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India's Telecom SDG

5G IA
INFRASTRUCTURE ASSOCIATION

BIF
BROADBAND INDIA FORUM
"Think Tank for Digital Transformation"

supported by



INDIA-EU ICT
STANDARDISATION
COLLABORATION

CONFERENCE BROCHURE

5G

India-EU Stakeholders' **Workshop on** **5G TECHNOLOGY** **LANDSCAPE**

organized by

Telecommunications Standards Development Society, India (TSDSI)
The 5G Infrastructure Association (5G-IA) | Broadband India Forum (BIF)

supported by

Delegation of the European Union to India and India-EU Cooperation
Project on ICT-Related Standardisation, Policy and Legislation

India Habitat Centre, New Delhi

5-6 February, 2019

DAY 1: Gulmohar Hall, IHC, New Delhi | **DAY 2:** Tamarind Hall, IHC, New Delhi



MESSAGE

Telecommunications Standards Development Society, India (TSDSI), is pleased to organize the **India EU Stakeholders' Workshop on 5G Technology Landscape** jointly with Broadband India Forum (BIF) and the 5G Infrastructure Association (5G-IA), with support from the EU Delegation to India and India-EU Partnership Project on ICT Cooperation. India has clearly articulated the need and desire to roll out 5G infrastructure and services at the earliest so as to meet her Digital India objectives and speed up economic growth. Towards this, TSDSI and its members have been partnering actively in global forums to ensure that requirements such as Low Mobility Large Cells in rural areas and deep IoT coverage are met from day one in an affordable manner in India and elsewhere. An end-to-end 5G testbed is also being built in India to test and demonstrate 5G capabilities including the ones mentioned herein. We look forward to fruitful engagement with various stakeholders in this Workshop to catalyze our efforts.



Prof Bhaskar Ramamurthi

Chairman, TSDSI



MESSAGE

It is a real pleasure for the 5G Infrastructure Association (5G-IA) to co-organise this first **India-EU Stakeholders' Workshop on 5G Technology Landscape**, jointly with TSDSI and BIF, with the support of the EU Delegation to India and of India-EU Cooperation Project on ICT-Related Standardisation, Policy and Legislation.

5G-IA and TSDSI, in their MoU signed last year, have defined some common topics of collaboration including 5G Standardisation, 5G Trials, Interoperability and Test Beds, Cloud, Satellite and Broadcast with 5G and Rural 5G. Most of them will be covered by the five 5G PPP Projects that are presenting their research and use cases at the Workshop. The Verticals industries involvement in 5G standardisation and development is also a strong feature pushed by 5G-IA, 5G PPP and the European Commission, towards a new ecosystem as a key differentiator of 5G deployment in Europe, as well as the cross-regional trials and projects that should be led at an international level.

For sure this Workshop, as a concrete illustration of the growing cooperation between India and Europe in 5G, will pave the way to joint projects and developments in the framework of globally harmonised 5G standards and spectrum bands, as targeted in 3GPP and ITU IMT2020.

For that purpose the 5G-IA/TSDSI MoU, as well as the excellent cooperation with BIF, will be the tools of next progress and realisations.

Jean-Pierre Bienaimé

Secretary General





MESSAGE

With the global roll-out of 5G commercial services, expected to commence in 2019/2020, India is also aiming to be in the forefront. There is much excitement in the regulatory-industry-academia ecosystem. In this context, Telecommunications Standards Development Society, India (**TSDSI**), The 5G Infrastructure Association (**5G-IA**) have jointly organised a Two-Day Workshop with support from the **Delegation of the European Union to India and India-EU Cooperation Project on ICT-Related Standardisation, Policy and Legislation, on “India EU Stakeholders’ Workshop on 5G Technology Landscape”**. It is indeed a historic event and we from BIF are greatly honoured and delighted to be part of it.



Today, the entire world is much excited about 5G. It is well recognised that 5G connectivity will be the essence of transformation of society, industry and, in fact, the very quality of living. It is the global standard that will herald Industry 4.0, the next industrial revolution. It will not merely revolutionize communications but enrich and evolve several verticals like healthcare, education, agriculture, manufacturing, entertainment and many more.

The uniqueness of this workshop is that it is the first time, global experts on the subject are getting together to discuss, deliberate and collaborate on two of the most important issues amongst others viz. ways and means of creating optimum digital infrastructure on a huge scale that is needed for delivering 5G as well as adoption of globally harmonised standards which takes into account India specific. This workshop shall focus on the paramount importance of creating the digital communications infrastructure that is required to be put in place which is absolutely essential for 5G to take off and the concurrent adoption of optimally harmonized global standards.

It is hoped that this Workshop will only be the first of more such events to follow with special focus and thrust on the creation of the requisite hi-class ubiquitous infrastructure to be able to deliver the 5G services.

I take this opportunity to wish the 2-day event all success and hope that all stakeholders obtain adequate learnings and guidance for taking India aggressively forward on the digital highway to 5G.

Mr. T.V. Ramachandran

President, Broadband India Forum



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About the Organisers:

Telecommunications Standards Development Society, India (TSDSI):

Telecommunications Standards Development Society, India (TSDSI) aims at developing and promoting India-specific requirements, standardising solutions for meeting these requirements and contributing these to international standards; contributing to global standardisation in the field of telecommunications; maintaining the technical standards and other deliverables of the organization; safe-guarding the related IPR; helping create manufacturing expertise in the country. TSDSI (website <https://www.tsdsi.in>) is registered as a society under India's Societies Registration Act XXI, 1860 and is recognised by the Department of Telecommunications, Govt. of India as India's Telecom SDO.

More information is available at <https://tsdsi.in>

5G Infrastructure Association (5GIA):

The 5G Infrastructure Association is the private side of the 5G Public Private Partnership (5G PPP). It is an industry led association committed to the realisation of 5G in Europe by 2020 for the benefit of both European society and industry. The 5G IA is committed to build global consensus on 5G. To this aim, the Association and its Members (operators, manufacturers, research and academic institutes, verticals, SMEs) carry out a wide-range of activities in key strategic areas including standardisation, frequency spectrum, R&D, cooperation with other strategic industry sectors. The 5G Public Private Partnership (5G PPP) is the 5G collaborative research program that is organised as part of the European Commission's Horizon 2020 program – The European Union Program for Research and Innovation. It is aimed at fostering industry-driven research, monitored by business-related, technological performance and societal KPIs. Within this research and innovation framework, the European Commission, with the approval of the European Parliament, has committed 700M€ of public funds to supporting 5G PPP activities. As part of the partnership role, complementary private investment in the order of at least five times this amount is being provided by Industry, SMEs, and Research Institutes to realise the 5G-PPP vision. The 5G PPP will deliver solutions, architectures, technologies and standards for the ubiquitous next generation communication infrastructures of the coming decade.

More information is available at <http://5g-ppp.eu/>.

Twitter: @5GPPP, #5GPPMWC

Broadband India Forum (BIF):

Broadband India Forum (BIF) is a policy forum and a think tank which works towards the propagation of Broadband in India and has participation from Digital Service Providers, Technology Providers, R&D and Chip Design Companies, System Integrators, Project Management, Satellite Service & Solution Providers, MSO and DTH, VSAT Service Providers and a large pool of intellectuals. The scope of BIF broadly relates to the activities concerning training, research, study, promotion and establishment on /of convergent technologies and projects based on Internet Protocol (IP), Broadband and SatCom-Broadcasting particularly over wire line and wireless; as also advocacy, coordination, facilitation and promotion of all activities with the objective of furthering the goals of the National Telecom Policy and in particular IP, Broadband and SatCom-Broadcasting and in general New Technologies. The activities of the Forum broadly relate to conducting research in collaboration with reputed institutions and to work with Government and Regulatory to assist them with inputs in various areas as well as coordination, promotion and formulation of expert opinion on topical subjects related to Broadband.

More information is available at <http://www.broadbandindiaforum.com/>



INAUGURAL SESSION:

Context Setting

(0930-1030Hrs)

Welcome by Ms Pamela Kumar, Director General, TSDSI

Opening Remarks:

- ❖ Prof Bhaskar Ramamurthi, Chairman TSDSI and Director IIT Madras
- ❖ Mr Jean-Pierre Bienaimé, Secretary General, 5G Infrastructure Association
- ❖ Mr T V Ramachandran, President, Broadband India Forum
- ❖ Mr Tonnie De Koster, Advisor (International Outreach) for Digital Single Market at the EC

Inaugural Address by Mr R K Pathak, Member Secretary, 5G HLF, DDG (IC), DoT

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Mr R K Pathak

Member Secretary,
5G HLF, DDG (IC), DoT

Shri R. K. Pathak has done his B.E. Hons. (Electrical) and M Tech (Power Electronics). He has more than 31 years of experience in different disciplines including entrepreneurship, standardization and promotion, development of manufacturing of telecom equipment and investment promotions. He has played instrumental role in promotion of domestic manufacturing through Make in India Policy of the Government, and in promoting exports of telecom equipment and services from the country.

He was also instrumental in setting up of Telecom Standard Development Society, India (TSDSI), for standard development from India and 5G India Forum for making India a technology provider.

Presently he is Deputy Director General (International Cooperation) in Department of Telecom and looking after work related to WTO, economic cooperation agreements, standardization, 5G High Level Forum and its implementation, promotion of telecom exports and Telecom Centre of Excellences (TCoEs). He has additional responsibility as Secretary, TEPC and also Director, TCOE India. He is Member Secretary of High Level Forum for 5G India 2020 and Executive Officer for 5G Program Office.

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Mr Tonnie De Koster

Adviser for Digital Single
Market International Outreach,
European Commission,
DG CNECT

Currently MrTonnie De Koster works as Advisor for the international outreach of the EU's digital single market strategy in DG Connect of the European Commission. Previously he worked in the same DG on designing the Digital Single Market and dealt as well with innovation policy for ICT companies and standardisation. Before rejoining DG Connect in 2011, Tonnie was Deputy Head of Unit in charge of the Innovation Union in DG Research and Innovation, and from end 2005 till end 2010, he was in charge of designing and implementing the Europe 2020 Strategy for Growth and Jobs and for economic governance at the Secretariat General of the European Commission.

Tonnie has a long experience in the field of digital policy. First as Assistant to the Director-General for Information Society (1996-2000) and then as Member of Cabinet of ErkkiLiikanen, Commissioner for Enterprises and Information Society (2002-2004) he was responsible for liberalising telecommunication services in Europe and for launching the eEurope strategy aimed at promoting ICTs in Europe.

Earlier Tonnie worked within the European Commission at developing a European policy in favour of SMEs (1993-1996). Tonnie De Koster is an economist by training.

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Jean-Pierre Bienaimé

Secretary General,
5G Infrastructure Association (5G-IA)

Jean-Pierre Bienaimé has been Secretary General of the 5G Infrastructure Association (5G-IA), representing the digital & telecommunications industry (operators, manufacturers, research and academic institutes, verticals, SMEs) in the Public-Private Partnership (5G PPP) with the European Commission, since 2016. He has also been Chairman of the 5G PPP Steering Board.

Joining France Telecom (FT) in 1979, Bienaimé has had responsibilities including Director Planning Department at FT, Advisor to the General Director of Moroccan Telecommunications in Rabat, Director of Marketing and Product Development for International Networks & Services at FT, Chief Executive Officer of Nexus International, and Vice-President Group Mobile Support at Orange. From 2009 until 2016, Jean-Pierre has been Senior Vice-President at Orange Wholesale.

Jean-Pierre has been Chairman of mobile industry association The UMTS Forum from 2003 until 2016, with a mission to promote a common vision of the development of 3G UMTS and 4G LTE and evolutions, and to ensure their worldwide commercial success.

Jean-Pierre is the chairman of IREST (Economic and Social Research Institute on Telecommunications), a think tank of influence based in Paris. Jean-Pierre is graduated from ESSEC Business School (Master in Management), from Sciences-Po Paris, from Ecole Nationale Supérieure des Postes & Télécommunications – Paris, and from INSEAD Executive MBA.

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Mr. T.V. Ramachandran

President, Broadband India Forum

Mr. T.V. Ramachandran, widely known in the telecommunications industry as 'TV', has played a key role in Mobile Telecommunications in India since it was first introduced in 1994. He was the 1st CEO of one of the earliest cellular ventures in India - Sterling Cellular Ltd (Essar Cellphone), Delhi – the predecessor of what is today Vodafone Delhi.

He was the first Chairman of the India Interest Group of GSM MoU Association and has been closely involved with GSM activities all through the years. He then moved on in 1997 to establish and lead the industry body – Cellular Operators' Association of India (COAI) and led it for 12 years – to the position of being one of the most credible and vibrant professional bodies that became accepted as the effective voice of the industry.

Since Jan 2015, He has set up his own Consultancy firm and advises several firms as well as industry bodies. Also, currently, he is President of the Broadband India Forum, the only Indian body exclusively focused on growth of Broadband; Member of the Global Advisory Body of the Panel of the Institution of Engg & Technology, London, on Internet of Things.

He has a Master's in Physics (specialisation in Wireless & Electronics) from Madras University and is also Honorary Fellow of the Institution of Engg. & Technology (IET) London & Honorary Fellow of the Institution of Electronics & Telecommunication Engineers (India).

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Pamela Kumar

Director General, TSDSI,
President & Founder Chair, Cloud Computing
Innovation Council of India

Since February 2017, Ms. Pamela Kumar has been appointed as the Director General of TSDSI. An alumnus of PEC Chandigarh, Rutgers University and IIM Bangalore, Pamela brings with her an experience of 30+ years in the communications, computers and semiconductor industry.

Prior to TSDSI, she has spent the first 10 years of her career at AT&T, Bell Labs in USA and at C-DOT in Bangalore. Later, she held leadership positions in Texas Instruments, IBM, Hewlett Packard Enterprise, R&D labs in India. She also did a short stint with 2 startups, setting up the R&D centers of Network Programs and Alliance Semiconductors. She holds 3 Patents granted by USPTO and has 5 patent applications pending in the Networking Accelerators domain. She has been a Keynote/invited speaker in 60+ Local and Global forums.

Pamela is also the Founding Chair and current President of Cloud Computing Innovation Council of India (CCICI). She is on the Governing Board of Indian Financial Technologies and Allied Services (IFTAS) and PEC University of Technology. She is the Bharti Chair for IT Research and Member Research Council, UIET, Panjab University. She also mentors a few Startups in the ICT space.

Pamela is currently the Chair of the IEEE Charles Steinmetz Awards Committee. She was the first ever appointee from India in the IEEE Standards Association - Board of Governors, as the Member at large for 2011-12. She has held several other leadership roles as a senior member of IEEE - such as General Chair of IEEE ANTS Conference, Coordinator for IEEE Region 10 Industry Relations, Chair for IEEE Computer Society Chapter & Vice Chair of IEEE Bangalore section, etc.

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SESSION #1:

Current Status of 5G Standardisation

(1100-1230Hrs)

- ❖ 5G Standardisation Landscape, Mr Satish Jamadagni, Vice Chairman TSDSI (Vice President, RJIO)
- ❖ 5G Standards Development Overview @ ETSI, Mr Dinesh Chand Sharma, Director-Standards and Policy, European Project SESEI(Seconded European Standardisation Expert in India)
- ❖ Indian opportunities and India-EU Engagement in 5G, Mr Kishore Babu, DDG (Policy), DoT
- ❖ EU's perspective on 5G standardisation, Mr Emilio Davila Gonzalez, Head of Sector, ICT Standardisation, European Commission
- ❖ Evolving Trends in 5G, Mr Manoj Misra, GSMA India
- ❖ Q&A

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Mr Satish Jamadagni

Vice Chairman TSDSI
(Vice President, RJIO)

20 years of industry experience in the telecom domain. Currently working as a VP in Reliance Jio. He is the Current Vice Chair of TSDSI, Chair of TSDSI SG-Networks, an active member of GTI (Global TDD Initiative) & 3GPP, Co-Chair of the Asia Regional Operators Group; Small Cell Forum (SCF) and previously on the board of the International Multimedia Teleconferencing Consortium (IMTC)

Over 120 granted/pending patents in the wireless domain.

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Dinesh Chand Sharma

Director – Standards & Public Policy,
EU Project SESEI

Since 2012, Mr. Dinesh Chand Sharma is associated with EUROPEAN STANDARDISATION PROJECT SESEI as Director – Standards and Public Policy. In this role and as Seconded European Standardization Expert in India, Mr. Sharma acts as the focal point in India representing European Standards Organizations (ETSI, CEN, CENELEC), European Commission (EC) and European Free Trade Association (EFTA). The activity of the Project SESEI is focused around sectors covering Smart City, ICT, Automotive and Electrical Equipment including Consumer Electronics.

Prior to this, Mr. Sharma worked with Ericsson for 15 years, having last working profile as “Director – Regulatory Affairs & Industry Relation”. Mr. Sharma began his career in Technical Customer Support back in 1992 and has over 26 years of industry experience covering various profiles such as Head of Regulatory Affairs, Head of Accounts & Commercial Management, Service Delivery and Customer Support Management both in India and abroad.

Mr Sharma also hold various Industry position such as Chairman Advisory Committee for M2M+IoT Forum India, Chairman - Standards & Policy Working Group of IET IoT Panel, and active membership at Telecommunication Engineering Centre, Department of Telecom, Bureau of Indian Standards etc.

Mr. Sharma holds a bachelor’s degree in Electronics, highest honors in Business Management from Stratford Institute, USA and a SUN Solaris certification.

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Mr Kishore Babu

DDG (Policy), DoT

Professional background

- ❖ Twenty Eight years of experience in diverse leadership positions in Information & Communication Technologies (ICTs), Telecommunications
- ❖ Multilateral Cooperation from the Department of Telecommunications with International and Regional Organizations
- ❖ Important contributions on ITU, APT and other Platforms for ITU WTDC, ITSO Assembly Parties meeting, ITU WCIT, WSIS, APT meetings

Current responsibilities related to Multilateral platforms

- ❖ Chairman, Working Group on Policy, Legal – APT Preparatory Process Vice Chair, APT Vice Chair, Telecommunications Development Advisory Group (TDAG) of ITU-D
- ❖ Vice Chair Council Working Group (CWG) Internet, ITU Preparatory process for WTDC-17

Academic background

- ❖ Indian Institute of Management (IIMB), Bangalore & Syracuse University, NY, USA: Post Graduate Diploma in Public Policy and Management, Focus area - Strategy
- ❖ S.V. University: Bachelor of Technology in Electronics & Communications Engineering

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Publications

- ❖ Long view on Enterprise telecom services
- ❖ ICT use and Household surveys in India

Approach Papers

- ❖ BRICS ICT Development Agenda and Action Plan
- ❖ DoT Partnership in Smart Cities
- ❖ ICT Measurement in the framework of ITU IDI in India
- ❖ Mobile for every one
- ❖ Comparative studies for Fixed Telephone Networks

Date of Birth

25th June 1967

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Emilio Dávila-Gonzalez

EC Directorate General CONNECT
Blockchain & Innovation Unit
Head of ICT Standardisation Sector
Brussels, Belgium

Emilio Dávila has worked since 2013 in the Unit dealing with Innovation within Directorate General for Communication Networks, Content and Technology (DG CONNECT). He is responsible of coordinating ICT standardisation strategies, and in particular building bridges between research and standardisation and how standardisation contributes to innovation.

Prior to this, Mr. Dávila was research project officer in the field of Intelligent Transport Systems, following Connected Vehicles, iMobility and eSafety initiatives. He was responsible for eCall file.

Emilio started working in the Commission in the Directorate General for Research, within the EU programme to support the participation of SMEs in the EU Framework Programmes for research and Innovation.

Before joining the European Commission, Mr. Dávila set up and directed the liaison office in Brussels of the Spanish Association for New Technologies, AENTEC, which brought together Spanish high-tech SMEs. Prior to it, he was liaison officer for ELIOP, a Spanish SME active on telecontrol systems and stations.

Mr. Dávila graduated as Telecommunication Engineer in the Polytechnic University of Madrid and holds a Degree in Law from the Spanish Open University.

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Manoj Kr Misra

Senior Public Policy Director-India,
GSMA

Manoj is responsible for leading the public policy team in India and industry advocacy agenda with governments, regulators and international institutions. Prior to joining the GSMA, Manoj spent 20 years working in a variety of capacities with the Industry (Vodafone-India, Cable & Wireless and Koshika Telecom Ltd-Ushafone) and Regulator (as Deputy Advisor of the Telecom Regulatory Authority of India (TRAI)). Manoj holds a Bachelor of Commerce from the University of Lucknow and is a Chartered Accountant. He is also an insolvency professional (IP) from the Insolvency and Bankruptcy Board of India.

He is specialised in the area of Public Policy, Telecom Pricing, Market and Financial Analysis, Analysis of Competition issues, Merger & Acquisitions, Regulatory Accounts, Interconnection (Interconnect Usage Charges) Costing, Cost Management, Regulatory audit, Licensing and Regulatory levies etc.

He has contributed a lot in the International Telecommunication Union (ITU) related activities as a lead & member of National working group of DoT. He was member of SAARC working Group on Telecom Tariff of DoT, the Government of India. Lectured in various National & international seminars on Telecom Pricing, Regulatory Accounts, Merger & Acquisitions, Interconnection (Interconnect Usage Charges) Costing, Cost Management, Licensing and Regulatory levies etc.

He has also been associated with various Industry bodies i.e. ACTO, COAI, ISPAI, FICCI, Broadband India Forum (BIF), European Business Group (EBG) and ITU-APT Foundation of India etc.

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SESSION #2:

5G Architecture and Applications

(1230-1315Hrs)

- ❖ Total Enterprise Communication in the 5G Era, Mr Vipin Tyagi, Executive Director, C-DOT
- ❖ 5G-MoNArch (5G Mobile Network Architecture for diverse services, use cases and applications in 5G & beyond) - “5G Architecture and Slicing for Customised Networks: the 5G-MoNArch Vision”, Mr Marco Gramaglia, University Carlos III of Madrid, deputy TM of 5G-MoNArch
Video demonstration by MoNArch
- ❖ Application use cases and Architecture Frameworks - Mr M P Singhal, Sr DDG TEC
- ❖ Q&A

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Mr. Vipin Tyagi

Executive Director of C-DOT

Presently, Mr. Tyagi, as Executive Director & Chairman of the Board, is heading C-DOT, which is engaged in development of various projects at the frontier of Telecom technology in the areas of Optical communications, Next Generation Networks and Wireless technologies. C-DOT is also playing important roles in 'Make in India' and 'Digital India' programs launched by Govt. of India, Department of Telecommunications. Digital communication infrastructure required for smart cities and smart buildings is also being innovated by C-DOT.

Mr. Tyagi is an innovation and Business Leader from Information Technology and Telecommunication Industry for over 35 years. He had founded and led a Company out of New Delhi for 12 years as Board Member and Global CEO. He has headed global business in India, Japan, Australia, USA and Europe. He has actively worked towards Research and Development of large systems, Organizational Development and creation of high performance teams. In October, 2009, Vipin decided to promote National level R&D and joined C-DOT.

Some of the notable projects are:

1. India's first 100 Gigabit per wavelength commercial grade optical fiber link in 2015 while at C-DOT.
2. Innovative Access product for providing internet based services to illiterate and technology unaware rural population through a product called GYANSETU in 2015.
3. India's first Indigenous Gigabit Passive Optical Network (G-PON) development & deployment while at C-DOT, 2010.

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4. World first Broadband Network based Video on Demand System with ATM Switches, Video Servers and set-top boxes for TV sets with global delivery teams in 1997 while at Network Programs.
5. India's biggest and most successful project for development of electronics switching systems for rural India and towns while at C-DOT. 1986 – 1993.
6. India's first Large Scale Message Switching Systems Development, while at ECIL, 1984.
7. Development of over 50 Products in area of Enterprise and Telecommunications Industry.

Achievements :

- ❖ Launch of Broadband Products developed by C-DOT aimed to enable Digital Broadband Connectivity by Hon'ble MOC&IT at C-DOT Delhi in July, 2015 during Digital India week.
- ❖ Launch of "GyanSetu" and MAX-NG, C-DOT's Next Generation Network (NGN) technologies as part of Good Governance Day in December, 2014.
- ❖ Inauguration of C-DOT Terabit Router & Fiber to the Desk (FTTD) by Hon'ble MOC&IT in October, 2014.

Awards : In Leadership of Mr. Tyagi

- ❖ Received Excellence Award from Minister of State (Communication) for development of Digital Switching System.
- ❖ C-DOT won three AEGIS GRAHAM BELL AWARDS for "C-DOT Wi-Fi Terminal" in the Innovative Telecom Product Category, "C-DOT GIS based Fibre Fault Localization System" in the Innovative Managed Services Category and "C-DOT Green Power Supply Unit" in Green Telecom Category
- ❖ C-DOT won the Frost & Sullivan's Award for C-DOT's "Customizable Service Management" Project under Process Innovation Leadership Category in the Service sector of Project Evaluation and Recognition Program in Nov, 2016.
- ❖ C-DOT won the National Intellectual Property (IP) Award in April 2016 under the category of "R & D institution/organization for Patents" on outstanding innovators, organizations and companies in the fields of patents, designs, trademarks and geographical indications.

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- ❖ C-DOT's GPON was awarded the "Most Innovative Product" at IESA (India Electronics and Semiconductor Association) Technovation Awards in Feb. 2016.
- ❖ C-DOT GyanSetu was awarded the "Recognition of Excellence" award at ITU Telecom World, Budapest, Hungary in October, 2015.
- ❖ C-DOT received "Certificate of Merit" Award by ELCINA-EFY Awards 2014-15 in Sept.2015 for Green Power Supply Unit.
- ❖ C-DOT received an Award by ELCINA-EFY Awards for Excellence in Electronics for 2011-12.
- ❖ Received fellowship program from IEEE-SA in 2017.
- ❖ Received Eminent Engineer Award by IET in recognition to unfailing commitment to excellence in field of Electronics & Communication.
- ❖ C-DOT received "Certificate of Merit" by ELCINA-EFY Group for excellence in electronics 2016-17.
- ❖ Received INDO-AFRICA ICT Awards 2017 hosted as 3rd Indo-Africa ICT Expo 2017 in Nigeria for Excellent R&D Innovation in Telecom Sector.

Education:

Master of technology (Computer Science and Engineering) from Indian Institute of Technology (IIT,Delhi). Bachelor of Electronics & Communication Engineering and Post Graduate Diploma in Management (2 years, from AIMA)

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Mr Marco Gramaglia

Deputy Technical Manager,
5G-MoNArch

Marco Gramaglia is a post-doc researcher at University Carlos III of Madrid (UC3M), where he received M.Sc (2009) and Ph.D (2012) degrees in Telematics Engineering. He held post-doctoral research positions at Istituto Superiore Mario Boella (Italy), the Institute of Electronics, Computer, and Telecommunications Engineering (IEIT) of the National Research Council of Italy (CNR, Torino, Italy) CNR-IEIT (Italy) and IMDEA Networks (Spain). He was involved in several EU projects and authored more than 30 scientific publications appeared in international books, conference and journals. Currently, he is the deputy technical manager of 5G MoNArch.

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Sh Mahabir Parshad Singh

Sr DDG & Head, Telecom Engineering Centre

A 1981 Batch ITS (Indian Telecommunication Service) officer, with more than 35 years of experience in IT & Telecom, he joined Senior Deputy Director General and Head of Telecom Engineering Centre (TEC) which is Technical arm of Department of Telecom in Jan, 2018.

Before joining TEC, ShSinghal was working as Chief General Manger & Chief Vigilance Officer in BBNL (Bharat Broadband Networks Ltd). He did his B. Tech in Electronics & Communication from Punjab Engineering College Chandigarh followed by Diploma in Management.

Shri Singh had served in various capacity in India & outside India. He has a vast experience in the area of Information Technology, Wireless Communications, Mobile Technologies, Optical Fibre/GPON (Gigabit Passive Optical-fibre Network) Technologies, HRD & Vigilance functions.

Extensive technical experience of planning, project execution and operation & maintenance in:

- ❖ Cellular Mobile Services
- ❖ IT systems like Network Management System (NMS) & Business Support System, Contact / Call Centre, Complaint Management System
- ❖ Broadband and Intelligent Network System
- ❖ Fixed line Telecom Network & services
- ❖ Telecom Cable Networks

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As Project Manager, he was responsible for planning, rehabilitation and upgradation of Telecom Network for Ministry of Communications Kuwait. During the period 1991 to 1996, he could complete the restoration of Telecom services in Kuwait, damaged by the Iraq invasion, in the shortest possible time by proper planning and execution.

As Head of TEC, he is responsible to finalise the specifications & standards for emerging technologies for their induction in India including 5G (IMT 2020), M2M / IOT, Artificial Intelligence, NFV (Network Function Virtualisation), SDN (Software Defined Network), Blockchain, XGPON, etc. To boost the 'Make-in-India' programme of Govt of India, he is actively involved for smooth induction of Scheme on 'Mandatory testing & certification of telecom equipment' for safety, security and technical conformance.

He has drafted many reports and technical papers. He has won many awards, medals & Certificates for his contributions in the field of Telecommunications including 'Sanchar Ativishes-Seva Medal.

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SESSION #3:

5G Trials

(1400-1515Hrs)

- ❖ “Pan-European 5G Trials Roadmap, and International Trials”, Mr Jean-Pierre Bienaimé, Secretary General, 5GIA
- ❖ Regulatory Perspective, Mr U K Srivastava, Principal Advisor (NSL), TRAI
- ❖ 5G HLF Initiative for Trials, Mr R K Pathak, Member Secretary, 5G HLF, DDG (IC), DoT
- ❖ India initiatives, Prof Kiran Kuchi, IIT Hyderabad
- ❖ Panel Discussion: Mr R K Pathak, DDG (IC), DoT (Moderator), Panelists: Mr U K Srivastava, TRAI; Prof Kiran Kuchi, TSDSI; Mr Jean Pierre Bienaimé, 5GIA
- ❖ Q&A

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Jean-Pierre Bienaimé

Secretary General,
5G Infrastructure Association (5G-IA)

Jean-Pierre Bienaimé has been Secretary General of the 5G Infrastructure Association (5G-IA), representing the digital & telecommunications industry (operators, manufacturers, research and academic institutes, verticals, SMEs) in the Public-Private Partnership (5G PPP) with the European Commission, since 2016. He has also been Chairman of the 5G PPP Steering Board.

Joining France Telecom (FT) in 1979, Bienaimé has had responsibilities including Director Planning Department at FT, Advisor to the General Director of Moroccan Telecommunications in Rabat, Director of Marketing and Product Development for International Networks & Services at FT, Chief Executive Officer of Nexus International, and Vice-President Group Mobile Support at Orange. From 2009 until 2016, Jean-Pierre has been Senior Vice-President at Orange Wholesale.

Jean-Pierre has been Chairman of mobile industry association The UMTS Forum from 2003 until 2016, with a mission to promote a common vision of the development of 3G UMTS and 4G LTE and evolutions, and to ensure their worldwide commercial success.

Jean-Pierre is the chairman of IREST (Economic and Social Research Institute on Telecommunications), a think tank of influence based in Paris. Jean-Pierre is graduated from ESSEC Business School (Master in Management), from Sciences-Po Paris, from Ecole Nationale Supérieure des Postes & Télécommunications – Paris, and from INSEAD Executive MBA.

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Mr. U. K. Srivastava

Principal Advisor,
Telecom Regulatory Authority of India

Mr U K Srivastava looks after telecom networks, spectrum and licensing. He belongs to the 1983 batch of Indian Telecom Service and is trained in transmission technologies, including optical, radio and satellite communications. He has managed various telecom activities including operations, maintenance, training, quality assurance, standardization and policy. He has been a member of various standing committees on satellite communications. He was deputed to ITU to serve in Iraq for two years and at ITU HQ in Geneva for a year and half. He has chaired the National Working Group-5 of ITU-T for a period of six years and has convened National Working Group-5 of ITU-R for eight years. He has also been actively involved in National Preparatory Committee (NPC) meetings and finalization of National Frequency Allocation Plan (NFAP)-2011. He has been associated with various standards development activities of ITU-T and ITU-R and has represented India in various conferences of these organizations. He also served as Vice Chairman of Study group-7 of ITU-R for a period of four years.

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Mr R K Pathak

Member Secretary,
5G HLF, DDG (IC), DoT

Shri R. K. Pathak has done his B.E. Hons. (Electrical) and M Tech (Power Electronics). He has more than 31 years of experience in different disciplines including entrepreneurship, standardization and promotion, development of manufacturing of telecom equipment and investment promotions. He has played instrumental role in promotion of domestic manufacturing through Make in India Policy of the Government, and in promoting exports of telecom equipment and services from the country.

He was also instrumental in setting up of Telecom Standard Development Society, India (TSDSI), for standard development from India and 5G India Forum for making India a technology provider.

Presently he is Deputy Director General (International Cooperation) in Department of Telecom and looking after work related to WTO, economic cooperation agreements, standardization, 5G High Level Forum and its implementation, promotion of telecom exports and Telecom Centre of Excellences (TCoEs). He has additional responsibility as Secretary, TEPC and also Director, TCOE India. He is Member Secretary of High Level Forum for 5G India 2020 and Executive Officer for 5G Program Office.

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Prof. Kiran Kuchi

IIT Hyderabad (IITH)

Prof. Kiran Kuchi received his B.Tech. in Electronics and Communications Engineering from Sri Venkateswara University College of Engineering Tirupati in 1995, M.S. and Ph.D. degrees both in Electrical Engineering from The University of Texas at Arlington, Texas, USA in 1998 and 2006, respectively.

Presently he also holds the position of Professor, Department of Electrical Engineering, IIT Hyderabad (IITH). He has been spearheading national 5G research and standards development efforts through his leadership role in TSDSI and participation in 3GPP (Third Generation Partnership Program). Prof. Kuchi is the founder and CEO of WiSig Networks Pvt Ltd, a wireless startup that develops 5G RAN systems.

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SESSION #4:

Rural 5G

(1530-1645Hrs)

- ❖ Overview of Low Mobility Large Cells (LMLC), Dr Radha Krishna Ganti, IIT Madras
- ❖ Frugal 5G – Addressing Challenges of Rural Connectivity, Mr Pranav Jha, IIT Bombay
- ❖ Panel Discussion: Mr Andreas Sommer, India EU PP for ICT Cooperation, Moderator; Panelists: Mr Satish Jamadagni; Prof Kiran Kuchi, TSDSI; Mr S N Gupta, BIF (Blue Town), Mr R B Prasad, WPC, DoT; Mr Deepak K Yadav, NOKIA

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Prof Radha Krishna Ganti

Associate Professor, IIT, Madras

Radha Krishna Ganti is an Associate Professor at the Indian Institute of Technology Madras, Chennai, India. He was a Postdoctoral researcher in the Wireless Networking and Communications Group at UT Austin from 2009-11. He received his B. Tech. and M. Tech. in EE from the Indian Institute of Technology, Madras, and a Masters in Applied Mathematics and a Ph.D. in EE from the University of Notre Dame in 2009. His doctoral work focused on the spatial analysis of interference networks using tools from stochastic geometry.

He is a co-author of the monograph *Interference in Large Wireless Networks* (NOW Publishers, 2008). He received the 2014 IEEE Stephen O. Rice Prize and the 2014 IEEE Leonard G. Abraham Prize and the 2015 IEEE Communications society young author best paper award. He was also awarded the 2016-2017 Institute Research and Development Award (IRDA) by IIT Madras.

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Mr. Pranav Jha

IIT Bombay

Pranav has 20+ years of research and development experience in communication and networking technologies with expertise in network architecture, communication protocols and resource management algorithms. He is an active participant in the development of technical standards in the areas of fifth generation wireless communication networks and Software Defined Networking (SDN) and leads two initiatives under IEEE Standard Association, "SDN based Middleware for Control and Management of Networks" and "Frugal 5G Networks".

He is currently associated with IIT Bombay, working on research programmes under the broad umbrella of wireless communication and networking, with focus on SDN based architectures for communication networks, public safety communication and broadband communication networks for rural areas. Pranav has multiple publications and patents in these areas.

Pranav has also developed and delivered workshops/tutorials on SDN, wireless communication network architectures, resource management schemes in wireless networks etc.

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Mr. Andreas Sommer

Team Leader and Senior Technical Advisor,
Project “India-EU Cooperation on ICT-Related
Standardisation, Policy and Legislation”

Andreas Sommer, German national, is Team Leader and Senior Technical Advisor of the “India-EU Cooperation on ICT-Related Standardisation, Policy and Legislation” project (2015-2019) to promote closer alignment between India and Europe with regard to the production and use of ICT standards and to harmonize the exchange of statistical data. With his master’s studies in telecoms engineering and business administration, he is active in the global ICT sector for 36 years, running his own consultancy and engineering company SEC based in Germany and South Africa for 30 years. Andreas has been advisor for telecom operators, governments and ICT ministers in Europe, Middle East and Asia / Pacific. Beside working on telecom regulations and policies, as senior project manager he has carried out major infrastructure projects, prepared national ICT strategies and broadband plans which were implemented with up to multi-billion US dollars of investment.

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Mr Satish Jamadagni

Vice Chairman TSDSI
(Vice President, RJIO)

20 years of industry experience in the telecom domain. Currently working as a VP in Reliance Jio. He is the Current Vice Chair of TSDSI, Chair of TSDSI SG-Networks, an active member of GTI (Global TDD Initiative) & 3GPP, Co-Chair of the Asia Regional Operators Group; Small Cell Forum (SCF) and previously on the board of the International Multimedia Teleconferencing Consortium (IMTC)

Over 120 granted/pending patents in the wireless domain

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Mr. Satya N. Gupta

Chairman - India & BIMSTEC, S Asia, Blue Town

An International expert in NGN technologies, Regulation, Interconnection and Broadband with 38 years' experience in all aspects of Telecom, including 25 years with Govt. and Regulator, Mr. Satya N. Gupta is publicly recognized as an Analyst, Author, Advocate and Advisor on ICT related Policies, Projects and Business. After his post-graduation from IISc. Bangalore, he joined Ministry of Communication in 1981 and Ministry of Railways in 1983. He is recipient of Minister of Railways award for outstanding performance for the digitalisation project.

A triple master in Electronics Design Technology, IT Management and Telecom Policy and Regulation, he is globally known as "NGNguru" he is a trainer and coach for telecommunication technologies, policy and regulation and a Regulatory advocate. Author of "Everything over IP- All you want to know about NGN". He also authored a concept called "Job Factory- Converting Unemployment into Entrepreneurship". His recent research based work, "Extra Mile- Walking the Talk on Rural Broadband Business", brings out the innovative business models. He has also established and mentoring a consulting startup named SAAM Corp advisors providing Govt. Affairs as Managed Service.

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He is recently appointed as the Secretary General of ITU-APT Foundation of India. Additionally he is Vice-President and Trustee of PTCIF and Co-chairs BIF committee on Rural Digital Infrastructure. He founded NGN Forum in India to spread awareness and capacity building in the field of emerging technologies. As a member of Expert panel of Commonwealth Telecom Organisation, he conducts training programs in the areas of NGN Technologies, Broadband Policy and Regulation, Interconnection Costing in NGN Era, Spectrum Management, IPV6, Artificial Intelligence, Blockchain and Blue-Ocean Strategy.

Presently, elevated as Chairman, Bluetown, India & BIMSTEC, S. Asia to forge newer partnerships and “Making It Happen” its Vision of “Connecting the Unconnected people living in Rural areas of World”.

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Deepak Yadav

Head of Radio Technology
India Region, Nokia

- ❖ Nearly 20yrs of experience in telecom world spread across all technology generations and different part of the world.
- ❖ Presently responsible for radio technology and spectrum management for India region.
- ❖ Strongly focused towards India 5G readiness across various stakeholders.
- ❖ Experience in the field of technology strategy, product management, service assurance, network planning and performance, WiFi, Small cells across all technology families (2G/3G/4G).
- ❖ Part of early days of mobile broadband launches in European and APEC markets to challenging African markets.
- ❖ Married with a child.
- ❖ Based out of Gurgaon office.
- ❖ Likes to read books and study new technology trends.

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Prof. Kiran Kuchi

IIT Hyderabad (IITH)

Prof. Kiran Kuchi received his B.Tech. in Electronics and Communications Engineering from Sri Venkateswara University College of Engineering Tirupati in 1995, M.S. and Ph.D. degrees both in Electrical Engineering from The University of Texas at Arlington, Texas, USA in 1998 and 2006, respectively.

Presently he also holds the position of Professor, Department of Electrical Engineering, IIT Hyderabad (IITH). He has been spearheading national 5G research and standards development efforts through his leadership role in TSDSI and participation in 3GPP (Third Generation Partnership Program). Prof. Kuchi is the founder and CEO of WiSig Networks Pvt Ltd, a wireless startup that develops 5G RAN systems.

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Mr. R.B.Prasad

Sri R.B.Prasad is an officer of 1983 batch of Indian Engineering Service. He has graduated in Electronics and Communication Engineering from BIT Sindri. He has done post graduation in Electronics and Communication Engineering from IIT Roorkee. He has also worked as lecturer in NIT Jamshedpur. He has worked in various capacity in Wireless Monitoring Organisation for verifying the technical and operational characteristics of Wireless Stations operating in fixed services, mobile services, aeronautical services, maritime mobile services, satellite services and broadcasting services. He has ensured interference free operation from harmful interference. He has gone through many courses in the field of spectrum management in USA, Canada, France and ITU Geneva.

He has further worked in the field of spectrum management in planning, engineering and licensing. He has played a key role in auction of spectrum for mobile service 1912 on ward. He has also been responsible for spectrum policy planning and licensing of Safety, Security, Defense and police organisation.

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SESSION #5:

5G mmWave and VLC Building Network Architecture

(1645-1730Hrs)

- ❖ Visible Light Communications: Research Challenges and Solutions, Asst. Prof Abhisek Dixit, IIT Delhi
- ❖ 5G PPP IoRL (Internet of Radio Light) - "5G mmWave and VLC Building Network Architecture: First Key Performance Indicator Results from the IoRL project", Mr John Cosmas, Project Technical Director
- ❖ Videos demonstration showcasing IoRL
- ❖ Learnings from Optical Wireless Communications Experiments towards Mobile Access Technology, Mr Subhas Mondal, Chief Architect 5G, WIPRO
- ❖ Q&A

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Mr. Abhishek Dixit

Assistant Professor, IIT Delhi

Abhishek Dixit is presently assistant Professor in Dept. of Electrical Engineering, IIT Delhi and is also associated with the Bharti School of Telecommunications and Management, IIT Delhi. He worked for a semester as an assistant Professor in the School of Computing and Electrical Engineering, IIT Mandi and as a post-doctoral researcher at Ghent University, Belgium in 2015. He received the Ph.D. degree from Ghent University, Belgium in 2014 and M.Tech. degree in Optical Electronics and Optical Communication from the Indian Institute of Technology, Delhi (India) in 2010. During his Ph.D., he was involved in several European projects, like IST-OASE, Alpha, GreenTouch. Currently, he is also involved in government-funded sponsored projects, CONE (Converged Optical Network Evolution) from Dept. of Science and Technology, and Lifi networks, from dept. of Telecommunication, and consultancy projects from CEL and FTTH Council Asia Pacific. He received Early Career Research Award in 2016.

His research interests include lightwave, broadband optical access networks, and optical wireless communication systems and networks. He is author or co-author of more than 50 national and international publications, both in journals and in proceedings of conferences.

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Mr Subhas Mondal

Chief Architect 5G, WIPRO

Subhas is the chief Architect for 5G at Wipro Limited. He is driving the architecture for the end to end 5G solutions across all the industry segments that Wipro cater to. Subhas is a Distinguished member of technical staff, IEEE Senior member and an IEEE distinguished speaker under Bangalore chapter. Subhas is an engineering graduate from IIT Kharagpur in Electronics and Electrical communication engineering. Prior to joining Wipro, he worked for CDOT as a research Engineer.

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Professor John Cosmas

MSc Digital Media Course Director in
Advanced Multimedia Design

Summary

I joined Brunel University in 1999 and soon became the leader of the Multimedia and Networks group. I have a BEng in Electronic Engineering from Liverpool University (1978) and a PhD in Image Processing from Imperial College (1987). Prior to Brunel, I worked as an electronic engineer at Tube Investments (1978-81) and at Fairchild Camera and Instrument Corp. (1981-83), and as a lecturer at Queen Mary College, University of London (1986-99).

Over the years, I have been at the forefront of research in the areas of digital multimedia TV, 2D/3D digital media with 3D virtual and augmented reality, and 3D TV, as well as digital media delivery and transmission networks. My current 5G research adventure focusses on the internet of radio light and the integration of digital media in the radio-light internet of small family homes, multi-occupancy high rise homes, buildings with public access (museum demonstrator) and public places (train station and supermarket demonstrators). Our research approach interweaves the digital design with the architectural interior design of spaces and the electronic design of the light roses.

Future plans include research related to the interactive and tactile internet and the development of digital media for specific interactive, tele-driven applications.

Responsibility

In my role as the Course Director for Brunel's MSc Advanced Multimedia Design and 3D Technologies, I endeavour to enrich the course so that our students are trained on the latest, cutting edge technologies.

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Anil Prakash

Director General, BIF

A widely experienced in Government Relation, Regulatory and Policy framework with strong techno-commercial background in Telecom, ICT and Broadcasting domain with 33 years works experience. . He is associated with International Telecommunications Union- ITU for more than a decade and had played an influential role in contributing towards ITU's activities in India.

He helped in setting up PTC India Foundation in 1994, ITU-APT Foundation of India in 2003 now he is co-founder & Director General of Broadband India Forum which functions as a policy forum and think-tank for the development & enhancement of the broadband ecosystem in India. He is active member of task various groups set up by the govt. and telecom associations and chamber of commerce.

He has represented at major international conferences more than two decades.

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SESSION #6:

5G Interoperability and Test Beds

(0930-1100Hrs)

- ❖ Govt. Perspective: Mr Rajiv Sinha, DDG (NT), DoT
- ❖ An overview of India 5G testbeds activities, Mr Babu Narayanan, Chief Technologist, CEWiT
- ❖ RF and Antenna design challenges in Indigenous 5G test bed development, Dr P H Rao, SAMEER – Centre for Electromagnetics
- ❖ Panel Discussion: Mr Babu Narayanan, Chief Technologist, CEWiT, Moderator; Panelists: Prof K V S Hari, IISc Bangalore; Dr Bighnaraj Panigrahi, TCS; Mr Madhur Bhardwaj, Airtel
- ❖ Q&A

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Mr. Rajiv Sinha

Deputy Director General
Networks & Technologies
Department of Telecommunications

Mr. Rajiv Sinha is an officer of Indian Telecommunication Service (ITS) of the Department of Telecommunications, Government of India and he has over 29 years of experience in various administrative & technical matters related to the field of telecommunications with specialization in Transmission technologies.

In his present assignment, he is working as *Deputy Director General, Networks & Technologies, Department of Telecommunications, Government of India* primarily having responsibility for framing policies and guidelines for the new emerging technologies like M2M, Cloud computing, 5G, Over The Top (OTT) services, IPV4 to IPV6 transition etc. He is also looking into the policy issues related to Net Neutrality.

His experience in telecommunications includes network planning, project implementation and operations of various telecom networks namely GSM networks, Transmission systems and IT systems.

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Mr Babu Narayanan

Chief Technologist, CEWiT

Babu Narayanan is Chief Technologist at the Centre of Excellence in Wireless Technology (called CEWiT), a research society of IIT Madras. He has nearly three decades of experience in ICT industry working in various research and development areas of Telecom and Real-time systems. After completing Masters in Electrical Engineering from IIT Kanpur, he had handled key assignments in the product and services industry before joining CEWiT in 2009. Through CEWiT, he helps in indigenous development of advanced wireless solutions for various markets in India and in building a stronger technology base in the areas of advanced research, technology development and standardization. He is one of the main architects of the 5G Test Bed program where an end to end 5G Test Bed is being developed by CEWiT along with a consortium of seven Institutes and several industry partners. He was the vice-chair of TSDSI, the Indian Telecom SDO, from 2016 to 2018.

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Dr P H Rao

SAMEER, Centre for Electromagnetics

Dr. P.H. Rao acquired his B.Tech from SV University, Tirupathi, M.S from B I T S Pilani, and Ph.D from The Queen's University of Belfast U.K. IEEE AP society - IEEE R10 Distinguished Lecturer for 2015-2016. Visiting faculty at IITM. Dr. Rao has more than 30+yrs of Research experience in Antennas, RF and Electromagnetics.

After a brief stay in Space Applications Centre, (ISRO) Ahmedabad, He joined SAMEER- CEM, Chennai and continuing there. During his stay at ISRO he was involved in the design and development of slotted array antennas for Space applications. At SAMEER he has been involved in various research activities like

- wideband Tracking and Jamming Antennas, Electronic Warfare and conformal missile antennas,
- Microstrip antennas, EBG's, Genetic Algorithm based array antennas, Reflectarray antennas, frequency
- independent antennas, reconfigurable antennas, Near-field Antenna measurements, and System on Package concepts. He has developed various novel antenna structures, feeding concepts and formulated theory to generate any arbitrary polarization from combination of two circularly polarized signals.

Currently he is working on Indigenous 5G Test bed a multi institute initiative (5 IITs and IISc). His current interests included shared aperture concepts, low SLL antennas, EM cloaking, Mixed signal system analysis and Metamaterial research.

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He was a visiting scholar at Georgia Tech, USA in 1992 and worked on Near –field antenna analysis and EBG configurations.

He collaborates on Electromagnetic Band Gap structures for Signal/ Power integrity applications with Georgia Tech, Atlanta, USA. He steered a computational EM cell, a joint collaborative project by IISc - SAMEER to analyze complex electromagnetic problems like antennas on ship, satellite, aircraft etc.

He has published 100+ papers in IEEE and IEE and referred journals and conferences and presented papers in various national and international conferences. His paper on wideband EBG was awarded IEEE Best paper award at IEEE-INCEMIC 2008. He delivered key note addresses at various International and National conferences and symposia. He conducted workshops on various topics including antennas, Electromagnetics, and communications.

He is a SENIOR MEMBER of IEEE and Vice chair of IEEE-AP Chennai chapter (2013-2015). He is a reviewer for IEEE Trans. on Antennas and Propagation, AP-magazine, IEEE Antennas wave propagation letters, IEEE EMC Transactions, IEEE MWCL, IEEE Trans. on MTT, Int. jnl. of Antennas and propagation and for various Int. conferences and symposia. He is listed in Who's Who in the world 2000 edition.

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Dr Bighnaraj Panigrahi

Scientist, TCS

Dr. Bighnaraj is currently working as a Scientist at TCS Research & Innovations, Bangalore. At TCS, he is working in various projects in Wireless Networks such as Information Centric Networks (ICN), 5G communications, Cloud Robotics, Tactile Internet, etc. Before joining TCS he was a Research Scientist-I at SDSMT, USA, and was working there on a NASA funded project on Deep Space Communications. Bighnaraj holds a BSc degree in Physics and two Master degrees (MSc and MTech) in Electronic Science and Computer Science, respectively. He obtained his PhD from IIT Delhi (2012) where he worked on cross-layer optimization problems for Wireless Sensor and Ad-hoc Networks. He has research experience of more than 10 years in different fields of wireless and NextGen networks. He has several international conferences, journal publications, and has 4 granted patents to his credit.

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Prof. K V S Hari

Indian Institute of Science, Bangalore

K V S Hari is a Professor in the Department of ECE, Indian Institute of Science, Bangalore. He holds a BE (ECE) degree from Osmania University, Hyderabad, MTech (Radar and Communication Systems) from IIT Delhi and PhD (Systems science) from U C San Diego and has been a visiting faculty at Stanford University and KTH- Royal Institute of Technology, Stockholm. His research interests are in Signal Processing with applications to 5G wireless communications, radar systems, autonomous vehicles, and affordable MRI systems. He is a co-author of an IEEE 802.16 standard on wireless channel models. He was an Editor of EURASIP's Signal Processing from 2006 to 2016 and is currently the Chief Editor (Electrical Sciences) of Sadhana, the journal of the Indian Academy of Sciences published by Springer. He is a Fellow of the Indian National Academy of Engineering and a Fellow of IEEE and also on the Board of Governors, IEEE Signal Processing Society.

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SESSION #7:

5G – Broadcast

(1115-1200Hrs)

- ❖ 5G-Xcast (Broadcast and Multicast Communication Enablers for the 5th Generation of Wireless Systems) - “The role of broadcast in 5G networks”, Dr Belkacem Mouhouche, Project Technical Director
- ❖ Video demonstration of 5G-Xcast
- ❖ Standardisation for Broadcast offload, Mr Anindya Saha, TSDSI GC Member (Saankhya Labs)
- ❖ Q&A

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Dr Belkacem Mouhouche

Project Technical Director, 5G-Xcast

Dr. Belkacem Mouhouche is a Principal Standards Engineer at Samsung Research UK. He holds a Ph.D. degree in Signal Processing from Ecole Nationale Supérieure des Télécoms (Telecom Paristech) in France. During his Ph.D. he worked on 3GPP third generation systems (UMTS). He later worked as a 3GPP standard Engineer following the development of HSDPA and LTE systems. He was also involved in FP7 European Project “End to End Efficiency” (E3) where he worked on cognitive radio in heterogeneous systems. His research interest are in the area of advanced techniques for the physical layer of future communication systems including MIMO, beamforming and coding applied to wireless systems. Dr. Mouhouche was also heavily involved in the development of the latest broadcast terrestrial standard ATSC3.0 and led the broadcast activity within the 5G-PPP project “Fantastic-5G”. Recently, he was appointed as technical manager of the 5G-PPP project “5G-Xcast” focused on new point to multipoint techniques for 5G networks.

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Mr Anindya Saha

CTO at Saankhya Labs, Pvt Ltd

Anindya is Chief Technology Officer (CTO) at Saankhya Labs with approximately 22+ years of experience. Anindya has been instrumental in the Instruction Set Architecture definition of CPUs for Saankhya's SDR platform and is currently responsible for the RF and Baseband activities.

Prior to his association with Saankhya Labs, Anindya used to work for Texas Instruments India and Broadcom. Due to his strong technical contribution and innovation, he was elected as a Member Group of Technical Staff at TI.

He holds 26 approved US and India patents in the domain of RF & Baseband design, VLIW CPU architectures and SDR Platforms. He has authored 3 IEEE publications and co-authored a chapter in the book titled "Handbook of Cognitive Radio" (by Springer). Anindya has a master's degree from IISc, Bangalore (1994-1996) and bachelor's from IIT-BHU, Varanasi (1989-1993) where he was the recipient of the Gold Medal in Graduate Studies.

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SESSION #8:

Satellite for 5G

(1200-1315Hrs)

- ❖ SaT5G (Satellite and Terrestrial Network for 5G), Mr Romain Bucelle, 5G R&D coordinator, Thales Alenia Space
- ❖ Video demonstration showcasing SaT5G
- ❖ Space Segment perspective, Dr P K Jain, Associate Director, SATCOM PO, ISRO
- ❖ Frequency coordination matters, Ms Revathi, Sr DWA (SAT) DoT
- ❖ Indian SATCOM Industry perspective: Mr Gaurav Kharod, Country Manager, India, INTELSAT
- ❖ Technology and Standards initiatives, Prof Kiran Kuchi, IIT Hyderabad
- ❖ Q&A

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Mr Romain BUCELLE

5G R&D Coordinator, Thales Alenia Space

Romain BUCELLE has more than 15 years of experience in fixed and mobile network engineering, operation and business. Within Thales Alenia Space, he is now in charge of coordinating R&D projects related to 5G initiative and planning future industrialization of 5G enabled products. Romain joined Thales Alenia Space as product line manager for the telecom applications of Stratobus HAPS platform. He was responsible for analyzing market opportunities, associated business cases, for defining telecom solutions involving Stratobus platform and related research work. Previously, Romain was CTO and then COO of the french based wireless Internet service provider and network operator named Alsatis where he gathered extensive experience ranging from R&D, network design and operation, to business development, marketing and strategic analyses. As a SME executive, he was involved in defining several regional public private projects aiming at reducing the digital divide in France by using satellite based solutions or terrestrial fixed and mobile wireless networks.

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Dr P K Jain

Associate Director,
SATCOM PO, ISRO

Dr. P K Jain has been working in ISRO Headquarters, Bangalore as Associate Director for satellite communication planning and policy implementation that includes configuration design of the planned communication satellites of ISRO and assigning the space segment capacity to users. Before this, he has worked as Associate Director for the satellite communication & navigation programme at ISRO Headquarters. He has also held the responsibility of implementing various Application-Programmes of ISRO like Tele-education, Search and Rescue, DTH based Disaster Warning Dissemination System, etc.

He started his career with National Remote Sensing Centre (ISRO), Hyderabad in 1989 and worked for the design and development of remote sensing satellite earth station communication equipment. As a Project Manager, he contributed for the commissioning of various national and international remote sensing satellite ground stations.

He also worked in Space Applications Centre (ISRO), Ahmedabad for the establishment of C-, Ext. C-, Ku- and Ka-band SATCOM earth stations in the capacity of the Project Manager-System Engineering.

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He received two ISRO Team Excellence Awards in 2009 for implementing “Tele-education” and “Disaster Warning and Communication Systems”. He is also the recipient of the IETE – Biman Behari Sen Memorial Award (2010) for distinguished contribution in implementation of various satcom based societal application programmes like Tele-education, Telemedicine, Disaster management; establishing remote sensing and satcom ground stations; and development of various satcom subsystems. He is recipient of D.V. Nirmal & Mangal Sain Award (BES-2012 Award) by Broadcast Engineering Society (India) in recognition of his contribution for outstanding work in broadcasting, especially for the development and implementation of the DTH based Disaster Warning Dissemination System.

He has published more than 25 papers in various journals & magazines of national and international repute. He can be reached at pkjain@isro.gov.in.

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Ms M.Revathi

Senior Deputy Wireless Adviser (SAT), DoT

- ❖ Did Bachelor of Technology (B.Tech) in Electronic and Communications Engineering from Jawaharlal Nehru Technological University, Hyderabad
- ❖ Joined Wireless Planning and Coordination (WPC) Wing as a Group A officer in 1996 through Indian Engineering Services (IES) exam. Cadre is IRRS (Indian Radio Regulatory Services).
- ❖ Did Post Graduate Programme in Public Policy Management from Management Development Institute (MDI), Gurgaon. As part of International component of the programme, completed one module at Sciences Po University, Paris.
- ❖ Underwent trainers training on repair and maintenance of radio frequency spectrum monitoring equipment at Thales, Cholet, France.
- ❖ Representing as Frequency Expert from Asia Pacific Region in the Frequency Working Party (FWP) of International Telecommunications Satellite Organisation, Headquarter at Washington, USA
- ❖ Assisted DoS as spectrum regulatory expert in dealing International arbitration cases at the International Court of Justice, The Hague.
- ❖ Contributed and attended various meetings on spectrum management at International Telecommunications (ITU) level and also at Asia Pacific Telecommunity (APT) regional level
- ❖ Past experience: Radio frequency interference resolution, Spectrum Auctions.
- ❖ Present portfolio: As head of Satellite section looking after all the issues related to management of satellite spectrum. Notification and coordination for orbital slots at ITU. Coordination with other countries.

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Mr Gaurav Kharod

Country Manager, Intelsat

Gaurav has been a satellite professional with 20+ years in Satellite communications and Broadcast markets with exposure in South East Asia markets. Currently Country Manager for India at Intelsat, beyond his understanding of business and technology, he has experience in regulatory affairs and public policy. Having experience across Hughes – a Service Provider, Viasat – a Network provider, and now Intelsat, Gaurav has the right mix of experience across the different aspects of a satellite communications service.

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Prof. Kiran Kuchi

IIT Hyderabad (IITH)

Prof. Kiran Kuchi received his B.Tech. in Electronics and Communications Engineering from Sri Venkateswara University College of Engineering Tirupati in 1995, M.S. and Ph.D. degrees both in Electrical Engineering from The University of Texas at Arlington, Texas, USA in 1998 and 2006, respectively.

Presently he also holds the position of Professor, Department of Electrical Engineering, IIT Hyderabad (IITH). He has been spearheading national 5G research and standards development efforts through his leadership role in TSDSI and participation in 3GPP (Third Generation Partnership Program). Prof. Kuchi is the founder and CEO of WiSig Networks Pvt Ltd, a wireless startup that develops 5G RAN systems.

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SESSION #9:

5G and Cloud

(1400-1500Hrs)

- ❖ Leveraging Cloud for 5G, Mr Satish Jamadagni, Vice Chairman TSDSI
- ❖ NGPaaS (Next Generation Platform as a Service) - “Next Generation Platform as a Service: 5G Cloud Native Solution”, Mr Gourav Prateek Sharma, Research Assistant/Gent University
- ❖ Video demonstration showcasing NGPaaS
- ❖ Status of Cloud Interoperability and Portability standards development, Prof Dinkar Sitaram, CCICI
- ❖ Q&A

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Mr Satish Jamadagni

Vice Chairman TSDSI
(Vice President, RJIO)

20 years of industry experience in the telecom domain. Currently working as a VP in Reliance Jio. He is the Current Vice Chair of TSDSI, Chair of TSDSI SG-Networks, an active member of GTI (Global TDD Initiative) & 3GPP, Co-Chair of the Asia Regional Operators Group; Small Cell Forum (SCF) and previously on the board of the International Multimedia Teleconferencing Consortium (IMTC)

Over 120 granted/pending patents in the wireless domain

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Mr Gourav Prateek Sharma

Research Assistant, Gent University

Gourav Prateek Sharma obtained his masters degree in Optoelectronics and Optical Communication from Indian Institute of Technology Delhi in 2017. In the second year of his masters, he got selected for DAAD IIT-sandwich scholarship to do his thesis work from TU Braunschweig, Germany, where he worked on SBS based optical frequency shifters. Since 2017, he is working towards his PhD at UGent-IMEC. His research focus is on provisioning of hardware accelerators for network functions in NFV environments.

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CONCLUDING SESSION

(1515-1630Hrs)

- ❖ Panel Discussion: Way Forward for Collaborative Approach, Mr Benoit Sauveroche, Delegation of the EU to India, Moderator; Panelists: Mr A S Verma, DDG (Mobile Technology), Telecom Engineering Centre (DoT); Mr Satish Jamadagni TSDSI; Mr Tonnie De Koster, European Commission; Mr Jean-Pierre Bienaimé, 5GIA; Mr Andreas Sommer, India EU Cooperation Project; Mr Xavier Piednoir, ETSI
- ❖ Closing Remarks: Ms Pamela Kumar, Director General, TSDSI
- ❖ Vote of Thanks: Mr Anil Prakash, Director General, BIF

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Mr Satish Jamadagni

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Mr Tonnie De Koster

Adviser for Digital Single
Market International Outreach,
European Commission,
DG CNECT

Currently MrTonnie De Koster works as Advisor for the international outreach of the EU's digital single market strategy in DG Connect of the European Commission. Previously he worked in the same DG on designing the Digital Single Market and dealt as well with innovation policy for ICT companies and standardisation. Before rejoining DG Connect in 2011, Tonnie was Deputy Head of Unit in charge of the Innovation Union in DG Research and Innovation, and from end 2005 till end 2010, he was in charge of designing and implementing the Europe 2020 Strategy for Growth and Jobs and for economic governance at the Secretariat General of the European Commission.

Tonnie has a long experience in the field of digital policy. First as Assistant to the Director-General for Information Society (1996-2000) and then as Member of Cabinet of ErkkiLiikanen, Commissioner for Enterprises and Information Society (2002-2004) he was responsible for liberalising telecommunication services in Europe and for launching the eEurope strategy aimed at promoting ICTs in Europe.

Earlier Tonnie worked within the European Commission at developing a European policy in favour of SMEs (1993-1996). Tonnie De Koster is an economist by training.

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Jean-Pierre Bienaimé

Secretary General,
5G Infrastructure Association (5G-IA)

Jean-Pierre Bienaimé has been Secretary General of the 5G Infrastructure Association (5G-IA), representing the digital & telecommunications industry (operators, manufacturers, research and academic institutes, verticals, SMEs) in the Public-Private Partnership (5G PPP) with the European Commission, since 2016. He has also been Chairman of the 5G PPP Steering Board.

Joining France Telecom (FT) in 1979, Bienaimé has had responsibilities including Director Planning Department at FT, Advisor to the General Director of Moroccan Telecommunications in Rabat, Director of Marketing and Product Development for International Networks & Services at FT, Chief Executive Officer of Nexus International, and Vice-President Group Mobile Support at Orange. From 2009 until 2016, Jean-Pierre has been Senior Vice-President at Orange Wholesale.

Jean-Pierre has been Chairman of mobile industry association The UMTS Forum from 2003 until 2016, with a mission to promote a common vision of the development of 3G UMTS and 4G LTE and evolutions, and to ensure their worldwide commercial success.

Jean-Pierre is the chairman of IREST (Economic and Social Research Institute on Telecommunications), a think tank of influence based in Paris. Jean-Pierre is graduated from ESSEC Business School (Master in Management), from Sciences-Po Paris, from Ecole Nationale Supérieure des Postes & Télécommunications – Paris, and from INSEAD Executive MBA.

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Mr. Andreas Sommer

Team Leader and Senior Technical Advisor,
Project “India-EU Cooperation on ICT-Related
Standardisation, Policy and Legislation”

Andreas Sommer, German national, is Team Leader and Senior Technical Advisor of the “India-EU Cooperation on ICT-Related Standardisation, Policy and Legislation” project (2015-2019) to promote closer alignment between India and Europe with regard to the production and use of ICT standards and to harmonize the exchange of statistical data. With his master’s studies in telecoms engineering and business administration, he is active in the global ICT sector for 36 years, running his own consultancy and engineering company SEC based in Germany and South Africa for 30 years. Andreas has been advisor for telecom operators, governments and ICT ministers in Europe, Middle East and Asia / Pacific. Beside working on telecom regulations and policies, as senior project manager he has carried out major infrastructure projects, prepared national ICT strategies and broadband plans which were implemented with up to multi-billion US dollars of investment.

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Pamela Kumar

Director General, TSDSI,
President & Founder Chair, Cloud Computing
Innovation Council of India

Since February 2017, Ms. Pamela Kumar has been appointed as the Director General of TSDSI. An alumnus of PEC Chandigarh, Rutgers University and IIM Bangalore, Pamela brings with her an experience of 30+ years in the communications, computers and semiconductor industry.

Prior to TSDSI, she has spent the first 10 years of her career at AT&T, Bell Labs in USA and at C-DOT in Bangalore. Later, she held leadership positions in Texas Instruments, IBM, Hewlett Packard Enterprise, R&D labs in India. She also did a short stint with 2 startups, setting up the R&D centers of Network Programs and Alliance Semiconductors. She holds 3 Patents granted by USPTO and has 5 patent applications pending in the Networking Accelerators domain. She has been a Keynote/invited speaker in 60+ Local and Global forums.

Pamela is also the Founding Chair and current President of Cloud Computing Innovation Council of India (CCICI). She is on the Governing Board of Indian Financial Technologies and Allied Services (IFTAS) and PEC University of Technology. She is the Bharti Chair for IT Research and Member Research Council, UIET, Panjab University. She also mentors a few Startups in the ICT space.

Pamela is currently the Chair of the IEEE Charles Steinmetz Awards Committee. She was the first ever appointee from India in the IEEE Standards Association - Board of Governors, as the Member at large for 2011-12. She has held several other leadership roles as a senior member of IEEE - such as General Chair of IEEE ANTS Conference, Coordinator for IEEE Region 10 Industry Relations, Chair for IEEE Computer Society Chapter & Vice Chair of IEEE Bangalore section, etc.

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Anil Prakash

Director General, BIF

A widely experienced in Government Relation, Regulatory and Policy framework with strong techno-commercial background in Telecom, ICT and Broadcasting domain with 33 years works experience. . He is associated with International Telecommunications Union- ITU for more than a decade and had played an influential role in contributing towards ITU's activities in India.

He helped in setting up PTC India Foundation in 1994, ITU-APT Foundation of India in 2003 now he is co-founder & Director General of Broadband India Forum which functions as a policy forum and think-tank for the development & enhancement of the broadband ecosystem in India. He is active member of task various groups set up by the govt. and telecom associations and chamber of commerce.

He has represented at major international conferences more than two decades.

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