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Leveraging Computing Resources of Edge Devices for Distributed Computing

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Leveraging Computing Resources of Edge Devices for Distributed Computing

ABSTRACT

Cloud platforms are built on resources and infrastructure owned and maintained solely by the cloud platform provider. While the cloud infrastructure is distributed across various locations, it does not leverage end-user distributed resources, such as mobile phones, IoT devices, etc. The techniques described in this disclosure enable leveraging end-user devices as cloud computing resources with appropriate permission from the users. The functionality is achieved via a secure capsule installed on the devices with user permission.

KEYWORDS

- Cloud platform
- Distributed computing
- Edge computing
- Idle devices
- Sharing economy

BACKGROUND

Cloud platforms are built on resources and infrastructure owned and maintained solely by the cloud platform provider. Such infrastructure includes hardware, software, network, power supply, etc. While the cloud infrastructure of many providers is distributed across various geographic locations, it currently does not leverage end-user distributed resources, such as mobile phones, Internet of Things (IoT) devices, etc.

DESCRIPTION

The techniques described in this disclosure leverage edge devices as distributed computing resources with appropriate permission from the users. Users can register any of their

devices to be a part of a distributed computing resource such as resources provided by a cloud platform provider, thus creating a reservoir of computing resources that is distributed across the globe. Users can register any type of devices, such as mobile phones, tablets, desktop computers, laptops, Internet-of-Things (IoT) devices, etc.

With user permission, the distributed computing platform utilizes the registered devices when the devices are in an idle state. For instance, if the user permits, a user's smartphone can be utilized as part of the distributed computing platform between 10pm to 6am, which are hours when the user is not actively using the phone.

For each registered device, the device owner can specify parameters for its use within the distributed cloud platform. The parameters can be specified in a variety of ways such as:

1. **Period:** Specific periods during the day. e.g., midnight to 5am
2. **Amount of time:** Maximum amounts of time per day, e.g., 8 hours per day
3. **Computing capabilities:** Maximum amount of consumption of resources such as CPU power, memory, storage, etc.; for example, a maximum of 10 GB storage may be allocated for use by the distributed computing platform
4. **Device location:** Physical location

The functionality of using an edge device as a resource in the distributed computing platform can be achieved via a capsule or secure container that is installed on each registered edge device with user permission. The capsule forms a separate sealed container within a device, with each container being allocated specified amounts of memory, storage, and computing power. The capsule has built-in mechanisms to measure the consumption of these device resources within a given period when the device is used as part of the distributed computing

platform. The provider of the distributed computing platform controls and maintains the security keys for the containers.

The technical capabilities of the capsule are applied to enable the use of computing capabilities of the registered device by the distributed computing platform in accordance with the usage parameters specified by the user. Such an architecture enables the parties served by the distributed computing platform to utilize the computing capabilities of a registered edge devices.

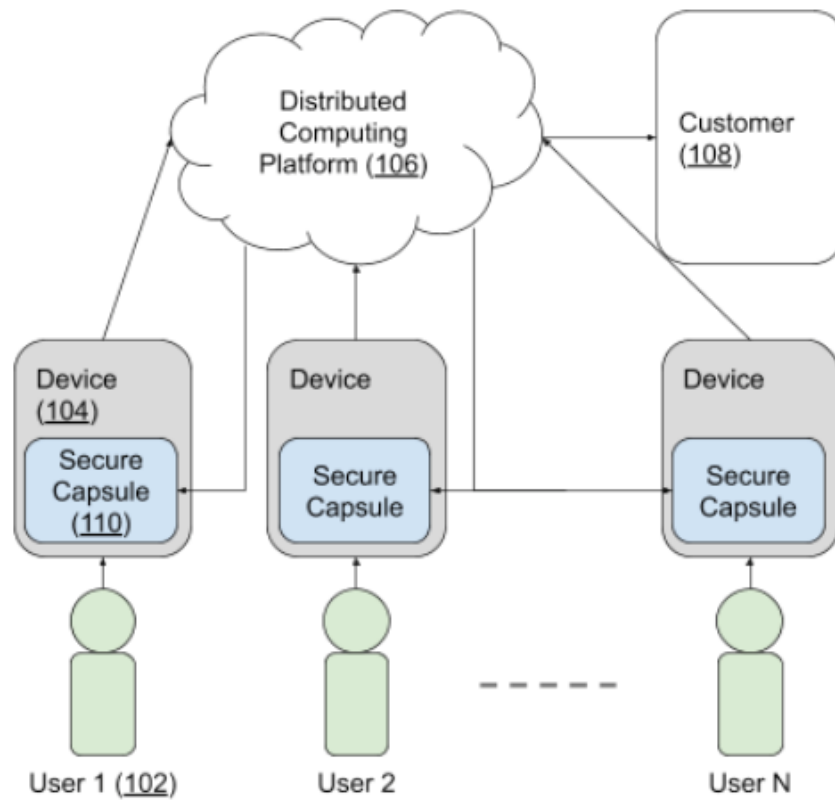


Fig. 1

Fig. 1 illustrates a user (102) that has registered a device (104) with a distributed computing platform (106). As the figure shows, any number of users can register their devices to permit the use of the computing resources of the device by the distributed computing platform. The use of the devices is constrained by a secure capsule (110) installed on each device and controlled by the distributed computing platform. Via the secure capsules, the computing

resources of the registered devices are made available to the customer (108) of the distributed computing platform in accordance with specified usage parameters.

The described techniques allow device owners to lend unused computing power of the devices for use by others. Users can be provided monetary compensation based on usage of their registered devices by the distributed computing platform.

Edge devices can thus serve as a reservoir of globally distributed computing power that can be packaged and offered to other enterprises in the form of Infrastructure-as-a-Service (IaaS). The described edge computing based approach has the advantage of global reach, thus enabling the platform provider to boost performance by provisioning resources in physical proximity to the customer locations.

CONCLUSION

The techniques described in this disclosure enable leveraging end-user devices as cloud computing resources with appropriate permission from the users. The functionality is achieved via a secure capsule installed on the devices with user permission. The device owner can specify parameters for use of the device within the distributed cloud platform and is provided monetary compensation based on usage of their registered devices by the distributed computing platform.