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Setting the Stage: Definitions & Acronyms

- **Protocols**:
  - **IP**: Internet Protocol. IP is a datagram-oriented protocol.
    - Datagram: “Data” + “Telegram”. Store and Forward system as opposed to a telephony circuit.
    - Data is chopped in packets (typically 1500 octets). Each packet contains enough information (the **IP header**) to enable routers to forward it across the network and a payload.
  - **Circuit Switched**: physical switching of copper wires for telephony
    - Virtual Circuits: Same, controlled by software
    - Virtual circuits must be set up by a signaling protocol (a control plane), prior to any communication (the data plane).
  - **QoS**: Quality of Service.
    - It is associated with reservation or prioritization of resources for specific data flow
  - **ATM**: Asynchronous Transfer Mode. The last of the telephony inspired network model in the 1990s. It is widely considered as a commercial failure.

- **Standard Bodies**:
  - **ITU**: International Telecommunication Union
  - **ETSI**: European Telecommunication Standard Institute

New-IP: Origin and Context

- **ETSI created in 2015 the Next Generation Protocol (NGP) Industry Specification Group (ISG)**
  - One of the many (research oriented) initiatives aiming at developing a new generation of network architecture. Two distinct efforts spawned from NGP. They share similar futuristic use cases but with completely different approaches.
  - **New IP**: increase the size of the IP header to include more information to enable routers to implement specific per-flow processing. It is sometimes called “Big IP”. New IP is heavily promoted by **Huawei** under different names (e.g., Future Vertical Communication Networks) at ITU-T and various other forums.
  - **Non-IP Networking (NIN):** remove the IP header all together to get back to a world of virtual circuits with a technology reminiscent of ATM. NIN was chartered last year by ETSI as an Industry Specification Group (ISG). It recently produced three Group Reports (GR).

- **New IP is NOT compatible with IP.**
  There are no standards for New IP.
  There are no publicly available reference implementation.

- **Note**: Several other IP replacement initiatives exist in various community. They are all at various stages of maturity. An important one to mention is Recursive Inter Networking Architecture (**RINA**) developed by John Day and promoted by Louis Pouzin.

New-IP: Technology, Challenge and Impact

- New IP can be summarized as IP with larger headers to bring the following functionalities:
  - **Bandwidth and latency guaranteed by contract** (located inside the IP header)
  - **Perspective**:
    - A similar approach was studied (and abandoned) in the late 1990 under the name “active networks”. Security was the major challenge: because bandwidth reservation is expensive, somebody needs to pay for it. This requires a **global, fine grain** (all the way down to the individual user) charging scheme, which in turn can only be implemented with a **global, fine grain** authentication of every packets by every router.
    - Lack of privacy and population control becomes a key feature of the Internet architecture.
  - **“ManyNets”:** a collection of independent networks, each with their own structure, governance and identifier system.
  - **Perspective:**
    - The current Internet is one global network used by multiple applications. “One World. One Internet.”

New-IP: Above and Beyond the "Old" IP for Futuristic Applications

- **Argument**: IP is over 40 years old, and is no longer suitable for modern applications, it is an obstacle for 5G, multimedia...

- **Perspective**:
  - Zoom, used everyday by millions of people around the world during Covid
  - Voice/Video calls on WhatsApp/Telegram/… have replaced traditional telephony
  - "IP is not suitable for multimedia" is not a new argument. It was brought every time a new generation of access network was defined. Each time IP has adapted.

- **New IP use cases** are defined at ITU NET-2030:
  - Holographic communications, tactile networking, digital twins…
  - Requirements: Bandwidth > 1Tbps per flow, latency < 1ms
    Note: similar use cases are now being pushed by some proponents of 6G

- **Perspective**:
  - Bandwidth: speed record on fiber: Early 2020: 1.52Tbps sur 80km
  - Latency: speed of light limitation: 1ms = 100km maximum
  - The last few decades has shown that increasing bandwidth was a cheaper and easier response to the deployment of new applications (VoIP, Video…) than explicit bandwidth management. On the Internet, "cheap" wins.
  - Replacing IP at the Internet scale is a very complicated endeavor.
    Case in point: we are already 25 years into IPv6 transition, and it is very far from. completed.

How Does this Impact ICANN? 6G…

- 6G is being discussed now for deployment 2030. Two possible directions:
  - 6G = 5G + more bandwidth (cheaper service)
  - 6G = new futuristic applications

- Geo-political pressures: **Is "One world, One Internet" still relevant?**
  - Unicity of a 6G standard is no longer guaranteed.
    - We could see a Chinese 6G and a Western 6G that are incompatible.
  - If the incompatibility extend to the IP layer, then we would no longer have a single Internet.
  - A 6G network based on New-IP **may or may not use the DNS. Even if it does, it may use a different set of domain names, with a different governance model.**