**ITU Regional Workshop on Organizational and Technical Aspects of Broadband Development
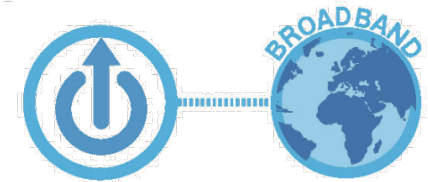(Odessa, Ukraine, 27-29 September 2017)**

ITU-D SG1 Q1

Policy, Regulatory and Technical Aspects of the migration from existing networks to broadband networks in developing countries, including next-generation networks, m-services, OTT services and the implementation of IPv6

Yahya Nasser Al-hajri
Yahya.hajri@tra.gov.om

Agenda

- The Roadmap for Affordable Broadband/NGN Services

- Development and Deployment of m-Services

- Development and deployment of IP-based services and applications (OTT) services

- Transition from IPv4 to IPv6

The Roadmap for Affordable Broadband/NGN Services

Public-Private Partnerships (PPP)

The United States government recognized the public-private partnership (PPP) as a vital tool for stimulating the development of broadband infrastructure and published a material called **Broadband USA: An Introduction to Effective Public-Private Partnership for Broadband Investment**

➢ **Model 1. Under the leadership of the private sector**
A commercial operator (private or non-profitable) builds a network, owns and operates it, and key public utilities and government development agencies facilitate the activities of such an operator by supporting planning, financing and regulatory support.

➢ **Model 2. Under the leadership of the public sector with the assistance of the private sector**
The state structure owns the network, while private sector partners create, operate and / or maintain the network, while receiving financial support and support in kind. To achieve the relevant goals, such a government structure can both use the existing organization and create a new one.

➢ **Model 3. The model of joint ownership**
A commercial operator (private or non-profitable) and a state enterprise jointly invest in the network and share its bandwidth. Both partners receive assistance in kind and other types of assistance in the financing of the project.

Public-Private Partnerships: guidelines

Involvement of a comprehensive group of partners

- work with a wide range of partners, including community leaders, government officials and commercial structures. The advantages include the ability to implement complex projects and ensure sustainable development.

Defining preliminary measures to promote cooperation

- Establish and document the role and contribution of each partner.

Creating a network with additional bandwidth

- in the case of a fiber network, the marginal cost of installing additional fiber links is low compared to the deployment of a separate network. Additional bandwidth is becoming the most important asset that investment partners can use to interest new partners or to develop new business models if the original model does not achieve the goals set for it.

Municipal Broadband

- Deploying our own municipal broadband networks is one of the ways to promote broadband access to the infrastructure. A well-managed municipal broadband network that meets the needs of citizens can make a significant contribution to economic growth and provide additional benefits, including increased competition, consumer choice, creation and maintenance of jobs, and expanded opportunities for education and health. To create a successful municipal broadband network, careful planning is necessary, taking into account the profitability of the various options for implementing broadband communications.

- Many cities throughout the **United States** have established their own broadband networks that have already contributed to significant economic growth and provided other benefits, including such as increased competition, increased consumer choice, the creation and retention of jobs, and the expansion of educational opportunities.

- A case study in **Brazil** shows how to maximize the benefits of investing in broadband infrastructure. In particular, 5,565 Brazilian cities were divided into groups and organized according to investment priorities.

Open Access

Some countries are implementing policies that create an enabling environment for open access.

➢ In **Afghanistan** on August 28, 2016, the Supreme Economic Council and the President of Afghanistan approved the "Open Access and Promotion of Competition" Policy. The policy encourages communication infrastructure owners to share their resources with a view to ensuring equal access to such networks for large and small telecom operators and Internet providers so that they can operate in a free market in fair competition and provide users with minimum capital better and Price ratio of the service.

➢ The **Republic of Korea** published the "Guidelines for Network Neutrality and Traffic Management", which presented a coherent approach that provides an honest environment for network users to provide open Internet access, on the one hand, and the sustainable development of network investments for Internet providers, with another. These guidelines include basic provisions covering issues such as user rights, transparency, rational traffic management, managed services, collaboration between groups of people with common interests, and public hearings.

Open Access: Guidelines

➢Absence of discrimination

- when distributing or providing access to communication networks in the market, the owners of such infrastructure facilities should not give preference to any of the operators.

➢Transparency

- communication infrastructure owners must ensure full, consistent and open provision of information to subscribers/users on the market.

➢Pricing

- Networks should be open and flexible in order to facilitate the innovation of service providers in a range of competitive and fair prices, and also to encourage potential competing suppliers to become wholesale customers of next-generation access networks instead of creating new networks.

Traffic exchange and international gateways

- ICT providers should have the right to enter into contracts with foreign private or public organizations for connection of communications, traffic exchange or any other commercial contracts relating to terrestrial fiber, microwave or satellite communications.

Reasonable access and right of refusal

- access must be fair and justified; The requirements for access should be met without discrimination and in a timely manner. The available infrastructure should also be shared by subscribers / applicants in the market in order of priority.

Internet Exchange Points (IXP)

- IXPs are physical locations where different networks connect to exchange Internet traffic via common switching infrastructures. IXPs are important to building national, regional, and international Internet ecosystems.

- Interconnections between networks, content providers and users are essential to create the 'network of networks' that is the Internet.

- IXP helps to (1) keep the local traffic local, (2) improve Quality of Service (QoS), (3) reduce transmission costs, (4) strengthen local Internet infrastructure, and (5) help build technical capacity in a country.

- By lowering the interconnection, transmissions and operating costs, IXPs help lower Internet access costs for the end users thereby making Internet access more affordable for a greater number of local Internet users.

- Effective and well-functioning IXPs must have transparent policies and regulations that encourage regional and international entities to participate in the local interconnection and peering environment, lower the costs associated with connecting to IXPs, promote local investment in the shared IXPs opportunities via tax holidays, and reduced duties on the equipment needed to build IXPs.

Development and Deployment of m-Services

Legislative framework for the implementation and operation of mobile payment systems: CIS countries

- In **Azerbaijan** and **Turkmenistan,** there are no special legislation on payment systems. Basic concepts and definitions in this regard are set out in a number of other laws.

- The legislative frameworks of **Azerbaijan, Tajikistan, Turkmenistan**, and **Uzbekistan** contain no clear definition of electronic money, although the concept of electronic money is used to varying degrees in a number of legal texts.

- In **Georgia**, "non-personal" prepaid cards may not be used to make payments over the Internet or for money transfers not involving the purchase of goods or services.

- **Ukraine** legislations defines mobile payment as "an electronic means of payment embedded within the hardware and software environment of a mobile telephone or other user mobile device".
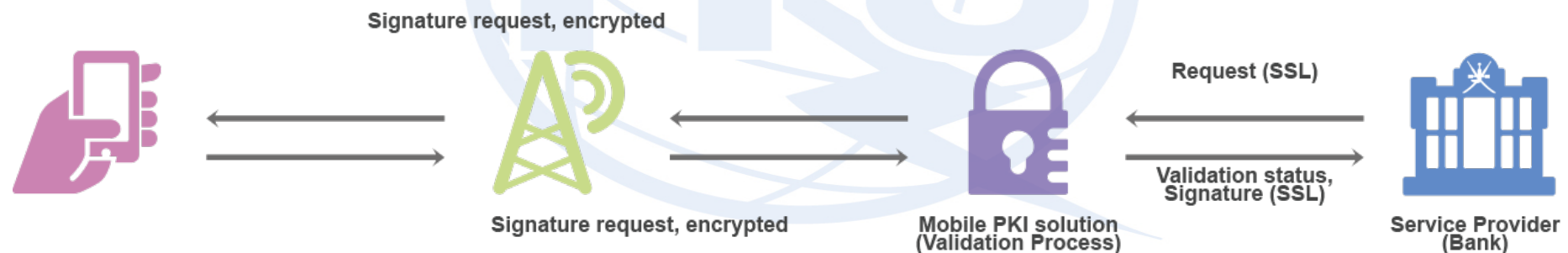
Regulatory and technical aspects of the development and deployment of mobile services

- In **Benin**, financial services provided on the basis of cooperation agreements between local banks and operators, as well as permits issued by the Central Bank.

- **Cameroon** mobile money product introduced by mobile operators with the backing of approved banks comprises e-wallets that can be charged at sales points, from a bank account at a partner bank, or by transfer from another user.

- **Cameroonians** are adopting mobile money "en masse", making it clear that these new products are meeting a real need both for businesses and the general public, specially, because its significantly reduce queuing at payment windows accounts.

Example of technical aspects: Oman Public Key Infrastructure (PKI)

- Oman Public Key Infrastructure (PKI) is a national initiative that sets the infrastructure needed for all government & private entities to provide m-Services in Oman. It is employed in order to enable online transactions for citizens and to raise the level of security and authenticity of electronic paperwork.

- It allows exchanging information securely as it provides a high level of confidentiality by using eID, mobile ID or USB Token.

Signature request, encrypted

Request (SSL)

Signature request, encrypted

Validation status, Signature (SSL)

Mobile PKI solution (Validation Process)

Service Provider (Bank)

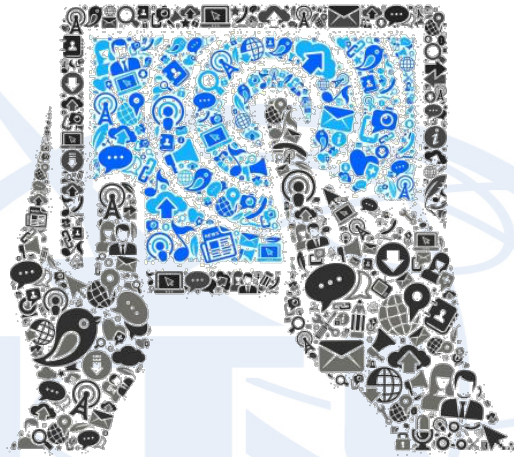# PKI Services

Authentication   Electronic Signature   Encryption   Email Encryption   Email signature

Development and deployment of IP-based services and applications (OTT) services

Approaches adopted by some Telecom operators

Blocking	Fair usage
Studies undertaken in the EU indicate that some network operators discriminate against traffic by competing OTT services: one in four internet users have experienced blocking or throttling of internet content.	Some network operators have a fair usage policy that imposes data, voice and messaging usage limits.
Own OTT Apps	**Partnerships**
Other operators have developed their own services to enhance customers experience – e.g., Telefonica's "TU go" or Orange's "Libon" voice over IP service and messaging apps	By working with OTT providers-e.g. E-Plus' partnership with WhatsApp in Germany and Hutchison's partnership with Spotify in Austria.
Pricing	**Bundling**
Some network operators have introduced new pricing models, either to limit customers from using OTT services – e.g. by relating prices to use of certain services.	By bundling their own services with other offers telecom operators may put OTT providers in a disadvantaged position

OTT Key Regulatory Issues

1. **Net neutrality** – the open Internet net neutrality principle, which asks operators to treat all data equally, and not intentionally block or slow down traffic that competes with their own services. Is also relevant to traffic management policies.
2. **Zero rating** -the practice of some mobile network operators not charging end customers for data used by specific applications or Internet services in capped data plans.
   1. Should MNOs be allowed this practice?
   2. Should regulators continue to apply a hands-off approach to business practices and commercial agreements between MNOs and other partners?
   3. Are there certain circumstances under which zero rating should be encouraged? – **such as connecting the public with government services**
3. **Market reviews –** when competition is considered not effective, regulatory measures aiming to address market failure can be imposed on dominant firms by national regulatory authorities (NRAs) after conducting a thorough market review.

Key Regulatory Issues

4. **Consumer rights –** certainly challenging for consumers to understand the impact of traffic management on their Internet use as it becomes more complex and widely used.
5. **Feasibility** – telecoms' business models' sustainability takes into account decreasing revenues and constant investment for increased bandwidth. For example, the European Union's political (digital) agenda has demanding objectives.
6. **Competition** – ensuring a level playing field between telecom operators and online service providers, and preventing anti-competitive behavior, taking into account the market power.
7. **Innovation** – Online service providers provide innovative services for consumers. Heightened regulation risks destroying these benefits.
8. **Lowering the regulatory burden on traditional telecommunications operators –** Regulators should consider lowering the regulatory burden on telecommunications operators where other general consumer protection or other laws already cover the behavior at issue.

win-win achievement in China

Facing the impact and influence of OTT services, telecom operators in **China** accelerated the pace of their transformation.

- China Telecom cooperated with Netease to release instant messaging app (YiXin). By the end of 2014, YiXin had more than **150 million** users, and it became one of the top 3 mobile instant messaging applications in **China**.
- China Unicom cooperated with Tencent by launching a new cellphone card (WeChat Wo) and it provided 500MB of mobile data traffic for WeChat by spending only 10 yuan (1.5 $). **1 million** WeChat card was sold in one month.
- China Mobile combined with OTT service providers, Qihoo 360 and Sina, implemented the consequent charging mode (Reverse Charging), in this setup, the OTT service providers (Qihoo 360 and Sina) endured users data traffic cost utilized by their applications.
- This cooperation mode demonstrates a win-win achievement between telecom operators and OTT service providers.

Suggestions for subsequent activity

The study suggest that regulators shall take the following follow-up measures:

1- Promote coordinated development between online service providers and telecom operators.

2- Enhance collaborated supervision among appropriate sectoral agencies. Industry's self-regulation, including enterprises' participation, and consumers' consciousness, forming a multi-stakeholder participated supervision pattern, should be supported when and where appropriate.

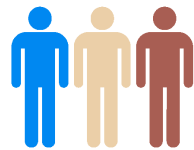# Transition from IPv4 to IPv6

Factors impacting IPv6 uptake

Demand

The interest in the transition to IPv6 or estimating the share of resources available.

Market

The availability of certified hardware and software on the market of a particular country. Not all countries have certified equipment and/or software that can support IPv6.

Human Capacity

It should be noted that this factor can significantly affect the economic feasibility of the uptake of IPv6.

Environment

can be crucial for the network owner. If top-level operators cannot provide IPv6-traffic transfers, the feasibility of internal capabilities to migrate to IPv6 may be rather low.

Customer Equipment's

It is necessary that work via IPv6 be supported not only by the equipment of operators, but also by the equipment of customers – workstations, home routers, etc.

Regulation and polices

Determines the availability of programs for the coordination of action to facilitate migration from IPv4 to IPv6.

IPv6 transition in India

Status after the launch of the National IPv6 deployment Roadmap, in India across different stakeholders:

- The various government organizations prepared a detailed **transition plan** for complete transition to IPv6 (dual stack) by December 2017 based on the network complexity and equipment/ technological lifecycles.
- Almost all the ISPs are now ready to offer **IPv6 services**.
- All government organizations in the country were asked to,
    - **Develop skilled IPv6-trained human resources** within the organization through periodic training over a period of one-to-three years to have a seamless transition with minimum disruption;
    - Provide **all new IP-based services** (like cloud computing, data centers, etc.) to be implemented for/by the government organizations on dual stack supporting IPv6 traffic with immediate effect;
    - Transition **all public interfaces** of government projects for delivery of citizen-centric services to dual stack supporting IPv6;
    - **Procure ICT equipment that is IPv6 ready** (dual stack) and go for deployment of IPv6 ready (dual stack) networks with end-to-end IPv6-supported applications;
    - Initiate **pilot projects** based on IPv6 innovative applications using IoT/M2M applications like smart metering, smart grids, smart buildings, smart cities, etc.;
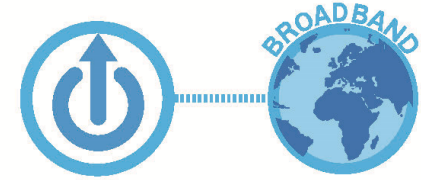
Embedding IPv6 into economic strategy in Zimbabwe

Zimbabwe has looked carefully at the issue of how the move to IPv6 can be done without adversely affecting businesses and commerce, and has come up with strategies including:

- Forming an IPv6 **task force** responsible for fact-finding and dissemination of relevant information and helping to develop a roadmap;

- Aligning ICT strategy with the **economic strategy** for the country;

- Implementing **Public-Private Partnerships (PPP)**;

- Ensuring that current **infrastructure projects** take into account future technologies that can deliver social benefits through IPTV and smart city concepts;

- Ensuring that any future systems are **IPv6-compliant**.

- Ensuring that the business and social communities can communicate with other IPv6 sites in the world;

- Getting assistance from the ITU to establish the **IPv6 test bed** for Southern Africa and Zimbabwe;

- Encouraging cooperation among equipment suppliers, application developers, and ISPs.

Thank you