Survey Introduction

- The **Eclipse IoT Working Group**, **IEEE IoT** and **AGILE IoT** co-sponsored an online survey to better understand how developers are building IoT solutions.

- The survey was open from February 11 until March 25, 2016. A total of **528 individuals participated** in the survey. Each partner promoted the survey to their communities through social media and web sites.

KEY FINDINGS

KEY FINDINGS

46% of respondents are
delivering IoT solutions today

An additional **29%** have plans to
deliver an IoT solution in
the next 18 months.
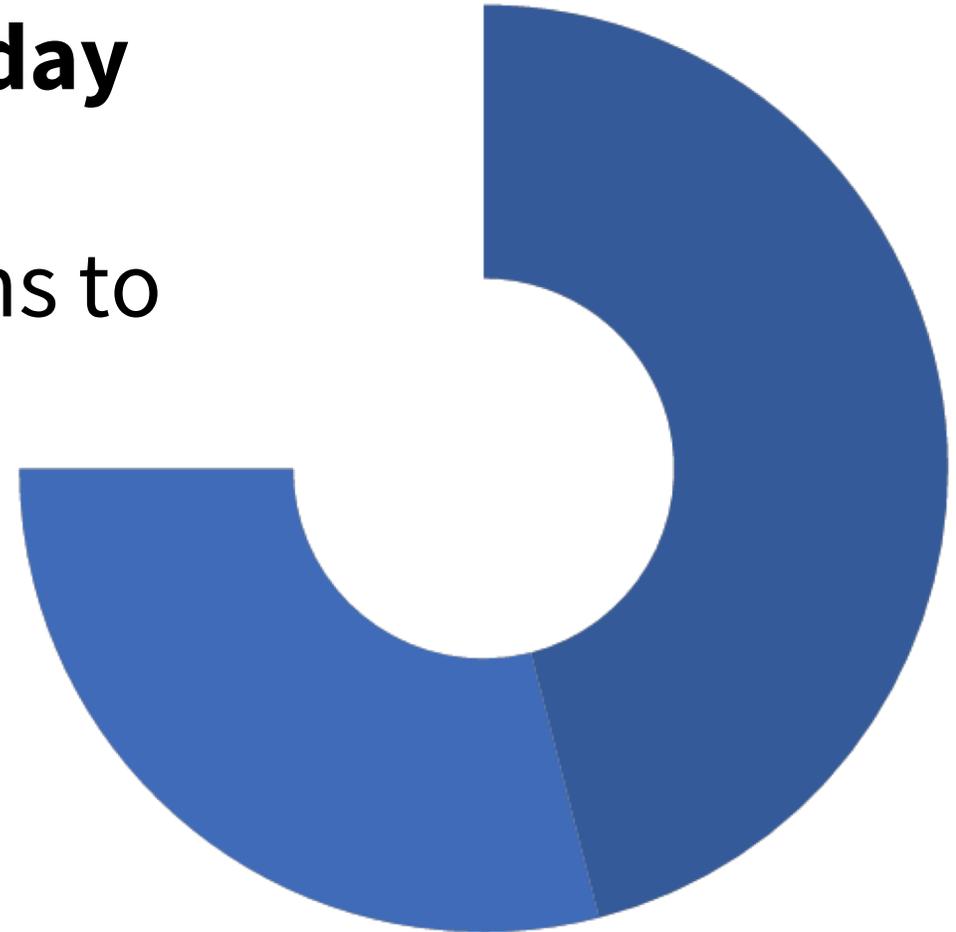
# Top 5 IoT Industries

**IoT PLATFORMS**   **HOME AUTOMATION**   **INDUSTRIAL AUTOMATION**   **ENERGY MANAGEMENT**   **CONNECTED CITIES**
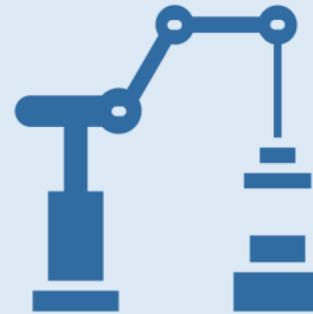
KEY FINDINGS

Top 3 concerns
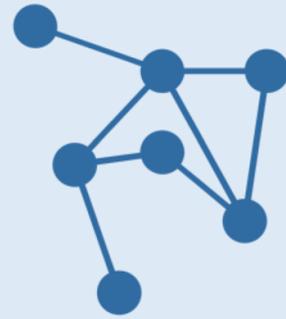
SECURITY   **INTEROPERABILITY**   **CONNECTIVITY**

KEY FINDINGS

Top IoT programming languages

Top IoT messaging protocols

C

HTTP

KEY FINDINGS

**Top IoT
Operating System**
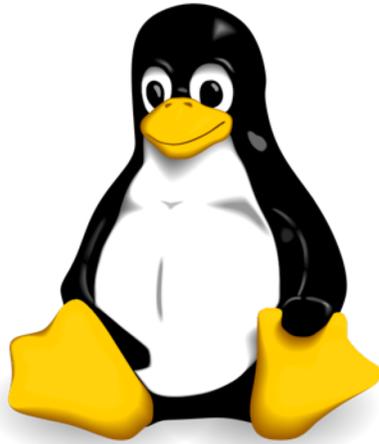
**Top IoT
cloud services**

Linux

Private cloud

KEY FINDINGS

Open IoT
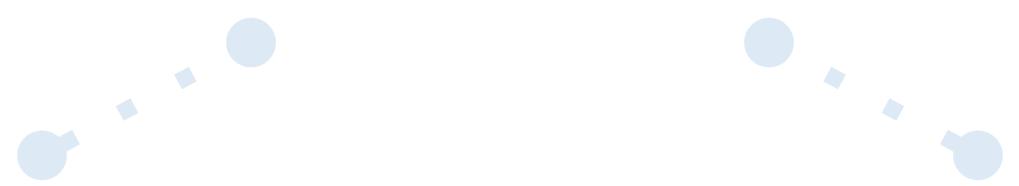
58%

actively participate in

open source

projects for IoT

52%

use

open hardware

for deployment or prototyping
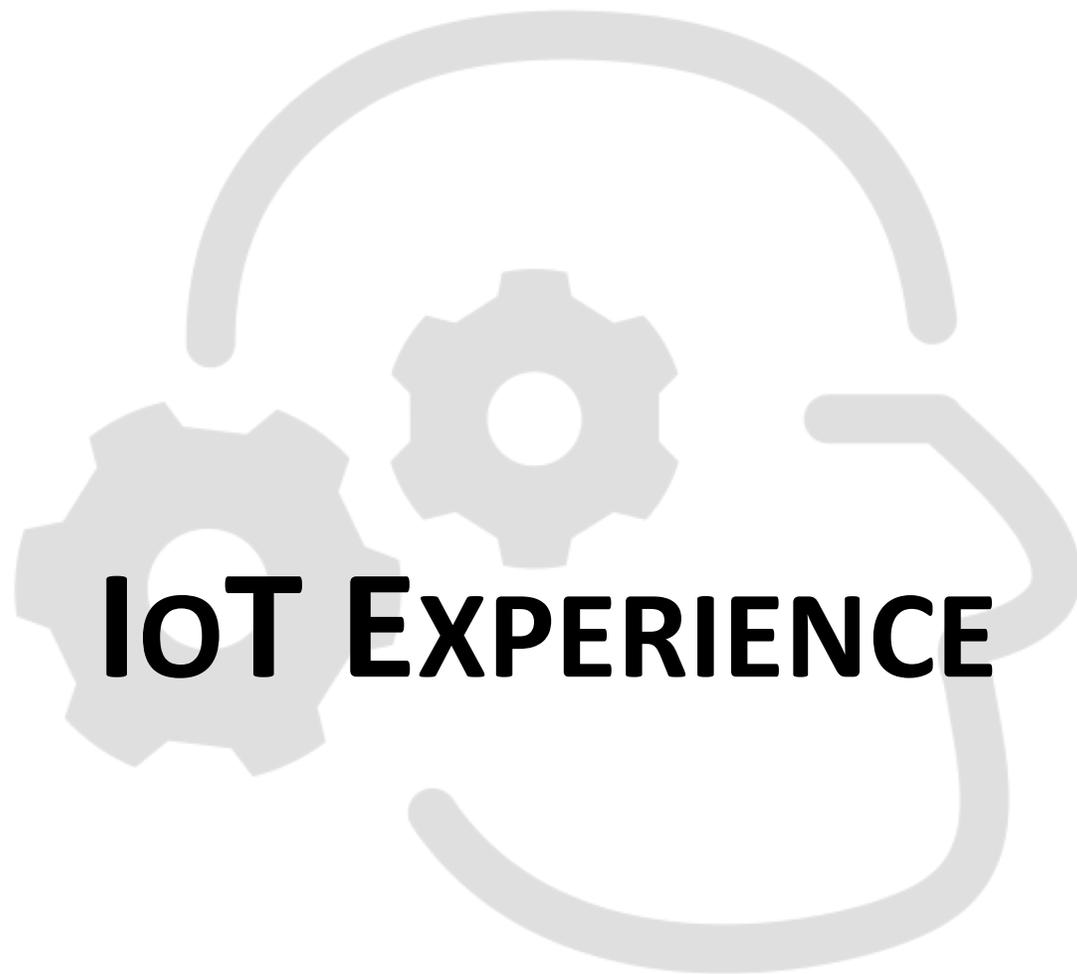
IoT Experience

IoT Experience

What is your experience with building IoT solutions?
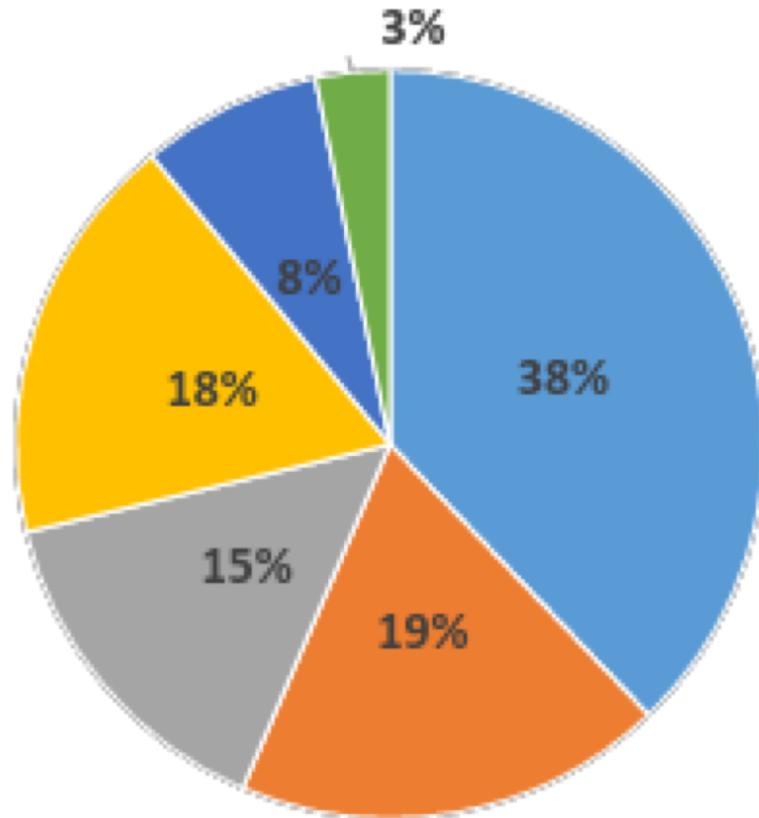
Legend:
- I develop IoT solutions for my company
- I am researching IoT solutions for my company
- I develop IoT solutions in my spare time
- I am learning about IoT technology in my spare time
- No experience
- Other

Pie chart values: 38%, 19%, 15%, 18%, 8%, 3%

CURRENT TECHNOLOGY FOCUS

What is your personal current technology focus within your organization?

24.9%	Embedded Software	
11.9%	Other	
11.3%	Web Development	
11.1%	Big data, data analytics	
10.9%	Enterprise Software	
9.4%	Cloud Computing	
8.2%	Mobile	
6.3%	Networking Infrastructure	
6.1%	Hardware Design	
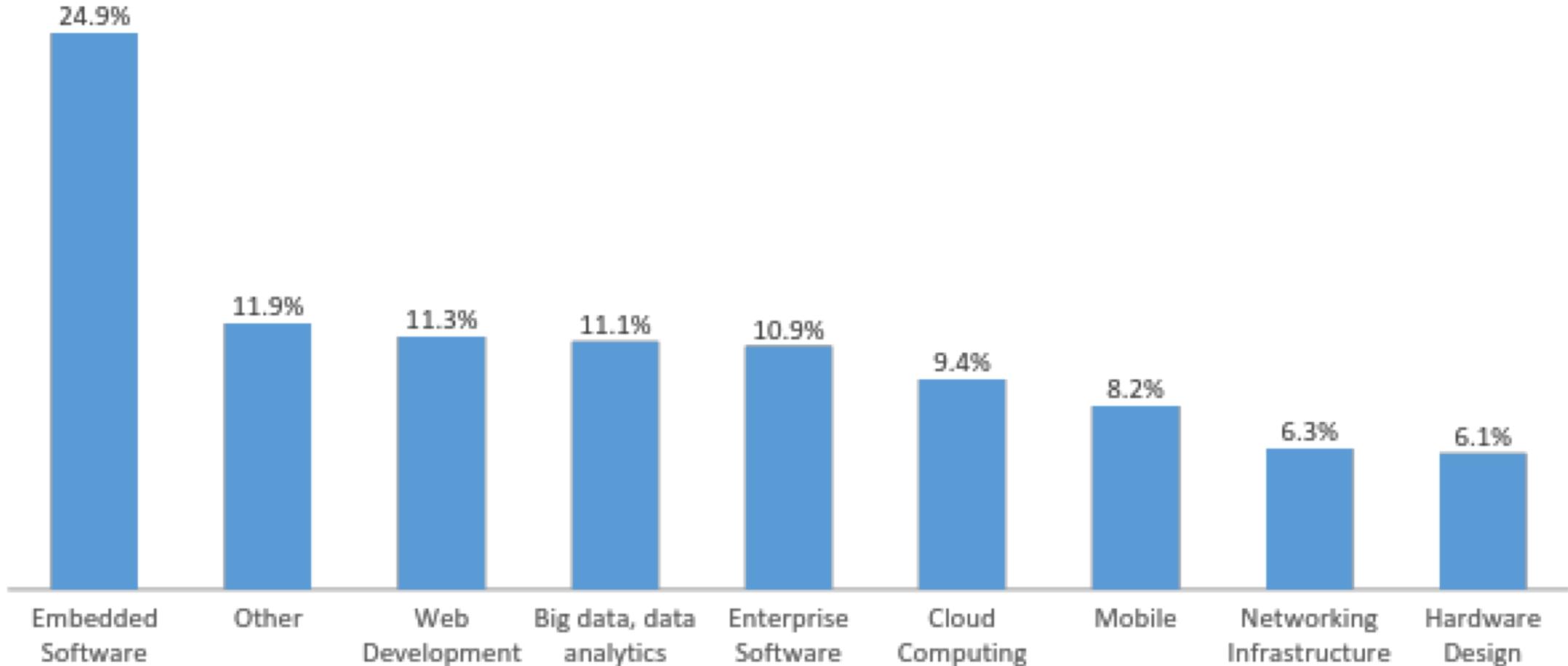
COMPANY PLANS FOR IoT

What is your company's plan for IoT solutions?
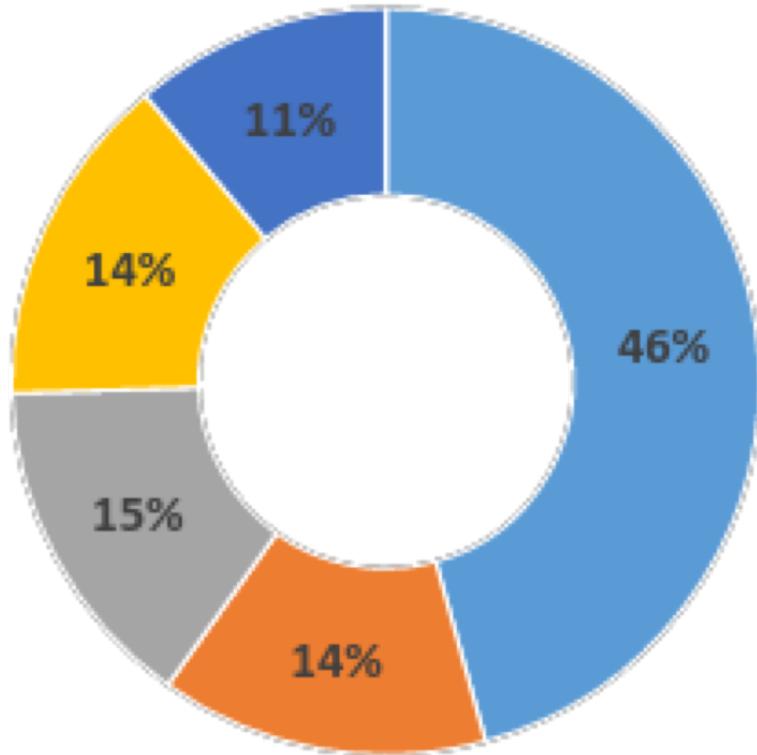
My company develops and deploys IoT solutions today

My company plans to develop and deploy IoT solutions in the next 6 months

My company plans to develop and deploy IoT solutions in the next 7-18 months

My company has no plans to develop IoT solutions

I don't know

46%

14%

15%

14%

11%

KEY INDUSTRIES

What industry or industries best describe(s) the type of IoT solutions you have built or will build?

Industry	Percentage
IoT Platform/Middleware	40.8%
Home Automation	38.6%
Energy Management	24.8%
Industrial Automation	24.6%
Connected Smart Cities	24.0%
Building Automation	20.8%
Healthcare	18.8%
Agriculture	16.8%
Automotive	15.8%
Environment	14.8%
Transportation	14.4%
Utilities	12.4%
Public Utilities	10.6%
Wearables	9.6%
Security/Public Safety	9.4%
Retail	6.6%
Security/Defense	6.4%
Banking/Financial/Fintech	5.8%
Fitness	5.4%
Collaborative and sharing economy	3.6%
Vending	3.0%

TOP IoT CONCERNS

What are your top 2 concerns for developing IoT solutions?

Concern	Percentage
Security	47.4
Interoperability	29.4%
Connectivity	22.3%
Integration with Hardware	20.9%
Cost	18.6%
Performance	16.3%
Privacy	15.7%
Complexity	13.2%
Maintenance	12.1%
Data Analytics	11.3%
Certification/Conformance	6.7%
Other	2.5%
I don't know	2.5%
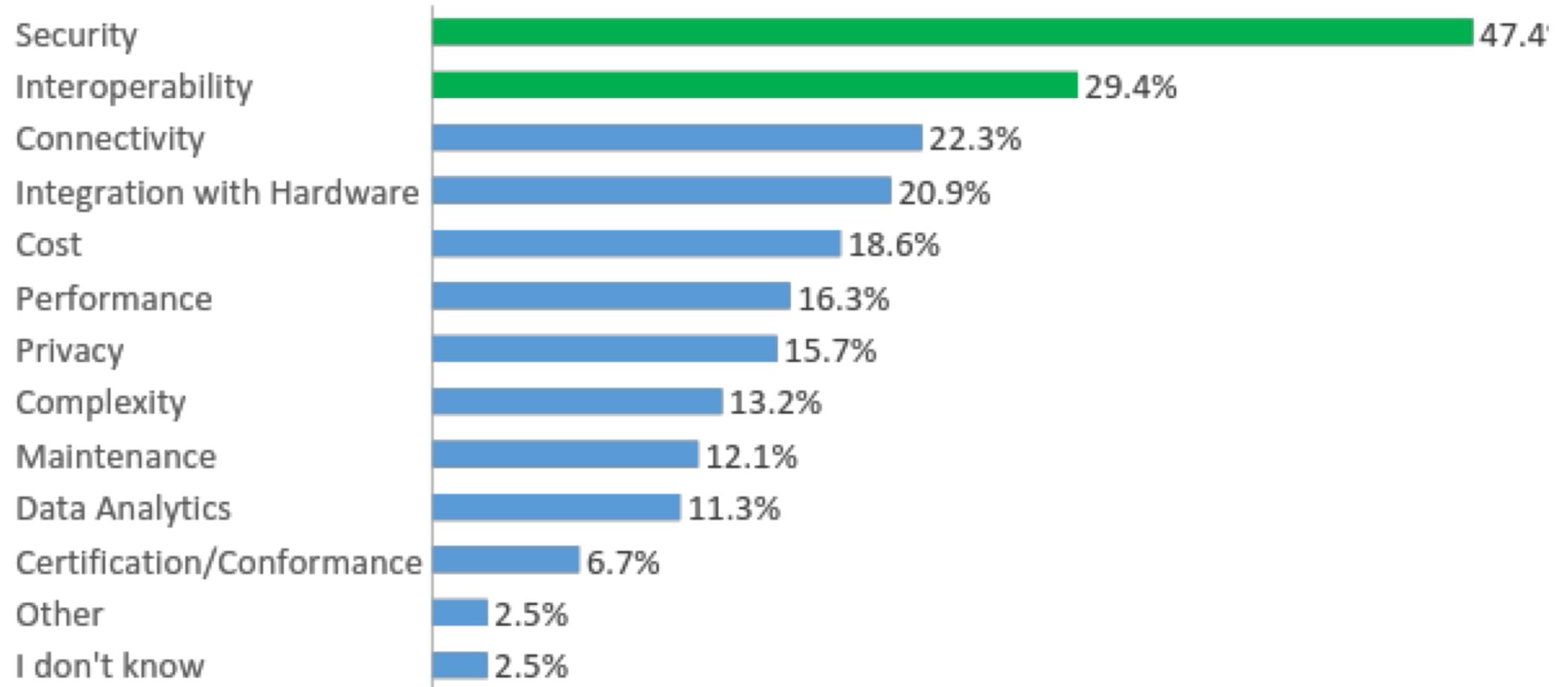
ORGANIZATIONS THAT HAVE IoT SOLUTIONS TODAY

What are your top 2 concerns for developing IoT solutions?

Performance becomes #3 issue
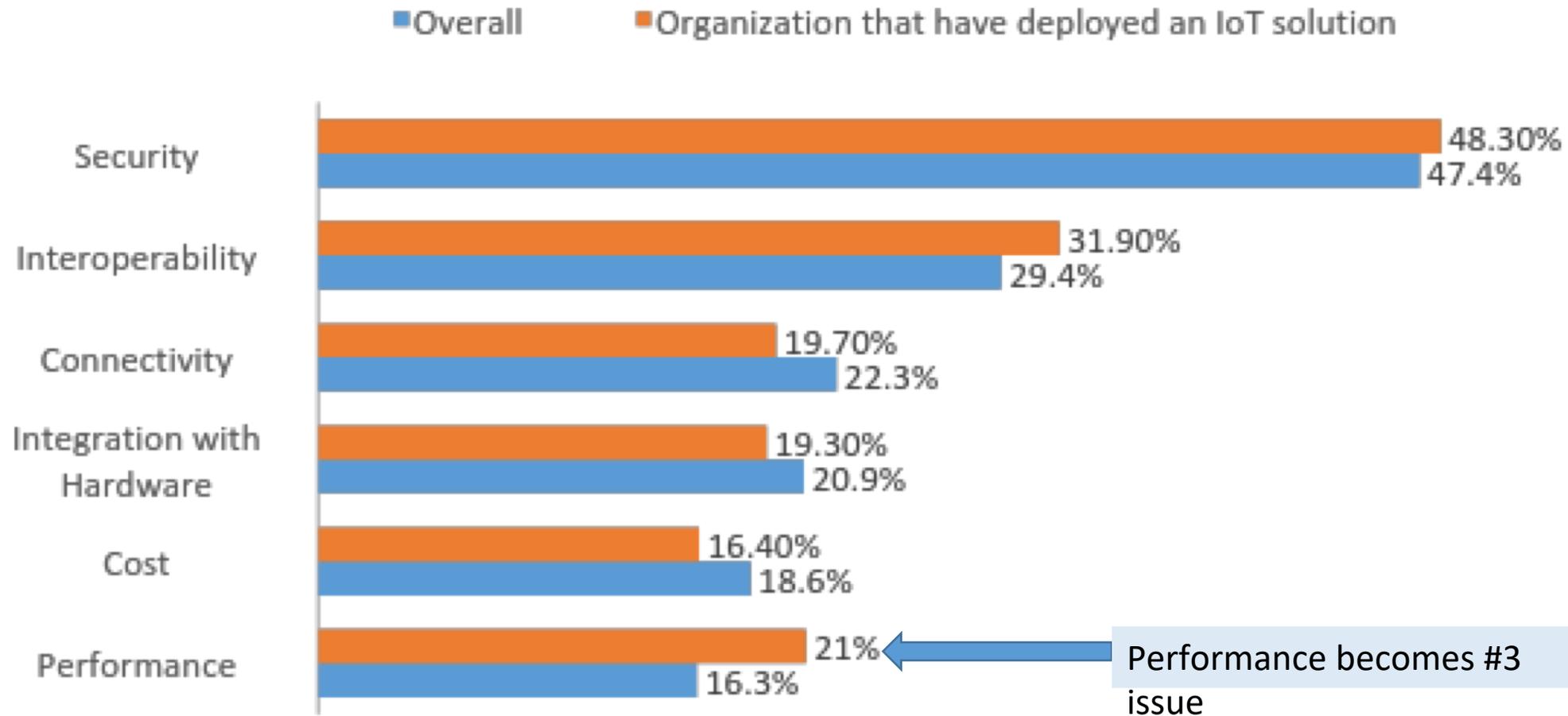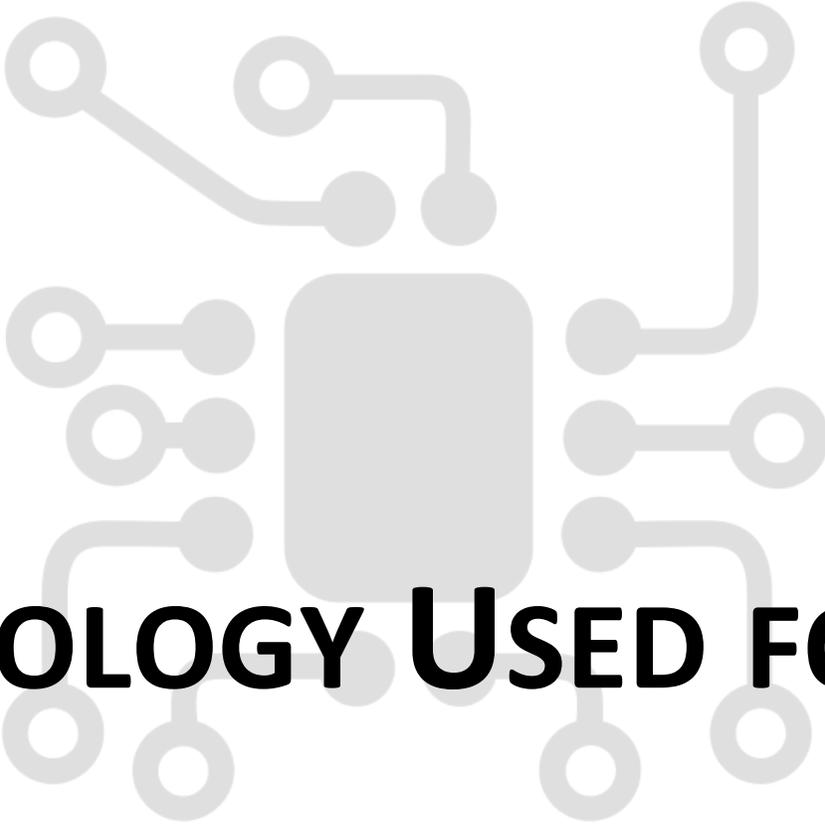
TECHNOLOGY USED FOR IoT

HOME AUTOMATION FRAMEWORKS

For your home automation solution, what framework/platform are you using or plan to use?

Legend:
- Google Nest — 9%
- Apple HomeKiT — 5%
- OpenHAB — 17%
- Eclipse SmartHome — 13%
- Smarthings Hub — 4%
- AllJoyn — 3%
- OIC — 4%
- Custom framework/platform — 16%
- I don't know — 17%
- Other (please specify) — 10%
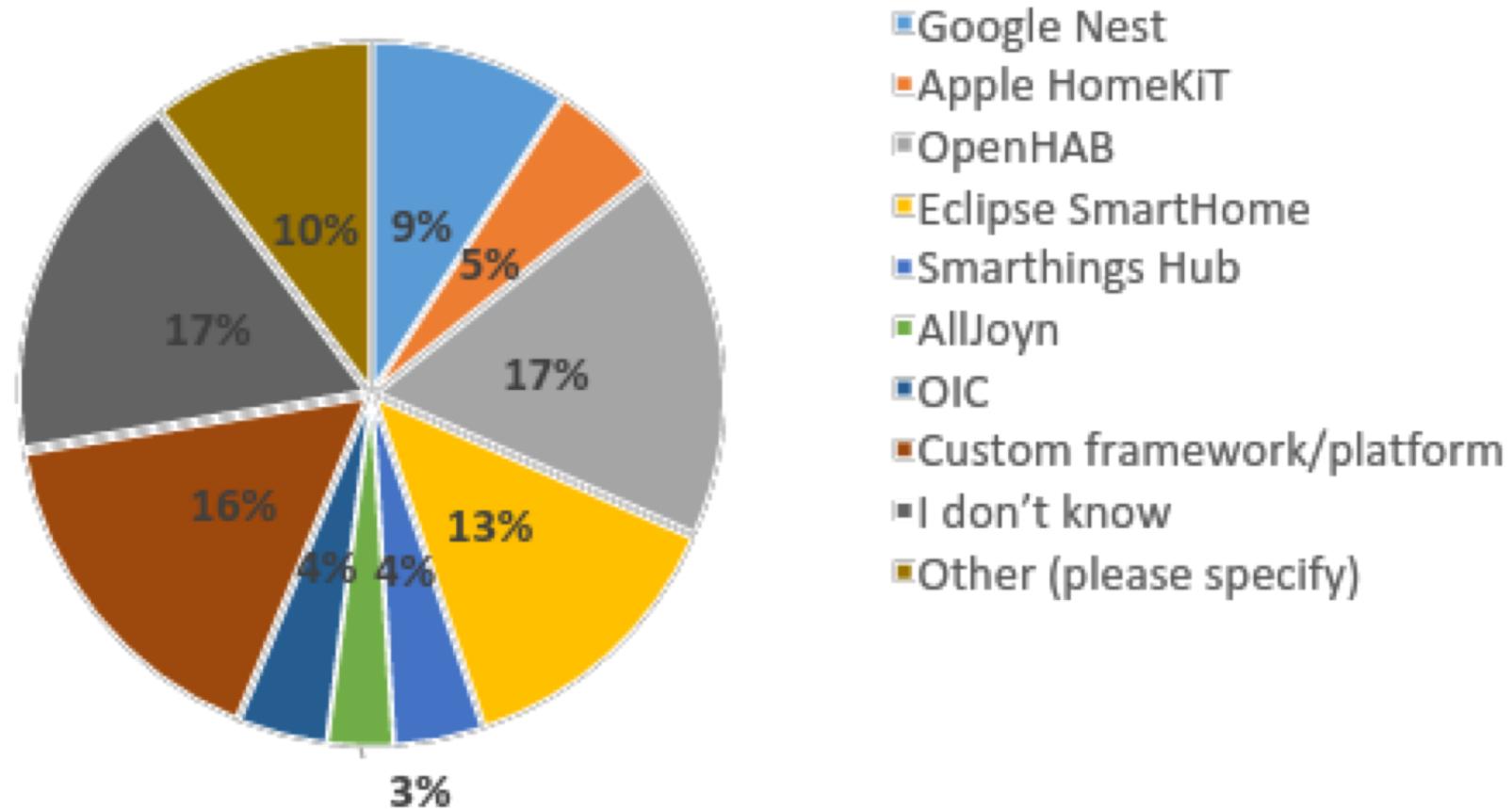
Programming Languages

Which programming languages, if any, do you use to build IoT solutions?

Language	Percentage
Java	51.9%
C	47.7%
Java Script	41.8%
Python	37.9%
C++	33.6%
Node.js	31.5%
C#	11.7%
PHP	11.2%
Lua	7.2%
Assembler	6.3%
Other	6.1%
Go	5.8%
Ruby	4.7%
SWIFT	4.7%
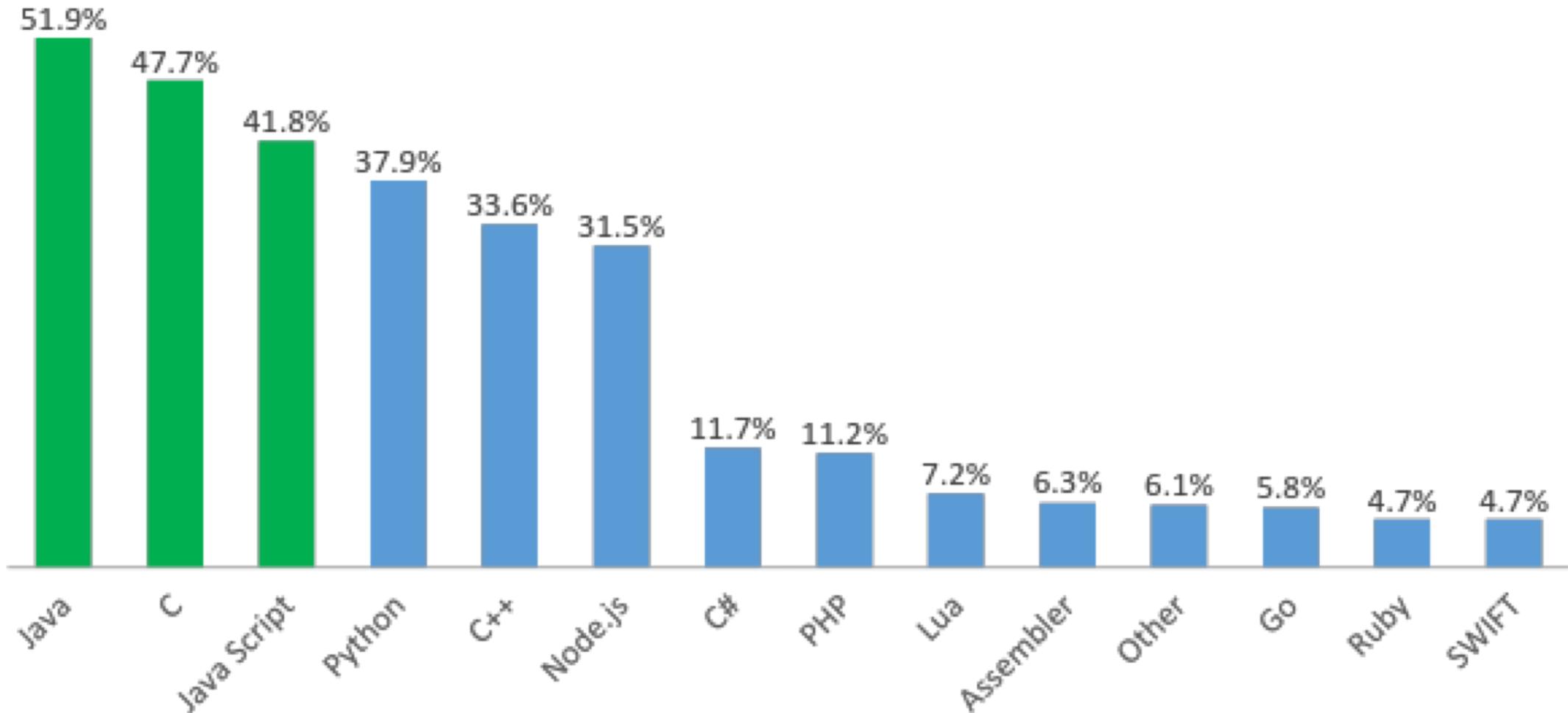
IoT Operating Systems

Which operating system(s) do you use for your IoT devices?
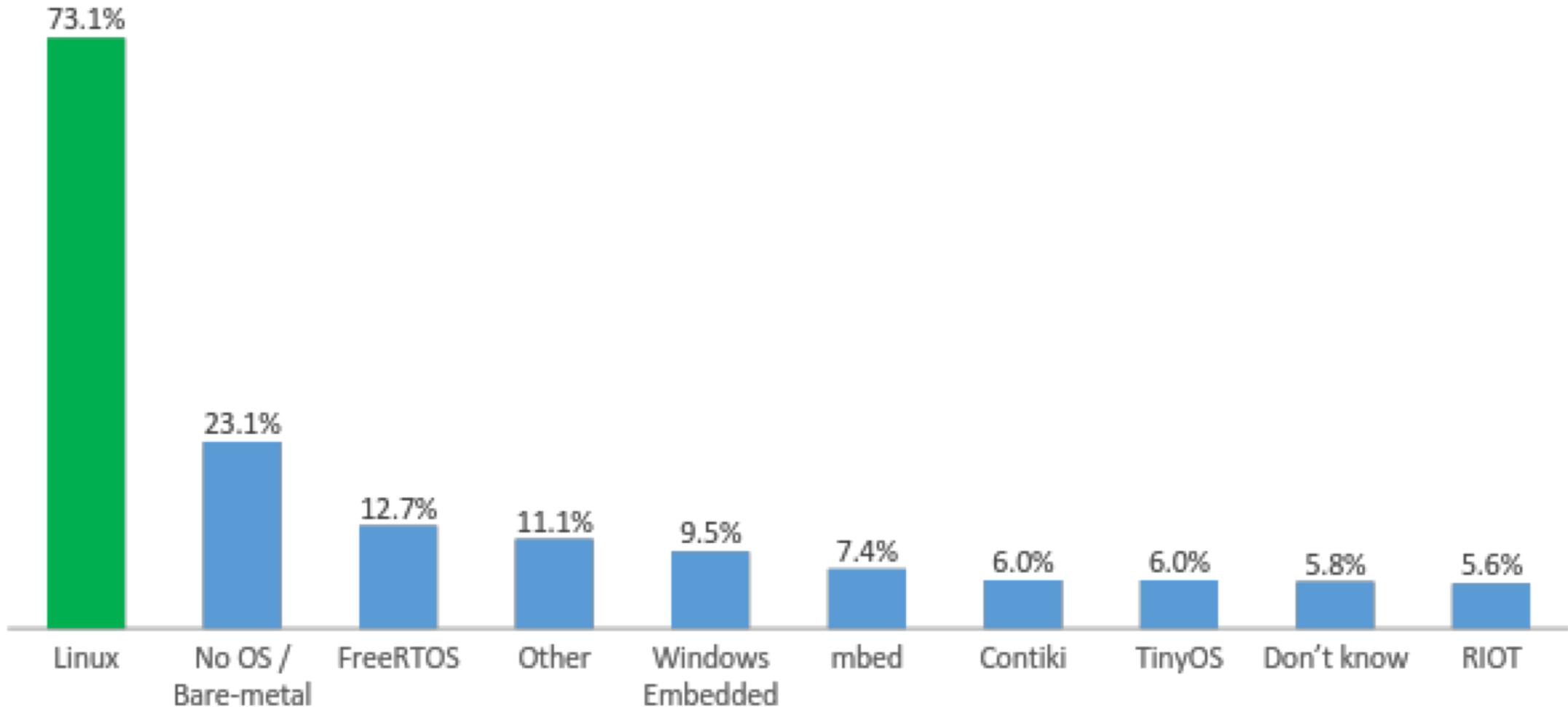
Bar chart showing percentages:
- Linux: 73.1%
- No OS / Bare-metal: 23.1%
- FreeRTOS: 12.7%
- Other: 11.1%
- Windows Embedded: 9.5%
- mbed: 7.4%
- Contiki: 6.0%
- TinyOS: 6.0%
- Don't know: 5.8%
- RIOT: 5.6%

CLOUD SERVICES FOR IoT

Do you use, or plan to use, any of the following cloud service offerings for implementing your IoT solution?

Service	Percentage
Amazon AWS	36.8%
Private/ On-premise cloud	34.9%
Microsoft Azure	20.8%
Google Cloud Platform	16.9%
IBM Bluemix	16.9%
No cloud service is used	16.9%
I don't know	10.5%
RedHat OpenShift	8.7%
Other	8.7%

Cloud Services for IoT

*Do you use, or plan to use, any of the following cloud service offerings for implementing your IoT solution?*

■ Overall   ■ Organizations that have deployed an IoT solution

Amazon AWS: 36.8% / 44.10%
Private/ On-premise cloud: 34.9% / 41.20%
Microsoft Azure: 20.8% / 25.60%
Google Cloud Platform: 16.9% / 12.30%
IBM Bluemix: 16.9% / 17.10%
No cloud service is used: 16.9% / 12.80%
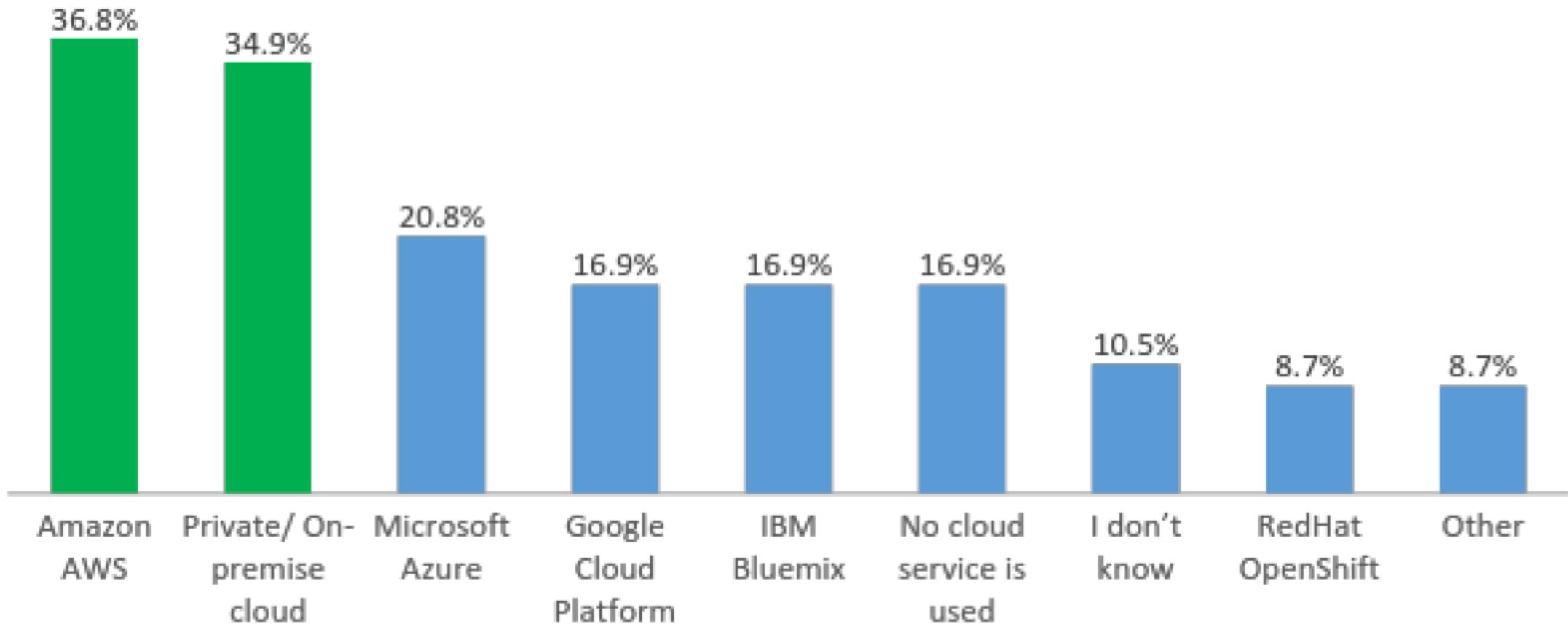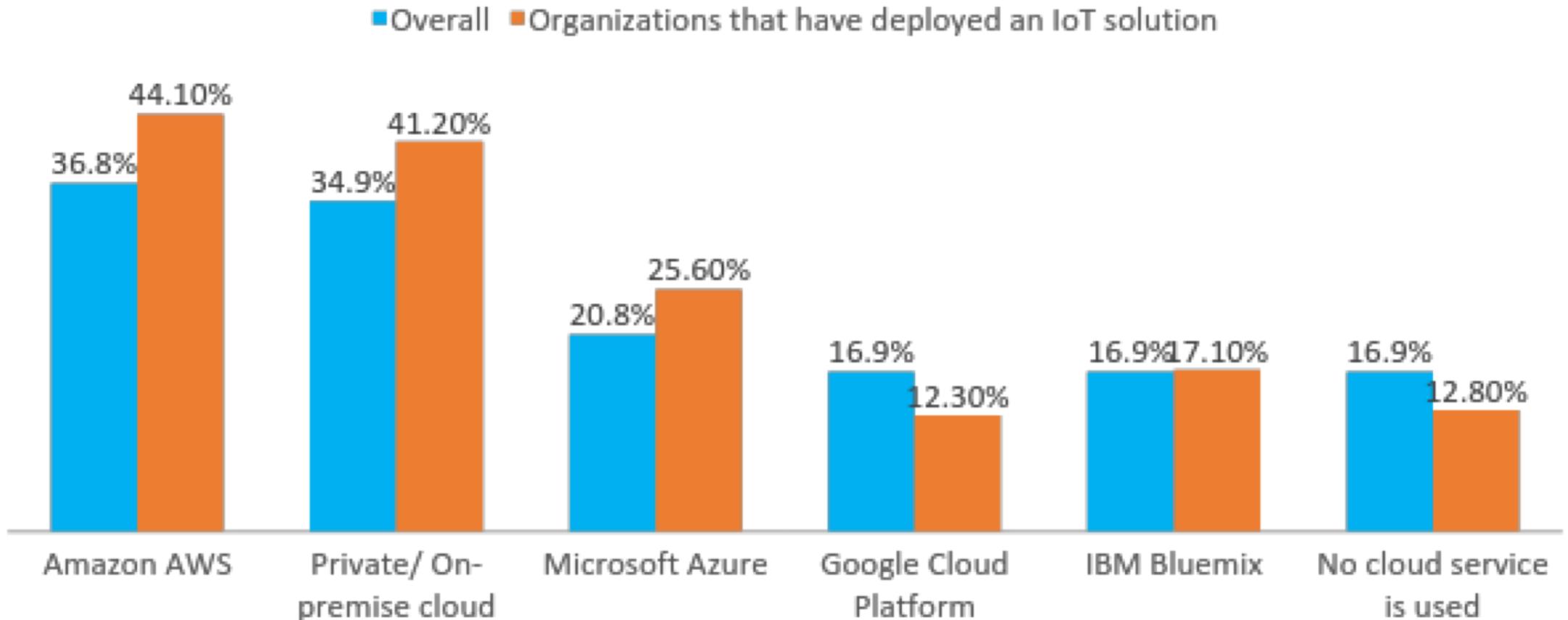
CONNECTIVITY PROTOCOLS

What connectivity protocol(s) do you use for your IoT solution?

Protocol	Percentage
TCP/IP	70.9%
Wi-Fi	67.0%
Ethernet	54.7%
Bluetooth / Bluetooth Smart	40.9%
Cellular	32.6%
Zigbee	25.4%
Serial RS-232/RS-485	24.5%
LPWAN (LoRa, Sigfox, LTE-M, etc.)	17.3%
6LoWPAN	16.2%
UPnP	8.5%
Other	8.1%
Thread	4.8%
Don't know	3.5%
Satellite	3.2%
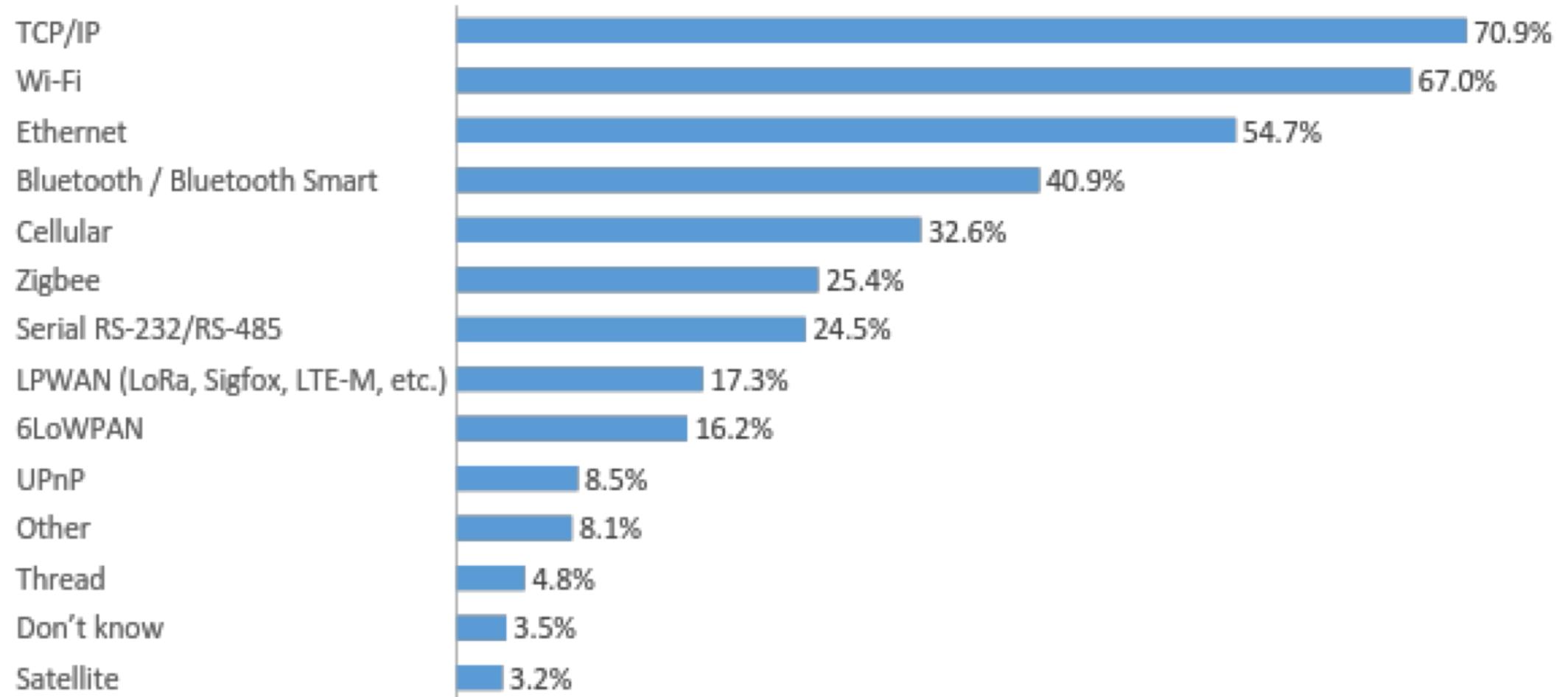
MESSAGING STANDARDS

What messaging protocol(s) do you use for your IoT solution?

Protocol	Percentage
HTTP	61.2%
MQTT	52.4%
CoAP	21.2%
HTTP/2	19.2%
In-house / proprietary	15.5%
AMQP	13.9%
XMPP	13.2%
I don't know	7.4%
Proprietary vendor protocol	6.2%
Other	5.3%
DDS	3.5%
None	2.3%
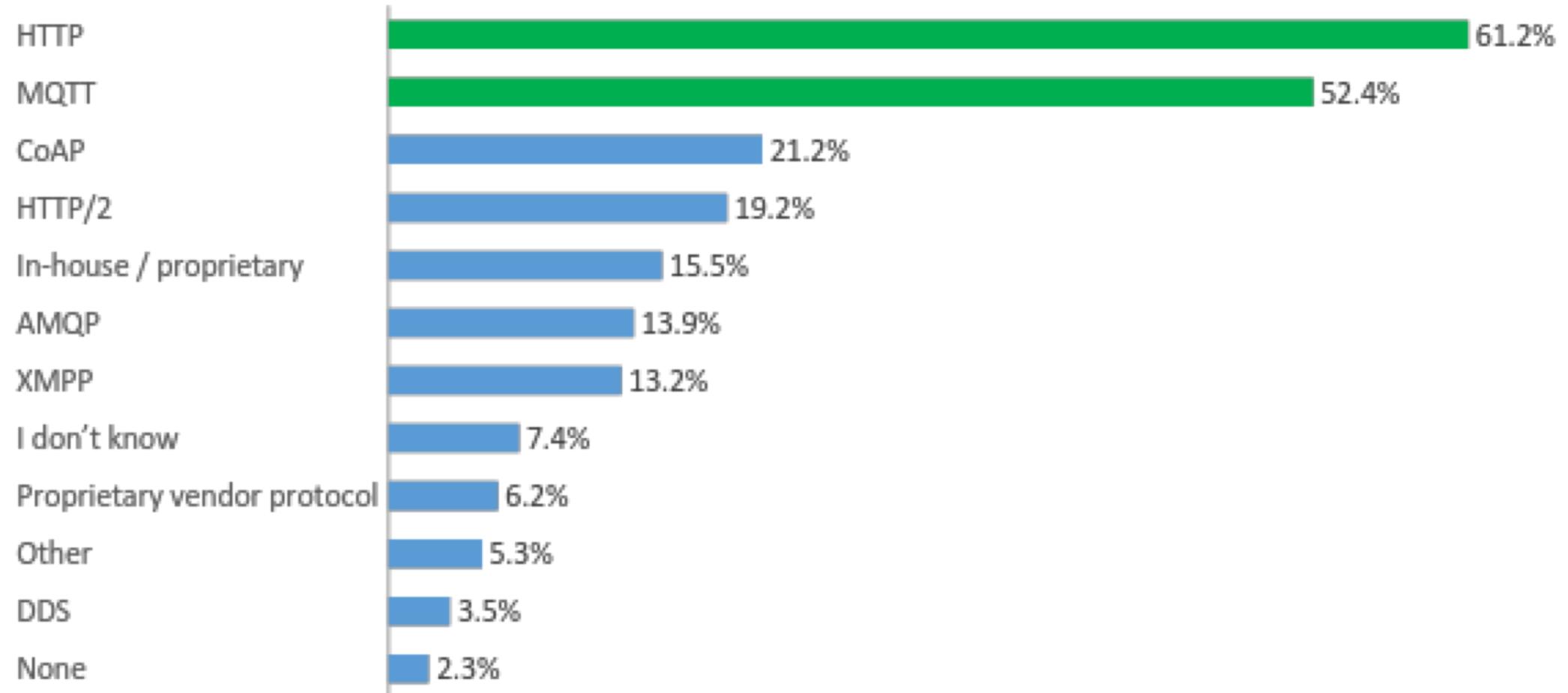
MESSAGING STANDARDS | IoT PLATFORM & SMART CITIES

What messaging protocol(s) do you use for your IoT solution?

■ Overall ■ IoT Platform ■ Smart Cities

CoAP usage increased for IoT Platforms and Smart Cities

Protocol	Overall	IoT Platform	Smart Cities
HTTP	61.2%	73.90%	73%
MQTT	52.4%	60.80%	62.20%
CoAP	21.2%	32.40%	35.10%
HTTP/2	19.2%	21%	16.20%
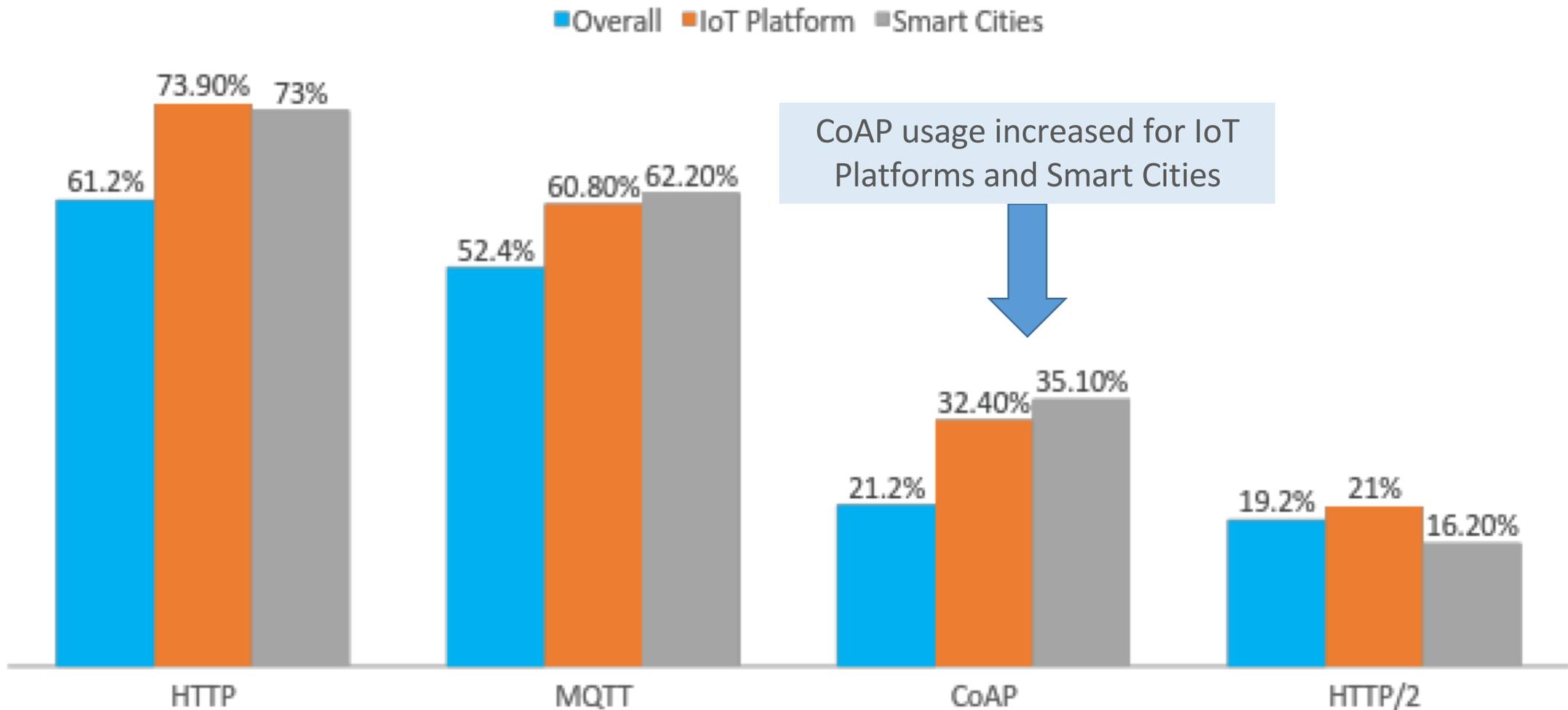
INDUSTRIAL PROTOCOLS

What industrial protocol(s) do you use in your IoT solution?

Protocol	Percentage
None	31.9%
Don't Know	26.0%
Modbus	18.9%
EtherNet/IP, ControlNet, DeviceNet	15.3%
CAN	14.0%
OPC-UA (IEC 62541)	8.4%
KNX	5.6%
Profibus, Profinet	5.4%
BACNet	4.6%
Other	3.3%
IEC 60870, 61850	3.3%
EtherCat	3.1%
DNP3	2.3%
FOUNDATION fieldbus	1.5%
Sercos	0.5%
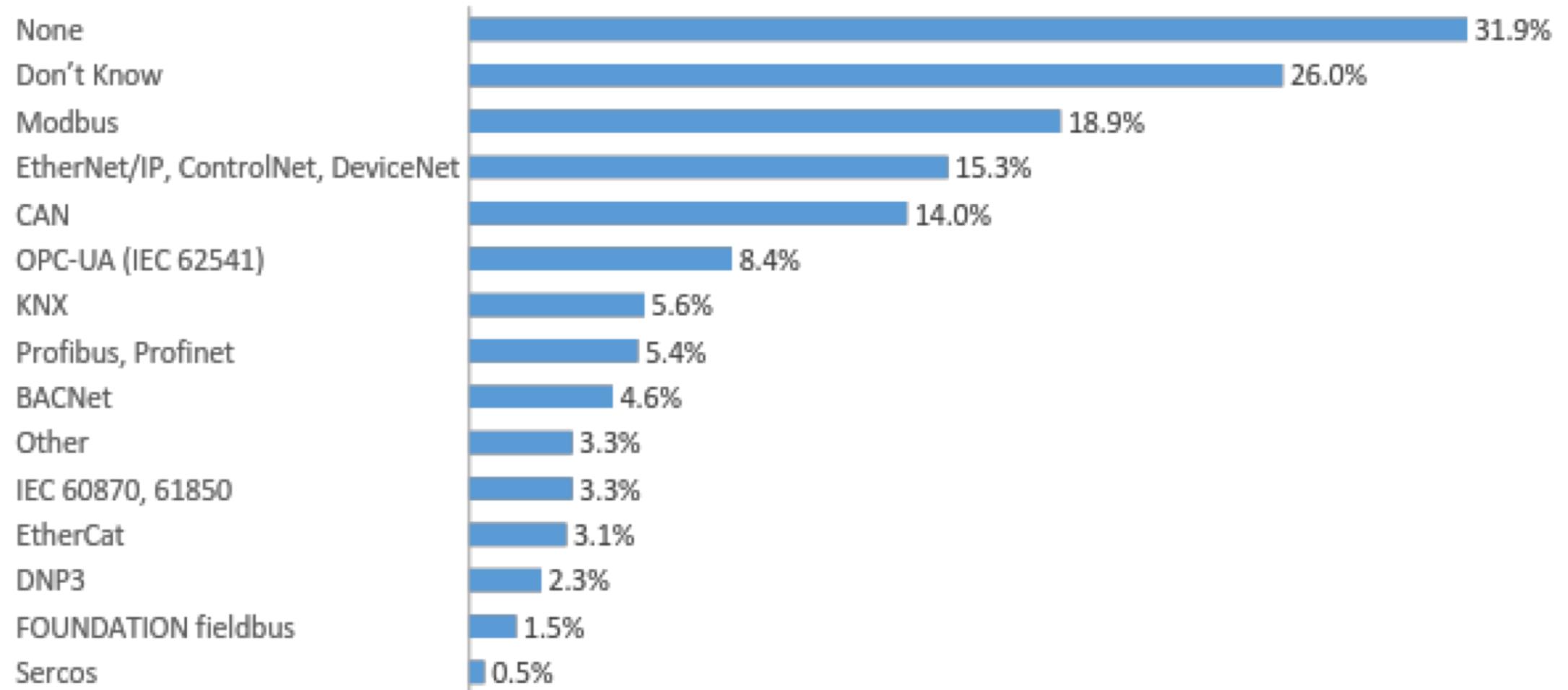
Usage of Open Hardware

*Have you ever used any open hardware platforms like Raspberry Pi, Arduino, BeagleBone, etc.?*
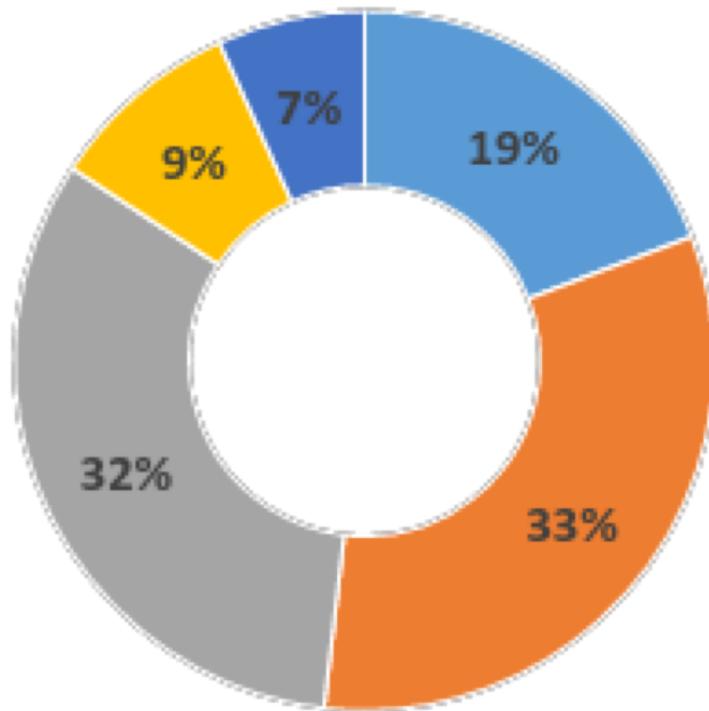
Yes, my company deploys IoT solution using an open hardware platform

Yes, my company prototypes IoT solutions using an open hardware platform

Yes, I have experimented with open harware in my spare time

No, but I intend to experiment with open hardware in the next 6 months

Never used open hardware

IoT Industry Perceptions

OPEN SOURCE POLICY

What is your company's policy about using open source technology for your IoT solutions?

3.0%	25.1%	16.6%	16.6%	24.9%	12.6%
Not allowed in any part of our IoT solution	Used but we do not participate or contribute to open	Used and we contribute bug fixes to open source	Used and we have developers who work on open	Fundamental to our business model	I don't know
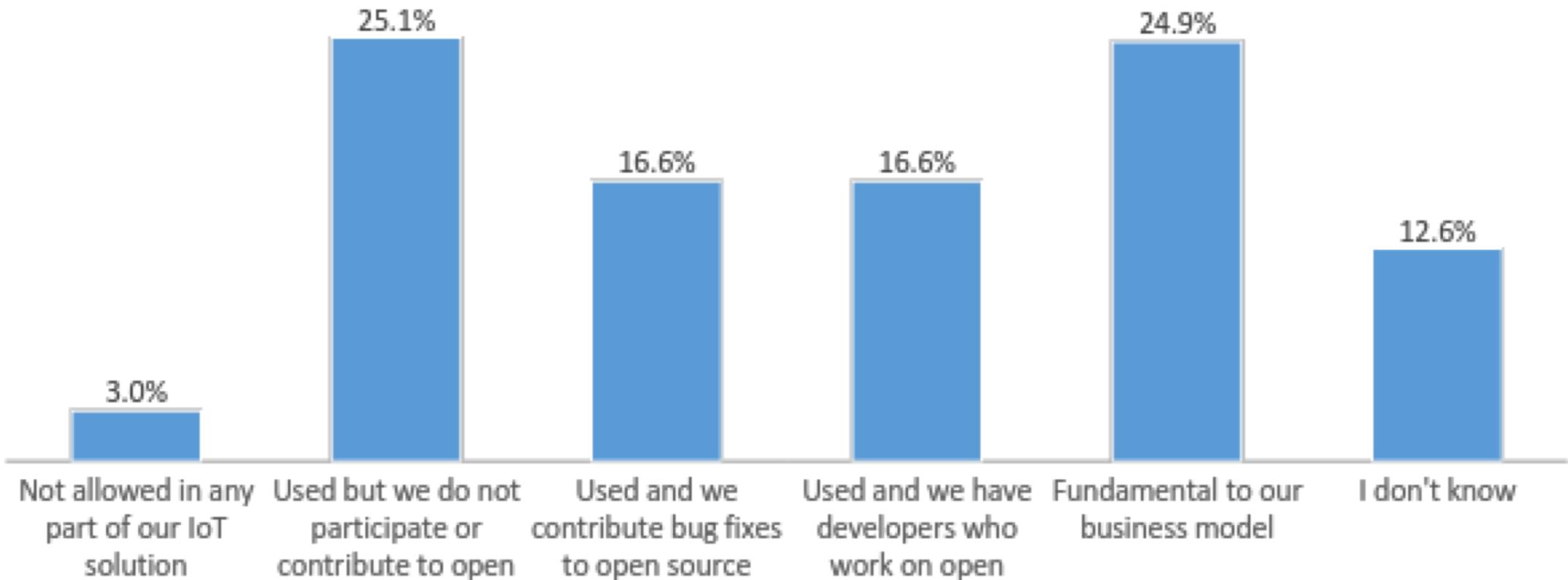
IoT Consortiums

*How would you rank your organization's perceived importance of the following IoT Consortiums to your IoT strategy?*

	Important	Neutral	Not Important	Don't Know	Never heard of them	Average Rating
AllSeen Alliance	38	69	42	73	116	3.47
Eclipse IoT	166	89	29	49	26	2.11
IEC	38	82	37	80	89	3.31
IEEE	135	111	33	65	14	2.20
IETF	104	81	30	66	54	2.66
Industrial Internet Consortium (IIC)	48	90	42	72	87	3.18
LoRa Alliance	70	74	35	71	89	3.10
OASIS	55	103	46	76	64	2.97
Open Interconnect Consortium (OIC)	42	79	39	86	94	3.33
OMA	41	76	32	77	114	3.43
OneM2M	34	78	36	74	112	3.46
Thread	34	81	41	71	108	3.41
W3C	146	88	38	64	13	2.17

TOP IoT CORPORATE LEADERS

WHO RESPONDED?

JOB TITLE

Pie chart legend:
- Developer — 30%
- Architect — 16%
- Development Manager — 12%
- Researcher — 10%
- Independent Consultant — 8%
- Executive — 6%
- Product Manager — 5%
- Student — 4%
- Other (please specify) — 9%
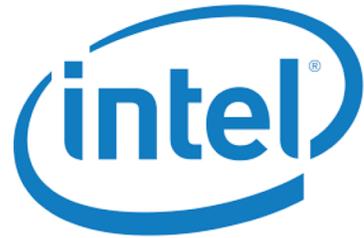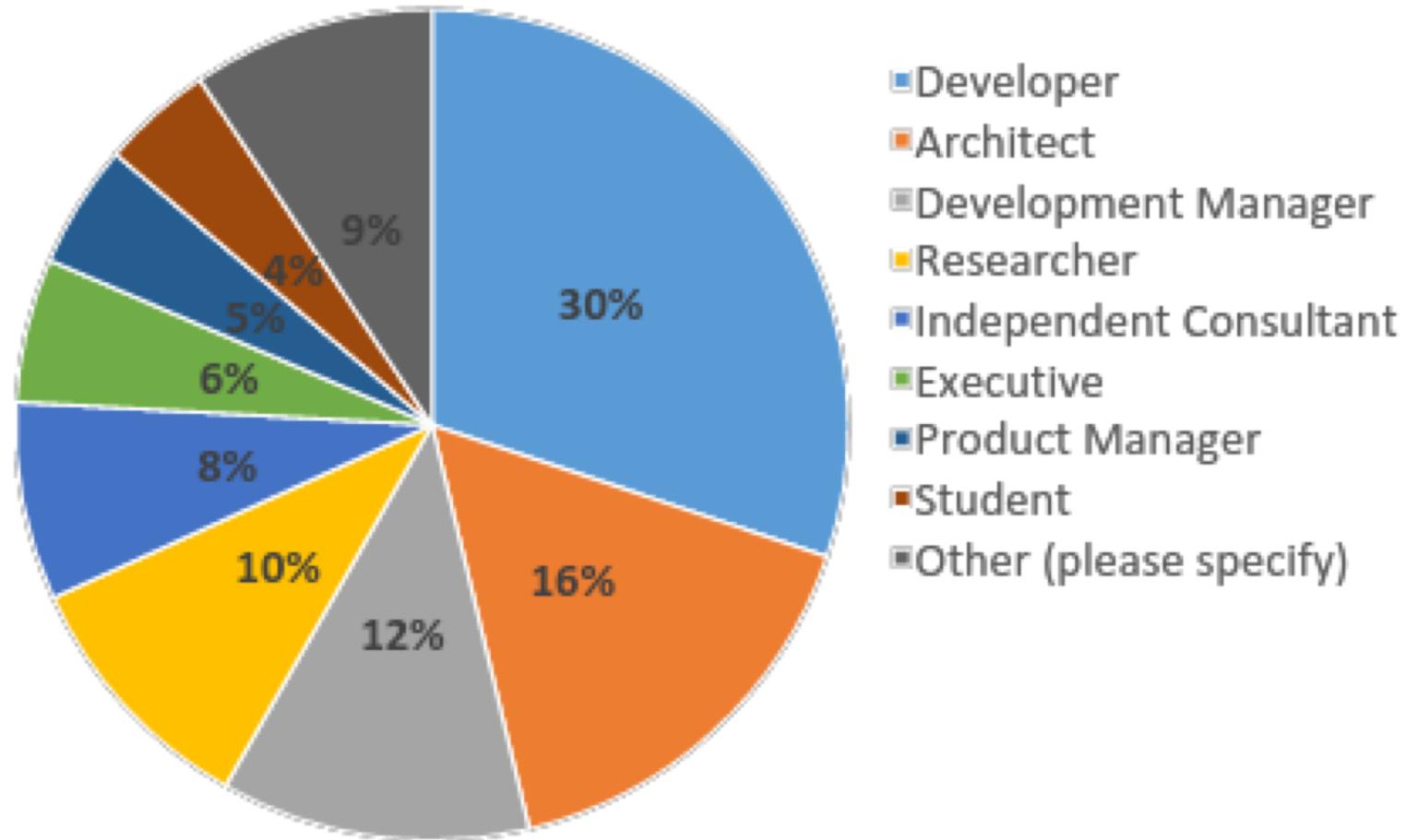
ORGANIZATION SIZE

How large is the organization you work for?

REGION

Where do you live?

Pie chart:
- Europe, 59%
- North America, 19%
- Asia and Pacific, 14%
- South America, 6%
- Middle East,
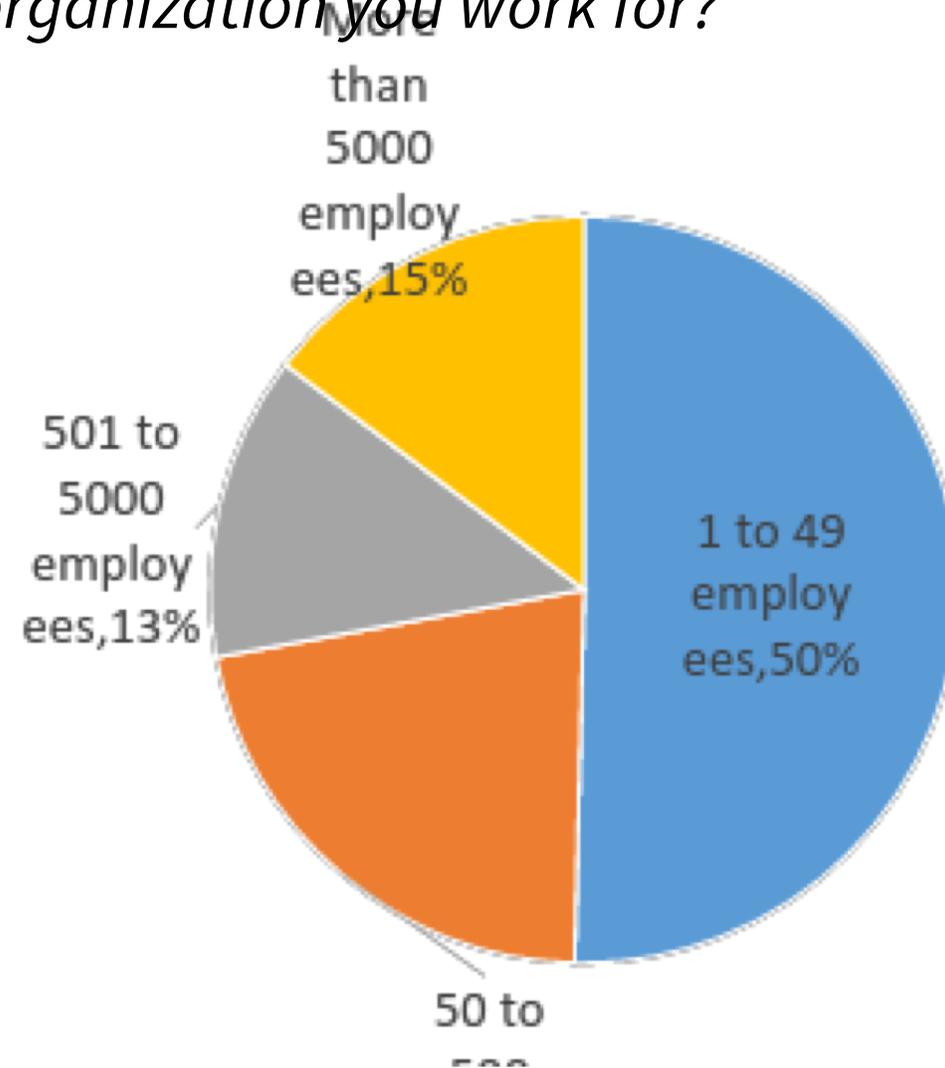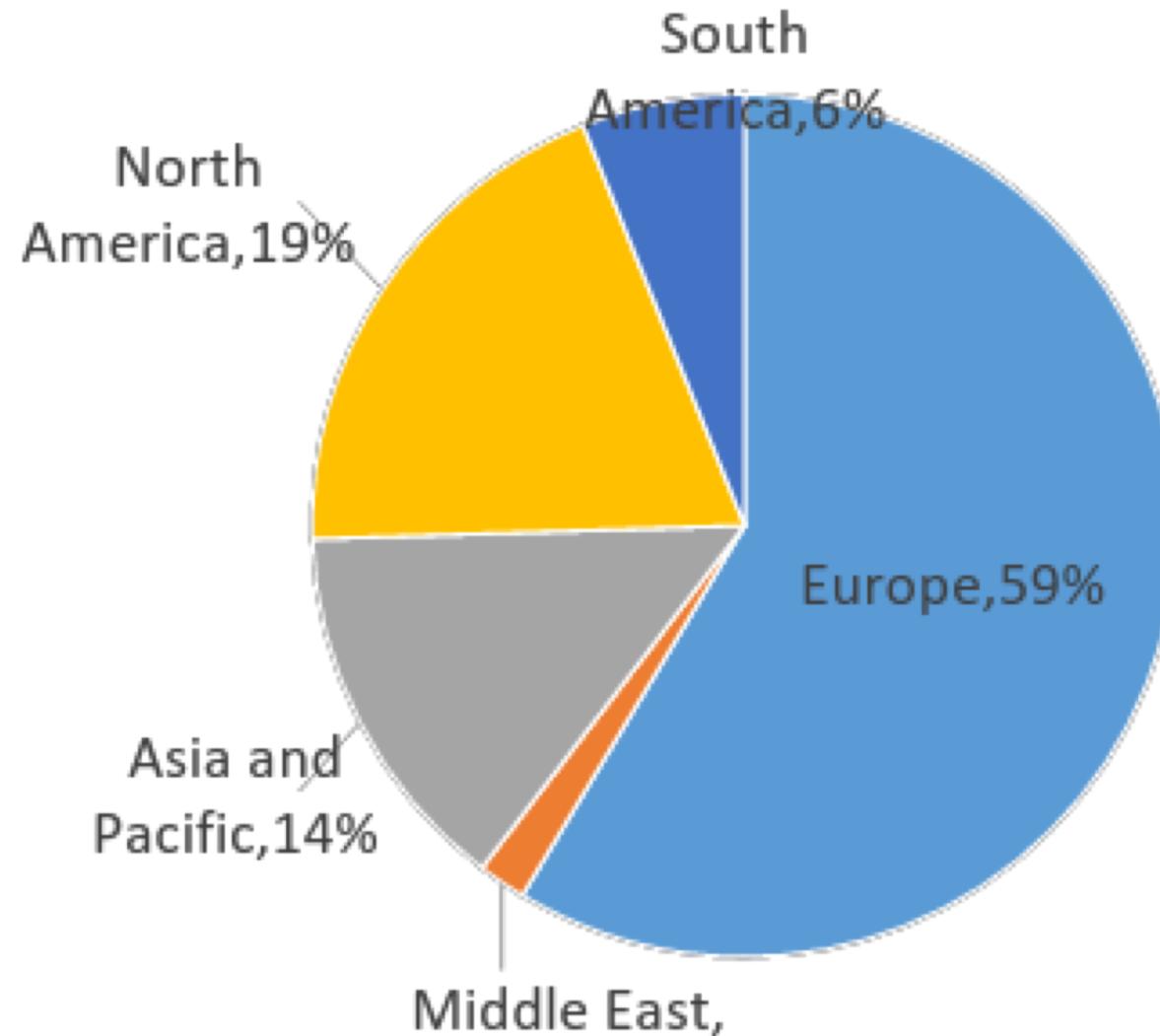
DIFFERENT RESPONDENT POOLS

DIFFERENT RESPONDENTS POOLS

The Survey was jointly sponsored by the Eclipse IoT Working Group, IEEE IoT and the AGILE IoT research project. Each sponsor group promoted the survey to their community.

A total of **528 individuals participated in the survey**; 281 from Eclipse IoT, 130 from AGILE IoT and 46 from IEEE IoT. The remaining response came from other organizations who helped promote the survey.

Some differences emerged between the Eclipse IoT respondents and the other groups (details on next page):

- Eclipse community was more focused on embedded technology

- C and Python were top languages in the non-Eclipse respondents; Java and C being top languages in Eclipse

- MQTT usage significantly higher in Eclipse; most likely due to Eclipse Paho and Eclipse Mosquitto

- Eclipse respondents more likely to have already deployed an IoT solution today

KEY DIFFERENCES BETWEEN ECLIPSE IoT RESPONDENTS & THE OTHER GROUPS

	Combined	Eclipse IoT	AGILE IoT, IEEE IoT, others
Embedded Technology Focus	24.9%	30%	19.1%
I develop IoT Solutions for my company	37.9%	46.3%	28.3%
My company develops and deploys IoT solutions today	45.7%	53.1%	37.9%
Top Languages	Java (51.9%) C (47.7%) JavaScript (41.8%)	Java (59.6%) C (45.4%) JavaScript (43.3%)	C (50.5%) Python (47.9%) Java (42%)
Message Protocols	HTTP (61.2%) MQTT (52.4%)	MQTT (61.8%) HTTP (58.1%)	HTTP (65.1%) MQTT (40.6%)
Key Roles	Developer (30.1%) Architect (16.1%) Dev Mgr(12%)	Developer (34.1%) Architect (19.4%) Dev. Mgr (12.4%)	Developer (25.1%) Researcher (16%) Architect (12%)
Location	Europe (58.6%) NA (19.4%) AP (14.1%)	Europe (56.2%) NA (24.4%) AP (13.8%)	Europe (61.5%) AP (14.4%) NA (13.2%)

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