# International roaming explained

Asia Pacific

Contents



# 1. Mobile roaming explained

International mobile roaming is a service that allows mobile users to continue to use their mobile phone or other mobile device to make and receive voice calls and text messages, browse the internet, and send and receive emails, while visiting another country.

Roaming extends the coverage of the home operator's retail voice and SMS services, allowing the mobile user to continue using their home operator phone number and data services within another country. The seamless extension of coverage is enabled by a wholesale roaming agreement between a mobile user's home operator and the visited mobile operator network. The roaming agreement addresses the technical and commercial components required to enable the service.

The most common international roaming services are:

- **Voice:** Making and receiving calls to or from home country, visited country or a third country, while abroad
- **SMS:** Sending and receiving text messages to or from home country, visited country or a third country, while abroad
- **Email:** Reading and replying to emails while abroad
- **Mobile broadband:** Using mobile devices or dongles to access the internet, including to download images, MP3s, films and software, while abroad
- **Applications:** Using mobile applications while abroad that require mobile data, such as location-based services and language translators.

International mobile roaming is one of a wider range of communications services offered to mobile users while travelling abroad. Other services include hotel services, Wi-Fi, national global SIMs cards, multiple SIM card mobile handsets, and local pre-paid SIMs cards.

## How mobile roaming works

When a mobile user is abroad and turns their mobile device on, the mobile device attempts to communicate with a visited mobile network. The visited network picks up the connection from the user's mobile, recognises whether


**Figure 1.1 Overview of international roaming technology and operations**

To explain roaming in more detail, Figure 1.2 the shows commercial and technical details for international mobile roaming. The diagram focuses on the international roaming wholesale and retail arrangements, for simplicity.

The mobile user (Mobile User A) has an international roaming service with their home operator (Home Operator) and is automatically connected to a visited network (Visited Operator A) while roaming. Mobile User A is automatically granted access to Visited Operator A's network when arriving in the visited country by an exchange of a data between Home Operator and Visited Operator A, where Visited Operator A confirms Mobile User A is a roaming customer with Home Operator. As such, the wholesale roaming agreement between Visited Operator A and Home Operator specifies how this data is to be provided to the visited operator. Home Operator usually has wholesale roaming agreements with more than one operator in the same visited country, which in this case is Visited Operator A and a second network, Visited Operator B. As a result, Mobile User A can call home using either visited operator networks, both of which use international transit services to carry the call back to Mobile User A's home country.

Mobile User A pays a retail price to Home Operator for the roaming service and does not pay Visited Operator A. Provided Mobile User B is not also roaming, they will not incur any extra charges to receive a call from, or to make calls to Mobile User A.

Visited Operator A sends transferred account procedure (TAP) files to a clearing house which forwards them to the Home Operator. TAP files are used for billing of calls while roaming.

Home Operator can then pay Visited Operator A the wholesale charges as per

it is registered with its system, and attempts to identify the user's home network. If there is a roaming agreement between the home network and one of the mobile networks in the visited country, the call is routed by the visited network towards an international transit network (Figure 1.1). The international transit network carrier is responsible for the call delivery to the destination network. Once this is done, the destination network will connect the call.

The visited network also requests service information from the home network about the user, such as whether the phone being used is lost or stolen, and whether the mobile device is authorised for international use. If the phone is authorised for use, the visited network creates a temporary subscriber record for the device and the home network updates its subscriber record on where the device is located so if a call is made to the phone it can be appropriately routed.

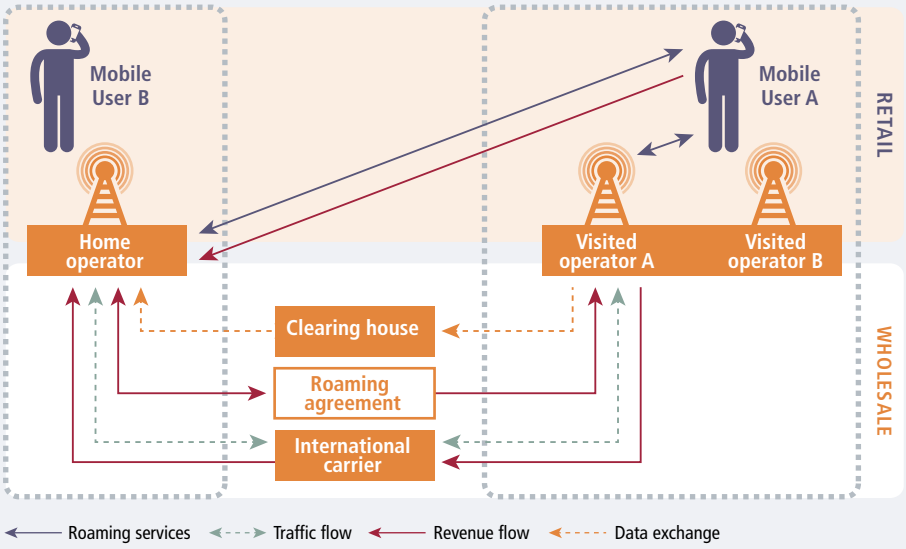



**Figure 1.2 Commercial links required for international mobile roaming**

call volumes in the TAP file and rates in the wholesale roaming agreement.

Visited Operator A pays an international carrier (International Carrier) for carrying the call and handing over the call to Home Operator. International Carrier pays Home Operator a termination rate for terminating the call in the home country.

## Data roaming

With the increasing popularity of feature phones and smartphones, the use of mobile data services while roaming is set to continue to grow exponentially. Mobile data services are typically measured in kilobytes (KB) or megabytes (MB), which refers to the volume of data transmitted for the service used. Data traffic volumes can vary significantly depending on the type and use of different data services.

| Activity | Data traffic use |
|---|---|
| One hour of instant messaging | 0.25 – 1 MB |
| One hour of web browsing | 1.5 – 25 MB |
| Download 100 emails | 1 – 10 MB |
| 100 minutes talk on VoIP video calling | Around 50 MB |
| Download one photo | 0.05 – 2 MB |
| Download one MP3 | 3 – 8 MB |
| One software download | 70 – 800 MB |
| Download one film | 700 – 1500 MB |
| Streaming one hour of video | 250 – 500 MB |
| Streaming one hour of audio | 50 – 150 MB |

**Figure 1.3: Mobile data traffic volumes**[1]

There are significant differences in the size estimates, as file size depends on the type of data, quality, and file length. For example, high definition and DVD quality streaming consumes greater amounts of mobile data than standard video or audio streaming.

# 2. Mobile roaming in the Asia Pacific

The mobile environment is growing in the Asia Pacific region, both in subscribers and data traffic. Roaming services, however, are still being established. Countries within the region are in different stages of economic development, with significant differences in inflation rates, currency exchanges, labour costs and GDP per capita. GDP per capita in some Asia Pacific countries can be up to 56 times higher than others in the region.[2] Overall, the average GDP per capita for the region is lower than in the developed world and four times lower than in Europe.[3]

There is varying market maturity across the region, with penetration ranging from four per cent in North Korea to 226 per cent in Macau.[4] On average, mobile penetration is one and a half times less than the European average, with 83 per cent of mobile users using prepaid subscriptions.[5] Asia Pacific's roaming services will continue to develop, as the region hosts just 25 per cent of the world's global roaming market with 42 per cent of the world's population.[6]

Roaming use and its relevance as a service for mobile users varies significantly across the region. Only 10 per cent of the region's population travelled abroad in 2011 (Figure 2.1), with factors such as greater distances between countries and less affordable travel contributing to this low rate. Research has shown up to 80 per cent of roaming traffic from the region is international calls to mobile user's home country.[8]

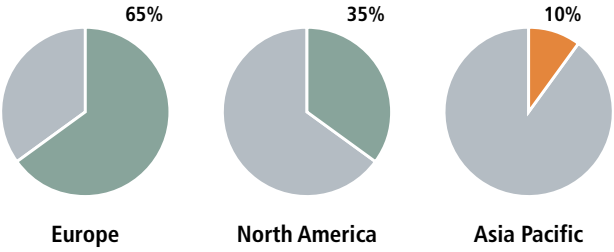



**Figure 2.1 Ratio of international trips to population %, 2011[7]**

## Roaming alternatives

The Asia Pacific mobile market is evolving in different ways to other parts of the world, with new lower-income subscribers and multi-SIM ownership driving the trend. It is also common to see Asia Pacific mobile users using roaming substitutes, such as call back services and international call forwarding services. Certain substitutes may be more appropriate than others depending on national market conditions.

For data roaming, Wi-Fi is generally regarded as the most common substitute in Asia Pacific. Although Wi-Fi coverage in some areas might be limited, it is considered that the main reasons for Wi-Fi being unavailable is low market demand or regulatory concerns.[9] In general, countries within the Asia Pacific region believe substitutes provide benefits to budget-conscious consumers rather than all mobile users.[10]

## Regional challenges

As the Asia Pacific market develops, structural and technical barriers must be addressed. Introducing roaming regulation while these obstacles remain could result in unintended and unforeseen consequences that negatively impact the industry, mobile users and government revenue. There are active and engaged regional groups working within the region to manage and improve roaming services for users. An intergovernmental organisation, the Asia Pacific Telecommunity (APT), serves as the focal organisation for ICT in the region, covering 38 member countries, four associate members and 130 affiliate members. Its roaming working group has been working with regulators and mobile operators to review the roaming environment for mobile users, resulting in the recent adoption of guidelines, as part of its working group report.

## Technical and structural barriers

Legal and technical developments are required to combat fraud and liberalise international gateways. Combating these barriers is vital prior to any implementation of roaming regulation, as they artificially inflate roaming charges in individual countries.

- **Fraud** remains a major financial concern for operators despite increased efforts and requires further investment in technology and negotiation of roaming agreements for minimisation.
- Some countries in the region regard particular types of telecommunications as illegal and **bypass**, for example traffic concealment by licensed carriers to avoid taxes or contribution to universal service; termination of traffic by unlicensed operators using technologies like VoIP and SIM boxes; flow of international voice traffic from PSTN to PC-to-PC calls through service provided by VoIP providers. In many countries, however, VoIP services are permitted. There is currently no specific investigation method for detecting heavy mobile callers in relation to bypass through VoIP and SIM boxes.
- **International gateways** are the facilities through which international calls are sent and received. Where international gateways are not liberalised, their costs make up a significant proportion of the total roaming costs. Even with volume growth, there is no bargaining power for operators working across monopolised gateways. This means inter-operator tariffs are likely to continue to be high. International long distance termination charges are another cost that inflates end-user prices. Although there has been much improvement in the level of competition, international gateway monopolies remain in at least eight per cent of Asia Pacific.[11] International roaming call prices between countries with liberalised gateways are typically 25 per cent lower than between those with gateway monopolies.[12]
- Asia Pacific countries have worked hard to remove issues of **double taxation** in the case of international roaming, which is a key issue in other regions. This is where sales or other indirect taxation is applied at a wholesale level on roaming or on international inbound services, and produces a situation of double taxation.

It is important that governments focus on removing and reducing these structural barriers to help to reduce roaming costs for mobile users.

## Technical barriers

In addition to structural burdens, the industry continues to heavily invest in meeting the technical challenges of international roaming. This level of investment is in addition to the investment in new technologies to achieve roll outs of mobile broadband across the region. Regulatory intervention on roaming services will affect the ability of operators to invest in meeting the challenges of national mobile broadband roll outs.

Technology challenges requiring investment:

- **Interoperability:** CDMA technology is in use in some parts of the region which prevents seamless roaming. Additionally, use of different GSM/3G spectrum can prevent many low-cost handsets from roaming. Enforcement of particular technologies and monitoring costs will disproportionately burden operators in less developed countries. Additional investment is required by operators to provide consistent quality of service across roaming networks.
- **Coverage:** Network coverage, particularly 3G, remains inconsistent as operators continue to roll out and upgrade their networks. Operators are investing in consumer communication and marketing to promote roaming and ensure transparency.
- **Quality of service:** Further investment is required in the Asia Pacific region to ensure consistent performance of the link connections for international roaming. This is so links have the adequate capacity, reliability, redundancy and diversity available in more developed mobile markets. Additional investment is also required to constantly monitor the loading and performance of the links to prevent congestion and ensure that the requirements are met.

## Inadvertent and border roaming

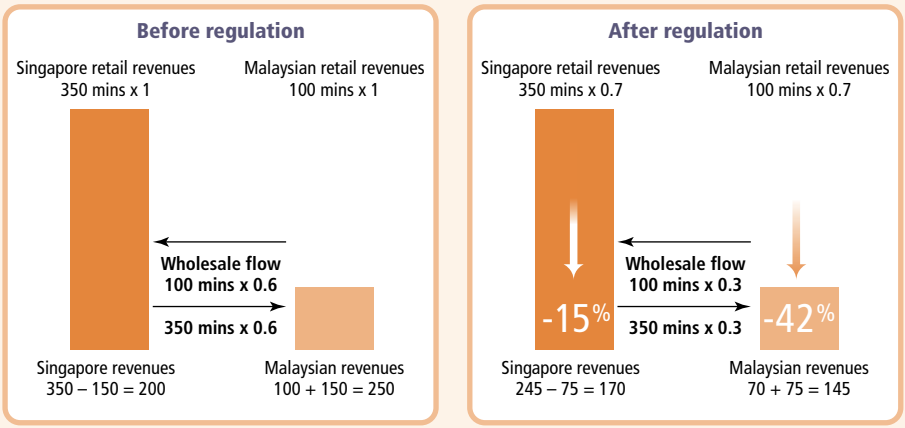
In addition to structural and technical barriers, incidences of inadvertent and border roaming can also affect mobile users. As a region, the Asia Pacific has low travel traffic around borders in comparison to Europe. In many cases, differences in frequencies used for mobile devices or existing geographical barriers eliminate the occurrence of accidental roaming. Where a border is divided by a street or river, for example, this is much harder.

Operators offer competitive roaming packages for mobile users in these zones and are continuing to invest in technical measures to eliminate inadvertent roaming in narrow border zones.

## Case study: Singapore and Malaysia

In May 2011, governments of Singapore and Malaysia announced bilateral price controls on international mobile roaming. The regulation required roaming price reductions of up to 30 per cent for voice calls and 50 per cent for SMS for all mobile operators in Singapore and Malaysia. The regulators adopted a European Union-style model of imposing wholesale and retail price caps on voice and SMS. However, the regulation did not address evidence of competitive activity in route pricing, where evidence is different to the European Union example. By not reviewing the evidence of competition on high-volume routes, a crucial stage of assessing the positive impact of competition was missed.

Regulators in both countries identified benefits of the regulation to be for business users, rather than general mass market mobile users. On considering income levels between Singapore and Malaysia, and in the greater Asia Pacific region, low-end mobile users on pre-pay subscriptions are more likely to see travel SIMs as attractive while post-pay roaming customers will most likely be business users or high-end mobile users. In the case of Malaysia and Singapore, the numbers of Singaporean mobile users that benefit from regulated retail price reductions is three times greater than the number of Malaysian users.




Assumes: Initial retail price = 1, Initial IOT = 0.6. Roaming traffic is inelastic.

**Figure 2.2 Macro-financial effects of roaming regulation on voice roaming revenues, Singapore and Malaysia**

It has also reduced Singaporean operators' out-payments to Malaysian operators, and total national roaming payments from the wealthier, more developed and densely populated Singapore to the less wealthy, developed and densely populated Malaysia.

Despite regulated price reductions, intervention does not appear to have increased international roaming traffic volumes (Figure 2.3). There has been no elasticity-linked increase in short-term economic welfare or strengthening of overall market performance.

Rather, it has created a welfare transfer from the regulated communications sector to businesses in other economic sectors. This case-study has not provided evidence that regulatory action on roaming will improve Asia Pacific regional communications linkages in the longer term.

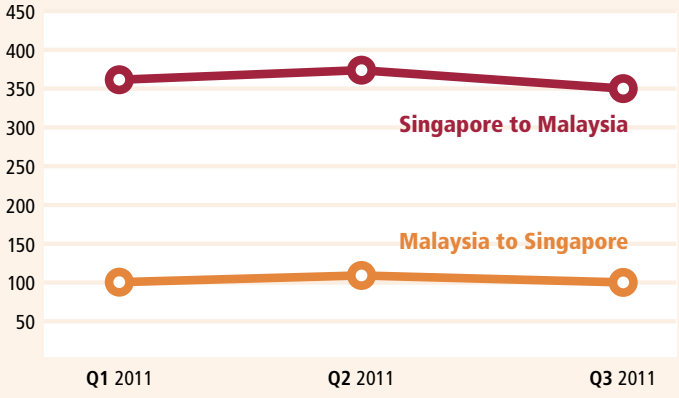



**Figure 2.3 Bilateral minute traffic volumes in 2011 (Q1-3)[13]**

# 3. Price trends

Regionally, market trends are positive and the industry is committed to taking the lead in developing innovative tariffs that suit mobile users. Roaming prices are declining and operators continue to develop innovative offers, including to accommodate inadvertent and border roaming, as described in Chapter 2, and to cater for regional tourism. Additionally, operators are investing heavily to address technical challenges such as interoperability and quality of service.

Mobile operators offer users a menu of tariffs where they can choose tariffs depending on their preferences. With different needs and uses, mobile users can choose the most appropriate tariff to suit them. If regulation determines one price over another, this would mean regulation effectively favours one group of mobile users over another.

As a result of the trend towards higher volumes of data downloaded, operators have introduced innovative data tariff packages, including flat rate daily, multi-day, weekly and monthly bundles, which deliver transparency and often significantly lower prices per megabyte than were previously available.

Examples of different tariffs available in the region include:

- Fixed or flat fee
- Similar charges for using the same network provider abroad
- Alliance partnerships (SIMs that works in specific countries at same rate)
- Flat-rate data-only SIMs that work in multiple countries
- Call home rates equivalent to local rates.

It should be noted that the structure of these roaming tariffs varies widely, from opt-in regional rates and monthly bundles for post-paid customers, to prepaid roaming tariffs and credits.

# 4. Impact of regulation

Regulators have expressed concerns about the level of roaming charges and consumer bill-shock. However, this concern should not necessarily translate to a single global or regional solution. Differences in market conditions between countries may determine certain higher roaming charges in some countries and the reasons for higher charges. As such, regulators should first address concerns at the local level.

Uniform regulatory measures may fail to address the source of any problem, and are likely to be detrimental to market performance. Global regulation cannot take into account all the different local market conditions and, as a consequence, may fail to address policy makers' concerns. Additionally, the imposition of uniform regulatory measures may introduce new problems that could have unintended consequences on mobile users and the industry.

### ■ Impact on developing countries

The development stages of telecommunications industry and the levels of use of roaming services vary significantly among economies in the Asia Pacific region. The adoption of a single framework to regulate roaming prices across all Asia Pacific countries may create unintended or unforeseen adverse impacts to some economies. Due to the large variations in GDP, economic growth rates, cost structures and inflation rates in Asia Pacific countries, it is neither reasonable nor practical to adopt uniform pricing for international roaming services across all Asia Pacific economies. In addition, volatility in foreign exchange rates may reduce tariff transparency if the uniform price caps across all Asia Pacific economies are priced in US dollars. This could place a greater financial burden on developing countries to meet regulatory requirements, impacting on funds available for other greater needs for the local population, such as subsidised handsets, or it may result in removing roaming services all together.

## Impact on tourist destinations

Roaming prices in the Asia Pacific are substantially lower on high volume, bilateral routes and the highest discounts are found on the highest volume, and most travelled routes. Regulation is unlikely to acknowledge the difference between on-net and off-net[14] visited networks, and as such reduces the competitive impact of such offers. The economic cost of providing roaming in tourist destinations may also be significantly greater than the economic cost of providing mobile services to the local population. Any shortfall might need to be met through increasing prices for the local population, which means they may end up subsidising the network capacity used by affluent tourists.

## Economic impact

The macro-financial implication of roaming regulation is an overall reduction of financial transfers from developed markets like Singapore to other Asia Pacific economies (Figure 2.2). In addition, mobile operators in less developed markets are subject to greater percentage revenue reductions as inter-operator tariff revenue falls in addition to retail revenue, leaving less revenue to invest in innovative services and extended broadband coverage in the future. Within the more developed markets, there appears to be a wealth transfer from the regulated communications sector to businesses in other economic sector, with no overall increase in economic performance.

Competitive market dynamics are already strong in the Asia Pacific and are the best frameworks from which to determine the price for international mobile roaming services. Mobile users choose a mobile tariff based on the full value it provides across a number of services and operators optimise the pricing and value of the bundled tariff to address the needs of their local market. Regulating on the roaming elements of the tariffs reduces operators' flexibility to tailor its services for the mass market of end-users. The Asia Pacific region should aim for a more competitive long term landscape than has resulted from the adoption of price regulation in to the European Union.[15]

The mobile sector is a major contributor to Asian economic growth and accounts for an estimated US$485 billion, or 2.7 per cent of GDP, across the 17 major AP17 countries. It also accounts for 11.4 million jobs — and for each job created by a mobile operator, there are eight more generated in the mobile ecosystem and wider economy. Additionally, in 2010 almost US$300 billion was generated

through various taxes and fees. This positive contribution of the mobile sector to employment, public funding and productivity is important for the region to sustain and grow. A global or regional regulation that decreases coverage, penetration and mobile phone use may in turn reduce the region's economic prosperity.[16]

# 5. Best practice

The industry recognises the concern of regulators regarding international mobile roaming prices. However, regulators need to also recognise that international mobile roaming is a complex service, involving many different factors that can influence price, as described in this brochure. This complexity creates a significant risk that regulatory measures will result in unintended, detrimental consequences for mobile users, governments and the industry, particularly in the long term. Regulating price may result in short-term benefits for mobile users; however, these are more than likely to be offset in the long-term by a reduction in the level of competition and innovation, as evidenced by the European Union experience.

It is for this reason that the industry supports a measured approach to regulation, where regulators:

- Encourage operators to take measures that enhance mobile user awareness (transparency and bill shock) of tariffs when they travel
- Address structural barriers that increase costs for service providers and mobile users, such as double taxation and international gateway monopolies, as well as those barriers that hold back the development of market based substitutes
- Only consider price regulation after:
  - Other measures have been given sufficient time to conclude there is a persistent problem
  - Clear evidence shows that operators offering roaming services have market power — that is, competition in the market for roaming services is limited
  - Clear evidence shows that the operator company derives its market power from owning a natural monopoly
  - Clear evidence shows the benefit exceeds the cost of regulation.

## Regional guidelines

The Asia Pacific Economic Cooperation (APEC) Telecommunications and Information Working Group (TEL) developed the *Guidelines for the Provision of Consumer Information on International Mobile Roaming*[17] following a workshop on international roaming. The APT further developed the guidelines into two best practice versions, for mobile operators and regulators.[18] These documents provide guidance on how to address international roaming and raise mobile user awareness for using mobile services while travelling abroad.

## Industry self-regulation

In June 2012, the GSMA announced an initiative that will provide mobile users with greater visibility of their roaming charges and usage of mobile data services when travelling abroad.

At a meeting held in July, 24 operator groups agreed to undertake a number of measures which will help mobile subscribers better understand their data roaming charges and more effectively manage their use of data services.

The measures include:

- Sending text messages to remind mobile users of their data roaming tariffs when they arrive in another country and turn on their mobile device
- Implementing a monthly data roaming spending limit to help consumers manage their roaming bill and sending alerts when their data usage approaches the limit
- Temporarily suspending data service when use exceeds the spending limit.

These are consistent with the APEC TEC guidelines and the APT international roaming working group report.

The measures – which already cover more than a billion mobile users – will offer a more transparent and uniform experience for all travellers. These operators groups agreed to implement these data roaming transparency measures by the end of 2012, extending the coverage to more than four billion connections across 120 countries.

# Endnotes

1 http://www.broadbandgenie.co.uk/mobilebroadband/help/mobilebroadbandusage-guide-what-can-you-get-foryourgigabyte, accessed 25 June 2012

2 A.T. Kearney 2012

3 Ibid

4 Source: EIU, Wireless Intelligence, Merrill Lynch Wireless Matrix, A.T. Kearney analysis

5 Wireless Intelligence Q1, 2012

6 A.T. Kearney analysis. Based on detailed bottom-up data for Europe. Asia Pacific is based on high-level estimate and includes wholesale and retail revenues for intra- and inter- region roaming

7 A.T. Kearney 2012. Based on number of trips divided by population so overestimates percentage of unique roamers. Regions based on UNWTO definitions.

8 A.T. Kearney analysis, 2011

9 Asia Pacific Telecommunity, International Mobile Roaming Working Group, Working Group Report, 15 May 2012

10 Ibid

11 A.T. Kearney, 2012. Sample for Asia Pacific based on 24 countries – data not available for 14

12 Source: Gateway Liberalization – Stimulating Economic Growth, GSMA, February 2007

13 Source: Celcom Axiata

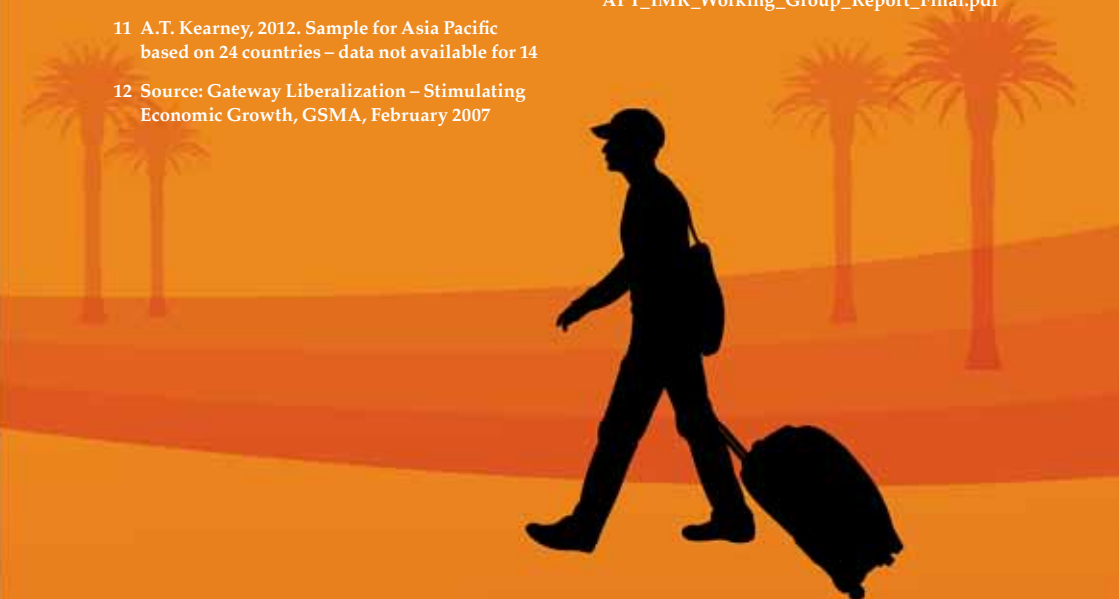
14 'On-Net' is when a call or message originates on the mobile user's home operator's network and terminates to another mobile number that resides with the operator. It does not matter if the receiver is using the home network or is off Island roaming with a different provider. 'Off-Net' applies when the call or message is made on a different network, such as while roaming, or when a mobile user uses their home network to make a call or send a message to a number that resides with a different network provider.

15 Commissioner Kroes' makes the observation that, in the case of the European Union, price competition has not emerged in the EU roaming services markets following the introduction of price regulation, http: europea.eu/rapid/pressReleasesAction.do?reference=speech/10/735

16 GSMA, *Asia Pacific Observatory 2011*

17 http://www.apec.org/Home/Groups/SOM-Steering-Committee-on-Economic-and-Technical-Cooperation/Working-Groups/Telecommunications-and-Information

18 http://www.apt.int/sites/default/files/2012/05/APT_IMR_Working_Group_Report_Final.pdf



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