

Preparing for IPv6 implementation using Artificial intelligence (AI)

"IPv6 is not just an incremental improvement, it is a fundamental shift in the way the Internet works. It is essential that we make the transition now to ensure that the Internet can continue to support the growing needs of the Asia-Pacific region." - Paul Wilson, Director General of APNIC

Agenda

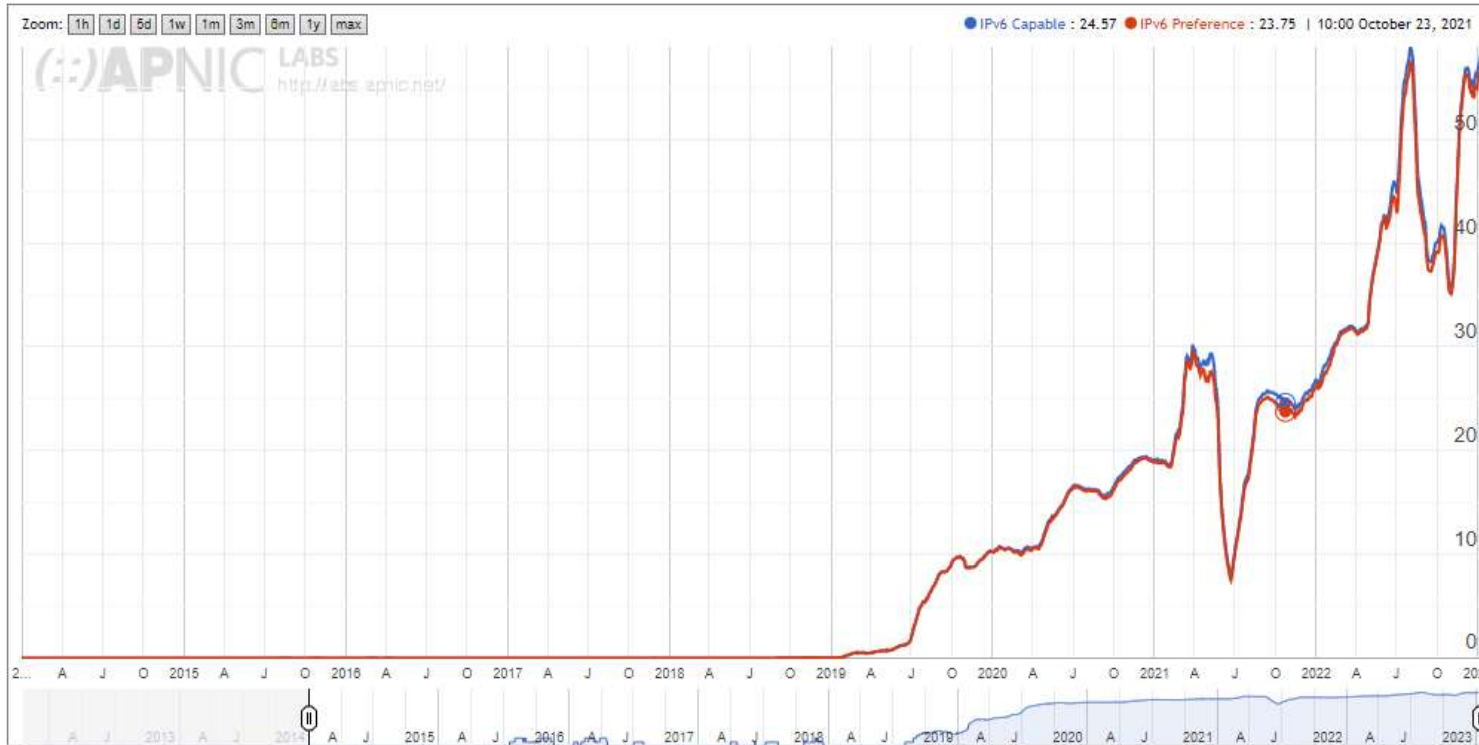
- IPv6 statistics
- Overview of ChatGPT
- How to use ChatGPT
- Questions

What is APNIC Labs seeing in Myanmar?

- APNIC Labs uses paid advertising (placed by Google) to measure end-user behaviour
 - Uses undisplayed pixel fetches (we call them 1x1 invisible pixels)
 - Tests DNS, IP and Transport behaviour fetching these assets
 - Includes IPv6, DNSSEC, RPKI & QUIC tests at this time
- This is not a measurement of mbps or kbps
 - It is a random sample of users, through HTML/browser/ads in games
 - We don't control placement numbers to the ISP
 - We think it's a reasonable approximation to usercount

IPv6: It's taking off!

Use of IPv6 for Myanmar (MM)

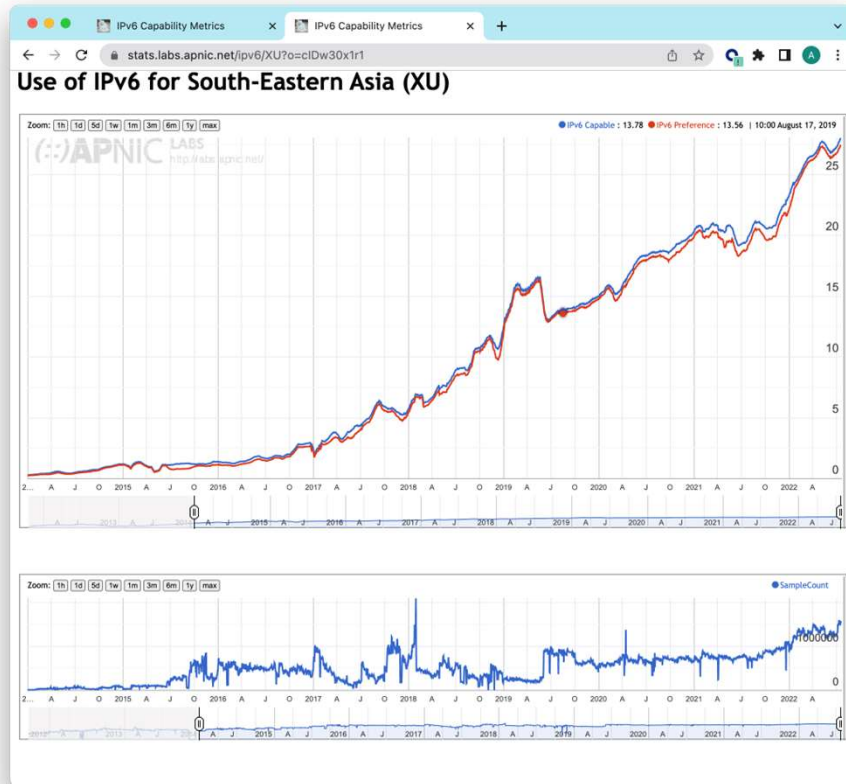


Approx. 30% increase for IPv6 Capability since October 2021 Which is continuing at pace.

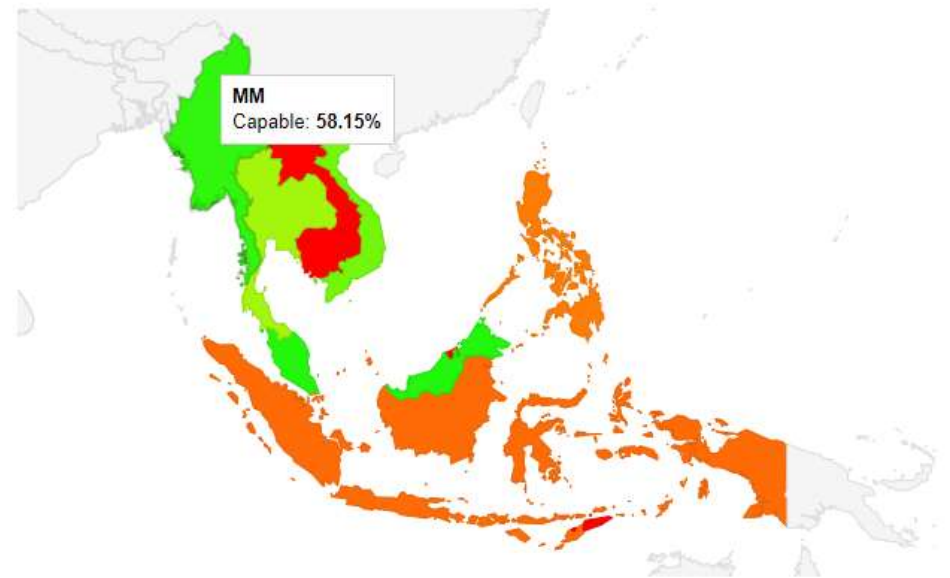
Well done!

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

...But there's still a way to go



Region Map for South-Eastern Asia (035)



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

What is ChatGPT

- ChatGPT is a natural language processing (NLP) model developed by OpenAI
- GPT-3 (Generative Pre-training Transformer v3) language model, is a transformer-based neural network trained on a large dataset of text.
- The dataset is based on information up to the end of 2021.

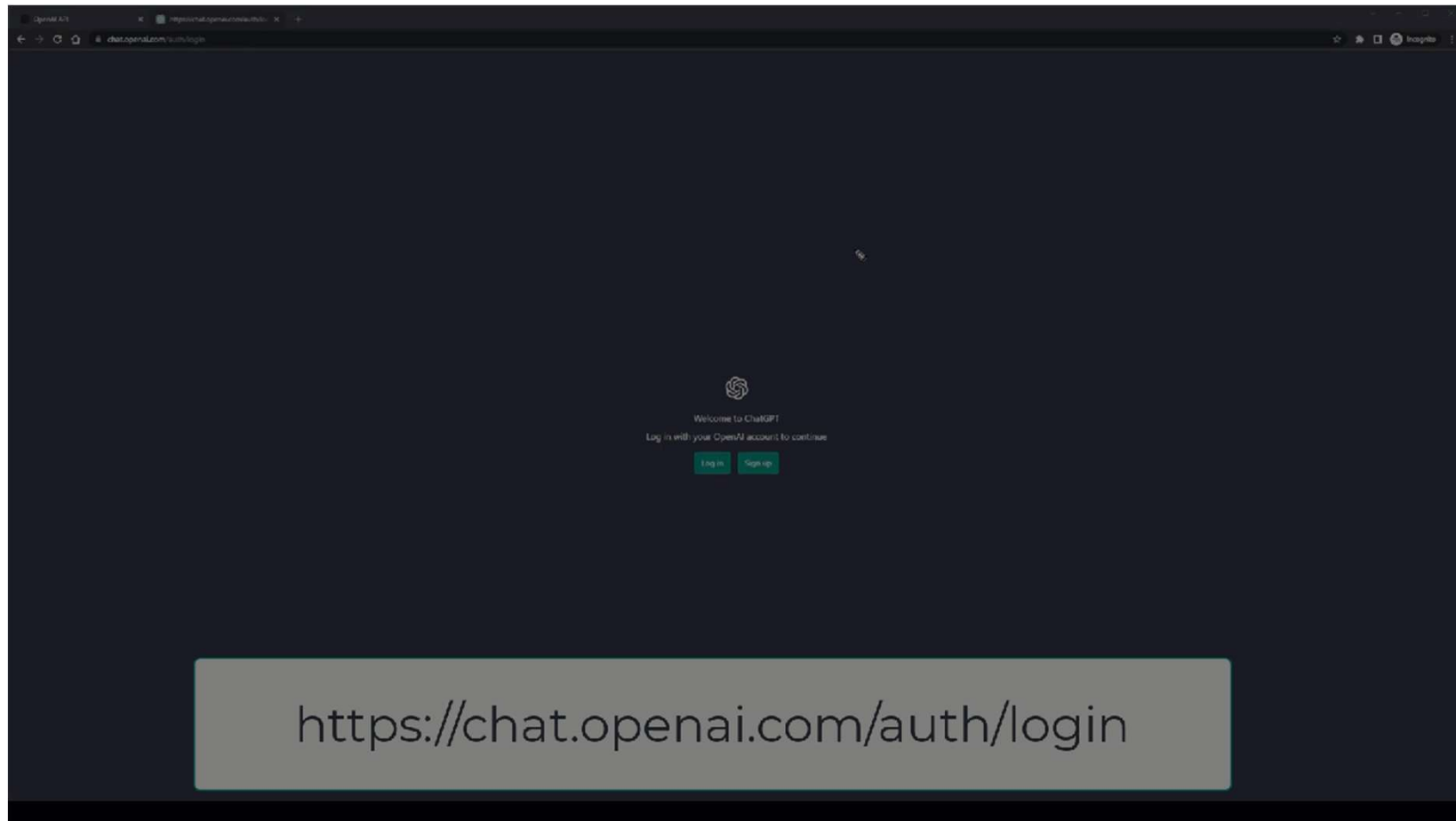
ChatGPT

- Artificial intelligence (AI) tools like ChatGPT3 can be useful for helping to plan and implement IPv6 deployment projects.
- Potential benefits of using the ChatGPT3 language model to write your next IPv6 deployment project:
 - Generate natural language text in a variety of styles and formats
 - Generate detailed and accurate descriptions of IPv6 deployment strategies, processes, and technical requirements.
 - Generate configs and sample code
 - Save time and effort in the project planning and documentation stages.
 - Help to ensure that all necessary considerations and best practices are taken into account in the IPv6 deployment project.

ChatGPT – How to use

- Create an account
- Think of a topic, for example - IPv6 deployment
- Create a list of questions to ask
- Refine or re-phrase the questions
- Do more research if required

ChatGPT – Create an Account



ChatGPT – IPv6 sample questions

- Do you know how to deploy IPv6 in an ISP?
- What are the necessary preparation before IPv6 implementation?
- Can you give a brief overview of rfc7381?
- What are the advantages of deploying IPv6?
- Can you give a business use case for deploying IPv6 in an MPLS network?

Do you know how to deploy IPv6 in an ISP

Do you know how to deploy IPv6 in an ISP?

Deploying IPv6 in an ISP (Internet Service Provider) involves several steps, including obtaining a block of IPv6 addresses from a regional Internet registry, configuring the ISP's routers to use IPv6, and setting up customer access to the IPv6 network. Here is a general overview of the process:

1. Obtain a block of IPv6 addresses: The first step in deploying IPv6 is to obtain a block of IPv6 addresses from a regional Internet registry, such as ARIN (American Registry for Internet Numbers), RIPE (Réseaux IP Européens), or APNIC (Asia-Pacific Network Information Centre).
2. Configure the ISP's routers: Once you have obtained a block of IPv6 addresses, you will need to configure your ISP's routers to use IPv6. This involves enabling IPv6 routing on the routers and configuring the routers with the appropriate IPv6 addresses and prefixes.
3. Set up customer access: After you have configured your routers for IPv6, you will need to set up customer access to the IPv6 network. This may involve setting up IPv6 tunneling, enabling IPv6 on customer access devices, and providing customer support for IPv6-related issues.
4. Test and roll out: Before rolling out IPv6 to all of your customers, it is important to thoroughly test the IPv6 network to ensure it is functioning properly. Once you have tested the network and resolved any issues, you can begin rolling out IPv6 to your customers.

I hope this information is helpful! If you have any more specific questions about deploying IPv6 in an ISP, feel free to ask.

Preparation before IPv6 implementation?



What are the necessary preparation before IPv6 implementation.

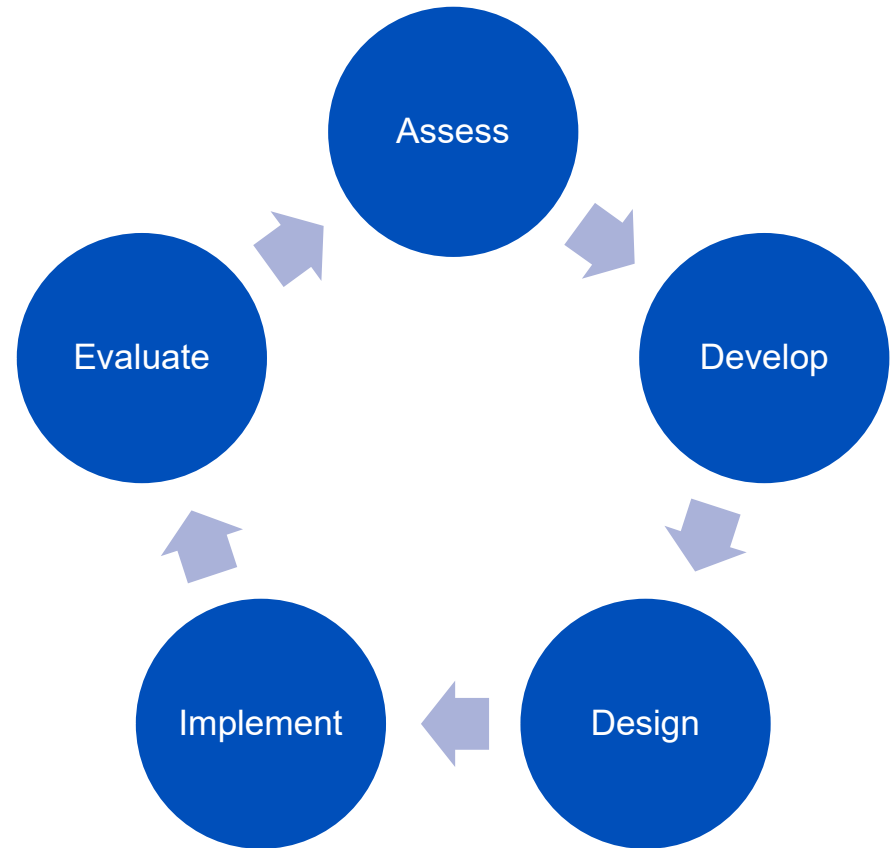


There are several important steps that organizations should take before implementing IPv6:


1. Assess the current state of IPv4 infrastructure: It is important to understand the organization's current IPv4 infrastructure, including the number of IPv4 addresses in use, the devices and applications that use IPv4, and any potential dependencies or challenges that may need to be addressed during the transition to IPv6.
2. Develop a strategy for transitioning to IPv6: Based on the assessment of the organization's current IPv4 infrastructure, it is important to develop a clear strategy for transitioning to IPv6. This may involve identifying the applications and services that will be migrated to IPv6, determining the appropriate IPv6 addressing scheme, and establishing a timeline for the transition.
3. Obtain IPv6 addresses and configure routers: In order to use IPv6, the organization will need to obtain a block of IPv6 addresses from a regional Internet registry and configure the organization's routers to support IPv6.
4. Enable IPv6 on customer access devices: In order to provide IPv6 access to customers, it will be necessary to enable IPv6 on the organization's customer access devices, such as modems and routers.
5. Set up IPv6 tunneling: If the organization's current infrastructure does not support IPv6, it may be necessary to set up IPv6 tunneling in order to provide IPv6 connectivity to customers.
6. Test the IPv6 network: Before rolling out IPv6 to all of the organization's customers, it is important to thoroughly test the IPv6 network to ensure it is functioning properly.


Stages of the project

- Assess the current state of IPv4 infrastructure.
- Develop a strategy for transitioning to IPv6.
- Obtain IPv6 addresses and configure routers.
- Enable IPv6 on customer access devices.
- Test the IPv6 network.



Give a brief overview of RFC7381


 Can you give a brief overview of rfc7381

 RFC 7381 is a document published by the Internet Engineering Task Force (IETF) that defines a set of requirements for Internet Service Providers (ISPs) that are transitioning to IPv6. The document is titled "IPv6 Provider-Assigned IPv6 Unicast Addresses".

The primary purpose of RFC 7381 is to define a set of requirements for ISPs to follow when assigning IPv6 addresses to their customers. The document specifies that ISPs should assign unique, globally routable IPv6 addresses to their customers, rather than using network address translation (NAT) or other methods to share a single IPv6 address among multiple customers.

RFC 7381 also defines requirements for the format and structure of the IPv6 addresses that ISPs assign to their customers. It specifies that these addresses should be derived from the ISP's globally unique IPv6 address block and should follow the rules specified in the IPv6 addressing architecture.

Overall, RFC 7381 is intended to ensure that ISPs can provide their customers with stable, globally routable IPv6 addresses that can be used for a wide range of applications and services.

 is this the latest version?


 RFC 7381 was published in 2014, so it is not the latest version of the document. The most recent version of the document is RFC 8200, which was published in 2017 and is titled "Internet Protocol, Version 6 (IPv6) Specification".


RFC 8200 is the definitive specification for IPv6 and supersedes all previous versions of the IPv6 specification. It defines the format and structure of IPv6 packets and the rules for how IPv6 packets should be processed by network devices.

If you are interested in learning more about IPv6, I recommend reading RFC 8200, as it provides a detailed overview of the IPv6 protocol and its various features. You can find a copy of the document online at the following URL:

<https://tools.ietf.org/html/rfc8200>

I hope this information is helpful! If you have any other questions, feel free to ask.

 Can you give dot points about rfc7381

 Certainly! Here are some key points about RFC 7381:

- RFC 7381 is a document published by the Internet Engineering Task Force (IETF) that defines a set of requirements for Internet Service Providers (ISPs) transitioning to IPv6.
- The primary purpose of RFC 7381 is to define requirements for ISPs to follow when assigning IPv6 addresses to their customers.
- The document specifies that ISPs should assign unique, globally routable IPv6 addresses to their customers, rather than using network address translation (NAT) or other methods to share a single IPv6 address among multiple customers.
- RFC 7381 also defines requirements for the format and structure of the IPv6 addresses that ISPs assign to their customers.
- The document is intended to ensure that ISPs can provide their customers with stable, globally routable IPv6 addresses that can be used for a wide range of applications and services.

I hope this information is helpful! If you have any other questions about RFC 7381 or IPv6, feel free to ask.

Give a brief overview of RFC7381

- Actual title is:
 - Enterprise IPv6 Deployment Guidelines
- <https://www.rfc-editor.org/rfc/rfc7381>

[\[RFC Home\]](#) [\[TEXT\]](#) [\[PDF\]](#) [\[HTML\]](#) [\[Tracker\]](#) [\[IPR\]](#) [\[Info page\]](#)

INFORMATIONAL

Internet Engineering Task Force (IETF)
Request for Comments: 7381
Category: Informational
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K. Chittimaneni
Dropbox, Inc.
T. Chown
University of Southampton
L. Howard
Time Warner Cable
V. Kuarsingh
Dyn, Inc.
Y. Pouffary
Hewlett Packard
E. Vyncke
Cisco Systems
October 2014

Enterprise IPv6 Deployment Guidelines

Abstract

Enterprise network administrators worldwide are in various stages of preparing for or deploying IPv6 into their networks. The administrators face different challenges than operators of Internet access providers and have reasons for different priorities. The overall problem for many administrators will be to offer Internet-facing services over IPv6 while continuing to support IPv4, and while introducing IPv6 access within the enterprise IT network. The overall transition will take most networks from an IPv4-only environment to a dual-stack network environment and eventually an IPv6-only operating mode. This document helps provide a framework for enterprise network architects or administrators who may be faced with many of these challenges as they consider their IPv6 support strategies.

ChatGPT – IPv6 sample questions

- What are happy eyeballs in regard to IPv6?
- Can you write the code for the happy eyeballs in bash?
- Can you give a work breakdown structure for an IPv6 project?
- Write a presentation outline for IPv6 preparation before implementation?
- Can you list top 10 resources for IPv6 deployment or migration?

Happy Eyeballs

WA

what are happy eyeballs in regards to IPv6



Happy Eyeballs is an algorithm used to improve the connectivity of devices to the Internet over IPv6. It is designed to address the issue of "IPv6 connectivity delay", which can occur when a device is trying to connect to the Internet using IPv6 and experiences a delay in establishing a connection.



The Happy Eyeballs algorithm works by having the device try to connect to a destination using both IPv4 and IPv6 simultaneously. If the device is able to establish a connection over IPv6, it will use that connection. If the device is unable to establish a connection over IPv6 within a certain amount of time, it will fall back to using IPv4.

The Happy Eyeballs algorithm is intended to improve the connectivity of devices to the Internet over IPv6 by reducing the delays that can occur when trying to establish a connection using IPv6. It is used by many modern operating systems and devices to improve the user experience when connecting to the Internet over IPv6.

I hope this information is helpful! If you have any other questions about Happy Eyeballs or IPv6, feel free to ask.

Happy Eyeballs – Create test script

what are happy eyeballs in regards to IPv6

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I hope this information is helpful! If you have any other questions about Happy Eyeballs or IPv6, feel free to ask.

```
#!/bin/bash

# Date created: 3rd Jan 2023
# Purpose: Give an example of how happy eyeballs algorithm works
# Author: ChatGPT and Warren Finch

# Set the default destination address
destination="www.apnic.net"

# Check if a destination was provided as an argument
if [ ! -z "$1" ]; then
    destination=$1
fi


# Set the timeout for IPv6 connection attempts
ipv6_timeout=200


# Set the flag indicating whether a connection has been established
connected=0

# Try to connect to the destination over IPv6
echo "Trying to connect to $destination over IPv6..."
ping -6 -c 1 -W $ipv6_timeout $destination >/dev/null 2>&1
if [ $? -eq 0 ]; then
    # Connection established over IPv6
    echo "Connected to $destination over IPv6."
    connected=1
else
    # Connection attempt over IPv6 failed
    echo "Unable to connect to $destination over IPv6."
fi

# If a connection has not been established, try to connect over IPv4
if [ $connected -eq 0 ]; then
    echo "Trying to connect to $destination over IPv4..."
    ping -4 -c 1 -W $ipv6_timeout $destination >/dev/null 2>&1
    if [ $? -eq 0 ]; then
        # Connection established over IPv4
        echo "Connected to $destination over IPv4."
        connected=1
    else
        # Connection attempt over IPv4 failed
        echo "Unable to connect to $destination over IPv4."
    fi
fi
```

Work Breakdown Structure (WBS)

 Can you give a work breakdown structure for an IPv6 project?

 Sure! Here is a possible work breakdown structure (WBS) for an IPv6 project:

I. Project Initiation

- Define the scope and objectives of the IPv6 project
- Identify and secure necessary resources (e.g., personnel, funding, equipment)
- Develop a project plan and schedule

II. IPv6 Planning

- Determine the current state of IPv6 adoption within the organization
- Assess the organization's current IPv4 infrastructure
- Develop a strategy for transitioning to IPv6
- Identify and prioritize applications and services that will be migrated to IPv6

III. IPv6 Deployment

- Obtain a block of IPv6 addresses from a regional Internet registry
- Configure the organization's routers to support IPv6
- Enable IPv6 on customer access devices
- Set up IPv6 tunneling, if necessary
- Test the IPv6 network to ensure it is functioning properly

IV. IPv6 Migration

- Migrate applications and services to IPv6
- Update documentation and procedures for IPv6
- Provide customer support for IPv6-related issues

V. Project Closure

- Review and assess the success of the IPv6 project
- Document lessons learned and best practices
- Close out the project and release resources

This is just one possible WBS for an IPv6 project, and the specific tasks and deliverables may vary depending on the needs and goals of your organization. I hope this helps!

List top 10 resources for IPv6

- <https://www.ipv6.com/>
- <https://www.cisco.com/c/en/us/about/security-center/ipj.html>
- <https://www.ipv6forum.com/>
- <https://www.nist.gov/itl/applied-cybersecurity/ipv6-deployment-guide>
- <https://www.internetsociety.org/resources/doc/ipv6/ipv6-migration-faq/>

Can you list top 10 resources for IPv6 deployment or migration

Sure! Here is a list of 10 resources that may be helpful for IPv6 deployment or migration:

1. The IPv6 Portal (<https://www.ipv6.com/>) is a comprehensive resource for information on IPv6 deployment and migration.
2. The Internet Protocol Journal (<https://www.cisco.com/c/en/us/about/security-center/ipj.html>) is a technical publication that includes articles and case studies on IPv6 deployment and migration.
3. The IPv6 Forum (<https://www.ipv6forum.com/>) is a global consortium that promotes the adoption and deployment of IPv6.
4. The IPv6 Deployment Guide (<https://www.nist.gov/itl/applied-cybersecurity/ipv6-deployment-guide>) is a comprehensive guide to deploying IPv6, developed by the National Institute of Standards and Technology (NIST).
5. The IPv6 Migration FAQ (<https://www.internetsociety.org/resources/doc/ipv6/ipv6-migration-faq/>) is a resource from the Internet Society that provides answers to common questions about IPv6 migration.
6. The IPv6 Ready Logo Program (<https://www.ipv6ready.org/>) is a certification program that helps vendors and end users ensure that their products and services are IPv6-ready.
7. The IPv6 Implementation and Deployment Guidance (<https://www.federalregister.gov/documents/2020/06/17/2020-12350/ipv6-implementation-and-deployment-guidance>) is a resource from the US Federal government that provides guidance on implementing and deploying IPv6.
8. The IPv6 Handbook (<https://www.internetsociety.org/resources/doc/ipv6/ipv6-handbook/>) is a comprehensive guide to IPv6, developed by the Internet Society.
9. The IPv6 Migration Guide (<https://www.apnic.net/publications/ipv6-migration-guide/>) is a resource from the Asia-Pacific Network Information Centre (APNIC) that provides guidance on migrating to IPv6.
10. The IPv6 Deployment and Support Center (<https://www.ipv6.com/ipv6-deployment-support-center/>) is a resource from the IPv6 Portal that provides tools and resources for deploying and supporting IPv6.

I hope this list of resources is helpful! If you have any other questions about IPv6 deployment or migration, feel free to ask.

List top 10 resources for IPv6

- <https://www.ipv6ready.org/>
- <https://www.federalregister.gov/documents/2020/06/17/2020-12350/ipv6-implementation-and-deployment-guidance>
- <https://www.internetsociety.org/resources/doc/ipv6/ipv6-handbook/>
- <https://www.apnic.net/publications/ipv6-migration-guide/>
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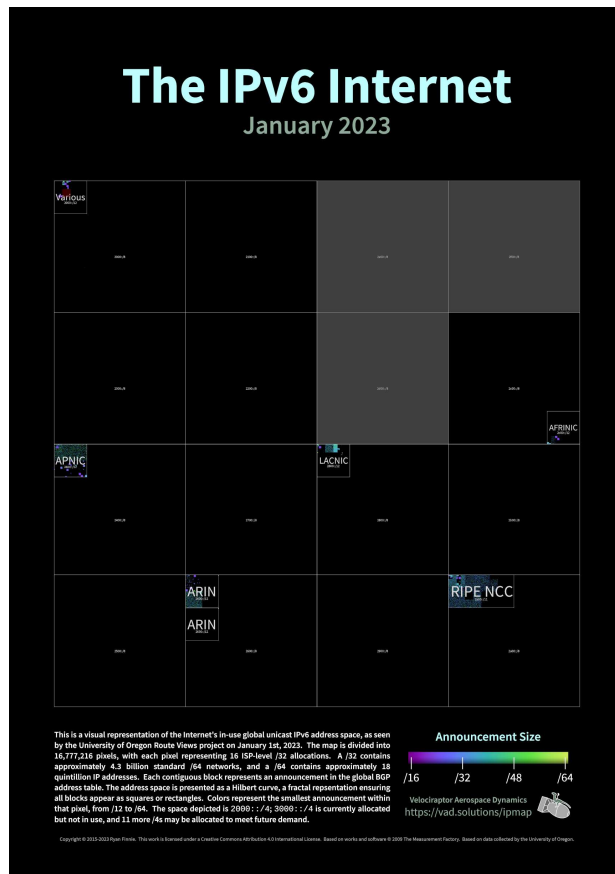
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Summary

- ChatGPT is not specifically designed or optimised for these types of tasks, so it may not be the most appropriate tool for the job.
- ChatGPT may not always provide accurate or useful information for tasks related to network design or IPv6 deployment, it could potentially serve as a starting point or a source of ideas for further research or exploration.
- Create an account and test it for yourself.

Questions?

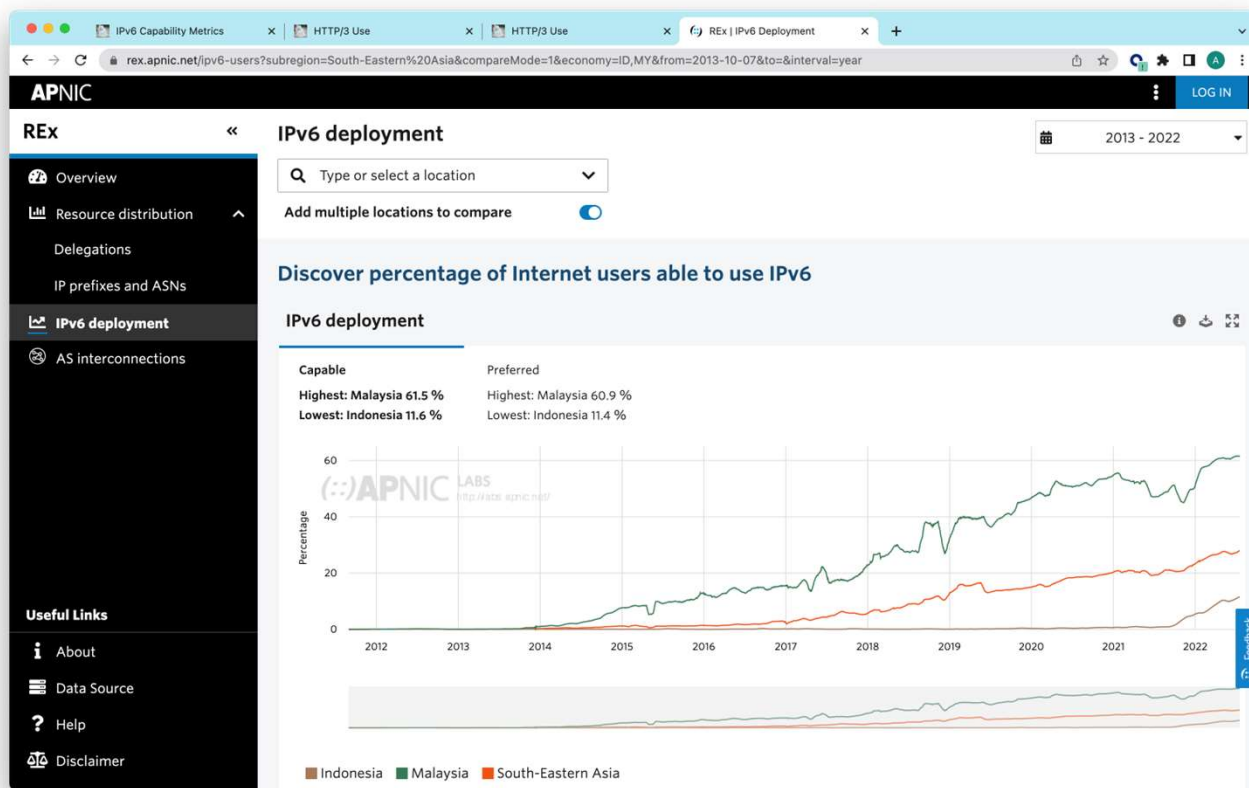
Visual Representation of IPv6



- The IPv6 map depicts the current in-use global unicast address space (2000::/4), with each pixel representing a /28, or 16 ISP-level /32 allocations.
- Each contiguous block represents an announcement in the global BGP address table.
- Black areas are unannounced, red areas are special blocks which are not globally routable, and grey is reserved for future use

REX HTTPS://REX.APNIC.NET

New Look and Feel, charting improvements



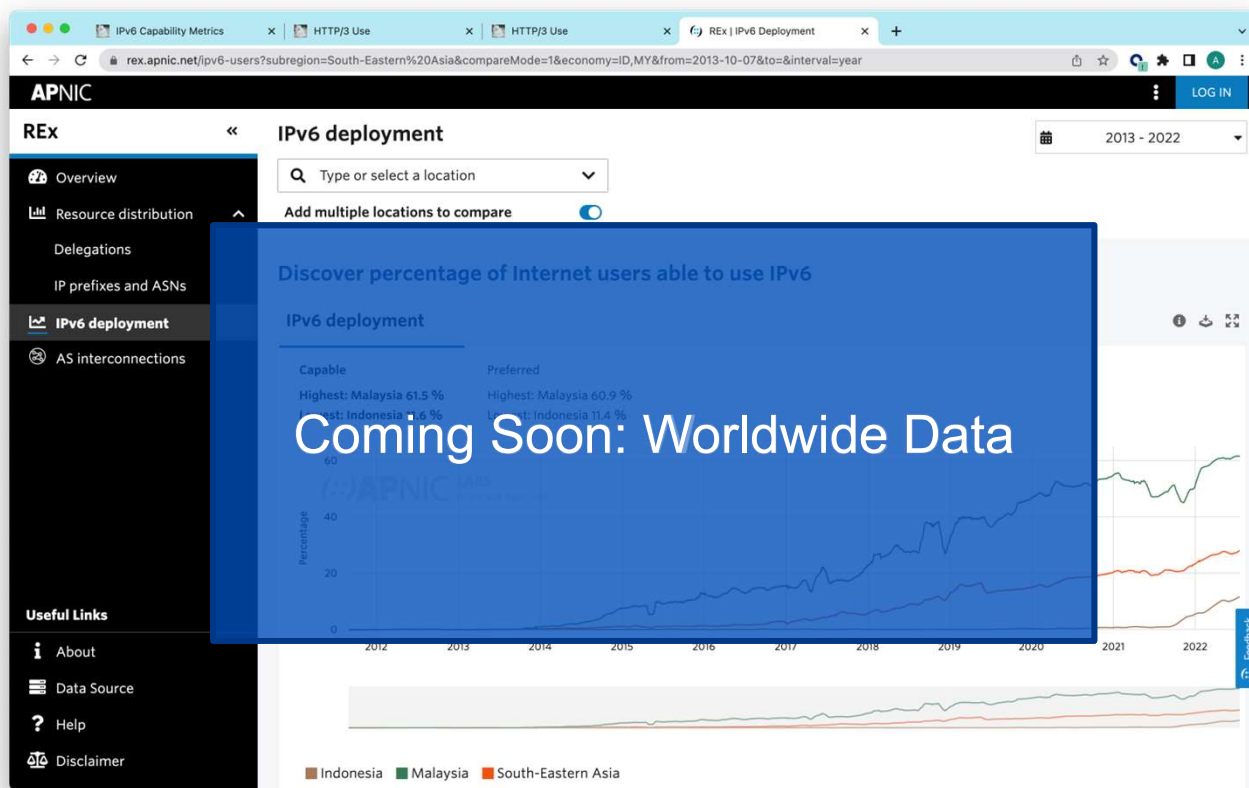
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