promise and "the African 5G"

- The OTT business model – tomorrow : Future promises and impacts on pricing and roll-out and MNO responses

- Potential impacts on international mobile roaming price trends in the medium term (3-5 years) and longer term

Basics of OTT technology

▪OTT implies communications carried over the physical network infrastructure using an IP protocol to reach services available on the Web. Examples are Skype, Viber, and FaceBook services.

▪The OTT data channel can be carried over any type of network infrastructure that gives Internet access – Wi-Fi, mobile 3G or 4G, fixed, or satellite - and combinations

▪This a pure data connection - but using VoIP and appropriate video standards, the IP packet stream can carry isochronous traffic for high quality voice and full-motion HD video globally for streamed TV – and so may avoid roaming charges for voice and SMS (but not for DATA if data session connected via an MNO)

▪Thus MNO voice might be used much less – only the data connection in this case (and also no need for MNO's valued added data service in a 'walled garden' such as search, games, shopping, sports etc – so no MNO ads & apps)

▪In some cases, the voice call or data session from a 3G or LTE handset might be carried by the MNO locally - to an internet gateway for international transit - and thus avoid any roaming fees.
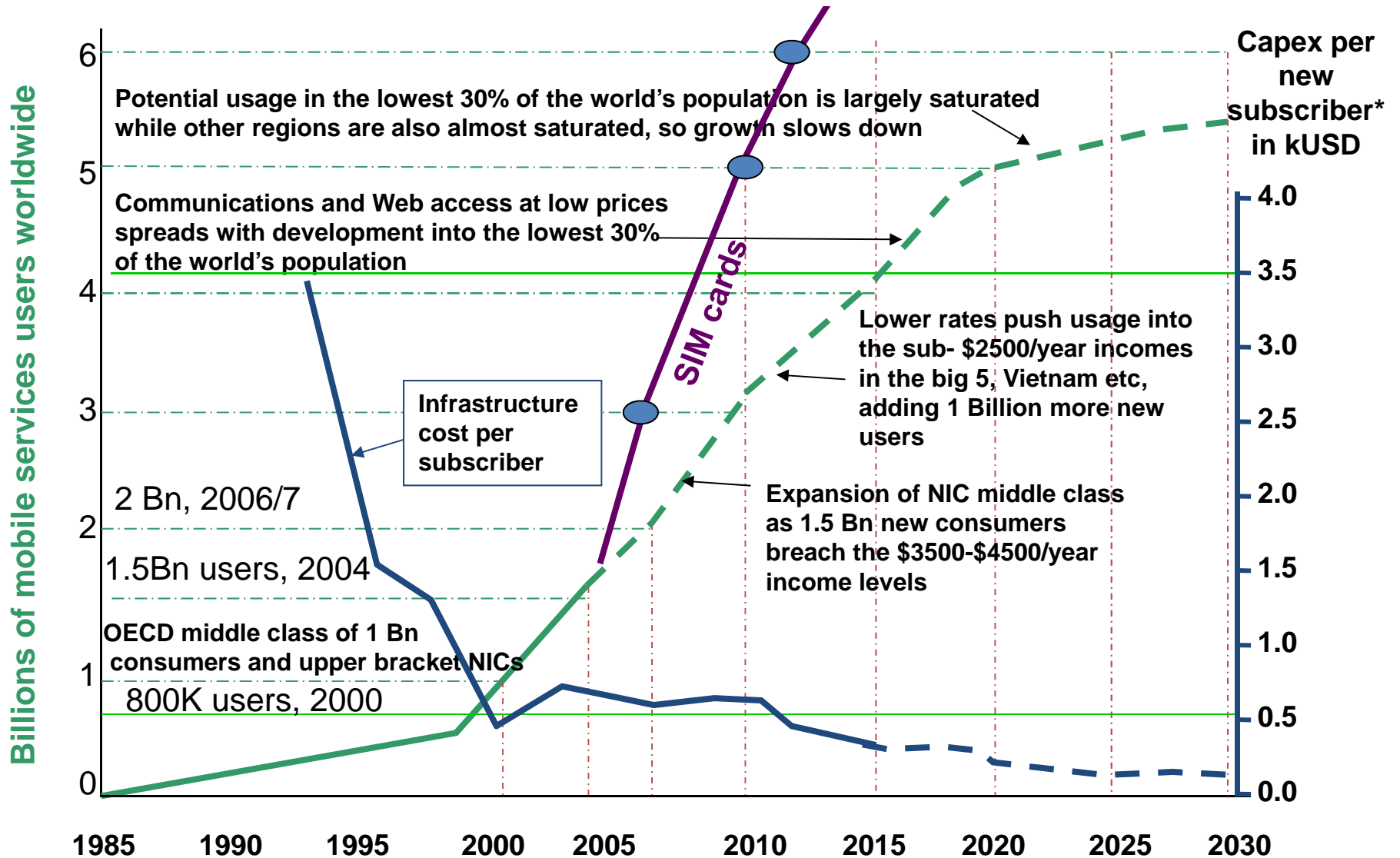
Forms of current usage of OTT

- OTT voice via VoIP for local and long distance calls, domestic & international

- Video chat / conferencing (typically an add-on to voice, eg Skype, Tango etc)

- Pure (Short) Messaging – WhatsApp, Twitter, etc

- Social networking and retailing which may include voice, video chat and texting – note that previously Skype was owned by e-Bay, before Microsoft

- OTT TV services – distribution of TV video content to a wide range of IP-enabled devices (TVs, PCs, STBs, mobile phones and tablets – eg Apple TV) by H.264/MPEG usually over the Internet in unmanaged fashion (– ie the open Internet, not a 'walled garden' Intranet) – still nascent but growing

    - Eg over 380 million people will watch online video 54 billion times via IP connected-TV devices in 2015* - still small compared to total TV viewers

*source: Informa

Global mobile user population growth & infrastructure cost/user

- With globalisation, OECD cost levels of services and handsets will slowly be rebalanced, set by average world prices
- Saturation is set by affordable price for the majority of users – may reach 65% of a global population of over 8.2Bn by 2030 (US Census Bureau) if world usage goes towards average OECD levels of saturation today = 5.3Bn users
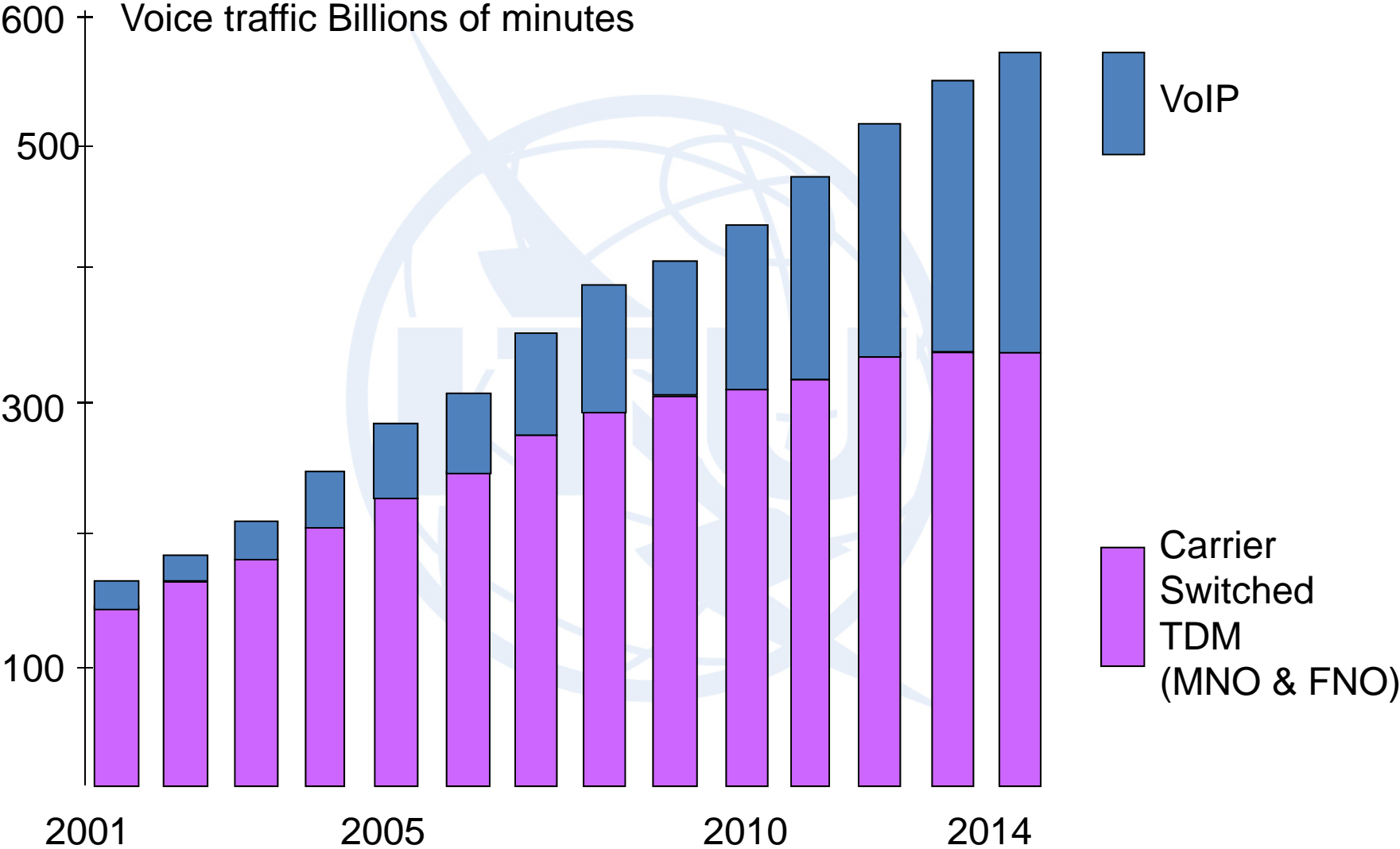
Billions of mobile services users worldwide

Capex per new subscriber* in kUSD

Potential usage in the lowest 30% of the world's population is largely saturated while other regions are also almost saturated, so growth slows down

Communications and Web access at low prices spreads with development into the lowest 30% of the world's population

SIM cards

Infrastructure cost per subscriber

Lower rates push usage into the sub- $2500/year incomes in the big 5, Vietnam etc, adding 1 Billion more new users

2 Bn, 2006/7

1.5Bn users, 2004

Expansion of NIC middle class as 1.5 Bn new consumers breach the $3500-$4500/year income levels

OECD middle class of 1 Bn consumers and upper bracket NICs

800K users, 2000

(projected estimates, SCF Associates Ltd)   NB Confidence in estimates reduces with time

22/04/2015

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Trends and drivers in telecoms use

▪Significant increase in the annual IP data volumes of Internet traffic as Petabytes become EXABYTEs $(10^{**}18)$ then Zettabytes $(10^{**}21)$ in 2016, driven by video - eg in the EU, 75% of data traffic is video and browsing – and voice becomes VoIP.

▪Data is the future mobile revenue driver - total MNO revenue 2014: 1.24Tn$*. But **mobile data** was only **3% of total IP traffic in 2013**, forecast to be still only **12%** in **2018** (Cisco, June 2014)

▪Rapid migration since 2007 to untethered consumer devices – smartphone, tablet- soon dominant user terminal device for data & voice (1.9 Billion used, end 2014*)

▪Roll-out of mobile networks that are more IP data oriented with LTE - rapidly in USA, Japan, South Korea, slower in Europe and Rest of World – 2.7 Billion mobile broadband connections 2014, 5.9 Billion forecast for 2020*

▪Take-up of OTT comms services:-
   ▪Skype, carries over 25% of cross-border international call minutes – BUT mostly via fixed line and Wi-Fi/ fixed broadband access - also Google Voice, Facebook growing
   ▪Social media, online gaming and dating sites are integrating OTT voice as a part of a larger user experience (Google, Microsoft, Facebook etc).
   ▪Spread of VoIP services was via Wi-Fi originally but some now via mobile data locally

▪Growth in take-up of broadband is via fixed line & Wi-Fi for OTT IPTV services.

*Source: GSMA, 2014

The reality of VoIP

Voice traffic Billions of minutes

Chart axis labels: 600, 500, 300, 100 (vertical); 2001, 2005, 2010, 2014 (horizontal)
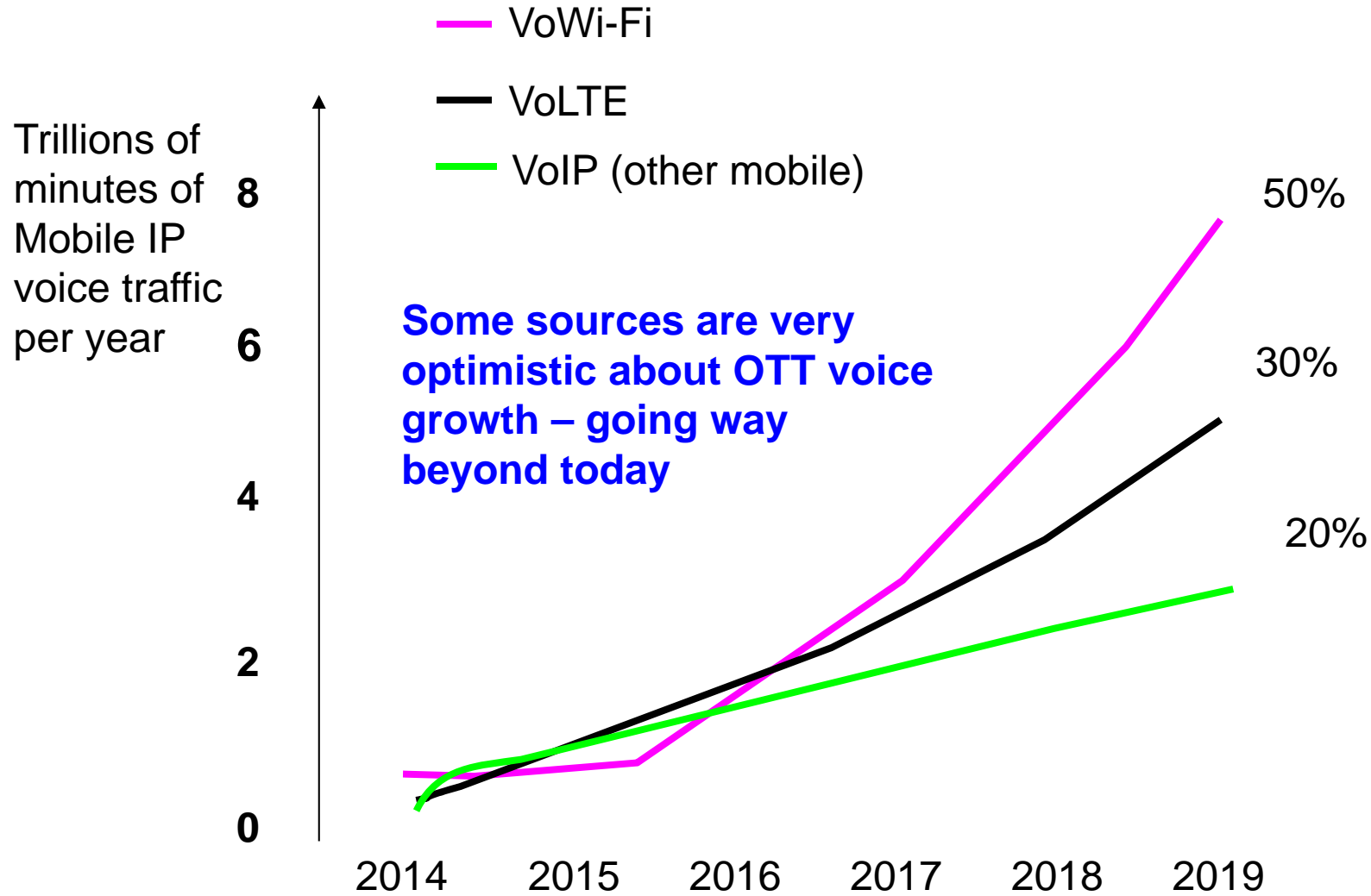
Legend: VoIP; Carrier Switched TDM (MNO & FNO)

CAGR in VoIP dropped from 15% in 2001 to 11% in 2011 and 6% in 2014

SOURCES : Cisco, Telegeography, SCF Associates Ltd , 2014

What shape will OTT take ?

unclear today but some forecasts expect **voice over Wi-Fi** will be the ultimate choice – against LTE and other mobile VoIP – but what sort of Wi-Fi?

Trillions of minutes of Mobile IP voice traffic per year

— VoWi-Fi
— VoLTE
— VoIP (other mobile)

Some sources are very optimistic about OTT voice growth – going way beyond today

50%
30%
20%

2014   2015   2016   2017   2018   2019

Sources : Cisco VNI Global Data traffic, ACG, SCF Associates Ltd

The promise of OTT

Conventionally, OTT promises - and the challenges it brings for the MNOs - are seen from **2 different perspectives**, often considered as unrelated:-

- OTT challenges mobile voice, SMS texting and mobile data plans for internet access – and thus competes for IMR on pricing

- OTT challenges traditional TV content distribution (– ie the linear programmed video entertainment from DTT broadcasters, CATV, satellite and stored media) with its interactive functionality for non-linear TV. With broadband mobile, entry to the video entertainment market could become the next MNO target.

However, the reality of network financing and of evolving rich web services (such as YouTube) is that they *may NOT be separate*, in the long term future. The drive to content provision is already embracing comms

Hence, it is necessary to consider both perspectives.

OTT could also be important in the M2M market, but may use different quite technologies to IP for voice and video – and avoid SIM charging
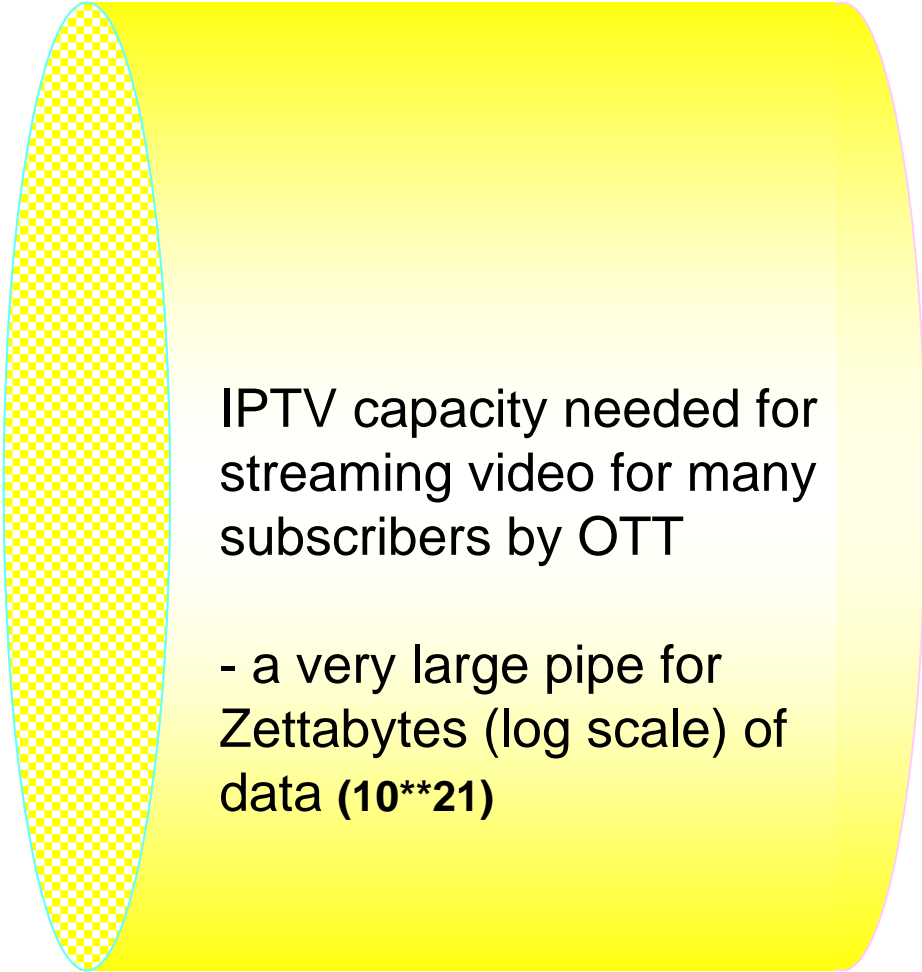
BUT there is a key problem with OTT for MNOs - take-up of the mobile channel is both technology and price throttled

- Charges for data over mobile are still very high and could remain high

- MNOs may have to maintain that pricing in some countries order to throttle demand – to prevent RAN (& perhaps Core) overload by IP traffic - as the 2G and 3G networks are not engineered to meet the data volume demands - eg video streaming

- Hence carrying large volumes of download & streaming from the mobile Internet is not yet widely possible

- So what are the volumes of data traffic today by network type?
  Data carriage varies by country but in EU and USA, may be of order of :-
    - Fixed only: 50%
    - Fixed+ Wi-Fi: 45% (Example for UK presented Ofcom 5G workshop, 12 March 2015)
    - USA: comparable figures (FCC-NTIA workshop on spectrum sharing 19 March 2015)
    - Mobile: 4% - 5%

- However these figures are in countries with extensive fixed networks so the key question is-   What is the REST OF THE WORLD to do?

Looking forward:-
- Will LTE ("4G") help – with various enhancements and LTE-U??
- Will offloading traffic through Wi-Fi be the solution – as MNOs are now investing in Wi-Fi

The real question is - a 2-pipe problem

IPTV capacity needed for streaming video for many subscribers by OTT

- a very large pipe for Zettabytes (log scale) of data **(10**21)**

MNO RAN capacity for data for the foreseeable future:
- **A comparatively narrow pipe**
- **Open to roaming surcharges**

Near 200 Exabytes in 2018 (approx 12% of 1.6 ZB, Cisco)

Eventual technical solution may only be fixed or Wi-Fi, or perhaps 5G for short range broadband networks = **urban ONLY**

Current mobile technical solutions, even with LTE Advanced, may continue to be the rule outside urban environments - **so roaming tariff issues with MNOs may persist**
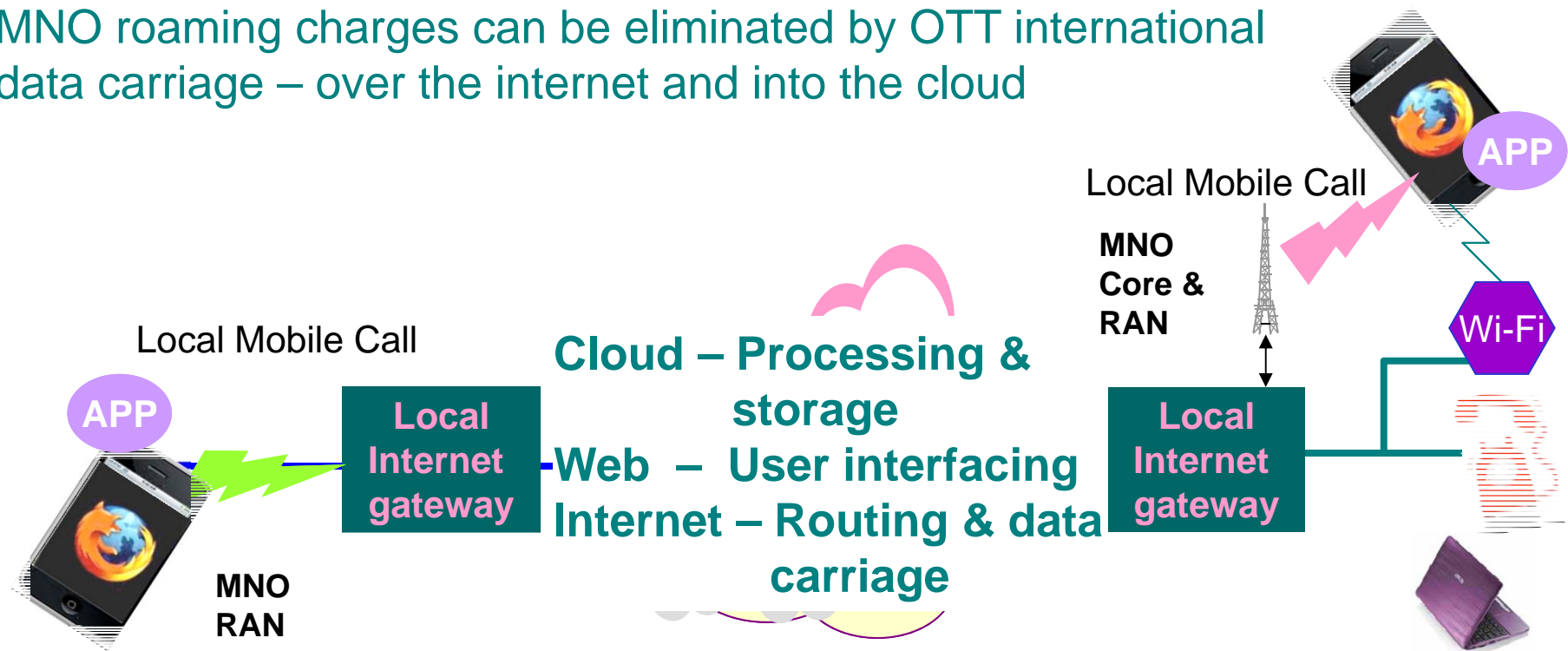
Over The Top Business model

▪ Business model an OTT Service Provider (OSP) is to offer some form of web access service on top of conventional carrier networks – fixed and mobile.

▪May not operate a network and usually does not lease network capacity from an MNO or FNO. However some, such as Vonage & Vopium, have invested in network assets such as VoIP switches & gateways; some have operator accords

▪Instead OSPs rely on the global internet and high speed IP networks to access the user - the user then connects to the selected Web services - social networking, email etc

▪So although the term "going over-the-top" refers to using infrastructure of a standard communications service provider (FNO or MNO) it does not necessarily imply local direct connection services at IP level.

Example - *Vonage Mobile* **– uses app from iTunes for international calling via Wi-Fi broadband OR via the MNO local connection into Internet for low cost flat rate 'unlimited' or possibly free global voice/texts/ videochat to 80+ countries.**

▪ **Free only for other** *Vonage Mobile* **app users on iPhone or Android mobile handsets**

▪ **Used on Facebook to talk to friends.**

The OTT Business model - today:

MNO roaming charges can be eliminated by OTT international data carriage – over the internet and into the cloud
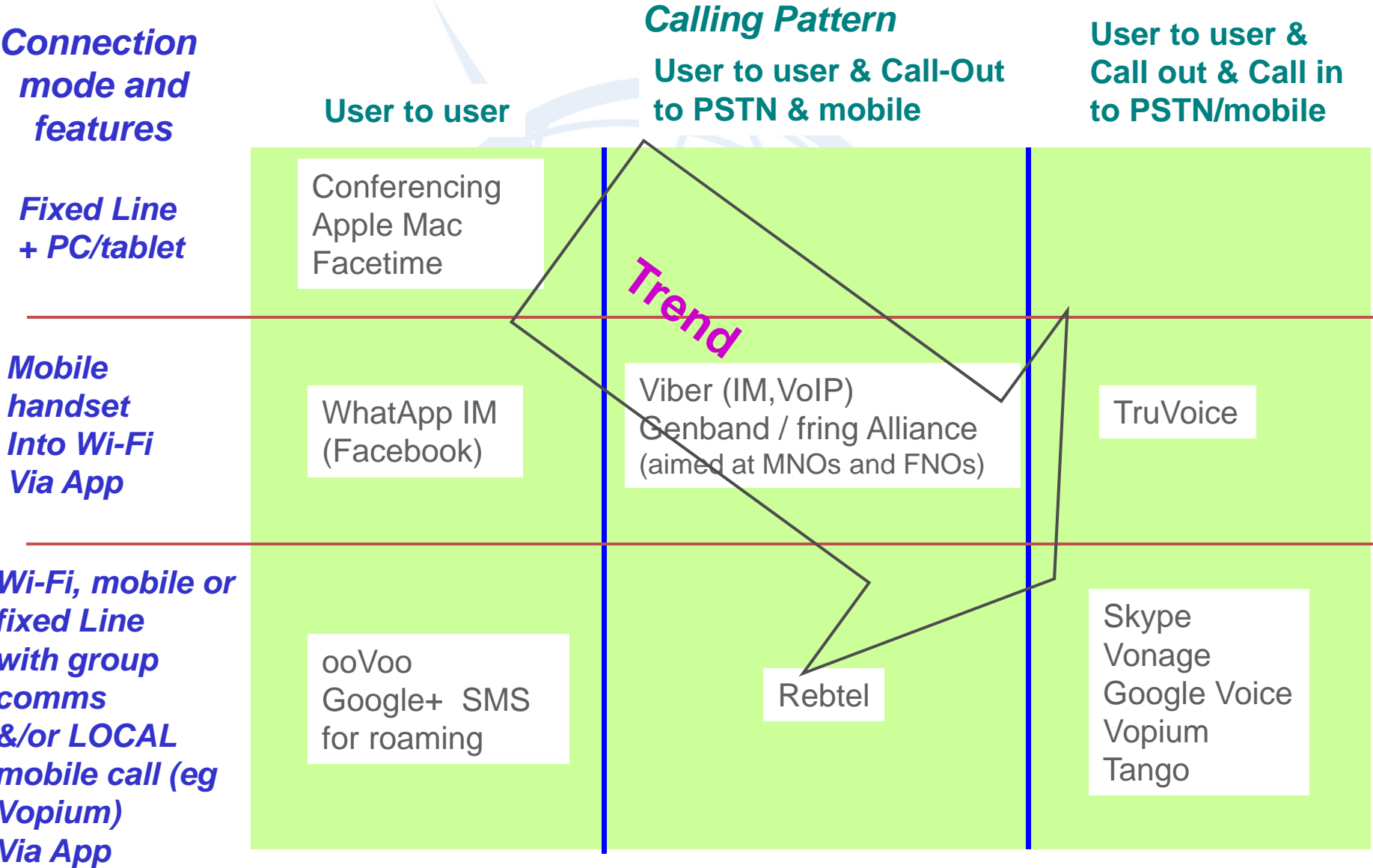
APP

Local Mobile Call

Local Internet gateway

Cloud – Processing & storage
Web – User interfacing
Internet – Routing & data carriage

Local Mobile Call

MNO Core & RAN

Wi-Fi

APP

Local Internet gateway

MNO RAN & Core, or via Wi-Fi usually into a fixed line (Voice over Wi-Fi)

Example - *Vopium*

Local call termination connection:-
• Wi-Fi hub connection via Internet to smartphone /Laptop App
• Call to fixed line phone
• Voice call to mobile
• Mobile call via MNO's internet interface on data plan
•Mobile data call via App on smartphone

OTT Voice comes in several forms, varying by calling pattern and connection mode

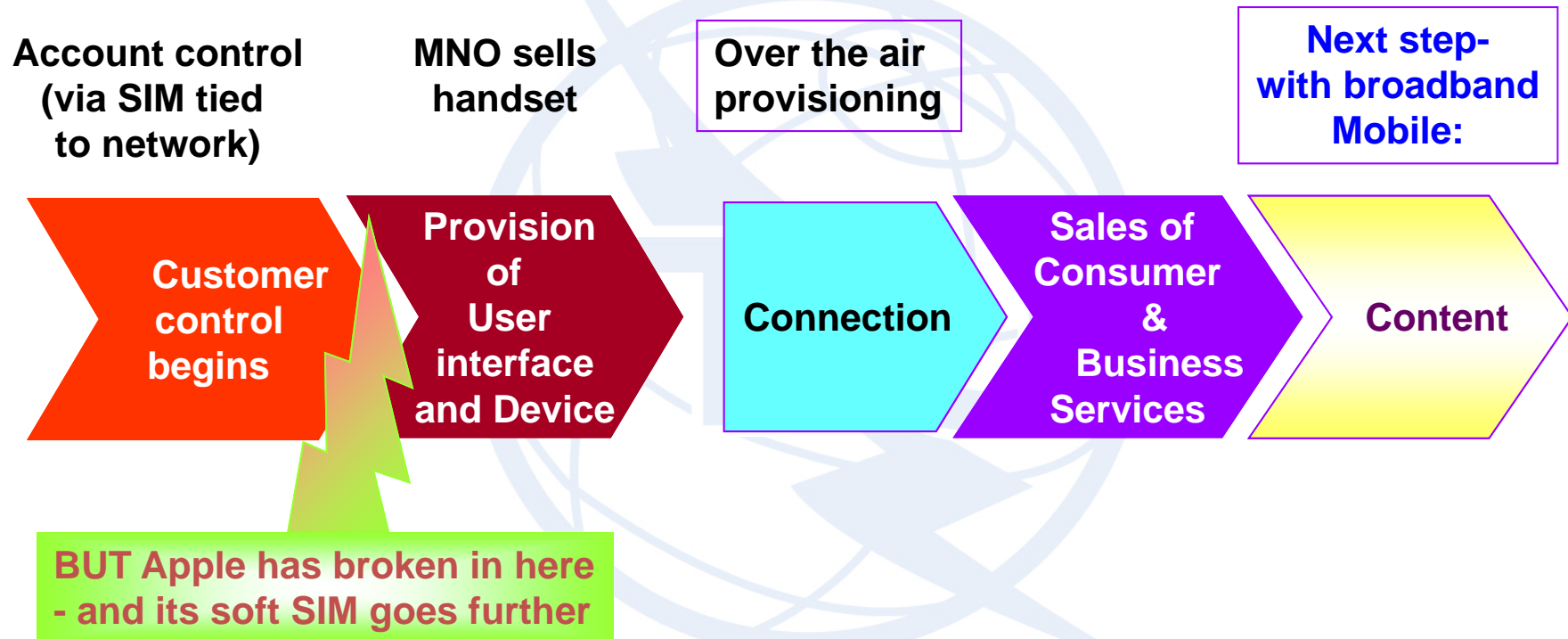| Connection mode and features	*Calling Pattern*		
	User to user	User to user & Call-Out to PSTN & mobile	User to user & Call out & Call in to PSTN/mobile
Fixed Line + PC/tablet	Conferencing Apple Mac Facetime		
Mobile handset Into Wi-Fi Via App	WhatApp IM (Facebook)	Viber (IM,VoIP) Genband / fring Alliance (aimed at MNOs and FNOs)	TruVoice
Wi-Fi, mobile or fixed Line with group comms &/or LOCAL mobile call (eg Vopium) Via App	ooVoo Google+ SMS for roaming	Rebtel	Skype Vonage Google Voice Vopium Tango

Trend

OTT players have problems with the Mobile voice business model

- OTT voice still regarded as a **niche market** so lacks investment levels of MNOs – main investors are VCs & business angels - major investors have held back, so far

- Result is small-time players, often on the edge of survival, with financial problems

- HOWEVER – this is changing rapidly - investments by largest global web and software players increasing fast – Google, Apple, Facebook, Microsoft (Skype) so VoIP might enter a growth phase

- Monetization is not easy – eg Skype has never managed to obtain major revenues from its large global user base - conversion rates into paying users is low and other models such as ads and pre-paid are yet to succeed

- Breach of **net neutrality** is a threat - ie that FNOs and MNOs would block VoIP traffic just as they have already threatened to, for streaming video

- MNOs could reply to VoIP by lowering voice charges, especially for roaming (eg Ilium Free in France, T-Mobile in USA)

- QoS can be a major problem for VoIP as Internet is 'best effort' delivery.

IPTV OTT business models also have some key issues

▪ Need sufficient capacity in delivery network to match number of simultaneous streaming users – dependent on investments in carriers' infrastructure

▪ Network neutrality issues are greater than for voice – unclear if MNOs/FNOs will try to limit video traffic volume- far bigger threat than for OTT voice as video volumes are thousands of times greater and application of restrictions would be in the global fixed networks, not just the MNOs' RANs.

▪ Capturing enough high value NEW content quickly - may lack own branded content (Netflix now creating OWN content) - plus DRM /copyright issues

▪ Differentiation from existing TV channels media industry model – unless can offer interactive choice for non-linear TV (as Netflix and BBC iPlayer do) and wide range of content, suffer lack of differentiation/ innovation, ie if only have programmed content in channels plus ads, then no advantage.

The MNO value chain today – from connection to content – the key element is Customer Control, based on the MNO's provision of the infrastructure

Account control (via SIM tied to network)

MNO sells handset

Over the air provisioning

Next step- with broadband Mobile:

Customer control begins

Provision of User interface and Device

Connection

Sales of Consumer & Business Services

Content

BUT Apple has broken in here - and its soft SIM goes further

- Traditionally, the MNOs have used control of connection to 'own' the customer with a SIM card and sales of the user device as the gateway to its infrastructure

- In today's market MNOs hope to move on to higher added value in services – especially content based – far beyond simple connection

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OTT competes with MNOs for revenue, profits and consumer control-
for both communications and content services

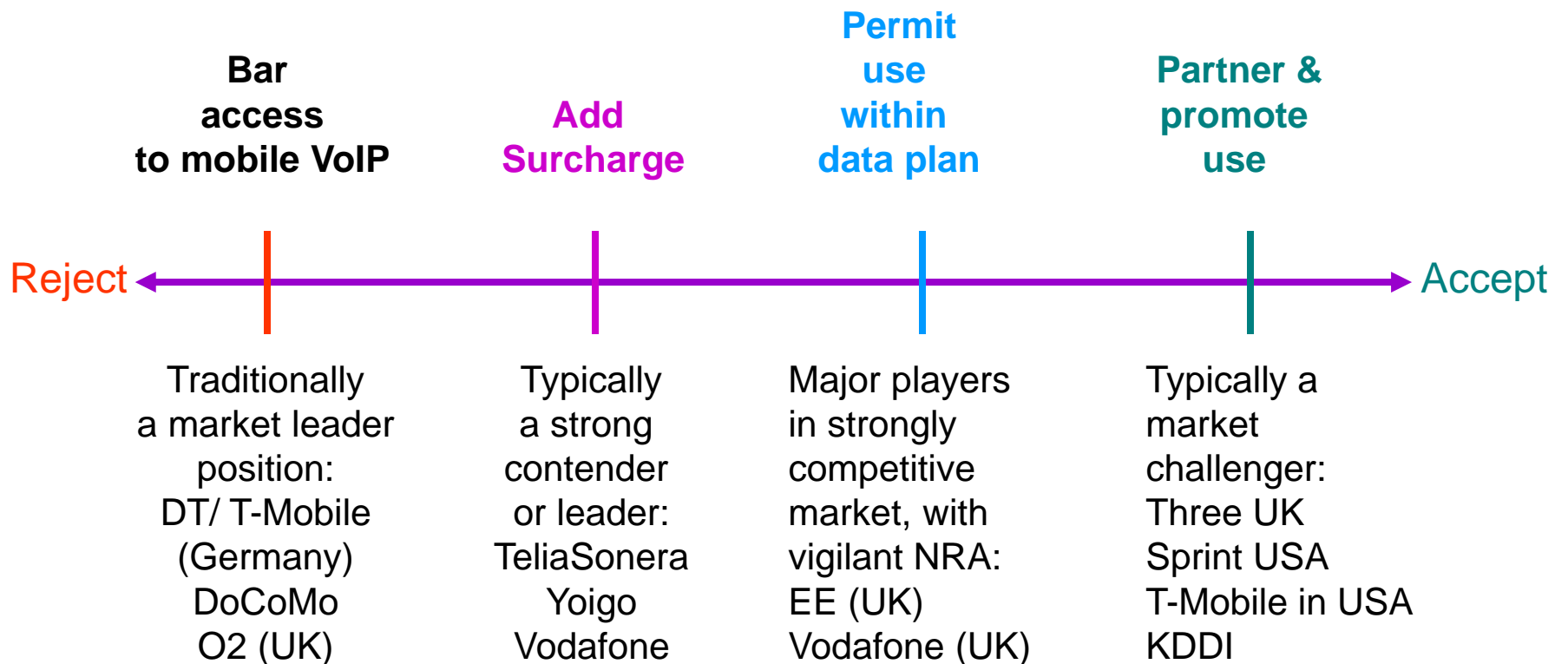| Value chain element	Revenue Opportunity	Financial penalty for MNOs
Customer control	•Customer profiling data for resale •Later tied sales of goods & services	Loss of account control (via SIM card) and so all subsequent potential add-on revenue streams
User interface	•Browser & OS •Device := BYOD	Loss of revenues from device sales as the device suppliers grab power - OTT is the natural partner for tablets/smartphones - & their Apps stores
Connection	•Voice •Internet IP Access •SMS	Loss of primary revenues for connection services for data, voice & SMS, both domestic & roaming
Consumer & Business Services	•Social networking •Search •Email •Retail •And the rest!	Loss of charges for services while web surfing on mobile devices; search ads to Google
Content	•S-VoD •Advertising •Apps	New content revenue streams - go direct to CPs like Netflix, or distributors like Amazon, so no revenue stream for MNOs

In the EU, BEREC have criticised MNO reactions in their traffic management practices

•In Europe in 2012, BEREC investigated practices at the request of the European Commission - found that several fixed and mobile network operators apply restrictions including blocking or slowing down certain data transport services, affecting a significant number of subscribers

•BEREC noted that such practices go beyond legitimate traffic management and differentiation of service offers

• Practices deemed to involve harmful discrimination including blocking, degradation and anti-competitive discrimination and opportunistic behaviour (so called 'hold-up' problem) to extract favourable terms and/or payments - but not to discriminate against competitors per se.

[REF: BEREC, May 2012. *A view of traffic management and other practices resulting in restrictions to the open Internet in Europe.* (for European Commission May 2012)
BEREC's comments on the ETNO proposal for ITU/WCIT, November 2012, http://bit.ly/12hw53O]

Operator attitudes towards mobile voice OTT players

(often their position may migrate with time, usually towards co-operation)

Bar access to mobile VoIP

Add Surcharge

Permit use within data plan

Partner & promote use

Reject ← → Accept

Bar access to mobile VoIP	Add Surcharge	Permit use within data plan	Partner & promote use
Traditionally a market leader position: DT/ T-Mobile (Germany) DoCoMo O2 (UK)	Typically a strong contender or leader: TeliaSonera Yoigo Vodafone	Major players in strongly competitive market, with vigilant NRA: EE (UK) Vodafone (UK)	Typically a market challenger: Three UK Sprint USA T-Mobile in USA KDDI

The MNO response today:–offer OTT voice & data
- But in limited form

- China Mobile offered Jego from 2013 – a number that connects direct to a VoIP Internet channel while the subscriber roams overseas, for OTT **incoming** voice calls for its existing subscribers, similar to Skype.

- For visitors to China, Jego registration with a China Mobile registered number offers free incoming calls and low cost calls to outside China (a form of 'plastic roaming')

- Swisscom offers its iO app for FREE internet connections for messaging when visiting other countries BUT only connects to other iO users

- Yoigo, a TeliaSonera MNO in Spain, offers VoIP services via its OTT VoIP Bono service - a mobile VoIP add-on plan to their standard mobile data offerings for service for Skype, Viber, and other VoIP clients from smartphone or other device. VoIP Bono customers get about 600 minutes of talk time with a100 MB allowance devoted exclusively to VoIP calls, at 6 euros per month, (average cost of 1 Eurocent /min).
- Telia has followed in Sweden. Note that the charge is higher than Telia's standard data charge - under investigation by the European Commission on net neutrality rulings.

The question needs a 3-pipe solution

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MNOs (& others) commit to data offload option – Wi-Fi:
•**Over fixed line (broadband)**
•**Over Wi-Fi WAN & MAN (eg Relish London)** & **possibly new Wi-Fi bands <700MHz**
•**IMR charges :=domestic**

MNOs may use offloading to Wi-Fi – even wide area MANs as technical solutions, **so roaming issues might reduce quickly in some countries**

MNOs reply - begin to offer IPTV

Example - USA's Verizon may deliver over-the-top (OTT) **video services** to consumers in 2 ways:-

- **1 Via LTE Multicast to wireless subscribers on its new LTE network –**

  - For major live TV events, **beam content** to its mobile subscribers, including big concerts and sporting events like Super Bowl

  - Claims multicast technology is efficient for delivering mass-appeal programming to large groups of viewers (even in same cell)

  - Plans to launch live mobile TV service sometime late 2015, when enough compatible phones, tablets and other mobile devices are in consumers' hands and enough content providers are on board - ie perhaps less than a year away

- **2 Via Internet to home broadband users on local Wi-Fi hub or direct fixed**

  - Offload traffic from mobile via the fixed network and Wi-Fi in the home

- Each offers a practical approach to the growing demand for "untethered" video

- May target younger consumers who have either cut the pay -TV cord or never signed up for a pay -TV subscription.

Source: Verizon, 23 Oct 2014, CFO earnings call

MNO responses tomorrow – impacts on mobile roaming tariffs

4 scenarios :

• **2 for nearer term outcomes (2 and 3) and 2 longer term scenarios (1 and 4)**

1. MNOs resist OTT – IMR prices maintained longest in developing world
- Status quo today of high IMR pricing continues for at least 5 years as MNOs refuse to lower data costs, especially roaming, perhaps because they cannot supply capacity essential to mobile internet access:
- MNO roaming tariffs remain static until OTT traffic expands in some countries
- So OTT only takes off in those economies with a rich fixed infrastructure, for Wi-Fi or direct fixed connection: eg EU, Japan, USA & some major Asian cities
- Could be driven faster by continuing global recession, as users seek lower pricing outside traditional mobile with OTT and so drive down IMR prices longer term

2. MNOs embrace low cost data and *a single domestic price* for IMR, *cost-based*, **as move to LTE and IP traffic via IXPs for international data carriage:**
- Build high capacity low cost national data networks – and link them dynamically into continuous virtual networks
- IMR rates reduce as cost-based roaming becomes industry-wide due to competitive pressures from OTT & other MNOs (& regulatory caps in some regions)
- MNO Revenues expand rapidly as international traffic expands faster than stagnant domestic

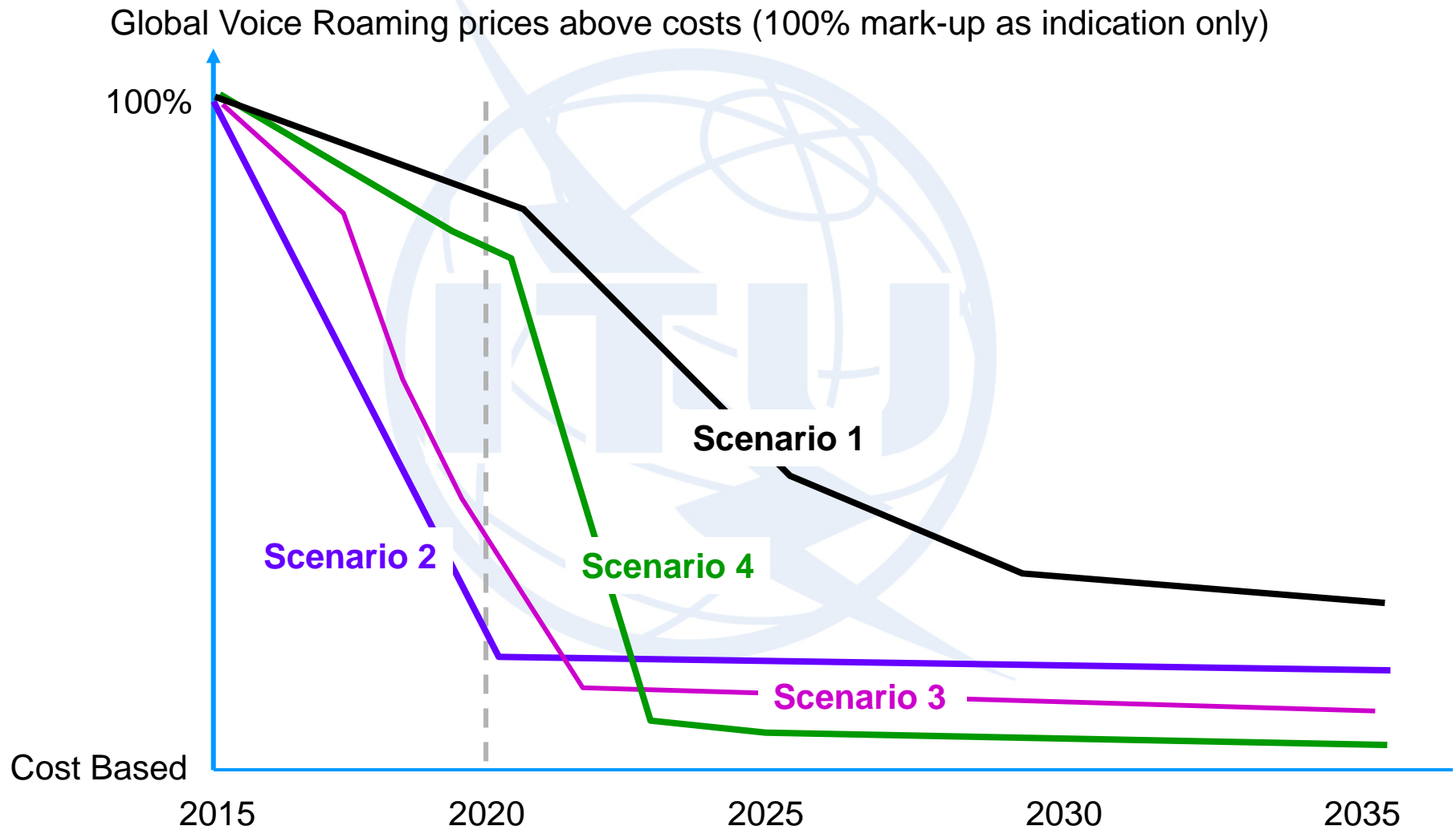# MNO responses tomorrow – 4 scenarios : 2 for near term outcomes - and 2 longer term scenarios

3. **High capacity streaming infrastructures - easily embraces voice and texting - built by OTT CPs such as Netflix and CDNs / CPs for Apple**
   - Needs revenue streams from content so aimed at high consumer density, and mostly more advanced economies – USA, Japan, EU – and other major cities
   - Connections via mobile channels as well as fixed but only in urban areas in advanced economies where MNOs accept broadband access at low cost
   - Overall costs for streaming over such an infrastructure: approx 5 US cents/hour/ stream for Opex + Capex (Source: Net2TV, 02Apr 2015). MNOs left behind.

4. **Future deployment of competing broadband mobile data networks**
   - '5G' networks deployed widely after 2022 in major 'smart cities'
   - Also - alternatives to MNOs in rural settings on some continents – eg 3rd Gen LEOs ("5G for Africa") with longer range mobile and even Wi-Fi in 400MHz band
   - Embraces a wider range of new technologies – eg for M2M IoT - VLF low speed national networks
   - Eventually OTT coverage for all. Some MNOs participate, adapting with business remodelling.

Potential impacts of OTT competition on MNO international mobile roaming price trends

Global Voice Roaming prices above costs (100% mark-up as indication only)

100%

Scenario 1

Scenario 2

Scenario 4

Scenario 3

Cost Based

2015   2020   2025   2030   2035

In Summary

• Near term, OTT may only have a strong impact on MNO revenues for voice and data roaming in those regions where Wi-Fi and fixed networks are widely available for internet access when users roam in other countries.

• Wi-Fi acts as the main substitute for the MNO's RAN, today, offering all the internet communications services to roaming visitors for VoIP (Skype, Tango etc), WhatsApp, Twitter etc for messaging & internet access at low rates for non-linear IPTV via S-VOD

• The future beyond 2020- 2025 depends on expansion of offerings by OTT players (especially in Web services for content) and whether the MNOs embrace OTT themselves to compete with leading OTT players - by moving away from traditional RAN and core architectures to far more IP-based global architecture – just as LTE points to.

• That may involve MNOs becoming much closer to the major web services players

• If the MNOs do not embrace OTT then countries with ubiquitous fixed infrastructure will turn rapidly to OTT on Wi-Fi, strongly challenging IMR.

• The rest of the world may turn more to OTT voice and SMS but only if local mobile data/voice calls to an IXP are permitted – or forced – challenging IMR revenues.

Global Recommendations

- What is needed is a global understanding of:

  - The concepts and terminology
  - Business models for all types of players
  - The evolution of significant market power
  - Directions of OTT technology progress
  - The way forward with OTT for all sections of the telecoms industry

- The role of the ITU is essential in this matter

ITU/BDT Regional Economic and Financial Forum of Telecommunications/ICTs for Latin America and the Caribbean
UIT/BDT Foro Regional sobre Economía y Finanzas de
las Telecomunicaciones/TICs para América Latina y el Caribe
Nassau, Bahamas 21-22 April/Abril 2015

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