Jan 24 2013

Internet convergence in action: is best effort internet already gone? Lessons from Norway

Blog Editor



There has been huge debate on whether the internet should remain as a network that does not differentiate between "levels" of content providers—something that is known as the Best Effort internet. Based on data from Norway, ***Hanne-Stine Hallingby****,* ***Silvia Elaluf-Calderwood*** *and* ***Gjermund Hartviksen*** *suggest that we may be already in the presence of a new type of internet.*

The conceptual framework for understanding the logical internet is based on the construction of a horizontal, layered architecture, which differentiates between physical, data link, network, transport, and application layers. This is different from the telecommunication networks model where a new service traditionally used to requiring new network architecture to be established. However, the digitalization of services and products offered over the telecom infrastructure allows us to observe an emergent phenomenon of increased vertical integration on the internet as well as the creation of further service specialization opportunities for telecom operators and users. This development and change in the way services are provided, leads to a new type of internet – an addition to the current *best effort internet* model.

In our study, we use a substantial proportion of Norwegian independent autonomous systems (AS) numbers that we classify according to size and type of services. Based on this analysis, we found four arch types along two dimensions (see Table 1 below).

	Hosting domains/websites for 3rd party	**NO Hosting**
End-user access	IAP and Hosting (Balanced ISP)	internet Access Provider (IAP) (Eyeball ISP)
NO End-user access	Hosting (Hosting ISP)	Content, application, service (CAS)

In the rows, we differentiate between those AS that provide internet access to end-users and those who do not. In the columns, we separate between AS providing hosting of domains, websites, etc. and the others that do not.

Based on our analysis of the data, we found that three of these arch types correspond to the broadly known as ISP types (the Eyeball, Balanced and Hosting ISP). In addition we have identified one arch type that neither provides access nor hosts anything but its own content; the Content, Application and Service (CAS) provider.

The four arch types were populated with about the same number of AS. A further look into the arch types reveals that they differ in many ways, e.g. customers, end-users, products and services, and revenue models. Despite the different challenges that all these arch types may face market-wise, they all share an interest in establishing revenue models that can carry the belonging costs. Most notably, they all share the risk of ending up carrying an unfair share of the internet costs: capacity,

quality, connection and hosting. A higher growth in the large IT industry and the stagnating telecommunications and publishing market are important underlying forces leading to changes and new risks in their market. Behind these dynamics is the increased demand for network capacity, especially due to the rise in video consumption. Indeed, this this is something that other research has described from available internet traffic data. One solution – forced on many traditional ISPs – has been to become significantly more cost efficient. However, this may not be a sustainable situation.

We argue that these new dynamics lead to (at least) two major groups of actors seeking to gain strategic advantage from the current internet traffic growth:

1. content providers and hosts;
2. IAPs that also may host content.

Content providers and hosts seek to have a highly reliable network access with a minimal set of traffic or transmission costs. One action is to acquire AS numbers and use settlement-free peering agreements for distribution of their traffic, which is possible in traffic exchange regimes rooted in symmetry, slowly becoming asymmetric. Internet access providers (IAPs), on the other hand, seek to take control over incoming traffic growth by hosting content within their own network. In doing so, they seek to rebalance traffic and create new revenue streams with content hosting and premium end-to-end connection on-net.

But this is not the whole picture either. We have found that in Norway, many internet and IT services are currently hosted locally—i.e. the delivery of these services to end-users is taken care of by local hosts in either of the two categories. The delivery takes form as the well-known retail relationship model, or a wholesale model which is a less described concept. Especially the retail model is exposed to quality of service (QoS) requirements. Thus, we argue that there will be a need for network QoS, as a result of the increased provisioning of mission critical software as a service. Even providing services based on best effort internet may require some assurance of network quality. As long as such quality requires local presence in some way, we may see more of the different forms of modularity in a local market – either as vertical integrated units or further specialization.

Overall, our preliminary findings support the hypothesis that the internet is becoming both more vertically integrated and converged, and more specialized or modularized.

We conclude that our type of research provides an insight into the internet through a descriptive analysis of the status in Norway. Our empirical data indicate the emergence of a different internet than generally assumed, and may serve as a meaningful contribution to discussion on both predictions and guidance for the way further. However this is just the beginning of a new internet era which requires further research in order to understand the relationships between the AS number holders and their partners.

Note: the findings of this research was founded by Telenor ASA and presented in the ITS Bangkok Conference in November 2012. The paper will soon be indexed at the public repository at Econstor. Full paper citation: Hallingby, Hanne-K, Hartviksen, Gjermund, Elaluf-Calderwood, S and Sørensen, C, “Convergence in action – a case study of the Norwegian internet”, Proceedings the The 19th ITS Biennial Conference 2012.

This article gives the views of the author, and not the position of LSE Network Economy Blog nor of the London School of Economics.

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About the authors

Hanne Kristine Hallingby – Telenor ASA

Ms Hallingby is Project Director for Telenor Research and Future Studies. She has worked in Telenor doing research and business and organizational development in the telecom and media industry for more than twenty years. Her research interests are empirical analyses of media practices, substitution, demand, and belonging business models and industrial structures. She holds a Master in Business and Economics, and a Master of Science in International Marketing and Strategy from BI – Norwegian Business School.

Silvia Elaluf-Calderwood – LSE

Dr Silvia Elaluf-Calderwood is a Research Fellow at the LSE Department of Management. She holds wide experience in the telecommunications industry in the UK and the Netherlands, and has a technical and managerial background in the Internet and Telecoms business.

Gjermund Hartviksen – Telenor ASA

Gjermund Hartviksen is Senior Research Scientist at Telenor Research and Future Studies. He has worked with different research projects within Telenor with an overall commercial objective to transform an incumbent telecom operator into a next generation telco. Gjermund holds a master degree in Computer Science from The University of Tromsø and a Master of Management form BI Norwegian Business School.

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