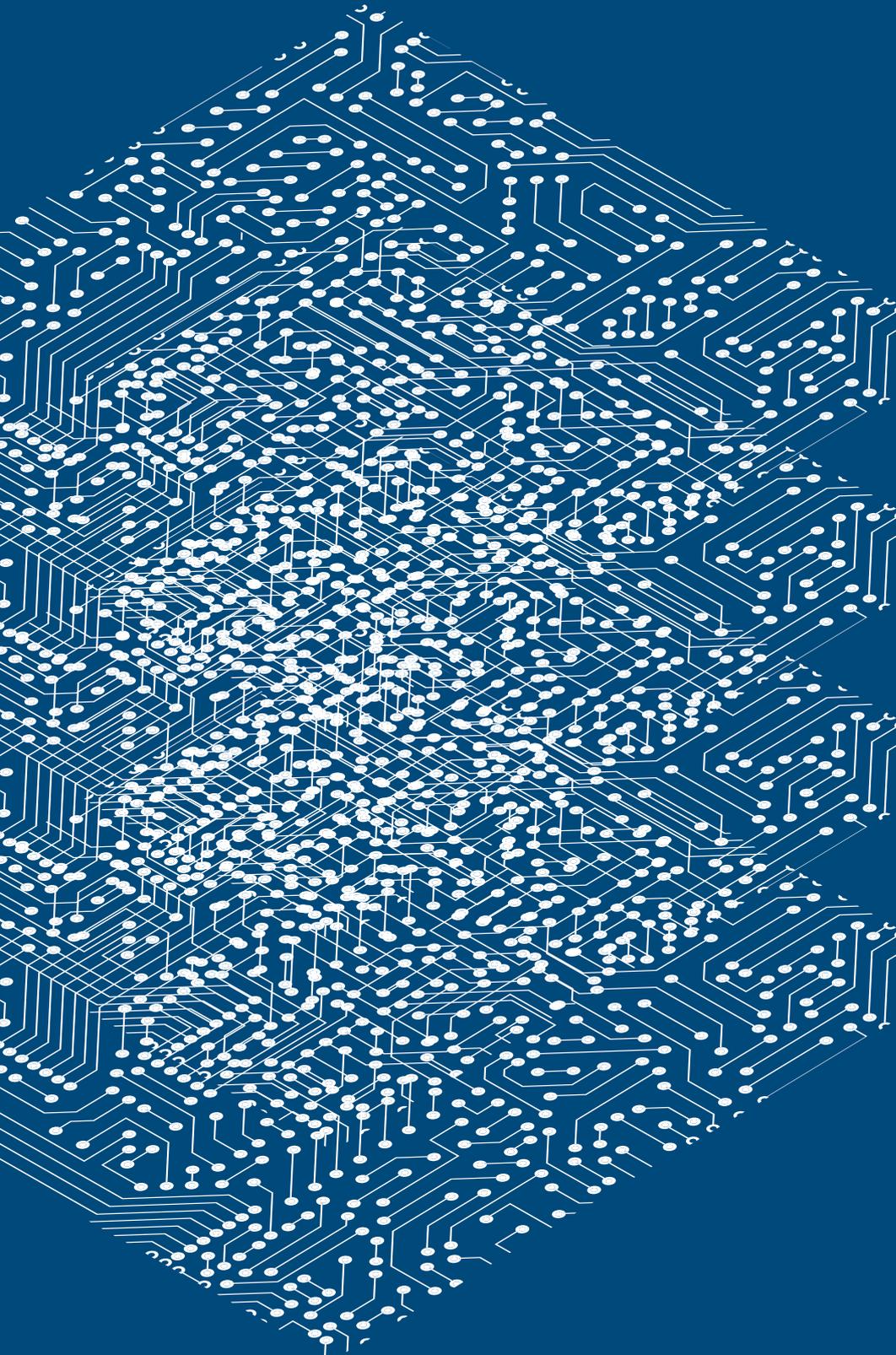


# What Exactly is SDN?

And why would I want it for my business?



WHITEPAPER

# Who Knows What SDN is?

A recently undertaken survey by Exponential-e, polling its wider audience of UK IT and business leaders revealed that 86% of those surveyed felt they did not really know what SDN was. Is it any wonder when there are so many conflicting opinions from the various tech companies all vying for our IT pounds? Some would have you believe it's a replacement for your Network control system. To others it's a software layer that runs on top of your Network. For the costliest it's a totally new type of Network built on new equipment (which of course you need to buy). The reality is both of these things, and none of them.

To begin we need to understand why software defined Networking is emerging. As Networks have become increasingly complex, they've also become increasingly hard to manage. In the same recent survey over 25% of those polled indicated that they were not getting the service they required from their Network service providers; and 21% cited problems with their internal IT resulting from a lack of "self-control" over their own Networks; obviously compounded by the fact that the service providers controlling their Networks aren't giving them the service they need. The problem with Networks, is people!

## Contents

Who Knows What SDN is?	2
The Evolution of the Network	3
Points of Demarcation	4
Networking in Layers	5
So Back to the Question: What is SDN?	6
What's in it for Me?	7
Conclusions	8

# The Evolution of the Network

86%

of those surveyed felt they **did not** really know what SDN was.

So how did we get to this place where managing a Network is such a problem? As it turns out, Networks today are infinitely more complex than only a few years ago. Where we used to have just a few connected bits of computer equipment, today's Networks are a web of wired and wireless connections with traffic moving in every conceivable direction and changing constantly.

*“Networks today are infinitely more complex than only a few years ago”*

The founding principal of the Internet was always that the complexity belonged at the edge, in the end devices themselves, not in the Network. Unfortunately, security concerns, manageability and the ever changing nature of how we expect Networks to work has led to a creeping complexity in our Networks cores. It's this complexity that we seek to eliminate through SDN.

Previous Network Model Example

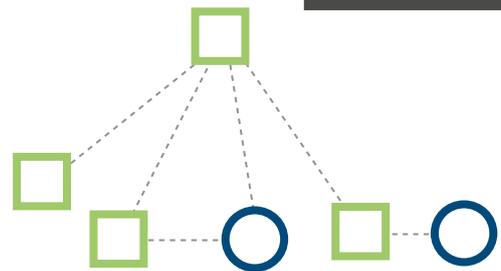


Figure 1

Today's Network Model Example

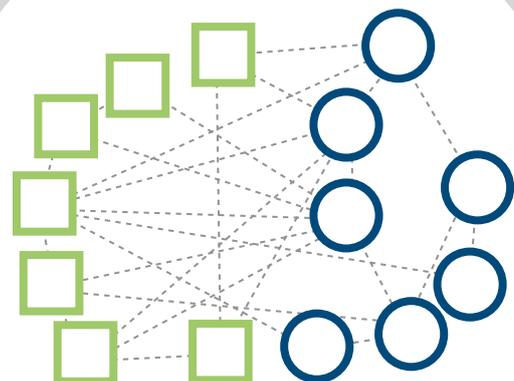


Figure 2

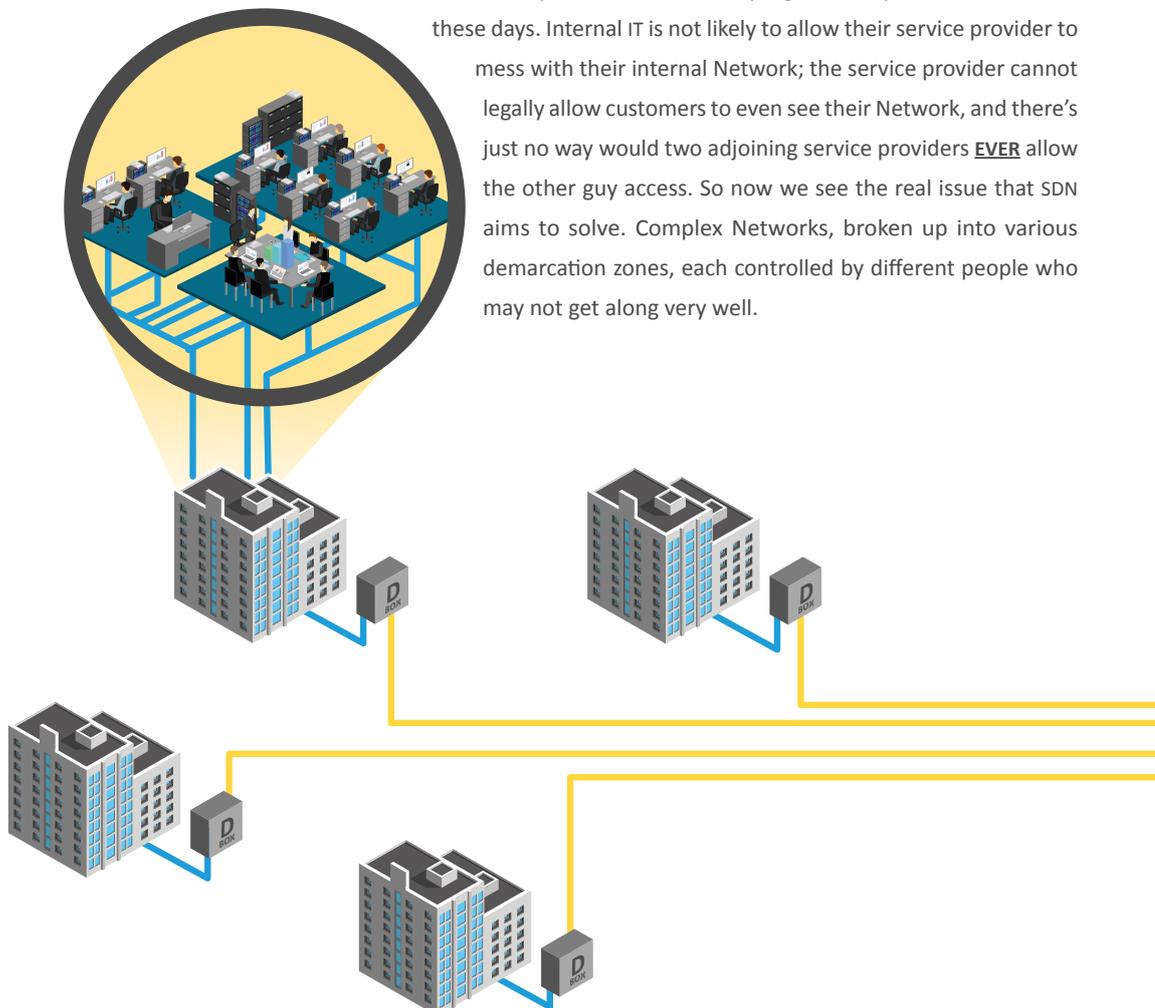
# Points of Demarcation

Unsurprisingly one of the biggest advocates of SDN technology is the Network service providers. Why is this not surprising? Recall the 25% dissatisfied with the service level of their service provider? SDN means that the service provider can provide less service while also providing better service. How's that possible? Well if the human element of making changes to the Network is eliminated, and replaced with software, it's a very small thing indeed for access and control of that software to be placed in the hands of the end-user, thus removing the need for the service provider to manually perform any adds / moves / changes, and thereby eliminating the problem of unsatisfied customers. If only it were that simple.

To understand this aspect of how SDN works, it's important to first understand the concept of "demarcation".

A demarcation point is a specific point along a Network (a path that Network traffic may follow) where the control, that is the ability to change the configuration of the Network, passes from one entity to another. Remember our problem with people? Because all of the devices along a Network need to be programmed by people, we just

can't have one person who's able to program every device end-to-end these days. Internal IT is not likely to allow their service provider to mess with their internal Network; the service provider cannot legally allow customers to even see their Network, and there's just no way would two adjoining service providers **EVER** allow the other guy access. So now we see the real issue that SDN aims to solve. Complex Networks, broken up into various demarcation zones, each controlled by different people who may not get along very well.



# Networking in Layers



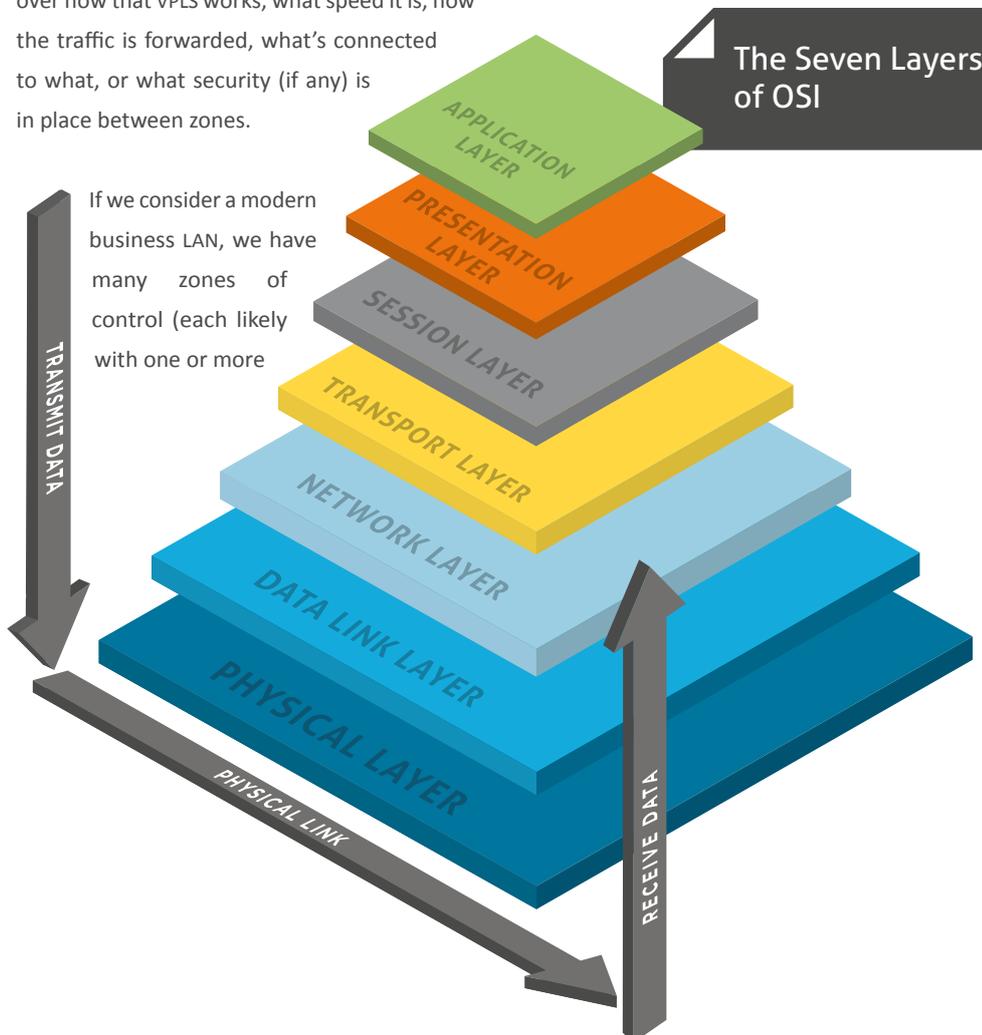
The good thing about all of our problems with complex Networks, is that these complex Networks are built on a fantastic and brilliant piece of work called the OSI model or “Open Systems Interconnection Model”. What this model provides, at least in principal, is the ability for end-to-end communications to happen at each of seven layers without really understanding what’s happening at the layers below. We see this already working today in many respects. I can for example have a Skype or Facetime phone call across the Internet, with some reasonable assurance of privacy, even though I do not own or control hardly any of the Networks between my PC and the PC of the person I’m speaking with.

What this means for SDN is that it is at least possible for me to build and control a “Network” while allowing other people to deliver some of the underlying elements; such as the fibre buried in the streets and the large service provider switches and routers that make up the Internet. In some very simple terms, we do this today with VPNs or “Virtual Private Networks”. A VPN already allows me to connect together my local Networks in two locations, across someone else’s Network yet having it appear as though I’m in total control and the Network is directly happening from end-to-end, LAN to LAN. Of course VPNs are very complex, require costly performance robbing encryption, and are generally difficult to maintain and nearly impossible to change quickly or without disruption. Again we have solid reason why we would

want to move to SDN... no more need of VPNs! You see what’s happened with VPN technology is that it rides on-top of the Network in a way where the underlying Network does not know what’s actually travelling across, to / from where, or why. The first step to resolve this was for service providers to implement their own virtual private LAN services (or VPLS) where the VPN is not required, but then the end users have no control over how that VPLS works, what speed it is, how the traffic is forwarded, what’s connected to what, or what security (if any) is in place between zones.

demarcation points). Some of the zones would be inside IT’s control, others would be with hosting providers, Network providers or Cloud providers.

SDN aims to give us a way to run a Network directly on top of each zone, but without really hiding what we’re doing from the Network devices underneath, the way a VPN would. We want to control the Network, or as the name implies define it without actually owning it.



# So Back to the Question: What is SDN?

## Centralised Control

Instead of each Network device deciding how to forward traffic, use a central “brain” to make those decisions with some knowledge of the end-to-end goal.

## Open Networking

Instead of proprietary remote control technologies, use a standard agreed open framework to allow for Network device control through software instead of people.

## Resource Virtualisation

Stop our Networks being defined by how the cables are connected and just like virtual servers, be able to create Networks as we imagine them with a click of a button.

## Function Virtualisation

While we’re creating our virtual Network we need to create virtual routers, Firewalls or load-balancers and not be limited by what’s physically available in the Network.

By combining together centralised control, with open control technology (software), the ability to create virtual Networks and then to populate those virtual Networks with virtual Network functions, we can begin to realise our dream of defining our Networks in software. The key is for the underlying technology to support at least some of these four tenets for us to really get the most out of SDN.

# What's in it for Me?

Now that we've got some understanding of why SDN has come about, and what exactly SDN is, the real question is: "What's in it for me?"

If you're a service provider the answer's fairly obvious. That's why every service provider is clamouring to get on the SDN band-wagon. For them it means less time spent configuring, updating, managing, connecting, touching and everything else they do to their Network. It's a brilliant cost and time saving move that goes light-years beyond just automation; it actually changes the very nature of their business!

If you're a user, then what? Well in truth, SDN solves only some of your problems, but it is a good start!

What SDN will not do is provide a panacea for unlimited flexibility. Network devices are not servers. To achieve the performance they need to deliver today, they are built on a raft of highly specialised hardware. This means that you'll always have some limitations on what tasks any given Network device can perform, and further restrictions on what tasks it can perform well. We see examples in things like Firewalls today. The amount of computing resources required to run even a 10Gbps Firewall is enormous, yet the high-end hardware based Firewall appliances can easily run up to a terabit (1024Gbps) of fully protected traffic. Don't think for a minute that SDN will eliminate Network hardware!

SDN will also not provide you with a smooth evolution. Most of the SDN technologies in play today will require some amount of upgrading. There's a path for each user, however the path

will vary. Working closely with your service provider to agree on an SDN strategy is a must!

Lastly, SDN will not "fix" the issue of end-user service experience. SDN provides the tools, but not the solution. In the same way that virtualising your servers did not instantly make them perform better, the same is true for SDN. Moving your Network to SDN will not solve your Network problems, but it will make solving them easier!

Going back to the survey let's address each challenge and see how SDN applies:

## Escalating software and hardware costs:

- SDN means that hardware can be utilised to a much higher level, just as with server virtualisation. Because it doesn't need to be configured for a single purpose, it can be used to capacity.
- SDN means that hardware appliances are more flexible and multi-purpose rather than single-use; again you're able to get more from them.

## Poor customer service from service providers:

- SDN means that you're in control of your services, your service provider is simply the plumbing underneath. More self-serve means less waiting for service.

## Lack of internal control over the Network:

- With SDN, you're in control end-to-end. The control is also much more policy and business rules driven, so it can automatically heal, adjust and adapt based on rules you define.

## Infrastructure unable to cope with growth:

- With SDN capacity can be reallocated and shared much more effectively. Just as with server virtualisation, you can shift Network workload around to ensure that users are getting the best quality of experience; purposely restricting or degrading service for applications that don't matter as much and getting so much more out of the Network you have.

*“SDN means that hardware can be utilised to a much higher level, just as with server virtualisation.”*

# Conclusion

When server virtualisation first arrived there were many who questioned its benefits. It did not make servers faster, or cheaper or instantly save IT money. It required new skills, new tools and new processes. A few years on there can be no question that maintaining even a small server estate is made almost infinitely easier through virtualisation. No more having to physically shuffle media around, fight with failing hardware to recover from outages, or constantly lay hands on physical machines.

SDN will see the same introduction. First will come doubt, then frustration, and finally freedom! No more command line configuring of the Network. No more late night scheduled maintenance windows. No more capacity management quagmires. To be sure, every business who has any amount of IT beyond a PC will gain tremendous advantages in agility, efficiency and reliability through adopting SDN. It is and will remain an evolution, not something you can buy and deploy. It will take time to transition, and it will require new skills, new software and new equipment. In the end it will virtualise the final frontier of our connected lives, meshing together with virtual servers, Data Centres, desktops and applications to allow us all to create our IT landscape through software, from the comfort of our desk – wherever that may be.

*“Meshing together with virtual servers, Data Centres, desktops and applications to allow us all to create our IT landscape through software, from the comfort of our desk – wherever that may be!”*

## How can Exponential-e help you?

### Connectivity:

Our privately owned Network is at the core of everything that we do. From offering you uncontended Smart Business Internet to managing your company's Wide Area Network, you can rely on Exponential-e to provide you with a reliable and low-latency backbone to your IT estate - with the added bonus of a single end-to-end SLA.

[www.exponential-e.com/connectivity](http://www.exponential-e.com/connectivity)

### Cloud:

Whether you are a small, medium or large sized company we have a Cloud solution to suit. Whether you are looking to implement Desktop-as-a-Service (DaaS) or require Data Centre Connectivity, our solutions are designed around your company's individual needs. With our Private Cloud operating behind your Firewall, your data does not transcend the public Internet - negating the risk of external security or privacy concerns.

[www.exponential-e.com/cloud](http://www.exponential-e.com/cloud)



Exponential-e Ltd  
100 Leman Street, London E1 8EU



Telephone  
+44 (0) 845 470 4001



Visit the website  
[www.exponential-e.com](http://www.exponential-e.com)



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