2020 Mbed Developer Survey Key Findings
Key findings

- Mbed community consists of skilful embedded software developers. 44% of our community use Mbed for professional purposes.

- 70% of our professional developers are familiar with IoT, 63% of them use Mbed to build IoT projects.

- Over 80% of IoT projects built with Mbed can be moved into production in 12 months.

- Industrial automation and smart spaces are the top 2 areas that Mbed is used for.

- Around half of Mbed users have already adopted Mbed OS 6.
Key findings

• Mbed Studio has become the most popular IDE for professionals and hobbyists, though Mbed Online Compiler is still heavily used by academics.

• Security is an important issue in the IoT industry. Over 50% of companies work on IoT projects are likely to increase BOM to protect against malicious firmware update and unauthorized use.

• AWS (47%), Azure (27%), and Google (21%) are the top 3 cloud services used by professional Mbed developers.

• More than half of our hobbyist developers said building Mbed project helps them learn new skills, which will benefit their career.
Introduction

Available in English, Japanese, Simplified Chinese, and Traditional Chinese, the 2020 Mbed Developer Survey was actively promoted on the Mbed website during 11th Nov to 31st Dec 2020. In total, we received 1,306 responses from over 72 countries/regions.

Since we started running the Mbed Developer Survey in 2017, this survey has gradually become an important source to inform product strategies. By reading this report, you are able to get an updated view of the whole Mbed community, the things in use, and the challenges and considerations that Mbed developers have in the development process.
Section 1

The Mbed community
Who are the Mbed community?

Mbed community mainly consists of three types of users: professionals, hobbyists, and academics.

In 2020, 44% of our users use Mbed to build solutions that were already in production or have the potential to be moved into production.
Where are Mbed developers?

Mbed developers are coming from all over the world.

The top 5 countries with the most respondents in this survey are the USA, Japan, China, India, and the UK, which resembles our data from Google Analytics in the last 6 months.
A pool of skilful embedded software developers

79% of our survey respondents indicated their embedded software development skill is above intermediate level.

For the professionals, 93% of them are above intermediate level.
### Skills of Mbed developers

**IoT skills are particularly popular among the professionals**

70% of the professionals reported their IoT skill level is above intermediate.

**Our community is still catching up with ML skills, lecturers are most skillful group in ML**

71% of survey respondents have no ML skills or are at beginner level, while 47% of lecturers are above intermediate level.

<table>
<thead>
<tr>
<th></th>
<th>Professionals</th>
<th>Hobbyists</th>
<th>Lecturers</th>
<th>Students</th>
<th>All</th>
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<tbody>
<tr>
<td><strong>IoT architecture</strong></td>
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<tr>
<td>Professionals</td>
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<td>All</td>
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</tbody>
</table>

**No experience** | **Beginner** | **Intermediate** | **Advanced** | **Expert**

70% of the professionals reported their IoT skill level is above intermediate.

Our community is still catching up with ML skills, lecturers are most skillful group in ML.

71% of survey respondents have no ML skills or are at beginner level, while 47% of lecturers are above intermediate level.
Roles in decision making

93% of professionals are involved in the decision making process on hardware, OS, and tools.

- I make the final decision for my team/company: 93%
- I make recommendations or influence decision makers: 30%
- I am responsible for specifications: 10%
- I am not involved in selection/purchase decisions: 0%
Company sizes of Mbed professional users

<table>
<thead>
<tr>
<th>Company Size</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Individual consultant</td>
<td>10%</td>
</tr>
<tr>
<td>&lt; 10 employees</td>
<td>58%</td>
</tr>
<tr>
<td>11 - 50 employees</td>
<td>11%</td>
</tr>
<tr>
<td>51 - 250 employees</td>
<td>15%</td>
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<td>251 - 500 employees</td>
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<td>501 - 1000 employees</td>
<td>5%</td>
</tr>
<tr>
<td>&gt; 1000 employees</td>
<td>5%</td>
</tr>
<tr>
<td>I prefer not to say</td>
<td>5%</td>
</tr>
</tbody>
</table>

58% of professionals work in small size companies.
What projects are built with Mbed?

63% IoT & IoT + ML

Top 5 categories

- Industrial automation
- Smart cities/buildings/homes
- Healthcare
- Utilities & Energy
- Automotive
Production status of Mbed projects

At the time we ran the Mbed survey, 36% professional developers indicated their projects were already in production, with 51% professionals reporting their projects will be in production in the next 12 months.
Most Mbed projects can be moved into production in under 12 months.
Section 2

Versions, technologies and tools in use
Mbed OS versions in use

Around half of Mbed users have already adopted Mbed OS 6.

The usage of Mbed OS 2 has dropped, although it is still used by 1/5 of hobbyists and academics.
Flash and RAM

Flash

RAM

<table>
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<th>Category</th>
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<th>Hobbyist</th>
<th>Academic</th>
<th>Don't know</th>
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</thead>
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<td>2%</td>
<td>29%</td>
<td>43%</td>
<td>2%</td>
</tr>
<tr>
<td>64 - 256 kB</td>
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<td>2%</td>
</tr>
<tr>
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<td>3%</td>
</tr>
<tr>
<td>&gt; 1MB</td>
<td>2%</td>
<td>3%</td>
<td>0%</td>
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<table>
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<th>Hobbyist</th>
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<td>25%</td>
</tr>
<tr>
<td>65 - 256 kB</td>
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<td>25%</td>
<td>30%</td>
<td>35%</td>
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<tr>
<td>&gt; 256 kB</td>
<td>30%</td>
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<td>40%</td>
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<tr>
<td>Don't know</td>
<td>45%</td>
<td>40%</td>
<td>35%</td>
<td>30%</td>
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</tbody>
</table>
Top 5 development tools in use

Select all that apply

Mbed Studio has become the most popular development tool for professionals and hobbyists.

Mbed Online Compiler is particularly popular in educational use.

Apart from Mbed Studio, Visual Studio and Mbed CLI are also popular among professional users.
Top 3 debug adaptors in use

Select all that apply

ST-Link is the most popular debug adaptor among all types of Mbed developers.

J-Link is another popular choice for professionals.
Top 5 connectivity technologies in use
Select all that apply

- Wi-Fi
- Bluetooth Low Energy
- Cellular/NB-IoT
- Ethernet
- LoRa

Cellular is particularly popular among professionals
Top 3 cloud services in use
Select all that apply

- AWS
- Google
- Azure

AWS and Azure are popular choices for professionals, while Google is popular among hobbyists and academics.
Toolchains in use

Select all that apply
Testing tools in use

Automated testing is not widely conducted by Mbed developers.

Compared with hobbyists and academics, professionals are more likely to include automated testing in their development process.
Section 3
Behaviours, attitude, and Feedback
Adoption of automated testing

Professionals who work on IoT projects, and who work for large organisations, are more likely to adopt automated testing in their development process.
How do Mbed professionals select MCU for their projects?

Select up to 4 answers

Development tools, OS support, and able to reuse code easily are the key values Mbed ecosystem offers in the MCU selection process.

Top 5 considerations

- Features
- Availability of development tools and SDKs
- Cost
- OS support
- Code reuse
Likelihood of increasing BOM for common security threats

Device counterfeiting and device software IP leak are the common security threats that could happen in both IoT and non-IoT projects.

Companies work on IoT projects are more likely to increase BOM to protect against security threats.
Over 50% of companies working on IoT projects are likely to increase BOM to protect against malicious firmware update and unauthorized use.
What motivated our hobbyist users?

Select all that apply

I enjoy building projects

It helps me develop new skills which will benefit my career

I’m exploring a potential new business idea

I like to share my projects with the developer community

Our hobbyist community mainly consists of self-driven developers who enjoy building projects.

More than half of them indicated building Mbed projects helps developing new skills, which will benefit their career.
Top challenges for building non-IoT projects

Non-professional developers

- **Documentation**: 30%
- **Setting up development environment**: 40%
- **Build system**: 30%

Professional developers

- **Setting up development environment**: 40%
- **Long term support of Mbed OS**: 30%
- **Platform support**: 20%
Top challenges for building IoT projects

Non-professional developers

- Setting up development environment
- Build system
- Platform support

Professional developers

- Code size (i.e., ROM and RAM footprint)
- Documentation
- Power consumption
Top 5 most wanted features to improve productivity
Select up to 4 options

Interface for device configuration tools (e.g., STCubeMX, MCUXpresso, etc.)
Make code reuse easier
Make it easier to add 3rd party libraries
Make it easier to keep libraries up to date
On-host development (using a simulator)
Thank You
Danke
Gracias
谢谢
ありがとう
Asante
Merci
감사합니다
धन्यवाद
Kiitos
شكرًا
ধন্যবাদ
תודה