Chapter 15

Impact of Architecture on Governance:
Ipv6 and Internet Post–IP

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ABSTRACT

This paper presents the basics about network architecture and some of the current proposals for the future of the internet. There are two keys factors to understand the ongoing discussions: the definition of what is a Network usually depends of the industry you are coming from, while all of these kinds of networks are needed. The second key deals with two different kinds of values: the value of scarcity and the value of abundance: efficiency versus adaptability. This leads to new technology such as Cognitive Radio.

INTRODUCTION

To handle governance issues on networks, technical knowledge is less important than architecture. A better understanding for choosing between different architectures gives a clearer view about constraints, opportunities and governance orientation. Hopefully, this means that you do not have to be a technical expert to deal with governance. This paper presents the basics about network architecture and some of the current proposals for the future of the internet.

1ST ARCHITECTURAL CHOICE: WHAT IS A NETWORK?

When you ask an expert the question "what is a network?" the amount of various different replies that you may get is amazing. According to their culture and history, everybody gives a very different explanation.

Which Industry do you Come From?

Someone who comes from the media industry may see a network as one emitter broadcasting information to several receivers. A radio or TV network is based on this kind of architecture. This is also

the case for the architecture of a meeting, when a speaker presents a speech to an audience. But ask the same question to someone from a telecom operator and he may answer that a network is a way to connect one point to another. After the connection, the two terminals can use the whole new route, and exchange information. This kind of architecture is the one used for the telephone network, but also the one you use, during the break at the meeting, when you call someone and say: "hey john, I've got something for you". In this case, you ask John to "unconnect" any other discussion and to pay full attention to you. The third way to describe a network is the one given to us by the Information Technology industry. Everyone can send info to anyone. If you use this architecture, you don't have to connect before having a conversation with someone, but each time you need to state to whom the information is being addressed. This is the kind of architecture the Internet has – at least at its early days. Each packet of information has a source address and a destination address, just like in the postal service. Getting back to our meeting example, this is rather like a working group: everyone sits round the table. If someone speaks to one of the participants, anyone can listen in, and get what he needs. This is also the architecture of roads. All cars (similar to packets of information given in the previous example) use the same road. You don't need to block the whole road for just one car, but this also means that if there are too many cars, there will be a traffic jam.

There is a fourth architecture for networks that can be represented by the Electronic industry: any terminal can send an alert to a supervisor. Home automation works this way: aggregating information from everywhere to a central point. In our meeting example, this would mean that various people report to the boss on what they have been doing recently and the result (See Figure 1).

"Intelligence is at the Edge of the Network"

There are four ways then to make something communicate with another (a technical terminal, a human, someone at a meeting or… a protein in a cell):

1. One broadcaster sends information to everyone.
2. First of all, the network establishes a connection between two terminal points.
3. Everybody can communicate with each other, by simply indicating the destination each time.
4. Any terminal point can send information to a centralized destination.

In most cases, the central network is just a neutral infrastructure. Only the second example – the telecom architecture – gives greater importance to the network by blocking and unblocking routes to reorganize itself and give a full path to connected terminals. This is why Lawrence Lessig says, "Intelligence is at the edge of the network".

The Push and Pull Strategies

There is one further aspect. In all of theses architectures, the information may be proposed by the sender (the right term is "push") or asked by the destination ("pull"). For example if a speaker makes a speech to an audience, we have two possibilities: the speaker gives the information he planned to provide (push) or answers a specific question from the audience (pull). Of course, one speech could use both ways. Furthermore, a meeting may have formal presentations, reports from participants, feedback times and breaks.

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