AN ANALYSIS REPORT ON

Rise of Stupid Networks – David Isenberg

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INSPIRATION:

While walking through the list of the topics which were mentioned in the list of assignments to be done, and a google search of each of the to find out which would be an “interesting” topic to undertake an assignment write-up upon, we stumbled upon this very topic, whose very name itself was as mesmerising and attention seeking, and a further dig up into the matter drove home the idea that the particular article, published initially by a former AT&T employee Mr. David Isenberg in order to please the organisation, has all references and links to it broken (except for the countable one or two, which fuelled the content of this article), and this triggered our curiosity to determine what went wrong that this particular “stupid” concept was completely “isolated” (and why is it that the AT&Ts are still frowning over this).

AFTER ALL, WHAT ARE THESE STUPID NETWORKS?

It may seem quite a paradox that in a world where machines are getting smarter and smarter, the idea of a stupid network is just another humorous depiction or a coloured criticism of some aspects of the internet. While this faith is partially consistent with the actual idea, the main catch lies in the generality of the entity.

It seems from the article that the “stupidity” in the “stupid networks” arises from the fact that the particular network consists of highly sophisticated end-points (which the author names as “intelligent”), the underlying network connection is still primitive and obsolete (termed “dumb”). Another way of looking at it refers to the transition of the communication paradigm from traditional telephonic based circuit switched services mainly focussed over voice transfer to a much more broader packet based internet, as seen through the perspective of a telephonic network giant’s engineer. This idea becomes much clear with a comparative description of the assumptions behind the traditional telephonic networks, and the transitions in the contemporary usage deeming these assumptions obsolete, and the spark of the idea of stupid networks, as given below.

Assumptions behind the telephonic network services:

The basic assumptions behind the rise of the telephonic companies, called together as the “*Classic Value Proposition”* can be noted down as

- *Scarcity:* Traditional systems consider that infrastructure which are scarce and expensive both financially and in terms of physical feasibility, should be
  a) Shared by a group of service providers or operators.
  b) Used in majority to provide Premium Services and lesser regular services.
- *Traffic:* Since the idea of transfer of data from one computational machine to another was still in the infancy stage in comparison to the widespread popularity of

voice communication, it was considered without any misinterpretation that “human voice” generates most of the traffic.

- *Technology:* Due to a wide gained popularity of circuit switched communication and a slow growth in the popularity of the Packet switched and other technologies then, it was thought that any communication can be achieved via circuit switching alone, thus deeming it as a “sole communication technology which matters”
- *Control:* In a time when the control was more in the hands of the service providers rather than the customers of the services, and the lack of idea of “user participation” and “customisation”, it was fairly believed that the network will be in the unanimous control of the telephone company.

However, there are a lot of reasons behind why these assumptions need to be either discarded, or remoulded for flexibility, a few quotable ones being

- A statistical reduction in the prices of the hardware, and a parallel popularity of trial or “use and throw” services as against the premium services, deeming the first assumption of scarce and expensive infrastructure invalid or diminishing in its truthfulness.
- A great increase in the “volume” and “variety” of non-vocal data traffic in the network, which is slowly catching up with the volume of “human voice” traffic, and the lack of optimisation of the network to handle this volume and variety.
- A shift of communication means towards Internet, Ethernet and Television based communication, which are
  a) Not based on the telephone network architecture
  b) Moving towards the simpler packet switched communication.
  thus rendering the belief that the only mattering communication technology is that of circuit switching.
- Independence of the details of the network operator as in the case of the Internet, which is thus acting as a harbinger of delegating the network control toward the end-user, and thus shifting from a centralised approach to what is known as a distributed approach.

This stimulated the growth of the idea of a network, which was more focussed on providing better and abstracted customer service, and inspired to the growth of a “stupid” network, with the following remarkable characteristics.

- A dumb transport in the middle and intelligent user-controlled endpoints.
- Design guided by plenty, not scarcity,
- Transport guided by the needs of the data, and not the design assumptions of the network.

WHY THE TRADITIONAL PHONE CALLS MAY NOT WORK FOR THE INTERNET TODAY? : THE IDEA OF COMPUTERS BEING SCARCE RESOURCES DECADES AGO

Reasons behind avoiding telephonic networks today

1) *The cost of using telephone network*

At the advent of the telephonic industry, it was definitely the case that the telephone calls then were expensive. The major reason was that the telephone calls then needed to be switched and multiplexed at the telephone exchange near the sender and the receiver and possibly even in the intermediate route, and since computer technologies were not that advanced then, it is clear that it had to be done manually. This also caused loss of reliability and excessive delay.

However with the advent of automation introduced with the use of computers in the telephone industry, it became very reliable cheap and easy to handle telephone calls.

Nevertheless, computers then were costly and scarce resources, especially since the memory components were costly resources.

2) *The applicability of Moore's law*

However, today electronic components have become much more inexpensive and plain, and clearly it is the case that Moore's law about the halving of the transistor size every 18 months holds to a large extent (no doubt why Moore later became the founding partner of Intel), and this clearly means that the computer industry can use these as against analogue telephonic mechanisms.

3) *Scalability misassumptions in the Telephone networks (as applied to the Internet)*

Telephonic networks have been engineered with a lot of assumptions, a few being

- Fixed and minimal size of the telephone calls
- Small number of call reattempts
- Peak Traffic of a telephonic network is just a fraction of the total allotted resources

However it is clear that these assumptions do not tend to remain constant and may episodically change, and hence the existing networks based on these assumptions may not scale well and adapt to these changes (thus even telephones being switched to Internet technology of VoIP)

“INTELLIGENCE” IN THE TELEPHONE CALLS:

As digital technologies began emerging in the market, telephone companies also thought of adapting the same technology in their business. The advent of automation and digitisation allowed quick and reliable communication among digital switches, databases (Service Control Points) and signal processing systems (Intelligent Peripherals) and they were able to communicate among each other by extending the telephone network's control protocol (SS7).

Then emerged the concept of “Intelligent Network Services”. As described earlier, these services were mainly for the concept of “vendor happiness”, rather than customer centralism. Even the equipment designed then satisfied similar requirement base, and clearly these had a limited interface and centred only around call completion, billing and automation and no other requirements.

Some examples of “Intelligent Network Services” were,

- Routing calls to different numbers than the one that the caller originally dialled like in the case of emergency numbers.
- Giving caller choices before the call is completed
- Saying, "Calling Card, Collect, Third-Party, or Operator" to control payment options.
- Verifying that the calling card number is valid in "real time"
- Supplying calling party numbers directly to customers for database lookup

HOW ARE THE CUSTOMERS BENEFITTING FROM THIS “INS”:

1) *The model at the Traditional Telephonic Companies – more restricted:*

It is really a great paradox that with the aim of a “vendor benefit” network, how is the case that the customers get to be happy, and why is it the case that the customers are still using the telephonic services. It even is not the case that alternatives cease to exist. This gives a hint that some service is being given by the telephones by which people are still sticking to it.

Generally when a particular service is to be introduced in the set of services being provided by a particular company, the following steps occur in the form of an elimination sequence, namely

- Plans with emerging pay-offs get considered for the sake of a business case seeking approval
- Next stage is Development
- Operations
- Administration
- Maintenance
- Plan Provisioning
- Implementation, which may take at least a decade.

2) The model of the Internet – more flexible:

But in this aspect, the internet has a huge upper hand, especially in deploying the feature required in the market at this point in time. It believes in a model of what is known as “do or die” approach.

When a feature demand arises in the market, what happen is that some developers can make an application this service (with least infrastructure), and this if, successful, gets sold and immediately into the market, or else gets withdrawn, and a new idea takes its place. The fundamental backbone being peer competition helps in accelerating the process of neo-feature introduction.

HOW INTERNET SHIFTS FOCUS TO THE END USER:

A few main features of the internet have made sure that the end-user participation is guaranteed, and thus giving the Internet an upper hand over the “*stupid”* network provider based network.

- *Abstraction:*

  The internet hides the details of the underlying technology parameters of the connection, and the user need not bother if his particular demand will be catered for use or not.

  This is not the case of the traditional telephonic network, where for instance the user needs to know the bit-rate at which he/she will have to transmit the message, the encoding mechanism which is suitable for both the parties, and so on.

- *Heterogeneity:*

  The internet has a specific featuring in linking together completely different technologies, and this is what the original definition is, “the network of networks”.

  However such a feature is seldom offered by the telephone provider at a very nominal cost

- *Elasticity:*

  The internet is designed in such a way that the user can be flexible in his/her usage. The usage of a particular service or the introduction of a newer service can be done at will and wish, without letting the intermediate operators or the internet service provider really bother about this.

  However, due to the existence of intermediate network operators, such a feature seems highly impossible in the case of traditional circuit switched telephony.

WHY THE DIGITAL WORLD IS EASIER?

Decades of experiments have proved the fact that digital communication is much more convenient and handy in the current scenario of networks, in comparison to the case of the analogue signal based networks.

One major aspect where the digital world as seen in the internet is better is in the context of updating. It is clear that in order to improve an analogue signal, the primary requirement is the rise of the sampling rate. This sampling rate can be improved but the update needs to be transported to every device, and for the contemporary devices this is a pain.

Further improvement could be done in this aspect was the improvement of bass(from 100 to 300 cycles per second) but this again created the problem that the intelligent agents deployed for the intelligent network services, used to create a lot of trouble in this aspect.

However, one biggest disadvantage to the digital network in this aspect is that you just supply bits at the sender and then pick these up at the receiver and no matter whatever be the technology and the updating, this atomic fundamental will never change.

A DISTRIBUTED APPROACH WITH WIDER NECK:

Current trends of the internet of a shift from an earlier decentralised approach or a centralised to a distributed approach has made a drastic impact on the usage of internet even for the purposes of telephony. With better connectivity technologies at the Internet Physical layer, the bottleneck problems too have been diminishing to a large extent.

A STUPID NETWORK WITH A BOSSY DATA:

As compared to the traditional telephone network based on a circuit switched approach , the current internet network is based on two awesome observations, namely

- *The Intermediate Network is made stupid*

  The idea is that as compared to the traditional circuit switched network where the intermediate channel had to be smart enough to make decisions on what to route and how to route, and thus ensuring a lesser and a minimal responsibility on the end users, the current Network has shifted all its focus on the ends, thus making them intelligent. Ultimately the network is just to deliver and pass whatever bits has been put into it, like a “stupid” plain pipe (thus stupid networks)

- *Data is the boss, not the network:*

  The telephonic system is based on the assumption that the ends or the intermediate routers would decide the path characteristics and the addresses of the information, and

the data will have no clue about it (like in a telephone network, you just send the signal, without even putting the address in the signal, and the other end receives it.)
However it would seem humorous if we make this “stupid” network in the current internet model, the boss.
In fact data being packet switched, it contains the routing information, and this clearly makes the data the boss over the network, thus commanding the network where it needs to go, by the use of routers and so on.
In general, the data in the internet is aware of where it needs to go, unlike telephonic network, where data is like the water in the pipe.

HOW IS DATA VARIETY HANDLED?

Handling of data of different types, or heterogeneity was one really important characteristic of the current internet, but how does it achieve it is a big question. After all, we claimed that the network is stupid, isn’t it?
Data of different types gets handled basically by two features attributed to the current day stupid network, namely

- *Network as a servant:*

The core idea behind this is that the network is stupid, and hence data is the one bosses it. Whatever requirements the data gives to the network, the stupid network will provide the same to the network. After all, its only task is to carry the bits. If it is financial data, the data will have better reliability with compromised delay, compromised reliability for lesser delay as in the media transfer, and so on. And this is achieved by the use of different end-to-end protocols.

- *Send whatever you want, whenever you want:*

This means to say that, in the internet, the user has the flexibility to send whichever type to data in any number at any time and to anyone, without bothering how the network will handle it, since the end processes and not the network will handle it.

HOW ARE THE TELEPHONY COMPANIES REACTING TO THIS?

It can be seen that with such emerging technologies, the telephonic companies will face a grave threat of losing position and market revenue. Accordingly they came up with a lot of interesting issues, which tried keeping them still in place, but for how long is still a big question.

- Call for banning of internet technology
- Call of imposing heavy federal charges on the Internet usage.

However due to the presence of a few farsighted entrepreneurs, it has always been the case that due to their lack of interest in maintaining the traditional telephony assumptions discussed in section 1, and have made sure that these new technologies of

the internet could see its dawn. Further some premier educational institutes in the west have also kept the internet wheel spinning, with new ideas like that of Internet 2 and IPv6 sprawling into the industry.

In a reaction to this, telephone companies began to massively advertise and propagate the use of the Intelligent Network Services, and some companies adhered to these services since they appeared more promising. But it will not be late if they realise that the stupid network can be much more promising to them.

WHAT MIGHT HAPPEN IN THE FUTURE? THE NEW VALUE PROPOSITION:

With so much trends in emergence of the "deliver the bits" method, and the savant efforts of the telephony sector to keep itself in the market at least if not grow, it seems like a big puzzle what might perhaps be the future of the Internet. Same has been the case with many other aspects of information technology, and it has been seen that with an advancement in the hardware, the focus is now shifting to the software, and this is how companies like Microsoft, Google and so on have an upper hand, as compared to the hardware contemporaries like Intel, AMD and so on(and this explains why Bill Gates parcelled home so much money !).
However the following assertions based on observations seem to be true and to be the guiding forces of the future Internet-Telephone tiff.

- *Emergence of a new technology doesn't mean a sudden fall in the older technologies:*
  It is always the trend that when a new technology arrives in the market, the new technology gets more popular than the older technologies, but the older technology doesn't get obsolete immediately. If that was the case, we would not have seen the trains existent today, nor we would still have loads of hard copy books in this PDF sage and so on.
- *Some Smart Companies may themselves cannibalize their older products after learning from their mistakes:*
  There are a lot of companies which do this Sony, Boeing and Intel being the noteworthy few. Most of these companies have developed products with unobserved flaws, and with observation, they themselves have modified and put newer products in the market, thus eliminating competition.
  But this seems unlikely in the restrained environment of telephone companies.
- *Shift of focus on the newer technology:*
  Some companies, especially telephone companies, should and actually do this, where they find that instead of using their own technologies and then losing revenue, it would be a more preferable trend to adapt to the newer technology and then propagate the same. It would not be long when we will see the telephone companies actually propagating stupid networks(and some like Vodafone etc. have already started this)

LONGEVITY VERSUS PROFIT:

Arie deGeus, in his master work, "The Living Company" (Harvard, Boston, 1997), based on his observations of a few companies, suggested that two behaviours are noteworthy among the companies

- *Struggle for profit:*
  In this, the primary focus of the company is to increase its profits, and in these cases the lifetime of the company is short, since the employees here will be looked at as resources, and may be downsized at will and wish.
  Average age of such companies was found to be 27 years

- *Struggle for longevity:*
  In this, with a prima facia focus lying in managing and surviving in the changes of the business climate, with no much focus on profit (c'mon some focus should be there to survive), these companies have a longer lifetime, since here the employees are actually made to be a part of a larger cohesive work community.
  Average age of these companies is about 40 years.

CONCLUSION:

In short, whatever we discover to be the new Stupid Network value proposition, a working hypothesis is that it will be based on intelligent end user devices, intelligent customers, employees whose intelligence is valued as corporate assets, and companies that can learn.

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