

5.4: Trends, the Changing Environment

Existing Trends Keep Getting Stronger

As new technologies and end-user devices come to market, businesses and purchasers must keep on acclimating to this ever-evolving condition. The job of the network is changing to empower the connections between individuals, devices, and data. There are a few new networking trends that will impact organizations and purchasers. A portion of the top trends include:

- Bring Your Own Device (BYOD)
- Video communications
- Online collaboration
- Cloud computing

Bring Your Own Device

The idea of any device, to any content, in any way, is a significant worldwide trend that requires huge changes to the manner in which devices are utilized. This trend is known as Bring Your Own Device (BYOD).

BYOD is about end users having the opportunity to utilize individual tools in order to get to data and convey over a business or campus network. With the development of customer devices and the related drop in cost, representatives and students can be relied upon to have probably the most progressive computing and networking tools for individual use. These individual tools can be laptops, e-books, tablets, cell phones, and tablets. These can be devices bought by the organization or school, bought by the individual, or both.

BYOD implies any device, with any possession, utilized anyplace. For instance, previously, a student who expected to get access to the campus network or the Internet needed to utilize one of the school's PCs. These devices were commonly constrained and seen as instruments just for work done in the study hall or in the library. Expanded availability through portable and remote access to the campus network gives students a lot of adaptability and opens doors of learning for the student.

Online Collaboration

People want to connect with the network, for access to data applications, in addition to team up with each other.

Collaboration is characterized as "the demonstration of working with another or others on a joint venture." Collaboration tools, give representatives, students, instructors, clients, and accomplices an approach to quickly interface, connect, and accomplish their targets.

For businesses, collaboration is a basic and vital need that associations are utilizing to sustain their competition. Collaboration is additionally a need in training. Students need to work together to help each other in learning, to create group abilities utilized in the workplace, and to cooperate on group based projects.

Video Communication

Another trend in networking that is basic to the correspondence and joint effort exertion is video. Video is being utilized for interchanges, cooperation, and amusement. Video calls can be made to and from anyplace with an Internet connection.



Figure 5.4.1: A video call showing a group of people on the screen. [Image](#) by photo by [Chris Montgomery](#) on [Unsplash](#) is licensed under [CC BY SA 2.0](#)

Video conferencing is an incredible asset for speaking with others from a distance, both locally and worldwide. Video is turning into a basic necessity for successful joint effort as associations stretch out across geographic and social limits.

Cloud Computing

Cloud computing is another worldwide trend changing how we access and store information. Cloud computing permits us to store individual files, even backup our whole hard disk drive on servers over the Internet. Applications, for example, word processing, and photograph editing, can be accessed utilizing the Cloud.

When it comes to businesses, cloud computing expands IT's capabilities without requiring interest in new infrastructure, preparing new faculty, or permitting new software. These services are accessible on request and conveyed economically to any device on the planet without trading off security or capacity.

There are four essential Clouds: Public Clouds, Private Clouds, Hybrid Clouds, and Custom Clouds.

Cloud computing is conceivable because of data centers. A data center is an office used to house PC frameworks and related parts. A data center can consume one room of a building, at least one story, or the whole thing. Data centers are commonly over the top expensive to manufacture and keep up. Therefore, just huge associations utilize secretly fabricated data centers to house their information and offer users assistance. Smaller associations that can't afford to keep up their own private data center can lessen the general expense of ownership by renting server and capacity services from a bigger data center association in the Cloud.

Emerging Technologies and Trends

5G Cellular

The next generation of wireless networks that promises faster speeds, lower latency, and ability to connect massive numbers of devices to expand Internet of Things (IoT) capabilities. 5G delivers theoretical peak speeds up to 20 Gbps, compared to 1 Gbps peak for 4G. Latency is reduced to 1-10 milliseconds vs. 40-70 ms on 4G. For example:

- 5G enables smart factories to wirelessly connect production systems, robots, automated guided vehicles (AGVs), sensors, and workers with ultra-reliable, high-bandwidth connections. This allows real-time control, automation, and data collection to optimize manufacturing. Failures can be rapidly detected and addressed to avoid costly downtime. Supply chain transparency is improved via interconnected systems.
- 5G enables much faster video and music streaming. You could download an HD movie in seconds versus minutes on 4G. Lag and buffering will be greatly reduced when gaming online or video chatting with friends. 5G also makes innovative technologies like virtual reality and augmented reality mobile experiences possible, which just aren't feasible on 4G networks. The high speeds and responsiveness open new doors for entertainment.

WiFi 6

Provides faster wireless network speeds, increased WiFi capacity, and improved performance when many devices are connected compared to typical existing WiFi. WiFi 6 supports maximum theoretical speeds up to 9.6 Gbps, compared to 3.5 Gbps for 802.11ac of today's technology. It allows for better supports bandwidth-intensive uses. For example:

- Enables retail stores to support digital signage, customer WiFi, IoT sensors, and point-of-sale systems without congestion.

- Improves streaming and large downloads in dense dorm or apartment buildings.

Space Networks

Satellite constellations in Low Earth Orbit (LEO) provide high-speed broadband Internet globally, including to rural and remote areas. Offers an alternative to ground-based infrastructure. For example:

- Allows businesses to access cloud services and operate anywhere without geographic restrictions.
- Provides Internet access to students from rural areas for distance learning.

Fun Fact: Is SpaceX's Starlink the first Low Earth Orbit (LEO) satellite network?

Before SpaceX, there are other companies that provided LEO satellite networks include Iridium, Globalstar, Orbcomm, Teledesic and are still active today. So, Starlink is not the first successful low Earth orbit satellite network, but it is probably the most ambitious and successful consumer LEO constellation to date.

SpaceX's Starlink is building a network of thousands of small low Earth orbit satellites to provide global high-speed broadband Internet access. With base stations connected to the Internet backbone, the satellites can relay signals to user terminals on the ground. Starlink offers speeds comparable to fiber optic networks and very low latency. It aims to provide affordable Internet to remote and rural areas unserved by traditional infrastructure. Some key facts include:

- Over 3,000 satellites launched since 2019 with plans for over 40,000
- Provides Internet globally including polar regions
- User terminal has motorized dish for uninterrupted signal
- Speeds of 100-200 Mbps download with 20-40 ms latency reported
- Leverages SpaceX's Falcon 9 rockets and in-house satellite production

Edge Computing

Processes data closer to where it is generated by users and IoT devices. Reduces latency, bandwidth use, and reliance on central cloud computing resources. For example:

- Enables real-time data analytics and quick decision -making by analyzing data on-site.
- Lowers lag time for online gaming by handling data processing closer to the user.

Quantum Networks

A quantum network utilizes unique quantum effects like superposition (particles can exist in multiple states at once) and entanglement (intrinsically linked particles share properties) to transmit information. It leverages quantum effects to enable capabilities not achievable with classical networks:

- Quantum encryption - Information is encoded in quantum states which cannot be copied or read without detection, providing virtually unbreakable security.
- Quantum teleportation - The quantum state of a particle can be transmitted to another distant particle without physically moving the first particle.
- Quantum computing - Multiple quantum processors can be connected over a quantum network to distribute computational tasks.

While still in the early research stages, quantum networks aim to provide ultra-secure communication, distributed quantum computing capabilities, and quantum-enhanced sensing and metrology. Their development is driven by recent advances in quantum computers, processors, and quantum memory. Significant technical challenges remain before wide deployment. For example:

- Will protect confidential corporate data from being hacked or accessed without authorization.
- May enable truly private online activities resistant to tracking or disclosure.

Ambient Computing

Integrates connectivity and intelligence into our everyday environments and activities. Computing fades into the background. For example:

- Enables smart conference rooms that can schedule meetings, set lighting and temperature, and start video calls automatically based on meeting details and participants.

- Allows a smart home to track activities and habits to customize and automate routines, like turning on the coffee maker when you wake up.

AI and Machine Learning

Automates network management, optimizes performance, identifies anomalies, predicts faults, and improves security through data insights. For example:

- AI can predictively detect network issues and misconfigurations before they cause outages.
- AI could tailor network priorities and bandwidth allocations based on individual usage patterns and devices.

Internet of Things

Billions of internet-connected smart devices, sensors, and everyday objects share data for automation and analytics. They will put more demands on networks. For example:

- Retailers implement IoT sensors, digital price tags, security cameras, robots, and more that rely on connectivity.
- Students could leverage smart devices like digital assistants, smart appliances, wearables, and lighting for convenience.

Virtual/Augmented Reality

Fully immersive digital experiences requiring high-speed, low latency networks to support advanced graphics, simulations, etc. For example:

- Replace in-person training with virtual reality simulations for serious situations like fire drills.
- Experience concerts, travel destinations or historic events through augmented reality.

Fun Factoid: What is Meta doing with Virtual/Augmented Reality?

Meta (formerly Facebook) sees a huge opportunity to transform gaming, work, education, shopping, and entertainment. It wants to lead the consumer virtual reality market with its Oculus VR headsets and Meta Quest platform. The Oculus Rift and Quest headsets immerse users in VR gaming, entertainment, and social interactions.

For augmented reality, Meta is developing smart glasses and other wearables to overlay digital information onto the real world. Prototypes include the Meta Frames glasses and Project Nazare concept. For more details, review this [article Mark Zuckerberg's augmented reality from the Verge](#) (2022.)

Meta also wants to extend beyond hardware to building 3D environments, digital commerce capabilities, avatar systems, and other software foundations to power virtual worlds to bring them to mainstream. Even though Meta is considered a leader for now, the market is still evolving and there are other competitors with deep pockets such as Apple, Google, Microsoft, Sony, among others. We are watching in real time the completion among these tech giants!

Reference:

Heath, A., *Mark Zuckerberg's augmented reality* (2022). Retrieved September 1, 2023 from [The Verge](#).

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