

Cloud Native at the Edge: Smart Cities

arm

A Project Cassini Reference Implementation

White Paper

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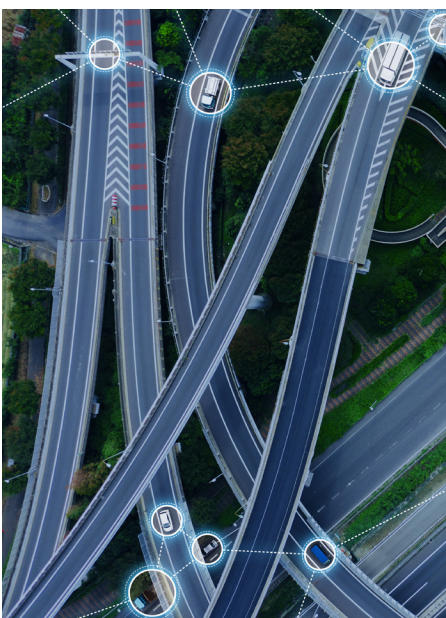
Smart City platforms need to consider integration across multiple, disparate subsystems to create a unified view that spans endpoints, intelligent gateways, and the cloud. System integrators and mobile network operators need simpler, more streamlined ways to develop and deploy such solutions. Here, we introduce SMARTER, an open platform reference design developed by Arm Research, that leverages elements of Project Cassini, the standards-based initiative for a cloud native software experience across a secure edge.

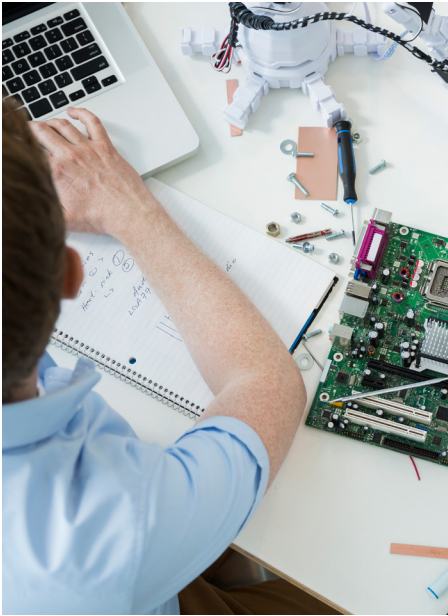
Challenge

Smart-city solutions need to support a wide variety of functions, such as environment monitoring for natural disasters, predictive modeling for city planning and traffic flow optimization, and providing real-time situational information to first-responder networks during emergencies.

Service providers deal with various design challenges, such as scalability across far and near-edge installations, edge PaaS architectures, multi-tenancy operation, application isolation, orchestration, and monitoring, and secure lifecycle management for endpoints and gateways.

Differences in technology, a lack of broad standards, fragmented security implementations and variations in regional requirements add an extra layer of complexity and cost, delaying deployments. These issues also make it more difficult for system integrators and commercial software vendors to deliver solutions that run without modification on different platforms and can hinder attempts to scale a deployment or translate a project from one place to another.





Solution Elements

To help smart-city service providers manage complexity, focus on innovation, and deploy faster, platforms need to be interoperable, end-to-end secure, and support applications that can be managed remotely using cloud native practices.

The **SMARTER** stack from Arm Research is designed to bring together core functional elements for cloud-native edge platforms, through an open reference design. SMARTER adopts Project Cassini vectors of Arm SystemReady, PSA Certified, and PARSEC – to showcase interoperability across diverse Arm platforms, allowing for broad choice and technology fit for edge architectures.

Cloud Native Principles in a Flexible, Adaptable Stack

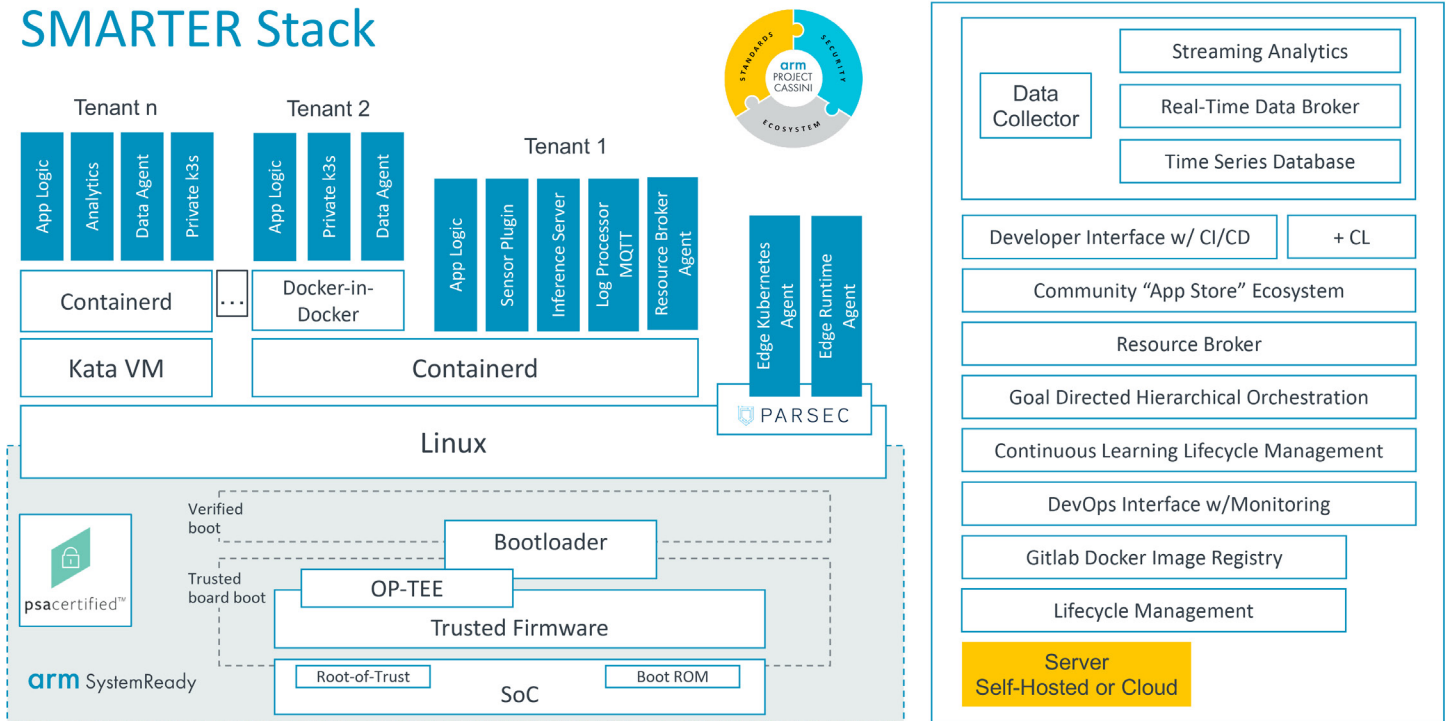
In a smart-cities deployment, endpoints such as HD cameras or weather sensors can send video streams or raw data to an edge node for pre-processing. These intelligent edge gateways support various modes of virtualization, run general-purpose or embedded OSes, implement hardware-assisted Root-of-Trust, and aggregate multiple software functions – through containerized applications. The SMARTER stack is designed primarily for intelligent IoT gateways, that bridge the world of endpoints to the cloud or core network. These systems manage workload deployment, data filtering, processing, and storage. The SMARTER stack also supports use of public, on-premises, and hybrid cloud solutions, for flexibility in how the deployment manages security, regulatory compliance, and process control.

Cloud native software techniques are used, to address the specific needs of edge operations. For example, Kubernetes is used to manage the control plane, with Docker as the container runtime engine. All functionality runs as containers and is remotely deployable, so it is easier to upgrade from within the platform, and only those containers needed to support applications, are deployed to a given node.

The stack keeps things simple by reusing k8s features, instead of replacing them, so developers use a familiar format to deliver enhanced functionality with edge elements.

When deployed on Arm-based architectures, developers can take advantage of optimal System-on-Chip (SoC) solutions for specific workloads, with features like advanced, built-in industrial-grade security and GPUs for video processing. Diverse solutions from the Arm ecosystem provide unparalleled performance-per-watt benefits that enable fanless designs, along with core densities that unlock broader service monetization opportunities.

SMARTER Stack



Smart-City Solutions can leverage the SMARTER Reference Stack

Working with SMARTER

The SMARTER project is hosted on [GitLab](#) and has been showcased on various Arm platforms such as the Raspberry Pi 3 and 4, and NVIDIA Jetson Xavier AGX, NX and Nano. A demo was shown as part of a CI/CD-at-the-edge use case with Rancher K3S in a [CNCF webinar](#). For more details, please visit the [SMARTER home page](#).

The Project Cassini Advantage

The SMARTER reference stack leverages Project Cassini to enable portability across diverse Arm platforms. Project Cassini includes the Arm SystemReady certification program for running standard, off-the-shelf OSes and hypervisors in a consistent manner across Arm platforms, PSA Certified for a secure baseline built on industry standards, and the PARSEC API for access to best-in-class security for applications.

Take the Next Step

We invite partners to engage on Project Cassini and explore the applicability of the SMARTER stack for smart city use cases and beyond. To get involved, contact us at project-cassini@arm.com or visit us at arm.com/project-cassini.