5G Technology

A view from ICANN Office of the CTO

Alain Durand

5G India 2020
4 November 2020

Introduction

- The Internet is increasingly mobile. The next wave of devices won't be limited to computers or smartphones with an actual human being in front of the screen. It will include Machine-to-Machine communication with Internet of Things (IoT) devices.

- Is the current model of the Internet (the TCP/IP protocol suite) still relevant in a 5G world?
    - Is DNS still operable in a 5G world, especially considering latency sensitive applications?
    - Is the set of unique identifiers ICANN helps coordinate still useful, or does 5G bring with it the need for a different set of identifiers?

Is the DNS workable in a 5G low latency environment?

Context:
We hear many claims that DNS is not compatible with 5G low latency requirements (<10ms)

Analysis:
- The 5G radio link is just the first leg of any communication.
- Assuming a datacenter located 1,000km away from an edge facility, connected over fiber, an additional 10ms RTT would be added. This delay is only happening once at connection time. It is negligible when communicating with a remote host.
- This delay might be significant in local M2M communications.

ICANN Position:

DNS resolution latency and caching are a network operation/optimization concern, not an architectural issue. As such, ICANN believes that the DNS is workable in a 5G low-latency environment.

Recommendation: use local caches with aggressive pre-fetching, modify apps to query DNS earlier.

Network Slicing: a Risk of Fragmentation of the Internet?

Context:

Network slicing is a virtualization technique to build many networks with different characteristics over a single cellular infrastructure.

Analysis:

- Network slicing is still in its early stages of standardization.
- Idea: putting aside spectrum for specific customers can bring extra revenues
- Target: Industry 4.0
- Potential: network slicing could also be used by large platform providers to create their private internet.
- Impact: departure from the Internet model of one network, multiple applications.

ICANN Position:

- ICANN believes the model of a single Internet, based on a global system of unique identifiers, is the best way to maximize the benefits the Internet can bring.
- If popular platforms evolve to leverage network slicing, there is a risk that the Internet would fracture and only the long tail of lesser-known applications will keep using the Internet global system of unique identifiers.

Will 5G need a new sets of identifiers?

Context:

IoT, VoLTE, WhatsApp, Telegram and other apps might suggest something else than phone number is needed.

Analysis:

- E.164 numbers are used within cellular networks only to identify end-user devices. Internally, since 2G, cellular networks have used another identifier, the International Mobile Subscriber Identity (IMSI), to route calls.

- There are no bridges between the various Instant Messaging (IM) systems and social media platforms. The reason being that those platforms compete with each other and see no value in interoperability.

- IoT device manufacturers typically use their own proprietary systems, often tied to the hardware. This persistence may cause privacy concerns.

- A new set of privacy-aware, ephemeral identifiers might be required. ICANN OCTO has demonstrated the use of such identifiers in the DNS

ICANN Position:

- There does not appear to be a clear need for a new identifier system for classic user-oriented applications using 5G. However, IoT is a domain that could benefit from new global identifiers, especially some that could better handle privacy. Such identifiers can be implemented directly within the DNS.

Non-IP solutions at the edge in 5G?

Context:

Non-IP solutions at the edge of 5G are proposed to address perceived latency or alleged limitations in the IP model to support constrained environments such as low energy/low bandwidth networks, or properly support latency sensitive applications.

Analysis:

- The IETF 6lowpan and 6lo working groups have defined extensions to enable IP on resource constrained devices (e.g. battery-operated): Zwave, Bluetooth Low Energy, DECT-ULE, NFC, PLC and others. Tools: link layer adaptation, protocol optimizations (header compression)

- The IETF, in collaboration with IEEE 802.1, has chartered the Deterministic Networking (DETNET) working group: "deterministic data paths that operate over Layer2 bridged and Layer3 routed segments, where such path can provide bounds on latency, loss and packet delay variation (jitter), and high reliability"

ICANN Position:

- ICANN notes that the IETF has already done extensive work to make IP work in constrained environments.

- However, specific verticals using private 5G networks are just a special case of proprietary networks where proprietary solutions can be deployed without any impact on the global Internet.

Engage with ICANN

Thank You and Questions

Visit us at **icann.org**
Email: email

@icann

linkedin/company/icann

facebook.com/icannorg

slideshare/icannpresentations

youtube.com/icannnews

soundcloud/icann

flickr.com/icann

instagram.com/icannorg