REPORT REPRINT

Eclipse Foundation's open source IoT activity reaches critical mass

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The story of open source software in enterprise IT is well known – fundamentally transforming and disrupting enterprise IT for the better. With a wide range of Internet of Things projects at the embedded device, edge/gateway and cloud platform layers now representing about 10% of all ongoing Eclipse Foundation projects, Eclipse IoT has surpassed a critical mass of projects and has set its sights on catalyzing integration, test bed and commercialization activities. At a recent Red Hat event, 451 Research participated in a roundtable discussion highlighting the latest EF activities and several IT vendors that are leveraging Eclipse IoT projects to create commercial value.

THE 451 TAKE

Implementing open source technologies is no longer atypical for enterprise IT decision-makers; it's the norm. Within the IoT ecosystem, there is no shortage of open source activity, but sorting through it all to find the right option, with appropriate features and usability for a given scenario, can be cumbersome for all but the most adventurous of developers. The Eclipse Foundation has been a leading champion for open source technologies for several years, and IoT now represents about 10% of all projects under its management. It is time to take a look at what Eclipse IoT has to offer as organizations that chose vendor-specific (proprietary) alternatives to get started begin to run into challenges regarding scale, complexity or cost that has them interested in open source alternatives. While it is not necessarily easier to get an IoT project up and running using open source software, the long-term advantages once an IoT system reaches critical scale are clear – more predictable costs and avoidance of vendor lock-in – and they are driving enterprises to investigate open source options. Open source platforms that run well both on-premises and in the cloud is another driver, especially for industrial enterprises that will, right or wrong, always eschew sending their critical data into a public cloud.

THE ECLIPSE FOUNDATION – OVERVIEW

The Eclipse Foundation was established in 2004 as an independent not-for-profit corporation. It relies on a proven governance model that ensures that no single entity can control the strategy, policies or operations of projects held in the Eclipse community. The EF is tasked with creating an environment for open source projects to thrive. It then helps to promote the adoption of Eclipse technologies along with foundation members. The foundation provides services such as intellectual property due diligence, community support, ecosystem development and supplying needed IT support infrastructure. The Eclipse Foundation's role in intellectual property management is perhaps its most important. The foundation uses proven processes to ensure that intellectual property is rightfully submitted by owners, providing peace of mind that Eclipse projects can ultimately be approved for commercial use. The EF is famously home to the Eclipse IDE and hundreds of other open source projects spanning runtimes, tools and frameworks used for a wide range of industries including automotive, geospatial, systems engineering and, of course, the Internet of Things. The Eclipse Foundation is staffed by 30 professionals; it has more than 1,500 committers, 350+ projects and more than 275 corporate members.

ECLIPSE IOT: CREATING AN OPEN INTERNET OF THINGS

With a mission to provide stewardship, infrastructure and governance within the open source community, the Eclipse Foundation believes it holds a critical role in the long-term development of the Internet of Things. The foundation started working seriously in IoT in 2011 when it launched Eclipse IoT, which it summarizes as follows: "Eclipse IoT is an open source community aimed at building and promoting open source software, open standards and open collaboration models needed for an open Internet of Things."

When the EF was first getting started in IoT, it was 'omnivorously seeking new projects,' but it is no longer proactively seeking out new projects for its roster. EF leaders believe that sometime last year, it reached a critical mass of projects in three germane IoT 'stacks' within the constrained devices, gateways and smart devices, and IoT cloud/platform domains. Although it won't say 'no' to new projects, the EF has pivoted its mission to focus on the usability of its existing projects to make it easier to attract a broad range of developers while promoting and encouraging committers to focus on easing the friction involved with integrating the distinct project 'stacks' with an eye toward commercial deployment. To support this goal, it has created Eclipse IoT Open Testbeds, which focuses on integration between open source technologies and commercial offerings with near-term commercial opportunities. One such test bed is focused on asset tracking and includes Red Hat, Samsung, Azul Systems and Eurotech. Another is production performance management, which is led by Bosch and CONTACT Software with supporting contributions from Eurotech and fortiss.

In total, the Eclipse IoT community boasts 36 IoT projects, 280+ developers, 2.4 million lines of software code, and 180,000 unique visitors monthly to its IoT microsite. Eclipse IoT includes several familiar corporate vendors including IBM, SAP, Samsung, Red Hat, Nokia, DT, Bosch, Canonical, Cloudera, Huawei, Eurotech, CA Technologies and Sierra Wireless.

SUMMARY OF ECLIPSE IOT PROJECTS:

OS stacks for IoT devices – These are the software building blocks required to deliver data from compute-constrained devices at the farthest 'edge' of an IoT architecture. A typical stack includes the following functions: operating system or real-time operating systems (OS/RTOS), hardware abstraction layer, communications layer (IoT protocols, field protocols), and remote management functionality. Selecting a device stack requires consideration of end device targets, compute and storage footprint, power requirements, OSS license and remote management. The Eclipse IoT community delivers open source projects that are packaged in popular OS/RTOS solutions such as Arm Mbed, Contiki NG, freeRTOS and Zephyr Project. Eclipse is particularly strong in the remote device management area with the Eclipse Wakaama project: a C implementation of OMA LWM2M currently in use by Sierra Wireless, Samsung Artik and Bosch.

OS stacks for IoT gateways – These are currently the most popular and active communities within Eclipse IoT. This stack includes all of the building blocks required to deploy an IoT gateway or smart device, usually serving as a 'middle tier' between IoT edge devices and centralized IoT infrastructure deployed in on-premises, hosted, cloud and private cloud architectures. Functionality in this stack includes capabilities for data management and messaging, connectivity and network management, and application runtime. The Eclipse Foundation has two major projects here: Eclipse Kura for industrial/enterprise environments and Eclipse SmartHome for home automation services. Eclipse Kura has been adopted and promoted by companies such as Nokia, Intel and Eurotech because it includes native support for MQTT messaging, supports a wide variety of industrial protocols including CAN bus, Modbus and BLE, and supports remote management from IoT cloud platforms. This stack is particularly relevant for brownfield IoT installations where data translation is required from industrial protocols to IPO. In home automation, the Eclipse SmartHome project has been commercially deployed in hundreds of thousands of homes through the Deutsche Telekom smart home service QIVICON.

OS stacks for IoT cloud – The cloud stack for IoT is also an extremely active area of community activity. This stack includes all of the building blocks for IoT cloud (public or private) implementations. This stack functionality includes connectivity, message routing, device registry, device management, data management, event management, analytics, and UI and application enablement. Related to this stack is the Eclipse Kapua project, which provides an integration platform for IoT services. For device management, Eclipse offers Eclipse Leshan, which is an OMA LWM2M implementation in Java built on top of Eclipse Californium. For message routing, Eclipse has Eclipse Hono – the open source equivalent of an IoT messaging hub. The Eclipse IoT cloud components work with many popular container technologies including Docker, Kubernetes and Red Hat OpenShift.

Additional projects emerging in Eclipse IoT – To support fog computing, ADLINK Technology is leading the Eclipse fog05 project. Fog05 has been designed to address the requirements of fog and multi-access edge computing and provides a decentralized infrastructure that brings together computing, networking and storage fabrics end to end while addressing the challenges imposed by resource heterogeneity. At the intersection of AI/ML and IoT is Eclipse Deeplearning4j – a java platform for high-performance, distributed and deep learning. Integrated with Hadoop and Apache Spark, DL4J brings AI to business environments for use on distributed GPUs and CPUs.

USING ECLIPSE BLOCKS TO BUILD IOT SOLUTION: EUROTECH, RED HAT AND CLOUDERA

At the Red Hat Summit in May, 451 Research met with executives at Red Hat, Eurotech and Cloudera, which have integrated their respective open source technologies to deliver an end-to-end IoT reference architecture. This architecture lacks a marketable name, but for all intents and purposes, it could be viewed as an open source alternative to popular IoT cloud offerings from AWS, Microsoft Azure and IBM. Red Hat would be the logical first port of call for enterprise interested in commercial support.

The proposed architecture enables bidirectional communication with devices via edge IoT gateways (Kura). Data is routed through the IoT integration hub (Kapua) for application integration within the enterprise application environment and for aggregation into the data management platform for deep analysis and machine learning. Data can be processed throughout the architecture based on use case requirements, including the capability to apply machine learning models and advanced analytics at the edge. Additional features include pre-integrated security and manageability across devices, access, authentication and applications, as well as data that is in motion and at rest. Its modular nature enables enterprises to protect existing technology investment and allows for the enterprise IoT environment to be run on-premises or multi-cloud (OpenShift), in a centralized or distributed design. Each of the core three vendors hopes that the message of lock-in avoidance, community-driven innovation and open source cost advantage will land with industrial enterprise prospects.