This article highlights the importance of open access regulation in the digital economy and discusses the key issues to be addressed by regulators, especially in developing countries. Different regulatory approaches are illustrated looking at the different layers of the Open Systems Interconnection (OSI) model, including Australia’s public funding of its new national broadband network, Mozambique’s infrastructure-sharing regulations, Singapore’s structural and operational separation, and the steps being taken in a number of African countries to ensure open access to international submarine cables.

What is open access?

Open access is “the possibility for third parties to use an existing network infrastructure”, according to the Best Practice Guidelines for Enabling Open Access, adopted by the 2010 Global Symposium for Regulators. Other definitions exist, each implying a different extent of openness. But there seems to be agreement that open access applies to infrastructure, and means that all suppliers are able to obtain access to network facilities on equal terms. The regulatory model and the conditions of access will vary, but open access is paramount if the new digital economy is not to fall back into monopoly.

In many countries, public ownership of telecommunication networks was instituted specifically to enable the large-scale investment in networks needed to provide affordable, ubiquitous telecommunication services. The market liberalization of the past 15–20 years has been achieved by facilitating open access to incumbents’ networks while encouraging the parallel growth of mobile networks. So successful has this strategy been that the former monopolies — now largely privatized — have lost more
than half their market share in many countries and have seen traffic growth diverted to mobile and other platforms. The picture is similar in the developed and developing world (see Figure 1).

Legacy networks cannot keep pace with the growth of bandwidth-hungry applications. Huge investment is needed. The benefits of competition are evident, but some new regulatory thinking is now required for a successful transition to the digital economy.

A number of countries (Australia, Qatar, Malaysia and Singapore, among others) have embarked on the creation of entirely new national broadband networks, deploying fibre-optic technology throughout the core network and, crucially, in the access networks that reach out to the end users. Investments in these networks are huge (Australia’s network, for example, is costing USD 45 billion) and this has led some countries to re-nationalize infrastructure so as to benefit from economies of scale and preferential borrowing rates.

Other countries (for example in Europe) are trying to find ways to improve investment incentives for network operators, while maintaining competitive supply. This involves removing some of the regulatory layers that have built up around dominant operators (operators with significant market power) to support or reward the development of ubiquitous broadband networks.

Developing countries such as Tanzania and Mozambique lack not only the public funds for full national broadband networks, but also fixed-network infrastructure. These countries are therefore pursuing hybrid solutions, which typically involve public investment (generally low-interest and loan-funded) in a fibre-backbone network, coupled with various forms of support and encouragement for privately funded access networks using a range of technologies.

Infrastructure-sharing regulations in Mozambique

Regulated open access is often limited in scope to passive infrastructure (ducts, poles, towers, exchanges and so on). The infrastructure-sharing regulations in Mozambique provide a typical example.

In December 2010, the regulatory authority in Mozambique published infrastructure-sharing rules that require all network operators to provide open access to passive infrastructure. The basic requirement is to publish a reference sharing offer and then negotiate individual sharing agreements with requesting licensees. There are also stipulations concerning capacity and quality of service, to ensure equal treatment for all operators. Pricing is to be fair and reasonable, and based on defined costing principles. Existing operators are required to take into account the needs of new entrants, for example by building capacity.
Open access is critical for national broadband networks

Open access is essential in the case of publicly funded national broadband networks, and generally required wherever there is the likelihood of economic bottlenecks preventing competitive supply. However, if the regulations offer sufficient incentive to encourage infrastructure investment, and if open access exists at the lower layers of the Open Systems Interconnection (OSI) model, as shown in Figure 2, then the importance of requiring open access decreases moving up the layers.

Recent work on open access in the European Union has focused on the need to ensure fair and transparent access to broadband network infrastructure. The European Regulators Group (BEREC) has observed the use of the term open access in the context of “facilitating broadband roll-out, particularly in relation to the roll-out of next-generation access (NGA) networks” and “in relation to the provision of additional current-generation broadband services in under-served areas”.

There is an emerging regulatory consensus that there should be open access to national broadband infrastructure. Even in highly developed markets, the scale and scope of investment required for broadband networks tends to create a dominant provider. Fibre access pipes represent an essential utility, and — except in densely populated areas — duplicating that infrastructure is neither commercially nor economically viable.

A monopoly on infrastructure, particularly in rural areas and developing countries, seems sensible. Regulatory action for broadband networks should therefore focus on ensuring access on fair, reasonable and non-discriminatory terms, rather than on encouraging infrastructure competition.

Open access needs investment incentives

Open access is especially important where broadband and next-generation access roll-out is supported by public funding. In such circumstances, mandated open access can promote network investment, prevent the uneconomic duplication of facilities, and strengthen competition.

Under European State Aid rules, the provision of public funding to broadband infrastructure projects is dependent on a commitment to open access. The related guidelines consider open access to mean effective, transparent and non-discriminatory wholesale access to the subsidized network. In addition to open access obligations, the conditions for receiving aid include detailed mapping of private infrastructure, open tender processes, technological neutrality and claw-back mechanisms. These
safeguards aim to promote competition and avoid crowding out private investment, while fostering the wide and rapid roll-out of broadband networks.

Infrastructure sharing can be the basis for the competitive supply of services, provided that rival service providers all enjoy the same terms and conditions of access. Substantial regulatory effort is now being made to mandate open access to passive infrastructure as shown in the table.

Open access is not always the right regulatory tool

If private capital cannot provide all the required investment, then investors (including the State) need support, and this has to be balanced against the desire for open access. In contrast, where a competitive market develops, the only regulatory interventions that are required concern competition, for example, to prevent anti-competitive mergers or acquisitions, or to prevent collusion. Between these two extremes, the need for regulatory intervention requires analysis and judgement.

Broadband service delivery constitutes a complex value chain, and competition may be facilitated at higher levels by a single provider being subjected to open access arrangements at lower levels. Regulators ought therefore to start their analysis at the lowest network layer, implement open access remedies as required, and then work up the layers, taking account of the likely impact of the remedies introduced in the lower layers.

Policy and regulatory tools

Open access is most effective in layer 1 of the model presented in Figure 2. Regulatory requirements at this layer can obviate the need for open access regulation at higher layers.

Many of the policy and regulatory tools for open access have already been deployed, and a range of regulatory remedies is available to curb anti-competitive practices. This is typified by the EU regulatory framework, which has been copied and modified in many other countries. In increasing order of severity, the remedies consist of:

- transparency, including the provision of a reference offer;
- non-discrimination, requiring the use of equivalent conditions in equivalent circumstances;
- obligations to provide access, specifically applied to unbundled facilities including the local loop, and the requirement to offer co-location;

Table 1 — Regulatory efforts towards infrastructure sharing

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Africa</th>
<th>Arab States</th>
<th>Asia-Pacific</th>
<th>CIS*</th>
<th>Europe</th>
<th>The Americas</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is infrastructure sharing mandated?</td>
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<td>18</td>
<td>12</td>
<td>8</td>
<td>1</td>
<td>24</td>
<td>17</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>13</td>
<td>2</td>
<td>14</td>
<td>5</td>
<td>11</td>
<td>13</td>
<td>58</td>
</tr>
<tr>
<td>Is co-location/site sharing mandated?</td>
<td>Yes</td>
<td>14</td>
<td>12</td>
<td>9</td>
<td>2</td>
<td>26</td>
<td>20</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>14</td>
<td>2</td>
<td>11</td>
<td>2</td>
<td>5</td>
<td>9</td>
<td>43</td>
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<td>21</td>
<td>38</td>
<td>12</td>
<td>43</td>
<td>35</td>
<td>192</td>
<td></td>
</tr>
</tbody>
</table>

*Commonwealth of Independent States

Source: ITU World Telecommunications Regulatory Database (www.itu.int/icteye).
price controls, which may include limits to cost recovery based on specific costing methods; 
- cost accounting obligations, including the requirement for external audit and the annual submission of separated accounts.

Such remedies support open access and facilitate service competition. This is especially important in developing countries, where low demand and limited supply options heighten the need for open access. Infrastructure-sharing regulations in Mozambique provide an example of effective regulation based on these remedies.

Adapting policy and regulatory tools for the digital era

The major difficulty facing rival suppliers of retail broadband services is access to the customer. The standard regulatory response covers unbundled local loops and bit-stream access, coupled with backhaul facilities from the local exchange to the operator’s point of presence.

Regulatory economists talk of a “ladder of investment” that service suppliers seeking access to customers ascend one rung at a time. Suppliers first take bit-stream plus backhaul. Then they build their own backbone infrastructure, so they no longer require the backhaul service. Then they deploy their own cables to the local exchange where, using co-location, they provide their own electronics, and they purchase just the unbundled local loop. They may even become wholesale providers, thereby improving their network usage levels and overall return on investment.

This is all well and good, but the regulatory arrangements may favour asymmetric digital subscriber line (ADSL) to the extent that it creates a barrier to moving on to fibre. This is especially true of unbundled local loops, where the point of co-location is often located within the boundaries of the copper network. The dominant operator’s ability to upgrade to next-generation access technology may be restricted, or the rival operator may be obliged to roll out more infrastructure in order to retain its existing customer base. Some regulators (for example in Hong Kong, China) are withdrawing from unbundled local loops for precisely this reason.

Open access may discourage private investment. It is therefore no surprise that some governments make their own investments (for example in New Zealand and Australia) or provide soft loans to a generally compliant private sector (for example in the Republic of Korea and Japan). Developing countries cannot afford such approaches, so they need to establish greater investment incentives and rewards through the pricing arrangements associated with open access.
Tanzania

Regulatory measures for future technologies

Bowing to economic reality, regulators may have to accept monopoly as a way of providing open access to passive infrastructure, although they can cut a fairer deal on pricing, to reflect the real cost of investing in infrastructure — one such arrangement exists in Tanzania. There should be a time-limit on the open access agreement, and designated review points along the way that allow the regulator to change the terms if necessary.

Managing the National ICT Broadband Backbone in Tanzania

With loans from the Chinese Government, Tanzania embarked, in 2009, on creating a USD 200 million National ICT Broadband Backbone. This involves rolling out 7000 km of national fibre backbone in four rings — north, south and west, plus metropolitan Dar es Salaam. The backbone provides a fibre-optic network, which is being managed and operated to provide high-speed broadband capability throughout the country at affordable prices. The national backbone also connects with the international submarine cables (SEACOM and EASSy) in Dar es Salaam, and provides land connectivity to Tanzania’s neighbours.

The national fixed-network incumbent, TTCL, manages the backbone on an open access basis. All service providers have the right to use this capacity and all (including TTCL) are supplied on the same basis. TTCL retains a management fee, which is determined on the basis of the utility-level cost of capital and a government-determined cost-recovery period. Transparency in the management and operation of the backbone is assured by:

- accounting separation — the accounts for backbone operation revenues, expenses and capital costs kept separately from the accounts for TTCL’s other business operations;
- independent audit of backbone operation accounts;
- publication of backbone operation accounts and of the auditor’s certificate;
- equal access, under the same terms and conditions of use, for all backbone wholesale customers, including TTCL;
- preparation of a backbone reference offer from TTCL setting out the terms and conditions for access and use of the backbone facility and services, applicable to all wholesale customers;
- publication of the arrangements and processes to ensure the commercial confidentiality of backbone customer information and transactions.
Singapore provides an example of extensive government activity and funding to develop next generation access networks, with the ultimate aim of providing high-speed broadband for all. A significant degree of separation is needed between industry participants to ensure that downstream operators have effective open access to the infrastructure. After extensive consultation, this separation has taken the form shown in the chart.

At the core of the structure, NetCo (owned by a consortium comprising SingTel, AXIA, SPH and SPT) is responsible for the design, building and management of passive infrastructure. In order to make available the promised speed of 100 Mbit/s to 1 Gbit/s, NetCo has to roll out a new fibre-optic network to all Singapore households, using the existing passive infrastructure owned by AssetCo.

OpCo (totally owned by StarHub, but operationally separated from StarHub’s other activities) is responsible for the management of active equipment. OpCo provides wholesale network services to retail service providers, which in turn provide service to retail customers.

To achieve its broadband vision, the government has funded 28 per cent of the investment in OpCo and 36 per cent of the investment in NetCo. The balance — more than USD 1.4 billion — will come from the private sector. The tender process for both
NetCo and OpCo included a funding requirement as part of the selection criteria. Singapore has opted for structural and ownership separation to ensure non-discriminatory access to essential passive infrastructure facilities. The Singaporean regulator appears to have concluded that providing the passive infrastructure needed for the roll-out of high speed broadband access is not prospectively competitive and could create a bottleneck in the market. By separating ownership of these facilities from all market players (including SingTel), the approach removes the downside of vertical integration, though it is not clear at what operational cost to SingTel this was achieved.

As a small and affluent island State, Singapore is not a template for providing services to rural areas. Nevertheless, New Zealand has recently opted for structural separation, and there is no reason why the approach should not work elsewhere.

The Singapore case raises some interesting points. One is that, even in an affluent city State where operational circumstances (high proportion of multi-dwelling blocks) are favourable, significant government funding is needed. This suggests that government funding may be needed in most countries. Another point is that the market may be satisfied with current speeds or unwilling to pay a premium for a faster service. This poses a significant market risk to both government and private investors. Also, if AssetCo is entrenched as a long-term monopoly, this may jeopardize efficiency, customer orientation and innovation.

The ACE project

Open access to Africa Coast to Europe (ACE) submarine cable

ACE is a submarine cable system for West Africa, with landing stations in 20 countries stretching from France to South Africa. In each of these countries a terminal party is established to operate the cable landing facility, and to own and maintain the cable segments within the national territory. The terminal party comprises one or more landing parties, each of which makes a designated minimum investment in the ACE landing point for that country. This investment depends on the number of investors and ranges between USD 25 million and 50 million. Generally, a special purpose vehicle (SPV) has been established to act as the terminal
party, and investment in the SPV may come from a number of sources, including operators, governments and international development agencies. For example, the SPV in Sao Tome and Principe is a limited company jointly owned by the government and the incumbent operator, and into which the government channels funds for the ACE project which originate from the International Bank for Reconstruction and Development.

SPVs have privileged access to international capacity, and sometimes an effective monopoly — especially where there is no other international access via undersea cable, and where satellite access is both expensive and limited in capacity. This gives the SPV significant market power, with the potential to act independently of rivals and contrary to consumer interests. National authorities therefore need to regulate SPVs (the West African Telecommunications Regulatory Authority has published guidelines for this purpose).

In Liberia, the regulator has recently commissioned a project to:
- identify the market for the international capacity provided by ACE;
- determine whether the Cable Consortium of Liberia (the terminal party for ACE) has significant power in this market;
- introduce regulations to ensure open access to the facilities of the Cable Consortium of Liberia and hence to the ACE cable, in a manner that both adequately rewards investors and ensures effective competition in international services.

This approach follows the EU regulatory framework and is an example of how regulators in developing countries can adapt best practice regulation from elsewhere to fit their circumstances.

One of the challenges faced by the Liberian Telecommunications Authority, and other regulators in similar positions, is to gauge future demand for the new facility. Identifying total cost is relatively straightforward: capital expenditure — depreciated over the 20-year lifetime of the cable — plus a return on investment and operating expenditure. To set prices, however, the total cost must be divided by some measure of demand. The difficulty is that demand is unpredictable, and may grow rapidly. Prices based on short-term forecasts will be too high and may stunt future growth of demand. Prices based on longer-term forecasts will initially be below cost, and the SPV’s investment will not be recovered if the forecasts prove over-optimistic. Appropriate arrangements are therefore likely to involve a price cap, with an annual review that allows for any under- or over-recovery of investment to be carried forward and influence the following year’s prices.