



2020 IoT Developer Survey Key Findings



October 2020

Executive Summary

- > In 2020, **Agriculture** has emerged as the leading industry focus area for **26%** of respondents
- > **Security (39%), Connectivity (27%)** and **Data Collection & Analytics (26%)** are still the top three concerns for IoT developers in 2020
- > **Artificial Intelligence (30%)** was the most frequently selected edge computing workload
- > **Privacy is a growing concern selected by 23% of respondents**, as awareness of the issues increases among organizations and consumers alike

Executive Summary (Continued)

- > **Communication Security (43%)** and **Data Encryption at rest (41%)** are the most widely used techniques for securing IoT solutions again this year
- > **Distributed Ledgers** have gained momentum as a way to secure IoT solutions
- > **Java** is the most widely used programming language at the **Edge (20%)** and in the **Cloud (24%)**
- > In 2020, the IoT Middleware market is dominated by **AWS IoT (35%)**, **Microsoft Azure IoT (31%)**, and **Google Cloud IoT Platform (30%)**
- > **Amazon AWS** with 40% (+6% in 2020), **Microsoft Azure** with 31% (+8% in 2020), and **Google Cloud Platform** with 26% (+6% in 2020) keep dominating the public IoT and Cloud Platforms in 2020

Introduction

The objective of the survey is to provide **essential insights about the IoT industry landscape, the challenges IoT developers are facing, and the opportunities for enterprise IoT stakeholders in the IoT open source ecosystem.** For the first time, the survey probes respondents about their use of edge computing, which will help influence the roadmap of the Eclipse Edge Native Working Group. From May 28 until July 10, **1652 individuals participated in the 2020 edition of the survey.**

The survey was heavily promoted on social media, on iot.eclipse.org, edgenative.eclipse.org, sparkplug.eclipse.org, on various IoT (developer) websites, in newsletters, blogs, LinkedIn groups, and it was shared with members of the Eclipse IoT, Edge Native, Sparkplug, and Tangle EE Working Groups, as well as Industrial Internet of Things (IIoT) influencers.



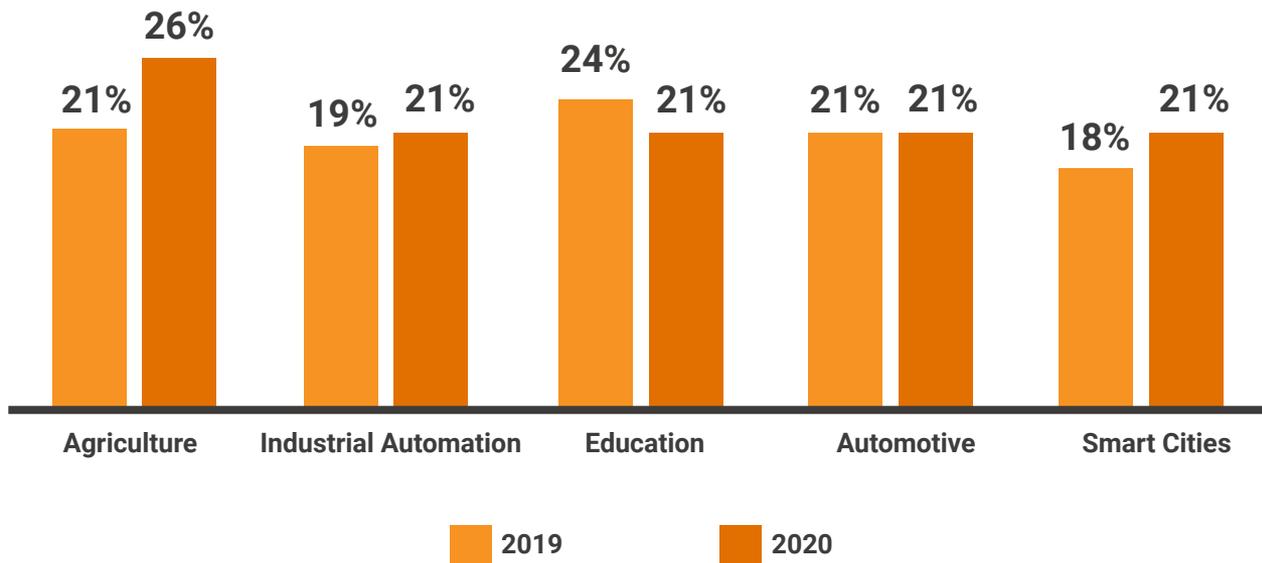
Survey Partners

Thank you for sharing the survey with your communities!





Key Industry Focus Areas





Smart Agriculture is growing

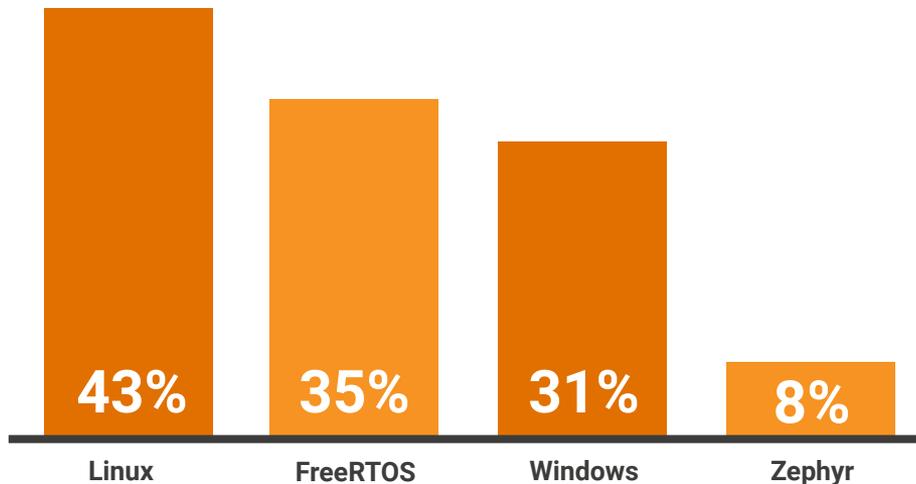
- Agriculture leaps into **first place (from 21% in 2019 to 26% in 2020) for industry focus areas**. The growth of smart farming reflects the rise in adoption of IoT-based solutions to increase yields, lower costs, reduce waste, among other driving factors.
- Industrial Automation, Education, Automotive, Connected / Smart cities are tied at **#2 (21% each)**.
- There is less interest in home automation (**from 22% in 2019 to 19% in 2020**). Consumers may have been burned by providers who abruptly discontinued their products and services (or suddenly started charging for them when previously free).



It's a Linux and FreeRTOS World

- **Linux (43%), FreeRTOS (35%) and Windows (31%)** are the top OSes for constrained devices and edge nodes
- **Windows** usage grows from **20% in 2019** to **31% in 2020** - probably driven by Azure IoT
- Surge by **Zephyr (from 3% in 2019 to 8% in 2020)**

Top Operating System Landscape



Top Edge Computing Workloads

**Artificial Intelligence**

30%

**Control Logic**

29%

**Data Exchange**

27%

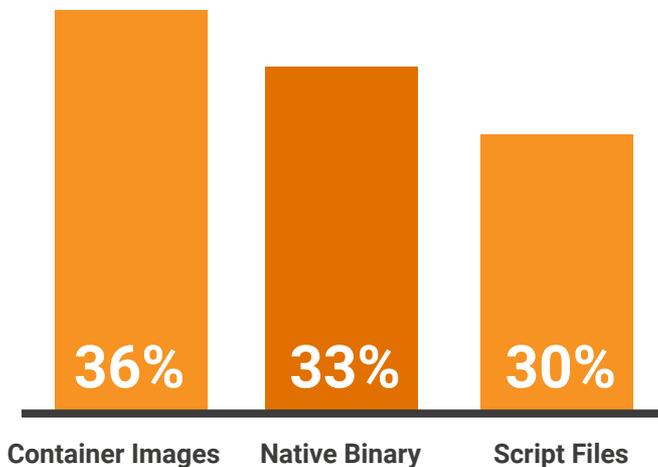
**Sensor Fusion**

27%

Artificial Intelligence (30%) was the most frequently selected edge computing workload in the survey. **Control Logic (29%)**, **Data exchange between multiple nodes (27%)** and **Sensor fusion (Data aggregation and filtering) (27%)** followed.



Top Edge Computing Artifacts for IoT Solutions 2020



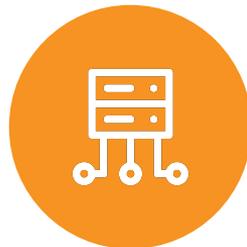
Container images (36%), native binary (33%), and script files (30%) are the leading edge computing artifacts for IoT solutions in 2020. The high percentage for native binary is an indication that they own the edge.



Top Ways for Deploying Artifacts of IoT and Edge Computing Solutions 2020



**Cloud-managed over
the air updates**
48%



**Locally-managed
over the air updates**
42%

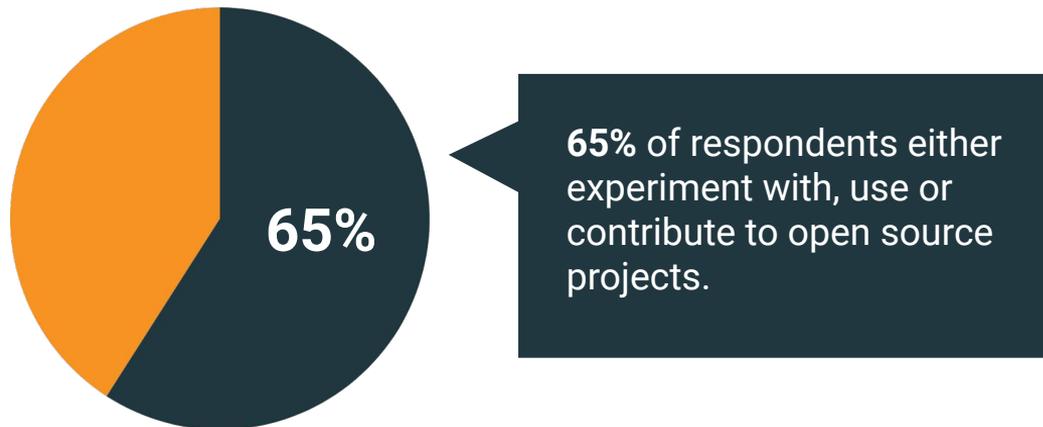


Network Cable
38%

Cloud-managed over the air updates (48%), locally-managed over the air updates (42%), and network cable (38%) are ranked top ways for deploying artifacts for IoT and edge computing solutions.

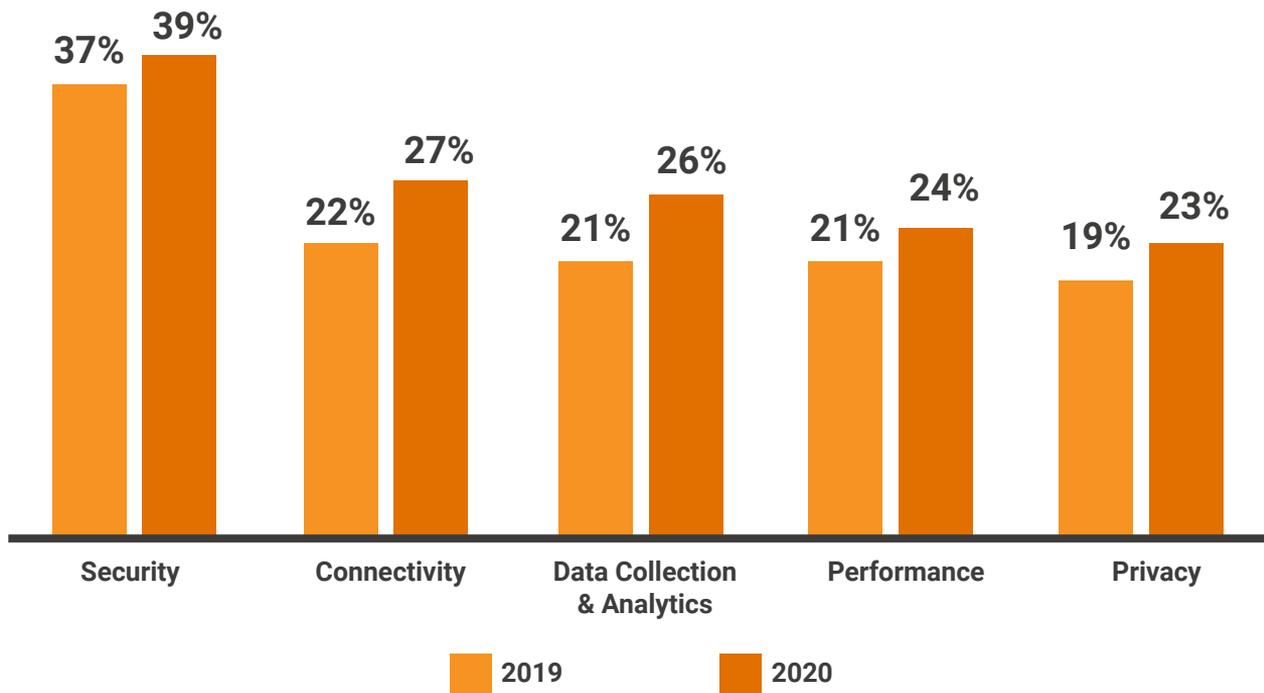


IoT is Synonymous with Open Source





The Top Concerns for IoT Developers





- **Security (39%), Connectivity (27%) and Data Collection & analytics (26%)** are still the top three in 2020
- Significant increase for connectivity means that figuring out the right connectivity solution for the use case is tricky
- The growing interest of IoT Developers in Data Collection & Analytics can be linked to the rise of **privacy**. Although analytics tools are mature, it is difficult to determine how to collect and manage data in accordance with regulations while protecting the customer privacy. Operational technology specialists fear that sending raw telemetry streams outside of the corporate firewall could compromise industrial secrets
- **Performance as #4 (24%)** shows that the market is getting past PoCs and initial deployments and focusing on optimizing production systems for user experience and to deliver business value, among other reasons
- **Privacy as #5** is on the rise (**from 18.75% in 2019 to 23% in 2020**) as awareness of the issues grows among organizations and consumers alike



Programming Languages: The Usual Suspects Strike Again

- **C, C++, Java, Python** and **JavaScript** dominate the IoT space, as they dominate the rest of the IT market.



C (20%) is number one for **constrained devices**.



Java (20%) is number one at the Edge and in the **Cloud (24%)**.

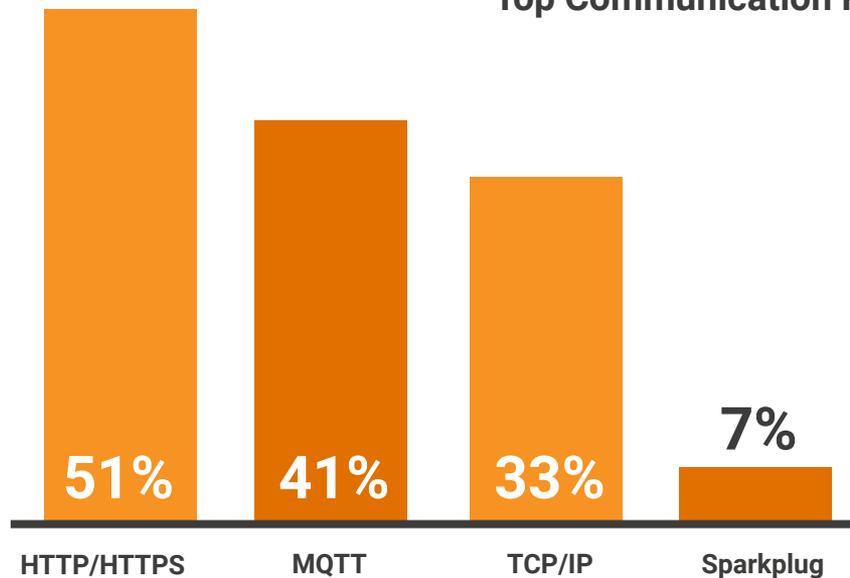


Programming Languages: Top 4 by Tier

IoT Constrained Device	IoT Gateway/Edge Node	IoT Cloud
1. C - 20%	1. Java- 20%	1. Java - 24%
2. Java - 19%	2. Python - 17%	2. Python - 17%
3. C++ - 15%	3. C - 13%	3. Javascript - 16%
4. Python - 10%	4. C++ - 12%	4. C++ - 8%



Top Communication Protocols in 2020



- Are dominated by **HTTP/HTTPS (51%)**, **MQTT (41%)**, and **TCP/IP (33%)**
- **Eclipse Sparkplug** has significant traction (7%).

Top Connectivity Protocols in 2020



WiFi
44%



Ethernet
39%



Cellular
(LTE, 4G, 5G, etc)
37%

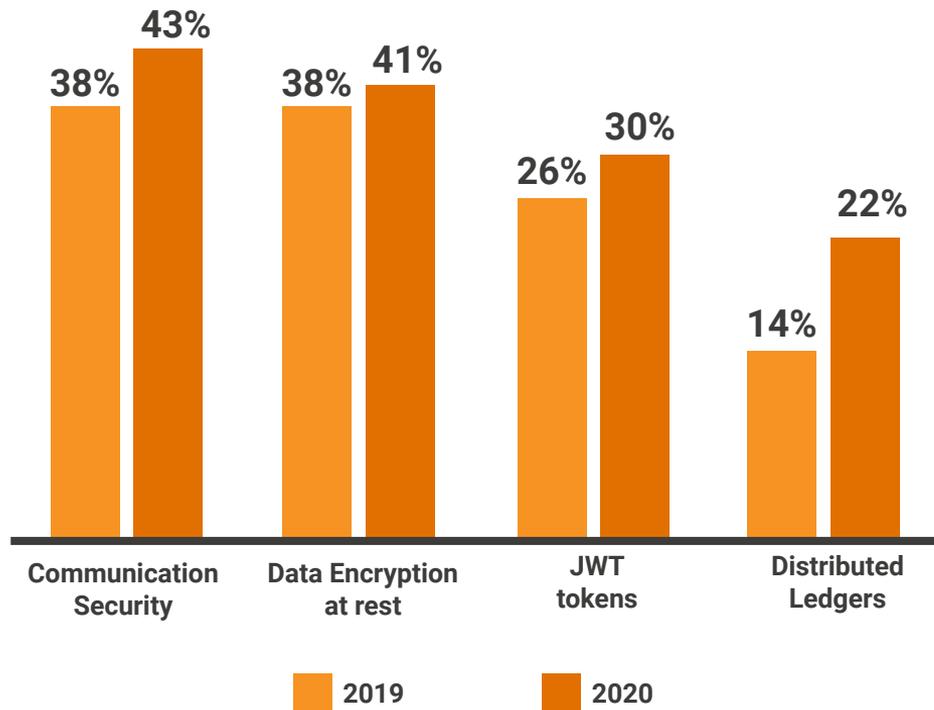


**Bluetooth/Bluetooth
Smart**
37%

Top Connectivity Protocols in 2020 are WiFi (44%), Ethernet (39%), Cellular (LTE, 4G, 5G, etc) and Bluetooth/Bluetooth Smart with equally 37%.



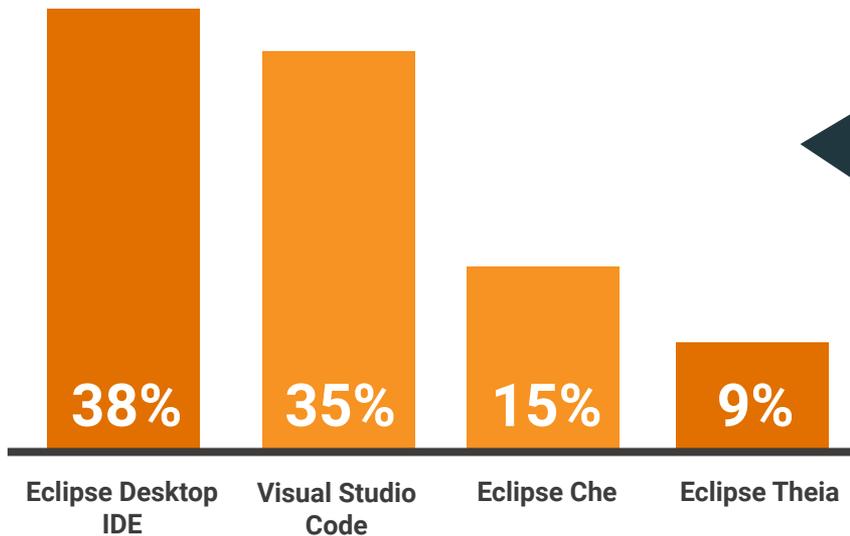
Top Security Technologies



- **Communication Security (43%, +5% in 2020)** and **Data Encryption at rest (41%, +3% in 2020)** are the most widely used techniques again this year.
- **JWT tokens** are popular for authentication (**30%, +4% in 2020**). They are easier to deploy in integration scenarios while OAuth is more targeted at human-centric scenarios.
- **Distributed Ledgers** grew to **22% in 2020 (as opposed to 14% in 2019)**. This demonstrates the relevance of the Eclipse TangleEE Working Group to the market.



Development Tools: Rise of the Cloud-based IDEs

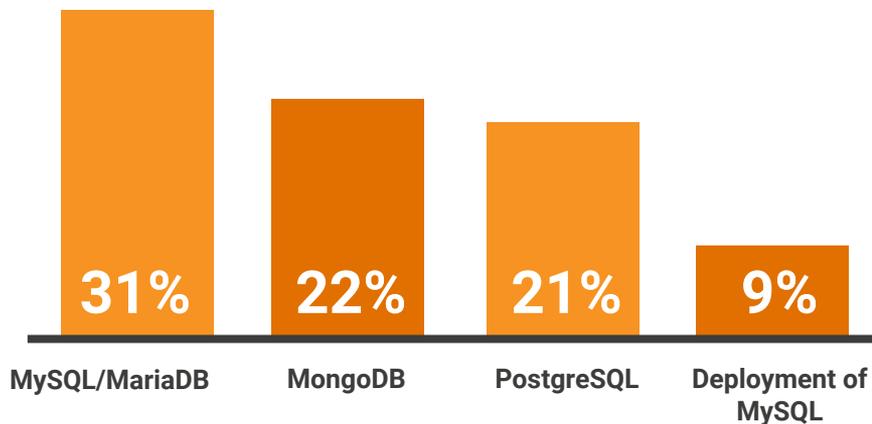


Top IDEs or text editors **Eclipse Desktop IDE** (eg. Eclipse JDT, Eclipse CDT) - **38%**, **Visual Studio Code (35%)**, and Notepad++ are still dominant in 2020.

Eclipse Cloud Development tools have great momentum! **Eclipse Che** grows significantly (+6% in 2020) while **Eclipse Theia** reaches 9%.



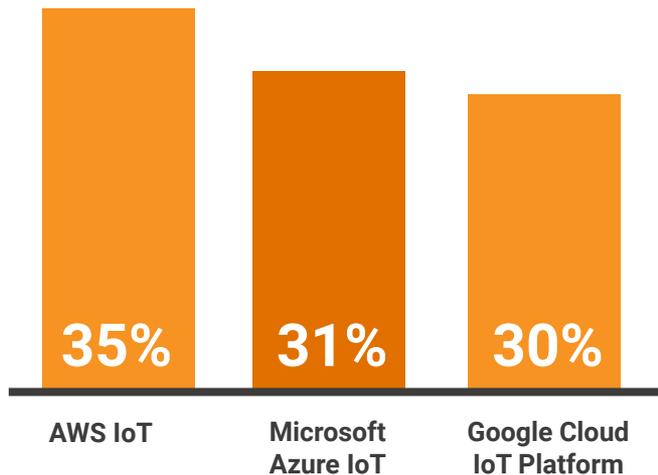
Open Source Databases Rule IoT



- **MySQL/MariaDB (31%), MongoDB (22%), and PostgreSQL (21%)** are prevailing as top Database Technologies in 2020
- The deployment of **MySQL** has decreased from 2019 (40%) with **9%**
- Only **4%** of respondents stated they rely on a **proprietary database**



IoT Middleware: The Race is Still Young



- In 2020, the top IoT Middleware are dominated by **AWS IoT (35%)**, **Microsoft Azure IoT (31%)**, and **Google Cloud IoT Platform (30%)**
- The market is much more competitive than in public cloud platforms, with the leaders packed within 5% of each other.
- The diversity in responses shows this specific market segment is still young and competitive.



Public Cloud and IoT: The Big Three Cement their Lead



Google Cloud Platform

AWS

40%

Azure

31%

Google Cloud Platform

26%

Amazon AWS with **40%** (+6% in 2020), **Microsoft Azure** with **31%** (+8% in 2020), and **Google Cloud Platform** with **26%** (+6% in 2020) keep dominating the public IoT and Cloud Platforms in 2020.



Top Organizations Relevant for IoT Strategies



**Apache Software
Foundation**
51%

Eclipse IoT
49%

Linux Foundation
49%

IEEE
41%

Apache Software Foundation (51%), Eclipse IoT/Eclipse Foundation (49%), Linux Foundation (49%), and IEEE (41%) are the top organizations developers consider relevant for IoT strategies.

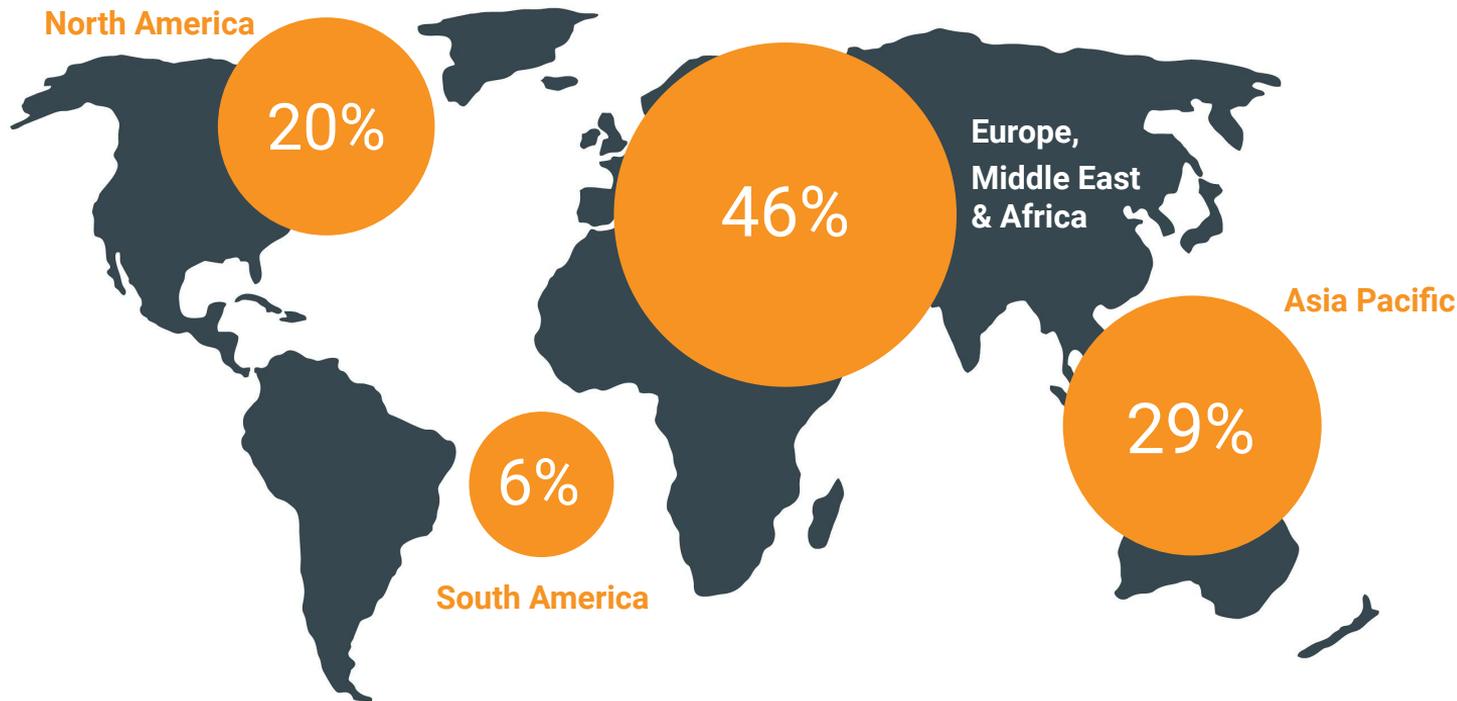


Demographics

Regions



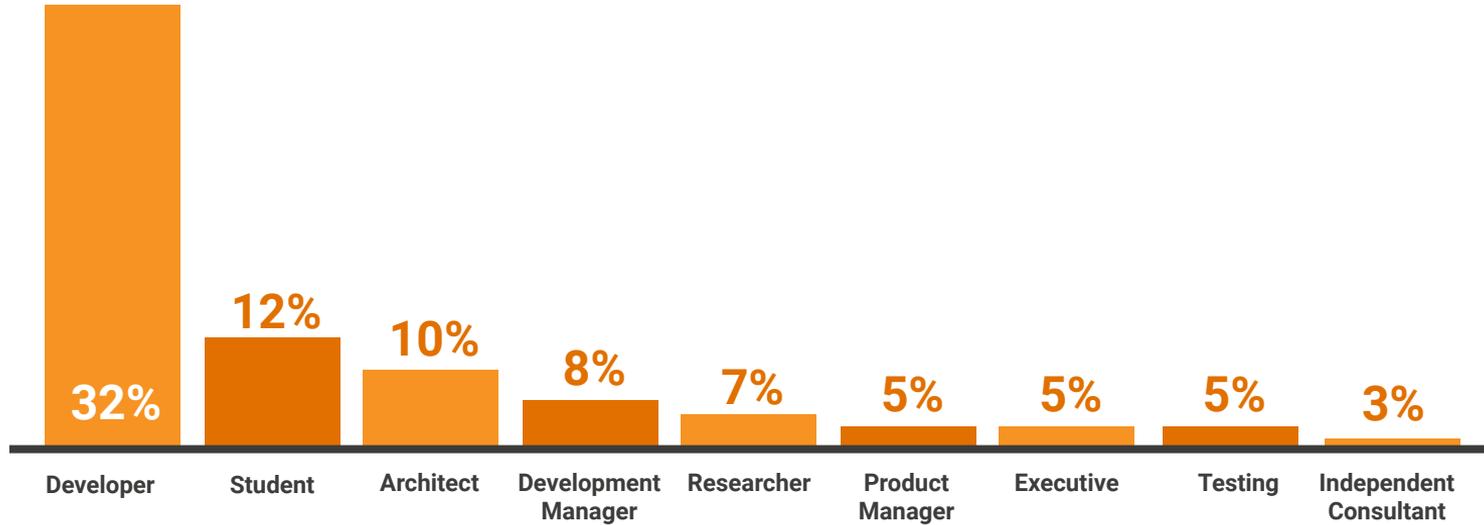
What region are you located in?



Roles



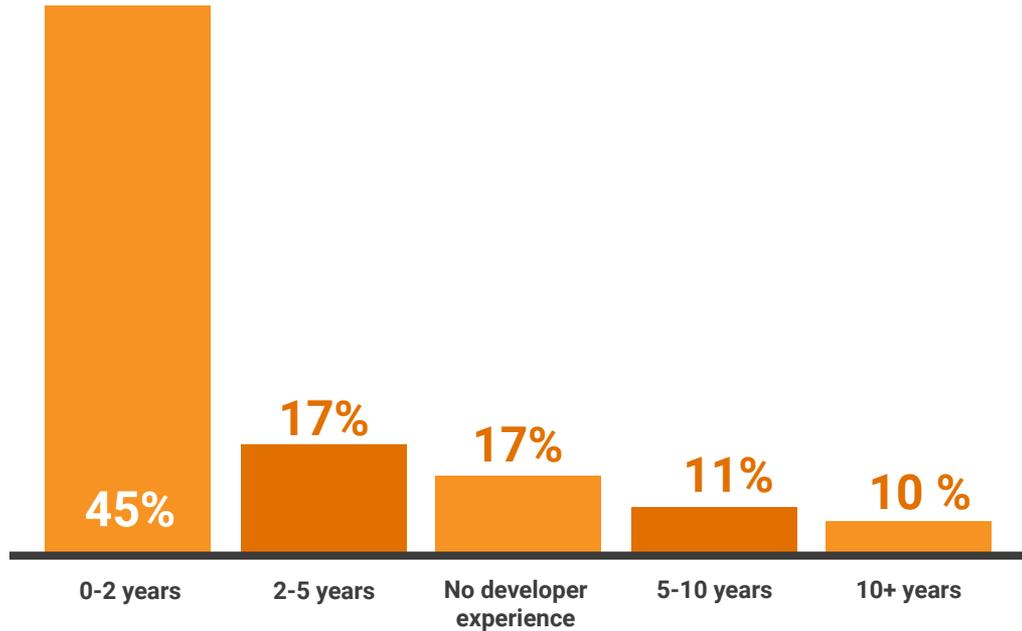
What best describes your role?



Experience



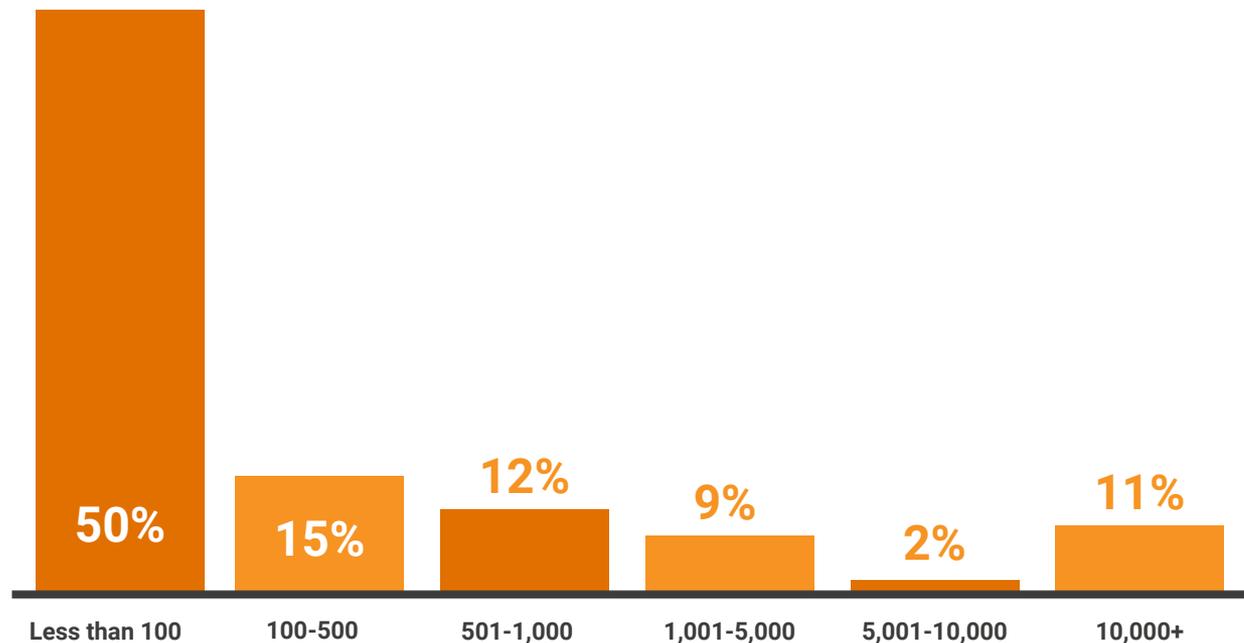
How much experience do you have developing IoT solutions?



IoT is attracting new developer interest - **45%** of our survey respondents have **0-2 years of IoT experience**. This means there are a lot of newcomers in the domain. Over 20% of respondents have 5 years of experience or more, which reflects the continuing maturation and growth of the IoT market.

Employees

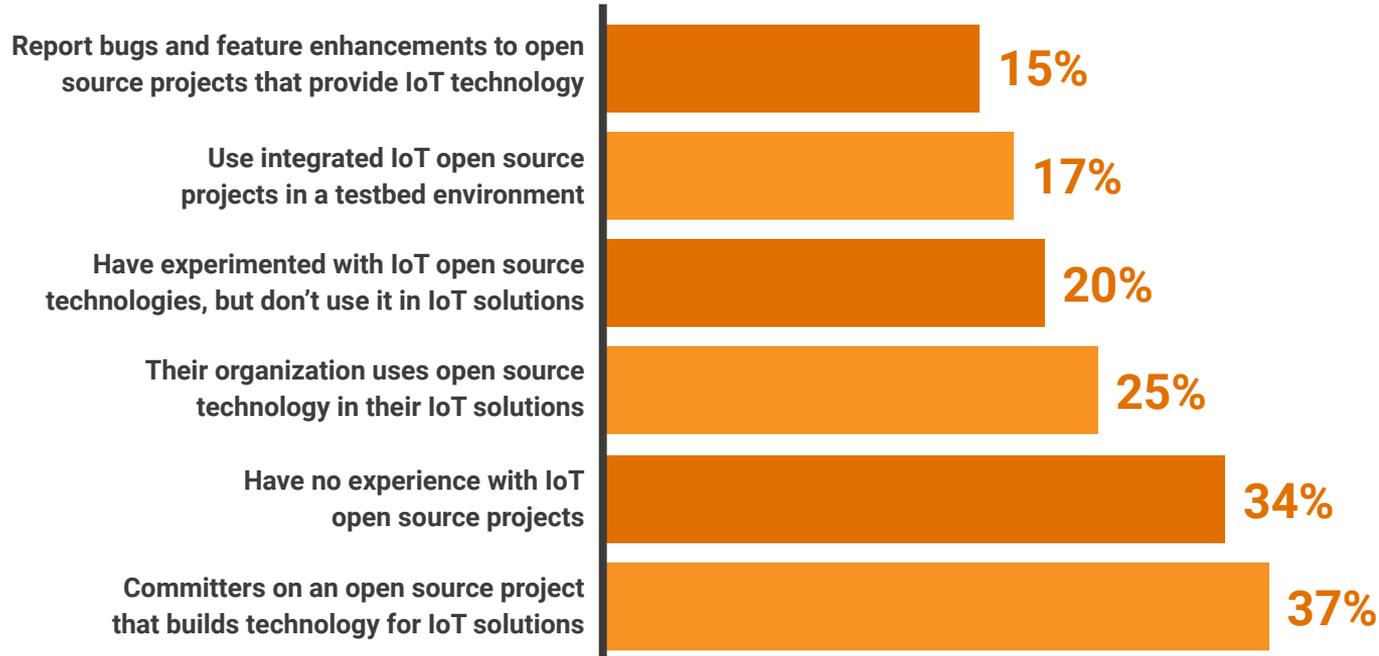
How large is the organization you work for?



Project Participation



Which of the following statements best describe your open source project participation?





Thank you!

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