LTI
Let's Solve

LTI mediacube

LTI's 5G | Cloudlet | MCC Predictive Resource Provisioning Platform

Experience lower operating costs, low latency, simplified content distribution and high performance with new-age technologies.

A Larsen & Toubro Group Company

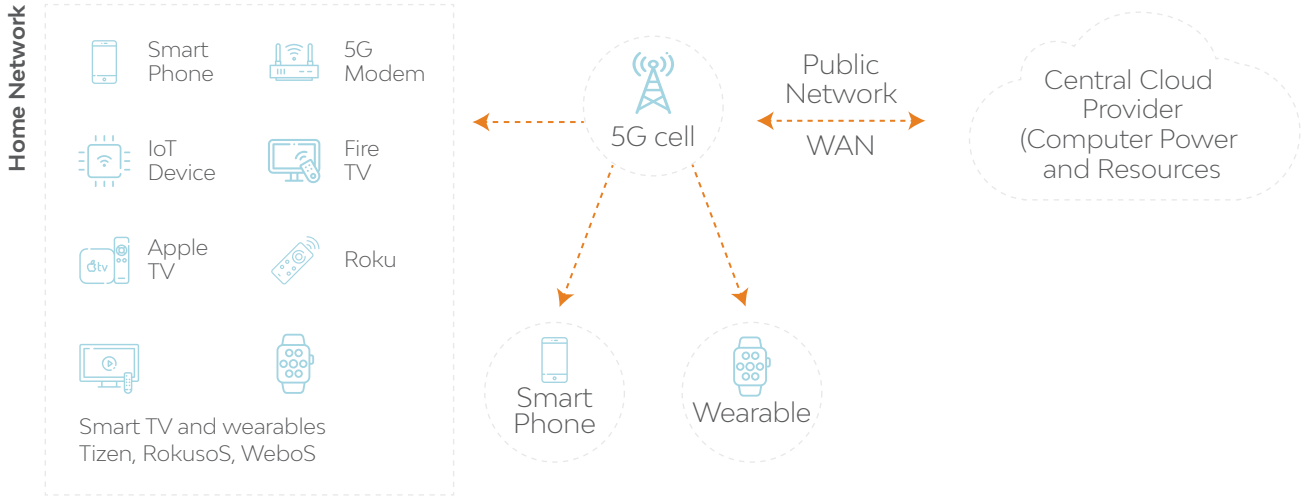
Overview

The realization of the magnitude of the increase in media and edge device mobility has dawned and awakened the interest of the media community, as to how to provide computationally-intensive processes at the edge, closest to the user and to provision these services to support device mobility. AR, VR, facial, object, semantic, activity, and body movement recognition, language interpretation, speech-to-text and text-to-speech are among the most active, advanced content applications being created for storytelling, education, communication and content branding. As a mobile user, it is important to provide a high QoE and consistency from cell to cell and Cloudlet to Cloudlet, as the user travels.

The current MCC, (Mobile Cloud Computing) architecture incurs too much latency for these applications to provide a high QoE for the end user due to the long path it takes to get to the cloud. In general, mobile media applications require 16ms or less of latency to perform optimally. A central cloud architecture can't provide this latency especially during peak hours.

Cloudlet technology is being rolled out due to the increase in 5G coverage worldwide to reduce application latency at the edge. 4G cell spacing is 17km, but 5G requires 300m cell spacing. This increases the cell density by a factor of 50 in some geographic areas. The result of this has brought about much discussion in increasing the backhaul bandwidth (Public Network WAN) from the 5G cell to the central office. The current MCC, 5G architecture is shown below.

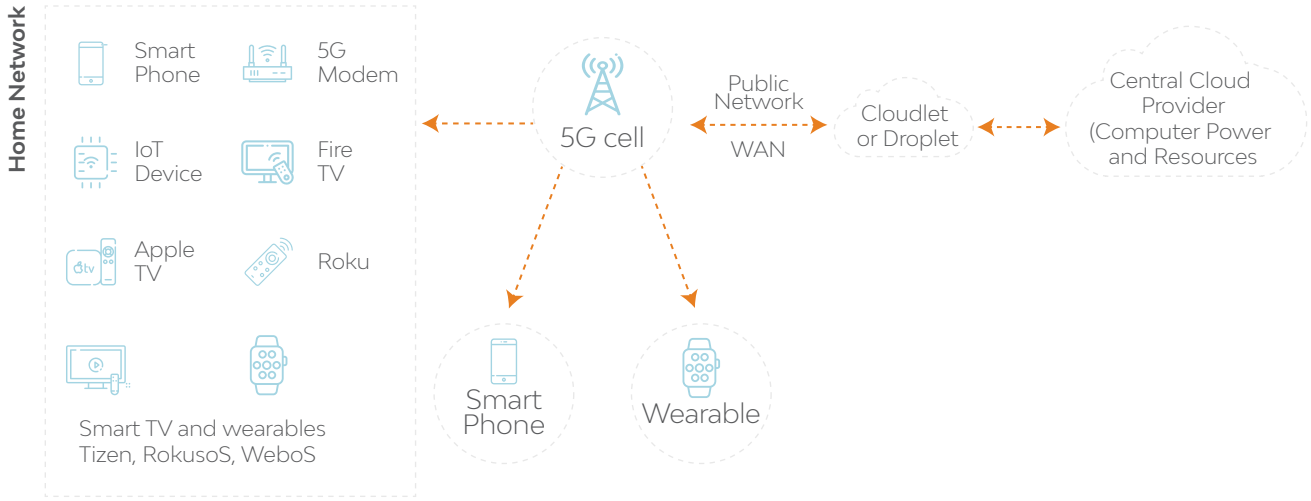
Current Architecture



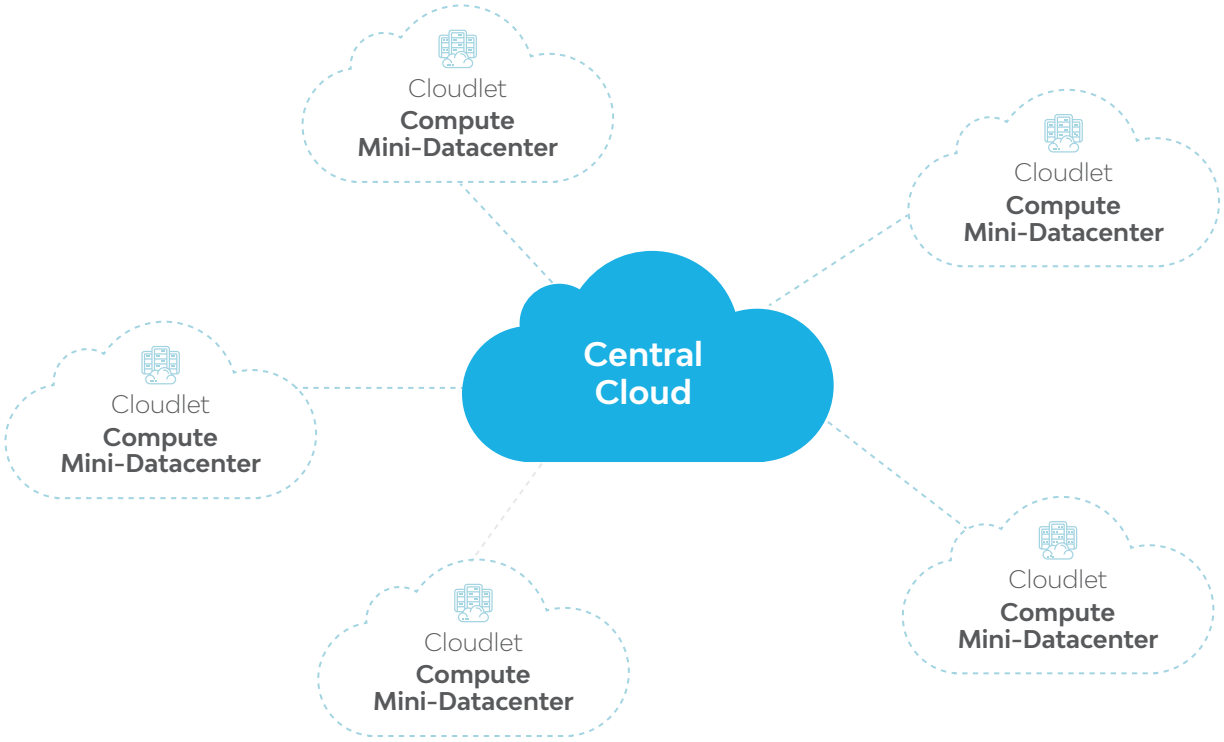
The above architecture will support general applications that do not require low latency. It will not support applications that require low latency such as AR, VR and ML real-time analytics, which will require costly backhaul bandwidth upgrades. Cloudlets will provide the low latency that these applications require by bringing the compute power to the edge and reduce the backhaul costs for the carrier. See the diagram below. We will call this architecture MEC – Media Edge Computing.

Media Edge Computing Architecture

Media Edge Computing Architecture

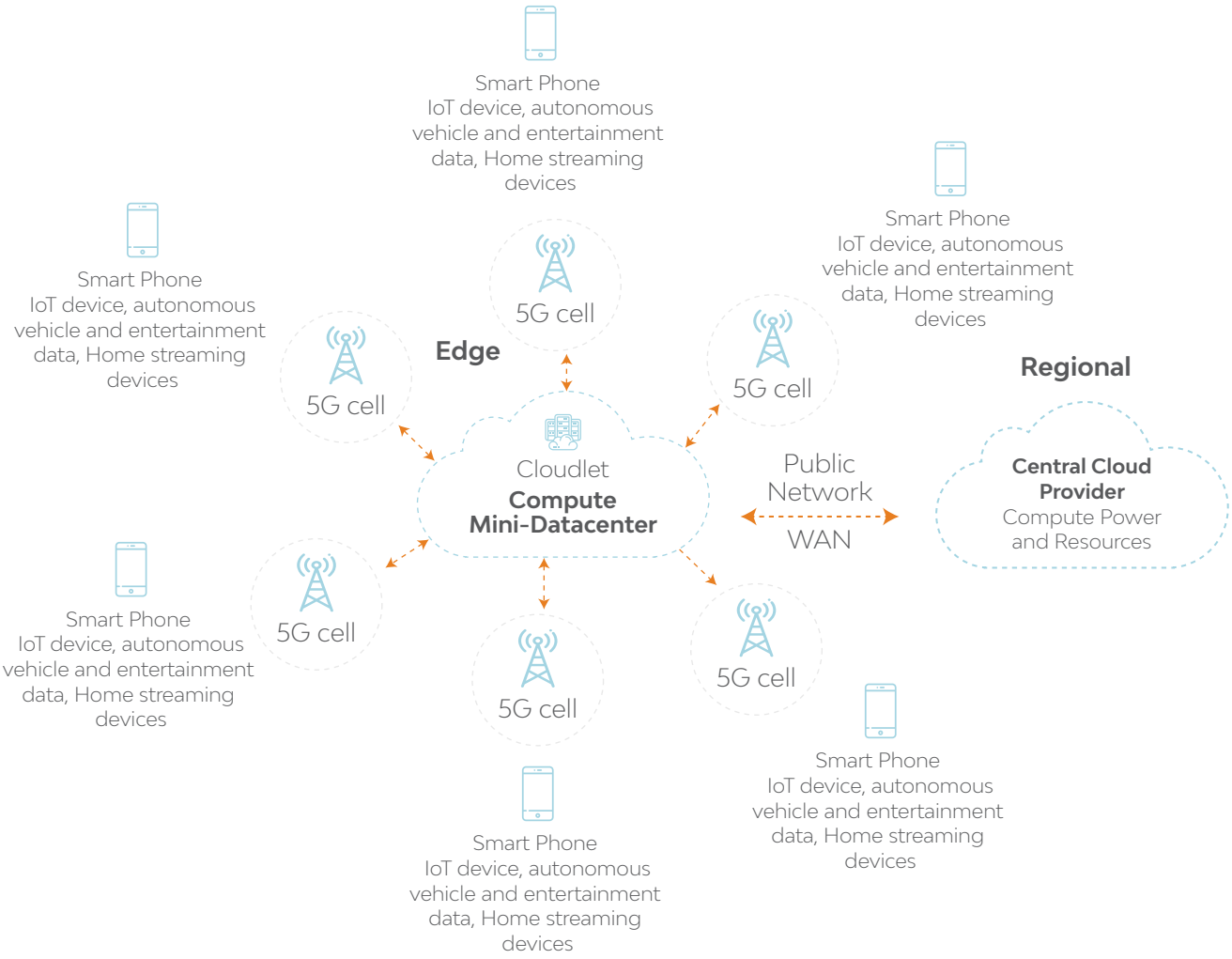


From a Cloudlet to Central Cloud perspective, we will have a configuration with Cloudlets connected to the central cloud for additional processing that does not require low latency. It also reduces the amount of backhaul bandwidth required for the 5G cells to the central cloud. See the diagram below.



Let's take a closer look at the edge. See the diagram below

Edge Cloudlet Architecture

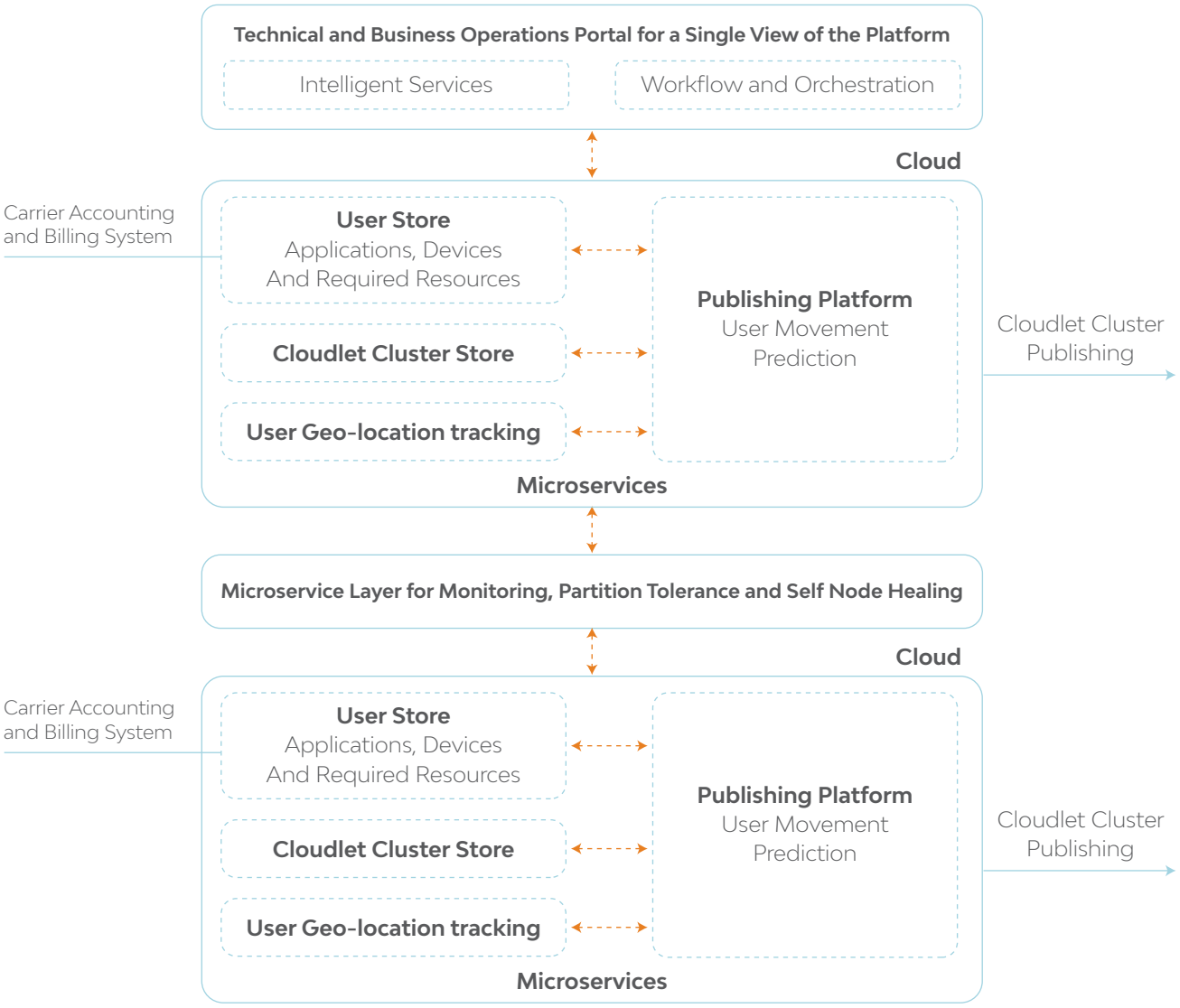


At the edge, we have devices that require CPU and GPU compute power with low latency, as well as real- time data and monitoring. Considering the amount of 5G cell density and the amount of cloudlets required, a user moving from cell to cell and Cloudlet to Cloudlet will require that the user geo-location and compute resources are pre- provisioned for their applications to track their movements, so that there is no interruption in service and above all, user experience. As an example, autonomous driving vehicles require no interruption in service as a car drives from cell to cell and Cloudlet to Cloudlet. Car entertainment systems require the same functionality for core entertainment services and sharing entertainment content between vehicles.

LTI Resource Provisioning Platform Solution

The provisioning platform consists of a user store of valid applications and devices, whereby the necessary compute power and user experience metrics are known. This is the user profile. Based upon the pre-determined user location, the platform will publish the resource information to an available Cloudlet cluster to anticipate the users' movements. As users add valid applications and new devices, the user store or profile will be updated and published to the Cloudlet cluster in the geo-location of the user. See diagram below.

LTI Resource Provisioning Platform Solution



Opportunity

This platform is applicable to all worldwide telecom carriers, ISPs and content providers.

Benefits

As users move from Cloudlet to Cloudlet, the resources they require are pre-provisioned, resulting in an excellent customer experience and customer satisfaction

The user pattern of movement data can be used to enhance further advertizing personalization and to offer more relevant content offerings

It relieves the operational complexity of distributed edge cloud architectures by automating resource provisioning at the edge

It will reduce operator cost in the management and operations of complex distributed networks

Content can be wrapped in any standards-based format at the edge, simplifying content distribution

One key component of the 5G technology stack is network slicing. This enables a dedicated part of the network to be made available for a dedicated set of users, a bit like a private wi-fi network; it means we can have a known and controllable environment to improve reliability of connections.

Other technologies such as edge computing (Cloudlets) allow for processing of signals closers to the point of acquisition and therefore, enable remote production workflows to become more streamlined.

5G is also designed to run on non-public networks, so in the same way a private wired or wireless network can be deployed currently. We hope to have the ability to set up networks as appropriate, this may be with existing providers, new companies with different business models or self-deployed on dedicated spectrum.

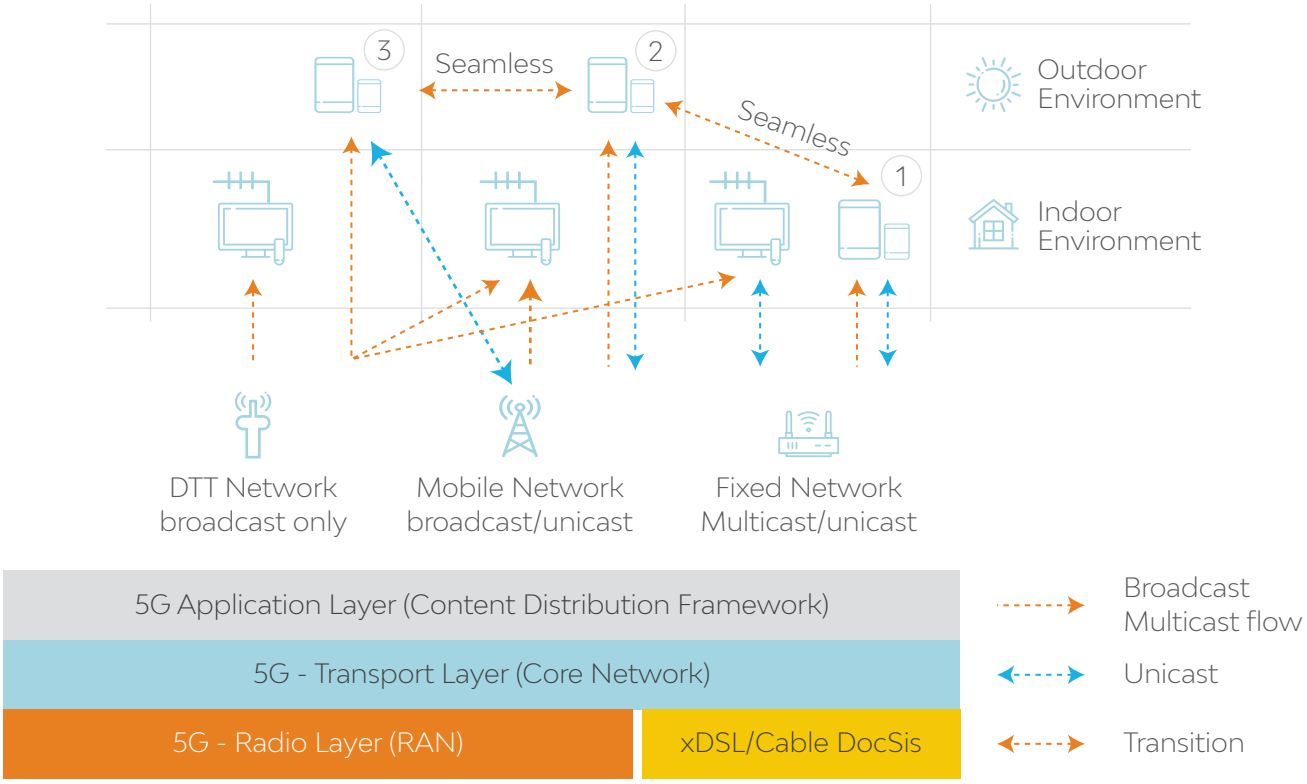
In the future, we hope that 5G will provide us with the reliability, flexibility and mobility required by production and help reduce costs associated with dedicated hardware for production use.

Media Use Case Categories

- Real-time Live Sports/eSports, News contribution and streaming – 5G bandwidth slice is less costly than fixed radio bandwidth and if the cameraman or production truck is moving, it ensures a high QoE and less propagation effects which affect the video signal.
- Non-real-time contribution
- Video IP switching at the Edge (Cloudlet)/Personalized Playout of content at the Edge – reduces the cost of increasing the Network Operations Center SDI switch by using the Edge and distributing the switching of program and commercial to the Edge, where 5G can provide deep personalized offerings.

- Mobile AR, VR and Gaming applications require low latency and high performance – provisioning resources at the edge reduces the latency otherwise not attainable by the central cloud providing a consistent and real-time user experience.
- The creation of micro-audience segments and virtual audiences at the Edge – 5G slices allow the creation of fine-grained, customized audience segments, which increase programming and advertising ROI.

5G – Application Layer – Content Distribution Network



[1] Y. Xu and S. Mao, "A survey of mobile cloud computing for rich media applications," IEEE Wireless Commun., vol. 20, no. 3, pp. 46–53, June 2013.

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