



Qatar National Broadband Network initiative

salience viewpoint

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Executive Summary

In June 2011, ictQATAR published “Qatar’s National ICT Plan 2015: Advancing the Digital Agenda” which will guide country’s ICT efforts through the end of 2015. The plan identifies connectivity issues as a major challenge for delivery of the stated ICT objectives and establishes a framework of programmes and initiatives to address these challenges.

The plan also identifies two initiatives as main projects that will help build the desired ICT infrastructure in Qatar. These are The Qatar National Broadband Network (Q.NBN) and International connectivity.

Following this, Qatar’s government has established Q.NBN as an independent company to accelerate the rollout of a nationwide high-speed open broadband fibre-to-the-home network. The government will invest USD 550 million in Q.NBN.

Q.NBN is to focus solely on the deployment of the passive infrastructure and licensed service providers will then lease access to the infrastructure to provide advanced services to individuals and businesses. Q.NBN aims to reach a coverage target of 95% of all households nationwide by 2015.

Our opinion is that the chosen model is one of a few viable options for Qatar and there should be possibility to review and adjust the framework as it develops and potentially create roadmap to one of the other models. Each model has its own advantages and shortcomings which we explain within this paper.

A possible outcome of the existing Q.NBN model is that Qtel will lose its monopoly in fixed-line services and may lose market share in the new competitive landscape.

Qtel will need to make some hard decisions, whether to run or decommission its legacy copper infrastructure, how to transform its business model and what to do with their engineering staff that is currently working as part of the copper unit. However if Qtel sees this as opportunity to transform itself into a leaner services-oriented company, then the QNBN network might provide an affordable delivery method for providing these advanced services.

Unlike Qtel, the development opportunity is positive for Vodafone Qatar. In the past Vodafone has struggled to find a viable fibre access investment case, considering the stronghold and the size of Qtel’s existing network. Q.NBN will enable Vodafone to compete quicker in fixed services and to develop a leaner operations model without the burden of legacy networks, systems, processes and people.

In general we see the introduction of the Q.NBN initiative as a step in the right direction of development of the fixed market in Qatar. The government has taken positive action by sponsoring the introduction of national fibre infrastructure, and this will help overcome some of the limitations of operator-led business cases while also providing a coordinated approach to managing the national roll-out.

There are still large number of issues that need to be resolved and the success of the national fiber project will depend on the way it is managed by Q.NBN and by the level of engagement and cooperation from the existing two operators.

National 2015 ICT plan - Qatar's government vision for ICT development

The role of ictQatar

The Supreme Council of Information and Communication Technology (ictQATAR) was established in year 2004 under decree by the Emir Sheikh Hamad bin Khalifa Al-Thani. Its role is to accelerate transformation of Qatar into an information-based society. ictQATAR governs the nation's ICT policy, telecom regulation and acts as the government's ICT champion.

ictQATAR spearheaded the creation of the 2015 plan, which includes inputs from key stakeholder groups across the country.

Qatar National ICT plan 2015

On 19th of June 2011, ictQatar published Qatar's National ICT Plan 2015: Advancing the Digital Agenda, which is the roadmap for future ICT development through the end of 2015. The plan is aligned with the Qatar's National Vision 2030, and specific ICT programs are aligned with Qatar's National Development Strategy 2011-2016.

The plan provides a roadmap for future advancement that clearly outlines Qatar's digital goals and objectives, along with the strategies and initiatives to achieve them over the next five years.

This National ICT Plan 2015 builds on the significant progress Qatar has made over the past several years since ictQATAR was established. This ambitious plan reaffirms the government's commitment to accelerating Qatar's efforts toward creating a vibrant ICT sector that will support the development of a knowledge economy and empower people to use ICT to enrich their lives. The plan also points the way to Qatar becoming an ICT regional hub.

Major challenges

The plan identified three main challenges that Qatar is facing at the moment:

1. Connectivity issues
2. ICT skills deficit
3. ICT business environment challenge

The paper points out that although good progress has been made, the demand is not satisfied yet: "Qatar's telecommunications infrastructure has grown significantly, and current public and private investments to expand capacity are promising. Yet a shift to a knowledge-based economy requires a robust and ubiquitous infrastructure that enables high-speed broadband connectivity for all

households and businesses. Currently broadband connectivity is not at the speeds required to meet the country's needs. Though Qatar is leapfrogging outdated technologies, keeping pace with demand is difficult, especially as new technologies and forms of media demand greater bandwidth and more sophisticated equipment."

Main objectives by 2015

Qatar's five-year plan has the following measurable goals:

- Double the ICT sector's contribution to GDP of Qatar (to USD 3 billion)
- Double the ICT workforce (to 40,000)
- Achieve ubiquitous high-speed broadband access for households and businesses (reaching 95% of households)
- Achieve mass ICT and Internet adoption by all segments of society (90%)
- Achieve wide accessibility and effectiveness of all key government services (160 online services)

Delivery framework

The plan describes five distinct strategic "Thrusts" that are the basis of the delivery of the 2015 goals.

It also describes development of benchmarks and a system to track and assess progress for all the major programs under the five Thrusts. In addition ictQATAR will monitor progress by conducting an annual ICT survey to monitor adoption and usage of ICT in Qatar's households, businesses, and the government sector.

Figure 1 gives overview of the five strategic Thrusts, the related programs and the initiatives behind each.

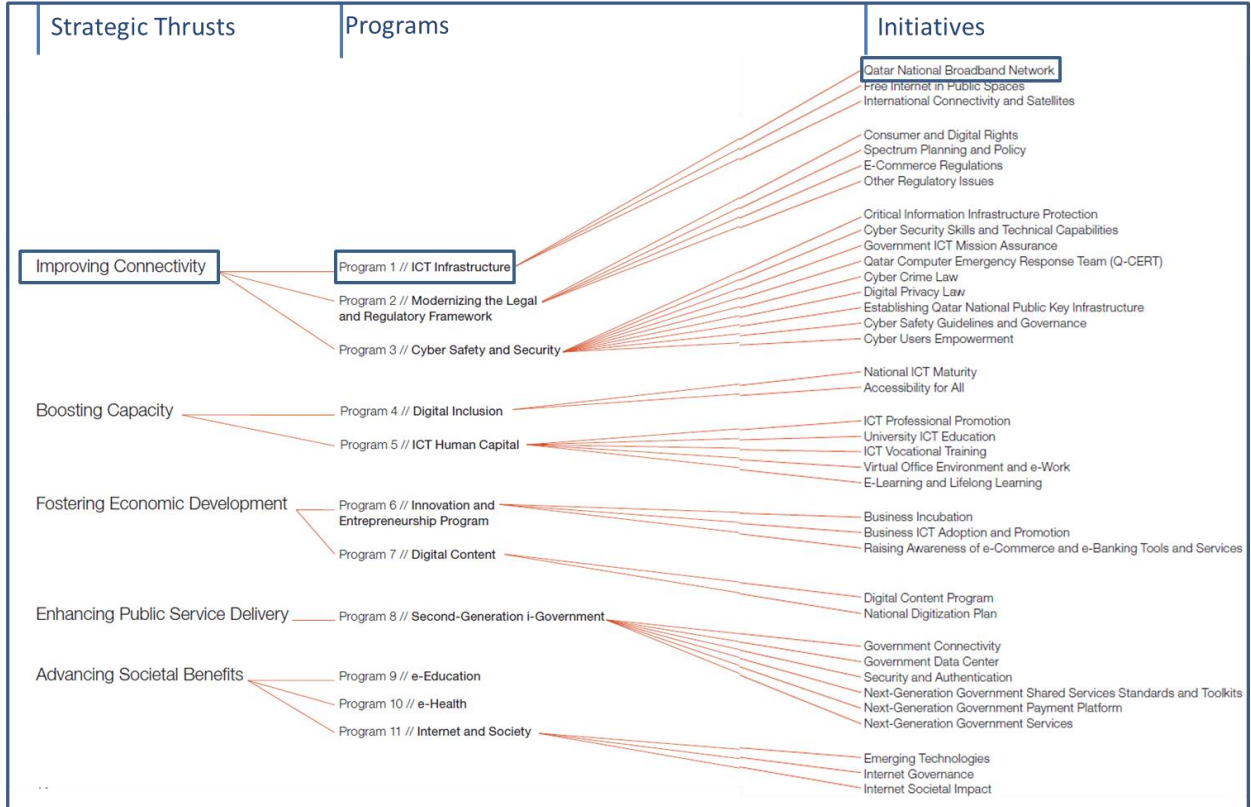


Figure 1: Qatar's 2015 National ICT plan

Q.NBN establishment – delivering national broadband deployment

Qatar's government established an independent company—Qatar National Broadband Network Company (Q.NBN) to accelerate the rollout of a nationwide high-speed open and accessible broadband fiber-to-the-home network. The government will invest USD 550 million in Q.NBN.

Q.NBN will focus solely on the deployment of the passive infrastructure and licensed service providers will then lease access to the infrastructure to provide advanced services to individuals and businesses. Q.NBN aims to reach a coverage target of 95 percent of all households nationwide by 2015.

This government-led initiative was developed in consultation with existing network operators and will support the development of their broadband service offerings. This network will also create the right environment for innovative small and medium enterprises (SMEs) to provide advanced services that are associated with high-speed connectivity and fiber such as traffic control and energy efficiency.

Note that Q.NBN will also support the mobile operators by providing fibre access to base stations throughout Qatar. This is very important enabler especially as LTE deployments have been already scheduled.

Key network features

Q.NBN has stated that the key features of the network will include the following:

- **Speed** - The network must support a minimum speed of 100 Mbps for in-country active connections with fiber access to the home.

Comment

The QoS and the performance of the network including the min speed will depend entirely on the design parameters of the active network – this is responsibility of the operators with the current model and not Q.NBN. To guarantee speed of 100 Mbps operators need to have Metro Ethernet design of their network or a GPON design with a limitation on the number of end users per passive splitter (max 25 if 2.5 Gbps GPON is used).

Also benchmarks show that FTTH users use up to four times the bandwidth of ADSL users – this would put pressure on the operators' core and international networks, increase costs, and erode their product margins. In reality this means that operators are likely to launch a set of products with different guaranteed speed parameters and subset of those is likely to be below 100Mbps.

- **Affordability** - Services to all segments of society will be affordable and set at competitive prices.

Comment

Again the pricing levels are set by the operators but ictQATAR might intervene to ensure that prices are kept at competitive levels. Affordability is a relative measure and only one factor in the decision process of end customers. A service might be affordable for a customer but if the customer doesn't perceive value in having the service, the demand will not materialise.

We believe that in order for the government to reach their goal for service take up, the government may need to subsidize products and/or provide a free basic package to every household in Qatar in order to stimulate the desired economic development.

- **Open Access** - The network will provide non-discriminatory access to service providers through regulatory guidelines and standards that ensure optimal interoperability.

Comment

Open access is a vague industry term and a lot depends on the specific intention.

We do believe that Q.NBN is well positioned to give open access to passive infrastructure for QTel and Vodafone Qatar. However in order to fully develop vibrant services in Qatar more service providers will be needed and therefore the issue will be here whether the existing operators can be properly incentivised to provide fair pricing on wholesale access for smaller independent Retail Service Providers (RSPs).

QNBN plans to offer only the passive network layer in order to encourage innovation in the active and service layers. The desired three tier model is shown in figure 2 but Q.NBN has not addressed the issue that there are only two operators who are vertically integrated between the top two layers reducing this model a two tier model.

Q.NBN Infrastructure Tier Focus

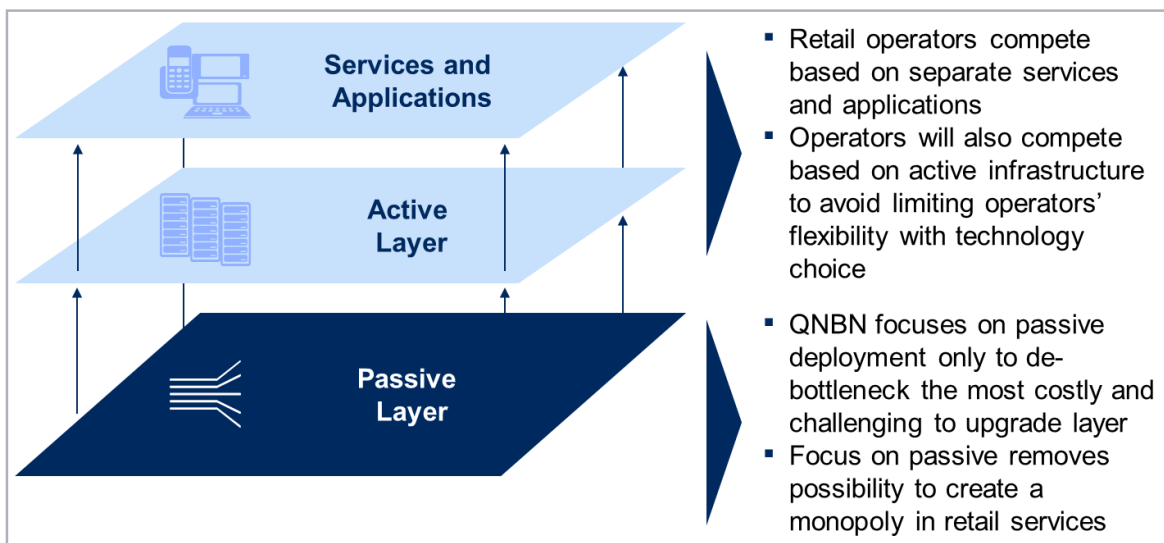


Figure 2: QNBN model

Deployment approach

In terms of network deployment QNBN has different approach depending on the status of particular area in Qatar:

1. **Brownfield area with good infrastructure** - QNBN will lease duct access and take responsibility for rolling out and maintaining fibre infrastructure. Fibre access is then leased to operators on a wholesale basis.

Comment

Qatar is currently lacking processes for leasing duct access and it's also unclear whether suitable asset inventory is in existence for the current state. Q.NBN might need to engage with the current duct asset managers such as Ashgal and commission an audit of the asset inventory.

In addition to the inventory audit a survey of the current state of the duct assets, including availability of space to install telecom sub ducts, must be performed. Recent audits of duct assets in countries such as the UK have shown that only small percentage of the existing ducts could be reused.

2. **Brownfield areas requiring upgrade** - QNBN will roll-out infrastructure in collaboration with government entities and QNBN will invest in new or additional fibre to upgrade areas where fibre does not meet required standards

Comment

Upgrading existing fibre areas that don't meet the specific standards might present a logistical and project management challenge especially in the light of any possible transition of existing customers from the old to the new fibre infrastructure. The customers belong to the operators and the interfaces between Q.NBN and the operators need to be aligned, integrated and automated in order to achieve the fiber upgrade whilst minimising customer disruption.

3. **Greenfield areas** - QNBN will invest and rollout fibre in cooperation with developers, ensuring developments are fibre-ready when complete.

Comment

Presently, different developers have different standards for civil works including duct standards. Q.NBN will need to develop specific national standards and guidelines for developers to ensure a standard installation of ducts and fibre on behalf of Q.NBN.

Comparison of the selected model with other possible scenarios

There are number of potential models to for implementation of and Next generation Network (NGN) in Qatar. Each of these has its own advantages and disadvantages.

In this section we provide our view on Q.NBN’s chosen model and our analysis of some alternative models. These alternative models could be seen as future progress from the existing model.

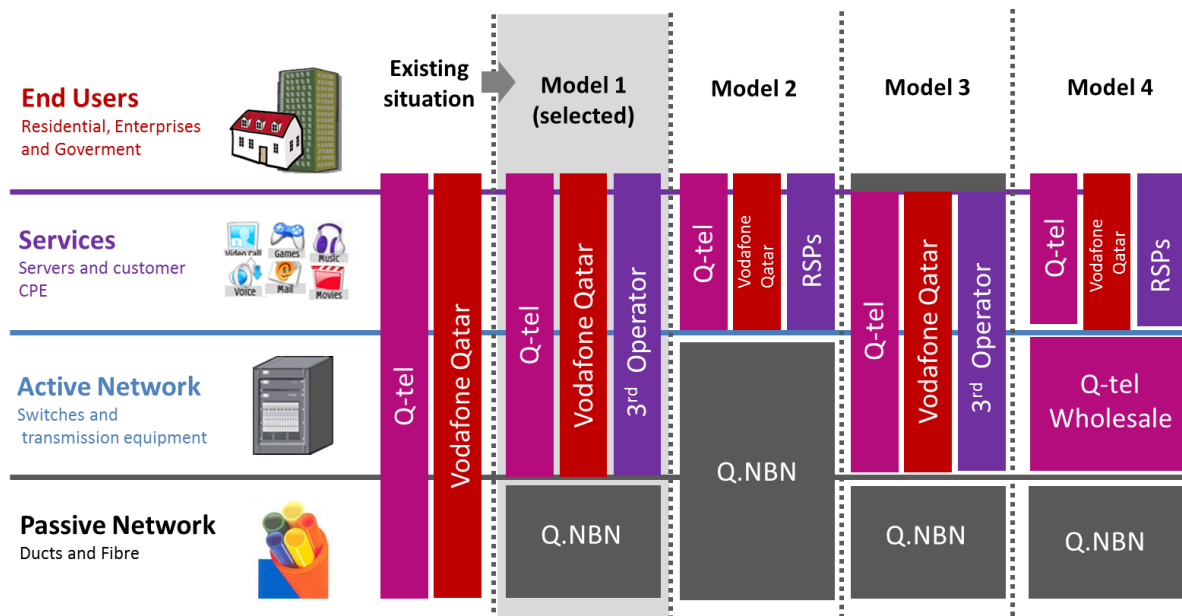


Figure 3: Qatar NBN models

Existing Situation

At present Qatar has two licensed fixed service and network operators, Q-Tel and Vodafone Qatar. Both of these are vertically integrated and they do not provide wholesale services. The same two operators are also acting as ISPs for the delivery of internet services.

Q-Tel has the monopoly in the fixed access networks with an extensive copper network and with ducts already in place. Q-Tel have also started to deploy FTTH in selected areas..

Vodafone Qatar has been affected from a delay in the issuance of its fixed license by ictQATAR. The operator is presently deploying a NGN core network but at the moment Vodafone has not made large investments on the deployment of a fixed access network.

Model 1: Government sponsored Netco – Q.NBN

This is the model that has been proposed and is being implemented. Qatar Government will invest into a government entity called Q.NBN that is tasked to become national passive fibre provider serving the licensed operators.

In the areas where ducts are available and are suitable to be reused, QNBN is looking to gain access to the existing ducts and install sub-ducts and fibre.

Advantages

Q.NBN, as the Government Netco will make the investment in to install the passive physical elements of a national FTTH infrastructure. These physical elements include the ducts, the fibre and the civil works amounting up to 80% of the overall costs of installing FTTH networks. As such the move by the government will enable both operators in Qatar to provide competitive services over fibre and to de-risk their fibre business case.

OPEX costs are also much lower for fibre than for copper enabling operators to run a leaner maintenance and operations infrastructure, therefore passing the cost savings to the end users and still keeping healthy product margins.

Furthermore, a centrally coordinated government effort to transform the national infrastructure is likely to be implemented quicker than if done by the two operators separately.

The model paves the way for licensing additional operators that could be up and running in shorter timescales than normal.

Disadvantages

Number of RSPs is limited to the operators. This will continue to be obstacle for development of the services space and inhibitor to third party innovation.

The take-up goal might not be achieved as Q.NBN doesn't have the mechanism to support this.

Two operators will still attempt to "lock in" customers by providing operator-specific equipment and by bundling services. If the customer desires a service mix from more than one operator (e.g. Voice over Fibre from QTel and Broadband over Fibre from Vodafone) then that customer will need to have two separate CPE units in the home. This is not an optimal approach.

Model 2: Government sponsored Netco and Opco

In our first alternative model, we look at the government extending the role of Q.NBN from provision of passive infrastructure to running an active wholesale network.

The extended Q.NBN could then offer a range of wholesale products from last mile active access products, core network aggregation where the traffic will be handed over to the RSPs at dedicated core nodes to international capacity products. In many ways this will transform Q.NBN to a one-stop shop for RSPs and allow them to tailor the way they serve their customers and to manage their network investment according to what they want to achieve.

Advantages

In addition to passive open access this alternative model enable active open access products that could be offered on wholesale basis to existing operators and to new RSPs. Leaving the product and service innovation as the only competing layer will further develop the availability and the range of services on offer including advanced Value Added Services. It will also enable even more affordable broadband than Model 1 because the government is effectively subsidising the active layer.

The active layer could be provided with the inclusion of national core network and access to international submarine cables. There are many examples that teach us that fibre broadband users will consume more data than ADSL users and that this shifts the cost and the bottleneck towards the core network and international connectivity links. Therefore subsidizing this part of the network will ensure that prices of consumer products are being kept at affordable levels.

Disadvantages

Additional investment from the government will be needed to achieve this.

Q.NBN will need to be developed into a full telecom operator both structurally and operationally. This will be immensely challenging task for a new entity without existing operator experience.

Government involvement in this entity might slow down its growth and commercial responsiveness as decisions processes might be lengthy and additional government policies might need to be developed.

The new extended Q.NBN would need to function as a national network monopoly in Qatar in both passive and active layers. However as this is at a price of opening up the RSP services space and the end result could be more beneficial to the country and to end users.

Model 3: Government sponsored Netco with subsidised basic package

This is similar to Model 1 but with one additional element - the provision of end user CPE is now the responsibility of Q.NBN and the government provides a basic package to everyone.

This approach means that a basic government subsidised bundle is available to everyone either free of charge or at a highly subsidised rate. Such a bundle could include:

- National voice calls
- Basic Broadband access
- Package of free TV channels
- E-Government portal

This puts telecom services at utility level. The provision of free, or highly subsidised, utilities is a practice that many Middle Eastern governments are already supporting in order to provide better living conditions to their citizens. Examples include government provided water and electricity and in the Information age, access to broadband could be seen as a similar utility.

Advantages

It will be easier to achieve the take-up target of 95% set by the government because the basic service will be rolled out across the country with central planning for service coverage. This model would provide access to the Internet, e-Government and e-learning services for everyone in Qatar and thereby support wider social inclusion and universal access to learning opportunities.

A single scalable customer device in the home eliminates the need to install multiple operator home gateway devices. Although this model does not preclude operators from providing other CPEs in the home such as media STB and video phones, it will standardise the basic access CPE device and its interfaces.

Disadvantages

Operator revenue (especially Q-Tel's) from basic services will be significantly undermined.

The government RSP entity providing the basic package would need to be developed and funded. This entity will need to have a service delivery and operations capability which will be great challenge to create.

The operators will see Q.NBN as threat to their traditional business model. However the upside of all this will be that this model would push the operators to become pure service providers and will spur innovation of services – as the operators will have to innovate in order to stay in the market.

Model 4: Functional split of QTel into Qtel Retail and Qtel Wholesale

This model is similar to Model 2 but puts Q-Tel as the monopoly operator of the active infrastructure that enables RSP services.

In order for Q-Tel to perform this role there would need to be a functional or maybe even a structural separation of the existing business units in order to achieve the equivalence principles and to deliver open access to all RSPs (including the Q-Tel RSP).

A good example of such model would be BT Openreach and BT Wholesale in the UK who provide a range of active and passive products to all UK RSPs under a stringent regulatory environment. The figure below provides a view of BT' fibre related product range.

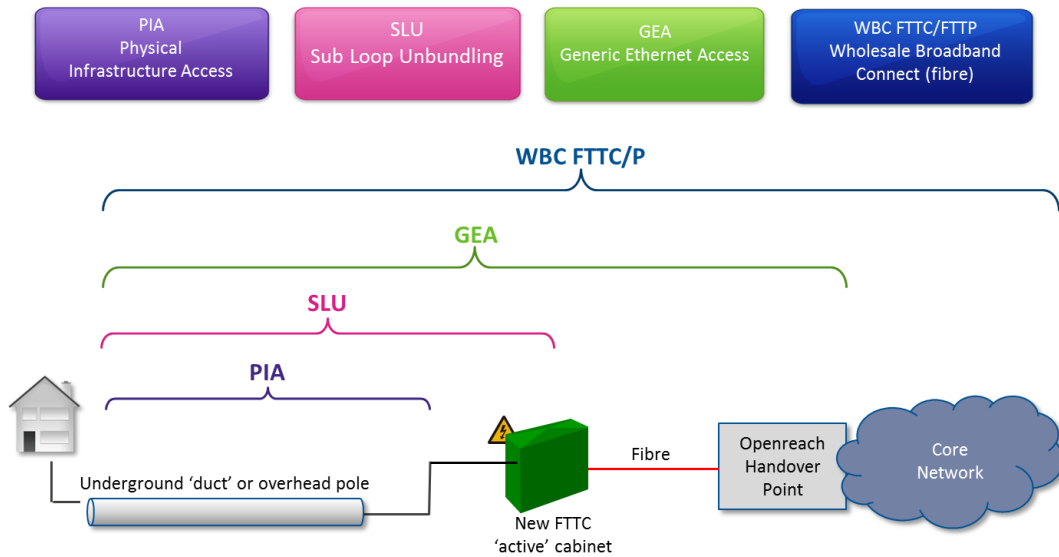


Figure 4: BT Openreach/Wholesale fibre product range

Advantages

QTel is already an established telecom operator and this approach will be quicker and easier to implement than it would be to extend the remit of Q.NBN.

QTel has already developed some processes and the OSS/BSS systems that could be extended to support wholesale offerings.

The potential structural split could be used to change the balance of government shares in the operator such that the government reduces its stake to a minority control of the wholesale operator and the QTel RSP. This will allow the new RSP to function in a pure competitive market without actual or perceived commercial influence from the Qatari government.

Equivalence principles would need to be implemented to ensure that all RSPs, including QTel RSP and Vodafone RSP, are fairly and equally treated.

Disadvantages

Potential functional or structural separation of QTel might be difficult considering all the commercial and political repercussions.

The move would exclude other operators namely Vodafone from competing in the access network space, repositioning them to be core network plus services operators only.

Establishing fair pricing and equivalence approach through a regulatory means might present a challenge for ictQATAR.

Potential outcomes from the adopted model

QTel and Vodafone Qatar

QTel will lose its monopoly in fixed line services and may start losing market share by the enablement of the competitive landscape

It would be understandable if QTel views Q.NBN as a potential threat to its business as the new Q.NBN access network will enable Vodafone Qatar to compete without the upfront investment in building the access network ducts and with a potentially lower cost of operations. QTel will be left to run or decommission its legacy copper infrastructure and with a challenge to transform its business model. This includes the engineering staff that is currently working as part of the copper unit.

At the same time QTel will lose its monopoly in the fixed market and will see impact to its fixed revenue line as customers start to switch service to Vodafone.

We expect QTel to exhibit similar behavior as other former monopolies and to initially attempt to undermine the Q.NBN development and to possibly stifle Q.NBN's network deployment.

However if QTel sees this as opportunity to transform itself into a leaner services oriented company then the QNBN network might provide to be an affordable delivery method for providing advanced services.

Q-Tel's current viewpoint on the Q.NBN development is clear from their response to the ictQatar's recent consultation:

"Qtel believes the QNBN should focus on extending fiber to locations that are not economically viable for operators, limit itself to lowest level of the technology stack, and avoid duplication in areas that are already addressed by other players. Qtel also mentions that wholesale products should be structured in a way that encourages facility-based investments.

Qtel is of the view that QNBN should be designed not to stimulate competition but rather to promote investments in areas where it would be unprofitable to deploy infrastructure on a standalone basis"

Vodafone Qatar will gain quicker access to new customers and a level playing field on which to compete with Q-Tel.

Unlike QTel, the implementation of Q.NBN is positive for Vodafone Qatar and will provide a new way for Vodafone to make its fibre access investment case work .

Q.NBN will enable Vodafone to compete quicker in fixed service provisioning and to develop a leaner operations model without the financial burden of legacy access networks, systems, processes and people.

Vodafone's support for Q.NBN is evident from their response to the ictQATAR consultation:

“VQ sees the role of QNBN as providing equivalent access for licensed operators to an FTTH network, co-location, ducts and metro-connectivity for fixed and mobile transmission .

VQ considers the QNBN is best served by having the two operators as both fully committed customers of the QNBN and also potential investors in the QNBN company

“VQ is of the view that, if executed successfully, the QNBN will have a significant positive impact on competition by allowing licensed operators to compete on a level playing field. ictQATAR’s role remains one of supporting the development of the QNBN and ensuring the viability of the model is not damaged by the behavior of Qtel, through its powers under the applicable regulatory framework, notably DSP access regulation”

Other RSPs

Qatar is the only country in the Middle East where there is lack of RSPs and the market is controlled by the two operators who effectively double-up as ISPs.

There is clear need for more RSPs and/or for a third operator in Qatar. ictQATAR has noted this in their recent publication announcing the start of consultation for the introduction of a new service-based provider in Qatar within the next year.

There is still a lack of clarity how the new entity will be positioned in the market and the scope of its operations, however we believe that any outcome will be positive for consumers in Qatar as this will introduce much needed competition in the fixed services space.

Conclusion

We see Qatar taking a strong lead in introducing the Q.NBN initiative, and that this is a step in the right direction for the development of the fixed telecommunications market in Qatar.

The government intervention to sponsor the introduction of national fibre infrastructure will help de-risk the operator led business cases and also provide a coordinated approach to managing the roll-out of the infrastructure and civil works therefore creating an opportunity for minimal disruption from the civil works and a timely realisation of the plans.

There are still large number of open issues that need to be resolved and the success of the project will depend on the way its realisation is managed by Q.NBN and by the engagement and cooperation of the existing two operators.

Similar cases around the world

Singapore NGNBN

Next Generation National Broadband Network (NGNBN) is a key infrastructure project in Singapore positioned as a public-private-partnership, with the government providing some funding to kick-start the project and to ensure that ultra-high-speed broadband services will be viable, affordable and sustainable for the long term.

1 billion SD has been the government budget for NGNBN given to iDA. The outcome of the process has been creation of two entities:

- Netco (OpenNet) is operating the passive infrastructure. 30% owned by the incumbent (SingTel) and the remaining split between three more entities.
- OpCo (Nucleus Connect) will sell ultra-high bandwidth to RSPs by leasing the passive network from the NetCo while itself designing, building and operating the active network infrastructure, including network switches and transmission equipment. It is owned by the second largest operator StarHub but with operational separation from the mother company.

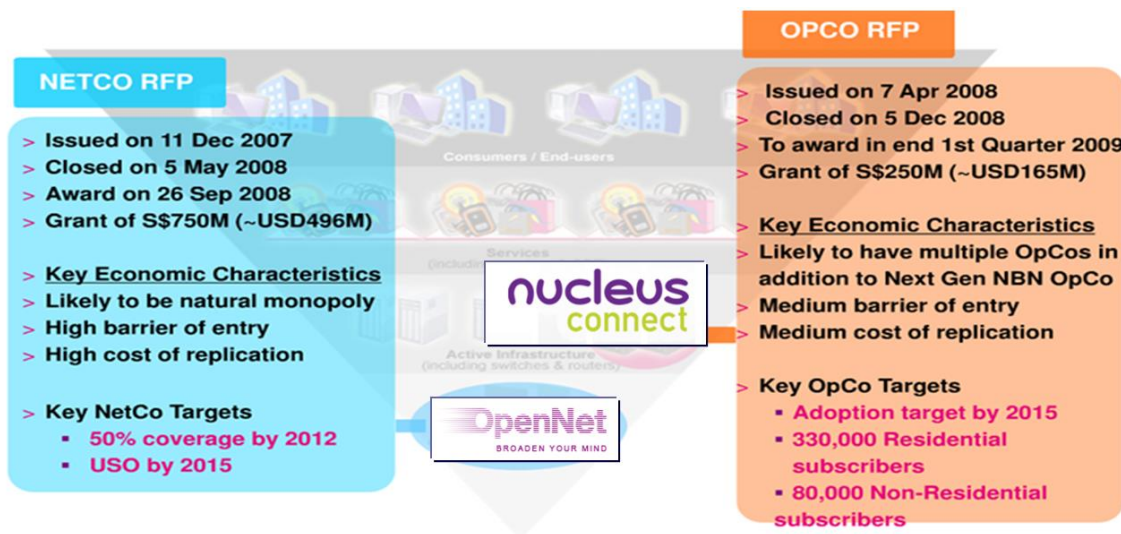


Figure 5: Singapore NGNBN bid outcomes

Australian NBN

The Australian National Broadband Network (NBN) will be operated on a wholesale-only, open access basis.

Retail service providers (RSPs) will be able to access infrastructure that is not owned or operated by one of its competitors.

On 7 April 2009, the Australian Government established NBN Co Limited (NBN Co) to design, build and operate the NBN. NBN Co's role is to realise the Australian Government's vision for the delivery of high-speed broadband services for all Australians.

NBN Co is a wholly owned Australian Government company that has been prescribed as a government business enterprise (GBE).

NBN Co will provide the infrastructure that will allow wholesale and retail service providers to deliver high-speed broadband services to all Australians.

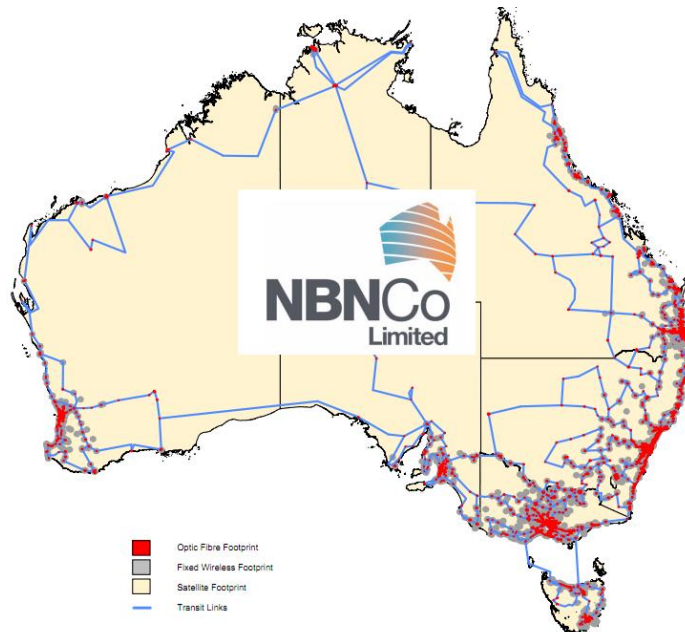


Figure 6: Planned coverage with the NBN network

Appendix A: Other applicable concepts for enhancing the service delivery

RSP online marketplace – Enabling Open Service Access over FTTH

RSP Online Marketplace is a tool for facilitating service selections between multiple Retail Service Providers (RSPs) in a more transparent and informed way for the end users over fibre deployed infrastructure. This only applies to the Models 2,3 and 4 described in the main document.

Background

End users should be able to buy services from multiple RSPs which are delivered over a single fibre connection and NTE/ONT provided by the OpCo. They should also be able to easily swap between RSPs to those offering better value for money enabling an open market for services. The OpCo should support this concept of Open Access by enabling the RSP through traffic aggregation, QoS for service classes, intelligent NTE, user relevant network information and a RSP Online Marketplace which is an open portal for RSP selection.

Functionality

The RSP Online Marketplace is the portal where all the RSPs will be able advertise their service offerings and the End User will be able to compare, select and purchase a specific service. The portal should also enable end users to access details of all the services to which they currently subscribe, check their usage and billing information and if required cease a service or change their service provider for a particular service

The orders are automatically provisioned through a series of interactions between the RSPs and the OpCo. We believe the user-friendliness of its interface, the accessibility on multiple platforms and the value it gives for the end users through the information it provides would be the key elements for its success.

The OpCo as non RSP biased and independent network operator is ideally positioned to operate this service in order to stimulate the RSP market, increase services adoption and network usage.

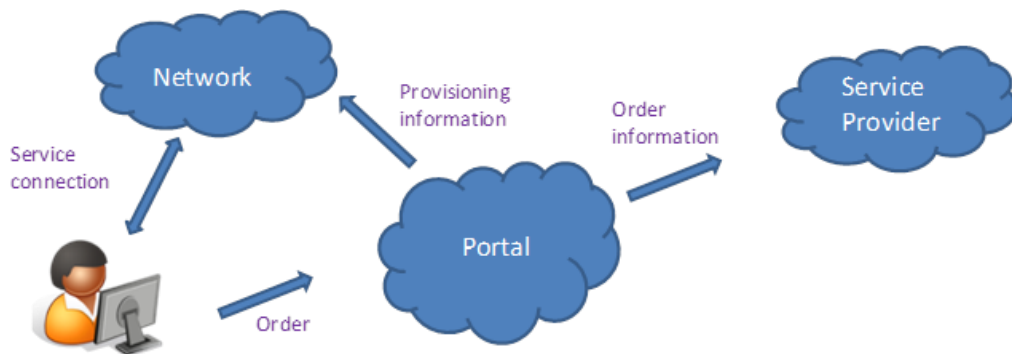


Figure 7: RSP Online Marketplace interaction example

Customer experience comparison

Normal customer interaction

- Customer plugs into existing Ethernet port on the wall
- Nothing happens
- Customer thinks about calling a telecom operator
- A couple of weeks later they call
- They then wait 3 days - 3 weeks for service to go live
- **The manual process consumes labour and takes up to a month to generate revenue. Some customers give up in course of process. The customer is unaware of the choice**

With automated provisioning

- Customer plugs into existing Ethernet port on the wall
- Menu appears on PC screen offering choice of bundles and services
- Customer selects a bundle and enters card / bank details
- System provisions service in ~20 seconds
- **Captures all potential customers, captures spur of moment impulse purchases, gains extra month of revenue, has zero labour cost, customer extremely happy**

Universal multiservice CPE

The idea behind this concept is that independent NetCo/Opco could introduce a Universal multiservice CPE in the home when the fibre network is initially deployed.

The RSP would then “lease” this box on a per use or per service on monthly basis. This would enable open access approach to be accomplished without RSPs lock-out. Before RSPs were locking users by demanding that they buy certain CPE boxes in order to receive their services (e.g. QTel TV box). The user would also be able to change RSP providers without having to incur the cost of another CPE in his home.

Disadvantages of having multiple CPEs in the home are clear:

- The user will not want multiple boxes in their home – space issue
- Somebody needs to pay for those boxes – usually the end user
- The User will be confused when a fault occurs and the OpCo will receive the call.
- It will increase the utility bill substantially
- Managing the devices in the home in the future will be very difficult.
- Managing the customer experience will be very difficult.
- It will increase the OSS complexity e.g. billing.
- It increases the security risk to on the LAN.
- It goes against the ‘green’ policies to have multiple boxes that operate in a similar way.
- It goes against the Home Gateway Initiative group recommendations.

- RSP might use it to “lock” end users therefore closing the market and limiting the choice for the end users

Example functionality of this CPE could include:

- Optical Network Termination
- Home Router
- Wireless LAN (802.11n)
- VoIP support
- PSTN support
- IPTV support (STB with network based PVR)
- Multiple VLAN
- QoS marking based on policies
- QoS support wired and wireless (802.11e)
- RSP portal support
- Thin client support

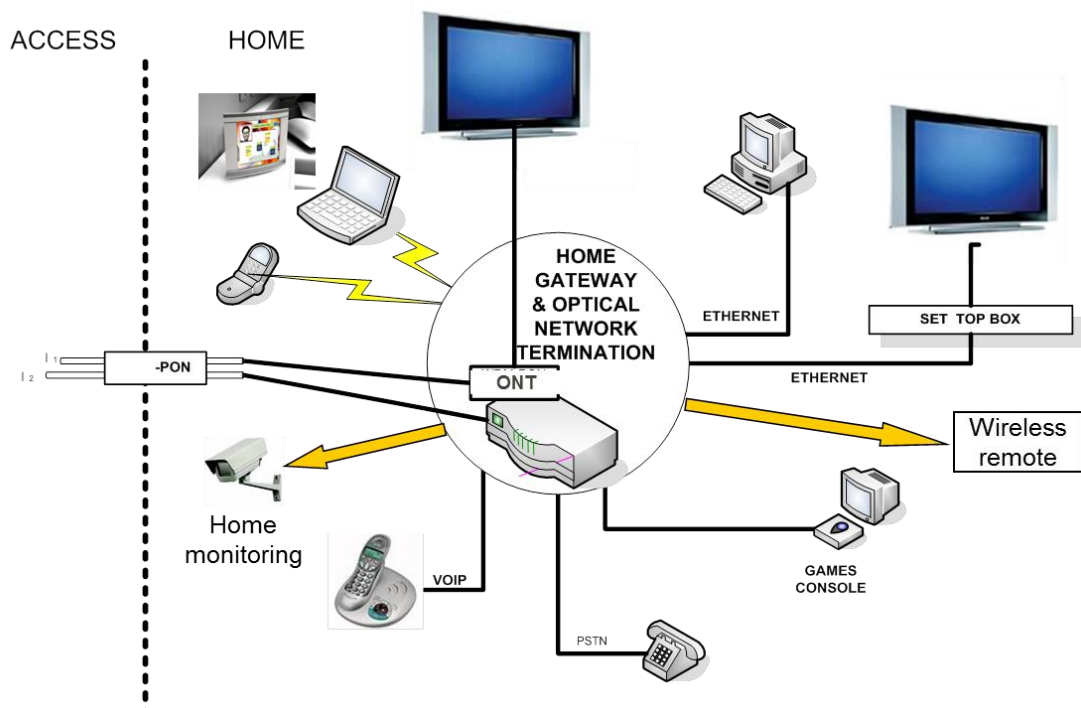


Figure 8: Universal multiservice CPE example functionality

Authors



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Ivan has more than ten years of experience working in the telecoms sector across Europe, East Asia and the Middle East. Prior to Salience he was principal consultant with British Telecom in Dubai. Ivan has acted as a senior manager for operators in the Middle East region to deliver a national broadband strategy in Saudi Arabia and to lead on developing the business case, company start up and investment strategy for a Qatar based cable operator.

Prior to that Ivan held various roles in BT ranging from Specialist Consultant working on Global Next Generation Network (NGN), Fibre Access and Services transformation projects in the UK, Singapore and India, responsible for setting up and heading BT's Asian Innovation Team in Malaysia and leading on number of initiatives as part of R&D activities in mobility, NGN and smart cards.

Ivan is regular speaker at telecom conferences on the subject of broadband strategies.

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