DROIDCON MEC HACKATHON 2020

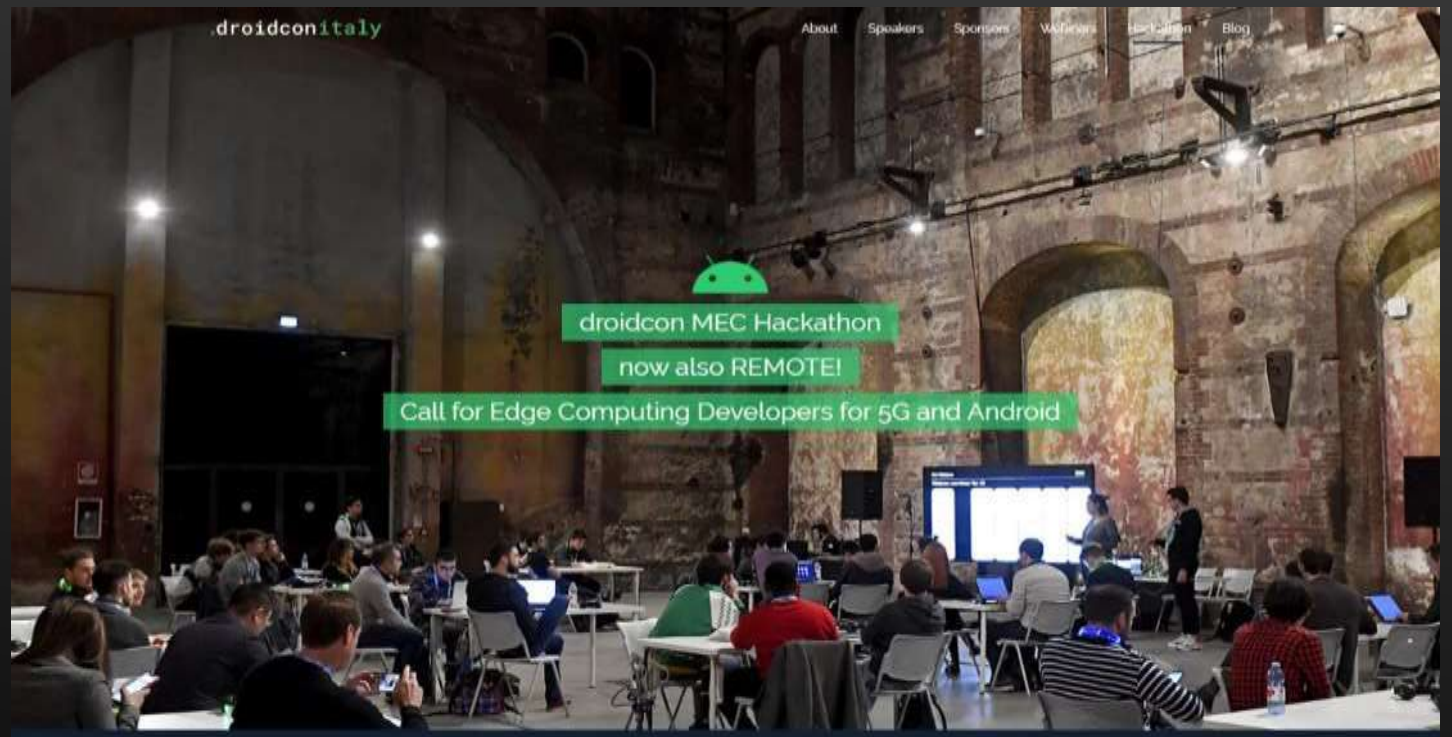
A primer for Edge Application Developers!

WEBINAR

Moderator: **Francesco Brocero** (Synesthesia)
Speakers: **Roberto Procopio** (TIM),
Purvi Thakkar (Intel), Alessandro Breccia (CISCO), Dinyar Dastoor (Intel),
Maurizio Floridia (LINKS Foundation), Jacob Smith (Equinix/Packet)
Guests: **Nicola Farronato** (Turin City, Innovation Team)
Michele Zarri (GSMA, Future Networks)

June 4th, 2020

DROIDCON MEC HACKATHON 2020



In preparation to the competition event, organizers will offer in advance to developers Teams **remote access** to MEC platforms, and related info/guides

Submissions are open

https://it.droidcon.com/2020/hackathon/

KEY DATES

- Submission deadline: **15 June 2020**
- Notification to the teams: **30 June 2020**
- Event competition: **25-26 November 2020**

WEBINAR SPEAKERS

- Roberto Procopio (TIM)
- Alessandro Breccia (CISCO)
- Purvi Thakkar (Intel)
- Maurizio Florida (LINKS)
- Dinyar Dastoor (Intel)
- Jacob Smith (Packet)

GUESTS

- Nicola Farronato (Turin City)
- Michele Zarri (GSMA)

AGENDA

- Droidcon MEC Hackathon 2020: General organization
- Edge Computing and Hackathons
- Assets for Developers
  - MEC servers and infrastructure at the event
  - OpenNESS platform
  - MEC Location API
  - OneAPIs
  - Remote servers
- Awards celebration at the conference day

- Talk from Guests
  - Turin City
  - GSMA

- Q&A

DROIDCON MEC HACKATHON 2020

- General organization

Droidcon MEC Hackathon 2020: the use case categories

Call for Edge Computing Developers for 5G and Android, to develop mobile applications for advanced services in MEC-enabled 5G networks

Examples of MEC-enabled vertical segments applications include (but are not limited to):

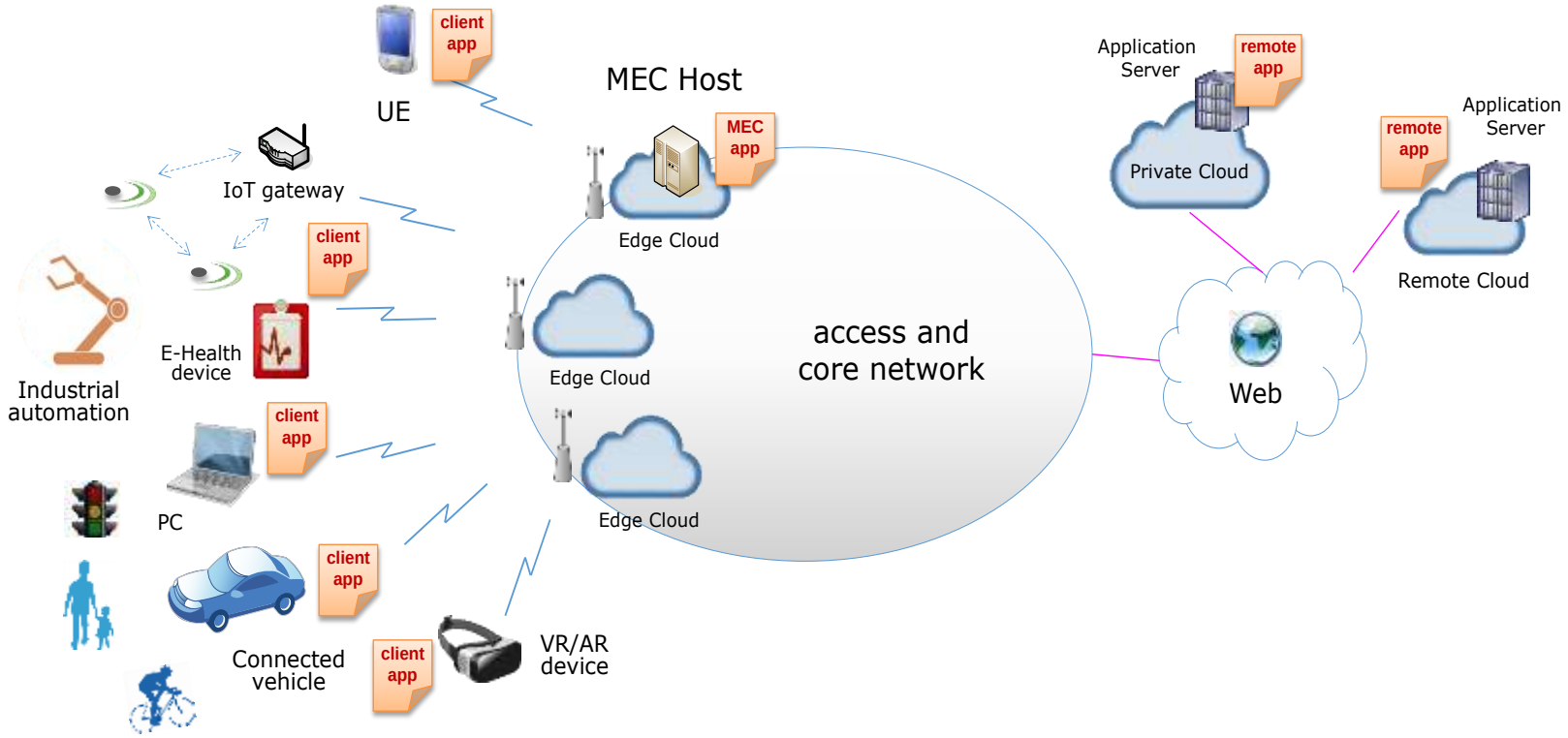
- automotive and cooperative vehicles
- virtual reality / augmented reality
- IoT scenarios (with sensors, fog nodes, …)
- robotics and factories of the future
- eHealth and mHealth
- media and entertainment
- applications for the energy industry
- etc

Note: the Organizing Committee decided to admit to this Hackathon Teams working on all these different topics

Droidcon MEC Hackathon 2020: the technical challenge

- Developers' teams at the Hackathon will be tasked to develop mobile applications for advanced services in MEC-enabled 5G networks, using **ETSI MEC technologies and APIs**.

- Candidate developers' teams are free to choose a specific challenge.



Special Challenges

- **Data Parallel C++** cross-architecture language from the **OneAPI initiative** to create custom accelerators on the FPGA for your kernel algorithm.
- **OpenVINO™ toolkit** to accelerate deep learning inference tasks for computer vision applications.

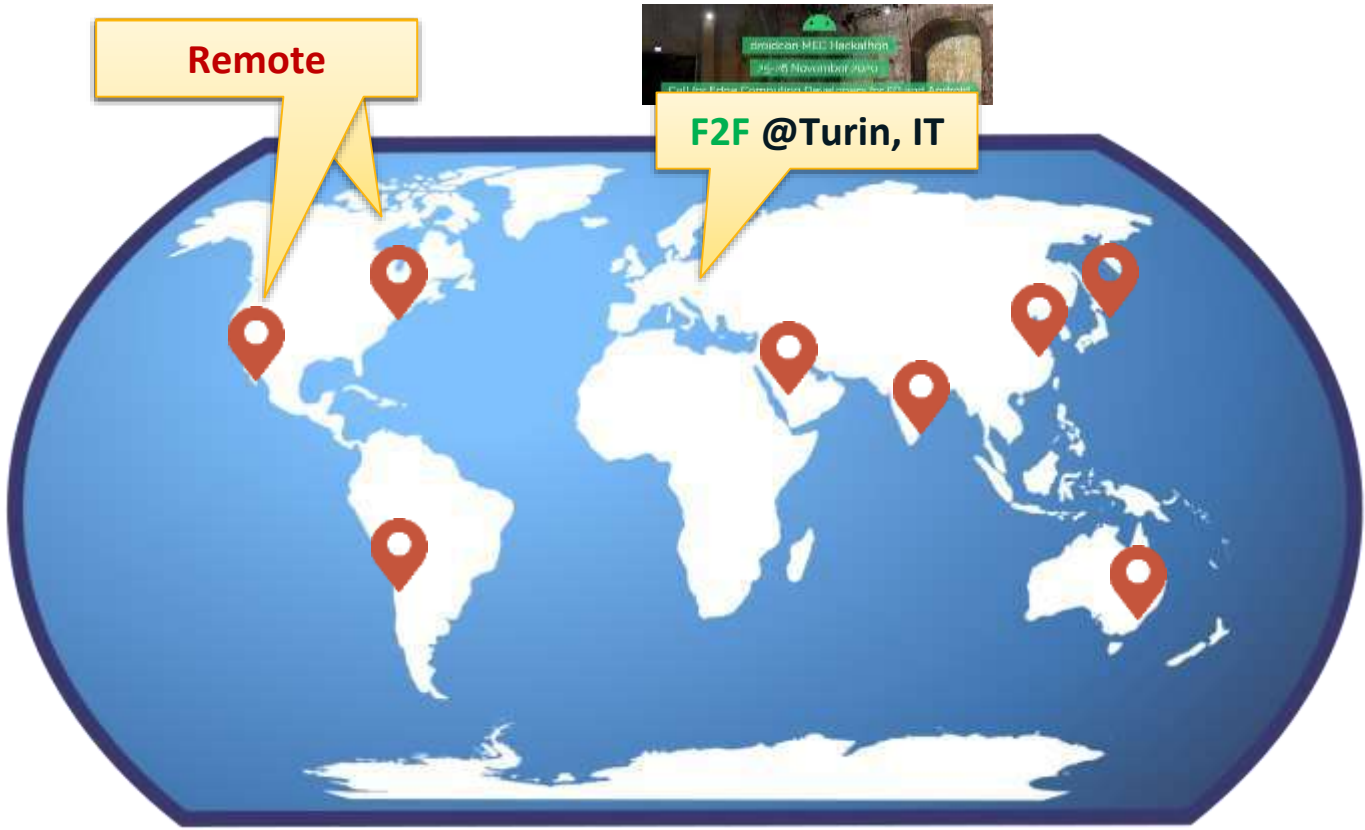
Droidcon MEC Hackathon 2020 - **overview**

Hybrid approach

- Developers can apply for F2F or remote participation

Two options offered:

- F2F participation – at the venue, they will exploit the presence of great MEC experts, and get insights on app development
- Remote participation – no need to travel at all, in case of issues! Developers can take part to the competition fully online, from their home. ☺



NOTE: in both cases, the Committee will offer **remote access to MEC infrastructure**, in advance to the Hackathon competition, in order to allow proper preparation of Teams

EDGE COMPUTING

- What's that, from an Operator and from SW developer perspective
- … and what is a **MEC Hackathon** ☺

What is a Hackathon?

Hackathon is a blended word – a combination of “hacking” (*clever programmer*) and “marathon” (an event marked by *endurance*).

Normally we referred to hackathon as a social coding event that brings computer programmers and other interested people together to improve upon or build a new software program in a limited amount of time. In fact, it is a strenuous sprint in application development rather than a marathon.

Hackathons are usually centered around a certain topic or theme and are great occasions for developing networking and exchange knowledge; normally prizes are awarded and projects launched during a hackathon can mark the beginning of a long-term endeavor.

Why Hackathon in MEC?

- MEC promotion

Promoting knowledge and adoption of ETSI MEC ISG standards and in particular application development utilizing MEC service APIs;

- Feedback to the standards

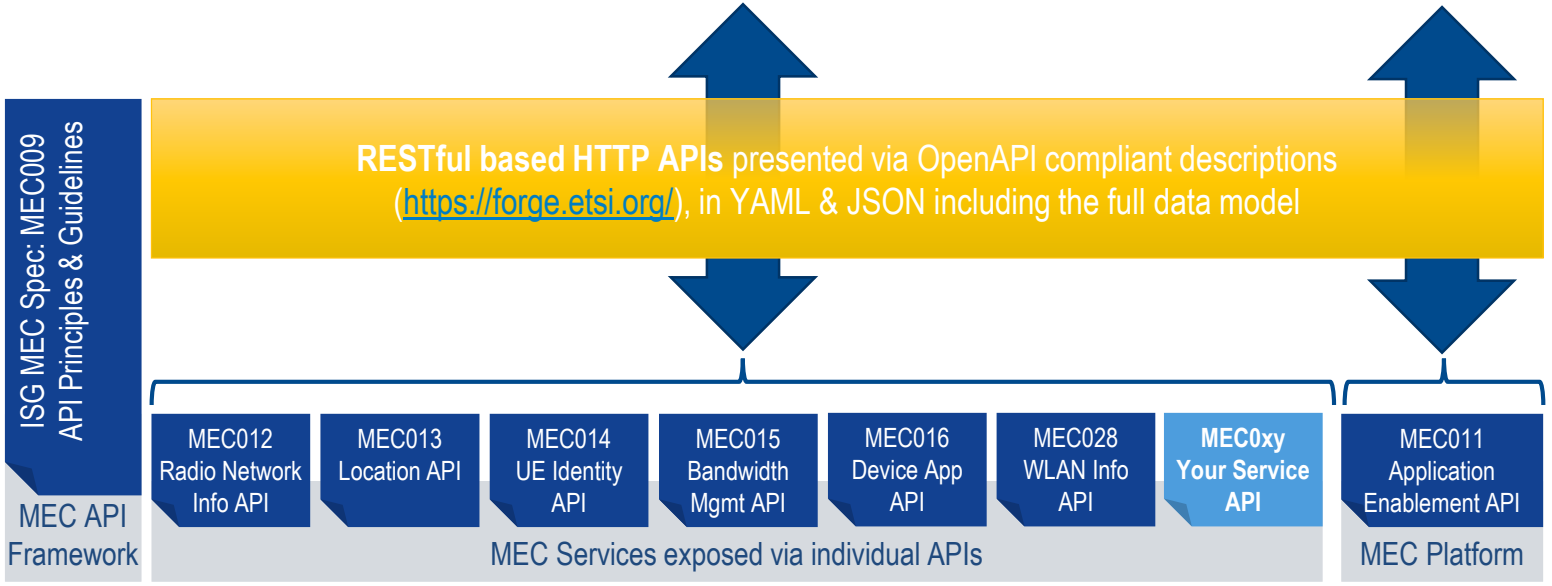
Gathering feedback in ETSI MEC on the developed standards from end users and validating in practice their ease of adoption, applicability and flexibility in different fields of application

- MEC innovation

Fostering the creation of use cases, applications and services in the context of Multi Access Edge Computing within areas of interest for ETSI MEC ISG

Hackathon role in MEC ecosystem

MEC Application Development Community



The publication of a great standard is not enough. It also needs to reach-out the end users.

Developers community should be engaged, to increase the adoption of that technology

Edge computing for the Telco Operators

Customers produce or consume information at the Edge

Edge computing is part of a distributed computing topology where information processing is located in a large number of locations close to the customers.

Edge Computing is a form of Cloud Computing

Complementary with centralized Cloud (public and private), part of a distributed computing topology, customer and network premises as possible edge locations.

Open and simple

The new capabilities enable by the Edge Cloud will be abstracted and provided to application developer in an open and secure way.

Telco Operators offer capabilities

Edge Computing offers “capabilities” ready to be consumed and able to support, alone or in combination, new use cases.

Edge Capabilities	
Low Latency  Ultra-low latency (≈ ms) is critical for real-time type of application	**Privacy / Security**  Sensible data will remain local without going into public domain (internet)
Local Processing  Elaboration of data produced locally to take decision avoiding large data transfer toward central D.C.	**Limited Autonomy**  Ability to continue to run also when disconnected from central Data Center.

Edge Computing from a SW developer perspective

From an **application point of view** a split into “terminal”, “edge” and “remote” components is envisaged.

Terminal

Minor changes to cloud app;
Authenticates with Edge;
Negotiates capabilities;
Monitors connection QoE;
Re-establishes connection on network change.

Edge

Uses network offered capabilities (e.g. location, QoE);
Proxies Authentication;
Caches user context;
User Context synch with Cloud.

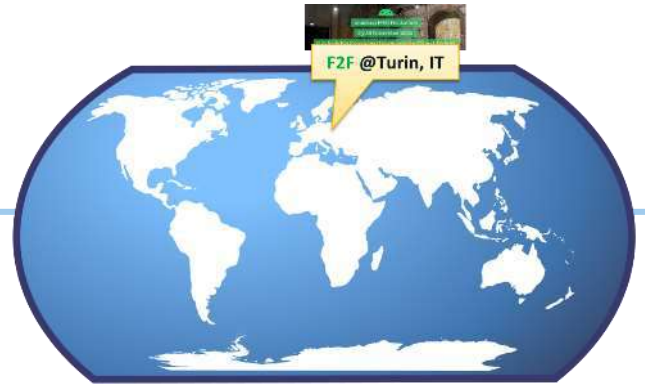
Remote

“Owns” service users;
Authenticate;
Maintains user context;
Stores mapping between edge and user.

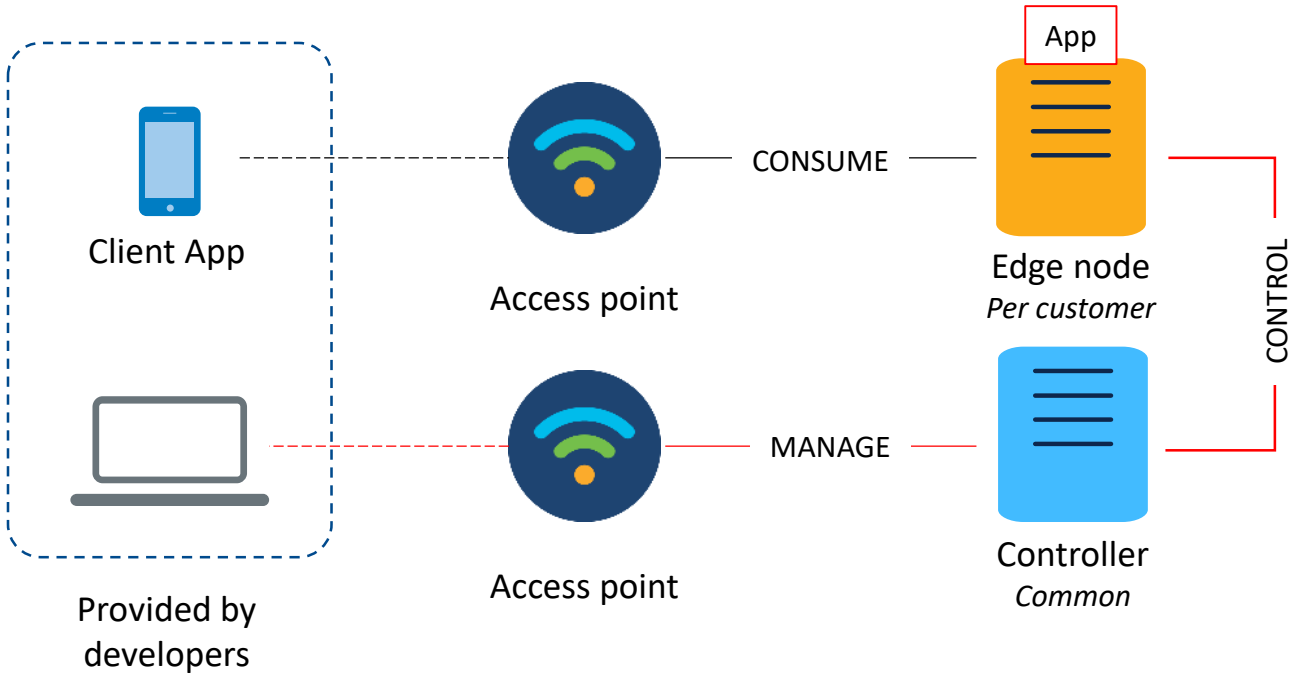
DROIDCON MEC HACKATHON 2020

- Assets offerd to Developers
  - MEC servers and infrastructure at the event

MEC servers and infrastructure at the F2F event



Event infrastructure
Logical view



Server building block
UCS C220 M5

1 RU
2 x CPU
192GB Memory
2 x 1TB SSD
4 x 10GE interfaces

DROIDCON MEC HACKATHON 2020

- Assets offerd to Developers
  - MEC servers and infrastructure
  - OpenNESS platform

Open Network Edge Services Software: OpenNESS

OpenNESS is an open source MEC software toolkit that enables **highly optimized and performant edge platforms** to on-board and manage applications and network functions with **cloud-like agility across any type of network**

Abstracts Network Complexity

Chose across many data planes, container network interfaces and access technologies

Cloud Native Capabilities

Support for Cloud native ingredients for resource orchestration, telemetry and service mesh

HW/SW Optimizations for Best Performance and ROI

Dynamic discovery and optimal placement of apps/services. Expose underlying edge hardware and enables control/management of hardware accelerators

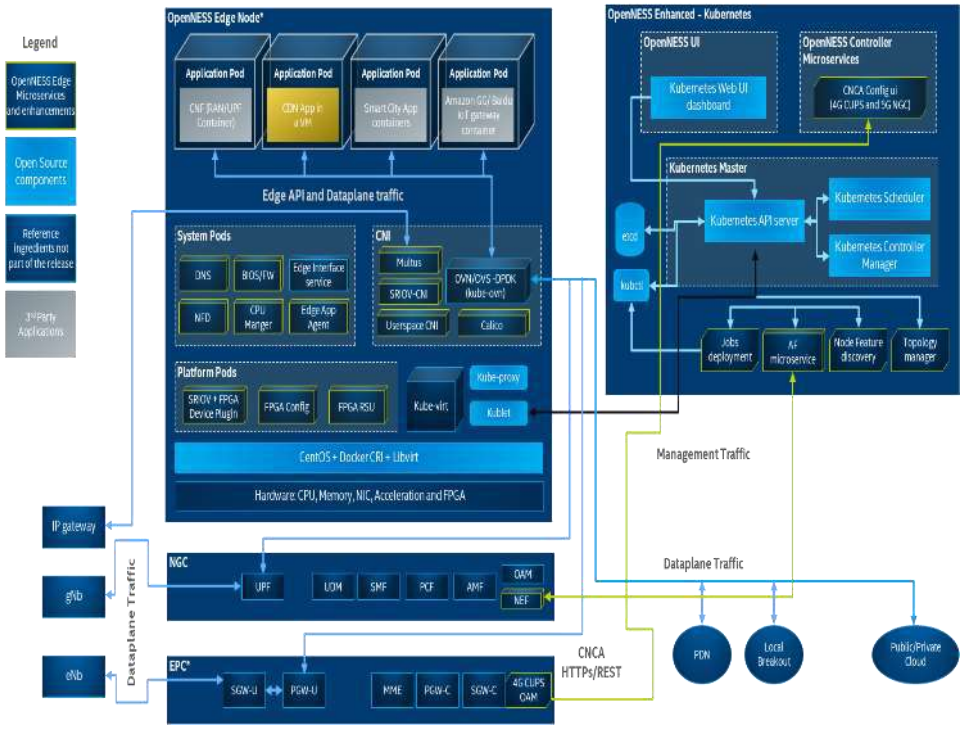
MODULAR, MICROSERVICES-BASED ARCHITECTURE WITH OPEN APIS

DATAPLANE	Support for multiple data planes (OVS-DPDK, VPP, AF_XDP, SRIOV)
MULTI-ACCESS NETWORKING	Data routing/ Traffic steering across 4G/5G/Wireline and private wireless via capabilities such as LTE CUPS, CBRS, 5G AF/NEF
ENHANCED PLATFORM AWARENESS	Expose underlying edge hardware capabilities
ACCELERATOR	Dynamic control and management of underlying HW accelerators
APPLICATION	Dynamic apps/services discovery, placement and traffic steering
SECURITY	Enable security of data and storage

Onboard Industrial, Retail, Smart City and all types of Apps on OpenNESS to realize new edge services

Flexibility to build/evolve Edge platform without the need to alter Customer/app Software

Open Network Edge Services Software: OpenNESS



*OpenNESS Edge Node can be deployed on Network Edge or On-Premise Edge

Get access to Open Network Edge Services Software at OpenNESS.org

DOCUMENTATIONS:

Architecture Overview

User Guides

OpenNESS White Paper

OpenNESS Overview Webinar/Video

Other Developer Resources here

Intel® Network Builder University Training

How to get started: »

DROIDCON MEC HACKATHON 2020

- Assets offerd to Developers
  - MEC servers and infrastructure
  - OpenNESS platform
  - MEC Location API

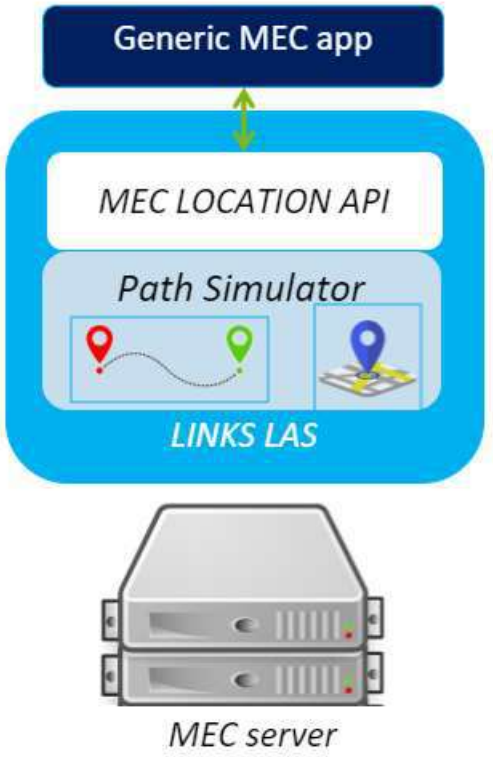
MEC Location API

LAS = LINKS API Simulator

- The location-related information of UEs served by the radio node(s), and associated to the MEC Server, is provided to the MEC applications through the MEC Location APIs.

- They enable MEC Apps developer to **perform tracking operations** or **location-based service recommendation**, etc..

- The information is retrieved through a RESTful approach, receiving and sending JSON compliant to the standard *ETSI GS MEC 013 V2.1.1*



MEC Location API

- **Base URL -** https://{apiroot}/location/{apiVersion}/. Two supported mechanisms:
  - **Lookup** (GET request)
  - **Subscription** (POST request)

- **Without available BTS,** LINKS developed a **path simulator** which simulates multiple UEs served by a BTS and their movement.

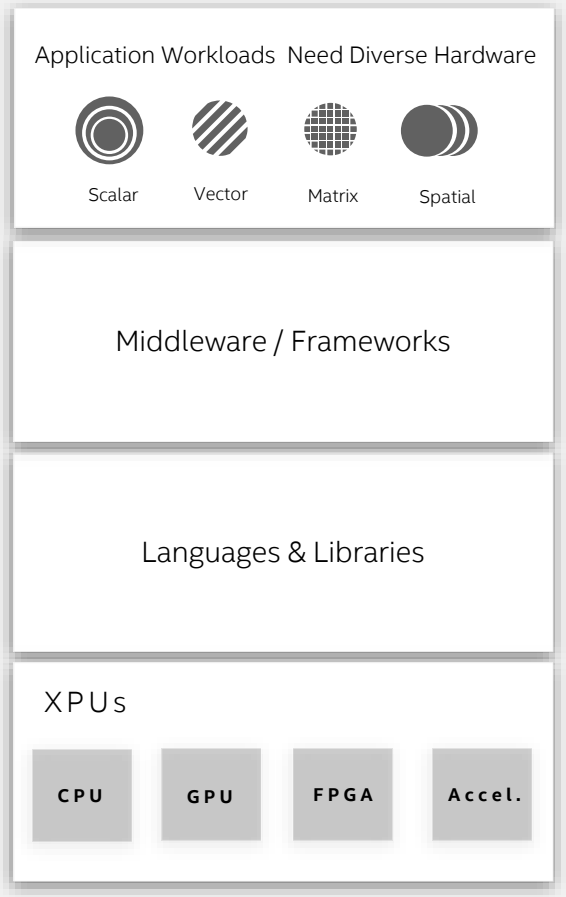
- In this way, developers are enabled to implement MEC applications in several scenarios, with the possibility to perform lookup and subscription

DROIDCON MEC HACKATHON 2020

- Assets offerd to Developers
  - MEC servers and infrastructure
  - OpenNESS platform
  - MEC Location API
  - Usage of OneAPI

Optional functionalities - OneAPI

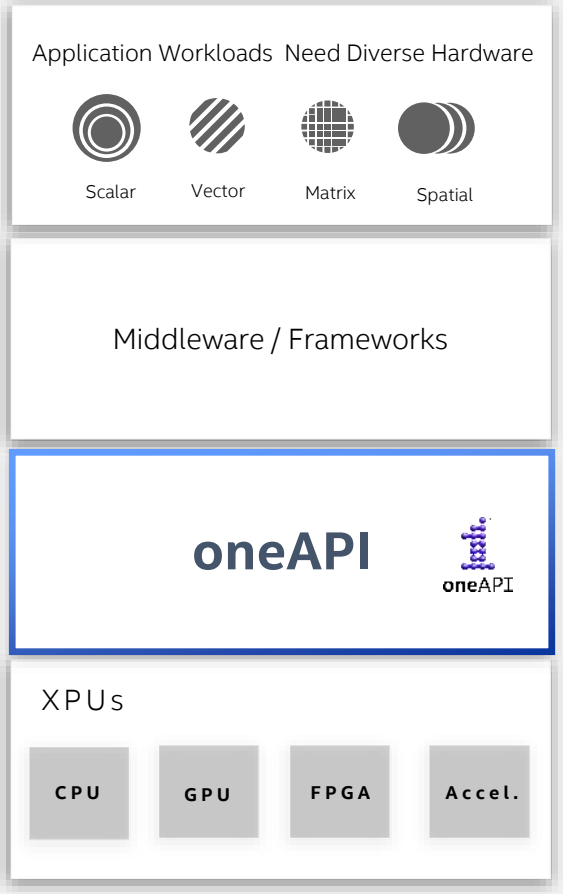
- Applications have growing need for specialized workloads that can take advantage of specialized HW



No common programming language or APIs

Inconsistent tool support across platforms

Each platform requires unique software investment



Unified and simplified language and libraries for expressing parallelism

Uncompromised native high-level language performance

Based on industry standards and open specifications

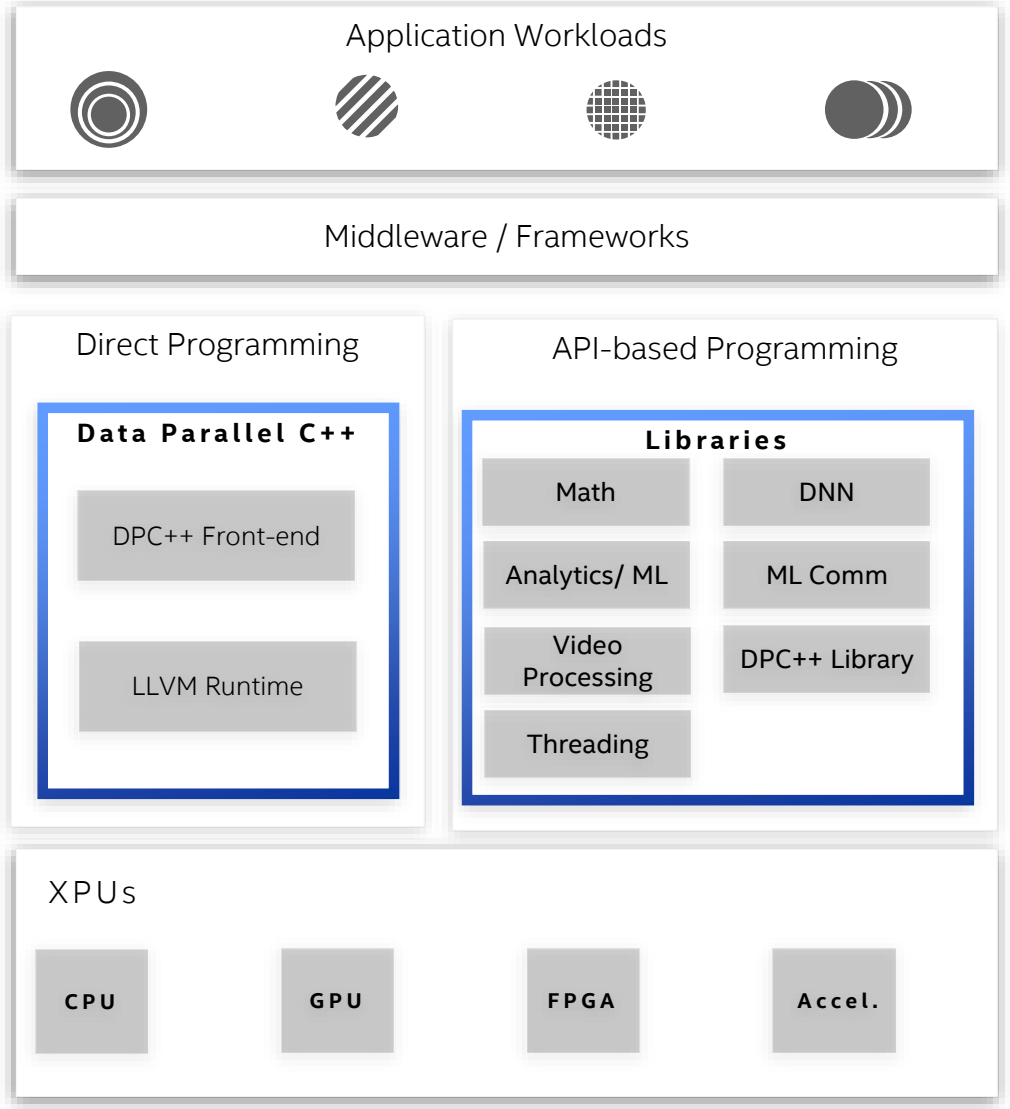
What is OneAPI

DPC++ is standards-based, cross-architecture Language

Based on C++ & incorporates SYCL to support data parallelism and heterogeneous programming

Delivers parallel programming productivity and performance across CPUs and XPUs

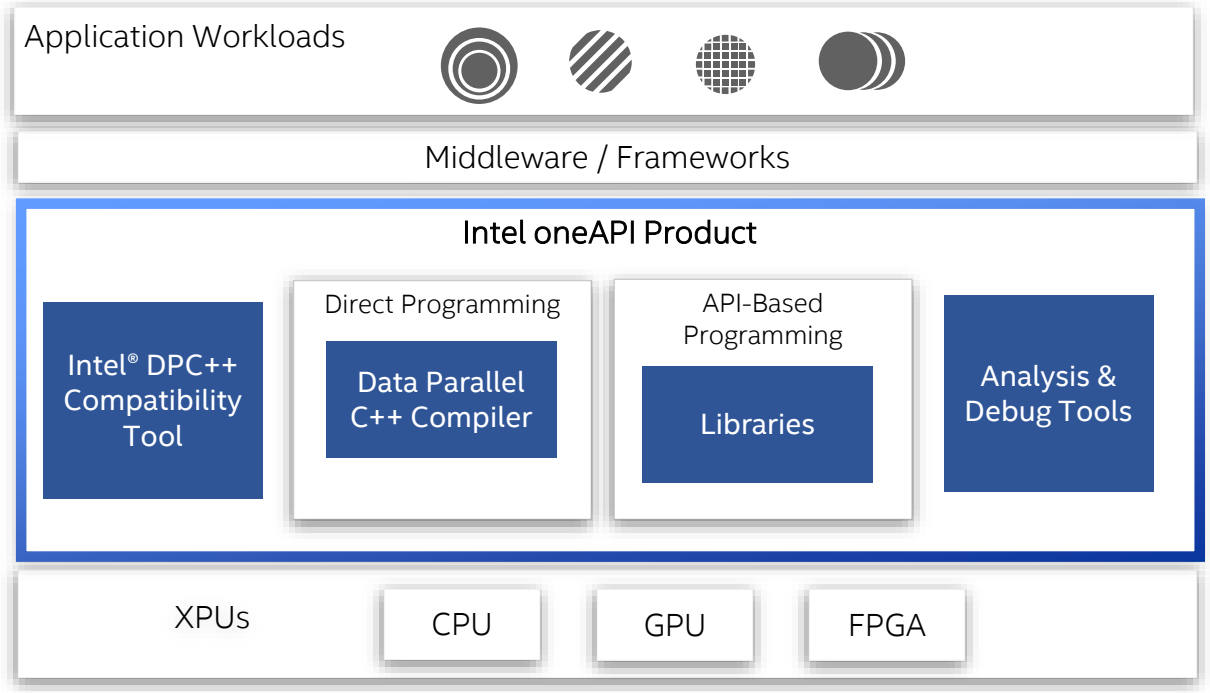
Includes open extensions to simplify data parallel programming



Designed for acceleration of key domain-focused functions

Each can be custom-coded for any platform to deliver uncompromised performance

How to access Intel® oneAPI and start programming xPUs



- More details on web & how to download software - https://software.intel.com/content/www/us/en/develop/tools/oneapi.html

- You can write applications on Intel® Dev Cloud
  - https://intelsoftwaresites.secure.force.com/devcloud/oneapi
  - *No need to install hardware or software*
  - *Easy access CPU, GPU and FPGA*
  - *Easy access to multiple toolkits*

Libraries you can use in your applications	
Intel® oneAPI DPC++ Library	Algorithms and functions to speed DPC++ kernel programming
Intel® oneAPI Math Kernel Library	Math routines including matrix algebra, FFT, and vector math
Intel® oneAPI Data Analytics Library	Machine learning and data analytics functions
Intel® oneAPI Deep Neural Network Library	Neural networks functions for deep learning training and inference
Intel® oneAPI Collective Communications Library	Communication patterns for distributed deep learning
Intel® oneAPI Threading Building Blocks	Threading and memory management template library
Intel® oneAPI Video Processing Library	Real-time video encode, decode, transcode, and processing

DROIDCON MEC HACKATHON 2020

- Assets offerd to Developers
  - MEC servers and infrastructure
  - OpenNESS platform
  - MEC Location API
  - Usage of OneAPI
  - Access to remote servers

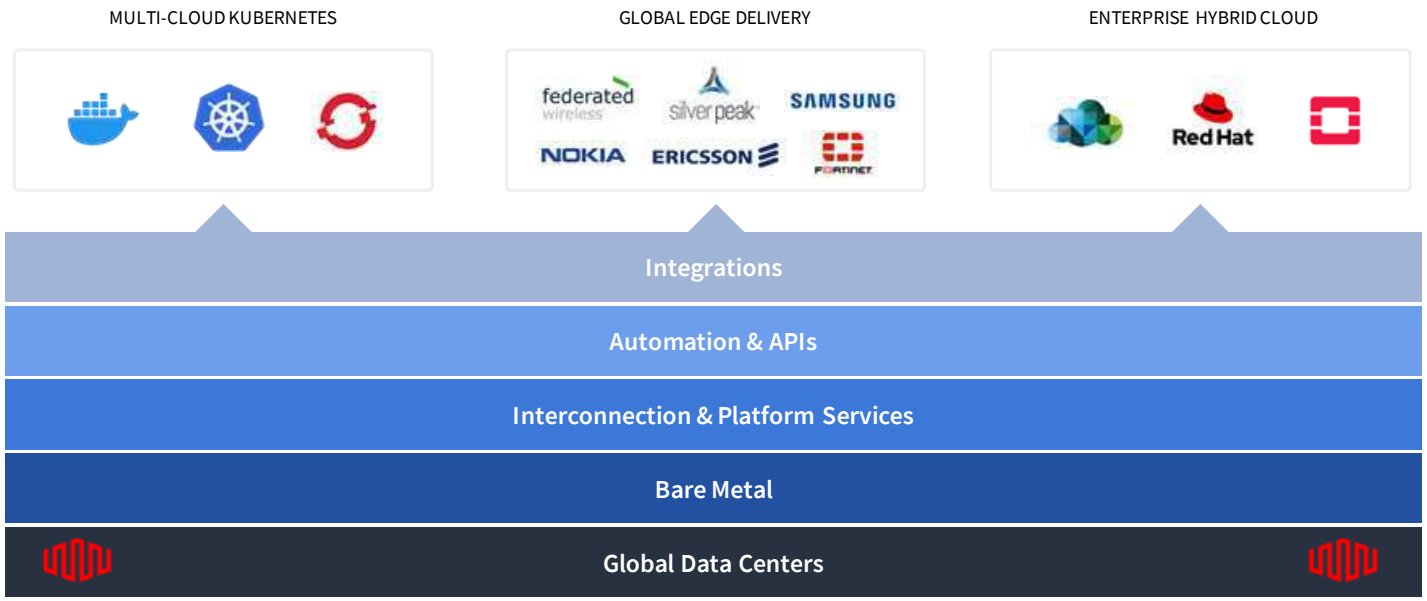
Remote Hackathon servers

- Packet Cloud in Equinix IBX's

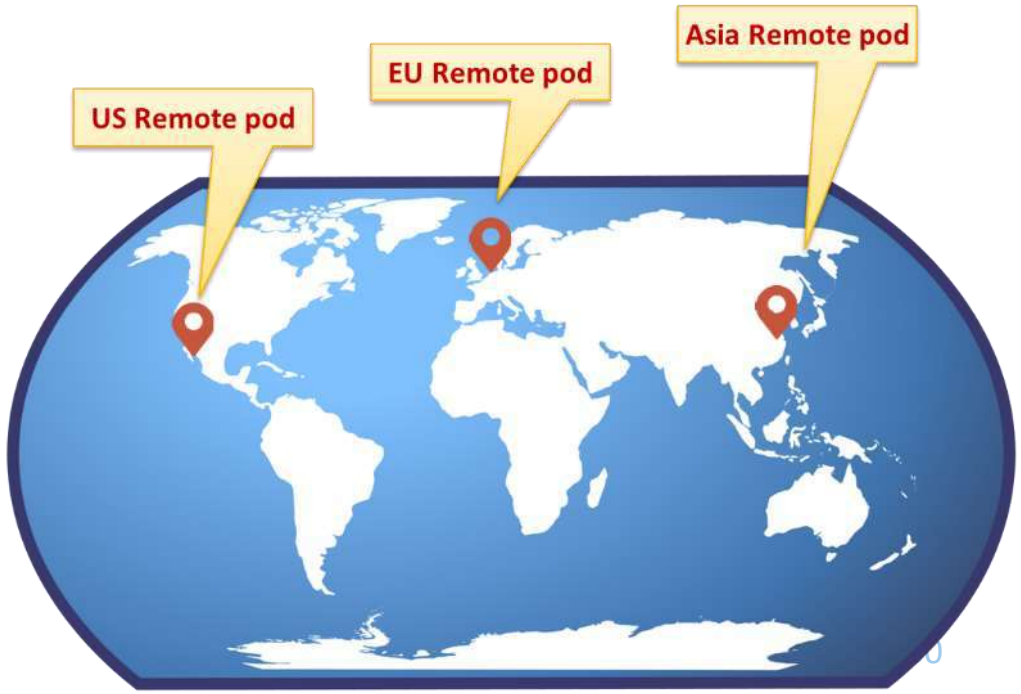
Additional builds in London, Paris, Frankfurt, Hong Kong, Seoul, Mexico City, Sao Paulo and across the Equinix footprint will be based on customer priorities. All sites live in Q3 2020.

Remote Hackathon servers

- Architected: Hybrid, Multi-Cloud



- Remote Pods offered to developers (also in preparation to the remote event)



DROIDCON MEC HACKATHON 2020

- Event and Awards Celebration

Droidcon MEC Hackathon 2020: The prizes

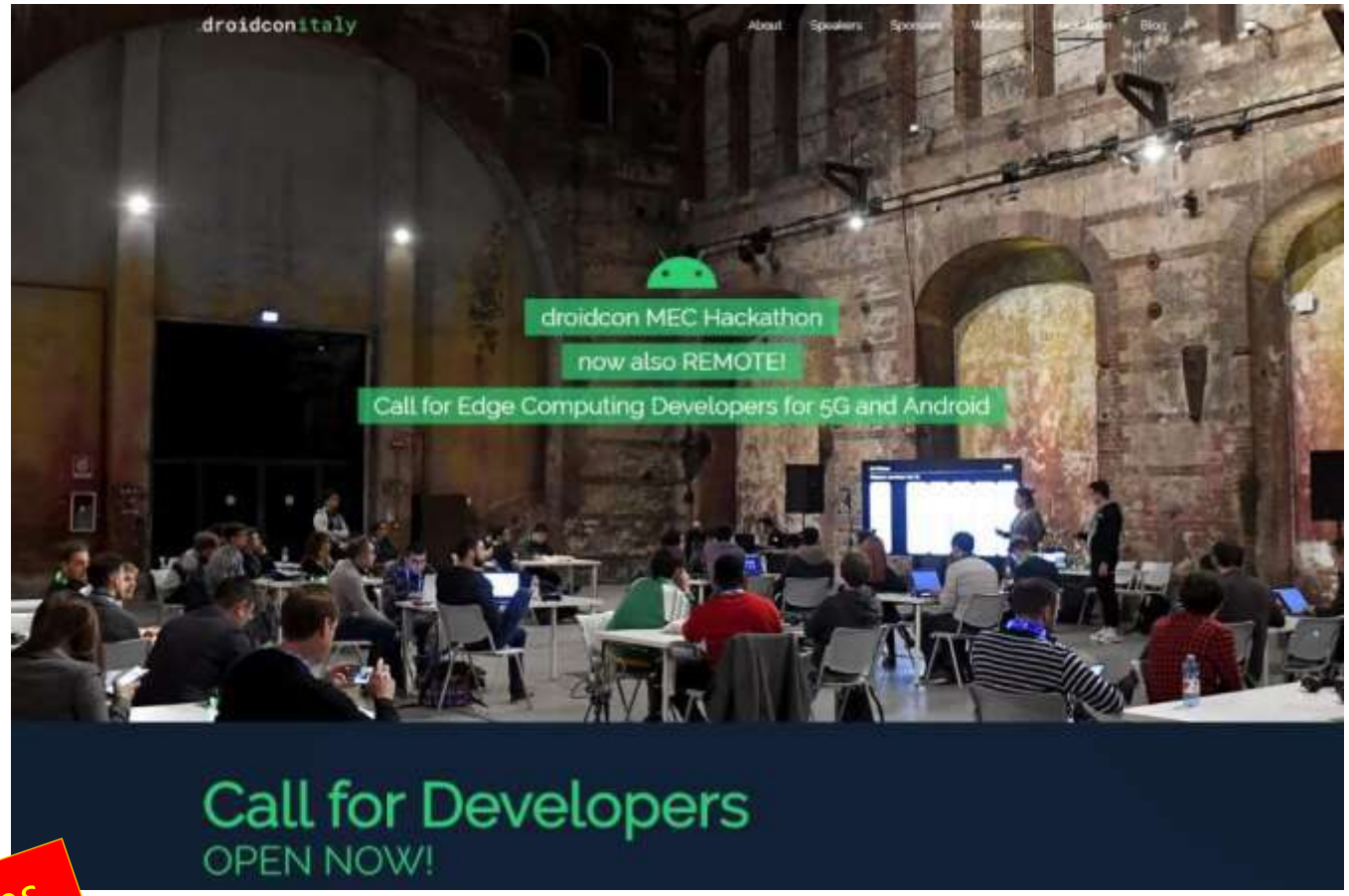
At the end of the competition there will be an **award ceremony**, where the Organizing Committee have organized a number of **prizes**:

- The venue host **Synesthesia** will provide the winners free passes for a **future Droidcon conference** (2020/2021). Synesthesia will also present a customized Hackathon Winners trophy to proudly display in their office.
- **Intel** will offer Amazon echo devices to the first 3 teams. The developers from the winner team will be eligible to be part of *Intel Software Innovator* program (https://software.intel.com/en-us/intel-software-innovators) and their project will be eligible to be featured as an **Intel** Early Innovation Project. This means that the project will be eligible for stipend to produce/present a tutorial/paper on their project, hardware funds for their project, and other start up mentorship program.
- Special prizes will be offered by the organizing committee in correspondence to particular achievements of the developers teams, for some of the following (optional) challenges: usage of OpenVINO toolkit, or DPC++ framework.
- The winners will be offered the possibility to participate to the **Smart Road project** - a consortium of partners, from car makers, network operators, universities and the **City of Turin -** with the aim of proposing their developed solution as possible implementation for testing activities in the urban environment of Turin.

More details are coming…

… Stay tuned!!

Droidcon MEC Hackathon 2020



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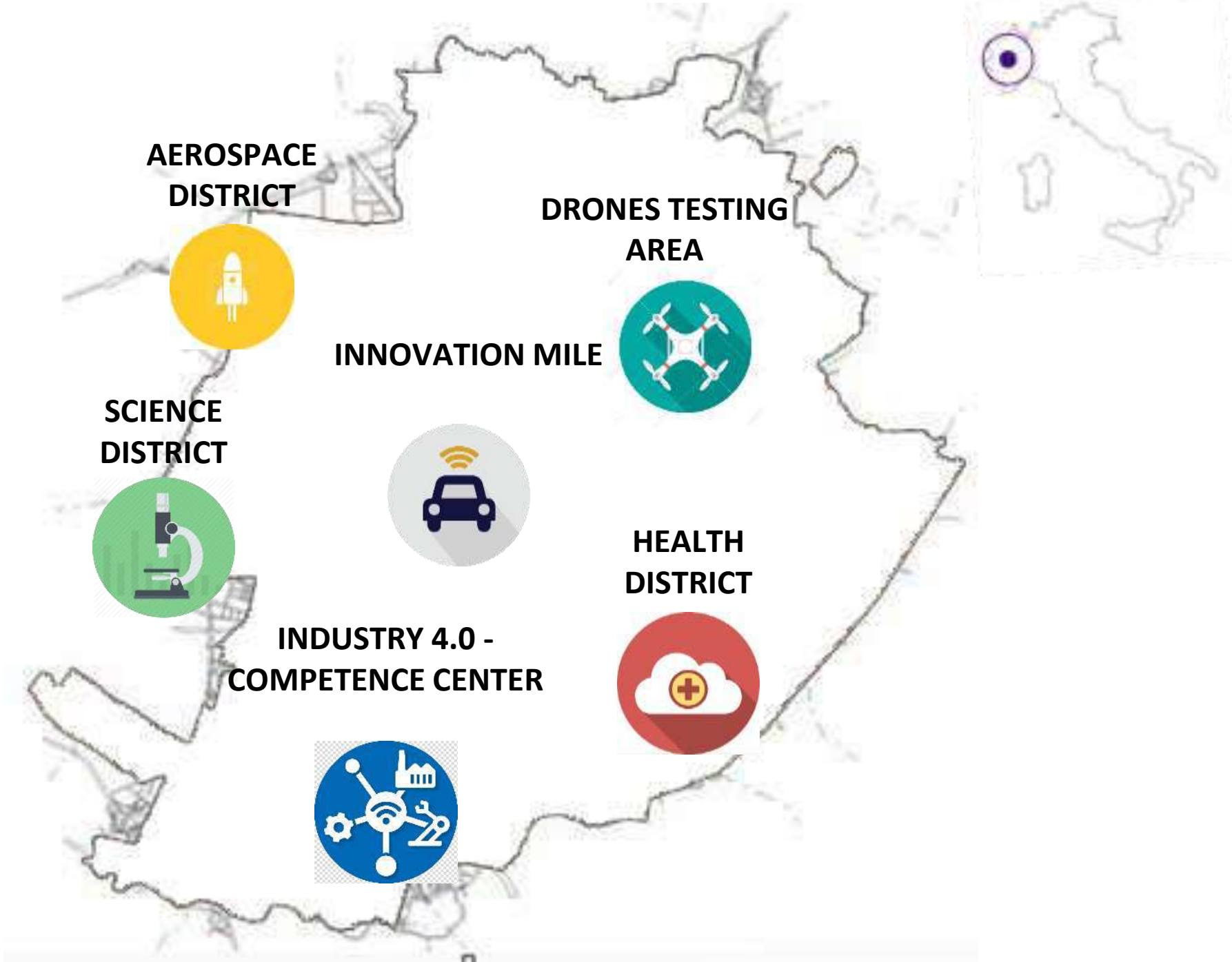
GUEST SPEAKER

- Turin City

NICOLA FARRONATO
HEAD OF INNOVATION TEAM CITTÀ DI TORINO

TORINO SMART CITIES

- 885.094 CITIZENS
- 102.000 STUDENTS
- 2 PUBLIC UNIVERSITIES
- 329 STARTUPS
- 74.000 COMPANIES



APPROACH: Public Private Partnership

Torino City Lab Partners

Corporates

Research & Innovation

Utilities

Smart Road Partners

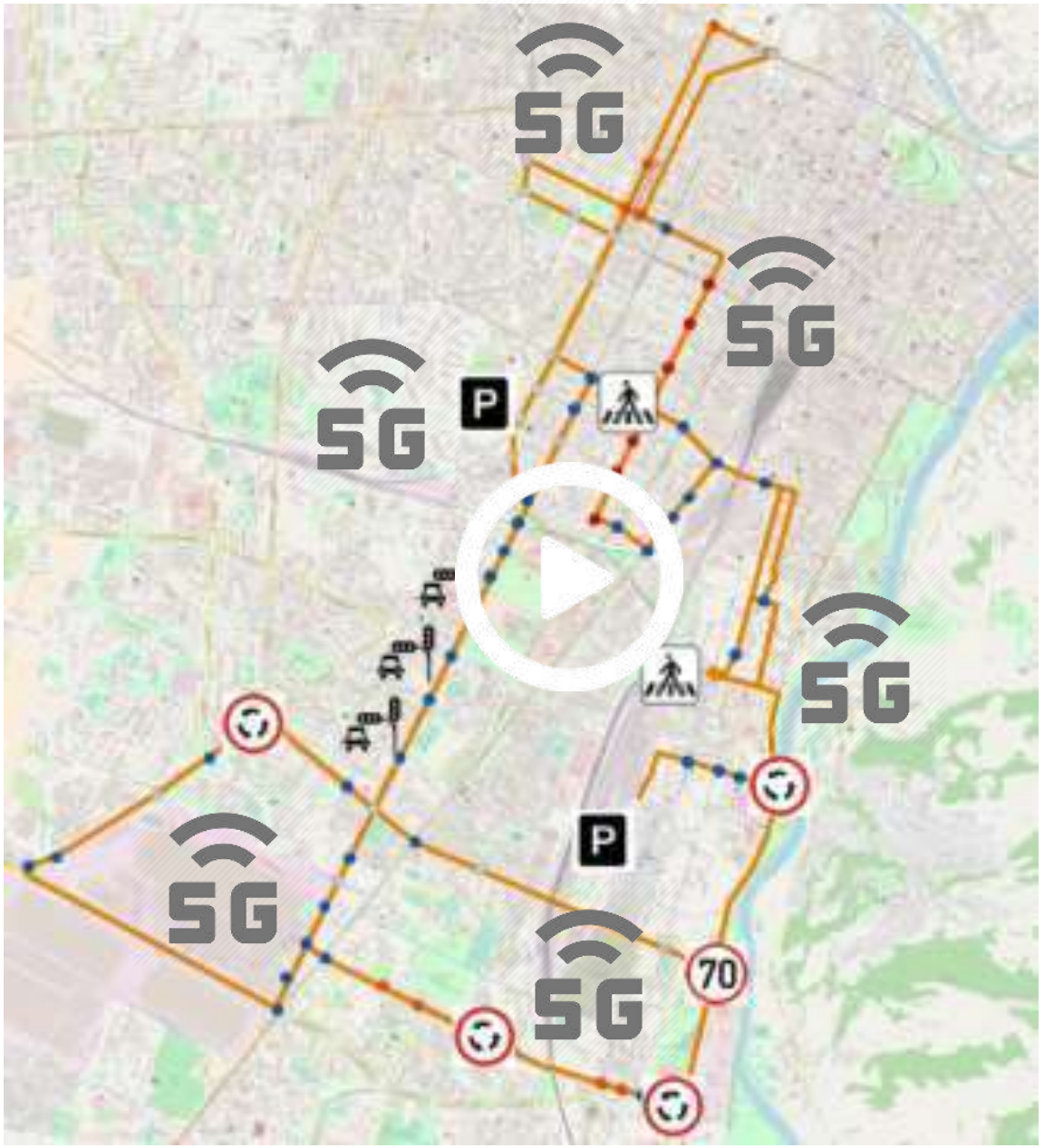
Automotive & Mobility provider

Telco & ICT

Associations, Insurances, Universities

Turin Smart Road

35KM OF URBAN CIRCUIT FOR TESTING AUTONOMOUS & CONNECTED CARS



GUEST SPEAKER

- GSMA

MICHELE ZARRI,
TECHNICAL DIRECTOR @ GSMA

Who is The GSMA?

THE GSMA WAS FOUNDED IN **1987**

15 OFFICES WORLDWIDE

SHANGHAI · SAN FRANCISCO · BEIJING · SAO PAULO · NAIROBI · NEW DELHI

LONDON · DUBAI · ATLANTA · BRUSSELS · BARCELONA · HONG KONG · BRASILIA · BUENOS AIRES

Connecting Everyone and Everything to a #BetterFuture

The mobile industry is the first to formally commit to the UN Sustainable Development Goals

The GSMA represents the interests of mobile operators worldwide

MORE THAN **750** MOBILE OPERATORS

WITH OVER **350** COMPANIES in the broader mobile ecosystem

The world's leading mobile industry events, Mobile World Congress and Mobile World Congress Shanghai, together attract nearly

190,000

The GSMA works to deliver a regulatory environment that creates value for consumers by engaging regularly with:

MINISTRIES OF TELECOMS

TELECOMS REGULATORY AUTHORITIES

INTERNATIONAL & NON-GOVERNMENTAL ORGANISATIONS

CONNECTING **23,000+** Industry Experts

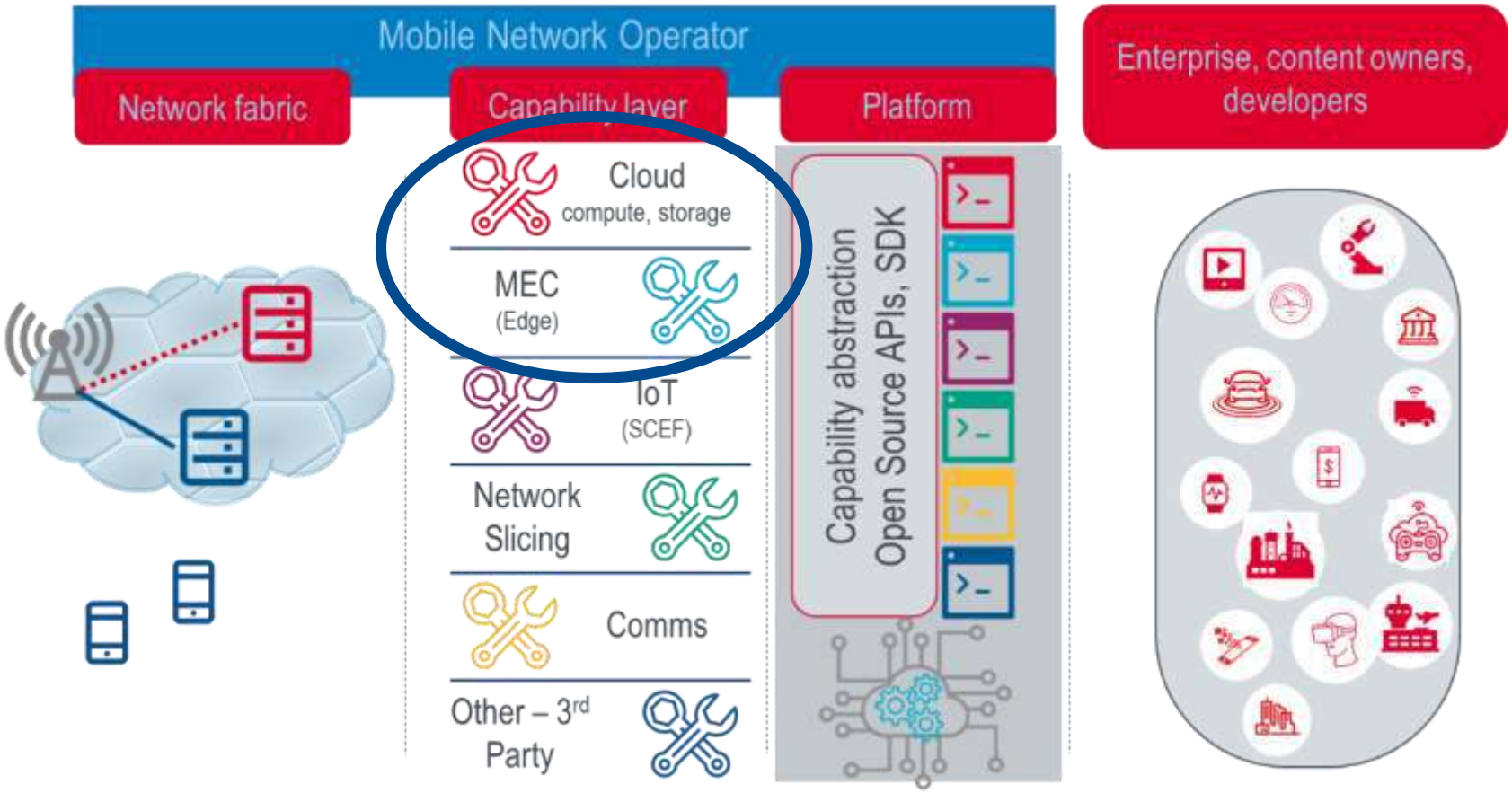
Exclusively for GSMA Members, InfoCentre[2] is your place to connect with a global community of industry experts

GSMA Working Groups provide frameworks and standards in commercial, operational and technical matters that help maintain and advance mobile industry ecosystems

8.7 bn+

MOBILE CONNECTIONS WORLDWIDE

Operator Platform – conceptual diagram



GSMA is looking for application developers to work on the next generation of 5G services

THANK YOU!

QUESTIONS ?

The Hackathon organizing committee

intel cisco TIM LINKS packet EQUINIX synesthesia droidcon

under the Patronage of Città di Torino

in collaboration with GSMA