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# CYBER ISSUES ON INTERNET

FRANCO-JAPAN CS WORKSHOP

APR. 25, 2019

KEIO University

Jun Murai



# Architectural Issues

- IP
- WEB
- IoT fragmentation
- MEC fragmentation

**The Internet**

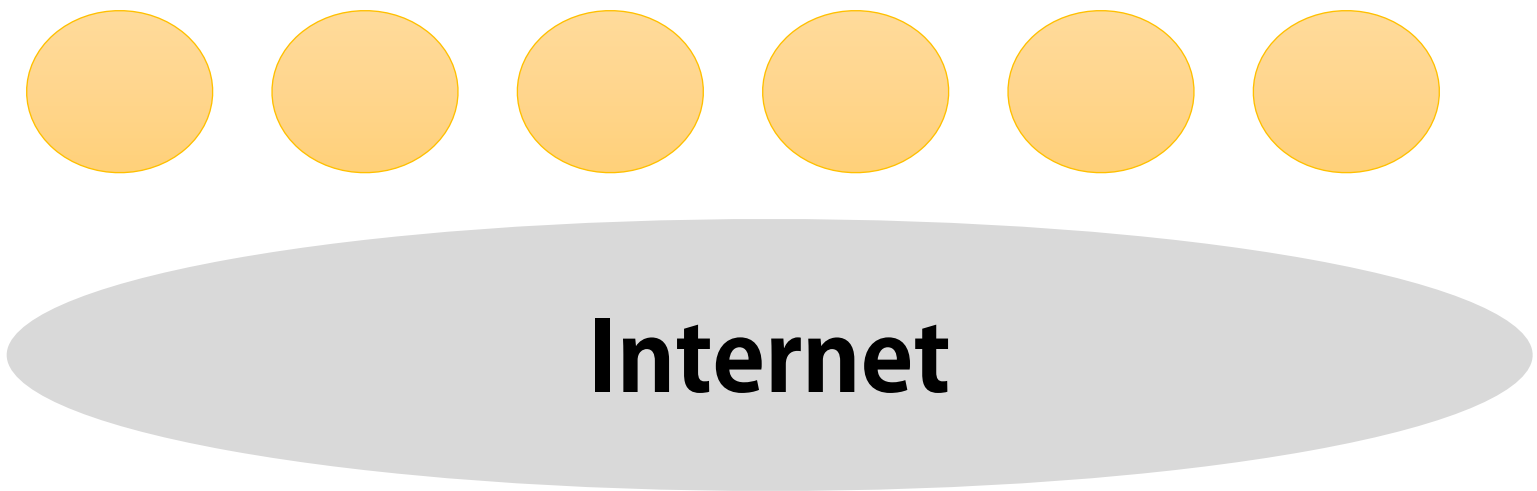
**IP**

**EGP**

**IGP**

**DNS**

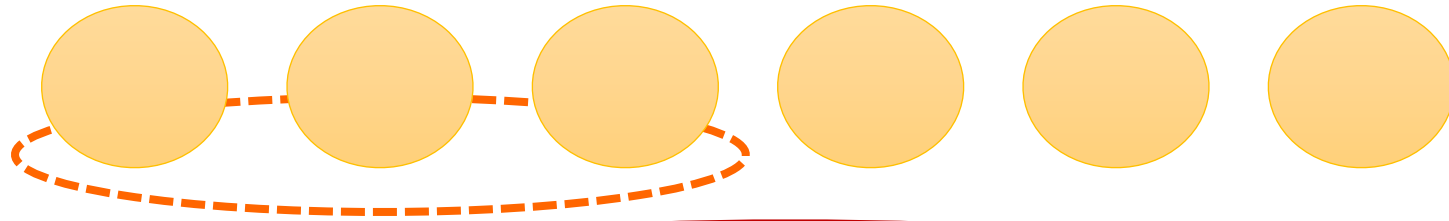
**IP address**



**Internet**

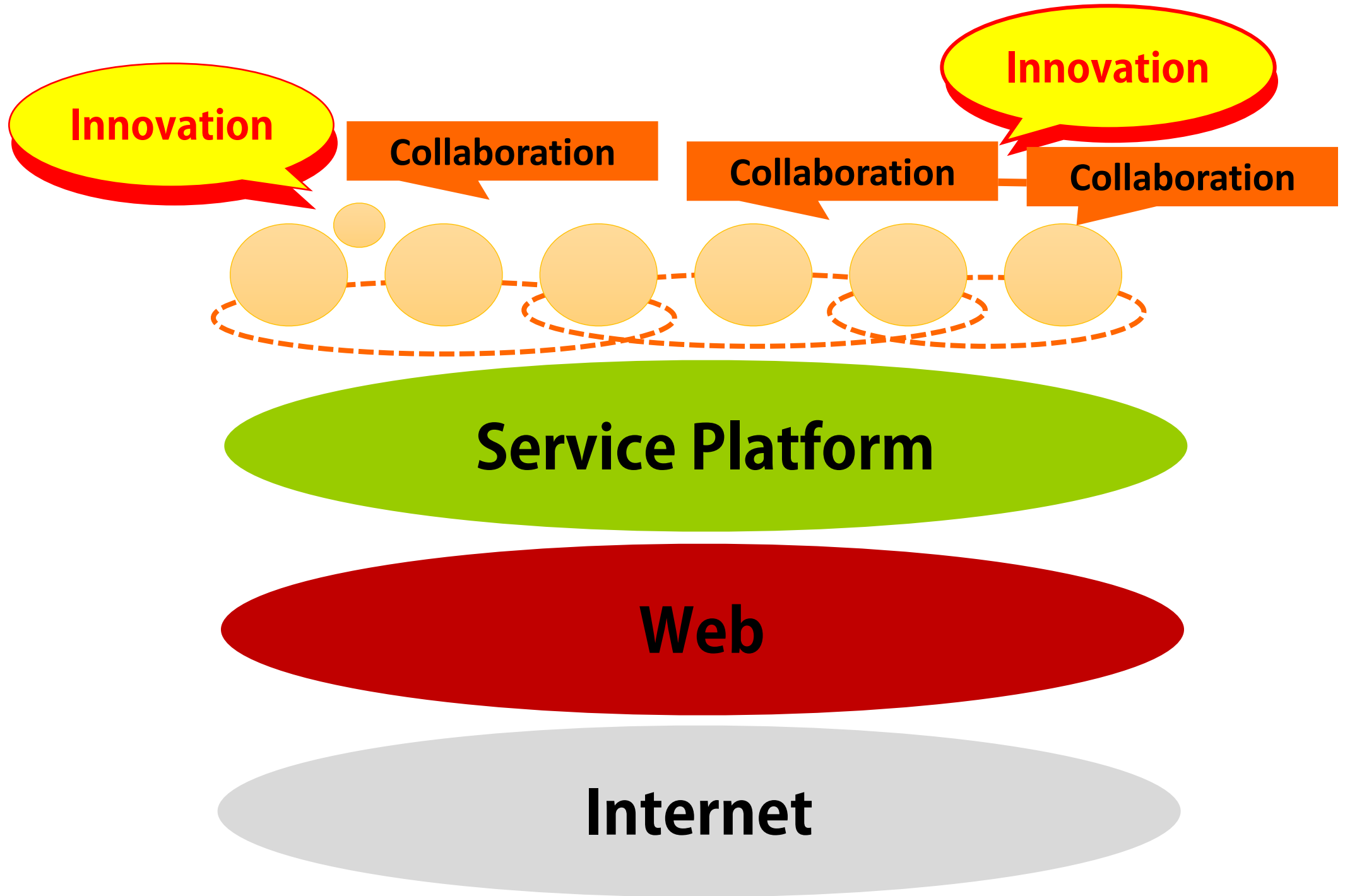


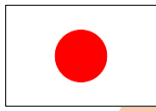
**Collaboration**



**Web**

**Internet**





インターネット = the Internet



# Various IoT Platforms depending industries



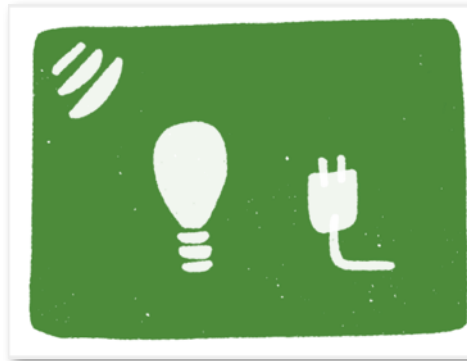
**Smart Homes**



**Wearables**



**Healthcare**



**Power & Environment**

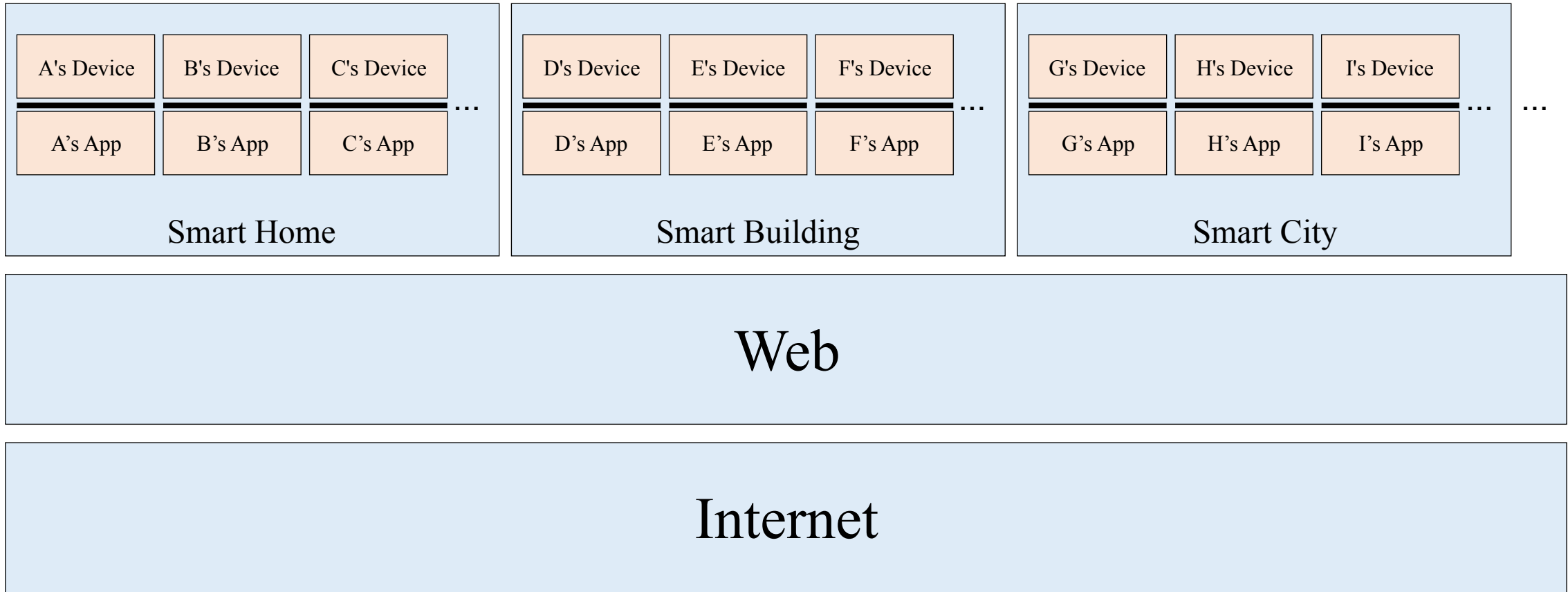


**Smart Cities**



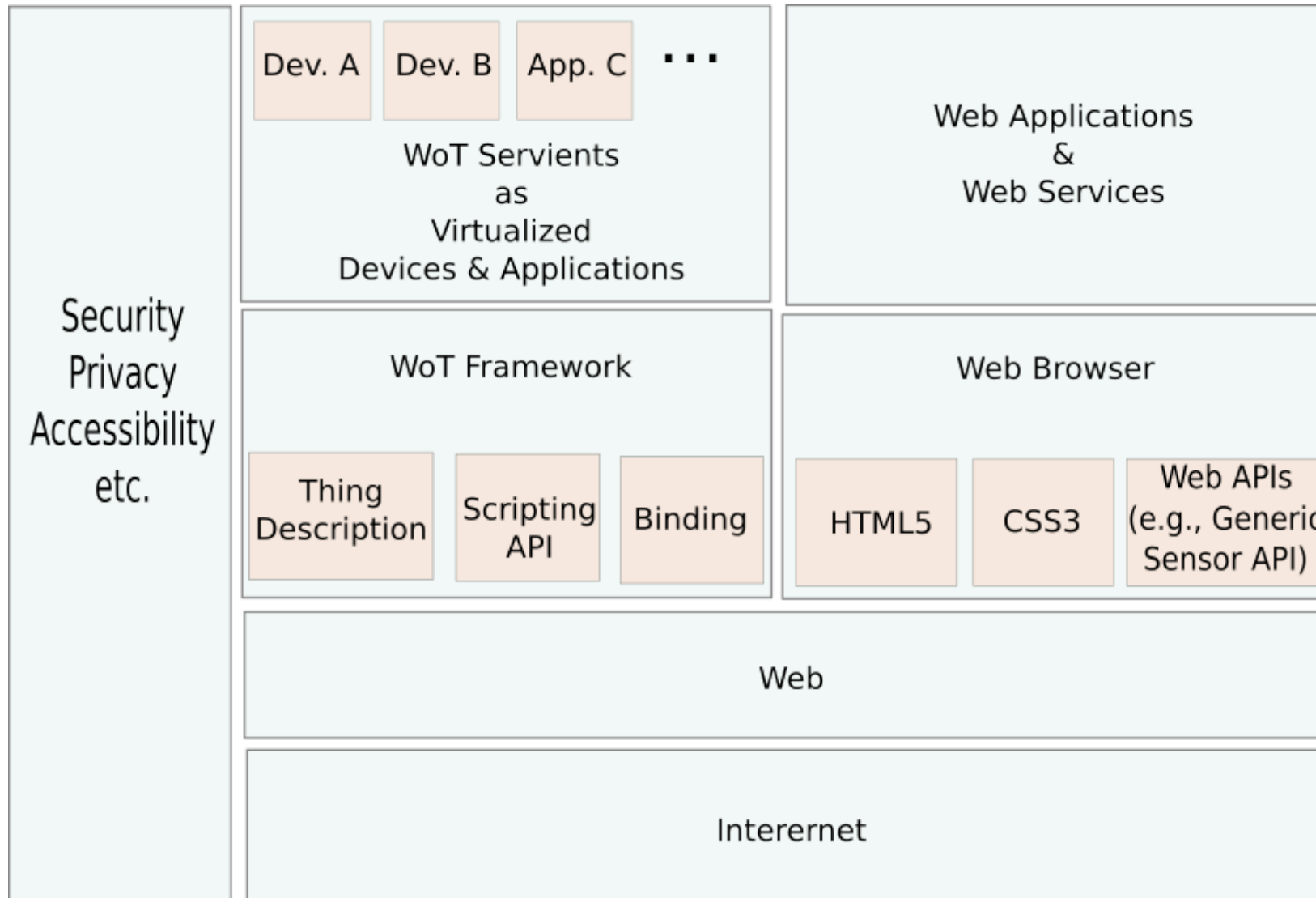
**Manufacturing**

# IoT Silos



# WoT: Interconnection of IoT silos using the Web

Web becomes the platform for data trading



# Target of Standardization

Basic module → WoT Servient (Server+Client)

## WoT Thing Description (TD):

Metadata to describe “Things”  
Properties, Actions and Events

## WT Scripting API:

Handling the capability of “Things”  
Standard API for IoT application development

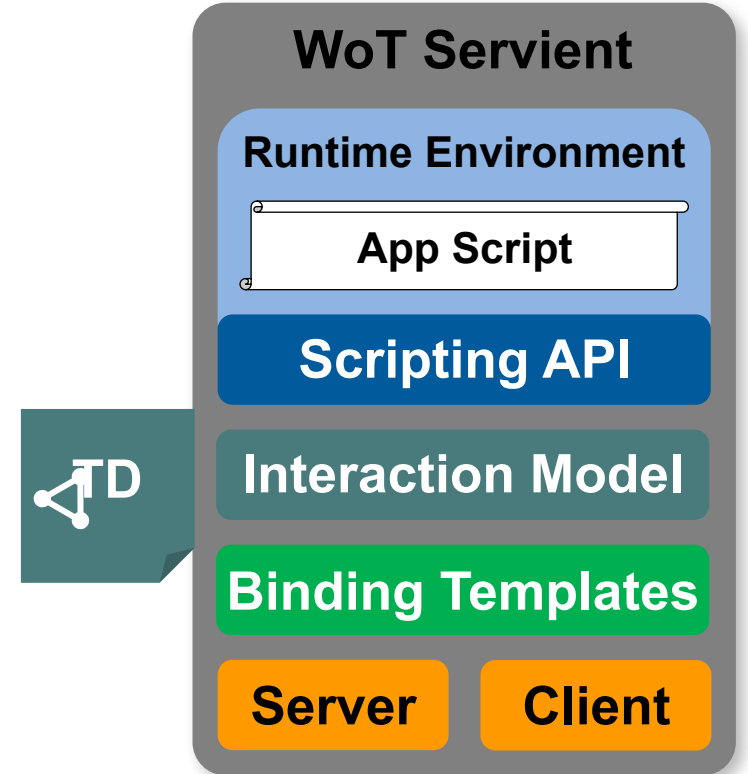
## WoT Binding Templates:

Mapping various communication protocols  
Converting protocols for various devices to standard messages

## Security & Privacy:

Security and Privacy for WoT purposes  
Security and Privacy considerations for WoT Building Blocks

11



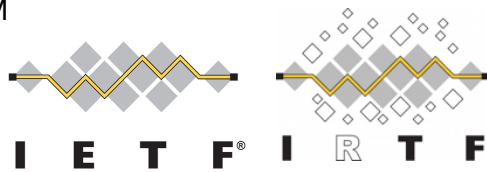
# WoT Participants





# Liaison with related SDOs

- INDUSTRIE 4.0
- Industrial Internet Consortium
- Open Connectivity Foundation
- OPC Foundation
- IETF/IRTF
- oneM2M
- AIOTI
- Etc.





5G

**What is 5G?**

# Japan's Docomo, KDDI, SoftBank and Rakuten get mobile phone **5G bands ahead of 2020 launch** (2019/4/10)

- The telecom ministry( 総務省 ) allocated mobile phone frequency bands for **superfast 5G services** to three major mobile carriers and the e-commerce giant Rakuten Inc. on Wednesday, ahead of an expected full-scale launch in 2020.
- Overseas, competition has been heating up for 5G services, which are touted as enabling smartphone users to download a two-hour film in just three seconds, with **U.S.** and **South Korean** mobile carriers both claiming to be the world's first to have launched commercial 5G operations.



# 割当結果まとめ

Bandwidth allocation result

- 以下のとおり、割当てを実施。
  - [3.7GHz帯及び4.5GHz帯] 2 枠割当て：NTTドコモ、KDDI / 沖縄セルラー電話
    - ※ 1 枠当たり100MHz幅
    - 1 枠割当て：ソフトバンク、楽天モバイル
  - [28GHz帯] 1 枠割当て：全ての申請者
    - ※ 1 枠当たり400MHz幅



なお、割当て（開設計画の認定）に当たり、**全者共通の条件及び個者への条件を付す**こととする。

## 【3.7GHz帯】



## 【4.5GHz帯】

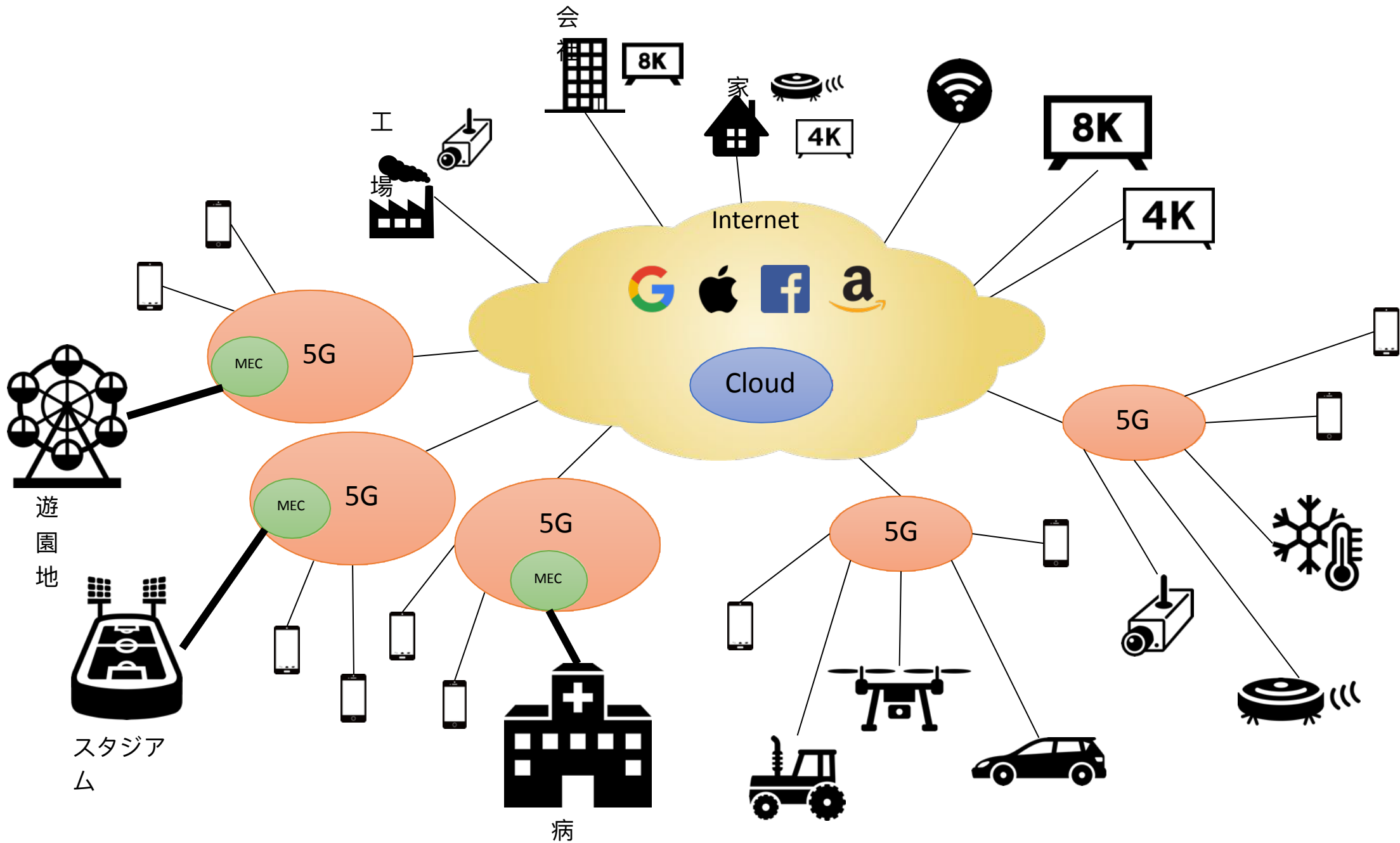


## 【28GHz帯】



1. NTT docomo
2. KDDI
3. Rakuten mobile
4. Softbank
5. KDDI







# Architectural Issues

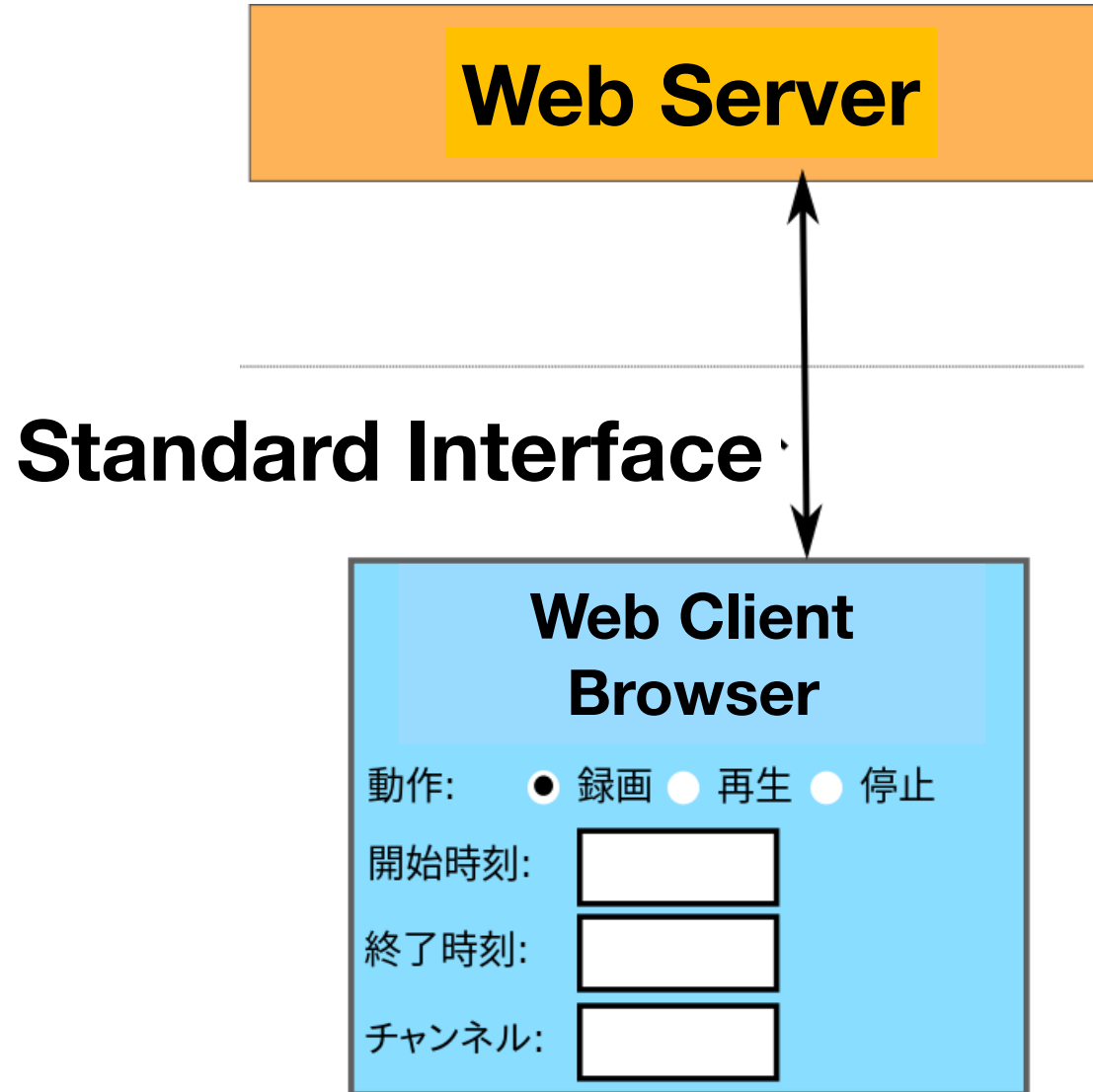
- IP
- WEB
- IoT fragmentation
- MEC fragmentation



# Uniformity vs Diversity

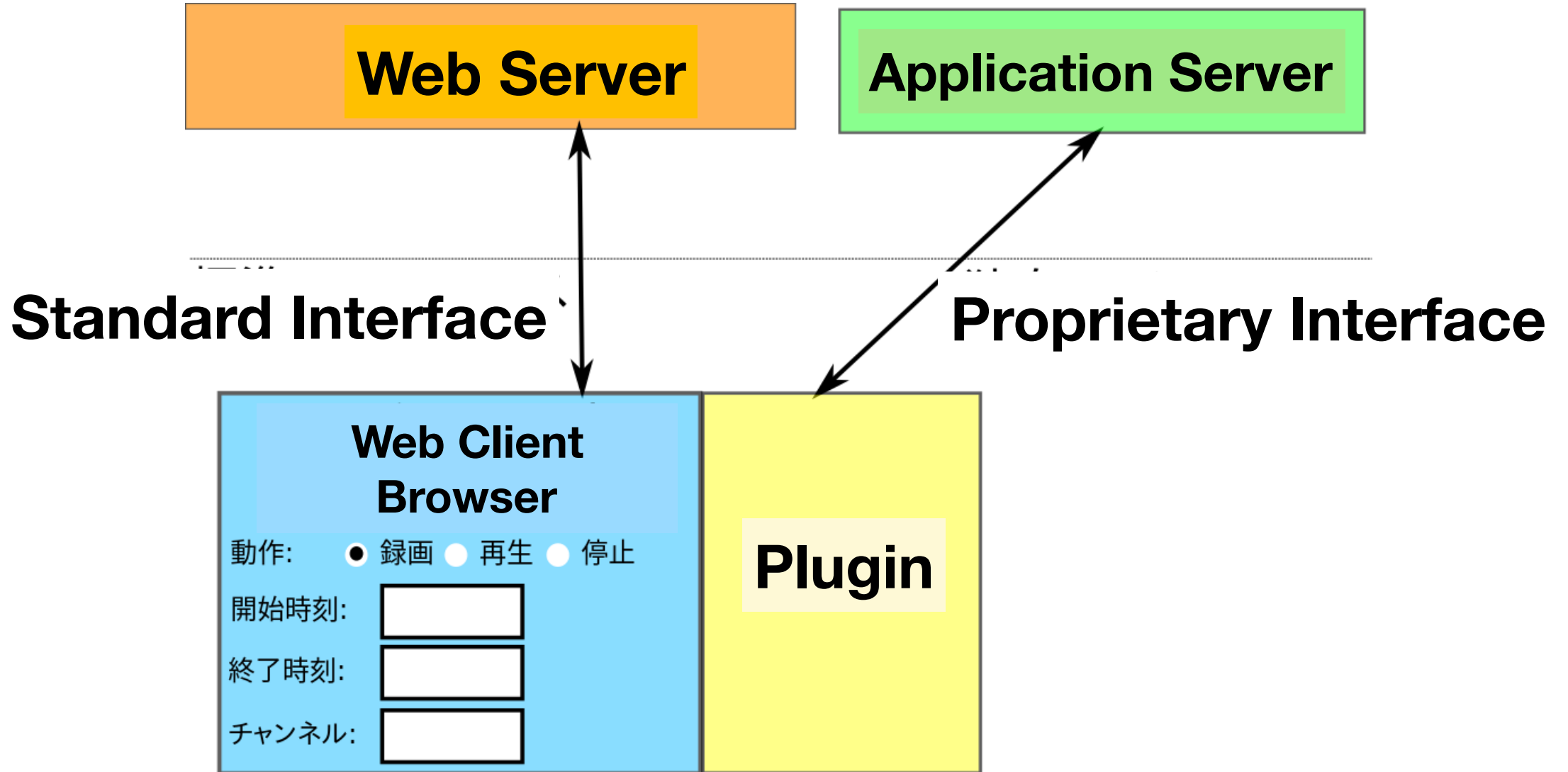
- Proprietary
- Cloud
- Root servers

# Once upon a time: Sharing Web pages

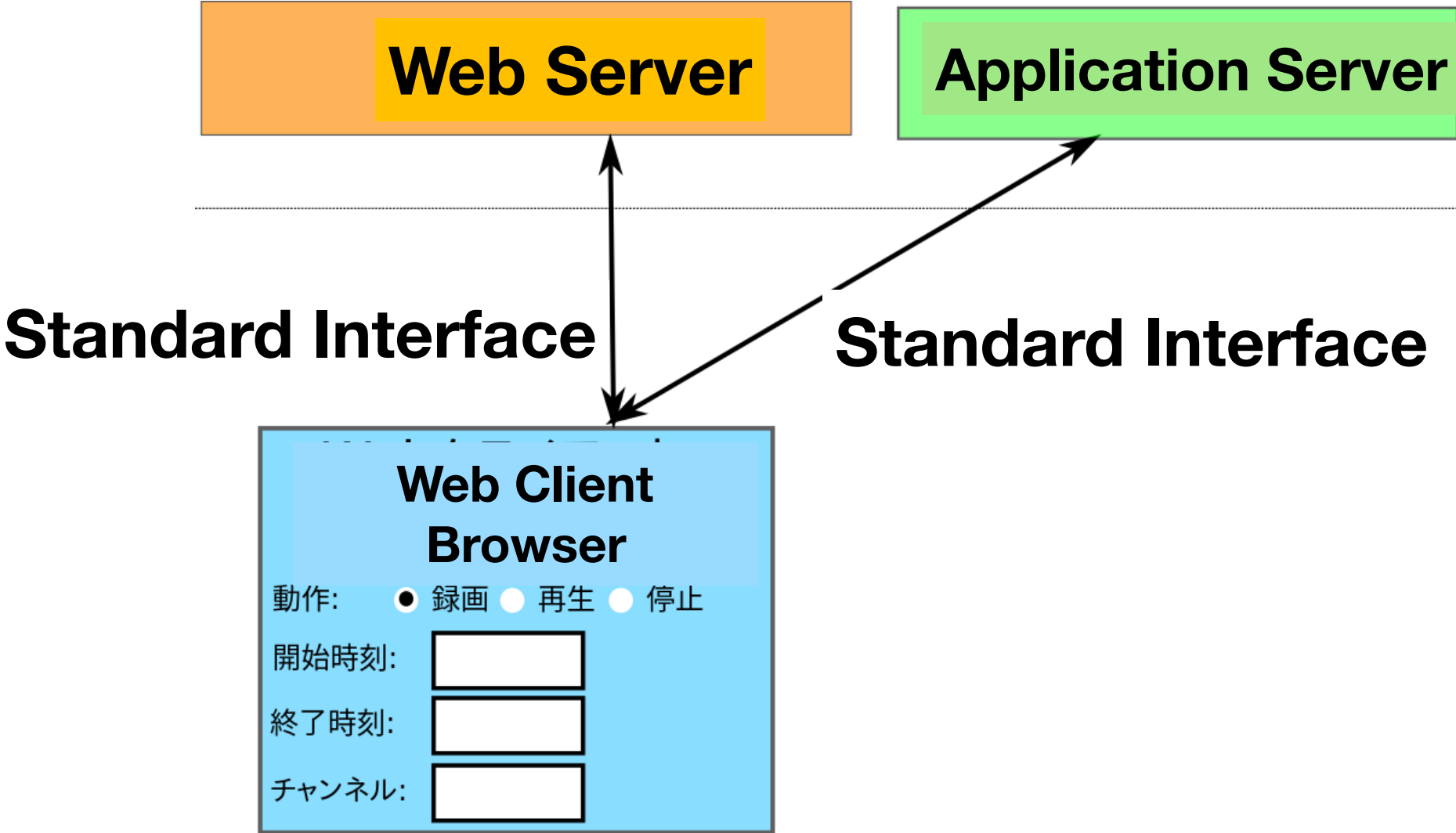




# Web application using Plugins



# Web application using HTML5 without plugins



Progressive Enhancement 

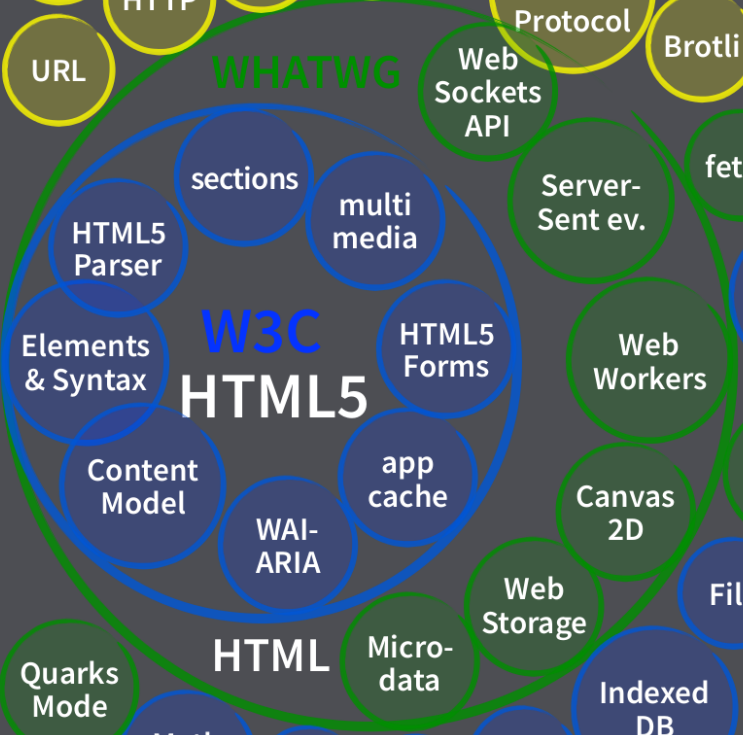
**IETF**



**Khronos**



**WHATWG**



**W3C HTML5**

**ECMAScript 2015**

**WebRTC**

**CSS Snapshot 2015**

**HTML Components**

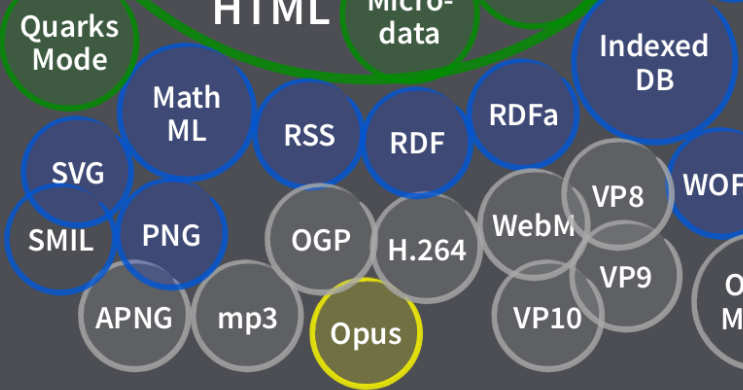
Game, VR & High Performance Apps

Device Control

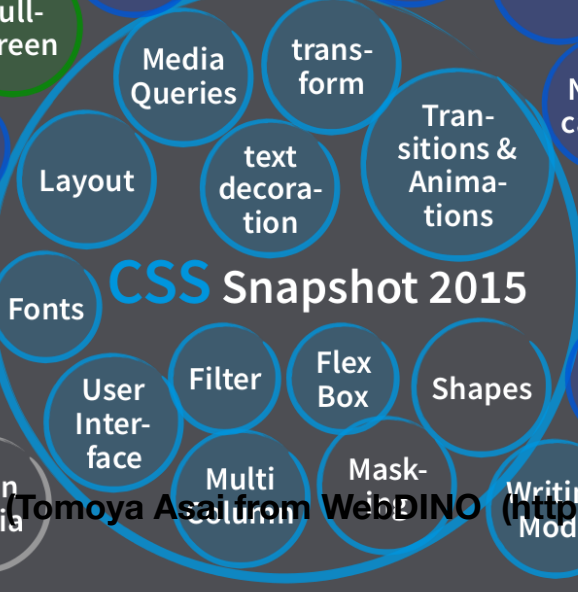
Real-Time Communications

Progressive Web Apps

Extensible for Anything!



**HTML**

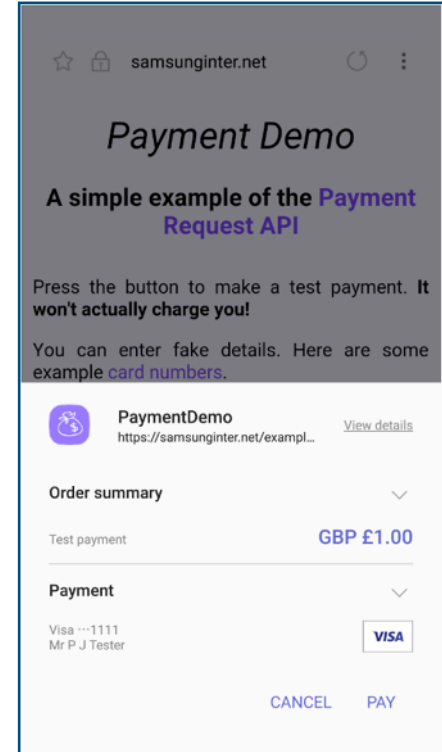
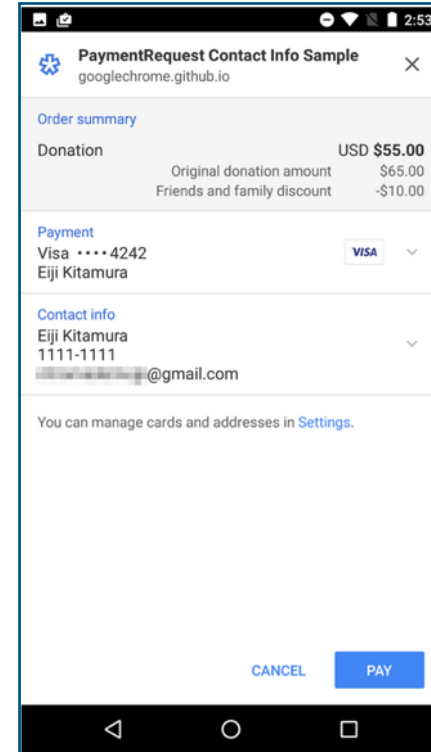
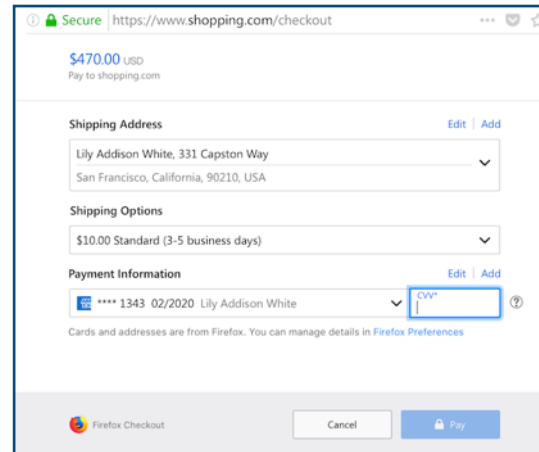
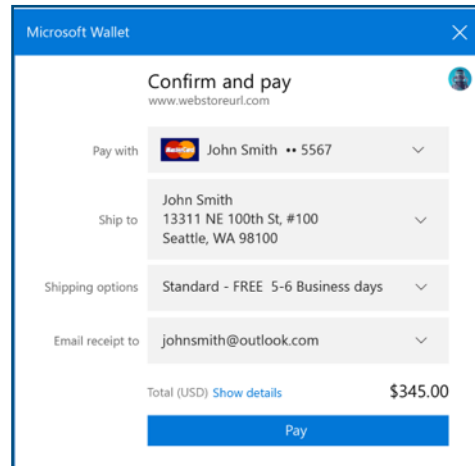
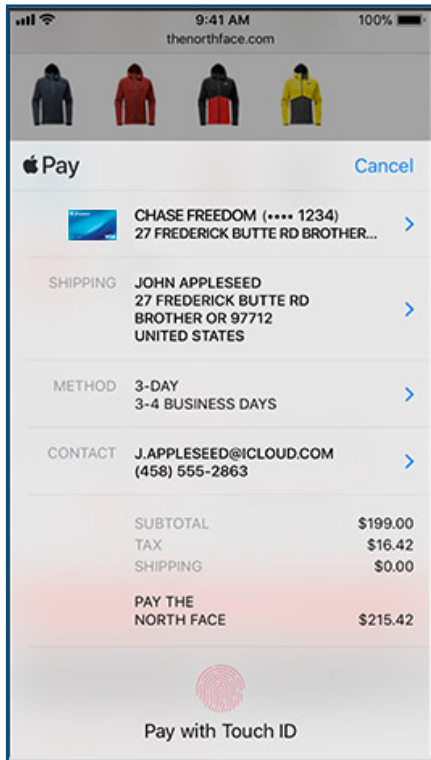


(Tomoya Asai from WebDINO (<http://webapi.link/>))

24

# Web Security&Privacy

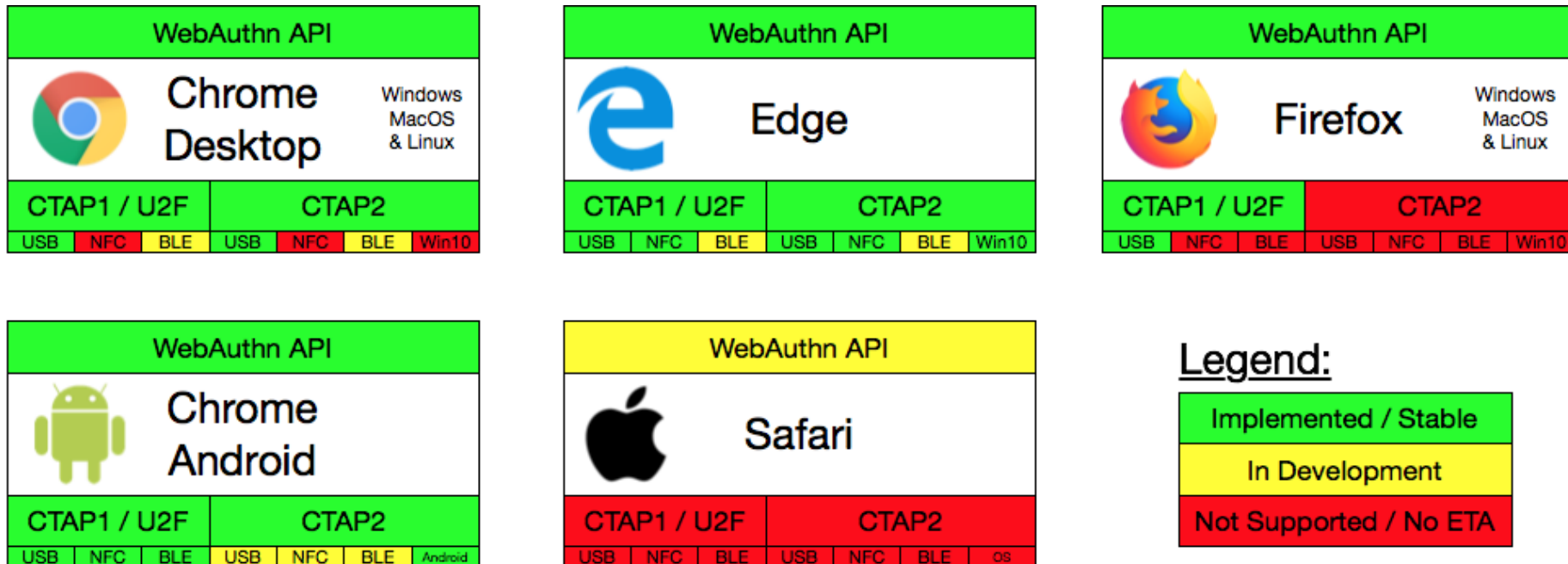
# Current User Experiences



# Hot Security Topics

- [Web Authentication](#): seamless 2-factor customer authentication
- Cards: Application of EMVCo specs into Payment Request ecosystem
  - Network Tokenization
  - 3-D Secure 2
  - SRC (new!)
- [W3C Workshop on Strong Auth and Identity](#)  
10-11 December 2018 in Redmond at Microsoft
- EMVCo, FIDO, and W3C investigating creation of a Secure Web Payments Interest Group for discussion
- European (PSD2) open banking APIs and Payment Request ecosystem

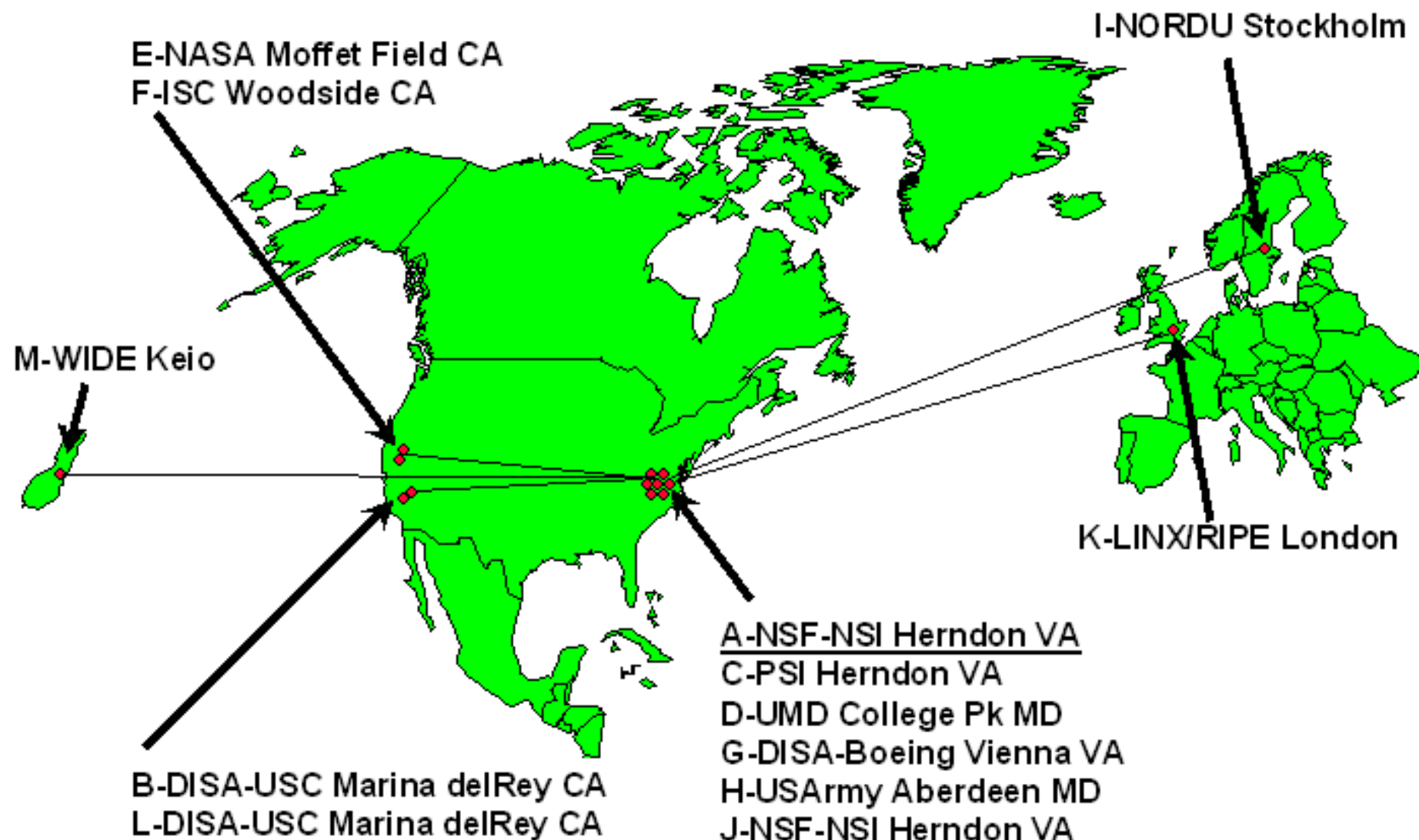
# FIDO/WebAuthn Implementation Status



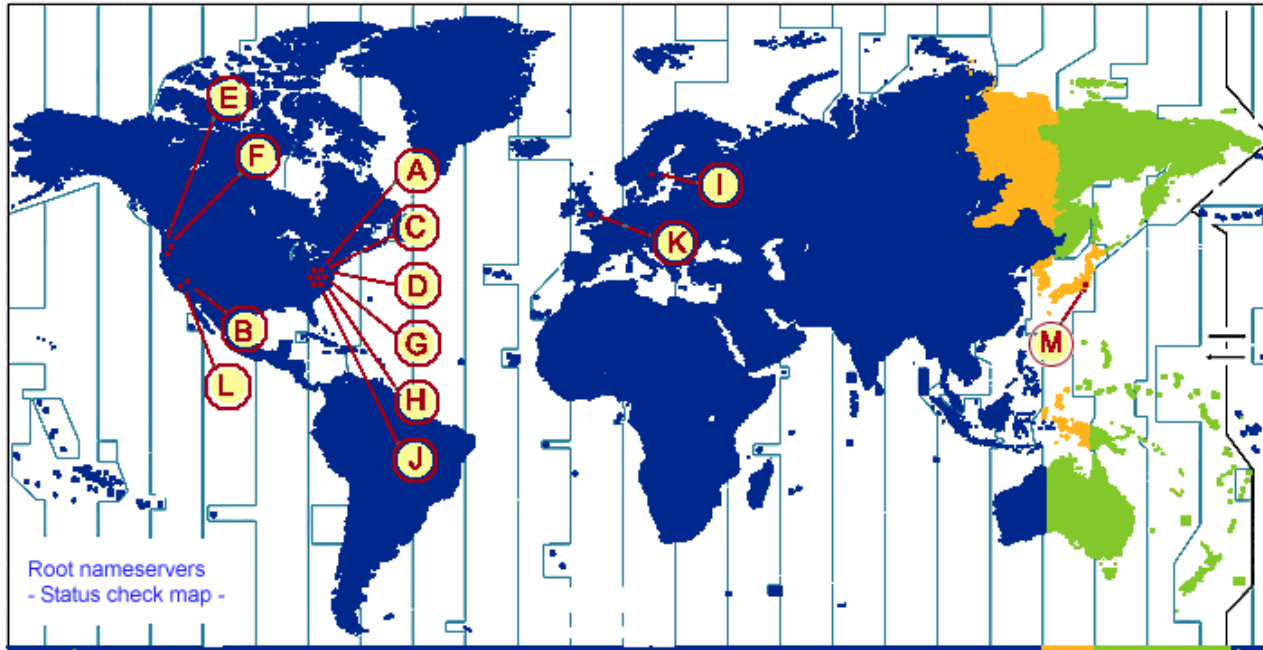
# DNS Root Servers

1 Feb 98

## Designation, Responsibility, and Locations





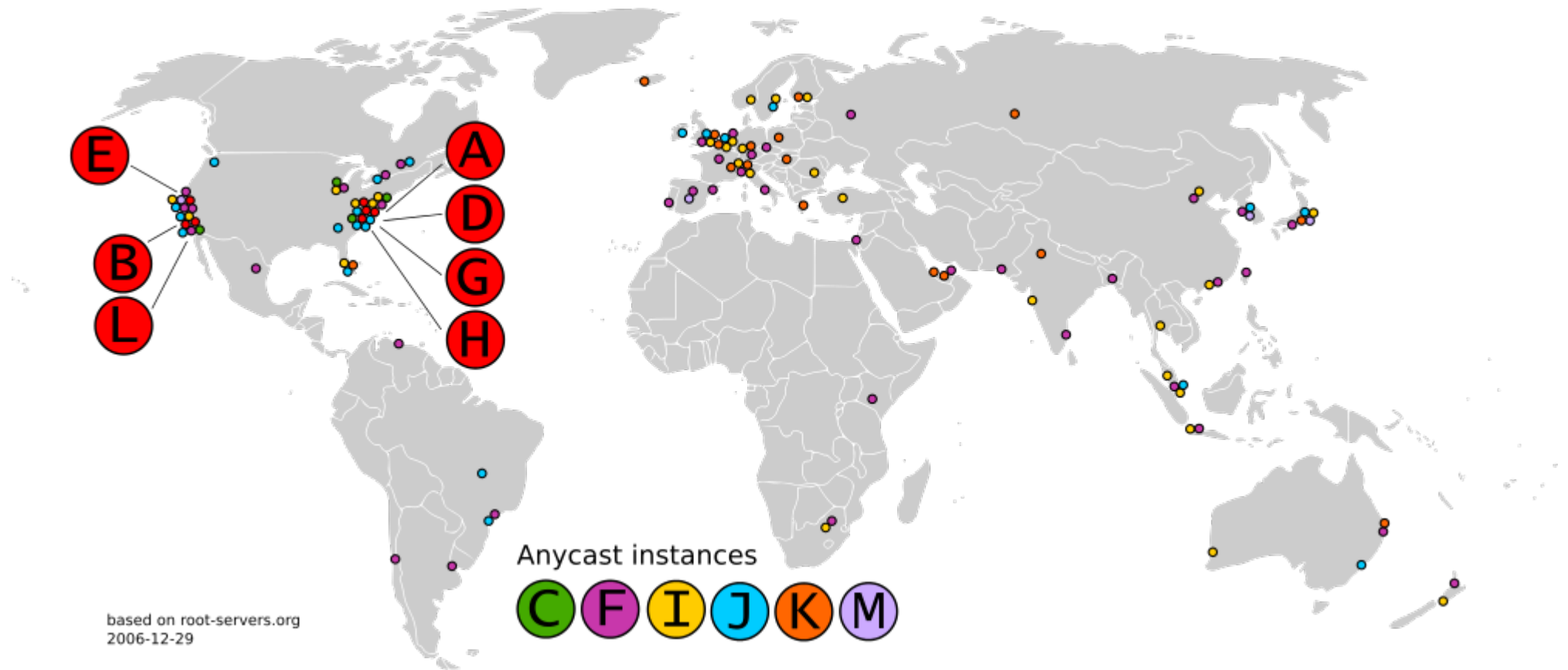


Server	Operator	Status
A	Network Solutions, Inc	working
B	USC/ISI	working
C	PSInet	working
D	UMD	working
E	NASA	working
F	ISC	working
G	DISA	working
H	ARL	working
I	NORDUnet	working
J	(TBD)	working
K	RIPE	working
L	ICANN/IANA	working
M	WIDE	<b>confirmed</b>



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I	NORDUnet	confirmed
J	(TBD)	confirmed
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M	WIDE	confirmed







# DNS Root Name Server Locations



# Attack Mitigation

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## Diversity



12 Professional Operators / 13 Independent Operations



# Uniformity vs Diversity

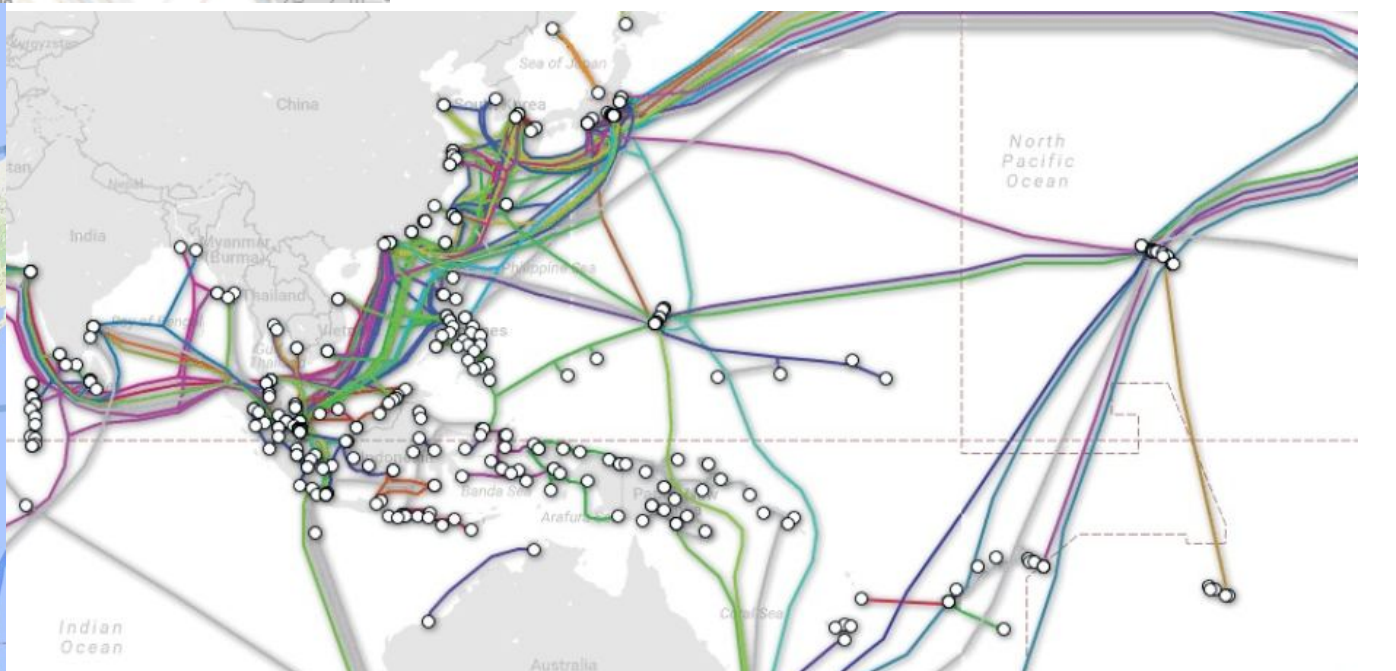
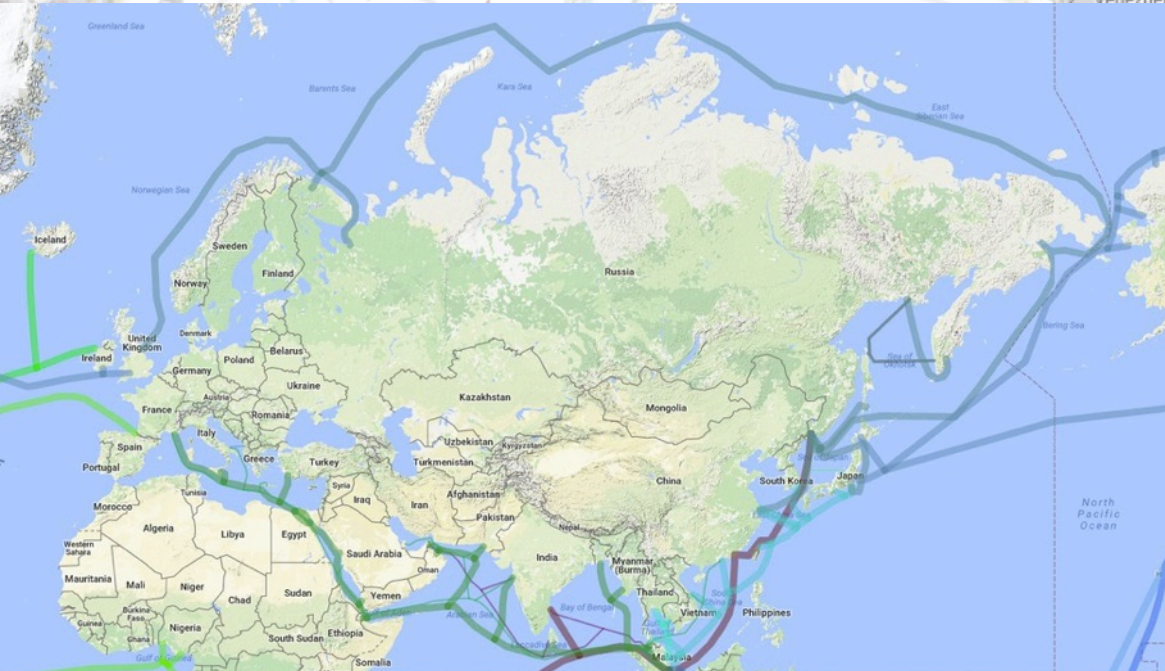
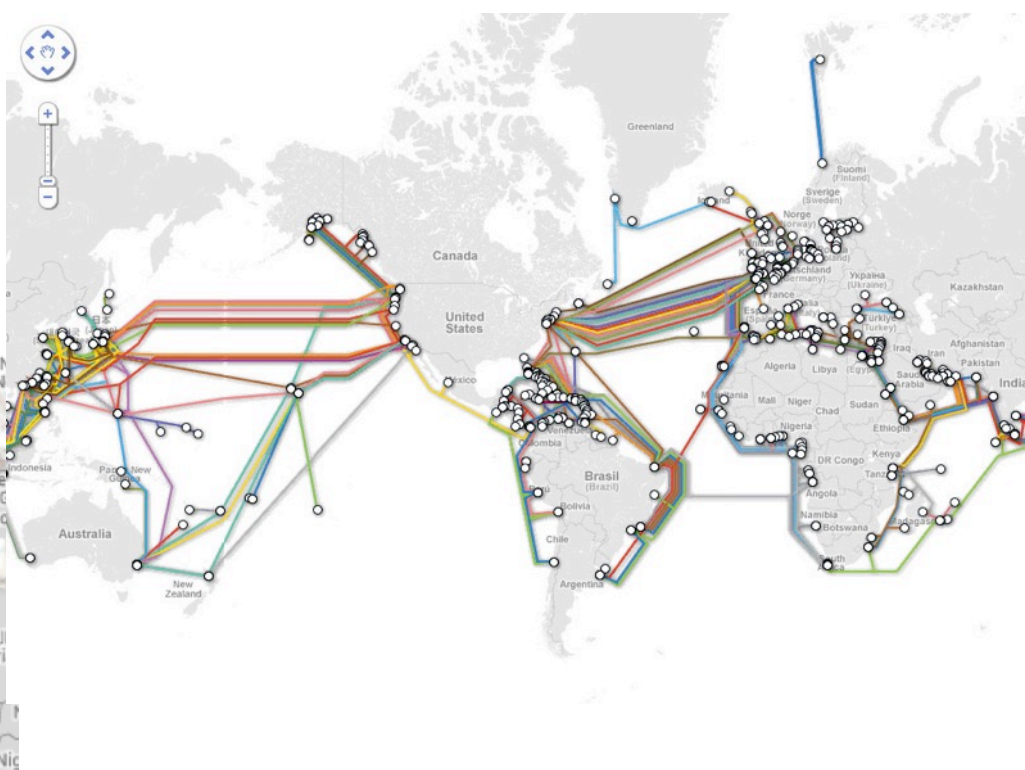
- Proprietary
- Cloud
- Root servers



# Global Topology

- Who own the infrastructure?
- Sub Cables
- LEOs
- Internet

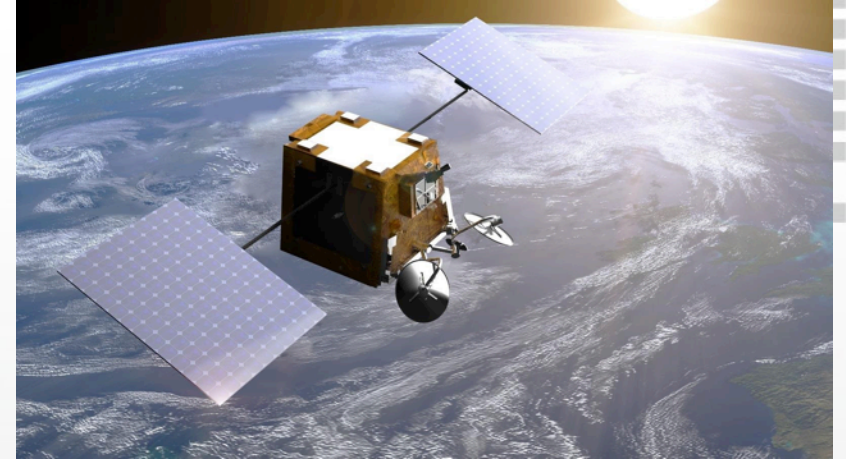






# News: OneWeb received \$1.25B in new funding

Following the [successful launch and deployment](#) of the first six satellites in a planned constellation of hundreds, OneWeb has raised \$1.25 billion in funding to kickstart mass production. It's a powerful endorsement of and ambitious plan to create an entirely new layer of global connectivity.



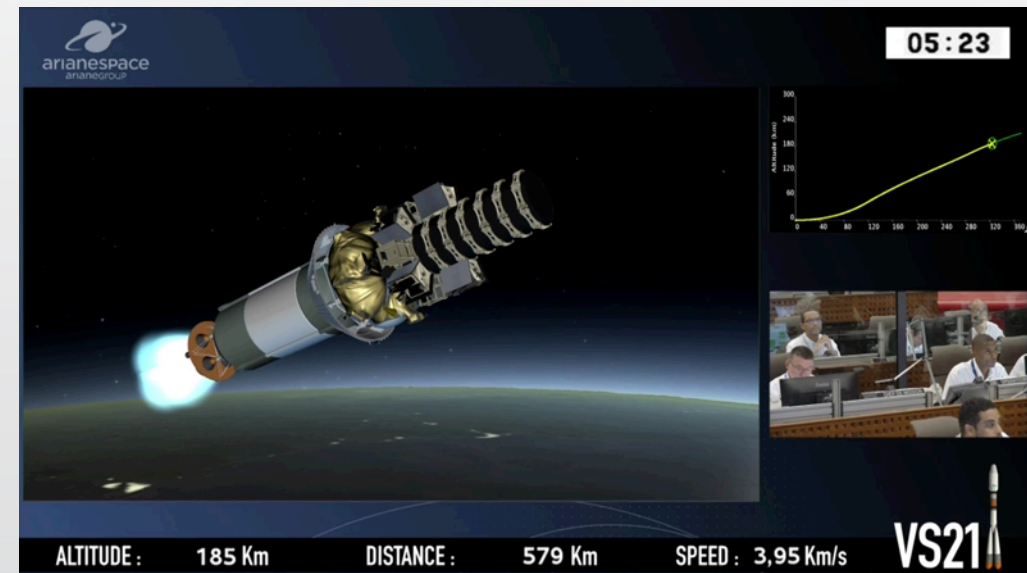
# OneWeb's first six global internet satellites are safely in orbit.

OneWeb is one of several companies that aims to connect the world with an Internet satellites. Its plan is to launch a total of 900 (650 at first) satellites to about a 1,100-kilometer low Earth orbit.

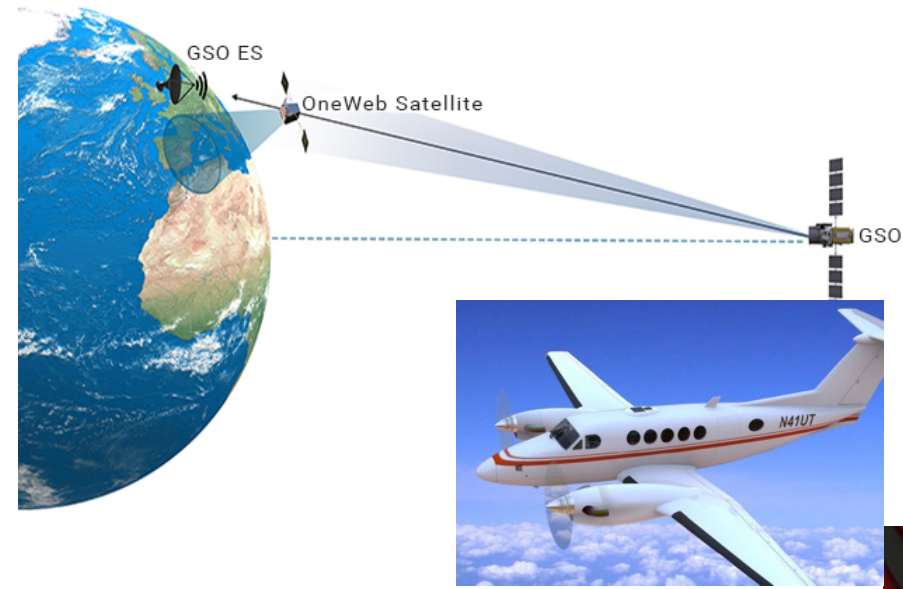
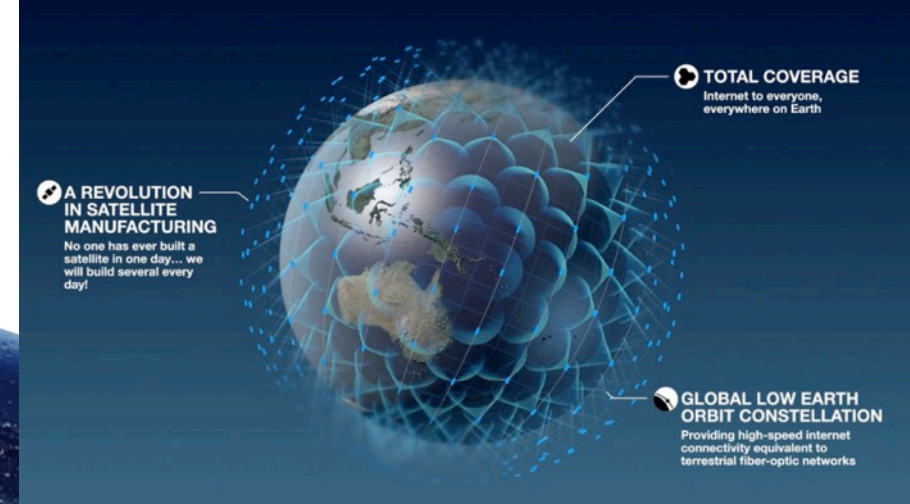
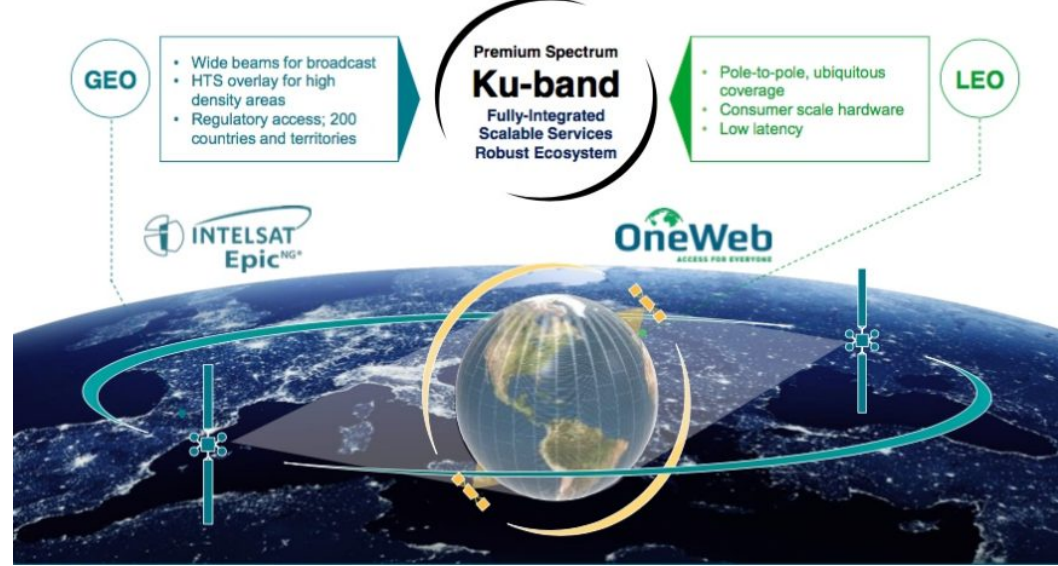
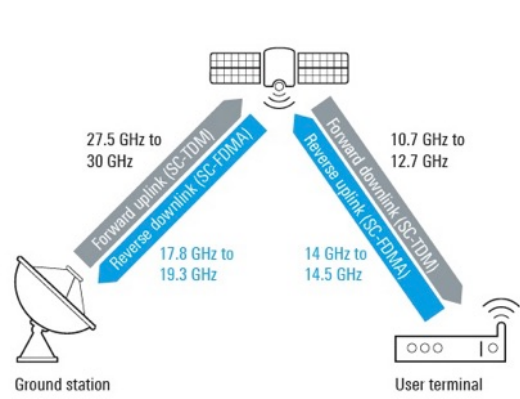
This time, the first six of the plan were successfully launched.

## Investors:

SoftBank, Virgin Group, Coca-Cola, Bharti Group, Qualcomm and Airbus





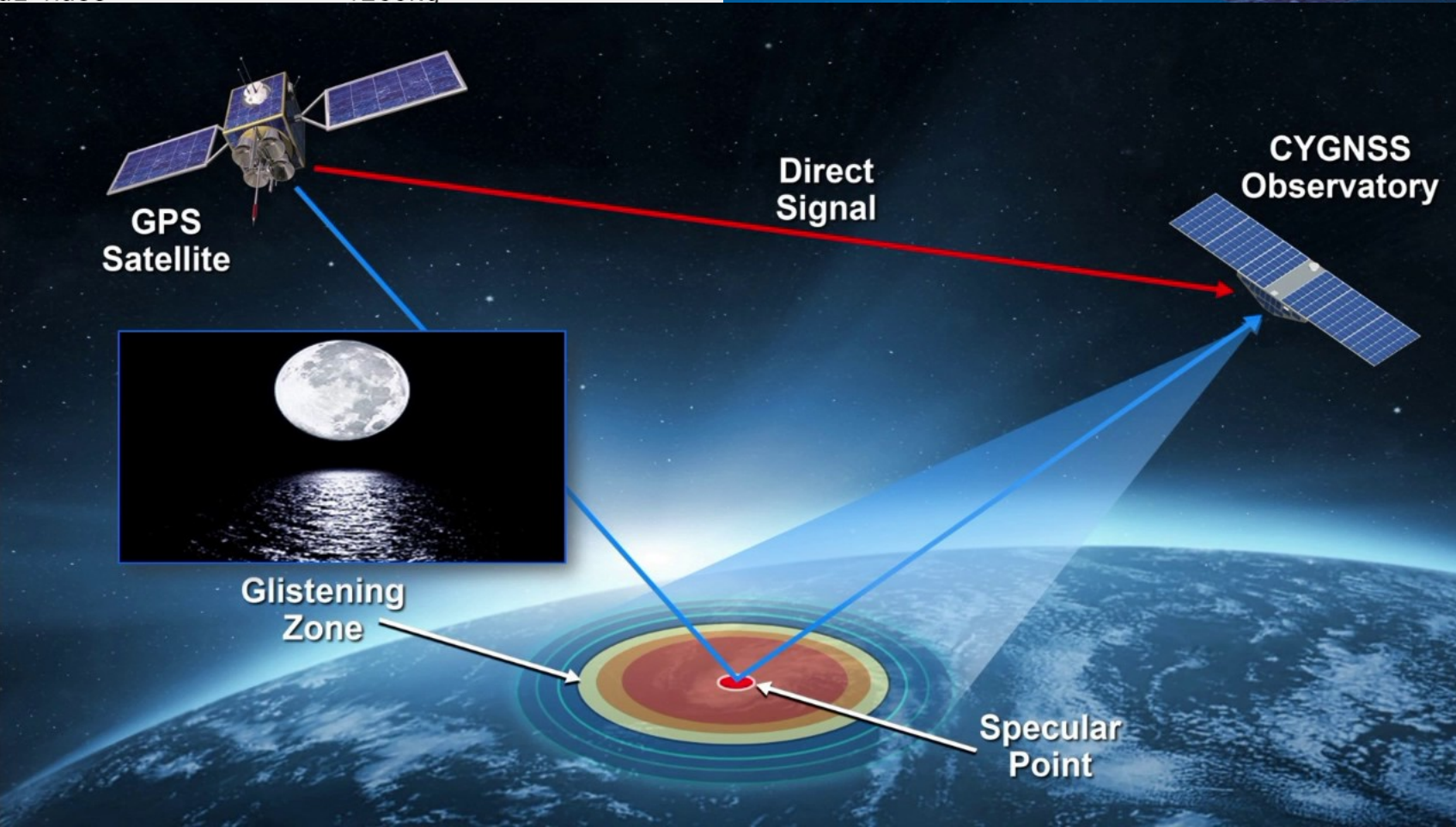




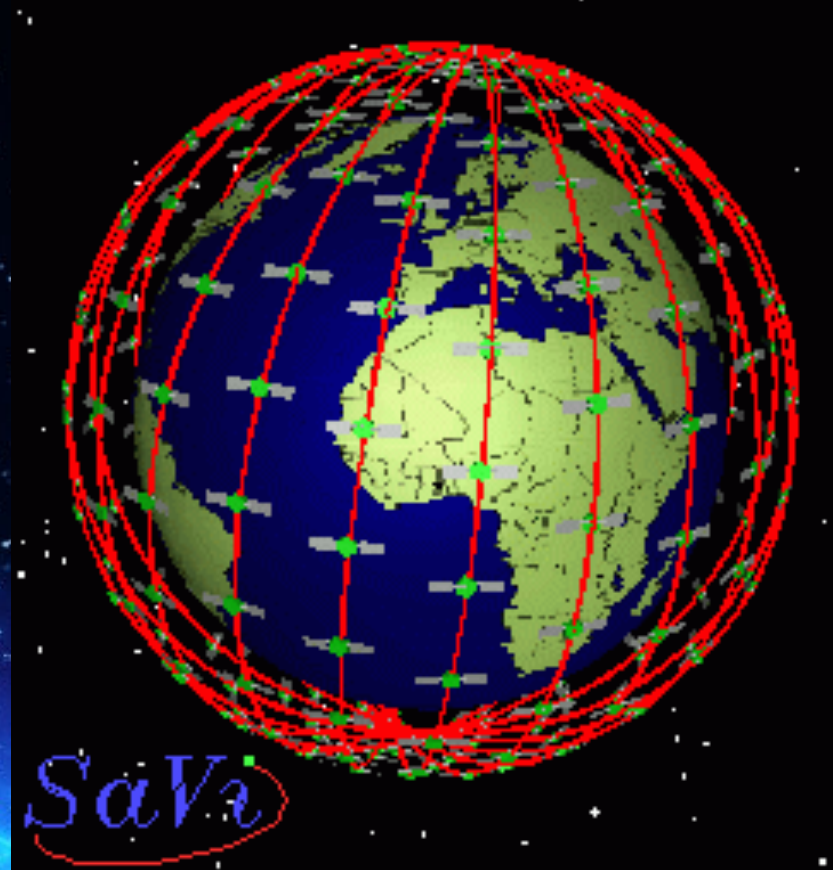
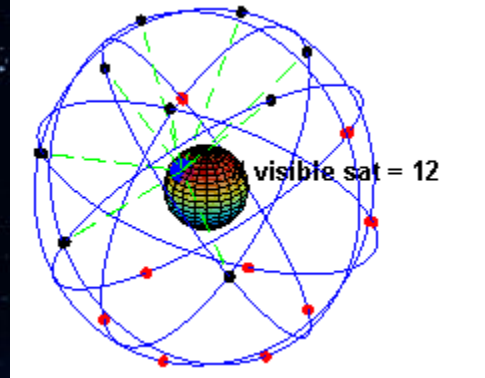
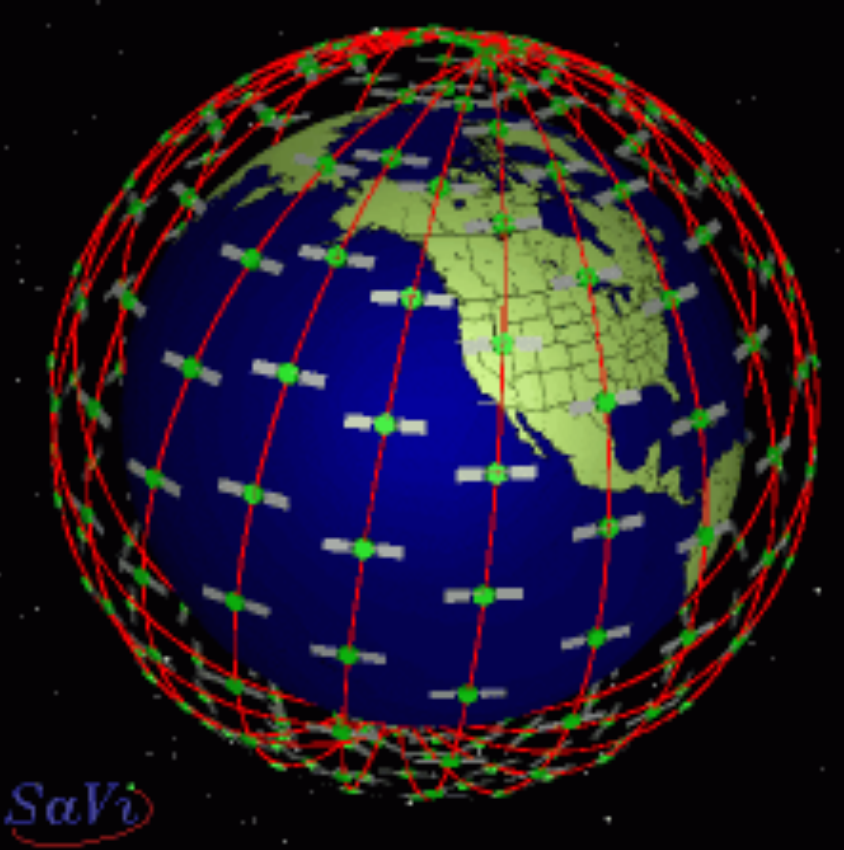


### Key Specifications

Orbit	LEO
Payload	Elite Bus 2000 Plus
Payload Power	2500W
Payload Mass	430kg
Satellite Mass	670kg
Fuel Mass	150kg
Total Mass	1250kg

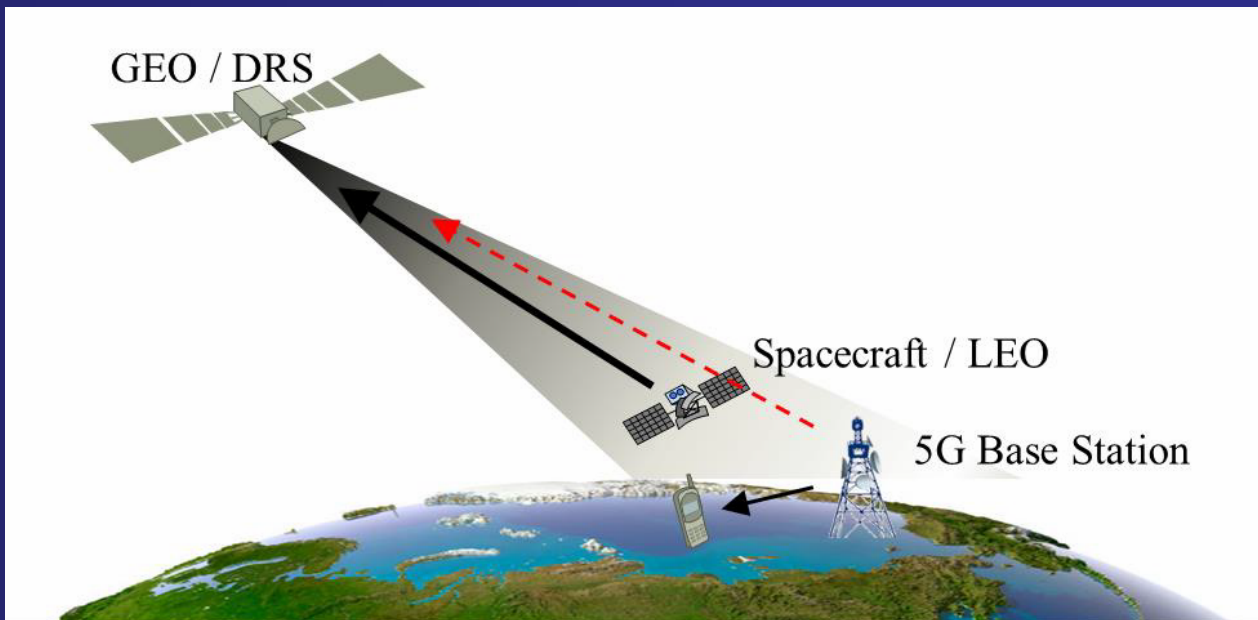






# 5G mmWave bands preliminary compatibility studies

- Conduct preliminary compatibility studies on certain frequency bands specified in WRC-19 AI 1.13, such as 25.25-27.5GHz (between IMT and ISS), 37-42.5GHz.
- Uncertainty remains in several aspects and needs further studies



IMT and ISS @ 25.25-27.5GHz as an example

## Channel model

- e.g. clutter loss **5G model**

- e.g., densities / antenna patterns / eirp of 5G BSs and UEs

## Overlaps of bands with other WRC-19 AI

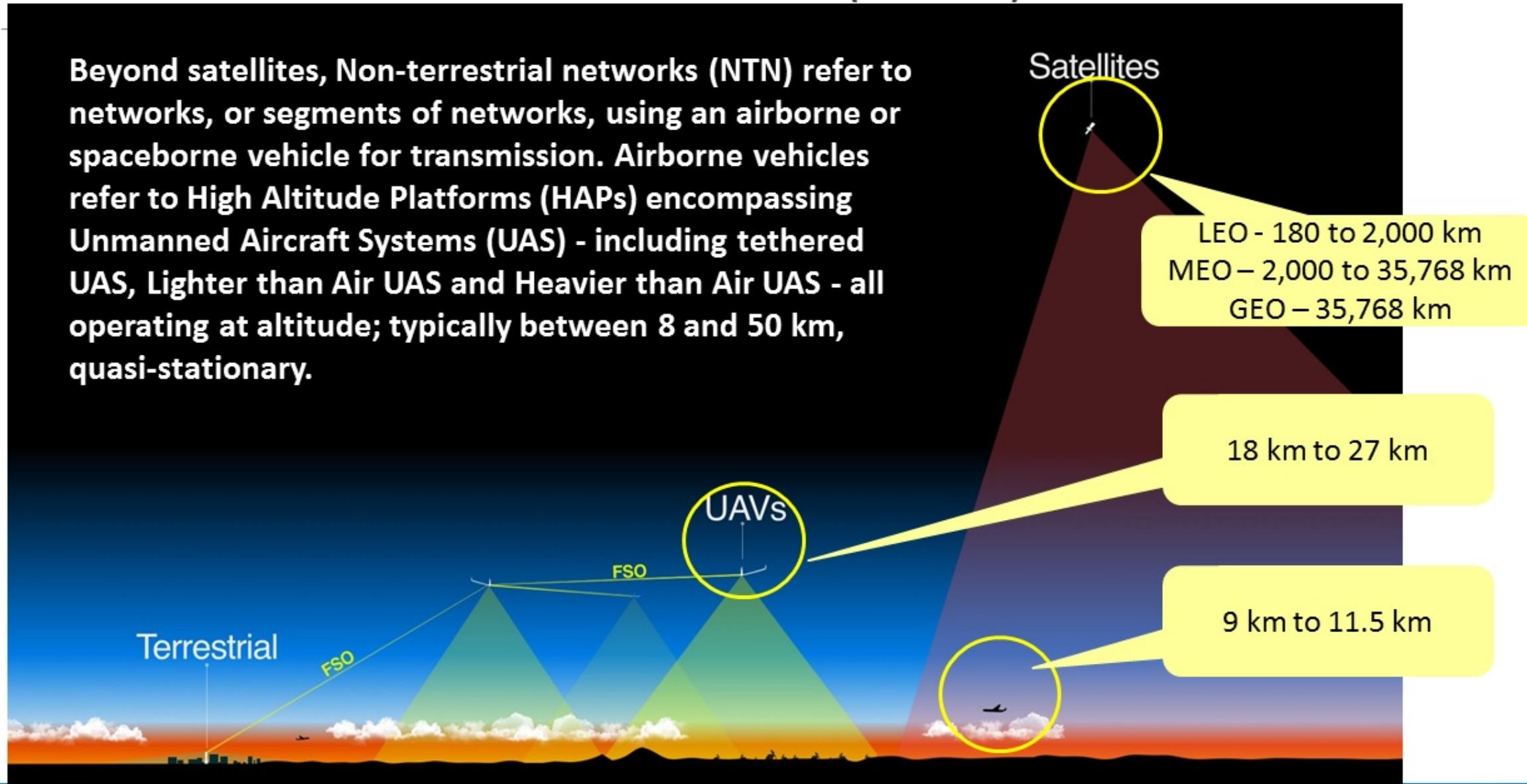
- 1.6 (NGSO FSS) / 1.14 (HAPS) / issue 9.1.9

Uncertainties needs further studies

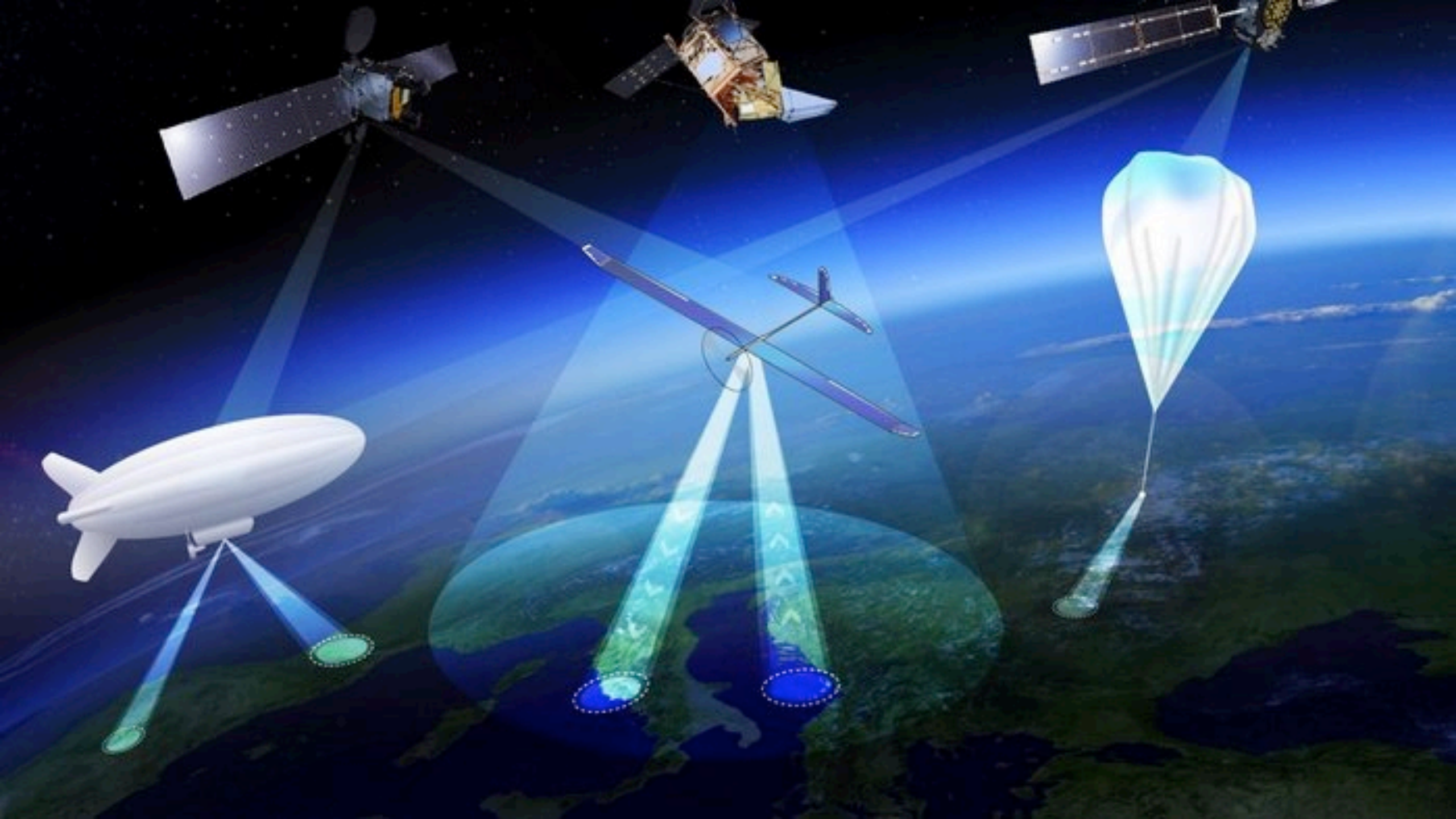


# Non-terrestrial networks (NTN)

Beyond satellites, Non-terrestrial networks (NTN) refer to networks, or segments of networks, using an airborne or spaceborne vehicle for transmission. Airborne vehicles refer to High Altitude Platforms (HAPs) encompassing Unmanned Aircraft Systems (UAS) - including tethered UAS, Lighter than Air UAS and Heavier than Air UAS - all operating at altitude; typically between 8 and 50 km, quasi-stationary.







**5G NETWORKS**

# SoftBank and Google to team up on airborne base station

'Pseudo-satellite' would bring 5G mobile coverage to remote areas

TAKAFUMI HOTTA, Nikkei staff writer

APRIL 24, 2019 18:04 JST



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# Global Topology

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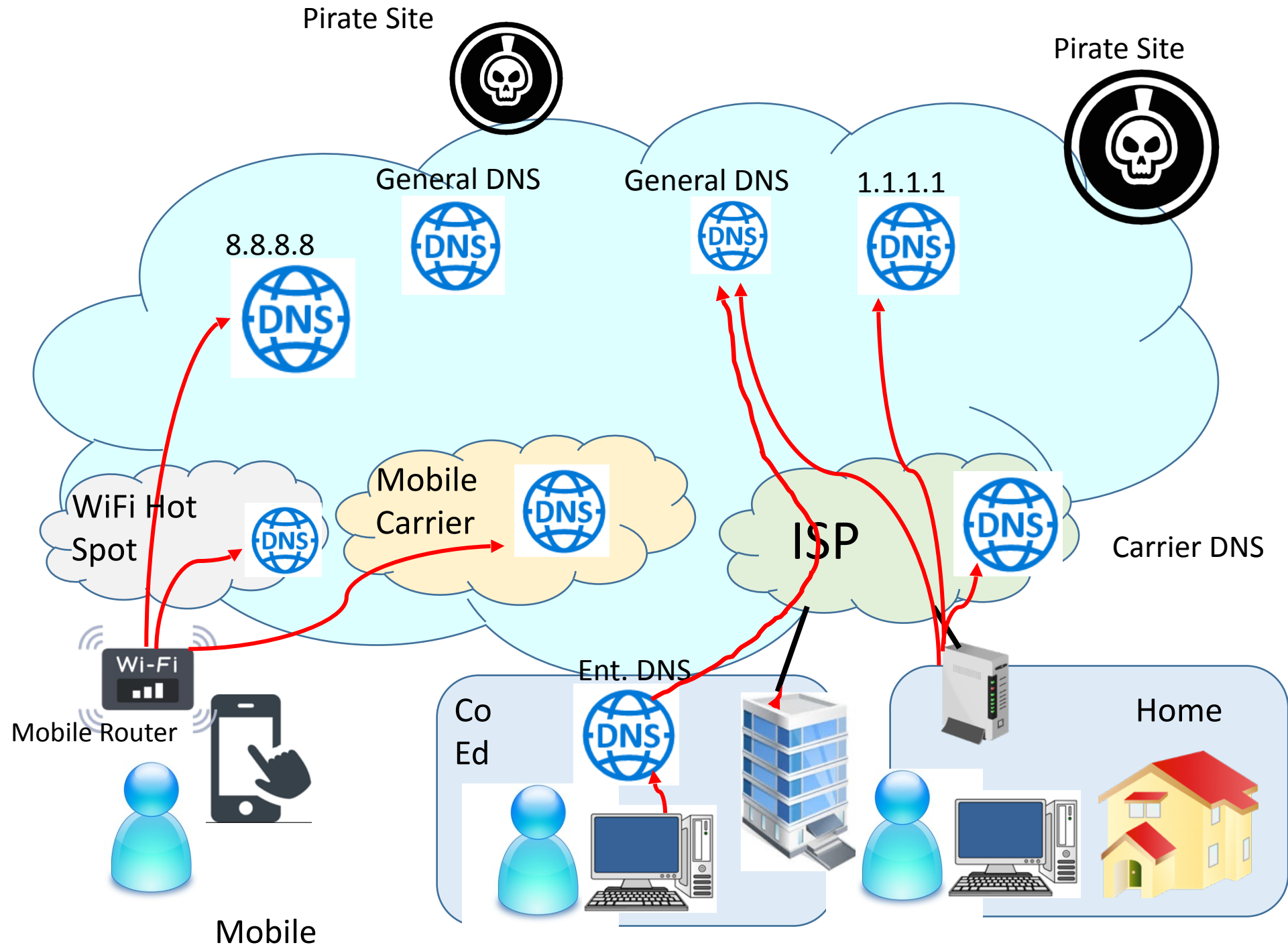


# Global Governance for Everyone

- Internet
- ‘Crypt asset’
- Health and Medicals
- Education
- Science
- Academics

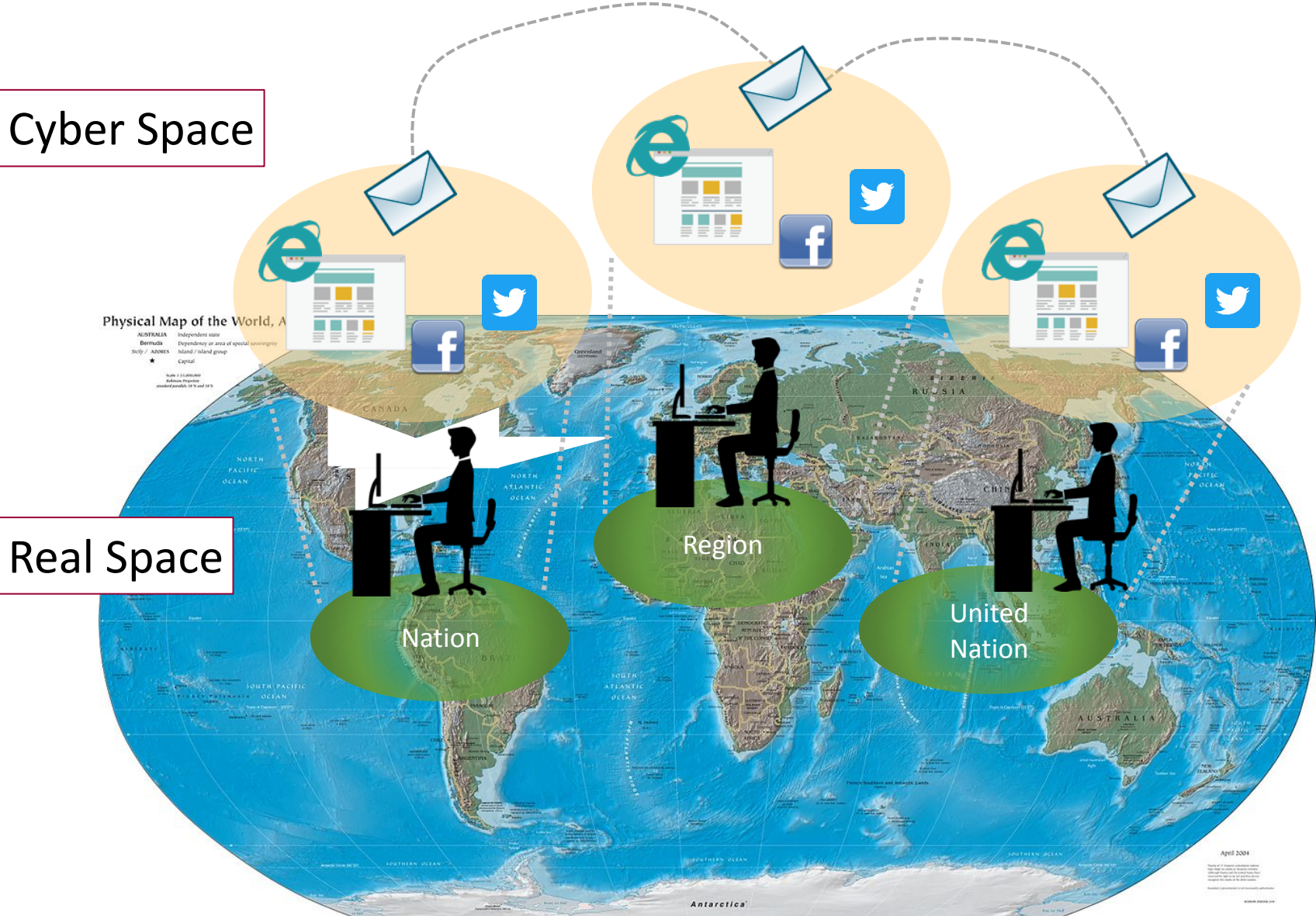


# 2018 DNS Blocking Request

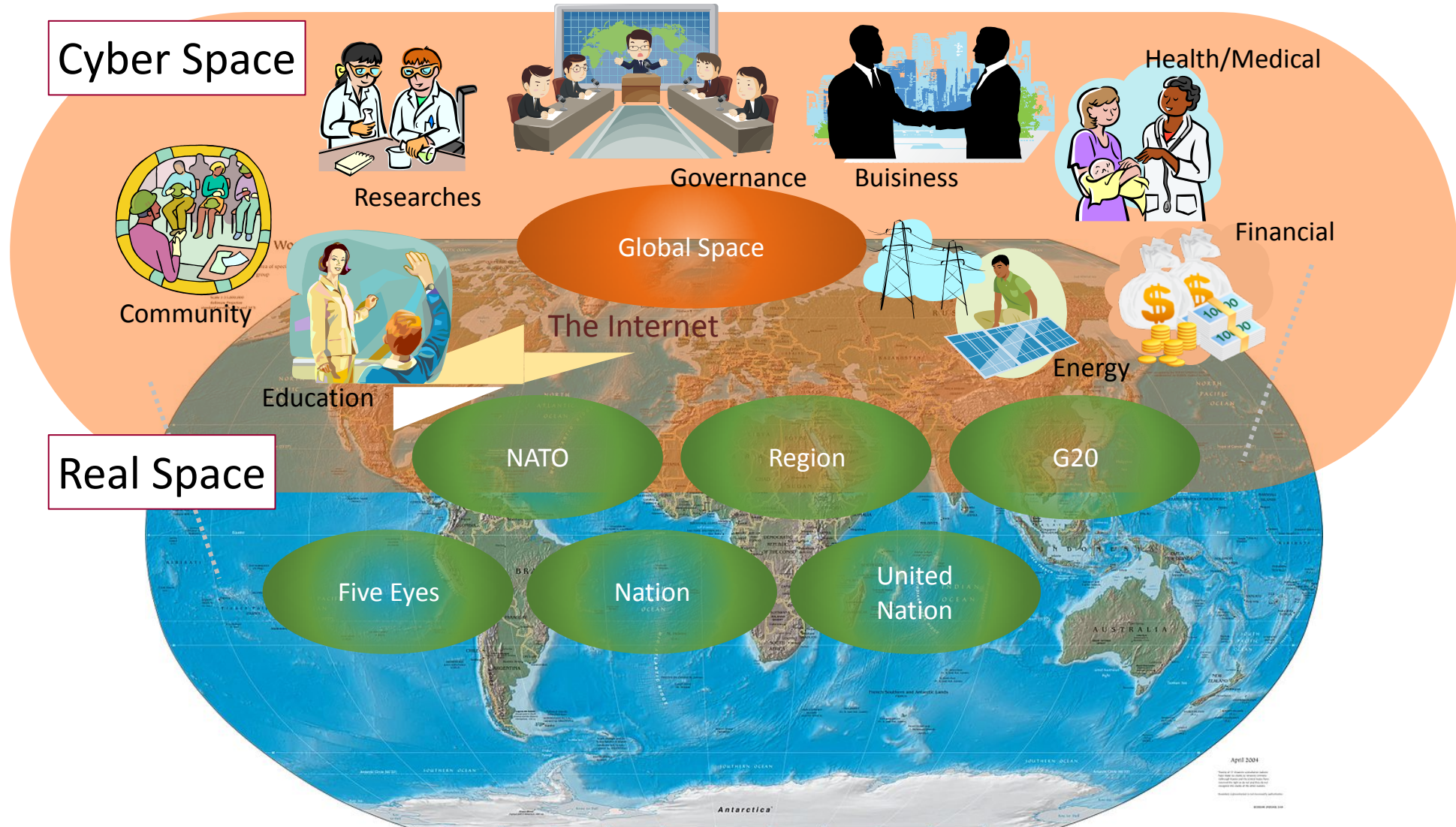




# Real Space and Cyber Space



# Cyber Space and Real Space



Cyber Space

Real Space



Researches



Governance



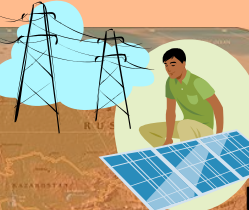
Business



Health/Medical



Financial



Energy



Education



Community

Global Space

The Internet

NATO

Region

G20

Five Eyes

Nation

United Nation



# “The Internet”

## Global Society: on a single planet

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- Multiple Culture
- Multiple Language
- Multiple Nations
- Multiple Laws
- Multiple Court
- Multiple Police





# International Society

Law, Legislation, Trial,  
Culture, Language, Police  
and  
Government

# Global Scale System

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Not,  
Centralized,  
Please!







# **Sophisticated Autonomous Distributed Systems**