



OPEN EDGE COMPUTING INITIATIVE **FALL ONLINE WORKSHOP**

7 AND 8 DECEMBER 2020

- DAY 2 -

WELCOME – OVERVIEW WORKSHOP PARTICIPANTS

Cloud Service Providers

AWS
Microsoft

Communication Systems and Technology

CommScope

Edge Applications

Akka
EdgeGap
Megh

Edge Infrastructure

EdgeInfra Group
Vapor IO

Edge Management Platforms

Alef Mobile Technology
Altran
Cirrus360
MobiledgeX
VMware

Research, Development, Innovation

CableLabs
Carnegie Mellon University
InterDigital

Silicon Technology

ARM
Intel
Seagate

Standardization, Industry Consortia and Open Source

ETSI MEC
GSMA
Huawei / ETSI MEC
NGMN
OpenStack Foundation
Small Cell Forum

Telecom Operators

AT&T
Bell Canada
BT
Crown Castle
Deutsche Telekom
JIO
Proximus
Telefonica
Verizon
Vodafone

Networking between Participants

- 1-to-1 Private Chat (at any time)
- 1-to-1 Voice / Video (break and after workshop)
→ tell Jim Blakley via chat whom would like to meet (2 or more participants)

DAY 2



Open Edge Computing Initiative Fall Online Workshop – Agenda

7 and 8 December, 2020

DAY 2 - 8 December 2020

<i>CET</i>	<i>EST</i>	<i>PST</i>	
17:15	11:15	8:15	Web-Conference Set-up and Test with all Participants
17:30	11:30	8:30	Welcome Overview Workshop Day 2 (Satya & Rolf)
17:35	11:35	8:35	Update on Edge Work at OEC & CMU OEC - Progress and Outlook (Rolf and Jim) CMU - Recent Research Results (Satya)
18:10	12:10	9:10	Edge Technology and Eco System ETSI MEC: moving the ecosystem forward Alex Reznik, ETSI MEC Accelerators in Data Centers & Edge Nodes Siamak Tavallaei, Microsoft A secure, cloud native Edge with ARM Project Cassini Augustine Nebu Philips, ARM

Networking Break

<i>CET</i>	<i>EST</i>	<i>PST</i>	
19:30	13:30	10:30	Future of Edge Simplified Persistent Storage to provide QoS and Resiliency Tom Prohovsky, Seagate Edge-Native XR Gaming Bob Gazda, Interdigital Edge is the New Cloud Joe Hammer, AlefEdge
20:25	14:25	11:25	Workshop Summary Summary of Workshop and Action Items (Satya & Rolf)
20:30	14:30	11:30	End of Workshop

1-to-1 communication between participants until 15:30 EST

CET = Central European Time

EST = Eastern Standard Time

PST = Pacific Standard Time

SESSION: UPDATE ON EDGE WORK AT OEC & CMU

OEC - PROGRESS AND OUTLOOK
ROLF AND JIM

CMU - RECENT RESEARCH RESULTS
JIM & SATYA



OPEN EDGE COMPUTING INITIATIVE

PROGRESS AND OUTLOOK

ROLF & JIM

OPEN EDGE COMPUTING INITIATIVE: KEY ACTIVITY AREAS

OEC mission slide
from yesterday

OEC Mission: ...is a collective effort for driving the business opportunities and technologies surrounding edge computing.

- **Drive Cross-Operator Edge Alignment**
→ Agree and establish a edge technology that enables a globally uniform mechanism to use Edge services (Edge Platform API's, Edge Interconnect, Edge Federation etc.)
- **Drive Edge Adoption**
→ Develop attractive edge applications and drive engagement with edge application developers
- **Tackle Key Technology Challenges**
→ Deliver prototype solutions for key technical edge challenges (hand-off, GPU sharing etc.).
Release solutions as open-source
- **Engagement and Alignment**
→ Cooperation with other edge related activities and initiatives (ETSI MEC, GSMA, Linux Foundation Edge, OpenStack etc.)
- **Living Edge Lab**
→ Provide and utilize an E2E testbed for edge applications and technologies

For further information

Twitter: @openedgecomput1, Web: www.openedgecomputing.org

OPEN EDGE COMPUTING INITIATIVE: PROGRESS SUMMARY

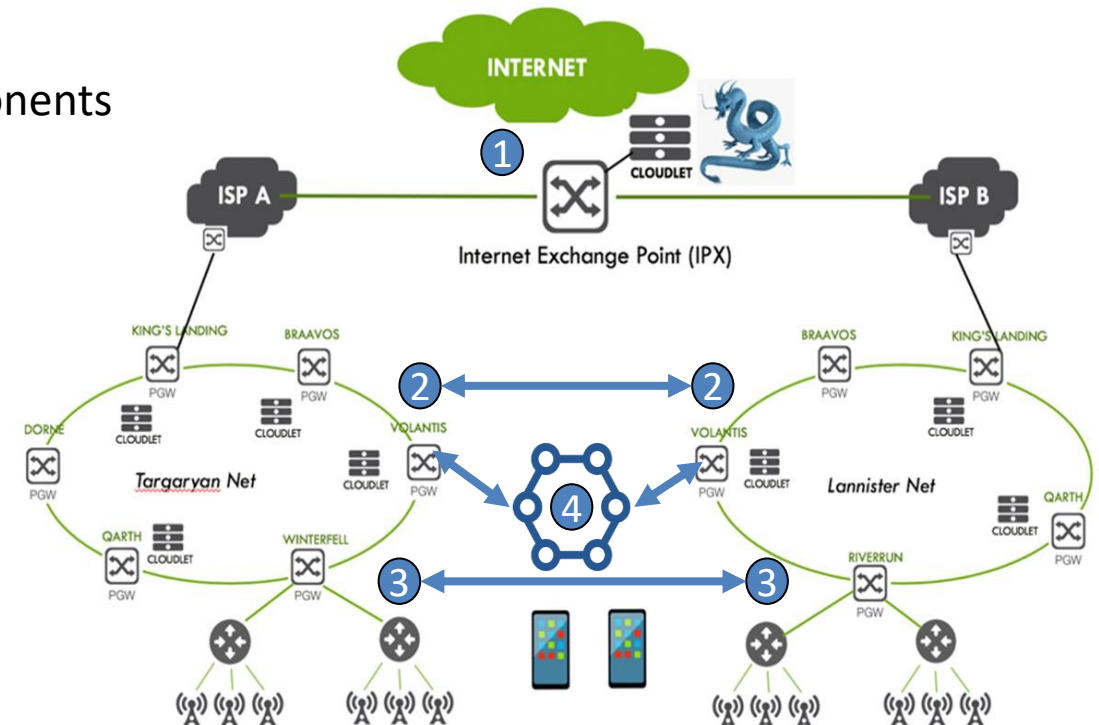
Progress @ Living Edge Lab: Multi-technology testbed for edge-native edge applications (since 2018)

- Existing lab infrastructure: outdoor cells across city of Pittsburgh with fibre backhaul, test licence
lab platforms: Azure Stack, Verizon / Envmt platform, MobileEdgeX platform...
- 20+ Edge-native applications: Virtual Desktop, OpenRTist, OpenScout, SandwichMaker, PingPong...
- Added AWS SnowCone indoor CBRS network
- Added Azure Stack platform upgrade with GPU components
- Added edge emulation capabilities (AdvantEDGE)

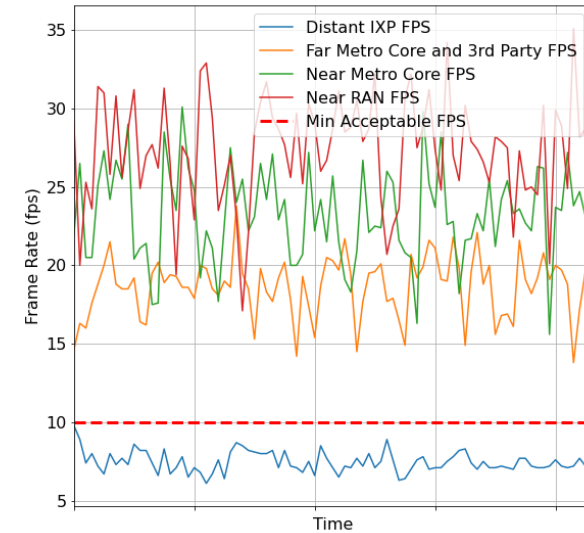
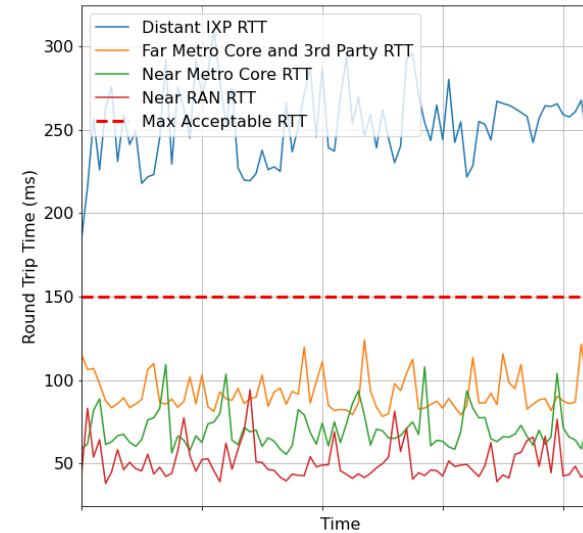
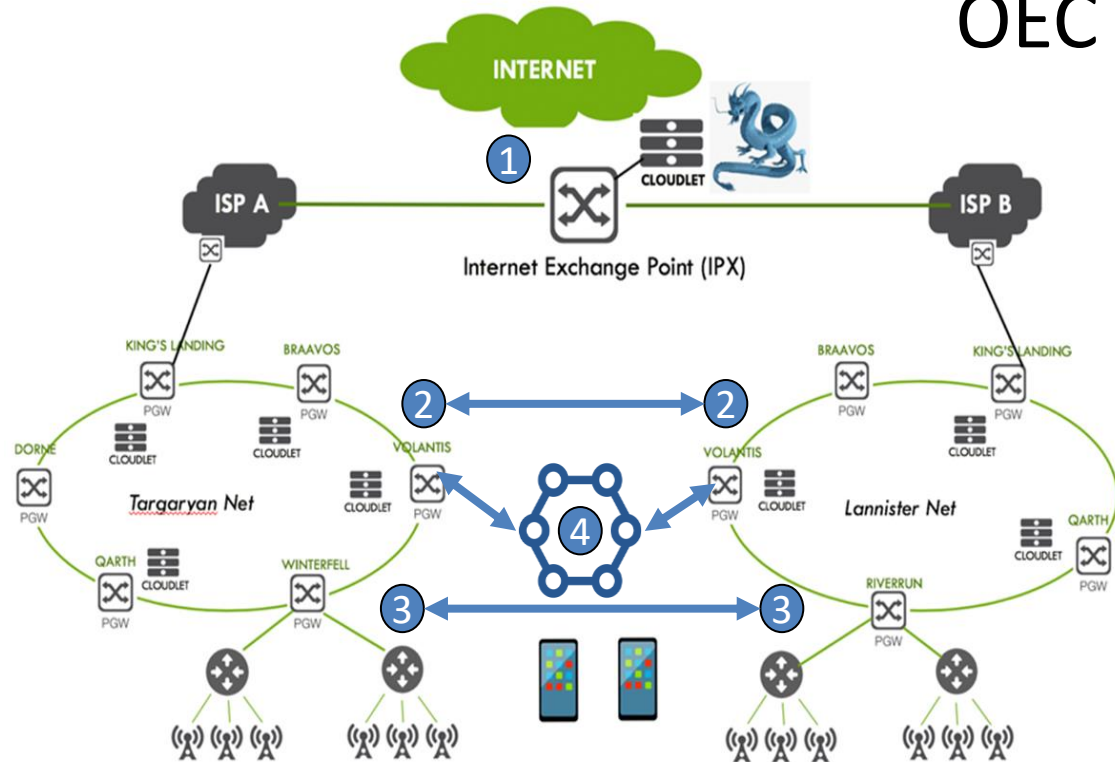
Example OEC Workstream:

“Low Latency Edge Operator Interworking”

- Challenge: How can we provide a seamless edge service experience across different edge operators?



OEC Workstream: “Low Latency Edge Operator Interworking”



	UE APP	Wireless Link (V)	RAN (W)	Metro WAN (X)	Out of Area WAN (Y)	Interconnect	EDGE APP
Mean Latency	Actual	LTE:3ms; 5G: 1ms	5ms	5ms	20ms-100ms	<1ms	Actual
Jitter	Normal $\sigma = 1\text{ms}$	Normal $\sigma = 1\text{ms}$	Normal $\sigma = 1\text{ms}$	Normal $\sigma = 1\text{ms}$	Normal $\sigma = 1\text{ms}$	Normal $\sigma = 0$	Actual
Throughput	Actual	1Gbps	1Gbps	1Gbps	1Gbps	1Gbps	Actual

<https://www.linkedin.com/pulse/shared-edge-experience-tomasz-gerszberg/>

<https://www.openedgecomputing.org/simulating-edge-computing-environments-to-optimize-application-experience/>



More Edge-Work Results
also in CMU-Update!

OPEN EDGE COMPUTING INITIATIVE: OUTLOOK AND FUTURE WORK

New OEC Workstreams and Possible Work Areas

- Data Management at the Edge: State transfer across edge nodes (agreed workstream)
- Edge- and FPGA-based social distancing trial at CMU (with AWS, Megh)
- Supporting Vodafone Edge Innovation Program (with AWS)
- Cross Edge Platform Work: API convergence, Handoff, Federation...
 - ...between Telco Edge Management Platforms
 - ...between Telco Edge and Cloud Edge Platforms (Microsoft Azure, AWS Wavelength, MobileEdgeX...)
- Seamless Edge Security from silicon to edge application
- Expanding Work on HW Accelerators (e.g. Adrenaline)
- Running an edge-based Virtual Desktop trial in Pittsburgh
- Add further Edge-Native Applications (drones, automotive, AR, gaming, IoT etc.)

Living Edge Lab – Targets and Next Steps

- Clear path to CBRS upgrade of outdoor network
- Expand Living Edge Lab coverage in Pittsburgh, USA (e.g. with Vapor IO)
- Adding further edge management platforms
- Mid-term plan: extension to 5G network (small cells & outdoor network)





CARNEGIE MELLON UNIVERSITY

RECENT RESEARCH RESULTS

JIM & SATYA

CMU EDGE COMPUTING RESEARCH VECTORS – 2020 HIGHLIGHTS

Accelerate Edge-Native Application Creation

- **NEW: OpenTPOD/ OpenWorkFlow**
- **NEW: OpenScout** – Extensible framework for object detection
- **NEW: Delphi** – Bandwidth-adaptive learning for edge-sourced video
- Gabriel version 2.0 released

Deliver New Capabilities For Applications

- **NEW:** Video decode storage POC (w/Seagate)
- **NEW:** Human-in-the-loop for WCA
- **NEW: Cygnus** – Edge detection of “black swans”

Understand How Edge Systems Perform

- **NEW:** OpenRTIST E2E benchmarking
- **NEW:** Application-driven edge environment simulation

Build Edge-Native Reference Apps

- **NEW:** Privacy-aware social distance monitoring w/FPGA (w/AWS/Megh)
- Extending LiveMap for early-discard
- EdgeVDI POC

<https://www.openedgecomputing.org/>

SESSION: EDGE TECHNOLOGY AND ECO SYSTEM

ETSI MEC: MOVING THE ECOSYSTEM FORWARD

ALEX REZNIK, ETSI MEC

ACCELERATORS IN DATA CENTERS & EDGE NODES

SIAMAK TAVALLAEI, MICROSOFT

A SECURE, CLOUD NATIVE EDGE WITH ARM PROJECT CASSINI

AUGUSTINE NEBU PHILIPS, ARM

SESSION: FUTURE OF EDGE

SIMPLIFIED PERSISTENT STORAGE TO PROVIDE QOS AND RESILIENCY

TOM PROHOFSKY, SEAGATE

EDGE-NATIVE XR GAMING

BOB GAZDA, INTERDIGITAL

EDGE IS THE NEW CLOUD

JOE HAMMER, ALEFEDGE

WORKSHOP SUMMARY – DAY 1 + DAY 2



Day 1

Session: “Edge Applications and Services”

- First insight into the new edge-related business unit at Microsoft
- Update on latest edge activities
 - at Vodafone and
 - At Verizon
- Perspective & critical review from an edge customer (EdgeGap)

Session: “Cloud Edge and Telco Edge”

- Interesting example of a cooperation between a cloud and an edge technology provider
- Insight into the further development of the Telco Edge

Day 2

Session: “Edge Work at OEC & CMU”

- Insight into OEC mission & processes
- Overview OEC + CMU work results

Session: “Edge Technology and Eco System”

- Update on ETSI MEC results and progress
- Community work on accelerator technology
- ARM perspective on the edge eco system

Session: “Future of Edge”

- New approach to edge data management
→ agreed new workstream
- Innovation in the area of edge-native XR gaming
- Insight into new E2E edge platform



MANY THANKS FOR YOUR ACTIVE PARTICIPATION !



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