IoT Developer Survey
April 2016
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.
Key Findings

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
- Java
- JavaScript
- C
- Python

Top IoT messaging protocols
- MQTT
- HTTP
Key Findings

Top IoT Operating System

Linux

Top IoT cloud services

Amazon Web Services

Private cloud

Microsoft Azure
58% actively participate in open source projects for IoT

52% use open hardware for deployment or prototyping

Open IoT
What is your experience with building IoT solutions?

- 38%: I develop IoT solutions for my company
- 19%: I am researching IoT solutions for my company
- 15%: I develop IoT solutions in my spare time
- 8%: I am learning about IoT technology in my spare time
- 18%: No experience
- 3%: Other
What is your personal current technology focus within your organization?
What is your company's plan for IoT solutions?

- My company develops and deploys IoT solutions today: 11%
- My company plans to develop and deploy IoT solutions in the next 6 months: 14%
- My company plans to develop and deploy IoT solutions in the next 7-18 months: 15%
- My company has no plans to develop IoT solutions: 14%
- I don't know: 46%
### Key Industries

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

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

What are your top 2 concerns for developing IoT solutions?

- 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%
What are your top 2 concerns for developing IoT solutions?

- **Performance** becomes a top concern for developing IoT solutions, with 48.30% of respondents highlighting it as a major issue, compared to 47.4% of those who have already deployed solutions.

- **Security** is the most common concern overall, with 31.90% of all respondents and 29.4% of those who have deployed solutions.

- **Interoperability** follows, with 19.70% overall and 22.3% among deployed solutions.

- **Connectivity** is a concern for 19.30% overall and 20.9% of deployed solutions.

- **Integration with Hardware** is a concern for 16.40% overall and 18.6% of deployed solutions.

- **Cost** is a concern for 16.30% overall and 18.6% of deployed solutions.

- **Performance** becomes the third most common concern, with 21% of those who have deployed solutions highlighting it as a major issue, up from 16.3% of all respondents.
TECHNOLOGY USED FOR IoT
For your home automation solution, what framework/platform are you using or plan to use?

- Google Nest: 17%
- Apple HomeKit: 10%
- OpenHAB: 9%
- Eclipse SmartHome: 16%
- Smarthings Hub: 4%
- AllJoyn: 4%
- OIC: 13%
- Custom framework/platform: 5%
- I don’t know: 17%
- Other (please specify): 3%
Which programming languages, if any, do you use to build IoT solutions?
Which operating system(s) do you use for your IoT devices?

- 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?

- 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?

- Amazon AWS: 44.10% (Overall) 36.8% (Deployed)
- Private/On-premise cloud: 41.20% (Overall) 34.9% (Deployed)
- Microsoft Azure: 25.60% (Overall) 20.8% (Deployed)
- Google Cloud Platform: 16.9% (Overall) 12.30% (Deployed)
- IBM Bluemix: 16.9% (Overall) 17.10% (Deployed)
- No cloud service is used: 16.9% (Overall) 12.80% (Deployed)
What connectivity protocol(s) do you use for your IoT solution?
What messaging protocol(s) do you use for your IoT solution?

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

CoAP usage increased for IoT Platforms and Smart Cities
**Industrial Protocols**

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

- **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.?"
IoT Industry Perceptions
**Open Source Policy**

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

- 25.1%: Used but we do not participate or contribute to open
- 16.6%: Used and we contribute bug fixes to open source
- 16.6%: Used and we have developers who work on open
- 24.9%: Fundamental to our business model
- 12.6%: I don’t know
- 3.0%: Not allowed in any part of our IoT solution
### How would you rank your organization’s perceived importance of the following IoT Consortiums to your IoT strategy?

<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>
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<tbody>
<tr>
<td>AllSeen Alliance</td>
<td>38</td>
<td>69</td>
<td>42</td>
<td>73</td>
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<td>Eclipse IoT</td>
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<td>IEEE</td>
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<td>IETF</td>
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<td>Industrial Internet Consortium (IIC)</td>
<td>48</td>
<td>90</td>
<td>42</td>
<td>72</td>
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<td>LoRa Alliance</td>
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<td>OASIS</td>
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<td>Open Interconnect Consortium (OIC)</td>
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<td>79</td>
<td>39</td>
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<td>OMA</td>
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<td>78</td>
<td>36</td>
<td>74</td>
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<td>Thread</td>
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<td>81</td>
<td>41</td>
<td>71</td>
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<td>W3C</td>
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<td>38</td>
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<td>13</td>
<td>2.17</td>
</tr>
</tbody>
</table>

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Top IoT Corporate Leaders
WHO RESPONDED?
How large is the organization you work for?

- 1 to 49 employees, 50%
- 50 to 500 employees, 13%
- 501 to 5000 employees, 15%
- More than 5000 employees, 15%
Where do you live?

- Europe: 59%
- North America: 19%
- Asia and Pacific: 14%
- South America: 6%
- Middle East: 1%
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
<table>
<thead>
<tr>
<th></th>
<th>Combined</th>
<th>Eclipse IoT</th>
<th>AGILE IoT, IEEE IoT, others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embedded Technology Focus</td>
<td>24.9%</td>
<td>30%</td>
<td>19.1%</td>
</tr>
<tr>
<td>I develop IoT Solutions for my company</td>
<td>37.9%</td>
<td>46.3%</td>
<td>28.3%</td>
</tr>
<tr>
<td>My company develops and deploys IoT solutions today</td>
<td>45.7%</td>
<td>53.1%</td>
<td>37.9%</td>
</tr>
<tr>
<td>Top Languages</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Java (51.9%)</td>
<td>Java (59.6%)</td>
<td>C (50.5%)</td>
</tr>
<tr>
<td></td>
<td>C (47.7%)</td>
<td>C (45.4%)</td>
<td>Python (47.9%)</td>
</tr>
<tr>
<td></td>
<td>JavaScript (41.8%)</td>
<td>JavaScript (43.3%)</td>
<td>Java (42%)</td>
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<tr>
<td>Message Protocols</td>
<td>HTTP (61.2%)</td>
<td>HTTP (61.8%)</td>
<td>HTTP (65.1%)</td>
</tr>
<tr>
<td></td>
<td>MQTT (52.4%)</td>
<td>MQTT (58.1%)</td>
<td>HTTP (58.1%)</td>
</tr>
<tr>
<td>Key Roles</td>
<td>Developer (30.1%)</td>
<td>Developer (34.1%)</td>
<td>Developer (25.1%)</td>
</tr>
<tr>
<td></td>
<td>Architect (16.1%)</td>
<td>Architect (19.4%)</td>
<td>Researcher (16%)</td>
</tr>
<tr>
<td></td>
<td>Dev Mgr(12%)</td>
<td>Dev. Mgr (12.4%)</td>
<td>Architect (12%)</td>
</tr>
<tr>
<td>Location</td>
<td>Europe (58.6%)</td>
<td>Europe (56.2%)</td>
<td>Europe (61.5%)</td>
</tr>
<tr>
<td></td>
<td>NA (19.4%)</td>
<td>NA (24.4%)</td>
<td>NA (14.4%)</td>
</tr>
<tr>
<td></td>
<td>AP (14.1%)</td>
<td>AP (13.8%)</td>
<td>NA (13.2%)</td>
</tr>
</tbody>
</table>