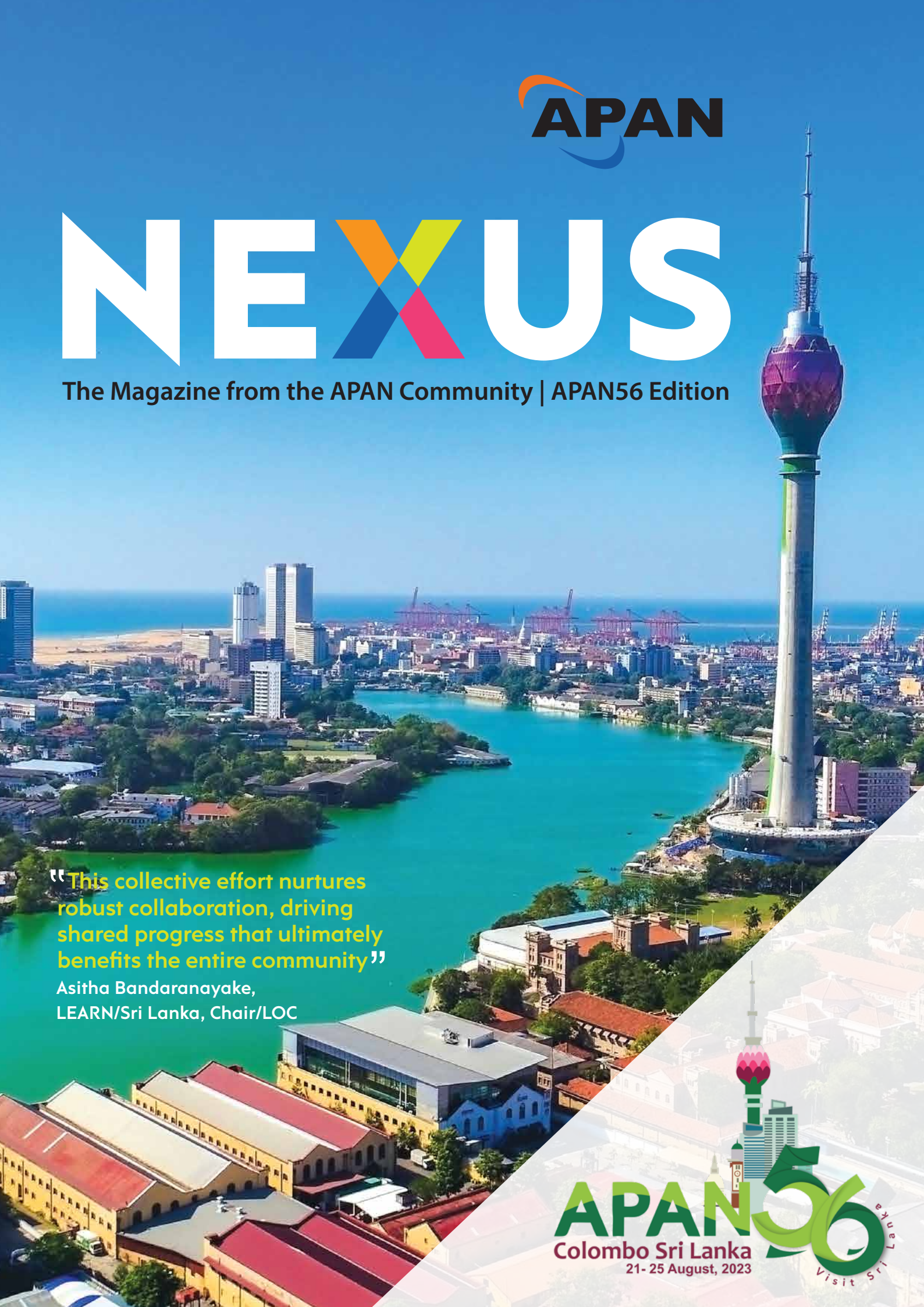
NEXUS

The Magazine from the APAN Community | APAN56 Edition



"This collective effort nurtures robust collaboration, driving shared progress that ultimately benefits the entire community"

Asitha Bandaranayake,
LEARN/Sri Lanka, Chair/LOC

APAN56
Colombo Sri Lanka
21- 25 August, 2023

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NEXUS

Message from APAN Chair Prof. Jilong Wang

Distinguished guests, scholars and friends,

2023 is the 26th year of APAN's establishment, and in APAN's history, this magazine is the first meeting magazine with the most comprehensive information shared by APAN community, which is undoubtedly a worthwhile and significant attempt. In conjunction with APAN56, the magazine introduced the history and development of APAN and its contributions to the development of the Asia-Pacific Internet through rich and diverse forms, which help us have a wider view of APAN from different angles and triggered thinking about the future. This pioneering work benefits from the meticulous planning and hard work of the host of this event, Lanka Education and Research Network (LEARN).

For many years, LEARN has been an intimate and important partner of APAN. As Sri Lanka's national education and research network, LEARN has built an advanced network infrastructure between higher education and research institutions in Sri Lanka, acting as an indispensable bridge between education and scientific research. LEARN actively participates in international collaboration and contributes greatly to the scientific and technological progress of the Asia-Pacific region.

As the local host of APAN56, LEARN has invested tremendous effort in preparing and organizing this event. Here, I sincerely pay tribute to LEARN and express my warm gratitude and congratulations. It is the wisdom and dedication of LEARN that have given us the opportunities to share, exchange, and discuss on this platform.

As the second physical meeting after COVID-19 pandemic, APAN56 shoulders a historical mission. During this meeting, we will not only continue to focus on the field of Internet research and construction, comprehensively discuss the challenges and problems encountered in the development of the Internet, but also focus on the field of artificial intelligence and high-performance computing.

The artificial intelligence technology represented by ChatGPT has achieved breakthrough development, bringing disruptive challenges to becoming a new turning point in the development of the world and human civilization. This technological development is inseparable from the Internet and also brings new requirements and challenges to the Internet, providing us with broad thinking space to explore the boundaries of Internet technology. At the same time, it will inspire us to explore deeper levels of future Internet technology development.

It is worth looking forward to the joint efforts of the APAN Program Committee, Technical Committee, and the Local Organizing Committee, this meeting will present a series of wonderful keynote speeches, working groups, training courses, etc., providing excellent opportunities for researchers seeking network technology knowledge and experience. This will undoubtedly be a great event in the history of APAN.

Dear friends, 26 years ago, APAN pioneers founded APAN, as a multinational organization, APAN brings together outstanding institutions and scholars in the field of academic networks in the Asia-Pacific region, we jointly explore the way of future Internet development, constantly seek innovative solutions, and draw the future blueprint of the Internet with the world.

Standing at the crossroads of the new era and facing the new international pattern and technological development, we must firmly uphold the spirit of openness and cooperation of the Internet. At the same time, we also need to deeply realize that the Internet and information technology fields are experiencing amazing changes in recent years, and we must continue to absorb new wisdom, inject new impetus into the development of the Internet, and are destined to embrace the development and change of new technologies. Actively embrace the development and iteration of Internet technology from a broader perspective, explore new education and scientific research models, promote the deep integration of technology and education, and build APAN into an important platform for gathering ideas, technology and innovation.

Finally, I would like once again to thank everyone for your participation and contribution to APAN56. In APAN, a stage of gathering wisdom, let us join hands closely, continue to practice the concept of "openness, equality, collaboration and sharing", fully share ideas, exchange cultures, and return with a full load.

I wish APAN56 a complete success, thank you all very much!

APAN NEXUS is a magazine that highlights the activities of the Asia Pacific Advanced Network (APAN) Community and their collaborative efforts in the research and education field. This edition has its main focus on the 56th meeting of the Asia Pacific Advanced Network Meeting (APAN56).

The Team Behind APAN NEXUS

Reflecting the span of the APAN Community, the articles you read in this magazine are contributed by a group of people in APAN, regional NRENs and its economies. The planning, production and editing are performed by a small team highlighted below.

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This magazine has received funding from Asia Pacific Advanced Network (APAN) via APAN Grant Program and is published by LEARN as part of the 56th meeting of the Asia Pacific Advanced Network (APAN56).

APAN General Manager's Message

Creating Synergy

The old saying "The whole is greater than the sum of its parts".

Similarly, APAN acts in the same way of creating a single shared vision, and values thru collaborations, knowledge sharing, and expansion thru a single goal of connecting all Research & Education Institutes under one motive – Creating Synergy.

NRENs (National Research and Education Networks) are proud to be part of the community they serve and can be highly motivated by the positive way in which their vision can provide benefits that support research and academic advances. There is a level of ownership found in NRENs that is a major drive in their success.

What is common among the research and education community is the innovative and pioneering spirit in the research and education community, which leads to rapid advances. The combination of knowledgeable users having both skills and ambitions is the key to making working solutions.

Like human relationships, Synergy is a constant process and must be managed. A National Research and Education Network is a never-ending journey that the community embarks together and constantly empowers each other thru each other.

With that being said, the future of APAN through these NRENs is exciting and transformative. These networks will continue to serve as critical enablers for collaboration, innovation, and knowledge exchange in the academic and research communities. Through ongoing technological advancements, strategic partnerships, and a commitment to meeting the evolving needs of their users, APAN will contribute to groundbreaking discoveries and advancements across various domains.

NRENs from emerging economies who are not APAN members yet are greatly welcomed and encouraged! Come speak to us!

Liana Jacinta Jaganathan
General Manager
APAN

APAN56 LOC Chair's Message

Greetings and Welcome to APAN56!

It is with immense pleasure and excitement that I extend my warmest greetings to all participants, collaborators, and friends as we eagerly commence the Asia-Pacific Advanced Network (APAN56) meeting. As the Local Organizing Committee (LOC) Chair, I am both honored and humbled to be coordinating this prestigious event, which promises to be a celebration of innovation, collaboration, and the boundless potential of human connection.

We gather in the vibrant city of Colombo, Sri Lanka, to engage in a journey of exploration, learning, and networking. The APAN meetings have consistently been at the forefront of fostering technological advancements, and APAN56 will be no exception.

At its heart, APAN is more than just a series of meetings; it is a testament to the power of collaboration across borders. With its international partnership of National Research and Education Networks (NRENs) spanning the Asia-Pacific region, APAN represents a nexus of knowledge, innovation, and collective aspiration. Over half of the world's population is touched by the influence of APAN, and this dynamic community plays a pivotal role in enabling high-speed network connectivity, facilitating research and education activities, and driving technological advancement.

In today's interconnected world, where boundaries are increasingly blurred, APAN serves as a beacon of unity, transcending geographical distances and cultural diversities. Our meeting is a convergence of researchers, scientists, policymakers, network professionals, and experts from diverse fields, who share a common vision of shaping a brighter, more interconnected future. The exchange of ideas, experiences, and insights is at the heart of what makes APAN56 a transformative experience.

This year's meeting introduces several exciting elements that enrich our engagement and highlight our commitment to education and collaboration.

The APAN56 Conference, an academic conference focused on the theme "AI and HPC: Better Together," promises to push the boundaries of knowledge, while nurturing a nexus between the academics and their service providers in NRENs. The conference theme reflects our commitment to exploring the synergy between Artificial Intelligence and High-Performance Computing, unlocking new realms of possibilities that will shape the future of our digital landscape. The APAN56 Datathon creates a platform for Sri Lankan students to showcase their talent and innovation. These additions underscore our commitment to nurturing the next generation of tech leaders and thinkers.

As we look to the horizon, we're also excited to unveil the inaugural issue of the APAN magazine, aptly named "Nexus." This publication will serve as a bridge between our community's past, present, and future. Its pages will echo with the stories of collaboration, innovation, and the transformative impact of APAN. From the comprehensive program schedule, keynote presentations, and Interviews with APAN personalities to the captivating visual stories of APAN55, every element of Nexus will be a testament to the dedication and passion that define our community.

Lanka Education And Research Network (LEARN) takes immense pride in being the local host for APAN56. It is our honor to welcome each one of you to our beautiful island nation and to create an environment that fosters learning, exploration, and connection. Our commitment to excellence is reflected in every aspect of the meeting, ensuring that your experience is both enriching and unforgettable.

As we embark on this journey, let us remember that the essence of APAN56 lies not only in the technologies we discuss but also in the relationships we forge. It is the collective spirit of collaboration, the willingness to share, and the passion for pushing the boundaries of innovation that truly define our community. Let us engage in meaningful conversations, learn from one another, and create memories that will last a lifetime.

On behalf of the entire Local Organizing Committee, I extend my heartfelt gratitude to each participant, sponsor, and supporter who has contributed to the realization of APAN56. Your enthusiasm and dedication have shaped this event into what it is-a celebration of the boundless possibilities that emerge when like-minded individuals come together with a common purpose.

At APAN56, let us embrace the spirit of discovery and unity that has been the hallmark of APAN gatherings. Together, we will explore new dimensions of technology, foster collaboration that transcends boundaries, and chart a course toward a brighter future for the Asia-Pacific region and beyond.

I eagerly looked forward to meeting you all in Colombo and to the profound impact our collective efforts will undoubtedly make. Let's create a nexus of inspiration, innovation, and collaboration at APAN56.

Warm regards,

Asitha Bandaranayake
Local Organizing Committee Chair, APAN56

From Editors' Pens

In a world where digital transformation is no longer a choice but an imperative, ideas know no boundaries, and innovation is a shared quest, we find ourselves at a watershed moment - a moment where collaboration, community, and connections define not just our present but our future.

As the editors of this special edition of APAN NEXUS, we welcome you to APAN56, a convergence of bright minds, luminous ideas, and purpose-driven technologies that shape the Asia-Pacific landscape. It is here that we unite, reflect, and embark on a journey of collective wisdom and innovation.

This magazine aims to encapsulate the spirit of APAN56, hosted by LEARN in Sri Lanka, where we navigate through various terrains of collaborative innovation that have become the beating heart of our region. The pages that follow are not merely ink and paper; they are a repository of passion, dedication, and a commitment to a connected future.

Our feature article offers a rich overview of APAN56 and the resonating theme of "Uniting the Asia-Pacific Community for Collaborative Innovation." It embodies our belief that geographical boundaries should not limit our desire to learn, innovate, and grow together. We also highlight the efforts that the Local Organizing Committee (LOC) has spearheaded to enrich the APAN meeting experience of our community.

The Keynote Story unveils the vision of Rene Buch, a vision that spans across national research and education networks (NRENs), building bridges where once there were gaps. Collaboration is the cornerstone of our success, and the insights from the Opening Plenary set the tone for a vibrant dialogue.

The heart and soul of APAN is its people, its history, and its journeys. Dr. Markus Buchhorn's reflections and Dr. Francis Lee's adventures remind us that connections go beyond mere networks; they are about human bonds and shared ambitions.

Telemedicine, a topic ever so relevant in our times, finds its rightful place with Dr. Tomohiko Moriyama's insights. It's a testament to our ability to adapt, innovate, and serve even in the face of adversity.

Our focus on Emerging NREN Collaboration and the success stories like fDLDUCF and BeLISAC Projects showcase our unwavering commitment to education and the empowerment of our South Asian neighbours.

With photographs that breathe life into APAN55 and a forward-looking roadmap towards APAN57, this magazine is a celebration of where we have been and where we are going.

APAN56 is more than a meeting; it is a milestone, a beacon guiding us towards a future where we engage and empower every member of our community. It reflects our collective hopes and aspirations, not as isolated nations but as a cohesive region striving together.

Let this magazine, NEXUS, be your companion in this extraordinary journey of APAN56, where ideas flourish, collaborations blossom, and the future awaits with open arms. As we turn the pages, let's also turn a new leaf in our relentless pursuit of excellence.

Together, we are more than the sum of our parts. Together, we are APAN.

Welcome to APAN56!

Wathsala Dayananda and Roshan G. Ragel
LEARN, Sri Lanka

ChatGPT
OpenAI

APAN56 Programme and Highlights

Introduction

APAN56, a distinguished event orchestrated by Lanka Education and Research Network (LEARN), graces captivating Colombo, Sri Lanka. This gathering assembles luminaries, visionaries, and policy shapers from the Asia-Pacific realm, uniting their insights, fostering collaboration, and delving into innovative solutions to shape the future of networking.

Venue

The Galle Face Hotel, established in 1864, is a storied Asian hotel catering to world travellers. With 156 guestrooms, each with historical traditions and character, the hotel offers stunning sea views and elegant colonial-style décor. Dining experiences at The Verandah, 1864 Restaurant, Pimms on the Chequerboard, and King of the Mambo are essential while in Colombo. The Grand Ballroom and Jubilee Ballroom provide memorable occasions for weddings.

Aug 21st

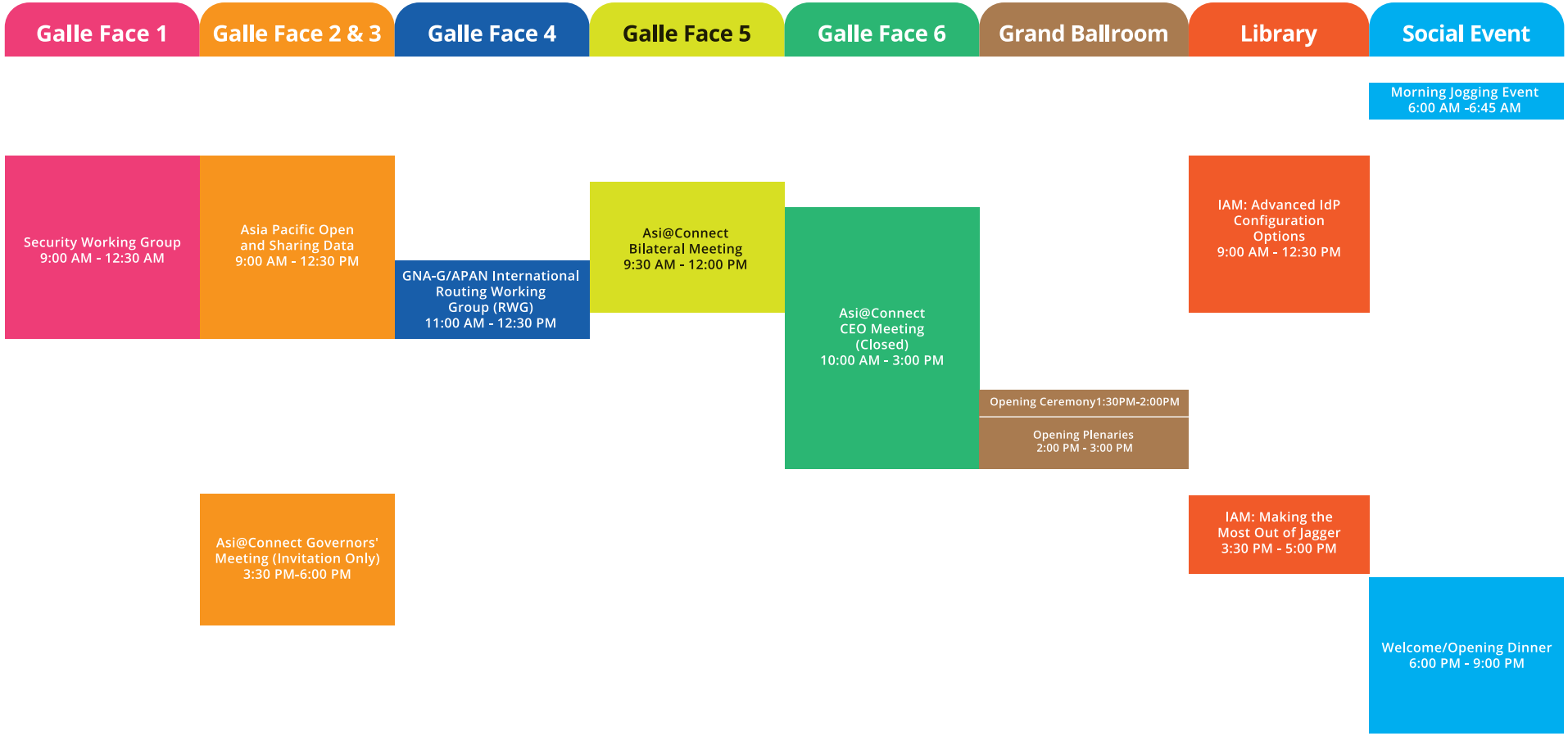
Galle Face 1	Galle Face 2 & 3	Galle Face 4	Galle Face 5	Galle Face 6	Social Event
AER Steering Committee Meeting (Closed) 9:00AM - 10:30 AM		Cloud Working Group 9:00 AM - 10:30 AM	APAN 101/ Fellowship Meeting 9:00 AM - 10:30 AM	IAM : Connecting with the Global Federation Community 9:00 AM - 10:30 AM	
Security Workshop : You Choose What to Learn in Security 11:00 AM - 12:30 PM			Agriculture Working Group (AgWG) & Rural Hybridization 1:00 AM - 3:00 PM	IAM : Adavanced Federated Idnetity Management-Multi-Factor Authentication 11:00 AM - 12:30 PM	
Security Workshop : Vulnerability Assessment and Penetration Testing 1:30 AM - 3:00 PM	Asi@Connect Steering Committee Meeting (Closed Meeting)	IoT Working Group 1:30 PM - 5:00 PM		IAM :Advanced Federated Identity Management - Assurance 1:30 PM - 5:00 PM	
Setting up an IXP (Tutorial) 3:30 PM - 5:00 PM	Asi@Connect Seminar & Forum 2:30 PM - 6:00 PM		APAN Board Meeting (Closed) 3:30 PM - 5:00 PM		REN Leaders Dinner (Invitation Only)

As virtual sessions, medical working groups meet throughout the day.

REN Leaders Dinner
(Invitation Only)

The APAN56 REN Leaders Dinner is an invitation-only gathering of notable leaders of Research and Education Networks (REN). This one-of-a-kind gathering provides a forum for REN leaders to make meaningful contacts, share insights, and spark joint activities, therefore building the global network that drives knowledge and progress.

Aug 22nd



Medical working group sessions are virtually conducted as morning sessions.

Opening Plenary

On August 22, a wonderful occasion with two distinguished speakers take place. Rene Buch, Senior Enterprise Architect Research & Education - NTT Germany and former CEO of NORDUnet, spoke about the transformative power of eNREN Collaboration in encouraging national and regional growth. Meanwhile, Snr. Prof. Sampath Amarathunga, Chairman of the University Grants Commission, Sri Lanka and former Vice-Chancellor of the University of Sri Jayawardenepura, discussed the critical role of LEARN in Sri Lanka's dynamic higher education scene. It was a day of insightful discussions that provided significant perspectives for the future.

Datathon

The APAN56 Datathon 2023 is a 24-hour competition for undergraduate students in various technology fields, aiming to empower them in real-world business challenges using authentic data. Co-organized by institutions like the University of Colombo School of Computing, Universities of Moratuwa, Peradeniya, and Jaffna, the event promotes innovation, teamwork, and a developer culture.

Sunrise Shuffle - Morning Jogging Event (Social Event)

On the vivid morning of August 22, 2023, the historic Galle Face Hotel stands high, welcoming the world to a new day. The early hours provide a special energy as the sun's gentle rays touch the historic facade, setting the stage for the commencement of an unforgettable event. At 6 a.m., a crowd of excited participants and interested onlookers gathers in front of this iconic restaurant, ready to embrace the day's offers. As the day progresses, the hotel's history and the dynamic surroundings combine to provide an experience that embodies the essence of both.

Aug 23rd

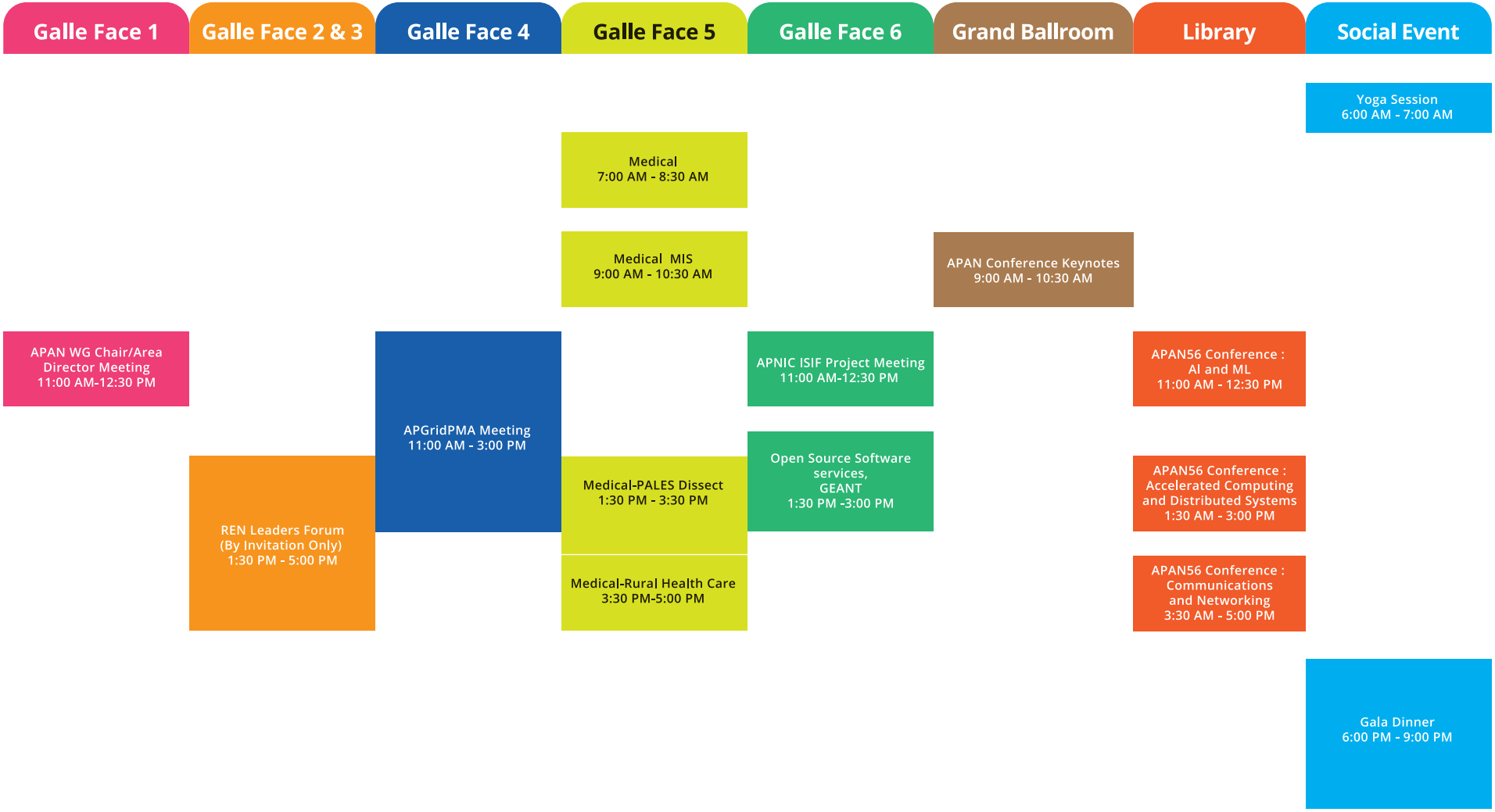
Galle Face 1	Galle Face 2 & 3	Galle Face 4	Galle Face 5	Galle Face 6	Library
Asia-Pacific Research Platform (APRP) 9:00 AM - 12:30 PM	Networking Engineering Workshop : Network Technology 9:00 AM- 10:30 AM	AI-Driven Networks Working Group 9:00 AM - 10:30 AM	Asi@Connect GM Follow-up Meeting (Closed) 10:00 AM - 5:00 PM	Emerging NRENs: Overcoming Challenges and Acceleratign Development 9:00 AM - 12:30 PM	Advanced Federated Identify Management - Entity Categries 9:00 AM - 10:30 AM
	Networking Engineering Workshop : Panel Discussion 11:00 AM- 12:30 PM	Disaster Mitigation 11:00 AM - 3:30 PM			Getting on board with REFEDS Baseline expectations 11:00 AM - 12:30 PM
Industry Forum 1:30 PM - 3:00 PM	Networking Engineering Workshop : What's happening in NREN world wide? 1:30 PM- 3:00 PM			Internet Governance and the role of NRENs 1:30 PM - 5:00 PM	IAM: Federation updates and Presentations 1:30 PM - 5:00 PM
APAN Council Meeting (Closed) 3:30 PM - 5:00 PM	Networking Engineering Workshop : Open Discussion 3:30 PM- 5:00 PM				

As virtual sessions, medical working groups meet throughout the day.

Industry Forum

On August 23rd, a significant event will occur at the Galle Face Hotel, where the APAN56 Industry Forum will be held in the prestigious Galle Face 1 venue. This interactive forum will bring together distinguished professionals, thought leaders, and experts from various industries. Expect intelligent debates, the exchange of creative ideas, and a venue to explore the latest breakthroughs in technology, business, and beyond. This event promises to be a knowledge nexus, providing a unique opportunity to network, learn, and receive vital insights into the future of industries in the Asia-Pacific region.

Aug 24th



As virtual sessions, medical working groups meet throughout the day. As the final virtual session, there are discussions about Medical-PALES Dissect' and 'Medical-Rural Healthcare.

REN Leaders Forum (invitation only)

The REN Leaders Forum emerged as a crucial highlight of the APAN56 meeting. The forum provided an intimate setting for key decision-makers to exchange views, explore new trends, and develop strategic relationships, fostering collaboration and innovation. Participants investigated cutting-edge technologies, shared best practices, and charted the future trajectory of RENs, assuring a stronger, more linked global research and education ecosystem. It embodied the spirit of APAN56's quest of networking advancement and quality.

APAN56 Conference Keynotes

The keynote addresses at APAN56 were genuinely illuminating, with two outstanding speakers laying the groundwork for ground-breaking conversations. Dr. Ryousei Takano, a seasoned Senior Researcher from AIST in Japan, gave an exciting discussion titled "ABCI and beyond: the world's first large-scale open AI infrastructure." His insights on the groundbreaking ABCI project and its disruptive impact on the AI landscape were enthralling, demonstrating the value of teamwork and innovation. Prof. Simon See, Senior Director and Chief Solution Architect at NVIDIA AI Technology Center, NVIDIA Corporation, delivered an equally captivating keynote. "High-Performance Simulation in the Age of AI," his keynote, emphasized the convergence of high-performance computing and AI, providing a glimpse into the unlimited possibilities this convergence offers.

Flex and flow - Yoga Session (Social Event)

Serenity awaits you at our upcoming yoga session on August 24, 2023, at 6 a.m. Explore traditional yoga methods to feed your body, mind, and spirit as we go on a holistic journey. Find your core, let go of your tension, and join us for this revitalising session. Set up your mat, sit back, and begin your journey to inner calm.

Gala Dinner (Social Event)

Participate in the fun at the APAN56 Meetup, where we'll be holding a spectacular social event - an elegant Gala Dinner on the evening of August 24. This evening promises to be a wonderful time to relax, network with other participants, and enjoy the friendly camaraderie that characterises our community. Join us for a fantastic night of delicious food, delightful conversations, and the opportunity to make valuable contacts. This exceptional event is open to the public, making it the ideal opportunity to celebrate our common interests and the spirit of collaboration. Let's make this evening at APAN56 one to remember!

Aug 25th

Grand Ballroom

Closing Pleaneries
9:00 AM - 10:30 AM

General Assembly
11:00 AM - 12:30 PM

Closing Plenaries

The first APAN conference provides a forum for broad debates and idea-sharing among experts and fans. Dr. Ryousei Takano, a Senior Researcher from the Institute of Advanced Industrial Science and Technology (AIST), Japan, will speak about the breakthrough ABCI project, the world's first large-scale open AI infrastructure. Prof. Simon See, Senior Director, Chief Solution Architect, and Global Head of NVIDIA AI Technology Center at NVIDIA Corporation, will also speak about High-Performance Simulation in the Age of AI. This conference promises to be a one-of-a-kind event, fusing advanced technology with innovation, making it a must-attend for those interested in the future of AI and high-performance computing.

Aparna Thewarapperuma, LEARN

LEARN Hosts APAN56 in Sri Lanka: Uniting the Asia-Pacific Community for Collaborative Innovation

Sri Lanka's National Research and Education Network (NREN), LEARN, is hosting one of the region's most prominent tech and academic events this August – APAN56. The Asian-Pacific Advanced Network (APAN) meeting brings together researchers, educators, network engineers, and policymakers to explore innovative initiatives to advance research and education in Asia Pacific. "This rendition of the APAN meeting, APAN56, will be hosted in Sri Lanka, and we intend to do things a little differently," share Consultant CEO of LEARN Professor Roshan Ragel and Consultant CTO of LEARN and Local Organizing Committee Chair of APAN56, Dr. Asitha Bandaranayake. "In addition to the general meeting that has been taking place over the past 27 years, we have added new pillars to the event that we believe will add value to all the participants like never before."

The Overview of an APAN Meeting

APAN is a non-profit organisation that connects the research and education networks of its member economies and other research networks across the world. Since its inception in the late 1990s, the organisation has worked towards promoting and facilitating network-enabled research and education activities related to network technologies, services, and applications among its members. Today, much of its membership consists of NRENs representing economies in Asia and Oceania.

Twice a year, APAN organises a series of meetings. Dubbed the APAN Meetings, this is where its members and other interested participants come together in working groups, BoFs, committees, workshops, plenary sessions, and other meetings.

Collectively across these sessions, participants will review progress, demonstrate technical advances, and make plans for future activities. Across these activities, two distinct components drive the significance and impact of these meetings.

Firstly, the working groups provide a space for researchers, academics, network engineers, and policymakers to engage in discussions about technical advances. These working groups cover various topics, including telemedicine, cybersecurity, agriculture, and more, fostering innovative solutions to pressing challenges. **Secondly, the meetings facilitate crucial discussions among NRENs, such as knowledge sharing among engineers and governing collaborative efforts - for instance, the Asi@Connect Project.** Thus the APAN Meetings offer a distinctive collaborative platform for its attendees to address shared regional challenges.

The latest APAN Meeting (APAN56) will be hosted by LEARN and take place from the 21st to the 25th of August 2023 in Colombo. Alongside the usual biannual meeting, APAN56 will also include a Research Conference and a Datathon as key pillars of the event for the first time in its history.

With about 100 sessions taking place across the five days, APAN56 welcomes the presence of the Heads of all regional NRENs, working group members, presenters, NREN engineers and researchers, APAN fellows, academics, students, and community industry sponsors.

What to Expect at the APAN56 Meeting

The APAN56 Meeting will host the usual sessions between working groups and the discussions between its member NRENs representatives. Alongside these, it will also feature the traditions of opening and closing plenary sessions. **The opening plenary at APAN56 features two keynotes on the topic of Emerging NRENs** by the CEO & Founder of RICS.DIGITAL, Rene Buch and Chairman of the University Grants Commission Sri Lanka, Snr. Prof. Sampath Amarathunga. **The closing plenary will focus on Rebuilding Sri Lanka through Agriculture, Innovation, and Technology** and feature keynotes by the Chairman of the National Science Foundation Sri Lanka, Snr. Prof. Ranjith Senaratne and Vice Chancellor of Wayamba University of Sri Lanka, Snr. Prof. Udith K. Jayasinghe Mudalige.

Beyond the keynotes and working group discussions, **the APAN meetings also play a pivotal role in hosting crucial governance meetings for the Asi@Connect Project.** These meetings include the Asi@Connect Steering Committee Meeting, the Asi@Connect Seminar and Forum, the Asi@Connect CEO Meeting, and finally, the Asi@Connect Governors Meeting. Together, these governance meetings underpin the spirit of collaboration and synergy that defines the APAN Meetings as it brings together key leaders of NRENs across the APAC region.

Closing Plenary
Rebuilding Sri Lanka through Agriculture, Innovation and Technolgy

Snr. Prof. Ranjith Senaratne
Chairman, National Science Foundation Sri Lanka,
Senior Professor of Crop Science, Faculty of Agriculture, University of Ruhuna,
Former Vice Chancellor, University of Ruhuna

Snr. Prof. Udith K. Jayasinghe Mudalige
Vice Chancellor of Wayamba University of Sri Lanka,
Senior Professor (Chair) of Agribusiness Management Department, Wayamba University of Sri Lanka,
Former Secretary to the Ministry of Agriculture

Further, **APAN56 will also host the APAN Fellowship Program.** The key objective of the program is to promote global participation through participation in APAN meetings. Acceptance into the program is offered on a competitive basis. For many students and early-career young researchers, it serves as a gateway to being a part of the wider APAN community. Prof. Ragel goes on to state that APAN56 will be hosting 20+ fellows.

APAN56 will also feature an Industry Forum. This exclusive event is designed to bring together industry leaders in a dynamic environment where they can showcase technological advancements alongside networking opportunities.

In addition to existing sessions, **LEARN is also hosting a Leaders Forum at the APAN56 Meeting.** This exclusive forum is a new addition that aims to bring together key leaders of NRENs within the APAN community.

The primary focus of the Leaders Forum is to facilitate an environment where these leaders can learn and exchange insights on how to enhance the strategic management of their respective NRENs. In doing so, the Leaders Forum aims to empower these key stakeholders with valuable insights and strategies to improve the effectiveness of their NRENs to serve their academic communities better.

APAN56 Conference : Deepening the Connection of Researchers & NRENs

Conference
AI and HPC :
Better Together

Dr. Ryousei Takano
Senior Researcher of the Institute of Advanced Industrial Science and Technology (AIST), Japan

Prof. Simon See
Senior Director, Chief Solution Architect, and Global Head, NVIDIA AI Technology Center, NVIDIA Corporation

The APAN56 Conference is the latest addition to the APAN Meetings, introduced by LEARN. **With the theme "AI and HPC: Better together," the conference aims to explore the synergies between Artificial Intelligence (AI) and High-Performance Computing (HPC). It will feature two keynote speeches open to all participants.**

The first keynote will be delivered by a Senior Researcher at the Institute of Advanced Industrial Science and Technology (AIST) Dr. Ryousei Takano, while the second will be presented by the Senior Director, Chief Solution Architect, and Global Head of the NVIDIA AI Technology Center, Prof. Simon See.

One significant aspect of the conference is its collaboration with Springer, a renowned academic paper publisher, to provide a platform for high-quality, peer-reviewed research at APAN.

This partnership enhances the conference's potential to attract experts in current technology trends. **As a result of these collective efforts, the Conference adds a new dimension to the APAN Meetings.**

One where cutting-edge research and innovative advances in trending research fields can be prominently recognised and shared. In adding this research conference to the APAN meeting, LEARN envisions it becoming a more open platform that fosters closer collaboration between NRENs and the wider research community. Thus, the Conference is poised to be a vital event that enriches the APAN56 Meeting and drives impactful developments in network-enabled research and education activities on a regional scale.

APAN56 Datathon: Nurturing Sri Lankan Talent

The APAN Datathon is another recent addition to the APAN Meetings, introduced by LEARN. **The Datathon represents a collaborative effort involving several universities in Sri Lanka aimed at providing an international platform for local undergraduates.** The Datathon's purpose is to give students real-world data and challenge them to solve practical problems using the latest technologies while enhancing their creativity, team-building, and entrepreneurship skills. Dr. Bandaranayake goes on to explain that by bringing the Datathon to APAN Meetings, "We aim to offer a prominent international opportunity for Sri Lankan talent to showcase their innovative solutions and capabilities to the wider APAN community and partners from both the US and Europe."

Collaborating with APAN : LEARN's vision for the research community

The APAN Meetings serve as a significant event for the Asia-Pacific community of experts, researchers, and stakeholders. The impact of its working groups serves as a crucible for intellectual exchange and breakthroughs.

Similarly, it brings together NRENs for critical discussions, fostering a spirit of unity and cooperation. By facilitating interactions between researchers and NRENs, the APAN Meetings create a collaborative environment for exchanging ideas, best practices, and insights, ultimately driving advancements in research and connectivity across the region.

As the conference unfolds over the coming days, the APAN56 Meeting hosted by LEARN is introducing exciting new additions that are poised to revolutionize the event's impact and outreach. Among these notable enhancements, the APAN Conference will be shedding light on the convergence of AI and HPC, fostering groundbreaking research and facilitating the exchange of knowledge.

In parallel, the APAN Datathon actively provides a platform for Sri Lankan undergraduates to showcase their talents and innovative solutions, fostering collaboration and honing their skill sets.

Within the evolving landscape of network-enabled research and education activities, LEARN continues to play a pivotal role, and these new inclusions in the APAN Meetings closely align with its core vision of promoting collaboration, facilitating knowledge exchange, and fueling innovation. Articulating this vision, Dr. Bandaranayake elaborates, "Despite the economic challenges faced by Sri Lanka, LEARN stands as one of the oldest and most esteemed NRENs in the Asia-Pacific region. By hosting the APAN56 Meeting, we aim to forge stronger connections among regional NRENs, researchers, and stakeholders. This collective effort nurtures robust collaboration, driving shared progress that ultimately benefits the entire community."

Collaboration Among NRENs To Build a Connected Future:

Insights from Rene Buch's APAN56 Opening Plenary

Rene Buch - Senior Enterprise Architect Research & Education - NTT Germany and former CEO of NORDUnet

In the intricate landscape of National Research and Education Networks (NRENs), economic disparities between networks and their host nations often translate into diverse challenges.

This is particularly evident across South Asian economies, where varying degrees of government financial support shapes the capabilities of these networks. These are some of the ideas shared in an opening plenary keynote at the APAN56 Meeting, where Senior Enterprise Architect Research & Education - NTT Germany and former CEO of NORDUnet, Rene Buch, highlighted these intricacies. Further insights from Rene shed light on the transformative potential of combined efforts among NRENs, as he emphasises that such collaboration can yield substantial advantages.

The benefits of collaboration among NRENs

The South Asian region encompasses a spectrum of economies at varying levels of maturity, reflecting on the support extended to their NRENs. Consequently, these networks grapple with distinct challenges due to varying resources and infrastructure.

Collaboration emerges as a game-changer, allowing NRENs to surpass individual limitations. Pooling resources, expertise, and strategies become the cornerstone of progress. As Rene Buch succinctly puts it, "When these countries work together, there are significant advantages for everyone." This encapsulates the spirit of shared advancement and collective empowerment that collaborative NREN endeavours embody.

Common development: Not wasting resources on redundant services

Collaboration between NRENs enables the shared development of services, which reduces costs and risks. A notable example is the fDLuDCf project, where several NRENs collaborated to enable online learning via Zoom. It proved vital during the COVID-19 pandemic.*

When NRENs collaborate to develop services collectively, the advantages ripple through cost savings and risk reduction. Rene underscores that shared development reduces the expense of duplicating services across different networks. Thereby, resources can instead be invested to broaden the range of services offered collectively to all member nations. Moreover, a collaborative environment reduces risk through diverse expertise and experience from multiple NRENs, in contrast to small isolated teams.

Rene aptly illustrates the benefits of shared development through the example of Network Operating Centers (NOCs). As networks expand, the necessity for NOCs to ensure round-the-clock network functionality becomes evident. By collaboratively establishing NOCs across different locations with standardised setups, the operational cost burden is significantly diminished for all NREN operators. This exemplifies the efficiency achieved through shared resources and collaborative approaches.

United to have a larger voice and greater visibility

When NRENs come together, particularly from smaller economies, their collective voice becomes larger and holds immense sway.

Another benefit of collaborative efforts among NRENs is that the amplification of their collective voice stands as a profound advantage. Rene underlines that united collaboration particularly strengthens small economies to make a resounding impact on the regional stage. By joining forces, smaller nations are empowered to present a united front that holds immense sway. This unity serves as a counterbalance to larger nations within a region and ensures that the collective voice garners attention and consideration.

Rene draws attention to the Nordic NRENs uniting with the establishment of NORDUnet, as a prime example of this principle. Through the collaborative pooling of resources, the Nordic NRENs represent a population of 25 million people. This consolidated strength propels them to the forefront of discussions, with speaking weight equivalent to that of powerhouse economies like the UK, France, and Germany. This showcases how NRENs, irrespective of their sizes, can harness the might of unity for their mutual benefit.

Rene adds that collaboration also begets enhanced visibility through marketing. By presenting a united front, NRENs amplify their reach and gain increased attention from crucial stakeholders, including funding agencies and government bodies. This visibility not only opens doors to essential resources but also cultivates a fertile ground for sharing use cases and success stories. While individual NRENs may struggle with marketing, collectively, they can draw up a framework which would help promote their collective impact locally and regionally to key stakeholders.

Spearheading innovation beyond national borders

Collaboration among NRENs goes beyond enhancing technical capabilities, such efforts enable innovation that drives meaningful societal transformation. Rene states that NRENs possess a unique blend of strengths beyond simply offering connectivity, which is what sets them apart from private ICT providers. Instead, they offer tailored solutions designed to meet the specific needs of academics in their respective nations.

This customised approach by NRENs is crucial, particularly when addressing the diverse challenges of their regions that cannot be effectively met through one-size-fits-all solutions. South Asia, for instance, faces a pressing need for education services that cater to its unique demands. NRENs emerge as key players in this endeavour, offering specialised services that demand a distinct skill set. Here, knowledge-sharing and collaborative efforts are paramount. The collective expertise of multiple NRENs paves the way for innovative solutions that effectively address these critical regional needs.

Fostering knowledge development and diversity across the region

Working together, NRENs can enable the transfer of knowledge and improve diversity in the regional IT industry. A notable example of this is Project BeLISAC, which trained female engineers from nations across South Asia.

Ultimately, the invaluable benefit of NRENs working together is that they build an environment that fosters the development of knowledge and improves industry diversity. Rene goes on to share that NRENs become vehicles for nurturing a more inclusive IT industry. By creating opportunities that span a broader spectrum of individuals, NRENs open the doors to a wider pool of talents. As these individuals gain expertise and experience through NREN engagement, they become equipped to contribute to the broader IT landscape, including the private sector. Over time, this influx of diverse perspectives and talents shape a more robust and diverse IT industry.

What makes a successful NREN collaboration?

From his many years of experience working with NRENs, Rene states that a successful NREN collaboration is characterised by a dual foundation of visionary mindset and strategic commitment. At its core, such collaboration necessitates a shift from short-term, individualistic objectives to a mindset that embraces long-term regional goals of regional development. This shift involves recognising that collective progress catalyses individual advancement. Coupled with this paradigm shift, effective collaboration requires the unwavering commitment of leadership to craft a comprehensive strategy to execute the envisioned regional transformation.

The Importance of a Long-Term Region-Focused Mindset

It's imperative that NRENs adopt a mindset focused on long-term goals to develop the region. The UPROUSEwithLEARN initiative is an example of mature NRENs uplifting developing NRENs, and strengthening the region.

The fundamental essence of a successful NREN collaboration lies in transcending individual short-term goals and aligning efforts with overarching, long-term objectives that benefit the entire region. Rene aptly expresses, "If everyone does only what's good for them, then everyone will suffer in the end." This sentiment underlines the necessity of unity in achieving lasting progress. Instead of solely viewing themselves as a national entity, NRENs must adopt an international perspective.

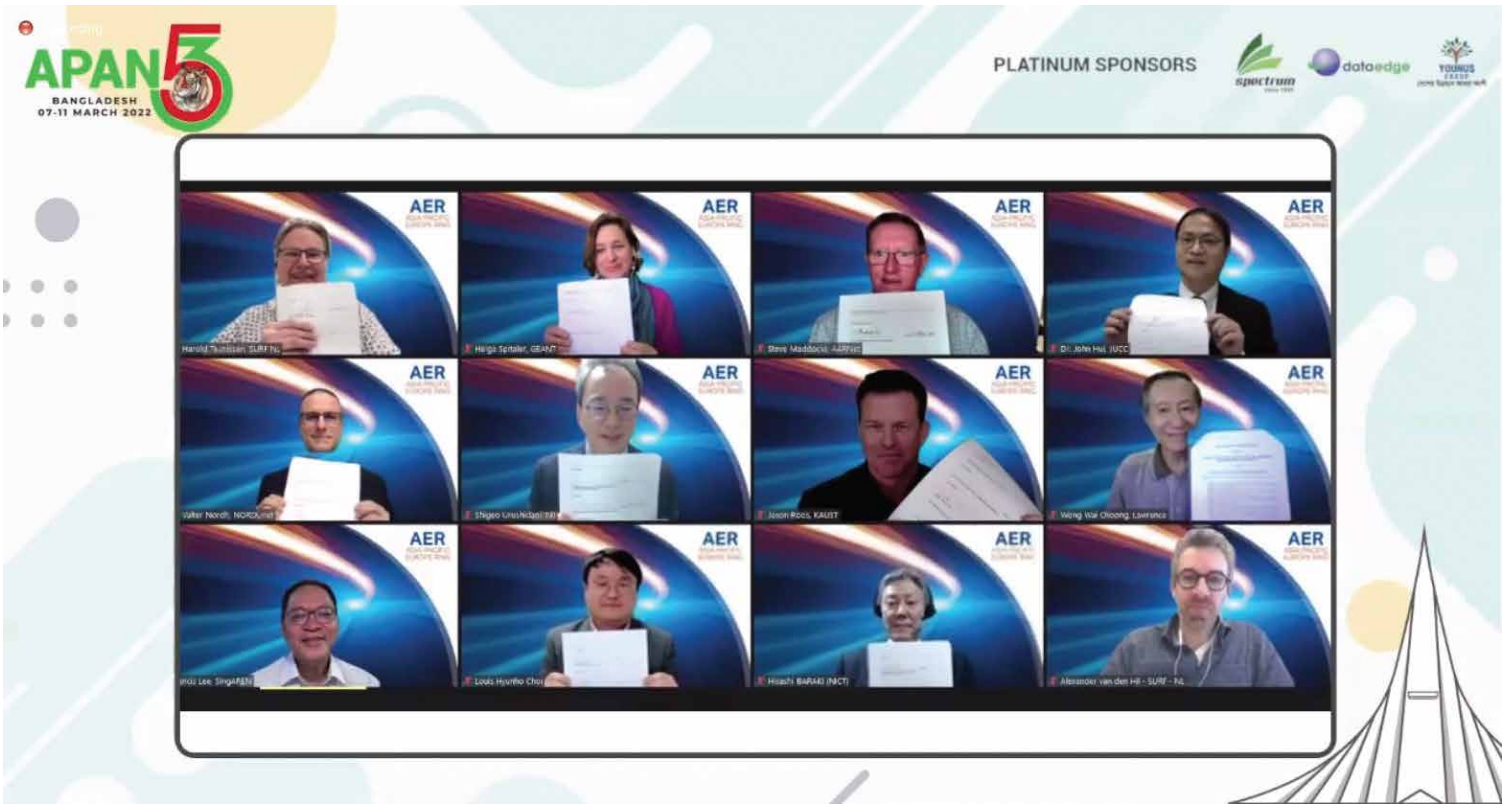
Yet, Rene observes that the absence of a common shared vision among international partners is usually the biggest challenge to collaborative efforts between NRENs. While focusing on individual needs is intuitive, directing efforts towards regional needs results in mutual upliftment. As Rene aptly puts it, "If you help the region, then you help yourself." A central tenet of the long-term, regional mindset is the understanding that an NREN helping their counterparts in neighbouring economies inherently enables their national growth as well. Recognising this symbiotic relationship between national and regional progress is pivotal in fostering effective NREN collaboration.

Having the right strategy and leadership committed to execution

With the right mindset in place amongst all key stakeholders, the next two crucial pillars of a successful collaborative endeavour between NRENs are a strategic roadmap and committed leadership. Rene emphasises that the commitment to spearhead collaborative efforts, coupled with the resolve to see them through, defines the trajectory of success. For sustainable progress, this commitment needs to withstand the test of time, ensuring that efforts continue to bear fruit beyond the initial phases. He goes on to add, "You don't get anywhere if you don't develop a strategy."

NRENs must pause to assess their current position, envision their desired destination, and meticulously plan the journey that connects the two. As NRENs mature, Rene states it's imperative to transition from a purely reactive stance to a structured approach that prioritises long-term objectives over immediate concerns. Granted, strategy formulation is a complex and challenging process for all organisations. It involves the engagement of stakeholders at all levels, cultivating a diverse range of ideas and inputs. Yet, despite differing circumstances between NRENs, Rene states that "With the right framework, it's possible to craft a clear strategy."

Examples of successful regional NREN collaborations



The renewal of the AER MoU at APAN53. Rene cites the AER project as a notable example of the immensely positive impact of NRENs working together.

One standout example of an impactful NREN collaboration is the Project BeLISAC (Building eLearning Infrastructure in South Asian Countries) by LEARN and BdREN. The initiative is building a robust infrastructure to enhance online learning in six South Asian economies. Further, in line with the UN SDGs, Project BeLISAC also aims to empower women and enhance diversity within the IT industry. To that end, it has trained a team of female engineers from each host nation to manage the network infrastructure. Rene Buch aptly highlights, "These collaborative efforts spearheaded by LEARN and BdREN have benefited several nations across the region."

The Asia Pacific - Europe Ring (AER) exemplifies another remarkable feat of collaborative achievement among NRENs. The AER MoU, inked in July 2019, established a cooperative framework for leading-edge Research and Education Networks (RENs) to establish 100G connectivity between Europe and Asia. This connectivity serves as a robust backup in the event of link failures, culminating in an exceptionally resilient 100G network ring. Rene Buch emphasises that this global feat wouldn't have been possible without Asian and European NRENs coming together.

Poor connectivity: The cost of NRENs not working together

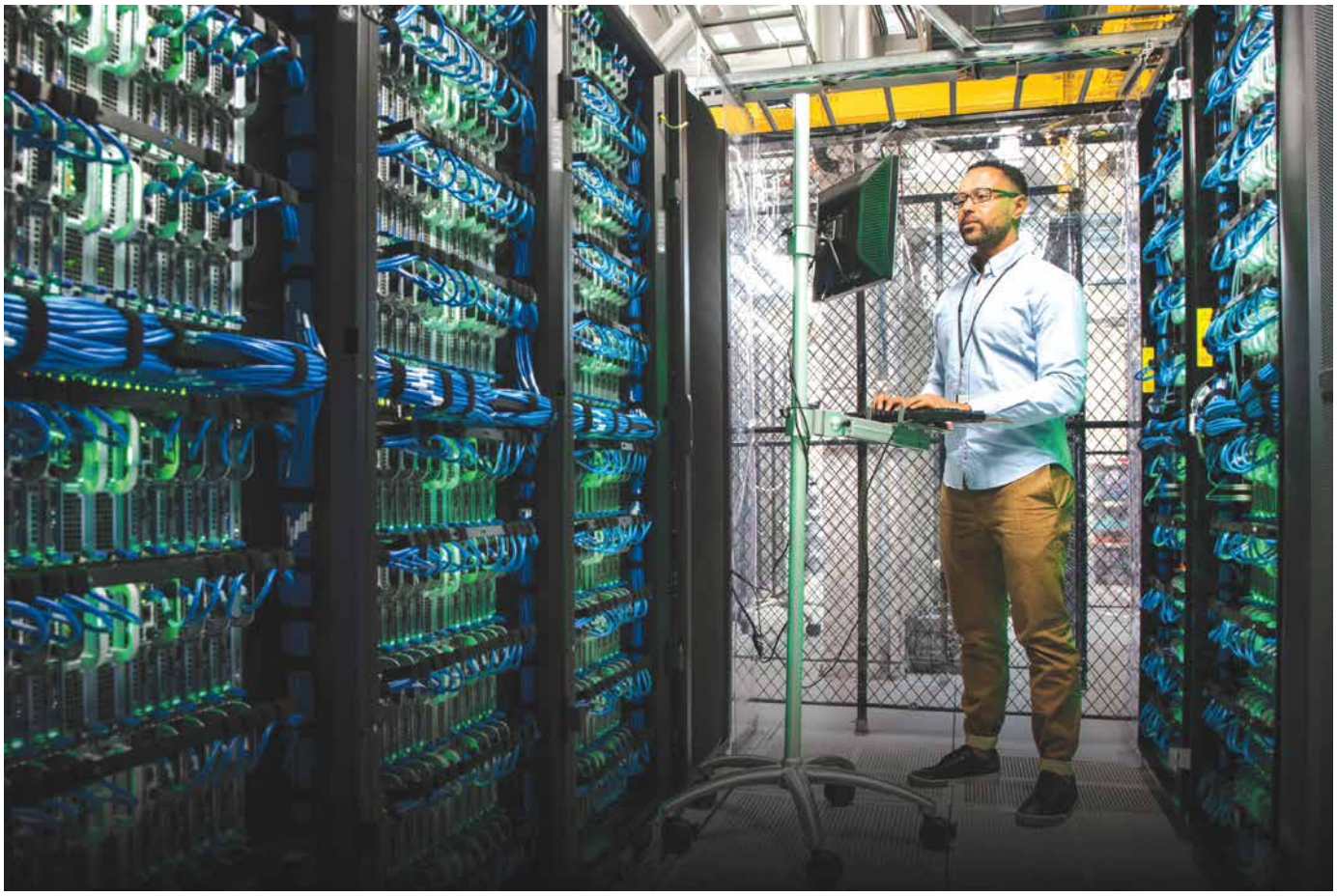
The consequences of NRENs within a region failing to collaborate reverberate far beyond individual networks. This reality becomes strikingly apparent when considering the pitfalls of poor connectivity, which can have cascading effects on development and progress. Rene underscores these potential losses as a compelling call to action for NRENs to unite their efforts. Looking at South Asia as an example, varying levels of NREN maturity and needs to characterise the landscape.

The strength of collaboration lies in its capacity to uplift all NRENs within a region, regardless of their starting point. This belief applies not only to services but also crucially to the development of infrastructure. In many instances, infrastructure is centralised around larger nations, relegating developing economies to peripheral roles in the global information highway. Poor connectivity results in limiting access to critical services for researchers and institutions in these nations. For example, while cloud computing thrives in developed nations with access to

a myriad of global providers, the same convenience eludes researchers in countries grappling with sluggish connectivity.

Rene Buch succinctly encapsulates this phenomenon, stating, "It's a ripple effect. If you don't have connectivity, then you have to replicate certain services locally to get good performance." Collaborative efforts among NRENs mitigate this challenge, endowing them with amplified voices and increased purchasing power when dealing with vendors. Thus, enabling the joint procurement of network links to improve connectivity.

This advantage transcends research domains, positively impacting entire nations. By honing negotiation skills and fostering international partnerships, NRENs pave the way for improved connectivity, subsequently catalysing economic progress and upward mobility.



Working together to build stronger networks

Ultimately, in the dynamic and diverse world of NRENs, collaboration stands as a transformative force, heralding a future of progress, innovation, and connectivity. Rene reaffirms that collaboration between NRENs results in stronger networks, which makes them more sustainable. By forging strategic alliances, fostering knowledge exchange, and uniting voices, NRENs fortify their networks, ensuring they stand strong against challenges and evolve in step with the ever-changing digital landscape. This cohesive approach not only yields a richer variety of services but also magnifies the collective influence, enabling NRENs to champion their communities, innovate for a diverse and dynamic IT industry, and pave the way for a future marked by robust connectivity and continuous progress.

*More information about the fDLuDCf project can be found here: https://dle.asiaconnect.bdren.net.bd

From Inception to Innovation:
The Story of APAN as Told Through the Eyes of Dr. Markus Buchhorn

Dr. Markus Buchhorn - Past General Manager of APAN

"My journey with APAN started with the beginning of APAN itself in 1996," says Dr. Markus Buchhorn.

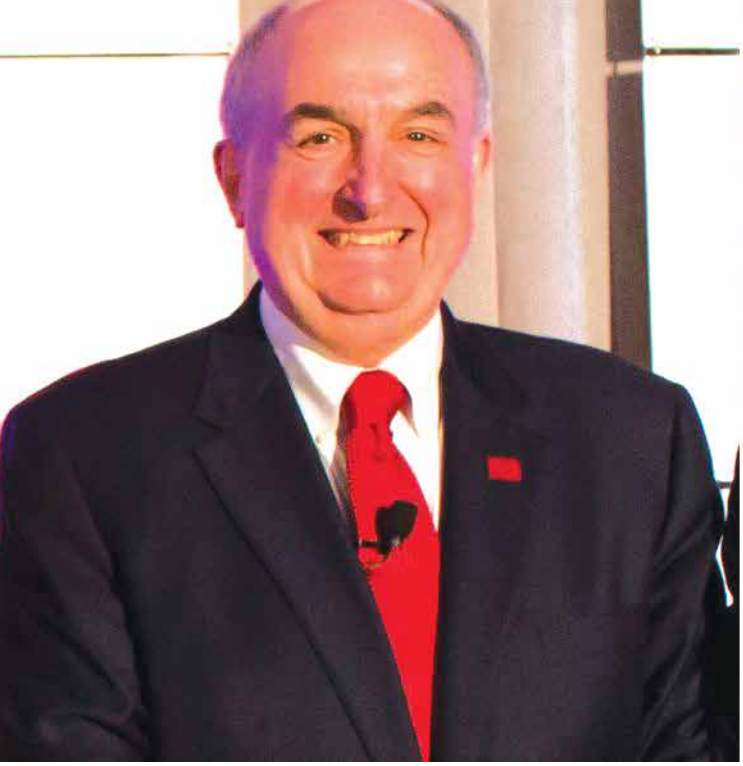
His journey intertwines seamlessly with the history of the Asia Pacific Advanced Network (APAN), chronicling its evolution from inception to its present-day stature. Collaborating with luminaries like Prof. Michael McRobbie and Dr. Kilnam Chon, he contributed to initial discussions that created the network that'd go on to unify NRENs across the APAC region.

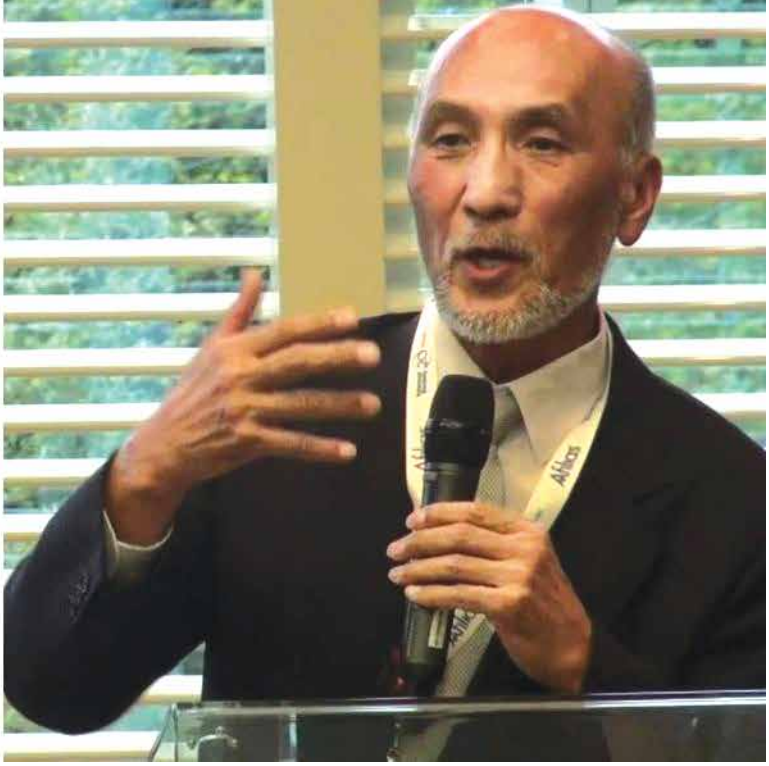
From his role as working group chair, an Area Director, a Primary Member and a meeting host, to assuming the mantle of General Manager, Dr. Buchhorn's journey mirrors the organisation's growth. Forward-thinking leadership understood that connectivity went beyond physical links, including essential data exchange for collaborative research.

Despite challenges, his guidance encouraged adaptability and creativity, driving APAN's evolution from a volunteer-based effort to a streamlined and effective platform. One that continues to play a pivotal role in the Asia-Pacific research and education landscape as a coordinator that transcends geopolitical boundaries.

The Origins of APAN: Fixing research connectivity in APAC

Dr. Markus Buchhorn's affiliation with APAN traces back to its very origins. It was a time when a nascent state of connectivity characterised the realm of research and education networks. There were several discussions around this issue, which gained momentum and was formally recognised at the APEC Symposium in Tsukuba, Japan, in March 1996. It culminated in a proposal by Prof. Michael McRobbie and Dr. Kilnam Chon at a symposium in Tsukuba for what would become the Asia Pacific Advanced Network at the APII Test-bed Forum in Seoul in June 1996.





Prof. Michael McRobbie (L) and Dr. Kilnam Chon (R) submitted the original proposal for APAN

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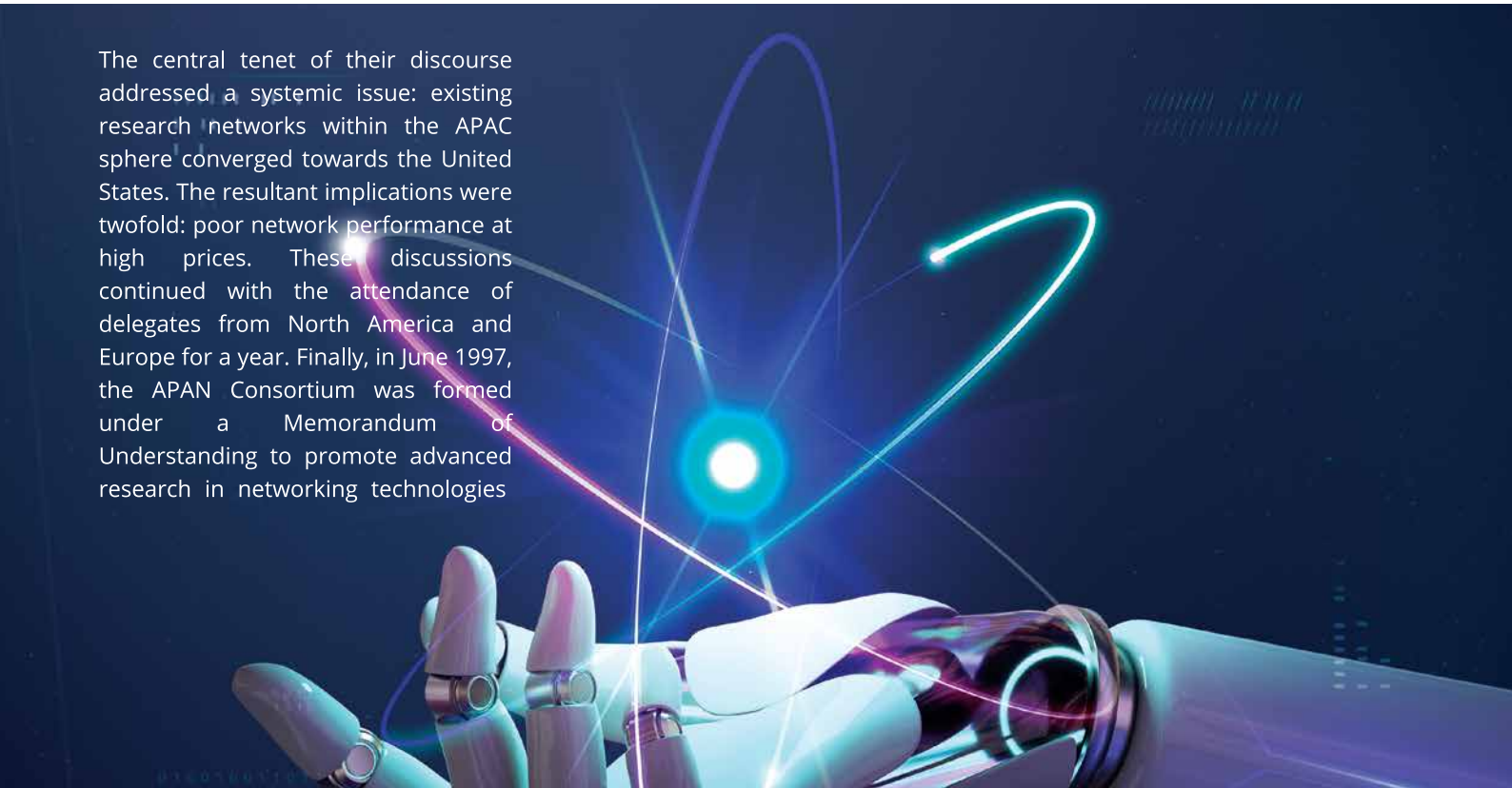
The central tenet of their discourse addressed a systemic issue: existing research networks within the APAC sphere converged towards the United States. The resultant implications were twofold: poor network performance at high prices. These discussions continued with the attendance of delegates from North America and Europe for a year. Finally, in June 1997, the APAN Consortium was formed under a Memorandum of Understanding to promote advanced research in networking technologies and the development of high-performance broadband applications. It brought together the significant international link investments by Japan along with Korea, Singapore and Australia, in a framework of openness, collaboration and sharing, to maximise value for all.

As Dr. Buchhorn aptly articulates, "At the time, regardless of location in Asia, all traffic routed through the US." Yet, market forces at the time meant the paradoxical nature of routing network traffic through transcontinental channels was the most optimal solution. “Due to market forces in the mid-1990s, it was paradoxically more economically viable for Japan and Korea, two adjacent economies, to use their existing links running through Seattle to exchange data rather than having a direct link to each other,” explains Dr. Buchhorn. This incongruity necessitated a departure from conventional practices, compelling a direct and efficient connectivity framework within the APAC landscape.



Before APAN: Why Researchers Needed Better Connectivity

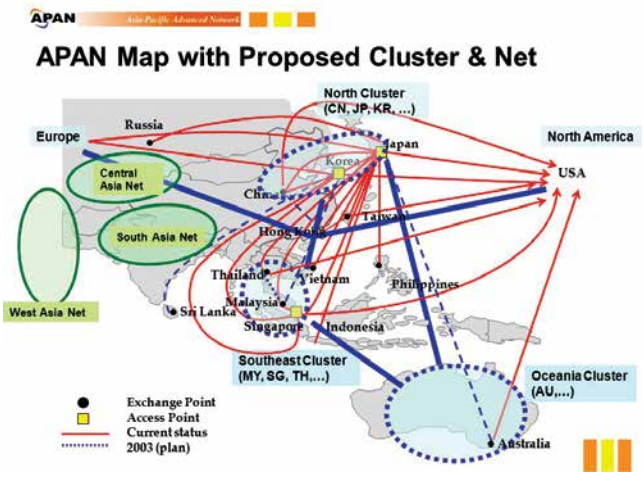
Researchers wanted better connectivity because they wanted data. For this reason, today many research projects are collaborative efforts that occur across borders, involving several researchers, and are only possible due to strong connectivity.

Dr. Buchhorn's journey with APAN unfurled against the backdrop of its formative years, characterised by a compact and tightly-knit community. Championed by Prof. McRobbie, Dr. Buchhorn emerged as a trusted volunteer, shouldering crucial responsibilities that would shape APAN's trajectory. In an era when APAN meetings were succinct (taking only two-to-four days with mostly a single stream at the time), Dr. Buchhorn's presence as Australia's main representative was prominent. In his role as an Area Director for APAN, supporting its many working groups, he was a linchpin connecting Australian academics with the international research community.

The 1990s marked an era of burgeoning collaboration, where the impetus for enhanced connectivity was rooted in the paramount need for accessible data exchange. "The main thing researchers wanted was data. A lot of research, back then, and much more today, is collaborative. It ignores institutional, state, and even national boundaries. Many discoveries today are made by teams of countless researchers. That was already starting back in the late 1990s, and they wanted to collaborate," explains Dr. Buchhorn. However, the technological landscape of the time posed challenges. Reliable platforms like video conferencing were sparse, and standards for various applications on the nascent internet were limited. It was amid this backdrop that networks like APAN began transforming how researchers collaborated.

To further illustrate this phenomenon, Dr. Buchhorn shared that at the time, genome researchers grappled with a pressing challenge: sharing the vast troves of gene sequences they were generating. Existing repositories for such data were focused on just three worldwide, driven by the demands of the academic journals at the time. These were situated in Japan, Europe, and the US, and extremely popular, resulting in sluggish and cumbersome information exchange. Recognising the need for improvement, Dr. Markus Buchhorn joined with colleagues to pioneer an innovative solution. Drawing inspiration from software distribution practices, they conceived the revolutionary notion of mirroring these genomic repositories across every APAN member economy, called the Bio Mirror. This involved creating localised replicas of the repositories within each economy, thereby granting researchers accelerated access to critical data to further their research.

Building The APAN Network: By Researchers for Researchers



The previous example highlights how central to APAN's success has been an unwavering commitment to its users. Even in its earliest days, the organisation opened its doors to researchers, inviting them to shape the network's trajectory. As Dr. Buchhorn affirms, "We didn't just want to build a network and hope researchers use it. APAN invited researchers to their meetings and asked them what they wanted." It was this user-centric philosophy, driven by discussions amongst researchers in its working groups, that helped APAN decide how its network would be built to ensure it created a positive impact.

Initially, APAN's focus, at its inception, was to build low-latency direct links. These links, despite not appearing as fast on paper, exceeded expectations by outperforming existing high-speed connections between Asia and the United States at the time. Dr. Buchhorn explains, "We showed that we could achieve faster and more efficient results with slower but direct links. They were a bit more costly in some aspects, but we had invaluable government backing." The essence of the APAN model rested on a collaborative ethos, a shared commitment to propel connectivity through collaboration.

Eventually, the cost of network connectivity became cheaper as key stakeholders recognised its importance, particularly for research and education. This phenomenon accelerated the momentum for APAN to expand its footprint. In hindsight, Dr. Buchhorn reflects, "Getting the first few economies, starting with the first 4 or 5 economies, was easy. As we broadened out, we just needed to be a bit more organised and structured and formalised how things like working groups or meetings were set up."

APAN incorporated: Solidifying the foundations with structure

As APAN steadily grew, a natural evolution toward formalisation took shape. "The process started casually, often during conversations over a cup of coffee. Part of it involved outlining fundamental guidelines, like establishing working groups," recalls Dr. Buchhorn. During those early days, APAN meetings concluded with a General Assembly where matters of collective concern were discussed. This assembly encapsulated a core belief in equality, where every member's voice held weight, regardless of their economic stature. Despite this, a formal leadership structure was absent.

By 2003, as APAN's aspirations grew, the need for a more defined structure became evident, especially in the pursuit of funding. Consequently, a membership fee was introduced, calculated based on GDP, under the guidance of Prof. Chon. Before this, all link owners were considered members, and no fees were levied.

This influx of funds proved transformative. It enabled APAN to broaden its initiatives, launching programs like the Fellowship Program and establishing a dedicated full-time central secretariat. Years of deliberation afterwards culminated in APAN's formal incorporation as a non-profit entity in 2009. Reflecting on the journey, Dr. Buchhorn notes, "It was a very gradual process. Someone wrote down some rules for things like hosting an APAN meeting. But we didn't write down a lot of things until we got to incorporation. Then we had to write it all down."

The evolution of NRENs and the role of APAN

Over the years, the role of APAN has undergone a nuanced transformation, closely aligned with the evolving connectivity needs of its diverse member economies. A fundamental realisation emerged - the drivers behind National Research and Education Networks (NRENs) must be comprehended within their unique contexts. In some economies, NRENs offer universities high-speed connectivity at rates beyond market offerings. In others, the focus is on heightened efficiency. Meanwhile, in developing economies, the mere establishment of connectivity is a milestone achievement.

Additionally, as connectivity advanced, the emphasis for many NRENs shifted from the networks themselves to the services they could provide. The trajectory of needs has been intrinsically tied to the internet's varying rates of evolution across economies since the 1990s. Ultimately, this diversity between NRENs translates to an array of distinct needs. Hence, APAN, with its strategic meetings serving as a nexus for collaboration and knowledge-sharing, plays a pivotal role in assisting its member NRENs. These gatherings offer a platform for cross-border interactions, fostering collaboration and catalysing solutions. Dr. Buchhorn goes on to describe the organisation's role stating, "What APAN specialises in today is providing a space where multiple members facing a problem can get together and find a solution. So a key role is that of a facilitator."

Becoming the General Manager of APAN

With APAN's formal incorporation in 2009, George McLaughlin assumed the role of its first General Manager. Around 2010, as Dr. Buchhorn transitioned to a consulting role after working full-time, a significant shift was on the horizon. George McLaughlin, having steered APAN through transformative phases, was preparing to retire. Recognising Dr. Buchhorn's extensive expertise and dedication, McLaughlin suggested to him to apply for the General Manager position. Following an interview at the APAN34 Meeting in Colombo in 2012, Dr. Markus Buchhorn assumed the role of General Manager, heralding a new phase of transformation for the organisation.

Amid this transition, discussions emerged among members about APAN's evolving role. A comparison with counterparts in Europe, North America, and Africa led to introspection. While APAN's unique working groups delved into topics like telemedicine and agriculture, there was a palpable sense that certain conversations were yet unexplored. This contemplation prompted Dr. Buchhorn to facilitate a more flexible approach, welcoming discussions on emergent topics beyond the structured working groups.

This pivotal shift encouraged more conversations encompassing cloud computing, Identity Federation, Cybersecurity, and more. New sessions, workshops, and broader discussions emerged within APAN Meetings, driving progress and fostering collaboration.

Concurrently, Dr. Buchhorn's tenure as General Manager witnessed strategic financial investments back into APAN. The establishment of a centralised secretariat and the APAN grant program injected renewed vigour. Dr. Buchhorn explains, "Money attracts more money. We might invest$5,000, which in turn allows researchers to get another $10,000 from elsewhere, which increases everybody's standing." This transformation altered APAN's operational landscape, building on the strong volunteer-centric framework to add some more professionally efficient support.

Throughout the 2010s, APAN embarked on a trajectory of self-investment, experimental initiatives, and new partnerships to better serve its members.

Reflecting on his tenure, Dr. Buchhorn underscores the evolution of the General Manager's role, built upon the foundational efforts of his predecessor, George McLaughlin, and driven by an unyielding commitment to enhancing APAN's impact. He went on to say, “As General Manager, you’re trying to inject energy and ideas into the conversations. Having the right conversations with the right people at the right time is a key part of the role to identify issues and opportunities proactively and see who we could involve to address them.”

Aspirations for the Future of APAN

As Dr. Buchhorn steps back from his role as General Manager of APAN, his vision for the organisation's future remains steadfast. Looking ahead, he reaffirms that since its inception and even today, APAN has played a pivotal role as a facilitator that transcends geopolitical boundaries. As it enters a new era, he believes in a trajectory of continuous self-improvement to face its next set of challenges while seizing new growth opportunities.

The challenges include fostering sustainable growth, particularly by providing more support for APAN meeting hosts. These gatherings, he reaffirms, are vital to APAN's essence as they drive progress. Hence, they demand a delicate balance between financial sustainability and inclusivity for participants from developing economies. Additionally, Dr. Buchhorn is keenly aware of the generational shift within APAN's membership, especially as senior members begin to retire. To ensure the organisation's enduring vitality, a robust succession plan is imperative. Leveraging the strengths of existing and potential leaders becomes paramount as APAN navigates the future.

Despite the challenges, the road ahead is not without abundant opportunities. Dr. Buchhorn believes APAN's vast potential for growth extends to assisting the development of new NRENs and empowering existing ones to ascend to higher levels of technological prowess. Notably, he envisions APAN potentially fostering growth among Pacific island nations and other economies not yet APAN Members, where untapped potential awaits exploration. His aspirations also envision APAN forging strategic partnerships with corporate entities to help its member NRENs amplify their impact and foster innovation.

From its nascent days, APAN embarked on a mission to redefine connectivity, transcending boundaries and fostering collaboration across the Asia-Pacific region. As he steps back from his role as General Manager, his legacy shines as a beacon guiding APAN's path forward - as one of innovation, inclusivity, and the unwavering pursuit of progress. His journey underscores the indomitable spirit of collaboration that propels APAN, transcending borders and driving transformative change.

The roadmap ahead, guided by his insights, holds the promise of continued growth, boundless discovery, and a network that evolves to empower the dreams of a thriving research community.

Forging Global Connections:

The Journey of Dr. Francis Lee and the Significance of Collaboration

Dr. Francis Lee - Founding President of SingAREN

Dr. Francis Lee's pioneering journey is deeply interwoven with Singapore's technological landscape. As the Founding President of SingAREN, he steered the establishment of Singapore's National Research and Education Network (NREN), revolutionising connectivity for the research and education community. Yet, Dr. Lee's imprint extended beyond Singapore's borders, through APAN and the TEIN project, he championed the power of collaboration, fostering a platform for researchers to unite and catalyse impactful outcomes.

Dr. Lee's dedication to advancing collaboration among NRENs shines through his multifaceted roles. Serving as a member of the Asi@Connect Governors and the Asi@Connect Steering Committee, he consistently advocates for the importance of NRENs working together to address evolving challenges and open doors for developing economies. His unwavering belief in collaborative strength echoes the sentiment that collective platforms like APAN among NRENs are pivotal in shaping a resilient and innovative future for research, education, and technological progress.

The origins of SingAREN

SingAREN emerged in 1998, with the resolute vision of connecting Singapore's research and education community with the international stage. Backed by a five-year financial commitment from the Government of Singapore, the network heralded a transformative era. When it came online, Singapore became the first nation outside of North America to establish a high-speed connection to the Very High-Performance Backbone Network Service (vBNS) of the United States. Taking on the role of its Founding President, Dr. Lee saw SingAREN being the voice for researchers within Singapore, propelling technological advancements that would empower its academics.

During the early days of its operation, SingAREN was focused on establishing vital links with institutions like MIT for distance learning and research collaboration. However, the state of internet networks in the late 1990s posed a significant challenge. It was a landscape characterised by high costs, sluggish speeds, and high latency. Dr. Lee aptly put it, "For proper distance learning to occur, you must have stable bandwidth. You can't be halting and resuming lessons every 5 minutes." As such, SingAREN, by leveraging its direct connection, drastically reduced latency, thus fostering a smoother and more effective global research discourse.

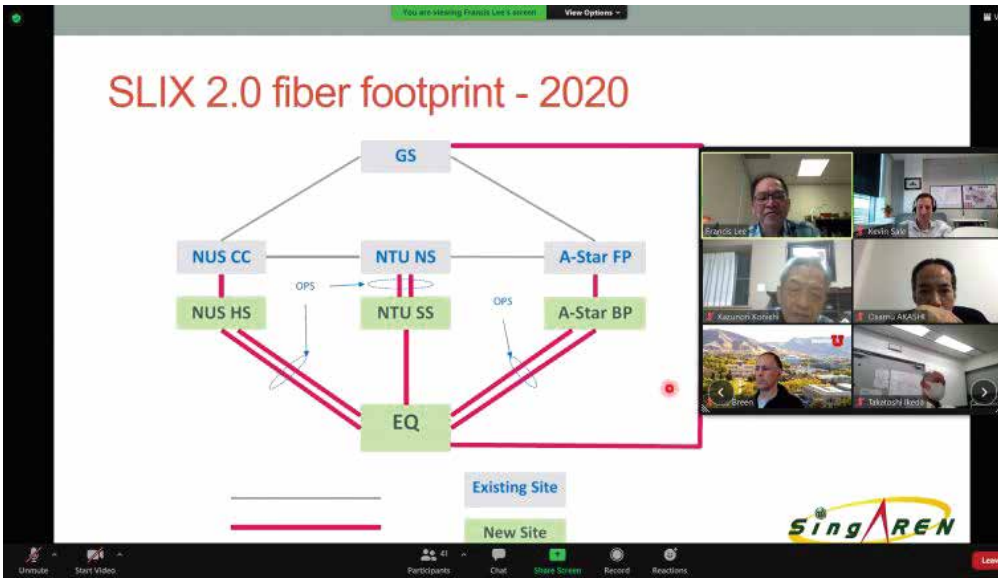
The year 2003 marked a pivotal juncture in SingAREN's journey, as it transitioned from a government-funded endeavour to a registered non-profit organisation. This shift underscored the network's commitment to serving the needs of the Singapore research and education community. To that end, the organisation invested heavily in its efforts to strengthen the network through additional links and services.

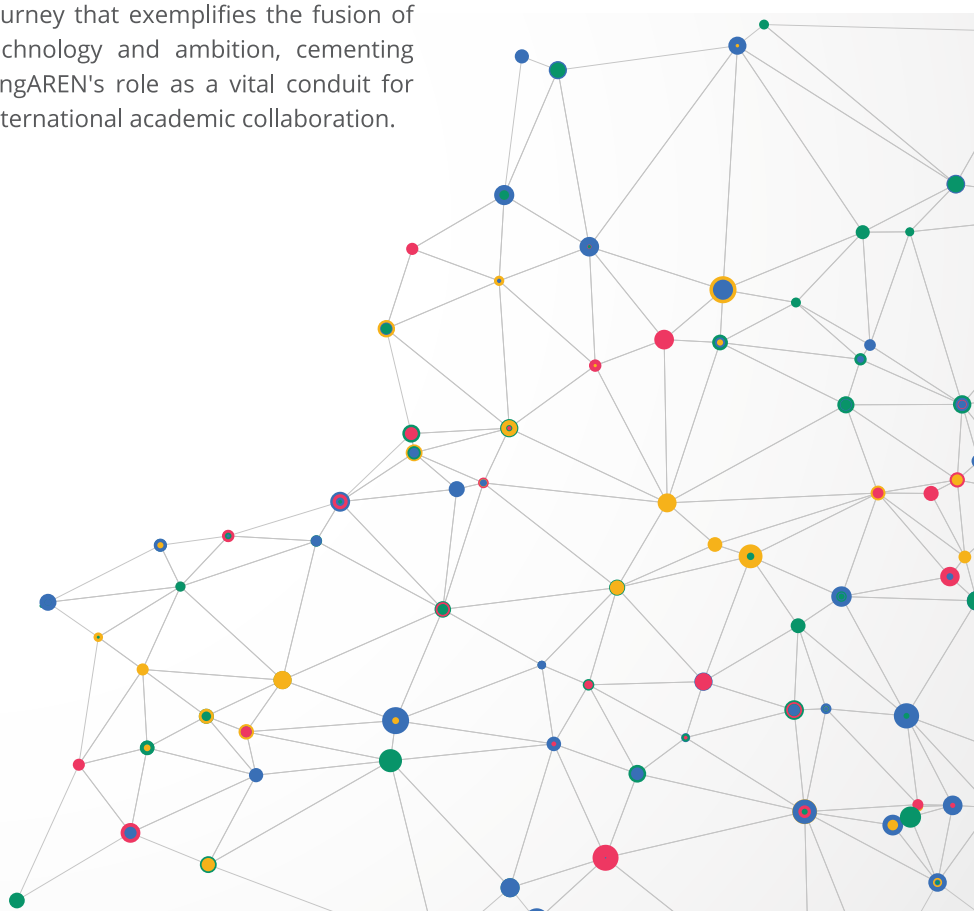
Evolving from a Single 1 Gbit/s link to Multiple 100 Gbit/s links

Towards its vision of empowering researchers in Singapore, following its incorporation, SingAREN embarked on a journey of strategic expansion and international alliances. Through a series of transformative initiatives, SingAREN not only amplified the speed of its network but also increased its resilience.

Notably, the SingAREN-Lightwave Internet Exchange (SLIX), conceived in 2013 through collaboration with A*STAR, NTU, and NUS, and funded by National Research Foundation of Singapore (NRF), epitomises these efforts. When SLIX came online a year later, Singapore's Research and Education community gained seamless access to a super high-speed network with 100 times more capacity. In 2019, the NRF granted another five years of funding for SLIX 2.0, accompanied by a comprehensive cybersecurity approach. The network's proactive stance against threats included robust monitoring tools and intelligence sharing among members.

These collaborative efforts propelled SingAREN from a government-funded initiative to a critical link connecting Asian researchers with the world. Dr. Lee highlighted, "As researchers, without fibre, we couldn't do anything beyond what the Telco provides." This foresight led to the establishment of a resilient network, enabling SingAREN's evolution from a single 1 Gbit/s network to multiple 100 Gbit/s. It's a journey that exemplifies the fusion of technology and ambition, cementing SingAREN's role as a vital conduit for international academic collaboration.





The importance of collaboration among NRENs

At APAN55, Dr. Lee (L) as Chair of the AER Steering Committee and Dr Buseung Cho (R), Director of the KREONET Center, Korea Institute of Science and Technology Information (KISTI) exchanging the signed MoU making KISTI the latest member of the AER network.

Concurrent with its domestic efforts to strengthen the network, SingAREN also embarked on a journey of international collaborations. In 1997, SingAREN was among the founding members of APAN. Two years after its incorporation, in 2005, SingAREN joined the TEIN2 network, linking the Asia Pacific and European research communities. 2017 saw the formation of the pivotal Asia Pacific Ring (APR) and a milestone, SG-HK-JP 100G Circuit, ushering in a new era of high-speed cross-border collaborations. SingAREN also entered into partnerships like Collaboration Asia-Europe-1 (CAE-1), which established a 100 Gbit/s link between Singapore and GÉANT Open in London. Notably, the Asia Pacific-Europe Ring (AER) MoU further showcased SingAREN's dedication to global networking, creating a resilient system for uninterrupted data flows between Europe and Asia.

Working together to build more resilient networks across Asia

In the early 2000s, Asian NRENs were focused on facing two challenges - establishing more direct links between Asia and the rest of the world while investing in local capacity building to manage these growing networks.

Throughout his time as the Founding President of SingAREN, Dr. Lee played a pivotal role in many of the efforts that drove regional collaboration among Asian NRENs, most notably with APOnet, TEIN, and its successor, the Asi@Connect project. He went on to say, "SingAREN will always be there to work with our neighbours. They are our friends, and we will contribute in every way possible to strengthen our community." It's this philosophy by Dr. Lee that drove the organisation's efforts to address two key challenges the region faced. The first challenge was investing in establishing more direct links between Asia and the rest of the world, which helped bring connectivity costs down. These savings were then invested towards capacity building across Asia to upskill local talent to manage these networks. Thus, through its collaborative efforts, SingAREN went beyond its original vision by playing a pivotal role in empowering academics across the Asia Pacific region with high-speed resilient networks.

Regional collaboration benefits everyone globally

San Diego Supercomputer Center Director Dr. Frank Würthwein (left) signed MoU with Dr. Francis Lee (right) as President of SingAREN

Reflecting upon his involvement in projects like APOnet, TEIN, and Asi@Connect, Dr. Lee emphasises the remarkable outcomes that emerge when NRENs unite to strengthen their global connections. These synergistic endeavours have produced transformative effects within the global research and education landscape. Beyond the surface benefits of higher bandwidth and increased redundancy for uninterrupted operations, lies a deeper impact. Strengthened connectivity serves as a catalyst, bringing researchers worldwide closer together, fostering a collective drive towards innovation. A notable illustration lies in the Large Hadron Collider project, which Dr. Lee states utilises the links of the TEIN network to drive their research forward. Thus, the collaborative spirit demonstrates its potential to construct a more enriched world.

APAN as a platform for regional collaboration

Dr. Francis Lee speaking at the APAN55 Meeting

Dr. Francis Lee's journey with APAN commenced in 1998, established as a conduit to interlink engineers and diverse research communities, APAN became a platform for researchers and engineers to converge, collaborate, and channel their collective efforts towards impactful outcomes. The evolution of APAN gatherings is a testament to its significance, blossoming from a single-room session to expansive five-day events featuring parallel sessions, including vital capacity-building endeavours. Acting as a bridge between research communities, Dr. Lee affirms that APAN Meetings continue to serve as a pivotal platform.

As Dr. Lee reminisces, APAN's beginnings witnessed a small cadre of like-minded individuals, a precursor to the modern organised entity. Over time, APAN embraced a more structured approach, spearheading initiatives such as fellowship programs to unlock opportunities and support for developing economies. In modern times, different NRENs face different challenges. Yet, Dr. Lee believes in the power of collaboration, both on a national and international scale, to address these issues. International projects like APAN, TEIN, and Asi@Connect exemplify collaborative strength, building trust and emphasising shared collective value. In a world of interlinked networks and evolving challenges, collaboration remains pivotal, fostering innovation and echoing Dr. Lee's belief in its power to shape a better future.

Connections Beyond Borders:

Jie An Discusses the Positive Impact of APAN Enabling NREN Collaborations

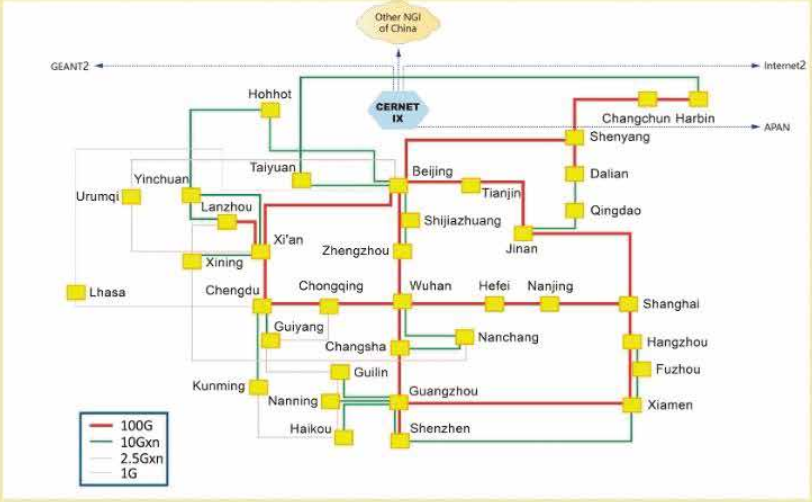
Jie An - Steering Committee Chair of the Asi@Connect Project

In the international landscape of networking and collaboration among researchers, Ms. Jie An, with pivotal roles at CERNET, Asi@Connect, and APAN, has played a crucial part in forging impactful partnerships across borders. Devoting her efforts to CERNET's international collaborations, CERNET's strategic initiatives connected Chinese researchers with the international community. Furthermore, her efforts with APAN, TEIN, and the Asi@Connect project resulted in stronger networks that empowered researchers and helped bridge the digital divide in developing economies.

At the heart of this story is a fundamental truth: progress thrives on collaboration among NRENs. Today, the Asia Pacific Advanced Network (APAN) provides the platform for NRENs to harmonise objectives and achieve shared goals. In exploring Jie An's endeavours, one witnesses first-hand the transformative potential of collaborative NREN partnerships within the realm of APAN.

Leading Collaborations to Connect CERNET with the World

CERNET: The Biggest NREN in China



- Fibre network backbone 100G DWDM
- Core IP network backbone 100G
- 31 provinces and over 200 cities
- Over 2000 universities and institutes
- 25m users

Jie An's story begins with her role as the senior assistant to the Director of CERNET, Prof. Jianping Wu. From the outset, she embraced the responsibility of representing CERNET's global interests. Serving as the manager of CERNET's international collaborations, she coordinated all the efforts of the leadership and operation teams to connect Chinese researchers with the world through partnerships with several organisations and NRENs around the world.

Notably, in 1999, she facilitated CERNET's entry into APAN, solidifying a lasting connection. Jie An's dynamic roles expanded—co-Chair of the APAN Education Working Group at the very beginning, Leading the China branch of the APAN Secretariat, supporting the APAN Program Committee as a member and the chair, and later, a guiding force as an APAN Board Director. Her influence wasn't confined to administrative realms; Jie An organised key APAN Meetings, including APAN10 in Beijing, APAN14 in Shanghai, APAN44 in Dalian, and APAN54 in Jinan, China. Yet, this is only part of her stories as her impact transcended borders.

In 2005, thanks to the dedicated efforts of GEANT Project Manager, David West, CERNET participated in the TEIN2 project, bolstered by support from the Chinese government. This marked the beginning of CERNET's journey as a pivotal NREN partner in not only TEIN2/3/4 but also the successive Asi@Connect project. At the helm of these endeavours was Jie An, a driving force who orchestrated and managed CERNET leadership's strategy of international contributions. She assumed key responsibilities, serving as CERNET's coordinator in TEIN2 and TEIN3, a Governor in TEIN4, and since 2016 has been serving as the Chair of the Asi@Connect Steering Committee.

Successful International Collaborations by CERNET

Under the guidance of CERNET's leadership, a steadfast commitment to global collaboration has permeated the organisation. Actively encouraging CERNET's members to participate in a spectrum of vital networking events—including APAN meetings, Internet2 gatherings, GEANT conferences, APNIC assemblies, and IETF sessions—has been a cornerstone of these endeavours. This strategic engagement has profoundly enriched CERNET's insights into the endeavours of other international NRENs, fostering strong channels of collaboration. The results of CERNET's international collaborations within the APAN community have been substantial, with regular in-person bilateral/multilateral communications and several successful projects standing as a testament to their impactful partnerships with other APAN members and global NREN partners.

TEIN 2/3/4 and the Asi@Connect Project (2005 - Today)

within the APAN community have been substantial, with regular in-person bilateral/multilateral communications and several successful projects standing as a testament to their impactful partnerships with other APAN members and global NREN partners.

APAN has played a pivotal role as a platform for regional collaboration efforts among NRENs. A notable example is that it hosts governance meetings for the Asi@Connect project.

In 2005, CERNET became a partner of the TEIN2 project, a journey which continued through TEIN3 and TEIN4 to culminate in the successive Asi@Connect project. This initiative has resulted in a robust NREN network infrastructure across the region through unwavering collaboration between all partners. It has also offered critical grants to initiate numerous sub-projects. These sub-projects encompass a spectrum of endeavours, from capacity-building programs to pioneering advanced network technologies. Collectively, Jie An states the efforts by TEIN and the Asi@Connect Project have brought considerable benefits to the region and have been instrumental in bridging the digital divide in developing economies. She goes on to highlight the critical role of APAN as a collaborative platform since it was at APAN Meetings where these projects were further developed in harmony with APAN as a whole community in this region.

Shaping the Future of Healthcare:

Exploring the Impact of Telemedicine with Dr. Tomohiko Moriyama

Dr. Tomohiko Moriyama - Vice Director of the International Medical Department at Kyushu University Hospital and Chair of the APAN Medical Working Group (Image credits: Kyushu University)

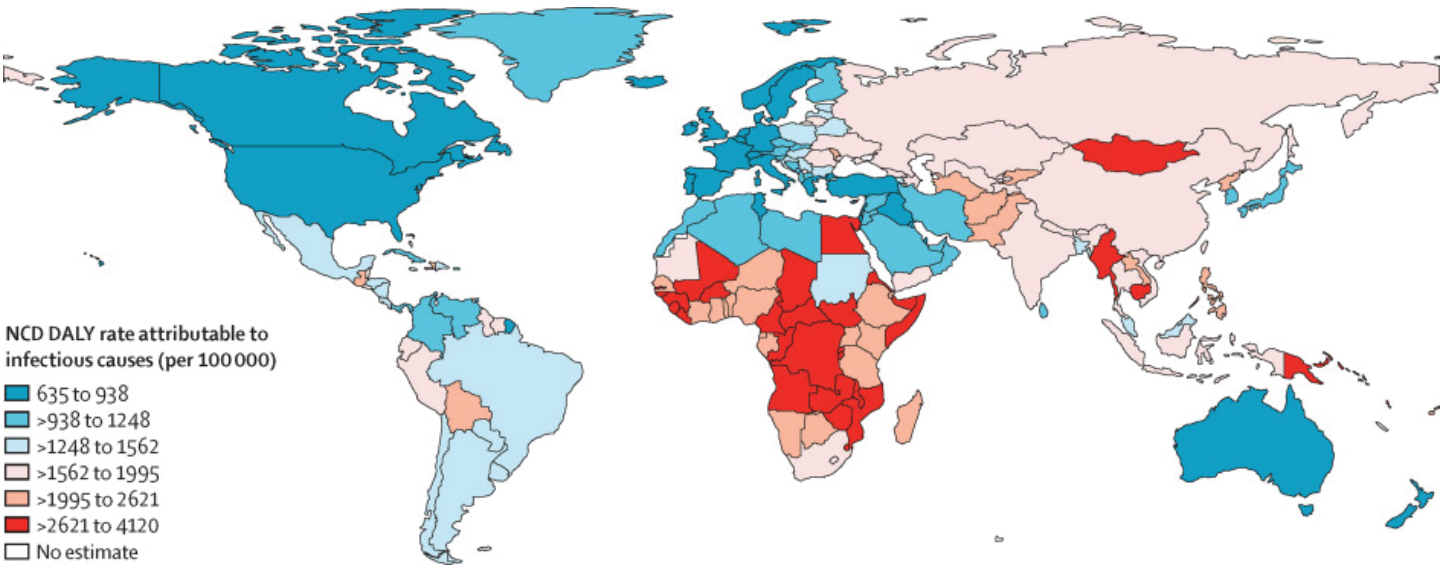
"Our vision is to reduce the disparity of healthcare that exists between developed and developing nations,"

states the Vice Director of the International Medical Department at Kyushu University Hospital and Chair of the APAN Medical Working Group, Dr.Tomohiko Moriyama. This aspiration encapsulates the transformative potential of telemedicine, a force that is progressively dismantling barriers to quality healthcare by enhancing accessibility, particularly in remote and underserved communities.

Simultaneously, these telemedical advances are redefining the landscape of medical knowledge exchange.

No longer constrained by geographical limitations, doctors from diverse corners of the globe are seamlessly sharing insights, techniques, and experiences, catalysing a dynamic shift in how medical knowledge is disseminated and refined. In this story, we explore with Dr.Moriyama the transformative potential of telemedicine to build a more equitable healthcare landscape, erasing the divide between those with easy access to medical care and those left on the fringes.

Reudcing Global Medical Disparity and the Danger of NCDs



(Image credits: The Lancet Global Health)

In the pursuit of a healthier world and to combat the pervasive threat of Non-Communicable Diseases (NCDs), the dedicated team at Kyushu University Hospital has set its sights on a noble mission: reducing medical disparities across the globe. Explaining the seriousness that NCDs pose, Dr. Moriyama explains, "The world is undergoing a significant demographic shift towards a hyper-ageing society. This phenomenon is not exclusive to Asia; it's a global one."

NCDs, which encompass a range of age-related diseases such as cancer and cardiovascular issues, cast a formidable shadow over global health. So tackling NCDs becomes increasingly imperative." Shockingly, these diseases account for a staggering 71% of all deaths, claiming the lives of approximately 41 million individuals annually. Delving into the data on NCD-related mortality among those under the age of 70, a stark contrast emerges: developed economies exhibit a notably lower mortality rate compared to their developing counterparts, where the toll is alarmingly high.

Pioneering Remote Exchanges Between Doctors

Since its inception in 2008, TEMDEC has hosted several remote discussions between doctors covering a wide array of topics. (Image credits - TEMDEC | Kyushu University Hospital)

Notably, Japan has achieved remarkable success in treating NCDs, particularly in the realm of cancer. The country's advancements in medical science and surgical techniques have garnered global attention, attracting doctors from all corners of the world who seek to learn from Japanese surgeons. Dr. Moriyama acknowledges these human exchanges are valuable and effective, but their sustainability is limited. This is owing to factors such as time constraints, expenses, and the scarcity of occasions for meaningful interactions among a limited number of individuals.

Recognising the limitations of traditional methods of knowledge transfer, Kyushu University Hospital established the Telemedicine Development Center of Asia (TEMDEC) in 2008. Led by Dr. Moriyama, its mission is to organise attractive, effective remote education, involving interactive discussions in various medical fields. Since then, TEMDEC has hosted 1772 events with participation from 1446 institutions spanning 82 countries. These events explored several topics, ranging from endoscopy to surgery, paediatrics to oncology, transplantations to dentistry, and countless others. Through these efforts, they pioneered remote discussions and live demonstrations connecting doctors globally, facilitating the exchange of techniques, insights, and expertise.

Dr. Moriyama went on to share that traditionally, live demonstrations necessitated the physical presence of participating doctors, often involving extensive travel. This approach, while valuable, posed several challenges. Language barriers and the impact of jet lag could create a less-than-ideal atmosphere for performing medical procedures. Organisers also had to navigate the complexities of obtaining a temporary medical licence for visiting doctors. More critically, patient safety was a concern when procedures were conducted in unfamiliar settings.

The introduction of remote doctor-to-doctor engagements has revolutionised this dynamic. Dr. Moriyama elaborates, "By leveraging technology to connect medical professionals across borders, doctors can now showcase their procedures in the familiar and controlled environment of their hospitals, surrounded by their trusted staff. This approach enhances patient safety and comfort, eliminates the risks associated with jet lag, and provides a seamless platform for knowledge exchange."

The Transformative Benefits of Remote Consultations for Patients

Remote consultations offer several benefits, particularly for patients afflicted with conditions that make it difficult for them to travel and for those in remote communities. (Image credits: Wall Street Journal)

Building atop its efforts to connect doctors remotely, Kyushu University Hospital recently expanded into remote patient consultations. This feat is enabled by secure networks for sharing high-quality images while ensuring patient privacy and confidentiality of sensitive medical information. Thus, the doctors of the hospital have now begun exploring the potential of this technology by hosting remote consultations with international patients. Dr. Moriyama firmly believes telemedicine efforts of this nature bring profound benefits to patients, particularly those who reside far from medical facilities.

These remote consultations offer a lifeline to individuals who would otherwise need to undertake arduous journeys or endure lengthy waiting times to access skilled medical professionals. This is particularly pertinent for patients dealing with conditions that make travel physically demanding, such as orthopaedic patients or those with cardiac issues. The availability of remote consultations ensures that these patients can receive expert medical guidance without the added burden of exhaustive travelling.

Moreover, the impact of remote consultations extends well beyond urban areas. In remote regions where access to specialised medical care is often limited, the integration of such technologies is nothing short of transformative.

But the biggest challenge to realising this potential is stable high-bandwidth networks. As Dr. Moriyama explains, "It's in remote areas where there is the greatest need for remote consultations with healthcare professionals. But these areas also struggle with poor network connectivity." Nevertheless, by overcoming this issue, telemedicine holds the promise of bridging the healthcare divide between urban centres and underserved remote regions.

Leveraging New Technologies to Train Medical Students

New technologies like Mixed Reality and Metaverse platforms hold the promise of enabling risk-free training environments for medical students, but their graphical capabilities need to improve substantially before they can be used for surgical training. (Image credits: Stock Imagery)

Towards the vision of reducing global medical disparity, Dr. Moriyama and his team, alongside the wider APAN Medical Working Group, have also been exploring the potential of new technologies such as the metaverse and mixed reality (MR) platforms. One notable demonstration took place during the APAN47 event held in Korea, where simulators were showcased that generated immersive 3D images of the human body. Commenting on these platforms, Dr. Moriyama said, "They're most helpful for medical students in learning human anatomy, which is one of the hardest topics they may face."

Such platforms have the potential to serve as invaluable training tools for medical students and young doctors, particularly when it comes to mastering intricate surgical procedures. Dr. Moriyama envisions these technologies as the future of medical education. He emphasises the crucial aspect of the metaverse and MR environments enabling training without subjecting real patients to risk. However, there remain challenges on the path to fully realising the potential of these technologies.

One significant hurdle is the current image quality of metaverse platforms, which has yet to reach the level required for precise medical education.

At present, the graphical capabilities of virtual platforms are primarily designed for video games. Dr. Moriyama, citing a simulator for training in emergency room scenarios, believes they enable medical students to better grasp fundamental tasks and processes. But while acknowledging the enticing possibilities, achieving high-quality images for virtual training of surgical procedures is likely years away. Nevertheless, the potential to revolutionise medical training, minimise patient risks, and elevate the expertise of future medical professionals makes this endeavour a promising pursuit.

How the COVID-19 Pandemic Transformed Telemedicine

The COVID-19 pandemic saw a broad shift among medical professionals to embrace digital platforms for collaboration, which was enabled by the rapid investment and improvement of these platforms at the time as well. (Image credits - TEMDEC | Kyushu University Hospital)

The COVID-19 pandemic, with its unforeseen disruptions, became an unexpected catalyst for transformation across various sectors, and the field of telemedicine was no exception. The journey of Kyushu University Hospital, with remote doctor-to-doctor engagements, reflected this broader shift that swept through the global medical community. In the early stages, Dr. Moriyama shares that the concept faced initial resistance. Particularly in developed economies across Europe and North America, medical professionals were accustomed to physical conferences as their primary avenue for knowledge exchange. Hence, many doctors were hesitant in embracing online platforms.

However, with the pandemic making in-person gatherings impossible, medical practitioners were compelled to shift their interactions to virtual spaces. What once seemed unfamiliar and unappealing gradually revealed its efficiency and effectiveness. Dr. Moriyama remarked on this pivotal shift stating, "Even if you wanted to meet in person, the situation didn't permit it. So we met virtually and realised it's quite simple and useful to communicate, have discussions, and even share presentations." Thus, the pandemic acted as a crucible, forcing medical professionals to adapt and embrace digital platforms for collaboration.

A key enabler of this transformation was the rapid investment in and improvement of video conferencing systems. Dr. Moriyama noted that video conferencing systems, once plagued by issues of unclear audio and video, have undergone substantial enhancements. This evolution in technology was profound enough to enable even remote instructions for surgical procedures, a development that was previously challenging due to technical limitations. In essence, the pandemic acted as a catalyst for a sea change in the medical community's attitudes toward telemedicine and remote collaborations.

The Impact of the APAN Medical Working Group

In the intricate world of medical advancements, the APAN Medical Working Group serves as a dynamic catalyst for knowledge exchange, collaboration, and research. Dr. Moriyama elaborates that the intricacies of medical practices often demand real-world validation of new methods. The collaborative environments of the APAN Working Groups serve as a bridge between theoretical concepts and practical applications. By enabling doctors across the world to work together, the APAN Working Group contributes significantly to the assessment of emerging technologies and techniques in diverse settings.

The APAN community not only facilitates valuable collaboration among medical professionals but also serves as a pivotal bridge between various stakeholders. This extends beyond doctors to include technologists, researchers, and individuals from various domains. For instance, Kyushu University held an event for endoscopists and reached out to the APAN community to expand its reach, which highlights APAN's role in expanding interactions and knowledge dissemination. Ultimately, Dr. Moriyama believes that the APAN Medical Working Group serves as a platform for empowering researchers. One that enables them to forge connections and initiate collaborative research endeavours that will push the boundaries of medicine.

Exploring the Future of Telemedicine

The Smart Cyber Operating Theater (SCOT®) is a shining example of what's possible with telemedicine today. While optimistic about the technology to help doctors serve more patients. (Image credits: The Government of Japan)

As the world of telemedicine continues to evolve, its future will be built upon robust, stable, and high-bandwidth networks. Dr. Moriyama re-emphasizes the paramount importance of reliable networks in telemedicine. He paints a scenario where a surgeon is guiding a critical procedure remotely, underlining that a network failure in such a moment could have grave consequences for the patient. While the challenge of stable high-speed networks remains, particularly in remote and underserved areas with limited bandwidth infrastructure, the imperative for such remote treatments persists.

Yet, Dr. Moriyama holds a hopeful outlook for the future, stating that researchers are already looking at telemedicine applications for 6G networks. Noting the progress being made, he points to the Japanese surgical society's preliminary guide to tele-surgeries, a milestone that highlights the growing integration of telemedicine into medical practice. Further exemplifying this trend is the Smart Cyber Operating Theater (SCOT®), a sophisticated networked operating theatre, which is a collaborative effort between multiple Japanese universities and private companies.

While technical challenges are met with optimism, Dr. Moriyama envisions an even greater challenge on the horizon: ensuring equitable accessibility to medical care. In developing economies, there are social systems that grant citizens access to affordable high-quality healthcare. However, the same cannot be said for many developing economies, where healthcare access is a luxury. While telemedicine can improve access to healthcare, Dr. Moriyama aptly points out, “The issue of affordability is one for public officials. But access to doctors is something we can change with telemedicine.”

The future of telemedicine, as envisioned by experts like Dr. Moriyama, is not only one of technological evolution but also of social change. It's a landscape where networks will grow stronger, remote interventions will become more precise, and global medical collaboration will flourish. Importantly, it's a future where technology bridges the disparity between medical services in developed urban centres and long-underserved remote communities, promising a world where medical expertise knows no boundaries.

Pandemic Success Stories of South Asian NRENs from APAN55

As the world navigated the uncharted waters of the COVID-19 pandemic, few sectors felt the impact as profoundly as education. The upheaval brought unforeseen challenges, disrupting traditional learning models and pushing institutions to their limits. As institutions worldwide grappled with the shift to remote learning, National Research and Education Networks (NRENs) across the region emerged as key players in ensuring the continuity of tertiary education. Amidst this backdrop of uncertainty, the APAN55 General Meeting convened in Kathmandu, spotlighting the remarkable stories of resilience from South Asia's NRENs.

In the face of unprecedented adversity, these networks not only rose to the occasion but emerged stronger and moreadaptable than ever before. The stories of the Facilitating Distance Learning using Digital Conferencing Facility (fDLuDCf) project and Building eLearning Infrastructure in South Asian Countries (BeLISAC) project, both nurtured by the Asi@Connect Project's Call-For-Proposals Initiative, echoed the collective sentiment of NRENs across the region - a commitment to ensuring uninterrupted education and technological advancement. The APAN55 Meeting provided a platform to share these inspiring narratives, reaffirming the vital role of NRENs in shaping the future of tertiary education and connectivity.

The fDLuDCf Project: Enabling Remote Learning in a Pandemic

The facilitating Distance Learning using Digital Conferencing facility (fDLuDCf) project was initiated in September 2018 by BdREN from Bangladesh in technical collaboration with NORDUnet.

The project also saw participation from 5 beneficiary economies, namely Bhutan, Nepal, Philippines, Sri Lanka and Thailand. Its primary objective was to promote the use of Digital Video Conferencing facilities regionally with local Zoom infrastructure for faculties, students, and researchers to use for remote learning and knowledge sharing. CEO of BdREN, Mohammad Tawrit, adds that by doing so, "The project also focused on South-South and North-South collaboration and knowledge transfers. It targeted the minimising digital divides and enhanced utilisation of the research network."

Mohammad Tawrit - CEO of BdREN and the PI for fDLuDCf and BeLISAC projects

Following its inception in 2018, the project saw slow but steady growth. But when the COVID-19 pandemic hit, and educational institutions were forced to close their doors, adoption skyrocketed almost overnight. Across the region, prolonged lockdowns saw tertiary education resuming in the form of remote learning. Describing Bangladesh's perspective, Tawrit shared that BdREN quickly allocated its

5,000 Zoom licences. He went on to share, “Initially the public universities were a bit hesitant, but as days went by and with no sign of the pandemic subsiding, their reluctance also started eroding resulting in delivery of fully online mode of lectures.”

Building Critical Local Infrastructure During a Lockdown

Prof. Roshan Ragel - Consultant CEO of LEARN

The Consultant CEO of LEARN, Prof. Roshan Ragel, shared that Sri Lanka’s tertiary education faculty members reacted similarly as it distributed its share of Zoom licences. However, the sudden overnight adoption of Zoom wasn’t without challenges. Namely, the biggest one was the heavy data consumption of video calls, which was a heavy cost for everyone involved. The sudden deluge of traffic-choked the data centre capacity of NORDUnet and resulted in it banning NRENs from using Zoom licences in production mode. At the same time, students and faculty were bearing high internet costs for these remote learning sessions.

To resolve these issues, LEARN proposed the concept of utilising Zoom’s on-premise licensing facility. It involved the creation of hosting meetings via local data centres. Granted, it was a difficult task to set up such infrastructure amidst the background of a nationwide lockdown. Despite the odds, LEARN’s member institutions contributed hardware, which was then set up by a team working remotely. Not only did it relieve the NORDUnet data centre, but it also “allowed telecom operators to enable free usage of Zoom for students and faculty using our licences,” added Prof. Ragel. Soon after, other regional NRENs followed suit and seeing no impending threat, NORDUnet enabled the NRENs to continue using the Zoom licences in production mode.

Managing Increasing Demand for Remote Learning

With the infrastructure in place, adoption quickly rose across the region as educational institutions embraced remote learning. However, this rapid rise soon presented new challenges. One was the shortage of licences, particularly in Bangladesh, where there were more faculty members than licences BdREN had in their repository. In response, BdREN’s software team developed a scheduler software, which allowed a single Zoom account to create multiple meetings at different times. “The increase of efficiency of a Zoom licence increased from 10% to almost 100% and as such, with 5000 Zoom licences, BdREN could cover almost 15,000 faculty members,” shared Tawrit.

Eventually, NORDUnet generously offered more Zoom licences, which helped resolve the shortage. But even then, as the number of faculty members using it rose, so too did the amount of meetings at peak hours. As a result, the local data centres of beneficiary nations were being pushed to their limits. Recounting how they faced this challenge, Tawrit said, “Each nation tackled it with their individual approaches. BdREN and LEARN swiftly proceeded to obtain new computing resources. LEARN also proceeded to create awareness among faculty members to reduce peak-hour traffic. Meanwhile, BdREN also leased some of its capacity to NREN in Nepal to help accommodate its demand. This sharing of resources was another example of South-South collaboration.”

The Transformative Impact of the fDLuDCf Project

Dr. Asitha Bandaranayake - Consultant CTO of LEARN and a Computer Engineering Lecturer at the University of Peradeniya, Sri Lanka

Throughout the COVID-19 pandemic, from March 2020 to June 2021, the fDLuDCf project facilitated 3 million sessions with the participation of 127 million students across the five beneficiary nations. Tawrit shares that in Bangladesh alone, 1.6 million meetings were held with the participation of around 80 million students. Similarly, in Sri Lanka, 1.5 million meetings were held with almost 80 million participants comprising both students and faculty, shares Prof. Ragel. Needless to say, the fDLuDCf project had a transformative impact on the South Asian region, making remote learning both accessible and showcasing its potential during uncertain times.

Tawrit goes on to describe the impact of the distance learning project as two-fold, "The direct impact was the benefit that was offered to the faculties of the universities – public and private regardless – which helped the universities in continuing their education. The indirect benefit for the NRENs came in the form of changing the mindset of the education community. For the very first time, the NRENs could make the community understand their utility. The NRENs could establish the fact that they are not simple internet service providers, rather they have added value to be offered to the community.

Speaking at the APAN55 Meeting, Consultant CTO of LEARN and Computer Engineering Lecturer at the University of Peradeniya, Dr. Asitha Bandaranayake, also spoke of the transformative impact of the fDLuDCf project on Sri Lanka's higher education sector, characterising it as a paradigm shift following the COVID-19 pandemic. He recognized the swift and widespread adoption of distance learning by many prominent Sri Lankan universities, which effectively harnessed the platform's capabilities. However, he also acknowledged a slower adoption rate among smaller universities. Dr. Asitha went on to underscore the importance of ensuring equal access to these opportunities, advocating for equity in education.

Project BeLISAC : Strengthening Remote Learning in the Region

The BeLISAC project made South Asia's NRENs more resilient, while also opening doors to fulfilling careers for its female engineers.

The Building e-Learning Infrastructure in South Asian Countries under TEIN (BeLISAC) project emerged as a successor to the fDLuDCf project. With funding from the Asi@Connect project under CFP5, its purpose was to develop IT infrastructure and services to expand online learning in 6 beneficiary Asian nations. It was an ambitious international endeavour that united the Asi@Connect project, NORDUnet, and six national research and education networks - BdREN (Bangladesh), CamREN (Cambodia), LEARN (Sri Lanka), LERNET (Laos), NREN (Nepal), and DrukREN (Bhutan).

Owing to their collective efforts, the BeLISAC project saw 4 data centres built across South Asia in Sri Lanka, Bangladesh, Bhutan, and Nepal to support this venture. These centres are connected via the TEIN (Asi@Connect) network and provide Zoom services for research and education in their host countries. Alongside this, in line with the United Nations Sustainable Development Goals, the BeLISAC project was committed to empowering women to help create a more diverse and equitable NREN community in Asia. To that end, its team was bolstered by the inclusion of female engineers from each beneficiary nation. Having received training from NORDUnet, these five female engineers spearheaded the development and maintenance of the project's infrastructure.

Achievements of the BeLISAC Project

Reflecting on the accomplishments of the BeLISAC project, Tawrit highlights, "The foremost milestone that could be achieved under the BeLISAC project can be attributed as the building of resilience for the participating NRENs in terms of the development of their computing capacity." Another pivotal achievement in the project's trajectory materialised in the form of its capacity-building program, specifically tailored to empower women as per its original objectives.

NORDUnet: The Facilitator of Emerging NRENs

Rene Buch - Former CEO of NORDUnet, receiving a special recognition award from the Asi@Connect Steering Committee at APAN55

Central to the remarkable success of the fDLuDCf project and the BeLISAC project has been the pivotal support offered by NORDUnet. With its unwavering commitment to innovation and collaboration, NORDUnet has been instrumental in reshaping the landscape of education and connectivity across South Asian countries. Well before these projects began, Tawrit recalls it was in 2016, during a visit to NORDUnet's Copenhagen office, that BdREN was first introduced to the concept of distance learning.

The provision of 10,000 Zoom licences by NORDUnet laid the foundation for the fDLuDCf project. Swiftly responding to the pandemic's challenges, NORDUnet significantly expanded licences twice, aiding local infrastructure development. This support persisted even after the fDLuDCf project's culmination in June 2021, reflecting NORDUnet's enduring commitment. In the inception of BeLISAC in March 2022, NORDUnet showcased visionary thinking, integrating women's empowerment into its core objectives. By involving female engineers, NORDUnet helped South Asian NRENs foster diversity locally and be aligned with international sustainability goals. Needless to say, the impact of NORDUnet's contributions resonates beyond project milestones.

Valter Nordh - CEO of NORDUnet speaking at the APAN55 Meeting

For its unparalleled commitment to supporting the development of South Asia's NRENs, the Asi@Connect Steering Committee offered a special recognition at the APAN55 Meeting. Additionally, the beneficiary countries bestowed the prestigious "Facilitator of the Emerging NRENs" award upon NORDUnet, acknowledging its indispensable role in nurturing the growth and sustainability of these networks. Additionally, at APAN55, the Secretary at the Ministry of Education, Science and Technology in Nepal, Pramila Devi Bajracharya, while recognising the efforts of beneficiary NRENs, thanked NORDUnet for its contributions to both projects.

Receiving these awards at APAN55 were NORDUnet's Former CEO, Rene Buch, and the current CEO of NORDUnet, Valter Nordh. Speaking at the event, Rene shared that these efforts were the result of a team working together and thanked all beneficiary NRENs for their efforts. Adding on, Valter said, "I am deeply touched and moved to witness the extent of success these projects have achieved. Together, we forge strength, embracing a new normal. The pandemic, albeit a challenging force, propelled us toward change, igniting contemplation on future possibilities for development. NORDUnet transcends its identity as a singular organisation; it embodies a coalition of five nations. As we gaze ahead, we envision possibilities within each country and through regional collaborations."

Building the Future of Remote Learning atop a Resilient Foundation

At the APAN55 Meeting, Pramila Devi Bajracharya - Secretary at the Ministry of Education, Science and Technology of Nepal, recognized the efforts of South Asia's NRENs and partners like NORDUnet for their resilient efforts during the pandemic

In the wake of unprecedented challenges brought forth by the COVID-19 pandemic, the resilience of NRENs emerged as a beacon of hope, illuminating the way for uninterrupted tertiary education. Reflecting on their collective impact, Tawrit states, "As a matter of fact, the principal outcome of the fDLuDCf and BeLISAC project can be attributed to the high level of collaboration among the South Asian NRENs. It is believed that all these NRENs can go ahead with any kind of collaborative initiative in future."

This spirit of partnership echoes in the plans for XeLISAC [Extending e-Learning Infrastructure in South Asian Countries], an upcoming project seeking support to enrich the educational experience further. Looking to the horizon, at the APAN55 Meeting, Prof. Ragel encapsulated the sentiment perfectly - sustaining the momentum achieved thus far requires the support of all stakeholders. With eyes set on the future, the vision encompasses MOOC Platforms, Digital Universities, and a transformative Digital Transformation. He also presented an open invitation to economies not yet actively engaged to become a part of these collaborative efforts. Thus, reaping their collective benefits, which helped strengthen not just beneficiary nations but also the wider South Asian region.

In closing, the fDLuDCf and BeLISAC projects stand as monumental testaments to the fortitude of South Asia's NRENs, not only in restoring educational continuity but in their evolution as robust entities tested by adversity. These projects underscored the transformative power of collaboration as the NRENs came together to surmount challenges and lay the foundation for a brighter higher educational landscape. In doing so, they illuminate a path forward that thrives on resilience, collaboration, and innovation to build a future where knowledge knows no boundaries.

Contributors : Mohammad Tawrit, BdREN, Shashini Withanage, LEARN

Capturing Connections: APAN55 Unveiled in Photos

Registration: Attendees eagerly sign in, marking the beginning of an inspiring event.

Introduction to APAN and Fellowship Meeting: Welcoming participants to a network of innovation and collaboration.

iFIRExMAN workshop session: Minds ignite as experts delve into the world of advanced networking.

Asi@Connect Governors' Meeting: Leaders chart the course for future connectivity across the world.

Routing Working Group: Addressing Global Routing: Experts unite to shape the pathways of digital connection worldwide.

APAN General Manager and APAN Secretariat at APAN55: Captains at the helm, steering progress in network evolution.

SEA-HAZEMON@TEIN-II Workshop on Information Centric Networking on Internet of Things (ICN-IoTs): Navigating the future of networking with Information-Centric IoT insights.


Tea breaks: Brief moments for networking and sharing, fueled by conversations and camaraderie.

Opening Plenary: A grand stage is set for ideas to take center stage, igniting the conference.


Social Dinner: A night of laughter and connections under the stars.

Open and Sharing Data Working Group (OSDWG): Asia Pacific Open-Sharing Data and NRENs Open Science: Breaking barriers to knowledge sharing and open science across Asia-Pacific.

Jamie Gillespie (Speaker) APNIC, Senior Internet Security Specialist at RPKI-Use Cases & Experience Sharing session: Envisioning secure internet landscapes through experienced eyes.

Lee Bu Sung, Francis (Speaker) School of Computer Science and Eng., Nanyang Technological University, SingAREN at the HPC in Asia Pacific Region session: Forging the future of high-performance computing in collaborative spirit.

Andrew Howard (Speaker) National Computational Infrastructure (NCI), Associate Director, Cloud Services at the HPC in Asia Pacific Region session: levating possibilities in computation and innovation.

AI driven Networks Working Group: Pioneers shaping networks with the power of artificial intelligence.

Sustaining NREN Services for the Future - FileSender and more:
Navigating the path to resilient and evolving network services.

Closing social dinner:
Cheers to shared accomplishments and new friendships formed.

Closing plenary:

The curtain falls on an eventful journey, with promises of continued progress.

Bridging Boundaries:
A diverse group comes together, trancending borders for shared knowledge.

Photo courtesy: APAN55 Official Photographers
Story by: Shashini Withanage

APAN's Vision for the Future:

Engaging and Empowering Members

As we actively engage in the ongoing APAN56 Meeting in Colombo, Sri Lanka, APAN is already charting a dynamic path for the future. Looking ahead, the consortium is aiming to amplify its impact and foster greater collaboration in the research and education networking domain. With APAN57 on the horizon, slated to take place in the enchanting city of Bangkok, Thailand, from January 29th to February 2nd, 2024, the organisation is preparing to build on the momentum generated at APAN56. Beyond this meeting, APAN envisions a future marked by three essential pillars: expanding its membership, igniting greater engagement, and elevating the significance of its meetings.

What to Expect at APAN57 Happening in Bangkok, Thailand

APAN57 will be hosted by ThaiREN in Bangkok, Thailand from January 29th to February 2nd, 2024

The upcoming APAN57 Meeting will be organised by the Thai Research and Education Network (ThaiREN) in the vibrant city of Bangkok, Thailand. This marks the fourth time ThaiREN will be hosting this prestigious event, with previous hostings being APAN13 (2002), APAN19 (2005), and APAN33 (2012). Scheduled to be held from January 29th to February 2nd, 2024, the APAN57 Meeting will take place at the Eastin Grand Hotel Phayathai. The meeting is expected to witness an assembly of approximately 200-250 international

participants, alongside an estimated 150-200 representatives from Thailand, bringing the total number of attendees to an impressive 350 to 450.

The APAN57 Meeting will prove to be a valuable platform for local and regional researchers to connect and exchange ideas, with prominent Thai participants hailing from member institutions of University Network (UniNet) and ThaiREN. The event will also foster knowledge sharing and fruitful discussions on various initiatives among both local and international participants, agencies, and universities. The organisers have emphasised their goal of engaging participants from all Working Groups within APAN, with the Telemedicine Working Group being one of the largest contingents. Beyond this, the APAN57 Meeting aims to serve as a conduit for diverse sectors to come together and collectively explore potential initiatives.

The organisers of APAN57 are currently exploring intriguing ideas for potential keynotes and workshops. Among these ideas is the possibility of a disaster-related workshop or masterclass in collaboration with the United Nations Office for Outer Space Affairs (UNOOSA) and the UN-SPIDER Programme. Additionally, they are considering offering participants the chance to explore innovative technology facilities during captivating day trips, such as to Kubota Thailand's smart farming technology facility or the community-based water management initiative (Saladin) supported by the Hydro-Informatics Institute (HII). However, these ideas are still in the exploration phase, and the final agenda will be communicated in due course, closer to the event.

With APAN57 on the horizon, the organisers from ThaiREN acknowledge the shared challenges faced by all, emphasising the significance of collective efforts and cooperation to navigate through turbulent times. It's a sentiment that echoes the pressing need for collaborative action and timely responses to address critical issues. Thus, the APAN57 Meeting in Thailand is poised to be a remarkable convergence of minds, fostering dialogue, and nurturing collaboration to drive advancements in research and education networks. With a rich tapestry of discussions and activities, it's poised to be a platform to drive progress towards addressing the APAC region's challenges and help us collectively envision a better future.

Building upon the success of past APAN meetings, APAN57 is expected to see between 350-450 delegates

APAN's Future: Stronger Engagements and More Inclusivity

Moving forward, APAN's future plans are focused on increasing membership by engaging with developing economies and increasing engagement with existing member NRENs and partner organisations

In recent times, APAN has dedicated much of its focus to its biannual meetings. The previous APAN55 Meeting in Kathmandu was the first held physically after the COVID-19 pandemic, adopting a hybrid format to accommodate broader participation. Drawing valuable insights from these experiences, today's APAN56 Meeting in Colombo has also been organised as a hybrid event to facilitate greater engagement. Since its inception, the APAN meetings have proven instrumental in establishing connections between various entities within the APAN community.

Looking ahead, APAN aims to enhance its engagement efforts and further cultivate relationships with its member NRENs. The organisation envisions taking on an expanded role as a coordinator between NRENs, working groups, partner organisations, and other community members. In pursuit of this objective, APAN is exploring new activities, including hosting more workshops and webinars throughout the year, in addition to its regular meetings. To achieve this, the organisation seeks to collaborate closely with NRENs to identify their specific support needs and design engagements that are tailored to address their concerns.

Most recently, APAN has also introduced the APAN Grant, providing member institutions with a means to fund activities that benefit the community, NRENs, and APAN itself. The grant has a broad scope and exists to support a variety of endeavours ranging from webinars and workshops to marketing initiatives, and more. By empowering member institutions with financial support, the APAN Grant aims to encourage active participation and knowledge sharing that benefits all members.

Furthermore, APAN aims to expand its engagements with partner organisations, seeking to build even stronger bonds and cooperation to collectively address the challenges and opportunities within the research and education networking domain. Finally, a significant aspiration for APAN is to embrace greater inclusivity by welcoming members from developing economies and facilitating their participation in the APAN community. The organisation is committed to opening doors and creating opportunities to foster their involvement and collaboration. With a clear vision for the future, APAN is poised to intensify its efforts in promoting collaboration, fostering innovation, and driving progress in the field of research and education networks across the Asia-Pacific region.

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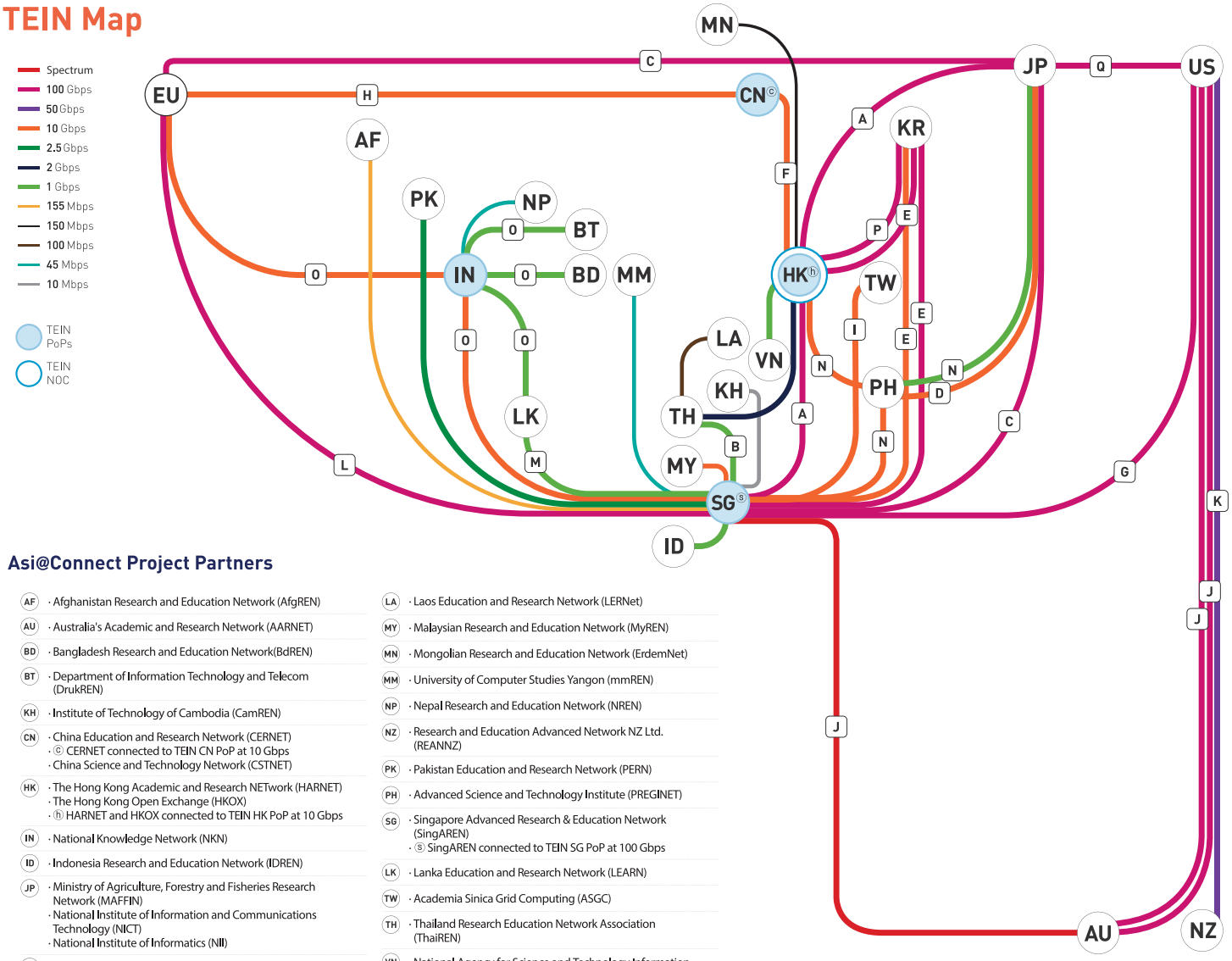
Asi@Connect

The EU co-funded Asi@Connect project provides a dedicated regional high capacity and high quality internet network, Trans Eurasia Information Network(TEIN), for Research and Education (R&E) communities across Asia-Pacific and Europe, and leverages e-infrastructures developed for public service projects.

TEIN Map



Asi@Connect Project Partners

- AF · Afghanistan Research and Education Network (AfgREN)
- AU · Australia's Academic and Research Network (AARNET)
- BD · Bangladesh Research and Education Network(BdREN)
- BT · Department of Information Technology and Telecom (DrukREN)
- KH · Institute of Technology of Cambodia (CamREN)
- CN · China Education and Research Network (CERNET)
  - ⓒ CERNET connected to TEIN CN PoP at 10 Gbps
  - China Science and Technology Network (CSTNET)
- HK · The Hong Kong Academic and Research NETwork (HARNET)
  - The Hong Kong Open Exchange (HKOX)
  - ⓗ HARNET and HKOX connected to TEIN HK PoP at 10 Gbps
- IN · National Knowledge Network (NKN)
- ID · Indonesia Research and Education Network (IDREN)
- JP · Ministry of Agriculture, Forestry and Fisheries Research Network (MAFFIN)
  - National Institute of Information and Communications Technology (NICT)
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- KR · National Information Society Agency (KOREN)
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- LA · Laos Education and Research Network (LERNet)
- MY · Malaysian Research and Education Network (MyREN)
- MN · Mongolian Research and Education Network (ErdemNet)
- MM · University of Computer Studies Yangon (mmREN)
- NP · Nepal Research and Education Network (NREN)
- NZ · Research and Education Advanced Network NZ Ltd. (REANNZ)
- PK · Pakistan Education and Research Network (PERN)
- PH · Advanced Science and Technology Institute (PREGINET)
- SG · Singapore Advanced Research & Education Network (SingAREN)
  - ⓢ SingAREN connected to TEIN SG PoP at 100 Gbps
- LK · Lanka Education and Research Network (LEARN)
- TW · Academia Sinica Grid Computing (ASGC)
- TH · Thailand Research Education Network Association (ThaiREN)
- VN · National Agency for Science and Technology Information (VinaREN)

*** As of 31 January 2022.**

** Other regions (Central Asia, Africa and Latin America) can be connected via global R&E networks such as EU(GÉANT) and US(Internet2)

The following links are fully financed/co-financed by the link owners whose support is gratefully acknowledged

- A · National Institute of Information and Communications Technology
  National Supercomputing Centre
  Singapore Advanced Research & Education Network
  Hong Kong Academic and Research NETwork
- B · National Institute of Information and Communications Technology
  Thailand Research and Education Network
- C · National Institute of Informatics
- D · Ministry of Agriculture, Forestry and Fisheries Research Network
- E · National Information Society Agency
- F · China Education and Research Network
  TEIN* Cooperation Center
- G · Internet2
  ARENA-PAC
  TransPAC/Pacific Wave
  Australia's Academic and Research Network
- H · Co-funded by China and EU
- I · Academia Sinica Grid Computing
- J · Australia's Academic and Research Network
- K · Research and Education Advanced Network New Zealand
- L · GÉANT NORDUnet SingAREN SURFnet TEIN
- M · LEARN Lanka Education and Research Network
- N · Advanced Science and Technology Institute
- O · National Knowledge Network
- P · Korea Research Environment Open NETwork
- Q · National Supercomputing Centre
  Singapore Advanced Research & Education Network

This publication has been produced with co-funding of the European Union for the Asi@Connect project under Grant contract ACA2016-376-562. The contents of this document are the sole responsibility of TEIN*CC and can under no circumstances be regarded as reflecting the position of the European Union.

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