Introduction :

- The next generation Internet Protocol (IPv6) is poised to make a new wave in the coming decade.

- There is some serious limitations of the current IP protocol, or IPv4 to be precise.

- IP version 6 or IPv6 (also known as IPng - ng for new/next generation), provides 128-bit addressing (that's billions upon billions of addresses).

- And compatibility with IPv4 addresses, security and authentication, quality of service (reserving bandwidth), plug-and-play for network device configuration, hierarchically structured routing and an ability to seamlessly integrate with the current IP during the transition stages.

How IPv6 works :

- IPv6 is technology with a main focus on changing the structure of current IP addresses, which will allow for virtually unlimited IP addresses.

- The current version, IPv4 is a growing concern with the limited IP addresses, making it a fear that they will run out in the future.

- IPv6 will also have a goal to make the Internet a more secure place for browsers, and with the rapid number of identity theft victims, this is a key feature.

- Efficient and hierarchical addressing and routing infrastructure- based on the common occurrence of multiple levels of Internet service providers.

Challenges in Today's Internet :

- Address depletion
- Loss of peer-to-peer model
- Increasing need for security PDA
- Burdened Infrastructure
- Increasing need for IP mobility
- Increased traffic flow
- New applications have specific delivery requirements
- Increasing need for security and information protection
- Varied usage of Internet requires continual "tweaking" of current Internet protocols

Challenges in Today's Internet :

- QOS Issues
  – Multiple methods available
  – Non-uniformity across network boundaries
- Security
  – No uniformity, myriad methods
  – Multitude of methods for "hackers" to attack networks
- Mobility
  – Increasing number of wireless/mobile devices accessing Internet services
  – Inadequate support for IP mobility in devices (moving seamlessly from one network to another)
  – 3G & 4G initiatives, 802.11x, Bluetooth, UWB moving connectivity from wireline to wireless

Why is IPv6 Here :

- IPv6 provides a platform for new Internet functionality that will be needed in the immediate future, and provide flexibility for further growth and expansion.

Features of IPv6 :

- Addressing
- Header
- Security
- Privacy
- Auto configuration
- Routing
- Quality of Service
- Expanded addressing and routing capabilities
  - 128-bit addresses
  - Multicast routing is now scalable with "scope" field
  - Defined usage of "Any cast" addressing

Features of IPv6 :

- Simplified header format
  - Some IPv4 fields dropped or made optional
  - IPv6 packet header only twice the size of v4 header, even though address is four times a v4 address
- Extension headers
  - "Options" are now placed in separate headers
  - "Options" are now any length
  - Router doesn't have to look at most "Options"*