VN NIC
Internet for all

REPORT ON
INTERNET RESOURCES IN VIET NAM
2022

.vn

INTERNET SPEED by VNNIC

IP v4 v6 Internet Address

3G 4G 5G

VNIX

25 YEARS

ADSL FTTH

DNS National .VN Domain Name System

INTERNET VIETNAM

THE DEVELOPMENT OF INTERNET RESOURCES AND NATIONAL INTERNET INFRASTRUCTURES

https://vnnic.vn

CONTENT

PREFACE

Cordial greetings from Viet Nam Internet Network Information Center (VNNIC)!

The year 2022 marks the 25-year milestone since Vietnam officially connected the global Internet. The Internet is entering a new stage of development, with the transition to IPv6, Internet of Things, 5G, Cloud, AI, and Big Data technologies. The Internet has become fundamental and indispensable for the establishment of digital space. Towards the 25th anniversary of connection Internet in Viet Nam, with the mission to provide core Internet infrastructure and essential services of Viet Nam's Internet network; leading, orienting and providing reliable information as well as new services based on Internet resources; connecting the community and promoting Internet safety in Viet Nam, VNNIC published "Report on Viet Nam Internet Resources 2022" with the theme "25 YEARS ANNIVERSARY OF INTERNET IN VIET NAM". This is a special publication that introduces readers to the 25-year journey of Viet Nam's Internet, reflected in the development of the Internet resources, which are important factors contributing to the development of Vietnam's Internet.

Over 10 years of publishing "Report on Viet Nam Internet Resources", We hope that this report will continue to act as a source of reference for regulators and authorities to build policies; help businesses, organizations and individuals catch up with the current situation, analyze the development trend of Internet resources in Viet Nam to serve their activities and research.

To complete this publication, the Editorial Board consulted the documents and data of the Ministry of Information and Communications and relevant agencies. However, omissions are inevitable, the Editorial Board is looking forward to receiving comments from readers so that the following publications can be more complete.

Our sincerest gratitude,

VIET NAM INTERNET NETWORK INFORMATION CENTER

PART I

Internet for all

ADSL - Internet broadband on cable

National digital infrastructure

Internet service prices were lowered

Shaping the future of Internet in Viet Nam

4G Internet was launched

IPv4-IPv6 transition

5G trial tests

General Department of Posts and Telecommunications governed Internet activities in Viet Nam

VNIX was established

DNNSEC was deployed

Decree on Internet management and online information

National Internet Center of Viet Nam (VNNIC)

VNNIC was recognized as the national Internet Registry (NIR) of Viet Nam

FTTH - fibre optic to household

First ".vn" domain names was registered

Viet Nam connected to global Internet

Internet management mindset "management to catch up with development need"

3G mobile broadband

First ".vn" domain name server was established.

First ISPs were born.

2020 - 2022

2016

2011 - 2013

2009

2003

2000 - 2001

1997

1994

25 YEARS

.vn

INTERNET SPEED

IP Internet Address

3G 4G 5G

VNIX

ADSL FTTH

DNS

INTERNET VIETNAM

THE DEVELOPMENT OF INTERNET RESOURCES AND NATIONAL INTERNET INFRASTRUCTURES

After 25 years since Vietnam officially connected to the global network on November 19th 1997, the Internet has become an important factor affecting the socio-economic development, facilitating the international integration, and accompanying the digital transformation and industrial revolution 4.0.

1991

Trial Internet connection was set up between Australia and Vietnam via telephone line.

The first email was sent from Vietnam.

1993

Vietnam's first mobile network was officially established.

The first .vn domain name was registered. The Institute of Information Technology (under the Vietnam Academy of Science and Technology) managed the the first DNS domain name server in Vietnam.

1994

Vietnam Internet backbone network formed 2 nodes in Hanoi and Ho Chi Minh City connected by 64Kbps link.

1996

▸ Decree No. 21/ND-CP (March 5, 1997) allowed people to connect to the Internet

▸ November 19, 1997: The Internet service was launched in Vietnam. Vietnam officially connect to the global network.

▸ VNPT, FPT, Saigon Postel and Netnam were the first enterprises to provide Internet services. The services were provided on the fixed telephone network infrastructure, with limited access speed (64 Kbps).

▸ The International Corporation of Assigned Names and Numbers (ICANN) officially delegated the management of the Vietnam country code top level domain name: ".vn".

1997

Internet service providers put trial tests on technology, phone services, and basic Internet services.

1999
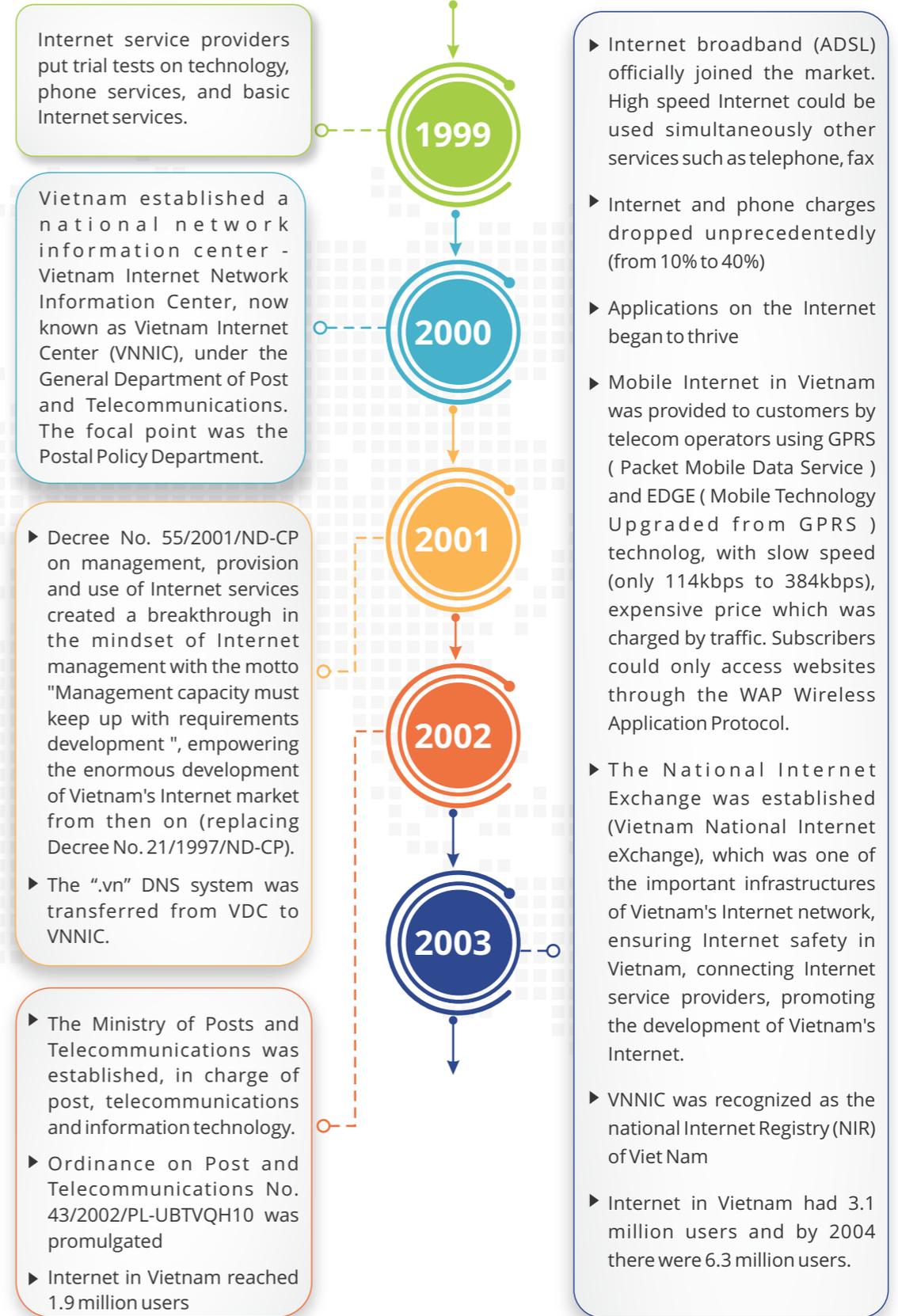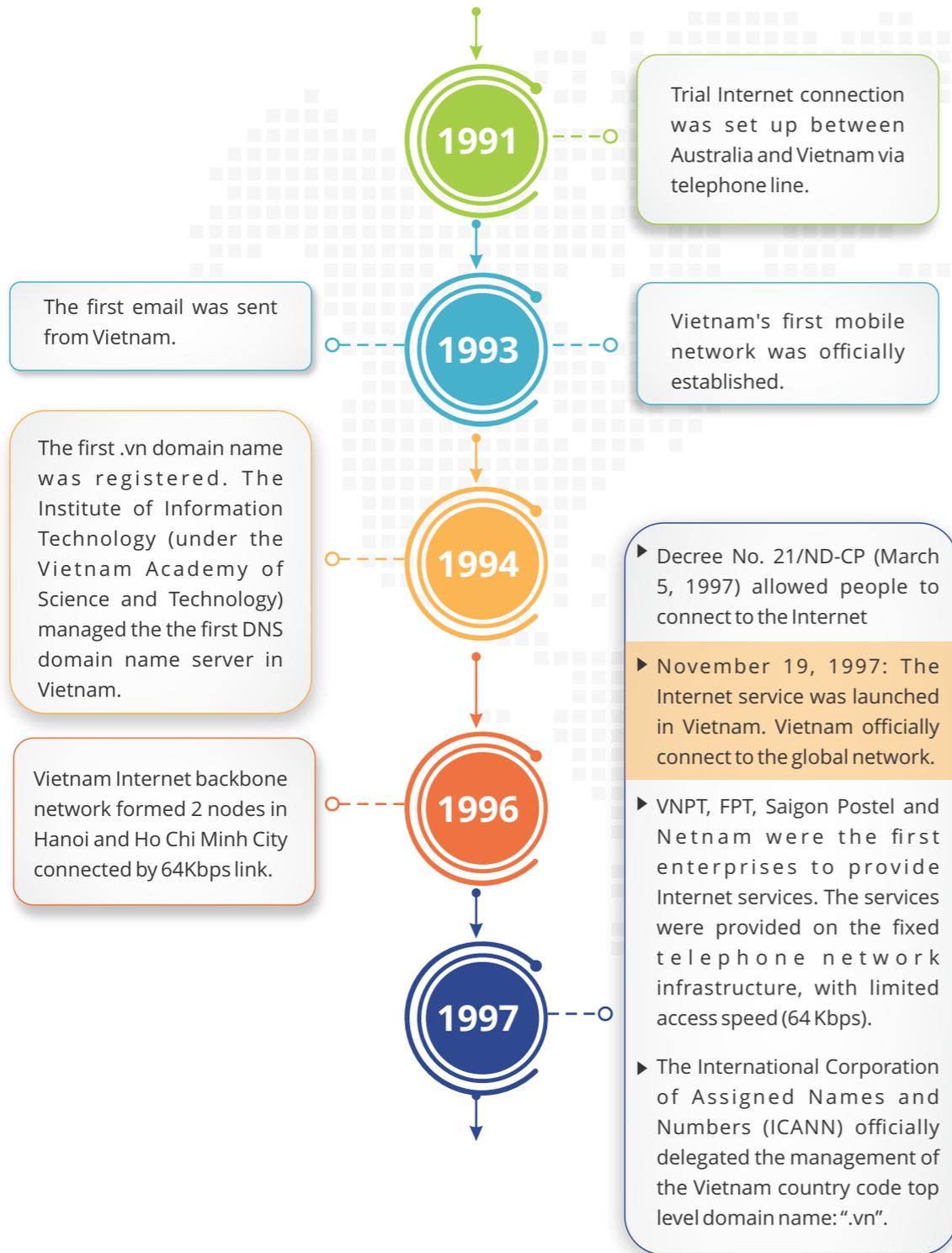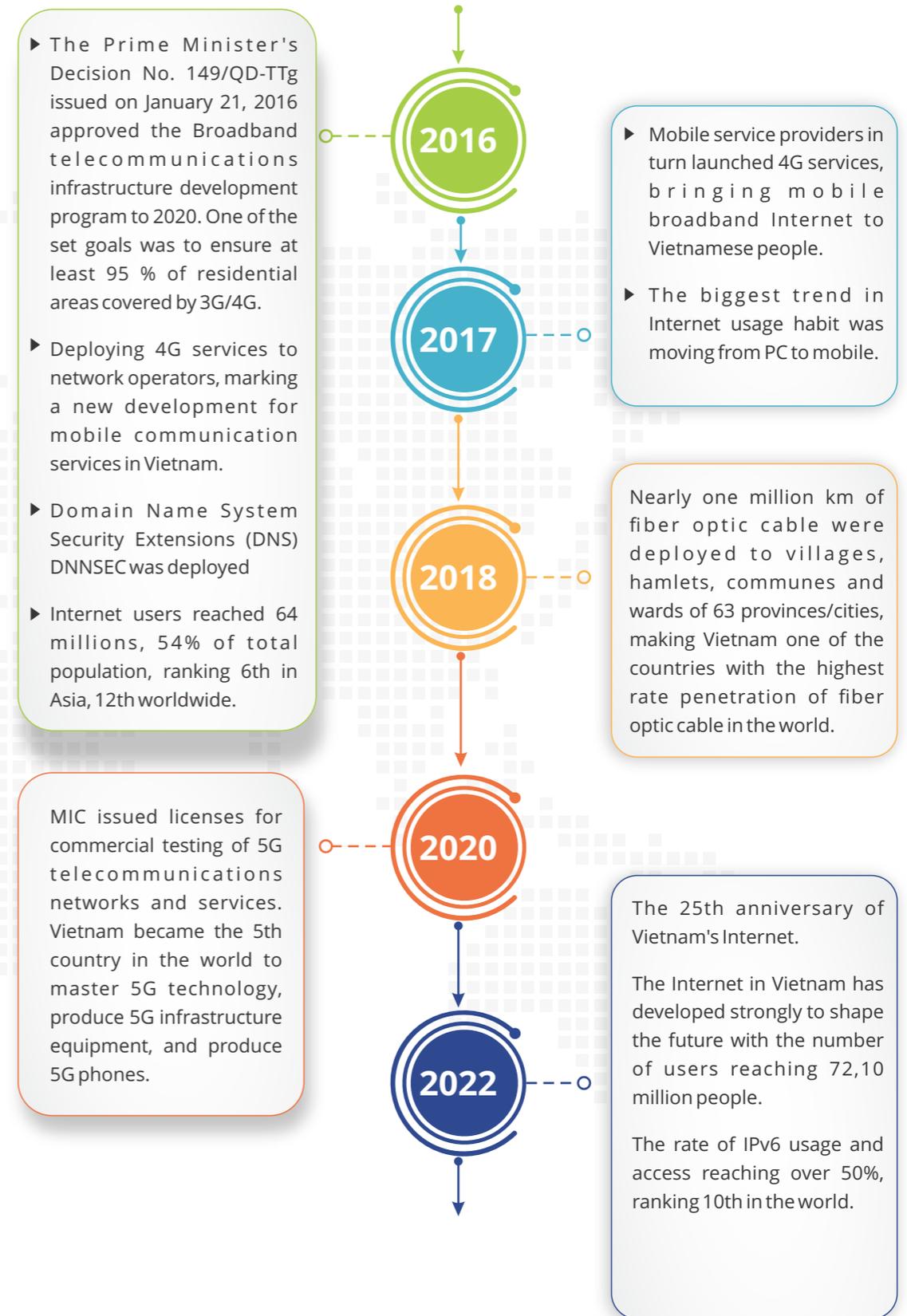
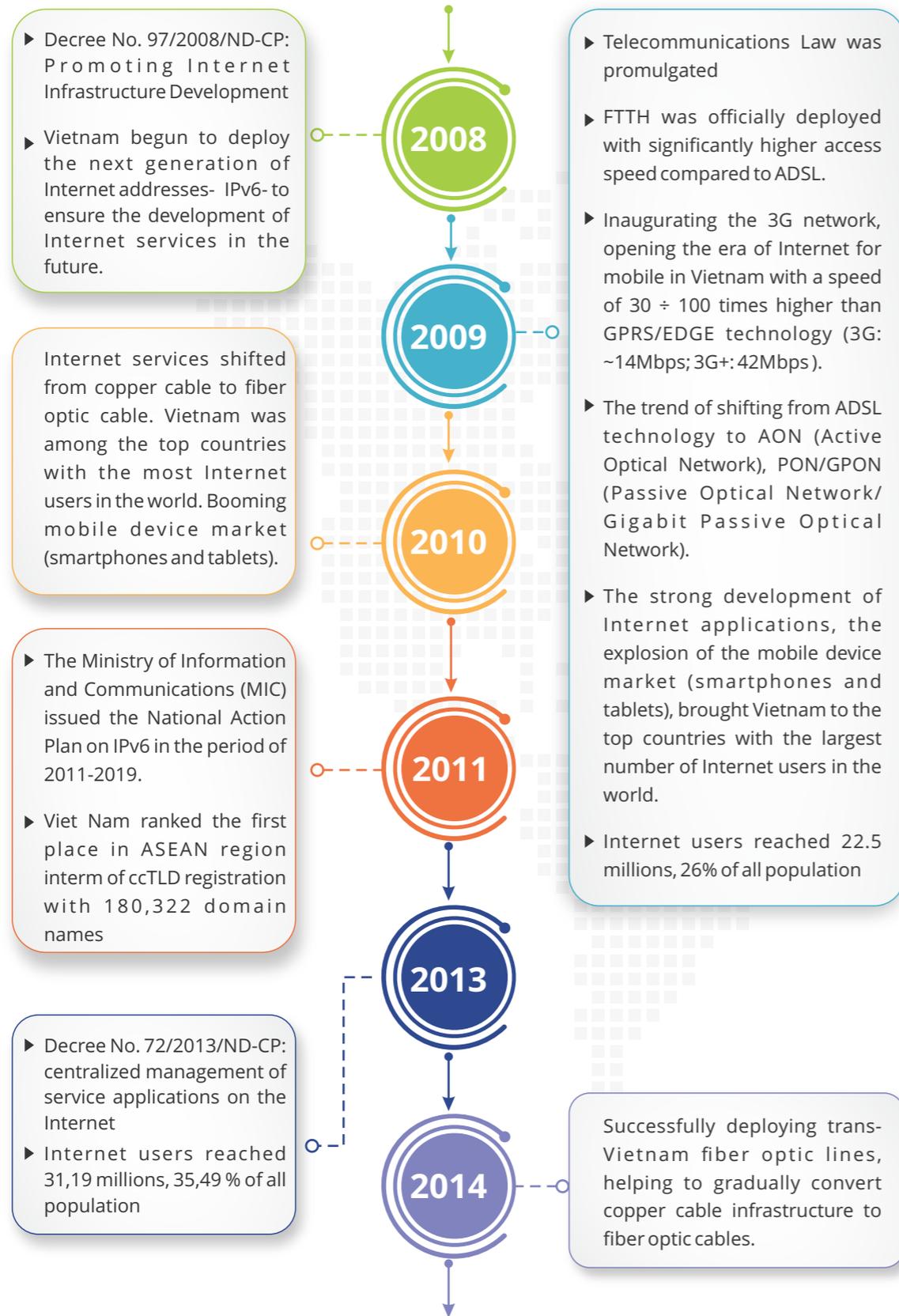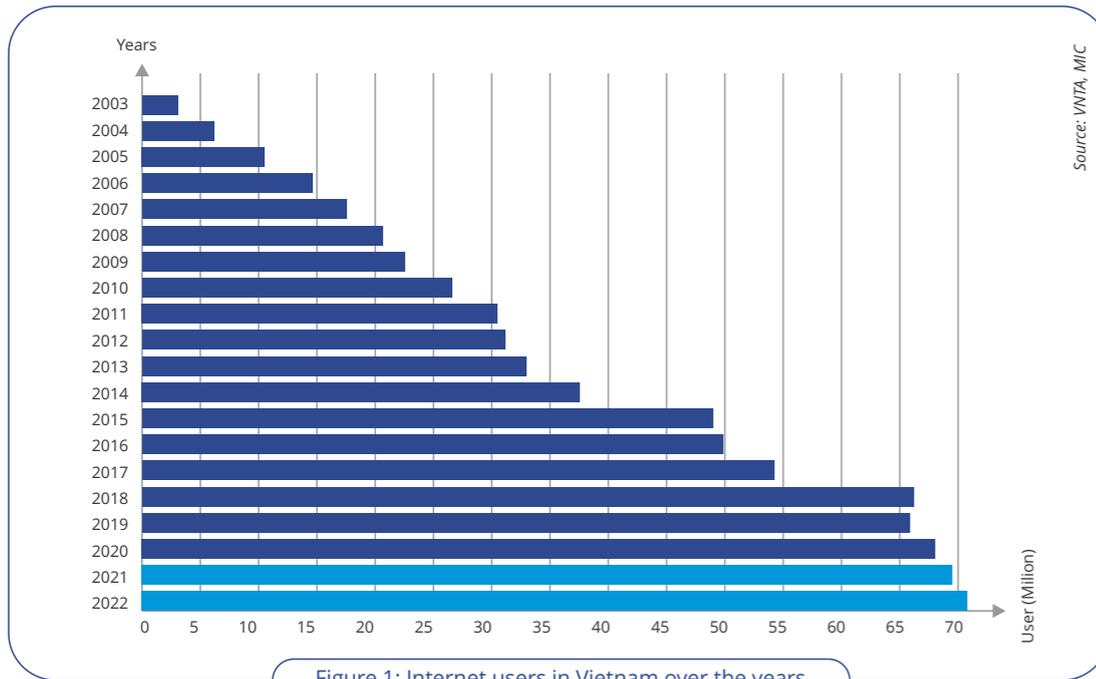Vietnam established a national network information center - Vietnam Internet Network Information Center, now known as Vietnam Internet Center (VNNIC), under the General Department of Post and Telecommunications. The focal point was the Postal Policy Department.

2000

▸ Decree No. 55/2001/ND-CP on management, provision and use of Internet services created a breakthrough in the mindset of Internet management with the motto "Management capacity must keep up with requirements development ", empowering the enormous development of Vietnam's Internet market from then on (replacing Decree No. 21/1997/ND-CP).

▸ The ".vn" DNS system was transferred from VDC to VNNIC.

2001

2002

The Ministry of Posts and Telecommunications was established, in charge of post, telecommunications and information technology.

▸ Ordinance on Post and Telecommunications No. 43/2002/PL-UBTVQH10 was promulgated

▸ Internet in Vietnam reached 1.9 million users

2003

▸ Internet broadband (ADSL) officially joined the market. High speed Internet could be used simultaneously other services such as telephone, fax

▸ Internet and phone charges dropped unprecedentedly (from 10% to 40%)

▸ Applications on the Internet began to thrive

▸ Mobile Internet in Vietnam was provided to customers by telecom operators using GPRS (Packet Mobile Data Service) and EDGE (Mobile Technology Upgraded from GPRS) technolog, with slow speed (only 114kbps to 384kbps), expensive price which was charged by traffic. Subscribers could only access websites through the WAP Wireless Application Protocol.

▸ The National Internet Exchange was established (Vietnam National Internet eXchange), which was one of the important infrastructures of Vietnam's Internet network, ensuring Internet safety in Vietnam, connecting Internet service providers, promoting the development of Vietnam's Internet.

▸ VNNIC was recognized as the national Internet Registry (NIR) of Viet Nam

▸ Internet in Vietnam had 3.1 million users and by 2004 there were 6.3 million users.

2008

- Decree No. 97/2008/ND-CP: Promoting Internet Infrastructure Development
- Vietnam begun to deploy the next generation of Internet addresses- IPv6- to ensure the development of Internet services in the future.

2009

- Telecommunications Law was promulgated
- FTTH was officially deployed with significantly higher access speed compared to ADSL.
- Inaugurating the 3G network, opening the era of Internet for mobile in Vietnam with a speed of 30 ÷ 100 times higher than GPRS/EDGE technology (3G: ~14Mbps; 3G+: 42Mbps).
- The trend of shifting from ADSL technology to AON (Active Optical Network), PON/GPON (Passive Optical Network/ Gigabit Passive Optical Network).
- The strong development of Internet applications, the explosion of the mobile device market (smartphones and tablets), brought Vietnam to the top countries with the largest number of Internet users in the world.
- Internet users reached 22.5 millions, 26% of all population

2010

Internet services shifted from copper cable to fiber optic cable. Vietnam was among the top countries with the most Internet users in the world. Booming mobile device market (smartphones and tablets).

2011

- The Ministry of Information and Communications (MIC) issued the National Action Plan on IPv6 in the period of 2011-2019.
- Viet Nam ranked the first place in ASEAN region interm of ccTLD registration with 180,322 domain names

2013

- Decree No. 72/2013/ND-CP: centralized management of service applications on the Internet
- Internet users reached 31,19 millions, 35,49 % of all population

2014

Successfully deploying trans-Vietnam fiber optic lines, helping to gradually convert copper cable infrastructure to fiber optic cables.

2016

- The Prime Minister's Decision No. 149/QD-TTg issued on January 21, 2016 approved the Broadband telecommunications infrastructure development program to 2020. One of the set goals was to ensure at least 95 % of residential areas covered by 3G/4G.
- Deploying 4G services to network operators, marking a new development for mobile communication services in Vietnam.
- Domain Name System Security Extensions (DNS) DNNSEC was deployed
- Internet users reached 64 millions, 54% of total population, ranking 6th in Asia, 12th worldwide.

2017

- Mobile service providers in turn launched 4G services, bringing mobile broadband Internet to Vietnamese people.
- The biggest trend in Internet usage habit was moving from PC to mobile.

2018

Nearly one million km of fiber optic cable were deployed to villages, hamlets, communes and wards of 63 provinces/cities, making Vietnam one of the countries with the highest rate penetration of fiber optic cable in the world.

2020

MIC issued licenses for commercial testing of 5G telecommunications networks and services. Vietnam became the 5th country in the world to master 5G technology, produce 5G infrastructure equipment, and produce 5G phones.

2022

The 25th anniversary of Vietnam's Internet.

The Internet in Vietnam has developed strongly to shape the future with the number of users reaching 72,10 million people.

The rate of IPv6 usage and access reaching over 50%, ranking 10th in the world.

Figure 1: Internet users in Vietnam over the years

Source: VNTA, MIC

Figure 2: Percentage of total population with Internet access over the years

Figure 3: Number of Internet broadband subscribers over the years

Source: VNTA, MIC

INTERNET INFRASTRUCTURE

FIXED INTERNET: FIBER OPTIC SYSTEM

100% Communes

93% Hamlets

75% Households

100% Schools

MOBILE INTERNET

3G/4G penetration
95% population

SMARTPHONE
80% population

MOBILE INTERNET
Top 50 fastest worldwide

Source: VNTA, MIC

IPv6 TRANSITION

53%
IPv6 usage rate

> 50
million IPv6 user

Top 10
worldwide

Source: VNNIC, MIC

.VN DOMAIN NAME

564,444
domain names

11th
Asia Pacific

43th
worldwide

Source: VNNIC, MIC

With a upgrade in mindset from "open to the capability of management" to "management must keep up and create development", by open and modern policies, after 25 years, Vietnam's Internet has grown strongly and seen great achievements, contributing to comprehensively changing the economic and social life of the country.

From a country with a minor and backward telecommunications infrastructure after the war, by innovative thinking, taking the lead and embracing new things, Vietnam has become a strong country in telecommunications and Internet. The Internet is modern and widespread, with a high level of universality, while telecommunications - Internet technologies are now equivalent to those of developed countries in the world. Viet Nam is among the pioneers of digital transformation.

REGARDING DEVELOPMENT DATA IN THE FOLLOWING AREAS

Internet resources: ".vn" ccTLD reached 564,444, ranked 2nd in ASEAN, top 11 in Asia - Pacific region; IP usage is in the top 20-30 countries globally.

Converting the Internet to a new generation with IPv6: The rate of IPv6 application in Vietnam reaches 53% with more than 50 million IPv6 users, the top 10 leading countries in the world in IPv6 deployment.

Vietnam's Internet transforms from the communication infrastructure into the digital infrastructure of the digital economy. Vietnam would achieve the goal of building a digital infrastructure to reach the advanced level of the ASEAN region. Self-reliance in Vietnam has been a key factor in creating the achievements of Vietnam's Internet for 25 years and the solution to success in the process of moving to the digital environment and building digital infrastructure. The unanimity of the Vietnamese communities, businesses, organizations and management agencies in a common goal will help reach a sustainable, safe and modern development path for Vietnam's Internet and Vietnamese society.

PART II

HIGHLIGTS 2022

**Internet resources,
Important Internet infrastructure in Viet Nam**

(As of October 31th, 2022)

01 ".VN" DOMAIN NAME

Total number

564,444

Growth rate

3.1%

Registrars

15

11th
Asia – Pacific

43th
worldwide

02 IP ADDRESS, AUTONOMOUS NUMBER (ASN)

IPv4

Total number: **> 16,2 million addresses**

growth rate: **0.43%**

Ranking: **8**th Asia – Pacific
45th worldwide

IPv6

Total number: **18,540**
billion bilion bilion (10^27) addresses.

growth rate: **15.84%**

IP MEMEBERS

Total number: **791 Members**

growth rate: **19.49%**

INDEPENDENT AS NETWORK

Total number: **533**

growth rate: **17.40%**
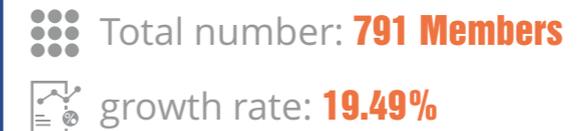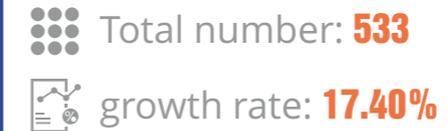
03 VIET NAM NATIONAL INTERNET eXCHANGE (VNIX)

04 IPv6 ADOPTION IN VIET NAM

52
network members

05
locations

399
bandwidth

>65
gates

60+GBPS
Max peak of traffic

37
10Gb gates

29
1Gb gates

53%
The use of IPv6 for Viet Nam
(1.7 times higher than global's IPv6 adoption rate
2.3 times higher than ASEAN's IPv6 average adoption rate).

RANKING

2nd
Asean

TOP 10
Worldwide

100%
IPv6 ready ".vn" DNS system

100%
VNIX members connect to VNIX via IPv6

IPv6 SERVICES

12 million
FTTH subscribers

43 million
IPv6 mobile subscribers

23,925
Website ".vn" IPv6 ready

IPv6 Training

3,600
Engineers from enterprises and government agencies

80
courses

05

RESOURCE PUBLIC KEY INFRASTRUCTURE (RPKI)

RPKI adoption rate in Viet Nam ROA/RPKI

61%

Number of members ROA/RPKI

>200
MEMBERS

25%
MEMBERS

RPKI& Routing Security training

05
COURSES

480
ATTENDEES

RPKI
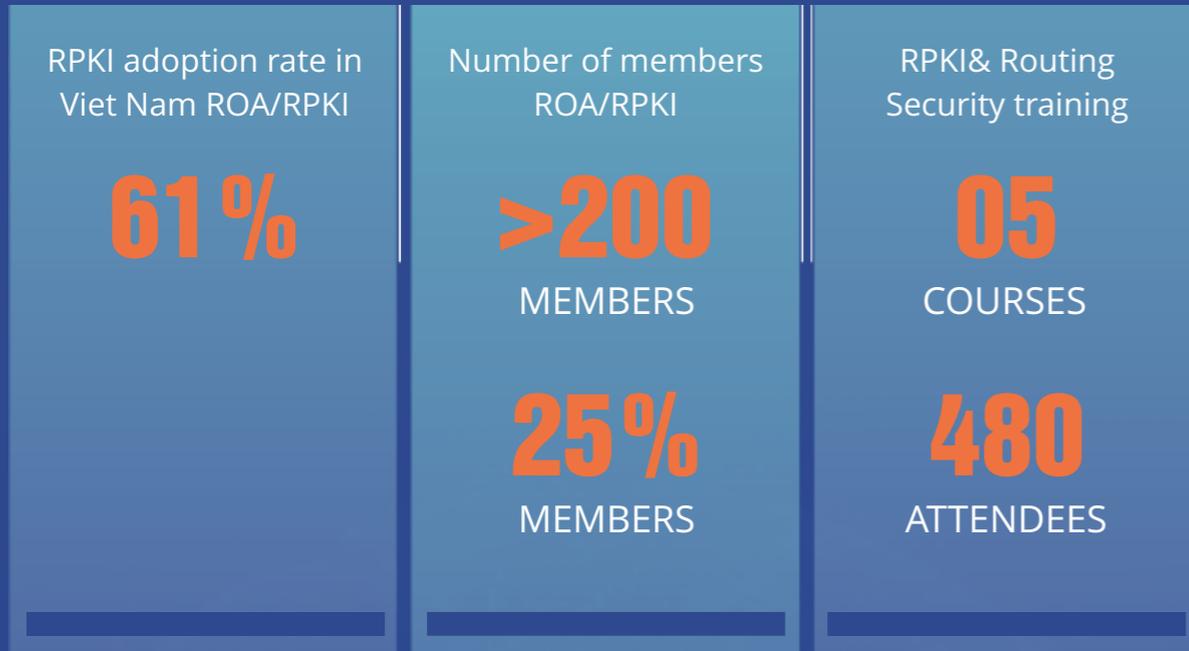
PART III

IMPORTANT RESOURCES AND INFRASTRUCTURE OF THE INTERNET – ACCOMPANYING THE DEVELOPMENT OF INTERNET IN VIETNAM

The development of Vietnam's Internet in the past 25 years has been closely associated with the development of Internet resources (".vn" domain names, IP addresses, and ASNs). The spectacular growth of the Internet in Vietnam has always been accompanied by the development of Internet resources and the safe and stable operation of the national critical Internet infrastructure technical system (National DNS System and Vietnam Internet eXchange).

VN NIC
Internet for all

I. INTERNET RESOURCES – VIETNAM INTERNET INDENTIFIERS

1 ".VN" DOMAIN NAMES : CONNECTING PEOPLE TO THE INTERNET

Domain name - the name that identifies the addresses of websites, portals, online service portals, and emails of organizations and individuals on the Internet - is the first factor to help users access the Internet instead of IP addresses which are difficult to remember. During 25 years of Internet development in Vietnam, the ".vn" country code top level domain (ccTLD) has become a useful tool to help connect and bring information and services of agencies, organizations, businesses and individuals to the online environment, affirming Vietnamese brands, products and services.

Marking the presence of Vietnam's Internet on the world Internet map
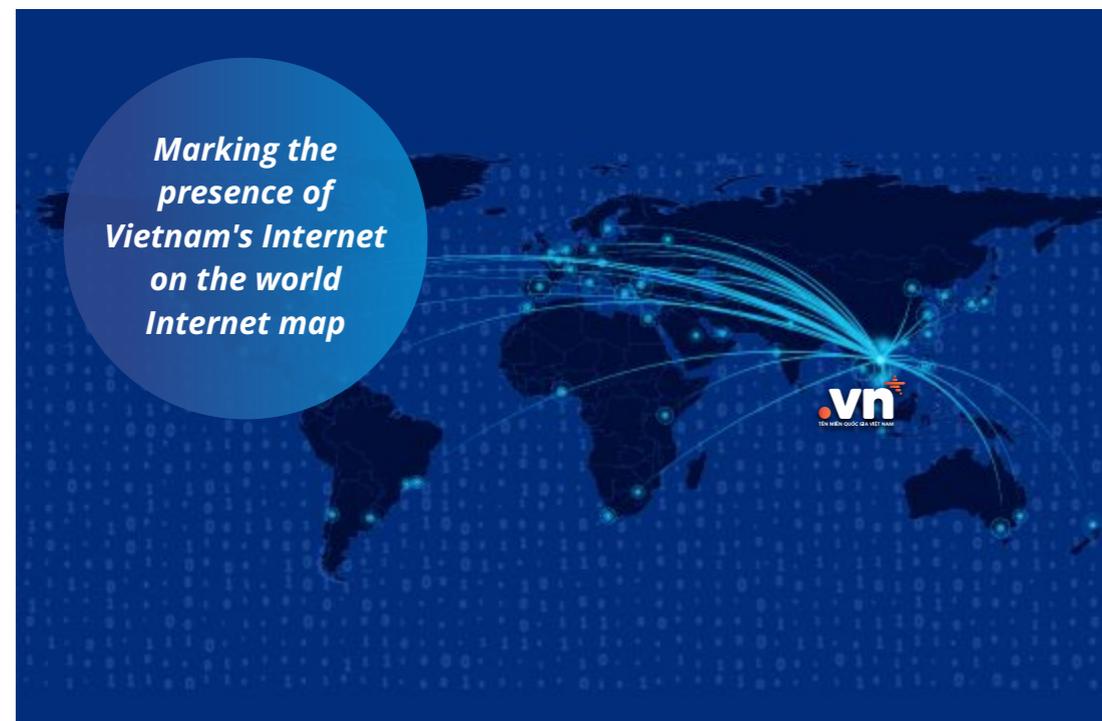
The ccTLD is an identifier that represent a country on the Internet. According to the ISO-3166, ".vn" is the ccTLD for Vietnam. In early 1994, when the Internet was still in the trial phase, Vietnam registered first ".vn" domain names through the Asia-Pacific Network Information Center (APNIC). In 1997, when Vietnam's Internet was connected globally, ICANN officially delegated the management of ".vn" ccTLD to the General Department of Post and Telecommunications. The focal point was the Postal Policy Department.

In 2000, the Vietnam Internet Network Information Center – VNNIC – was officially established, taking over the activities of promoting the registration of ".vn" domain name. Along with the development of Vietnam's Internet for 25 years, the domain name ".vn" has affirmed important values: Identity - Trust - Safety.

Carrying out the mission of building trust and developing Vietnamese brands

Domain names are the foundation for developing websites and social networks that provide information to the community, improve social intelligence, and create opportunities for e-commerce activities. Websites, emails with the ".vn" domain name have clearly identified the geographical location and Vietnam's image in cyberspace, creating trust with users in the process, connecting official information sources and services on the Internet.

With the nature of the national domain name, the ".vn" domain name carries the mission to build trust and develop online brand for Vietnamese businesses . A survey conducted by VNNIC in 2021 shows that 86% of respondents assessed that websites with ".vn" domain name would have superior reliability compared to international domain names. Building a website with a trusted domain name is a sustainable goal that businesses participating in e-commerce aim for. No matter how many online distribution channels a business has, the website is still the place where customers go to look up information and decide to put their trust in the business.

.vn TÊN MIỀN QUỐC GIA VIỆT NAM · IDENTITY · TRUST · SAFETY

86%

VALUABLE TRUST FOR **ENTERPRISE WEBSITES AND EMAILS**

CUSTOMERS CONSIDERED **WEBSITES USING ".VN" DOMAIN NAME** TO BE MORE RELIABLE AND SAFER.
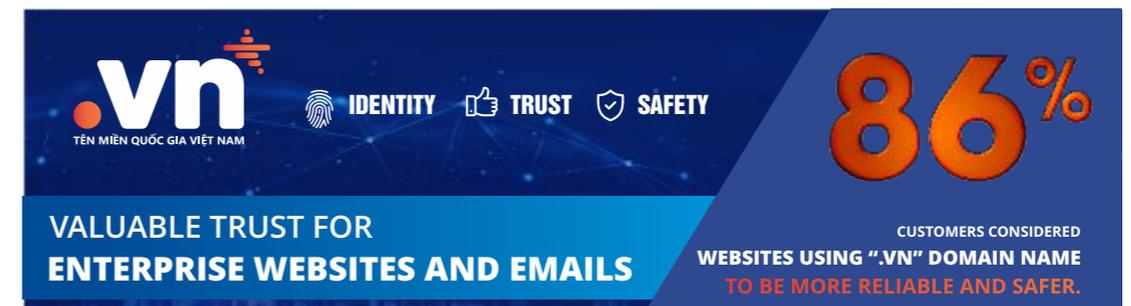
WHY DO ENTERPRISES NEED TO BUILD WEBSITES?

❯ Establishing the presence, and creating trust

❯ Controlling the introduction of products

❯ Creating sources of information

❯ Receiving feedbacks from customers and settling

❯ SEO advantage

(Source VECOM)

Via social network | 24 | 51 | 25
Via enterprise website | 24 | 54 | 22
Via e-commerce platforms | 18 | 58 | 23
Via mobile apps | 11 | 52 | 37

Legend: Low, Middle, High
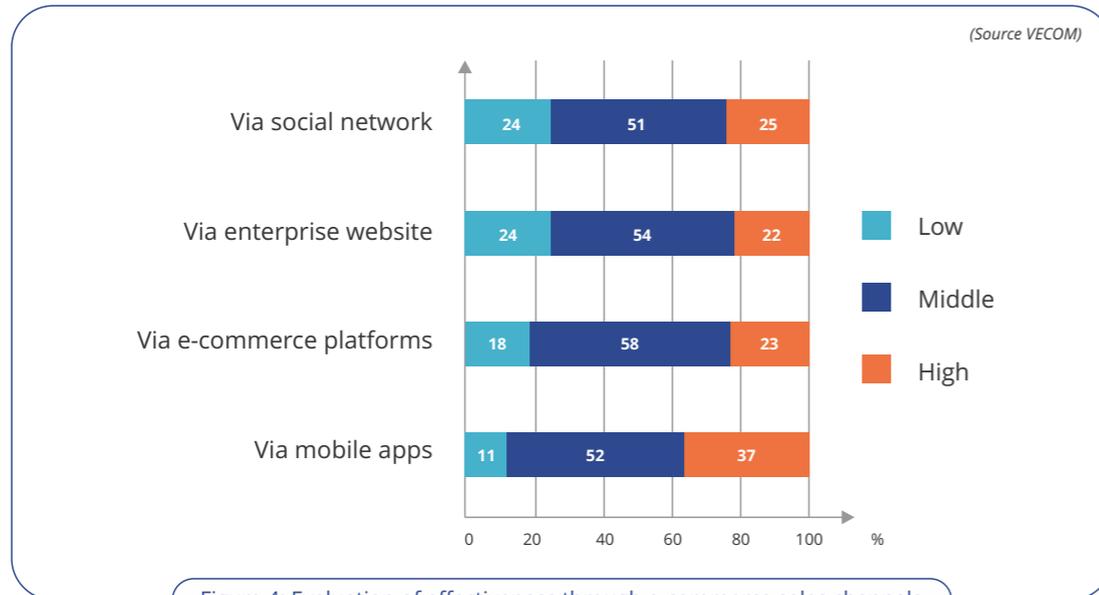
Figure 4: Evaluation of effectiveness through e-commerce sales channels

The Vietnam E-commerce Business Index (EBI) published by the Vietnam E-commerce Association (VECOM) showed that the rate of using ".vn" domain names of Vietnamese enterprises has been a higher usage rate than other types of domain names.

(Source VECOM)

	2017	2018	2019	2020
.VN	56	60	59	59
.COM	36	32	35	36
.NET	2	2	1	1
OTHER	6	6	5	4
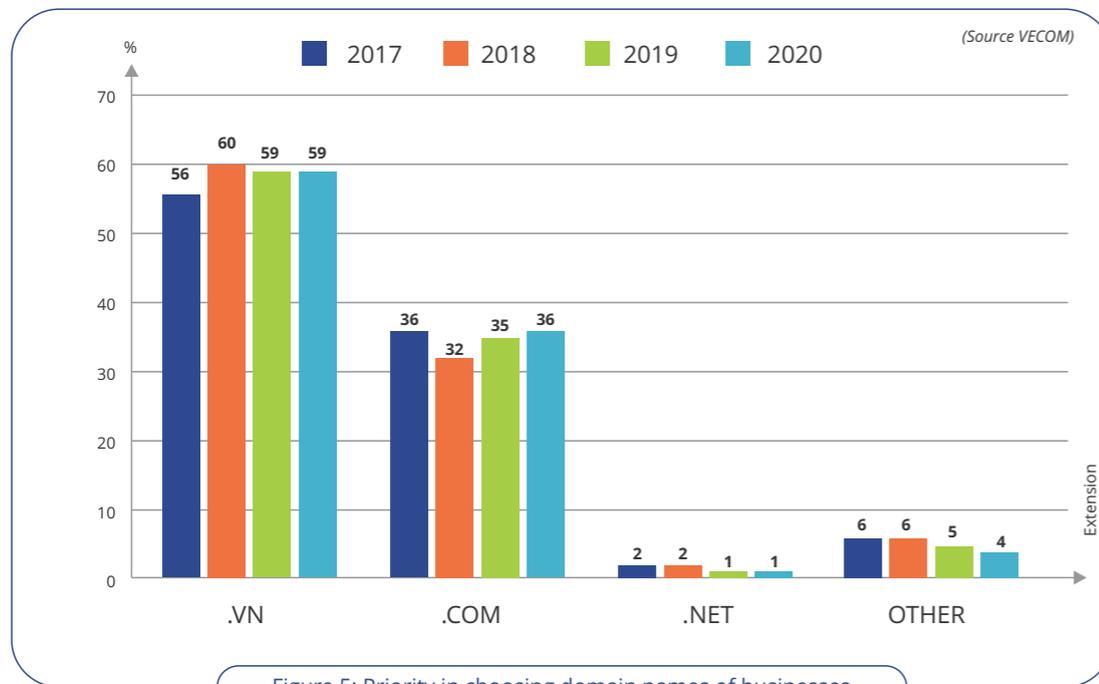
Figure 5: Priority in choosing domain names of businesses

Along with the development of the Internet and e-commerce, during the past 25 years, the ".vn" domain name has been associated with hundreds of thousands of Vietnamese brands, contributing to improving the prestige and recognition online. In the current Vietnamese market, from trillion-dollar brands to individual brands, all are using the ".vn" domain names. 9 out of 10 businesses in the Vietnam Top Strong Brands in 2021 (according to the assessment at the Vietnam Top Strong Brand Program) are using the ".vn" domain names.

Image 1: Top Vietnamese strong brands in 2021

Serving information technology activities of state agencies

The ".vn" domain name is a prerequisite for the implementation of information technology application in the activities of state agencies, specifically the electronic portals operating from central to local levels, and online public services. Therefore, the management system currently establishes 1,166 keywords (political fields, fine traditions, newspapers/news, banking, ..) and checks the registration requirements for registering domain names to avoid inappropriate domain name registrations; reserves 40,106 domain names that are not open for free registration (domain names are names of party or state agencies or may affect fine customs and traditions...); protects 2,658 active domain names of party and state agencies with strict monitoring status to maintain IT activities of party and state agencies .

543 2000 **14,345** 2005 **127,364** 2010 **348,514** 2015 **517,331** 2020 **564,444** 2022 Year

NUMBER OF ".VN" DOMAIN NAMES OVER THE YEARS
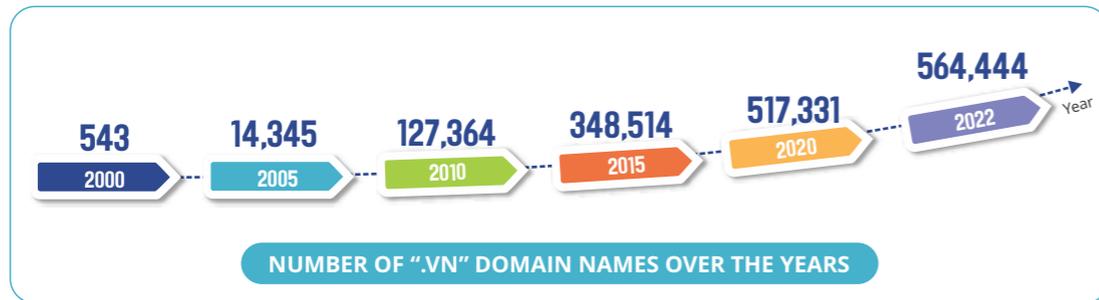
Along with the trend of digital transformation associated with the development of the digital economy, digital society, digital government, the desire for a reliable online presence of people and businesses has become increasingly important. VNNIC aims to popularize the ".vn" domain name to the entire population, promote the digital transformation community to use the ".vn" domain name and "Make in Vietnam" digital products and services, serving economic activities, digital society, towards the goal of " Internet for all". The namespace of ".vn" domain names should be expanded with 03 new second level domain name extensions: ".id.vn" (for Vietnamese citizens); ".io.vn" (for digital technology applications, platforms, digital services); "ai.vn" (artificial intelligence); priority in registering domain names under ".biz.vn" for newly established enterprises and business households to promote start-up activities and develop the digital economy.

Digital resources serve for digital transformation

2 IP ADDRESSES, AUTONOMOUS SYSTEM NUMBER (ASN) ASSOCIATED WITH INDEPENDENT NETWORK DEVELOPMENT AND MODERN INTERNET INFRASTRUCTURE OF VIET NAM

IP/ASN Development

After 25 years of Internet development, Viet Nam's Internet network has expanded in size, diversified in connections, and routed based on IP/ASN.

When Viet Nam officially connected to the Internet in 1997, a national private network had not been established. All connections were using IP addresses and ASNs allocated outside Viet Nam. In 1998, Viet Nam had the first independent AS with 14,336 IPv4 addresses, initially forming the Internet of Viet Nam. The first AS conducted international AS.

Year	IPv4 address	IPv6 addresses (octillion)	ASN
1997	0	0	0
1998	14,336	0	1
2002	79,872	0	3
2007	3,839,232	317	38
2012	15,564,544	1,347	139
2017	15,907,072	3,486	275
2022	16,200,448	18,540	533

Table 1: The development of IP/ASN in Viet Nam over the past 25 years

In 2002, Viet Nam had 03 AS belonged to the largest network operators in Viet Nam, including VNPT, Viettel, and FPT with 79,872 IPv4 addresses to establish infrastructure and provide Internet services to end users. However, at that time, most of the AS of large ISPs connected separately and directly to the upstream providers.

In 2003, VNNIC was officially recognized as Viet Nam national Internet region (NIR), managing, supporting and guilding technology to develop the demostic IP/ASN. Since then, Viet Nam's IPv4, Ipv6 addresses and ASN have grown constantly and thoroughly for Viet Nam's Internet development.

As of October 2022, Viet Nam has had more than 16 million IPv4 addresses, ranking 8th in the Asia-Pacific region, 29th worldwide; 18.540 octillions IPv6 addresses. From 03 independent networks, up to now, there have been 533 AS and 791 organizations using independent IP addresses. They are nuclear networks connected to each others to form the Internet of Viet Nam.

The growth of IPv4, IPv6 addresses and ASN have reflected the growth in number and scale of Viet Nam's Internet network.

The role of the National IP/ASN Managing Organization – Viet Nam NIR

On July 31st, 2003, the Asia Pacific Network Information Centre (APNIC) officially recognized VNNIC as the national organization managing IP addresses and ASNs (NIR) in Viet Nam; being responsible for managing and promoting the use of IP addresses, ASNs in Viet Nam, bringing advantages to the Viet Nam's Internet community.
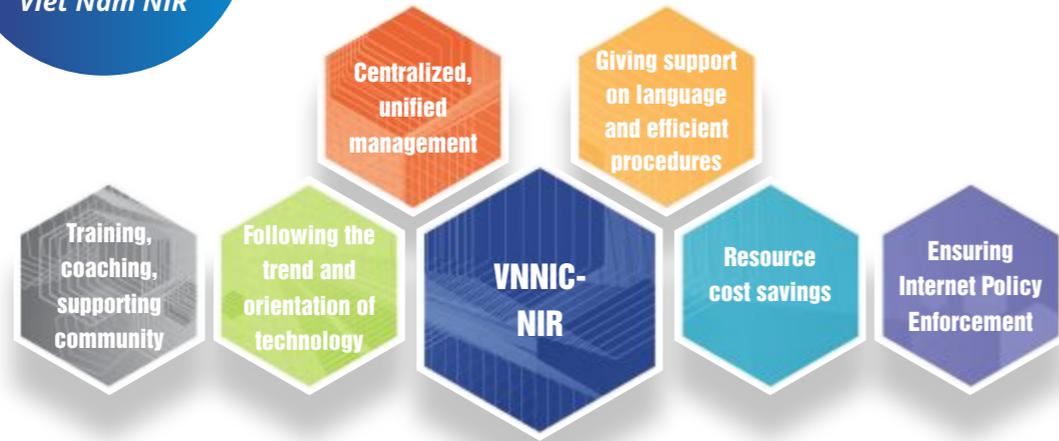
Image 2: The role of NIR in Internet development in Viet Nam

IP/ASN for connecting, routing, and developing Viet Nam's Internet infrastructure

The Internet infrastructure is connected through IP addresses and AS. The development of IP/ASN helps to increase the number of domestic and international connections, routing. At the beginning, Viet Nam has its own AS but not yet connected to each other. With the direction of the Ministry of Information and Communications and VNNIC, AS have gradually connected to each other to form the Internet of Viet Nam through the development of IX points (Internet Exchange) in Viet Nam.

IX is the general trend of Internet development in the world. In 2003, the Vietnam National Internet eXchange (VNIX) was established, helping to connect the AS of ISPs in Viet Nam. With the development of IP and ASN resources, many new AS networks were formed, such as ministries, branches, localities, banking, finance, securities networks, etc. In 2019, VNIX's policies changed and expanded connectivity to all AS networks in Viet Nam.

There are currently 16,000 IPv4 pools and more than 5,000 IPv6 pools routed internationally; more than 10,000 IPv4 zones and 4,000 IPv6 zones routed domesticly; more than 9,000 IPv4 zones, 3,000 IPv6 zones routed via VNIX. This is a resource to ensure the connection and development of Viet Nam's Internet network in the past 25 years and in the future.
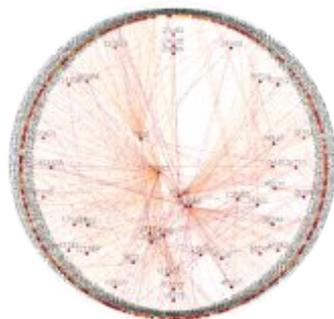
Figure 6: Viet Nam AS-IPv4 connection chart
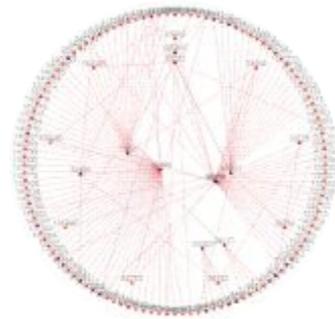
Figure 7: Viet Nam AS-IPv6 connection chart

In addition to the growth and development of IP/ASN resources, the "expanding of domestic Internet connections through direct peer-to-peer connections, connecting to Internet exchange points (IXPs), to international Internet exchange stations, etc. Expanding regional and international Internet connections, especially developing undersea fiber-optic cables system, turning Viet Nam into one of the regional connection hubs. Deploying new generation Internet protocol (IPv6) addresses " is the solution to develop Viet Nam's Internet infrastructure in the future.

3 DEPLOYING IPv6 TO GUARANTEE INTERNET RESOURCES DEVELOPMENT IN VIET NAM

IPv4 addresses have been exhausted, IPv6 deployment should be inevitable for Viet Nam's Internet development including digital infrastructure, digital government and new Internet services such as 5G, Cloud, IoT development. After nearly 15 years of promoting IPv6 in Viet Nam, there were several important milestones:

1 The first directive on IPv6 of the Ministry of Information and Communications

On May 6th, 2008, the Minister of Information and Communications issued Directive No. 03/2008/CT-BTTTT on promoting the use of new generation of Internet addresses IPv6. The directive is the first legal document to guide IPv6 activities in Viet Nam.

2 Establishment of the National IPv6 Task Force

The National IPv6 Task Force was established under Decision No. 05/BTTTT dated January 6th, 2009 by the Minister of Information and Communications to carry out the function of promoting the development of IPv6 addresses in Viet Nam. The main task of the Task Force was to research and establish IPv6 development and application strategies; plan and create a roadmap for the implementation of IPv4 to IPv6 in Viet Nam.

3 National transition IPv6 Action Plan with many activities to promote, support and guide IPv6 transition

Based on the plan, the Task Force effectively oriented the tasks and goals for each involved in the IPv6 deployment in Viet Nam. The main target of the Plan is "Ensuring the stablity and sustainablity of Viet Nam's Internet operation on the basis of IPv6 technology". The plan successfully completed exceeding the set target and contributed to the good development of Internet infrastructure with IPv6.

The National Action Plan on IPv6 Review Conference

Viet Nam's Internet infrastructure has been well converted to IPv6. National IPv6 Network Infrastructure on the basis of VNIX, national DNS and large ISPs have connected to form and launch the IPv6 network in Viet Nam. This has been the foundation for IPv6 deployment and, Viet Nam's Internet infrastructure development.

4. Ipv6 task at the National Digital Transformation Program and the IPv6 For Gov Program in the period of 2021 – 2025

By promoting IPv6 deployment early and properly by the Ministry of Information and Communications with the agencies and businesses, as of October 2022, Viet Nam's IPv6 usage rate reached 53%, ranking in top 10 globally.

Time	IPv6 usage rate	ASEAN Ranking	Global ranking
2015	0.03%		
2016	5%	3	45
2017	10%	3	30
2018	25.58%	2	13
2019	39.68%	2	8
2020	45.60%	2	10
2021	47.00%	2	8
T10/2022	53.00%	2	10

Table 2: The IPv6 deployment in Viet Nam's Internet infrastructure

According to the IPv6 deployment tasks in the National Digital Transformation Program (Decision No. 749/QD-TTg of the Prime Minister) and the IPv6 For Gov Program (Decision No. 38/QD-BTTTT of the Ministry of Information and Communications), the target of 2021-2025 period is to convert IPv4 to the new generation of Internet protocol (IPv6) throughout the entire Viet Nam's Internet network. Viet Nam Internet Network Infomation Center (VNNIC) assigned as the leading organization of IPv6 deployment and IPv6 For Gov program by the Ministry of Information and Communications.

Many training and supporting activities on IPv6 deployment were organized regularly. More than 80 training programs for over 3,600 students, including nearly 2,500 individuals from the state agencies, took a great part in the good results of the IPv6 For Gov Program.
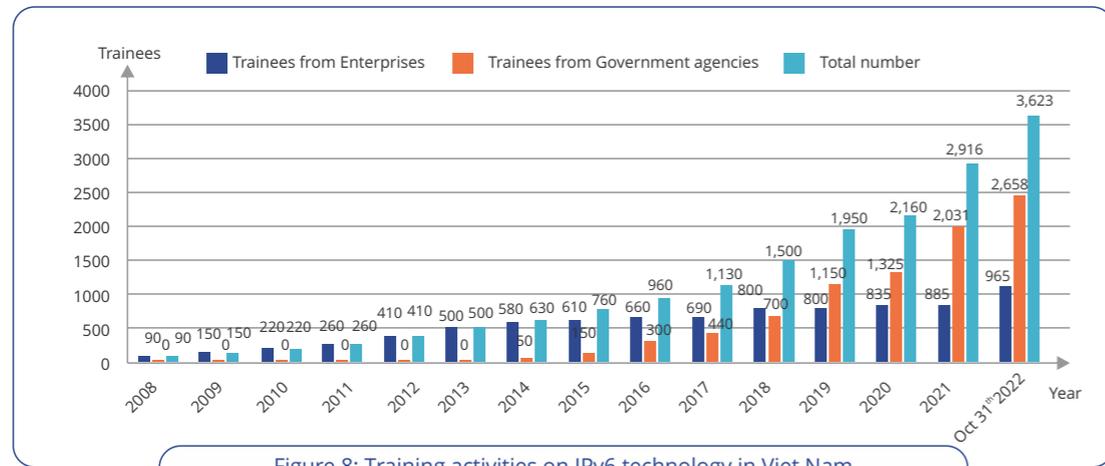
Figure 8: Training activities on IPv6 technology in Viet Nam

Both private sector and state agencies has achieved a great result. There are 63/63 provinces and cities; 16/22 Ministries, ministerial-level agencies and 03/08 state agencies have issued the IPv6 Deployment Plan; 8/22 Ministries, branches and 36/63 Provinces/Cities has successfully converted IPv6 for e-portal and public service portal.
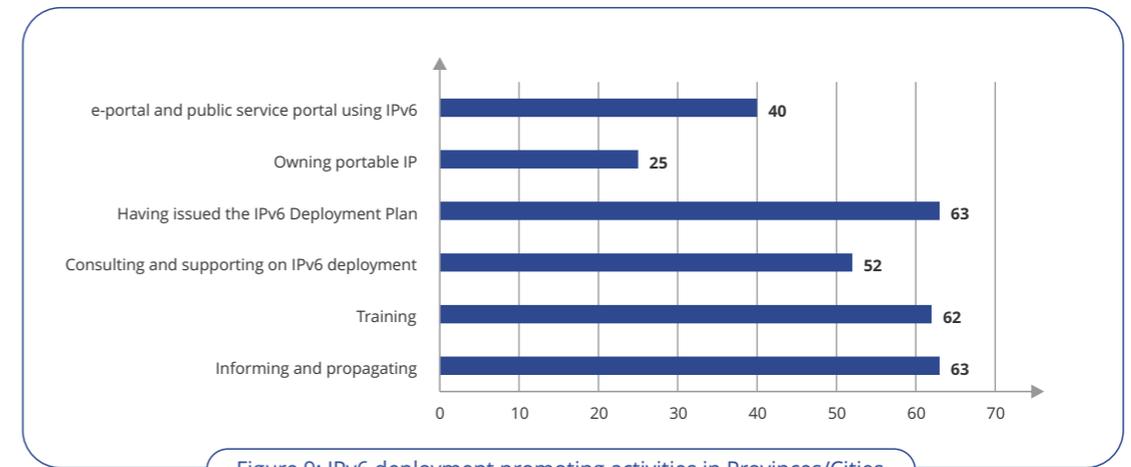
Figure 9: IPv6 deployment promoting activities in Provinces/Cities
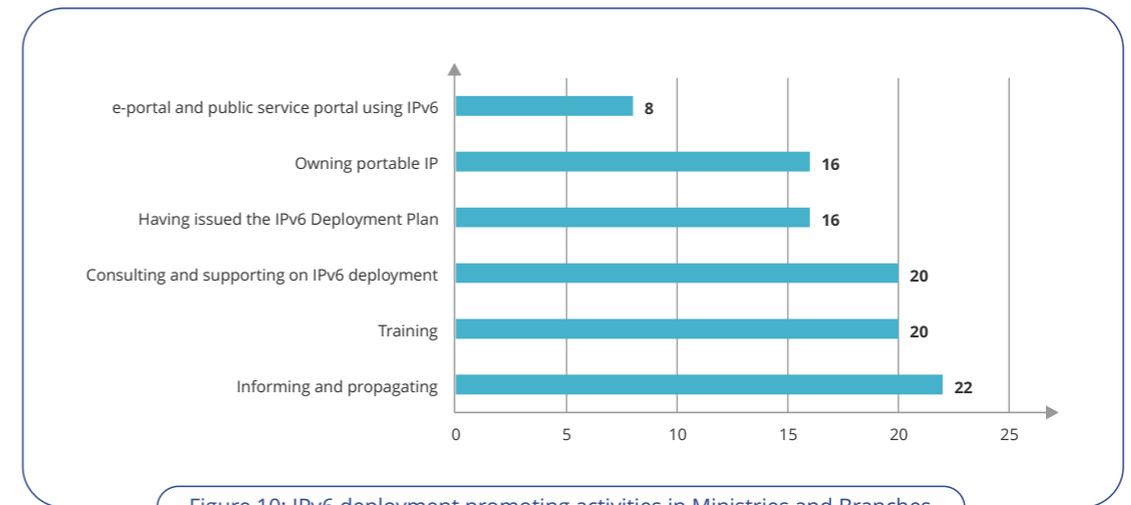
Figure 10: IPv6 deployment promoting activities in Ministries and Branches

After the IPv6 deployment of the national Internet infrastructure, the private enterprises and state agencies' Internet infrastructure have also been ready and successfully converted IPv6 for network and service systems. Overall, the important infrastructure groups have been formed for the comprehensive IPv6 deployment of Viet Nam's Internet. Viet Nam has catched up with other countries in the world in terms of IPv6 deploying speed. After 25 years, the Internet infrastructure has successfully converted to IPv6, ready to develop IPv6 Internet long with the new technologies such as IPv6 for 5G, Cloud, IoT and IPv6-only, IPv6+ in the further future.

II. BUILDING AND DEVELOPING AN IMPORTANT NATIONAL INTERNET INFRASTRUCTURE SYSTEM, ENSURING EFFICIENT EXPLOITATION AND USE OF

In Vietnam, the national DNS system together with the VNIX have been developed according to international standards, which is the foundation for providing new application/services, promoting the development of Vietnam's Internet, ensuring stable, smooth, high-quality and safe operation, contributing to promoting the platforms for digital transformation, developing online services, and bringing e-Government towards Digital Government

1 NATIONAL DNS SYSTEM – THE HEART OF VIETNAM INTERNET ACTIVITIES

USING DNS TO GAIN ACCESS TO INTERNET SERVICES

DNS lookup
DNS SERVER:
WEB SERVER:
EMAIL SERVER:
web transaction
Email transaction
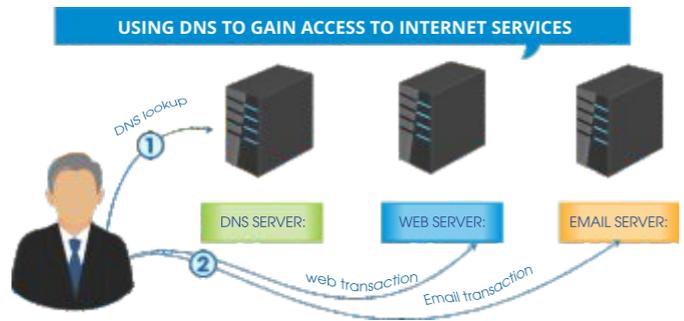
In Vietnam, the national DNS system ".vn" is an important national information system, responsible for resolving addresses for all domain names ".vn", which is considered the "heart" of the Internet netwok. Satisfying the development requirements of Vietnam's Internet over the period, the national DNS system has been ensuring and maintaining DNS activities on the Internet smoothly and safely; ready to promote Internet development with new technology trends, e-commerce services, e-government, digital government, digital transformation in Vietnam in the safest way.

DEVELOPING THE SCALE AND QUALITY OF THE NATIONAL DNS SERVER SYSTEM, MEETING THE NEEDS OF USING INTERNET SERVICES IN VIETNAM

Along with the explosive development of Vietnam's Internet associated with ensuring information security for systems and services, the national DNS system has been continuously upgraded and expanded in both size and quality.

Image 3: Distribution of clusters

From the scale of 02 server clusters in the country (in 2001 when VNNIC officially took over), the national DNS system ".vn" has expanded and deployed 08 server clusters in the country and overseas at more than 100 locations around the world to respond quickly, safely and stably to the ".vn" queries from users around the world.

The national DNS system is deployed according to international standards, applying Anycast, DNSSEC, IPv6 technologies , helping to bring DNS services closer to users, safer and more reliable, thereby enhancing the quality and reliability when accessing and using Internet services in Vietnam on the basis of domain names. Currently, the national DNS system is managing more than 564,000 ".vn" domain names.

| 8 CLUSTERS domestic and overseas | 100% 8/8 CLUSTERS with IPv6 | ISO ISO 27001 (2015) | DNSSEC, ANYCAST... | 318 BILLION queries (2022) |

.VN DOMAIN HOSTING DISTRIBUTION MAP ON THE WORLD
October 31st, 2022

.VN DOMAIN SERVER DISTRIBUTION MAP ON THE WORLD
October 31st, 2022
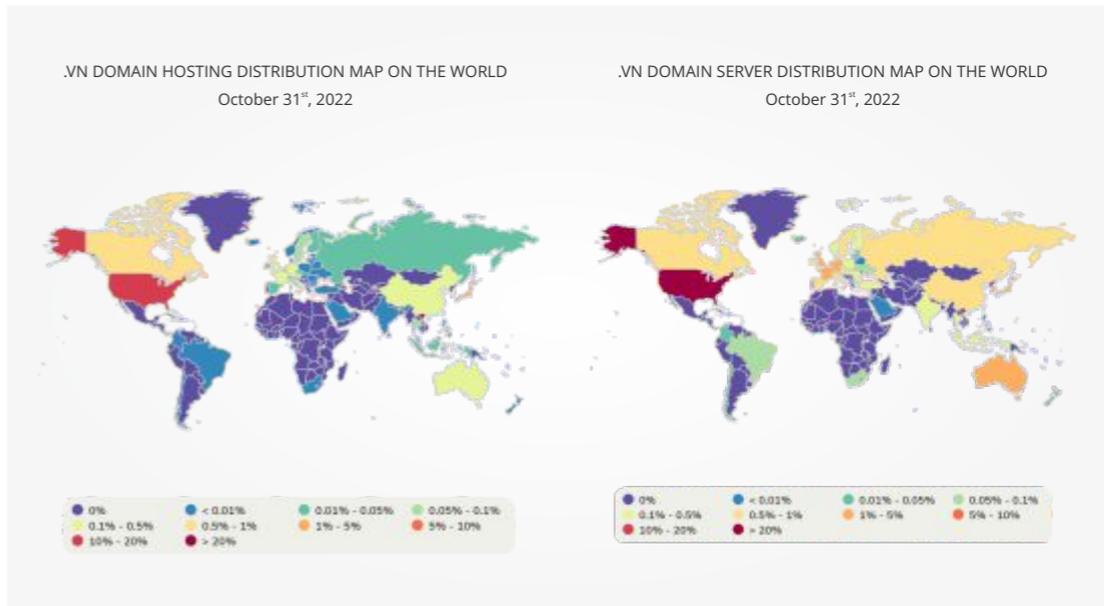
As of October 2022 , the DNS system has received and responded to about 318 billion queries, equivalent to about 10 thousand queries per second.
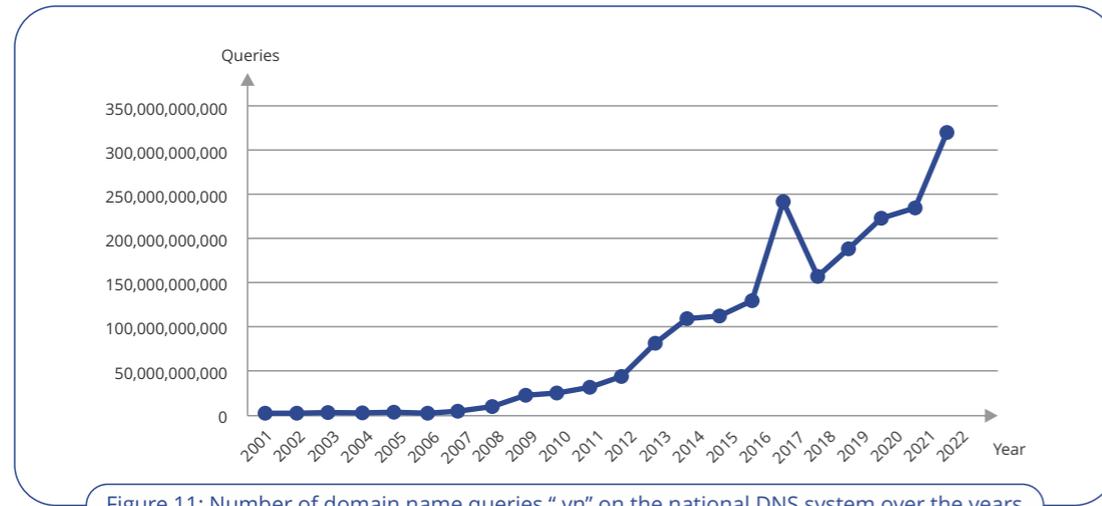
Figure 11: Number of domain name queries ".vn" on the national DNS system over the years

IMPLEMENTING DNSSEC: AN IMPORTANT STEP IN THE DEVELOPMENT OF INTERNET INFRASTRUCTURE IN VIETNAM, READY TO PROMOTE THE E-COMMERCE AND E-GOVERNMENT SERVICES

DNSSEC (Domain Name System Security Extensions) is an extended security standard for the DNS system to ensure the authenticity and integrity of data in the DNS system's domain name query responses. Using DNSSEC helps to ensure accurate access to services on the Internet, avoiding phishing. Facing the situation that Internet development, e-commerce, major strong e-government and network security might have complex threates of safety and security, the implementation of DNSSEC for the ".vn" DNS in Vietnam should be very crucial. As of October 31, 2022, there are **6,566 ".vn" domains that have implemented DNSSEC.**

DEPLOYING THE DOMAIN NAME ROOT SERVER SYSTEM (DNS ROOT) IN VIETNAM: SPEEDING UP ACCESS TO SERVICES USING DOMAIN NAMES
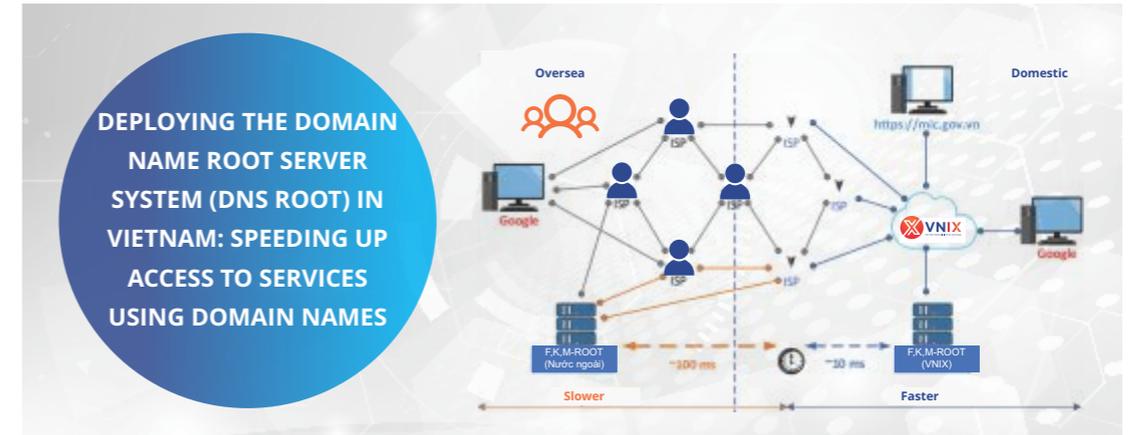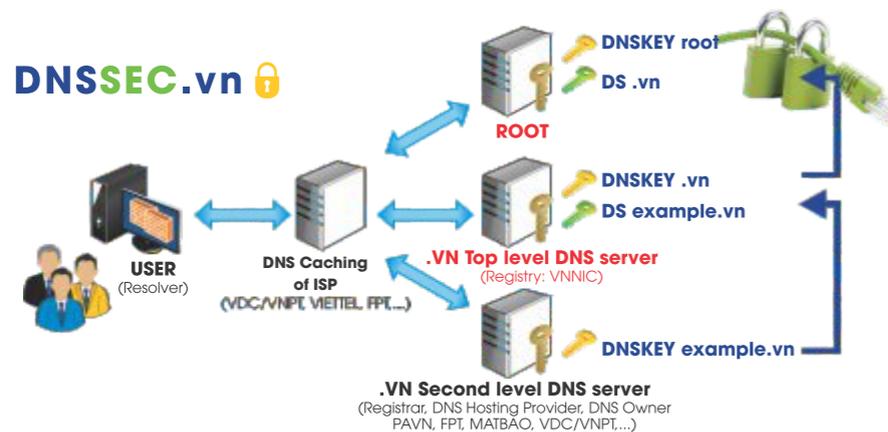
Since 2020, VNNIC has been successful deployment of DNS Root clusters in Vietnam at the VNIX points. Successful implementation of DNS Root reduces dependency on an international connection when querying for domain names from Vietnam, which would be directed to Root server clusters located in Vietnam instead of connecting to other foreign Root server clusters, thus increasing the speed of access access services using Internet domain names in Vietnam.

NATIONAL DNS SYSTEM ASSOCIATED WITH THE DEVELOPMENT OF INTERNET, E-GOVERNMENT, DIGITAL GOVERNMENT, DIGITAL TRANSFORMATION IN THE COMING PERIOD

During 25 years of companionship, the national DNS system has played a very important role in promoting Internet development. The national DNS system always ensures and maintains the ".vn" domain name query activities on the Internet to be smooth, safe and secure. In the future, the development of new technologies such as Internet of Things (IoT), Bigdata, 5G, Metaverse, cloud computing, ... might lead to an increasing demand for Internet use. The development of new technologies increases the requirements for performance and connection quality of services in the Internet, providing the closest access to real-time, availability, and high security. In addition, facing the increasing risks of network threats, it must be guaranteed that the national DNS system would always operate safely and stably, ready to serve for the development of the Internet, e-commerce services, e-Government, digital government in Vietnam.

2 **VIET NAM NATIONAL INTERNET EXCHANGE –**
DIGITAL INFRASTRUCTURE FOR DIGITAL CONVERTER

VNIX ESTABLISHMENT: TO CONNECT INDEPENDENT NETWORKS AND INFRASTRUCTURES, DEVELOP INTERNET SERVICES

Viet Nam Internet was officially opened and connected to the international Internet in 1997. Netnam, VNPT, FPT and SPT were the first Internet service providers (ISPs). In this early stage, domestic traffic was still limited, data had to be transferred using expensive international routes and through many different networks, leading to problems of network security, large latency, data packet loss, service interruption. Besides, ISPs had to buy international bandwidth at a high cost. These problems lasted for a long time due to the difficulty of negotiating agreements and peering connections between ISPs in the country at that time. In 2003, VNNIC established Viet Nam National Internet eXchange - VNIX with the aim to create a neutral environment to connect all networks, keep traffic local and develop stable and secured Internet in Viet Nam.

Along with the growth of Viet Nam's Internet infrastructure, during 20 years of establishment and development, VNIX has well performed its role as a national Internet exchange creating shorter and more direct connections between network operators, therefore helps to save international connection and Internet access costs and increase service quality. VNIX also supports emergency responses when there is an international fiber optic cable problem, helping to ensure stable Internet infrastructure in Viet Nam.

EXPANDING VNIX DEVELOPMENT ACCORDING TO INTERNATIONAL STANDARDS

The emerging technology trends of Internet of Things (IoT), Bigdata, 5G, cloud computing, etc., have led to the increasing demand for Internet usage, as well as the challenges of infrastructure operations and innovation. To solve Internet connection problems in Viet Nam and further improve the operational efficiency of VNIX, the VNIX should be developed according to international trends and standards. In the early days, government policies only allow ISPs to connect to VNIX. Since 2019, agencies, organizations and enterprises (ISP, ICP, IDC, Cloud, government networks, state agencies,...) with independent network numbers (ASNs) and IPs allocated and managed by VNNIC are allowed to connect to VNIX. The members can choose which type of connection they prefer, either multilateral or bilateral peering.
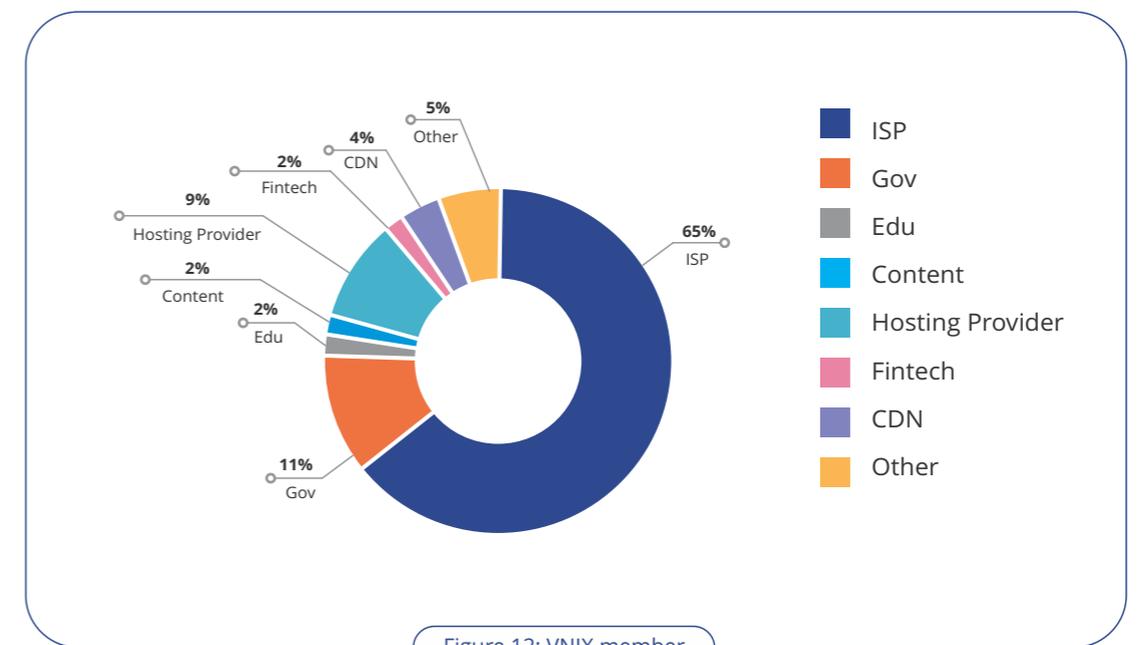
Figure 12: VNIX member

DEVELOPING DIGITAL INFRASTRUCTURE AND CONNECTING DIGITAL PLATFORMS; ENSURING INTERNET SAFETY IN VIET NAM

In the new era, VNIX has become a digital infrastructure connecting digital platforms, promoting national digital transformation as defined in Decision 749/QD-TTg dated June 3rd, 2020, of the Government. The Prime Minister approved the "National Digital Transformation Program to 2025, with the orientation to 2030".

Image 4: VNIX Model
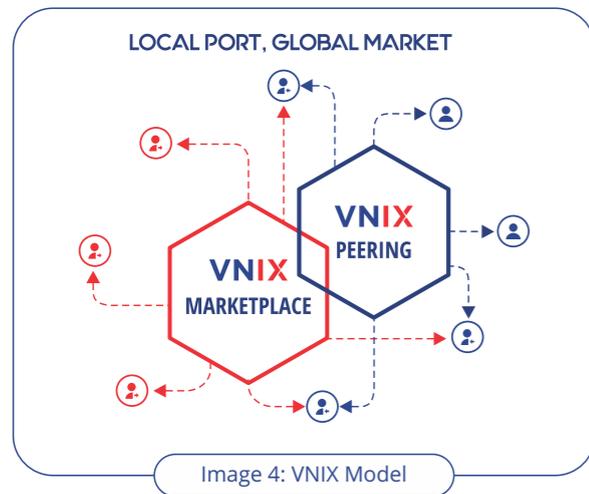
To better support and facilitate the connection of digital platforms, VNIX services will be provided with several solutions such as building POPs (Point of Presence) located at neutral IDCs, Remote Peering, etc.,. Accordingly, an independent network could peer with VNIX through the infrastructure provided by Telcos, instead of deploying additional physical transmission lines. As a result, it helps to optimize costs and quality of services, ensure security, safety, bringing VNIX closer to the organizations and enterprises in need.

On VNIX infrastructure, VNNIC provides free services and tools for members, including public key infrastructure (RPKI), Internet speed measurement tool in Viet Nam (i-Speed by VNNIC: https://i-speed.vn), real-time synchronization service (NTP), DNS Root, minimizing and preventing DDoS attacks,...

In the new development phase of the Internet with the digital transformation trends, besides managing and developing Viet Nam's Internet resources, the critical Internet Internet infrastructure - VNIX will continue to accompany and promote its active role in the overall development of Viet Nam, as well as, effectively contribute to the national digital transformation, helping Viet Nam firmly enter the digital era.
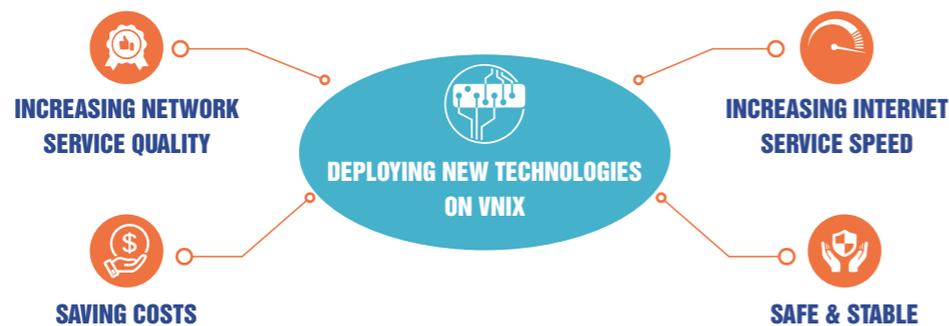
3 INTERNET ROUTING SECURITY WITH RPKI TECHNOLOGY

Valid routing occurs when businesses and organizations advertise the correct range of IP addresses that they own and use connections such as peering or transit according to the provider's routing policy. However, according to the original design of the Internet, routing activities take place on a public network environment without any security solution, so there is a lot of risk of being attacked, hijacked prefixes on the Internet.
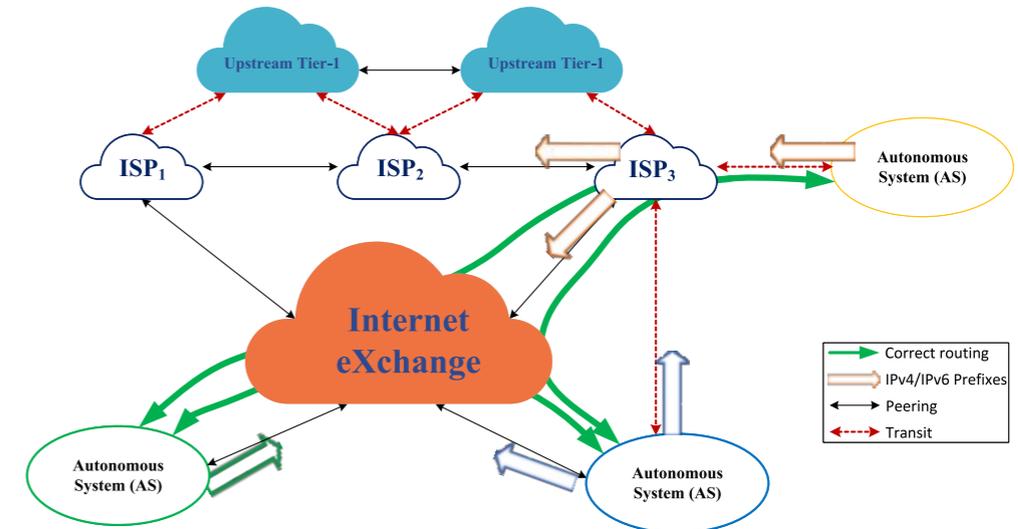
Image 5: Depicting a normal routing operation on the Internet
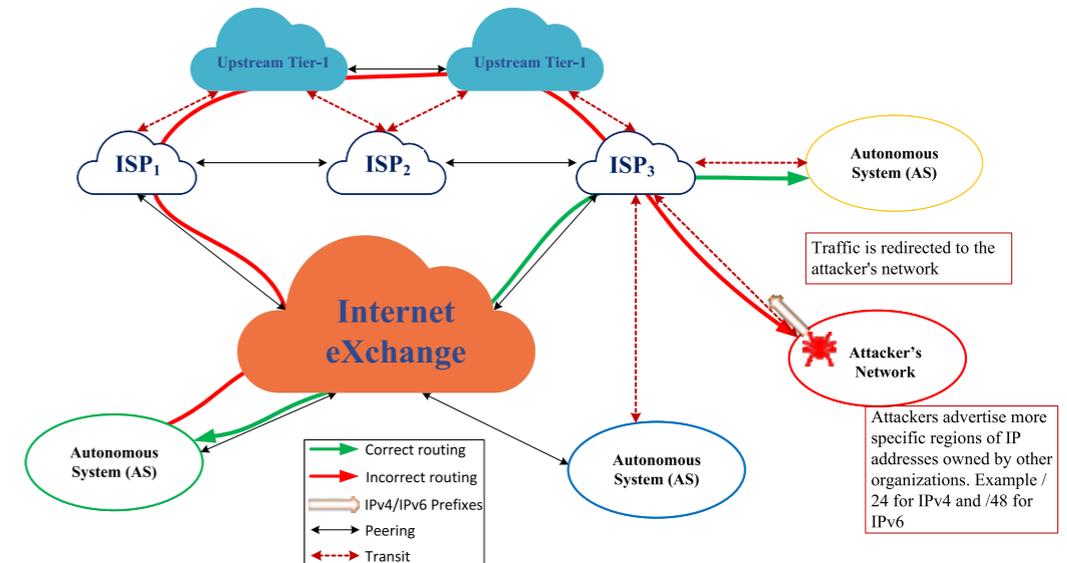
Image 6: Simulating a routing attack operation

After 25 years of Internet development, today Vietnam's Internet network has expanded in scale and diversified routing connections. Before the risk of routing attacks, RPKI (Resources Public Key Information) technology has been widely applied. RPKI is an Internet resource digital signature (IP, ASN) technology that helps authenticate routing information on the Internet. It overcomes hijacking attacks or routing changes (hijack, leak); ensure safety and security in Internet routing activities.

After nearly 5 years of promoting deployment, by October 2022, the results of ROA/RPKI Vietnam's digital resource signing have grown strongly, reaching 61% (up 44% compared to 2021) with more than 200 IP/ASN members who implemented route
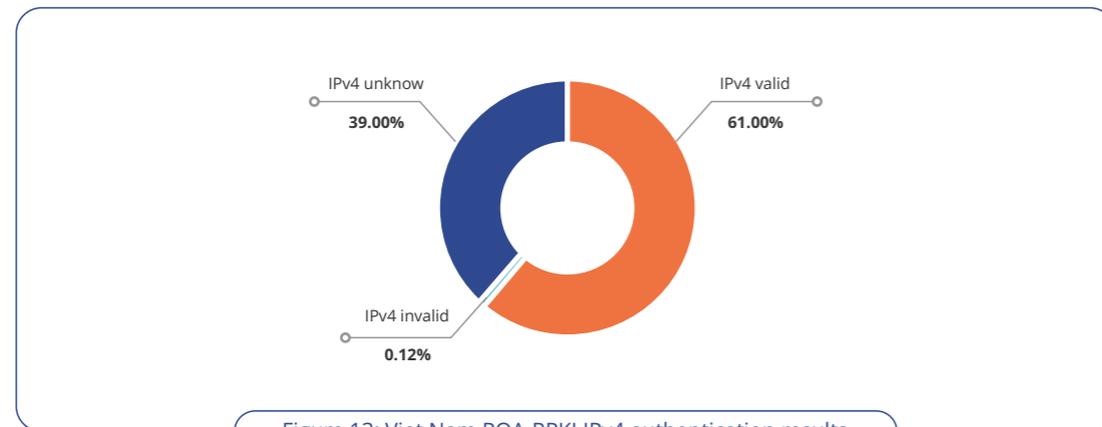
Figure 13: Viet Nam ROA-RPKI IPv4 authentication results
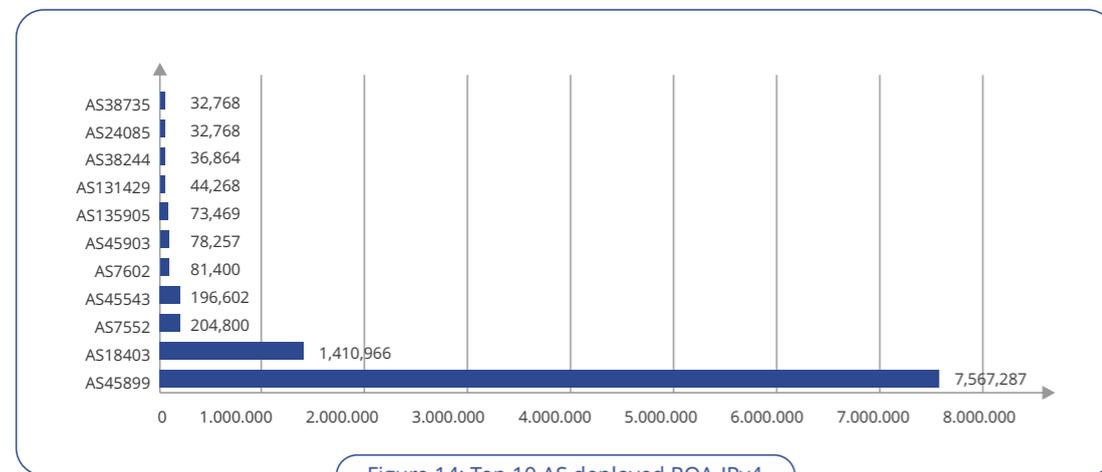
Figure 14: Top 10 AS deployed ROA-IPv4

Typical ISPs in Vietnam that deploy ROA/RPKI with a high rate include:

VNPT Group (99%), FPT Telecom (99%), SCTV (100%), CMC (95%), MobiFone (89%), VNG (100%), GDS (100%), QTSC (97%)...

III. **DEVELOPING VIET NAM INTERNET SPEED MEASUREMENT SYSTEM (I-SPEED BY VNNIC) - IMPROVING VIETNAM INTERNET QUALITY**

HIGHLINES

Average Internet Speed of users in Viet Nam in 2022

	FIXED BROADBAND		MOBILE BROADBAND	
	DOWNLOAD	UPLOAD	DOWNLOAD	UPLOAD
Mean speed	75,3 MBPS	58,3 MBPS	40,6 MBPS	18,9 MBPS
Median speed	54 MBPS	51,2 MBPS	30,9 MBPS	12,9 MBPS

NUMBER OF MEASURE SERVERS

52
domestic measure points

04
oversea measure points
(Hongkong, Singapore, Australia, Japan)

NUMBER OF MEASUREMENTS

> 5 Milion
As of October 31th, 2022

VNNIC Internet Speed (i-Speed) is a product developed by VNNIC in collaboration with the Telecommunication Authority, Ministry of Information and Communications, to measure Internet speed in Viet Nam. Users can measure their Internet access speed through the i-Speed by VNNIC App on mobile devices using Android and iOS operating systems or on the Website https://speedtest.vn, https://i-speed.vn.

i-Speed by VNNIC is a neutral tool, reflecting accurate and objective results, helping users to self-test, evaluate the quality of Internet access services, and able to select suitable packages and service providers. Besides the basic features of an Internet speed testing system (parameters reflect Internet access speed: Download, Upload, Ping, Jitter; information about connection type (wifi/3G/4G/) 5G); user equipment; measuring location; service provider...), i-Speed by VNNIC would also measure the ability to access the Internet of the new generation IPv6, which had been currently not supported by foreign systems currently.

The evaluation of Internet quality from user experience (crowd-sourcing) is a method applied in many countries around the world. These tests could analyse the carrier's capacity, and evaluate from user data to provide details about actual customer experience. This method was standardized by the International Telecommunication Union by recommendation ITU-T E.812.

BUILDING A DATABASE ON INTERNET ACCESS SPEED IN VIET NAM

The data collected from the user's testing results was intensively analyzed by VNNIC according to many criteria and supplemented to enrich the data for state management and Internet access quality of enterprises in each location. The results will also be shared to Internet service provider to detect concave points in waves, and making timely solution to increase the quality. The data was analyzed by week/month; including fixed broadband network speed, mobile broadband network, download speed chart in 5 largest cities in the country, network speed map of the whole country.

In order to meet the needs of users, VNNIC had implemented the statistical method according to the mean and the median to ensure that the data are close to reality and follow the general trend in the world today. Data and statistical methods are published on the i-Speed website.

DATA SHARING FOR LOCALITIES AND ENTERPRISES TO IMPROVE INTERNET QUALITY

VNNIC had implemented the i-Speed Portal and granted access rights to each locality and enterprises. Thereby, localities and enterprises could proactively obtained data to support state management, promote using i-Speed, and improve the network, promote the development of local Internet infrastructure in particular and Vietnam's Internet infrastructure in general.

In 2022, the system was also deployed to expand the number of measuring points to 52 points which locate at the Viet Nam National Internet eXchange (VNIX) and network of Internet service providers (ISPs), mobile service, cloud and hosting providers. Moreover, VNNIC cooperated with international organizations to deploy 04 more speedtest servers in Hong Kong, Singapore, Japan and Australia.

In the coming year, VNNIC would continue to coordinate with Internet service providers and relevant organizations to upgrade the i-Speed application, deploy more oversea speedtest servers, towards the common goal of ensuring safe and high-quality connection of the Vietnam's Internet network, improving digital infrastructure capacity, serving the national digital transformation.
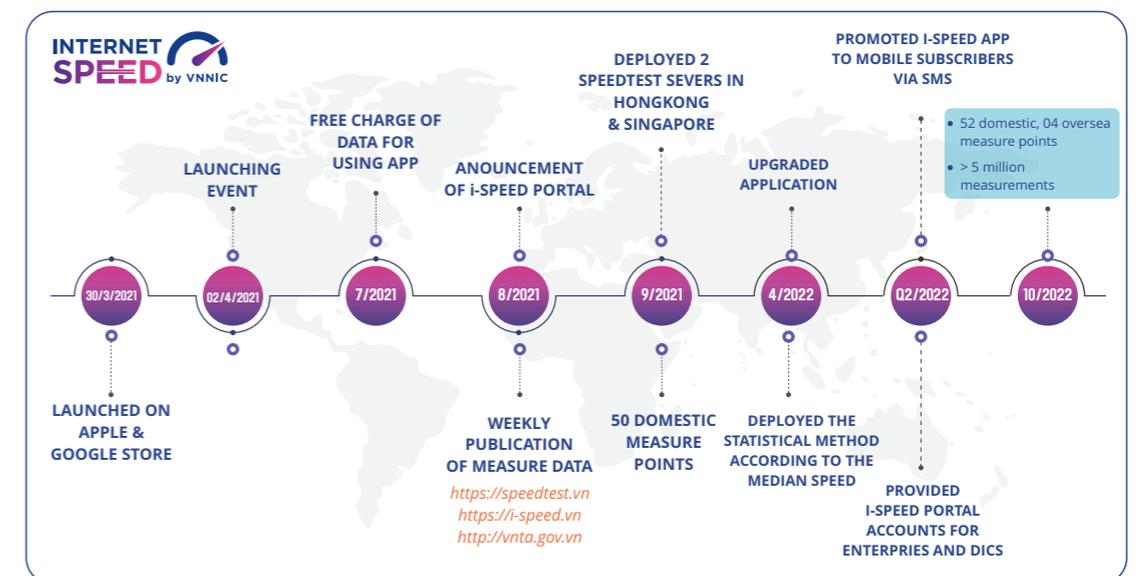
PART IV

MAIN ACTIVITIES IN THE DEVELOPMENT OF CRITICAL INTERNET RESOURCES AND INFRASTRUCTURE OF VIETNAM IN 2022

In 2022, a series of activities have been organized with the goal of building, connecting and developing the Internet community in Vietnam.

I. DEVELOPING INTERNET COMMUNITY

1 PROVIDE INFORMATION, KNOWLEDGE OF INTERNET

THE POLICIES AND LAWS RELATED TO INTERNET RESOURCES

In order to help the ".vn" domain name registrars and gTLD registrars easily access and update the legal regulation of national Internet resources, thereby supporting customers and the community to use the Internet effectively, VNNIC has regularly organized trainning activities on legal regulations and operational training.

Jan 19th, 2022

Online conference for ".vn" domain name registrars to inform the new provisions in the Circular No. 21/2021/TT-BTTTT dated December 8, 2021 amending and supplementing Circular 24/2015/TT-BTTTT dated August 18, 2015 regulating the management and use of Internet resources.

May 20th, 2022

Conference to publicze the policies and laws on registration, using and providing services relatated to gTLDs to gTLD registrars in Vietnam.

27 -29 Oct, 2022

Training course for ".vn" domain name registrars with the aim of standardizing and improving the quality of .vn management in Viet Nam.

23-24 Nov, 2022

VNNIC in collaboration with the Inspector of the Ministry of Information and Communications, The Legal Department, Inspectors of Ho Chi Minh city Department of Information and Communications held a conference to disseminate legal documents on gTLDs and educate management skills for gTLD registrars in Vietnam with the aim of supporting and guiding gTLD registrars.

ANALYZING AND SHARING INTERNET DATA

In April 2022, VNNIC Internet Atlas 2.0 system was launched, as a set of data charts and maps organized in a scientific way, VNNIC Internet Atlas provides users information related to the Internet resources. architecture and operations in Vietnam.

KNOWLEDGE ON INTERNET RESOURCES AND INFRASTRUCTURE

Continuing the development VNNIC Internet Academy platform at website https://academy.vnnic.vn:

- Building 15 new courses and 10 academic articles.
- The total number of students as of November, 2022 is 2,212, increasing 58% compared with the same period last year.
- Inviting 10 experts from foreign agencies and organizations to share knowledge.
- Organizing monthly Workshops and Webinar (12 sessions).

Providing Internet knowledge for students

- Holding exhibition booth to promote Internet resources, giving lectures and presentation at Dong A and Viet Han University's events.
- Providing internship for students and organizing events for students at many universities throughout the country.
- Providing knowledge on Internet resources and Internet governance at Youth Internet Governance Forum Viet Nam 2022 (YIGF 2022).

2 CONNECTING THE INTERNET EXPERT COMMUNITY

In the spirit of connecting, sharing and bringing the value of the Internet to everyone, VNNIC had established and developed the community forum for Internet experts. This community has been growing stronger which was reflected in the great number of participants engaging at VNNIC's events on Internet and Internet resources. Some major forums were VNIX Network Operators Group Confernece, VNNIC IP Members Meeting, VNNIC Internet Conference...

VNNIC INTERNET CONFERENCE 2022

With the goal of developing a safe and sustainable Internet in Vietnam, the first VNNIC Internet Conference was successfully held in Da Nang on June 22nd-25th, 2022. The main theme of the event was "The future of the Internet". The event brought together around 300 representatives of leaders, officials of state agencies, domestic and international experts from several organizations and enterprises operating in the fields of telecommunications, Internet, lecturers, students - the future generation of Vietnam.

VNIX NETWORK OPERATORS GROUP CONFERENCE 2022

The VNIX Network Operators Group Conference 2022 (VNIX-NOG) was took place in Quy Nhon on October 6-7, 2022, gathering a large number of network operation engineers and Internet experts in Vietnam and internationally. The conference focused on sharing technologies and solutions to improve the quality of important Internet infrastructure services, operation, ensuring network safety and security, and the role of the National Internet eXchange in developing Vietnam's Internet in the new period.

II. SUPPORTING STATE AGENCIES AND ORGANIZATIONS TO DEVELOP THE CRITICAL INTERNET RESOURCES AND INFRASTRUCTURE

In 2022, VNNIC have implemented many coordination and cooperation activities with other departments, agencies and associations such as: supporting the new generation of Internet (IPv6) deployment and restructuring the IT network infrastructure of state agencies; Promoting the use of Vietnam Internet speed measurement application "i-Speed" to create a database and statistics reflecting the reality of Internet service quality in Vietnam; Developing ".vn" ccTLD in localities.

1 POPULARIZING ".VN" CCTLD

Due to the process of digital transformation associated with the development of the digital economy, digital society, digital government, citizens and enterprises are now aware of the importance of having a reliable online brand. VNNIC aims to popularize the ".vn" domain name, promote the digital transformation community to use the ".vn" domain name and "Make in Vietnam" digital products and services in activities related to digital economy and digital society, towards the goal of "Internet for All". Therefore, Viet Nam could reach the goal of having at least 1 million ".vn" domain names by 2025.

LAUNCHING THE NEW BRAND IDENTITY OF ".VN" CCTLD

In order to meet the development requirements towards universalizing ".vn" domain names for the whole population in Viet Nam, associated with digital citizens and digital businesses, enhancing the recognition of the national domain name ".vn", VNNIC has changed ".vn" brand identity. The new identity of the domain name ".vn" brings the modern, youthful, friendly feelings, and national pride to every Vietnamese.

Signing MoUs

VIET NAM E-COMMERCE ASSOCIATION (VECOM)
May 12th, 2022

HAI PHONG DEPARTMENT OF INFORMATION AND COMMUNICATIONS
May 27th, 2022

Signing Memorandums of Understanding (MoU) with Departmenst of Information and Communications and Associations to promote the development of Internet resources.

EFFECTIVE ONLINE BUSINESS MODEL TRANSFORMATION PROGRAM WITH DIGITAL SERVICES USING ".VN" DOMAIN NAME IN LOCALITIES

BA RIA - VUNG TAU:
- **Registrar:** iNET
- **Time:** March 25th, 2022
- **".vn" domain name registration portal:** https://brvtict.vn/

HAI PHONG:
- **Registrar:** Nhan Hoa
- **Time:** May 27th, 2022
- **".vn" domain name registration portal:** https://haiphongioc.vn/

BEN TRE:
- **Registrar:** P.A Viet Nam
- **Time:** August 19th, 2022
- **".vn" domain name registration portal:** https://bentreict.vn/

POPULARIZING THE NATIONAL ".VN" DOMAIN NAME ENHANCING ".VN" BRAND PRESENCE VIA EXHIBITION BOOTH

To help the community get to know domain name ".VN" better, VNNIC opened exhibition booths in many cities and universities across the country.

MAY 12ND, 2022

JUNE 24TH, 2022

VNNIC Internet Conference in Da Nang

Vietnam Online Business Forum (VOBF 2022) in Ha Noi

SEPTEMBER 24TH, 2022

AUGUST 18TH, 2022

Workshop for students and enterprises - Unitour FPT SkillKing

Digital Transformation Day in Thua Thien Hue

OCTOBER 7TH, 2022

OCTOBER 20TH, 2022

Vietnam Online Marketing Forum (VOMF) in Hanoi

Digital Transformation Day 2022 workshop in Lam Dong

OCTOBER 24TH, 2022

"IoT for students 2022" event in Da Nang

AWARDING CERTIFICATES OF MERIT TO ".VN" DOMAIN NAME REGISTRARS WITH OUTSTANDING ACHIEVEMENTS IN PROMOTING AND DEVELOPING REGISTRATION AND USE OF DOMAIN NAME ".VN" IN 2021

In January 2022, VNNIC awarded Certificates of Merit to Registrars with outstanding achievements in 2021 in ".vn" domain name development: iNET; GMO-Z.com RUNSYSTEM; Nhan Hoa; PA Viet Nam; Mat Bao.
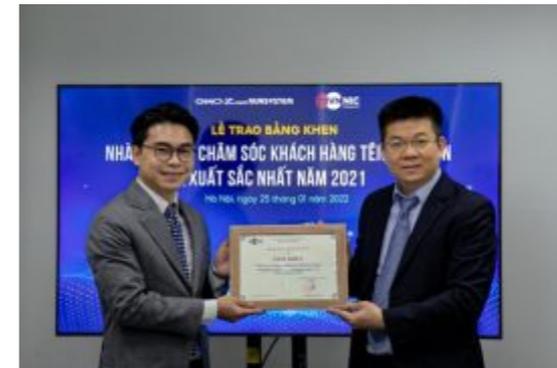
GMO-Z.com RUNSYSTEM Registrar

Nhan Hoa Registrar

iNET Registrar

P.A Vietnam Registrar

50

51

2 TRAINING, PROMOTING IPV6 TRANSITION

Implementing the IPv6 For Gov Program for the period of 2021 - 2025 and the IPv6 deploying plan in 2022, VNNIC has supported state agencies as well as ISPs to improve their knowledge and skills for IPv6 deployment.

March 22-25, 2022

Training and supporting IPv6 Internet infrastructure and information technology systems for leaders and officers in charge of Information Technology from Departments and Branches of Hai Phong.

May 17-18, 2022

VNNIC and APNIC jointly organized training program on RPKI and IPv6 Security for Vietnamese ISPs.

May 24-27, 2022

VNNIC and Department of Central Post and Telecommunication jointly organized an advanced training program on IPv6 for officers in charge of information technology of the Office of the Party Central Committee, the Office of the Government, the Office of the President and Ministries, branches sectors.

June 9-10, 2022

Advanced training on IPv6 deployment and digital infrastructure development for state agencies in Lao Cai.

June 22-23, 2022

Advanced training on IPv6, DNS for IT officers from state agencies in the Central and Central Highlands areas.

July 21-22, 2022

Advanced training on IPv6, DNS for IT officers from state agencies in the Northern and North Central areas.

September 22-23, 2022

Advanced training on IPv6, DNS for IT officers from state agencies in the Southern area.

3 PROMOTING THE USE OF VIETNAM INTERNET SPEED MEASUREMENT APPLICATION I-SPEED

In April-May 2022, major mobile network operators cooperated with the Ministry of Information and Communications to send messages promting i-Speed to millions of mobile users.

Enabled new i-Speed Internet speed measurement points in: Sydney (Australia), Hong Kong (China), Singapore.

i-Speed Portal account for enterprises, Departments of Information and Communications to access the datas.

(FYI) Ministry of Information and Communications: Please install and use i-Speed app to test your Internet speed. Using i-Speed regulary will contribute to the Internet service's quality development in Vietnam. Install i-Speed via https://speedtest.vn/tai- ve (data-free download).
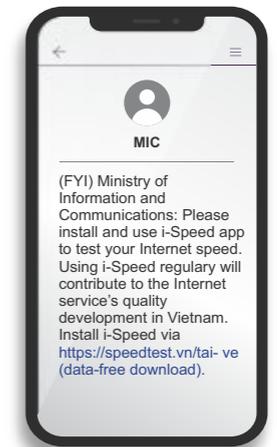
III INTERNATIONAL COMMUNITY DEVELOPMENT AND COOPERATION

VNNIC maintains cooperation with international partners and organizations. Especially, in 2022, VNNIC had representatives to join the Boards of some regional Internet organizations, improving the status of Vietnam in the international Internet community.

December 27-28, 2021

VNNIC and KISA hold bilateral meetings to strengthen cooperation in developing Internet resources.

March 1-9, 2022

VNNIC on behalf of Vietnam successfully defended APT's proposal on amending ITU's Resolution 64 on IPv6 deployment at WTSA-20.

September 8-15, 2022

VNNIC's representative participated in APNIC 54 Meeting and APIX Meeting as NIR SIG Chairwoman.

September 27th, 2022

VNNIC signed the Memorandum of Understanding on developing Internet resources with JPNIC.

October 23-27,2022

VNNIC's representative participated in APTLD 82 Meeting as a Board member.

November 24-26, 2022

VNNIC collaborated with LANIC to conduct a Workshop on Internet Infrastructure and Routing Security for engineers from LANIC, Lao ISPs and Registrars.

PART V

STATISTIC INFORMATION

As of November 30th, 2022

VN NIC
Internet for all

I. ".VN" COUNTRY CODE TOP LEVEL DOMAIN NAME

1 STATISTICS ON THE NUMBER OF NEW REGISTERED ".VN" DOMAIN NAMES 2022
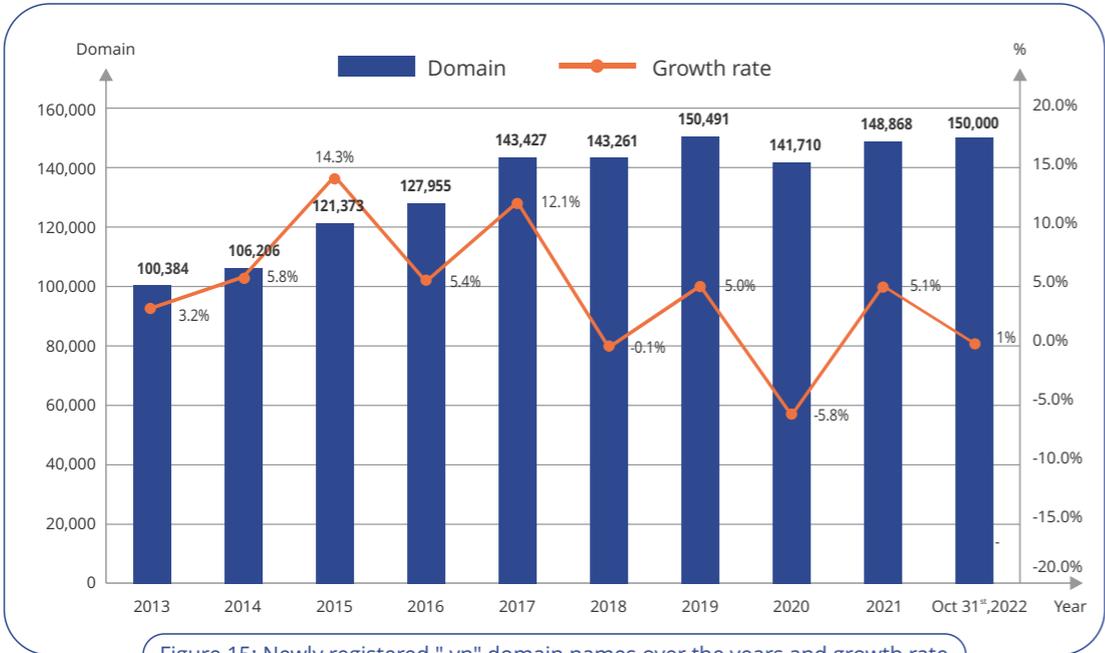
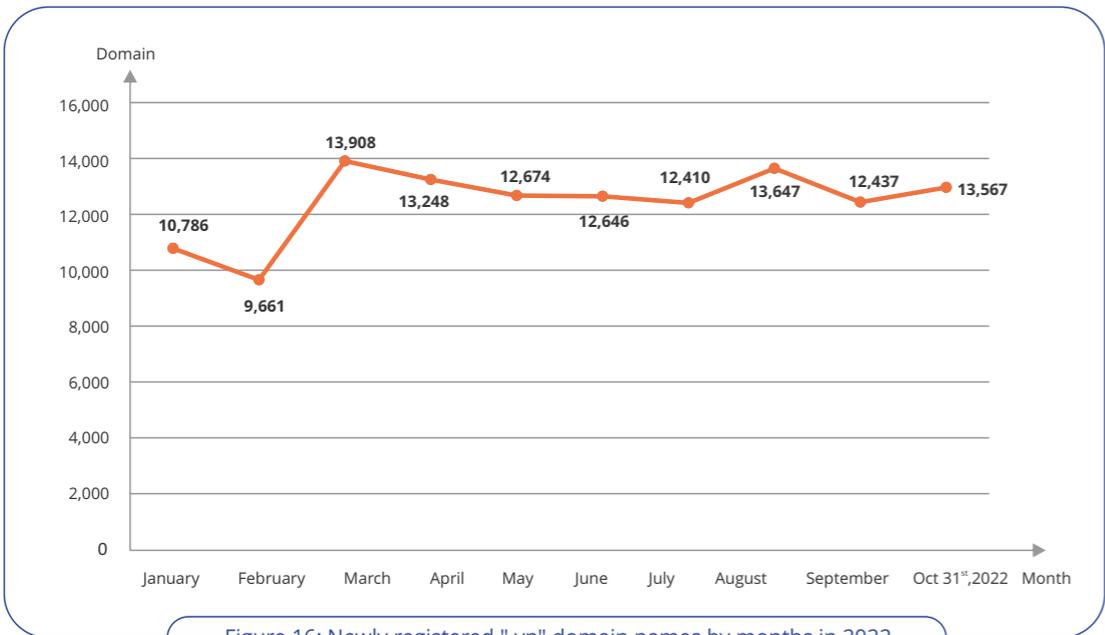Figure 15: Newly registered ".vn" domain names over the years and growth rate

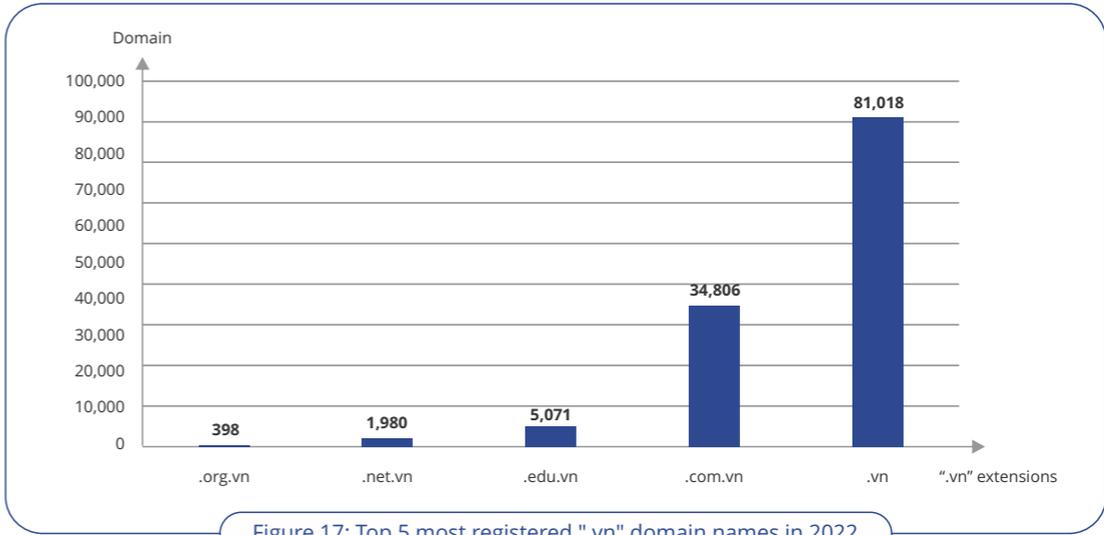Figure 16: Newly registered ".vn" domain names by months in 2022

Figure 17: Top 5 most registered ".vn" domain names in 2022

The major domain name extensions are still ".vn" and ".com.vn" (accounting for more than 90%). However, factfully, when the number of domain names under these two extensions is large, it also means that the opportunity to choose a beautiful domain name in this type of domain names is getting less, and that's when users tend to switch to other domain extensions that are still available, such as "biz.vn", "edu.vn", net.vn".

In 2023, when a group of new domain name extensions will be deployed including "ai.vn" (for artificial intelligence), "io.vn" (for digital technology, "id.vn" (identifier) digital citizenship), or the free registration policy for "biz.vn", "id.vn" will lead to a major change in the structure of domain name extensions.
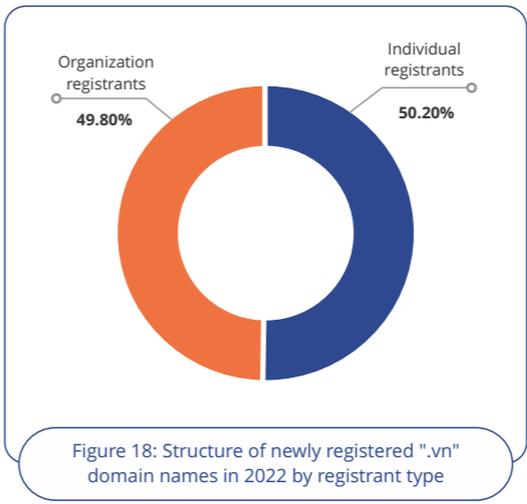
Figure 18: Structure of newly registered ".vn" domain names in 2022 by registrant type
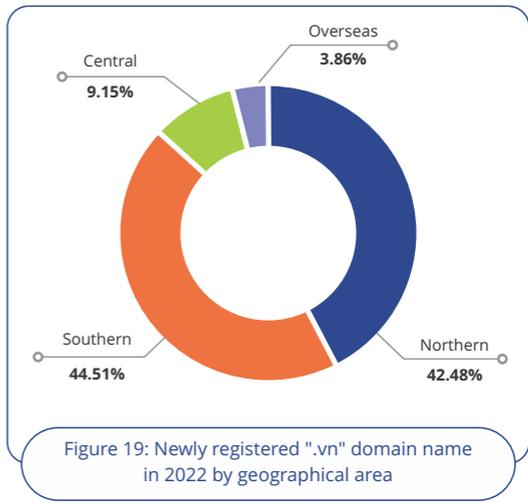
Figure 19: Newly registered ".vn" domain name in 2022 by geographical area

In the past 5 years, there has been a big shift in the structure of domain name registrants. Before, the number of registered domain names was mainly organizations and companies, but now that situation has reversed. Registrants who are individuals have taken up the majority of new registration. This also coincides with the increasing trend of online self-employed individuals in the past 5 years. It can be said that e-commerce activities have really changed the behavior and subjects of domain name registration.

Registration and use of ".vn" domain names is still concentrated mainly in the North (mainly Hanoi) and the South (mainly Ho Chi Minh City). In the central region, the bright spots are mainly concentrated in Da Nang, while the rest of provinces have not changed much. This also reflects the fact that e-commerce and digital transformation activities in the region are still mainly concentrated in the provinces and municipalities.
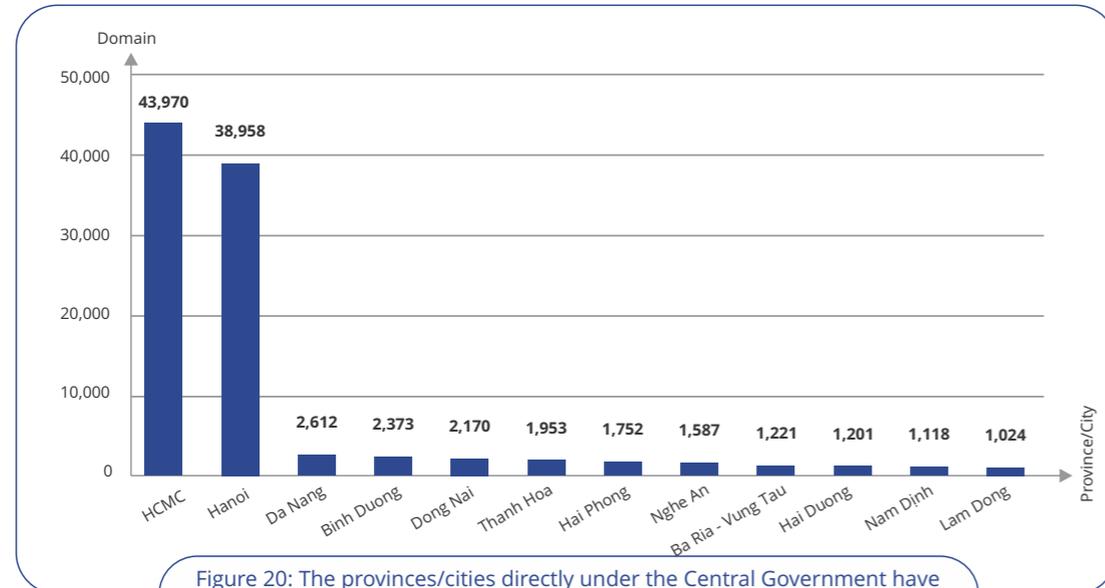
Figure 20: The provinces/cities directly under the Central Government have the highest number of newly registered ".vn" domain names in 2022.
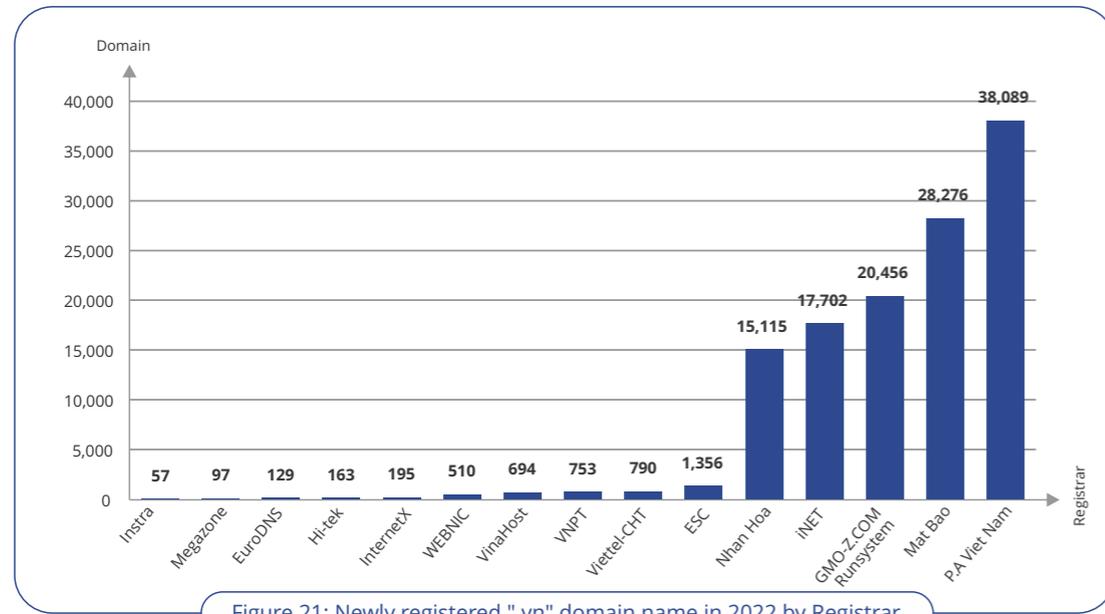
Figure 21: Newly registered ".vn" domain name in 2022 by Registrar

The top 5 registrars in the system in terms of new registrations are PA Vietnam, Mat Bao, GMO, Nhan Hoa and iNET, with the total number of new registrations accounting for 96% of the total number of domain registrations domestically and overseas.

2 STATISTICS ON THE NUMBER OF ACCUMULATED ".VN" DOMAIN NAMES
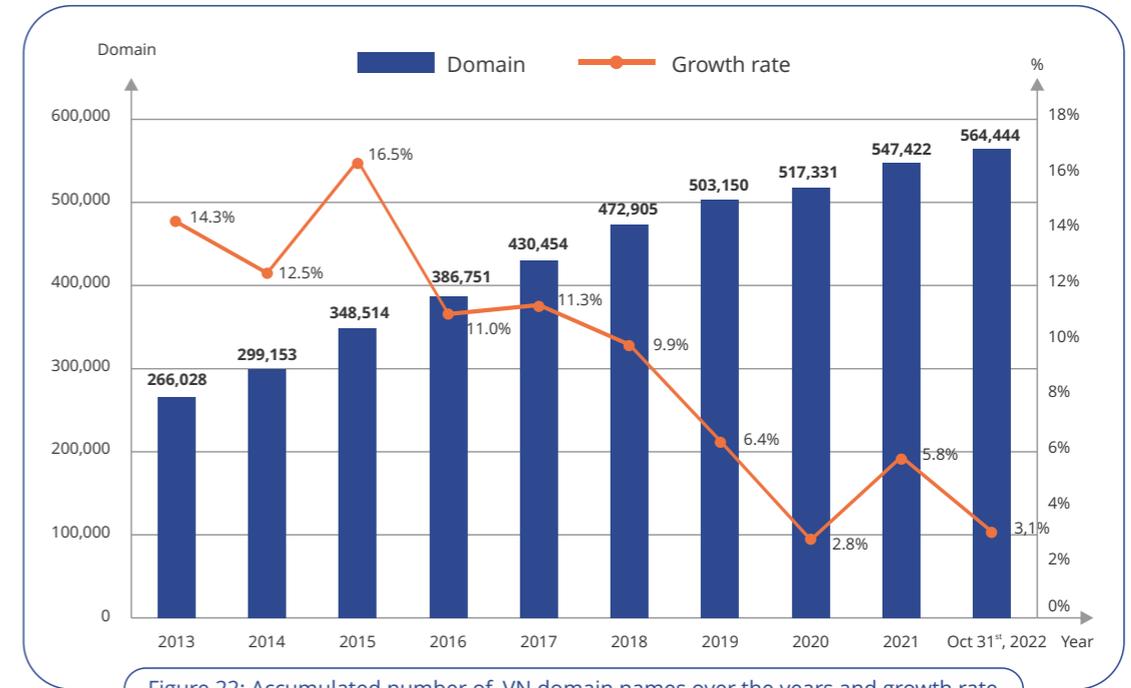
Figure 22: Accumulated number of .VN domain names over the years and growth rate

After 25 years, the accumulated number of ".vn" domain names reached 564,444 names in October 2022, with the growth date of 3.1% compared to year-end 2021.
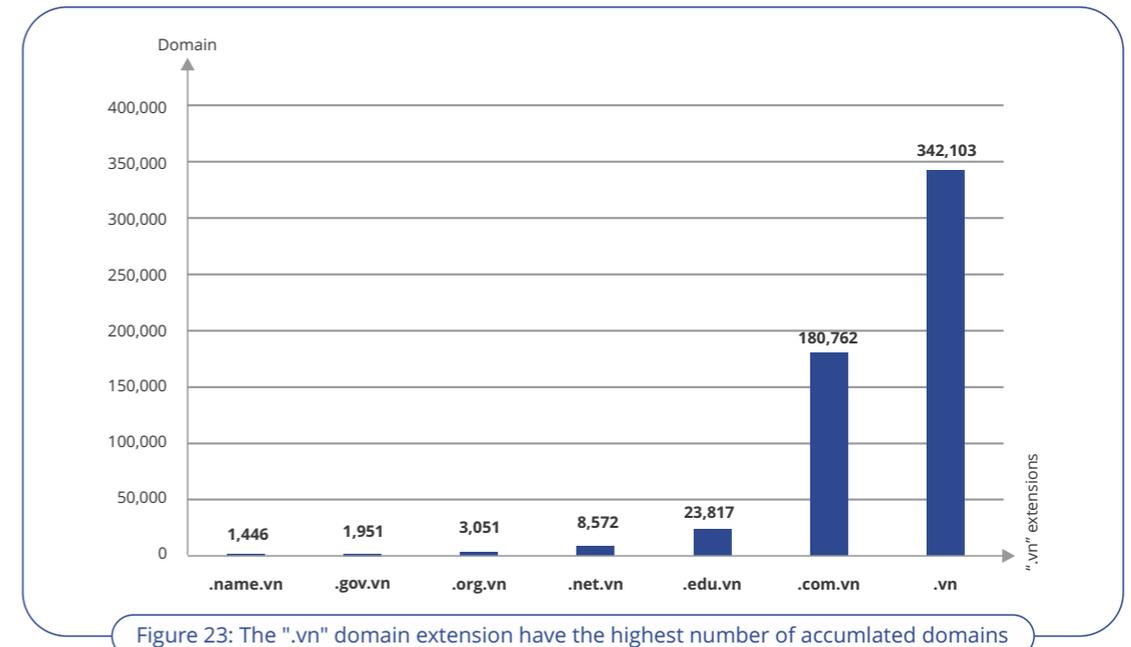
Figure 23: The ".vn" domain extension have the highest number of accumlated domains

Figure 24: The structure of ".vn" domain names by registrant

Organization registrants **49.80%**

Individual registrants **50.20%**

Figure 25: The structure of ".vn" domain names by geographical distribution

Central **9.15%**

Overseas **3.86%**

Southern **44.51%**

Northern **42.48%**
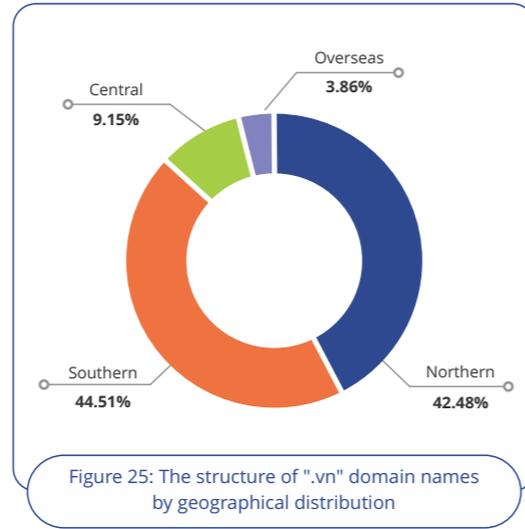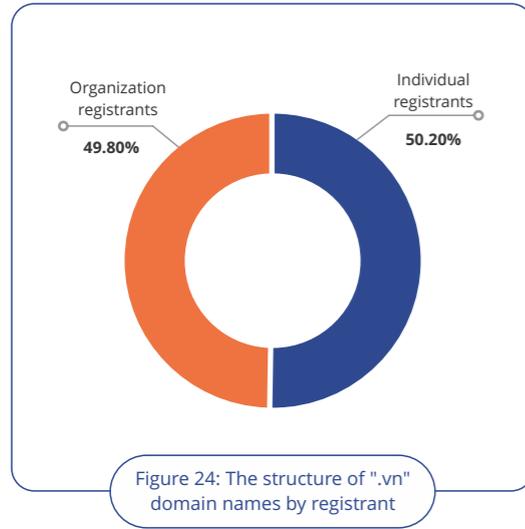
No.	Province/ City	Total number ".vn" domain names	Domain name under ".gov.vn"
1	Ho Chi Minh City	206,353	209
2	Hanoi	189,521	688
3	Danang	10,852	31
4	Binh Duong	9,892	20
5	Hai Phong	8,572	36
6	Dong Nai	8,405	26
7	Thanh Hoa	5,986	47
8	Nghe An	5,352	70
9	BA Ria Vung Tau	4,593	9
10	Nam Dinh	4,369	9
11	Khanh Hoa	4,206	50
12	Hai Duong	4,127	9

Table 3: The provinces/municipalities with the highest number of ".vn" domain names

Ho Chi Minh City was the city with the highest number of domain names in the country, with 206,353 domain names, followed by Hanoi (189,251 domain names), Da Nang (10,852 domain names), Binh Duong (9,892 domain names). and Hai Phong (8,572 domains)
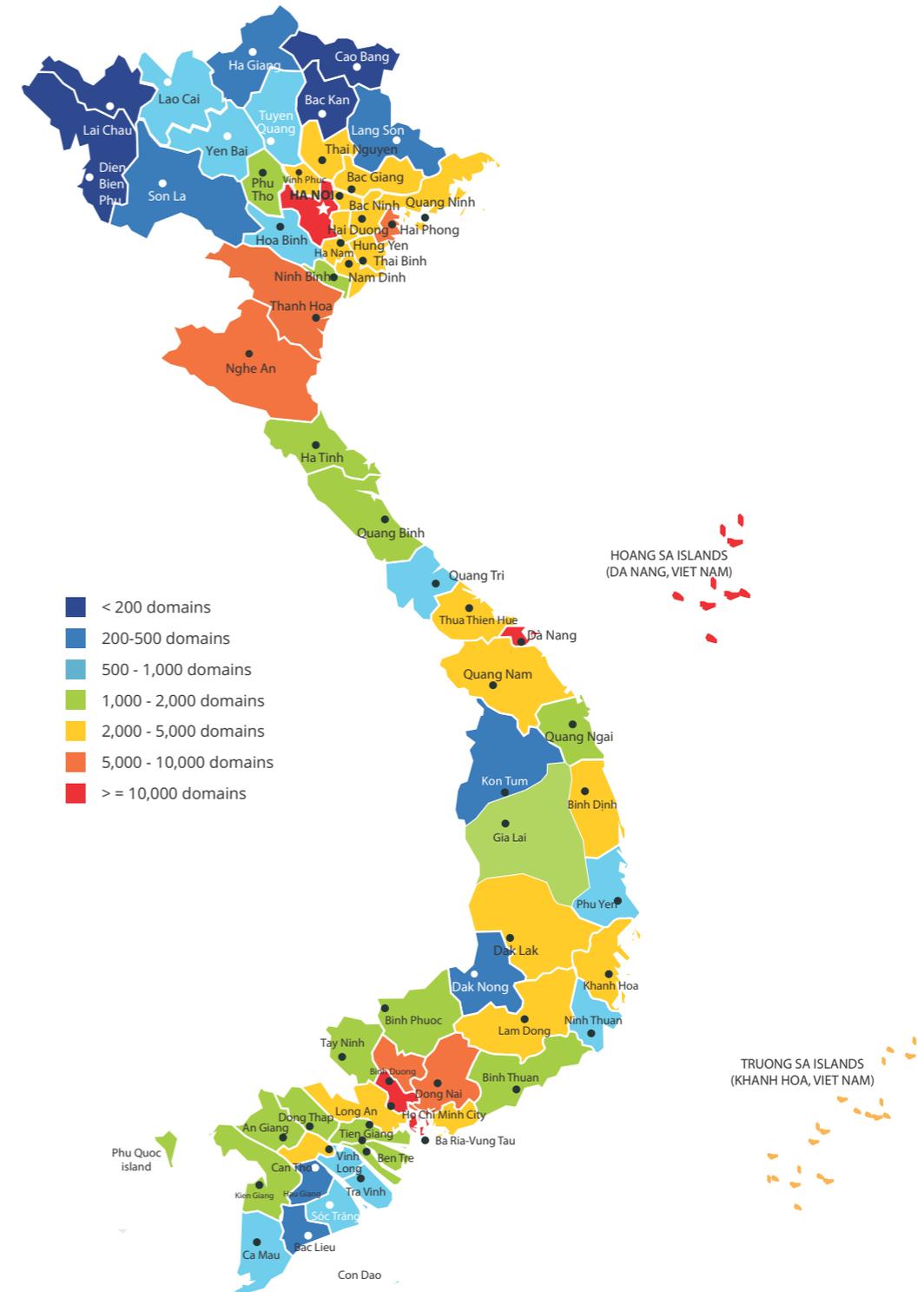
Image 7: Number of the ".vn" domain name in the provinces/ municipalities

< 200 domains
200-500 domains
500 - 1,000 domains
1,000 - 2,000 domains
2,000 - 5,000 domains
5,000 - 10,000 domains
> = 10,000 domains

No.	Province/ City	Percentage of enterprises registering ".vn" domain	No.	Province/ City	Percentage of enterprises registering ".vn" domain
1	Hanoi	19.71%	33	Quang Ngai	4.32%
2	Ho Chi Minh City	16.24%	34	Ninh Thuan	4.30%
3	Danang	9.25%	35	Lao Cai	4.26%
4	BA Ria Vung Tau	9.18%	36	Nam Dinh	4.23%
5	Hai Phong	8.60%	37	Phu Yen	4.18%
6	Long An	7.83%	38	Ninh Binh	4.07%
7	hung Yen	7.81%	39	Vinh Long	4.05%
8	Khanh Hoa	7.79%	40	Yen Bai	3.97%
9	Can Tho	7.68%	41	Kien Giang	3.88%
10	Binh Duong	7.27%	42	An Giang	3.48%
11	Dong Nai	6.78%	43	Thanh Hoa	3.36%
12	Hue	6.45%	44	Hau Giang	3.36%
13	Bac Ninh	6.20%	45	Binh Phuoc	3.33%
14	Hai Duong	5.97%	46	Tuyen Quang	3.27%
15	Lam Dong	5.96%	47	Ha Tinh	3.25%
16	Binh Thuan	5.69%	48	Gia Lai	3.18%
17	Ha Nam	5.58%	49	Kon Tum	3.09%
18	Quang Ninh	5.51%	50	Son La	3.02%
19	Vinh Phuc	5.47%	51	Ca Mau	2.90%
20	Thai Nguyen	5.36%	52	Tra Vinh	2.79%
21	Pacify	5.20%	53	Quang Tri	2.75%
22	Phu-Tho	5.17%	54	Soc Trang	2.60%
23	Peace	5.15%	55	Lang Son	2.48%
24	Ben tre	5.13%	56	Quang Binh	2.34%
25	Tay Ninh	4.74%	57	As tall as	2.12%
26	Dak Lak	4.68%	58	Bac Lieu	2.10%
27	Quang Nam	4.67%	59	Dak Nong	2.08%
28	peaceful	4.65%	60	Lai Chau	1.83%
29	Dong Thap	4.55%	61	Dien Bien	1.67%
30	Tien Giang	4.45%	62	Bac Kan	1.53%
31	Nghe An	4.45%	63	Ha Giang	1.20%
32	Bac Giang	4.44%			

Table 4: Percentage of enterprises registering ".vn" domain names over total number of enterprises in provinces/municipalities
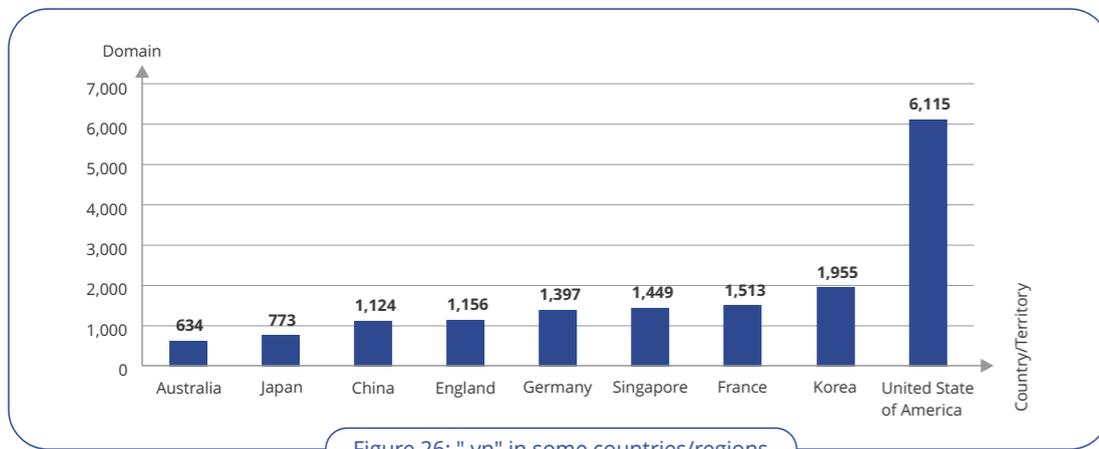
Figure 26: ".vn" in some countries/regions
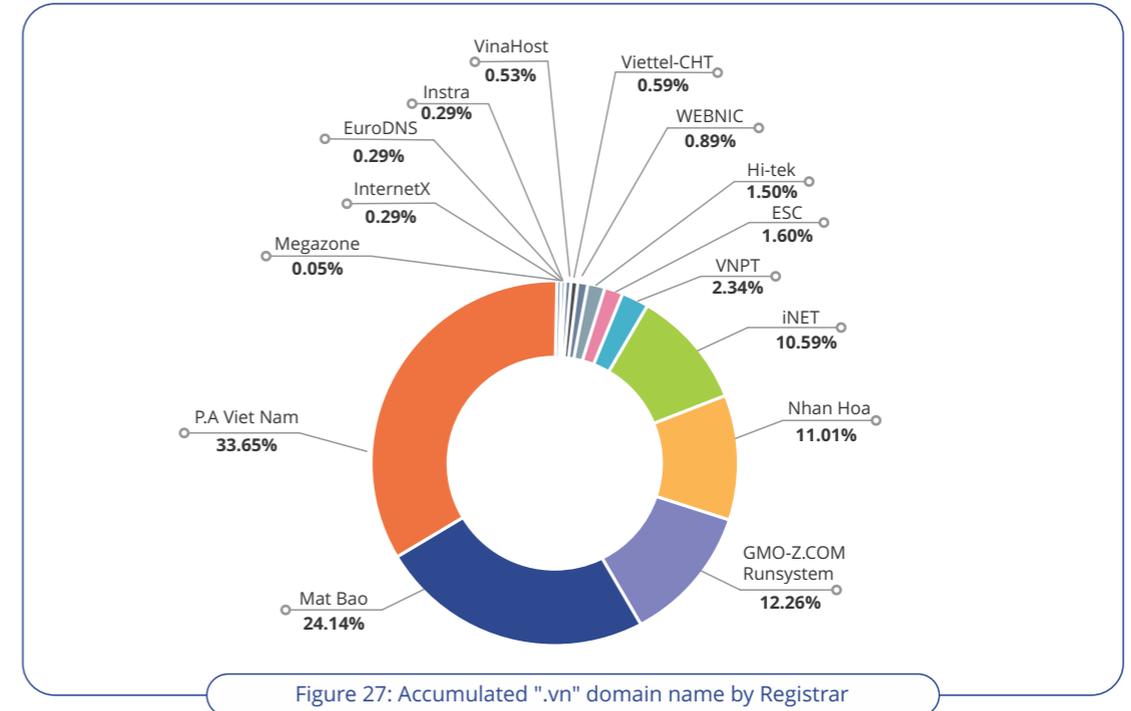
Figure 27: Accumulated ".vn" domain name by Registrar

P.A Vietnam held the largest market share in the Registrar system with 33.65% of total domain names, followed by Mat Bao (24.14%), GMO (12.26%), Nhan Hoa (11.01%) and iNET (10.49%).
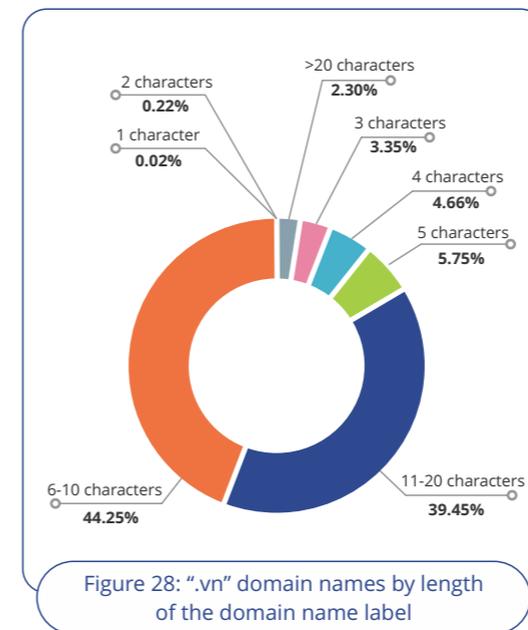
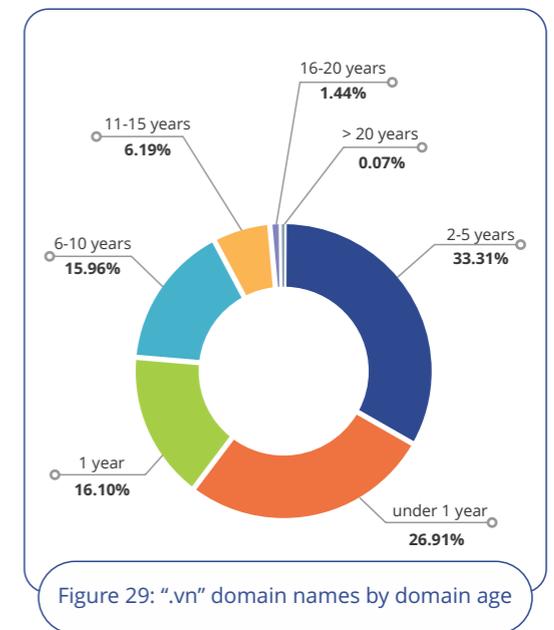Figure 28: ".vn" domain names by length of the domain name label

Figure 29: ".vn" domain names by domain age

The largest number of maintained domains focused on domain names registered for less than one year, equivalent to 26.91% of the total maintained domain name.
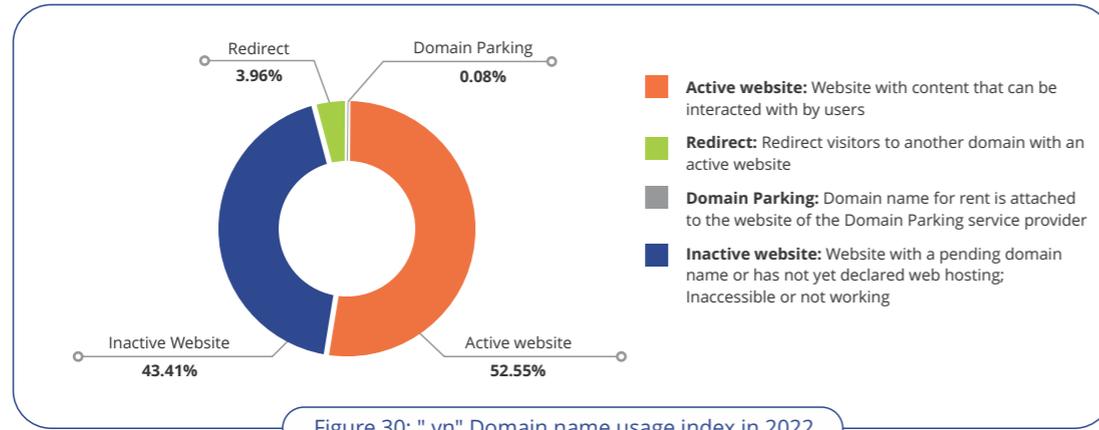
3 **INDICATOR OF USING THE ".VN" DOMAIN NAME**

Active website: Website with content that can be interacted with by users

Redirect: Redirect visitors to another domain with an active website

Domain Parking: Domain name for rent is attached to the website of the Domain Parking service provider

Inactive website: Website with a pending domain name or has not yet declared web hosting; Inaccessible or not working

Figure 30: ".vn" Domain name usage index in 2022
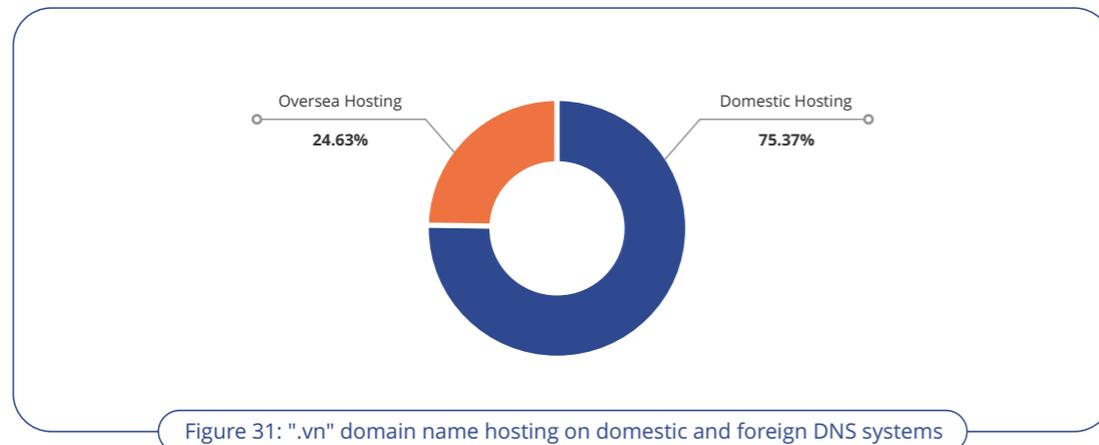
Figure 31: ".vn" domain name hosting on domestic and foreign DNS systems

According to current legal regulations, electronic newspapers, general information portals, social networks; Websites and portals of Party and State agencies must use ".vn" domain names and store information in Vietnam. The rate of using domestic hosting services at 75% has shown that domestic hosting service providers are fully capable and have a service ecosystem to meet the diverse needs of customers, reflecting customer confidence in domestic suppliers.

4 **".VN" DOMAIN NAME REGISTRARS**

DOMESTIC REGISTRARS

P.A Vietnam Company | Mat Bao Company | GMO Runsystem Company | Nhan Hoa Softwere Company Co., Ltd | iNET Software Company Limited | Vietnam Data Communication Company | Online Solution Company | Viettel-CHT Company Limited | Vinahost Company

OVERSEA REGISTRARS

Web Commerce Communications Ltd. | Instra Corporation | EuroDNS SA | InterNetX Company | HI-TEK INC., JSC | MEGAZONE Corp

5 **SERVICES OF ".VN" DOMAIN NAME**

5.1 Domain name protection service ".vn" (Registry Lock)

Registry Lock service for the domain name ".vn" helps to protect the domain name against the risk of attacks, changes in contact information or changes related to DNS servers, etc.

2.930 DOMAIN NAMES ".VN" have implemented Registry Lock service
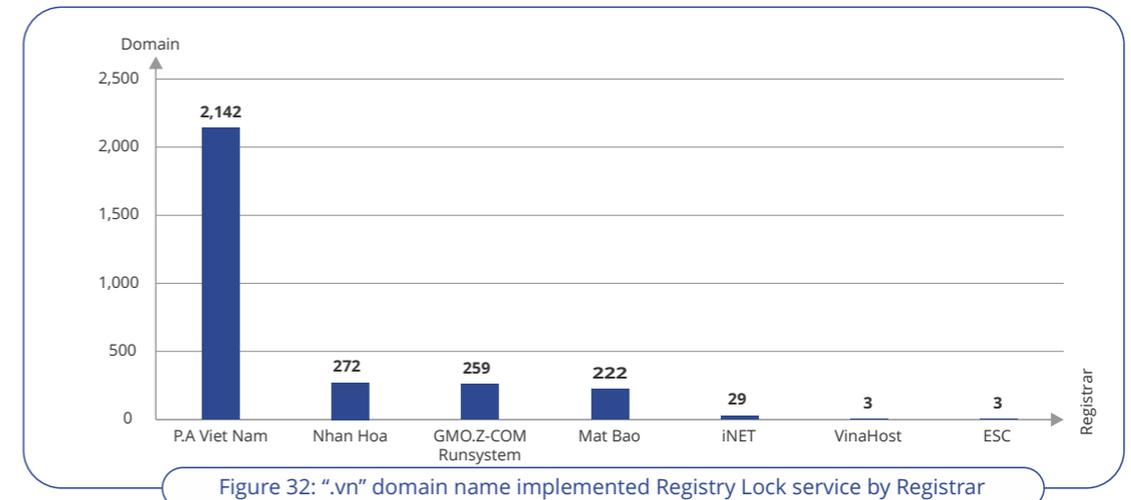
Figure 32: ".vn" domain name implemented Registry Lock service by Registrar

Registry lock service is a very popular and trusted service of large companies and corporations that are highly conscious in preventing the risks of unintended website redirection and email. This service contributes to bring reliable and safe value to .vn domain names. With the increasing problem of technology crime, this service is a valuable shield to help protect the domain names, websites, and data from being stolen.

5.2. DNSSEC (Domain Name System Security Extension) Standard

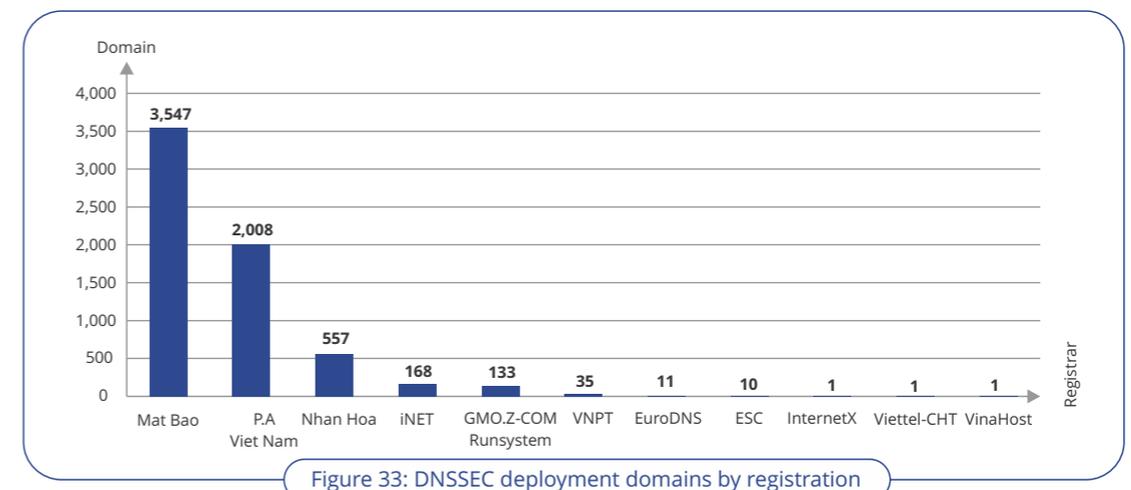**6.566 DOMAIN NAMES ".VN"** have implemented DNSSEC

Figure 33: DNSSEC deployment domains by registration

II. IP ADDRESS AND AUTONOMOUS SYSTEM NUMBER(AS
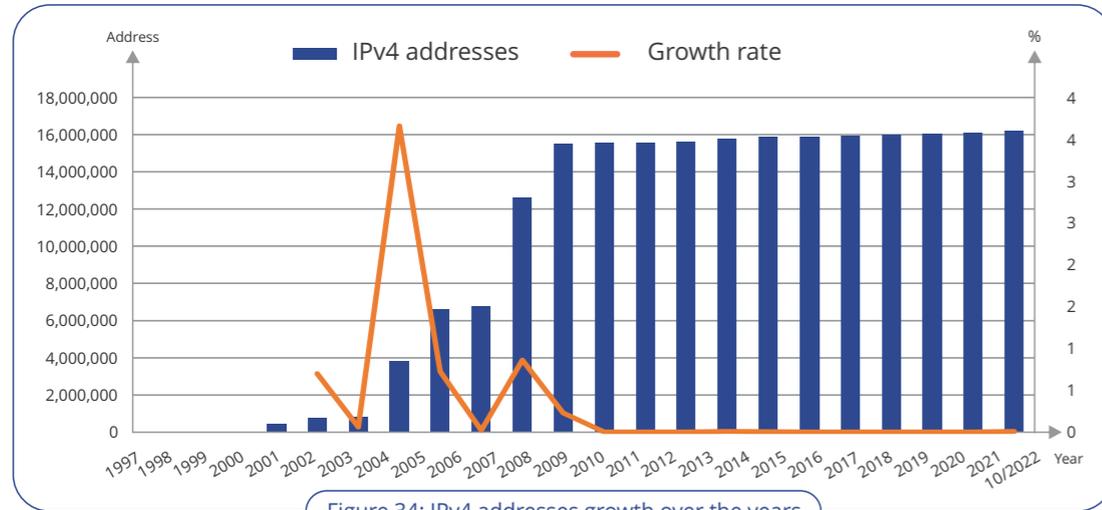
1 IPv4 ADDRESS GROWTH

Figure 34: IPv4 addresses growth over the years

After VNNIC became the NIR of Vietnam, the number of IPv4 in Vietnam respectively reached 1 million, 2 millions, 3 millions and nearly 4 millions in 2007 reaching 10 millions IPv4 addresses in 2010, reaching 15.5 millions addresses in 2011. From 2011 to now, due to limited allocation policy, the number of IPv4 has grown steadily but slowly.
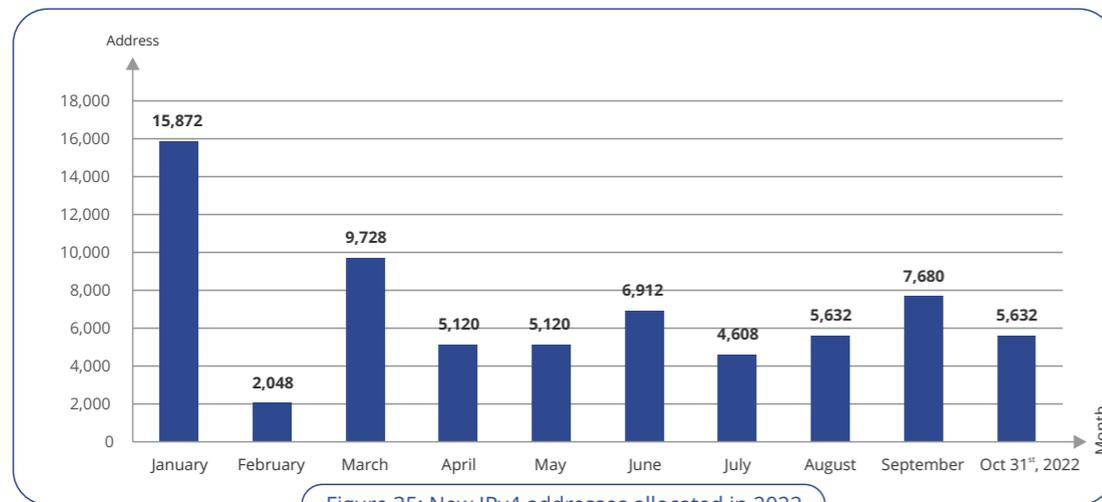

Figure 35: New IPv4 addresses allocated in 2022

In 2022, the number of IPv4 addresses allocated monthly is steady, especially in January and March 2022. As of October 2022, the number of IPv4 addresses in Vietnam has reached 16 millions, ranking eighth in the Asia-Pacific region, and 29th globally.

2 IPv6 ADDRESS GROWTH
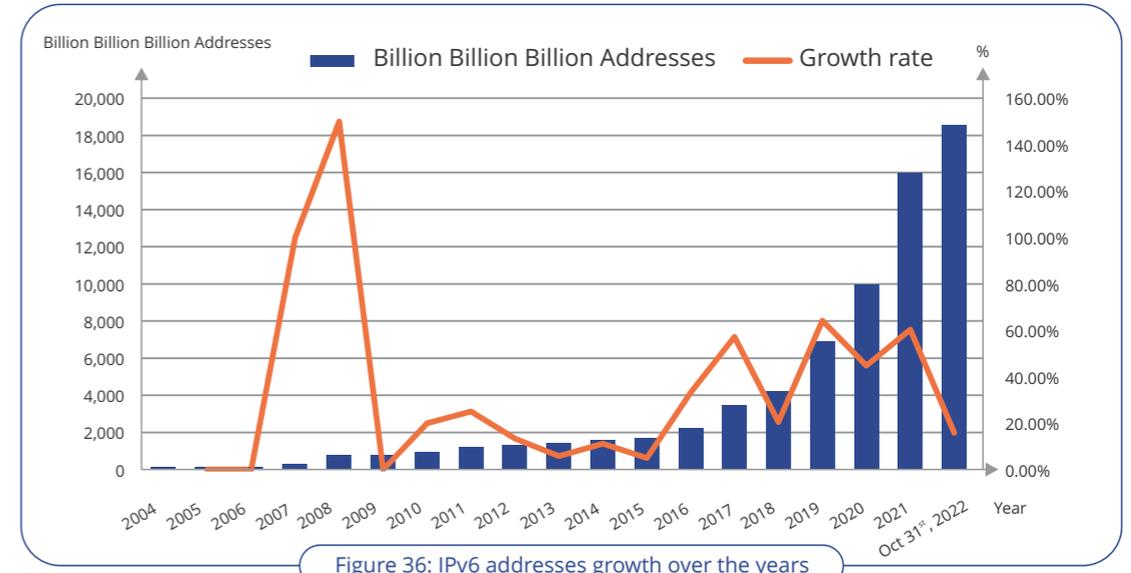
Figure 36: IPv6 addresses growth over the years

In 2004, the first IPv6 address space was allocated to Vietnam. In 2008, after Directive No. 03/2008/CT-BTTTT dated May 6, 2008 on promoting IPv6 deployment, the number of IPv6 addresses allocated to Vietnamese organizations and enterprises increased by 150%. Identifying IPv6 as a long-term solution for Vietnam's Internet development, the number of IPv6 resources grows grately, as 30% per year averagely.
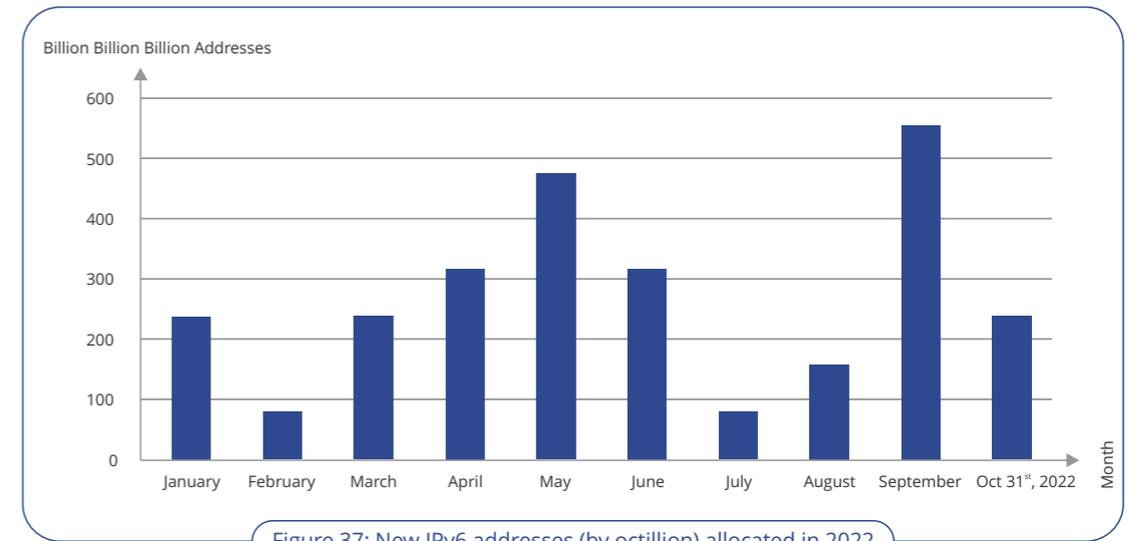
Figure 37: New IPv6 addresses (by octillion) allocated in 2022

In 2022, organizations and enterprises, especially state agencies, have actively registered to use IPv6, 68 new IPv6 pools have been allocated. As of October 2022, Vietnam has 18,540 octillions (10^{27}) IPv6 addresses. Internet resources has fully prepared for using and developing Vietnam's Internet.

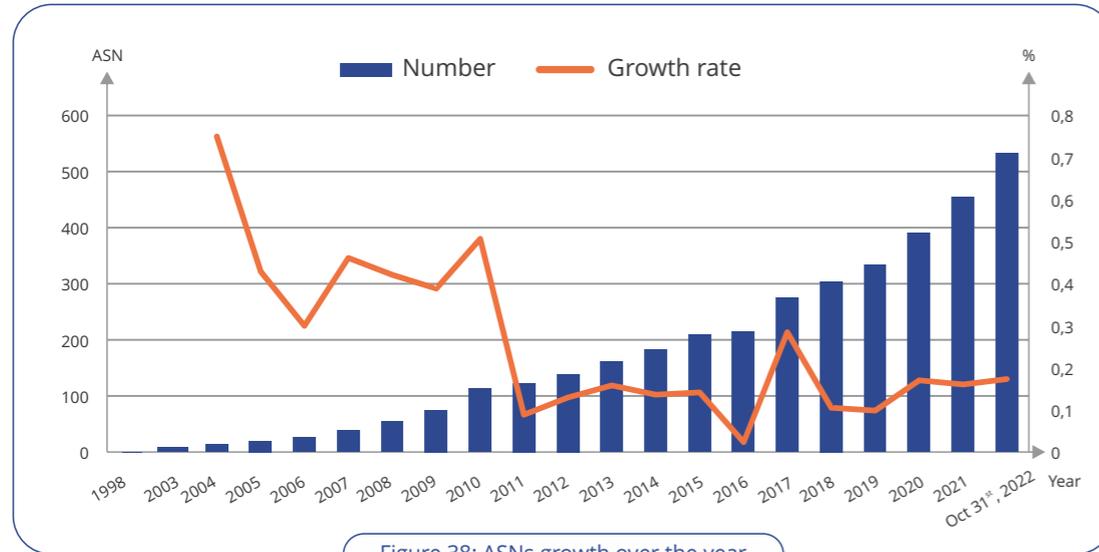## 3 DEVELOPMENT OF INDEPENDENT AS

Figure 38: ASNs growth over the year

In 1998, Vietnam had one AS with 14,336 IPv4 addresses, initially forming the Vietnam's Internet network. In 2002, Vietnam had 03 AS owned by the largest network operators in Vietnam, including VNPT, Viettel, and FPT with 79,872 IPv4 addresses to establish Internet infrastructure and provide Internet services to users. After 25 years of development, the number of AS in Vietnam has grown well, as the average annual growth rate is 26%.
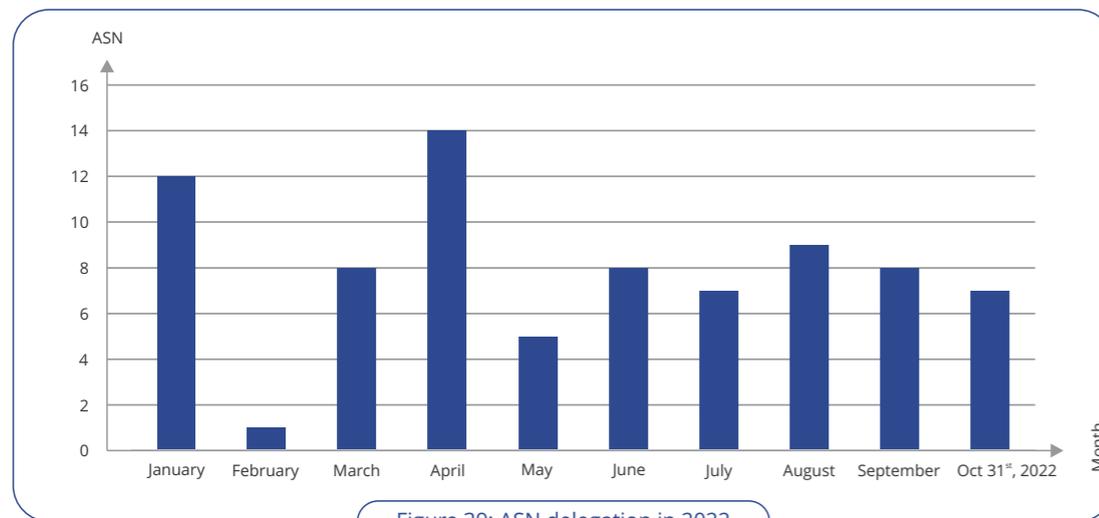

Figure 39: ASN delegation in 2022

In 2022, the number of AS grew well, with 79 newly allocated AS. As of October 2022, Vietnam has reached 533 ASNs. AS were allocated to diverse industries and fields such as: ISP, IDC, State agencies, Finance, banking, securities, schools, hospitals, electricity, e-commerce,.... These are the nuclear networks to connect and develop Vietnam's Internet.

4 DEVELOPMENT AND STRUCTURE OF IP ADDRESS COMMUNITY

The demand for independent IP and AS is increasing, following by the growth of Internet. Many agencies, organizations and enterpries recognized the importance of using independent IP/AS. In the past 10 years, the number of IP address members who are organizations and enterprises allocated independent IP has grown steadily, with an average growth rate of 33% per year and 78 new members per year.
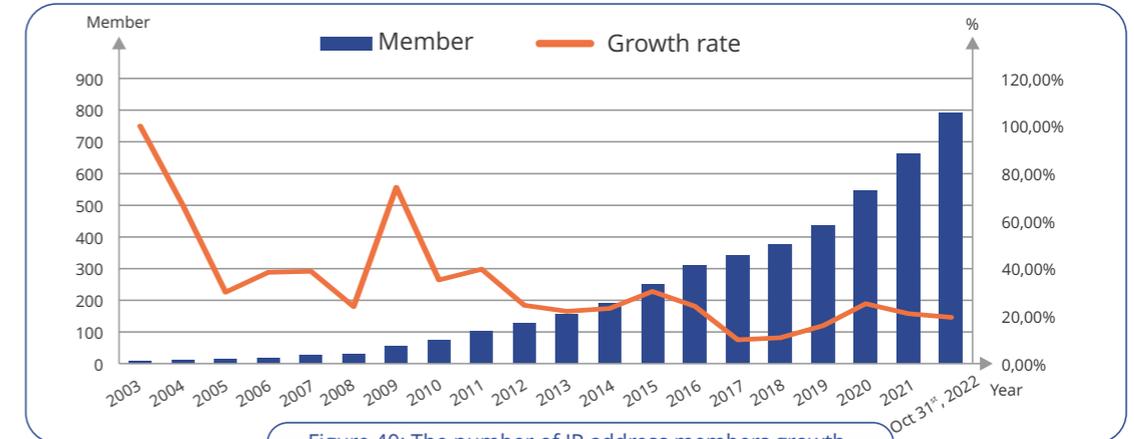

Figure 40: The number of IP address members growth

In the last 3 years, the demand for IPv4 has increased sharply, there are over 100 new members each year. In the first 10 months of 2022, the number of organizations allocated independent IP continued to increase with 129 new members, bringing the total number of Vietnam IP address members to 791.
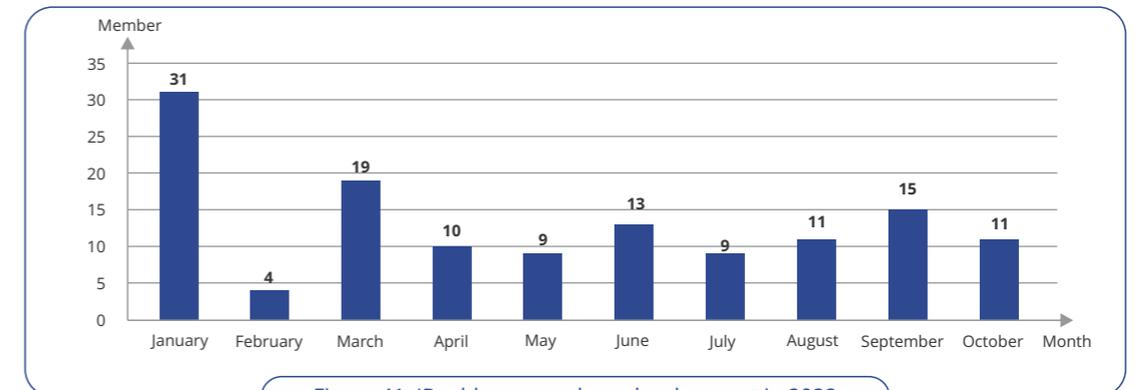

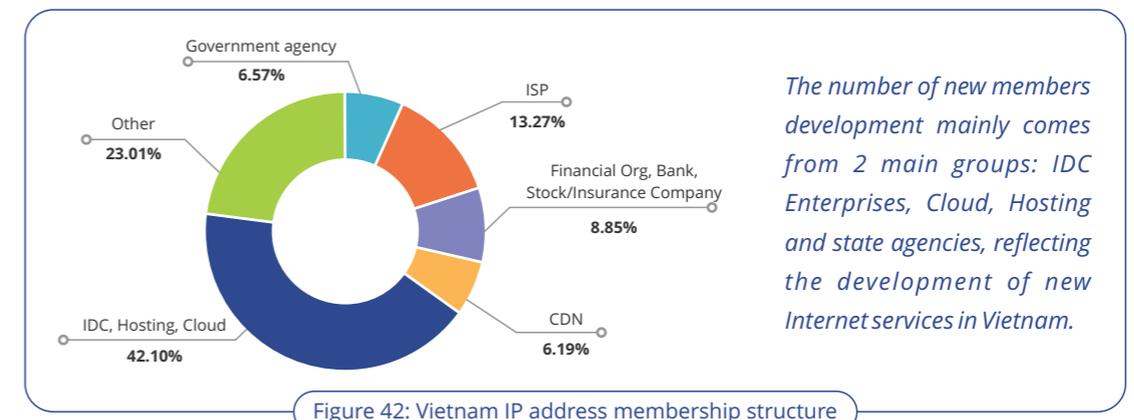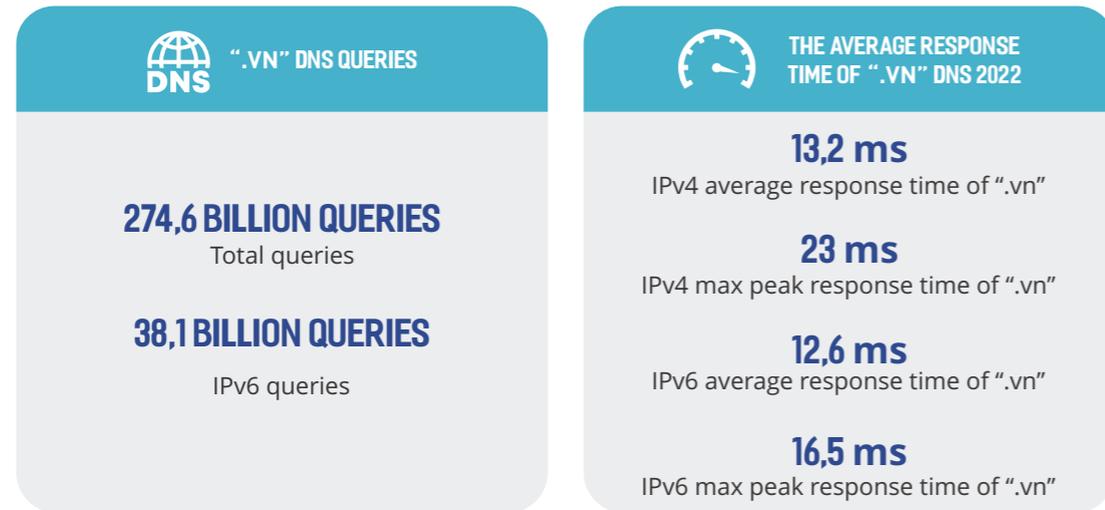Figure 41: IP address members development in 2022

Figure 42: Vietnam IP address membership structure

The number of new members development mainly comes from 2 main groups: IDC Enterprises, Cloud, Hosting and state agencies, reflecting the development of new Internet services in Vietnam.

III NATIONAL ".VN" DNS

1 QUALITY MONITORING OF ".VN" DNS QUERY

In 2022, the total number of queries on the national ".vn" DNS system increased by 120% compared to the same period in 2021. This also reflected interest and usage of ".vn" services.
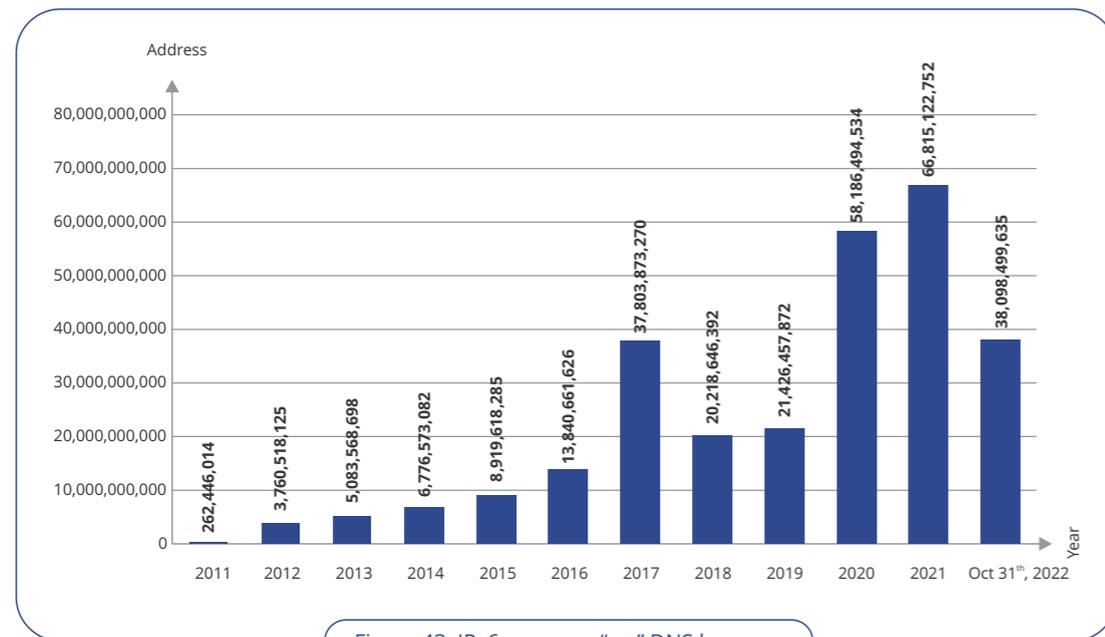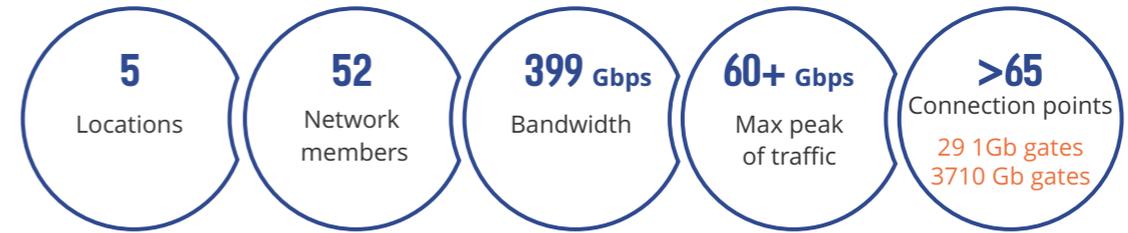
".VN" DNS QUERIES

274,6 BILLION QUERIES
Total queries

38,1 BILLION QUERIES
IPv6 queries

THE AVERAGE RESPONSE TIME OF ".VN" DNS 2022

13,2 ms
IPv4 average response time of ".vn"

23 ms
IPv4 max peak response time of ".vn"

12,6 ms
IPv6 average response time of ".vn"

16,5 ms
IPv6 max peak response time of ".vn"

2 IPv6 QUERY ON ".VN" DNS

Figure 43: IPv6 query on ".vn" DNS by years

IV VIETNAM NATIONAL INTERNET eXCHANGE (VNIX)

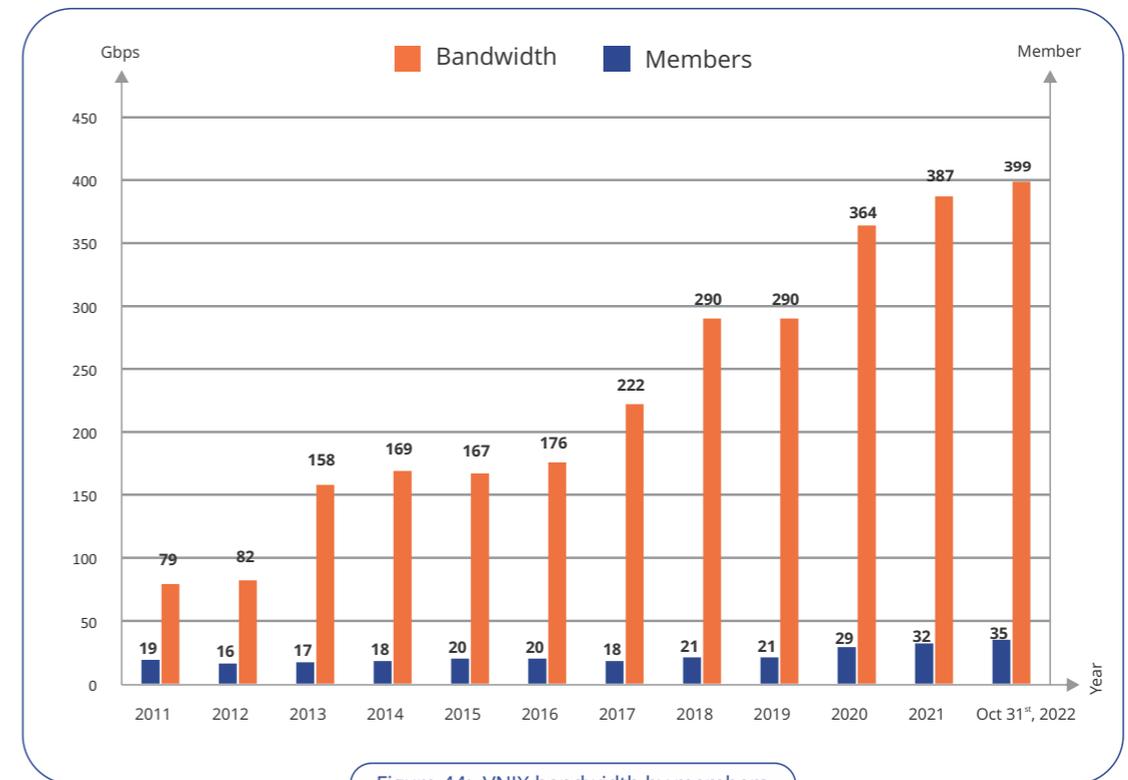| 5 Locations | 52 Network members | 399 Gbps Bandwidth | 60+ Gbps Max peak of traffic | >65 Connection points 29 1Gb gates 3710 Gb gates |

1 VNIX MEMBERS AND BANDWIDTH GROWTH

Figure 44: VNIX bandwidth by members

In 2022, the number of members connecting VNIX increased by 4 members. The connection bandwidth via VNIX reaches nearly 400 Gbps.

2 **VNIX MEMBERS AND BANDWIDTH BY CONNECTION LOCATIONS**

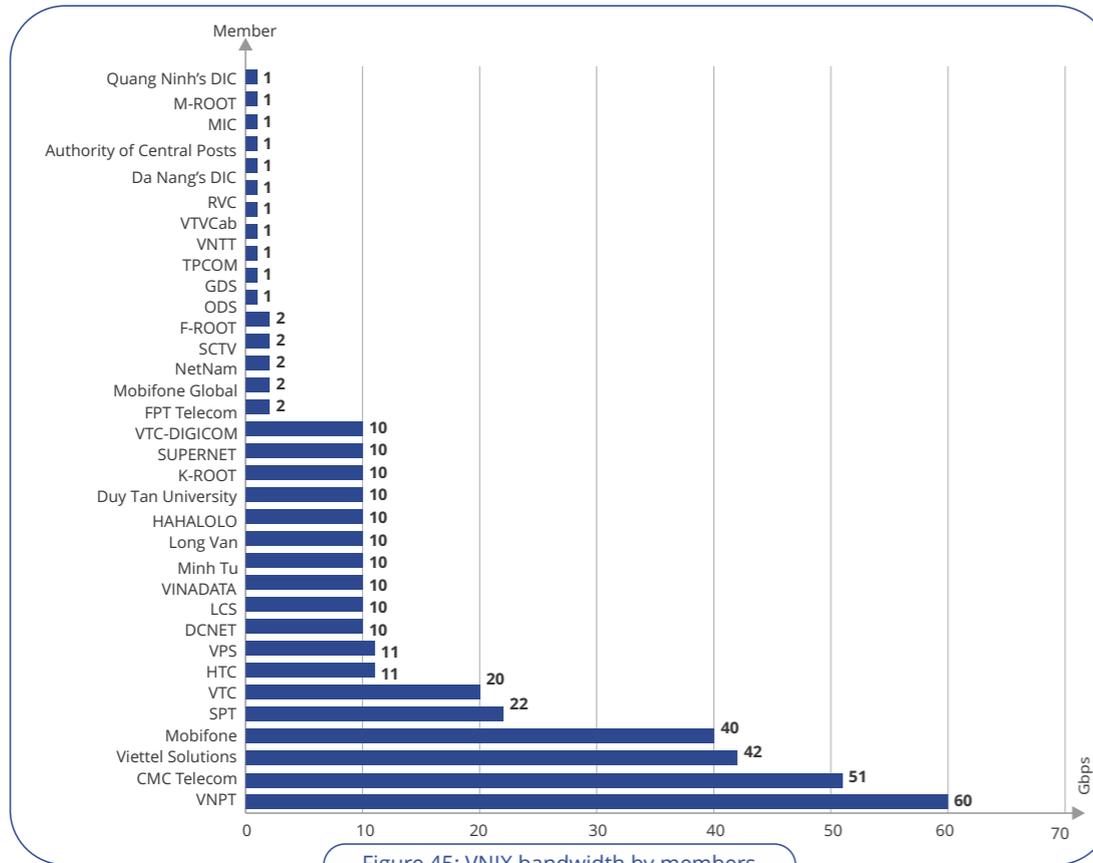| VNIX POINT	MEMBER	BANDWIDTH (Gbps)	IPv4 PREFIX	IPv6 PREFIX
VNIX Hanoi	21	171	11,839	5,043
VNIX Ho Chi Minh City	21	171	12,708	5,123
VNIX Da Nang City	10	57	7,514	3,396

Table 6: VNIX members and bandwidth by connection locations
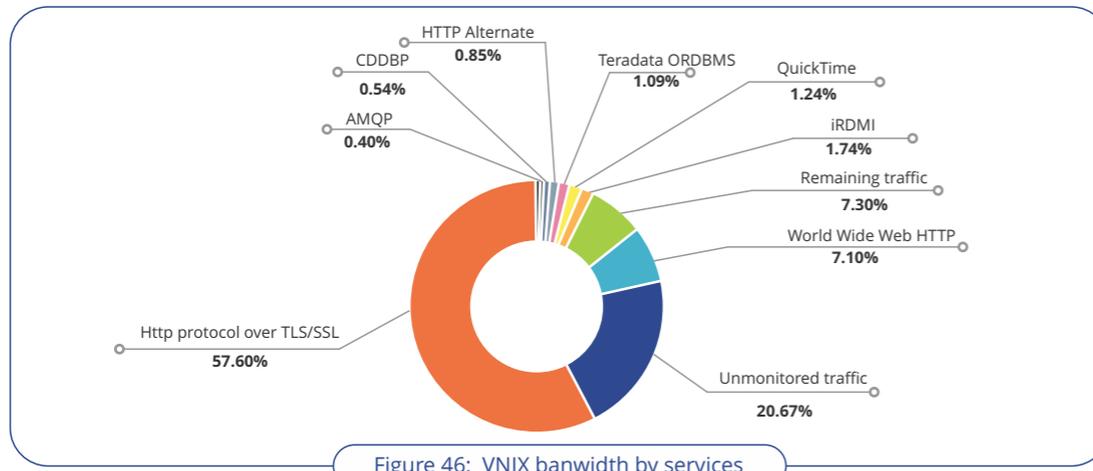

Figure 45: VNIX bandwidth by members

Figure 46: VNIX banwidth by services

V. **VIETNAM'S INTERNET SPEED**

56 MEASURE POINTS

4 MEASURE POINTS
HONGKO, SINGAPORE, AUSTRALIA, JAPAN

52 MEASURE POINTS
DOMESTIC

1 **IPv6 PENETRATION RATE OF I-SPEED RESULTS BY VIETNAMESE USERS**

Considering the important transition to IPv6, Viet Nam is one of the top 10 leading countries in the world in IPv6 deployment. The i-Speed application had deployed and calculated the IPv6 penetration rate, thereby contributing to promote IPv6 transition.
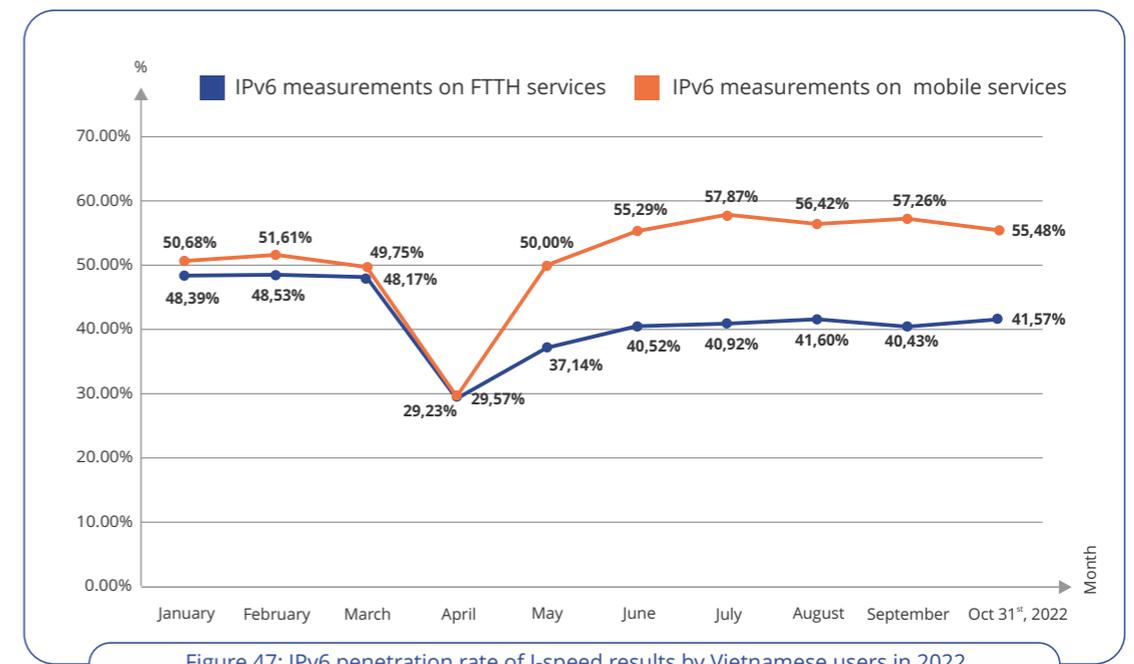

Figure 47: IPv6 penetration rate of I-speed results by Vietnamese users in 2022

2 FIXED INTERNET BROADBAND SPEED

According to the statistical results from the i-Speed system, fixed broadband network speed was increasingly improved to meet the increasing demand of Internet users.
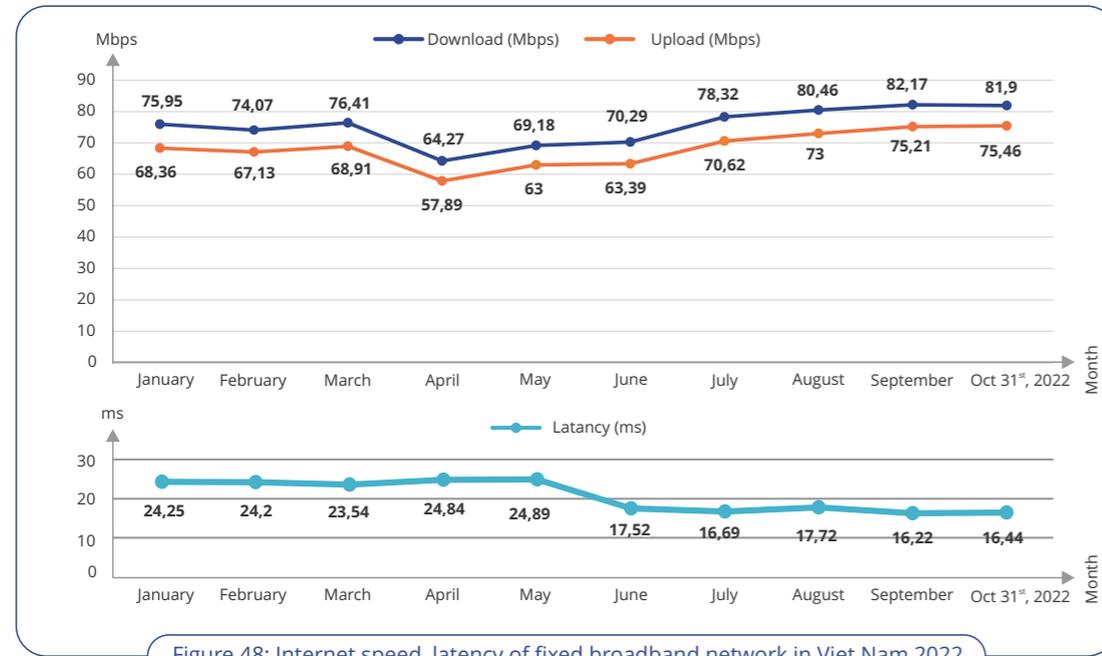

Figure 48: Internet speed, latency of fixed broadband network in Viet Nam 2022
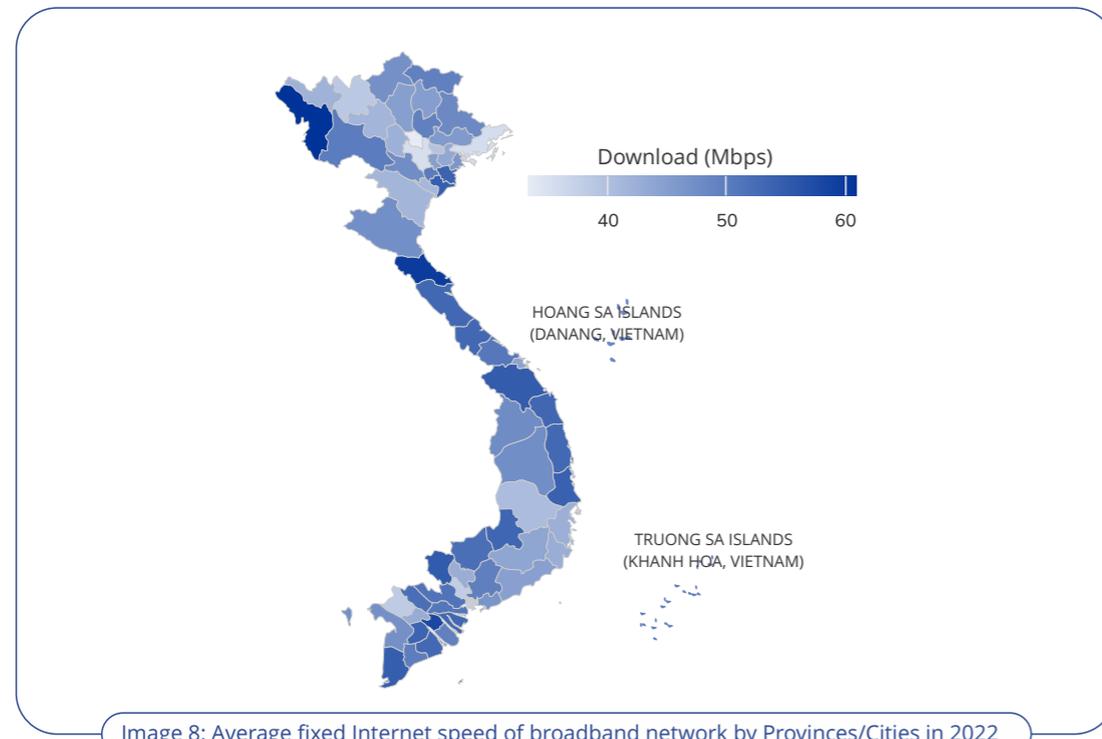

Image 8: Average fixed Internet speed of broadband network by Provinces/Cities in 2022

Some large provinces/cities with high population density were not among the top provinces with good Internet speed. That also reflected the high demand of Internet users in the above regions. Internet providers need to continue to upgrade network infrastructure to improve service quality.
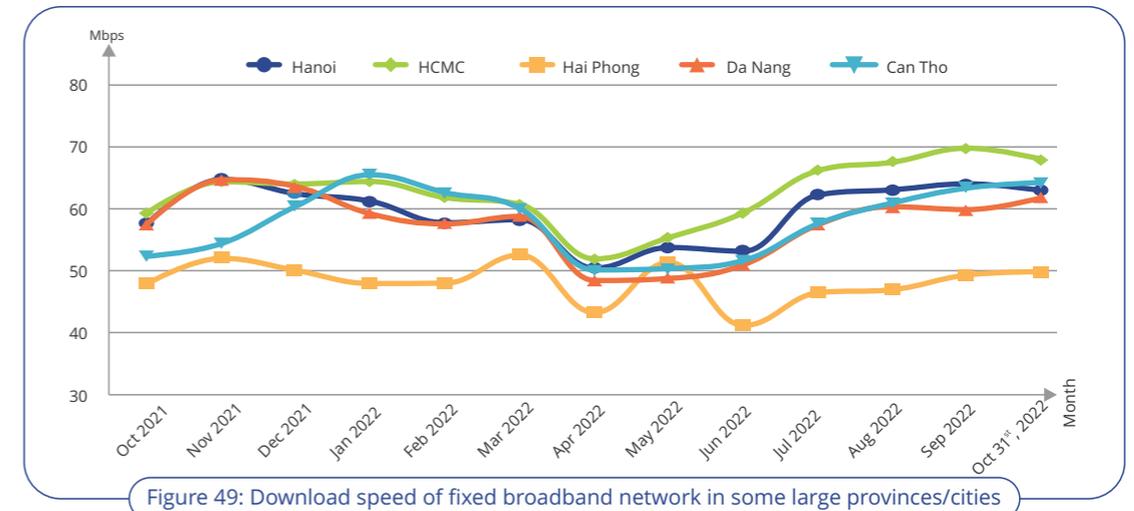

Figure 49: Download speed of fixed broadband network in some large provinces/cities

3 MOBILE INTERNET BROADBAND SPEED

According to statistics on the i-Speed system, in 2022, the mobile broadband network speed had not improved considerably. In the past time, the network operators and the localities had been actively and diligently trying to detect and handle concave points in waves. The i-Speed application helped users, localities, and network operators in assessing network quality and thereby improving service.
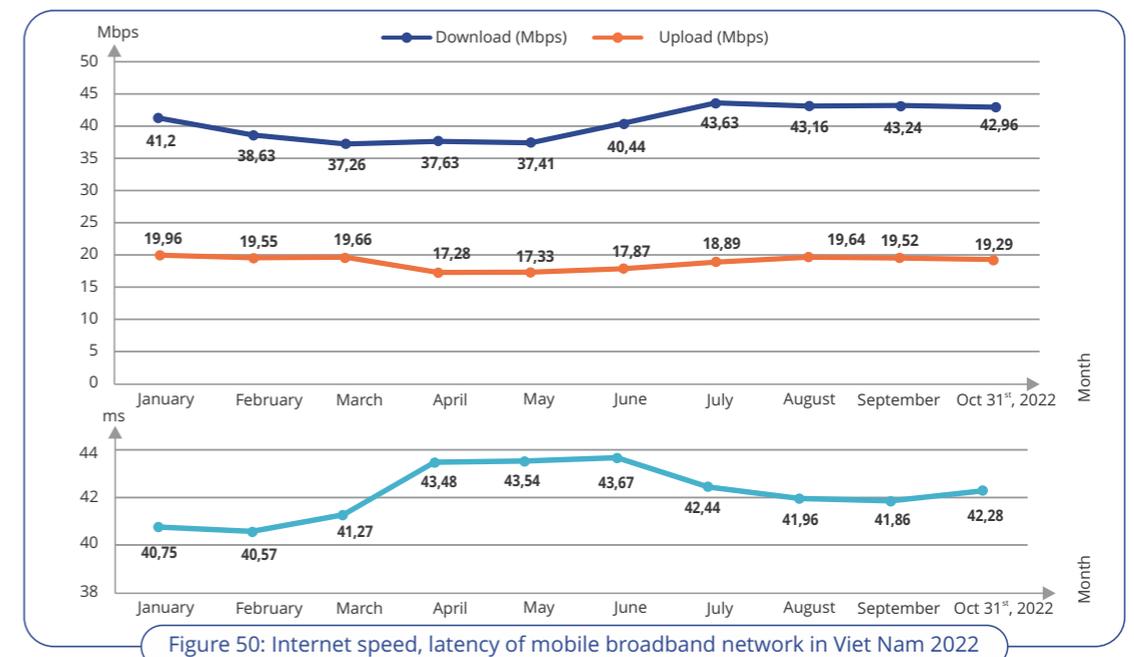

Figure 50: Internet speed, latency of mobile broadband network in Viet Nam 2022
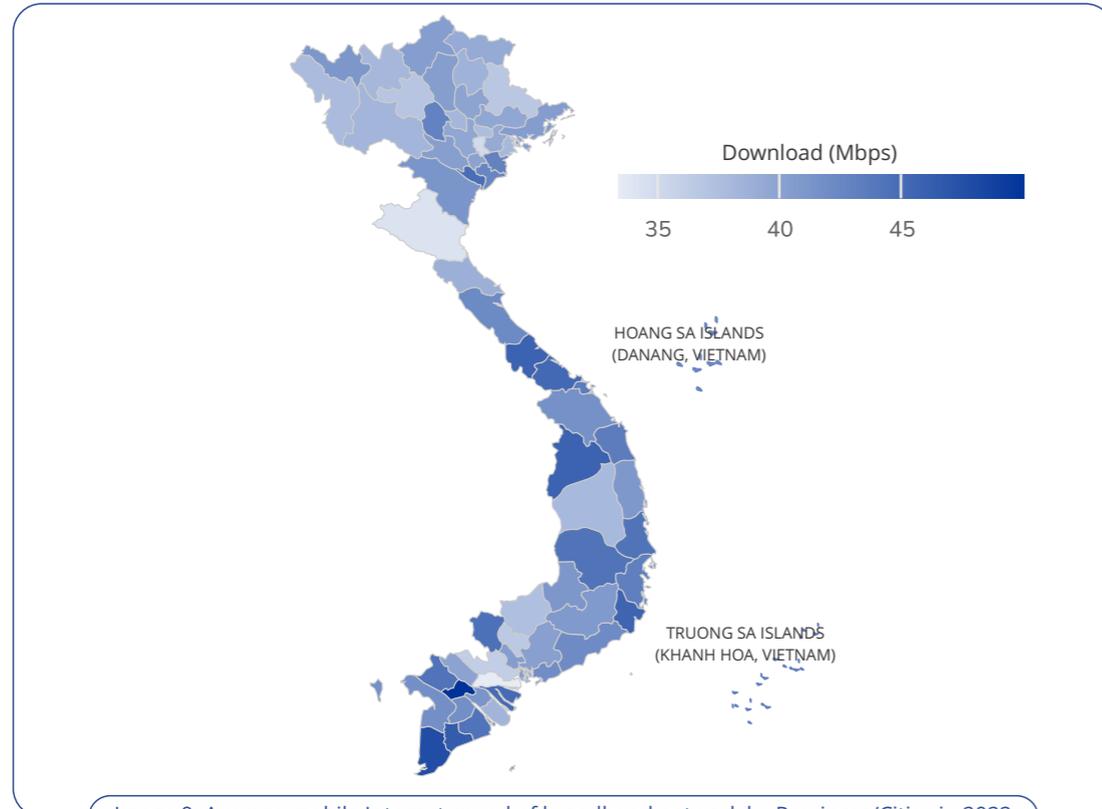
Image 9: Average mobile Internet speed of broadband network by Provinces/Cities in 2022
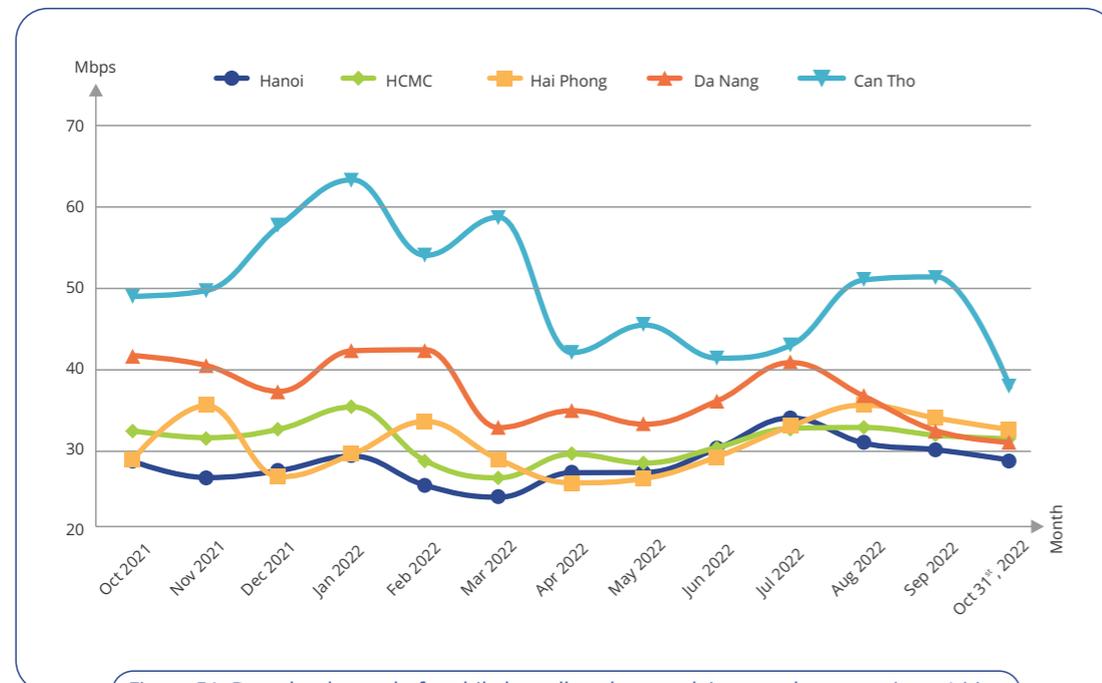

Figure 51: Download speed of mobile broadband network in some large provinces/cities

NO.	PROVINCES/ CITIES	FIXED BROADBAND SPEED		MOBILE BROADBAND SPEED		IPv6 ADOPTION RATE (i-SPEED)
		Download (Mbps)	Upload (Mbps)	Download (Mbps)	Upload (Mbps)	
1	An Giang	69,93	62,08	44,23	19,70	38%
2	Ba Ria - Vung Tau	73,38	65,99	41,88	19,31	46%
3	Binh Duong	75,93	70,64	36,46	19,31	43%
4	Binh Phuoc	66,94	61,00	37,37	18,15	52%
5	Binh Thuan	68,99	62,83	41,99	18,96	45%
6	Binh Dinh	63,99	57,41	40,90	16,83	53%
7	Bac Lieu	70,17	63,95	46,29	19,90	50%
8	Bac Giang	78,75	69,72	39,49	15,77	45%
9	Bac Kan	59,25	57,23	38,51	14,69	45%
10	Bac Ninh	68,75	63,77	37,51	15,85	39%
11	Ben Tre	87,38	73,53	44,91	19,86	53%
12	Cao Bang	65,53	51,30	39,22	16,28	49%
13	Ca Mau	76,12	67,69	47,60	20,15	54%
14	Can Tho	79,73	72,20	49,98	29,38	43%
15	Dien Bien	112,12	89,97	37,70	13,97	61%
16	Da Nang	78,23	71,54	43,38	21,09	44%
17	Dak Lak	61,54	58,64	44,15	18,95	40%
18	Dak Nong	61,02	54,58	40,98	17,42	53%
19	Dong Nai	85,04	76,96	40,18	20,24	49%
20	Dong Thap	64,41	59,22	39,88	18,54	52%
21	Gia Lai	88,56	76,96	37,92	17,95	47%
22	Ha Giang	84,13	68,67	40,27	15,00	47%
23	Ha Nam	63,84	59,13	39,91	17,03	50%
24	Ha Noi	76,01	67,83	39,58	17,16	35%
25	Ha Tinh	63,52	59,44	38,81	16,95	60%
26	Hoa Binh	83,15	72,34	40,22	16,75	47%
27	Hung Yen	60,22	57,74	34,84	15,61	45%
28	Hai Duong	63,22	58,65	39,24	15,96	43%
29	Hai Phong	61,72	59,33	38,00	17,23	46%
30	Hau Giang	82,19	74,30	41,66	14,40	54%
31	Khanh Hoa	70,03	63,27	43,10	19,50	42%
32	Kien Giang	70,18	63,96	41,63	18,11	47%
33	Kon Tum	60,82	52,76	45,65	16,40	48%
34	Lai Chau	102,30	84,71	40,96	18,08	42%
35	Long An	79,30	71,12	35,98	17,12	51%
36	Lao Cai	68,23	63,22	38,02	15,73	38%
37	Lam Dong	68,09	61,94	40,65	18,84	44%
38	Lang Son	62,62	54,91	36,62	17,09	48%
39	Nam Dinh	71,91	67,38	42,48	20,04	54%
40	Nghe An	52,96	51,17	34,19	18,14	47%
41	Ninh Binh	97,49	82,67	44,68	20,03	41%
42	Ninh Thuan	92,29	78,30	45,53	19,47	43%
43	Phu Tho	69,80	65,32	42,84	15,69	42%
44	Phu Yen	58,95	54,68	44,12	19,21	54%
45	Quang Binh	92,03	78,21	42,16	18,05	53%
46	Quang Nam	67,39	62,67	41,46	18,34	55%
47	Quang Ngai	73,10	66,21	43,36	17,27	53%
48	Quang Ninh	60,55	56,82	40,46	16,80	35%
49	Quang Tri	64,68	61,85	45,65	19,41	53%
50	Soc Trang	90,82	76,82	44,19	16,52	53%
51	Son La	62,35	57,28	38,21	13,69	50%
52	TP. Ho Chi Minh	79,31	73,04	40,40	20,70	38%
53	Thanh Hoa	90,73	78,46	41,15	16,98	41%
54	Thai Binh	72,65	68,36	42,85	17,30	54%
55	Thai Nguyen	60,52	57,81	39,79	17,57	49%
56	Thua Thien Hue	61,82	58,10	45,09	20,03	51%
57	Tien Giang	68,24	63,83	33,36	16,81	51%
58	Tra Vinh	62,73	57,98	38,29	17,61	49%
59	Tuyen Quang	107,70	95,93	40,36	16,41	45%
60	Tay Ninh	77,93	72,62	44,38	20,49	55%
61	Vinh Long	63,58	57,62	41,15	18,14	58%
62	Vinh Phuc	77,93	68,15	38,15	17,56	33%
63	Yen Bai	52,95	49,77	36,75	15,10	41%

Table 5: Average Internet speed and IPv6 adoption by Provinces/ Cities in Viet Nam

*O*ver the past 25 years, the spectacular growth of Viet Nam's Internet resources, as well as the safe and stable operation of the critical national Internet infrastructure have accompanied and created the driving force for the robust development of Viet Nam's Internet. With these results, Viet Nam has deeply and broadly integrated into and contributed positively to the general development of the global Internet.

In light of the new development phase of the Internet with the global trend of digital transformation, we believe that both Vietnam's Internet resources and critical national Internet infrastructure will continue to strengthen their roles in the overall development of Viet Nam's Internet network and services and devote to the national digital transformation.

The Report on Internet, Internet Resources in Vietnam 2022, in addition to providing information for readers, would be also a sincere thanks from Vietnam Internet Network Information Center to domestic and international partners, beside the Internet community in Vietnam. Hopefully, VNNIC would continue to receive your trust, support and companionship for Viet Nam's Internet to develop and integrate with the world with the spirit of "Internet for all".

Best regards!

VIET NAM INTERNET NETWORK INFORMATION CENTER