Satellite's role in the penetration of broadband connectivity within the European Union

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***Abstract*—The European Commission (EC) has recently acknowledged that broadband coverage for all - the 2013 target of the Digital Agenda for Europe (DAE) - has been achieved thanks to satellite broadband services, such as Tooway™, the consumer-grade Internet access at 20 Mbps via the Eutelsat KA-SAT satellite. However, broadband take-up in the European Union (EU) is still far from being satisfactory, notably in rural and remote areas where satellite solutions are ideally suited.**

To assist public policies called on solving this shortage, Eutelsat has triggered the SABER (SAtellite Broadband for European Regions) project, a consortium of satellite operators, manufacturers and 22 EU regions, with the external support of EC, the European Space Agency (ESA), the European Investment Bank (EIB), Eurisy and the Network of European Regions Using Space technologies (NEREUS). The main objectives of SABER are to raise awareness of satellite broadband and to provide best practices and guidelines for public procurement for EU institutions and regional Public Authorities (PAs).

To overcome the difficulty posed by a scattered base of unserved users in a fragmented European market, SABER proposes the adoption of simple, efficient and cost-effective voucher schemes, which support users' demand in areas where the one-off costs necessary to access broadband services are a genuine barrier to take-up. Open to competition and consistent with EU rules for public grants, voucher schemes subsidizing the cost of purchasing and installing user ground equipment also overcome the complexity that arises from the regional management of EU funds, provided they are implemented at local level on the basis of a common approach and methodology designed at EU or national level.

Keywords—Broadband Coverage; Broadband Take-Up; Digital Divide; Digital Agenda for Europe; European Union; KA-SAT; SABER Project; Voucher Schemes

I. INTRODUCTION

Roughly 2.3 million Europeans have no access to fixed terrestrial 'basic broadband'[a] connectivity (see Fig. 1). This affects many individuals, communities and businesses in remote or rural areas where the unit costs for terrestrial connection increase significantly as population densities drop, because of high fixed investment costs.

The European satellite operators' private investments - the most significant being Eutelsat's KA-SAT satellite - have however contributed to achieving full broadband coverage of the European Union (EU).

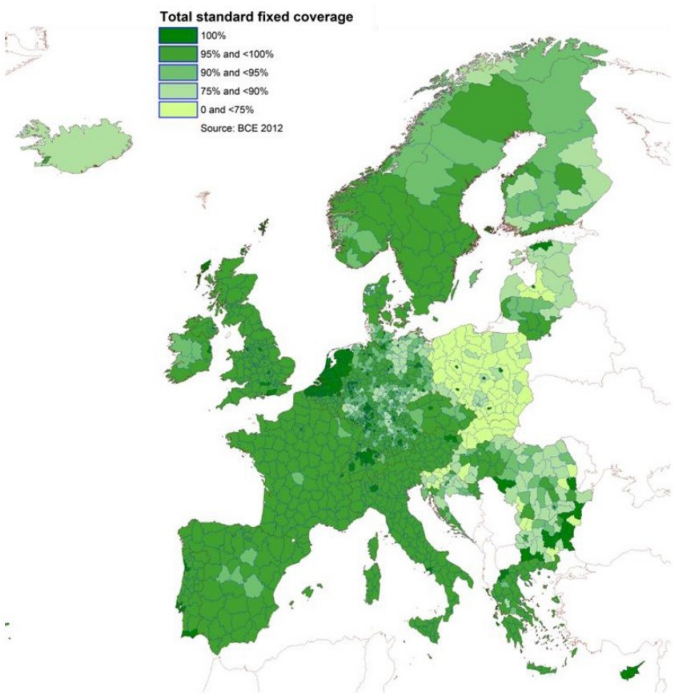

Fig. 1. Standard fixed coverage per EU region, end of 2012[b]

a Scoreboard (2013 update),Digital Agenda for Europe, European Commission http://ec.europa.eu/digital-agenda/en/scoreboard

b Point topic broadband coverage in Europe, 2012 Final report in http://ec.europa.eu/digital-agenda/sites/digital-agenda/files/DAE%20SCOREBOARD%202013%20-%202-BROADBAND%20MARKETS%20_0.pdf

In fact, ubiquitous and immediately available satellite services have a fundamental role in this achievement, as recognized by the Vice-President of the European Commission (EC) Neelie Kroes at the Broadband-for-All event (17 October 2013): *Thanks to the extra coverage provided by satellite broadband, we have achieved our 2013 [Digital Agenda for Europe] target of broadband for all. That's a great result for European citizens*. Mrs. Kroes also stated that *The EU is technology neutral, but for those in the most isolated areas, satellite is a good option to stay connected; and it's likely to remain so*[c].

II. Available Satellite Solutions for Broadband Internet Access

In this respect, it is important to mention that recent progresses in satellite broadband technology have considerably increased capacity and speed and reduced both fixed and recurrent costs for the final user. In fact, as acknowledged by the EC, *today satellite broadband is completely comparable with DSL broadband in terms of both performance and cost*[d]. Therefore satellite broadband access has become a viable option for consumers.

The KA-SAT satellite, for which Eutelsat invested 350 M Euros (including the related terrestrial infrastructures), is the first High Throughput Satellite (HTS) launched in Europe and has been operational since May 2011. KA-SAT's concept is based on a payload with 82 Ka-band spot beams (see Fig. 2) connected to a network of 10 ground stations. This configuration enables frequencies to be reused 20 times and takes total throughput to beyond 90 Gbps.

KA-SAT, which provides coverage across Europe and the Mediterranean Basin, is intended to serve up to 1 million of currently unserved or under-served users.

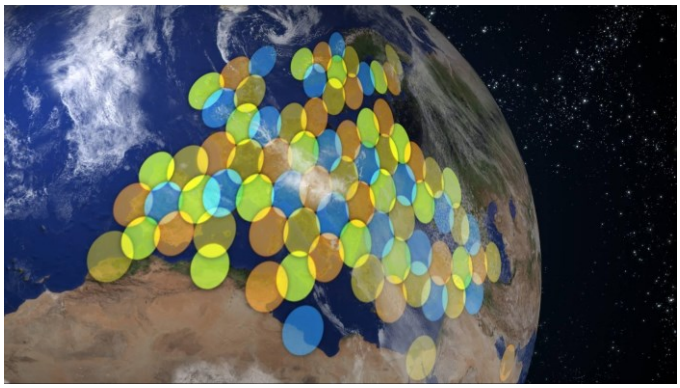

Fig. 2. KA-SAT coverage

Thanks to KA-SAT, Eutelsat - through its Tooway™ service[e] - provides ubiquitous broadband access at 20 Mbps downstream and 6 Mbps upstream (speeds which compare favorably with those of DSL services) for monthly subscription fees of 30 Euros.

HTS such as the Eutelsat's KA-SAT are therefore 'game changers' as they have removed any performance and cost barriers to the delivery of consumer-grade Internet access. Satellites can now complement or even replace terrestrial links where user experience, profitability, sustainability and affordability indicate so.

In the near future, the development of ground segment technology will allow Eutelsat to offer services with even higher broadband speeds on the same capacity. Meanwhile European manufacturers are developing Research and Development (R&D) activities for new generations of HTS able to provide 50-100 Mbps by 2020.

III. The Need for Broadband Internet Everywhere

However, despite the crucial importance of high-speed Internet for overall development (see the correlation between fixed broadband and competitiveness in the EU in Fig. 3), broadband penetration within the EU remains low. This is especially the case in remote and rural areas.

Nonetheless, user demand exists in these areas, although users are scattered over all the territory. The very remoteness of these areas actually increases their need to access broadband for social and / or economic reasons in a way that can span distance.

Broadband Internet can contribute to the improved competitiveness of agriculture and forestry, quality of life and diversification. High-quality Internet provision can help unlock the potential of rural areas, and can make them more attractive places to live[f]. For instance, broadband internet enables farmers to plan production, market products and access prices in international markets, check weather forecasts or establish cooperation agreements with other market players.

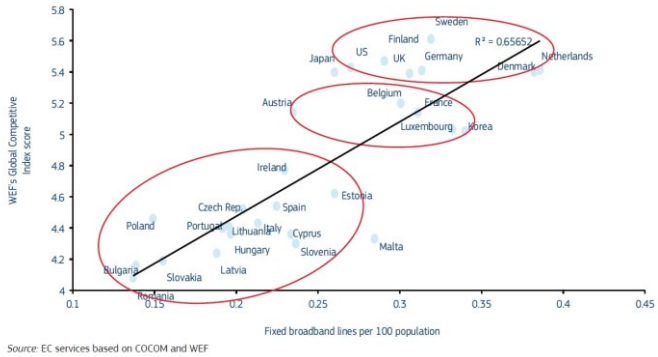

Fig. 3. Correlation between fixed broadband and competitiveness[g]

c 100% basic broadband coverage achieved across Europe – EU target achieved ahead of schedule.
Next stop is fast broadband for all, Press release, European Commission, 17 October 2013, http://europa.eu/rapid/press-release_IP-13-968_en.htm

d Broadband for all via Satellite, Digital Agenda for Europe, European Commission, http://ec.europa.eu/digital-agenda/en/broadband-all-satellite

e See more information on http://www.tooway.com/

f See the EC Communication on Better access for rural areas to modern Information and Communication Technology, http://ec.europa.eu/agriculture/rurdev/employment/ict/index_en.htm

g Scoreboard (2012), Digital Agenda for Europe, European Commission, page 46, http://ec.europa.eu/digital-agenda/en/download-scoreboard-reports#2014

More generally, better access to modern ICT is useful in a wide range of fields relevant to rural and remote areas (tourism, health and ageing, administration, youth and education, etc.).

As a matter of fact, the Europe 2020 strategy[h], together with the establishment of objectives such as *Deliver sustainable economic and social benefits from a Digital Single Market based on fast and ultra-fast Internet and interoperable applications, with broadband access for all by 2013, access for all to much higher Internet speeds (30 Mbps or above) by 2020, and 50% or more of European households subscribing to Internet connections above 100 Mbps*, also states that *at EU level, the Commission will work to promote internet access and take-up by all European citizens*.

It is unlikely that the issue of low take-up will be solved with terrestrial solutions in those remote and rural areas where difficult topographical conditions or low population density make them either impractical or economically unviable. Satellite solutions are ideally suited to providing instant access to broadband irrespective of location, with a deployment cost independent of end-user location, but are still under-exploited in Europe.

A correct integration of the satellite option in the implementation of public policies for broadband development could help to solve this problem. For instance, public funds - such as European Regional Development Funds (ERDF) and the European Agriculture Funds for Regional Development (EAFRD) - can be used to subsidize the cost of satellite user ground equipment - antenna plus modem (see Fig. 4) - and installation.

Fig. 4. Tooway™ user's ground equipment

This is the only missing component to supplying Internet access but represents several hundred Euros (and as such might be an obstacle for widespread take-up of satellite broadband, especially in areas with low purchasing power). The eligibility of user ground equipment for European public subsidies has been recognized by EU institutions[i].

IV. THE PARADOX OF THE EQUATION: USER NEEDS, SATELLITE SOLUTIONS AND PUBLIC FUNDS

The above section has demonstrated that there are clear user needs in unserved or underserved areas of Europe and available satellite solutions - such as those provided by KA-SAT - that can immediately meet these needs. Furthermore, the necessary equipment is eligible for European public funding.

How then can the low take-up be explained, once the three pre-requisites for enabling take-up of satellite broadband in public policies for unserved areas are present?

As indicated in Fig. 5, the main obstacles to the creation of a virtuous circle are:

– Lack of awareness and misperceptions.

Many people still remember old generations of Internet via satellite when services were slow and expensive, and do not know that modern satellite solutions are accessible and affordable and can be deployed in a matter of days.

– Lack of demand aggregation.

Potential adopters in rural and remote areas are scattered throughout the territory, which often prevents the available satellite solutions to being taken into proper consideration by Public Authorities (PAs).

– Lack of guidelines for procurement.

PAs are used to managing the deployment for large terrestrial solutions (e.g. the rollout of backhaul infrastructure in optical fibre), but they are very rarely experienced in methodologies and tools to efficiently deploy satellite solutions, for instance using grants to fund the onsite supply, installation and acceptance testing of the user terminal. Nor have European institutions made available a common approach - compliant with EU rules - for the use of European funds to subsidize satellite solutions.

h Communication from The Commission: EUROPE 2020 A strategy for smart, sustainable and inclusive growth, page 12

i See, for example, Annex III of Council Regulation (EC) No 473/2009 of 25 May 2009 amending Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and Regulation (EC) No 1290/2005 on the financing of the Common Agricultural Policy

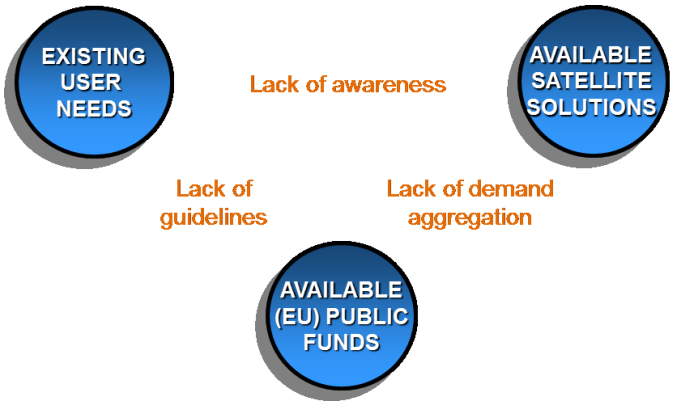

Fig. 5. Pre-requisites and obstacles to the large scale deployment of the satellite broadband solution in public European policies

V. THE SABER PROJECT TO CUT THE DIGITAL DIVIDE

The EC has recognized the importance of maximizing the contribution of satellite-based broadband services to tackling the digital divide in Europe and meeting the objectives of the Digital Agenda for Europe (DAE). Conscious of the lack of awareness among PAs and the difficulties they encountered to subsidize satellite broadband, the EC has been supporting the SABER project (SAtellite Broadband for European Regions) since November 2011.

This ongoing project, triggered by Eutelsat and led by CSI-Piemonte, a region of Italy, is co-financed by the EC[j] in the framework of the Thematic Network on the 'Contribution of satellite systems to 100% EU broadband coverage'.

SABER is built on a consortium of 26 public and private partners including major European satellite operators and manufacturers and 22 EU regions[k].

The project has analyzed the experience of deploying satellite broadband access solutions by national or regional authorities in order to raise awareness, share best practice, develop guidelines for deployment and disseminate information to interested regions across Europe.

In addition, SABER has created a broad network of external stakeholders: the EC, the European Space Agency (ESA), the European Investment Bank (EIB), Eurisy and the Network of European Regions Using Space (NEREUS). These high-level stakeholders have been supporting SABER outcomes - derived from field experiments - and recognize the consortium's analysis and recommendations as neutral and practical.

j Under the Information and Communication Technology Policy Support Programme; Area: CIP-ICT-PSP.2012.5.3- Contribution of satellite systems to 100% EU broadband coverage. See the Project ID Card at http://ec.europa.eu/information_society/apps/projects/factsheet/index.cfm?project_ref=325132

k See the list of all SABER partners in Acknowledgment

VI. THE CHALLENGE OF SPARSE, NON-AGGREGATED DEMAND IN A FRAGMENTED MARKET

This article focuses on the solution that SABER recommends to overcome, or at least to smooth, two major obstacles that are slowing down the take-up of satellite broadband in Europe: the absence of a single telecom market and the dispersed management of public funds.

First, the EU telecoms market is fragmented into 28 national markets (and even into regional markets) with different languages, different needs and purchasing power, and, last but not least, different rules and regulations.

Satellite services are provided to a relatively small number of customers per country/region (when compared to the customers of terrestrial telcos), as they are spread across the entire EU. This prevents some economies of scale and makes the cost of acquisition and management of users more significant than for terrestrial telcos.

It is not a coincidence that in geographically large countries with single telecoms markets, such as the USA and Australia, the take-up of satellite broadband is very substantial. In addition, the USA and Australia have put in place central policies for broadband deployment, supported by centralized management of public funding, which have been instrumental in starting and accelerating take-up.

This is not the case of the European Union.

In fact, EU public funding that can be used to support the deployment of broadband infrastructures in areas hit by market failure, such as the ERDF and the EAFRD mentioned in §III, is allocated to regions and typically managed at regional (or even at sub-regional) level.

This is an appropriate level for most terrestrial-based deployments which are highly local processes (it implies right-of-way and digging permits, construction or lease of repeaters and local node sites, compliance with local town planning, coordination with other utilities, etc.) that are typically able to aggregate large numbers of end-users thus achieving a critical mass.

For satellite-based broadband, none of the above considerations holds.

While local PAs are instrumental in identifying unserved end user demand in their territories that are suited to satellite-based solutions, an approach to investments in satellite broadband coordinated at pan-European or at very least national level would certainly be more efficient and effective. It would also leverage the better technical and economic expertise and experience on the procurement of these solutions that is available at higher government levels.

VII. CENTRALLY-DESIGNED VOUCHER SCHEMES AS A SOLUTION

The necessity to accelerate broadband penetration in remote and rural areas of Europe, namely through the adoption of satellite solutions in public policies, calls for solutions able to reduce the barriers described in §IV.

To this end, SABER has drafted detailed guidelines recommending the implementation at regional level of centrally-designed voucher schemes to subsidize the one-off connection costs necessary to access broadband services in areas where there is evidence that demand exists and that connection charges are a genuine barrier to take-up.

Based on key regional experiences of publicly-supported satellite deployment in unserved regions, e.g. in the UK, France and Spain, the SABER partners have identified voucher schemes as the most simple, efficient, effective, and quickest-to-launch solution to subsidize the purchase and installation of the user ground equipment (a cost of a few hundred Euros per household).

The backbone infrastructure already exists for satellite broadband networks in the form of satellites and the related terrestrial infrastructures financed by private investment. Therefore the voucher schemes are demand-oriented public interventions (compared to the supply-side interventions in terrestrial networks, which are intended to improve broadband coverage through the financial support for the deployment of backhaul infrastructures (see Fig. 6)).

Here are the main steps to implement a voucher scheme:

- A central PA (at European or national level) designs an overarching scheme;
- The regional PA identifies the end users eligible for satellite broadband…
- …and launches a call-off procedure to establish an open register of satellite Internet Service Providers (ISP) which respects a minimum quality of service (in terms of service speed, volume allowance, etc.).
- Each eligible user selects an ISP from the register and gets an anti-fraud voucher from the regional PA.
- The ISP supplies, installs, activates and tests the terminal at the user's premises.
- The user pays the ISP with the voucher.
- Finally, the supplier gets the voucher reimbursement from the local PA.

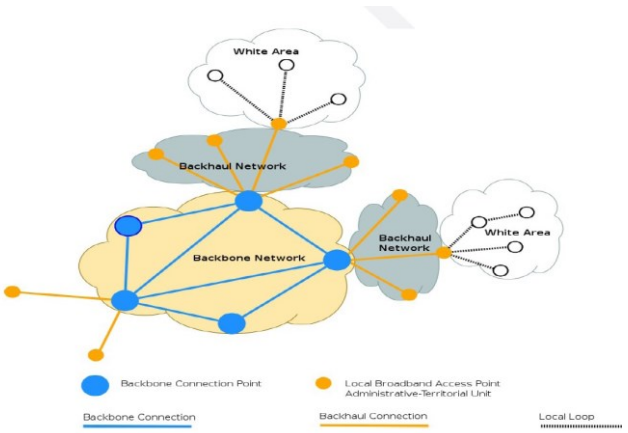

Fig. 6. Broadband infrastructure reference model

The voucher schemes proposed by SABER are designed to work in conformity with the rules for the use of ERDF and EAFRD, and are open to adapt / insert / specify local parameters as required by a regional PA.

In addition to being flexible (the overall financial contribution is proportional to the number of adopters) and simple to implement for PAs (they save the administrative cost and complexity of launching a conventional tender), the procedure works with the market, supports existing services and encourages maximum participation by all providers. It finally empowers the end users to whom the financial contribution is made available directly and is therefore demand rather than supply driven.

VIII. Conclusion and Further Work

The pace of broadband take-up in Europe is slow, especially in rural and remote areas, in spite of the valuable option provided by satellite broadband services, such as Tooway™, the consumer grade internet access at 20 Mbps delivered via the Eutelsat KA-SAT satellite.

A consortium triggered by Eutelsat, co-financed by the European Commission and made up of satellite operators, manufacturers and 22 European regions has been working under the leadership of CSI-Piemonte, a region of Italy, since November 2011 in the framework of the 'SAtellite Broadband for European Regions' (SABER) project. SABER assists public policy makers for accelerating take-up and achieving the objectives of the Digital Agenda for Europe (DAE), by leveraging the contribution of satellite broadband.

Among the recommendations in its best practice guidelines, is the adoption of simple, efficient and cost-effective voucher schemes to subsidize the purchase and installation of user ground equipment, in areas where these one-off costs are a genuine barrier to broadband take-up.

SABER also recommends that voucher schemes, which support existing user' demand and are open to competition, are implemented at local level on the basis of a common approach and methodology designed at EU / national level, so as to overcome the complexity due to the regional management of EU funds.

At present, SABER partners are focusing their attention on the 2014-2020 EU financial framework and on the DAE objective of 30 Mbps for all Europeans by 2020, with 50% at 100 Mbps.

The ability to provide 30 Mbps for all on consumer-grade equipment is just a matter of the manufacturing process. At the same time, European manufacturers are developing R&D activities for new generations of satellite able to provide 50-100 Mbps by 2020-22. Notwithstanding the satellite industry's commitment to support the 2020 objectives, SABER argues that public policies must continue to launch voucher schemes to support currently available satellite broadband services - even below 30 Mbps - as an immediate and significant step to improving penetration in those areas with poor or no terrestrial broadband connectivity.

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