Regulation Environment around the World: Impacts on Deployments

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Abstract: Optical access systems aim at covering worldwide requirements. Nevertheless, a great disparity in FTTx deployments between countries is observed. Among several factors, regulation choices play a major role for which after analysis some guidelines will be given.
OCIS codes: (060.0060) General; (060.4250) Networks

1. Introduction

Optical Access Network deployments in diverse FTTx implementations based on PON technologies gain momentum in more and more countries around the world. Whereas several transmission technologies based on single mode fibre emerged at the beginning of the 1990's, the worldwide market settles now on Gigabit capable technologies for massive roll-out.

Early starting countries almost enter the renewal stage of their first generation optical access network deployments, when others just start deploying their fibre infrastructure. Surely local history of telecommunication and cultural eagerness for bandwidth explain part of the differences, but also the path taken in different countries by the regulation authorities that prioritized the deployment of an emerging "essential" facility or those favoring a competition status quo maintaining approach.

Some of the models observed around the world will be discussed to understand how they inferred on technical specifications, business cases and deployment pace. An analysis will help to point out the requirements that Next Generation systems will have to fulfill in order to meet a worldwide market without major regulation impairments.

2. General observations on optical access deployments around the world

Many presentations given in FTTH Council, Fora and numerous seminars around the world are presenting updated aggregated figures that are individually available on local regulators' websites [1]. So the presentation will be focused on highlighting significant facts to extract some guidelines for Next Generation technologies to move forward, avoiding the traps of regulation.

In order to do that it is necessary to first establish some basic observations that will be used later:

- Regulation doesn't start during early experiments and deployments, but only comes up when a significant market appears, with opportunity for several investors.
- Five types of leading optical access operators can be identified, each case of dominancy observed drive to specific regulation rules sets: MSO cable TV companies, Incumbent telecom operators, Competitive telecom operators, Facilities operators, Local authorities.
- Investors will only start technology roll out when their business case is consolidated. Regulation then acts as a competition enabler provided the technology fulfills all requirements at possibly the price of significant additional developments, delays and costs. Regulation does not act as a driver for deployments.
- Neither vendors nor operators can any longer justify the development of an access solution for a local market. Given the costs of the optical access systems, affordability of the systems requires a worldwide market from the start.
- Beyond early trials with non fully carrier-class solutions, politics and local authorities are the first that can motivate deployments first because spotting commonalities in facility networking will mean significant savings and secondly because of their mandatory reaction to competition among territories to attract industries and business users or keep them, especially when other countries offer better facilities.

It is no wonder that a significant part of the early deployments of optical access technologies has been driven with public funding under initiation of local authorities. Arguably, when politics and local authorities see a real threat, they may question regulation in order to clarify the business case in order to enable investors to roll out new telecom facilities.

3. Where there is a Will there is a way

Unlike areas such as Europe where due to intrinsic complexity of regulation structure optical access broad deployments experience extra delays, early settlements of deployment conditions in Asia and US enabled sooner and faster roll out of the fibre infrastructure [2].

Those regulations intended to favour competition [3], address two very different market segments that first deployments of optical access face simultaneously, namely the passive infrastructure and the first system generation.

- *On the one hand* optical fibre plant doesn't by itself provide any revenue; nevertheless given the volume of investment and time to be rolled out, it has to be deployed in a future proof manner with the ability to host a plurality of systems possibly with simultaneous access of several operators. Operators are willing to roll out fibre with wholesale and bitstream offers and/or in an unbundling compatible way, when required by regulators, provided that:

- Global investments for their business case is not endangered by excessive costs of unbundling extra features required (blindfold resources over-dimensioning, excessive number of access and flexibility points, heavy control and monitoring process)
- Return on investments is assured under conditions of equity in access and attractive fees for facilities rental
- Unbundling doesn't harm the Quality of Service (QoS) through multi-players on the infrastructure
- There is a fairness in unbundling applicable rules

- *On the other hand* systems which will provide revenues and have to be compliant with the passive plant (ODN Optical distribution Network) specifications. Whenever system designs don't fill the regulation requirements, either the underlying technology is compatible with the addition of local features, which changes the business case costs and delays or the technology will never be considered although deployed worldwide e.g:

- FCC [4] in the US requiring POTS unbundling over fiber that brought major cost impact through addition of POTS interface, copper twisted pair testing features and power back-up
- Japan regulation requesting a solution for a WDM RF Video overlay
- Northern Europe countries & Ofcom in UK [4] requiring "fair and equal access" for service providers to a local access network
- Wholesale offers are very commonly required.

These competition enablers, when decided "ex ante" without full knowledge of the market and market shares, usually induce parallel investments or at least over-dimensioning of common resources in part of the optical access network depending on the unbundling requirements. While remaining affordable in dense areas, those extra costs become excessive in rural or small town areas especially when obviously the market doesn't provide a market for several competitors from the start. Therefore, some regulators such as Arcep in France[4] define specific rules for dense areas and "less dense" areas. Pushing the reasoning one step further, some local authorities start to anticipate that their geographical area will never attract the interest of private operators and therefore have anticipated the construction of their own optical access network, under specific public initiative rules.

To add some complexity for system designers, they are soon going to enter a system renewal process, for the pioneering operators as in Japan and even in the US for early APON and BPON based generations. These investments in plant and systems will no longer come together, provided some replacement evolution path or co-existence process has been foreseen between generations. It must be underlined that similarly to copper, no deploying operator so far was willing to double its fibre plant to enable a full co-existence of two system generations for upgrade purpose.

Finally a major differentiator in deployment is the driver given by States and government on whether such a massive effort for optical access should encompass legacy services (Universal services) as is the case in the US, or if they are considered as an overlay infrastructure focused only on new broader band services. Depending on this basic assumption, integration of legacy interfaces and related QoS in terms of availability, might strongly impact the undergoing design of the optical access network. Unlike copper technology in which legacy POTS and DSL are easily unbundled through passive filters, there is no such "easy" capability over optics, so specific rules to avoid a monopoly in bundles of services have been investigated.

4. Examples of technical impact of regulatory choices

Local regulatory choices and deployment strategies will require specific features and Countries policies will open some room for network optimizing. So before going towards a full optical access network, several questions have to be answered:

- Local loop ownership and financing conditions
- ULL (Unbundling of local loop) opening points location and conditions (civil work, physical media, wavelength, logical or "virtual" through wholesale & bit-stream offers …)
- Is optical access meant to take over from copper or is overlay mandatory to maintain legacy services
- How far can transverse optimizations be used across client types and architectures with some per equation across areas?
- Is universal service with such as POTS requiring 48V voltage generation, power backup and line testing capability mandatory or an option?
- How green will be green enough for optical access technologies in the future?

History shows that early optical access adopting countries had answers to some key questions such as clear UNI interfaces (as with ATM at first in Japan) with service responsibility left to external multiplexers, and fiber ownership to the deploying company at the price of unbundled transparent POTS capability.

Those early decisions obviously condition all subsequent requirements for any future technologies, since they set the guidelines to the first deployments thus the inescapable rules for compatibility with legacy infrastructure.

5. Features required by regulation from Next Generation optical access systems

For widely deployed systems based on long existing standards such as GE-PON and G-PON, regulation evolution would mean very difficult retrofit. Features required to be regulation proof either already exist, are limited to minor adaptation or belong to next generation optical systems to avoid unaffordable costs linked to developments for local situations. The chart below tries to catch some of the main features required in diverse situations:

Features required to induced to enable ULL at system level across competitors
- Cost impact must be limited to areas where unbundling is expected and effective - All competitors have similar conditions / costs on the unbundled section - No potentially harming process/solution to existing access is allowed (QoS, availability …) - Protection against mismatch between OLT and ONU types is mandatory - Privacy of services and data must be assured across - In WDM scheme, all wavelength sets must be equivalent in performances and costs - Only authorized access to connectivity and services must be possible

6. Conclusion

If there is little hope for a technology to encounter a single and simple worldwide regulation situation, including the necessary features to make it "regulation proof" described in this presentation, this technology would enable a broad acceptance by regulators and competing optical access operators.

7. References

[1] Roland Montagne – IDATE, "FTTH Panorama European Union & Middle East" in FTTH Council Europe Lisbon February 24 2010.

[2] Philippe Chanclou, Stéphane Gosselin & al.: "Overview of the optical broadband access evolution" in IEEE communications magazine (Aug 2006)

[3] Europe's Information Society to be found on http://ec.europa.eu/information_society/policy/ecomm/index_en.htm.

[4] Examples of regulation by ARCEP(F), OFCOM(UK) and FCC(US), … at http://www.arcep.fr/index.php?id=8650&L=1 , http://stakeholders.ofcom.org.uk/telecoms/ and http://wireless.fcc.gov/index.htm?job=rules_and_regulations … Japan and Korea also to be checked since pioneers in the domain.

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