The IPv6 Forum
The New Internet

IPV6 FORUM

ITU Committed to connecting the world

SUSTAINABLE DEVELOPMENT G☉ALS

Focus Group on Vehicular Multimedia (FG-VM)

IPv6-Based
Vehicular Multimedia
VISION

IPV6 FORUM

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Target: One Internet

	InterNET InterNAT	Dual-NET	New InterNET
	IPv4/NAT 2^{32}	IPv4/NAT/IPv6	IPv6 2^{128}
Address Space	NAT Only	NAT /IPv6	No IPv4 – No NAT
Network Control	Loose Ends	IPv4 Fallback	e2e Control
New functions	None	IPv6	New e2e SRv6, Bierv6
CAPEX OPEX	Heavy	Very Heavy	One Internet

2

Broken Internet: IPv4 --- NAT   --- CGNAT

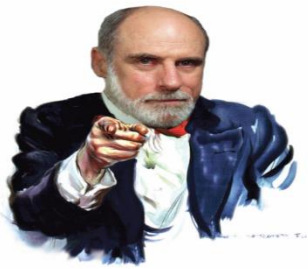NAT: the only alternative for large and growing networks

Photo: Xinhua News

IPv6 goes direct, access to legacy IPv4 resources via constrained NATs

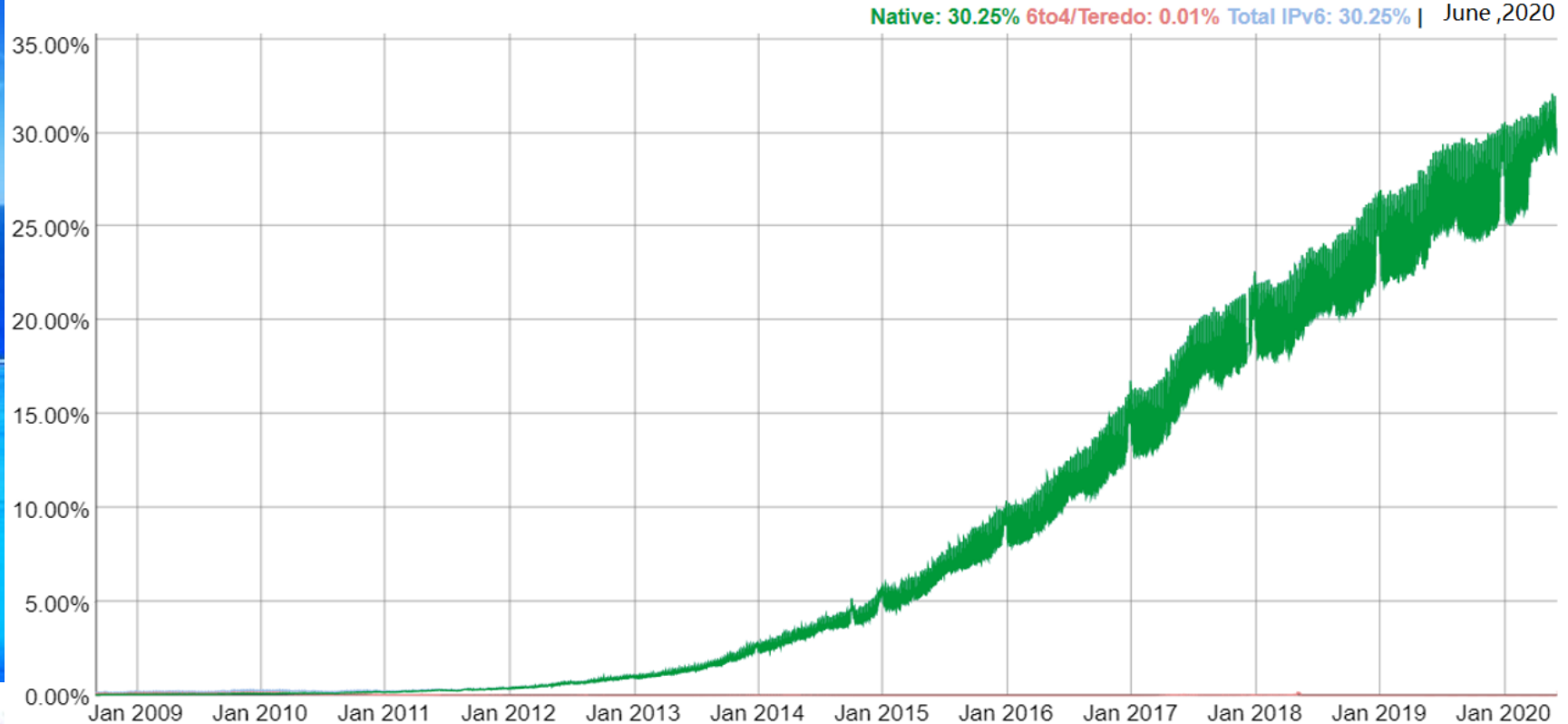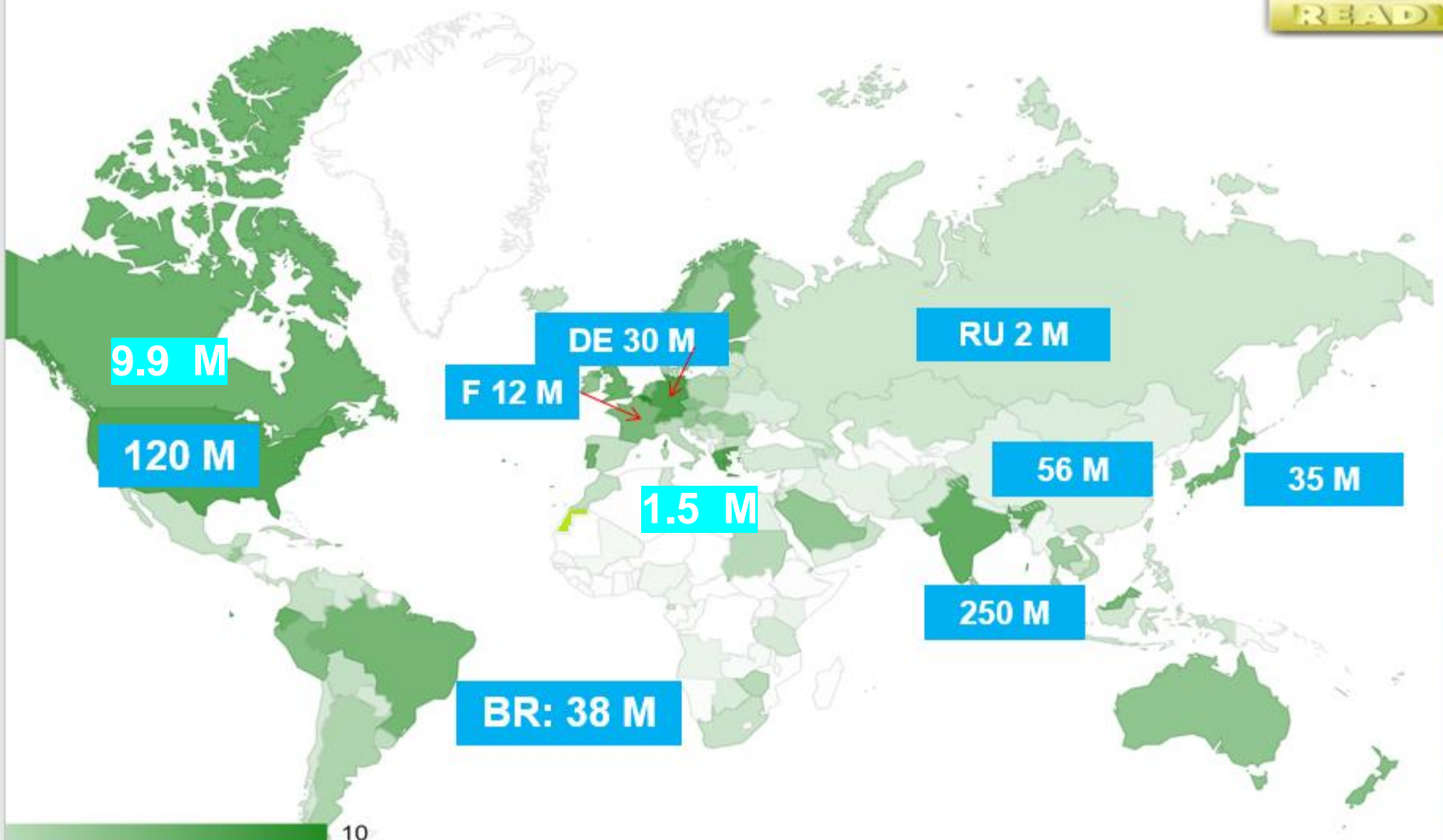# IPv6 Brings User-Experience from the Economy Class to the Business Class

IPv6 +

IPv4

IPv6

First Class

Business Class

NAT
Luggage
Class

Crossed 30%
Google v6 Users 2
100% by 2025

I WANT YOU TO USE IPv6
— VINT CERF

Google™

Native: 30.25% 6to4/Teredo: 0.01% Total IPv6: 30.25% | June ,2020

IPv6 Deployment Worldwide

9.9 M

DE 30 M

F 12 M

RU 2 M

120 M

1.5 M

56 M

35 M

250 M

BR: 38 M

10

WEB Generations

WEB 1.0	WEB 2.0	WEB 3.0	WoT
IPv4	**IPv4/NAT**		**IPv6**
HTTP	HTML	XHTML	WoT
WWW	Interactive	Semantic Web	
Tim Berners-Lee	Tim O'Reilly	W3C	Dave Raggett
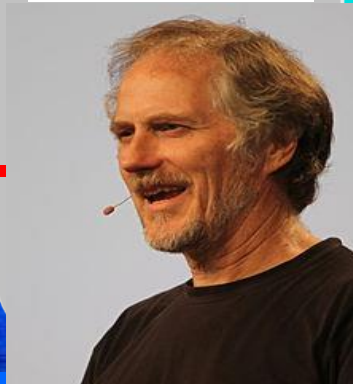
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I o T Generations

	IoT 1	IoT 2	IoT 3
IP	**Non-IP**	**IPv4/NAT**	**IPv6**
Technology	**RFID/KNX BackNet LoRA**	**One-Way Gateways**	**Two-Way Things-2-Things**
Media	**Network of Things**	**IoT devices**	**IPv6 Sensors ...**
	Kevin Ashton		
			Global IoT Internet

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Success Challenges: Kevin Ashton 2012

ADDRESSES
LOW POWER
SENSOR DATA FORMATS
PHYSICAL MARKUP LANGUAGE
MACHINE LEARNING INTERCHANGE
LOSSLESS COMPLEX SIGNAL COMPRESSION
STREAMING DATA FOR FEEDBACK SYSTEMS

Use IPv6

Harvesting Power Wireless Power

Open data formats

CoAP

Autonomicity

standardisation

Sensor QoS

Potential Economic Impact of IoT in 2025

$3.9 – 11.1 Trillion value of IoT

Potential economic impact of IoT in 2025, including consumer surplus, is $3.9 trillion to $11.1 trillion

Legend: ■ Low estimate □ High estimate

Size in 2025[1]
$ billion, adjusted to 2015 dollars

Settings — **Total = $3.9 trillion–11.1 trillion** — **Major applications**

Settings	Size in 2025 ($ billion)	Major applications
Human	170–1,590	Monitoring and managing illness, improving wellness
Home	200–350	Energy management, safety and security, chore automation, usage-based design of appliances
Retail environments	410–1,160	Automated checkout, layout optimization, smart CRM, in-store personalized promotions, inventory shrinkage prevention
Offices	70–150	Organizational redesign and worker monitoring, augmented reality for training, energy monitoring, building security
Factories	1,210–3,700	Operations optimization, predictive maintenance, inventory optimization, health and safety
Worksites	160–930	Operations optimization, equipment maintenance, health and safety, IoT-enabled R&D
Vehicles	210–740	Condition-based maintenance, reduced insurance
Cities	930–1,660	Public safety and health, traffic control, resource management
Outside	560–850	Logistics routing, autonomous cars and trucks, navigation

Massive Capacity

Adrian Scrase
CTO – ETSI
Secretary 3GPP

April 2019

- Key requirement for IoT-dedicated radio interfaces. Besides the physical layer itself, this is achieved by a set of improvements such as:
  - No data transmission when the device has "nothing to say" (also improves consumption)
  - Random spread of start transmit time, so e.g. all the electricity meters do not start sending their data at the same time
  - Devices Grouping, so e.g. all the electricity meters can be addressed at once
- Naming, numbering and addressing:
  - Alternatives to E.164 for Machine-Type Communications:
  - Use of IPv6 addressing, instead of (capacity limited) E.164 numbering

Cloud Computing Generations

	CC 1	CC 2	CC 3
IP	IPv4/NAT		IPv6
Technology	Shareware	AWS Propietary	Openstack
Media	-		..
		C. Pinkham W. Van Bilijon	HB
			Global CC

Wireless Generations

0G	1G	2G	3G	4 G	5G

Non-IP → **IPv4/NAT** **IPv6**

Analogue		GSM	WCDMA	OFDM	MIMO/ mmWAVE
Voice	Voice	Digital V	WAP	IMS	IOT?
urprise: Fax & Modem	Eaves-dropping	SMS	WEB	Youtube	VERTICALS

3GPP
A GLOBAL INITIATIVE

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Very Next Wireless Generation

5G

IPv6

MIMO/ mmWAVE

IOT?

VERTICALS

W. Internet

6G

IPv6

Teraherz

Indoor Terabit

DEEPER VERTICALS

W. Internet

Future Networked Car Symposium

5 March 2020
Geneva, Switzerland

Geneva International
Motor Show

FNC 2020

IPv6 endorsed at the FNC 2020

https://www.itu.int/en/fnc/2020/Documents/The%20Dispatcher_April%202020.pdf

Organized by

UNECE ITU

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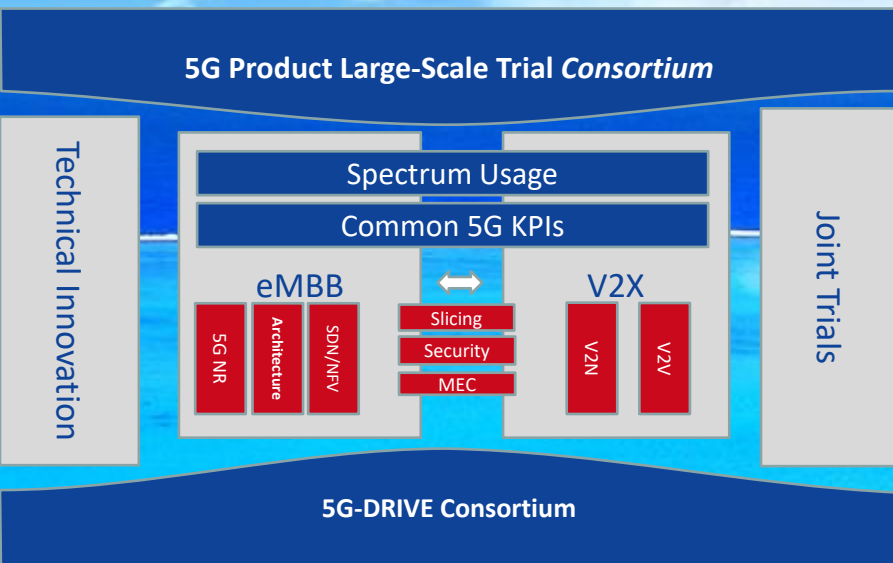**5G Harmonised Research and Trials for service Evolution between EU and China**

GA No. 814956
H2020-ICT-22-2018 | EU-China 5G Collaboration

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5G-DRIVE in nutshell

- 5G DRIVE aims is to bridge current 5G developments in Europe and China through joint trials and research activities in order to facilitate technology convergence, spectrum harmonisation and business.

- 30-month (September 2018 – February 2021) Research and Innovation Action project, funded under the Horizon 2020 Framework programme.

- 17 partners from 10 European countries (Germany, Finland, Belgium, Italy, Switzerland, Poland, Greece, Portugal, United Kingdom and Luxembourg).
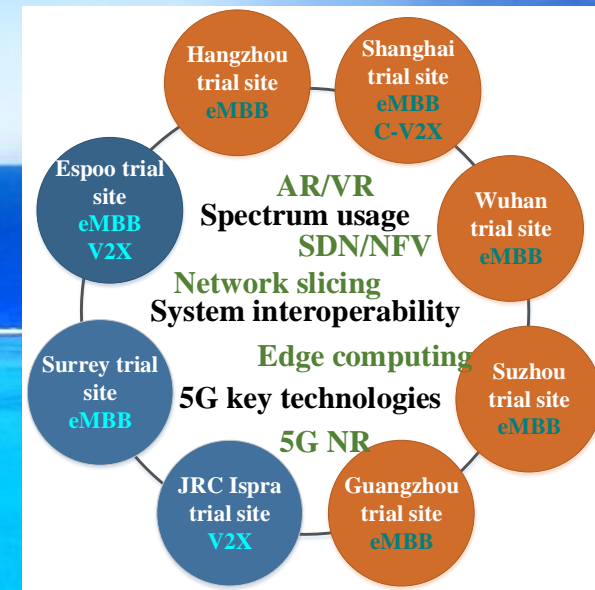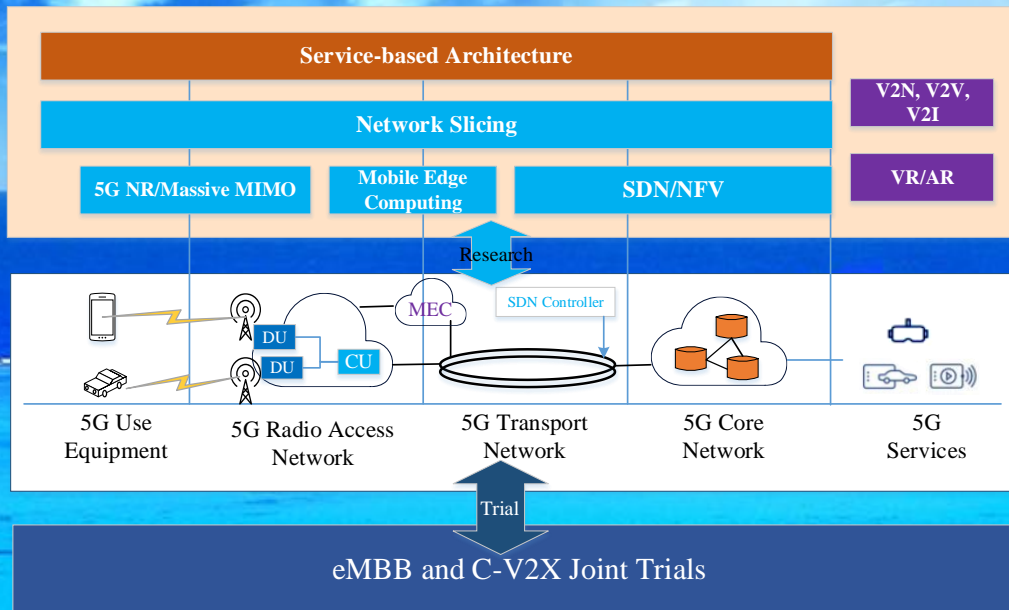

5G Product Large-Scale Trial *Consortium*

Technical Innovation

Spectrum Usage

Common 5G KPIs

eMBB | V2X

5G NR | Architecture | SDN/NFV

Slicing | Security | MEC

V2N | V2V

Joint Trials

5G-DRIVE Consortium

Chinese Twin Project Consortium: China Mobile, Huawei, Datang, Ericsson China, Trac Management Science Research Institute MoPS
Research Institute of Highway MoT, Shanghai International Automobile City
Beijing University of Posts and Telecommunications
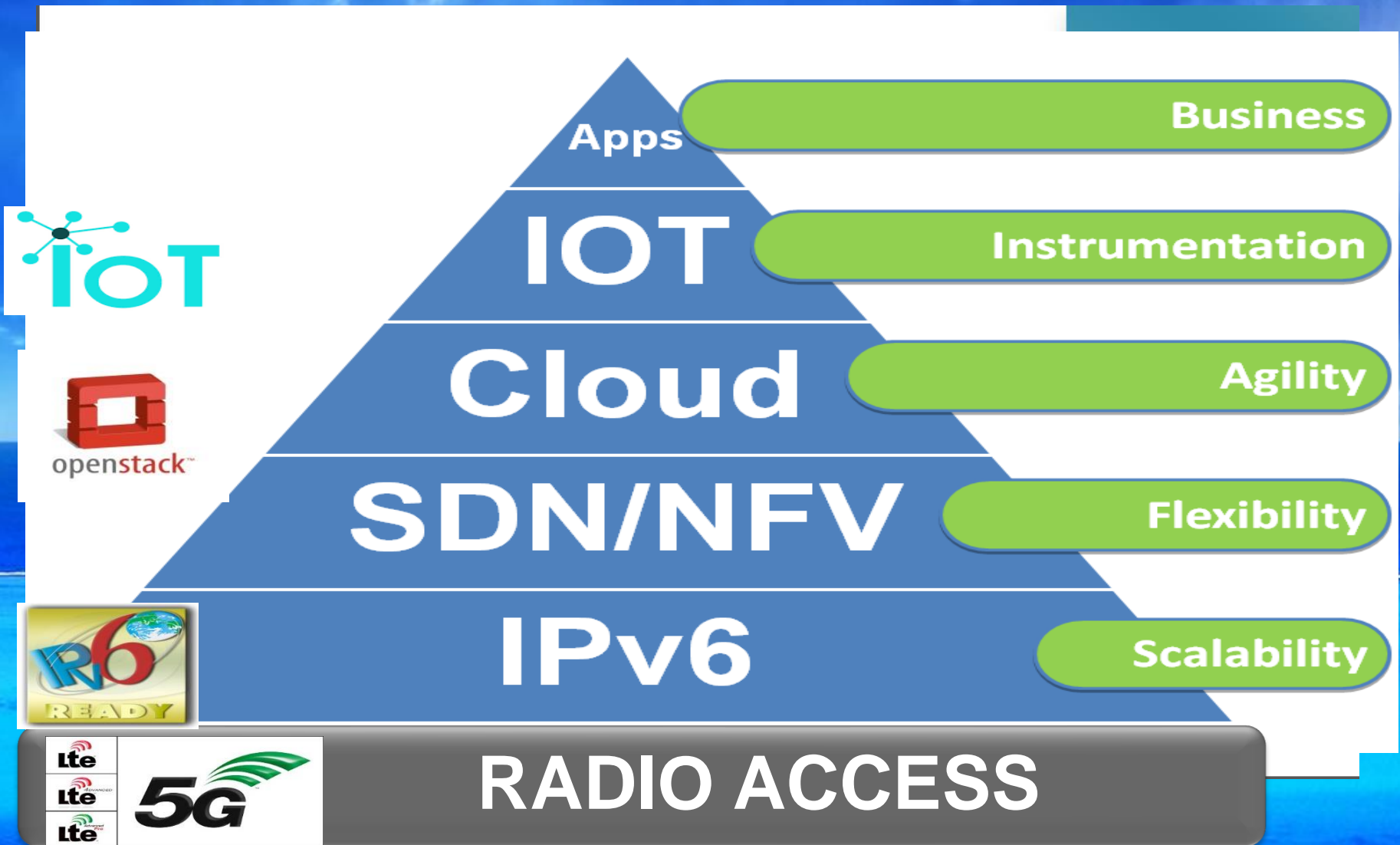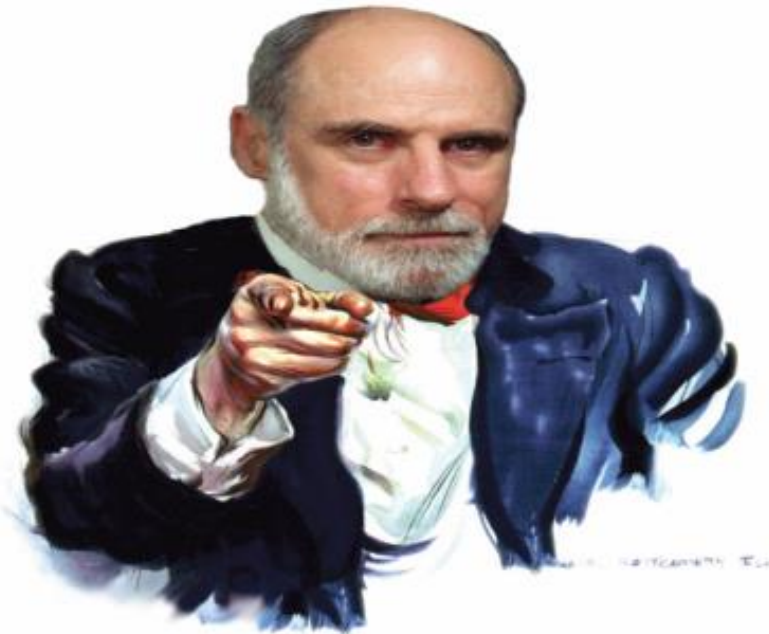
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EU-China 5G trial collaboration

► **5G-DRIVE collaborates with 5G Product R&D Large-scale Trial project led by China Mobile**
  □ **Cover from terminals, RAN, transport network, core network, and 5G services**
  □ **5G trial cities in Chinese twinning project**

Service-based Architecture

V2N, V2V, V2I

Network Slicing

VR/AR

5G NR/Massive MIMO | Mobile Edge Computing | SDN/NFV

Research

SDN Controller

MEC

DU
DU   CU

5G Use Equipment | 5G Radio Access Network | 5G Transport Network | 5G Core Network | 5G Services

Trial

eMBB and C-V2X Joint Trials

Hangzhou trial site eMBB
Shanghai trial site eMBB C-V2X
Espoo trial site eMBB V2X
Wuhan trial site eMBB
Surrey trial site eMBB
Suzhou trial site eMBB
JRC Ispra trial site V2X
Guangzhou trial site eMBB

AR/VR
Spectrum usage
SDN/NFV
Network slicing
System interoperability
Edge computing
5G key technologies
5G NR

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Message From Vint Cerf Honorary Chair IPv6 Forum