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

The survey was open from January 24 until March 5, 2018. A total of 502 individuals participated in the survey. Each partner promoted the survey to their communities through social media and web sites.
KEY FINDINGS
WHAT PEOPLE ARE BUILDING

1. IoT Platforms
2. Home Automation
3. Industrial Automation
4. Smart Cities
5. Energy Management
6. Agriculture
7. Automotive
8. Building Automation

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Key IoT Concerns

Security

Data Collection & Analytics

Connectivity

Hardware Integration
**Key IoT Security Technologies**

**Communication security**
(e.g TLS, DTLS)

**Data Encryption**
Most Collected Type of Data

- Time Series Data
- Device Information
- Log Data
93% of Databases Used in IoT Are Open Source
TOP IOT PROGRAMMING LANGUAGES

- **Devices**
  - C
  - CPP
  - PY
  - JAVA

- **Gateways**
  - JAVA
  - PY
  - C
  - CPP

- **Cloud**
  - JAVA
  - JS
  - PY
  - PHP
TOP IOT OPERATING SYSTEMS & DISTROS

- 71%

Raspbian
Ubuntu
Debian
CLOUD PLATFORMS OF CHOICE FOR IOT

aws

Azure

Google Cloud Platform
CONSOLIDATION IN MESSAGING PROTOCOLS

HTTP/2

HTTP

Proprietary protocols
What is your primary experience with building IoT solutions?

- **40%**: I develop IoT solutions for my company
- **21%**: I am learning about IoT technology in my spare time
- **14%**: I am researching IoT solutions for my company
- **13%**: No experience
- **10%**: I develop IoT solutions in my spare time only
- **2%**: Other (please specify)
**COMPANY PLANS FOR IoT**

*What is your company's plan for IoT solutions?*

- 44%: My company develops and deploys IoT solutions today
- 17%: My company plans to develop and deploy IoT solutions in the next 7-18 months
- 14%: My company plans to develop and deploy IoT solutions in the next 6 months
- 13%: My company has no plans to develop IoT solutions
- 12%: Don't know

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Key Industries

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

![Bar chart showing percentage of industries for IoT solutions]
KEY INDUSTRIES / TRENDS 2016-2018

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**Top IoT Concerns**

**What are your top 2 concerns for developing IoT solutions?**

- **Security**: 39.0%
- **Data Collection & Analytics**: 18.5%
- **Integration with Hardware**: 15.5%
- **Connectivity**: 15.5%
- **Interoperability**: 15.1%
- **ROI**: 14.1%
- **Scalability**: 11.6%
- **Privacy**: 11.2%
- **Standards**: 10.8%
- **Performance**: 10.8%
- **Maintenance**: 10.2%
- **Cost**: 8.2%
- **Complexity**: 7.6%
- **Don't Know**: 5.4%
- **Certification/Conformance**: 3.6%
- **Other**: 3.0%
Top IoT Concerns / Trends 2016-2018

- Data Collection & Analytics: 18.5% (2016), 18.5% (2017), 18.5% (2018)
- Connectivity: 15.5% (2016), 15.5% (2017), 15.5% (2018)
- Integration with Hardware: 15.5% (2016), 15.5% (2017), 15.5% (2018)
- Interoperability: 15.1% (2016), 15.1% (2017), 15.1% (2018)
- Scalability: 11.6% (2016), 11.6% (2017), 11.6% (2018)
TECHNOLOGY USED FOR IOT
Which of the following programming languages, if any, do you use to build IoT solutions?
Which of the following programming languages, if any, do you use to build IoT solutions? (Constrained Devices)
Which of the following programming languages, if any, do you use to build IoT solutions? (Gateways)
Which of the following programming languages, if any, do you use to build IoT solutions? (Cloud Platform)

- JAVA: 53.2%
- JAVASCRIPT: 37.5%
- PYTHON: 29.3%
- PHP: 12.5%
- C#: 9.3%
- C++: 7.5%
- GO: 5.9%
- R: 5.1%
- OTHER: 4.8%
- C: 4.0%
- RUBY: 2.9%
- SWIFT: 2.9%
- LUA: 2.4%
- ASSEMBLER: 1.9%
- RUST: 1.3%

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Which operating system(s) do you use for your IoT devices?

- 71.8% Linux
- 22.9% Windows
- 20.4% FreeRTOS
- 19.9% No OS / Bare Metal
- 10.5% Other
- 8.8% Contiki
- 7.2% TinyOS
- 6.1% RIOT OS
- 5.2% QNX
- 3.6% VXWorks
- 3.0% Zephyr
- 2.8% Micrium OS
- 1.9% Huawei LiteOS
- 1.7% Keil RTX5
- 1.1% Others
ALTERNATIVES TO USING LINUX FOR IOT

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Which operating system(s) do you use for your IoT devices? (Constrained Devices)
Which operating system(s) do you use for your IoT devices? (Edge / Gateway)
If you are using Linux, what distribution do you typically use for your IoT solution?

- Raspbian: 43.3%
- Ubuntu/Ubuntu Core: 40.2%
- Debian: 30.9%
- Android: 19.6%
- CentOS: 15.6%
- Yocto Project: 14.2%
- Other: 8.2%
- Android Things: 7.9%
- OpenWRT or equivalent: 7.9%
- Don't use Linux: 7.7%
- uCLinux: 2.0%
- Tizen: 1.7%

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<table>
<thead>
<tr>
<th>Hardware Architecture</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arm Cortex-M3 / Arm Cortex-M4</td>
<td>28.0%</td>
</tr>
<tr>
<td>Other 32-bit MCU</td>
<td>23.5%</td>
</tr>
<tr>
<td>Arm Cortex-M0 / Arm Cortex-M0+</td>
<td>20.7%</td>
</tr>
<tr>
<td>Arm Cortex-M7</td>
<td>19.6%</td>
</tr>
<tr>
<td>16-bit MCU</td>
<td>19.1%</td>
</tr>
<tr>
<td>8-bit MCU</td>
<td>17.9%</td>
</tr>
<tr>
<td>Don't Know</td>
<td>26.1%</td>
</tr>
<tr>
<td>Don't Use Constrained Devices</td>
<td>7.8%</td>
</tr>
<tr>
<td>Other</td>
<td>5.3%</td>
</tr>
<tr>
<td>Hardware Architecture</td>
<td>Percentage</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Intel X86_64</td>
<td>31.8%</td>
</tr>
<tr>
<td>ARM V8 (Cortex-A64)</td>
<td>24.5%</td>
</tr>
<tr>
<td>Intel X86</td>
<td>22.6%</td>
</tr>
<tr>
<td>ARM V6</td>
<td>22.0%</td>
</tr>
<tr>
<td>Other</td>
<td>15.9%</td>
</tr>
<tr>
<td>Don't Use Gateways</td>
<td>15.0%</td>
</tr>
<tr>
<td>Other (Please Specify)</td>
<td>10.3%</td>
</tr>
<tr>
<td>Other</td>
<td>7.8%</td>
</tr>
<tr>
<td>Other</td>
<td>7.2%</td>
</tr>
<tr>
<td>Other</td>
<td>3.9%</td>
</tr>
<tr>
<td>Other</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

What hardware architectures are you using for your IoT gateway(s)?
Which of the following security-related technologies do you use in your IoT solution?

- JSON WEB DATA ENCRYPTION
- PUBLIC OVER\n- BLOCKCHAIN
- SECURED AUT & OVER\n
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What type of IoT data are you storing in a database or data store?

- Time Series Data: 61.9%
- Device Information: 60.4%
- Log Data: 54.1%
- Contextual Data: 42.0%
- Operational Data: 37.8%
- Enterprise Data: 18.0%
- Images / Video: 17.7%
- Audio: 7.2%
- Don't Know: 6.9%
- None: 4.8%
- Other: 0.9%
Which of the following database technologies do you use in your IoT solution?
Do you use, or plan to use, any of the following cloud service offerings for implementing your IoT solution?
What connectivity protocol(s) do you use for your IoT solution?

- TCP/IP: 62.9%
- Wi-Fi: 55.3%
- Ethernet: 47.7%
- Bluetooth / Bluetooth Smart: 38.3%
- Cellular: 35.6%
- UDP/IP: 32.2%
- Zigbee: 21.6%
- LPWA: 21.3%
- Serial RS-232/RS-485: 17.9%
- 6LoWPAN: 13.4%
- Z-Wave: 9.1%
- UPnP: 6.1%
- Don’t Know: 5.8%
- Other: 3.7%
- Thread: 2.7%
- Satellite: 2.7%
What messaging protocol(s) do you use for your IoT solution?

- **MQTT**
- **HTTP**
- **WEBSOCKETS**
- **HTTP/2**
- **COAP**
- **AMQP (0.9 AND/OR 1.0)**
- **IN-HOUSE / PROPRIETARY**
- **OTHER (PLEASE SPECIFY)**
- **DON'T KNOW**
- **DDS**
- **XMPP**
- **PROPRIETARY VENDOR PROTOCOL (SPECIFY BELOW)**
- **NONE**
MESSAGING STANDARDS - TRENDS
**TEXT EDITORS / IDES**

*Which text editor(s) or IDE(s) do you use when building IoT solutions?*

<table>
<thead>
<tr>
<th>Editor/IDE</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECLIPSE DESKTOP IDE</td>
<td>40%</td>
</tr>
<tr>
<td>ARDUINO IDE</td>
<td>35%</td>
</tr>
<tr>
<td>NOTEPAD ++</td>
<td>30%</td>
</tr>
<tr>
<td>VISUAL STUDIO CODE</td>
<td>25%</td>
</tr>
<tr>
<td>INTELLIJ IDEA</td>
<td>20%</td>
</tr>
<tr>
<td>VIM</td>
<td>15%</td>
</tr>
<tr>
<td>ATOM</td>
<td>10%</td>
</tr>
<tr>
<td>ANDROID STUDIO</td>
<td>10%</td>
</tr>
<tr>
<td>VISUAL STUDIO</td>
<td>5%</td>
</tr>
<tr>
<td>SUBLIME</td>
<td>5%</td>
</tr>
<tr>
<td>OTHER</td>
<td>5%</td>
</tr>
<tr>
<td>PLATFORM.IO</td>
<td>5%</td>
</tr>
<tr>
<td>ECLIPSE CHE</td>
<td>5%</td>
</tr>
<tr>
<td>EMACS</td>
<td>5%</td>
</tr>
<tr>
<td>ECLIPSE ORION</td>
<td>5%</td>
</tr>
<tr>
<td>DON'T KNOW</td>
<td>5%</td>
</tr>
</tbody>
</table>

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TEXT EDITORS / IDEs – TRENDS

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IoT Industry Perceptions
Which of the following statement(s) best describes your IoT open source project participation?

- 48%: My organization uses open source technology in our IoT solutions
- 24%: I am a committer on an open source project that builds technology for IoT solutions
- 22%: I have no experience with IoT open source projects
- 22%: I have experimented with IoT open source technology, but don’t use it in IoT solutions
- 19%: I report bugs and feature enhancements to open source projects that provide IoT technology
- 2%: Other

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## IoT Consortia

How would you rank your organization’s perceived importance of the following IoT Consortia to your IoT strategy? (1 = Important, 5 = Never heard of them)

<table>
<thead>
<tr>
<th>Consortium</th>
<th>Important</th>
<th>Neutral</th>
<th>Not Important</th>
<th>Don't Know</th>
<th>Never heard of them</th>
<th>Average rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eclipse IoT</td>
<td>56.89%</td>
<td>21.20%</td>
<td>6.36%</td>
<td>11.31%</td>
<td>4.24%</td>
<td>1.85</td>
</tr>
<tr>
<td>Apache Foundation</td>
<td>44.24%</td>
<td>29.14%</td>
<td>8.63%</td>
<td>16.91%</td>
<td>1.08%</td>
<td>2.01</td>
</tr>
<tr>
<td>W3C</td>
<td>38.72%</td>
<td>31.58%</td>
<td>11.65%</td>
<td>15.79%</td>
<td>2.26%</td>
<td>2.11</td>
</tr>
<tr>
<td>IEEE</td>
<td>37.59%</td>
<td>28.95%</td>
<td>13.53%</td>
<td>18.05%</td>
<td>1.88%</td>
<td>2.18</td>
</tr>
<tr>
<td>IETF</td>
<td>29.02%</td>
<td>26.67%</td>
<td>10.59%</td>
<td>23.53%</td>
<td>10.20%</td>
<td>2.59</td>
</tr>
<tr>
<td>LoRa Alliance</td>
<td>30.80%</td>
<td>23.95%</td>
<td>13.31%</td>
<td>17.49%</td>
<td>14.45%</td>
<td>2.61</td>
</tr>
<tr>
<td>Industrial Internet Consortium (IIC)</td>
<td>19.23%</td>
<td>26.54%</td>
<td>14.23%</td>
<td>24.23%</td>
<td>15.77%</td>
<td>2.91</td>
</tr>
<tr>
<td>Open Mobile Alliance (OMA)</td>
<td>24.03%</td>
<td>22.09%</td>
<td>11.63%</td>
<td>21.32%</td>
<td>20.93%</td>
<td>2.93</td>
</tr>
<tr>
<td>OASIS</td>
<td>13.15%</td>
<td>27.09%</td>
<td>17.13%</td>
<td>25.10%</td>
<td>17.53%</td>
<td>3.07</td>
</tr>
<tr>
<td>Open Connectivity Foundation (OCF)</td>
<td>18.22%</td>
<td>22.48%</td>
<td>13.18%</td>
<td>23.64%</td>
<td>22.48%</td>
<td>3.1</td>
</tr>
<tr>
<td>oneM2M</td>
<td>15.18%</td>
<td>24.51%</td>
<td>15.18%</td>
<td>21.01%</td>
<td>24.12%</td>
<td>3.14</td>
</tr>
<tr>
<td>Thread Group</td>
<td>10.81%</td>
<td>20.08%</td>
<td>15.83%</td>
<td>24.71%</td>
<td>28.57%</td>
<td>3.4</td>
</tr>
<tr>
<td>OpenFog</td>
<td>11.37%</td>
<td>20.00%</td>
<td>10.59%</td>
<td>25.49%</td>
<td>32.55%</td>
<td>3.48</td>
</tr>
</tbody>
</table>
WHO RESPONDED?
**What is your job title?**

- **30%** Developer
- **16%** Architect
- **12%** Development Manager
- **10%** Researcher
- **9%** Independent Consultant
- **8%** Other
- **6%** Executive
- **5%** Product Manager
- **4%** Student
- **3%** Role in sales and/or business development
- **2%** Not currently employed
- **2%** Testing
What is your personal current technology focus within your organization?
How large is the organization you work for (# employees)?

- 1 TO 49: 37.4%
- 50 TO 500: 20.8%
- 501 TO 5,000: 14.8%
- 5,000+: 22.6%
- NOT ASSOCIATED WITH AN ORGANIZATION: 4.4%
Where do you live?

- North America: 17%
- South America: 7%
- Europe: 52%
- Africa + Middle East: 5%
- Asia + Pacific: 19.0%