



CTC(T&IT), CRPF



e-Newsletter



November, 2020



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“You must be the change you wish to see in the world.”

VIRTUALLY UNHACKABLE QUANTUM INTERNET

US officials and scientists have begun laying the groundwork for a more secure "virtually unhackable" internet based on quantum computing technology. ... The aim is to create a parallel, more secure network based on quantum "entanglement," or the transmission of sub-atomic particles

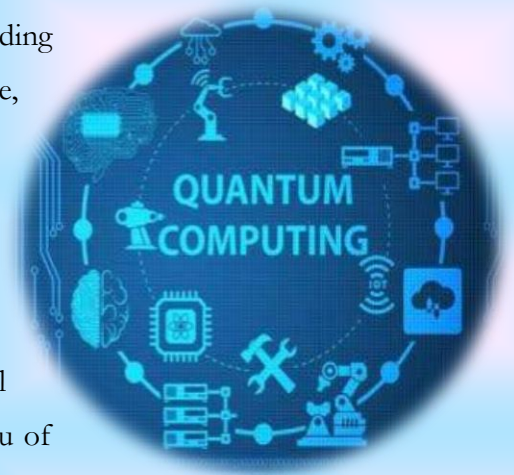
One of the hallmarks of quantum transmissions is that they are exceedingly difficult to eavesdrop on as information passes between locations. Scientists plan to use that trait to make virtually unhackable networks. Early adopters could include industries such as banking and health services, with applications for national security and aircraft communications. Eventually, the use of quantum networking technology in mobile phones could have broad impacts on the lives of individuals around the world.

Quantum Internet : The quantum internet is a network that will let quantum devices exchange some information within an environment that harnesses the weird laws of quantum mechanics. In theory, this would lend the quantum internet unprecedented capabilities that are impossible to carry out with today's web applications.

In the quantum world, data can be encoded in the state of qubits, which can be created in quantum devices like a quantum computer or a quantum processor. And the quantum internet, in simple terms, will involve sending qubits across a network of multiple quantum devices that are physically separated.

That might sound similar to the standard internet. But sending qubits around through a quantum channel, rather than a classical one, effectively means leveraging the behavior of particles when taken at their smallest scale – so-called "quantum states", which have caused delight and dismay among scientists for decades.

So to understand how the quantum ecosystem of the internet 2.0 works, you might want to forget everything you know about classical computing. Because not much of the quantum internet will remind you of your favorite web browser.



QUANTUM (SAFER) COMMUNICATIONS

One of the most exciting avenues that researchers, armed with qubits, are exploring, is security.

When it comes to classical communications, most data is secured by distributing a shared key to the sender and receiver, and then using this common key to encrypt the message. The receiver can then use their key to decode the data at their end.

The security of most classical communication today is based on an algorithm for creating keys that is difficult for hackers to break, but not impossible. That's why researchers are looking at making this communication process "quantum". The concept is at the core of an emerging field of cybersecurity called quantum key distribution (QKD).

QKD works by having one of the two parties encrypt a piece of classical data by encoding the cryptography key onto qubits. The sender then transmits those qubits to the other person, who measures the qubits in order to obtain the key values.

US officials and scientists have begun laying the groundwork for a more secure "virtually unhackable" internet based on quantum computing technology.

At a presentation, Department of Energy (DOE) officials issued a report that lays out a blueprint strategy for the development of a national quantum internet, using laws of quantum mechanics to transmit information more securely than on existing networks.

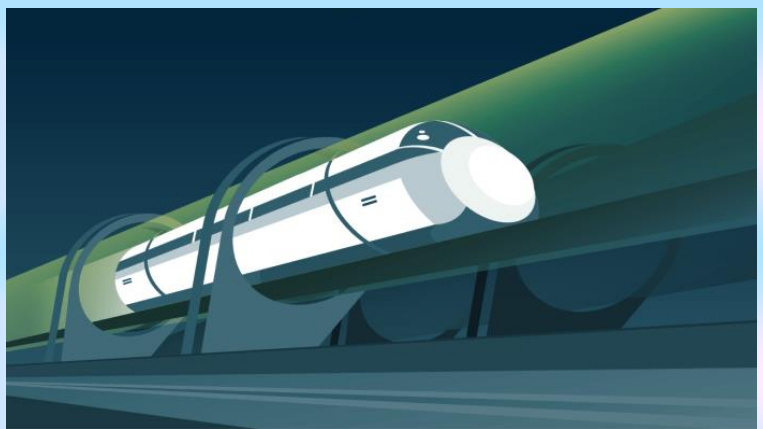
HYPERLOOP (TRANSPORTATION MODE OF THE FUTURE)

Introduction

Hyperloop is a new form of ground transport currently in development by a number of companies, It could see passengers travelling at over 700 miles an hour in floating pod which races along inside giant low-pressure tubes, either above or below ground.

What makes Hyperloop different?

There are two big differences between Hyperloop and traditional rail. Firstly, the pods carrying passengers travel through tubes or tunnels from which most of the air has been removed to reduce friction. This should allow the pods to travel at up to 750 miles per hour.



Secondly, rather than using wheels like a train or car, the pods are designed to float on air skis, using the same basic idea as an air hockey table, or use magnetic levitation to reduce friction.

What are the benefits of Hyperloop?

Supporters argue that Hyperloop could be cheaper and faster than train or car travel, and cheaper and less polluting than air travel. They claim that it's also quicker and cheaper to build than traditional high-speed rail. Hyperloop could therefore be used to take the pressure off gridlocked roads, making travel between cities easier, and potentially unlocking major economic benefits as a result.

When are the first Hyperloops going to be available?

A number of different companies are working to turn the idea into a functioning commercial system. Hyperloop technology is still in development even though the basic concept has been around for

many years. At the moment, the earliest any Hyperloop is likely to be up and running is 2020 but most services are expected to be later, as trials of the technology are still in their early stages.

Where will Hyperloop services run?

It's still not clear where Hyperloops will actually be established but a number of companies have sketched out routes in the US, Europe, and elsewhere. Potential routes include New York to Washington DC, Pune to Mumbai, Kansas City to St Louis, Bratislava to Brno, Vijaywada and Amaravati, and many more.

What is the history of Hyperloop?

The idea of using low-pressure or vacuum tubes as part of a transport system has a long heritage. The Crystal Palace pneumatic railway used air pressure to push a wagon uphill (and a vacuum to drag it back down) way back in Victorian south London in 1864. Similar systems using pneumatic tubes to send mail and packages between buildings have been in use since the late nineteenth century, and can still be seen in supermarkets and banks to move money around today.

One clear predecessor of the Hyperloop is the 'vactrain' concept developed by Robert Goddard early in the twentieth century; since then, many similar ideas have been proposed without much success.

However, it was entrepreneur Elon Musk who really reignited interest in the concept with his 'Hyperloop Alpha' paper in August 2013, which set out how a modern system would work -- and how much it would cost.

How does a Hyperloop tube work?

The basic idea of Hyperloop as envisioned by Musk is that the passenger pods or capsules travel through a tube, either above or below ground. To reduce friction, most -- but not all -- of the air is removed from the tubes by pumps.

Overcoming air resistance is one of the biggest uses of energy in high speed travel. Airlines climb to high altitudes to travel through less dense air; in order to create a similar effect at ground level, Hyperloop encloses the capsules in a reduced-pressure tube, effectively allowing the trains to travel at airplane speeds while still on the ground.

In Musk's model, the pressure of the air inside the Hyperloop tube is about one-sixth the pressure of the atmosphere on Mars (a notable comparison as Mars is another of Musk's interests). This means an operating pressure of 100 pascals, which reduces the drag force of the air by 1,000 times relative to sea level conditions, and would be equivalent to flying above 150,000 feet.

How do Hyperloop capsules work?

The Hyperloop capsules in Musk's model float above the tube's surface on a set of 28 air-bearing skis, similar to the way that the puck floats just above the table on an air hockey game. One major difference is that it is the pod, not the track, that generates the air cushion in order to keep the tube as simple and cheap as possible. Other versions of Hyperloop use magnetic levitation rather than air skis to keep the passenger pods above the tracks.



The pod would get its initial velocity from an external linear electric motor, which would accelerate it to 'high subsonic velocity' and then give it a boost every 70 miles or so; in between, the pod would coast along in near vacuum. Each capsule could carry 28 passengers (other versions aim to carry up to 40) plus some luggage; another version of the pods could carry cargo and vehicles. Pods would depart every two minutes (or every 30 seconds at peak usage)

How would Hyperloop be powered?

The pods will get their velocity from an external linear electric motor -- effectively a round induction motor (like the one in the Tesla Model S) rolled flat. Under Musk's model, the Hyperloop would be powered by solar panels placed on the top of the tube which would allow the system to generate more energy than it needs to run.



Human Trial

Virgin Hyperloop has "successfully" completed the first-ever human trial in the hyperloop pod at the DevLoop test facility in the US on 12/11/2020.

Two passengers, both company staff, travelled 500 metres in 15 seconds, reaching 107 mph (172 km per hour), marking the completion of the first-ever trial, the company said.

Hyperloop in India

The Maharashtra government has deemed hyperloop a public infrastructure project and approved the Virgin Hyperloop-DP World Consortium as the original project proponent (OPP) for the Mumbai-Pune hyperloop project.



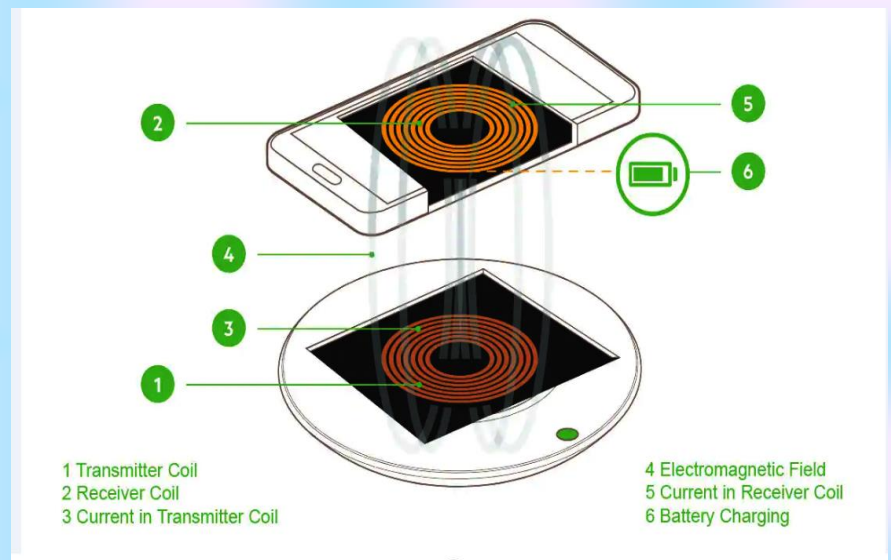
“A World Without Cords” Wireless Charging

Charging is an optimized inductive charging, also known as “wireless charging” allowing you to charge your devices wirelessly. Only compatible devices’ batteries are charged by using induction transfer without requiring separate chargers, cables or adapters... Simply place your compatible device on top of the wireless pad and watch your device charge

How wireless charging

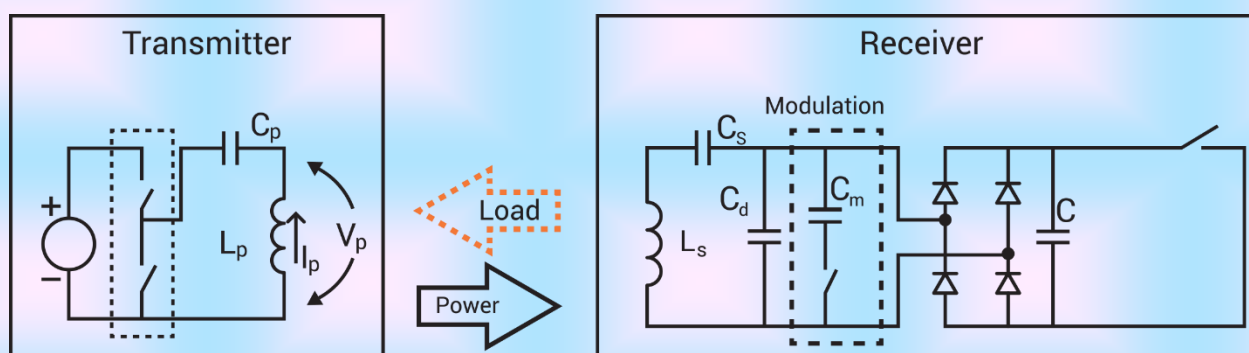
chargers that use loosely-coupled or radiative electromagnetic resonant charging that can transmit a charge a few centimetres; and uncoupled radio frequency (RF) wireless charging that allows a trickle charging capability at distances of many feet.

There are two charging technologies: electromagnetic resonant and radio frequency, which offers the ability to move around a space and still have your mobile device charge.



Both technologies offer distinct advantages in terms of spatial freedom, ease of use, and ease of installation

That's because loosely coupled charging provides more spatial freedom – the ability to simply drop a phone, tablet or laptop on a desktop and have it charge.



There are two coils: one in the transmitter and the other in the receiver. A magnetic field is generated with an alternating current in the transmitter coil, and this magnetic field induces voltage in the receiver coil. In a real scenario, the receiver in the mobile device takes power from the electromagnetic field and converts it into electrical current to charge the battery.

Mobile device manufacturers that are working with this standard includes: Asus, HTC, Huawei, LG Electronics, Motorola Mobility, Nokia, Samsung, BlackBerry, and Sony. All the devices with Qi logo are compatible to wireless chargers

- system comprises
- Base station
- Mobile devices
- Power conversion
- Communication

Let's take a look at how these devices operate in order to charge a battery.

Base Station:

It contains one or more power transmitters that comprise of a transmitting coil, which generates an oscillating magnetic field. The base stations are typically of flat surfaces i.e. Interface Surface, on which multiple devices can be placed.

Mobile Devices:

These are the devices that consume inductive power. They can be either smartphones or tablets and hold a receiver coil that contains a power receiver. This receiver provides power to the battery. Communication and control units are also there in power receivers.

Power Conversion:

The transmitter in the base station has a power conversion unit that converts electrical power to wireless power signal. Whereas, the receiver in the mobile devices comprises of a power pick-up unit that converts wireless power signal back to electrical power.



Communication:

The communication and control unit are present in power receivers and this communication is always followed by a technique called modulation.

What is the best choice from inductive and resonant mode?

Tightly-coupled systems are best suitable due to their high-power transfer and their low heat production. This is an advantage for heat-sensitive devices such as smartphones. The downside is that tightly coupled coils are sensitive to misalignment.

Loosely-coupled systems have low-power transfer efficiency. Such types of systems are best suitable for the applications that have tight electromagnetic induction or electromotive force.

The best choice depends on your needs.

Charging Power:

wireless charging with low power is able to deliver up to 5 Watts of power at the receiver output whereas Qi charging with medium power can deliver up to 120 Watts. Also, the communication between transmitter and receiver should be enabled during charging process; the charging process will not start without any interoperable communication.

In comparison to the traditional charging, wireless charging is considered slower but the good news is that it causes no harm to humans since wireless chargers emit non-ionizing radiations.

Advantages:

Wireless technology has the biggest advantage of having compatibility with all cell phones and chargers from different manufacturers.

Non-radiative energy is transferred and so it is not harmful to humans.

No need to constantly plug and unplug the device for charging purposes.

It has protected connections with no corrosion.

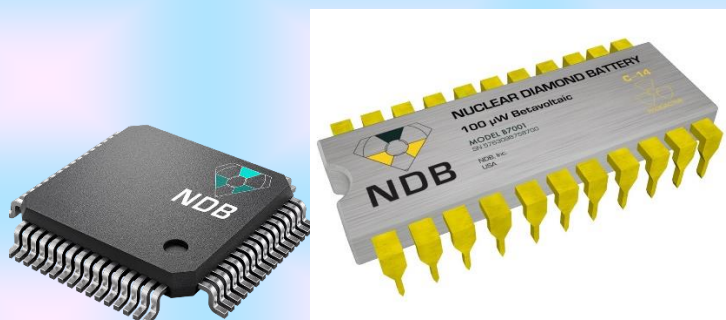
Disadvantages:

Loosely-coupled systems have lower efficiency that waste heat.

Charging is slow as compared to traditional charging.

Complex and increased cost of manufacturing.

NANO-DIAMOND SELF-CHARGING BATTERIES



California company NDB says its nano-diamond batteries will absolutely upend the energy equation, acting like tiny nuclear generators. They will blow any energy density comparison out of the water, lasting anywhere from a decade to 28,000 years without ever needing a charge. They will offer higher power density than lithium-ion. They will be nigh-on indestructible and totally safe in an electric car crash. And in some applications, like electric cars, they stand to be considerably cheaper than current lithium-ion packs despite their huge advantages.

The heart of each cell is a small piece of recycled nuclear waste. NDB uses graphite nuclear reactor parts that have absorbed radiation from nuclear fuel rods and have themselves become radioactive. Untreated, it's high-grade nuclear waste: dangerous, difficult and expensive to store, with a very long half-life.

This graphite is rich in the carbon-14 radioisotope, which undergoes beta decay into nitrogen, releasing an anti-neutrino and a beta decay electron in the process. NDB takes this graphite, purifies it and uses it to create tiny carbon-14 diamonds. The diamond structure acts as a semiconductor and heat sink, collecting the charge and transporting it out. Completely encasing the radioactive carbon-14 diamond is a layer of cheap, non-radioactive, lab-created carbon-12 diamond, which contains the energetic particles, prevents radiation leaks and acts as a super-hard protective and tamper-proof layer.

To create a battery cell, several layers of this nano-diamond material are stacked up and stored with a tiny integrated circuit board and a small supercapacitor to collect, store and instantly distribute the charge. NDB says it'll conform to any shape or standard, including AA, AAA, 18650, 2170 or all manner of custom sizes.

And so what you get is a tiny miniature power generator in the shape of a battery that never needs charging – and that NDB says will be cost-competitive with, and sometimes significantly less expensive than

– current lithium batteries. That equation is helped along by the fact that some of the suppliers of the original nuclear waste will pay NDB to take it off their hands.

Radiation levels from a cell, NDB tells us, will be less than the radiation levels produced by the human body itself, making it totally safe for use in a variety of applications. At the small scale, these could include things like pacemaker batteries and other electronic implants, where their long lifespan will save the wearer from replacement surgeries. They could also be placed directly onto circuit boards, delivering power for the lifespan of a device.

In a consumer electronics application, NDB's Neel Naicker gives us an example of just how different these devices would be: "Think of it in an iPhone. With the same size battery, it would charge your battery from zero to full, five times an hour. Imagine that. Imagine a world where you wouldn't have to charge your battery at all for the day. Now imagine for the week, for the month... How about for decades? That's what we're able to do with this technology."

And it can scale up to electric vehicle sizes and beyond, offering superb power density in a battery pack that is projected to last as long as 90 years in that application – something that could be pulled out of your old car and put into a new one. If part of a cell fails, the active nano diamond part can be recycled into another cell, and once they reach the end of their lifespan – which could be up to 28,000 years for a low-powered sensor that might, for example, be used on a satellite – they leave nothing but "harmless by products."

In the words of Dr. John Shawe-Taylor, UNESCO Chair and University College London Professor: "NDB has the potential to solve the major global issue of carbon emissions in one stroke without the expensive infrastructure projects, energy transportation costs, or negative environmental impacts associated with alternate solutions such as carbon capture at fossil fuel power stations, hydroelectric plants, turbines, or nuclear power stations. Their technology's ability to deliver energy over very long periods of time without the need for recharging, refuelling, or servicing puts them in an ideal position to tackle the world's energy requirements through a distributed solution with close to zero environmental impact and energy transportation costs."

Indeed, the NDB battery offers an outstanding 24-hour energy proposition for off-grid living, and the NDB team is adamant that it wishes to devote a percentage of its time to providing it to needy remote communities as a charity service with the support of some of the company's business customers.

Should the company chew right through the world's full supply of carbon-14 nuclear waste – a prospect that would take some extremely serious volume – NDB says it can create its own carbon-14 raw material simply and cost-effectively.

The company claims to have completed a proof of concept, and is ready to begin building its commercial prototype once its labs reopen after COVID shutdown. A low-powered commercial version is expected to hit the market in less than two years, and the high-powered version is projected for five years' time. NDB says it's well ahead of its competition with patents pending on its technology and manufacturing processes.

Should this pan out as promised, it's hard to see how this won't be a revolutionary power source. Such a long-life battery would fundamentally challenge the disposable ethos of many modern technologies, or lead to battery packs that consumers carry with them from phone to phone, car to car, laptop to laptop across decades. NDB-equipped homes can be grid-connected or not. Each battery is its own near-inexhaustible green energy source, quietly turning nuclear waste into useful energy.

Sounds like remarkable news to us!

Technical Quiz

R&D Team

1. _____ monitors user activity on internet and transmit that information in the back-ground to someone else
 - a) Malware
 - b) Spyware
 - c) Adware
 - d) None of these
2. All of the following are examples of real security and privacy risks EXCEPT:
 - a) hackers
 - b) spam
 - c). viruses
 - d). identity theft
3. Which of the following is the least secure method of authentication?
 - a) Key card
 - b) fingerprint
 - c) retina pattern
 - d) Password
4. unsolicited commercial email is known as?
 - a) Spam
 - b) Virus
 - c) Crackers
 - d) Proxy
5. When IT Act 2000 came into effect?
 - a)17 October,2000
 - b) 11 November,2000
 - c) 17 October,2001
 - d) 11 November,2001

6. Which section of IT Act deals with Hacking of computer systems and its penalties?

- a) Section 64
- b) Section 65
- c) Section 66
- d) section 63

7. In which HASH algorithm, process Y is denoted as a random number.

- a) Direct hashing
- b) Mid-square hashing
- c) Fold Shift Hashing
- d) Pseudo random hashing

8. H-mac hashing are used in

- a) SSL,IP
- b) digital Signature
- c) VPN
- d) Proxy Server

9 Keylogger is type of

- a) Worm
- b) Trojan Horse
- c) Virus
- d) Spyware

10 Firewall is used to protect an intranet from

- a) Unauthorized access
- b) Virus
- c) Malware
- d) Trojan

Technical Terms

R&D Team

APT	Advanced Persistent Threat	A cyber attack that continuously uses advanced techniques to conduct cyber espionage or crime
APWG	Anti-Phishing Working Group	An international consortium that brings together businesses affected by phishing attacks with security companies, law enforcement, government, trade associations, and others.
AV	Antivirus	A computer program used to prevent, detect, and remove malware.
AVIEN	Anti-Virus Information Exchange Network	A group of Antivirus and security specialists who share information regarding AV companies, products, malware and other threats.
CAPTCHA	Completely Automated Public Turing Test to Tell Computers and Humans Apart	A response test used in computing, especially on websites, to confirm that a user is human instead of a bot.
CARO	Computer Antivirus Research Organization	An organization established in 1990 to study malware.
CAVP	Cryptographic Algorithm Validation Program	This program provides validation testing of FIPS-approved and NIST-recommended cryptographic algorithms and individual components. Cryptographic algorithm validation is necessary precursor to cryptographic module validation.
CBC	Cipher Block Chaining	Operation for a block cipher using an initialization vector and a chaining mechanism. This will cause the decryption of a block of cipher text to depend on preceding cipher text blocks.
CBC-MAC	Cipher Block Chaining Message Authentication Code	This constructs a message authentication code from a block cipher. The message is encrypted with some block cipher algorithm in CBC mode. This creates a chain of blocks with each block depending on the correct encryption of the previous block.
CERIAS	Center for Education and Research in Information Assurance and Security	A part of Purdue University dedicated to research and education in information security.

Acknowledgement

We are highly thankful for reading out this compilation and hope it will be useful for you in our 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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Answers to the Quiz

1	2	3	4	5	6	7	8	9	10
B	B	D	A	A	C	D	A	D	A