

BIF Digital Dialogue on “Opportunities & Challenges in IPv6 Implementation” held on 7th October 2021

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1. The covid 19 pandemic had made us rethink that all organizations should take care of their customers.
2. Pandemic has raised the importance of internet enabled services like never before.
3. New users on the internet means requirement of more addressing space.
4. IPv4 was created in mid 80s with 32-bit address and gave us almost 4 billion addresses. There were two kinds of addresses - public & private. Private addresses were locally unique and public addresses were globally unique.
5. We started running out of IPv4 addresses in the 90s.
6. Finally, IPv6 was designed as 128-bit address, offering infinite addressing space, more security, more encryption, auto-configuration, and the data can be sent in the range of 0-4 Gigabits in the form of jumbo packets.
7. IPv6 OS automatically creates two IPV6 addresses – a randomized MAC addresses to hide the device identity, and an ‘IPV6 with real MAC address’ for E2E applications, which, although not so prevalent presently, will be available with the next wave of internet innovations.
8. **Some key features of IPV6:**
 - a) Significant stoppage of Man-in-the-middle attack.
 - b) Secured name resolution - the Secure Neighbor Discovery (SEND) protocol is capable of enabling cryptographic confirmation.
 - c) While IPv4 offered IPsec support as an optional feature, IPV6 supports it as a mandatory feature.
 - d) Simplified header format for better QoS, faster routing & switching, Traffic Class, flow label field, improving streaming of several applications like VoIP, Ecommerce, gaming, etc.
 - e) IP host mobility - enables the mobile node to arbitrarily change its location on an IP n/w while still remaining reachable and maintaining existing connections.
9. Some of the practical uses of IPv6 are: -
 - a) Enterprise on the move. e.g., Courier companies.
 - b) Multicast - conserves bandwidth.
 - c) Centralized building management.
 - d) Intelligent transport systems.
10. There is a proposal for discussion in various meetings for working on new IP schemes with regards to IPv6 not suitable for new services beyond 2030/future networks.
11. India has the highest number of IPv6 devices, i.e., almost 360 million - almost double that of USA. This is led by the country’s mobile operators and will grow further. India probably could be the only country which has a fully IPv6 operator. Our operators need more IPv6 addresses in advance to meet the needs.
12. We, in the government, clearly appreciate the fact that IPV6 is a must to realise the mission of Digital India.
13. The Indian government has realized the importance of IPv6 long ago and our NTP 2012 recognizes the futuristic role of IPv6. DoT also realized the same and charted the national IPv6 roadmap in 2015.
14. A number of initiatives were also taken by the government for IPv6 proliferation in the country, and the significant outcome of the first roadmap led to a formation of an IPV6 task force to bring various industry stakeholders on a common platform to decide/debate on issues related to IPv6.

15. Government organizations are already on the path to IPv6 adoption, as IPV6 nodal officers have been appointed in all Central Ministries/departments/states/UTs. Instructions are also being given to procure IPv6 compliant devices along with various websites to be made compliant.

16. TEC initiatives:

- a) TEC has established an IPv6 ready logo lab in 2013, which has the unique distinction of being approved by IPv6 ready logo forum. There are only 6 IPv6 labs in the world - US, Korea, Taiwan, Europe, India (Bangalore) and China.
- b) The lab in TEC has the capability of conformance testing of IPV6 code protocols as per RFCs and interoperability testing. In this testing, the interoperability of the devices is tested against 4 different OS with different IPv6 stacks - Router and Host.
- c) TEC is also the Vice Chair for APAC region as per quarterly rolling plan by IPv6 ready logo forum, for reviewing the test results of other IPv6 ready logo accredited labs. TEC has also recently announced the mandatory testing for telecom equipment, and notified phase 3 and 4 of the products, including IPv6 as one of the essential requirements.
- d) Recently, TEC has come out with M2M/IoT technical reports, wherein it is mentioned that all devices and gateways to be connected directly to PSTN or PLMN should have IPv6 or at least dual stack. Hence, BIS has already mandated IPv6 for smart electricity meters working on cellular technology.

17. Clearly, IPv6 consists of many stakeholders and for the road to IPV6 adoption, we should ensure that all stakeholders perform in a coordinated manner. There will be challenges and we should work together to overcome the same and make it happen.

18. Substantial amount of work has been done for IPv6 transitions as stipulated in the Roadmap v2 of Government of India. But we find in some segments that the transition is taking a longer time due to legacy networks and complex nature of the issue.

19. A major challenge is a part of IPv6 based content availability. Most content providers like Google, Facebook, Twitter, WhatsApp, etc. have already enabled their services over IPv6. Newer devices including smartphones, notebooks, IoT hardware, are also IPv6 enabled by default. However, a large number of websites still exist which are yet to adopt the new protocol.

20. Transition to a pure IPv6 facility is a mammoth task. Organisations need to ensure that there is no disruption to critical services as a large number of web apps were devised without IPv6 in mind.

21. We all appreciate that the sustainable development and evolution of Internet infrastructure is essential to global cyberspace and digital economy, and the IPv6 root server which manages the internet can serve as a great tool. Creating such infrastructure at a national level is important. This can serve as a multistakeholder platform for diverse and innovative players from across the internet community, academia, and users in the country, to collectively experiment and develop the local infrastructure to maintain and operate the new internet.

22. IPv6 root server system is critical to manage the security and stability of the Internet. Historically, there are 13 root server authorities from the IPv4 era - with 10 in US, 2 in EU and 1 in Japan, creating a somewhat unequal geographic distribution of critical internet management resources.

23. As we step into the next generation internet era, it offers us a great opportunity to manage this critical infrastructure locally and create a more open architecture, which welcomes innovation and flexibility.

24. The main three factors that contribute to the adoption of IPv6 and establishing IPv6 root server locally, are additional address space for new application, emergence of new connected devices which require more addresses, and having a root server that will contribute to in-country expertise, building on critical information infrastructure and for knowledge base.

25. The benefits of IPv6 are quite evident, and the opportunities that lie before us are quite humungous, and as we embark upon the journey to 5G, it is important that we work together to achieve the country's vision and mission.