IEEE

# International Network Generations Roadmap

*-2021 Edition-*

# Edge Automation Platform

IEEE Future NETWORKS

*An IEEE 5G and Beyond Technology Roadmap*

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This edition of the INGR is dedicated to the memory of Earl McCune Jr., who left us tragically and too soon on 27 May 2020. Earl was a microwave/RF guru, brilliant technologist, major industry/IEEE contributor, global visionary, keen skeptic, and all around fantastic human being. He was a major contributor to the INGR's early work on energy efficiency, millimeter-wave, and hardware. He worked for a technologically advanced yet more energy efficient world, and the contents of the INGR are a tribute to that vision. Rest in peace, Earl!

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# ABSTRACT

The platform for edge and its automation is proposed as Edge Automation Platform Framework (EAPF 2020) and this covers Platform to Infrastructure standardization as underlay optimizations. The Service to run on edge to cloud continuum is proposed as Edge Service Platform Framework (ESPF 2021) which will cover the edge service optimizations for low sub millisecond latencies and higher bandwidth and capacities for 5G/IoT/WIFi6 and beyond.

Proposed the Edge Automation Platform Framework (EAPF) 2020

Edge Platform includes the necessary Infrastructure and Platform framework to be able to support the constraints of Infrastructure traits and tolerances. Simple abstractions of Compute, Networking and Storage have stood the test of time & form factors from Bare Metal, VMs to containers. Standardizing Infrastructure abstractions as Kubernetes nodes & clusters has led to the concept of Serverless Platform as the next generation Edge Platform Framework. The evolving concept of Automating the Edge Platform as proposed in the 2020 release as part of EAP Framework (EAPF) 2021.

Proposed Edge Service Platform Framework (ESPF) 2021

Edge Service includes the necessary Platform and Applications that are distributed and delivered to consumers and enterprises. The requirements to support privacy, security and proximity functionality for location-based delivery of services leads to touch point of edges all over from on-prem, IoT Gateways, light poles, small cells, macro cells, fronthaul, Micro Data Centers, midhaul, central office, provider edge with microservices architecture, loosely coupled composable services from service catalogues across the edge to cloud continuum.

Essentially, we are replacing the first edition of EAP with this new edition of serverless EAPF (2020) & distributed service ESPF (2021). One can oversimplify it as Platform to Infrastructure representing EAP Framework and Platform to Service representing ESP Framework.

The era of domain specific services needs a new distributed Edge Service Platform Framework (ESPF) that is able to support different models of Management Plane (MP), Control Plane (CP) and Data aggregation plane (DP) and Edge User Plane Functions (EUPF) to support serverless Edge Native Functions (ENF) & services (ENS) of different domains. Moving away from hyperconvergence cloud Infrastructure to serverless form is fueled by federated distribution of service functions, service mesh, service chains and block chains with AI/ML models and feedback loop-based optimizations. Besides Infrastructure domain acceleration through parallel processing, in-line encryption, decryption, load balancing across heterogeneous edges & clouds add to the serverless services. Containerization and Blockchain are emerging to provide futuristic edge native solutions. We are currently evaluating requirements on ESPF. We plan to scope emerging Blockchain (BC), Web 3.0 and other elements to support real time, domain specific edge services with multi-RAT/Multi-access Edge computing (MEC), WiFi6/Green Services with Crypto based security in 2021 editions. We have several linkages within INGR to drive the efforts with collaboration and support.

Key words: 5G, AIML, BC, CNF, CP, DP, EAPF, ENF, ENS, ESPF, EUPF, INGR, IOT, MEC, RAT, UP