

## **Name of SIG: Intelligent Internet Edge (IIE)**

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## **Scope and Objectives**

Cloud computing provides a scalable services consumption and delivery platform and abundant resources to users. However, it is insufficient for the scenarios for fast and high-quality data retrieval, and sometimes suffers from the problems of security, reliability and availability. Therefore, it cannot satisfy the requirements from the emerging applications, such as augmented and virtual realities (AR/VR), Internet of Things (IoT), 4K/8K streaming, smart city, vehicular systems, and disaster services. Against this backdrop, there is a strong trend to move the computations from the cloud to the Internet edges closer to users.

There are diverse possibilities for the Internet edges, which may include a variety of entities, such as small data centers, end devices, and resource-sufficient networking nodes. Fog/Edge computing is usually expected to bring the resources including storage and computation resources closer to users. For this IIE SIG, we investigate the scope where the entities at edge

not only can provide the resources to the users but also can collaboratively and intelligently provide in-network storage and computing services for users. They should be investigated comprehensively from several aspects: applications, software, hardware, networking, and computation.

At the Internet edge, the new computation technologies, such as big data analytics, modern machine learning technology, artificial intelligence (AI), blockchain, and security processing, have the great potential to be embedded into network to enable it to be intelligent and trustworthy. On the other hand, information-centric networking (ICN), data center network, software-defined network (SDN), network function virtualization (NFV), and network slicing have emerged as the novel networking paradigms for fast and efficient delivering and retrieving data. This triggers the convergence between the emerging networking concepts and the new computation technologies to reach the vision of an intelligent Internet edge.

For intelligent Internet edge, there are many open challenges: what services should be provided at edges; how to enable the coordination and communications between the edge and the cloud; how to enable the intelligent collaborations and networking among the edges; what computations should be embedded at the entities at the edges; which entity should be enforced with the computation; how can the computations, such as big data analytics, security, AI, machine learning, blockchain, be seamlessly embedded into the edge and enable it to be efficient, trustworthy and accountable; how to fast locate the required and suitable computation entity; how to efficiently transfer data through series of computation entities; how to efficiently collect and process the big edge data; how to design system and network architectures to easily support the efficient and diverse services; how to design the hardware architecture; how to design the middleware for the edge; how to balance the working load at the edge; how to achieve ultra-low latency communications with distributed edge computations; how to define and manage the edge/fog systems; how to build and operate small data centers; how to regulate the distributed process execution; how to adapt the resources with the dynamic user demands; and how to migrate the Internet edge to the computation-enabled intelligent edge.

In summary, this SIG will focus on the technical challenges and applications to enable the Internet edge to be intelligent. We envision that the intelligent Internet edge will provide more efficient support for the emerging applications. The areas of interests include, but are not limited to, the following:

- Intelligent edge system and networking architecture and protocols for integrating storage, computation, and communications
- Intelligent coordination and networking between edge, fog, and cloud
- Hardware architectures for intelligent Internet edge
- Software architectures and toolkits for intelligent Internet edge

- Coordination and networking among intelligent edges
- Coordination and networking among the entities in the intelligent edges
- Integration of edge/fog computing with networking
- Migration to the intelligent Internet edge
- Intelligent service function/computation chaining
- Network function virtualization, software-defined network, and network slicing for distributed computations
- Information-centric networking with/for computation
- In-network computation for future networks, inter-data center networking and 5G
- In-network computations for big data, 4K/8K streaming, IoT, 5G, and AR/VR
- Trust, security, privacy for intelligent Internet edge
- Accountability, reliability, and resiliency for intelligent Internet edge
- Quality of services and energy efficiency for intelligent Internet edges
- Programming models and scheduling for intelligent Internet edge
- Storage systems for intelligent Internet edge
- Load balancing for intelligent Internet edges
- Distributed artificial intelligence with/for edge networking
- Integrating Blockchain with distributed edges and Internet finance
- Software and hardware infrastructure for small data centers
- The construction and operations for intelligent small data centers
- Machine learning, data mining and big data analytics in networking
- Collection and processing for big network data
- Applications for intelligent Internet edge, such as AR/VR, IoT, 5G, cyber-physical system, smart city, vehicular system, healthcare
- Quantum computing at intelligent edge
- Deployment and management for intelligent Internet edge
- Performance monitoring, metering, modelling, and evaluations for intelligent Internet edge

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### **Webpages**

Homepage: <https://github.com/IEEEITCIIE/Home/wiki>

Linkedin HP: <https://www.linkedin.com/groups/10413513/>