NEWS LETTER

May, 2020

CTC T & IT, Ranchi, Jharkhand

Shri Amit Taneja, DIGP	Shri Rajesh Sahay, Comdt.	Shri Sanjay Belwal, DC.
Patron	Chief Editor	Editor & Publisher

Index

"One machine can do the work of fifty ordinary men. No machine can do the work of one extraordinary man."

NOMA (Non-Orthogonal Multiple Access)

उ.नि./तक. मनोज कुमार मल्होत्रा

Non-Orthogonal Multiple Access

अभी तक मोबाइल कम्युनिकेशन टेक्नोलॉजी में **OMA system** Orthogonal Multiple Access का प्रयोग किया जाता है | रिसोर्स जिनका समुचित इस्तेमाल करने के लिए बंटवारा करना है ऑर्थोगोनल कहलाते हैं जैसे TDM में सभी यूजर के लिए स्लॉट बांटते हैं और FDM में बैंडविड्थ बांटते हैं | इससे यूजर इंटरफेरेंस नहीं होता है | किन्तु इनमें बढती डिमांड सीमित रिसोर्स के कारण डाटा रेट कम हो जाती है |

अर्थात ऐसे पड़ता टाइम इंटर और का

NOMA या नॉन ऑर्थोगोनल मल्टीप्ल एक्सेस विशेष प्रकार का सिग्नल डिजाईन है जिसमे यूजर के बीच टाइम या फ्रीक्वेंसी को बांटने की आवश्यकता नहीं है, बल्कि सभी यूजर पूरा टाइम और पूरा फ्रीक्वेंसी स्पेक्ट्रम एक साथ इस्तेमाल करेंगे जिससे उनकी डाटा स्पीड कम नहीं होगी | किन्तु इसके लिए दो यूजर के सिग्नल में अंतर करने के लिए किसी अन्य लक्षण पर काम करना होगा|

NOMA का उद्देश्य एक ही समय एक ही फ्रीक्वेंसी स्पेक्ट्रम पर ज्यादा सेवा देना है और ज्यादा एफिशिएंसी प्राप्त करना है | इसके लिए यह यूजर का एरिया के हिसाब से बिखरा होना, लो डाटा रेट डिमांड वाली एप्लीकेशन जैसे सेंसर की रीडिंग, गाड़ियों का जीपीअस डाटा या मशीन टू मशीन कम्युनिकेशन आदि को अधिक देकर रिसोर्स व्यर्थ नहीं करना आदि बातों को ध्यान में रखता है |

नोमा में एक प्रकार है पॉवर नोमा | इसमें दो सिग्नल में विभेद इनके पॉवर स्ट्रेंथ से करते हैं | दूर से प्राप्त होने वाला सिगनल वीक होगा जबकि नजदीक से मिलने वाला सिग्नल स्ट्रोंग होगा | टावर के नियर यूजर का स्ट्रोंग चैनल गेन होता है और फार यूजर का वीक चैनल गेन होता है | इससे सेम फ्रीक्वेंसी और टाइम होने पर भी इनमे अंतर किया जा सकता है | यूजर के इस प्रकार पेअर बनाकर हम चैनल की कैपेसिटी डबल कर सकते हैं | सेल का बेस स्टेशन इनके सिग्नल स्ट्रेंथ से इनके सिग्नल को पहचान कर इनको अलग अलग प्रोसेस करता है | टावर से ट्रांसमिशन के समय अलग अलग मोडुलेशन परसेंट रख कर फाइनल पॉवर में फार यूजर को हाई पॉवर शेयर और नियर यूजर को लो पॉवर शेयर देते हैं|

इस प्रकार एक ही फ्रीक्वेंसी होने के कारण दोनों सिग्नल में इंटरफेरेंस होना स्वाभाविक है | फार यूजर अपने पावरफुल सिग्नल और नियर यूजर के सिग्नल की कम स्ट्रेंथ के कारण थोडा सा इंटरफेरेंस तो प्राप्त करता है, किन्तु इसे इग्नोर करके चैनल के कम्पोजिट सिग्नल से सामान्य रूप से अपना सिग्नल डिकोड कर लेता है |

नियर यूजर का अपना सिग्नल वीक है और फार यूजर का स्ट्रोंग, जिससे उसे भारी इंटरफेरेंस मिलता है | इसलिए उसे चार काम करने होते है : पहला वह कम्पोजिट सिग्नल से फार यूजर का सिग्नल डिकोड करता है | दूसरा इस डाटा से फार यूजर सिग्नल को दुबारा बनाता है | तीसरा इस फार यूजर सिग्नल इंटरफेरेंस को कम्पोजिट सिग्नल से माइनस करता है, जिससे इंटरफेरेंस फ्री सिग्नल मिलता है | चौथा इस क्लीन सिग्नल से नियर यूजर अपना डाटा डिकोड करता है | इस प्रकार एक ही कम्पोजिट सिग्नल से दो यूजर डिवाइस अपना डाटा निकाल सकते हैं | यहाँ हमने फार यूजर और नियर यूजर डिवाइस की प्रोसेसिंग को ब्लाक डायग्राम के रूप में दिखाया है |

डाटा प्रोसेसिंग में सामान्य तकनीक QPSK का ही इस्तेमाल कर सकते हैं , किन्तु सामान्य QPSK और नोमा सुपर इम्पोस्ड सिग्नल के QPSK में थोडा अंतर होता है| नार्मल सिग्नल में एक ही डाटा के दो दो बिट मिलाकर चार फेज में डाटा भेजते हैं | नोमा में दो बिट फार यूजर डाटा और दो बिट नियर यूजर डाटा को मिलाकर QPSK बनाते हैं फिर इन चार डाटा में से एक छांट कर इनको पुनः तीन अन्य सैंपल के साथ मिलाकर QPSK बनाते हैं| इस प्रकार यह 3D QPSK की तरह दिखता है जिसके हर QUADRATURE में दोनों यूजर का डाटा होता है |
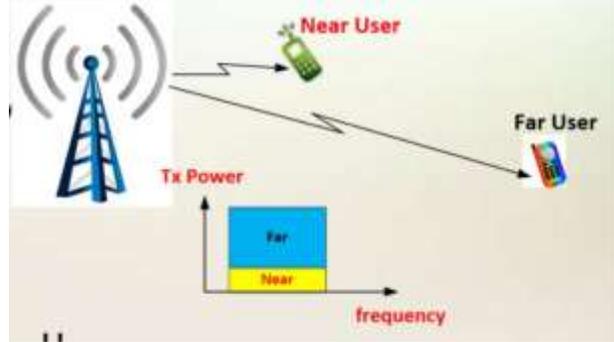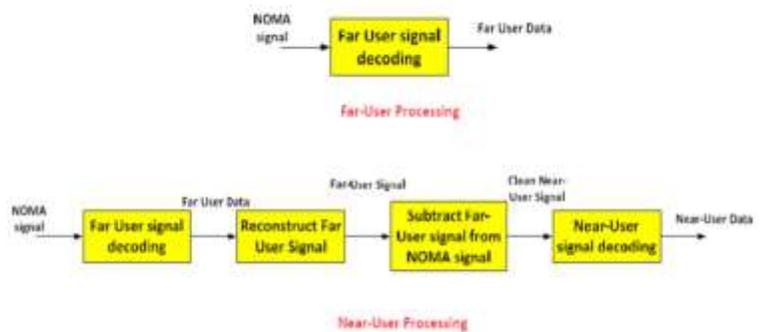
क्या NOMA 5जी में उपयोगी हो सकता है इसके बारे में कुछ रिपोर्ट देखेंगे | किसी चैनल की डाटा रेट कैपेसिटी शेनोन थ्योरी से पता की जा सकती है | इसके अनुसार मैक्सिमम डाटा रेट दो बातों पर निर्भर है, पहला चैनल की बैंडविड्थ W और दूसरा सिग्नल टू नॉइज़ रेश्यो| इसमें भी बैंडविड्थ का SNR की अपेक्षा ज्यादा प्रभाव होता है |

$C = W \log_2 (1 + SNR)$ bits/s

OMA में यदि दो यूजर हैं तो दोनों को चैनल की आधी आधी बैंडविड्थ मिलेगी किन्तु आपस में कोई इंटरफेरेंस नहीं होगी और सिग्नल में केवल एक्सटर्नल नॉइज़ ही होगी | सेम परफॉरमेंस के लिए नियर यूजर को कम पॉवर पर और फार यूजर को ज्यादा पॉवर पर काम करा सकते हैं|

NOMA में दोनों यूजर फुल बैंडविड्थ पर काम करते हैं नियर यूजर की पॉवर कम और फार यूजर की सिग्नल पॉवर ज्यादा होती है | दोनों को नॉइज़ के रूप में एक दुसरे का इंटरफेरेंस मिलता है | नियर यूजर प्रोसेसिंग द्वारा आसानी से फार यूजर के इंटरफेरेंस या नॉइज़ को कैंसिल कर सकता है, इसलिए उसके सिग्नल में केवल एक्सटर्नल नॉइज़ का ही प्रभाव होता है | फार यूजर नियर यूजर के इंटरफेरेंस नॉइज़ के साथ ही कोम्प्रोमाइस करता है और उसका SNR कम होता है |

OMA: $SNR_{near} = P_{near} / Noise$ & $SNR_{far} = P_{far} / Noise$

NOMA Near-user can cancel Far-user signal: $SNR_{near} = P_{near} / Noise$

NOMA Far-user can't cancel Near-user signal: $SNR_{far} = P_{far} / (P_{near} + Noise)$

टोटल चैनल कैपेसिटी दोनों यूजर की कुल कैपेसिटी के बराबर होगी | ऊपर फार्मूला से स्पष्ट है की NOMA की कुल कैपेसिटी OMA के मुकाबले कम से कम दुगनी होगी |

OMA में टोटल रेट कांस्टेंट रहता है और यह एक लिमिट के बाद बढ़ नहीं सकता | यदि एक यूजर का डाटा रेट बढाते हैं तो दुसरे यूजर का डाटा रेट कम हो जाता है | नोमा में एक यूजर की रेट कैपेसिटी बढ़ने से भी दुसरे यूजर पर कम असर पड़ता है | नोमा में दोनों यूजर के बीच अंतर करना मुश्किल नहीं है | दो यूजर पेअर बनाकर NOMA को प्रयोग करके देखा जा चुका है | तीन यूजर पर एक साथ नोमा में कम्युनिकेशन करना अभी रिसर्च में है | यदि यह संभव हुआ तो अधिक यूजर के साथ नोमा का प्रयोग होगा और अधिक यूजर को सेम रिसोर्स में जोड़ा जा सकेगा | नोमा को 5 जी में एक तकनीक के रूप में स्वीकार किया गया है और इसको **MUST** यानि " मल्टी यूजर सुपर पोजीशन ट्रांसमिशन " टेक्नोलॉजी नाम दिया गया है | इसको और प्रभावी बनाने के लिए रिसर्च के मुख्य बिंदु हैं :

- **User pairing selection**
- **Power sharing ratio**
- **Using multiple antennas**
- **More realistic scenarios**

नोमा यूजर के बीच रिसोर्स शेयरिंग पर आधारित है | इस शेयरिंग से ज्यादा डाटा रेट संभव है, इसलिए नोमा, यूजर की संख्या और डाटा रेट बढाने में मदद कर सकता है | इसको प्रैक्टिस में लाने के प्रयास किये जा रहे हैं | उम्मीद है कि यह जल्द ही 5 G में कार्य करेगा |

Top **10** Technologies that changes human life

ASI/C Ashkar V H

So many new technologies have appeared in the past half century that it's impossible to list them all. But these 10 high-tech breakthroughs stand out over the last 50 years because they've revolution-ized the way human live. We look back at their beginnings, as well as where they've taken us today.

1. **The Internet.**

This one seems like a no-brainer, but the Net's unique strength is that no two people will agree on why it's so important. The world's largest and most unruly library, it's also a global news channel, social club, research archive, shopping service, town hall, and multimedia kiosk. Add to that the most affordable mass medium ever, and a curse to anyone with a secret to keep. Three-fifths of Americans now use the Net, but it remains to be seen whether the connections to one another will transform us, or prove that we'll never change.

2. **Genetic engineering.**

Everyone knows Watson and Crick, who unraveled the secret of DNA in 1953. But have you heard of Boyer and Cohen, who constructed the first organism with combined DNA from different species in 1973? They inserted toad genes into a bacterium that then replicated itself over and over, passing the toad's genetic code down through generations of bacteria. Thirty years later, an estimated 70 percent of processed foods contain genetically modified in-gredients, such as soybeans or corn engineered for higher crop yields. Of course, the much bigger potential — good and bad — is in engineering humans. It might prevent birth defects, and dis-eases later in life. But the side effects could be disastrous and unknown.

3. **Digital media.**

"The camera doesn't lie" went a saying not heard much since the release of Photoshop 1.0 in 1990. Dig-itized audio, pictures, movies, and text let even an amateur edit reality — or conjure it from scratch — with a keyboard and a mouse. A singer's bad notes, a model's blemishes, or an overcast sky ina movie scene can be fixed as easily as a spelling error. Just as important, digital media can be copied over and over nearly for free, stored permanently without fad-ing, and sent around the world in seconds. It rightly worries the movie and music in-dustries, but how do you put the genie back in the bottle if there's no bottle any-more?

4. **Personal computers.**

Before IBM recast the desktop computer from hobbyist's gadget to office au-tomation tool in 1983 — followed by Apple's people-friendly Macintosh a year later — a "minicomputer" was the size of a washing machine and re-quired a special air-conditioned room. But the trained technicians who operated the old mainframes already knew computers were cool: They could use them to play games, keep diaries, and trade messages with friends across the country, while still looking busy. Today, thanks to the PC, we all look busy.

5. **Space flight.**

Americans from 50 years ago would be disappointed to learn we never went further than the Moon — no Mars colony, no 2001 odyssey to Jupiter, no speed-of-light spaceships. Even the Shuttle is in trouble. But the space race against the Russians that dominated the national psyche (and a good chunk of the budget) in the '60s and '70s pushed the development of hundreds of enabling technologies, including synthetic fibers and integrated computer circuits, necessary to fly men to the Moon and back. And the astronauts brought back a lesson from space: "We saw the earth the size of a quarter, and we realized then that there is only one earth. We are all brothers."

6. **Mobile phones.**

The idea for cellular phone service dates back at least to 1947, but the first call was made from the sidewalk outside the Manhattan Hilton in 1973 by Martin Cooper, a Motorola researcher who rang up his rival at AT&T Bell Labs to test the new phone. Thirty years later, more than half of all Americans and others own one and cellular networks are beginning to serve Internet access at broadband speeds through thin air.

7. **Nuclear power.**

When the Queen herself threw the switch on the world's first atomic power plant at Calder Hall outside London in 1956, nuclear reactors were seen as a source of cheap, pollution-free energy. But a partial meltdown in 1979 at the Three Mile Island reactor in Pennsylvania soured Americans on nukes as safe power. Nonetheless, the United States today has about 100 active plants that generate 20 percent of the country's electricity — second only to coal as a source of power — and have been steadily increasing their capacity. Will the next 50 years bring a better alternative?

8. **Electronic funds transfer.**

The Federal Reserve Bank of San Francisco set up a paperless transfer system with the Los Angeles branch in 1972. By the end of the decade, instantaneous transfers of millions of dollars in value between banks, insurance companies and other financial institutions had become common. The real appeal of EFT today is its trickle down to the individual: You get grab cash from your bank account anywhere in the world, and use PayPal to buy and sell stuff on eBay without sending money or checks through the mail.
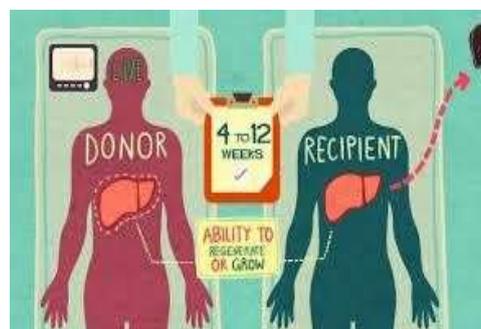
9. **Robots and artificial intelligence.**

The term "robot" was coined by Czechoslovakian playwright Karel Capek in 1920 — "robota" being a Czech word for tedious la-bor — but the first real industrial robot was built in 1954 by George Devol. Five years later, the Massachusetts Institute of Technology founded its Artificial IntelligenceLaboratory in a quest to mechanically mimic human minds as well as hands. Today, robots assemble products better, faster and often cheaper than manual laborers, while more than 8 million U.S. airline flights a year are scheduled, guided and flown with the superhuman assistance of advanced software. Still,some Ameri-cans eye such systems with the cynical view of novelist Kurt Vonnegut, whose 1952 story "Player Piano" warned that the machines might leave people without a purpose — or a job.

10. **Organ transplants.**

In 1954, Dr Joseph Murray removed the kidney from one human patient and implanted it in another. The recipient accepted the kidney as its own rather than rejecting it as a foreign body. It was more than skillful surgery: Murray had chosen a pair of identical twins, Ronald Herrick and his terminally ill brother Richard, in hopes their similar genetic makeup would reduce the likelihood of Richard's body re-jecting Ronald's liver. Soon afterward, though, other re-searchers developed drugs that could squelch a transplant recipient's immune system long enough for the new organ to become incorporated into its new body. Today, some 25,000 p e o p l e a year receive a new heart, kidney, liver, lung, pancreas or intestine — and a new lease on life.

Technology Trending in 2020

HC/RO C R Barad

This year, telecommunications companies are gearing up for some of the biggest technological advancements the industry has seen in years. Trends such as the 5G revolution and the advancement of the internet of things (IoT) will reshape the telecom sector and force innovation on a massive scale. This arrival explores four of the most pertinent advancements that will affect telecom companies in 2020.

5G Networks

5G stands for 5th generation — the most recent iteration of broadband connection. 5G brings three major upgrades to the table. It provides greater speed to move more data, decreases latency for shorter load times, and increases the ability to connect more devices at once. 5G networks will enable more detailed and efficient augmented and virtual realities, higher resolution video, fully autonomous vehicles, massive connected IoT networks (like smart cities), and more. 5G is the most highly anticipated change to the future of telecom. Though it isn't set to officially launch until 2021

IoT and Smart Cities

The IoT consists of a network of connected devices, able to communicate with each other, and which can be controlled and monitored remotely. By 2021, there will be an estimated 30 billion connected IoT devices worldwide, many of which will be industrial connections, an essential component of smart cities.

Smart cities take the IoT a step further by creating an interconnected network that residents can access online, often via a mobile app. A network like this will provide data and communication channels that allow users to better manage their day-to-day activities, from corresponding directly with their government, to instantly finding a parking spot on a busy day.

The main goal of smart cities is to create a better quality of living for their citizens by streamlining urban services like energy and transportation through smart technology. However, prior to the promise of 5G networks, experts couldn't foresee the capacity to support the amount of data a truly connected city would generate. Now that 5G is on the horizon, major urban areas will be racing to be the first to introduce their own smart city.

Artificial Intelligence

AI in the telecom industry encompasses a myriad of focus areas. Customer service and network optimization are at the top of that list. Throughout this year, some of the biggest implementations of AI will be in these spaces (this seems redundant). In fact, according to IDC 63 percent of telecom companies are investing in AI systems this year. Predictive analytics is one of the most promising capabilities of AI technology, especially for the telecom community. AI-based analytics provide telecom companies with the ability to use data and machine learning software to predict future industry trends and potential infrastructure snags, and to continuously assess their service for bugs or potential pitfalls. Additionally, AI-based chat-bots and virtual assistants will transform the way businesses handle customer service. They can automate conversations and successfully mimic human speech, while drawing data and insights to provide personalized and positive experiences. Believes that 85 percent of interactions with customers will be automated by 2020.

Diversified Ecosystems

Much like ecosystems function in nature, industrial ecosystems are a network of cross-industry organizations that work together to create a stronger, more advanced industry. The telecom industry will see a move toward creating those lucrative ecosystems. According to a recent Accenture report, ecosystems will unlock $100 trillion in value during the next 10 years by unlocking competitive agility. Telecom companies have the highest potential to come together and form such alliances. Industry leaders agree, with 83 percent citing ecosystems as an important piece of their disruption strategy.

Modern teaching aids-worthwhile

ASI/RO Betha Anand

Modern teaching aids or perfectly to say MODERN AGE TEACHING is actually the need of the day. It will be very wrong to say that our past learning method or traditional teaching was not good enough. Many great men have been established and have made this world proud, by learning the same old learning methods.

introduction

Today , the case is different. Parents are getting more demanding when it comes to their child development; counting all the three stages of a child development-PHYSICAL; EMOTIONAL and MENTAL development. And even students show their interest of garbing any possible knowledge they can. The textbook and dictation is a thing of the past, where teachers come, teach and leave; with no homework, no tests and no assessments. But all this may be true in the past; not at this preset era, where teachers, themselves have to prepare a lot before coming to the classroom.   Modern teaching aids demands more preparations from the teachers like audio and video presentations. Many schools and colleges have started adding such aids and techniques in their daily curriculum to aid students with all-inclusive learning package and environment.

Is modern teaching aids a boon or bane?

In today's competitive life, learning with simple method is out of question. Many subjects do need help from technology, when it comes to teachings like History and Sciences, where every matter cannot be learned and understood by simple blackboard or oral recitation. A video presentation compact discs, digital video discs, which can help student to learn in the classroom or can be taken home for extra practice.

Physical development:

A number of questions have been raised among educators, psychologists and various organizations, about the concern of the early computer use. Even though computer can be of great help; but what about the physical development.   By sitting a lot in front, the computer has the risk of syndrome like Carpal Tunnel Syndrome, WHICH IS CAUSED DUE TO REPETITIVE MOTION INJURY. And also, now-a-days, classrooms are packed with air-conditioners; which is not good for students, as it lowers the calorie-burning rate and students tends to eat more; which lead to obesity.

Now-a-days, children also prefer sitting in front of computers and television with air-conditioner on in their home too, which leave no time foe out-door games and activities. Eyestrain is also another problem which lead to dryness of eyes, headaches and blurry vision.

Emotional and mental development:

Even this area of development has been spoiled by the new age learning. Spending a lot of time in front of the computers, make it literally impossible for the child to interact with real humans. If all the studies are done on the computers, video and audio presentations ; and LCD projectors, then what time will be left for the students to interact with the their students and teachers and even they won't be able to share their knowledge with each other as well, which hinder there emotional and mental development.

Conclusion:

New and innovative methods are always welcome, only if their original purpose is to **supplement and enhance** the true methods of knowledge. Indeed, of replacing the traditional way of learning; the modern teaching aid can aid the traditional methods of learning which will do wonders for the students to be creative and use their skills in a proper way, when it comes to knowledge.

Technical Quiz

1. Which of the following bank has launched 'mVisa' – a mobile-based payments solution?

    [A] SBI
    [B] ICICI Bank
    [C] HSBC Bank
    [D] Canara Bank

2. Which Indian software company signed on to the Climate Pledge and announced to go net carbon free by 2040?

    [A] Wipro
    [B] Tata Consultancy Services
    [C] Infosys
    [D] Tech Mahindra

3. Which of the following is not true about Immediate Payment Service (IMPS)?

    [A] To use IMPS, both the account holder and beneficiary needs to have Mobile Money Identifier (MMID).
    [B] Internet Banking Account facilitates IMPS to transfer money to any account.
    [C] The facility is provided by National Payments Corporation of India through its existing NFS switch.
    [D] IMPS offers an instant, 24X7, interbank electronic fund transfer service through mobile phones.

4. Which FinTech company has partnered with major e-commerce firms including Flipkart, to promote digital ecosystem?

    [A] MobiKwik
    [B] PhonePe
    [C] FreeCharge
    [D] Paytm

5. Which one of the following is controlled by the World Wide Web?

    [A] Universal banking
    [B] Virtual Banking
    [C] Wholesale Banking
    [D] None of these

6. Which payment bank launched 'Suraksha Salary Account' for workforce of MSMEs?

[A] Airtel Payments Bank
[B] India Post Payments Bank
[C] Jio Payments Bank
[D] Paytm Payments Bank

7. Ashwani Bhatia has been appointed as the new Managing Director of which Indian public sector bank?

[A] Punjab National Bank
[B] Bank of India
[C] State Bank of India
[D] Union Bank of India

8 Global firms TPG and L Catterton are set to buy stake in which Indian digit al company?

[A] Jio Platforms
[B] Bharti Airtel
[C] Vodafone Idea
[D] Novi Digital Entertainment9.

9. Who are the beneficiaries of the newly launched scheme PM SVANIDHI?

[A] MSMEs
[B] Migrant Labourers
[C] Street vendors
[D] Textile Industries

10. Broadcast Engineering Consultants India Limited (BECIL), that was seen in news, is a public sector enterprise under which Ministry?

A] Minister of Communication
[B] Ministry of Information and Broadcasting
[C] Ministry of Electronics and IT
[D] Ministry of Commerce and Industry

Technical Terms

End-to-End Encryption

One of the biggest encryption buzzwords is that of end-to-end encryption. Social messaging platform service WhatsApp began offering its users end to end encryption (E2EE) in 2016, making sure their messages are private at all times.

Salt

When passwords are part of key creation, the encryption process requires additional security steps. One of those steps is salting the passwords. At a basic level, a salt adds random data to a one-way hash function.

Document Management

Document management, often, referred to as Document management system is a software which is used to track, store, and manage electronic documents and an electronic image of paper through a scanner. It is one of the basic big data terms you should know to start a big data career.

Fuzzy Logic

Fuzzy logic is an approach to computing based on degrees of truth instead of usual true/false (1 or 0) Boolean algebra.

Load balancing

Load balancing is a tool which distributes the amount of workload between two or more computers over a computer network so that work gets completed in small time as all users desire to be served faster. It is the main reason for computer server clustering and it can be applied with software or hardware or with the combination of both.

Log File

A log file is the special type of file that allows users keeping the record of events occurred or the operating system or conversation between the users or any running software.

Zettabyte

It is the big data term related to the measurement of data. One zettabyte is equal to 1 billion terabytes or 1000 exabytes.

Data Cleansing

Data Cleansing/Scrubbing/Cleaning is a process of revising data to remove incorrect spellings, duplicate entries, adding missing data, and providing consistency. It is required as incorrect data can lead to bad analysis and wrong conclusions.

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.
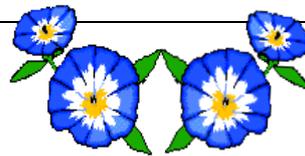
R&D Team
CTC T&IT CRPF, Ranchi, Jharkhand
✉ ctcit@crpf.gov.in

Answers to the Quiz

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