Enabling Secure IoT Gateways with SUSE® Embedded Operating Systems

Gateways have become a critical element and primary driver of IoT, tasked with moving and processing data and information to connected devices and hardware throughout vast and complex networks. As a result, security, interoperability, low cost and ease of management have become both the objective and the challenge that organizations face when developing gateway solutions. Embedded operating systems from SUSE address these challenges head on in order to help organizations maximize the expanded use of Linux, making it more cost effective and highly reliable for sustainable, long-term growth.

Get the Most out of Linux for IoT Gateways:

+ *Reduced Cost*
+ *Enhanced Security*
+ *Simplified Management/Maintenance*

■ **Products:**

SUSE Linux Enterprise Server
Just Enough Operating System (JeOS)
SUSE Studio
SUSE Manager

Introduction

The shift from a physical to digital world has been enabled by the Internet of Things (IoT) with a promise to bring a better, smarter world to consumers. "The Internet of Things refers to the networking of physical objects through the use of embedded sensors, actuators, and other devices that can collect or transmit information about the objects. The data amassed from these devices can then be analyzed to optimize products, services, and operations."[1] VDC predicts the "Global market for gateway

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1. **www.mckinsey.com/industries/ semiconductors/our-insights/the-internet-of-things-sizing-up-the-opportunity**
2. **www.vdcresearch.com/_Documents/ briefs/IoT/14-m2m-intelligent-gateways. pdf**
3. **www.vdcresearch.com/_documents/ briefs/IoT/16-IoT-Gateways.pdf**

devices is expected to reach $900M in 2019, up from $500M in 2014, a 12.9% CAGR."[2] With continued growth, new challenges arise in how companies manage the security, access and expansion of their IoT infrastructure.

The IoT systems gateway binds IoT systems together. Given this, a renewed focus has been placed on the security, flexibility and cost management associated with these central hardware/software solutions. More and more organizations are turning to Linux to secure, manage and customize their IoT gateway devices. VDC Research estimates that more than half of IoT gateway devices shipped in 2016 featured a Linux-based operating system.[3] SUSE® Embedded Solutions can help organizations cost-effectively build and manage their IoT gateway devices.

TOP CONCERNS AT THE GATEWAY LEVEL

At the heart of the IoT infrastructure lies system gateways. Gartner predicts that there will be 20.4 billion connected things in use worldwide by 2020.[4] Managing the complexity, security vulnerabilities and increased costs are all top concerns associated with IoT infrastructure. With proper attention to these IoT gateway areas, organizations can optimize products, services and operational costs effectively. Top concerns for IoT adoption are highlighted in Figure 1 at right.
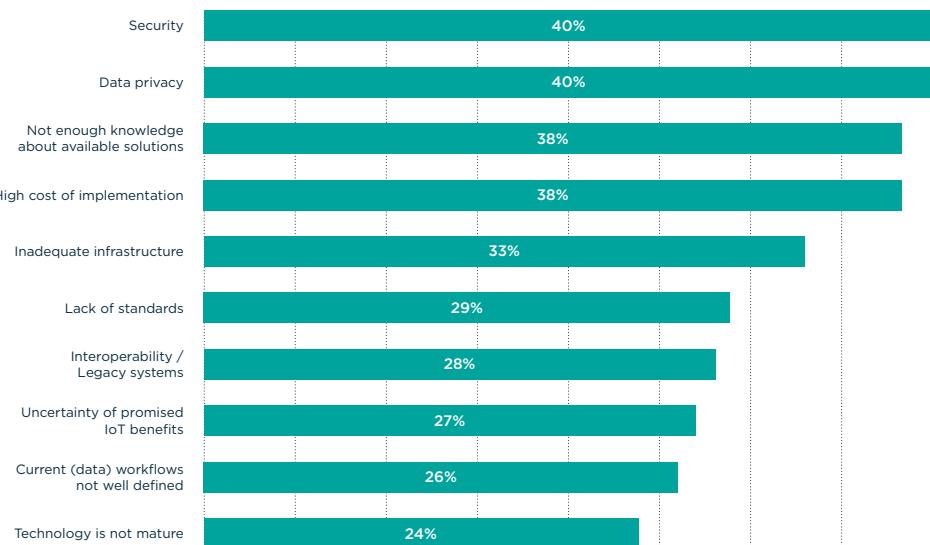
Benefits of Partnering With SUSE

1. Security

Security awareness has increased across all computing platforms as developers strive to build interoperable, connected devices, hardware and systems. As more connected devices enter the IoT gateway, the possibilities for vulnerability increase. Gateways are the entry point to the overall network and run a number of applications that monitor and control critical systems, often in remote locations. Gateways provide businesses with data, insights and triggers, including system failure, equipment failure or system-critical alerts.

It is critical that the IoT gateway enables the right devices to connect to the desired gateways and receive critical security updates. "When intelligent processing is pushed from the cloud to the gateway and edge devices, companies are increasingly concerned about the risk of cyber-attack. These are very real concerns that can disrupt operations, result in theft of information, or worse, cause human injury."[5] Gateway security management needs to account for current and future growth needs. "To make IoT deployments

Figure 1. *IoT Adoption Concerns*[6]

successful, networks need to be ready and secure. Organizations looking to deploy Internet of Things solutions need to use IoT gateways and make sure their networks have enough capacity and security to handle a wave of new devices."[7]

Linux is well positioned to address the obstacles and challenges developers face in an IoT environment. The operating system requirements for IoT development align with the capabilities that Linux has to offer. "You'll find that the quickest way to build components of an IoT ecosystem is to use embedded Linux, whether you're augmenting existing devices or designing a new device or system from the beginning. Embedded Linux shares the same source code base as desktop Linux, but it is coupled with different user interface tools and other high-level components. The base of the system is essentially the same."[8]

2. Connectivity

Gateways are the central hub for moving and processing information and supporting various functions, including: device connectivity, protocol translation, data filtering and processing, security, updating and management. Business process automation and efficiencies can be realized when integration and connectivity are enabled. Receiving this
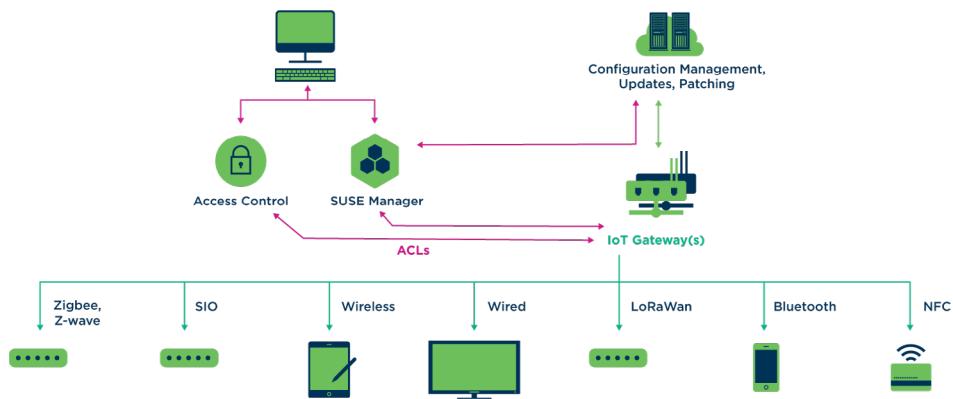
4 **www.gartner.com/newsroom/id/3598917**
5 **www.embedded.com/design/system-integration/4441232/1/Requirements-and-issues-for-developing-customized-intelligent-IoT-gateway**
6 **www.ioti.com/security/top-10-reasons-people-aren-t-embracing-iot**
7 **https://biztechmagazine.com/article/2016/10/make-iot-deployments-successful-networks-need-be-ready-and-secure**
8 **https://opensource.com/article/17/3/embedded-linux-iot-ecosystem**

Enabling Cloud Commputing

Figure 2. *SUSE Embedded Solutions Connectivity in IoT*

critical information in real time enables companies to manage, monitor and become more efficient.

Many enterprises are looking for a stable and flexible connectivity stack that lets them "mix and match their sensors and backends depending on their preference," says Jason Shepherd, Director of IoT Strategy and Partnerships, Dell.[9] "There are a lot of silos of connectivity. While progress is being made at standard bodies, companies in the industrial space don't want to necessarily replace all of their equipment to accommodate the IoT."

In an IoT environment, patches and updates are not always easy to administer because not all devices are on-premises or they might not be connected to the Internet. Some updates might even require physical access to the device—which is not always practical. Given this, IoT systems need ways to simplify

connectivity and communications between devices that weren't previously possible. "One significant factor is connectivity. The need to extend the IoT reach within the network, whether it's a factory, hospital, or white goods in the home, means connecting existing legacy or 'brownfield' devices alongside new devices, which typically leads to the need for customized interfaces."[10]

Linux enables developers to build on industry-standard architectures, hardware components and server and storage applications. The device operating system must integrate seamlessly with the hardware and support industry-standard

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9 **https://optio3.com/2017/08/31/automation-and-iot-efficiency-could-add-15-trillion-to-worldwide-gdp/**
10 **www.embedded.com/design/system-integration/4441232/1/Requirements-and-issues-for-developing-customized-intelligent-IoT-gateway**

networking interfaces. Through successful integrations and connectivity, organizations are able to run a more efficient, secure business with Linux-based embedded operating systems.

With SUSE Embedded solutions, you can ensure that only the right devices are connected to the desired gateways. Other benefits include:

■ *Scaling Connectivity*
  – Manage data in the cloud by processing data closer to the edge. Data can be processed at the gateway.
  – Access controls and other security features can be used to increase the number of edge devices connected without impacting cloud services.
  – The capability to pre-process data at the edge, reducing the amount of raw data being sent to the cloud.
■ *Managing Connectivity*
  – SUSE Just Enough Operating System (JeOS)
  – Managed by SUSE Manager
  – Configuration management via Salt
■ *Enabling Edge Computing*
  – Gateway(s) running a container-compatible OS
  – SUSE JeOS, Docker (or LXC / VMs)
  – On-connect Container-as-a-Service
  – Each gateway or cloud device can have a trusted container image
■ *Robust Data and Analysis*
  – Analytics at the gateway can be used to make near real-time decisions
  – Use Portus registry
  – Deploy upon demand

Contact us at:
www.suse.com

3. Cost Management

The ability to customize a managed Linux distribution for gateways can save customers significant time and money. When organizations can leverage existing equipment infrastructure, they are able to achieve higher efficiencies, reduce costs and enhance productivity. Organizations that rely on unmanaged Linux distributions often end up with a mix of proprietary and open source code, and realize the challenges and cost restrictions of management, updates and patching. All of these factors can drive up development costs and costs to end-users, eroding profits or diminishing competitive advantage. With SUSE Embedded solutions, developers can:

■ *Utilize JeOS to develop fixed-function appliances and leverage platform flexibility to develop systems faster and stay focused on critical project requirements.*
■ *Create powerful and innovative solutions rather than spending unnecessary time on the management, maintenance and scalability of an unmanaged Linux system.*
■ *Benefit from embedded, specific contract agreements built on streamlined operating system usage and project requirements.*
■ *Leveraging expert resources and tools that lower total cost of ownership while strengthening security and simplifying management and maintenance.*

MANAGING SECURE AND CONNECTED GATEWAYS WITH SUSE

The selection of an operating system to secure and manage IoT system gateways is critical to the success of IoT initiatives, and Linux continues to capture market share as the operating system for such devices. Investing in the right technology solutions can help to overcome many of the challenges developers and companies face when bringing IoT solutions to market—making Linux a key building block in transforming the IoT gateway market. "Linux, in particular, continues to grow its developer base and support from leading vendors," says Daniel Mandell, an analyst at VDC Research. "Linux is the primary OS for new connected device classes such as IoT gateways."[11]

With SUSE, developers can focus on creating innovative products for IoT that are secure and add identifiable business value. Instead of spending time building and supporting a home-grown operating system, tools like **SUSE Studio**™[12] allow you to build, update, configure and manage your application images through its **powerful web-based tool.** In addition, SUSE Manager allows you to select which security updates or patches will be applied. Live patching provides a way to address security issues while maintaining uptime requirements by applying updates to the running kernel, allowing for downtime to be scheduled at a later time (up to one year later).

SUSE Embedded Solutions enable organizations to effectively manage IoT gateways in the following ways:

■ *Use and leverage the existing building blocks of your IoT gateway and infrastructure*
■ *Focus on simple connectivity with the IoT device connected to the gateway*
■ *Scale access protocols, IoT devices, gateways and servers*
■ *Ensure that only the right devices are connecting to the desired gateways*
■ *Easily apply critical security updates*
■ *Manage data at the earliest, lowest level of infrastructure*

To learn more about SUSE Embedded Solutions, contact our technical team today at **embedded@suse.com**, or visit us online at **www.suse.com/embedded/** for additional information and resources.

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11 **www.linux.com/news/embedded-linux-keeps-growing-amid-iot-disruption-says-study**
12 **https://susestudio.com/**