



Monthly

e-Newsletter

January-2023



Never stop learning, Because life never stop Teaching

**“Words will not speak and the silence
freezes into the images of the apartheid”**

:- Homi K. Bhabha

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READER'S CENTER

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SOFTWARE-DEFINED NETWORKING (SDN)

Software Defined Networking (SDN) is an approach to networking that uses software-based controllers or application programming interfaces (APIs) to communicate with underlying hardware infrastructure and direct traffic on network.

Software-defined networking (SDN) technology is an approach to network management that enables dynamic, programmatically efficient network configuration in order to improve network performance and monitoring, making it more like cloud computing than traditional network management. SDN is meant to address the static architecture of traditional networks. SDN attempts to centralize network intelligence in one network component by disassociating the forwarding process of network packets (data plane) from the routing process (control plane). The control plane consists of one or more controllers, which are considered the brain of the SDN network where the whole intelligence is incorporated.

Why Software-Defined Networking is important?

SDN is a great option for large, complex networks that require lots of up-time. It gives engineers the ability to re-route networks on the fly. For example, when an outage occurs, a software defined network can be configured to automatically reroute around that area and maintain the connections your users need.

- **More Efficient Network Management:** -SDN offers real-time visibility into your network performance. This visibility gives you the ability to optimize your network's performance and to drive its efficiency (as well as that of your team's).
- **Increased Control with Greater Speed and Flexibility:** - Instead of manually programming multiple vendor-specific hardware devices, developers can control the flow of traffic over a network simply by programming an open standard software-based controller. Networking administrators also have more flexibility in choosing networking equipment, since they can choose a single protocol to communicate with any number of hardware devices through a central controller.
- **Customizable Network Infrastructure:** - With a software-defined network, administrators can configure network services and allocate virtual resources to change the network infrastructure in real time through one centralized location. This allows network administrators to optimize the flow of data through the network and prioritize applications that require more availability.
- **Faster Scalability:** -SDN offers automated scaling-up (and scaling down). This ability, combined with the additional visibility it brings, gives engineers the operational ability to normalize traffic across a wide space, and to do it quickly and seamlessly good design and effective management. But if you're looking for an opportunity to improve your network's performance and to cut costs, SDN may be the way to go.
- **Robust Security:** - A software-defined network delivers visibility into the entire network, providing a more holistic view of security threats. With the proliferation of smart devices that connect to the internet, SDN offers clear advantages over traditional networking. Operators can create separate zones for devices that require different levels of security, or immediately quarantine compromised devices so that they cannot infect the rest of the network.
- **Cost-Savings:** -Because SDN offers the real-time ability to automatically reroute or to stand-up new functions and routes, you can increase your nines of uptime without adding new hardware and increasing costs.

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How Does Software Defined Networking (SDN) Work

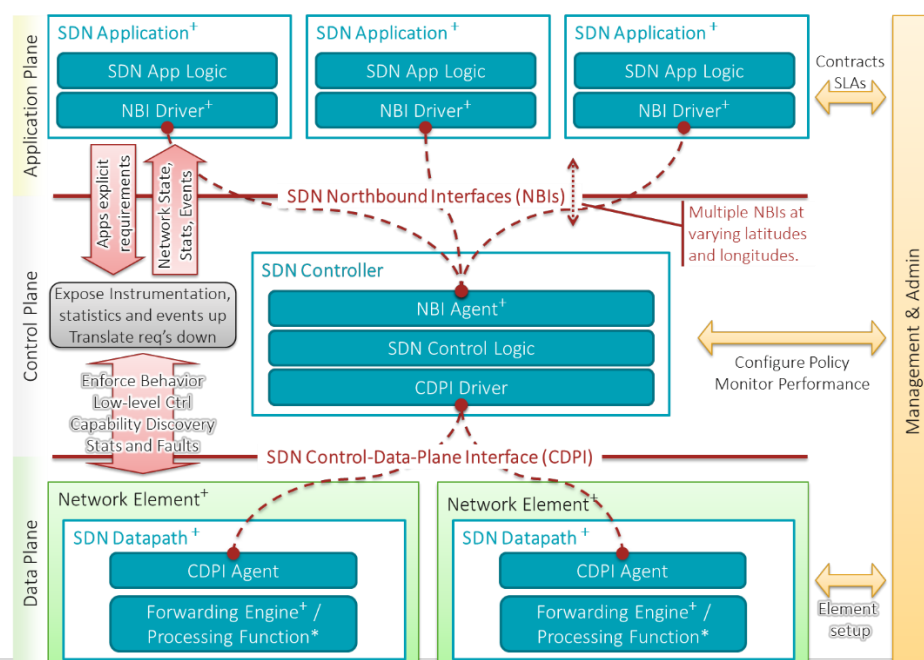
There are three parts to a typical SDN architecture, which may be located in different physical locations:

- **Applications**, which communicate resource requests or information about the network as a whole
- **Controllers**, which use the information from applications to decide how to route a data packet
- **Networking devices**, which receive information from the controller about where to move the data

While the premise of centralized software controlling the flow of data in switches and routers applies to all software-defined networking, there are different models of SDN.

- **Open SDN:** Network administrators use a protocol like Open Flow to control the behaviour of virtual and physical switches at the data plane level.
- **SDN by APIs:** Instead of using an open protocol, application programming interfaces control how data moves through the network on each device.
- **SDN Overlay Model:** Another type of software-defined networking runs a virtual network on top of an existing hardware infrastructure, creating dynamic tunnels to different on-premise and remote data centers. The virtual network allocates bandwidth over a variety of channels and assigns devices to each channel, leaving the physical network untouched.
- **Hybrid SDN:** This model combines software-defined networking with traditional networking protocols in one environment to support different functions on a network. Standard networking protocols continue to direct some traffic, while SDN takes on responsibility for other traffic, allowing network administrators to introduce SDN in stages to a legacy environment.

A high-level overview of the software-defined networking architecture The following list defines and explains the architectural components:



APPLICATIONS OF SDN

Software Defined Mobile Networking (SDMN)

Software Defined Mobile Networking (SDMN) is an approach to the design of mobile networks where all protocol-specific features are implemented in software, maximizing the use of generic and commodity hardware and software in both the core network and radio access network. It is proposed as an extension of SDN paradigm to incorporate mobile network specific functionalities.

SD WAN

An SD WAN is a WAN managed using the principles of software-defined networking. The main driver of SD-WAN is to lower WAN costs using more affordable and commercially available leased lines, as an alternative or partial replacement of more expensive MPLS lines. Control and management is administered separately from the hardware with central controllers allowing for easier configuration and administration.

SD-LAN

An SD-LAN is a Local area network (LAN) built around the principles of software-defined networking, though there are key differences in topology, network security, application visibility and control, management and quality of service. SD-LAN decouples control management, and data planes to enable a policy driven architecture for wired and wireless LANs. SD-LANs are characterized by their use of a cloud management system and wireless connectivity without the presence of a physical controller.

Security Using the SDN

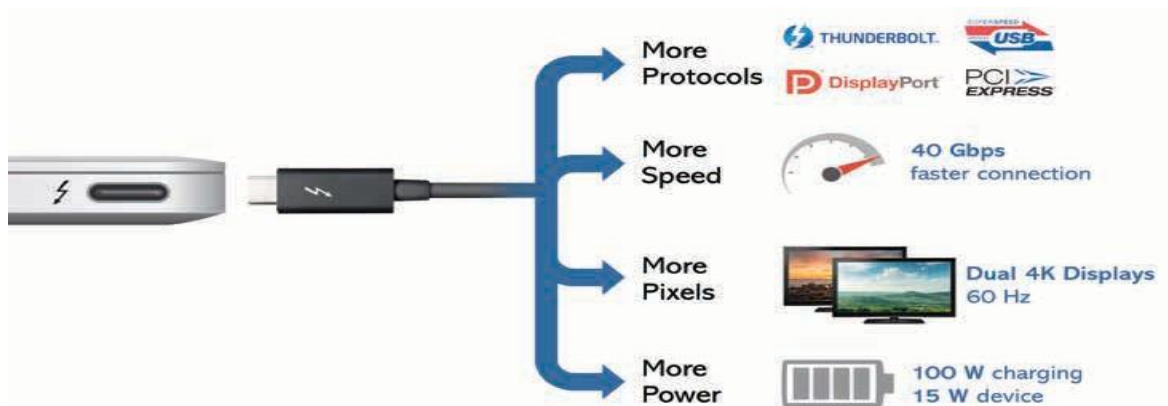
SDN Architecture may enable, facilitate or enhance network-related security applications due to the controller's central view of the network, and its capacity to reprogram the data plane at any time. Another kind of security application leverages the SDN controller by implementing some moving target defence (MTD) algorithms. MTD algorithms are typically used to make any attack on a given system or network more difficult than usual by periodically hiding or changing key properties of that system or network. In traditional networks, In an SDN network, such tasks become more straightforward to the centrality of the controller.

Group Data Delivery Using SDN

Distributed applications that run across data centers usually replicate data for the purpose of synchronization, fault resiliency, load balancing and getting data closer to users (which reduces latency to users and increases their perceived throughput). All of these operations require data delivery from one machine or data center to multiple machines or data centers. The process of reliably delivering data from one machine to multiple machines is referred to as Reliable Group Data Delivery (RGDD). SDN switches can be used for RGDD via installation of rules that allow forwarding to multiple outgoing ports.

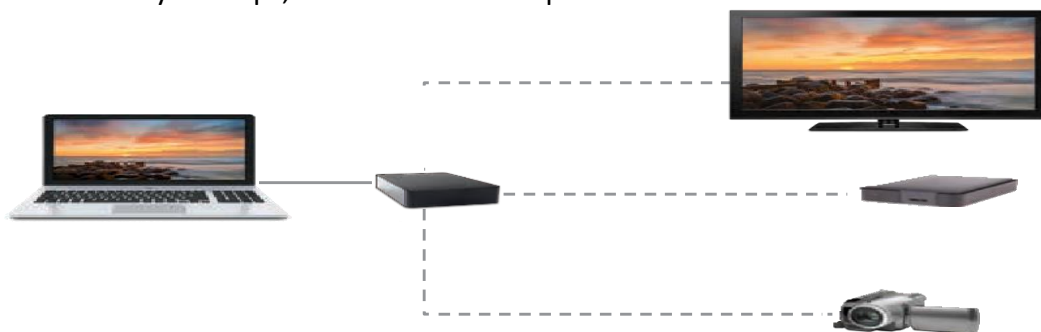
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THUNDERBOLT TECHNOLOGY



Major computing industry trends have necessitated a new form of I/O that can deliver on the vision of future computing:

- Continued advances of video and audio media quality (4K content and displays) creating unprecedented amounts of data.
- Relentless shrinking of system form factors with less room for multiple, large connectors.
- Dramatic growth of processing and storage from new technologies and the march forward of Moore's law.
- Demand for the flexible performance from a single system to meet the needs of a desk bound creator and an on-the-go mobile consumer at the same time
- Thunderbolt 3 is a way to gain uncompromised performance of the fastest data, and the highest quality display technology available in their PC – all over a single standard connector.
- Whereas uncompressed 1080p content consumed around 4 Gbps of data, uncompressed 4K consumes nearly 15 Gbps, or 16 million more pixels than HD.



The Thunderbolt Vision

Thunderbolt is a sophisticated technology, with a simple vision – The connector that just works. Intel believes Thunderbolt can be the only external connector you need for your PC. Power? Data? Display? External graphics? Thunderbolt is the single connector that can deliver on all your connectivity needs, from the mundane to the complex. Connect to a dock and expand to your legacy peripherals, directly cable to a Monitor or two, or connect to a single (or series of) high performance dedicated Thunderbolt devices. Importantly, Thunderbolt 3 builds on the new USB-C reversible connector and integrates the latest USB 3.1 technology to deliver high performance and high compatibility to the existing standard. One connector for everything; that is the Thunderbolt vision. A consumer doesn't need to know anything other than if they plug their device into a Thunderbolt 3 port, everything will just work.

How Thunderbolt 3 Works

Thunderbolt is a tunneling architecture designed to take a few underlying protocols, and combine them onto a single interface, so that the total speed and performance of the link can be shared between the underlying usages of these protocols – whether they are data, display, or something else. At the physical interface level, Intel's Thunderbolt 3 silicon builds in a few important features:

A physical interface (PHY) layer that can dynamically switch it's operating mode to drive either:

- USB 2.0, 3.0, and 3.1
 - Display Port 1.1 and 1.2a
 - Thunderbolt at 20 and 40 Gbps.
-
- In the Thunderbolt mode, Thunderbolt 3 port has the ability to support at least one or two (4 lane) DisplayPort interface(s), and up to 4 lanes of PCI Express Gen 3.

Different Connection Modes

With Thunderbolt 3 having dynamic detection of the capabilities of the cables and devices that are plugged in, there are several modes that can be detected and activated, in a way generally transparent to the consumer.

If a cable and device supporting Thunderbolt are plugged in, the Thunderbolt silicon activates its highest capability mode and configures four high-speed links at either 10 Gbps or 20 Gbps (depending on cable and device support) to support the Thunderbolt transport. This provides bidirectional data rates of 20 or 40 Gbps.

HC/RO Vijay Kumar

TECHNICAL INNOVATIONS THAT COULD CHANGE SMARTPHONES

Smartphones have gotten so advanced today that it can almost be hard to tell the difference between the top options. That's not to say you'd literally mix up an iPhone and its Samsung counterpart but there aren't too many defining features that really set one apart from another at this point. It may be that things will continue this way for a while. On the other hand, though, the increasingly evident similarity between leading smartphones might also spark some fairly major innovations in the near future. As Apple and Samsung look to set themselves apart from one another, that is, some big changes could be on the horizon. It's for that reason we're exploring a few specific hardware tech innovations that could bring about significant smartphone changes.

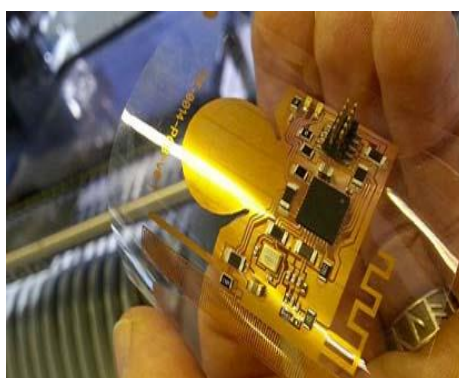
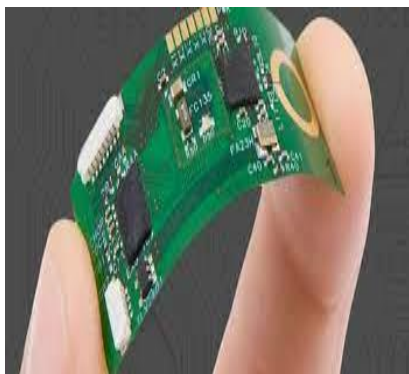
Stretching Screens



One major innovation that we've actually seen already is the advent of smartphone screens that can bend and fold. These have recently been unveiled by Samsung, and despite somewhat mixed reviews, they may spark a fresh arms race in design. That's what makes rumors of stretchable phone screens so interesting. Last year news emerged that LG has invented such a screen, as well as a new phone casing that would allow for stretching in multiple directions for various purposes.

It's unclear if or when this tech will be put to use in mainstream smartphones — but one could imagine all kinds of interesting new functions coming about as a result of a stretchable screen.

2. Adaptable PCBs



processors that power the bulk of smartphone activity is already advancing in fairly extraordinary ways.

If phones do in fact take on new forms and physical capabilities — folding, bending, stretching and so on — one overlooked challenge is how to build internal electronics that can handle the changes. Fortunately, design for the printed circuit boards and

Modern design software for PCBs can be customized for numerous purposes. These include the building of compact or even flexible circuit boards, which can be more useful in unorthodox devices. Brand new designs may have to be made if indeed smartphones start to bend and stretch — but the technology is certainly within our grasp, if not already available.

3. Underwater Screens

It's kind of amazing how quickly we got used to the idea of water-resistant mobile phones. Gone are the days, with the latest smartphones at least, of worrying about damage from heavy rain or a light splash; now, we can drop our phones into swimming pools and bathtubs and they're generally fine! However, that doesn't mean they're functional in water just yet, and that's what may change in the near future. It was actually rumored last year that the iPhone 11's display would work underwater, meaning the screen would actually maintain its interactive quality even when covered in water. That proved not to be the case when



the iPhone 11 range was released, but the rumor is still out there. We may see displays of this kind before long.

4. Airborne Charging



We may soon see a whole new technology enabling more convenient charging as well. By now many smartphone users are already taking advantage of wireless charging. Soon, though, that idea might be replaced by *airborne* charging — battery power drifting through the air into smartphones just as easily as WiFi.

This technology actually exists and has, surprisingly quietly, for a few years now. For it to be perfected and applied to consumer mobile devices will likely take a little more time. But don't be surprised if you start hearing about Apple, Samsung, and others exploring the idea of airborne charging.

Conclusion:-

Of course, there are other areas of innovation that are more software-based (AI, augmented reality, etc.) and those are exciting too. But in this article, we focused on hardware changes that we are likely to see emerge in mobile devices within the next 5 years.

ASI/T Nitish Kumar

Acknowledgement

We are highly thankful for reading out this compilation and hope it will be useful for you in day to day professional and personal life. We would like to hear your interest areas, suggestions from you to make this newsletter more informative and interesting. Your views will definitely help us to create this newsletter as an effective medium to reach you with latest development in the fields of communication and technology.

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