# IT'S TIME TO MAKE THE SWITCH TO SOFTWARE DEFINED NETWORKING

How SDN can help Enterprises, Service Providers and Equipment Manufacturers build Networks that are both business ready and ready for business

# ABSTRACT

## In a software defined age your Net-worth is linked to your Network

Networking is undergoing a sea change in order to deal with the demands of an ecosystem that is increasingly connected and constantly hungry. The idea of "Software Defined X" has emerged from the shadows to occupy center stage and has attracted significant interest and conjecture while a couple of new acronyms have popped up all over the networking landscape.

SDN (Software Defined Networking) and NFV (Network Function Virtualization) have captured people's attention and are increasingly redefining the way networks are built and managed for a world that is modern, connected and always switched on.

In an increasingly competitive global landscape, where innovation and creation of new business models isn't restricted to companies with scale, it becomes imperative to break down all the impediments to market agility and business advantage. With the window of opportunity for responding to market disruptions becoming smaller by the day, technology is not just a key enabler. In fact, it is a trump card in many cases, especially if organizations are looking to dominate an existing market or create a completely new one.

However, the luxury of time is something that few can afford as what might seem to be a ripe market opportunity today can disappear into thin air if not acted upon urgently. Networks have always been the connecting highways that have ensured agility and flexibility – two attributes that are highly critical to thrive in today's hyper competitive business environment.

Unfortunately, traditional networks are increasingly coming under fire as more and more instances of network outages and suboptimal performance tend to become commonplace. It is now imperative for networking to take a generational leap forward that is essential to overcoming the limitations of a dated infrastructure that is simply not built to cater to the demands of a disruptive marketspace.

While Computing and Storage are two areas that have progressed by leaps and bounds from tapping into the plethora of benefits offered by virtualization, the same cannot be said about Networking. If an organization has to truly reap the rewards of the many disruptive technologies available to them and capitalize on market opportunities, they would need to overcome the crippling limitations of traditional networks. And the answer to this is ensconced in three simple letters that signify a multitude of transformational technologies
 - S | D | N

# SOFTWARE DEFINED
# NETWORKING

## It's time to clear the air

Even though the term software defined networking has been around for a few years now, there still seems to be a lot of conjecture about what it truly means. Considering it started as an experiment in the hallowed halls of Stanford, SDN did attract some amount of skepticism as an overtly academic indulgence. Ironically, there are many differing opinions on the definition of software defined networks that could stoke the fires of many passionate conversations between the believers and the skeptics. However, a largely agreeable definition is one offered by the Open Networking Foundation:

"The aim of SDN is to provide open interfaces enabling development of software that can control the connectivity provided by a set of network resources and the flow of network traffic through them, along with possible inspection and modification of traffic that may be performed in the network."

To say that SDN merely divides opinions would be an understatement. It has people who swear by its disruptive and transformational attributes and it also has its fair share of detractors who are intent on discrediting it as a theoretical concept best confined to inspired white boarding sessions and little else.

However, if one were to make an attempt at demystifying the cloud of smoke surrounding SDN, it would be best to classify it as an overarching concept that contains multiple network technologies that work together to ensure the network, storage and compute are all flexible and agile to truly help businesses in making quantum leaps.

Although not a completely novel concept in its own right, SDN is centered around the idea of providing a centralized view of the network along with ensuring optimized management by creating distance between two crucial elements – the controlling plane and the forwarding plane.

To use an analogy, the control plane and forwarding plane are essentially the white and blue collars of the networking world. The control plane has a centralized view of the network and is able to make intelligent decisions while the forwarding plane is the taskforce that is assembled to do the leg-work and execute instructions on the ground. Each is as important as the other to ensure a smooth, seamless, agile and flexible networking experience that is cost optimized and easy to manage.

# DIFFERENCES BETWEEN
# TRADITIONAL AND SOFTWARE DEFINED
# NETWORKS

At this point it would be useful to spend some time in understanding the fundamental differences between Traditional and Software Defined Networks. At its simplest when packets are being sent through a traditional network and a path is clogged, there is an instant disconnection that causes disruption to business as usual and adversely affects productivity.

This happens because the rules in traditional networking are pre-defined and cannot be changed on the fly. Networks that are defined by software however allow for a switch to be connected to a controller, which makes the switch programmable and capable of understanding instructions in real time. This provides for great flexibility to re-route traffic through an alternate path in order to ensure continued connectivity. And few things are as prized in today's intense and bandwidth consuming business landscape as an always on network.

## Splitting the Difference

| Traditional Networking | Software Defined Networking |
|---|---|
| Hardware Dominated | Software Dominated |
| Configurable networks | Programmable Networks |
| Custom ASICs | Merchant Silicon- x86, general purpose CPUs |
| Distributed Control Plane | Centralized Control Plane |

# SOFTWARE DEFINED
# NETWORKS

## At the heart of Digital Disruption

According to recent surveys, any downtime caused by disruptions in a traditional data center can be obscenely expensive.
At its worst, a single event could cost up to $1 million or $11,000 per minute.

A major North American Telecommunications conglomerate suffered a massive nationwide network outage leaving their customers in the lurch. More than 17,000 official complaints were registered while thousands of customers attacked the company on Twitter.

As can be seen from the anecdotes provided above, an ill performing network can be a deal breaker leading to a significant loss of revenue while eroding an organization's brand equity. In addition, it severely hampers employee productivity and can be a proverbial albatross that gradually chokes business innovation.

At the very core of it, the multitude of technologies bundled as Software Defined Networking can help in providing the following benefits:

### Ease of Programmability through Automation

SDN offers the ability to manage network demands in real time by building programmability into the switches. This way the switches can intelligently understand and reroute traffic in order to ensure business continuity with minimal human involvement.

### A single centralized view of the Network

At a time when all the intricate pieces of a technology landscape need to work together seamlessly, SDN is able to provide a centralized view of the network that is software enabled, highly intelligent and most importantly vendor-agnostic.

### Scalability and Cost Optimization

By embracing a software defined network, an organization is able to curtail significant investments in hardware while at the same time driving down recurring operational expenditures by the orchestration of individual functions. There is also the built in capability to scale up or down as dictated by business demands.

### Increased Market Responsiveness

A software defined network along with new development methodologies like DevOps is critical in fueling agility and bolstering an organization's response to ripe market opportunities. It is a critical piece in ensuring that speed of deployment is in sync with the demands of business.

# THE SDN
# ADVANTAGE

A global leader in online payments recently made waves with the performance of their open source platform, which is able to handle more than 1 billion transactions a day on minimal infrastructure.

Using a Software Defined Networking approach they were able to dynamically scale, steer and prioritize traffic to deliver an optimized user experience.

### 1 Virtualization

Allows for the most effective use of network resources irrespective of where they are physically located or how they are organized.

### 2 Orchestration

Enables the control and management of thousands of devices with one command.

### 3 Programmability

Allows Addition of new features and altering traffic flows on the fly.

### 4 Dynamic Scaling

Flexibility to scale the network based on the demand

### 5 Easy Deployment

Simplifies the process and dramatically reduces the time needed to deploy the network.

### 6 Automation

Minimizing manual involvement significantly reduces the time and expenses in troubleshooting, policy enforcement and provisioning, re-provisioning and segmentation of resources.

### 7 Centralized Visibility

A single pane of view to configure, monitor and manage the network.

### 8 Performance

Optimize network device utilization through load balancing, capacity optimization and fast failure handling.

### 9 Multi-tenancy

A single software deployment enables tenants to have complete control over their addresses, topology, routing and security.
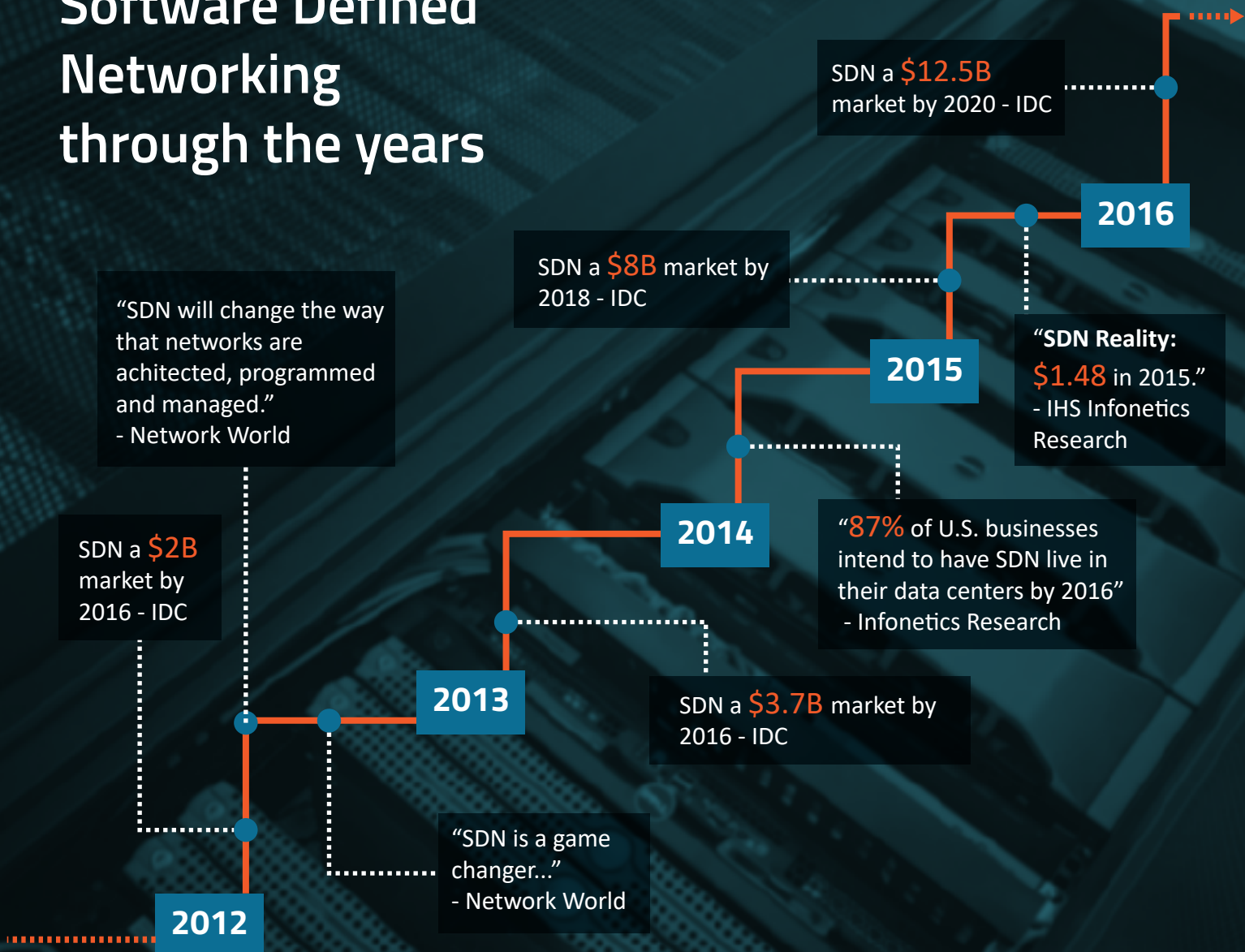
### 10 Service Integration

Load balancers, firewalls, Intrusion Detection Systems (IDS) are provisioned on demand and placed appropriately on the traffic path.

# THE SURGE OF
# SDN

## The proof is in the numbers

Software Defined Networking continues to gain major traction with each passing year and has become a regular fixture in the networking world. Even though it will continue to attract varying passionate views about its true potential, it is hard to ignore the numbers that narrate the story of a software defined uprising.

## Software Defined Networking through the years

SDN a $12.5B market by 2020 - IDC

**2016**

SDN a $8B market by 2018 - IDC

"**SDN Reality:** $1.48 in 2015." - IHS Infonetics Research

"SDN will change the way that networks are achitected, programmed and managed." - Network World

**2015**

SDN a $2B market by 2016 - IDC

**2014**

"87% of U.S. businesses intend to have SDN live in their data centers by 2016" - Infonetics Research

**2013**

SDN a $3.7B market by 2016 - IDC

"SDN is a game changer..." - Network World

**2012**

According to a recent report by Allied Market Research, Physical network infrastructure comprised of close to half the SDN market due to its appeal in minimizing the complexity of network management through SDN-enabled switches, routers, and other network devices, while consistently driving down capital costs and operational expenditures.

## 43%

It has also been found that Enterprises have taken to SDN in a major way contributing 43% of the global market last year followed by Telecommunications providers. The next big wave of growth is expected to come from the cloud service providers due to the rapid growth in the use of cloud computing services by various organizations.

## 22%

The other major industry to embrace SDN is Information Technology accounting for close to 22% share of the global market followed by the telecom industry, while consumer goods & retail is expected to drive the next level of growth.

## 10-11%

Given below is a rather interesting SDN adoption lifecycle put together by IXIA that showcases how SDN deployments will continue to be in the 10-11% range all the way up until 2017.

# SDN Adoption Lifecycle

2013
2014
2015
2016
2017

| Innovators 2.5% | Early Adopters 13.5% | Early Majority 34% | Late Majority 34% | Laggards 16% |
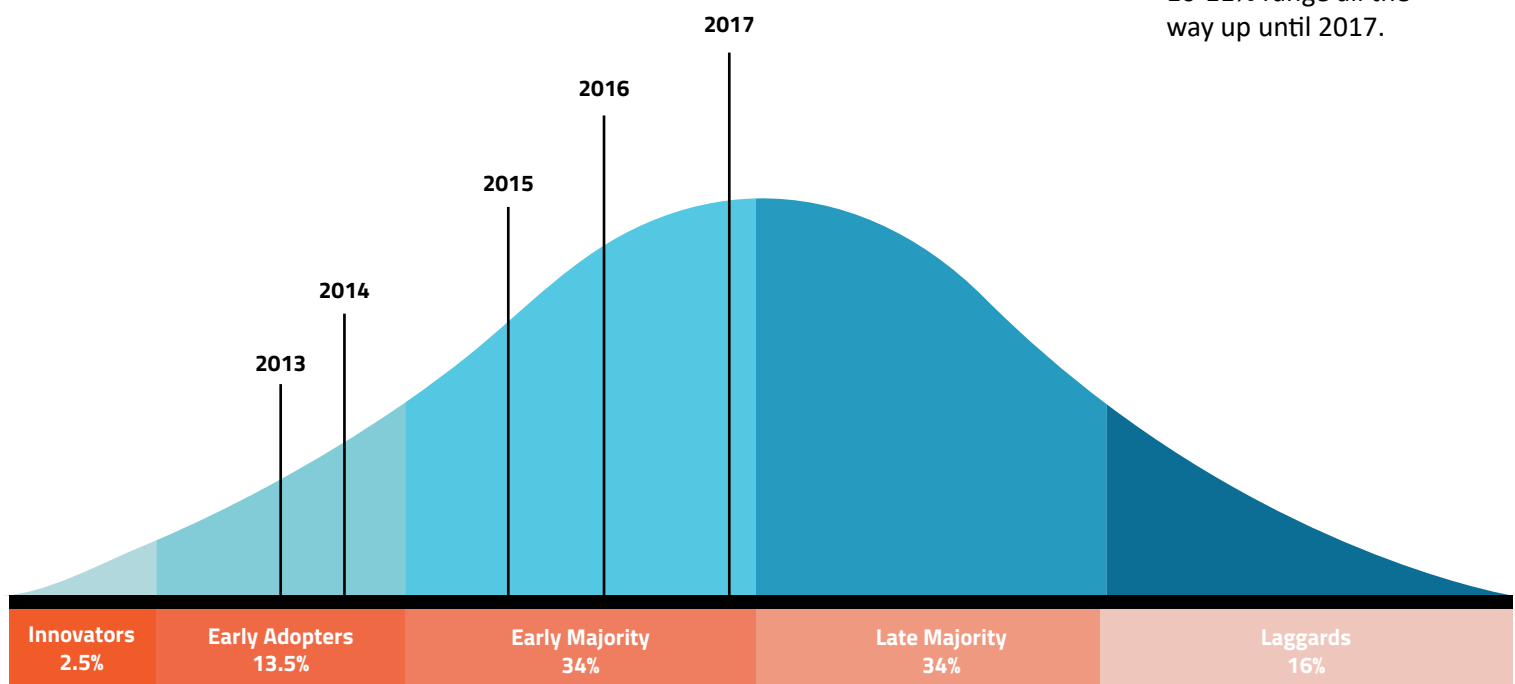
# Building
# Open SDN

The true potential of a Software Defined Network lies in its openness and ability to be unrestricted by proprietary platforms and pre-defined standards. In an open world where there are no more boundaries of geography or time zones, the need of the hour is an open network that is based on standards that are accepting, progressive and amenable to change. This is certainly true of SDN- as there are plenty of open standards and opensource projects accelerating its adoption.

In providing the freedom and flexibility to create your own setup, SDN is making inroads by overcoming the rigidity of traditional platforms. Gartner estimates that by mid-2017, open source software will be a part of mission-critical software in 95 % of global enterprises. To this end, Software-defined Networking (SDN) and Network Functions Virtualization (NFV) have a vast and thriving open source community, which is committed to nurturing projects that promote open and scalable networks.

Open standards like OpenFlow (ONF), OCP and Open source Projects like OpenStack, OpenDayLight (ODL), ONOS (ON. Lab), OPNFV, OPEN MANO, OpenvSwitch, CORD, FD.io, etc. are widely regarded as important building blocks instrumental in creating use cases, frameworks and opensource reference platforms that industry experts will collaboratively develop to foster the adoption of SDN and NFV.

In addition, organizations that go down the path of an open software defined network stand to benefit tremendously from not having a vendor lock in, avoiding heavy licensing fees and mitigating capital expenditures on hardware thus allowing them to innovate freely and focus their energies on responding to market opportunities.

# ADDRESSING THE CHALLENGES IN
# ADOPTING SDN

While SDN has tremendous potential to radically improve network performance, it also comes with its fair share of challenges. It is precisely for these reasons that detractors of SDN have had a field day in claiming it to be an academic concept with limited practical applicability. Let's take a look at some of these challenges:



## Lack of Support for SDN from Network Equipment Manufacturers – NEMs would ideally not like to cede control of the intelligence of their devices. However, the very concept of SDN requires switches to be devoid of intelligence so they can be programmed on the fly. However, there are multiple independent service providers who work hand in hand with NEMs to get their devices SDN ready.



## Walking the tight rope between legacy and software defined infrastructure – As is the case with any transformative technology, SDN should be adopted gradually in bits and pieces. During this time an organization will have to strike the right balance between its traditional environment and parts of it that are now software defined. The solution would be to start with non-mission critical applications to choose the right SDN components and eventually test and deploy end

to end network management capabilities.



## Ensuring a high quality end user experience – Ultimately it goes without saying that end consumers care primarily about the quality of their experience and not as much about the technology that is powering it. However, timelines are generally short and organizations are scrambling to get their offering out to the market. At times like these it becomes critical to go through all the right performance testing in order to ensure and smooth and seamless customer experience.



## Lack of success stories and use cases – Due to the relative newness of SDN, there aren't enough marquee success stories of the quantitative benefits that it has delivered. Even though the proponents of SDN talk about all the benefits that it can deliver like flexibility, agility and automation,

there is a distinct lack of confidence amongst organizations to take the plunge. These concerns can be addressed by service providers who are willing to do POCs and are willing to patiently walk an organization through the SDN journey.



## Paucity of experienced and skilled resources – Owing to the fact that SDN has been around for a relatively short period of time there is quite understandably a shortage of experienced professionals who are highly skilled. The only viable solution is to train and upskill your existing resources by convincing them of the potential software defined networking has to offer. Often times, working closely with the right engineering services vendor who can bring their expertise to the table can help tremendously.
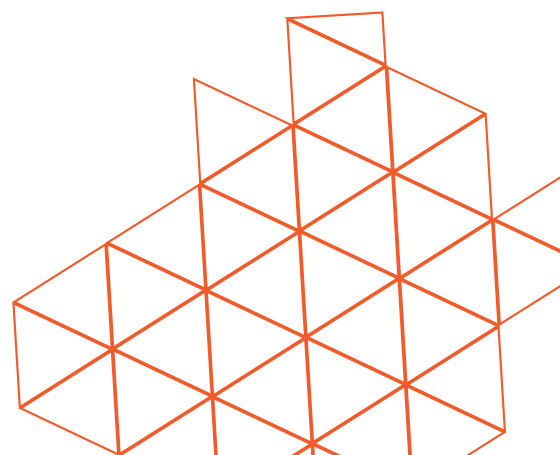
# HAPPIEST MINDS– HELPING YOU
# SWITCH TO SDN
# WITH A HAPPY MIND

Happiest Minds has deep expertise in developing a software centric open architecture based on SDN and NFV and combining it with server class commodity hardware to provide the desired intelligence in the network that makes it simple, agile, programmable and flexible.

With our approach, we at Happiest Minds work together with organizations in understanding their unique requirements to provide 'state of the art' product development using SDN, NFV, Cloud, Mobile and Big Data technologies.

We bring with us a deep understanding of the open SDN ecosystem that taps into the latent potential of switches and routers to rise above the limitations of proprietary technologies. Showcased to the right are a couple of examples of how we have harnessed the full potential of open-standard APIs, protocols and open-source technologies to deliver exceptional value to our customers with Proof of concepts, R&D projects, field trials and deployment grade solutions.

The time for Software Defined Networks is now and the organizations that act swiftly in making the switch will stand to benefit immensely by optimizing their network investments and ensuring business agility. The world is certainly opening up and embracing change, it's time for your network to do the same.

## Network Monitoring system for a leader in Packet Monitoring systems

Happiest Minds has provided end-to-end SDN transformation services to a Tier-1 OEM in Packet Monitoring Systems by leveraging SDN controllers and White Box switches. We worked on multiple projects covering varied technologies such as Intel DPDK, Big Data Analytics and Visualization for Packet Monitoring amongst many more.

### Benefits:
• Enabled customer to penetrate the SDN enterprise cloud and telco cloud deployment markets.
• White Box infrastructure enabled the client to develop a low cost solution with greater market appeal
• 10x Scalability improvement and line rate performance for physical function and near line rate for virtual function

## Ultra- low cost SD-WAN solution for a Network Performance Solution vendor

Happiest Minds built a low cost yet robust SDWAN solution that efficiently manages enterprise WAN, with the capabilities to introduce new services (IDS, IPS, Firewall) monitor bandwidth utilization, and dynamically steer DPDK accelerated traffic based on pre-provisioned configurations over available outgoing WAN links.

### Benefits:
• Reduced time to market, which enabled the customer to establish themselves as a leader in providing SD-WAN services
• 8x bandwidth cost savings demonstrated to the customer with minimal CAPEX expenditure of <$100 per site
• 93% of line rate throughput by effectively managing an IMIX traffic profile using DPDK

**Please write to us at**

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**if you have any queries about Software**

**Defined Networking or how Happiest**

**Minds can help.**

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