TẬP ĐOÀN BƯU CHÍNH VIỄN THÔNG VIỆT NAM

IPv6 for 5G and the Industrial Internet

Building the Next-Generation Digital Infrastructure

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Agenda

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02 Implementing IPv6 for 5G and IIoT

03 Case studies

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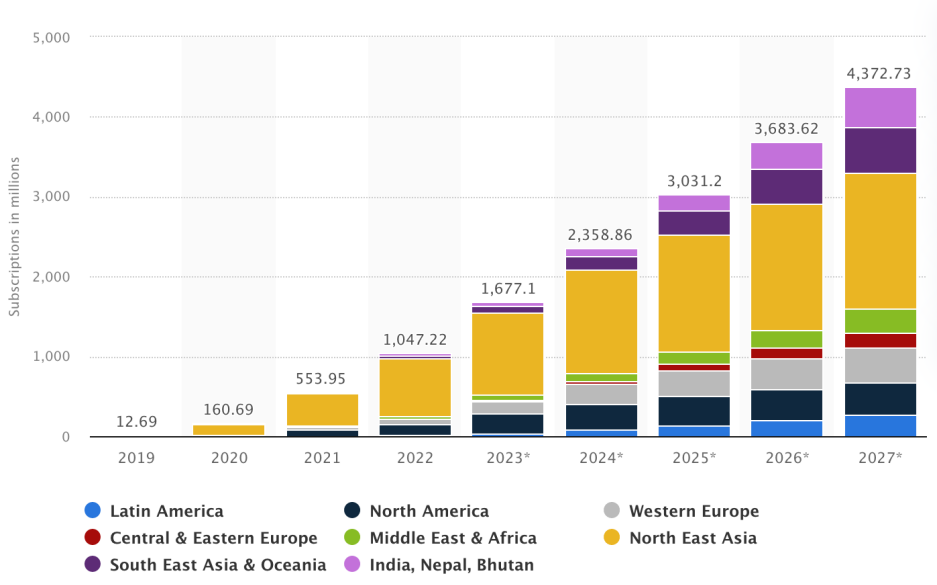
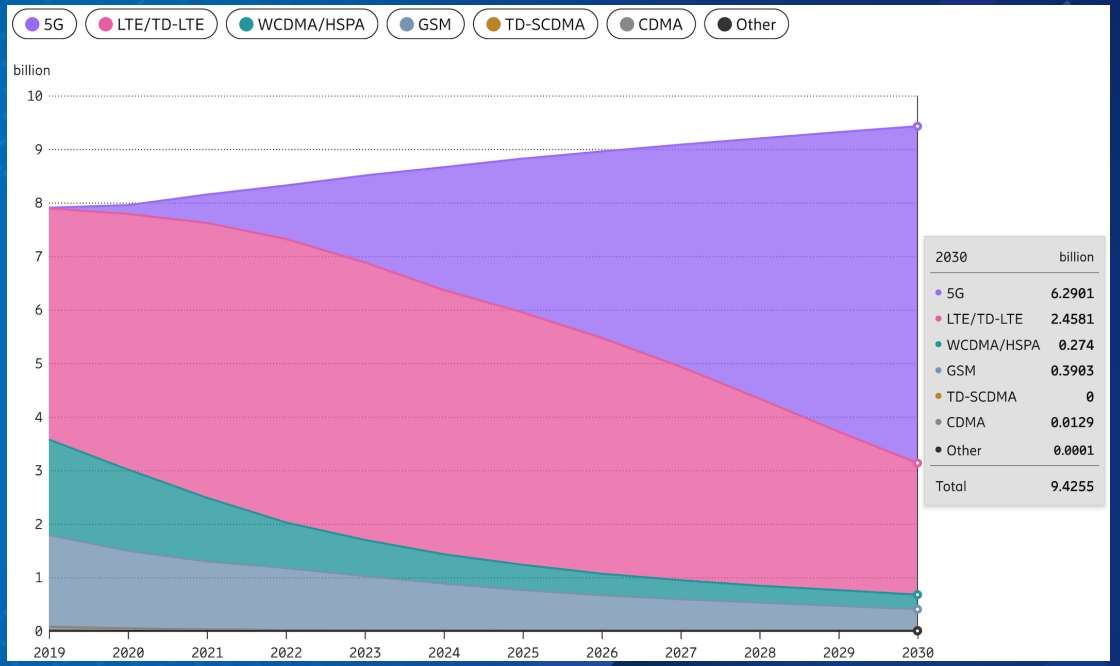
05 Suggestions

1 Why IPv6?


MEDIA HUB
FINTECH
Ai
4G
VNPT E-Learning
VNPT Cloud
VNPT IoT Platform
oneSME
5G
VNPTPay
SMART CITY

5G Forecast





5G subscribers forecast to 2030 (source: Statista, Ericsson)

- *7/2025: Viet Nam has ~ 11 million 5G users (Viettel: ~ 6 mil; VNPT's Vinaphone: ~ 3 mil; Mobifone: ~ 2, 5 mil) (source: Telecom Review Asia)*

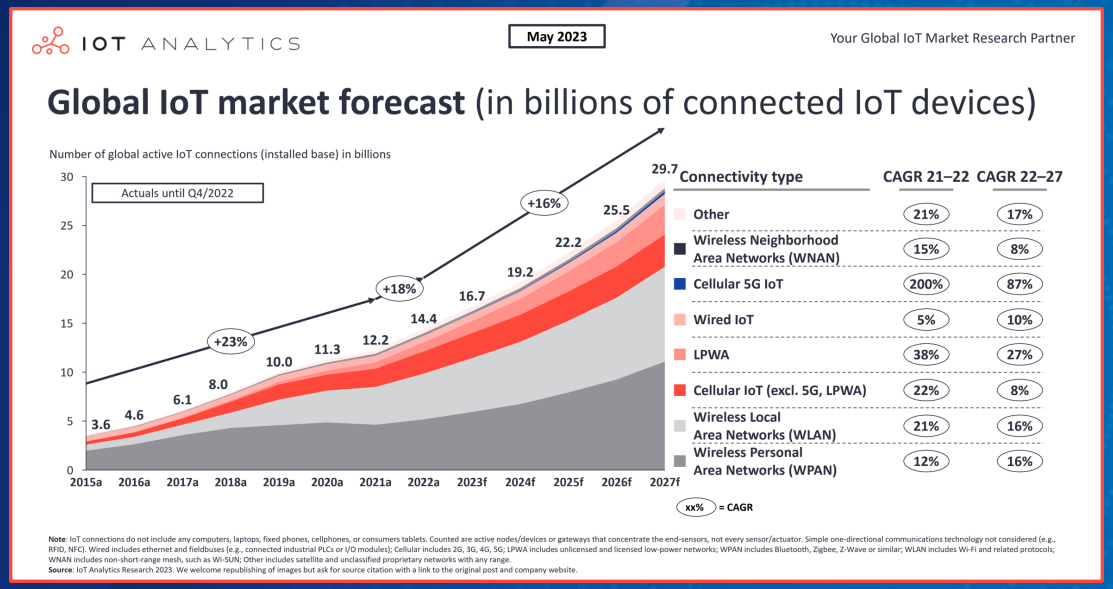
IoT Forecast

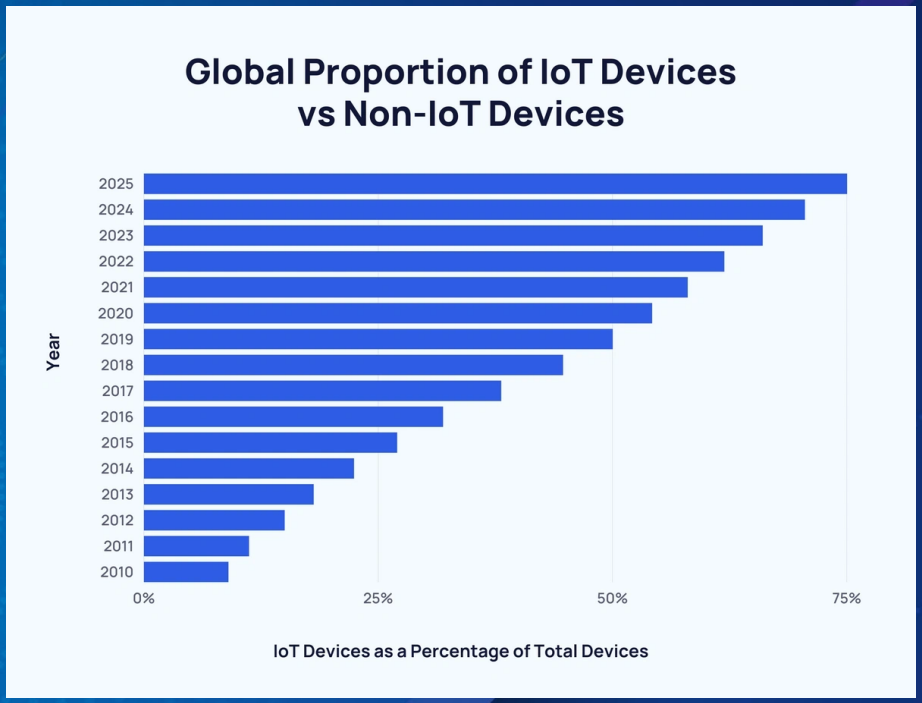
A network of interconnected devices, sensors, and machines within industrial settings that autonomously collect and exchange data in real-time, enabling enhanced monitoring, control, and optimization of industrial processes without the need for human intervention

Industry IoT
Stay Connected

Industrial Internet = Industrial IoT (IIoT) = IoT + Cloud + Big Data + AI in Industry

IoT Forecast



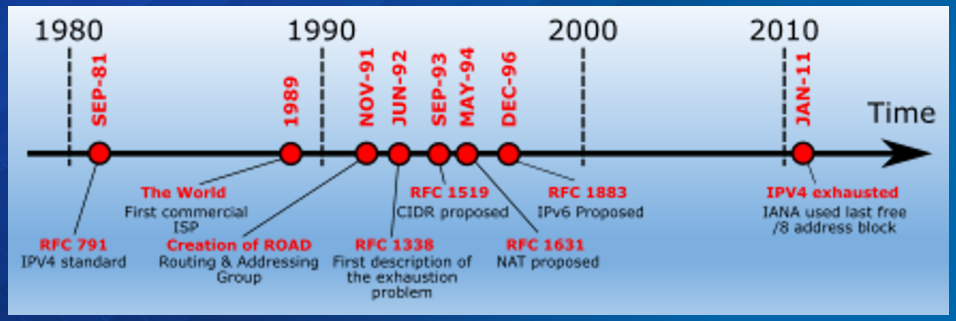


Global IoT from 2015 to 2027 (source: IoT Analytics)

- *Forecast to 2027: 15 million IoT devices in Viet Nam (source: Deloitte)*

Why IP6

The critical role of IPv6 in 5G and IIoT



IPv4	IPv6
Deployed 1981	Deployed 1998
32-bit IP address	128-bit IP address
4.3 billion addresses Addresses must be reused and masked	7.9×10^{28} addresses Every device can have a unique address
Numeric dot-decimal notation 192.168.5.18	Alphanumeric hexadecimal notation 50b2:6400:0000:0000:6c3a:b17d:0000:10a9 (Simplified - 50b2:6400::6c3a:b17d:0:10a9)
DHCP or manual configuration	Supports autoconfiguration

✗ *The limited address space of IPv4 cannot meet the demands of 5G and IIoT.*

✓ *IPv6 is indispensable for 5G and IoT:*

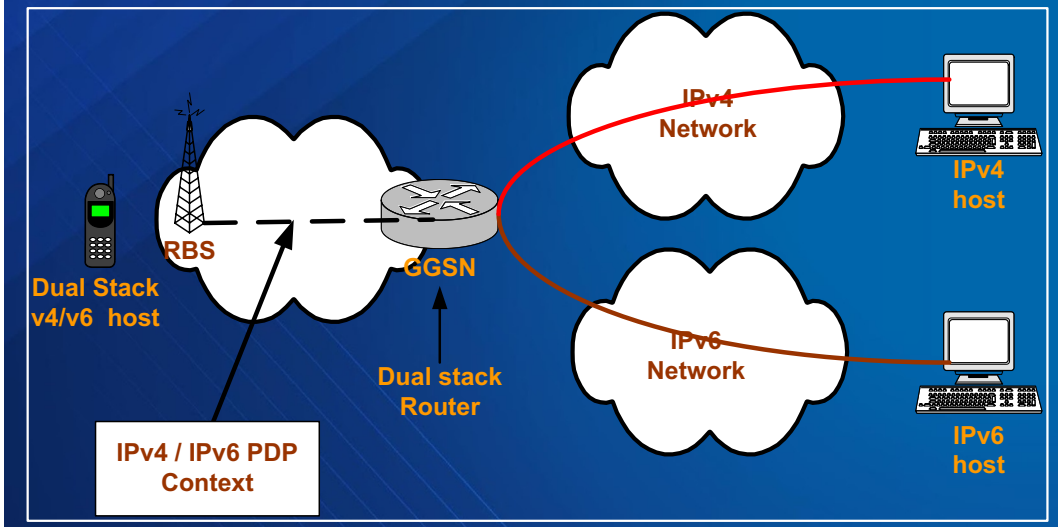
1. *Virtually unlimited address space*
2. *Supports billions of devices connected simultaneously*
3. *Enhances security, flexibility, and mobility*

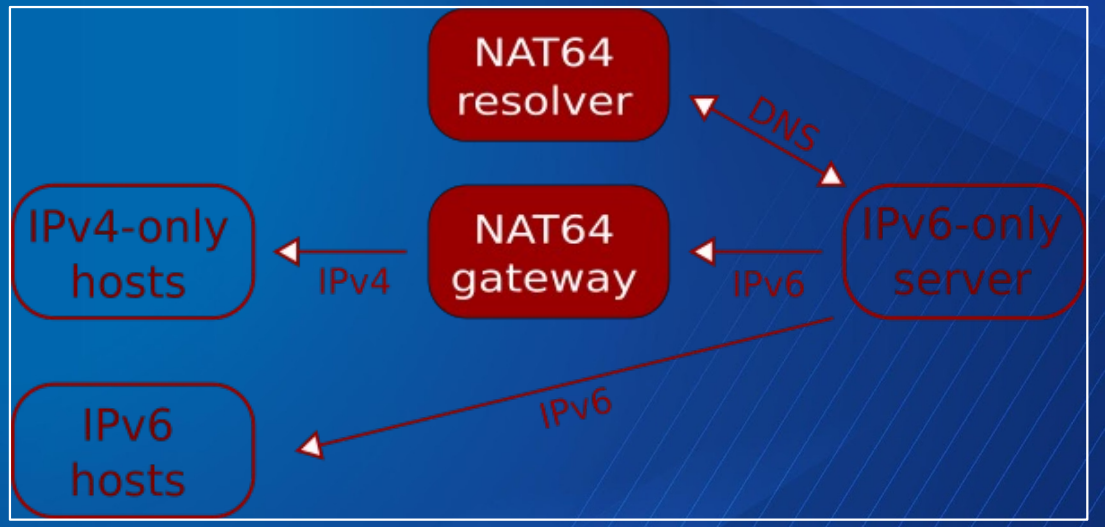
2 Implementing IPv6 for 5G and IIoT

Implementing IPv6 for 5G and IIoT

The two most common methods of deploying IPv6

- *Dual - stack.*
- *IPv6 only.*





Dual - stack

IPv6 only

Pros and cons

+ ***Smooth transition:*** *allows coexistence of IPv4 and IPv6 during migration.*
+ ***Compatibility:*** *supports both IPv4-only and IPv6-enabled applications.*
+ ***Flexibility:*** *operators can gradually migrate services without disruption.*
+ ***Reliability:*** *provides fallback to IPv4 if IPv6 connectivity is not available.*

+ ***Complexity:*** *increased configuration and troubleshooting workload.*
+ ***Resource demand:*** *Requires more CPU, memory, and address management.*
+ ***Not sustainable long-term:*** *IPv4 exhaustion persists, operators must maintain CGNAT.*

Dual-Stack is an effective transition solution, but not a long-term goal

Pros and cons

IPv6

+ ***Simplified architecture:*** *no need to maintain dual protocol stacks.*
+ ***Scalability:*** *virtually unlimited address space for billions of IoT/5G devices.*
+ ***End-to-end connectivity:*** *eliminates NAT, enabling direct communication.*
+ ***Better performance:*** *reduced overhead from translation mechanisms (e.g., NAT, CGNAT).*
+ ***Future-proof:*** *aligns with 5G Standalone (SA) design and Industry 4.0 requirements.*
+ ***Security readiness:*** *mandatory IPSec support, easier policy enforcement per device.*

+ ***Legacy system compatibility:*** *many existing IPv4-only applications and devices cannot connect.*
+ ***Transition challenges:*** *requires complete IPv6 readiness across network infrastructure.*
+ ***Deployment cost:*** *investment needed for upgrading or replacing non-IPv6 equipment.*
+ ***Interoperability issues:*** *external services or partners still using IPv4 may face access limitations.*
+ ***Operational readiness:*** *engineers and admins must be fully trained in IPv6.*

IPv6-Only is the optimal and sustainable solution for 5G/IoT, but it requires a fully ready ecosystem (apps, networks, end devices,...) to enable large-scale deployment

3 Case studies

Case studies

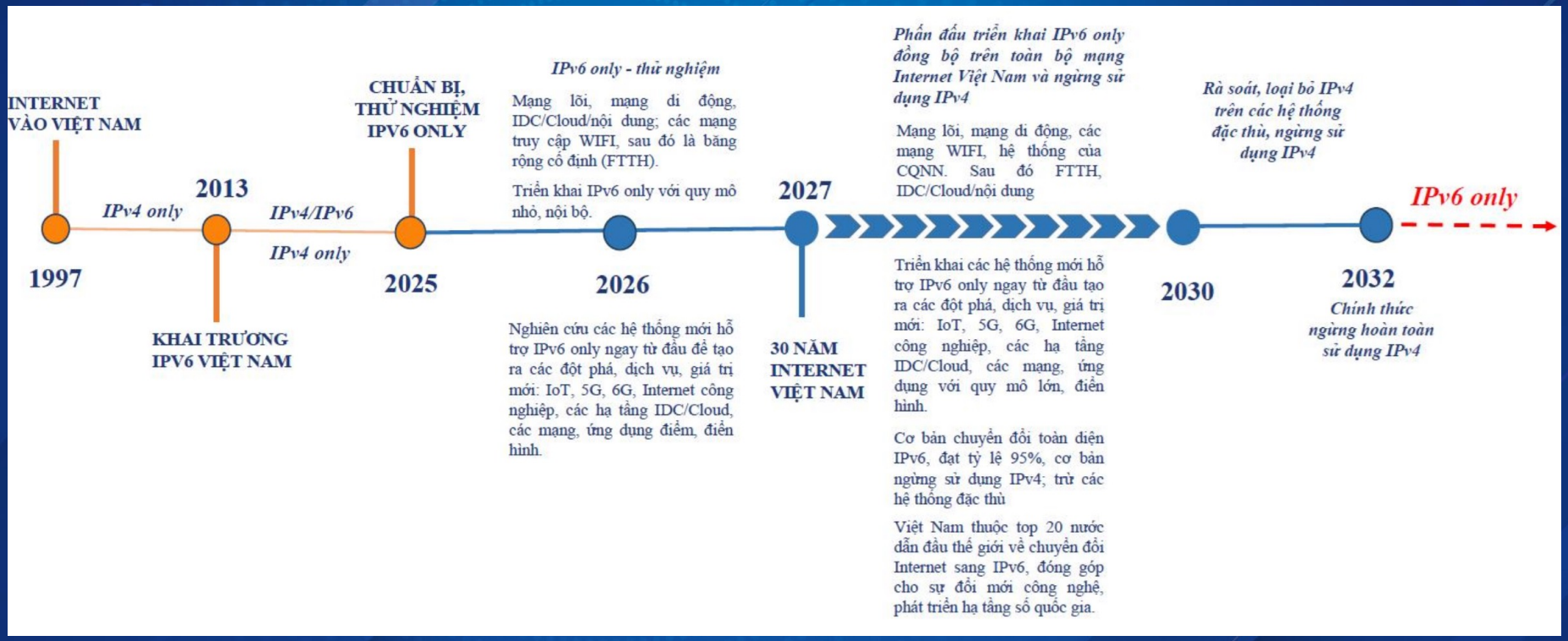
- Dual-Stack: ~50% operators (source: IETF)
- IPv6-Only: deploying mainly in mobile operators.

❖ Examples of Operators deploying IPv6-Only (mainly in mobile networks):

❖ Countries that have announced plans to deploy IPv6-Only:
US, Germany, Czechia, China, India, Malaysia, Vietnam,.... (~ 2030)

Case studies

❖ Vietnam's IPv6-only plan:



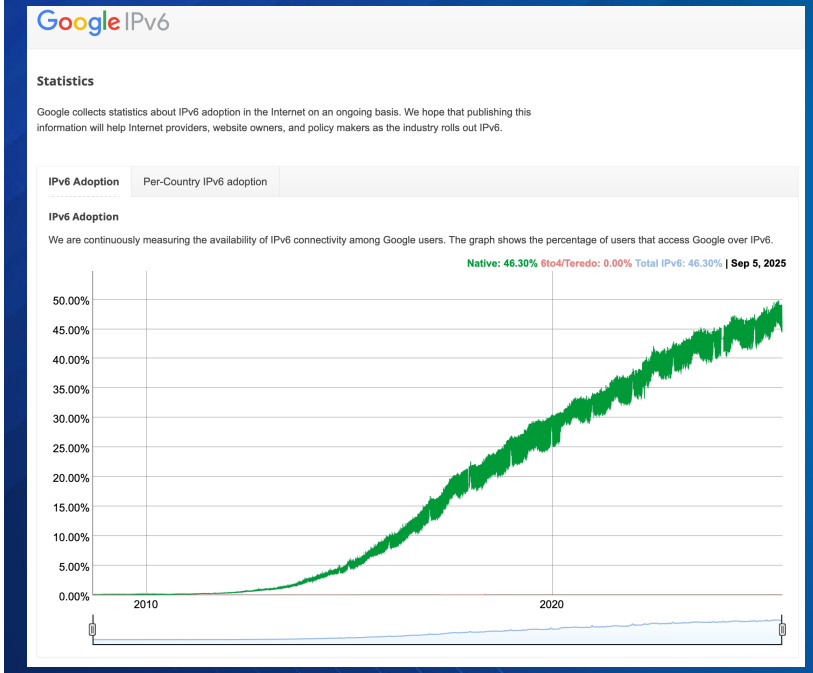
Case studies

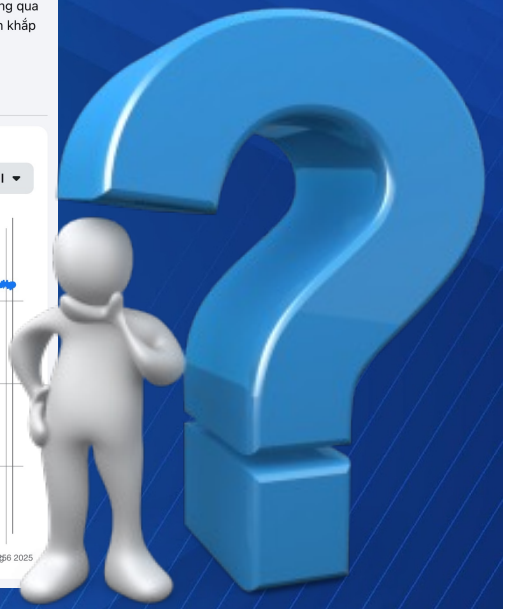
- VNPT's IPv6-only plan:

- ~ 2030: IPv6 only.
- **Early 9/2025: current IPv6 implementation at VNPT:**
  - **75% FTTH subscribers.**
  - **89% mobile subscribers.**
  - **100% IDC.**
- 5/2018: first operators in Viet Nam launched IPv6 for mobile users.
- 11/2016: launched IPv6 for FTTH subscribers.

4 Current IPv6 deployment status

Current IPv6 deployment status





IPv6 worldwide deployment (source: Google, Facebook)

Current IPv6 deployment status

Google IPv6 Country Rank

Per-country ranking table based on data from Google IPv6 Statistics page.

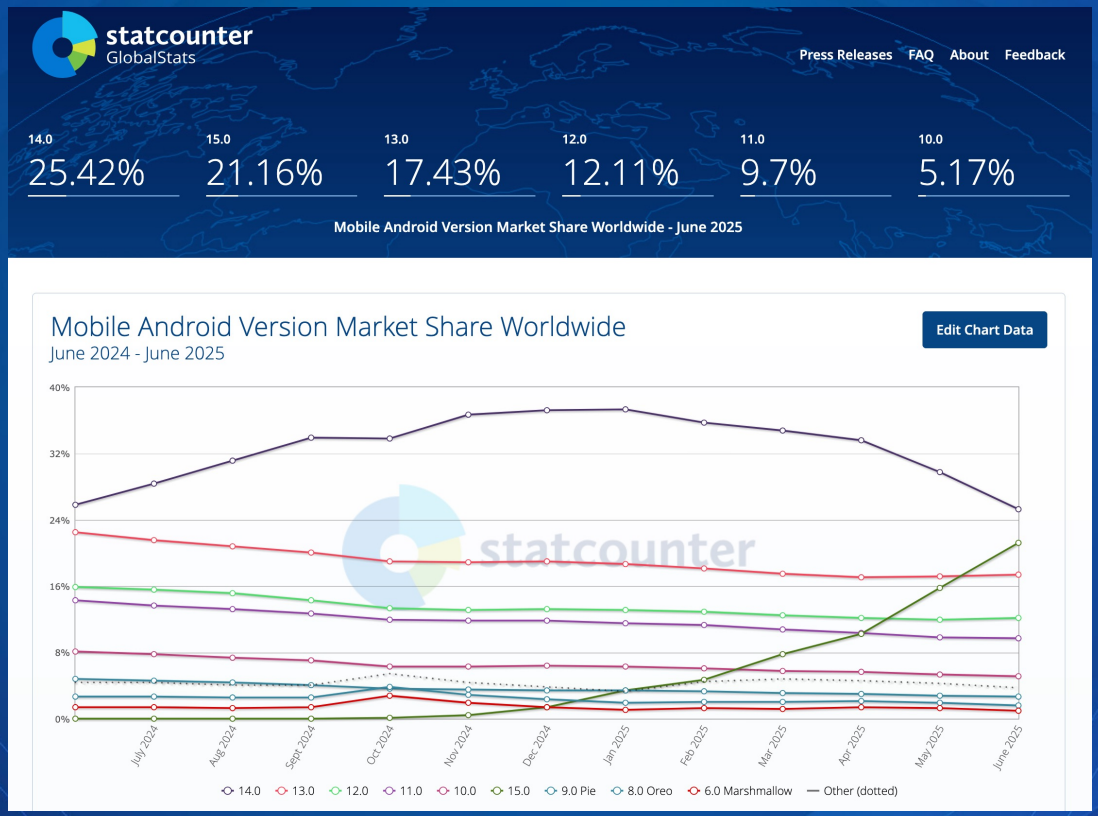
#	Country	Adoption	Latency	Impact
1	France	85.86%	-20ms	-0.02%
2	Unknown Region	78.97%	-10ms	-0.01%
3	India	75.16%	-10ms	-0.07%
4	Germany	74.18%	-10ms	-0.01%
5	Saudi Arabia	68.73%	-10ms	-0.04%
6	Malaysia	65.55%	0ms	-0.08%
7	Belgium	64.56%	0ms	0.0%
8	Greece	59.73%	-60ms	-0.06%
9	Guatemala	56.98%	-10ms	-0.03%
10	Israel	55.87%	-20ms	-0.13%
11	United States	55.01%	-10ms	-0.04%
12	Uruguay	54.77%	0ms	-0.02%
13	Japan	54.73%	0ms	-0.01%
14	Vietnam	54.16%	10ms	0.01%
15	Hungary	53.74%	-10ms	-0.02%
16	Sri Lanka	53.62%	-10ms	-0.02%
17	Nepal	53.05%	-10ms	-0.01%
18	Puerto Rico	52.99%	0ms	-0.01%
19	Taiwan	52.76%	-10ms	-0.0%
20	Mexico	51.83%	-10ms	-0.04%

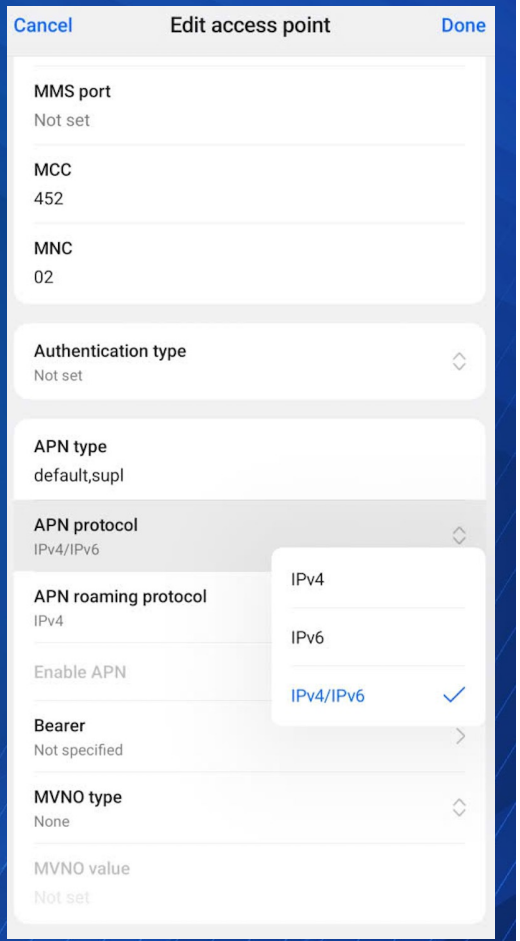
(source: Google 9/2025)

Current IPv6 deployment status

Key factors affecting IPv6 adoption:

- *Limited business incentives*
- *Application & content gaps*
- *Many manufacturers.*
- *Many types of devices.*





5 Suggestions

Suggestions

- Policy: Mandate IPv6 transition roadmaps for government agencies, ISPs,....
- Ecosystem growth: Encourage apps, cloud, and digital services to adopt IPv6 and promote IPv6-only trials in 5G/IoT.
- Raise awareness of IPv6's long-term benefits among businesses and the public.
- Capacity building: Expand IPv6 training and certification programs for engineers.
- Financial support: Provide financial aid, tax incentives, and funding for IPv6 projects, manufacture, export/import,... (based on each country's policy).


Thanks for your attention !