

# Annual **Report** 2021

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**Bangladesh Research and Education Network**

**“We are not only aiming for our success,  
rather we are chasing for winning the  
hearts of our members.”**

*Mohammad Tawrit*

**Mohammad Tawrit  
CEO, BdREN**



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MESSAGE FROM  
**CHAIRPERSON**



**Professor Dr. Kazi Shahidullah, Chairperson**  
Bangladesh Research and Education Network (BdREN) Trust

“I am proud to let you know that BdREN has been rated second in the maturity ratings among the 14 NRENs from least developed and middle-income economies”

It is a wonderful experience to continue as the caretaker of BdREN which has stepped into the third year of its operation under BdREN Trust on the expiry of the Higher Education and Quality Enhancement Project (HEQEP) and I feel privileged to put my notes on the second Annual Report illustrating the detail achievements of BdREN. I mentioned in the first Annual Report that NRENs need to scrape through various types of challenges and this proved to be not an exception for BdREN, neither the second year was any short of those challenges. However, overcoming all those challenges BdREN could make many achievements during this period of time. BdREN could earn the distinction and the confidence of its member universities to become the only operator to serve them in terms of data connectivity and to sustain that achieved milestone it has been striving continuously to attain 99.99% availability of the offered connectivity services applying its innovative methodology. It is expected that BdREN will be able to attain its target shortly.

Talking about the recent achievements, the hosting of APAN53 will certainly stand out. First of all, it was BdREN's success both nationally and internationally which could attract the attention and earn the confidence of APAN Board that BdREN is capable of hosting such an auspicious event. Subsequently, through hosting APAN53 so successfully it could add another feather in its cap. I am grateful to the BoT members, BdREN Officials, University faculties, Policy makers, BdREN stakeholders and, last but not the least, all the sponsors who contributed to their maximum to the outstanding success of this monumental event.

With the continuation of the rage of the devastating pandemic BdREN could continue rendering its Zoom Application licensing services to approximately 27,000 faculty members with the courtesy of Ais@Connect project and NORDUnet. During the year a total number of 5.4m online classes were held with a total duration of 327m class-hours having participation of 270m students.

As I committed in the preface of the First Annual Report about the horizontal and vertical expansion of services, BdREN could enhance its membership base from a figure of 110 to 159 only within a span of one year which is a rare

feat for any NREN. In terms of vertical expansion BdREN could manage adding GPU services to its forte. In the software domain BdREN has been trying to customize its eFile application software fulfilling the unique requirements of each individual university. I am confident that this eFile Application will be able to cater to the exclusive demand of many universities which will be literally impossible to be taken care of by the A2I developed eNothi Application. At the same time BdREN is moving forward with customizing the open source LMS to the satisfaction of the universities.

I am proud to let you know that BdREN has been rated second in the maturity ratings among the 14 NRENs from least developed and middle-income economies. This has been made possible through the prudent decision making of the board members, help from its member institutions and earnest cooperation of its stakeholders. BdREN, in partnership with LEARN, could successfully earn a consultancy project under Asi@Connect for assessment of needs for the Asia-Pacific NRENs (NNA). Accomplishment of this project has earned significant accolades and acclaims from the community. Also, as a follow-up project of fDLuDCf, BdREN could convince TEIN\*CC to be awarded with a project named BeLISAC under Asi@Connect, again with active support of NORDUnet, which will help BdREN in continuing its support of facilitating online learnings for the community.

I hope that BdREN will continue its drive to incorporate more institutions to its repository in the coming years and leveraging on its economy of scale it will be able to offer its services at a far economical rate which is a long-standing demand of the member institutes.

Wishing all the very best for BdREN.

**- Professor Dr. Kazi Shahidullah, Chairperson**  
Bangladesh Research and Education Network (BdREN)Trust

MESSAGE FROM  
**VICE-CHAIRPERSON**



**Professor Dr. Dil Afroza Begum, Vice-Chairperson**  
Bangladesh Research and Education Network (BdREN) Trust



**I think, the facts and figures placed in the report signal that BdREN has been delivering its services quite successfully to its member institutes with world class quality”**

It is indeed a matter of great pleasure and pride that on its entering into the third year of its operation after the expiry of the Higher Education Quality Enhancement Project [HEQEP], BdREN is going to publish its 2nd Annual Report covering the period of financial year 2020-21. My heartiest congratulations to the BdREN executives for making that happen.

First and foremost, the growing acceptability among the universities being covered by BdREN is something for me to savor. It is indeed worth-noting that the researchers, academicians, and the administrators engaged in the universities, both private and public, have started considering BdREN as their own organization – the very concept which BdREN has been long trying to promote. This has been an amazing achievement which will bring BdREN and the universities even closer. Also, the research institutes are slowly knowing the fact that BdREN is somewhat different from the traditional service providers and its presence in the market is going to create revolution in the industry.

Among other achievements, the hosting of APAN53 successfully to the maximum satisfaction of national as well as international communities have been proved to be a new landmark for BdREN. It will give BdREN the confidence to host similar international events onsite in future with wider coverage. There is no denying that under the guidance of the Board of Trustees led by honorable Chairperson Prof. Dr. Kazi Shahidullah, BdREN has been moving forward with the enthusiasm, agility and confidence more than ever before.

Last year, BdREN promised to make both horizontal and vertical expansion of its services to gain customers’ confidence and to make itself financially sustainable. The statistics presented in this report demonstrates the fact that BdREN has kept its promises to an extent. To be candid BdREN has made significant progress in gaining the confidence of its members through expansion of its services, although it is true that BdREN needs to navigate further to make it fully financially sustainable. I would like to reiterate the fact that BdREN has not only made its footprint in the research and education sector of Bangladesh but also gained mileages in relevant international arena, especially among Asia-Pacific NRENs that is reflected through its larger involvement and engagement with organizations like Asi@connect and APAN particularly in delivering its consultancy and event hosting services.

The massive task of supporting online class and meeting facilities that BdREN has been providing free-of-cost in large scale through Zoom for the universities and research institutes since the onslaught of the pandemic, I believe, it will be remembered by the education and research community forever. However, there is no justification of being complacent, rather BdREN should continuously strive mustering all its energy and resources to move into the new frontiers. In this regard a few of the standout services namely Establishing customized Learning Management System (LMS); Offering world-wide free roaming service (eduroam) to a number of educational institutes; Configuring federated Identity and Access Management (IAM) service; Establishing state of the art Video Conferencing and Smart Classroom facility; Producing NREN Maturity and Need Assessment Model; Designing, implementing and maintaining Campus Network; and Offering GPU based services have already been accomplished by BdREN.

Though BdREN has been significantly contributing to the education and research sector in Bangladesh, it needs to be remembered that the expectations from Academic and Research sector are huge and at the same time they are dynamic in nature. Hence, BdREN needs to deploy all its resources to figure out the needs of its members and subsequently address the same in quickest possible time.

As such, BdREN requires to maintain close ties with its members, sit routinely with them, discuss intricately to assess their real needs and take measures to fulfil them. Such an approach will benefit the institutions as well as the country as a whole. Along with the horizontal and vertical expansion of services, BdREN also should focus, with equal importance, on consolidating the existing services and uplifting their quality benchmark. I think, the facts and figures placed in the report signal that BdREN has been delivering its services quite successfully to its member institutes with world class quality; at the same time, I do agree that communicating about the benefits of the offered products and services to their current and potential end-users has been a constant challenge and is yet to be addressed in full. I wish that BdREN will focus its attention to look into this very aspect hereon. This will help BdREN serve its purpose more effectively through extending the benefits of the offered services to the end-users. Thus, BdREN can establish itself as one of the most successful and leading NRENs in the research and education sector across the globe.

**- Professor Dr. Dil Afroza Begum, Vice-Chairperson**  
Bangladesh Research and Education Network (BdREN) Trust

MESSAGE FROM  
CEO



**Mohammad Tawrit, CEO**  
Bangladesh Research and Education Network (BdREN) Trust



## The standout achievement of the year came with our innovative planning as we could make our connectivity as the sole connectivity for the most of the public universities which are under special packages.”

To be precise we are into the third year of our operations under BdREN Trust and the position where we are standing now makes us feel that we are living the dream. Three years back while we started our venture all our policy makers were bit skeptical about the future of BdREN. The question of the sustainability of the organization was the major area of concerns. Today, sitting at the helm of its executive structure, I can confidently say that the sustainability of BdREN is no longer a question. At the moment, BdREN has reached at such a stature that I can convince my Board of Trustees not only to allocate money for running the “Operational expense” but also to invest in “Capital expense” showing the outcome that the additional financing might bring forth. I believe that is the biggest achievement which BdREN can boast of.

I would like to give the credit in enabling BdREN to attain such stature to all my policy makers for taking the right decisions at the right time. I would also like to thank my Board Members for giving me enough freedom to run the show. At the same time I would also like to show my gratefulness to all the member institutions particularly the universities for finally coming to terms in understanding the fact that BdREN is their own organization, not an alien one as they used to think before, and as such, it is their responsibility to take care of it. Without their help all our dreams could easily turn into nightmares. The contributions of other stakeholders are also worth remembering. The Power Grid Company of Bangladesh - which came forward at the very beginning with the offer of leasing its Optical Fiber Network to BdREN at a meagre price demonstrating its humility – has again showed their magnanimity in allocating additional fiber to connect the new universities that have very lately come into operations. This has given BdREN the flexibility of setting its roadmap for the future. Last but not the least, Bangladesh Telecommunications Company Limited, the largest public telecom operator, has been kind enough to offer its cheapest Internet Rate for BdREN. Along with that BTCL has committed to offer the most economic rate to BdREN for Virtual Private Network services to connect the universities with a redundant

network. The confidence of International forums like Asi@Connect and Asia Pacific Advanced Network [APAN] is also worth mentioning as they have placed their firm conviction in BdREN respectively through extension of scores of projects as grants and allowing BdREN to hold international conference. The hosting of the said conference immensely enhanced BdREN’s image. We certainly owe to all our partners who have contributed to the success and sustainability of BdREN.

To brief a few of our achievements in FY 2020-2021, I am proud to reveal that similar to the previous years the sum of our operating and non-operating revenue has exceeded the operating expense and a major portion of the generated surplus was used in meeting the capital expense. The downside of the revenue generation was that we had to bank on the non-operating revenue to generate this surplus. Our goal is to turn the operating revenue itself to surpass the operating expense through ramping up operating revenue and cutting down operating expense. I believe that we will be able to do it in the near future.

Successful hosting of 53rd event of APAN was a demonstration to both the national and international community that BdREN is an organization which is not far behind from the NRENs belonging to other developing and even the developed countries. This was the first time an APAN event was organized in “Hybrid” format which was a learning example for the future hosts. It is worth mentioning that in the overall maturity rating out of 14 NRENs from Least Developed and Middle Income economies across Asia-Pacific community, BdREN stood second which expresses the pace at which BdREN is surging ahead.

However, the standout achievement of the year came with our innovative planning as we could make our connectivity as the sole connectivity for the most of the public universities which are under special packages. This approach will enable UGC to save a huge sum of money because in yesteryears UGC had to allocate budget for the universities both for BdREN connectivity and for a few

other ISPs as backup. With the latest mode of connectivity, BdREN could provide the universities a solution with a network availability of 99.99% on a monthly average, which could instill enough confidence in the university authority to continue with BdREN as a sole connectivity provider.

In continuation with the previous year, as the apocalyptic pandemic raged through its devastation throughout the entire financial year, we could continue our support for the faculty members of the higher education community providing Zoom Application services at free of cost. As before, the appreciation and accolade of the community continued on pouring. The impact is vindicated through the number of BdREN membership which almost got 1.5 times during the financial year.

In the arena of content development our software team could come up with a number of fabulous milestones in terms of developing eFile System, NREN Maturity Calculator, the eCompendium for Asi@Connect and customization of Learning Management System for IER of Dhaka University. In the field of consultancy and design our achievements have been quite amazing. As an international consultant BdREN could win the bid of framing the second Asi@Connect Compendium. Moreover, in partnership with Lanka Research and Education Network [LEARN], BdREN orchestrated the maturity model and NREN Need Assessment model for the Asia-Pacific NRENs. Accomplishment of this specific activity has garnered accolades from other community members.

Also, BdREN continued its venture of designing a number of campus area networks for different public universities and also for College Education Development Project [CEDP] free-of-cost as a part of its Corporate Social Responsibility [CSR]. In addition to that BdREN could complete converting the WiFi network of the residential halls of a few of the public universities into Wired Network to enhance the quality of services. The same is under execution and planning phase for few others.

Considering a new arena of business to tread on, BdREN could successfully supply, install and commission the hardware for enriching the network and video conferencing system of a few of the universities during the financial year and a few are under process. This gives BdREN a new domain to work on.

In attaining grants from Asi@Connect project, right after the successful completion of the "Distance Learning" project, another BdREN proposal namely "Building e-Learning Infrastructure in South Asian Countries under TEIN [BeLISAC]" could earn the nodding of TEIN\*CC involving five (5) other countries with the mentorship and co-financing support of NORDUnet. In addition to that, another project involving "Capacity Development in Transmission System for NREN Engineers" involving participation of trainees from 10 different countries has been allocated.

I won't disagree that few failures were also experienced. The much-coveted college connectivity under CEDP is yet to get approval from the authority. The eFile system is yet to be officially introduced in the universities although it could earn the acceptance and praises from a few of the pilot users. We are still hopeful of introducing the system at a few universities in the upcoming year. The much-expected Higher Education Acceleration and Transformation project is yet to see its day-light, which is putting additional pressure on BdREN financing due to engagement of BdREN's investment in Capital Expense. In a way, this might become a blessing in disguise for BdREN as it is going to be a litmus test for BdREN's financial sustainability.

Besides the admitted failures, I reckon that it was a year of phenomenal successes for BdREN. As committed before, we still want to continue our horizontal and vertical expansions of our connectivity and services. Nevertheless, the enhancement of satisfaction of the member institutions will remain as our main objective. With support from the member institutes, stakeholders and the partners we intend to turn BdREN into a trendsetter for other NRENs to follow suit.

**- Mohammad Tawrit, CEO**  
Bangladesh Research and Education Network (BdREN) Trust



BdREN is pleased to offer its Annual Report 2021, after coming into operation at the expiry of HEQEP project. This year is marked by the achievement of successful hosting of APAN53. BdREN has recently set its target in achieving Network Availability of 99.99% for its members who are either protected at the last mile using VPN established through BTCL or who are connected with BdREN as a part of a ring network. Although it is difficult to ensure that BdREN can consistently maintain this highly optimistic target, yet the steps taken by BdREN in making its members' connectivity fully redundant have already earned significant customers' satisfaction, trust and reliance. In the period of July 2020 to June 2021, Nationwide Network Availability recorded was 99.79%, derived from 99.82% inside Dhaka and 99.76% outside Dhaka. The lower achievement of the availability was due to the fact that BdREN started its redundancy venture just a couple of months back and it will take some time to complete the process.

BdREN kept its promise of continuing both Horizontal and Vertical Expansion. We expanded our member institutes from 110 (July 2020) to 159 (July 2021). This number comprised of 40 Public Universities, 62 Private Universities and 57 Research Institutes/other Organizations. On another dimensioning scale, out of these total 159 Members, 102 are full members (Universities), 51 are Associate members (Research Institutes and other Higher Educational Institutes), 3 are Affiliated members (other organizations) and rest 3 are Industry members.

On Vertical Expansion part, we introduced GPU services during this year. eFile application software, which is very flexible and customizable to meet users' demand, was made available for our Member Institutes. We also introduced, Customized LMS, eduroam, Federated Identity, eduGAIN, and Video Conferencing & Smart Class-room solutions.

Right policy making by the BoT members, receiving enough freedom & timely support from the policy makers, and extraordinary support from PGCB & BTCL helped BdREN achieve customers' satisfaction and financial sustainability. PGCB and BTCL provided support in the form of allocation of fiber and delivery of IP Transit Service at a much cheaper cost respectively. Asi@Connect and Tsinghua University, China extended their full support offering grants to undertake different research and development projects. Operational Excellence in BdREN could yield an operational surplus

that allowed BdREN to invest on its CapEx.

In this year, BdREN has redefined its Vision, Mission, Values, and Objectives. We have focused on earning trust, confidence and credibility from the institutions in research/education sector through customer-oriented work-practices, positive attitude, transparency, collaboration, innovation and overall respect to all outside and inside stakeholders.

Last year, BdREN's flagship activities included: a) Expanding its eduroam network that facilitates global and national internet roaming services in educational institutes free of cost; b) Bringing educational institutions gradually into Federated Identity services by connecting them to locally deployed TIGERfed and connecting to global eduGAIN network which is ensuring that the institutions can avail all TIGERfed services like LMS, OwnCloud, Integrated Zoom and full suite of eduGAIN services through single sign-on; c) Developing and Deploying eFile System in few Universities on pilot basis; d) Deploying & Maintaining Smart classroom/ Distant Learning Theaters; and e) deploying Learning Management System for Gender and Inclusive Pedagogies (GIP) project in IER, DU.

Apart from BdREN's flagship activities, there were a few standout achievements for BdREN. Hosting APAN53 successfully in hybrid fashion is definitely one achievement that BdREN is proud of. BdREN's capability, demonstrated in hosting the event, also brightened the face of Bangladesh to other participating countries.

Secondly, BdREN and its member institutes could grab 5 out of 21 awarded projects by TEIN\*CC under the latest "Call for Proposal" in its fifth edition, which is a substantial achievement. It is by far the highest among all participating countries.

Apart from flagship activities and standout achievements, we are proud to put forward some of our regular activities that have huge contributions to the country and the society.

One such contribution is facilitating Research activities through offering Virtualization and Computing Services to Researchers. From the University of Dhaka - Department of Biochemistry and Molecular Biology, Department of Physics, Department of Computer Science and Engineering, Department of Electrical and Electronic Engineering, Institute of Information

Technology, From BUET - Institute of Information and Communication Technology, From Asian University of Bangladesh - Department of Computer Science and Engineering and some other Departments/Institutes have produced some outstanding research outcomes in their doctoral and post-doctoral curricula, using our Virtualization and Computing Services

Secondly, BdREN, in cooperation with NORDUnet and Asi@Connect, offered significant support to researchers and educationists by providing premium Zoom licenses at free-of-cost, that made the Distance Learning and Distance Video Conferencing possible. The trend continues even after recession of the COVID pandemic. At present the total Zoom users under BdREN is around 27,000. During July 2020 to June 2021 timeframe, our Zoom service was used in 171 institutes to conduct 1.3m online classes covering a duration of 1.7m class-hours.

One of the services with which BdREN dominates in the market is local and international consultancy. In the field of local consultancy, BdREN did a number of surveys and designs on Campus Network and deployed campus networks at a few campuses. BdREN has extended this consultancy service to CEDP (College Education Development Project) as well for connecting 120 colleges under National University and in designing the campus network in a number of colleges. Last year, BdREN converted WiFi network into wired network for improving internet services in densely populated residential halls of a few public universities which resulted in noteworthy satisfaction among the students. Also, BdREN has supplied, installed and commissioned hardware for video conferencing facility for few other universities and medical colleges.

As mentioned, BdREN's consultancy services are not limited within the national boundary, rather BdREN has stamped its foot-mark on international arena. BdREN has been regularly contributing to the whole NREN community; developing and deploying NREN maturity model in cooperation with LEARN (Sri Lanka's REN) is one such evidence. The target was to assess the needs of different NRENs. The consultants from BdREN and LEARN prepared the NREN maturity model by which overall ranking of the NRENs can be assessed. It is a matter of utmost pride that BdREN secured second position among 14 NRENs in Asia-Pacific region in the ranking generated by this model.

Another contribution in the arena of international consultancy was framing the Asi@Connect Compendium

2020. BdREN prepared the Asi@Connect Compendium, encompassing the data collected through survey from the NRENs across the Asia-Pacific community. The said Compendium furnishes a clear insight on the current status and development of research and education network in Asia-Pacific region and beyond. It is worthy to be mentioned that following the example of GÉANT, BdREN has developed the electronic version of the Compendium which shows the dynamic landscape of the present status of NRENs.

After completing facilitating Distance Learning using Digital Conferencing facility [fDLuDCf] project under the umbrella of Asi@Connect, BdREN is continuing its commitment towards facilitating online learning program for the community through its follow-up project named Building eLearning Infrastructure in South Asian Countries under TEIN [BeLISAC].

As part of supporting lesser developed NRENs, BdREN has made a unique venture in providing Video Conferencing Services of Nepal Research and Education Network by hosting the Multi-Media Router (MMR) Servers of Zoom Application in the BdREN Data Center platform. This stands out as the first instance of sharing Data Center facilities in this region.

As BdREN expanded its services both horizontally and vertically, the usage of services has also increased which is reflected in the growth of its traffic usage.

Research Traffic increased by 229% from July 2020 to June 2021 (from 147 TB to 484 TB). Commodity Traffic increased 78% (from 2504 TB to 4448 TB). The internet bandwidth increased from a figure of 8Gbps to 14Gbps. BdREN's eduroam services recorded 7,670 local users' login and 5,057 international visitors' login in the above-mentioned timeframe.

In Cloud Computing part, CPU usage rose up to 694 GigaHertz and Memory usage surged up to 2962 GigaByte in June 2021.

Several Network Expansion initiatives were taken during the reported timeframe. Tender has been floated to connect additional nine (9) universities, both Public and Private, to get connected to BdREN. The Server Farm and Storage facility have been expanded by a significant margin. Many of the universities' connectivity with BdREN have been upgraded from 1Gbps to 10Gbps. A plan is underway to connect BdREN with its upstream provider using 40Gbps

interface.

Besides network expansion in the form of capacity & coverage and improvement in its quality, BdREN felt the need of its human resource development, both on functional level and on soft-skill. Several soft-skill sessions were arranged on topics like: Leadership, Attitude, Communication skill, Problem-solving skill, Decision-making skill, Respectfulness, Ownership, Responsibility, Delegation, Empowerment, Prioritization and Deadline maintenance internally to shape the attitude of BdREN employees. Having employees with high skill and right attitude, BdREN is pledged to create a revolution in the industry which will lead to increase its members' satisfaction and loyalty.

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# BdREN **INTRODUCTION**

## A BRIEF

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BdREN is a state-owned autonomous 'Trust' engaged in creating a research-friendly digital environment for faculty members and students, primarily in the higher education sector; through supporting them with high speed internet/data connectivity and over-the-top application services including, but not limited to, virtualization and cloud computing, network services like DNS, Web and email, Video Conferencing Service, Learning Management System, eduroam and federated services, colocation, hosting, disaster recovery, capacity development, consultancy and research grants. As a continuation of Higher Education and Quality Enhancement Project (HEQEP), since 2019, BdREN has been relentlessly striving for bringing a qualitative change in the Research and Education sector of Bangladesh in cooperation with other NRENs across the globe and in collaboration with relevant entities in Bangladesh, especially Power Grid Company of Bangladesh and Bangladesh Telecommunications Company Limited. At the same time, it is maintaining a very close relationship with University Grants Commission of Bangladesh (UGC) and Ministry of Education (MoE).

# UNIQUENESS OF BdREN

## Connectivity with Global NRENs

All the NRENs across the globe are connected through respective regional RRENs (RRENs) with a high speed and high quality pseudo-public network connectivity.

## BdREN provides 'eduroam' services

Educational Roaming (eduroam) service offers users to access internet connections free-of-cost from anywhere in the world.

## BdREN offers High Performance Computing (HPC) Facility

BdREN facilitates its esteemed members with Infrastructure as a Service (IaaS) in the form of virtual machines comprised of CPU, RAM, Storage and GPU.

## Arranging Research Fund and Training under Asi@Connect project

Asi@Connect, a conglomerate of 28 NRENs from 24 countries under Asia-Pacific region, releases funds for different research projects targeting benefits of the community.

## State-of-the-art Video Conferencing, Event Broadcasting and Live Streaming

BdREN facilitates conducting online meetings, seminars, workshops, training programs, classes and exams at free of cost for its member institutes.



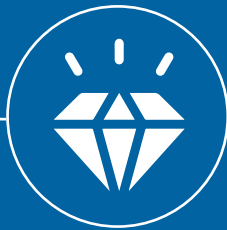
## VISION

To establish BdREN as the default 'home of choice' for all the Bangladeshi researchers and Educationists in serving their needs.



## MISSION

To establish BdREN as one of the iconic NREN brands in terms of helping researchers and educationists in doing their research, through access to quality network, applications and contents while addressing their needs in an agile, innovative, collaborative and caring manner.



## VALUES

### Customer Oriented

All our thoughts and actions are directed to satisfy our existing and potential customers.

### Trustworthy

Transparency and Commitment are key to our behavior for earning trust from employees, customers and stakeholders.

### Integrous

Integrity is inseparable part of our character in every situation.

### Respectful

High regards for all customers as well as external and internal stakeholders.



# CULTURE

## BdREN General

## BdREN Leadership

Positive Attitude	•	Empowerment
Innovation & Creativity	•	Egalitarian
Team-Work	•	Encourage Diversity
Going-Extra Mile	•	More Support than Dictate
Ownership	•	Openness
More Listening than Speaking	•	Lead by Example

Building and Operating a high bandwidth, high quality network

Delivering network excellence capitalizing on the latest technologies

Providing cost-effective & best in class applications and services through economies of scale

# Objectives

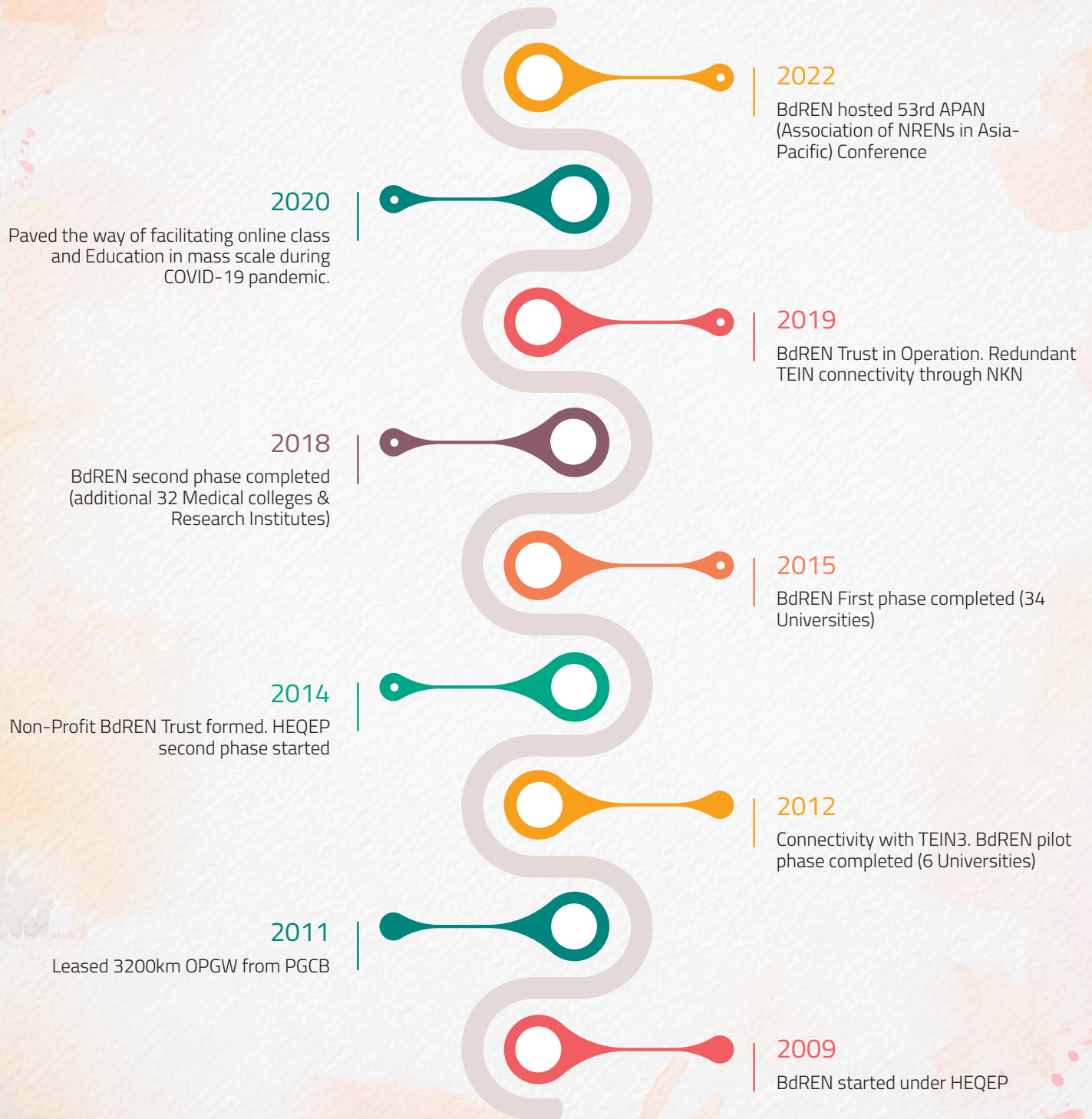
Attracting NRB scientists, engineers and researchers working in different disciplines across the world

Connecting to international RENs, such as APAN, Internet2, GEANT through TEIN Network and participating in world-wide REN associations, initiatives and forums

Fostering innovative and stimulating work environment

Ensuring financial sustainability

# Our History





## OUR BOARD

BdREN is being operated as a state-owned non-profit autonomous Trust with a board of trustees consisting of representatives from the Universities, UGC, MoE, and other members co-opted for their expertise and position in relevant industries.



**Prof. Dr. Kazi Shahidullah, Chairman**  
University Grants Commission of Bangladesh, and  
Chairperson, BdREN Trust



**Professor Dr. Dil Afroza Begum, Member**  
University Grants Commission of Bangladesh, and  
Vice-Chairperson, BdREN Trust



**Prof. Dr. Muhammed Alamgir**

Member, University Grants Commission of Bangladesh,  
and Member, BdREN Trust

Although I have been on board with BdREN's policy making team very recently, yet I have been involved with the activities of BdREN for long since 2009, the starting time of establishment of Bangladesh Research and Education Network (BdREN), an initiative taken by the University Grants Commission of Bangladesh through Higher Education Quality Enhancement Project (HEQEP). The formation of BdREN is a milestone in establishing virtual network among the higher educational and research institutes of Bangladesh within themselves and beyond. During the COVID-19 pandemic period, BdREN performed an outstanding job providing uninterrupted online connectivity to its members without increasing the subscription fee. There is no doubt that BdREN has

achieved trust in providing quality services in the recent time and is surging forward with new ideas and services, but there is no room for complacency. In this cut-through market, BdREN focussing on its long term sustainability needs to augment the quality of its offered services to the best satisfaction of its members and at the same time BdREN should persistently strive to crop up with innovative services which will be beneficial and attractive to its members.

I wish BdREN phenomenal success in its future endeavors.

BdREN played a vital role in ensuring virtual meetings and online classes during COVID-19. The service extended by BdREN was very relevant and timely based on the socio-economic, administrative and academic needs of Bangladesh. I am optimistic that the rendered service would be more effective, productive as well as conducive in our respective working places in future.



**AKM Aftab Hossain Pramanik**

Additional Secretary, MoE and Member, BdREN Trust



**Prof. Dr. Shahid Akhtar Hossain**

Vice-Chancellor, Eastern University (EU) and  
Member, BoT, BdREN Trust

BdREN is moving forward at an amazing pace and has already established itself as one of the highest ranking NRENs in the Asia-Pacific community. Among the services being offered by BdREN the quality internet services across the country, the computing and storage services and facilitating distance learning services are worth mentioning. BdREN's provided computing and storage services was utilised during the recent university cluster admission for the agricultural universities to the fullest satisfaction of the beneficiaries and the stakeholders which could garner wide appreciation for BdREN. I wish BdREN will add on more applications targeting the academicians and students to serve the community even better and thus thrive in the industry.

BdREN is now a popular and essential name in every higher educational institution. BdREN is playing a pivotal role in the progress of digital Bangladesh and has opened a new horizon in the process of meeting the challenges of 4IR.



**Prof. Dr. Md. Shahidur Rashid Bhuiyan**

Vice-Chancellor, Sher-e-Bangla Agricultural University,  
and Member, BoT, BdREN Trust

I would like to thank BdREN for their excellent service in facilitating and promoting online education and research works especially for their contribution during COVID-19 pandemic when face-to-face educational activities were disrupted. Moreover, due to their timely intervention it had been possible to continue the works of all educational stakeholders in a more effective way during pandemic time and stay connected with each other. The quality service of BdREN is playing a very significant role in developing educational resilience among all the relevant stakeholders. I believe that the scope and contribution of BdREN in the areas of technology enabled education and research will keep flourishing in the future.



**Prof. Dr. Md. Forhad Hossain**

Vice-Chancellor, Mawlana Bhashani Science and Technology  
University (MBSTU) and Member, BoT, BdREN Trust

I am proud to be involved with BdREN as it focuses on the digital transformation of the universities in serving the higher education students, faculties and researchers. BdREN is pioneer in distance learning program with its well-equipped facilities including Zoom Application as well as Distance Learning Theaters. I further appreciate BdREN's exclusive strategy of focusing on providing a quality campus network in the universities which is the cornerstone for the beneficiaries to enjoy BdREN services to their fullest satisfaction. I sincerely hope that BdREN will continue their good work in this regard and thereby not only take the higher education sector of the country to a new height, but also become a trendsetter for other NRENs in the global community in coming years.



**Prof. Dr. Swadesh Chandra Samanta**

Vice-Chancellor, Patuakhali Science and Technology University (PSTU) and Member, BoT, BdREN Trust



**Prof. Dr. M. Kamruzzaman**

Vice-Chancellor, Hajee Mohammad Danesh Science and Technology University (HSTU) and Member, BoT, BdREN Trust

Bangladesh has adopted a people-centered development approach under the visionary and dynamic leadership of Honorable Prime Minister Sheikh Hasina as envisioned by the Father of the Nation Bangabandhu Sheikh Mujibur Rahman. In this context BdREN has been established as a high-performance data communications network providing company among higher education and research institutes in both public and private sectors. I am delighted to notice that BdREN has been discharging its responsibilities since 2009 in a very effective way.

I wish BdREN a rousing success in the days ahead.

BdREN has successfully embedded the concept of sustainability into research and innovation for continuing development of network excellence between the academics and students of Bangladesh and international academic community. I extend my best wishes to the BdREN contingent for their concerted efforts in preparing the Annual Report 2021.



**Prof. Dr. Qumrul Ahsan**  
Vice-Chancellor, University of Asia Pacific (UAP)  
and Member, BoT, BdREN Trust



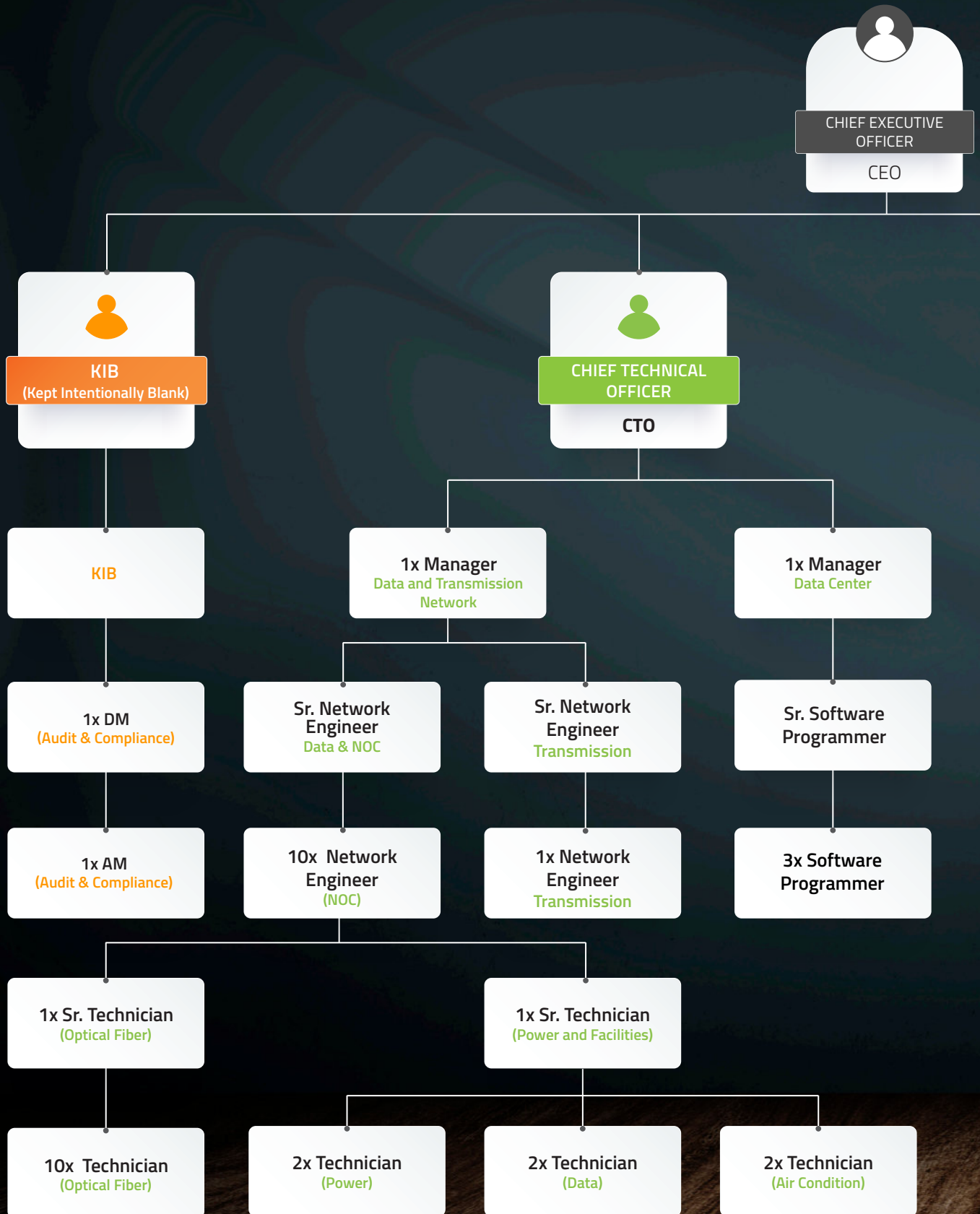
**Prof. Dr. Md. Ismail Khan**  
Vice-Chancellor, Chittagong Medical University and  
Member, BoT, BdREN Trust

We are aware about today's diverse and interdependent world. 21<sup>st</sup> Century Learning is based on the essential skills, knowledge and dispositions that learners need to succeed as citizens and workers in today's world.

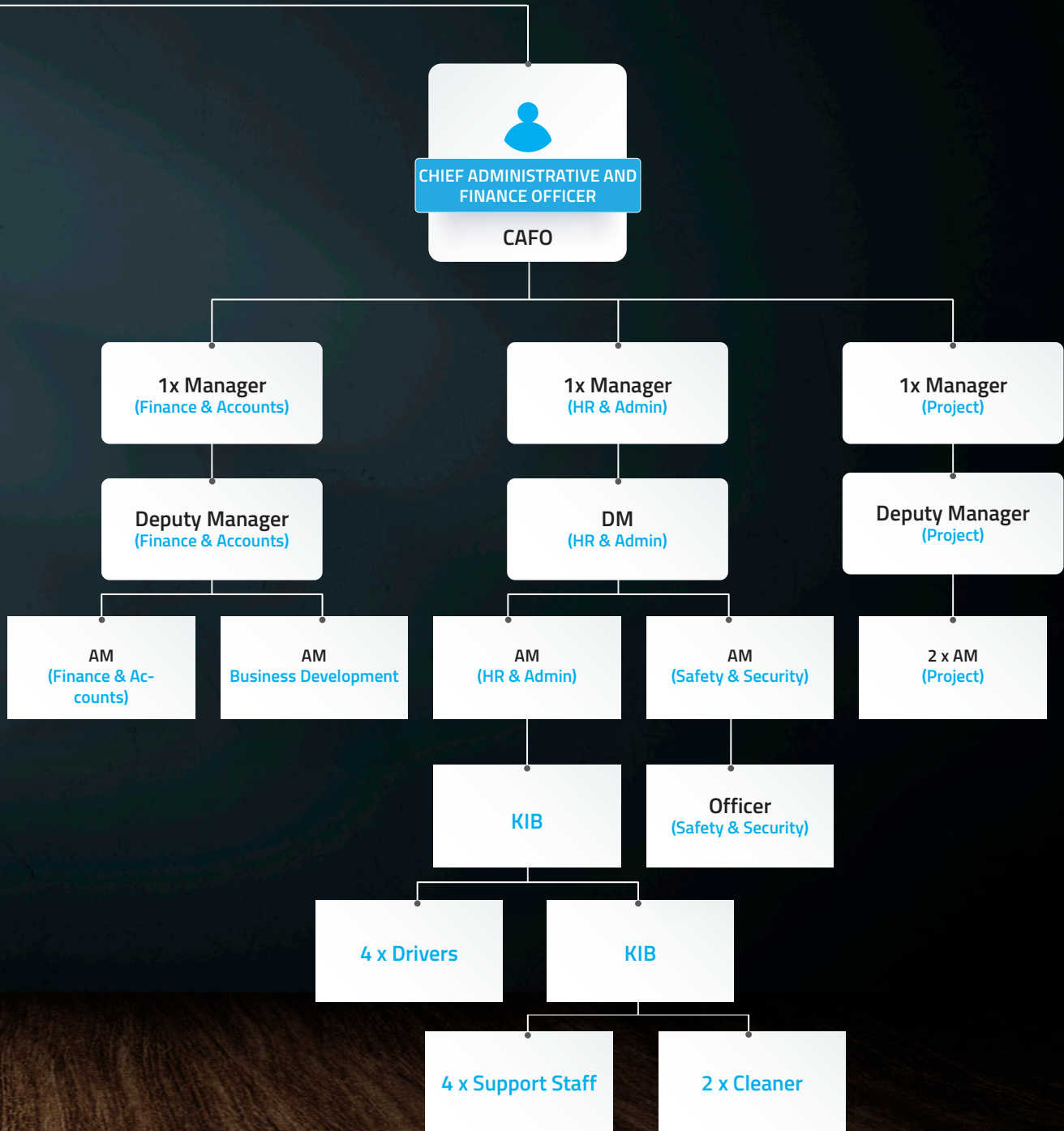
Developing learning skills encompass communication, collaboration, critical thinking and creativity. Networking allows to exchange information which ensures communication & collaboration among academics & institutions of our country. And BdREN is playing the role for establishing the network for ease of communication and strengthening the collaboration.

Appreciate BdREN for its amazing contribution in making things happen in the research and education sector.

# Bd ORGAN



# REN ORGAN





## OUR TEAM

BdREN team, comprised of skilled Engineers & Administrators and led by its Chief Executive Officer, discharges strategic and operational oversight of the network. They are responsible for the day-to-day operation and maintenance of the network and are accountable to the Board of Trustees.



**Mohammad Tawrit**  
**CEO**  
 Field of Expertise: Communication Technology



**Dr. Mohammad Farooq Ali Tarafder**  
**FCMA, ACS**  
**CAFO**  
 Field of Expertise: Finance, Accounting and Taxation



**Ekhlas Uddin Ahmed**  
**CTO**  
 Field of Expertise: Network Optimization, Process Optimization, E2E Service Management



**Biplab Chandra Mahanta**  
**Manager (HR & Admin)**  
 Field of Expertise: HR, Admin & Finance



**Md. Ariful Islam**  
**Manager (Data & Transmission Network)**  
 Field of Expertise: Data and Transmission Network



**Khandakar Rashedul Arefin**  
**Manager (Data Center)**  
 Field of Expertise: Data Center and Virtualization



**Md. Sajidul Islam**  
**Sr. Network Engineer (Data&NOC) (Study Leave)**  
 Field of Expertise: Communication System



**Alam Ahamed**  
**Sr. Network Engineer (Transmission)**  
 Field of Expertise: DWDM & Transmission System



**Md. Sajal Biswas**  
**Network Engineer (Transmission)**  
 Field of Expertise: Data and Transmission Network



**Shamim Ahmed**  
**Network Engineer (NOC)**  
 Field of Expertise: Data Network System



**Jamilur Rahman**  
**Network Engineer (NOC)**  
 Field of Expertise: System Admin & Cloud Virtualization



**Kamrul Hasan Shakil**  
**Network Engineer (NOC)**  
 Field of Expertise: Data Network, Designing Campus Network, Network Operation



**Md. Ariful Islam Arman**  
**Network Engineer (NOC)**  
 Field of Expertise: Virtualization,  
 System Administration



**Abu Naser Md. Nafew**  
**Network Engineer (NOC)**  
 Field of Expertise: Video Conferencing and e-Learning, IAM



**Anup Kumar Malakar**  
**Network Engineer (NOC)**  
 Field of Expertise: Data and  
 Transmission Network



**Md. Nazmus Sakib**  
**Network Engineer (NOC)**  
 Field of Expertise: Data and  
 Transmission Network



**Nazim Uddin Tuhin**  
**Network Engineer (NOC)**  
 Field of Expertise: Data and  
 Transmission Network



**Md. Masud Rana**  
**Network Engineer (NOC)**  
 Field of Expertise: Data and  
 Transmission Network



**Md. Inzamal Islam**  
**Network Engineer (NOC)**  
 Field of Expertise: Data and  
 Transmission Network



**Amitosh Gain**  
**Software Programmer**  
 Field of Expertise: Software Engineering and Database



**Punam Chowdhury**  
**Software Programmer (Study Leave)**  
 Field of Expertise: Software  
 Development



**Satta Sundar Talukder**  
**Software Programmer**  
 Field of Expertise: Software Development, Database and System Design & Administration, Data Structure & Algorithm



**Latifur Rahman**  
**Software Programmer**  
 Field of Expertise: Software  
 Development



**Khadizatul Kubra**  
**Asst. Manager (Finance & Accounts)**  
 Field of Expertise: Finance And  
 Accounting



Mohammad Imam Hosen  
Asst. Manager (HR & Admin)  
Field of Expertise: HR And Admin



Tanjum Tamanna  
Asst. Manager (Finance & Accounts)  
Field of Expertise: Finance And Accounting



Md. Imranur Rahman  
Asst. Manager (Business Development)  
Field of Expertise: Marketing



Md. Abdul Jalil  
Sr. Technician (Power & Facilities)  
Field of Expertise: Power System



Md. Asaf-Ud-Dowla Shamrat  
Sr. Technician (Optical Fiber)  
Field of Expertise: Optical Fiber



Md. Atiqur Rahman  
Technician (Data)  
Field of Expertise: Data and Transmission Network



MD. Kawsar  
Technician (Optical Fiber)  
Field of Expertise: Optical Fiber



Md. Mamun Hossain  
Technician (Optical Fiber)  
Field of Expertise: Optical Fiber



Md. Nesaruddin  
Technician (Power)  
Field of Expertise: Data and Transmission Network



Md. Sohel Chowdhury  
Technician (Optical Fiber)  
Field of Expertise: Optical Fiber



Md. Masudur Rahman  
Technician (Power)  
Field of Expertise: Power System



MD. Aminul Islam Amin  
Technician (AC)  
Field of Expertise: Air Conditioning System

# FLAGSHIP ACTIVITIES



# EXPANSION IN EDUCATIONAL ROAMING (eduroam) SERVICES

Being a national research and education network operator, BdREN has been steering educational roaming (eduroam) service in Bangladesh since October 2017. BdREN has been continuously expanding this service, both horizontally and vertically, respectively by adding new institutes under its belt and offering additional benefits and opportunities to the community. Using eduroam service, Bangladeshi students, researchers, faculty members and staff from participating institutes are able to obtain free-of-cost, secure WiFi roaming access when visiting other national and international participating institutes by simply opening their laptops or turning on their smart phones. Starting

from the last quarter of 2021, altogether twenty (20) universities containing 2000+ Access Points (APs) across the country have been covered under eduroam services with Institutional Radius Servers (IRSs) configured at each university campus. Following the hierarchy of upstream connectivity, BdREN established connectivity from its configured National Radius Server (NRS) with TLRs in Asia-Pacific region located in HARNET at Hong Kong and AARNet at Australia.

## INTRODUCING IDENTITY FEDERATION SERVICE AND JOINING eduGAIN

BdREN deployed TIGERfed as its Identity and Access Federation for educationists and researchers with integration of plethora of applications like Zoom, Moodle and OwnCloud. Any member institute of BdREN can come forward and join as Identity Provider (IdP) for enjoying the benefits to be offered by the Service Providers. At the same time any organization can join the federation as Service Provider (SP) if it intends to offer any useful application. As soon as an organization joins TIGERfed as Identity Provider, all users under that organization starts getting the benefits to be offered by the Service Providers.

TIGERfed has also attained the membership of eduGAIN [educational Global Authentication Infrastructure Network] that interconnects the participating identity federations worldwide. Users of TIGERfed can access all other services provided by all other federations connected to eduGAIN across the world. eduGAIN is a framework which provides an infrastructure for establishing trusted communications between identity providers and service providers in different participating federations. End-users are authenticated at identity providers and obtain access to services offered by service providers regardless of their locations across

### The benefits of Identity Federation:

- Enhances enterprise security
- Reduces operational cost and complexity
- Improves user experience
- Improves allocation of resources

the globe. Becoming a member of TIGERfed, any Identity Provider or Service Provider can collaborate with other identity federations world wide.

# DEVELOPMENT OF ELECTRONIC FILE (eFILE) APPLICATION

In this digital era similar to other developing nations, most of the organizations in our country have been facing the challenges involved with the manual and paper-based filing system; Such challenges include the enormous volume of documents which take costly space to store; the wastage in terms of working hours for searching documents; and sufferings from lack of mobility, efficiency, confidentiality and security. Above all, the lack of mobility issue creates the prime obstacle in doing the “home office” which is the order of the day.

To surmount those challenges, BdREN software team has developed an electronic filing system on its own at the shortest possible time right after the pandemic jolted the globe and at a time BdREN was forced to move to the mode of “Home Office”. The File Management software named “eFile” was designed in a way not only to cater to the demands of BdREN itself, but also with the vision

of extending it to the universities and other BdREN member institutions if similar needs are evolved. The “eFile” application had a significant impact in converting the modality of BdREN office from “physical” to “online” turning “home-office” into a reality during the peak of the pandemic. However, once the traditional office commenced with the recession of the pandemic, even then the “eFile” system was found equally beneficial and completely replaced the traditional “pen and paper” filing system. At the moment, BdREN is trying to translate its dream into reality by customizing the application responding to the demands of the universities and offering the customized ones to the universities for their usage. A copy of the fully customized eFile system tailored in accordance with the demands of the university authority has been deployed at Bangladesh University of Engineering and Technology (BUET) on “pilot” basis.

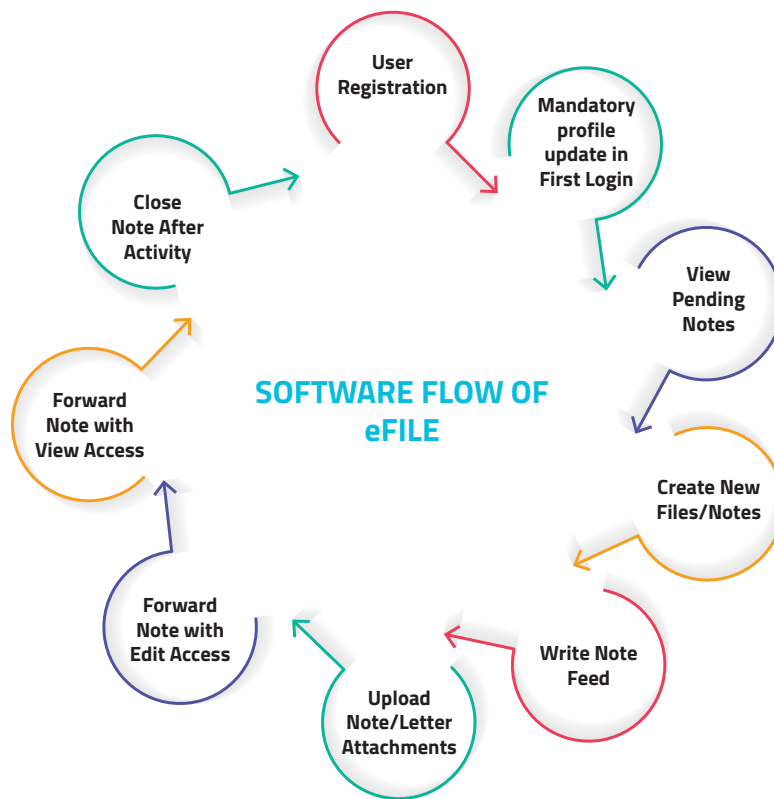


Figure 1: Software flow of eFile

# DESIGNING AND INSTALLATION OF SMART CLASSROOM AND VIDEO CONFERENCING SYSTEM

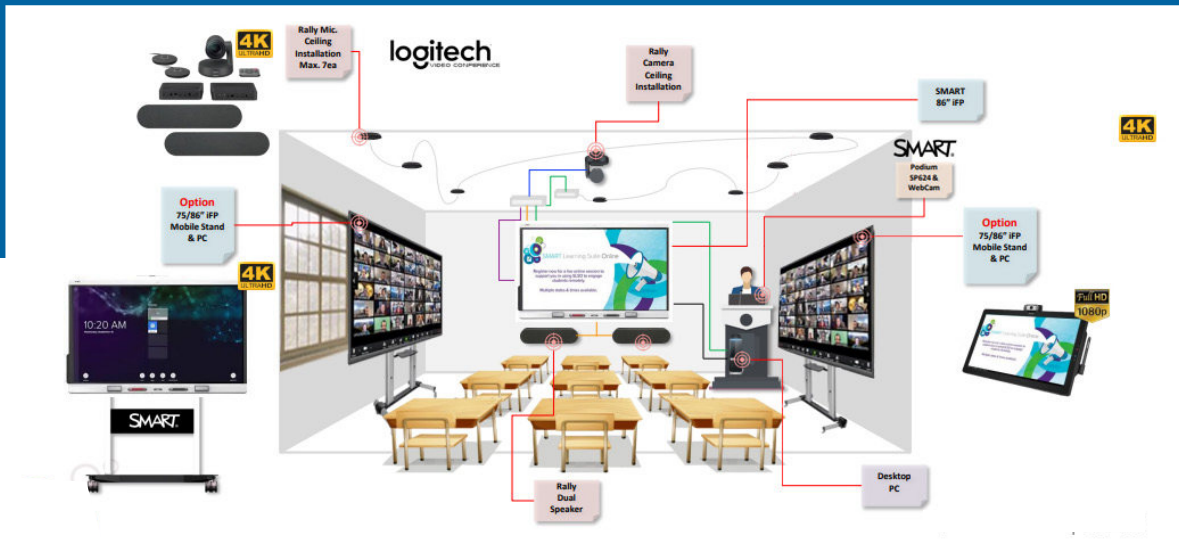
Advancement in Information and Communication Technology field has resulted in a fabulous impact in the “mode of delivery” of the higher education and has enabled the teachers and students in enhancing their capabilities in teaching, learning and research activities. Provision of smart classrooms is one such facilities that has improved the qualities of teaching and learning and at the same time it has made the mode of delivery flexible, innovative and enjoyable.

BdREN established Distance Learning Theater (DLT) at 34 public Universities, 12 Medical Colleges and 3 Private Universities. It has also established Distance Collaboration Center (DCC) at 10 Research Institutes. DLTs and DCCs are fully equipped with state-of-the-art video conferencing technology. It enables the students, teachers and researchers to share and participate in remote live and recorded classes and conferences to disseminate knowledge and experience both across the country and across the world. The codecs which are installed in the DLTs and DCCs, communicate with the core

video conference application system installed at Data Center (DC) at UGC and Disaster Recovery Center (DRC) at BUET.

During the global outbreak of the pandemic, online learning had been the only solution available. It is expected that once the fallout of the pandemic lets up, the benefits in “online” learning modality due to its flexibility will keep on encouraging the teachers and the students to continue the same - mostly in “blended” format. In this case, DCCs and DLTs will play a vital role.

Smart Classrooms are highly popular among the faculty members and the students. During online class, they enjoy the facility of accessing the Internet, using electronic resources, online course management tools, and other curriculum related materials. Smart classrooms integrate voice-recognition, computer-vision, and other modern technologies, collectively referred to as intelligent agents, to provide a distance-education experience similar to a traditional classroom experience.



Due to its high demand among the universities, BdREN has been engaged in designing state-of-the-art smart classrooms for a number of universities where students and teachers can participate in the classes either by being physically present inside the classroom or through online.

# LEARNING MANAGEMENT SYSTEM (LMS)

A learning management system (LMS) is a software application for the administration, documentation, tracking, reporting, automation, and delivery of educational courses, training programs, or learning and development programs. BdREN provides different learning management platforms to its esteemed members using varieties of opensource learning management systems.

## BdREN LMS Services

Providing computation and storage resources for hosting the application

Customization of the application in accordance with user needs

Development of Themes and plugins

Ensuring Data Loss Prevention through backing up of contents Installation and commissioning

Installation and commissioning

Delivery of training and instructions on the usage, operation and management of the application

# STANDOUT ACHIEVEMENTS





# HOSTING APAN53

## MAIN EVENT

Asia-Pacific Advanced Network (APAN) refers to both the organization representing its members, and to the backbone network that connects the research and education networks of its member countries/economies to each other and to other research networks around the world.

APAN organizes two meetings each year where its members and other interested participants come together in working groups, BoFs, committees, plenary sessions, and other meetings to review progress, demonstrate advances in technology and applications, and make plans for the future activities. The meeting venues are being changed regularly so that various APAN members can spread awareness among the NREN officials, stakeholders and policy makers.

While APAN Board offered BdREN to host APAN53 event online, BdREN took it as a matter of pride and privilege.

Considering the level of the pandemic, BoT unanimously decided to host the event online. However, to keep the flavor of an onsite event, it was planned to organize the event in “Hybrid” mode rather than making it fully “online”. After threadbare discussion with APAN Program Committee, it was finalised that the inaugural event would be accomplished in “hybrid” mode where designated local participants would be physically present at the venue and others, including the overseas participants, would join online. Other events were planned to be fully “online”. The schedule of the program was fixed from 07-11 March 2022 and the opening ceremony was decided to be held on 08 March 2022. The venue for the opening event was selected as the Nabab Nawab Ali Chowdhury Senate Bhaban, University of Dhaka. The Honorable Minister, Ministry of Education was invited to grace the inaugural session as the “Chief Guest”.



### *The event comprised of:*

- ▶ INAUGURAL CEREMONY
- ▶ KEYNOTE SPEECHES: 6
- ▶ WORKGROUP MEETINGS: 42
- ▶ TRAININGS/WORKSHOPS: 11
- ▶ OTHER MEETINGS: 2
- ▶ GENERAL ASSEMBLY

In the inaugural ceremony more than 150 participants were present in-person and around 100 participants joined virtually.

Dr. Dipu Moni MP, Honorable Minister, Ministry of Education graced the grand inauguration ceremony as the "Chief Guest". Mr. Mohibul Hassan Chowdhury MP, Honorable Deputy Minister, Ministry of Education was present as the "Special Guest" and Prof. Dr. Md. Akhtaruzzaman, Honorable Vice-Chancellor, University of Dhaka delivered his video message as "Guest of Honor". The inaugural ceremony was presided over by Prof. Dr. Kazi Shahidullah, Chairman, University Grants Commission of Bangladesh and Chairperson, BdREN Trust. Prof. Dr. Dil Afroza Begum welcomed the audience.

The keynote speeches which were delivered in the conference addressed few burning issues like environmental challenges, outcome based Education, Blended Learning, Smart Agriculture, Financial Technology and Digital Earth Technology. The keynote speeches were delivered by renowned scientists and researchers residing in Bangladesh and outside world.

Other than the keynote speeches, the event had trainings as well as workgroup and other meetings which supposedly proved to be immensely beneficial to the community. The event was wrapped up through a General Assembly with the next host CERNET taking the charge of hosting the APAN54 event.

## **PRE-EVENT PRESS CONFERENCE**

A pre-event press briefing was held on 05 March 2022 Saturday from 11:00am-12:30pm at UGC Auditorium where Prof. Dr. Dil Afroza Begum, Vice-Chairperson, BdREN and Convenor, LOC, APAN53 gave a brief of the session and replied to the various queries from the journalists.

Prof. Dr. Humayun Akhter, Vice-Chancellor, Bangladesh Open University (BOU) and Convenor, Press & Media Committee and BdREN officials were present in the press briefing along with journalists from both electronic and press media.



## OUTCOME

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The main outcome of the six-monthly APAN events is to update the participants about the development of technologies among the NRENs. Also, it pans out the upcoming technologies and their benefits. Considering that aspect APAN53 was definitely a phenomenal success.

The secondary goal of hosting the APAN events is to create awareness among the members of the host NREN, its stakeholders and its policy-makers about the benefits of having an NREN in the country. BdREN could assemble many of its members in registering and participating in the very event. Moreover, the stakeholders and policy-makers were literally bemused by BdREN's capability in

organizing the grand inaugural event. This could transcend a message about the technical capability of BdREN which might attract the investors in putting their money for the betterment of BdREN.

Another critical outcome was to earn the confidence of the APAN Board. The way BdREN took the challenge of hosting the event in "Hybrid" mode for the very first time in the history of APAN, could convince APAN that BdREN is well capable of hosting an in-person event in future. In near future, BdREN can propose organizing an in-person event which will uplift the image of BdREN to its community.

## UTILIZATION PLAN OF THE OUTCOME

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The widespread proliferation of the success of this event may help BdREN in its drive to make its horizontal and vertical expansion of services among its existing and potential members.

The success in organizing the event lies in the fact that it could spawn a great deal of coordination and cooperation from different committees formed through participation of university faculty members, representatives from the industry, stakeholders and policy makers. In the end, a cordial rapporteur could be built among the committee members. BdREN believes that in future this will act as a huge strength for BdREN.

The successful hosting of APAN53 has brought BdREN representatives at a very close proximity with the APAN Program Committee and APAN Technical Committee members. Obviously, this amicable relationship might create future opportunities for BdREN. APAN Program Committee has already incorporated CEO, BdREN as its member which has created the opportunity for BdREN to raise its voice to ventilate its needs.

Moreover, BdREN is actively considering organizing an "in-person" event in very near future. It is believed that through hosting an "in-person" event BdREN will be able to enhance its image by a big margin.

## LEARNING FROM THIS EVENT

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The main challenge of hosting such an online international event is to manage the session considering widely varying time zones across the world. Although all the keynote sessions which BdREN was in charge of, could be delicately managed, yet there is no doubt about the accompanying challenges faced in doing so.

The participation of the attendees in the sessions, particularly in the plenary sessions, was not that

encouraging. The organizers should give an in-depth look to figure out the causes of such apathy and address the same.

It was learnt from the event that in selecting the keynote speakers, the organizers should be judicious enough. High profile persons who don't have enough time should not be nominated as the speaker rather they can adorn the session as Chair.



# SUCCESS OF BdREN AND ITS MEMBER INSTITUTES IN ASI@CONNECT'S CALL FOR PROPOSAL-5 [CFP5]

It is a matter of utmost pride and pleasure that in the announced results under "Call for Proposal-5 [CFP5]" by TEIN\*CC, out of 21 awarded projects, BdREN and its member institutes could grasp five (5) against their names. Here is the brief of the success story under different Work Packages (WP2-WP6) in CFP5:

**Table 1: Number of Awarded Projects under different Work Packages in CFP5**

Name of Packages	Number of Packages Awarded	Packages Awarded to BdREN	Packages Awarded to BdREN's members
WP-2	3	1	2
WP-3	2	0	1
WP-4	5	0	0
WP-5	9	1	0
WP-6	2	0	0
Total	21	2	3

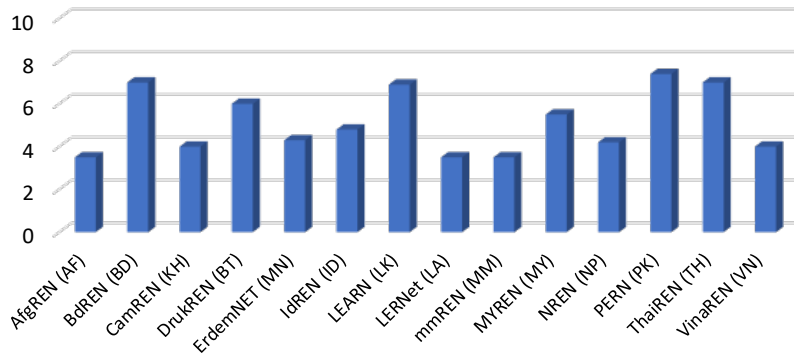
It is observed that the success rate of Bangladesh is around 24% which is quite heartening. Not only that, in many of the proposals, BdREN and its member institutions have emerged as the beneficiaries which is noteworthy too. We, on behalf of BdREN, congratulate all the awardee institutions in Bangladesh and the team members working behind it from the core of our hearts. Hope their endeavor will continue in the same way in future to make a successful implementation of the awarded projects and to enhance the glory of our beloved motherland.

## NREN MATURITY MODEL AND BdREN'S STANDING

In order to find a roadmap towards a more efficient allocation of fund under Asi@Connect project, an open "request for proposal (RFP)" was floated by TEIN\*CC, the executing body of the said project to assess the needs of the NRENs. In response to the RFP a proposal was submitted in the form of a collaborative effort between LEARN and BdREN. After threadbare evaluation, the submitted proposal was accepted. In the process, LEARN and BdREN combinedly engaged themselves in developing a model to figure out the needs of the NRENs.

The NREN Needs Analysis [NNA] model contains two sub-models. 1. NREN Maturity Model [MM] and 2. NREN Needs Assessment Model [NAM]. Under the maturity model, all the 14 participating and beneficiary NRENs were graded in accordance with their maturity judged on the basis of 10 main attributes comprising Lifetime, Connectivity, Bandwidth, Ownership, Services, Financial Stability, Strength of Human Resources, Visibility, Collaboration, and Level of Expertise. BdREN came as the second top-most NREN along with ThaiREN securing a total score of 7.0 out of 10 in terms of maturity which is an amazing feat considering BdREN's lifetime and the level of economy of Bangladesh.

## NREN Maturity Level (10 Scale Score)



Out of the 14 NREN studies, the maximum score is 7.4 out of 10.0 with a mean score of 5.2 out of 10.0 and a standard deviation of 1.45

Figure 2: NREN Maturity Level

## Details of BdREN's position in Maturity Level is as below:



Bangladesh Research and Education Network

Maturity Score:



Year of Establishment	Initiated in 2009; Established as a Non-profit Trust in 2014
Operational Mode	NREN Trust
Financing Type	Hybrid (Government & Self) Financing

## Maturity Gauges

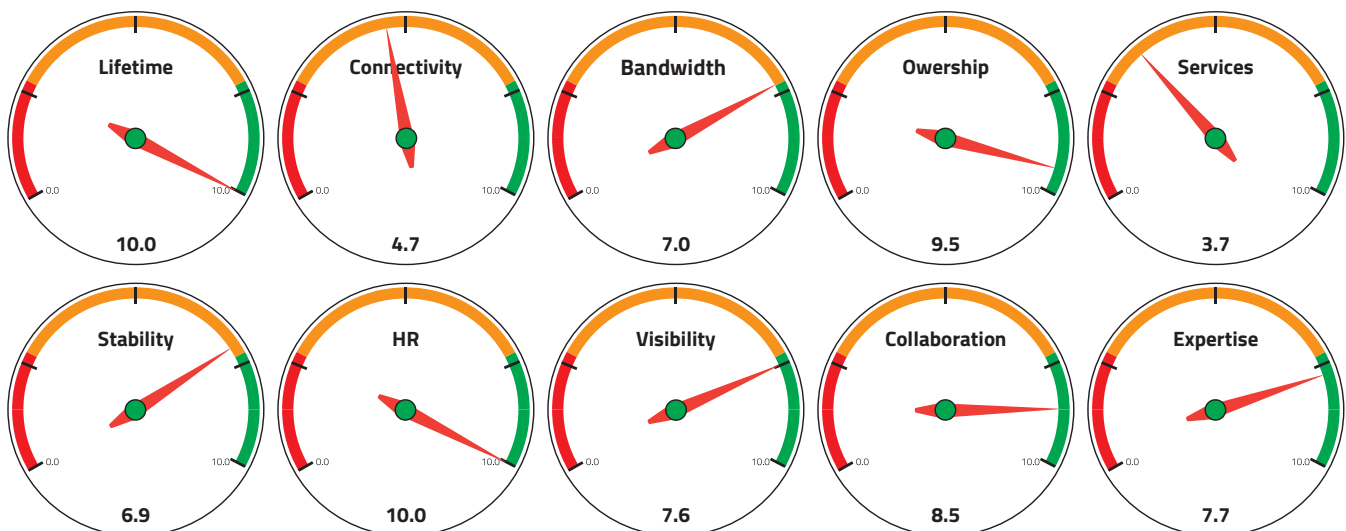


Figure 3: BdREN's Score in each of the ten (10) parameters under the Maturity Model

# DEVELOPING ASI@CONNECT COMPENDIUM

BdREN team composed and produced Asi@Connect Compendium 2020 covering the status of the NRENs across the Asia-Pacific region. The Asi@Connect compendium provides an authoritative reference for anyone with an interest in the development of research and education network in Asia-Pacific region and beyond. The Compendium covers a wide range of topics about NRENs' users, offered services, TEIN Topology, NRENs' Traffic and Link characteristics and performances, budget and staffing, NRENs' landscape and market share. The document draws a detail picture about the involvement of NRENs in different Call for Proposal funded under Asi@

Connect projects. A chapter has been dedicated to portray the fallout of the COVID-19 pandemic on all these NRENs across the Asia-Pacific region and the remedial measures which have been taken by the NRENs to withstand the disaster and thereby thrive in the industry.

This is the second Compendium document that was published by TEIN\*CC on 28 December 2021. The very first edition of Asi@Connect compendium was also produced by the consultants who were incumbents in BdREN. The Asi@Connect NREN Compendium is found online at: [www.tein.asia/sub/index.php?page=1&mc=7070&idx=2524&a=view](http://www.tein.asia/sub/index.php?page=1&mc=7070&idx=2524&a=view)

## DEPLOYMENT OF LMS FOR GENDER AND INCLUSIVE PEDAGOGIES (GIP) PROJECT UNDER IER, DU

BdREN deployed an advanced Learning Management System (LMS) which was offered to the Institute of Education and Research (IER), University of Dhaka for facilitating their esteemed project named "Impact of Gender and Inclusive Pedagogies on Student Participation and Learning Achievement at Secondary School during the

Pandemic and Beyond". Gender and Inclusive Pedagogies (GIP) offers a set of proven interventions to ensure equal participation and learning achievement addressing differences in students' gender, ability, ethnicity, and other backgrounds.



Figure 4: MoU Signing Ceremony between BdREN and Institute of Education and Research (IER), DU on 27 Dec 2021

A hand is shown from the bottom right, palm up, holding a glowing, particle-based DNA double helix structure. The background is a vibrant blue and green gradient with scattered binary code (0s and 1s) and bokeh light effects. The text is centered in the middle of the image.

**CONTRIBUTION TO COUNTRY:  
EDUCATION AND  
RESEARCH SECTOR**

# FACILITATING RESEARCH ACTIVITIES THROUGH COMPUTATIONAL AND STORAGE RESOURCES

Due to inadequate computing and storage resources in the Higher Education Institutions, many of the faculty members and researchers use BdREN's resources for their researches and thesis projects to run simulations and analyze collected data. Utilizing BdREN's HPC facilities, different researchers from different sectors (Computer Science and Engineering Department, Electrical and Electronic Engineering Department, Institutes of Information

Technology, Department of Biochemistry, Department of Physics, Molecular Biology, Fisheries Department, Image Processing and similar others) did perform their research activities. Some of the researchers published their works in the form of books and some proceeded to the level of patenting their works as well.

## A. DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, UNIVERSITY OF DHAKA

### Accelerating Recursive Partition-Based Causal Structure Learning

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Authors:

Md. Musfiqur Rahman, Ayman Rasheed, Md. Mosaddek Khan, Mohammad Ali Javidian, Pooyan Jamshidi and Md. Mamun-Or-Rashid

This paper proposed a generic causal structure refinement strategy that can locate the undesired relations with a small number of CI-tests, thus speeding up the algorithm for large and complex problems.

### A Local Search Based Approach to Solve Continuous DCOPs

---

Authors:

Amit Sarker, Moumita Choudhury and Md. Mosaddek Khan

Continuous DCOPs (C-DCOPs), an extension of the DCOPs model has been proposed which can formulate problems having continuous variables.

## B. DEPARTMENT OF PHYSICS, UNIVERSITY OF DHAKA

### A DFT+U look into experimentally synthesized monoclinic scheelite BiVO<sub>4</sub>

---

Authors:

Jannatul Fardush Tanha, S. F. U. Farhad, U. Honey, N. I. Tanvir, Tarique Hasan, Sadiq Shahriyar Nishat, Alamgir Kabir, Shahrhan Ahmed, Mahmuda Hakim, M. N. I. Khan, Mohammad Moniruzzaman and Imtiaz Ahmed

This study presented a combined experimental and Hubbard interaction corrected density functional theory (DFT+U) based study of monoclinic scheelite (ms) bismuth vanadate BiVO<sub>4</sub> (BVO).

## Structural, elastic, vibrational, electronic and optical properties of SmFeO<sub>3</sub> using density functional theory

---

Authors:

Shahran Ahmed, Sadiq Shahriyar Nishat, Alamgir Kabir, A.K.M. Sarwar Hossain Faysal, Tarique Hasan, Shovon Chakraborty and Imtiaz Ahmed

This research performed first principles simulations for the structural, elastic, vibrational, electronic and optical properties of orthorhombic samarium orthoferrite SmFeO<sub>3</sub> within the framework of density functional theory.

## Multi-multifractality and dynamic scaling in stochastic porous lattice

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Authors:

Tushar Mitra and Kamrul Hassan

In this article, the authors extended the idea of stochastic dyadic Cantor set to weighted planar stochastic lattice that leads to a stochastic porous lattice.

## Recent development on fragmentation, aggregation and percolation

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Authors:

Tushar Mitra and Kamrul Hassan

The authors have defined an entropy which paved the way to define specific heat and showed that the critical exponents of percolation obey Rushbrooke inequality.

## A weighted planar stochastic lattice with scale-free, small-world and multifractal properties

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Authors:

Tushar Mitra and Kamrul Hassan

This study investigated a class of weighted planar stochastic lattice (WPSL1) created by random sequential nucleation of seed from which a crack is grown parallel to one of the sides of the chosen block and ceases to grow upon hitting another crack.

## A DFT+U Approach to Doped SrTiO<sub>3</sub> for Solar Harvesting Applications

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Authors:

Shahran Ahmed Joy, Tarique Hasan Shushmoy, A. K. M. Sarwar Hossain Faysal and Sadiq Shahriyar Nishat

The authors presented a Hubbard U optimized density functional theory based study of band gap engineered doped SrTiO<sub>3</sub> suitable for light sensitive applications.

## C. DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING, UNIVERSITY OF DHAKA

### Graphene based hyperbolic metamaterial for tunable mid-infrared biosensing

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Authors:

Sarah Cynthia, Rajib Ahmed, Sharnali Islam, Khaleda Alia and Mainul Hossain

In this paper, the authors introduced a hyperbolic metamaterial (HMM) biosensor, that exploits the strong, tunable, mid-IR localization of graphene plasmons, for detecting nanometric biomolecules with high sensitivity.

### Plasmonic corrugated waveguide coupled to a rectangular nano-resonator as an optical filter

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Authors:

Mehedi Hasan, Ferdousi Mayo, Md. Sahabul Hossain, Rajib Ahmed, Mainul Hossain, Khaleda Ali, and Sharnali Islam

An optical filter, having a maximum transmission of 71% at single mode, with salient out-of-band rejection was designed with a combination of corrugated waveguide and nano-disk resonators.

### Array of Embedded Plasmonic Nanoparticles for Light-harvest Enhancement in Perovskite Solar Cell

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Authors:

Mehedi Hasan, Ferdousi Mayo, Md. Sahabul Hossain, Rajib Ahmed, Mainul Hossain, Khaleda Ali, and Sharnali Islam

In this work, the authors reported an improved 3D model of perovskite solar cell achieving an average absorption of 67.98% using a commercial tool called COMSOL Multiphysics.

### Performance analysis of nanowire and nanosheet NCFETs for future technology nodes

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Authors:

Fahimul Islam Sakib, Md Azizul Hasan and Mainul Hossain

The authors presented a comparative analysis on the performance of NC-NWFETs and NC-NSFETs through fully calibrated, three dimensional computer aided design (TCAD) simulations.

### Negative Capacitance Gate-All-Around Tunnel FETs for Highly Sensitive Label-Free Biosensors

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Authors:

Fahimul Islam Sakib, Md Azizul Hasan and Mainul Hossain

The authors proposed a nanoscale, highly sensitive and label-free biosensor based on negative capacitance gate-all-around tunnel field-effect transistor (NC-GAA-TFET).

## Performance Analysis of Perovskite Solar Cells Using DFT-Extracted Parameters of Metal-Doped TiO<sub>2</sub> Electron Transport Layer

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Authors :

Sadiq Shahriyar Nishat, Md. Jayed Hossain, Faiyaz Elahi Mullick, Alamgir Kabir, Shaestagir Chowdhury, Sharnali Islam, and Mainul Hossain

In this work, the authors analyzed first-principles calculations based on DFT to obtain the electronic and optical properties of pristine rutile TiO<sub>2</sub> and TiO<sub>2</sub> doped with tin (Sn) and zinc (Zn).

## X-Shaped Air-Hole Orientation Based Photonic Crystal Fiber Biosensor with Indium Tin Oxide Film

---

Authors:

Sadiq Shahriyar Nishat, Md. Jayed Hossain, Faiyaz Elahi Mullick, Alamgir Kabir, Shaestagir Chowdhury, Sharnali Islam, and Mainul Hossain

This work presents a theoretical investigation of a novel photonic crystal fiber (PCF) biosensor, which utilizes principle of surface plasmon resonance (SPR) effect. The numerical characterization was done using the finite element method (FEM) through COMSOL Multiphysics software.

## A 1.55 $\mu\text{m}$ Wideband 1 $\times$ 2 Photonic Power Splitter With Arbitrary Ratio: Characterization and Forward Modeling

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Authors:

Lubaba Tazrian Rahman, Mahmud Elahi Akhter, Faizul Rakib Sayem, Mainul Hossain, Rajib Ahmed, M. M. Lutfu Elahi, Khaleda Ali and Sharnali Islam

In this work, the authors demonstrated an in-depth investigation of photonic power splitters by considering the transmission properties of 16,000 unique ultra-compact silicon-based structures engraved with SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, and Si<sub>3</sub>N<sub>4</sub> nanoholes.

## Mid-infrared biosensors with grating coupled graphene based hyperbolic metamaterial

---

Authors:

Sarah Cynthia, Rajib Ahmed, Sharnali Islam, Khaleda Ali, and Mainul Hossain

This study was based on metal based plasmonic biosensors suffer from high losses in the mid-IR wavelengths, limiting detection sensitivity.

## D. INSTITUTE OF INFORMATION TECHNOLOGY, UNIVERSITY OF DHAKA

### A New Approach to Scrutiny of the TLS Implementation

---

Authors:

Jamilur Rahman and Mohammed Shafiul Alam Khan

The authors proposed a new scheme in TLS security with its prototyped deployment as a browser extension for verifying TLS implementation.

E. DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOLOGY,  
UNIVERSITY OF DHAKA

Variant Identification and de novo Transcriptome Analysis of *Corchorus olitorius* var. O-9897 and acc. 2015

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Authors:

Mohammad Riazul Islam

This research was designed to unravel the variation of a low-temperature sensitive variety (O-9897) and a low temperature tolerant variety (2015) at genomic and transcriptomic level.

Transcriptomic Analysis Provides Insights into Allergen Profile of *Hilsa shad Tenuialosa ilisha*

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Authors:

Mohammad Riazul Islam

The primary objective of this study was to shed light on the allergenic proteins present in *Hilsa* obtained from freshwater and brackish water based on transcriptomic analysis.

Generation of Reference Transcriptome from Tissue-Specific Transcripts of *Hilsa* from Different Habitats for Comparative and Correlational Studies.

F. DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING,  
JAHANGIRNAGAR UNIVERSITY

A Novel Approach for wavelength Optimization in GPON Quad play

---

Authors:

Md. Hayder Ali and Mohammad Hanif Ali

In this paper a graphical comparison was presented in context of receiving sensitivity both for triple and quad play.

G. INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGY,  
BUET

Microcontroller Based Pure Sine Wave Inverter

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Authors:

Nasim Ahmed and Md. Ziaur Rahman Khan

The design of a microcontroller based pure sine wave single phase inverter was presented here.

## A Single-Phase Grid-Connected Inverter using Phase Control Method

---

Authors:

Nasim Ahmed and Md. Ziaur Rahman Khan

The design of a single-phase grid-connected inverter (GCI) using the phase-control technique was presented here.

## A Secure IoT enabled Pure Sine Wave Inverter using Payload Encryption of MQTT Protocol

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Authors:

Nasim Ahmed and Md. Ziaur Rahman Khan

The design of the secure internet of things (IoT)-based single phase pure sine wave inverter using payload encryption of message queuing telemetry transport protocol was presented here.

## Logistic Regression based Islanding Detection for Grid-Connected Inverter

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Authors:

Nasim Ahmed and Md. Ziaur Rahman Khan

A new logistic regression algorithm was implemented for the islanding monitoring.

## A Secure IoT Based Grid-Connected Inverter using RSA Algorithm

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Authors:

Nasim Ahmed and Md. Ziaur Rahman Khan

The model of the internet of things (IoT) based single-phase grid-connected inverter using RSA (Rivest-Shamir-Adleman) algorithm was presented here.

## H. DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, ASIAN UNIVERSITY OF BANGLADESH

### Full Rate General Complex Orthogonal Space-Time Block Code for 4-Transmit Antenna

---

Authors:

Mohammad Ashraful Islam Jewel and Miftahur Rahman

In this paper, the authors achieved a full rate, generalized complex orthogonal space time block code for 4 transmit antenna.

# ENSURING AVAILABILITY OF PREMIUM ZOOM LICENSES AT FREE-OF-COST


BdREN's role in facilitating online education by providing Zoom Application Licenses to faculty members of both public and private universities has been widely-acclaimed and well-appreciated by the community. All these Zoom Licenses were arranged from a distance learning sub-project awarded by TEIN\*CC under Asi@Connect project. Untiring efforts from BdREN software team produced a scheduler video application software named "vSession" which was developed in two months' time and could handle a capacity of around 20,000 faculty members with limited number of zoom application licenses.

During the spread of COVID pandemic, the usage of video conferencing system became popular to continue day to day activities. Video conferencing software not only creates a more collaborative meeting culture in an organization, rather it provides a foundation for enabling today's digital workforce. Video communications allow educational institutions to expand their impact across geographics to reach more students and to offer new learning opportunities from guest lecturers, to co-ordinate research among institutions, and to reach off-campus students. Regardless of whether it is known as eLearning or distance learning, the use of video communications increases productivity, reduces costs, allows access to subject matter experts (regardless of location), and offers students real-time and immediate access to classes and course materials. The combination of multimedia and instructional design, coupled with practice activities and

feedback, results in a learning environment that helps students retain course content. Learners want full control of their learning session and eLearning gives them the opportunity to learn from anywhere at any time.

To remain competitive and increase revenue, educational institutions need to use video communications to reach existing and new students, provide access to outside experts, collaborate with other institutions, and virtually communicate with students, faculty and staff. BdREN offers zoom licenses to its member institutions mostly free-of-cost. At first, BdREN started to provide premium zoom accounts to every faculty member by following some criteria. However, the request of getting zoom account from university teachers were increasing excessively and it was very difficult to ensure zoom accounts to all the faculty members of Universities. So, BdREN took a decision to build vSession system by which zoom account could be shared among faculty members. vSession is like a shared platform of zoom accounts in the background. By leveraging "on-prem" zoom accounts and vSession, BdREN fulfilled the needs of the education community of Bangladesh. At present the total zoom users including vSession under BdREN is around 27,000.

Since 10 September 2020, Teletalk Bangladesh Ltd. has been facilitating the university students free Internet service for attending online classes under the BdREN Zoom platform.



**INTERNATIONAL  
CONTRIBUTIONS &  
COLLABORATIONS**

# CONNECTIVITY WITH GLOBAL RESEARCH CHANNEL

BdREN started its journey with connectivity to global Research and Education Network by connecting its network with a 45Mbps link that terminated in the Mumbai PoP which belong to the TEIN (Trans-Eurasia Information Network). TEIN network is the Asia-pacific regional research and education network that was established by connecting countries in Asia-pacific region to GÉANT (European Regional Research and Education Network) and Internet2 (Research and Education Network in North America) with high-bandwidth optical fiber. Since the third phase of TEIN evolution in 2009, BdREN has been an active part of the TEIN network and directly connected to their network infrastructure. Today's TEIN network has come through a number of evolving phases over the last two decades. Building on previous project phase of TEIN, the current phase named Asi@Connect connects almost all the countries in Asia and Pacific region. Asi@Connect also aligns to and interacts with other regional R&E network projects and organizations in other parts of the world.

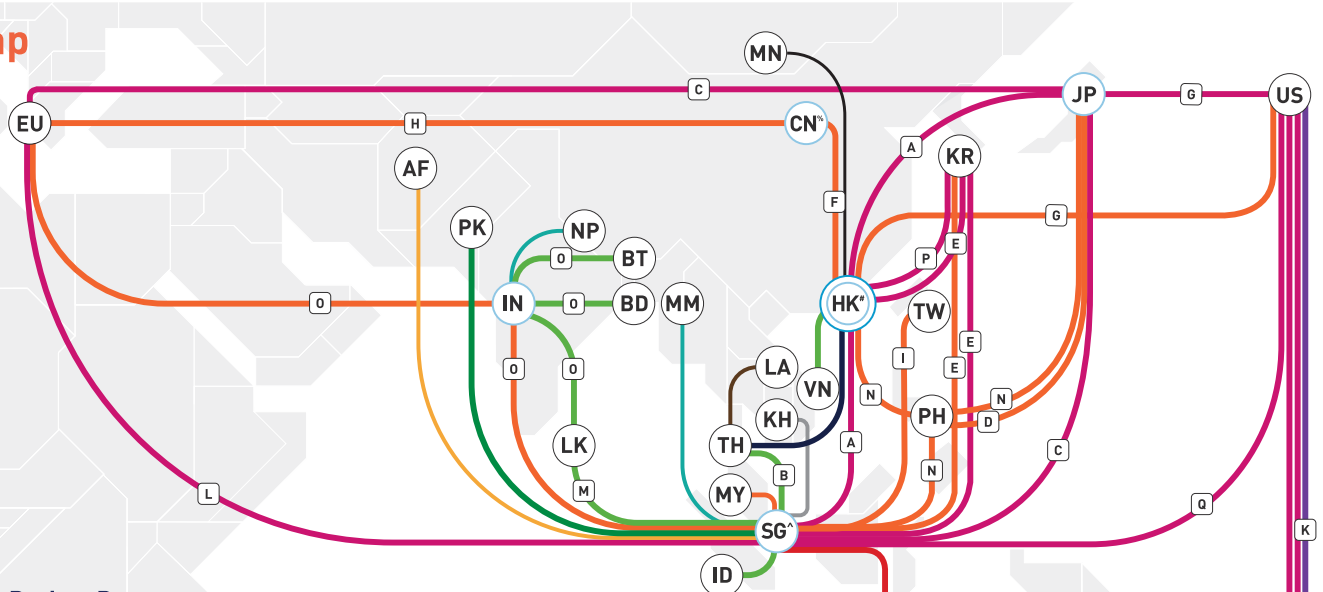
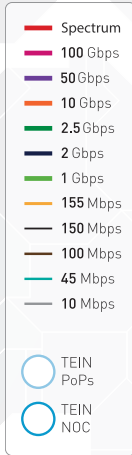
Connectivity to TEIN surely enabled BdREN get connected to any other Research and Education Network in the world. However, due to the non-optimal availability of the Dhaka-Mumbai link, the link was shifted to Singapore from Mumbai in November 2018. On the other side, a huge volume of research traffic was getting generated from the increasing number of connected institutions, and the 45Mbps Dhaka-Singapore link was found to be inadequate for carrying this high volume of traffic. In the meantime, National Knowledge Network of India (NKN) came up with a project to connect Bangladesh, Nepal, Sri Lanka, Bhutan and Myanmar to its hub. NKN, having 10Gbps connectivity with Singapore in Asia and GÉANT in Europe, offered 1Gbps connectivity

## Regional R&E Network connected with TEIN

- GÉANT (Europe)
- RedCLARA (Latin America)
- CKLN (Caribbean)
- AfricaConnect3 / WACREN / UbuntuNet (Africa)
- CAREN (Central Asia)
- Internet2 / ESnet / CANARIE (North America)
- ASREN (Middle East)

to BdREN for a five-year period with all cost with regard to the operation and maintenance of the link to be borne by NKN. It turned out to be a timely and financially viable proposal for BdREN. Also, NKN agreed to provide Google, Microsoft and Facebook Cache services. BdREN accepted the proposal and the 1Gbps connectivity was inaugurated jointly by honorable Prime Minister of Bangladesh and her counterpart in India on 11 March 2019. BdREN found that the established link with NKN was a highly stable link and as such BdREN got rid of the BdREN-Singapore link which resulted in a huge cost savings for BdREN.

# TEIN Map



## Asi@Connect Project Partners

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

\* As of December 2020.

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

Figure 5: International Network Map

# COLLABORATIONS AND ASSOCIATIONS WITH GLOBAL xREN COMMUNITY

The primary objective of BdREN was to connect all the universities and research institutes in single platform and also to interconnect them with the global R&E networks like TEIN (Asia-Pacific), GÉANT (Europe), Internet2 (USA) and others.

BdREN's presence in global REN Community is quite conspicuous and pervasive. It isn't necessarily limited within Asian boundary rather it has traversed even across Europe and USA. BdREN is beneficiary and proactive partner of Asi@Connect, which was ensued from Trans-Eurasia Information Network-3 (TEIN3). Asi@Connect is a project working with the European Union and 28 national research and education network partners from 24 Asia-Pacific countries or economies. As a member of Asi@Connect BdREN won a number of sub-projects granted under different call for proposal. A number of international training as well as R&E collaboration programs were conducted under those granted sub-projects financed by Asi@Connect.

At the end of 2017 BdREN could sign an MoU with NORDUnet under which NORDUnet was supposed to provide technical advice for the upliftment and sustainability of BdREN and for establishing BdREN as an emerging REN in the community. The continuation of that MoU, signed with NORDUnet, proved to be a boon for BdREN in winning one of the most successful and prestigious projects allocated under Asi@Connect titled "facilitating Distance Learning using Video Conferencing facility [fDLuDCf]" which was run from September 2018 to June 2021.

One of the recognized milestone of BdREN is the involvement in drafting and composing of 2018 and 2020 "Asi@Connect Compendium". It has undoubtedly established BdREN's footprint as a consultancy service provider internationally considering the fact that it was awarded by TEIN\*CC through an open RFQ which was participated by organisations from different countries.

BdREN team has been also collaboratively working as members of different working groups and committees in the Joint Research on IPv6 Network Management Project initiated by Tsinghua University, China since June 2020.

BdREN, in partnership with LEARN, made a distinction by winning the "NREN Needs Assessment [NNA]" project floated by TEIN\*CC. An "NREN maturity calculator" has been designed and framed by the BdREN software team which will be able to assess the maturity of NREN online by following the model suggested by the NNA. If the model gets its global acceptance, the maturity calculator can be used across the globe for evaluating the level of a particular NREN.

BdREN has won another distance learning project in December 2021 as a follow up of the fDLuDCf project. The contract for the project named "Building e-Learning Infrastructure in South Asian Countries under TEIN [BeLISAC]" was signed in March 2022. Under this project distributed Data Centers will be built in four (4) South Asian countries [Bangladesh, Bhutan, Nepal and Sri Lanka] and Zoom Application Licenses will be provided for continuation of distance learning courses for a period of another two (2) years. Moreover, the video conferencing service is supposed to be extended to Laos and Cambodia under the project. In addition to that there are capacity development programs for female interns and network engineers. Last but not the least, one (1) female engineer will be recruited in each of the six (6) beneficiary countries for a period of one (1) year. It is expected that the initiative will be able to narrow the gender disparity in the community.

BdREN has succeeded another efficacious project named "Capacity Development Program for NREN engineers and engineers from NRENs' member Institutes on DWDM Transmission Network". It will result in arousing the latent demand of implementation of Transmission Network in respective countries and bridging the digital divide among

the varying economies of Asia-Pacific region. In each year, BdREN usually organizes a good number of International Trainings and Workshops. But, due to apocalyptic pandemic, it was difficult to arrange any onsite National and International Training or Seminar in 2020-2021. As such, all the organized training programs during this period of time were held online.

Dr. Mohammad Farooq Ali Tarafder ACMA, BdREN's Chief Administrative & Finance Officer (CAFO) has been participating as one of the Members of Asi@Connect Steering Committee since 2020 which is a notable distinction. BdREN hopes that Dr. Farooq with all his efforts and dynamism will contribute for the betterment of this industry and will uphold the image of BdREN in the community. Furthermore, BdREN Officials are usually invited to speak on different occasions in the APAN meetings, international seminars and workshops.

BdREN software team has designed and developed the e-Compendium for Asi@Connect on its own initiative. The

facility has been demonstrated to TEIN\*CC and its steering committee members. BdREN is waiting for the nodding of the community. BdREN intends to handover the facility to TEIN\*CC so that it can be used to ensure effective and timely delivery of the compendium.

BdREN's role in facilitating online education by providing Zoom Application Licenses to faculty members of both public and private universities has been widely-acclaimed and well-appreciated by the community. As mentioned before, all these Zoom Licenses were arranged from fDLuDCf project and is being continued under BeLISAC project.

BdREN is becoming more and more popular to the community because of its support in fostering research and collaboration in both national and International perspective. BdREN's goal is to thrive itself as one of the top most NRENs in the Asia-Pacific region and transform itself into a role-model for the emerging NRENs.



# SUCCESSFUL COMPLETION OF fDLuDCf PROJECT AND ITS IMPACTS ON R&E COMMUNITY

## BACKGROUND

This project principally focused on six beneficiary countries - Bangladesh, Bhutan, Nepal, Philippines, Sri Lanka and Thailand. The purpose of the project was to establish distance learning education service that will primarily be used by students, faculties, researchers and academics in all the beneficiary countries and will become a trendsetter for other NRENs in the TEIN community. At the same time experts from different NREN communities were encouraged to participate in Digital Seminars (DigiNars) and Digital Talk-show Programs using this facility which deluged the community with immense benefits. Additionally, the project worked as a bridge for transferring knowledge among the countries which were at different levels in terms of their expertise.

## OBJECTIVES

The principal objectives of the project were as follows:

- 1. Deploy a Digital Conferencing Platform***
- 2. Enhance Collaboration among NRENs***
- 3. Reduce the Digital Divide***
- 4. Facilitate Distance Learning Courses***
- 5. Create Trainers through Train-The-Trainer programs***
- 6. Arrange Training Program for Professionals***
- 7. Enhance the utilization of TEIN***

## MAIN ACTIVITIES

Three (3) DigiNars were arranged under this project on key topics, such as "Competitive Edge of NRENs and Financial Sustainability", "Progress and Challenges in Introducing eduroam and Federated Identity under Asi@Connect/GÉANT" and "Challenges at the outbreak of COVID-19 and the initiatives taken by NRENs". Representatives from various NRENs across the world, even from outside of the TEIN community, joined these seminars and shared their experiences.

Six (6) DLE courses were arranged to train participants on burning issues like 1) Cyber Security, 2) Ethical Hacking, 3) Practical Cryptography, 4) Introduction to Big Data and Hadoop, 5) Data Center Virtualization and Cloud Computing Infrastructure, and 6) Advanced Data Analysis using industry accepted and widely popular statistical package which were widely participated by trainees from different countries across the world. The instructors in these training programs were chosen from Bangladesh and Sri Lanka based on their expertise on the very topic.

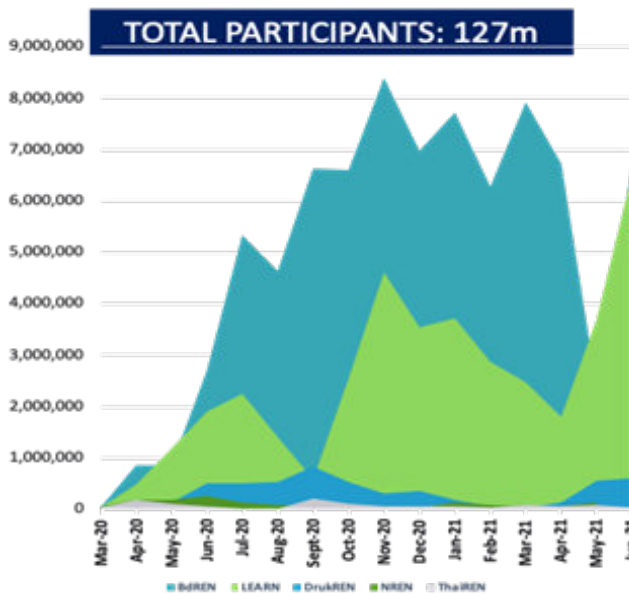
Two (2) Digital Talk-shows were organized on “Versatility of Blockchain Technology” and “Selection of LMS and Video Collaboration Applications” which were attended by relevant representatives of various NRENs and other member institutes of the NRENs. A proceeding of the latter one containing recommendations for the NRENs was prepared and published.

Moreover, a number of training programs and seminars were organised to promote the benefits of the distance learning technology and its usage.

## PRINCIPAL OUTCOME

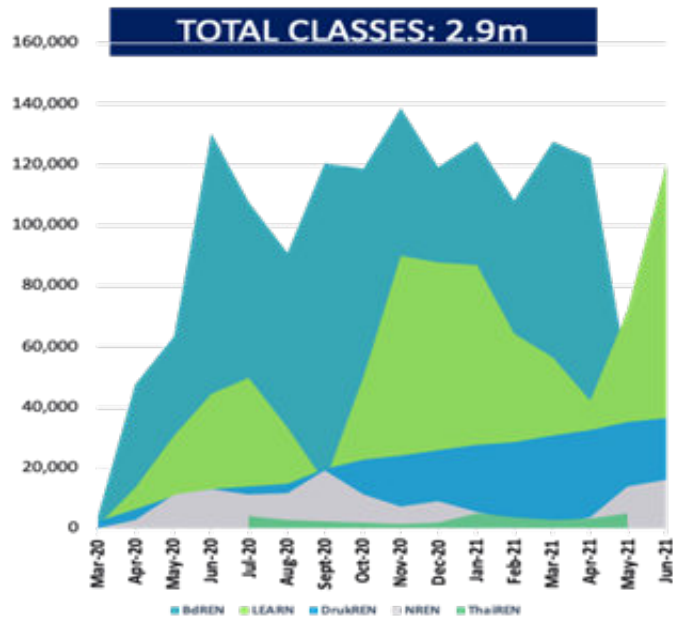
With the onslaught of the pandemic, all the educational institutes across the beneficiary countries started closing down which created the opportunity for NRENs to offer the available Zoom licenses under the project for conducting online classes. It was a blessing in disguise for the community which welcomed and embraced the offer gleefully. The usage surged within a couple of months as demonstrated in the figure below:

It is to be mentioned that probably this is the first time NRENs of the beneficiary countries could offer services which were badly needed by their member institutions. And that also readily off the shelves in quickest possible time and at “free of cost”. The NRENs could make the member institutions well understand their worth and could prove them to be indispensable at least for the time being. Thus, the serving NRENs could earn a significant level of acceptance from the member institutes.



Moreover, as shown in the above figure in terms of number of participants, the total participants in the online classes were 127 million during the period March 2020 – June 2021 where the major contributors were Bangladesh and Sri Lanka.

It is understood from the figure that in total 2.9 million classes were conducted by five (5) of the beneficiary countries during a period from March 2020 to June 2021 with Bangladesh and Sri Lanka dominated with major share.



# OTHER ACHIEVEMENTS

Installation of Zoom on-prem version resulted in the enhanced quality of service [minimize delay and jitter] and ensured the avoidance of expensive internet bandwidth.

Procurement of equipment for beneficiaries gave ownership of the end-devices to the beneficiary NRENs.

Exponent of Collaboration in the form of participation in the events and technology as well as application sharing.

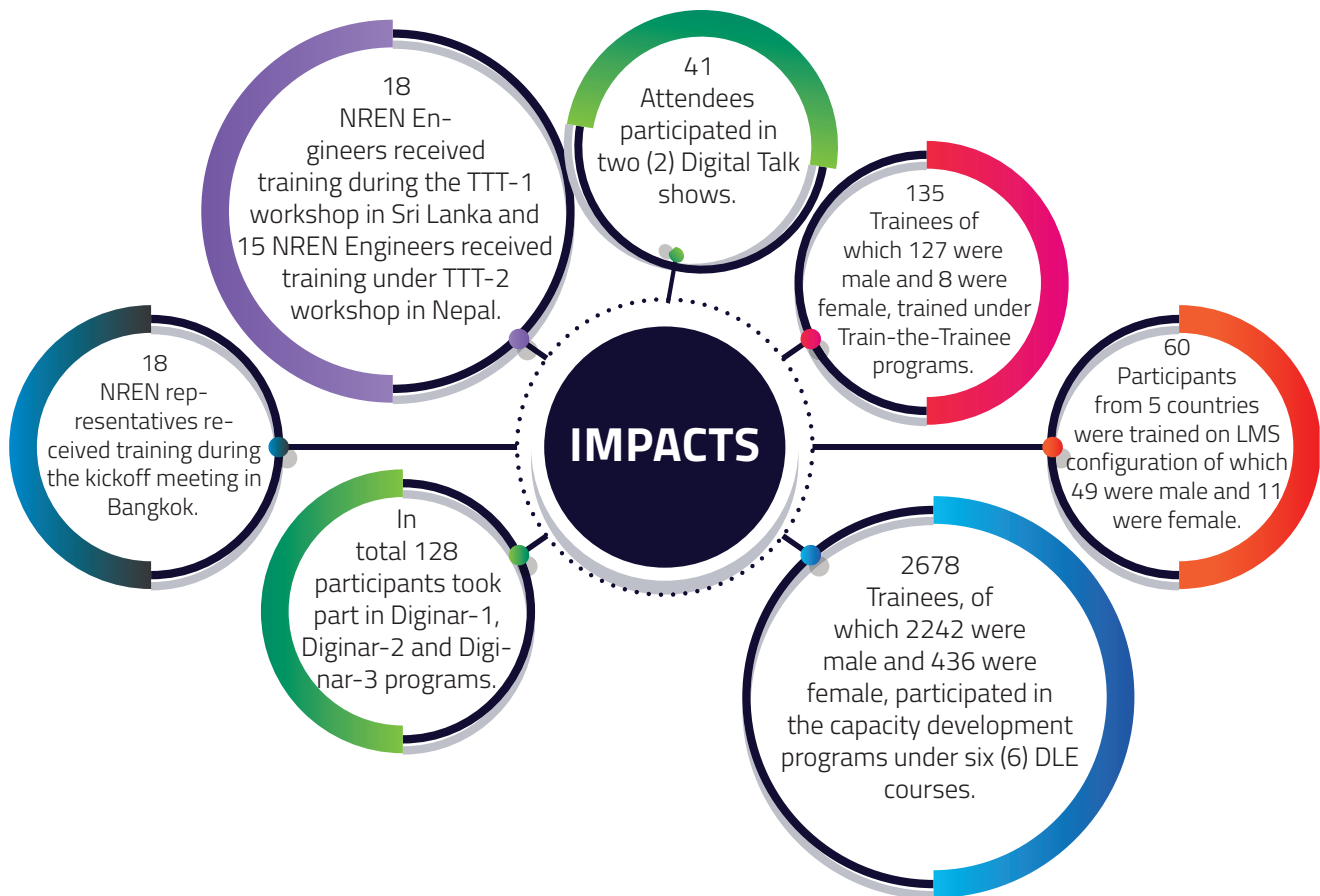
Awareness and Knowledge sharing programs were arranged under Digital Seminars and Digital Talk-shows.

Capacity Development programs were conducted in the form of Distance Learning and Education (DLE) courses and Train-the-Trainers & Train-the-Trainees programs.

A number of DLE courses, Train-the-Trainer programs, Train-the-Trainee programs and Training on LMS Configuration were organized participated by students, professionals and NREN Engineers across the Asia-Pacific Community.

Minimize Gender Disparity: The project was a catalyst for minimizing gender diversity. In total under capacity development program 480 female trainees participated against 2678 male trainees.

Wide acknowledgement about its success in different seminars, talk shows and portals



## ASI@CONNECT SUPPORT

- Asi@Connect supported the full financing of the project.
- Asi@Connect helped in creating the platform for BdREN through contacts with NORDUNet. NORDUNet provided technical assistance and resource financing through providing Zoom Application licenses and Platform.
- Asi@Connect has created the platform to build the human network with other beneficiary countries. Without this human network, the dream of initiating such a project would have been a nightmare.

## ACKNOWLEDGEMENTS

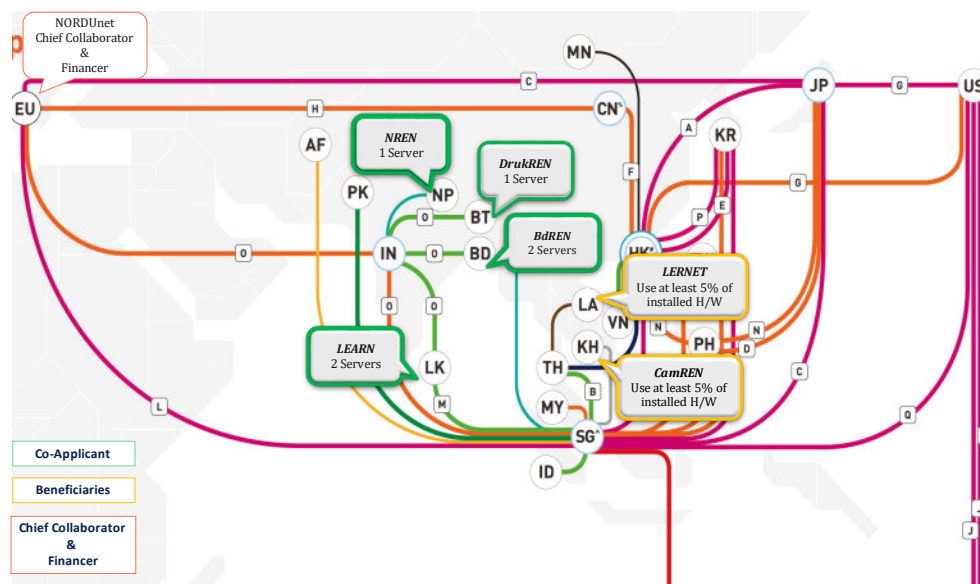
The fabulous achievement of the project could earn a topic of discourse in every follow-up APAN events either in the form of talk show or seminar. ISOC published a special feature on the project supporting education during pandemic at <https://www.internetociety.org/blog/2021/04/boosting-education-and-research-during-covid-19/>. Special feature was brought up in AARnet's "InTheField" blog site exclusively for Bangladesh, Nepal, Thailand and Sri Lanka. Articles and Newsletters published by BdREN and LEARN, are available in the respective web portals. Keynote paper was presented in bdNOG12 highlighting the success of the project. TEIN\*CC arranged a special webinar on "Education" in December 2021 to promote the phenomenal success of this project.

Web Portal: <https://dle.asiaconnect.bdren.net.bd>

## BUILDING e-LEARNING INFRASTRUCTURE IN SOUTH-ASIAN COUNTRIES UNDER TEIN (BeLISAC)

To overcome the hardware crunching problem faced under fDLuDCf project and be prepared to cater to the community demands of more meetings and classes in future, a project named “Building e-Learning Infrastructure in South-Asian Countries under TEIN [BeLISAC]” was initiated. The target of the project was to procure computing resources which will be placed at four (4) Data Centers in Bangladesh,

Bhutan, Nepal and Sri Lanka. In addition to that CamREN and LERNET have been included who will be provided Zoom Controller and Zoom MMR facilities (5% of the installed computing resources and full cloud recording support) from the installed hardware in these four (4) countries. The project has been awarded by TEIN\*CC to BdREN under Call for Proposal-5 [CFP5] in Work Package-5 category.



**Figure 6: Role of participating NRENs and RRENs**

The Zoom Application licensing support [Total: 31,000] will be provided by NORDUnet to support the ongoing online/blended education and other seminars and meetings. Six (6) female engineers are supposed to be recruited for a period of one-year one each from the six beneficiary countries. Capacity development in the form of recruitment of female interns will take place in all six (6) beneficiary countries for varying period in two (2) separate groups. In addition, Engineers of NRENs and member institutions of respective NRENs of four (4) beneficiary countries, where the servers will be installed, will be trained up onsite [hands-on].

Total cost of the project [238,000 Euros] will be Tri-party financed. The mode of such financing will be as follows:

**NORDUnet:** Capacity Development of a group of Female

Interns in all six (6) countries, Grooming of female engineers in all six (6) countries under the oversight of a mentor, Distribution of logistic resources (laptops) for the six (6) female engineers and visit to NORDUnet conference for all those 6 (six) female engineers [66,000 Euros other than Zoom License cost].

**BdREN, LEARN and NREN:** 20%, 20% and 10% respectively of the cost of computing resources which will be installed in respective country [22,500 Euros].

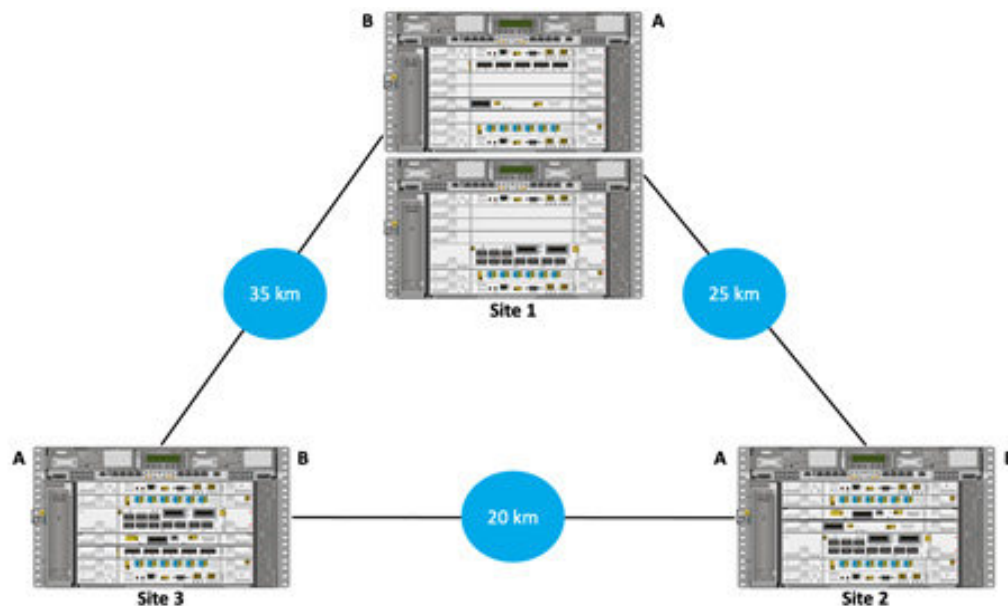
**Asi@Connect/TEIN\*CC:** The major cost of the computing resources, cost of capacity development for a group of female interns & NREN engineers in four (4) countries and visibility & promotional cost for the project [149,500 Euros].

## CAPACITY DEVELOPMENT TRAINING PROGRAM ON DWDM TRANSMISSION NETWORK

BdREN provides high-speed optical fiber network connectivity to all the Public Universities and a few of the Private Universities spanning across different parts of the country using its own state-of-the-art DWDM Transmission Network. One of the most outstanding achievements BdREN could make was leasing the country-wide 4000km+ fiber from Power Grid Company of Bangladesh (PGCB) at nominal cost which paved the way of developing a state-of-the-art DWDM Transmission Network. It gave BdREN enough flexibility in extending its country-wide network to reach

the universities distributed across the country.

While building the Transmission Network, BdREN could develop a "Test Lab" for leveraging that in imparting trainings for the local operators and engineers belonging to different member institutions. Such training on DWDM technology has been offered for the first time under Asi@Connect project.



**Figure 7: Architectural View of DWDM Network Test Lab**

In order to enrich the knowledge of the engineers of the other NRENs who have such Transmission Network or who are planning to have similar network BdREN came out proposing a training on "Dense Wavelength Division Multiplexing (DWDM) and its application" which has been awarded under Work Package-2 in Call for Proposal-5.

The training will be held in blended format to save the cost and to make sure that trainees will get the maximum output from the program. The format will be as follows:

**Virtual Training to be conducted over Zoom Platform:** 8 classes, 2 classes/week, 2 hours/class.

**Physical Training:** 5 days (8 hours/day), Mostly hands-on

Female Candidates will be preferred to attend the training program. From the host country at least 30% participants will be female candidates.

## NREN NEED ASSESSMENT: GOALS AND OUTCOMES

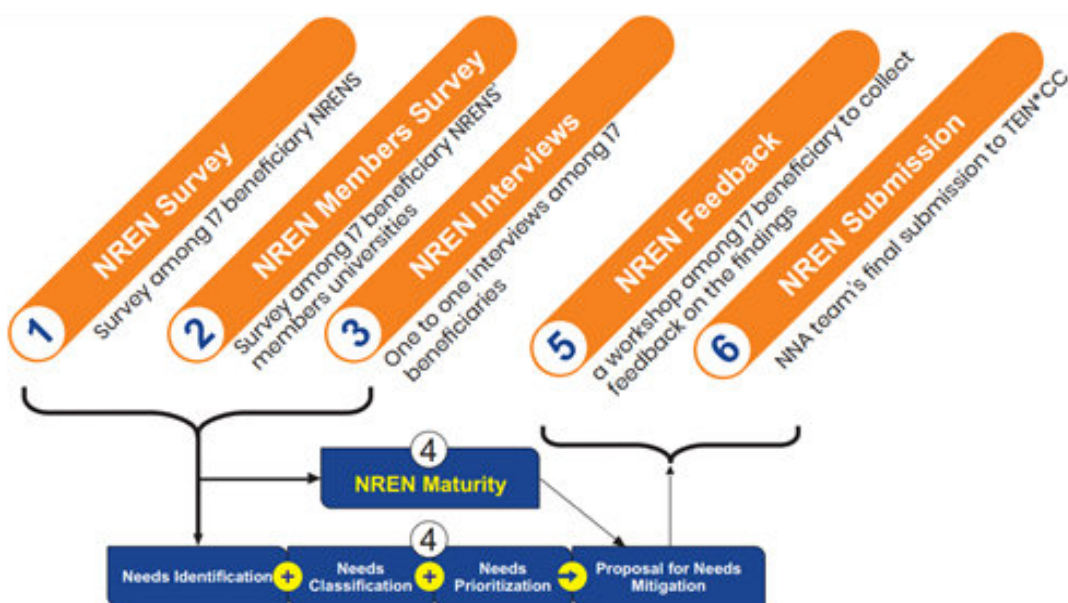
BdREN, in collaboration with LEARN, won the consultancy job on “NREN Needs Assessment (NNA)” which has been awarded by TEIN\*CC on 28 January 2021. The consultancy project which valued **36,300 Euros** turns out as the highest valued international consultancy job that has been won by BdREN so far. The attainment of the contract stands out to be a unique distinction and noteworthy achievement in this community. This achievement is a follow-up of BdREN’s earlier feat of winning consultancy contract for framing “Asi@Connect Compendium-2019” in October 2020 which worthed an amount of **10,000 Euros**.

Under the consultancy project TEIN\*CC intended to make a Need Assessment Analysis which will identify the real need as well as recognize the strengths of each NREN of least-

developed and developing countries. Also, through the fruitful completion of this project TEIN\*CC liked to have the capacity to be able to prioritize the allocation of financing by choosing the right project. The overall objective is to make the allocation of budget more effective to address the needs and to boost the strengths of the NRENs.

Initially, an online survey was conducted among the 17 beneficiary NRENs and 12 responses were received. The second phase of the survey was conducted through the interview (virtual platform) with 11 NRENs out of the 12 NRENs who responded. A survey was also conducted for the NRENs’ member institutes where 52 responses were received.

### NNA: ROADMAP



**Figure 8: NNA Roadmap starts with surveys and interviews and ends with a report of findings and recommendations.**

Several models were proposed where the team plotted the data received through surveys and interviews into those models. From those Survey data, the team analyzed to identify, classify, prioritize their needs and finally recommended a priority list to TEIN\*CC.

# JOINT IPV6 RESEARCH PROJECT WITH TSINGHUA UNIVERSITY, CHINA

BdREN team has been collaboratively working with the Joint Research on IPv6 Network Management Project initiated by Tsinghua University, China since June 2020. This project aims to develop the key technologies required for the support, collaborative management and governance for IPv6 networks, and to foster a collaborative environment in which data can be acquired, analyzed, and shared. It involves 23 research institutes from 12 Asian and 2 European countries. This project will be ended up in May 2023. Additionally, the project will

explore key technical difficulties in the field of Internet Governance of IPv6 Cyberspace, form governance rules and establish demonstrations. The 23 research institutes are jointly solving the problems to achieve trust, sharing and collaboration among independent and autonomous management entities, and construct a "Collaborative Management Architecture Model for IPv6 Cyberspace" which results in the formation of a Cyberspace Governance Technical Forum (CGTF).

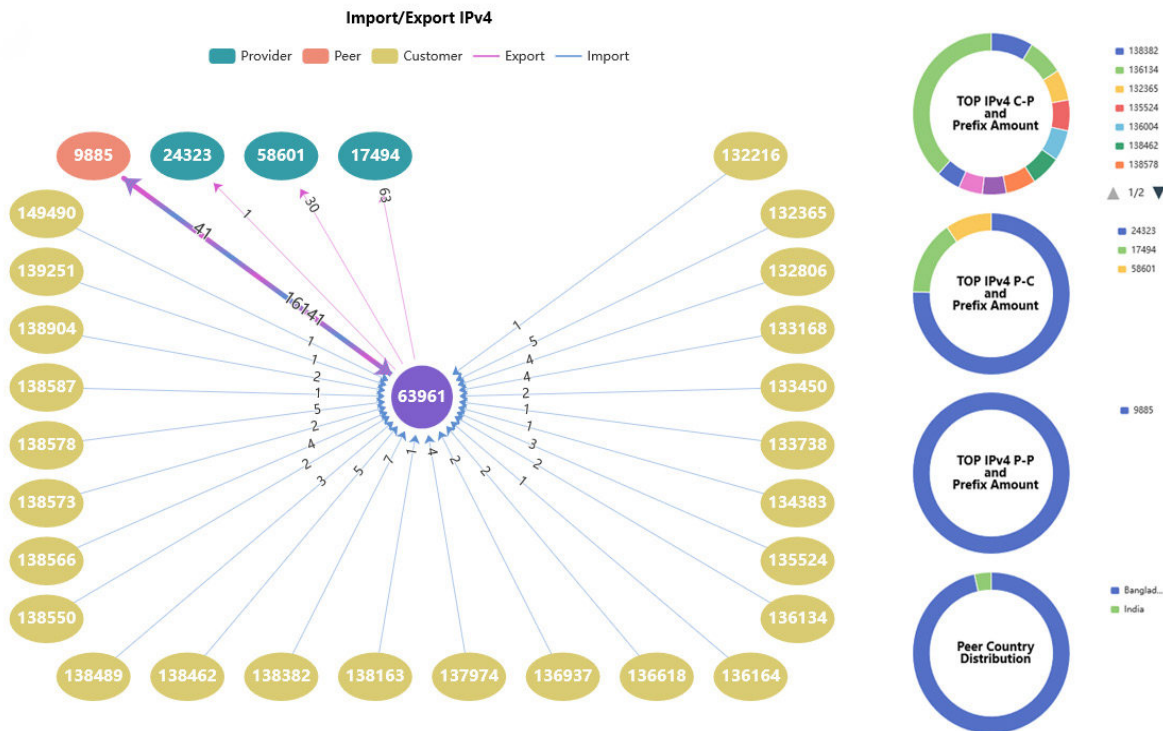


Figure 9: BGPWatch Dashboard: Showing IPv4 BGP Peers of BdREN

## Objectives of the Research Project

**Framing Collaborative Management Architecture Model for IPv6 Cyberspace**

**Active Measurement of IPv6 Network with Massive Address Space**

**Passive Measurement of High-speed IPv6 Network**

**Tracing IPv6 International Inter-Network Threat**

**Framing New Rules for International Cooperative Governance on IPv6 Cyberspace**

**Demonstration of IPv6 Cyberspace Collaborative Management**

# SaaS SERVICE FOR NEPAL REN (NREN)

BdREN has made a unique venture in supporting the Video Conferencing Services of Nepal Research and Education Network by hosting the Multi-Media Router (MMR) Servers of Zoom Application in the BdREN Data Center platform. Engineers of both BdREN and NREN with their sincere effort could finally end up configuration and testing and finally commissioned the service on 22 September 2020. Probably, this initiative is the first of its kind by any NREN in Asia to share its Data Center capacity. With high demand from the community at the outbreak and upsurge of COVID-19 and with NREN not having enough computing resources, BdREN came forward with its spare Data Center capacity to help out Nepal REN honoring its request.

BdREN hopes that with application of policy routing the traffic generated against the services could be routed

through the TEIN platform which could be one step forward towards meeting the long standing objective of Asi@Connect to increase the research traffic. At the same time this sharing of computing resources will enhance the utilization of resources of those NRENs having spare capacity in their Data Center and thus will result in increased level of cooperation and brotherhood among the NRENs.

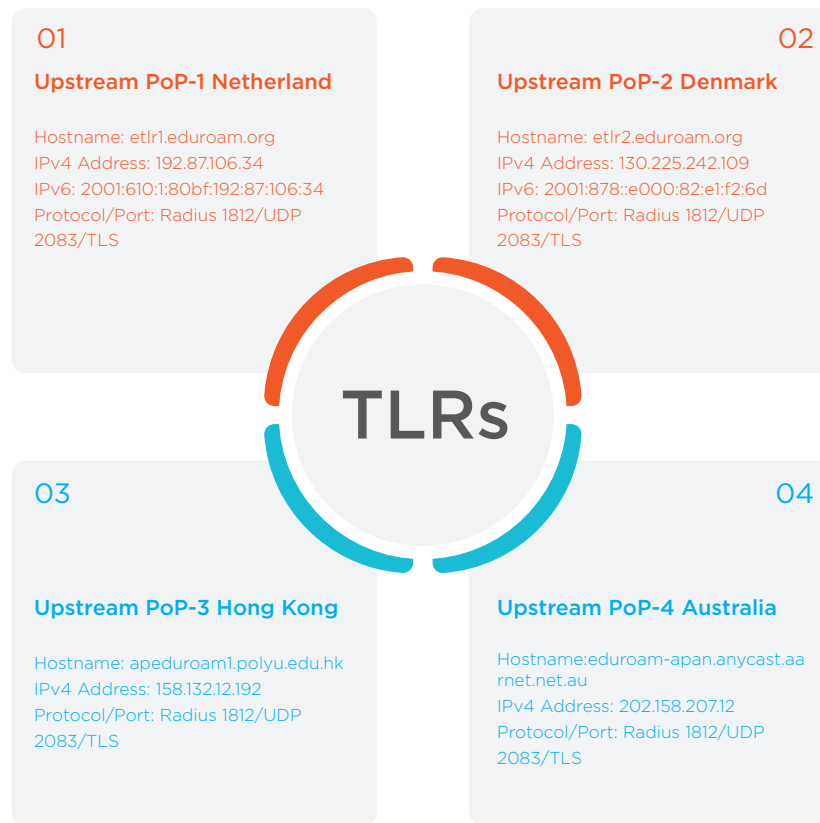
BdREN further hopes that following this example other NRENs, particularly the NRENs of developed countries, will come forward to mitigate the scarcity of computing resources of the developing or under developed countries and thereby contributing to the development of research activities in the latter. This will certainly usher a new way to reduce the digital divide which exists between the countries across Asia and Pacific region.

# FOOTPRINT IN GLOBAL eduroam COMMUNITY

Global Wi-Fi hotspot roaming [eduroam] was introduced by BdREN in 2017 and it has been deployed nationwide. Federation Level RADIUS (FLR), alternatively known as National RADIUS server (NRS), has been installed at BdREN Data Center to connect Identity Providers (IdPs) and Service Providers (SPs) located in each of the beneficiary institutions across the country. It also provides the uplink connectivity with Top-Level Radius Servers (TLRs) in order to connect IdPs and SPs located across the world.

Our deployed FLR/NRS server has been being connected with two (2) Top Level RADIUS servers located at AARNet (Australia) and HARNET (Hong Kong) since 2020. In deploying eduroam, BdREN follows the best practices given by GÉANT. Previously, it was connected with eTLRs located at SurfNET (Netherlands) and DeIC (Denmark). To be mentioned that these connectivities were established in 2016 when eduroam service was introduced in Bangladesh.

Established in 2016 but now discontinued.



Established in 2020 and now active.

**Figure 10: Two (2) TLRs previously connected & two (2) TLRs currently connected with BdREN's NRS**

As a National Roaming Operator (NRO), we send all Federated Tickers (FTicks) for national and international roaming to the central eduroam Operations Team operated by GÉANT which is the pan-European Regional Research and Education Network (RREN) connecting all the NRENs across Europe. This eventually results in painting a picture of National and International users' login statistics for BdREN [[https://monitor.eduroam.org/f\\_ticks\\_country.php](https://monitor.eduroam.org/f_ticks_country.php)].

Very recently, BdREN team has deployed the eduroam Configuration Assistant Tool (CAT) for 4 (Four) different participating Institutions that enhances the security for their end users. The tool builds customized installers for a range of popular PC and smartphone platforms and ensures that users are protected against rogue wi-fi hotspots. The

deployment of CAT will be continued for other participating Institutions

Since the beginning of 2022 altogether 20 (twenty) universities have been configured with eduroam services with Institutional Radius Servers (IRSs) configured at each university campus. Also, brief portrait of the presence of eduroam services under BdREN is available at [https://monitor.eduroam.org/map\\_service\\_loc.php](https://monitor.eduroam.org/map_service_loc.php)

eduroam, the secure global roaming wireless network for the research and education sector, is now available at more than 12,000 locations in over 100 countries worldwide. BdREN will continue working with its member Institutes to extend their access to eduroam realm.

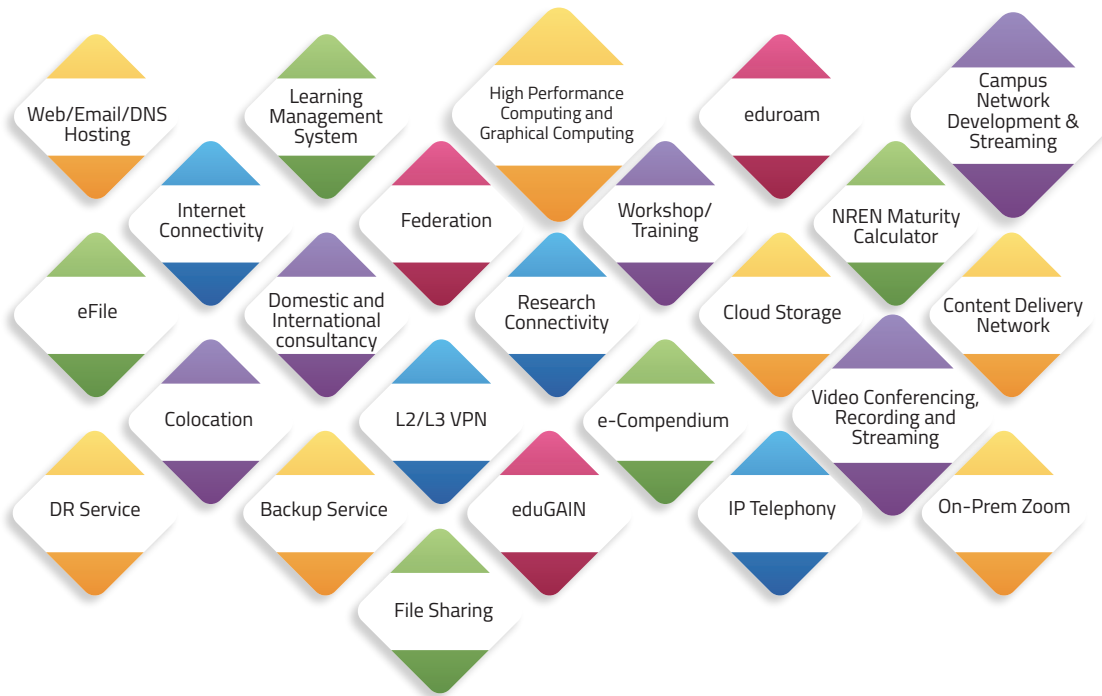


Our Services

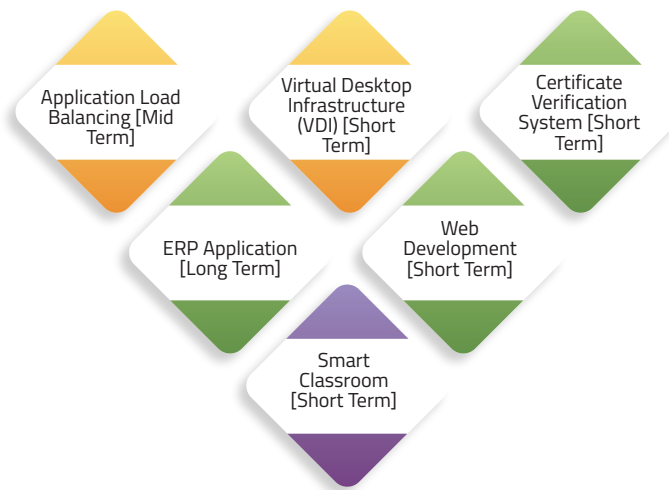
# SERVICES FOR OUR MEMBER UNIVERSITIES/ INSTITUTES

BEING OFFERED

■ Connectivity  
 ■ Data Center  
 ■ Federation  
 ■ In-house Software  
 ■ Others



PLANNED



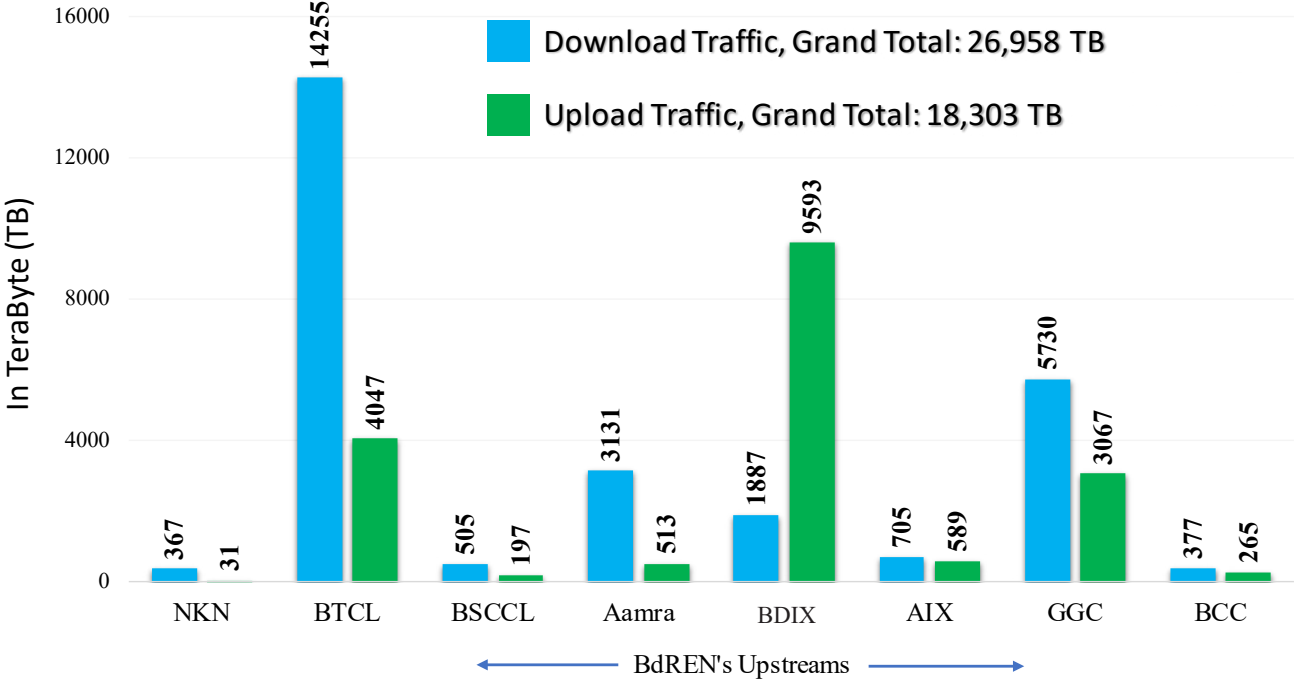
# SERVICE STATISTICS- FACTS AND FIGURES

**Total Resource Pool:  
1200 CPU Cores,  
5.5 TB of Memory,  
300 TB of Storage**

**A Single Virtual Machine:  
96 Core CPU  
512 GB Memory  
Anything from a pool of 300 TB SAN Storage**

# TRAFFIC STATISTICS

## UPSTREAM TRAFFIC

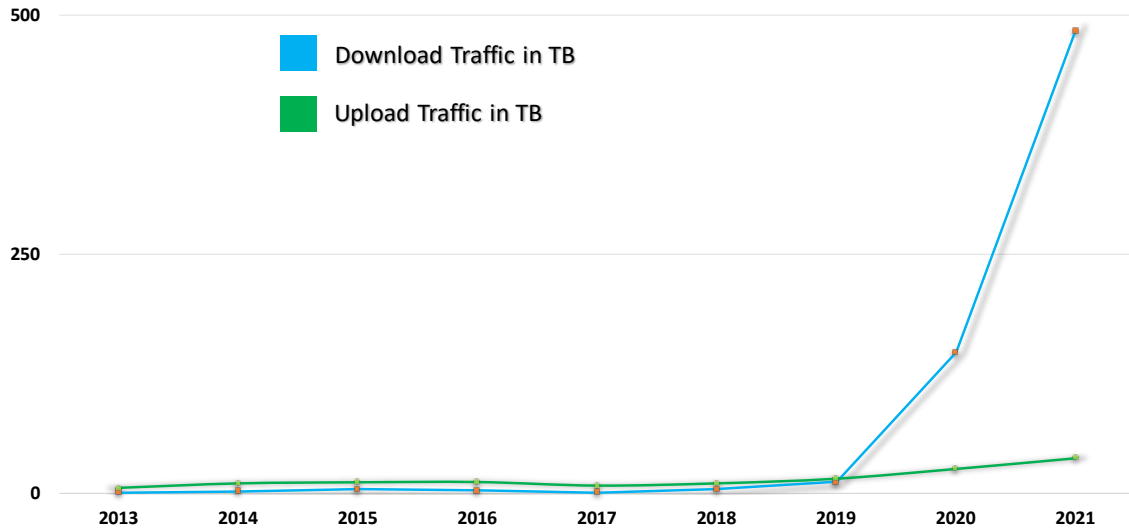


**Figure 11: Upstream Traffic Usage in 2020-21**

In 2020-21, total Download traffic from BdREN's Upstream has been recorded as 26,958 TB, whereas total Upload traffic has been recorded as 18,303 TB. The overall Upstream Traffic was 45,261 TB with a Download to Upload traffic ratio of 1.5 : 1. High Upload traffic in BDIX is resulting from BdREN's signature service: 'Zoom'.

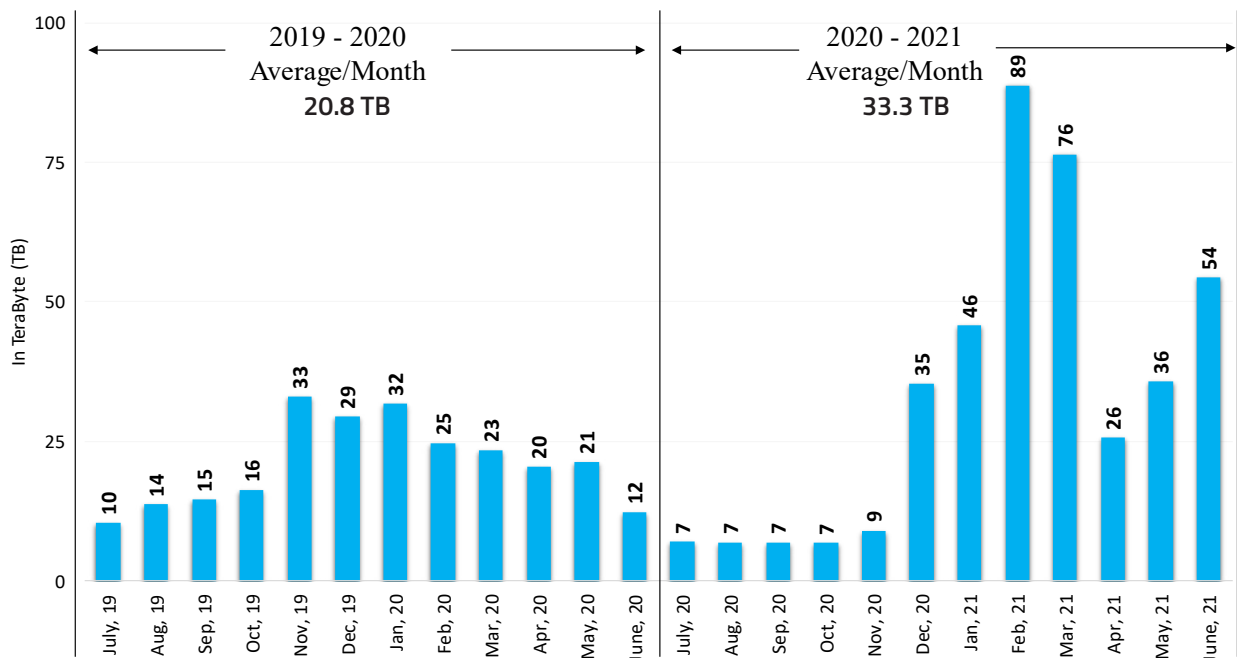
## TRAFFIC GROWTH

BdREN is providing both Commodity Internet services and connectivity to Global Research and Education Network. As such BdREN is connected to both public Internet and pseudo-public Global Research Network.

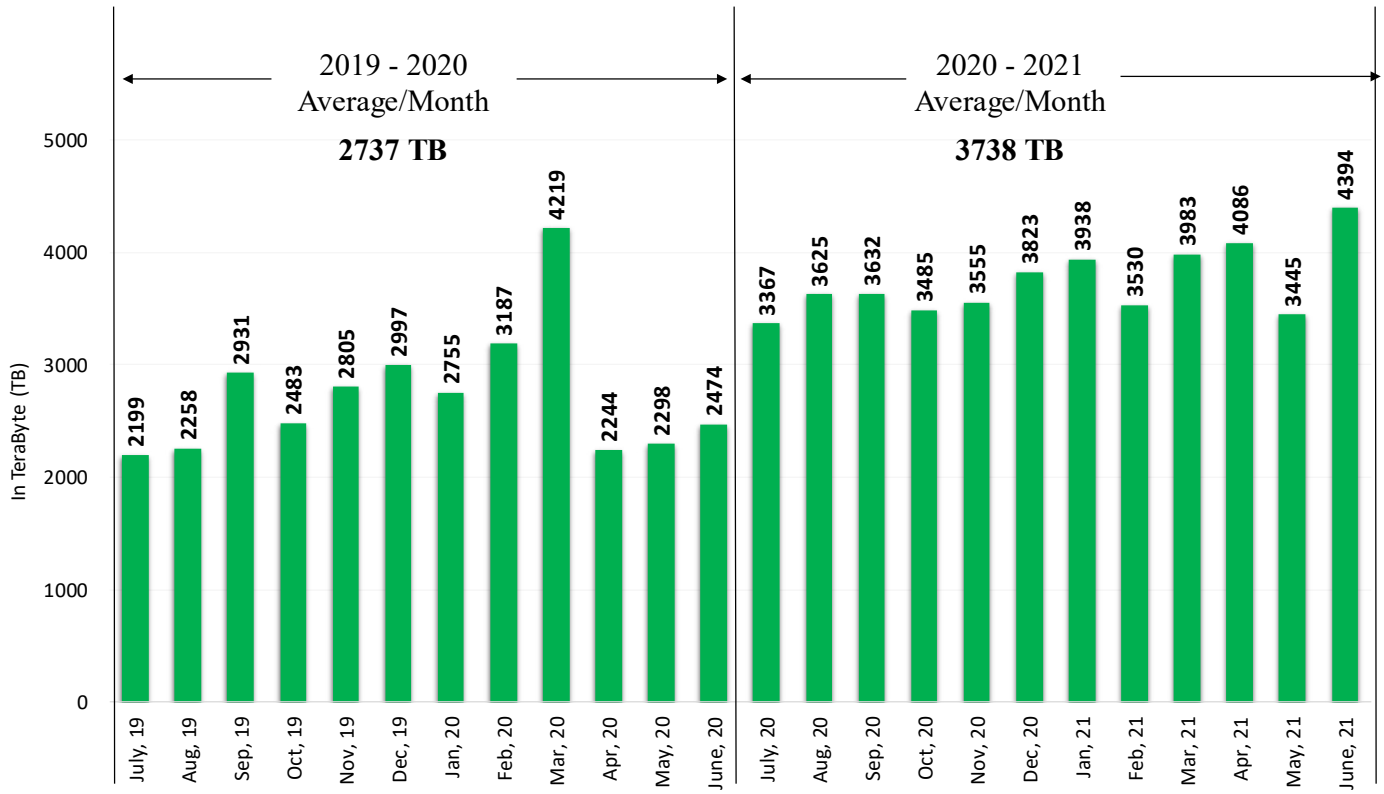


**Figure 12: Trend of Research Traffic growth over the years**

A revolution in research traffic from global R&E hub has started since 2013. Although BdREN's participation is visible since 2019 with a record growth of 385% (upload+download) taking place in 2019 to 2020 which continued its remarkable increase in 2020 to 2021 as well with an increment of 202%.

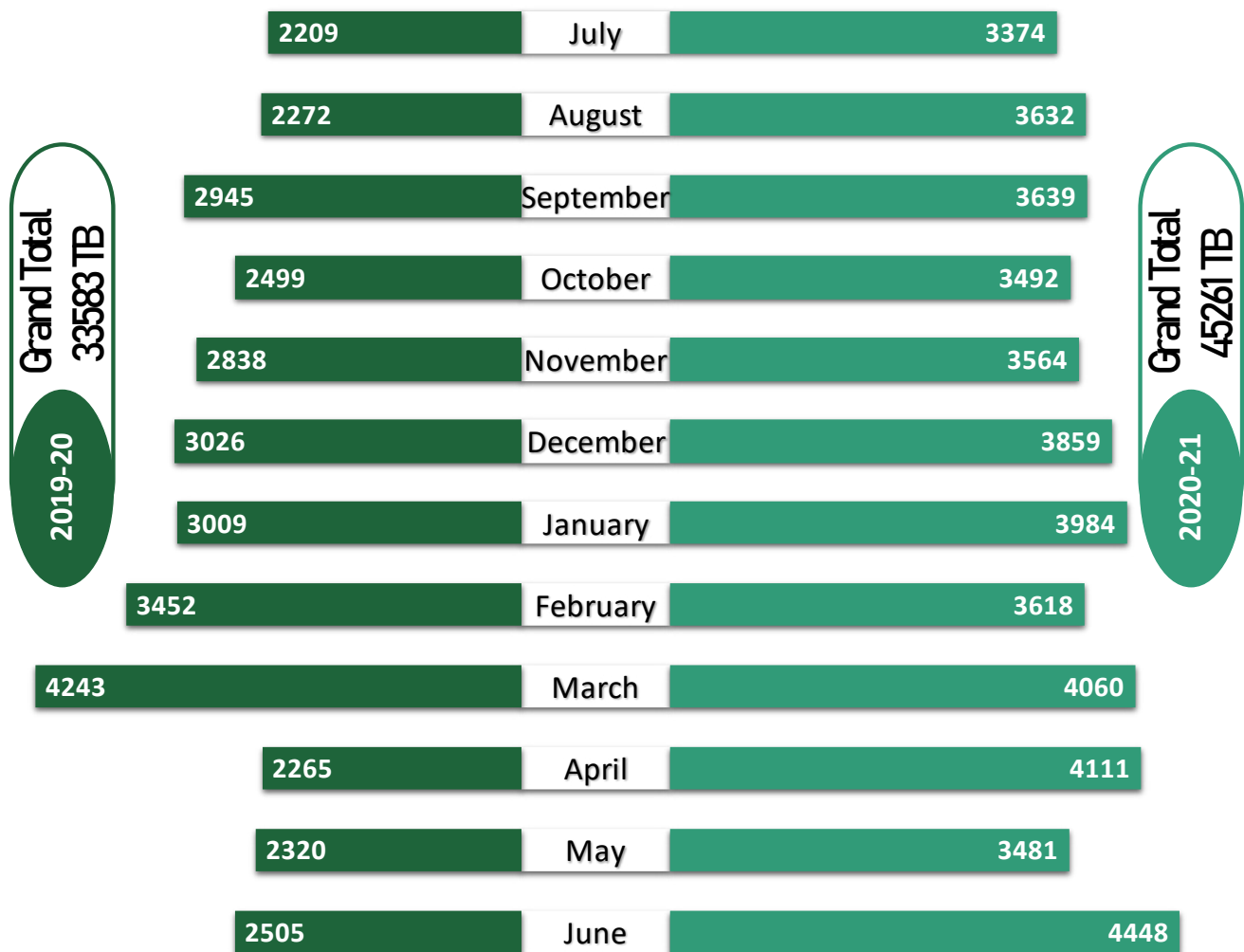


**Figure 13: Monthly Research Traffic in last 2 years**



**Figure 14: Monthly Commodity Traffic in last 2 years**

Monthly research & commodity internet traffic shows a clear increasing trend. In terms of 'Average/Month traffic usage' the Research and Commodity traffic increased by 60% and 36% respectively during the period from 2019-2020 to 2020-2021.



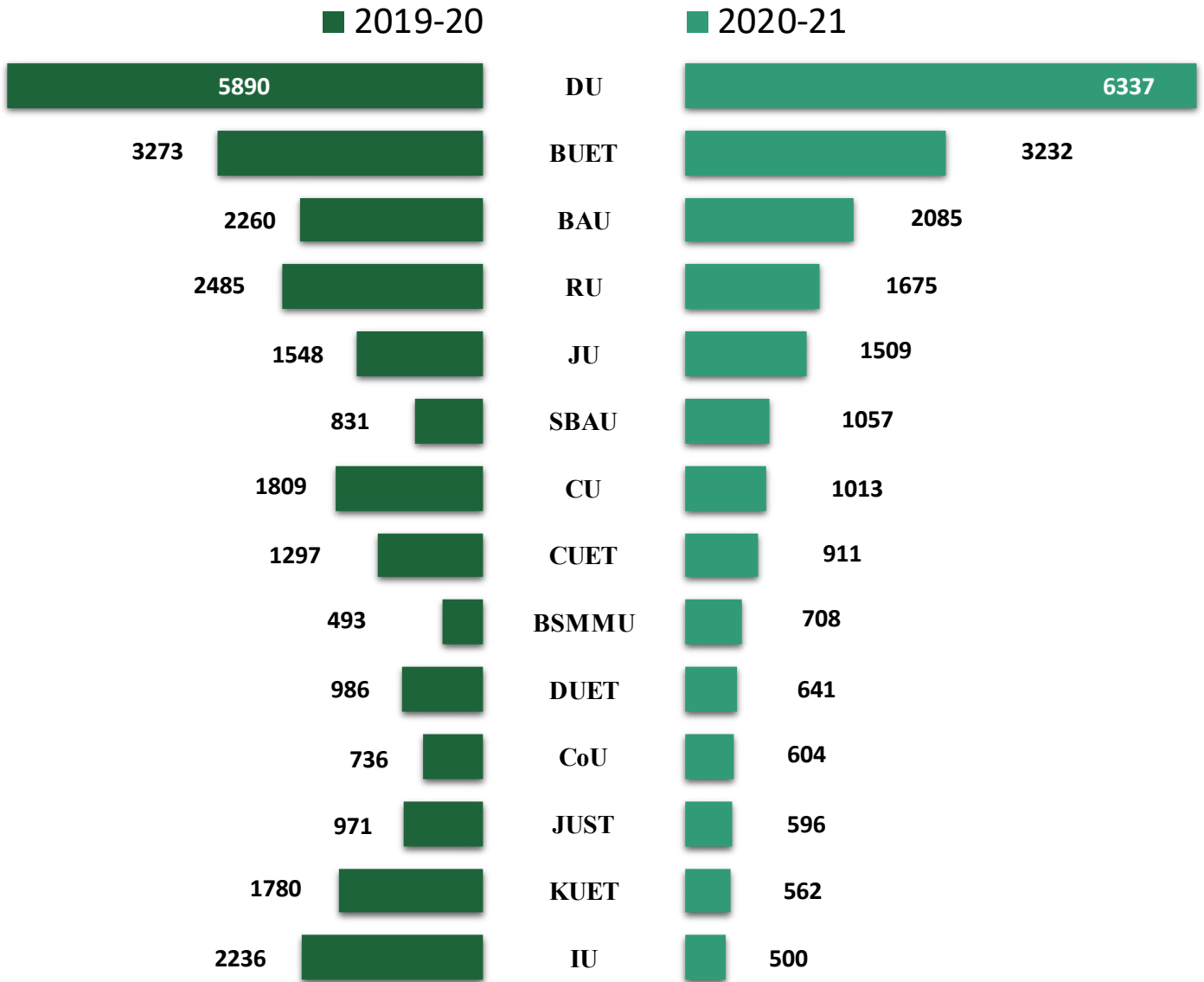
**Figure 15: Month-on-Month Comparison of Total Traffic (Research + Commodity) in Tera Byte (TB), 2019-20 vs 2020-21**

In terms of Traffic Volume (Figure-15) the overall traffic pattern shows an increasing trend over the period with a noticeable exception during the period when the country went for a strict lockdown as COVID-19 just started spreading (April to June 2020). Overall traffic got reduced significantly during that period of time. Total generated traffic volume was 33,583 TB and 45,261 TB in 2019-20 and 2020-21 respectively, which shows a 35% increase year on year.

A pair of metal scales is shown on a wooden surface. The scales are filled with various stones and weights. The text "INSTITUTION-WISE TOTAL TRAFFIC VOLUME (IN+OUT)" is overlaid on the image in white, bold, uppercase letters.

**INSTITUTION-WISE TOTAL  
TRAFFIC VOLUME (IN+OUT)**

## Traffic Volume $\geq$ 500 TB



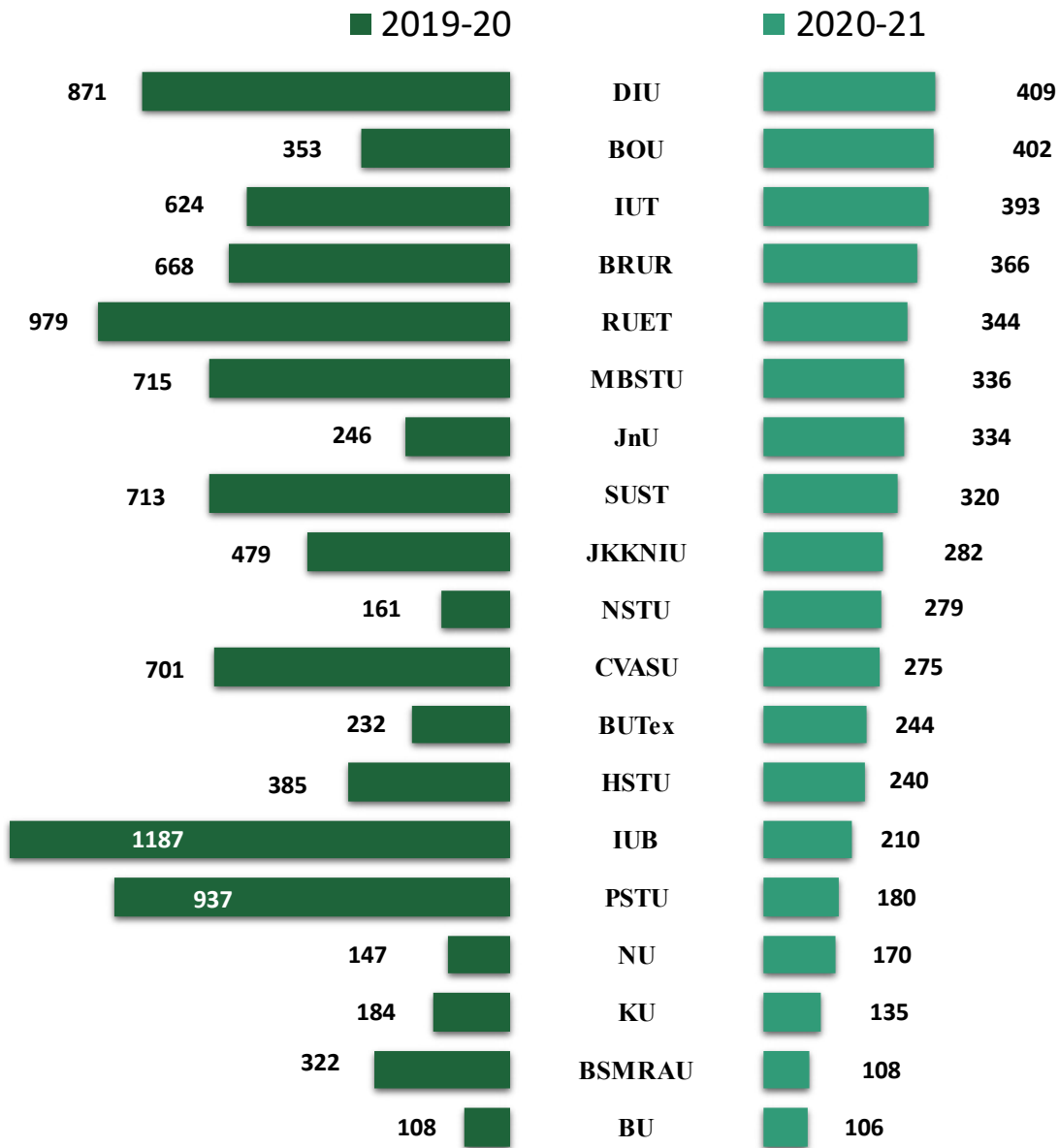
**Figure 16: Institution-wise Total Traffic Volume (In+Out) in TB comparing 2019-20 vs 2020-21 [Traffic Volume  $\geq$  500TB]**

To present the picture in a better way, the institutions are grouped with respect to traffic volume as:

- \* Figure-16: Traffic Volume  $\geq$  500 TB
- \* Figure-17: 100 TB  $\leq$  Traffic Volume < 500 TB
- \* Figure-18: Traffic Volume < 100 TB

Figure-16 demonstrates that Dhaka University consumed by far the highest traffic in both 2019-20 and 2020-21 with significant increase in traffic in the latter year. For other institutions (with exception of SBAU and BSMMU) the traffic in 2020-21 is less as compared to that of in 2019-2020 due to the fallout of COVID-19.

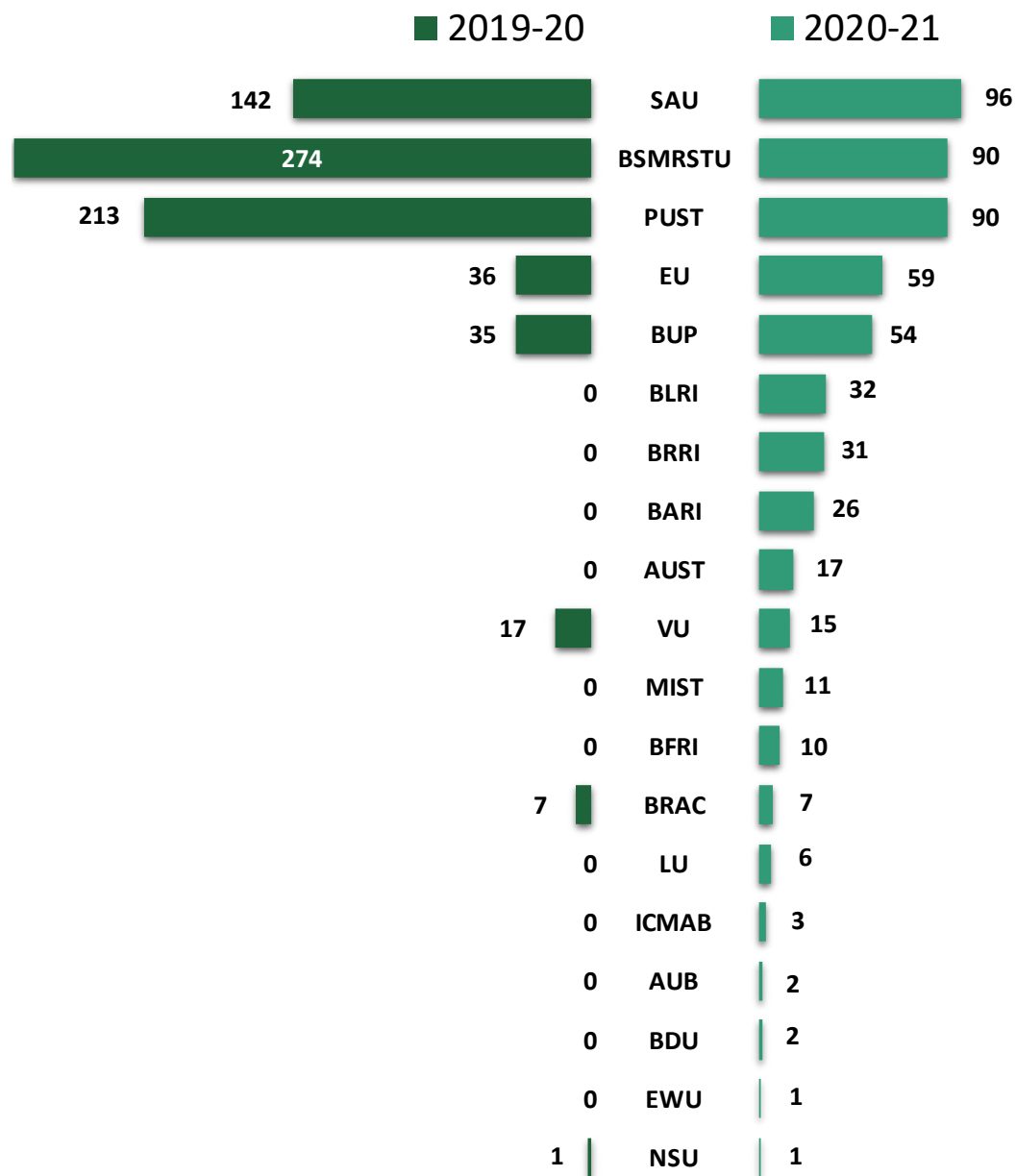
## 100 TB ≤ Traffic Volume < 500 TB



**Figure 17: Institution-wise Total Traffic Volume (In+Out) in TB comparing 2019-20 vs 2020-21 [100 ≤ Traffic Volume < 500TB]**

Similar to Figure-16, it is vivid from Figure-17 that for most of the institutions the traffic in 2020-21 has experienced a significant reduction.

## Traffic Volume < 100 TB



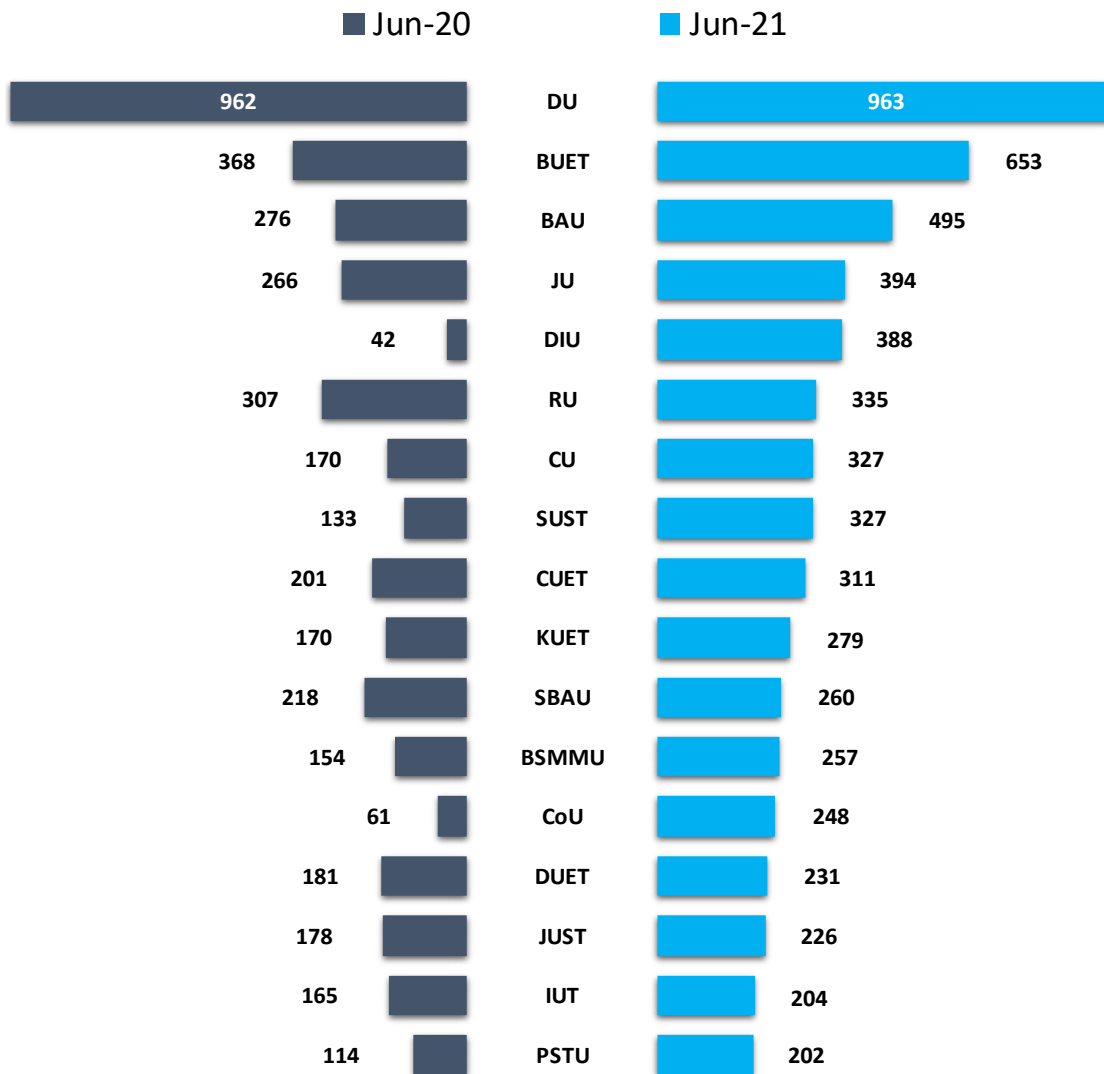
**Figure 18: Institution-wise Total Traffic Volume (In+Out) in TB comparing 2019-20 vs 2020-21 [Traffic Volume < 100TB]**

As concluded in the previous two (2) figures, the same is reflected in Figure-18 where it is demonstrated that for most of the institutions the traffic reduced drastically. Eleven (11) institutions found to consume zero (0) traffic in 2019-2020 because they were connected with BdREN in 2020-2021.



# Institution-wise Maximum Bandwidth

## Maximum Bandwidth $\geq$ 200 Mbps



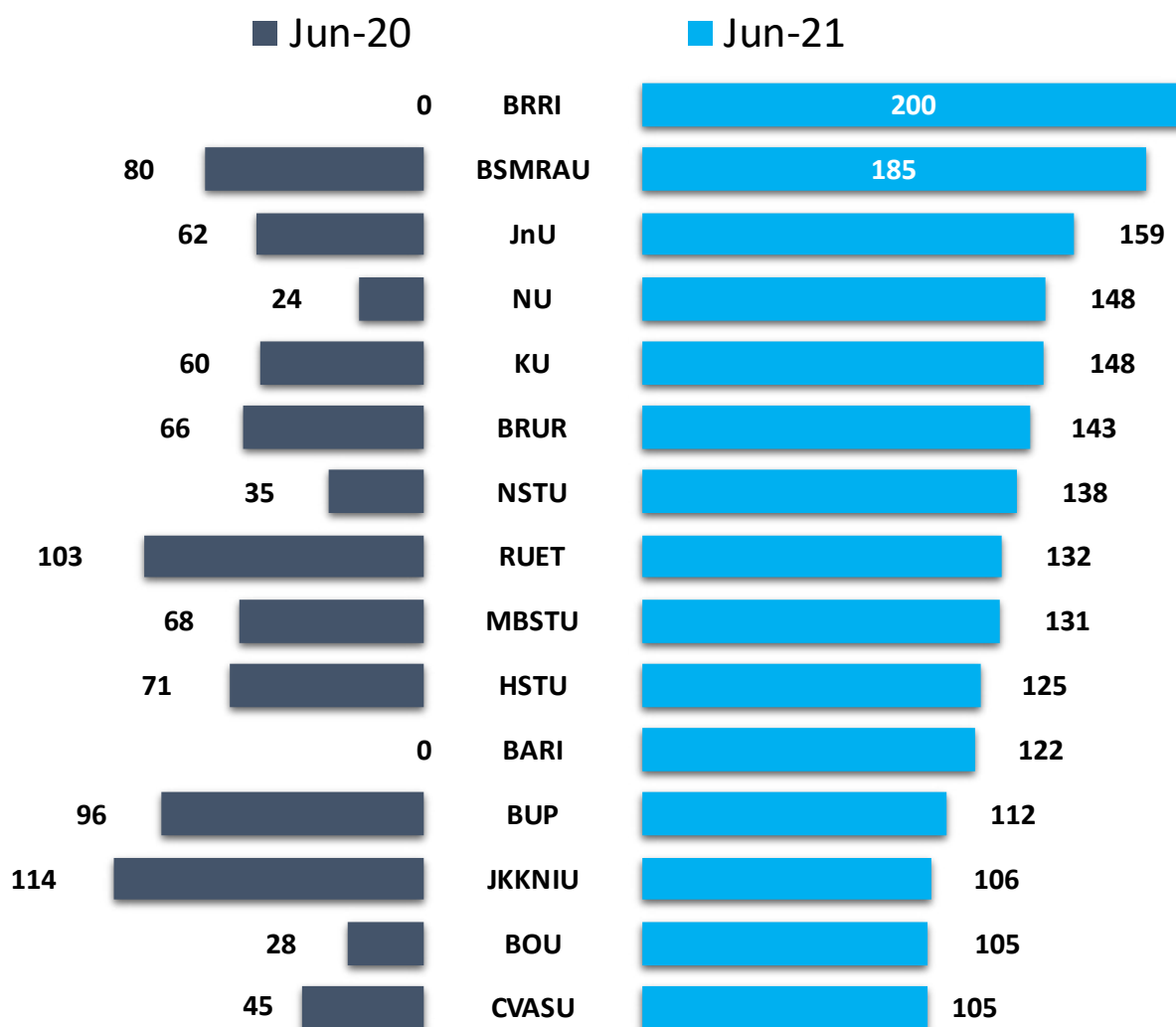
**Figure 19: Institution-wise Maximum Bandwidth consumption comparing only June 2021 with June 2020  
[Maximum Bandwidth  $\geq$  200 Mbps]**

For better representation in terms of usage of maximum bandwidth the institutions are divided into three (3) groups:

- \* Figure-19: Maximum Bandwidth  $\geq$  200 Mbps
- \* Figure-20: 100 Mbps  $\leq$  Maximum Bandwidth < 200 Mbps
- \* Figure-21: Maximum Bandwidth < 100 Mbps

It is evident from Figure-19 that for most of the institutions the usage has phenomenally increased with DU taking the lead.

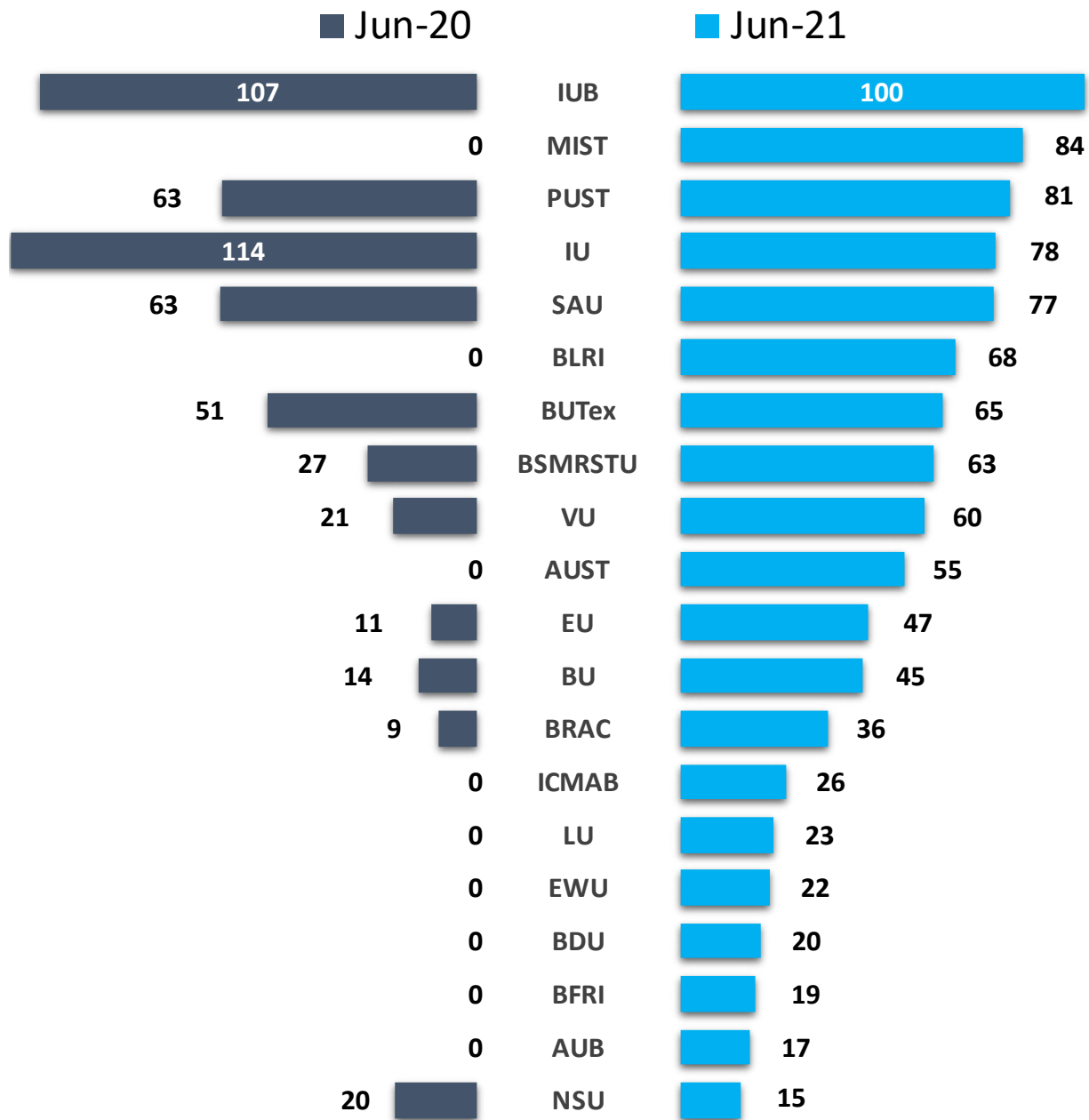
## 100 Mbps ≤ Maximum Bandwidth < 200 Mbps



**Figure 20: Institution-wise Maximum bandwidth consumption comparing only June 2021 with June 2020 [100 ≤ Maximum Bandwidth < 200 Mbps]**

Among the group of institutes expressed in Figure-20, the same trend of increase in bandwidth usage in June 2021 in comparison to June 2020 is displayed.

## Maximum Bandwidth < 100 Mbps



**Figure 21: Institution-wise Maximum bandwidth consumption comparing only June 2021 with June 2020**  
**[Maximum Bandwidth < 100 Mbps]**

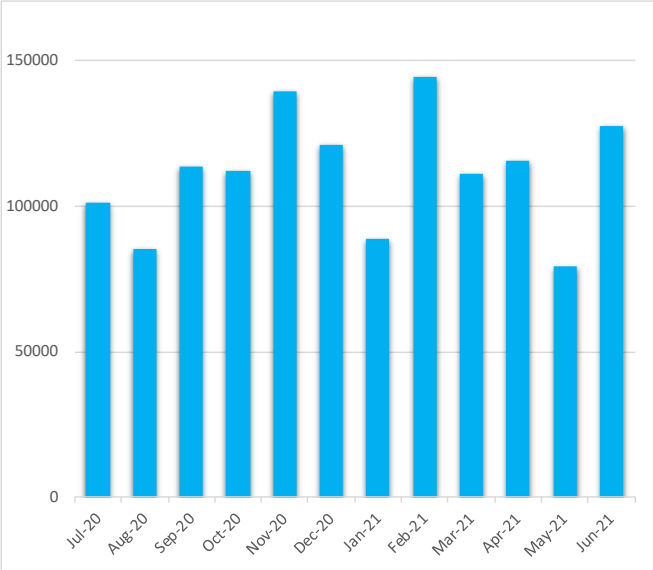
In this group (<100 Mbps) the maximum bandwidth usage has increased for most of the Institutions. Few of the Institutions with zero (0) usage of maximum bandwidth in June 2020 were connected with BdREN after that time.

# VIDEO CONFERENCING STATISTICS

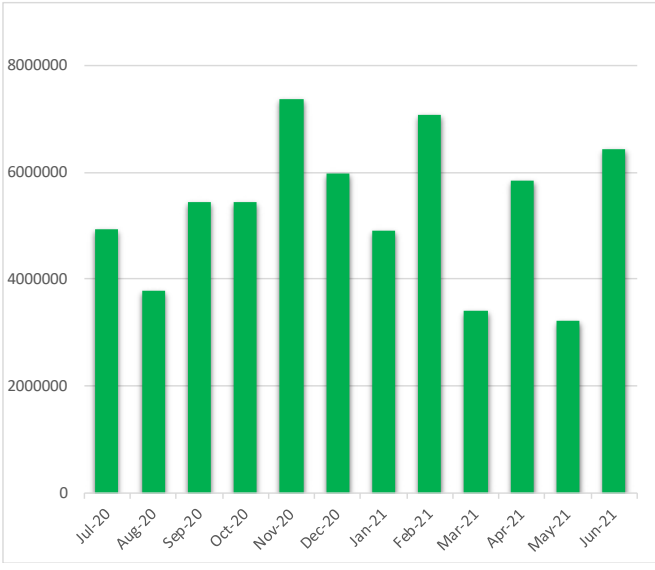
## Zoom & vSession Usage



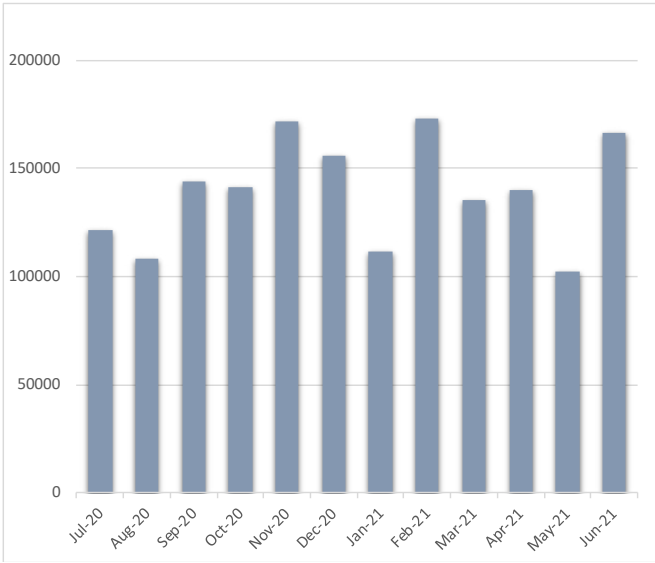
# MONTH-WISE ZOOM APPLICATION USAGE STATISTICS




Online Classes	
Total	13,40,193
Monthly Peak	1,11,682



Participants	
Total	6,37,80,733
Monthly Peak	53,15,061

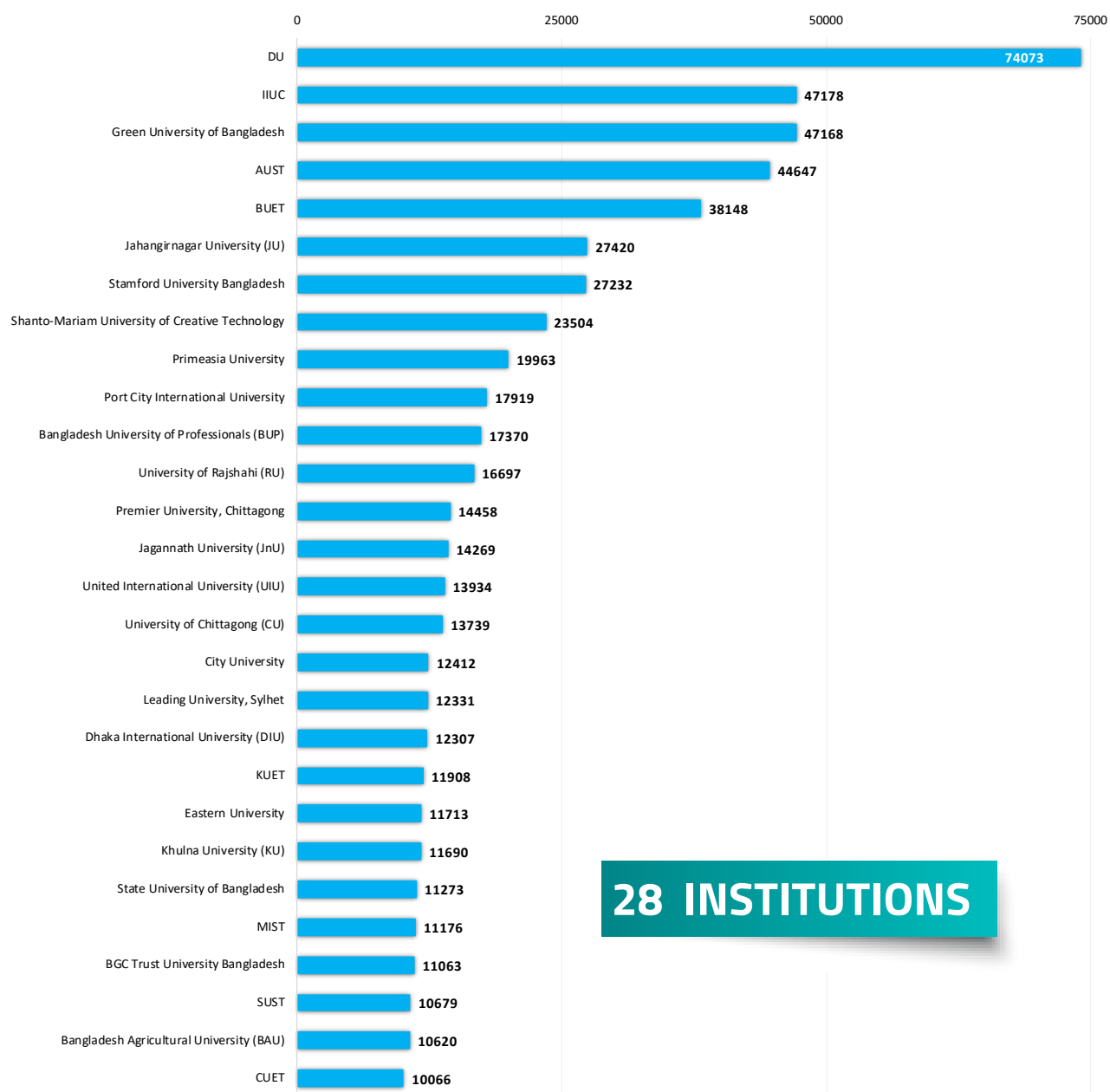


Duration, Hours	
Total	16,71,824
Monthly Peak	1,39,318



# INSTITUTION-WISE TOTAL ONLINE CLASSES

## Number of Classes $\geq$ 10,000



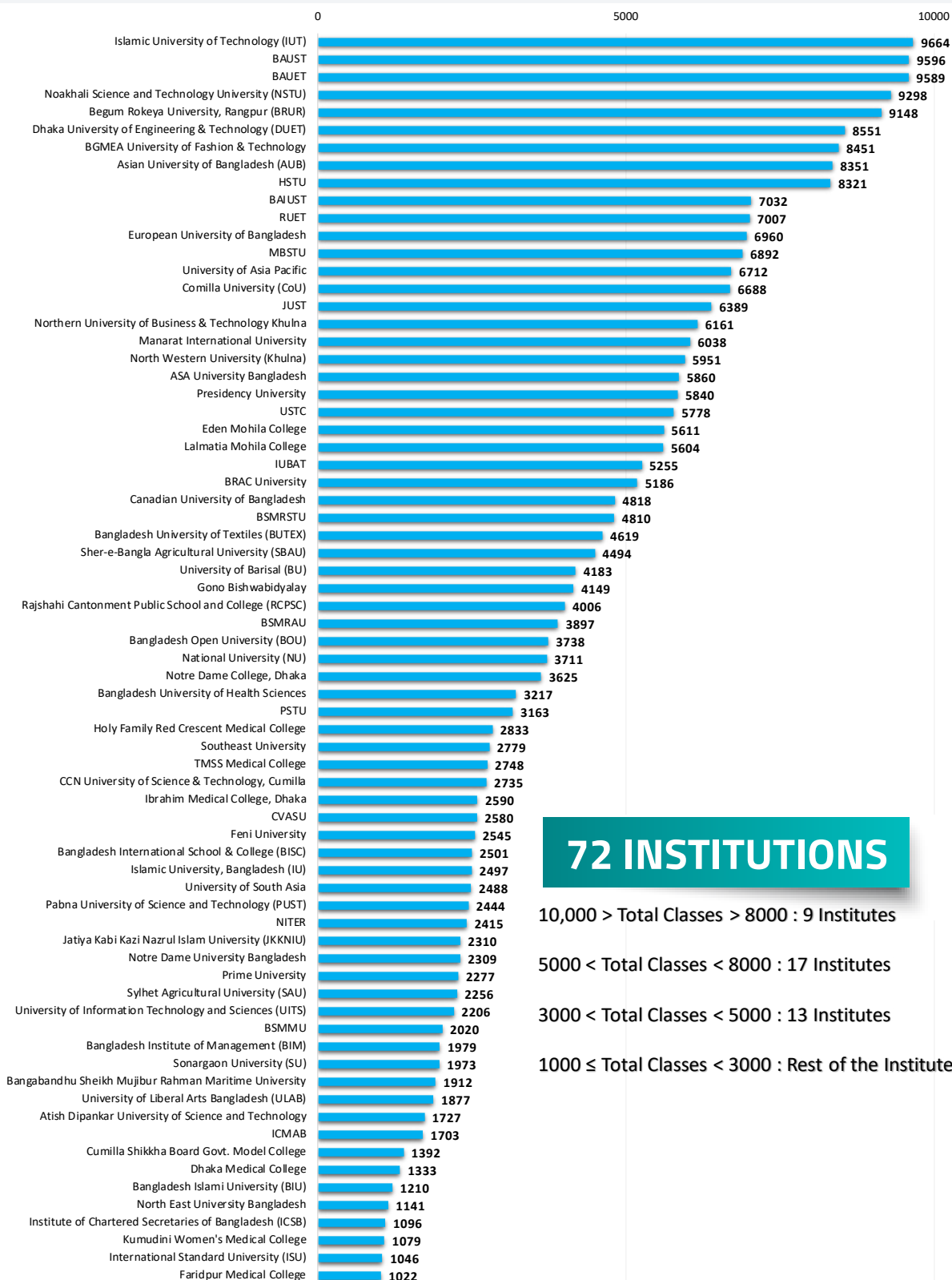
**Figure 22: Institution-wise total number of classes held during July 2021-June 2022**  
**[Number of Classes  $\geq$  10,000]**

Again for better presentations of the video conferencing statistics, the institutions are divided into four (4) groups:

- Figure-22: Number of Classes  $\geq$  10,000
- Figure-23:  $1,000 \leq$  Number of Classes  $<$  10,000
- Figure-24:  $100 \leq$  Number of Classes  $<$  1,000
- Figure-25: Number of Classes  $<$  100

Among all of the Institutions, Dhaka University (DU) stands 1<sup>st</sup> for the highest number of classes conducted online. It is to be mentioned that total 224 individual Institutions across the country used BdREN’s zoom services for conducting their online classes.

# 1,000 ≤ Number of Classes < 10,000



**72 INSTITUTIONS**

10,000 > Total Classes > 8000 : 9 Institutes

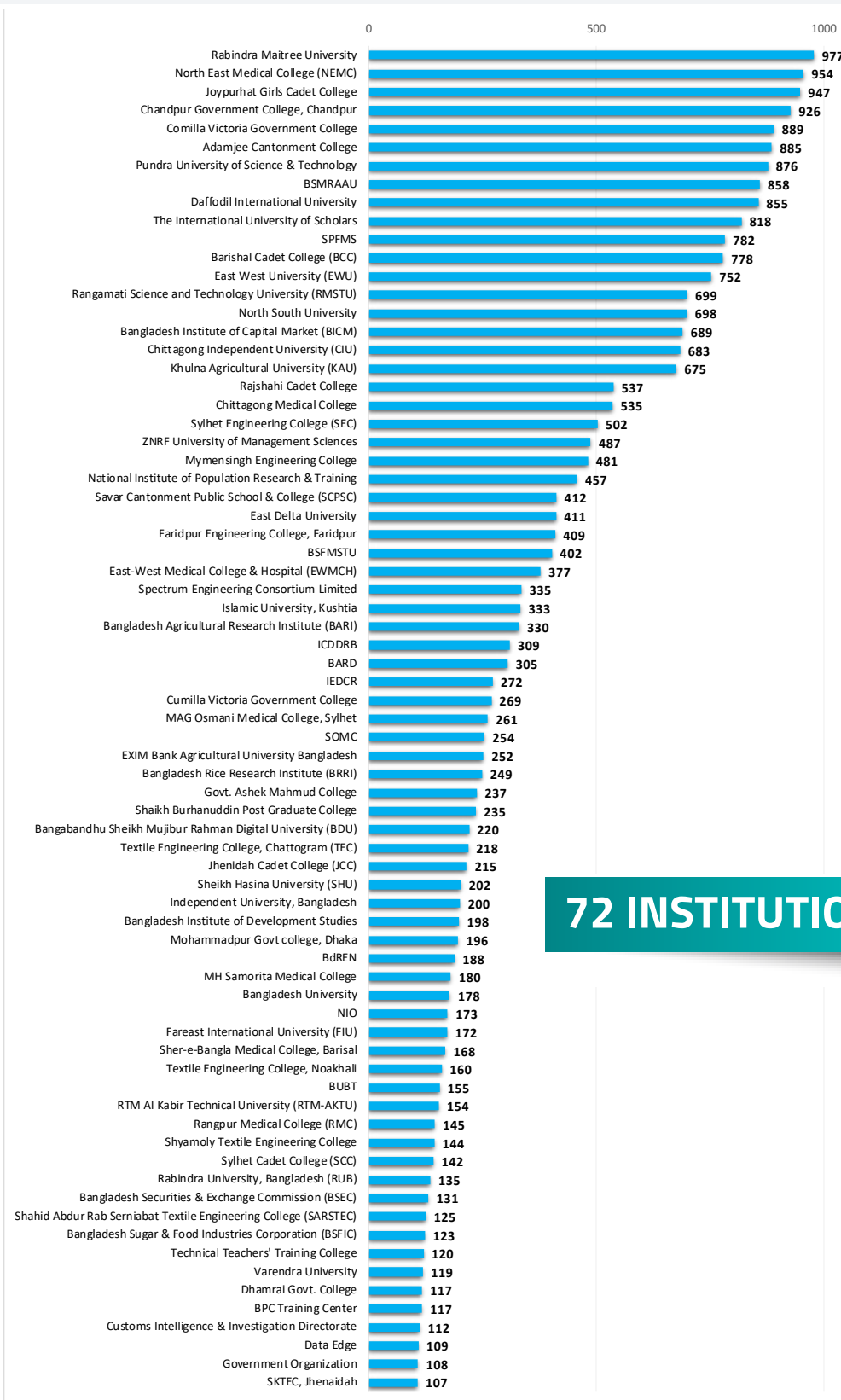
5000 < Total Classes < 8000 : 17 Institutes

3000 < Total Classes < 5000 : 13 Institutes

1000 ≤ Total Classes < 3000 : Rest of the Institutes

**Figure 23: Institution-wise total number of classes held during July 2021-June 2022 [1,000 ≤ Number of Classes < 10,000]**

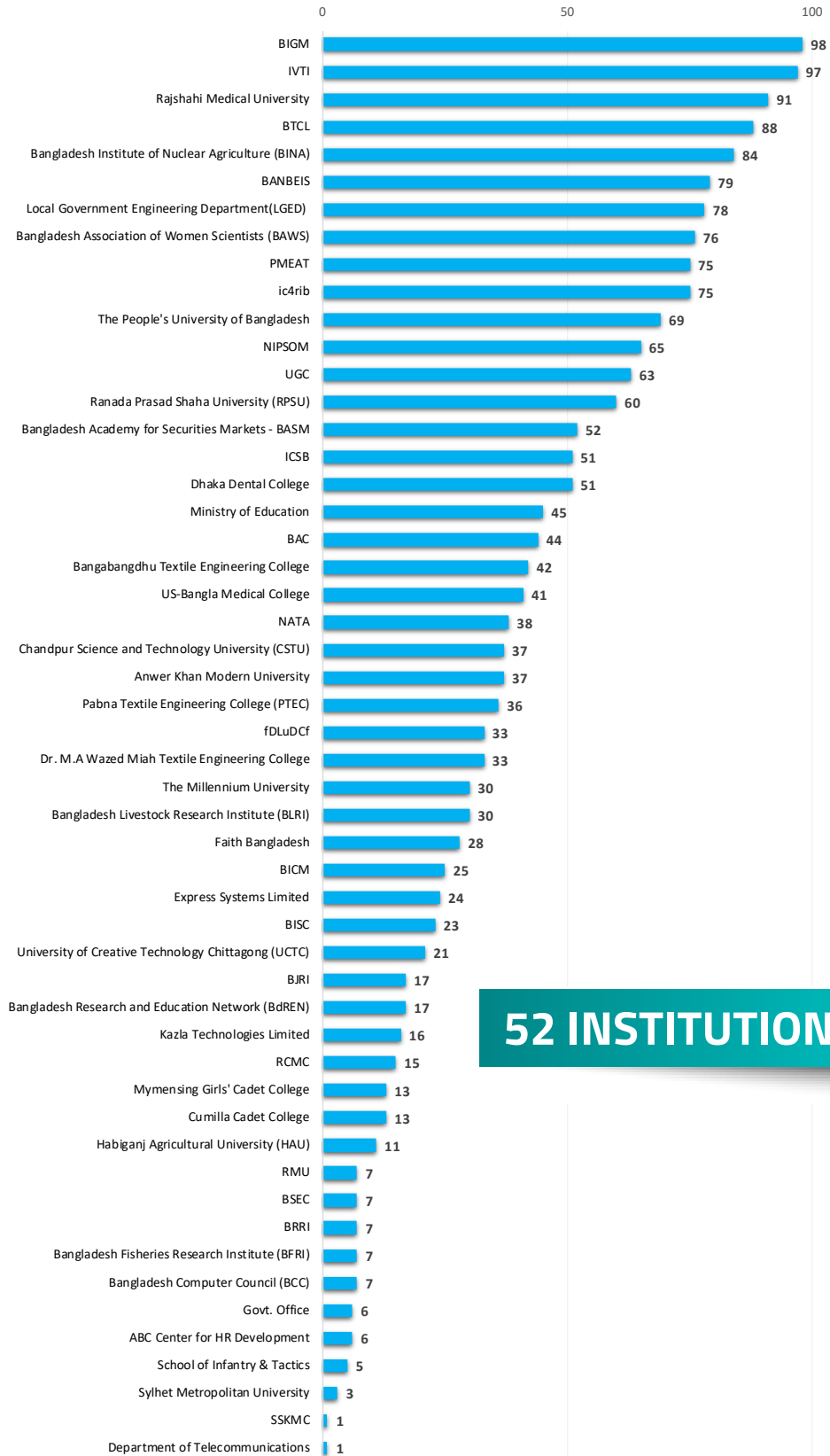
# 100 ≤ Number of Classes < 1,000



**72 INSTITUTIONS**

**Figure 24: Institution-wise total number of classes held during July 2021-June 2022 [100 ≤ Number of Classes < 1,000]**

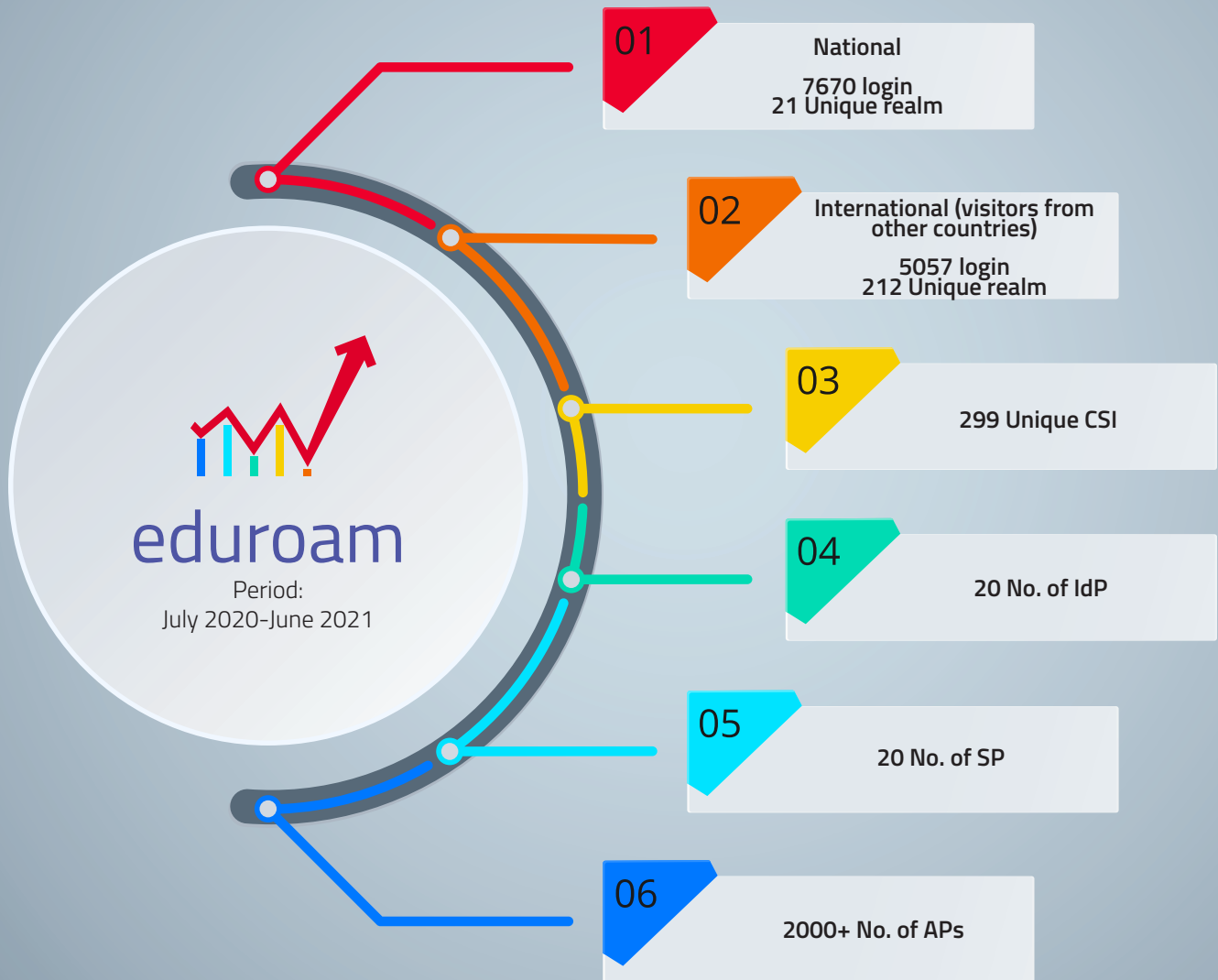
# Number of Classes < 100



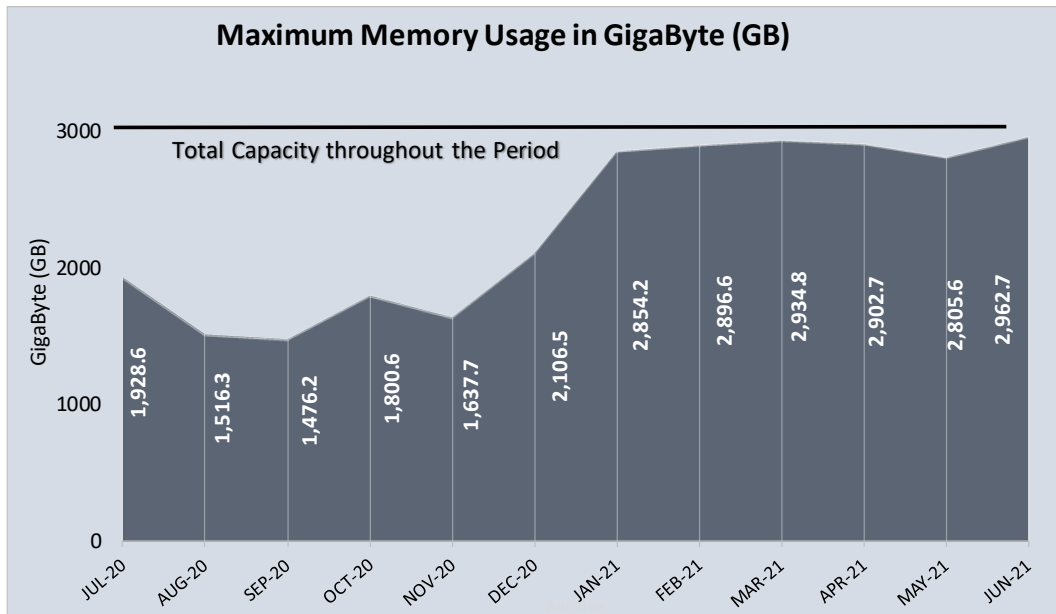
**52 INSTITUTIONS**

**Figure 25: Institution-wise total number of classes held during July 2021-June 2022  
[Number of Classes < 100]**

# eduroam USAGE

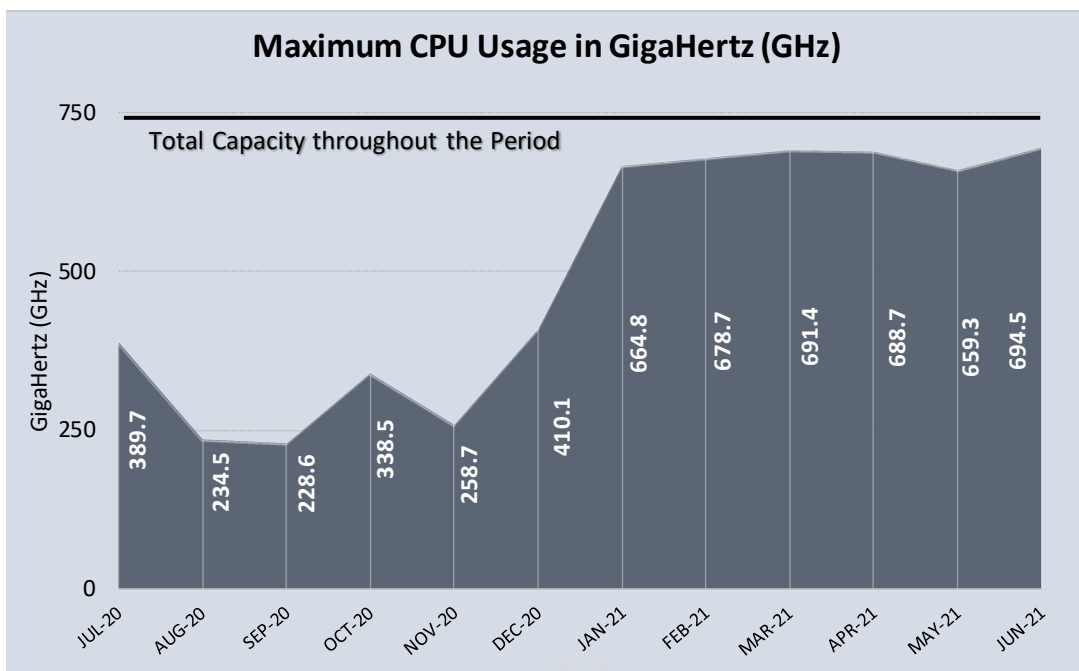


# CLOUD COMPUTING USAGE



It is evident from the figure that the usage of memory has rapidly increased in the earlier part of 2021 compared to that of in the later part of 2020, and the usage was at its peak during June 2021. The average memory usage in the financial year of 2020-21 was 2.3 TB.

**Figure 26: Monthly Maximum Memory Usage in GB during the financial year 2020-21**



With increasing usage of memory, the usage of CPU has also rapidly increased in the earlier part of 2021 compared to that of in the later part of 2020 and the usage was at its zenith during June 2021. The average CPU usage in the financial year of 2020-21 was 495 GHz.

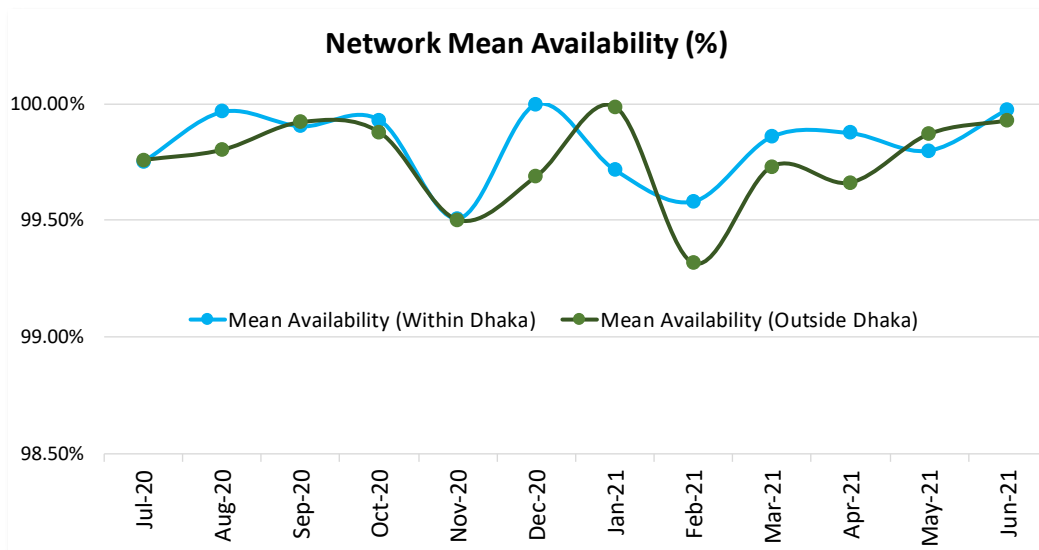
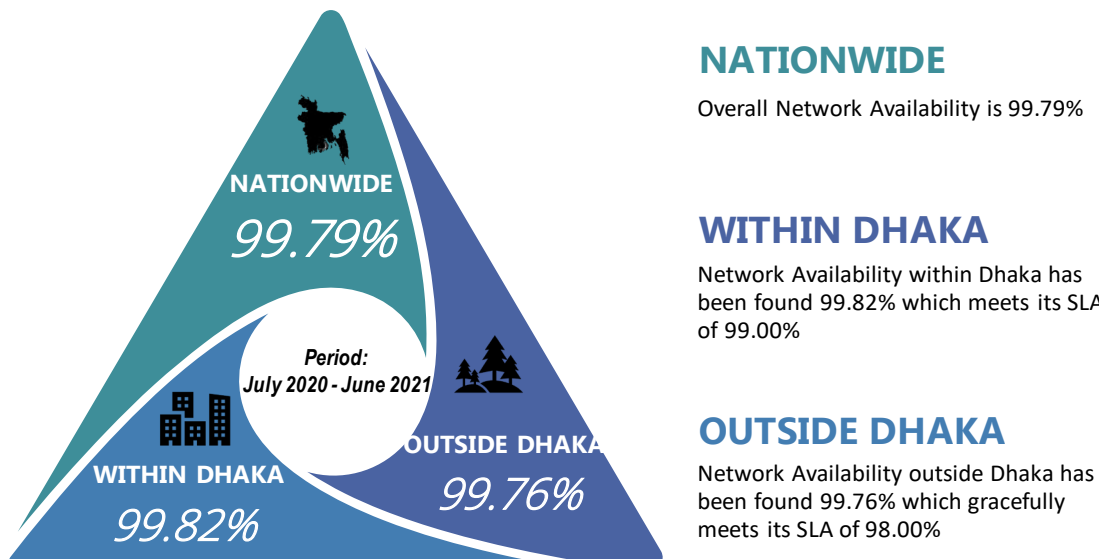
**Figure 27: Monthly Maximum CPU Usage in GHz during the financial year 2020-21**



# NETWORK PERFORMANCE STATISTICS

BdREN always puts its efforts in enhancing its offered QoS (Quality of Service) which is the measurement of the overall performance of a service, particularly the performance experienced by the users of the network. Here, the network performance is presented with the KPIs: 'Network availability', 'Latency' and 'Packet Loss', measured to/from the external sources.

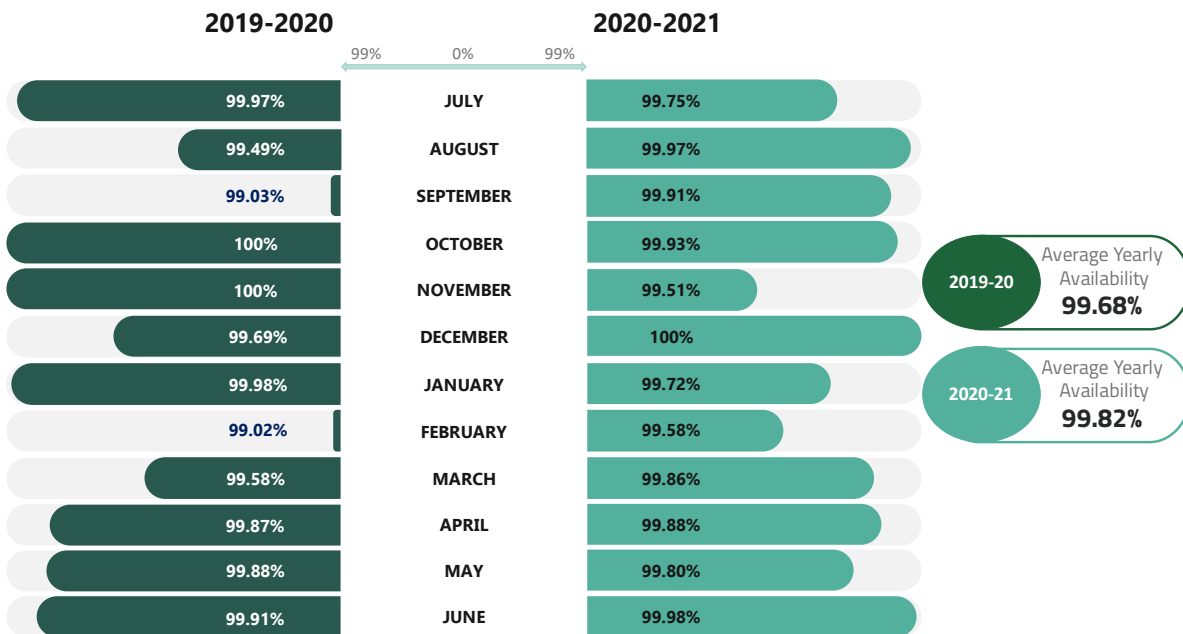
## NETWORK AVAILABILITY



**Figure 28: Monthly Mean Availability of BdREN's Network in 2020-21**

The Figure-28 shows network mean availability with 2 line graphs; one is for the Institutions situated within Dhaka, and another group is for institutes outside Dhaka. It can be observed that except February 2021, mean availability for every other month were above 99.5%.

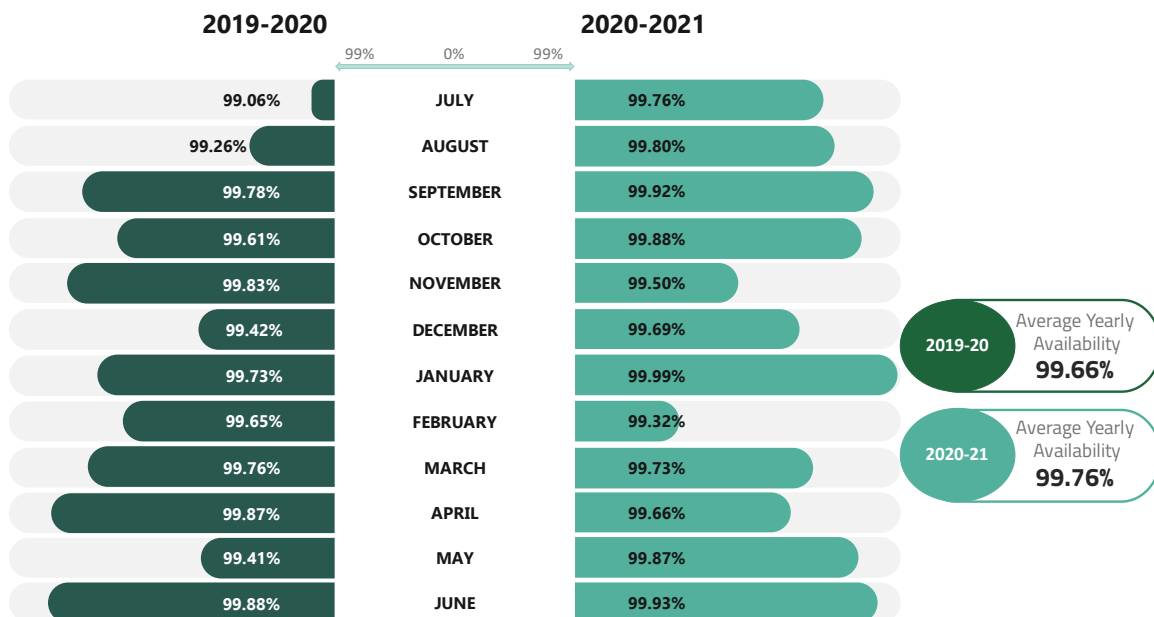
## NETWORK AVAILABILITY INSIDE DHAKA



**Figure 29: Month-on-Month Network Availability inside Dhaka [2019-20 vs 2020-21]**

It can be concluded from Figure-29 that monthly network availability for the Institutions located inside Dhaka met the SLA of 99.00% in every month during 2019-20 and 2020-21. The Average Availability in 2020-21 has been found as 99.82% which is significantly higher than that of 99.68% in 2019-20.

## NETWORK AVAILABILITY OUTSIDE DHAKA



**Figure 30: Month-on-Month Network Availability outside Dhaka [2019-20 vs 2020-21]**

It can be concluded from Figure-30 that monthly network availability for the Institutions located outside Dhaka met the SLA of 98.00% in every month during 2019-20 and 2020-21. The Average Availability in 2020-21 has been found as 99.76% which is significantly higher than that of 99.66% in 2019-20.

# INSTITUTION-WISE YEARLY AVERAGE AVAILABILITY

## INSIDE DHAKA

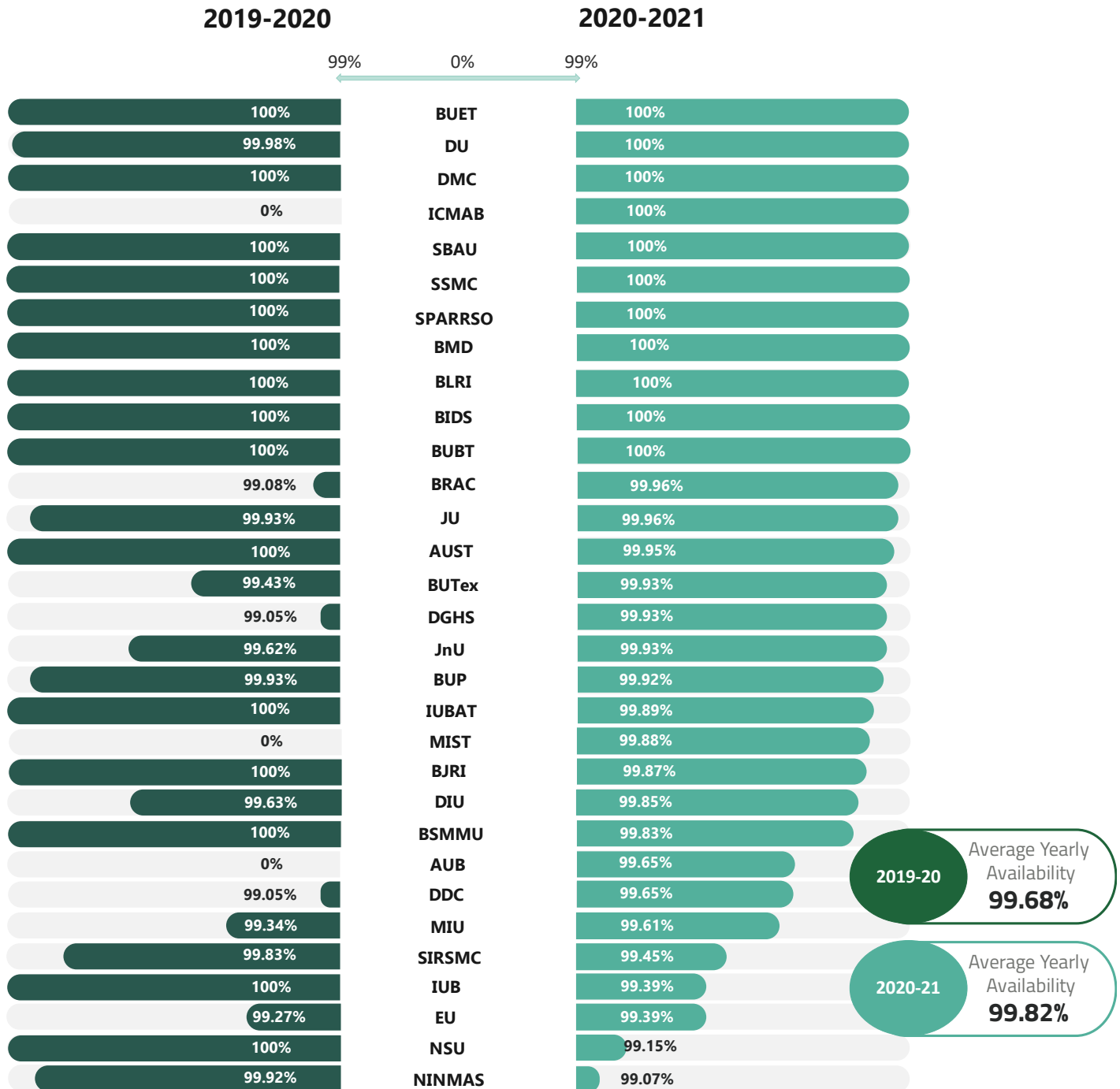


Figure 31: Institution-wise yearly "Network Availability" for Institutions located inside Dhaka [2019-20 vs 2020-21]

# OUTSIDE DHAKA

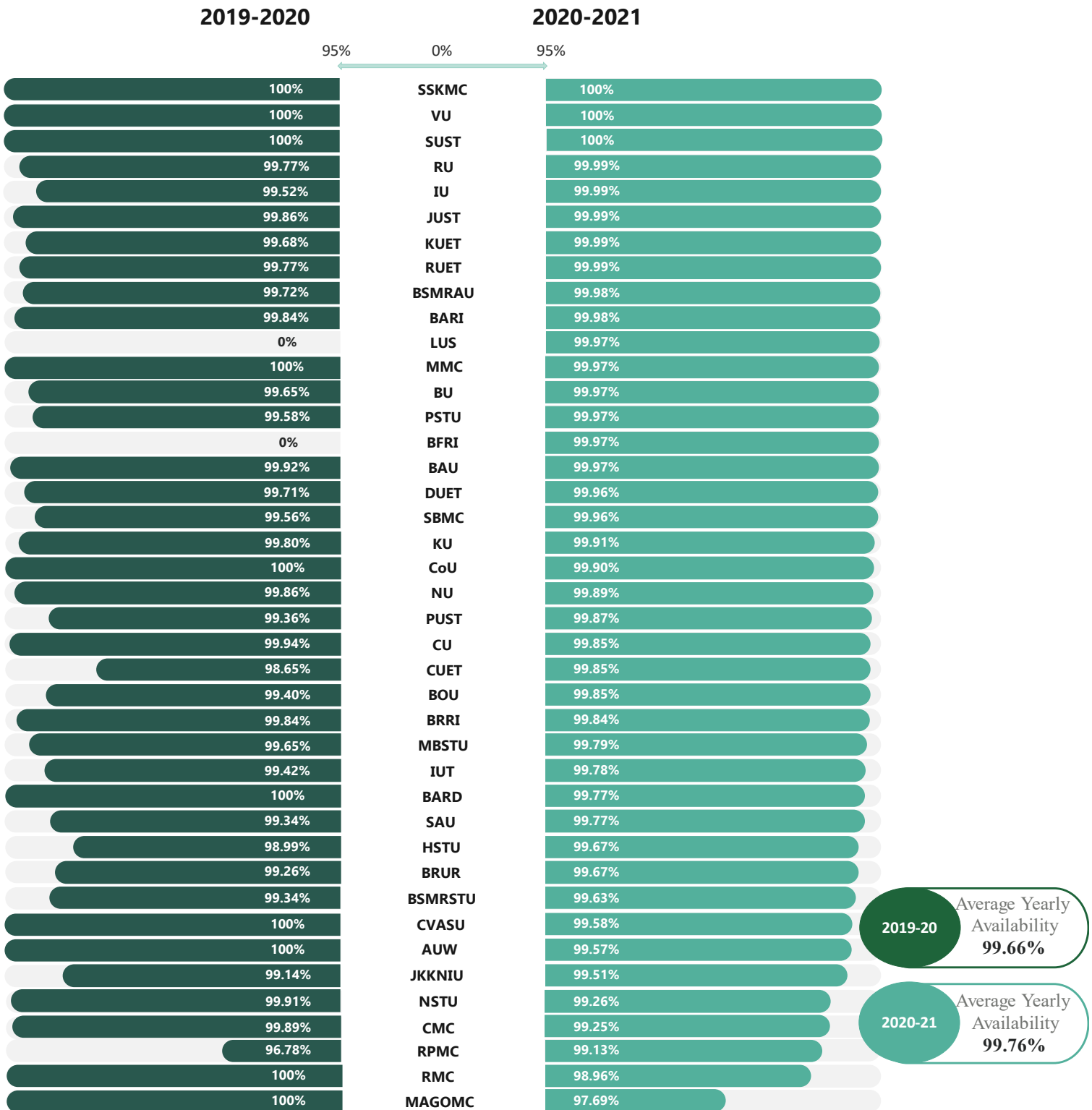
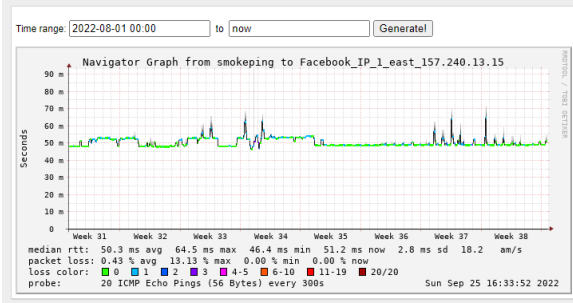


Figure 32: Institution-wise yearly “Network Availability” for Institutions located outside Dhaka [2019-20 vs 2020-21]

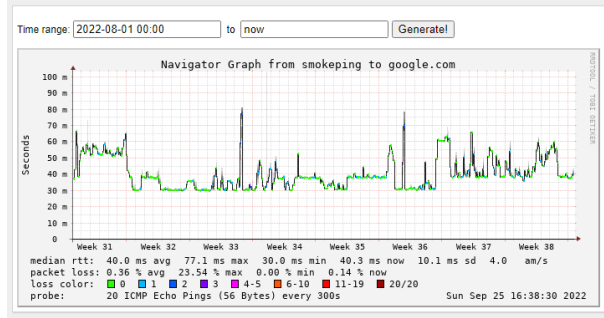
# LATENCY AND PACKET LOSS STATUS TO/FROM EXTERNAL SOURCES

## Facebook\_IP\_1\_east\_157.240.13.15



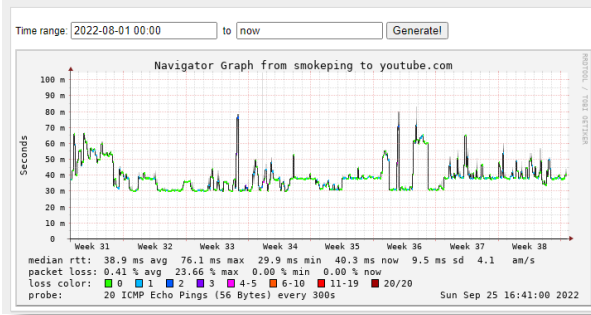
Standard Latency for Facebook in East zone: **48 ms**  
 BdREN's measured average latency: **50 ms**  
 BdREN's measured average packet loss for Facebook: **0.43%**

## google.com



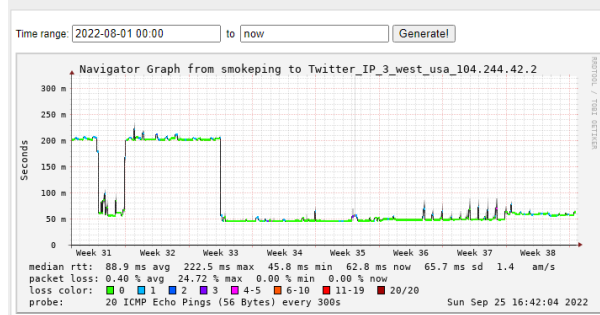
Standard Latency for Google in East zone: **48 ms**  
 BdREN's measured average latency: **40 ms**  
 BdREN's measured average packet loss for Google: **0.36%**

## youtube.com



Standard Latency for YouTube in East zone: **48 ms**  
 BdREN's measured average latency: **39 ms**  
 BdREN's measured average packet loss for YouTube: **0.41%**

## Twitter\_IP\_3\_west\_usa\_104.244.42.2



Standard Latency for Twitter in East zone: **230 ms**  
 BdREN's measured average latency: **89 ms**  
 BdREN's measured average packet loss for Twitter: **0.40%**

# OUR MEMBERS



As of July 2021, BdREN had 102 Universities as "Full Member", 51 Institutes as "Associate Member", 3 Institutes as "Affiliate Member" and 3 Organizations as "Industry Member". Most of the Public Universities and many of the Private Universities are directly connected to BdREN backbone network to get the basic services like Internet Access, Computing and Virtualization Services, IP Telephony and similar other services. On top of that, a few of the value-added services like eduroam, federated access and eduGAIN are also being offered to all those universities

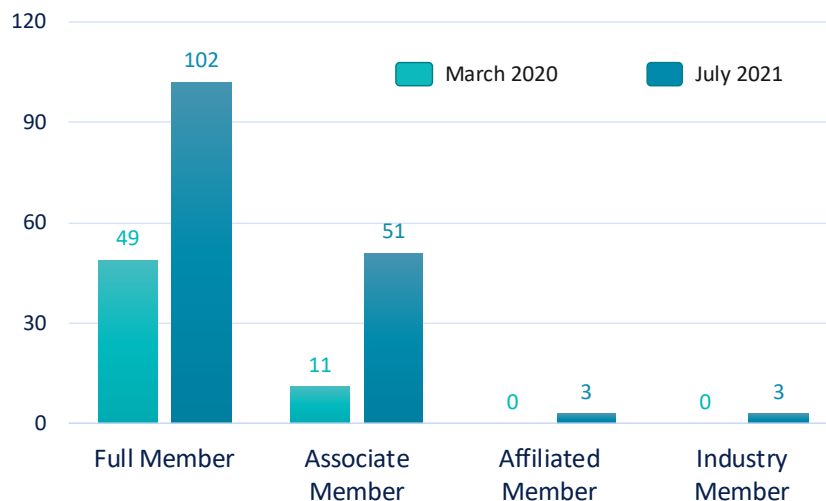
which are directly connected to BdREN. Many of the other institutes who are associated members of BdREN are also directly connected to BdREN and are entitled to avail the above-mentioned services. During COVID-19 pandemic, the growth of BdREN membership was quite amazing as opposed to the earlier period of time due to incessant popularity of usage of video conferencing services using "Zoom Application", which BdREN provided free- of-cost.

### Category of Membership

- Full Member** : All the Universities.
- Associate Member** : Educational/Training Institutes other than Universities and the Research Institutes.
- Affiliated Member** : Organizations supporting financing of Research and Education
- Industry Member** : Commercial Organizations in the relevant industry.

**Table 2. List of BdREN's Member Institutions**

Membership Type	March 2020	July 2021
Full Member	49	102
Associate Member	11	51
Affiliated Member	0	3
Industry Member	0	3
Total	60	159



**Figure 33: BdREN's Member Institutions under different categories**

# FULL MEMBERS



Ahsanullah University of Science and Technology (AUST)



Asian University for Women (AUW)



ASA University Bangladesh



Atish Dipankar University of Science and Technology



Asian University of Bangladesh (AUB)



Bangladesh University of Engineering and Technology (BUET)



Bangladesh Agricultural University (BAU)



Bangladesh University of Professionals (BUP)



Bangabandhu Sheikh Mujib Medical University (BSMMU)



Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU)



Bangabandhu Sheikh Mujibur Rahman Science and Technology University (BSMRSTU)



Begum Rokeya University, Rangpur (BRUR)



Bangladesh Open University (BOU)



Bangladesh University of Textiles (BUTex)



Bangabandhu Sheikh Mujibur Rahman Digital University (BDU)



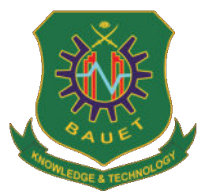
Inspiring Excellence



Bangladesh University of Business and Technology (BUBT)



Bangladesh Army International University of Science and Technology



Bangladesh Army University of Engineering and Technology (BAUET)



Bangabandhu Sheikh Mujibur Rahman Aviation and Aerospace University



Bangabandhu Sheikh Mujibur Rahman Maritime University



Bangladesh Islamic University (BIU)



Bangladesh Army University of Science & Technology (BAUST)



Bangladesh University of Health Sciences (BUHS)



BGC Trust University Bangladesh



Chittagong Independent University



Comilla University (CoU)



City University



CCN University of Science and Technology



Chittagong University of Engineering & Technology (CUET)



Chittagong Veterinary and Animal Sciences University (CVASU)



Chandpur Science and Technology University (CSTU)



Dhaka University of Engineering & Technology (DUET)



Dhaka International University (DIU)



Daffodil University



European University Bangladesh



East West University (EWU)



Eastern University (EU)



East Delta University



Feni University



Fareast International University



Green University of Bangladesh (GUB)



Gono Bishwabidyalay



Habiganj Agricultural University (HAU)



Hajeer Mohammad Danesh Science and Technology University (HSTU)



Islamic University (IU)



Islamic Arabic University (IAU)



Independent University, Bangladesh



Islamic University of Technology (IUT)



International University of Business Agriculture and Technology (IUBAT)



International Islamic University Chittagong (IIUC)



International Standard University (ISU)



Jahangirnagar University (JU)



Jagannath University (JnU)



Jashore University of Science and Technology (JUST)



Jatiya Kabi Kazi Nazrul Islam University (JKKI)



Khulna University (KU)



Khulna University of Engineering & Technology (KUET)



Khulna Agricultural University (KAU)



Leading University, Sylhet



Mawlana Bhashani Science and Technology University (MBSTU)



Manarat International University (MIU)



National University (NU)



Noakhali Science and Technology University (NSTU)



North South University (NSU)



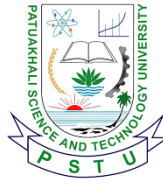
Notre Dame University Bangladesh



Northern University of Business and Technology, Khulna (NUBT)



North Western University (NWU)



Patuakhali Science and Technology University (PSTU)



Pabna University of Science and Technology (PUST)



Primeasia University



Premier University



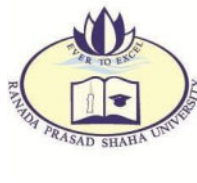
Presidency University



Prime University



Port City International University



Ranada Prashad Saha University



Rajshahi University of Engineering & Technology (RUET)



Rajshahi University

Rajshahi University (RU)



Rangamati Science and Technology University (RMSTU)



Rabindra University, Bangladesh (RBU)



Rabindra Maitree University



Rajshahi Medical University



Shahjalal University of Science & Technology (SUST)



State University of Bangladesh



Southeast University



Sheikh Hasina University, Netrokona, Bangladesh



(Government Approved)

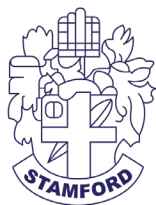
Shanto-Mariam University of Creative Technology



Sher-e-Bangla Agricultural University (SBAU)



Sylhet Agricultural University (SAU)



Stamford University Bangladesh



University of Dhaka (DU)



University of Chittagong (CU)



United International University (UIU)



University of Information Technology and Sciences (UITS)



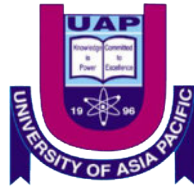
University of Scholars



University of Barisal (BU)



University of Liberal Arts (ULAB)



University of Asia Pacific (UAP)



University of South Asia



University of Science and Technology Chittagong (USTC)



Varendra University



ZNR University of Management Sciences (ZUMS)

## ASSOCIATE MEMBERS



Adamjee Cantonment College



Bangladesh International School & College (BISC)



Bangladesh Fisheries Research Institute (BFRI)



Bangladesh Institute of Development Studies (BIDS)



Bangladesh Agricultural Research Institute (BARI)



Bangladesh Rice Research Institute (BRR)



Bangladesh Meteorological Department (BMD)



Bangladesh Academy for Rural Development (BARD)



Bangladesh Institute of Nuclear Agriculture (BINA)



Bangladesh Livestock Research Institute (BLRI)



Bangladesh Institute of Governance & Management (BIGM)



Bangladesh Institute of Management (BIM)



Bangladesh Securities and Exchange Commission (BSEC)



Bangladesh Institute of Capital Market (BICM)



Chittagong Medical College



Cumilla Shikha Board Govt. Model College



Cumilla Victoria Government College



Chandpur Government College



Dhaka Dental College



Dhaka Medical College



Dhamrai Govt. College



Eden Mohila College



Faridpur Medical College



Faith Bangladesh



Faridpur Engineering College



Govt. Ashek Mahmud College, Jamalpur



Holy Family Red Crescent Medical College



Ibrahim Medical College



International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B)



Kumudini Women's Medical College (KWMC)



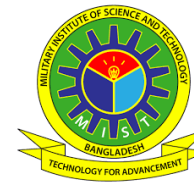
Lalmatia Mohila College



Local Government Engineering Department (LGED)



Mohammadpur Government College



Military Institute of Science and Technology (MIST)



Mymensingh Engineering College



National Institute of Nuclear Medicine & Allied Science (NINMAS)



National Institute of Ophthalmology & Hospital (NIOH)



National Institute of Population Research and Training (NIPORT)



National Institute of Textile Engineering and Research (NITER)



Notre Dame College



North East Medical College



Rajshahi Cantonment Public School & College



Savar Cantonment Public School and College



Shaheed Suhrawardy Medical College, Dhaka



Shaikh Burhanuddin Post Graduate College, Dhaka



Sylhet Cadet College



Sylhet MAG Osmani Medical College



The Institute of Chartered Secretaries of Bangladesh (ICSB)



The Institute of Cost and Management Accountants of Bangladesh (ICMAB)



TMSS Medical College



US-Bangla Medical College & Hospital

## AFFILIATED MEMBERS



Bangladesh Association of Women Scientists



iBAS++, Finance Division



International VAT Training Institute

## INDUSTRY MEMBERS



Data Edge Limited



Kazla Technologies Limited



Spectrum Engineering Consortium Limited



# **BdREN IN OUR CUSTOMERS' EYE**

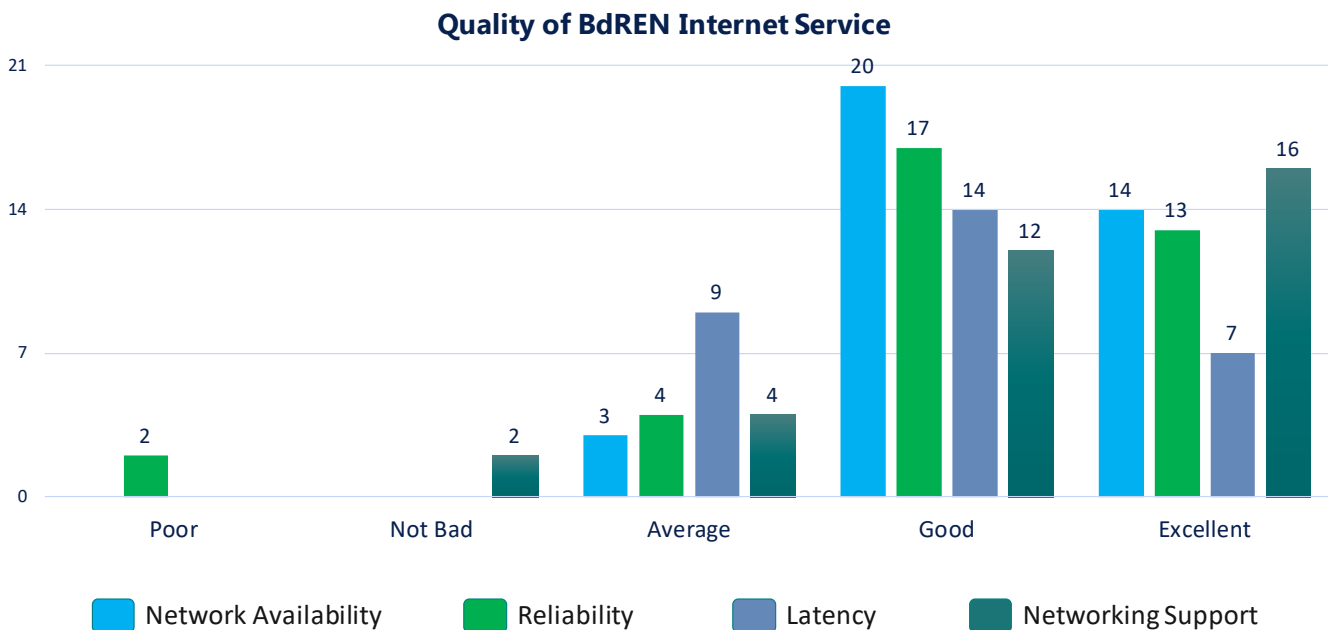
# IMPROVEMENT INITIATIVES TAKEN ON THE INPUTS FROM 2020 SURVEY

BdREN has passed through a long arduous journey to reach today's stature. It has always tried to work pretty closely with its Member Institutes so that it can identify their latent demands and figure out ways to address them. BdREN conducted an online survey nationwide from 10 October 2020 to 13 December 2020 on "BdREN Service Demand" by preparing a structured questionnaire and then by distributing it online to each individual Member Institution. 56 Institutions responded to this survey, though all didn't put their marks in all the survey areas. This year BdREN has opted for a different approach in collecting individual feedback from its esteemed member Institutes

as well as Local and International Stakeholders/Partners. The feedbacks have been portrayed in the next section.

Here is a glimpse of the previous survey outcome and related improvement initiatives taken by BdREN during the year of 2021.

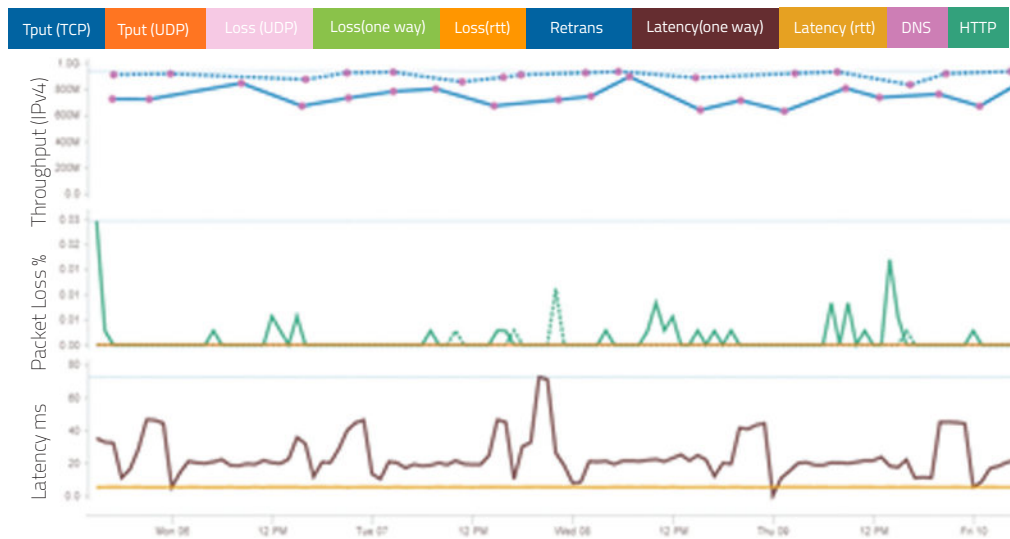
In response to the question on "How do you rate BdREN Internet Connectivity" four parameters namely 1. Network Availability, 2. Latency, 3. Reliability and 4. Networking support were placed to the respondents to rate on.



**Figure 34: Quality of BdREN Internet Service rated by customers**

From Figure-34 it can be reckoned that though Network Availability and Reliability found to be BdREN's predominant strength where 92% and 91% of total respondents appraised either with "Excellent" or "Good" remarks, the "Latency" rating was not that much promising where 21 respondents rated it as either "Good" or "Excellent", and 9 respondents rated it as "Average" service. It is to be mentioned that "Latency" issue doesn't depend only on the quality of the service providers' network. However, BdREN took this rating as a warning sign, and realized the need of delving into this problem. To probe the QoS parameters, BdREN has already established "perfSONAR" servers on a

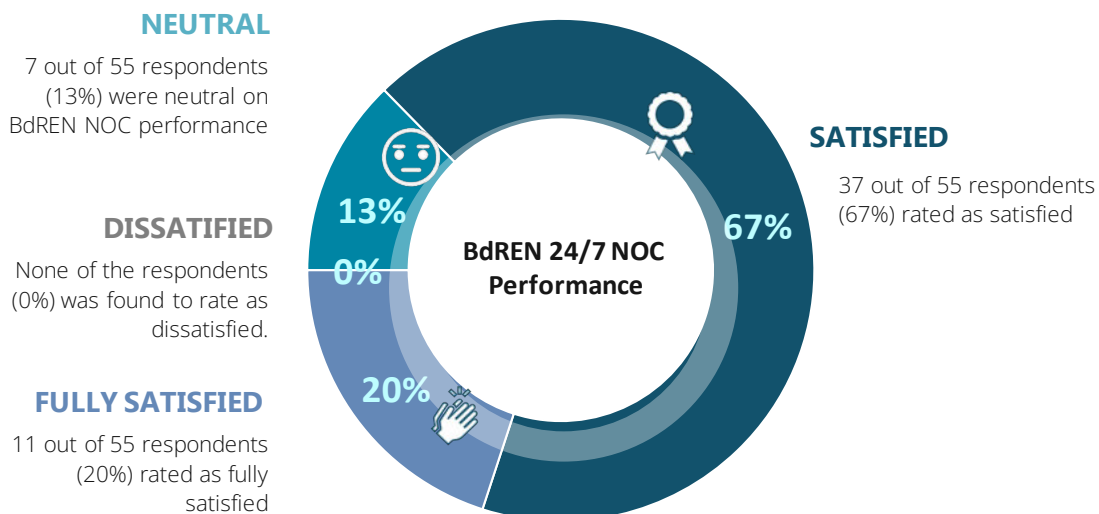
pilot basis in the network of a few of the individual member institutes who faced this latency problem. perfSONAR provides real time report on the latency, packet loss and jitter of each individual clients. We have installed perfSONAR server in BSMRAU, CVASU and BdREN's own network as on December 2021, and have been collecting statistical QoS figures at regular intervals. So far, the collected statistics have revealed that the additional "Latency" that was being encountered by the member institutes are not resulting from BdREN connectivity. A snap of the resulting graph taken from perfSONAR server hosted at CVASU campus has been portrayed in the Figure-35.



**Figure 35: Network Performance Measured at CVASU**

BdREN provides 24x7 single point of contact through Network Operations Center (NOC). A question was framed for collecting feedback about the "satisfaction level" of the users

on the provided support from NOC. The feedback that came out of the survey was as follows:

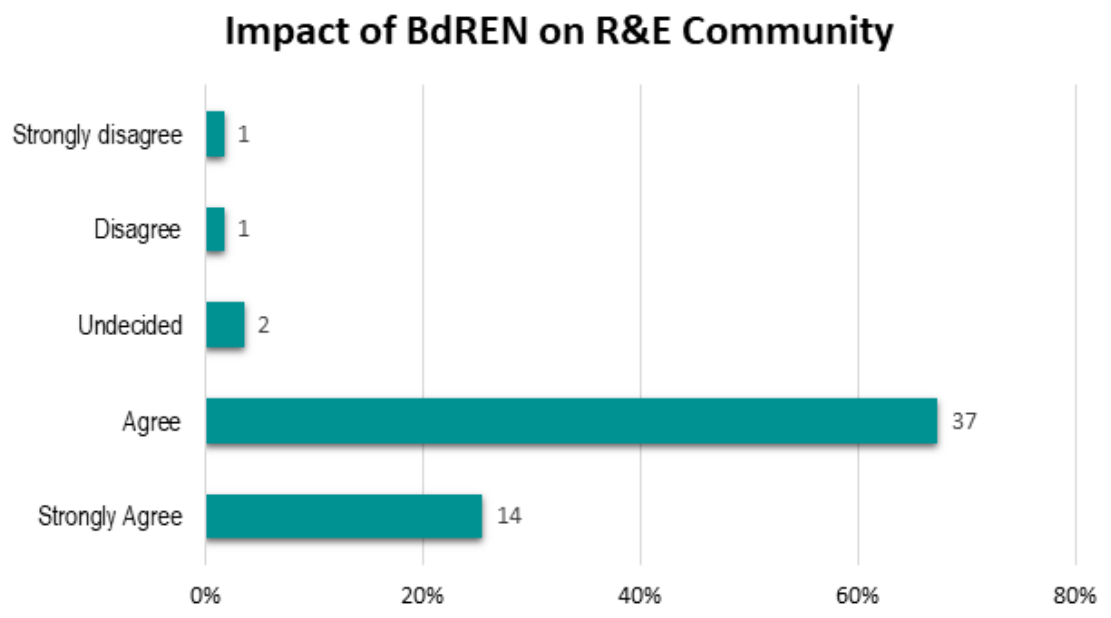


Under comment section in the question about NOC performance and its reporting, "Port City University" raised an issue related to "failure of generating desired report" for vSession Application. BdREN software team has already developed a structured dashboard for vSession platform, and authoritative users can extract a detail report in accordance with their needs. Furthermore, with regard to responses against "queries on expectation of reporting from BdREN", respondents were highly interested to get "Monthly Availability" and "Fault data" report. To meet the expectations, since January 2021 BdREN NOC team has been providing the report delineating usage and availability statistics of all facilitated services on a monthly basis to the individual member institutes who are using any of the BdREN provided services.

In another query on Members' "preferred mode of communication", it came out that "E-mail" is the most preferred way followed by "Direct Phone Call". Accordingly, several respondents also preferred "SMS" notification which was in third place. Taking the initiative to mitigate the demands, BdREN software team has already established an SMS portal for dispatching relevant information to the corresponding representatives of the concerned member Institutes through SMS. Owing to that development, along with sending E-mail, BdREN NOC team has been also notifying its members any incident through SMS.

Another rating on **whether BdREN could create an impact on Research and Education sector**, out of 55 respondents 37 member Institutes stamped for "Agree", 14 members

opted for "Strongly Agree", only 1 member expressed with "Disagree" and 1 reported "Strongly Disagree" with 2 remained "Undecided".



**Figure 36: Rating on BdREN's Impact on R&E Community**

# WHAT OUR STAKEHOLDERS SAY?

## MEMBER INSTITUTIONS



**Prof. Dr. Mohammad Rafiqul Islam**  
Vice-Chancellor  
Islamic University of Technology (IUT)

widely available. It is also expected that BdREN enriches its research services upholding the vision of the organisation. More research grants may be awarded. Research seminars/ conferences may be organized frequently. Finally, as a partner of BdREN, IUT expresses its willingness to take part in BdREN Trust services and governance to its full extent as deemed necessary. Best regard and wishes for the BdREN Trust.”

“BdREN has been an excellent IT partner of IUT from the very beginning. They have been working with close collaboration of ICT center of the university. The first service we receive from BdREN is the alternative high availability fiber connection. Secondly, during the COVID-19 pandemic the virtual conferencing facility generously provided by BdREN was most useful for the faculty members and students. The unlimited video conferencing facilities along with webinars enabled the university to continue its online academic activities. The Distance Learning Theatre (DLT) donated by BdREN to the university was also very useful to host online-physical blended seminars during the pandemic. Hopefully the operation and maintenance service of DLT will be continued in future with support from BdREN.

As the IT market is reshaping dynamically and giant tech companies are redesigning their service policies, it is necessary for BdREN to exercise guardianship to ensure seamless and enhanced IT services to its partner universities. The organization should make its cloud and GPU services



**Prof. Dr. Md Rubaiyat Hossain Mondal**  
Director, IICT, BUET

“We would like to thank BdREN for a number of great services that they provide to different universities including Bangladesh University of Engineering and Technology (BUET). The most important and useful activities are the design and support of the campus network, providing Internet bandwidth, and licensed Zoom services.

Since there are many universities including newer universities under UGC, the services of BdREN have to be extended to all of them. The organogram of BdREN may be revised so that the huge and burgeoning demand for services of the universities can be met in a proper and timely manner. Although each university will have its own ICT Cell or equivalent office, BdREN can play a major role in ensuring smooth and latest ICT services. This will reduce the chances of each university solving the same problem or developing the same software module for its need- BdREN can be a common platform for all. It is expected that BdREN will now

expand its activities in the software development side required for the universities. These include the e-filling system, inventory management system, loan management system, and possibly a form of Enterprise resource planning (ERP) solution. BdREN may also develop a cyber security specialist team who may help to ensure secured websites of all the universities. Besides, BdREN may expand the HPC and GPU services to the universities.”



**Dr. Muhammad Asif Hossain Khan**  
Director, ICT Cell, DU

“Dhaka University (DU) is a user of BdREN services since the beginning. We are really impressed with the 24/7 support service and the quality of BdREN services. Also the co-operation of BdREN Technical personnel is well appreciated. However, we would prefer UGC to allow us to use BTCL as redundant upstream internet connectivity provider as a failover of BdREN connectivity.

DU would recommend BdREN to consider IX bandwidth separately from Internet bandwidth. DU would also prefer BdREN to use the upstream bandwidth through BSCCL. It is also recommended for BdREN to provide DDoS protection solution like Cloudflare.

In next three (3) years’ time we want BdREN to contribute more to facilitate education and research as an advanced technology organization.”



**Prof. Dr. Md. Ashraful Hoque**  
Dean, IUT

“BdREN’s Activities related to creating online facilities are excellent which facilitate tertiary education all over the country. I think practical hands-on training to the root level will help students to enjoy all facilities provided by BdREN. I want to see BdREN providing online facilities to all schools up to primary level. Licensed Zoom service is one of the most relevant services for IUT.”



**Prof. Dr. A.H.M. Ashfak Habib**  
Director, IICT, CUET

“At first, I would like to thank BdREN for providing the licensed video conferencing facilities to CUET and other universities of Bangladesh during the COVID-19 pandemic. It was a wonderful and highly appreciable initiative of BdREN that a large number of students were directly benefited from this service. BdREN established the campus-wide network in CUET and connected the campus through a high bandwidth link. We are very happy with the high bandwidth availability, but have a slightly different view on the network maintenance support. While working with BdREN we got the feeling that they are slightly less accountable to their clients compared to other private companies. However, overall, the endeavor of BdREN is highly appreciable and we hope that the company will grow further and will come up with more new support and services. All the best for BdREN.”



**Prof. Dr. Mohammad Abul Kashem**  
ex-Director, IICT, DUET

“BdREN provided 24/7 support services, internet bandwidth services, cloud based services, established campus network, Distance Learning Theater, Zoom Application licenses during the pandemic and afterwards, installed IP Telephony services and connectivity with research network which enable Research data to be downloaded and uploaded at high speed – all of them are well-acclaimed. However, BdREN should improve its feedback system and monitoring platform. Also, I would prefer BdREN to make a proper sustainable strategy and update its stakeholders about that. I hope that BdREN will set up a strong infrastructure to establish more connectivity within the national and global education network.

We appreciate BdREN in having a significant experience to establish the system. However, BdREN should try to address its weaknesses in the form of lack of both technical and administrative human resources. In terms of services BdREN should focus on providing Online examination and recruitment application, File Sharing and Management and Broadcasting and Live Streaming services.”



**Dr. SM Taohidul Islam**  
Professor and Chairman, EEE, PSTU

“The campus network that has been established by BdREN deserves lot of acclaims. But, maintenance of campus network should be improved. BdREN should take measures to train up a few university professionals in relevant campuses to maintain the campus network.

BdREN has developed significant experience in designing Campus Network and in providing Zoom application service. BdREN should develop trained personnel in maintaining the campus network. There is an opportunity in extending BdREN Data Center services and establishing a research software repository which BdREN should put focus on. Also, it needs to decentralize its support framework so that the far-flung universities get immediate support.”



**Rahat Hossain Faisal**  
Director, Networking and IT,  
University of Barishal

“Within a very short time, BdREN has created new era for the higher education sector, especially for the researchers in Bangladesh. Most of the related services are there but those are not utilized with its full capacity. It is because of lack of awareness program. Different research related training and workshops, utilizing different BdREN services like High Performance Computing, can make the change.

I have my confidence in the BdREN team for their contribution in transforming Bangladesh into a land of innovation.”

## PARTNERS – LOCAL



**Shyam Sunder Sikder**  
Chairman (Senior Secretary)  
Bangladesh Telecommunication Regulatory  
Commission (BTRC)

“BdREN is playing an active role in providing efficient communication and dissemination of information within the education and research community as well as strengthening Bangladesh in the field of research, education and development. I hope, BdREN will accelerate its activities to build a knowledge-based society. I wish all the best for BdREN on the occasion of stepping into 3<sup>rd</sup> year in its operation.”



**Mr. Golam Kibria**  
Managing Director  
Power Grid Company of Bangladesh Limited (PGCB)

“BdREN’s role in the education and research sector of Bangladesh is of significant value and PGCB is proud to contribute to BdREN’s communication backbone network with its Optical Ground Wire (OPGW) resources. I hope, our cooperation will be fostered in the upcoming days with a view to ensuring even better utilization of OPGW resources for the sustainable development of Bangladesh.”



**A. K. M. Habibur Rahman**  
Managing Director  
Bangladesh Submarine Cable Company  
Ltd. (BSCCL)

“The unique idea of establishing BdREN especially for tertiary education and research institutes paved the way for high-speed communications among the members. BdREN is made for facilitating connectivity, collaboration and innovation amongst the research and education networking community.

BdREN, equipped with trained manpower, has a state-of-the-art data center with computing and storage resources. The member institutions are connected to BdREN through optical fiber. These empowered BdREN to be used as a common platform by all its members for their system automation and various value-added communication services. If it happens, this will enhance the efficiency of the administration, improve service delivery, optimize usage of IT resources, save capital investment and eventually reduce the IT service cost of the members.

I hope member institutions shall be able to make a high-speed intranet among themselves for transporting huge data traffic to be generated through research and computational activities using BdREN connectivity.”



**Dr. Md. Rafiqul Matin**  
Managing Director, BTCL

"BdREN's support services and reporting features against video conferencing services need to be improved.

I hope that in near future BdREN will be more engaged in research activities and will include all the educational institutions in this field. BTCL wants active partnership with BdREN through telecommunication infrastructure at the back end. BTCL would like to facilitate network and bandwidth services to BdREN for enabling state-of-the-art services in the education and research sector in Bangladesh.

I wish BdREN every success in the coming days."

## PARTNERS – INTERNATIONAL



**Dr. Rajan Parajuli**  
Director, Nepal Research and Education  
Network

"BdREN leadership has made some long-run collaboration efforts in recent years which will not only foster existing partnership among NRENs but also help justify the relevance of NREN in the current time."



**Prof. Dr. Markus Buchhorn**  
General Manager, APAN

“BdREN is one of the newest National Representative Members of APAN, having joined less than 5 years ago. Since that time the wider APAN community and I have become keenly aware of the energy and strength of the BdREN team, in their support of research and education domestically as well as internationally. They very quickly participated in the Asi@connect project, undertaking several work packages around NREN assessment and development. They provided crucial assistance to their nation during the pandemic period to ensure continuity and stability, a challenge faced by many NRENs. For APAN they enthusiastically leapt at the opportunity to host an APAN meeting, which even though it ended up largely virtual, they handled with grace, energy and great professionalism. They delivered an outstanding meeting for well over 1000 participants across the globe. APAN looks forward to working closely with BdREN in the future, and one day when this pandemic passes to hold a future meeting in person in Bangladesh.”



**Gerrit W. Bahlman**  
ex-Deputy Chair, APAN

“It is with enormous pleasure that I note the second annual report of BDREN. Bangladesh has joined the international community of national research and educational networks facilitating access to a global community of researchers and educators able to thrive in data intensive collaborative information exchange. The rapid emergence of BDREN as a player in the Asia Pacific Advanced Network community is evident in their host role in APAN53 and in Bangladesh’s growing involvement and contribution in the Asi@Connect research and development project. To achieve this level of community recognition in just three years is a remarkable achievement.”



**Jie An**  
Chair, Asi@Connect Steering Committee

“With the vital support of Bangladesh government and world bank, BdREN has been working hard and keeping growing very quickly to become a key national education and research network infrastructure in Bangladesh, and an important international partner in the international initiatives and projects in the Asia Pacific and the globe.”



**Douglas Harre**  
Member, APAN Program Committee and  
ex-CTO, REANZ

"I would like to add my best wishes to BdREN CEO Mohammad Tawrit and his team for the many notable successes they have achieved over the past 12-18 months.

Faced with the challenges of the COVID-19 pandemic, BdREN has managed to not only maintain their core services, but also deliver an increasing range of network-related services to their almost 180 members. This notably includes a huge growth in Zoom-related traffic made possible via their strategic partnerships with NORDUNET, Asi@Connect and the TEIN network.

They have also delivered a range of e-Learning and related training sessions across the region, plus overseen the background research and production of major publications such as the regional Asi@Connect Compendium and the Network Needs Analysis (in conjunction with their colleagues at LEARN in Sri Lanka).

In addition, the BdREN team organised and delivered a very successful APAN53 event, during the height of the pandemic. I am pleased to see that BdREN is part of a regional initiative to increase the number of female network engineers working in local NRENs. I look forward to BdREN showing leadership in this area, through their own recruitment processes and thereby supporting young Bangladeshi women to have successful careers in this exciting field.

Congratulations on this latest publication and wishing you all the best for 2022 and beyond."



**Assoc. Prof. Francis Lee Bu Sung**  
Governor, Asi@Connect from SingAREN

"BdREN joined the TEIN/Asi@connect projects on 2012. Since its joining it has grown in its role and now it has become a key player in the community. It has participated actively in TEIN/Asi@connect activities, eg. workshops, grants, etc. It has also provided a new way in forming an NREN, as BdREN was created as a Trust, with tremendous support from the government. This is a model which other NRENs could possibly follow in their development.

BdREN certainly has its ears on the ground, listening to the pulse of its community. A great example is how BdREN responded to the impact of COVID-19. BdREN's response was swift and effective in the scaling of the videoconference system to meet the needs of the nation and its members.

I congratulate BdREN on its achievements in serving the community."



**Erik-Jan Bos**

ex-Policy & Strategy Officer, NORDUnet,  
Denmark

“It has been my great honor and pleasure to work with the talented people of BdREN in both the fDLuDCf and BeLISAC Projects over the last many years, as their leadership in these projects has tremendously helped Bangladesh as well as the entire region in South-East Asia and beyond with e-learning initiatives.”



**Prof. Dr. Roshan G. Ragel**

Consultant | Lanka Education and Research  
Network (LEARN)

“I see BdREN as a beacon among emerging NRENs in the Asia Pacific region and an exemplary NREN to follow. However, I still see a few within BdREN consider it an NREN from an LDC, making its stance less significant. I believe it is essential to take pride in what you do while perfecting it. I wish BdREN all the very best!”



**Rene Buch**

CTO EOSC Association and ex-CEO  
NORDUnet

“Since 2016 BdREN has been on an exciting journey establishing itself as a crucial infrastructure for Research and Education in Bangladesh and in addition being a spearhead for international projects in the SE Asian region developing core competencies and enhancing services to the benefit of the communities.”



**Chalernpol Charnsripinyo**  
Governer, Asi@Connect from ThaiREN

“I think BdREN is a distinguished national research and education network with strong support and management team. BdREN is very active in the international research and education network community. I wish BdREN success in future development and sustainability.”

“DrukREN has worked closely with BdREN to help deliver e-Learning infrastructure in the region. BdREN has a strong commitment to improving research and education collaboration in the region.”



**Karma Jamyang**  
Dy. Chief ICT Officer,  
Ministry of Information & Communications, DrukREN, Bhutan.



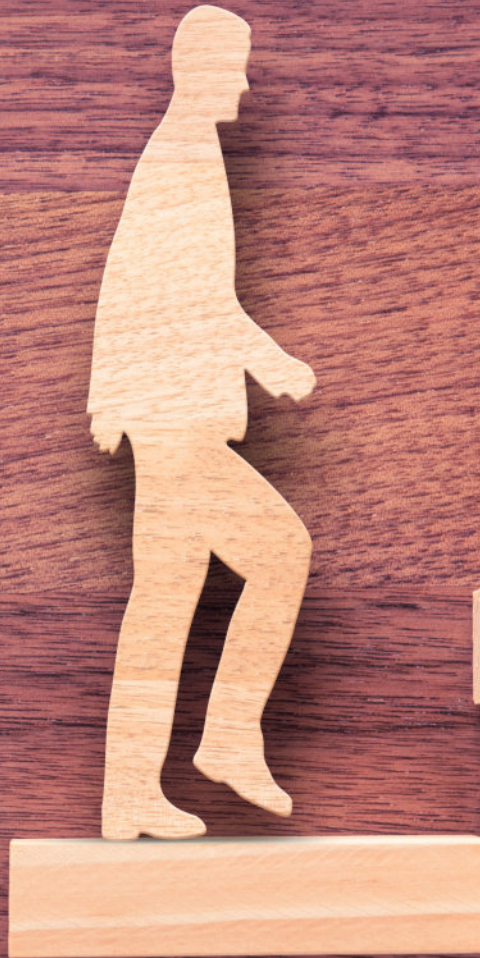
**Brook Schofield**  
A Freelancer in the APAN Community

“BdREN is no longer a sleeping tiger, camouflaged in the background of R&E networking. It continues to surprise me with the strength of its services, events and collaboration with peers.”

“In my view, BdREN epitomizes the way an NREN should operate, especially in a developing country. The recent Asi@Connect NNA study also acknowledged this fact, while recognizing the rapid rise of BdREN in the region within a very short period of time. I send my best wishes to BdREN and hope to extend our collaborations in the future for mutual growth.”



**Asitha Bandaranayake**  
Consultant CTO, Lanka Education and Research Network (LEARN)



# DEVELOPMENT ACTIVITIES

# EXECUTION OF THE PREVIOUSLY PLANNED ACTIVITIES

With a vision to facilitate our esteemed users, BdREN always undertakes new initiatives to deploy new services, to upgrade the existing systems and service platforms. According to those planned activities, BdREN consistently endeavours to execute and implement at its best effort. In the last annual report, several planned activities were reported and intended to deploy in upcoming days. Now it's time to evaluate and visualize how many plans have been already executed in production as well as the progress of those plans which aren't not still in production level.

## Deployment of LMS as a service

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BdREN has already launched this momentous service for conducting online academic activities along with storing of its respective contents at least for a period of one year. Now BdREN is offering customized learning management platforms to its esteemed members. Already the Institute of Education and Research (IER), University of Dhaka is using an advanced Learning Management System (LMS) which was implemented by BdREN and hosted on its Data Center for facilitating their esteemed project named Gender and Inclusive Pedagogies (GIP).

## Deployment of GPU as a service

---

BdREN has already deployed GPU based servers in production level and currently we are offering vGPU enabled virtual machines as a service to our respective researchers who work in the area of Artificial Intelligence (AI), Machine Learning (ML), Signal processing or Image processing.

## Introducing backup and restoration facility as a service

---

BdREN has created the facility for the universities and other member institutions to back up their applications as well as databases in BdREN cloud. In addition, restoration of any backup data is also accomplished by BdREN in case of any disaster.

## Creation of Identity Federation and Joining eduGAIN

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BdREN initially implemented TIGERfed identity and access federation as test phase by adding two identity providers and some service providers (i.e; Zoom video conferencing system, user management of Identity Providers, etc). In the last annual report, it wished to bring its identity federation to production level. But, due to inadequate positive responses from publishers along with few other unwanted challenges, it failed to bring it to production level. Nevertheless, the federation has been performing well as a test platform and it has also become the member of eduGAIN to collaborate and access services distributed worldwide.

## Implementation of Certificate Verification System

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Verifying students' certificates manually is a challenge in terms of authenticity and time to verify. BdREN has planned to deploy a central/distributed repository system where users will be able to verify a particular student's academic certificate online from anywhere in the world. With positive response from the universities BdREN expects to establish it at the soonest.

## Implementation of eFile application for member Institutes

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Already, eFile has been deployed at BUET for their administrative file processing and managing. "eFile" application has received wide range of acknowledgment and appreciation from different universities considering its benefits as opposed to "eNothi" system. Hopefully, in the near future BdREN developed eFile system will be able to land in the universities.

## Creation of Service Portal for users

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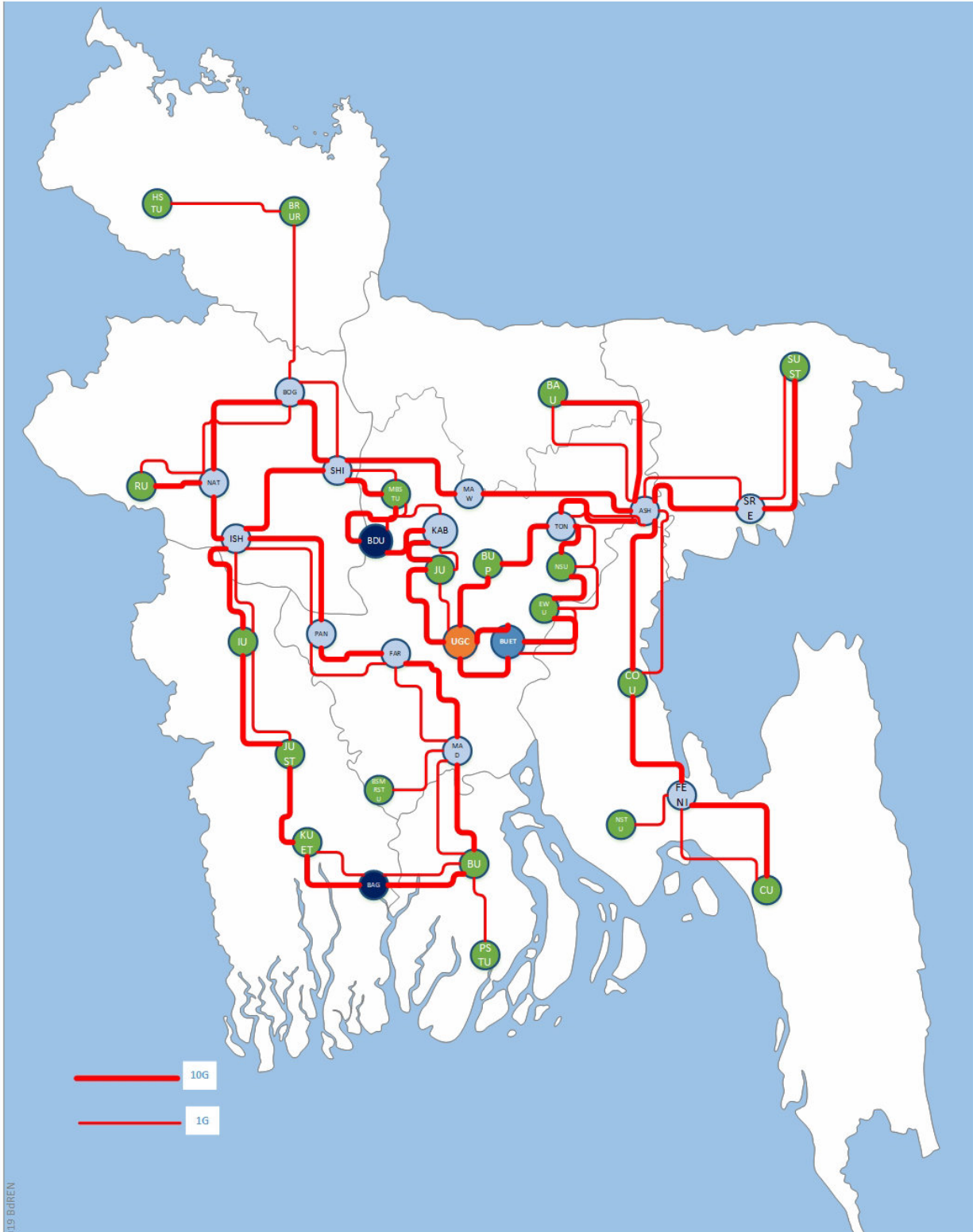
BdREN launched its service portal to receive requests from users. Each user who wants to receive services from BdREN, needs to register first and the authorized person will verify this. After getting registered, the user will be able to generate their requirements which will be directed to BdREN after being nodded by the authorized person of the very institute/organization. When the service is provided by BdREN, the user as well as the authorized person will be notified through email. All statistics pertaining to the availed services will be visible to the users. A summary report of their usage, request status and pending list will also be visible through this portal.

# NETWORK INFRASTRUCTURE RELATED

BdREN has established its country-wide network to provide nationwide academic network among the Universities. Universities can collaborate with each other using BdREN without accessing commercial Internet. Our customers increasingly value the reliability of the BdREN network, particularly for accessing cloud services and research traffic that are worthwhile contribution to research, teaching and learning. To improve the performance and availability of these services for BdREN customers, BdREN

increased the bandwidth capacity of both its backbone and access channel as and when it was felt necessary. BdREN Transmission network is built using an IP/MPLS data network on top of DWDM transmission network leasing Optical Ground Wire (OPGW) from PGCB for connecting the Universities across the country. The following nationwide map indicates BdREN hosted PoPs (Point of Presences) across the country, and it is constantly expanding.

# BANGLADESH RESEARCH AND EDUCATION NETWORK DWDM TRANSMISSION BACKBONE

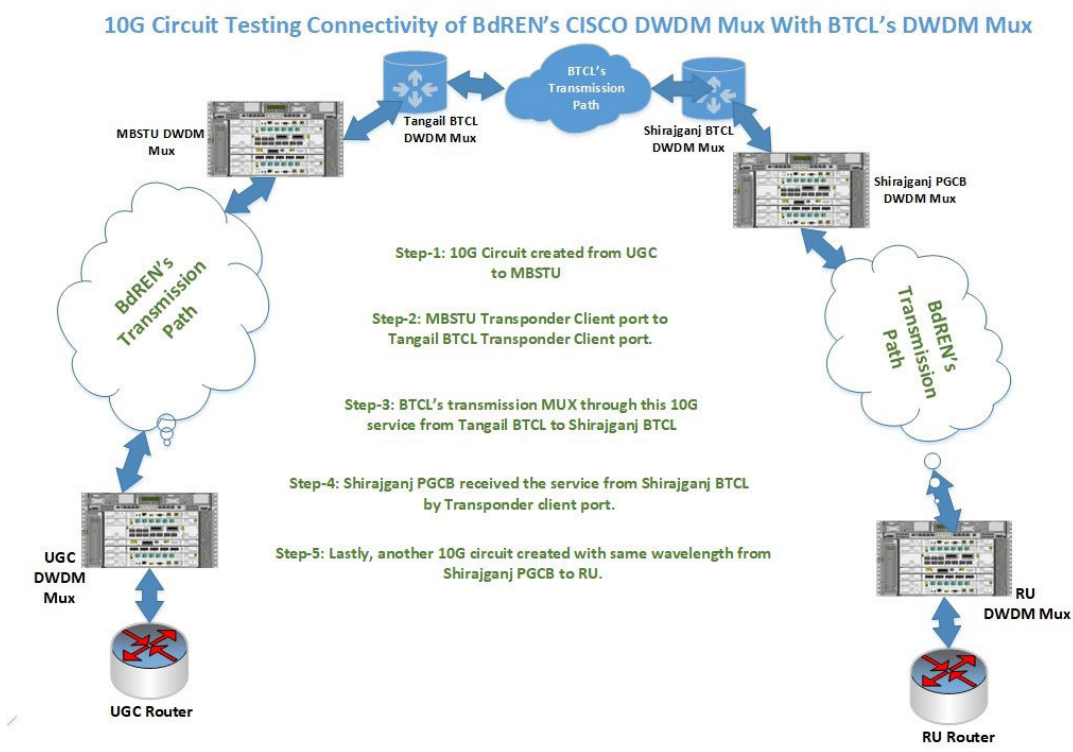


DWDM Transmission Nodes

1 BU, Barishal	8 IU, Kushtia	15 HSTU, Dinajpur	22 NSU, Bashundhara	29 CoU, Cumilla	36 PGCB, Cox's Bazar	42 NU, Gazipur
2 KUET, Khulna	9 PGCB-SS, Ishwardi	16 MBSTU, Tangail	23 PGCB-SS, Tongi	30 PGCB-SS, Feni	37 Bagerhat PoP	43 BSMRAU, Gazipur
3 BSMRSTU, Gopalganj	10 PGCB-SS, Natore	17 PGCB-SS, Kabirpur	24 Rental House, Mawra	31 NSTU, Noakhali	38 SFMU, Jamalpur	
4 JUST, Jashore	11 RU, Rajshahi	18 JU, Savar	25 BAU, Mymensingh	32 CU, Chattogram	39 SHU, Netrakona	
5 PGCB-SS, Madaripur	12 PGCB-SS, Shirajganj	19 UGC, Dhaka	26 Ashuganj PGCB	33 BUP	40 BDU, Kallakair	
6 PGCB-SS, Faridpur	13 PGCB-SS 230KV, Bogura	20 BUET, Dhaka	27 PGCB-SS, Sreemangal	34 PSTU	41 JNU, Dhaka	
7 Rental House, Pangsha	14 BRUR, Rangpur	21 East West Univ.	28 SUST, Sylhet	35 PGCB-SS, Dohajari Chattagram		

**Expansion of 1G to 10G:**  
Inter-operability between BTCL and BdREN DWDM Transport Network

To test the inter-operability of BdREN's CISCO DWDM Mux a connectivity was made with BTCL's ZTE DWDM Mux at the 10G transponder level as follows and it was found to be perfectly compatible.



**Figure 37: 10G Circuit Testing Connectivity of BdREN's CISCO DWDM Mux with BTCL's DWDM MUX**

## Termination of colored 10G lambda directly at the Router's Interfaces

By inserting 10G Colored Smart Optics SFP into Cisco Routers and by directly terminating 10G lambda into those routers, 10G circuits could be successfully tested using Cisco DWDM transport network. The test network is represented as follows:

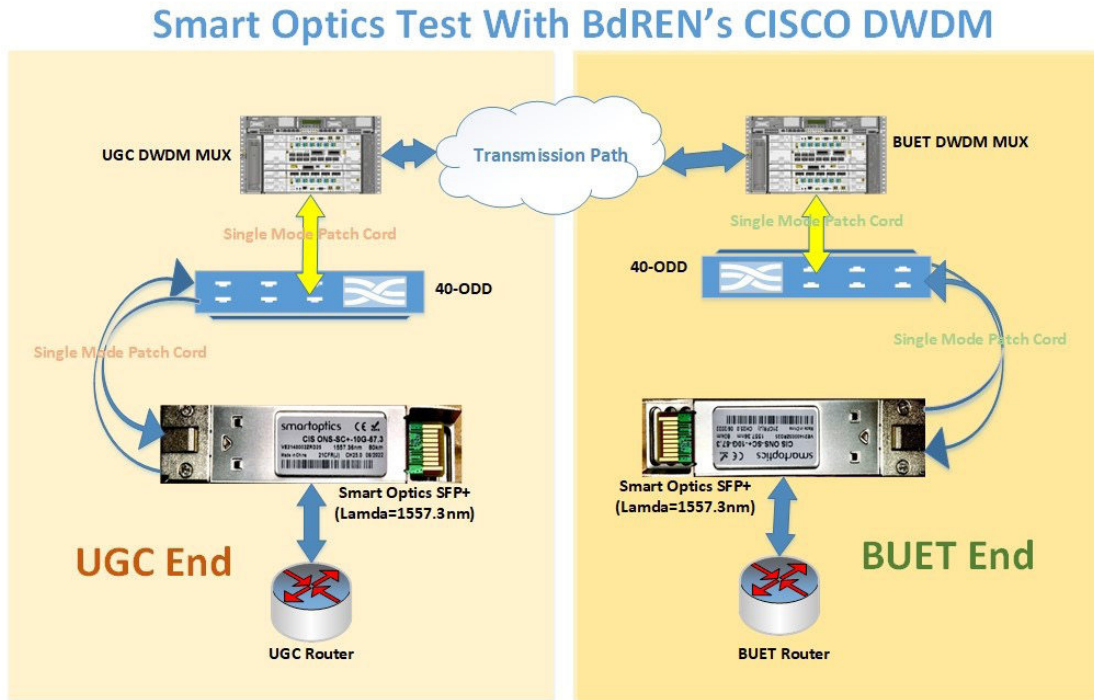
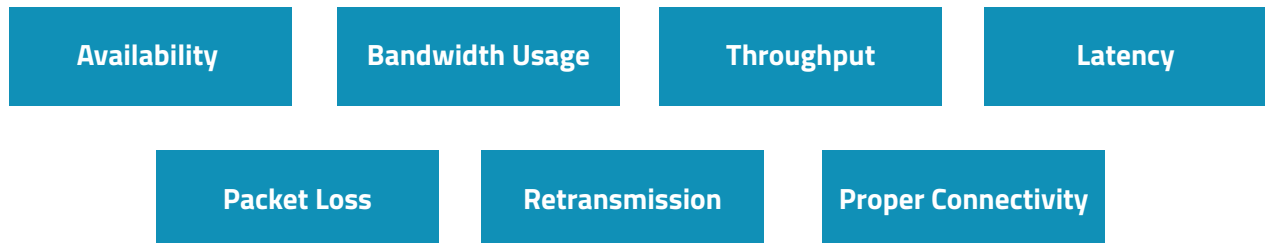


Figure 38: Smart Optics Test with BdREN's CISCO DWDM

## Initiative to enhance performance using NMS

A corporate Research and Education network needs to perform conscientiously in order to satisfy the demands of its users. Here in BdREN multiple state of the art network monitoring tools are used to observe the network's behavior and discover performance problems.

The following are the network performance metrics which BdREN consistently keeps track of for delivering satisfactory QoS to its member institutions.



The NMSs which are in use in BdREN are:

- SolarWinds Engineer’s Toolset
- Cacti
- LibreNMS

In addition BdREN uses ITOC (IT Operation Center) for monitoring the power status of a site, real-time battery voltage level, battery health, site temperature, generator status, health, fuel-level and runtime and much more. BdREN’s self-developed voltage and temperature monitoring tool also helps to keep track of power-outage and temperature in all the PoPs across the country.

## Implementing Back-up Connectivity for all Universities

To achieve high availability, BdREN is now offering redundant connectivity using various technologies and methods leveraging all available options described as follows:

**Table 3: Types of Redundancy implemented by BdREN**

Type of Protection	Mode of Protection	Target Availability
Last mile protected	VPN through BTCL	Highest
Distribution Point protected	VPN through BTCL	High
Ring Redundancy	Underground Fiber	Highest
	Overhead Fiber	Low

## BdREN prefers IPv6

IPv6 (Internet Protocol version 6) is the most recent and next generation Internet Protocol. Since the establishment of BdREN, the whole network infrastructure have been being deployed with IPv6 protocol support. As IPv6 has many effective advantages over IPv4, BdREN always prefer using IPv6 for all the offered services.

The following table shows the detailed picture of IPv6 readiness of BdREN.

**Table 4: IPv6 Readiness of BdREN**

DNS Server	Web Server	Mail Server	DHCP/SLAAC Server	Routing	Switching	Type of Configuration
Full	Full	Full	Full	Full	Full	Dual Stack

# DATA CENTER- ARCHITECTURE AND EXPANSION

BdREN has a high-performance computing Data Center, situated at UGC Bhaban and DR at ICT Building, BUET with a capacity as given below:

## Compute, Storage and Backup System:

BdREN has huge compute capacity comprises of 1200 Core CPU, 32 GB GPU, 5.5TB of Memory and 400 TB of Storage. VMware vSphere and KVM based ProxmoxVE virtualization platforms are installed to provide Infrastructure as a Service (IaaS). To provide Data Loss Prevention (DLP), disk based backup system VEEAM is also deployed at BdREN Data Center ensuring Full System Backup at every week and Incremental Backup at each day having a "Retention period" of one month.

## Electrical Power Supply:

BdREN Data Center facility is served by a permanent 3 phase 250KVA sub-station powered by DESCO. Two 80KVA UPSs are running to provide dual source backup power to individual rack. Moreover, two 32KW Rectifiers are installed to provide -48V DC power supply to the Data and Transmission Network equipment. As a backup to this UPS and Rectifier power source, 2 (two) 100KVA diesel generators are installed.

## Air Conditioning:

Four 8-ton PAC is serving the Data Center facility operating in N+1 model.

## Physical Security:

BdREN Data Center access is restricted by biometric access control system. The perimeter (inside and outside) is monitored by CCTV system.

## Fire Suppression:

Automatic Fire Fighting System along with smoke detector is installed at Server room and power room where power system is installed. Moreover, zone-based water detection system is also installed under raised floor.

## 7x24 Monitoring:

NOC engineers are monitoring all BdREN services including hardware 24 hours a day and 7 days a week.

Similar infrastructure with reduced capacity has been installed on ICT Building at BUET.

## Launching GPU (Graphical Processing Unit) as a Service

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To mitigate the unbridled demand for GPU featuring servers by researchers, BdREN has recently deployed Tesla-T4 GPU featuring physical server in the data center. BdREN is now able to provide vGPU enabled virtual machines to researchers who need to run medium to large-scale ANN, CNN, AI, Machine Learning, Image Processing, NLP, high-end graphical work, and so on.

## Deploying NVMe SSD Storage

To ensure spontaneous service to our esteemed clients, it was mandatory to upgrade the storage system in terms of installing NVMe SSD storage. BdREN is enhancing the SAN capacity with deploying NVMe SSD storage system to cope up with the advancement of modern storage technology. This end-to-end NVMe storage system having 14.4 million IOPS can increase operational efficiency for our offered services.

## ORGANIZATIONAL DEVELOPMENT

BdREN reinforced its focus on its human resources to get maximum out of them, and to create a working environment where people will find the perfect camaraderie. For ensuring that, BdREN Management emphasized on:

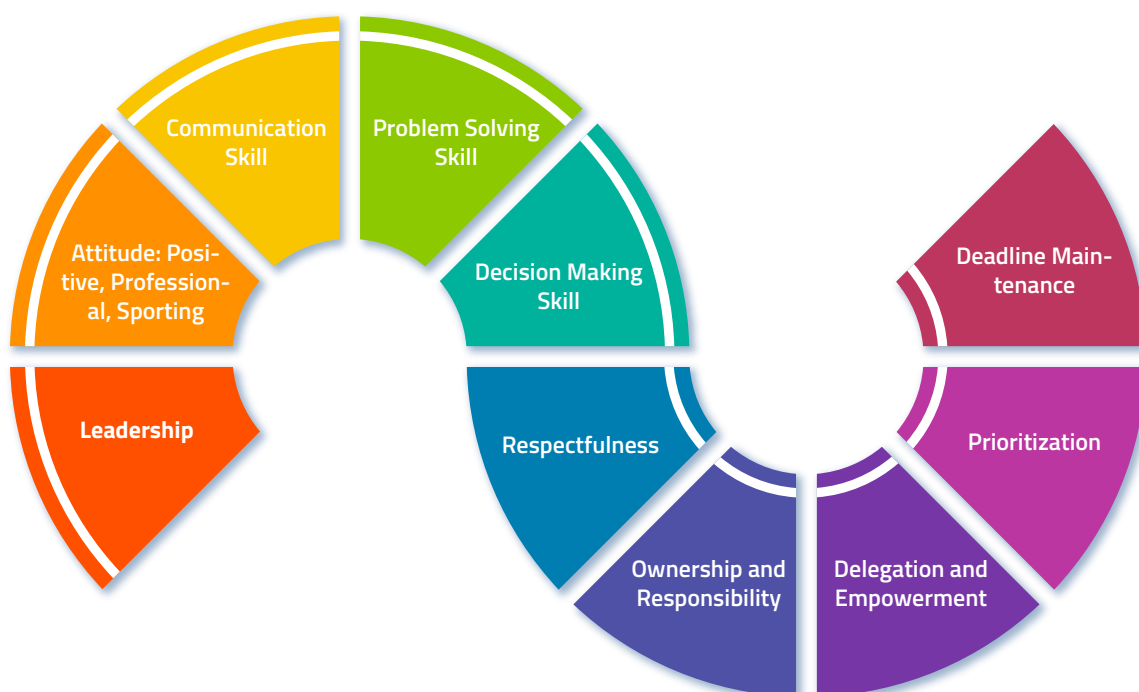
- a. Further development of organization Culture and Values
- b. Skill development for its human resources.

Along that line, first, BdREN took one step back and re-defined its Vision, Mission, Values, Goals, Objectives and Strategies through several internal Strategic workshops.

This would help create full alignment among its working forces 'top to bottom' regarding a) what the company is going to achieve and then b) how to achieve, in next couple of years.

After redefining Vision, Mission, Goals and Strategies, BdREN Management conducted several workshops on implementing new Values and Culture among its employees and then conducted several Soft-skill trainings as part of continuous Soft-skill development program.

Those soft skill trainings focused on improvement of following attributes:





# OUR FUTURE PLANS

## Virtual Desktop Infrastructure (VDI)

The faculty members while conducting various technical, and sometimes even for non-technical courses, have to manage their own computer lab. There are various challenges for managing exclusive lab environments due to specific requirements of each course, regular update and upgradation, processing capacity of the devices used, software licenses and many others. Moreover, many universities don't have sufficient lab facility as well. Sometimes, labs are not available during vacation or at night for female students. Considering all these factors, BdREN is going to launch Virtual Desktop Infrastructure (VDI) solution for its members. They will be able to do all the desktop computer activity 24x7. This service will be provided on "on-demand" basis for a single user or to a group of users.

## Expanding eduroam facility across the country

BdREN commissioned eduroam service way back in 2017. Currently, BdREN provides eduroam services to 20 campuses (having both IdP and SP), containing 1912 Access Points (APs) across Bangladesh. BdREN is in the process of further expanding this service to new Member Institutes. Moreover, BdREN is planning to expand its eduroam service to other Institutes and even to the public hotspots namely Airports and Railway Stations.

## Single Sign-On (SSO) to join eduGAIN

eduGAIN provides an efficient, flexible way for participating federations, and their affiliated users and services, to interconnect. eduGAIN's main objective is to connect identity federations around the world, simplifying access to content, services and resources for the global research and education community.

## Industry Grade Professional Training in large scale

It is a challenge for a fresh graduate to get a job without proper knowledge that industry demands. Usually, the graduates have theoretical knowledge gathered from reading books and following lectures. And obviously there remains a gap between what the students know and that the industry desires. To narrow that gap, BdREN is going to arrange industry grade professional training for the graduate students so that they can produce output within shortest period of time on their recruitment.



# EVENTS

IN 2020-2021

# BOARD OF TRUSTEES (BoT) MEETINGS

## 31st BoT Meeting (15 June 2021)



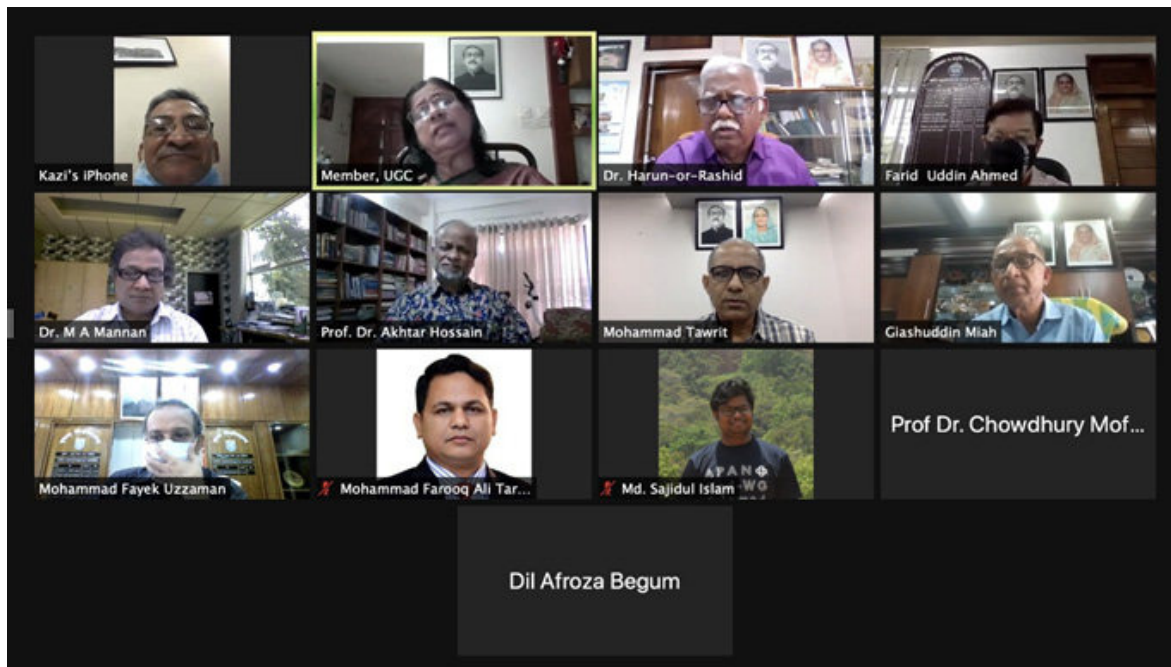
## 30th BoT Meeting (01 June 2021)



## 29th Bot Meeting (28 February 2021)



## 28th Bot Meeting (10 November 2020)



## 27th BoT Meeting (25 October 2020)



## 26th BoT Meeting (06 September 2020)



## RECORD OF ATTENDANCE OF HONOURABLE BoT MEMBERS IN BOARD MEETINGS

*Table 5: Record of Attendance of Honourable BoT Members in Board Meetings*

SL	Name and Designation	26 <sup>th</sup> BoT Meeting	27 <sup>th</sup> BoT Meeting	28 <sup>th</sup> BoT Meeting	29 <sup>th</sup> BoT Meeting	30 <sup>th</sup> BoT Meeting	31 <sup>st</sup> BoT Meeting		
1	Professor Dr. Kazi Shahidullah, Chairman, UGC	✓	✓	✓	✓	✓	✓		
2	Professor Dr. Dil Afroza Begum, Member, UGC	✓	✓	✓	✓	✓	✓		
3	Professor Dr. Md. Akhtar Hossain, Ex-Member, UGC	✓	✓	✓	✓	✓	✓		
4	Professor Dr. Md. Giashuddin Miah, Vice-Chancellor, BSMRAU	✓	✓	✓	Members' membership ended here				
5	Professor Farid Uddin Ahmed, Vice-Chancellor, SUST	✓	✓	✓					
6	Professor Dr. Mohammad Fayekuzzaman, Vice-Chancellor, KU	✓	✓	✓					
7	Professor Dr. M A Mannan, Vice-Chancellor, BOU	✓	✓	✓				✓	
8	Professor Dr. Harun-or Rashid, Vice-Chancellor, NU	—	—	✓				—	
9	Professor Dr. Chowdhury Mofizur Rahman, Vice-Chancellor, UIU	✓	✓	✓				✓	✓
10	Professor Dr. Md. Ismail Khan, VC, Chittagong Medical University	Yet to assume the position of membership			✓	✓	—		
11	Professor Dr. Shahid Akhtar Hossain, Vice-Chancellor, EU				✓	✓	✓		
12	Professor Dr. Mahmud Hossain, Vice-Chancellor, KU				✓	✓	✓		
13	Professor Dr. Nasim Banu, Vice-Chancellor, BOU				✓	✓	✓		
14	Professor Dr. Md. Mashiur Rahman, Vice-Chancellor, NU				✓	✓	✓	—	
15	Professor Dr. Shahidur Rashid Bhuiyan, Vice-Chancellor, EU				✓	✓	✓	✓	✓
16	Mr. AKM Aftab Hossain Pramanik, Additional Secretary, MoE				✓	✓	—	✓	✓
17	Mr. Abdullah Al Hassan Chowdhury, Additional Secretary, MoE	✓	✓	—					

A wooden signpost with three directional signs. The top sign points up and to the right, the middle sign points left, and the bottom sign points up and to the left. The background is a blurred landscape with green hills and a cloudy sky.

**Seminars**

**Training**

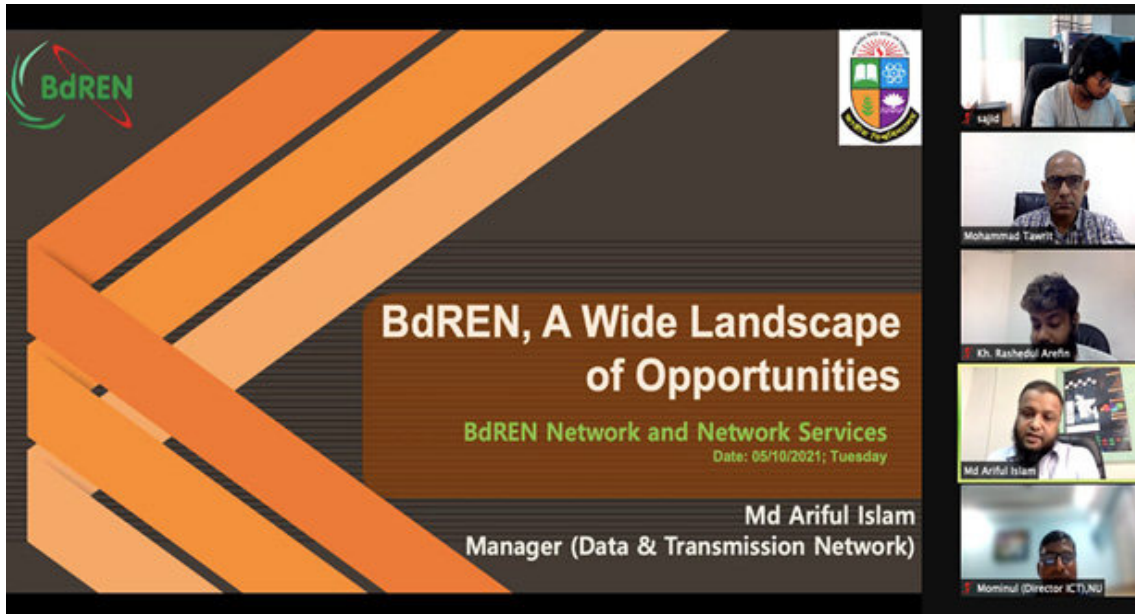
**Workshops**

## TRAININGS, SEMINARS AND WORKSHOPS

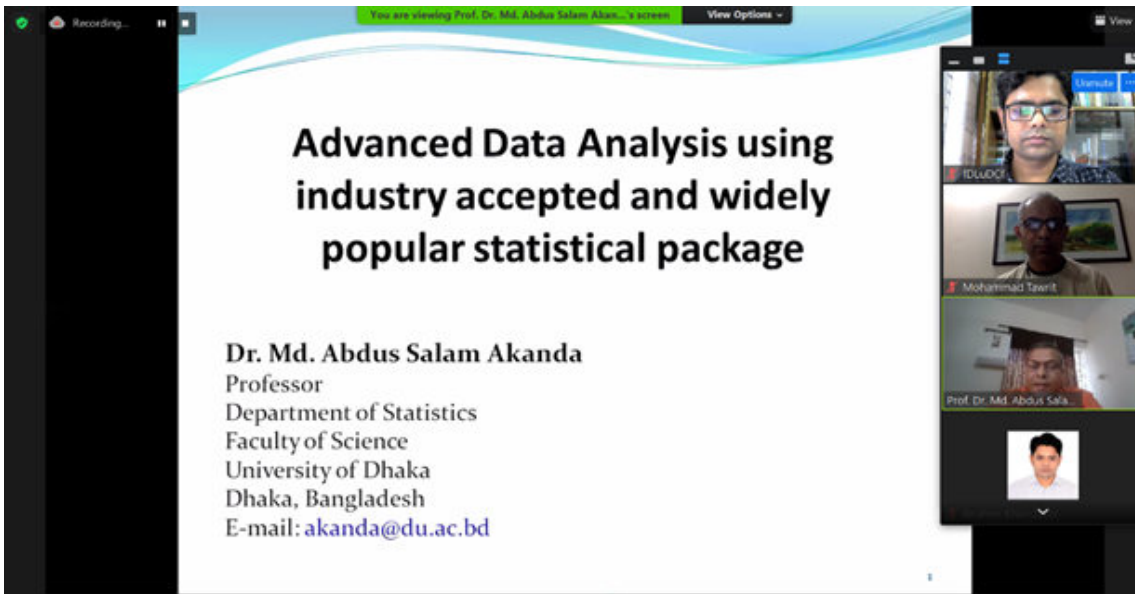
BdREN provides training services to its member institutes on a regular basis on topics covering both basic and advanced technologies. In the financial year of 2020-2021, the following events were organized by BdREN. Due to devastating COVID-19 pandemic, it was difficult to arrange those trainings and seminars physically. Therefore, all the programs were held online during this period.

**Table 6: Detail of Events facilitated by BdREN**

Name of the event	Type of Event	Timeline	Mode of conduct
NIA-AfDB ICT Online Seminar : Strategies for Digital Transformation of Public Services	Seminar	09 - 10 June, 2021	Online
Awareness Program arranged for National University	Awareness Program	10 May, 2021	BdREN hosted video conference
How to use BdREN vSession and Zoom for Online Education	Training	24 April, 2021	BdREN hosted video conference
Advanced Data Analysis using industry accepted and widely popular statistical package	Certificate and award giving training	16 hours 21 Oct, 2020 — 01 Jan, 2021	BdREN hosted video conference
How to use BdREN vSession and Zoom for Online Education	Training	29 December, 2020	BdREN hosted video conference
Selection of LMS and Video Collaboration Applications	Seminar	10 December, 2020	BdREN hosted video conference
Identity Access Federation under iFIRE project	Training	30 Nov 2020 – 16 Dec 2020	Online
Identity Access Federation	Awareness Program	19 October, 2020	BdREN hosted video conference



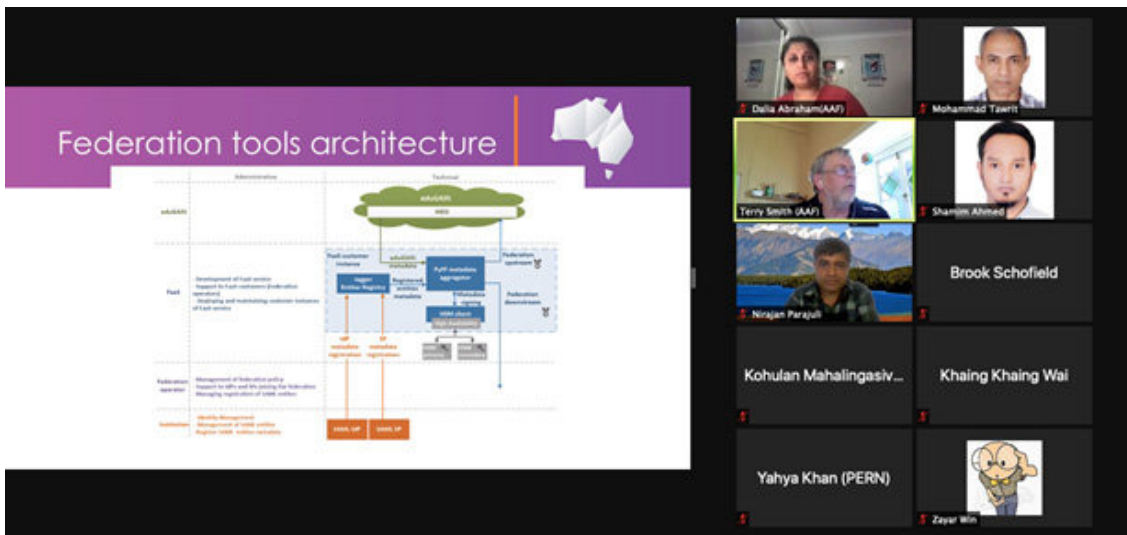
Awareness Program arranged for National University <<10 May, 2021>>



Training program on “Advanced Data Analysis using industry accepted and widely popular statistical package” under fDLuDCf project <<21 Oct, 2020 - 01 Jan, 2021>>



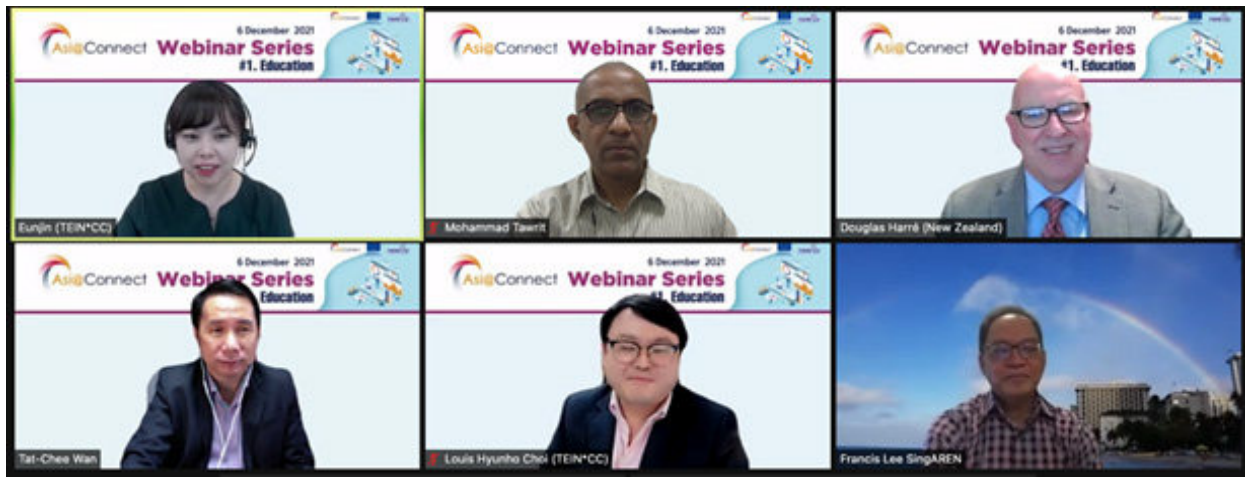
A Digital Talk on “Selection of LMS and Video Collaboration Applications” << 10 December, 2020>>



Training Arranged by Australian Access Federation under iFIRE project <<30 Nov 2020 – 16 Dec 2020>>



An online awareness workshop on the " Identity Access Federation" held on 19 October 2020



Webinar series on "Education" organised by TEIN\*CC <<21 December 2021>>

In the first webinar series on "Education" organised by TEIN\*CC, Mohammad Tawrit, CEO, BdREN presented a paper on "Achievements, Sustainability and Way-forward: facilitating Distance Learning using Digital Conferencing facility (fDLuDCF)" - a project allocated under CFP2 in the category of WP5 through Asi@Connect financing.

NREN professionals were present in the webinar. Douglas Harre [NZ], Former Vice-Chair of Asi@Connect, acted as the Moderator.

## CONSULTANCY



BdREN Team led by its Chief Executive Officer Mohammad Tawrit handed over the survey report for extension and enrichment of the campus network of Rajshahi University (RU) to the honorable Vice-Chancellor Prof. Dr. Golam Sabbir Sattar <<24 March, 2022>>



BdREN Team led by its Chief Executive Officer Mohammad Tawrit visited Varendra University, Rajshahi on 24 March 2022 to meet its honorable Vice-Chancellor Prof. Dr. M. Osman Gani Talukder. During the meeting CEO, BdREN narrated in brief about BdREN's offered services. The Honorable Vice-Chancellor informed us about the requirements of Varendra University.

The Honorable Vice-Chancellor was intrigued to know about the variety of services BdREN has at its repertoire, particularly he showed his interest in Virtual Computing and Virtual Desktop Services of BdREN. He advised technical personnel of the University to keep in touch with BdREN technical experts and to match the requirements of the university with the products and services being offered by BdREN. The feasibility of BdREN's connectivity to the new campus was also discussed and a survey was planned to be made at the earliest to assess the connectivity cost to serve the desired bandwidth.

CEO, BdREN expressed his firm commitment to come up with the best possible pricing model to support the cause of the university. During the meeting CEO, BdREN was accompanied by Md. Ariful Islam, Manager, and Kamrul Hasan Shakil, Network Engineer of BdREN.

It is expected that BdREN is going to sign a contract with College Education Development Project [CEDP] to establish connectivity with 120 colleges under National University. The long-term goal of BdREN is to develop an exclusive "Education Network" comprising of all the Universities, Higher Secondary Colleges and Secondary Schools.



A glimpse of one of the meetings between CEDP and BdREN on Feasibility of BdREN Connectivity to 120 colleges under National University (NU) on 26 December 2021

BdREN continued its venture of designing a number of campus area networks for College Education Development Project [CEDP] free-of-cost as a part of its Corporate Social Responsibility [CSR].



"Campus Network Survey" report submission and subsequent meeting with Project Director at CEDP office on 11 January 2022. BdREN team conducted physical survey for developing campus area network in eleven (11) colleges under National University.

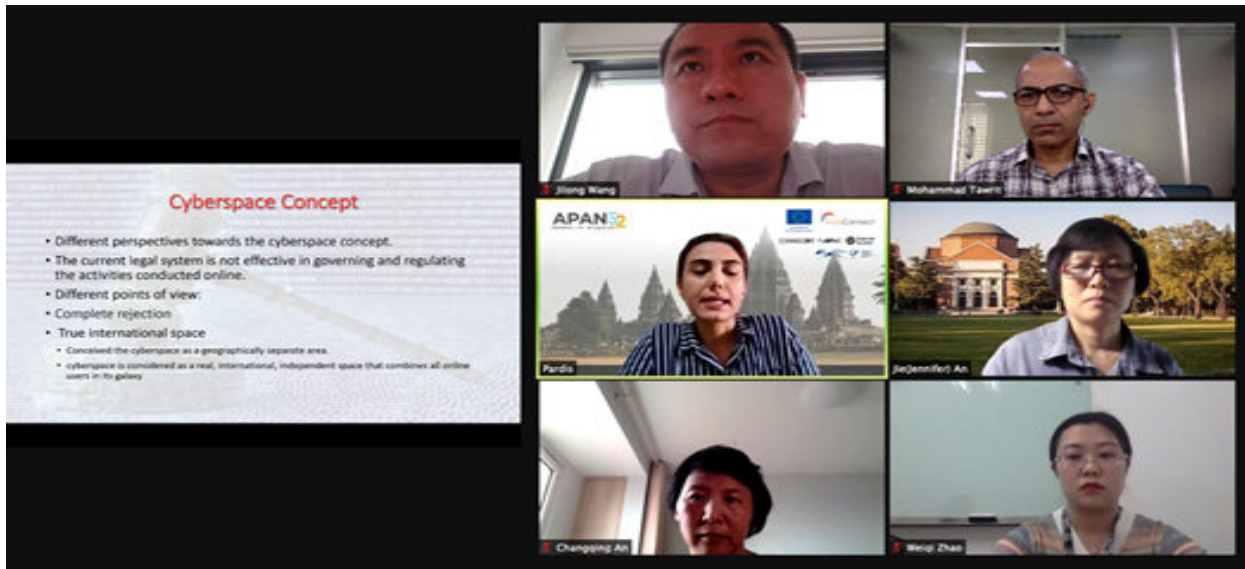


CEDP Project Progress meeting with World Bank and CEDP authority at BDREN Conference Room on 1 June, 2022

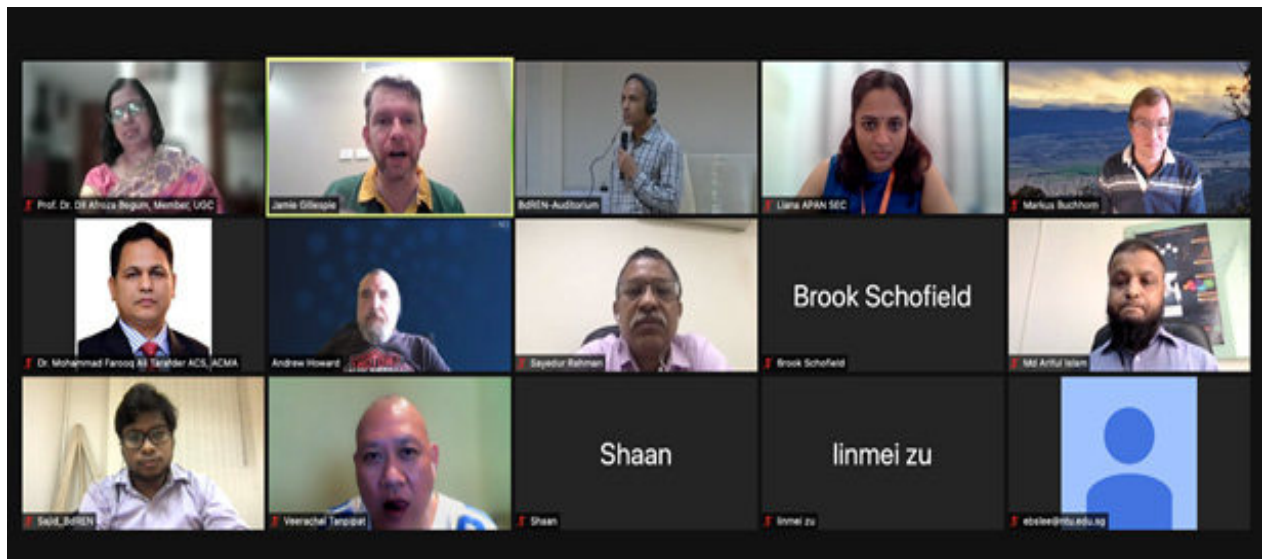
## MEETINGS



A knowledge sharing session between BdREN and CISCO at BdREN Conference Room where CEO, BdREN and officials from both BdREN and CISCO were present. <<29 March, 2022>>



Discussion Session on "Joint IPv6 Project Update" << 8 March, 2022>>



Trial session arranged for demonstrating APAN53 meeting in hybrid format <<1 March 2022>>



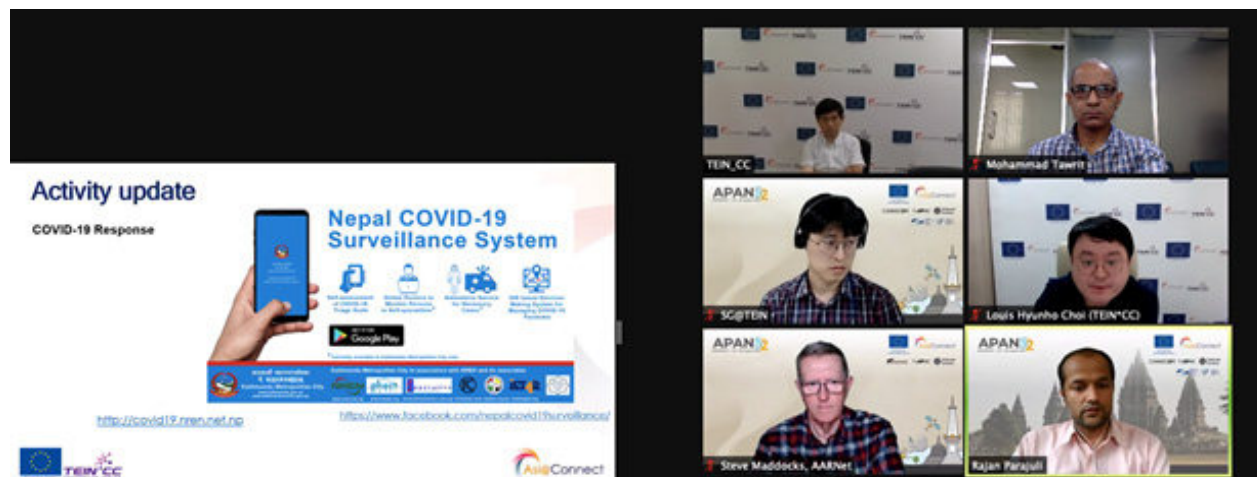
APAN53 Technical Committee Meeting <<25 February 2022>>



Meeting with Professor Imran Rahman, Honorable Vice-Chancellor of the University of Liberal Arts (ULAB) about extending the services of BdREN to ULAB <<30 December, 2021>>



Local Organizing Committee Meeting of APAN53 <<21 December, 2021>>



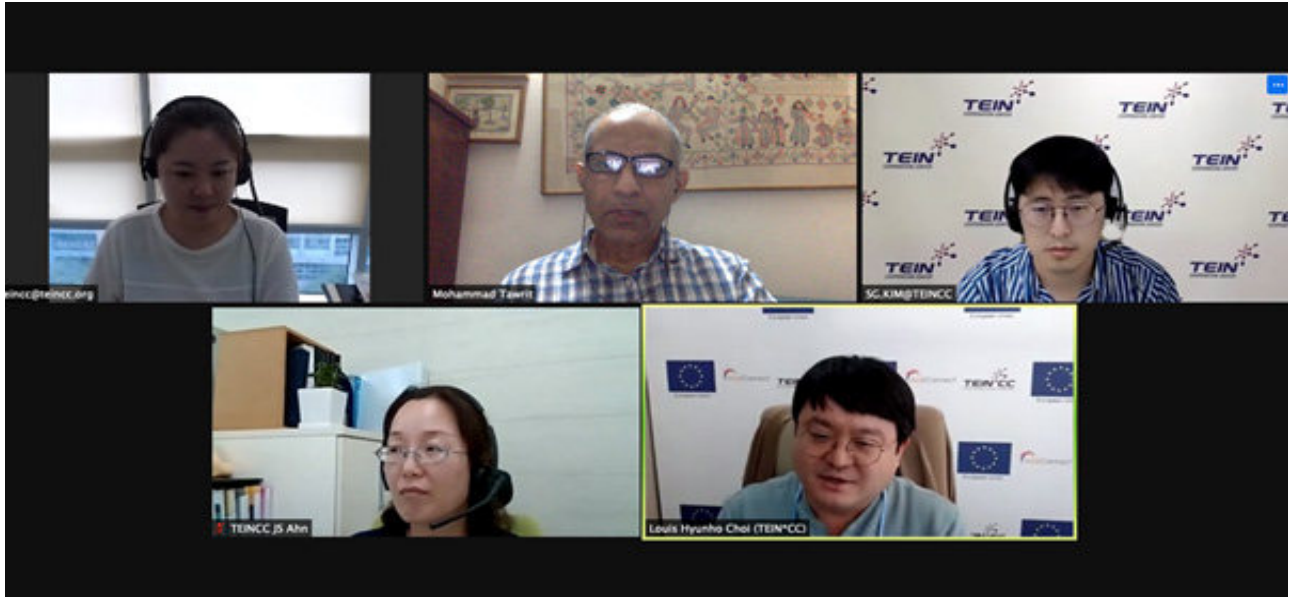
10th Asi@Connect "Project Update" Meeting to update the Status and Roadmap of BdREN <<10 September, 2021>>



10th Asi@Connect Governors' Meeting <<02 August 2021>>



Meeting on eduGAIN between Australian Access Federation (AAF) and TIGERfed << 17 March 2021>>



Bilateral Meeting between BdREN and TEIN\*CC. <<10 June 2021>>



Bilateral Meeting with Bangladesh University of Professionals (BUP) << 25 February 2021>>

# ANNUAL EXCURSION



A short visit was arranged for BdREN's employees and their family members at Chhuti Resort in Gazipur on 11-12 February 2022

## INTERNSHIP AND STUDY VISIT

BdREN welcomes potential students from member universities based on requests for internship or study visit. BdREN team willingly shares its knowledge on industry standard technologies and their deployment.



BdREN warmly accepted the request from Bangladesh Army University of Engineering & Technology (BAUET) for conducting internship program. 15 students from CSE department completed their internship from BdREN over the period from 19 June to 21 July 2022. They were given an indepth presentations on BdREN activities and services. They were also given hands-on demonstrations on the Data Center equipment and its management. After one (1) month of internship, they submitted project reports which were evaluated by BdREN, to their authority as part of their internship program.



Participants of a Training program on “Oracle Database 19C Administrator Certified Professional” arranged by Bangladesh Power Management Institute visited the Data Center of Bangladesh Research and Education Network (BdREN) on 21 September 2022. The main objective of the visit was familiarization with different types of activities conducted in a Tier-III Data Center. BdREN warmly welcomed the trainees and arranged presentations on BdREN’s activities and services. The trainees were also given hands-on demonstrations on the Data Center equipment and its management.

422,254,000

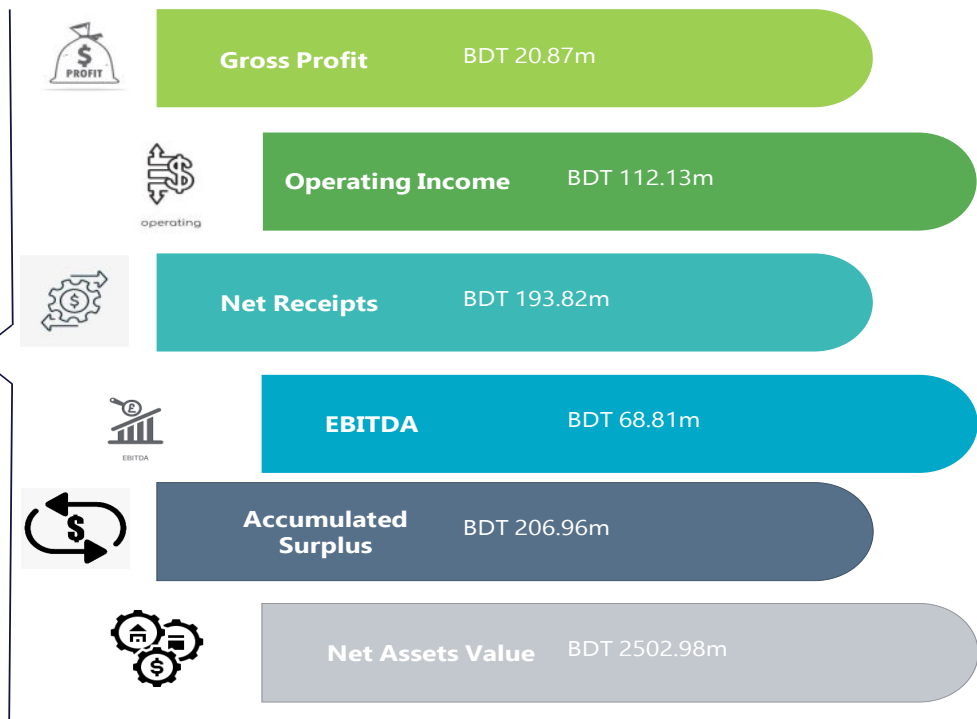
324,231,700

# FINANCIAL REPORT



# KEY FINANCIAL METRICS

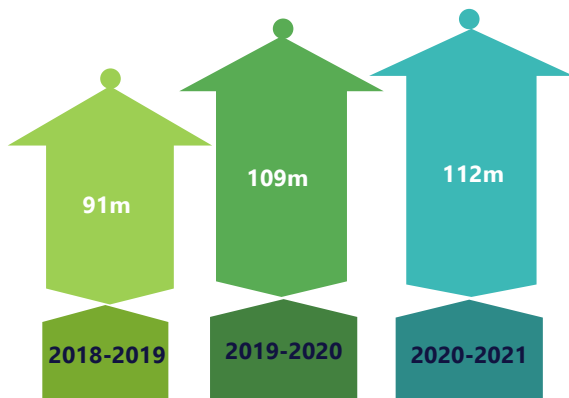
## Key Financial Metrics



# FINANCIAL GROWTH TREND

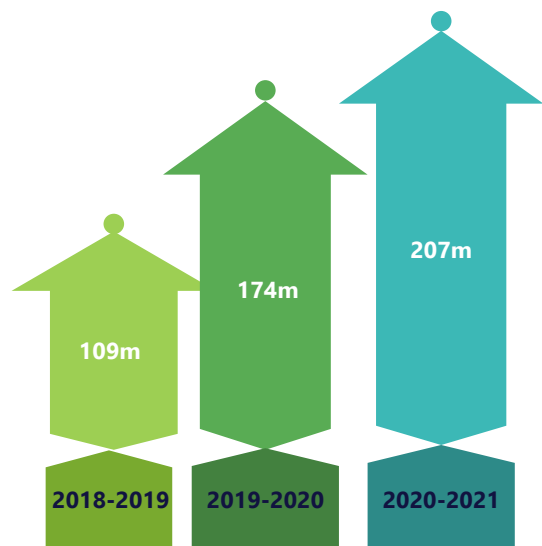
## Operating Income

Steady Increase in Operating Income is observed, although due to COVID the growth was little less during the last financial year.



## Accumulated Surplus

Steady Increase in Accumulated Surplus is observed, although same as Operating Income, due to COVID the growth was little less during the last financial year.

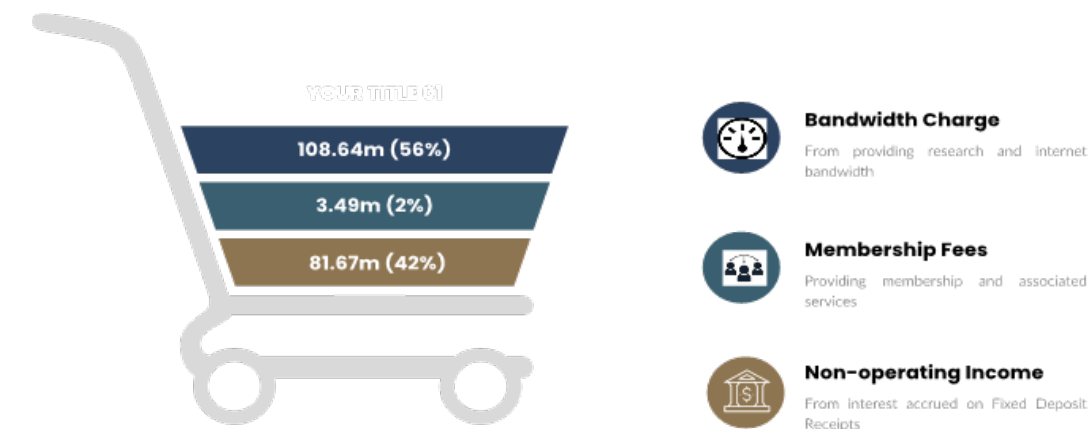


## OUR FINANCES

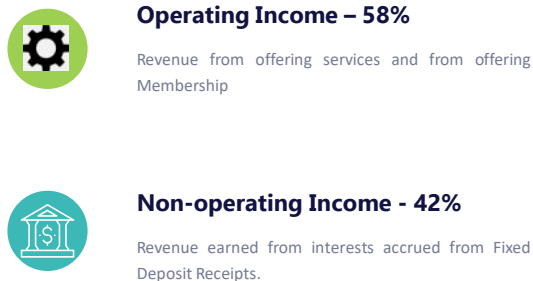
The Audited Accounts of BdREN for the year ended 30 June 2021 are enclosed herewith. BdREN's Financial achievement in FY 2020-2021 is demonstrated with an increase in its Accumulated Surplus of BDT 33.33 million and the percentage being 19.20%. As you will find total revenue receipts was BDT 193.80 million as against BDT 200.02 million of FY 2019-2020 and total expenditure of BDT 326.36 million (including depreciation and amortization expense of BDT 200.54 million) against BDT 304.36 million (including depreciation and amortization expense of BDT 187.01 million) in FY 2019-2020. Overall Financial Position of BdREN is healthy. The Value of Total Assets was BDT 2,547.29 million, Total Trust Fund BDT 2,502.98 million and External Liabilities were BDT 44.30 million as of 30 June 2021. BdREN's cash generation is positive, it's a strong indicator that BdREN's liquid asset is increasing. Also, another indicator of BdREN's Financial Strength is its higher equity ratio of 0.98. Some important elements of financial statements have been presented through graphs and charts.

## REVENUE

Total Operating Income was BDT 112.13 million in FY 2020-2021 representing an increase of BDT 3.12 million (2.86%) compared to that of FY 2019-2020. Total non-operating income was BDT 81.67 million in FY 2020-2021 which shows a decrease of BDT 9.34 million (10.27%) compared to that of FY 2019-2020 due to fall in Interest rate on Bank Deposits. EBITDA was BDT 68.81 million in FY 2020-2021 as against BDT 83.17 million in FY 2019-2020. The reduction of EBITDA caused from a decrease in non-operating income.

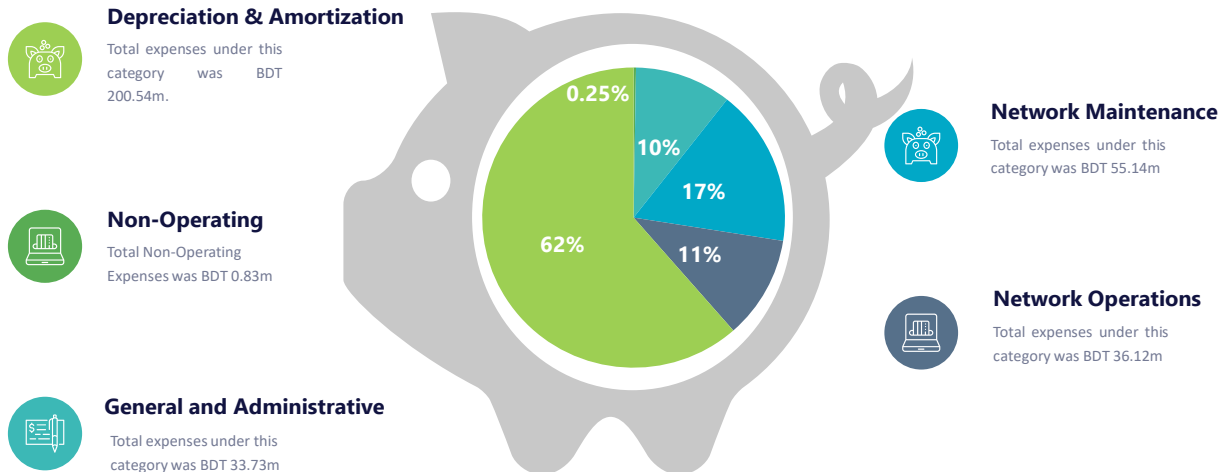


Same as the previous year, the revenue was dominated by the non-Operating Income which occupied 42% of the total revenue whereas the contribution from Operating Income was 58%



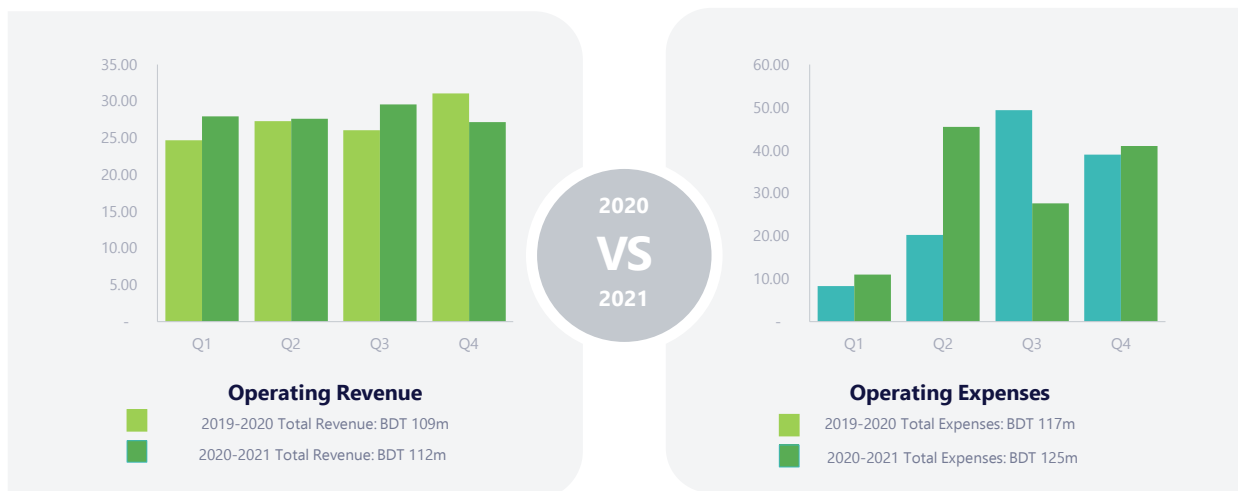
## EXPENDITURE

With a partial increase of BDT 22 million (7.23%) the total expenditure was BDT 326.36 million in FY 2020-2021. The major expenditure heads were Network Operational Expense (BDT 36.12 million), Network Maintenance Expense (BDT 55.14 million), General & Administrative Expense (BDT 33.73 million), Depreciation and Amortization Expense (BDT 200.54 million) and non-operating expenditure (BDT 0.83 million).



## QUARTERLY REVENUE AND EXPENSES 2019-20 VS 2020-21

The quarterly revenue earning is almost squarely distributed over the four quarters for both financial year 2019-20 and 2020-21. Although the mode of collection of revenue under different packages, which shares the major contribution in BdREN's revenue earning, changed from collecting at source from UGC to collecting from end-users in the form of universities, the quarterly revenue earning remained unaffected. This shows the satisfaction of the end-users on BdREN services and also the efficiency of BdREN's revenue collection.

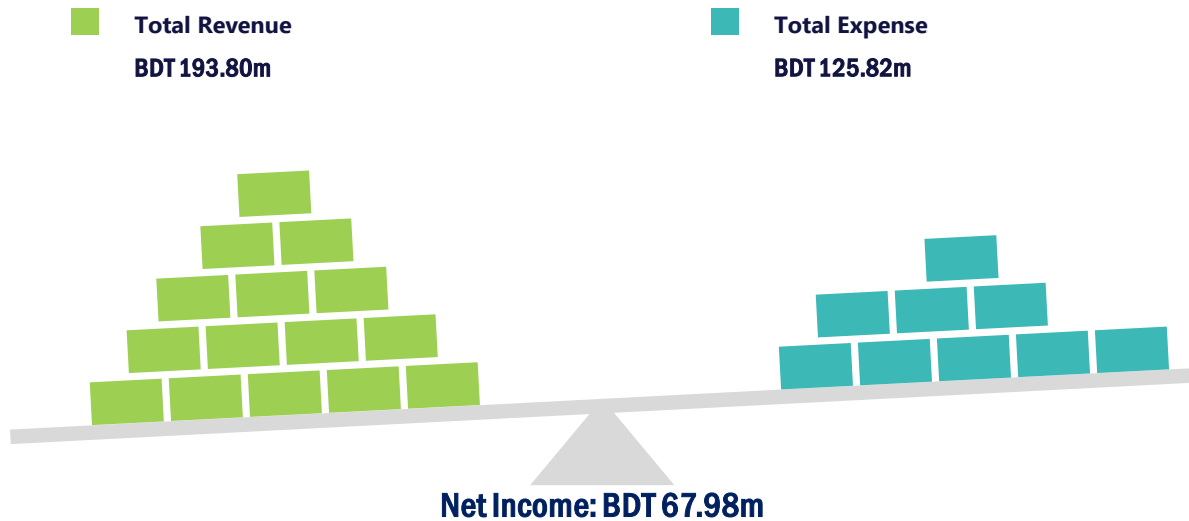


On the expense side for both financial year 2019-20 and 2020-21 the expenses are bit skewed at the later quarters than at the beginning.

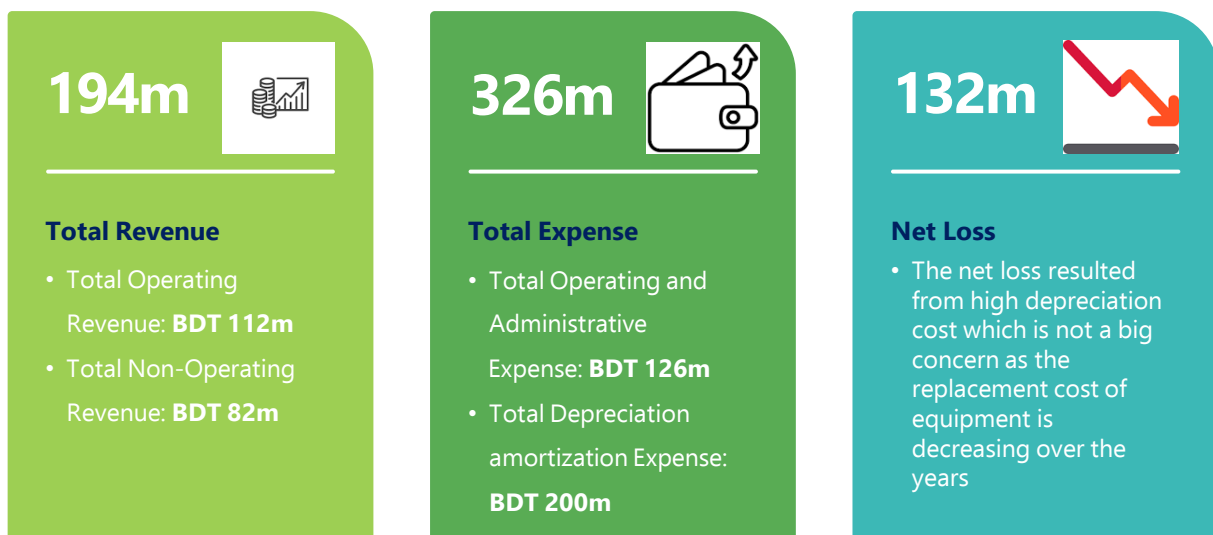
## STATEMENT OF COMPREHENSIVE INCOME

### Revenue vs Expenses

Total Revenue Receipts during the FY 2020-2021 was found to be BDT 193.80 million and Total Expense was BDT 125.82 million sans Depreciation and Amortization expense. Total revenue receipts decreased by 3.11% due to decrease in Non-Operating Income caused by reduction in interest rate. Total expense increased by 7.23%.



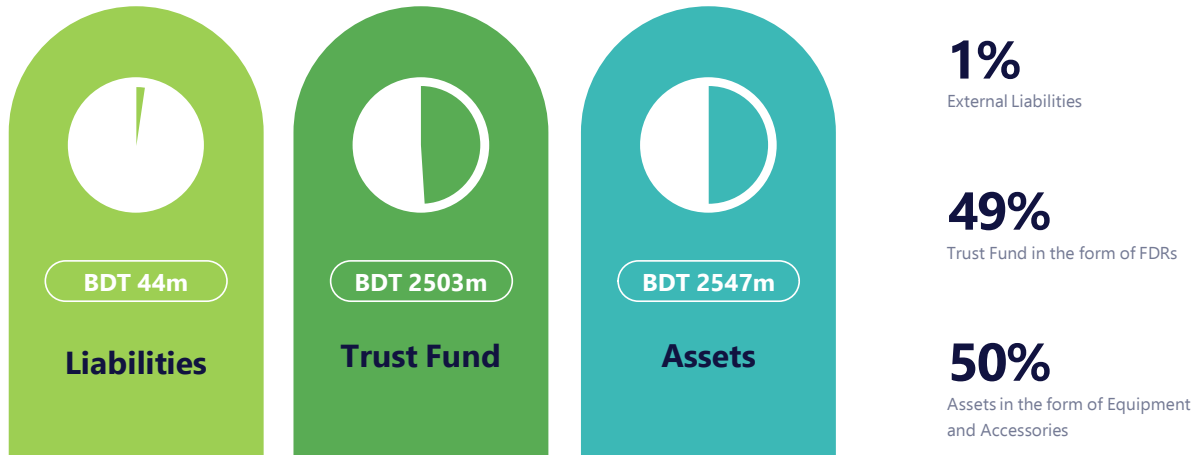
On the other hand, considering "Depreciation and Amortization Expenses", Total expense was BDT 326.36 million. As mentioned before, total revenue receipts decreased by 3.11% due to decrease in non-Operating Income caused by reduction in interest rate. Total expense increased by 7.23% mostly due to increase in "Depreciation and Amortization Expense" as well as "Administrative Expense" which resulted in Net Loss of 132m. However, as the replacement cost of the equipment and accessories is on a downward trend, this is not going to be a major concern for the sustainability of BdREN



In ratio format: Net Income Ratio was (-) 68.65% and Operating Expense Ratio was 64.59%

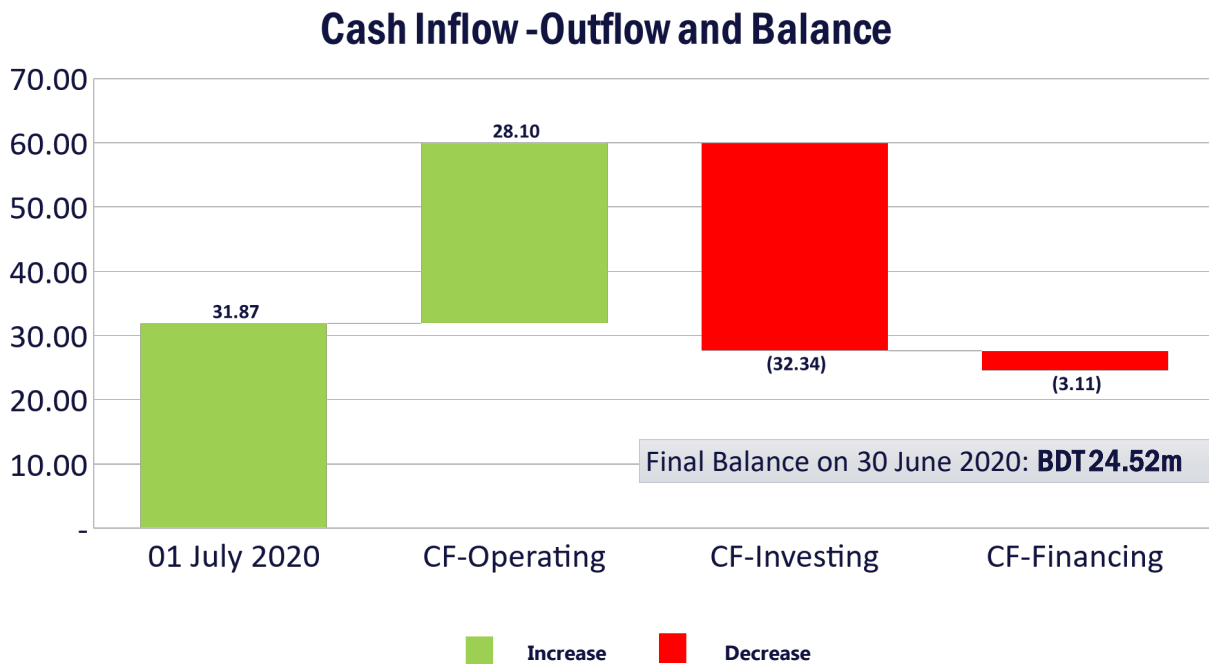
## STATEMENT OF FINANCIAL POSITION

The Equity Ratio was 0.982 which is almost 1.00 which indicates a healthy and strong financial position of BdREN. The other liquidity ratios results were: Quick Ratio 0.88, Current Ratio 2.99, Working Capital Ratio 1.99 and Debt to Equity ratio 0.018. The overall result signifies that BdREN is in more sustainable and less risky position. The distribution of Assets and Liabilities for BdREN as at 30 June 2021 is shown below:



## STATEMENT OF CASH FLOW

BdREN Trust follows standards and best practices for cash and fund management. It manages its cash separately for operational, investment and financing activities. Its cash generation is positive which indicates that BdREN is in a good position to survive and expand its business:



# CHANGES IN EQUITY

BdREN's Financial achievement in FY 2020-2021 is demonstrated with an increase in its Accumulated Surplus of BDT 33.33 million and the percentage being 19.20%.



**ACCUMULATED SURPLUS**



**2018-2019  
BDT 109m**



**2019-2020  
BDT 174m.**



**2020-2021  
BDT 207m**

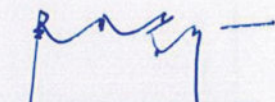


**BdREN Trust**  
**Statement of Profit or Loss and other Comprehensive Income**  
**For the year ended 30 June 2021**

	Notes	Amount in Taka	
		FY 2020-2021	FY 2019-2020
<b>Operating Income:</b>	9	<b>112,130,346</b>	<b>109,012,772</b>
Annual Membership fee	9.1	3,490,000	1,450,000
Service Revenue	9.2	108,640,346	107,562,772
<b>Less: Operating Expenses:</b>	10	<b>325,532,031</b>	<b>303,916,147</b>
Network Operational Expense	10.1	36,119,757	34,228,530
Network Maintenance Expense	10.2	55,142,537	52,312,333
General & Administrative Expense	10.3	33,729,925	30,319,021
Depreciation and Amortization Expense		200,539,812	187,056,263
<b>Profit/(Loss) from Operations</b>		<b>(213,401,685)</b>	<b>(194,903,375)</b>
<b>Add: Non-Operating Income</b>	11	<b>81,671,507</b>	<b>91,013,555</b>
Income from Bank Interest	11.1	80,665,139	90,902,038
Discount receipts on payment	11.2	266	16
Others receipts	11.3	1,006,102	111,501
		<b>(131,730,178)</b>	<b>(103,889,820)</b>
<b>Less: Non-Operating Expense</b>	12	<b>832,355</b>	<b>446,377</b>
Financial Expense	12.1	821,000	436,500
Bank Charges	12.2	11,355	9,877
<b>Profit/(Loss) before Tax</b>		<b>(132,562,533)</b>	<b>(104,336,197)</b>
Less: Income Tax Expense		484,505	1,000,132
<b>Profit/(Loss) after Tax</b>		<b>(133,047,038)</b>	<b>(105,336,329)</b>

The annexed notes form an integral part of these financial statements

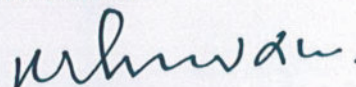
  
CAFO

  
Chief Executive Officer

  
Vice-Chairperson

  
Chairperson

Signed in terms of our annexed report of even date.



Md. Abdus Satter Sarkar, FCA  
ICAB Enrollment No. 1522  
For and on behalf of,  
Mahfel Huq & Co., Chartered Accountants  
Firm Registration No. P-46323  
DVC:

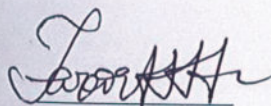


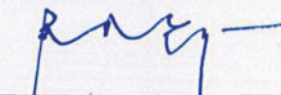
Dhaka, 31 October 2021

**BdREN Trust**  
**Statement of Financial Position**  
**As at 30 June 2021**

Notes	Amount in Taka FY 2020-2021	Amount in Taka FY 2019-2020		
		Restated	Actual	
<b>ASSETS</b>				
<b>Non-Current Assets</b>	<b>3</b>	<b>1,384,297,701</b>	<b>1,552,498,906</b>	<b>1,350,997,979</b>
Property, Plant & Equipment	3.1	1,220,710,882	1,382,782,501	1,112,271,945
Furniture & Fixtures	3.2	27,817,988	30,830,698	101,201,861
Intangible Assets	3.3	30,168,831	23,685,707	22,324,173
Long-Term-Advance	3.4	105,600,000	115,200,000	115,200,000
<b>Current Assets</b>	<b>4</b>	<b>1,162,991,049</b>	<b>1,131,926,450</b>	<b>1,131,926,450</b>
Cash and Cash Equivalents	4.1	24,519,941	31,871,913	31,871,913
Investment in FDR	4.2	1,080,000,000	1,050,000,000	1,050,000,000
Stationary	4.3	54,045	17,097	17,097
IT Accessories	4.4	-	-	-
Advance, Deposite & Pre-payments	4.5	731,647	371,963	371,963
Accounts Receivables	4.6	32,605,312	32,997,901	32,997,901
Advance Income Tax (AIT)	4.7	25,080,104	16,667,575	16,667,575
<b>Total Assets</b>		<b>2,547,288,750</b>	<b>2,684,425,356</b>	<b>2,482,924,429</b>
<b>LIABILITIES &amp; TRUST FUND</b>				
<b>Current Liabilities</b>	<b>5</b>	<b>27,744,843</b>	<b>28,723,490</b>	<b>28,723,491</b>
Accounts Payable	5.1	18,685,761	20,560,381	20,560,381
Expenses Payable	5.2	1,607,959	792,776	792,776
Audit Fee Payable	5.3	57,500	57,500	57,500
VAT Payable	5.4	474,631	68,933	68,933
Withholding Tax Payable	5.5	21,478	16,118	16,118
Provision for Income Tax	5.6	4,477,894	3,974,773	3,974,773
Asi@Connect Project Fund	5.7	1,173,710	939,141	939,141
fDLuDCf Project Fund	5.8	1,172,905	2,310,101	2,310,101
Unearned Revenue	5.9	29,227	3,767	3,767
Other Funds	6	43,778	-	-
<b>Non-Current Liabilities</b>		<b>16,562,188</b>	<b>19,619,878</b>	<b>19,619,878</b>
Accounts Payable -dataedge Ltd.	7	16,562,188	19,619,878	19,619,878
<b>Trust Fund</b>	<b>8</b>	<b>2,502,981,718</b>	<b>2,636,081,988</b>	<b>2,434,581,060</b>
Capital Fund	8.1	896,700,000	896,700,000	896,700,000
Operational Fund	8.2	62,180,575	62,211,825	62,211,825
Donation and Grants	8.3	1,337,142,730	84,089,446	84,089,446
Revaluation Reserve	8.4	-	1,477,615,788	1,217,951,127
Accumulated Surplus	8.5	206,958,413	115,464,929	173,628,662
<b>Total Equity &amp; Liabilities</b>		<b>2,547,288,750</b>	<b>2,684,425,356</b>	<b>2,482,924,429</b>

The annexed notes form an integral part of these financial statements

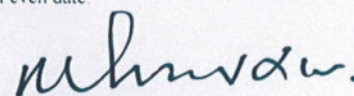
  
CAFO

  
Chief Executive Officer

  
Vice-Chairperson

  
Chairperson

Signed in terms of our annexed report of even date



Md. Abdus Satter Sarkar, FCA

ICAB Enrollment No. 1522

For and on behalf of,

Mahfel Huq & Co., Chartered Accountants

Firm Registration No. P-46323

DVC: 2111231522AS363263

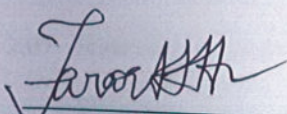
Dhaka, 31 October 2021

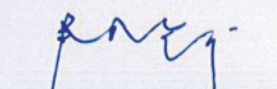


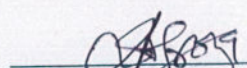
**BdREN Trust**  
**Statement of Cash Flows**  
**For the year ended 30 June 2021**

	Amount in Taka	Amount in Taka
	FY 2020-2021	FY 2019-2020
<b>Cash flows from operating activities</b>		
Net Income	(133,047,038)	(105,336,329)
Depreciation & Amortization	190,939,811	177,456,263
Increased Inventories	(36,948)	(8,885)
Decreased Long-term Advance	9,600,000	9,600,000
Increased Advance, Deposite & Pre-payments	(359,684)	13,180,787
Decreased Accounts Receivables	392,589	(3,633,152)
Increased FDR	(30,000,000)	(125,000,000)
Advance Income Tax Paid	(8,412,529)	(9,280,549)
Decreased Accounts Payable	(1,874,620)	17,315,551
Increase in Audit Fee Payable	-	57,500
Increase Expense Payable	815,183	(499,052)
Increase in unearned Revenue	25,460	3,767
Increase VAT Payable	405,698	18,931
Increased other Funds	43,778	-
Increase Asi@Connect Project Fund	234,569	319,500
Decreased fDLuDCf Project Fund	(1,137,196)	1,811,259
Increase Provision for Income Tax	503,123	1,000,132
Increase Withholoding Tax Payable	5,360	(39,781)
<b>Net cash flows from/(used in) operating activities (A)</b>	<b>28,097,556</b>	<b>(23,034,058)</b>
<b>Cash flows from Investing activities</b>		
Purchase of Non-Current Assets	(32,338,606)	(25,134,857)
<b>Net cash flows from/(used in) investing activities (B)</b>	<b>(32,338,606)</b>	<b>(25,134,857)</b>
<b>Cash flows from financing activities</b>		
Endowment Fund Receipt (Capital Fund)	-	-
Changes in Operational Fund	(31,250)	-
Refund of Donation/ Accumulated Surplus	(21,982)	(163,541)
Payment of Long Term Debt	(3,057,690)	(56,567,210)
<b>Net cash flows from/(used in) financing activities (C)</b>	<b>(3,110,922)</b>	<b>-56,730,751</b>
<b>Net Cash flows from All Activities [A+B+C]</b>	<b>(7,351,972)</b>	<b>(104,899,666)</b>
<b>Cash and cash equivalents at the ending of the Previous year</b>	<b>31,871,913</b>	<b>136,771,579</b>
<b>Analysis of cash and cash equivalents at the ending of the year</b>	<b>24,519,941</b>	<b>31,871,913</b>

The annexed notes form an integral part of these financial statements

  
CAFO

  
Chief Executive Officer

  
Vice-Chairperson


  
Chairperson

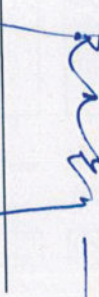
**BDREN Trust**  
Statement of Changes in Trust Fund  
For the year ended 30 June 2021

Amount in Taka

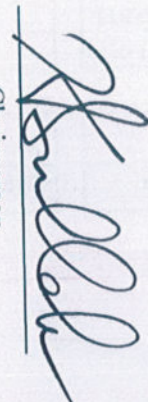
Particulars	Capital Fund	Operational Fund	Revaluation Reserve	Donation & Grants	Accumulated Surplus	Total
Balance as at 01 July 2020	896,700,000	62,211,825	1,477,615,788	84,089,446	115,464,929	2,636,081,988
Add: Addition During the Year	-	(31,250)	1,477,615,788	1,477,615,788	(21,982)	1,477,584,538
Add: Adjustment	-	-	(1,477,615,788)	-	(133,047,038)	(1,477,637,770)
Add: Net profit for the year	-	-	-	-	224,562,504	(133,047,038)
Add/(Less): Depreciation & Amortization	-	-	-	(224,562,504)	224,562,504	-
Balance as at 30 June 2021	896,700,000	62,180,575	-	1,337,142,730	206,958,413	2,502,981,718
Balance as at 30 June 2020	896,700,000	62,211,825	1,217,951,127	84,089,446	173,628,662	2,434,581,060

The annexed notes form an integral part of these financial statements

  
CAFO

  
Chief Executive Officer

  
Vice-Chairperson

  
Chairperson

Dhaka, 31 October 2021

# *Acknowledgements*

BdREN extends its special thanks to all the BoT members who spent their inordinately precious time in giving their worthy comments. Their precious comments will work as guidelines for determining BdREN's future goals and objectives.

Special acknowledgement to the representatives of the member institutes and other stakeholders as well as partners who provided their priceless comments by being candid in expressing their working experience with BdREN - sparing their extremely valuable time. Their feedback and comments will enrich us in fixing our roadmap and will help us to reflect upon and ameliorate our performance in coming days.

All the BdREN Employees who have contributed with the collection and delivery of the contents deserve special accolades and acclaims. Besides, BdREN acknowledges the contribution of the officials who anchored the whole proceedings as well as streamlined and compiled all the gathered information to give this report a professional look and shape. However, BdREN wants to exclusively appreciate the untiring efforts of Ekhlas Uddin Ahmed, Chief Technical Officer and Jamilur Rahman, Network Engineer in making the document impeccable and exemplary.

BdREN also acknowledges with thanks the contribution of Rahat Muzir, the Graphics Designer of this report, who made this report highly colorful and exclusively attractive.

Last but not the least, BdREN profoundly expresses its gratitude to Dr. Gauranga Chandra Mohanta, Retd. Additional Secretary, GoB and ex. Project Director (HEQEP) for dedicating his valuable time and exquisite skills in reviewing this report. Undoubtedly this report would have lost its glory had it not been so delicately and skillfully brushed by this highly dedicated personality.

## Acronyms & Definitions

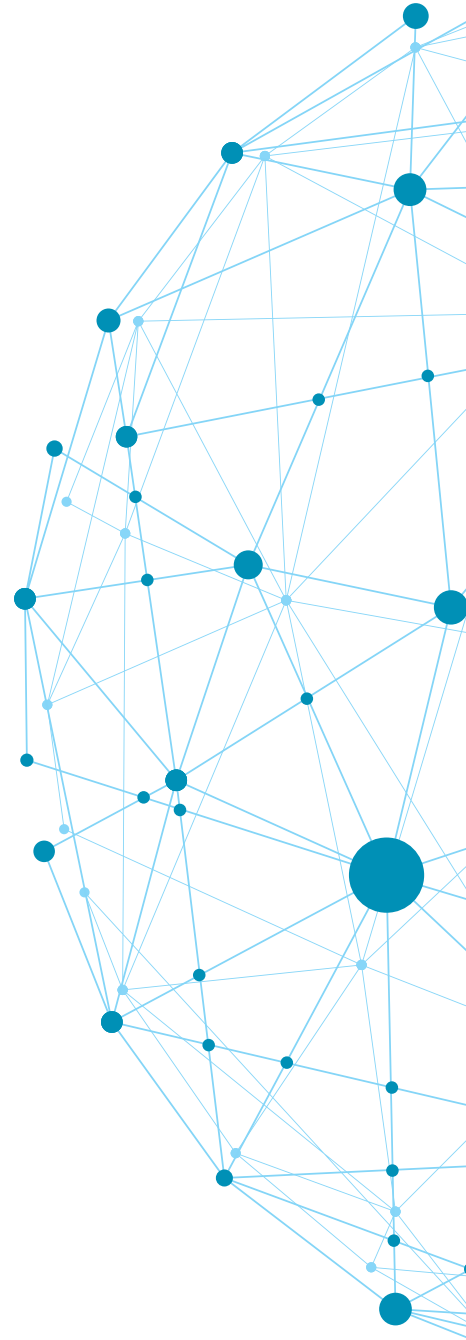
4IR .....	Fourth Industrial Revolution
AARNET .....	Australia's Academic and Research Network
AI.....	Artificial Intelligence
AIX.....	Aamra Internet Exchange
AP .....	Access Point
APAN .....	Asia Pacific Advanced Network
AUST .....	Ahsanullah University of Science and Technology
BARI .....	Bangladesh Agricultural Research Institute
BCC.....	Bangladesh Computer Council
BDIX.....	Bangladesh Internet Exchange
BdREN.....	Bangladesh Research and Education Network
BDT .....	Bangladesh Taka
BDU .....	Bangabandhu Sheikh Mujibur Rahman Digital University
BeLISAC .....	Building e-Learning Infrastructure for South Asian Countries
BFRI .....	Bangladesh Fisheries Research Institute
BGP .....	Border Gateway Protocol
BIDS.....	Bangladesh Institute of Development Studies
BJRI .....	Bangladesh Jute Research Institute
BLRI .....	Bangladesh Livestock Research Institute
BoT.....	Board of Trustees
BOU .....	Banagladesh Open University
BRACU .....	BRAC University
BRRI.....	Bangladesh Rice Research Institute
BRUR.....	Begum Rokeya University, Rangpur
BSCCL.....	Bangladesh Submarine Cable Company Limited
BSMMU.....	Bangabandhu Sheikh Mujib Medical University
BSMRAU .....	Bangabandhu Sheikh Mujibur Rahman Agricultural University
BSMRAAU .....	Bangabandhu Sheikh Mujibur Rahman Aviation and Aerospace University
BSMRSTU.....	Bangabandhu Sheikh Mujibur Rahman Science and Technology University
BTCL.....	Bangladesh Telecommunications Company Limited
BTRC .....	Bangladesh Telecommunication Regulatory Commission
BU .....	University of Barishal
BUBT .....	Bangladesh University of Business and Technology
BUET .....	Bangladesh University of Engineering and Technology
BUP .....	Bangladesh University of Professionals
BUSCO .....	Benchmarking Universal Single Copy Orthologs
BUTEX .....	Bangladesh University of Textiles

BW .....	BandWidth
CamREN .....	Cambodia Research and Education Network
CapEx .....	Capital Expenditure
CAT .....	Configuration Assistant Tool
CCTV .....	Closed-Circuit Television
CE .....	Customer Edge
CEO .....	Chief Executive Officer
CERNET .....	China Education and Research Network
CFP5 .....	Call for Proposal-5
CMC .....	Chittagong Medical College, Chittagong
CoU .....	Cumilla University
CGTF .....	Cyberspace Governance Technical Forum
CKLN .....	Caribbean Knowledge and Learning Network
CPU .....	Central Processing Unit
CTO .....	Chief Technical Officer
CU .....	University of Chittagong
CUET .....	Chittagong University of Engineering and Technology
CVASU .....	Chattogram Veterinary and Animal Sciences University
DCC.....	Distance Collaboration Center
DDC.....	Dhaka Dental College, Dhaka
DeIC .....	Danish e-Infrastructure Cooperation
DESCO.....	Dhaka Electric Supply Company Limited
DFT .....	Density Functional Theory
DigiNar .....	Digital Seminar
DIU.....	Daffodil International University, Dhaka International University
DLC .....	Distance Learning Courses
DLE .....	Distance Learning and Education
DLT .....	Distance Learning Theater
DMC.....	Dhaka Medical College
DNS.....	Domain Name System
DRC.....	Disaster Recovery Center
DrukREN.....	Druk Research & Education Network
DU.....	University of Dhaka
DUET .....	Dhaka University of Engineering and Technology
DWDM .....	Dense Wavelength Division Multiplexing
EBITDA.....	Earnings Before Interest, Taxes, Depreciation, and Amortization
eduGAIN.....	EDUcation Global Authentication INfrastructure
eduroam .....	Education Roaming
EEE.....	Electrical & Electronics Engineering
eFile .....	Electronic File
ESnet .....	Energy Sciences Network
eTLR.....	European Top-Level Radius
EU .....	Eastern University, European Union
EWU.....	East West University
F-ticks .....	Federated Ticker System
fDLuDCf.....	facilitating Distance Learning using Digital Conferencing facility

FDR.....	Fixed Deposit Receipt
FEM.....	Finite Element Modeling
FET.....	Field-Effect Transistor
FinFET.....	Fin Field-Effect Transistor
FLR.....	Federation Level RADIUS
FY.....	Financial Year
GB.....	Giga Byte
Gbps.....	Gigabits Per Second
GC.....	Guanine-Cytosine
GÉANT.....	GÉANT is the pan-European data network for the research and education community
GHz.....	Gigahertz
GGC.....	Google Cache Server
GIP.....	Gender and Inclusive Pedagogy
GPU.....	Graphics Processing Unit
HARNET.....	Hong Kong Academic and Research NETWORK
HEI.....	Higher Education Institute
HEQEP.....	Higher Education Quality Enhancement Project
HPC.....	High Performance Computing
HPE.....	Hewlett Packard Enterprise
HSTU.....	Hajee Mohammad Danesh Science & Technology University
IaaS.....	Infrastructure as a Service
IAM.....	Identity and Access Management
ICDDR'b.....	International Centre for Diarrhoeal Disease Research, Bangladesh
ICMAB.....	The Institute of Cost and Management Accountants of Bangladesh
ICSB.....	The Institute of Chartered Secretaries of Bangladesh
IdP.....	Identity Provider
IDREN.....	Indonesia Research and Education Network
IER.....	Institute of Education and Research
iFIRE.....	Increasing Federated Identity, Roaming and E-infrastructure
IGP.....	Interior Gateway Protocol
IIG.....	International Internet Gateway
IMCH.....	International Medical College and Hospital
IOPS.....	Input/Output Operations per Second
IPTSP.....	IP Telephony Service Provider
IPv4.....	Internet Protocol version 4
IPv6.....	Internet Protocol version 6
IRS.....	Institutional Radius Server
IRU.....	Indefeasible Right of Use
ISOC.....	Internet Society
ISP.....	Internet Service Provider
IU.....	Islamic University
IUB.....	Independent University, Bangladesh
IUBAT.....	International University of Business Agriculture and Technology
IUT.....	Islamic University of Technology
IXP.....	Internet eXchange Point
JKKNIU.....	Jatiya Kabi Kazi Nazrul Islam University
JnU.....	Jagannath University
JU.....	Jahangirnagar University

JUST .....	Jessore University of Science & Technology
KU .....	Khulna University
KUET .....	Khulna University of Engineering & Technology
KVA .....	Kilo-Volt-Amperes
KVM.....	Kernel-based Virtual Machine
KW.....	Kilo Watt
L2VPN .....	Layer 2 Virtual Private Network
LDC .....	Least Developed Country
LEARN.....	Lanka Education and Research Network
LERNet.....	Laos Education and Research Network
LMS .....	Learning Management System
LU .....	Leading University
MAGOMC .....	Sylhet MAG Osmani Medical College
MB.....	Mega Byte
Mbps.....	Megabits per second
MBSTU.....	Mawlana Bhashani Science and Technology University
MIST .....	Military Institute of Science and Technology
MIU .....	Manarat International University
ML .....	Machine Learning
MMC.....	Mymensingh Medical College, Mymensingh
MMR.....	MultiMedia Router
MoE .....	Ministry of Education
MoU.....	Memorandum of Understanding
MPLS .....	Multiprotocol Label Switching
MRTG.....	Multi Router Traffic Grapher
NINMAS.....	National Institute of Nuclear Medicine & Allied Science
NKN.....	National Knowledge Network
NMS .....	Network Management/Monitoring System
NNA .....	NREN Needs Assessment
NOC.....	Network Operation Center
NORDUnet.....	Regional Research and Education Networks (RRENs) of the five Nordic countries
NREN.....	National Research and Education Network
NREN.....	Nepal Research and Education Network
NRO .....	National Roaming Operator
NRS .....	National Radius Server
NSTU .....	Noakhali Science and Technology University
NSU.....	North South University
NU.....	National University
NVMe .....	Non-Volatile Memory Express
On-Prem .....	On Premise
OPGW.....	Optical Ground Wire
OS.....	Operating System
PAC .....	Precision Air Conditioning
PaaS.....	Platform as a Service
PE.....	Provider Edge
PGCB.....	Power Grid Company of Bangladesh
PoP.....	Point of Presence
PSTU.....	Patuakhali Science and Technology University
PUST.....	Pabna University of Science and Technology

R&D.....	Research and Development
R&E.....	Research and Education
RAM.....	Random Access Memory
REN.....	Research and Education Network
REANNZ.....	Research and Education Advanced Network New Zealand
RMC.....	Rajshahi Medical College
RPKI.....	Resource Public Key Infrastructure
RpMC.....	Rangpur Medical College
RSA.....	Rivest-Shamir-Adleman
RREN.....	Regional Research and Education Network
RU.....	University of Rajshahi
RUET.....	Rajshahi University of Engineering & Technology
SaaS.....	Software as a Service
SAN.....	Storage Area Network
SAU.....	Sylhet Agricultural University
SBAU.....	Sher-e-Bangla Agricultural University
SBMC.....	Sher-e-Bangla Medical College
SDN.....	Software Defined Networking
SingAREN.....	Singapore Advanced Research and Education Network
SLA.....	Service Level Agreement
SMS.....	Short Message Service
SOMC.....	Sylhet MAG Osmani Medical College
SP.....	Service Provider
ShSMC.....	Shaheed Suhrawardy Medical College
SSKMC.....	Sheikh Sayera Khatun Medical College
SSMC.....	Sir Salimullah Medical College
SSO.....	Single Sign-On
SSD.....	Solid State Drive
SurfNet.....	National Research and Education Network of the Netherlands
SUST.....	Shahjalal University of Science and Technology
TB.....	Tera Byte
TCAD.....	Technology Computer-Aided Design
TEIN*CC.....	Trans-Eurasia Information Network-star Corporation Center
ThaiREN.....	Thailand Resaerch and Education Network
TIGERfed.....	Trust, Identity and Group management for Education and Research Federation
TLR.....	Top Level Radius
TST.....	Technical Support Team
TTT.....	Train The Trainer
UGC.....	University Grants Commission of Bangladesh
UPS.....	Uninterruptible Power Supply
VAT.....	Value Added Tax
VC.....	Vice Chancellor
VM.....	Virtual Machine
VPN.....	Virtual Private Network
VS.....	Versus
vSession.....	Virtual Session
VU.....	Varendra University
Wi-Fi.....	Wireless Fidelity



## BdREN

Plot: E-18/A, UGC Bhaban,  
Agargaon Administrative Area,  
Sher-e-Bangla Nagar, Dhaka-1207  
+880-9612-2-BdREN  
[info@bdren.net.bd](mailto:info@bdren.net.bd)