VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF INFORMATION TECHNOLOGY

Date: 08.05.2024

Report on Online Faculty Development Programme on 'Blockchain Technology and Its Current Research Challenges'

Organized By: Department of IT, Vasavi College of Engineering, Hyderabad
In Association With: ISOC, Hyderabad Chapter
Dates: 29th April – 3rd May 2024

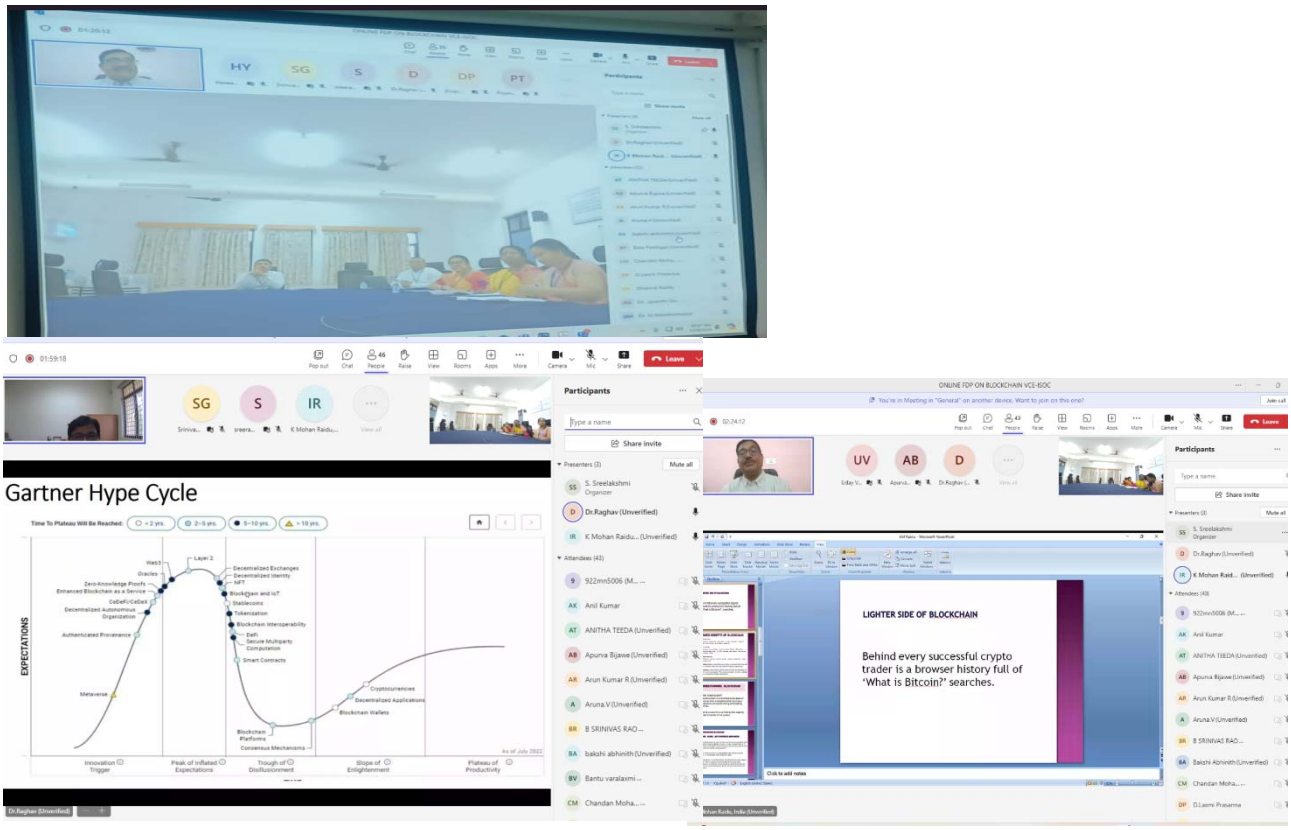
Day 1: Monday, 29 April 2024

10:00 – 11:00: Inaugural Session

The event began with a formal inaugural session, marking the commencement of the Faculty Development Programme. The session started by introduction of the dignitaries and a warm welcome to the participants by Ms S. Aruna

The Prayer invocation was sung by Ms Anusha ,3/3 IT student. The introduction speeches on FDP were delivered by Dr. S V Ramana, Principal VCE , Chief Guest Mr. Mohan Raidu, President ISOC Hyderabad, Informatics India and Dr. K.Raghavendra Kune ,scientist ADRIN-ISRO.The convener of the programme Dr. K. Ram Mohan Rao, HOD-IT shared the overview of the programme's objectives. The session then followed by key note Addresses by Dr. K.Raghavendra Kune ,scientist ADRIN-ISRO and Mr. Mohan Raidu, President ISOC Hyderabad, Informatics India.

Vote of thanks for the Inaugural session was proposed by the faculty coordinator of the FDP,Dr. Tilottama goswami.



Inaugual session and key note speeches

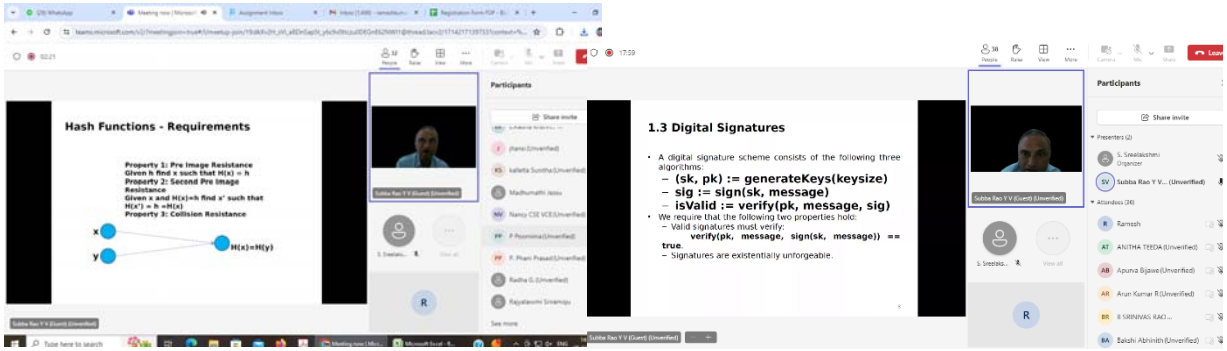
10:30 – 11:00: Key Note Address-1 - Introduction to Blockchain
Expert: Dr. K.Raghavendra Kune ,scientist ADRIN-ISRO

11:00 – 12:00: Key Note Address-2 - Introduction to Blockchain
Expert: Mr. Mohan Raidu, President ISOC Hyderabad, Informatics India

14:00 – 15:00: Basics: Crypto Primitives, Hash Function, Digital Signature, Public Key Cryptography
Expert: Dr. Subba Rao, SCIS, University of Hyderabad

Dr. Subba Rao provided an in-depth session on the cryptographic principles underlying Blockchain technology. He covered:

- **Crypto Primitives:** The basic building blocks of cryptographic protocols, including encryption and decryption processes.
- **Hash Function:** How hashing ensures data integrity and security in Blockchain .
- **Digital Signature:** The role of digital signatures in authenticating transactions.
- **Public Key Cryptography:** How public and private keys work together to secure communications in the Blockchain network.



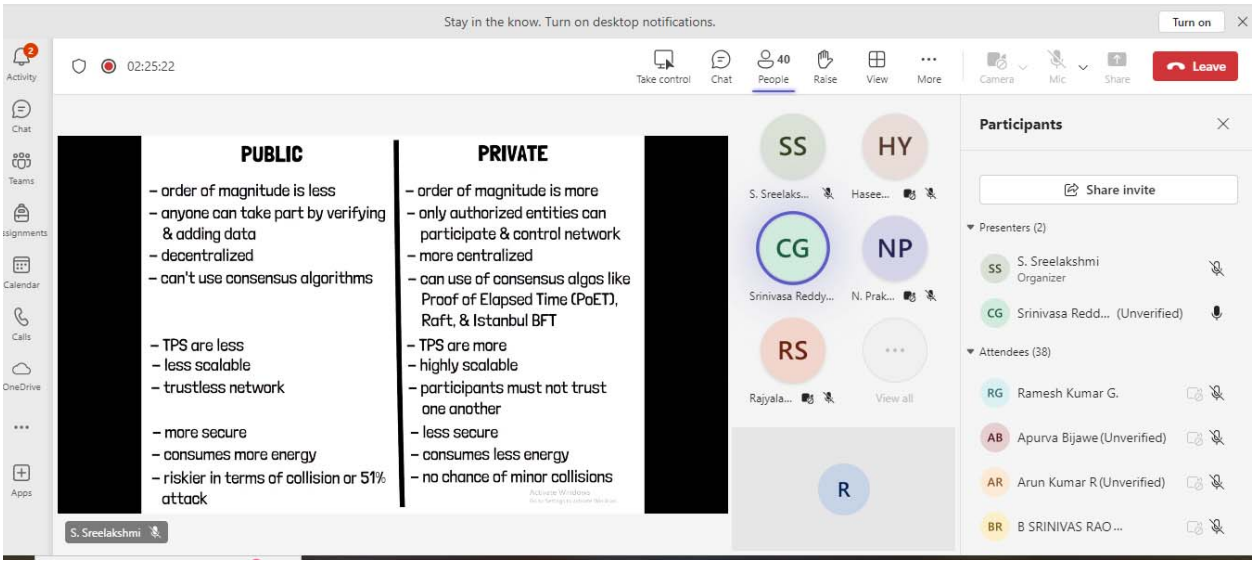
Dr. Subba Rao explaining about hash functions and Digital signatures

15:00 – 16:00: Public Vs Private Blockchain
Expert: Mr. Srinivasa Reddy Gurram, Public Private Partnership Projects & Chair - Inter Society Relations at ISOC Hyderabad

Mr. Srinivasa Reddy Gurram discussed the differences between public and private Blockchain s:

- **Public Blockchain:** Open to anyone, decentralized, and secure through consensus mechanisms like Proof of Work (PoW) or Proof of Stake (PoS).
- **Private Blockchain:** Restricted access, typically used by enterprises for specific applications requiring control and privacy.

He elaborated on the use cases, advantages, and challenges of both types, providing insights into when and why an organization might choose one over the other.



Mr. Srinivasa Reddy Gurram explaining types of Blockchain

Summary

The first day of the Online Faculty Development Programme provided participants with a robust foundation in Blockchain technology. The sessions were designed to introduce the core concepts and cryptographic underpinnings of Blockchain , as well as to differentiate between public and private Blockchain s. The expertise shared by Dr. K.Raghavendra Kune ,scientist ADRIN-ISRO, Mr. Mohan Raidu, Dr. Subba Rao, and Mr. Srinivasa Reddy Gurram was invaluable, offering both theoretical knowledge and practical insights into the world of Blockchain . Participants left with a clearer understanding of Blockchain 's potential and its implications for future research and application.

Day 2: Tuesday, 30 April 2024

10:00 – 11:00: Distributed Consensus, Proof of Work, Stake, Burn, and Elapsed Time
11:00 – 12:00: Public Ledgers, Bitcoin, Smart Contracts
Expert: Mr. R. Dharma Reddy, Ex Microsoft, VCE

Mr. R. Dharma Reddy began the day with an enlightening session on distributed consensus mechanisms used in Blockchain networks. Key points included:

- **Proof of Work (PoW):** The process by which miners solve cryptographic puzzles to validate transactions and create new blocks, ensuring security and preventing double-spending.
- **Stake:** How Proof of Stake (PoS) relies on validators who lock up a certain amount of cryptocurrency as a stake, which is used to achieve consensus.
- **Burn:** A method where coins are sent to an irretrievable address to reduce supply, impacting the consensus mechanism.
- **Elapsed Time:** The concept of Proof of Elapsed Time (PoET), which uses a trusted computing environment to ensure that participants are selected fairly based on elapsed time.

In the second session, Mr. Dharma Reddy delved deeper into the components of Blockchain :

- **Public Ledgers:** The transparent and immutable records maintained by Blockchain networks.
- **Bitcoin:** The original cryptocurrency, its underlying technology, and its impact on the financial world.
- **Smart Contracts:** Self-executing contracts with the terms of the agreement directly written into code, enabling automated and trustless transactions.
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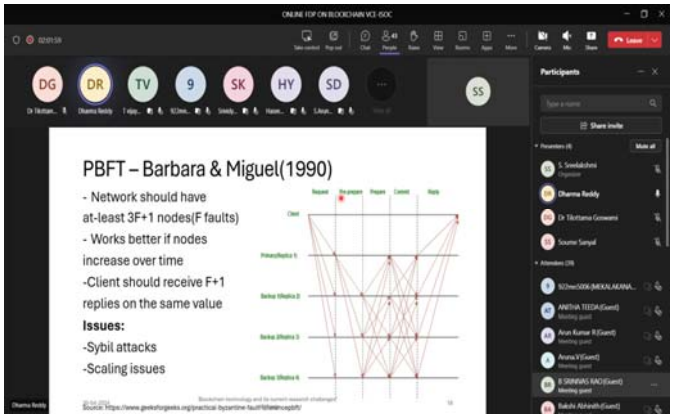
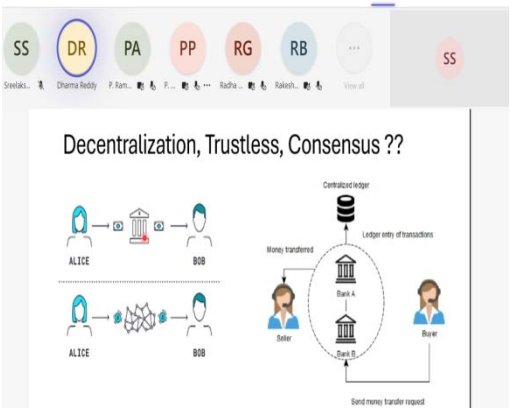




Mr. Dharma Reddy discussing about public ledgers and Decentralisation

14:00 – 15:00: Cybersecurity, Attacks, and Privacy: Cyber-attacks to Blockchain, Insider Threats & Privacy
Expert: Mr. Sreeram Ch, Tech Mahindra

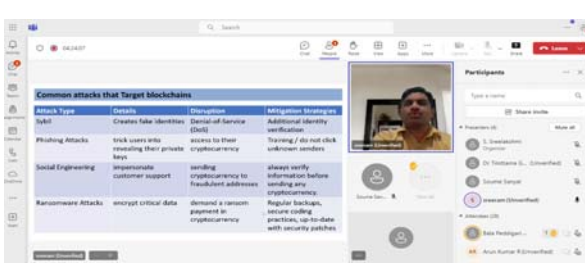
Mr. Sreeram Ch addressed the critical aspects of cybersecurity in Blockchain technology:

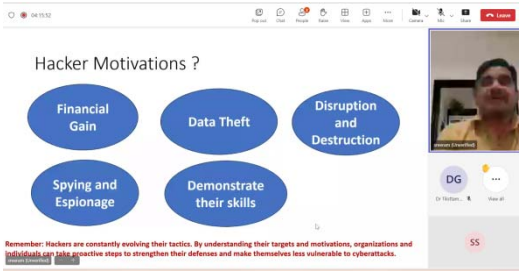
- **Cyber-attacks on Blockchain:** Various attack vectors, including 51% attacks, Sybil attacks, and DDoS attacks.
- **Insider Threats:** Risks posed by individuals within the organization, and strategies to mitigate these threats.
- **Privacy:** The importance of privacy in Blockchain transactions and the techniques used to enhance it, such as zero-knowledge proofs and confidential transactions.

15:00 – 16:00: Cryptocurrency, Tokens, ICOs, Open Datasets
Expert: Mr. Bala Peddigari, TCS & Secretary ISOC Hyderabad

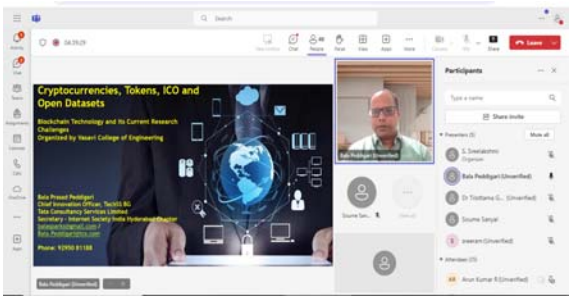
The final session of the day was conducted by Mr. Bala Peddigari, focusing on various aspects of cryptocurrencies:

- **Cryptocurrency:** An overview of digital currencies, their market dynamics, and regulatory challenges.
- **Tokens:** Differentiation between utility tokens and security tokens, and their roles in the Blockchain ecosystem.
- **ICOs (Initial Coin Offerings):** The process of raising capital through cryptocurrency tokens, benefits, and risks.
- **Open Datasets:** The significance of open data in Blockchain , fostering transparency, and innovation





Mr. Sreeram discussing about cyber attacks



Mr. Bala Peddigari discussing about cryptocurrencies and initial coin offering

Summary

The second day of the Online Faculty Development Programme continued to build on the foundational knowledge of Blockchain technology. Mr. R. Dharma Reddy's sessions provided a thorough understanding of consensus mechanisms and key Blockchain components like Bitcoin and smart contracts. The cybersecurity session by Mr. Sreeram Ch highlighted the importance of protecting Blockchain networks from various threats. Finally, Mr. Bala Peddigari's insights into cryptocurrencies, tokens, ICOs, and open datasets rounded out a comprehensive day of learning. Participants gained deeper insights into both the technical and practical aspects of Blockchain , equipping them with knowledge crucial for research and development in this field.

Day 3: Wednesday, 1 May 2024

10:00 – 11:00: Introduction to Ethereum Blockchain
11:00 – 12:00: Ethereum Smart Contracts using Solidity
Expert: Dr. Parwat Singh Anjana, SUPRA, California, US

Dr. Parwat Singh Anjana commenced the session by introducing the Ethereum Blockchain , a pivotal platform in the world of Blockchain technology. Key points covered in the session included:

- **Overview of Ethereum:** Its creation, purpose, and how it differs from Bitcoin.
- **Ethereum's Architecture:** Explanation of nodes, accounts, gas, and the Ethereum Virtual Machine (EVM).
- **Use Cases:** Practical applications of Ethereum in various industries such as finance, supply chain, healthcare, and beyond.

Dr. Anjana highlighted Ethereum's ability to support smart contracts and decentralized applications (DApps), emphasizing its role in advancing Blockchain technology.

Continuing from the previous session, Dr. Parwat Singh Anjana delved into the specifics of Ethereum smart contracts and the Solidity programming language. Key aspects included:

- **Smart Contracts:** Their definition, purpose, and how they automate and enforce agreements without intermediaries.
- **Solidity Language:** Basics of writing smart contracts using Solidity, including syntax, functions, and events.
- **Practical Examples:** Demonstrations of simple smart contracts, such as a basic token and a voting system.

The session was interactive, with live coding examples and a Q&A segment to address participants' queries about Solidity and smart contract development.

14:00 – 15:00: Building Decentralized Applications (DApps)

15:00 – 16:00: Building Decentralized Applications (DApps) - Continued
Expert: Dr. Syed Imtiyaz Hassan, CSIT, MANUU

Dr. Syed Imtiyaz Hassan began the afternoon session by explaining the concept of DApps and their significance in the Blockchain ecosystem. Highlights included:

- **Introduction to DApps:** What they are, their characteristics, and how they differ from traditional applications.
- **Architecture of DApps:** Components such as smart contracts (backend), frontend (user interface), and middleware.
- **Development Tools:** Overview of tools and frameworks like Truffle, Remix, and MetaMask that facilitate DApp development.

Dr. Hassan also discussed the challenges and best practices in building robust and secure DApps.

In the concluding session, Dr. Syed Imtiyaz Hassan provided a hands-on workshop where participants engaged in building a simple DApp. Key activities included:

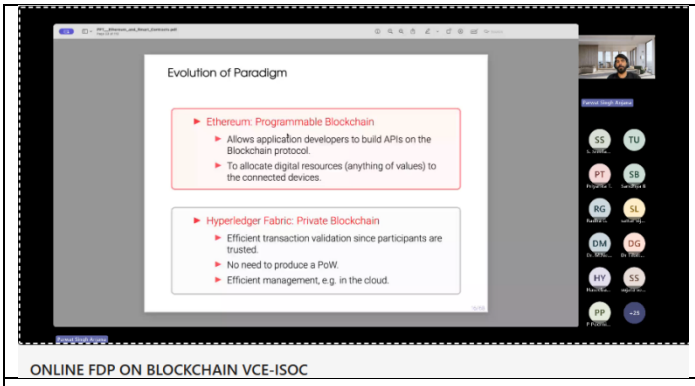
- **Step-by-Step Development:** A guided process from setting up the development environment to deploying a DApp on the Ethereum test network.
- **Interaction with Smart Contracts:** Practical exercises on how the frontend interacts with deployed smart contracts.
- **Debugging and Testing:** Techniques to debug and test DApps to ensure functionality and security.

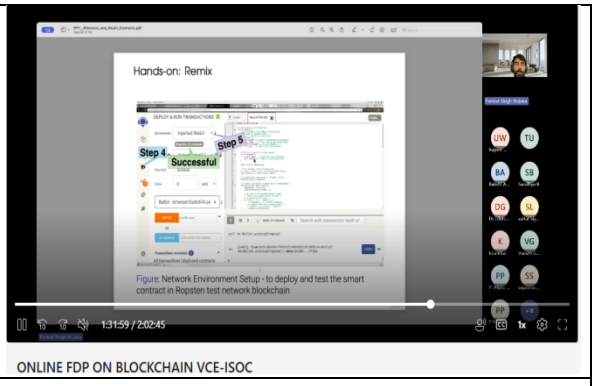
Participants had the opportunity to ask questions and receive personalized assistance, making it a highly interactive and productive session.

Summary

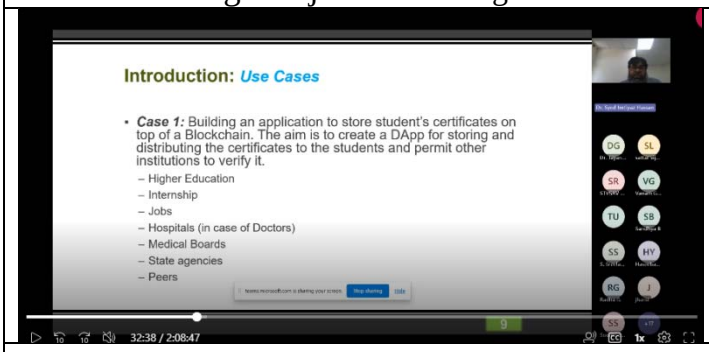
The third day of the Online Faculty Development Programme offered participants a comprehensive understanding of Ethereum and its application in developing smart contracts and DApps. Dr. Parwat Singh Anjana's sessions provided foundational knowledge on Ethereum and Solidity, while Dr. Syed Imtiyaz Hassan's workshops translated that knowledge into practical skills for building decentralized applications. This combination of

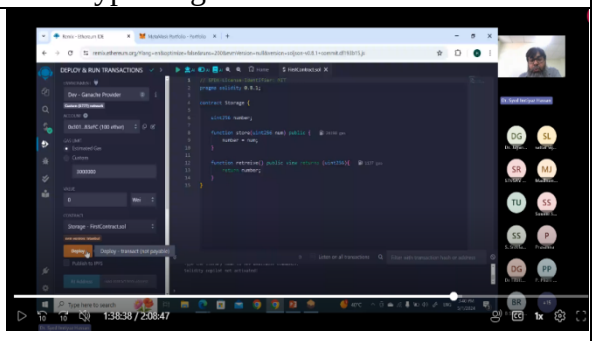
theoretical and hands-on learning equipped participants with the necessary tools to explore and innovate within the Ethereum Blockchain ecosystem.





Dr. Parwat Singh Anjana discussing about Ethereum and Hyperledger framework and its Demo





Dr. Syed Imtiyaz Hassan discussing about usecases and Solidity

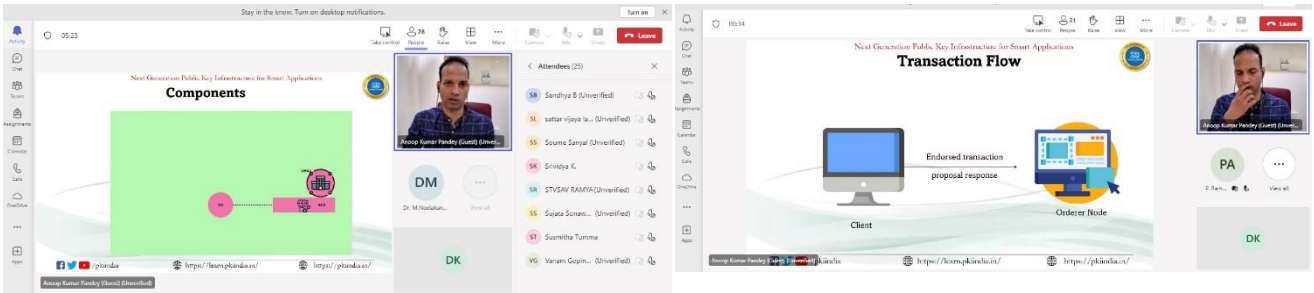
Day 4: Thursday, 2 May 2024

10:00 – 11:00 Hyperledger
11:00 – 12:00 Chaincode Development using Go/Java/Javascript

Expert: Anoop Kumar Pandey, C-DAC

Mr. Anoop Kumar Pandey initiated the session by introducing Hyperledger, a prominent framework in Blockchain technology. Key highlights included:

- **Overview of Hyperledger:** Its purpose, architecture, and how it addresses enterprise-level Blockchain solutions.
- **Hyperledger Fabric:** Explanation of components such as channels, chaincode, and consensus mechanisms.
- **Use Cases:** Applications of Hyperledger in sectors like finance, supply chain, and healthcare.



Mr. Anoop Kumar Pandey discussing about components of Hyperledger and transaction flow

The session provided insights into how Hyperledger differs from public Blockchain s like Ethereum and Bitcoin, focusing on its permissioned nature and scalability.

Continuing from the previous session, Mr. Anoop Kumar Pandey delved into the specifics of chaincode development for Hyperledger. Key aspects included:

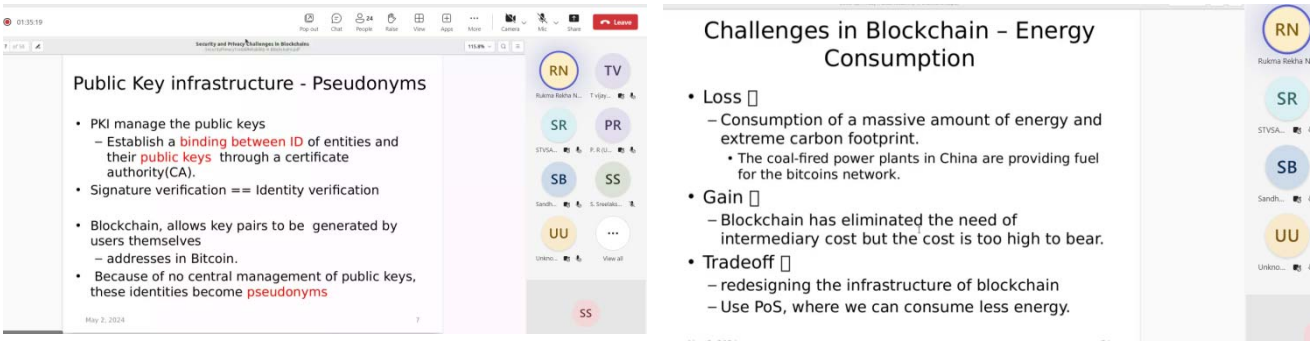
- **Chaincode Basics**: Definition, purpose, and how it defines the rules for transactions within a Hyperledger network.
- **Programming Languages:** Overview of Go, Java, and JavaScript for writing chaincode.
- **Hands-on Examples**: Practical demonstrations of writing and deploying chaincode for simple transactions.

The session was interactive, with participants gaining practical knowledge on developing Blockchain applications within a permissioned network using Hyperledger Fabric.

14:00 – 15:00 Security and Reliability, Privacy and Trust in Blockchain
Expert: Dr. Rukma Rekha, SCIS, UoH

Dr. Rukma Rekha commenced the afternoon session by discussing critical aspects of Blockchain technology related to security, privacy, and trust. Highlights included:

- **Security Measures:** Techniques such as cryptography, consensus mechanisms, and secure coding practices.
- **Privacy Considerations:** Challenges and solutions for maintaining confidentiality in Blockchain transactions.
- **Trust Establishment:** Building trust in decentralized systems through transparency and auditability.



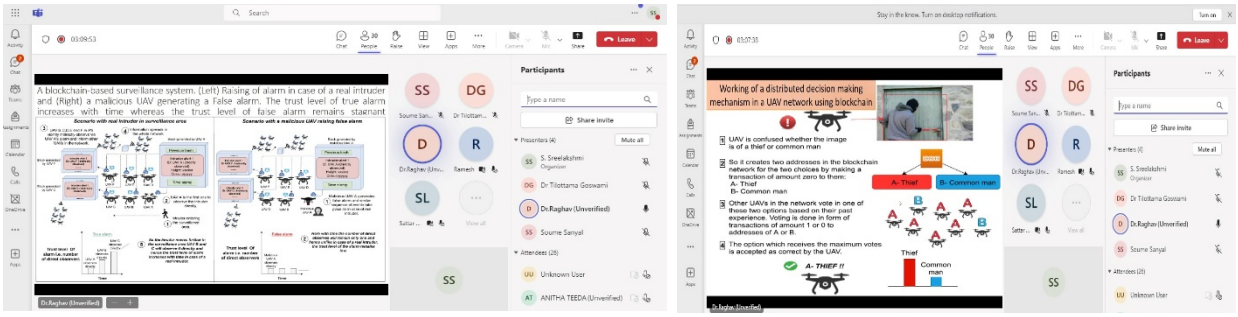
Dr. Rukma Rekha explaining PKI and challenges in Blockchain

15:00 – 16:00 Case Studies Related to Collision Avoidance and Traffic Management
Expert: Dr. Raghavendra Kune, ADRIN

In the final session of the day, Dr. Raghavendra Kune presented case studies illustrating the application of Blockchain technology in collision avoidance and traffic management scenarios. Key points covered:

- Use of Blockchain: How distributed ledgers can enhance data integrity and real-time communication in transportation systems.
- Practical Examples: Case studies demonstrating successful implementations of Blockchain for improving traffic flow and safety.

- Future Directions: Challenges and opportunities for further research in applying Blockchain to smart city initiatives.



Dr. Raghav explaining challenges in Blockchain based Surveillance system

The sessions addressed current research challenges in enhancing the security and reliability of Blockchain networks, crucial for deploying robust applications.

Participants engaged in discussions on the potential of Blockchain to revolutionize urban mobility and safety protocols.

Summary: The fourth day of the Faculty Development Programme offered a diverse exploration of Blockchain technology through sessions on Hyper ledger framework, chaincode development, security considerations, and real-world applications in traffic management. Experts provided theoretical insights and practical demonstrations, equipping participants with essential knowledge and skills to address current research challenges in Blockchain technology. This combination of theoretical sessions and practical workshops facilitated a comprehensive understanding of Blockchain's potential across various domains, enhancing participants' ability to innovate and contribute to the evolving field of Blockchain technology.

Day 5: Friday, 3 May 2024

10:00 – 11:00 Demonstration of National Blockchain Framework
Expert: Dr. Jyotsna, C-DAC

Ms. Jyotsna commenced the session with a demonstration of the National Blockchain Framework, highlighting its significance and applications in governmental and public sector domains. Key highlights included:

- **Overview of National Blockchain Framework:** Objectives, architecture, and components such as identity management and data governance.
- **Use Cases**: Practical applications in areas like healthcare, land registry, and administrative services.
- **Interoperability and Scalability**: Challenges and solutions in integrating diverse systems under a unified Blockchain framework.

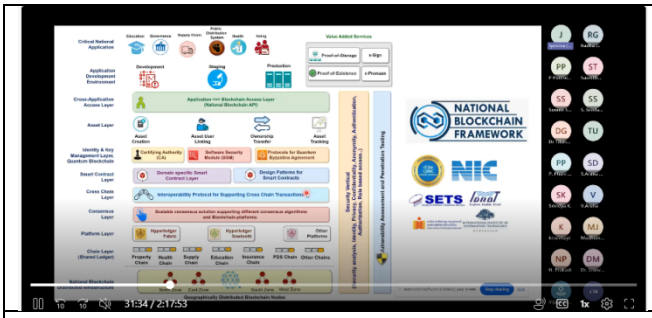
The session provided insights into how Blockchain technology can streamline governance and enhance transparency and efficiency in public services.

11:00 – 12:00 Cybersecurity & Machine Learning
Expert: Mr. Madhava P, Cyber Warrior, BSNL

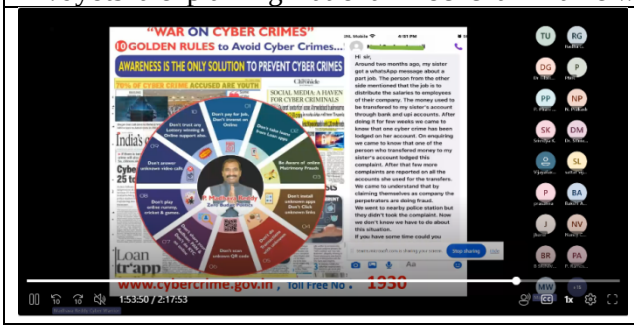
Mr. Madhava P delved into the intersection of cybersecurity and machine learning, emphasizing their role in securing Blockchain ecosystems. Key aspects included:

- **Cybersecurity Fundamentals:** Threats, vulnerabilities, and risk management strategies specific to Blockchain networks.
- **Machine Learning Applications:** Use of ML algorithms for anomaly detection, intrusion prevention, and secure data sharing. Examples illustrating the synergy between cybersecurity practices and machine learning techniques in Blockchain environments

Participants gained insights into advanced approaches to safeguarding Blockchain infrastructure against evolving cyber threats.



Dr. Jyotsna explaining National Blockchain frame work

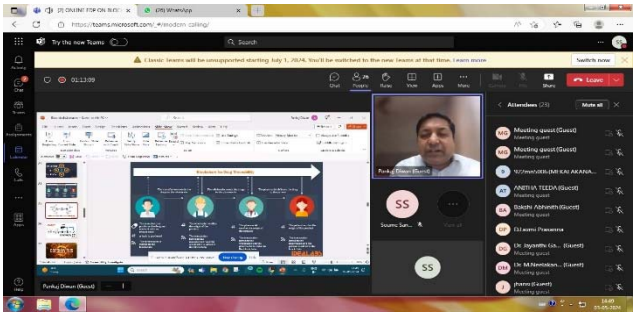


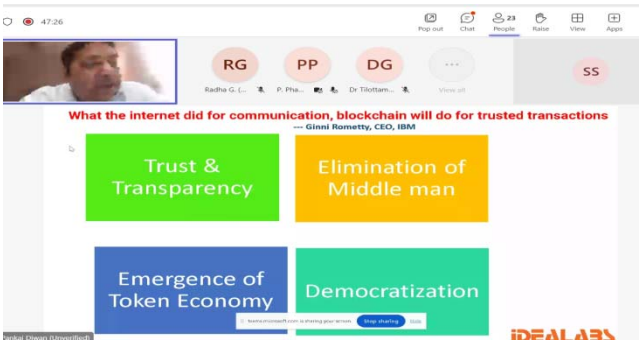
Mr. Madhava P session explaining cyber crimes and Q/A session

14:00 – 15:00 Blockchain Industry Use Cases and Practical Implementation
Expert: Mr. Pankaj Diwan, Co-Founder, India Blockchain Forum

Mr. Pankaj Diwan explored industry-specific use cases of Blockchain technology and their practical implementation strategies. Highlights included:

- **Industry Adoption Trends and Real-world Examples:** How sectors such as finance, supply chain, healthcare, and logistics are leveraging Blockchain for operational efficiency and cost savings. Case studies showcasing successful Blockchain implementations in optimizing processes and enhancing trust among stakeholders.
- **Regulatory Considerations:** Discussion on regulatory frameworks and compliance requirements impacting Blockchain adoption in different industries.





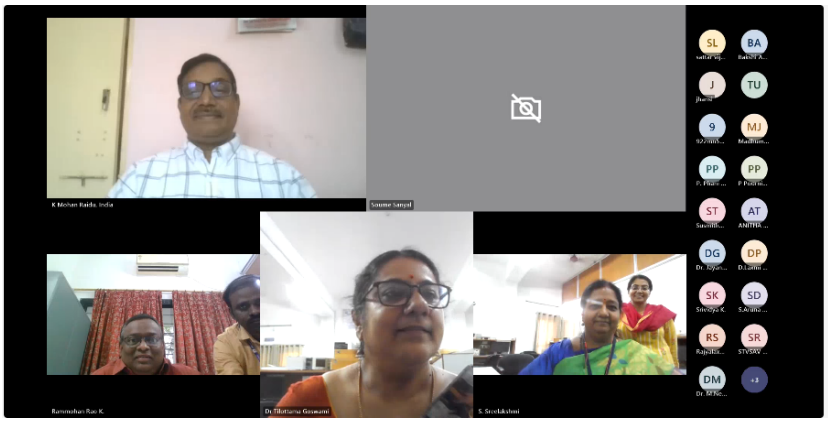
Mr. Pankaj Diwan discussing about usecases of Blockchain

The session provided valuable insights into the transformative potential of Blockchain across various sectors, encouraging participants to explore innovative applications.

Summary: The fifth day of the Faculty Development Programme focused on advanced topics including the National Blockchain Framework, cybersecurity strategies, industry use cases, and concluded with a reflective valedictory session. Experts shared valuable insights, practical demonstrations, and real-world examples, equipping participants with the knowledge and skills to navigate challenges and opportunities in Blockchain technology. The programme successfully fostered collaboration, learning, and innovation among participants, paving the way for continued exploration and application of Blockchain solutions in diverse sectors.

15:00 – 16:00 Valedictory Session

The valedictory session marked the conclusion of the Faculty Development Programme. Participant expressed their experiences and Feedback on the sessions and overall organization.



Organisers group photo.

Vote of thanks for the Valedictory session was proposed by the faculty coordinator of the FDP, Dr. S.Sree Lakshmi. The valedictory session provided closure to the programme, celebrating participants' engagement and commitment to advancing their knowledge in Blockchain technology.

The programme received highly positive feedback, emphasizing the following key points:

- **Informative Sessions:** Participants found the sessions to be informative, covering a wide range of topics essential to understanding Blockchain technology.
- **Excellent Speakers:** All speakers were commended for their expertise and ability to deliver and demonstrate complex concepts effectively.
- **Solid Foundation in Blockchain Basics:** Participants appreciated the thorough coverage of basics, which included fundamental concepts like Distributed Ledger Technology (DLT), smart contracts, digital signatures, cryptography (including hash functions and Merkel tree functionality), and their mathematical representations.
- **Smooth Schedule:** The programme proceeded smoothly as per the schedule, ensuring all sessions were conducted timely and efficiently.

Learning Key Points: Participants highlighted their key takeaways, which included understanding Blockchain applications, security challenges, and issues related to Blockchain implementation.

The 5-day FDP provided a comprehensive exploration of Blockchain technology, equipping participants with foundational knowledge, practical insights, and awareness of current research challenges. The collaboration between Vasavi College of Engineering and ISOC, Hyderabad Chapter facilitated an enriching learning experience, fostering a deeper understanding of Blockchain's potential and its implications across various sectors. Participants expressed readiness to apply their newfound knowledge and skills, indicating the programme's success in preparing them to engage with Blockchain technology in their professional capacities.

The Certificates and FDP expert's presentations were shared to participants through email.

We sincerely thank our Management, VCE, Principal Dr.SV.Ramana sir of VCE for providing their acceptance and encouragement for conducting the FDP. We thank the Dr. Mohan Raidu sir, Dr. Salman sir and members of ISOC Hyderabad chapter for their support in the FDP. We thank all the Experts who have shared their invaluable knowledge and expertise during the FDP. We thank our HOD, Dr. K. Ram Mohan Rao sir for providing us all Guidance and support for conducting the workshop. We also thank all Sessions in charges Dr.Neelakantappa, Dr.Prashanth, Ms.Soume Sanyal and Ms.Radha. We thank Mr. G.Ramesh Kumar for the technical support provided in conducting the FDP. Further, we thank all IT Department teaching, Nonteaching staff and student office bearers of our VCE-ISOC Academic Hub for their active support during the Programme.

Faculty coordinator HOD-IT