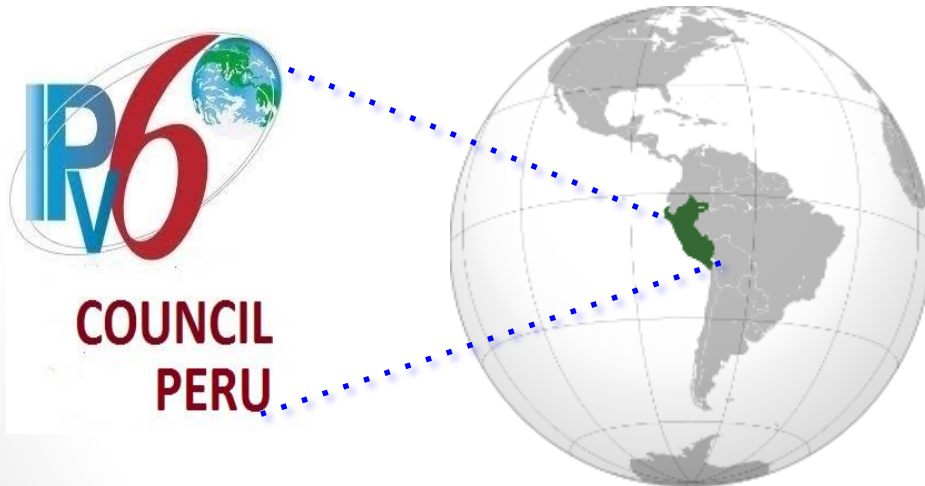


GIoTS-IPV6-based IoT Deployment Around the World IoT WEEK2017

International Conference Centre of Geneva (CICG), Geneva



Rosa M. Delgado

President

IPv6 Council Peru

6 June 2017

IoT a great opportunity for emerging economies !!

Agenda

How critical is Internet for Emerging nations?

Internet of Things (IoT)

The New Internet, IPv6

IPv6 Forum Latin America

IoT & IPv6 Figures

IPv6 Background in Peru

IPv6/IoT Potential Applications

Conclusions and Recommendations

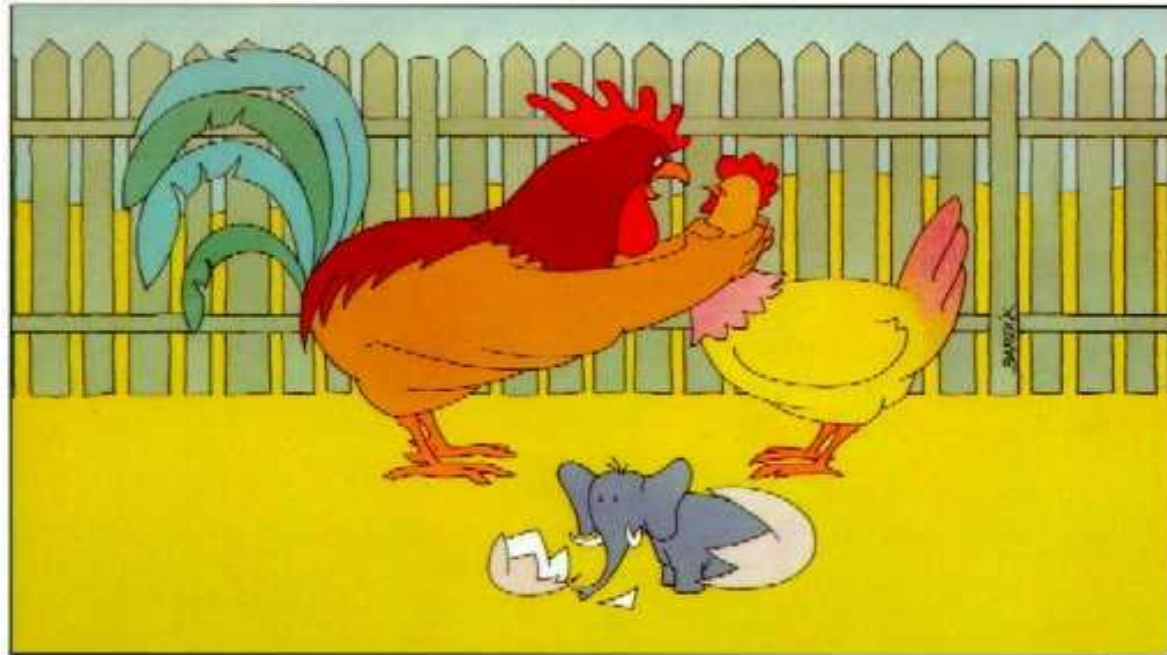
Next Steps



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How critical is Internet for Emerging nations?



Introduction



The rapid and massive proliferation of smart mobile devices on the Internet, broadband and cloud services, have already **exhausted the number of available IP addresses in its current Internet Protocol version 4 (IPv4);**

The **new Internet Protocol version 6 (IPv6)** uptake has been *rather* slow over the years. **Today, more than 18% of wired-up (or traffic!!!) Internet users are connected to IPv6 services;**

*IPv6 enables emerging countries to increase the supply of Internet services and become **more competitive players** for **Internet of Things (IoT)**, Smart Cities, SmartGrid, Mobile Internet, eGovernment and sensor networks.*

IPv6 is about the smooth continuation of the Internet!!

How critical is Internet for Emerging nations?

The most important infrastructure for innovation, development and poverty reduction *however, most of the world is still offline !!!*

The Internet is a global collaborative network with its economic, political and social diversities which, **plays a key role in building a solid information society;**

Free flow of data benefit the nation's wealth and social goals to **enhance democracy, accountability and an expansion of the rule of law;**

Opens new pipelines of opportunities in education, health, government and security services and new business models for industries like energy, agriculture, mining, finance, oil, gas, manufacturing and so on;

It prevents 'Digital Divide' as Broadband, Optical fiber, IPv6, mobile technologies, 4G or 5G ecosystems, and all connected things, are proliferating in the world.

IPv4 is over but, are we ready for IPv6?

*Internet **of** Things (IoT)*



Things, Internet, and connectivity are the three core IoT components

Tapping the Benefits of IoT

IoT address **key challenges facing developed and developing nations;**

Governments have a key leadership role to play in creating capacities and making their networks able to support IoT and Big Data to introduce new business models, increase industry efficiency and improve service delivery;

Emerging countries are catching up with IoT in a way that **enables innovation, new apps and adds value to existing ones;**

Implementers around the world are finding out how IoT could help them to build new, more effective and flexible services

Broadband is essential for IPv6 and IPv6 is critical for IoT

IoT Opportunities & Threats

The future of leveraging IoT for **developing countries is promising;**

According to McKinsey, the IoT market will generate from 4 to 10 Trillion a year by 2025, which represents 11% of the global economy. A *40% of this growth could be generated in developing economies;*

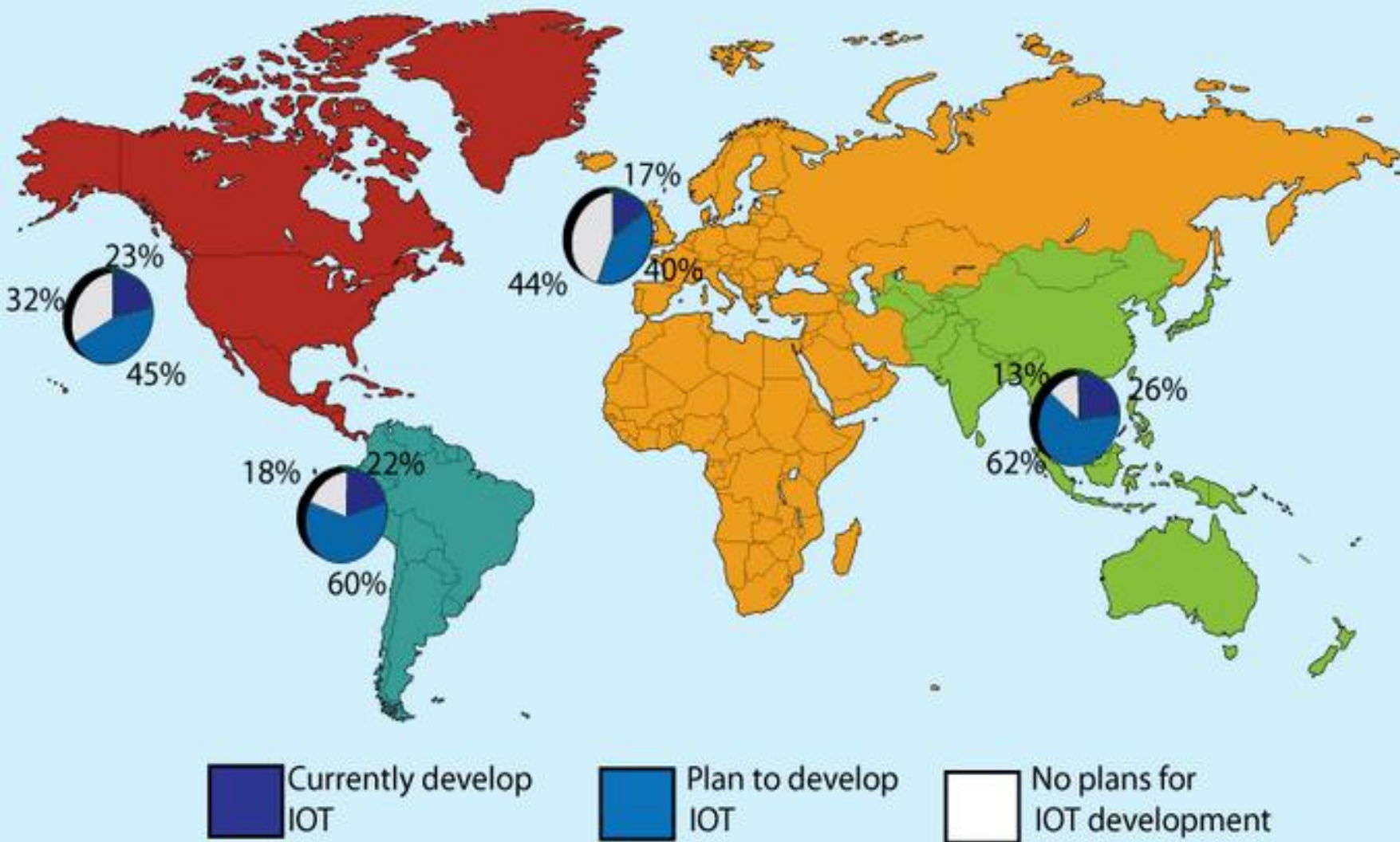
IoT and data revolution are opening opportunities to achieve development goals by providing new data sources that leads to the analysis, **understanding and tackling of existing development issues;**

Offer emerging markets world opportunities to increase the offer of Internet services and **to become a more competitive player** for Smart Cities, Grid, sensors and energy reduction (buildings, households) services, automation industry, tele-surveillance, tele-medicine, cyber-security.

However, cyber vulnerabilities remain the main challenges for IoT

Broadband is essential for IPv6 and IPv6 is critical for IoT

Global Distribution of Internet of Things Development



APAC and North American developers are the most likely to currently engage in IoT projects. APAC developers are more likely to have IoT in their plans.

Latin America Status

IoT investments.

- According to a survey(**) on how important developers consider IoT for the future?. **Latin Americas**, 60% of developers in the region are planning to begin IoT projects, while 22% already do.

Connectivity

- In 2016, according to Cisco, Latin American IP traffic **grew by 25%**, mainly with traffic growth of the **mobile internet at 87%**. However, when it comes to **IoT adoption** for the industry the percentage was low;
- Internet penetration by percentage of the population in Latin America **was over 50%, higher** than the world average and it is projected to grow by 2020 on 10%. According to Cisco, this has not pushed the growth of the number of connected devices in the same period of time. No progress is expected!
- **Latin America: 2 connected devices per person in 2014 and 3 in 2020, Western Europe 8** Internet-connected devices per capita in 2020. **USA**, 11.6 devices per person in 2020.

Current industrial IoT deployments

- According to Cisco, overall result may not be optimistic, but this did not stop a considerable impact in ICT enterprises. In fact, a large number of case studies are in place in Central and South American countries.

*Cisco 2015 VNI report

**Survey conducted by the Evans Data Corporation

The New Internet, IPv6

The New Internet – IPv6

Designed to **replace the current Internet protocol (IPv4)** addressing space providing millions and millions of IP addresses;

It is impossible to sustain economic growth with **IPv4, which has already been exhausted (4.3 Billion address space);**

IPv6 adoption has become an urgent global issue. However, **most of the industry is still on IPv4 and has not shown interest towards IPv6 (2^{128} or 3.4×10^{38});**

The only technical alternative for universal broadband access and innovative industry applications;

Essential force to generate Innovation, economic growth and employment.

Benefits v6 vs v4

- Greatly expanded address space (32/128 bits);
- Always-on capabilities - innovative Internet applications compared to IPv4;
- Expanded autoconfig mechanisms
- Extensions for authentication and privacy
- Enhanced mobile applications;
- Improved security, IPSEC support;
- Quality of service (flow labelling capability)
- Extensible, flexible, easy and cheap to implement.

IPv6 Implications for Emerging Countries

Vint Cerf, father of the Internet,

“The Internet needs to keep evolving and there are things that should happen beyond IPv6 but to overcome the present address space exhaustion, we need to implement IPv6 essentially everywhere.”



The IPv4-based Internet will not stop working, but it will stop growing, while the IPv6 based Internet is designed to grow for many years.

IPv6

Today, **it** is more relevant for **the least developed countries than for developed regions**, as the *enabler for technology development and integration with industrialized countries*;

The transition process

Creates new opportunities to boost Internet security, while identifying widely used structures that will no longer be supported when the IPv4 protocol will be replaced. Therefore, it is essential to establish *a security policy*, to remain alert to security vulnerabilities, as IPv6 continues to be adopted;

The open standard qualities of IPv6

Prevent the stakeholders from technology lock-in and excessive dependence from corporations

Broad band is essential to IPv6, and IPv6 is critical to IoT !!

IPv6 Forum Latin America

IPv6 Forum Status in Latin America

IPv6 International Forum

- Latif Ladid, President
- Members are: Forums, Councils, Task Forces

Latin American IPv6 Councils, Forums and Task Forces

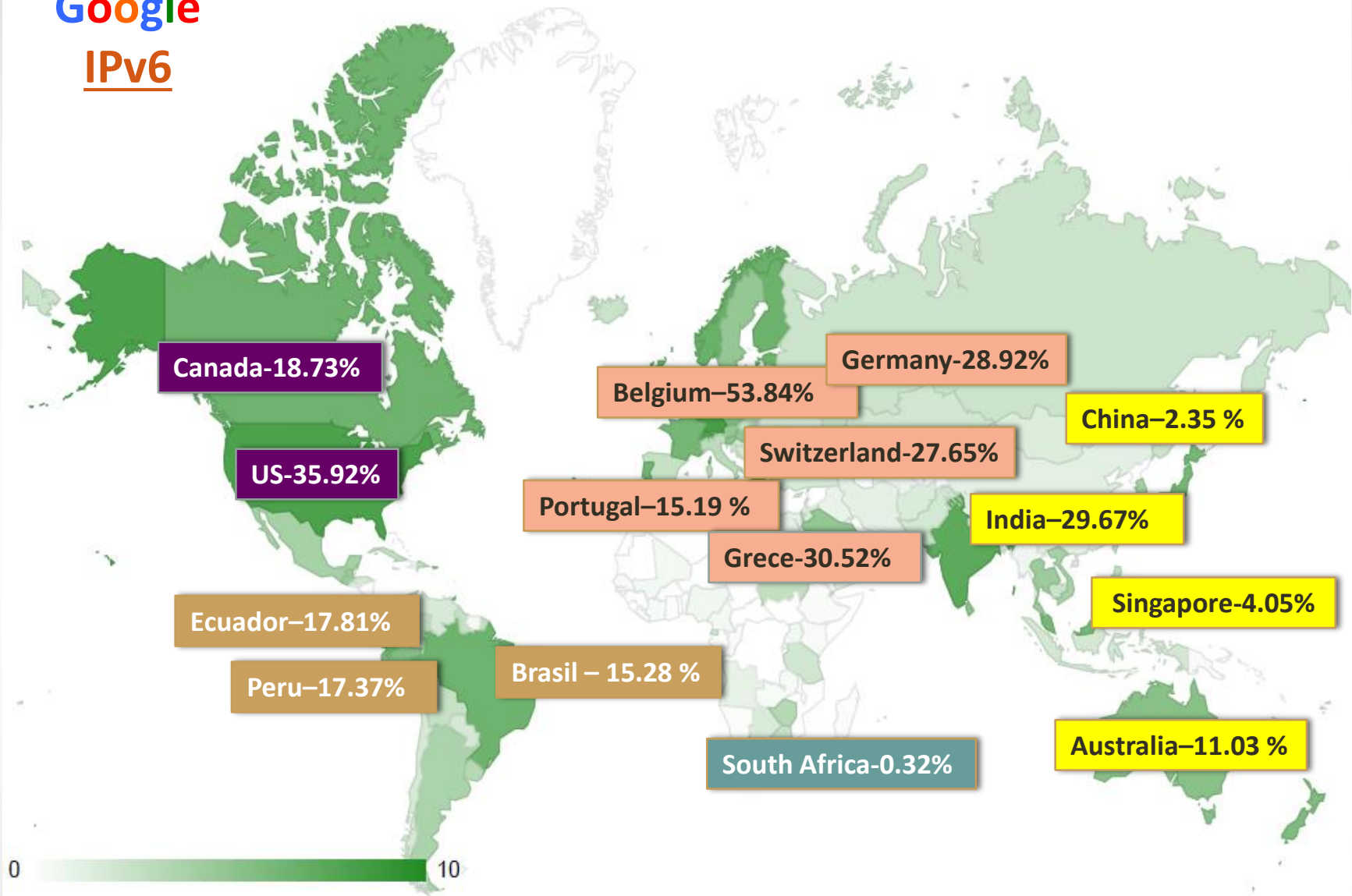
- IPv6 Councils: Peru, Colombia and Argentina (currently very active)
- Strong IPv6 Promotion Policy: Cuba, Colombia, Ecuador and Costa Rica.
- IPv6 Forum Chapters: in Brazil and Mexico, pioneers of IPv6 research in the region.
- IPv6 Task Forces: [Peru \(2005\)](#), Argentina, Brazil, Colombia, Cuba and Panama.



IPv6 Council Peru

- **24 Nov 2015** - Organization of the great national and international event of 'IPv6, innovation and competitiveness', Westin Hotel, Lima, Peru. It was attended by 300 members of the Peruvian and international technological and strategic society;
- **23 Nov 2015** - organization of an academic event at INICTEL with the participation of the NAP, Inictel and IPv6 Forum of Switzerland and Peru
- **Jun 2016** - Promote the proliferation of post-graduate thesis in technical areas and the social impact of IPv6 in Peru
- **Sep 2016** - Promote capacity building in Peru with the support of the Peruvian business sector (Camara de Comercio de Lima)
- **Jan 2017** - the Global IPv6 Forum granted the 'Jim Bound prize' to the IPv6 Forum Peru, due to its "Leadership in IPv6 Adoption and Deployment, a major achievement that requires skills, forward thinking and vision to empower Peru with a powerful Internet".
- **Aug 2017** - IPv6 Strategies and Deployment workshop for the Government of Peru (Vice-Minister of TICs). The panelists will be from IPv6 Council of Peru, operators, providers and other experts.

IoT & IPv6 Figures



<https://stats.labs.apnic.net/ipv6/>

IPv6 Adoption Worldwide

IPv6 Users by Country

Date: 30 May 2017

Source: <https://labs.apnic.net/dists/v6dcc.htm>

Index	ISO-3166 Code	Internet Users	V6 Use Ratio	V6 Users (Est)	Population	Country
1	BE	10109309	55.43	5603935	11422949	Belgium
2	DE	70971603	41.88	29721011	80649549	Germany
3	CH	7353067	35.22	2589638	8432417	Switzerland
4	US	288324176	34.24	98718472	325790030	United States of America
5	GR	7063611	33.45	2362723	10900635	Greece
6	LU	553892	32.47	179859	581820	Luxembourg
7	PT	6915955	26.52	1833771	10276308	Portugal
8	IN	465606607	24.97	116269017	1337950022	India
9	GB	60555720	24.76	14995195	65394947	United Kingdom of Great Britain and Northern Ireland
10	JP	114900869	22.12	25411557	126126092	Japan
11	IE	3838543	21.37	820422	4738942	Ireland
12	FR	56039156	18.63	10441291	64860135	France
13	PE	13141549	18.40	2417957	32052560	Peru
14	CA	32326774	18.33	5924311	36527429	Canada
15	EC	7135628	18.24	1301857	16555983	Ecuador
16	EE	1194349	17.57	209799	1306728	Estonia
17	MY	21296431	16.11	3430537	31044361	Malaysia
18	NO	5207437	14.78	769507	5313712	Norway
19	AU	20887921	14.54	3036307	24545149	Australia
20	TT	945247	14.22	134397	1367942	Trinidad and Tobago

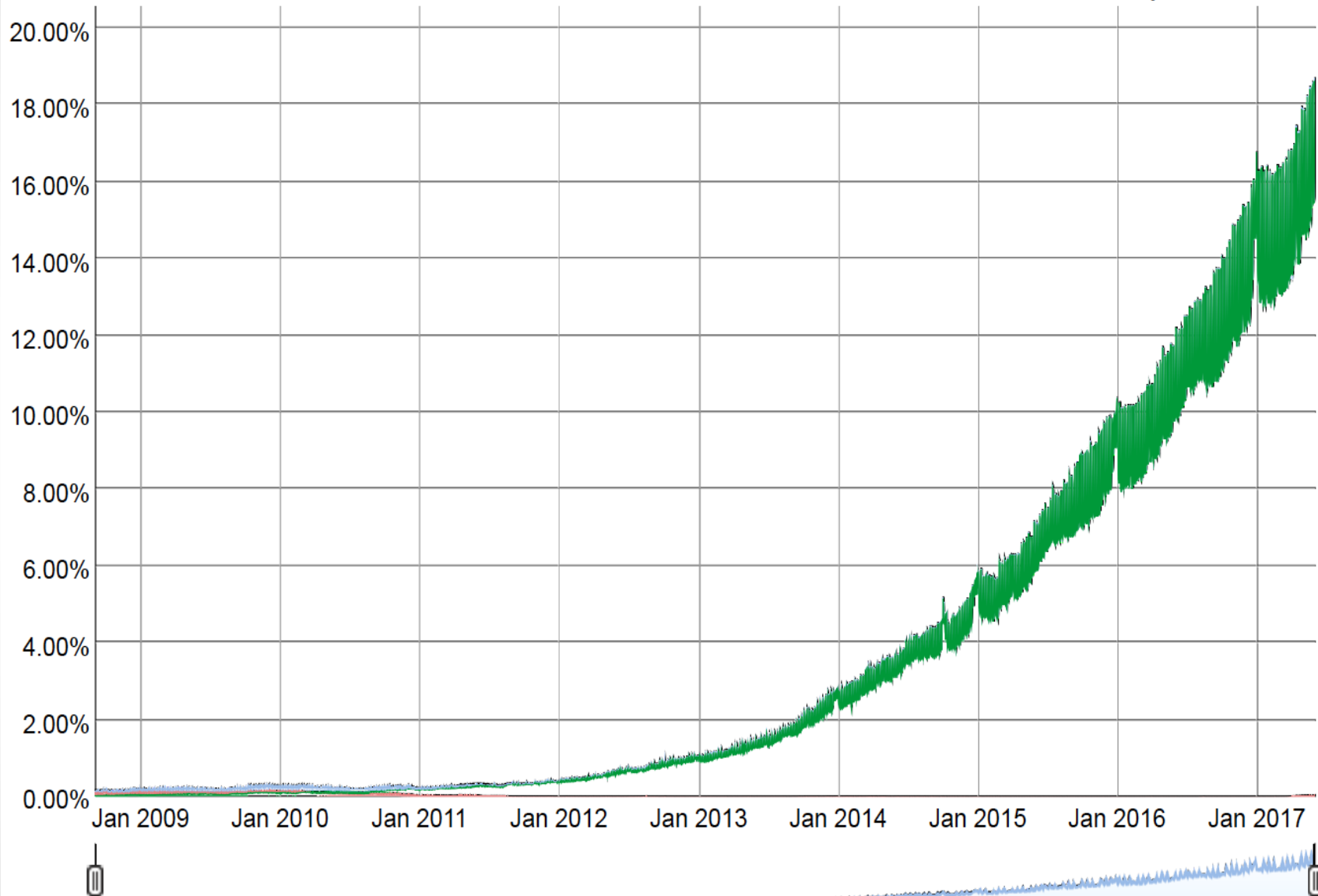
Today, Brazil, Ecuador and Peru are among the Top 15 of IPv6 Users worldwide, although Ecuador and Peru were not known among the most "techies" in the Latin American region during the long life of IPv4.

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IPv6 Adoption

Native: 18.20% 6to4/Teredo: 0.05% Total IPv6: 18.25% | Jun 4, 2017



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IPv6 Background in Peru



*Best known for its Machu Picchu and
its pan flute*

Some Good Symptoms in Peru

Peru is one of the Top 15 countries in IPv6 since 2012

The first emerging country, according to Google, to join the countries with the highest IPv6 penetration in the world - Peru, an IPv6 Success Story?;

The creation of the Vice-Ministry of Technologies of the Information, 2016

Replaces the Vice-Ministry of Communications with new objectives and functions that will be oriented to promote the digitization of the State to better serve the citizens. Costa Rica, Colombia and Brazil are the reference when we speak about adopting, developing and promoting public policies;

Telefonica del Peru (TdP)

Excelled in its deployment efforts of IPv6 is placing Peru among the top IPv6 nations in the world since 2013. How did TdP achieved its IPv6 deployment efforts? With just 24.0% of investment in its network, they managed to cover 99.95 % of total Peru with IPv6 network. Other operators will be providing IPv6 services as from 2017 (<http://labs.apnic.net/dists/v6dcc.html>);

Extensive infrastructure deployment

Since last 5 years, strong investment for massive fiber optic networks to enhance access to the Internet and the possibility to offer more IoT, mobile and Cloud services (more than 40,000 Km of fiber optics to bring the Internet to more than 1,700 districts of the country. MTC budget for 2017 is of US \$ 2,400 million);

Peru's economic growth reached 3.9% at the end of 2017

With an annual projection to reach 4% in 2017, the Peruvian index is the highest in the region;

BBC Mundo: Most attractive and optimistic country to live in Latam

In 2017, Peru has been considered **the most attractive** country in Latin America for living and working. Peruvian's optimism is reflected both locally and globally, the second nation with the highest percentage of people that expects more economic growth.

Peru

Display Users Data ? (../stats/information.php#users)



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IPv6 Barriers in Peru

Peru is growing faster than many countries in the developed world but, **but some shortfalls** remains the main challenges to address:

- Lack of leadership and institutionality to adopt IPv6 by the different sectors of the industry and government;
- Lack of adequate level of knowledge, experience, IP skills and network infrastructure to support IoT advanced applications;
- Lack of adequate training or excellence centers
- Limited generation **of digital content** and applications related to eGovernment, Smart City, eHealth, eEducation, IoT, and so on.
- Compared to other countries of the region, the Peruvian ICT **market is still small**

A limited investment in areas that directly affects competitiveness, economic growth and job creation.

- Until 2015, Peru invested 0.20 % of GDP in technology, innovation and science, while other countries in the region reached 0.5% of GDP (Foreign Trade Society of Peru, ComexPerú).
- Low budget and priority for research, development and innovation (R+D+I). Only 0.20% of its GDP was allocated to this topic while other countries in the regions allocated 5-10 times higher;
- Budget constraints to access, Internet and related services, due to the low income in some regions.



IPv6/IoT Potential Apps Latin America



Collaboration between public and private sector

To invest on Innovation is key !!

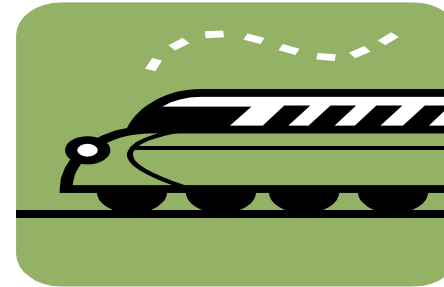
Investors need to **be confidence in the economy they invest;**

Educate authorities, entrepreneurs and information society on IPv6 implications for **competitiveness, innovation and differentiation** is more than urgent;

Commitment to improve environmental sustainability in areas such as renewable energies, water management recycling, waste re-utilization and so on;

Industry needs support from scientists and talents to create opportunities and recover research talent within the region.

IPv6 – IDs & Transports



WiFi Connectivity

Information to passenger
Traffic monitoring
Passenger Access to the
the terminal Wifi.



e-Luggage
(smart cards)

No more Lost
Luggage but,
luggage
directed to
follow
passengers
(RFID)



No more
passport
checking but,
iris & facial
recognition

e-Passport
(e-IDs)



Airport Services



Peruano Digital promueve el desarrollo e inserción productiva mediante el uso de las TIC y el Internet

**Innovation must serve the needs of
rural areas startups**

Opportunities in Peru

Peruvian's economy is a source of global opportunity, not a risk

Successful industry sectors which may need more automation, efficiency, creativity and innovation.

IoT apps

In Peru the IoT impact follows the pattern of world development but the progress is being perceived more in some specific niches:

Mining companies (security, green technologies, mineral separation.)

Peru has introduced robotics and innovative solutions in the exploitation sector. It exports mining 'knowledge' and products to Bolivia, Ecuador and Chile. Some companies have all their assets interconnected: Caterpillar machines, for example, share all their automated movements. That overcomes the problem of downtime for such expensive machinery (Cisco Data Center).

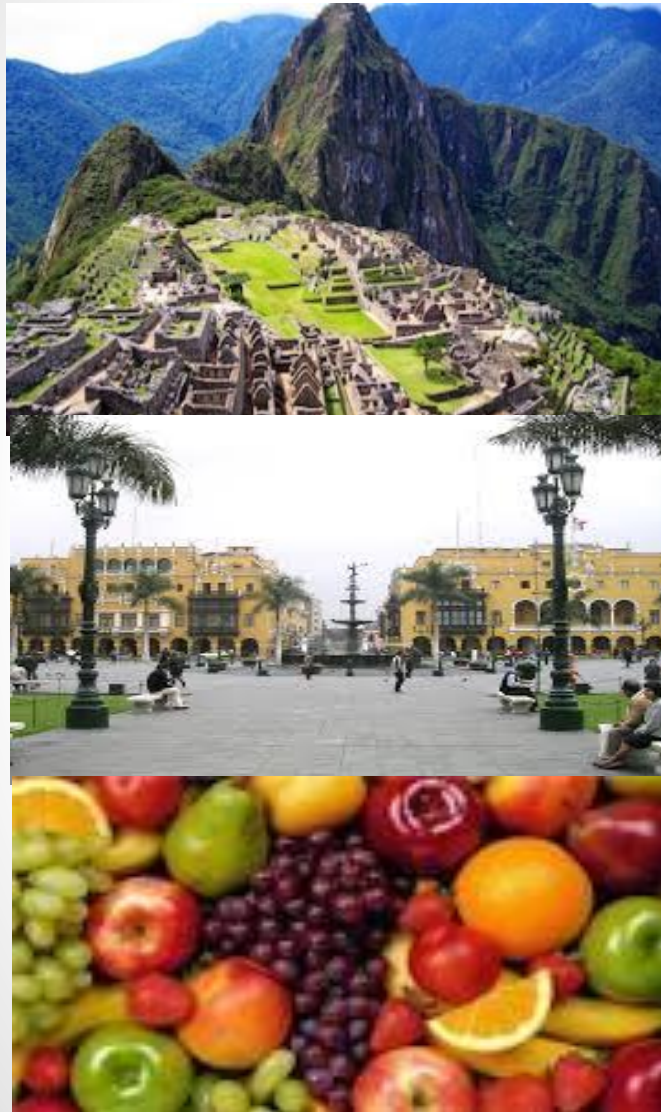
Financial sector as, VisaNet or Mastercard can accumulate information through an M2M device as basic to these times as the well-known POS.

Alarm companies provide services to their customers to control the security of their homes remotely.

Advertisement management billboards is an example. The companies until recently sent a person to change the billboards and place the new notice. Now they have decided to interconnect them with M2M and they do it from a device.

The developments of LG and Samsung in appliances: there is no longer one that does not incorporate the option of operating with IoT.

Other applications will find correlate as part of the new global standards of their industries.



Collaboration between public and private sector



Some Latin American current projects – not IPv6 yet

Drones to be controlled from your mobile phone.

- *In Peru drones are measuring the purity of the air in the mining surroundings (4000 to 5,000 meters over the sea level)*

- In Dubai, they are speeding up the document delivery service.



Floods Alert: The floods produced by 'El Niño' the current caused deaths and homeless people in 2017 in the north of Peru. Today, the government is seeking to use boats and cruises in the Pacific cost, Amazons river and some other rivers to measure the water's temperature to alert on future potential floods.

Floating banks: Latin America's largest public bank, Caixa Econômica Federal, has many customers living in isolated communities attached to the Amazon River. To reach these people, the bank looked to the waterways (satellite technology).

Internet Cabines: Kiosks located across rural parts of the country that allow people to connect to the internet and access e-learning services, as well as provide online public services (photocopy machines, use of PCs, small business marketing)

Banking Trucks: parked up in the village main square that provides basic banking services to people in most isolated places. These trucks will have a reliable and secure and reliable mobile broadband connection linking them with the main banks to get loans, pay bills from the truck, etc.

Smart cities: driven by automation and IoT technologies, to respond to environmental and social concerns (wasting energy, citizen safety, water usage, emergency response, sensor technologies-parking spot availability). Advanced data analytics tools monitor, analyze and optimize the way traffic flows on city streets and ensure that public transportation supply meets user demand. Opponents are worry that city managers **will not keep data privacy** top of mind and handle the huge amount of data that citizens produce on a daily basis sensitively.

Conclusions and the way to go



Conclusions & Recommendations

Latin America is now catching up with its ICT retard;

*Latin American nations recognize the importance of **being among IoT/IPv6 'early adopters'** for sustainable development;*

*State leadership is crucial, the **IPv6 Roadmap for government agencies** will speedup the IPv6 adoption process in the country;*

*State, private sector and academia need to be **involved in intensive IoT/IPv6 awareness and capacity building efforts;***

IoT is here!! Benefits deployment need to be maximized, while minimizing potential risks to security, privacy, interoperability, standards and regulatory;

A limited investment in areas** that directly affects competitiveness, economic growth and job creation remains a barrier to development. **Investment in (R+D+I) projects is crucial.

***IoT/IPv6 will contribute to poverty reduction,** if it is tailored to the needs of the poor and if it is used for the right purposes.*

Next Steps

World Top 10 in IPv6 positioning should serve to harvest benefits that keep growing the Internet and foster potential innovation and new technologies in Peru;

Launch the IPv6 Roadmap for government agencies
(implementation and monitoring);

Educate authorities, entrepreneurs and information society on IoT/IPv6 implications for competitiveness, innovation and differentiation.

The most successful industries should take the lead in (R+D+I) projects including **legacy systems to be replaced** by state-of-the-art technologies;

More policies to foster innovation, free movement of data
and the ability to trade in digital services;

More IPv6 contents (tourism, gastronomy, culture, museums, etc);

More local ISPs and providers need to move to IPv6 (competition);

More adequate training/excellence centers at national level;

Connecting the unconnected or undeserved users so that
'the poor can directly benefit of the use of IoT' applications.

Thank you

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National Network of Optical Fiber

Connecting the country Cost, Andes and Amazons



Inter-Oceanic Projects

In partnership with China

Brazil-Peru Highway

Así será el recorrido del tren bioceánico

Inversión: US\$ 10 mil millones

Tendido Perú-Brasil: 8.000 km (5.000 Brasil y 3.000 Perú)

Tiempo de construcción: 5 años



Brazil-Peru Train

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