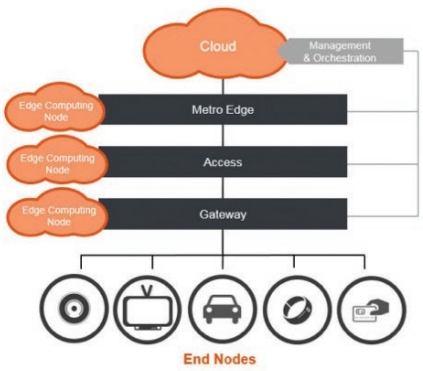
COMPUTING AT THE EDGE

Cloud-computing has created new computing paradigms based on virtualization, massive scale and platform service models. Clouds, while flexible, depend on workloads not being overly sensitive to network latency or bandwidth. For applications where humans are directly involved; such as mobile phones, tablets or personal computers, the delays and bandwidth limitations of cloud computing are not noticeable. For applications requiring real-time millisecond responses like autonomous driving, dealing with massive amounts of data such as real-time video processing, or applications with regulatory requirements on where data is located or processing is performed, relying solely on cloud-based computing will not provide acceptable solutions.

- Edge computing is a concept that has been developed over several years to support IoT deployments. Edge computing works by selectively moving cloud-compute processing from cloud data centers to edge and end node processing platforms. Edge computing differs from traditional embedded systems by leveraging the agile software models of cloud systems. Edge computing makes use of virtualization and containerization of software to support the deployment of software than can be continually updated.
- Edge computing systems often operate over public networks, consequently they require integration of both wired and wireless network connectivity and importantly, they require being built with a hardware root of trust. Hardware root of trust is an approach to computing where the processing of security algorithms as well as key and certificate storage are performed in trusted hardware. Hardware-based trust systems are much more robust than software-based systems against cyber-attacks seeking to compromise software-based systems.
- Edge computing also helps to guarantee user's privacy and security by sanitizing traffic to the Cloud, filtering personally identifiable information where necessary.



- Edge computing can be applied to all levels of networks between clouds and end-nodes, including on gateways, access and metro edges. The concepts of Edge computing may also be applied to end nodes. Edge computing is revolutionizing the way embedded systems are architected, moving to truly distributed systems from a system of loosely coupled fixed function appliances.

EDGE COMPUTING WITH AWS

- By leveraging the AWS Greengrass software, AWS Lambda functions developed for the AWS Cloud can be run locally on Edge computing devices. This approach supports keeping device data in sync with cloud data stores even when not continuously connected to the Internet. In conjunction with the AWS IoT services, AWS Greengrass ensures that IoT devices can respond quickly to local events, operate with spotty connections and minimize the cost of transmitting data to the cloud.
- Typical use cases cover Industrial equipment running real time analytics for performance optimizations, self-driving vehicles making safety decisions, home automation security systems offering resilience to tampering and more.

SUPPORTING ARTIFICIAL INTELLIGENCE THROUGH MACHINE LEARNING

- The last several years have seen a rapid increase in the use of machine learning (ML) as a technology to support artificial intelligence (AI) workloads like Alexa. While the Cloud will remain the best place to train ML algorithms, increasingly Edge devices are becoming the best place to execute the inference component of ML and enable AI for whole new classes of systems. ML training is often and rightfully described as GPU-intensive, however the outcome of cloud-based ML training can be very efficiently executed on multicore Arm® processors.
- The power efficient performance of multicore Arm® Cortex®-A53 and A72-based SoCs assisted by local GPUs or vector processing engines makes NXP's SoC offerings the best choice to run the most popular open-source software libraries for machine learning.
- Computer vision algorithms running on Edge nodes support the extraction and transmission of semantic data instead of sending raw video streams; reducing bandwidth requirements, while enhancing privacy. Allowing the broader use of connected video and imaging technology without overwhelming networks.

NXP'S ROLE

NXP features the broadest lineup of processors for Edge Computing from the single-core sub-1Watt, LS1012A to the recently announced 16-core LX2160A. NXP offers AWS Greengrass running on all of its Layerscape® processors which are all also equipped with NXP's trusted architecture platform and cloud commissioning software to support the security of IoT devices throughout their lifecycle: manufacturing, commissioning, deployment, update, and decommissioning. Each processor features a unique ID, on-chip secure storage, along with secure boot and software over the air update, critical to IoT security leveraging certificate-based, Just in Time registration to AWS IoT service.

SECURE CONNECTIONS FOR A SMARTER WORLD

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