ASPENCORE

2019 Embedded Markets Study

Integrating IoT and Advanced Technology Designs, Application Development & Processing Environments

March 2019

Presented By: EETimes embedded

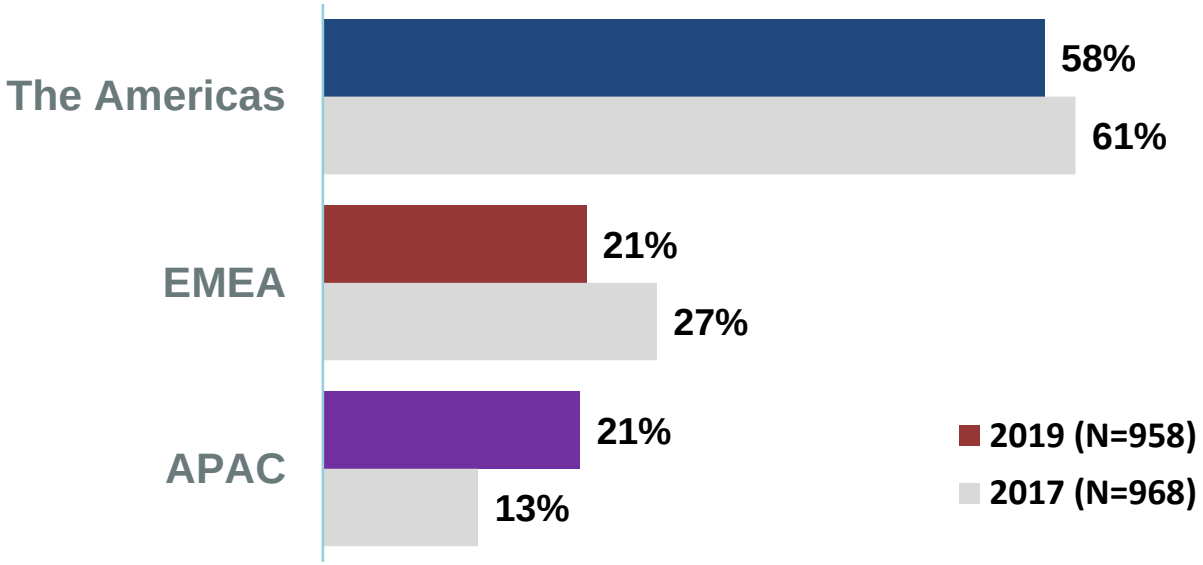
Preliminary Comments

- **Results:** Data from this study is highly projectable at 95% confidence with +/-3.15% confidence interval. Other consistencies with data from previous versions of this study also support a high level of confidence that the data reflects accurately the EETimes and Embedded.com audience's usage of advance technologies, software and hardware development tools, chips, operating systems, FPGA vendors, and the entire ecosystem of their embedded development work environment and projects with which they are engaged.
- **Historical:** The EETimes/Embedded.com Embedded Markets Study was last conducted in 2017. This report often compares results for 2019 to 2017 and in some cases to 2015 and earlier. This study was first fielded over 20 years ago and has seen vast changes in technology evolution over that period of time.
- **Consistently High Confidence:** Remarkable consistency over the years has monitored both fast and slow moving market changes. A few surprises are shown this year as well, but overall trends are largely confirmed.
- **New Technologies and IoT:** Emerging markets and technologies are also tracked in this study. New data regarding IoT and advanced technologies (IIoT, embedded vision, embedded speech, VR, AR, machine learning, AI and other cognitive capabilities) are all included.

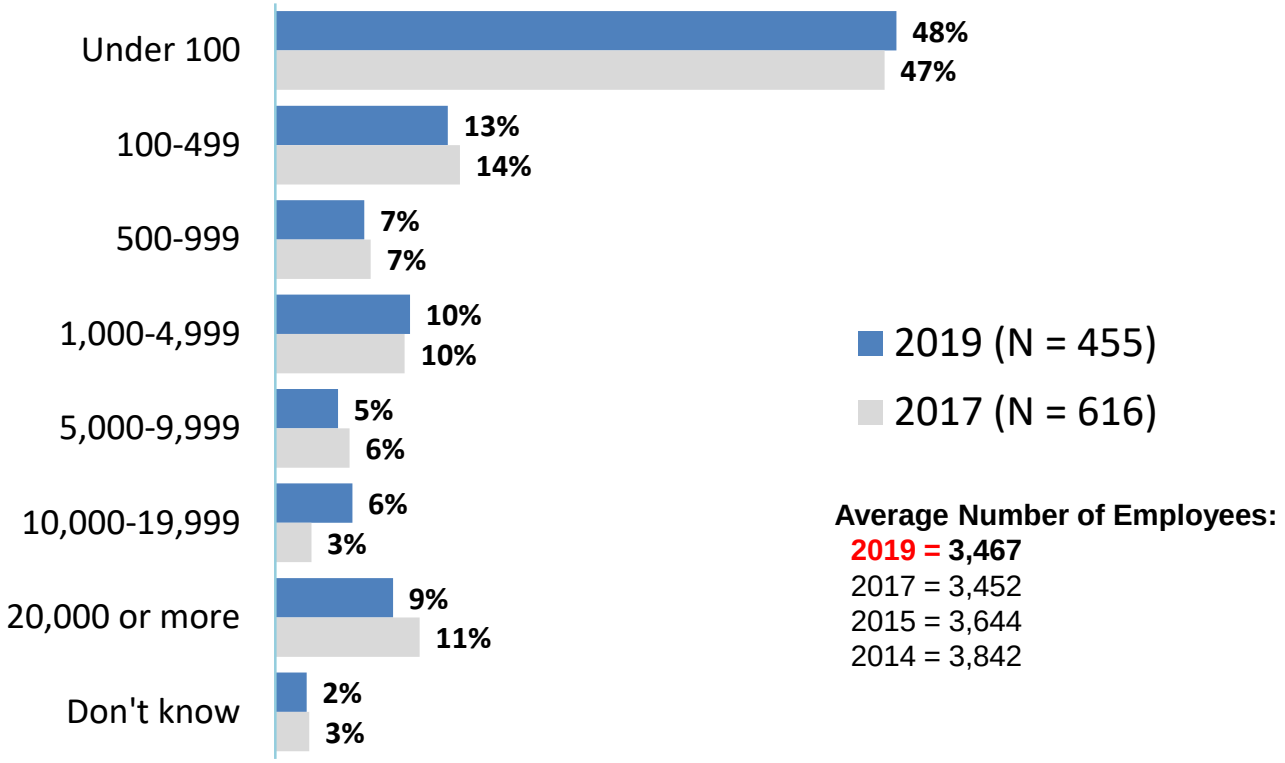
Purpose and Methodology

- **Purpose:** To profile the findings of the 2019 Embedded Markets Study comprehensive survey of the embedded systems markets worldwide. Findings include *technology* used, all aspects of the *embedded development process*, *IoT, emerging technologies, tools* used, *work environment*, *applications developed for*, *methods/ processes*, *operating systems used*, *reasons for using chips and technology*, and *brands* and *specific chips* being considered by embedded developers.
- **Methodology**: A web-based online survey instrument based on the 2017 survey was developed and implemented by independent research company Wilson Research Group. It was fielded on January 29, 2019, and closed March 7, 2019.
- **Sample:** E-mail invitations were sent to subscribers to EETimes and Embedded.com and AspenCore related brands with reminder invitations sent at 5-7 day intervals. Each invitation included a link to the survey and incentives to participate.
- **Returns:** This data is based on 958 valid respondents for an overall confidence of 95% +/-3.15%. Confidence levels vary by question. Confidences for questions with:
  - **958 respondents for 2019 = 95% +/- 3.15%**
  - **1,234 respondents for 2017 = 95% +/- 2.8%**
  - 600 respondents = 95% +/- 4.0% = high confidence, fairly tight margin of error
  - 400 respondents = 95% +/- 5.0% = high confidence, standard margin of error
  - 300 respondents = 95% +/- 5.5% = high confidence, with slightly wider margin of error
  - 200 respondents = 95% +/- 6.7% = high confidence, with still wider margin of error

In which region of the world do you reside?



How many employees does your company have at all locations?



Average Number of Employees:

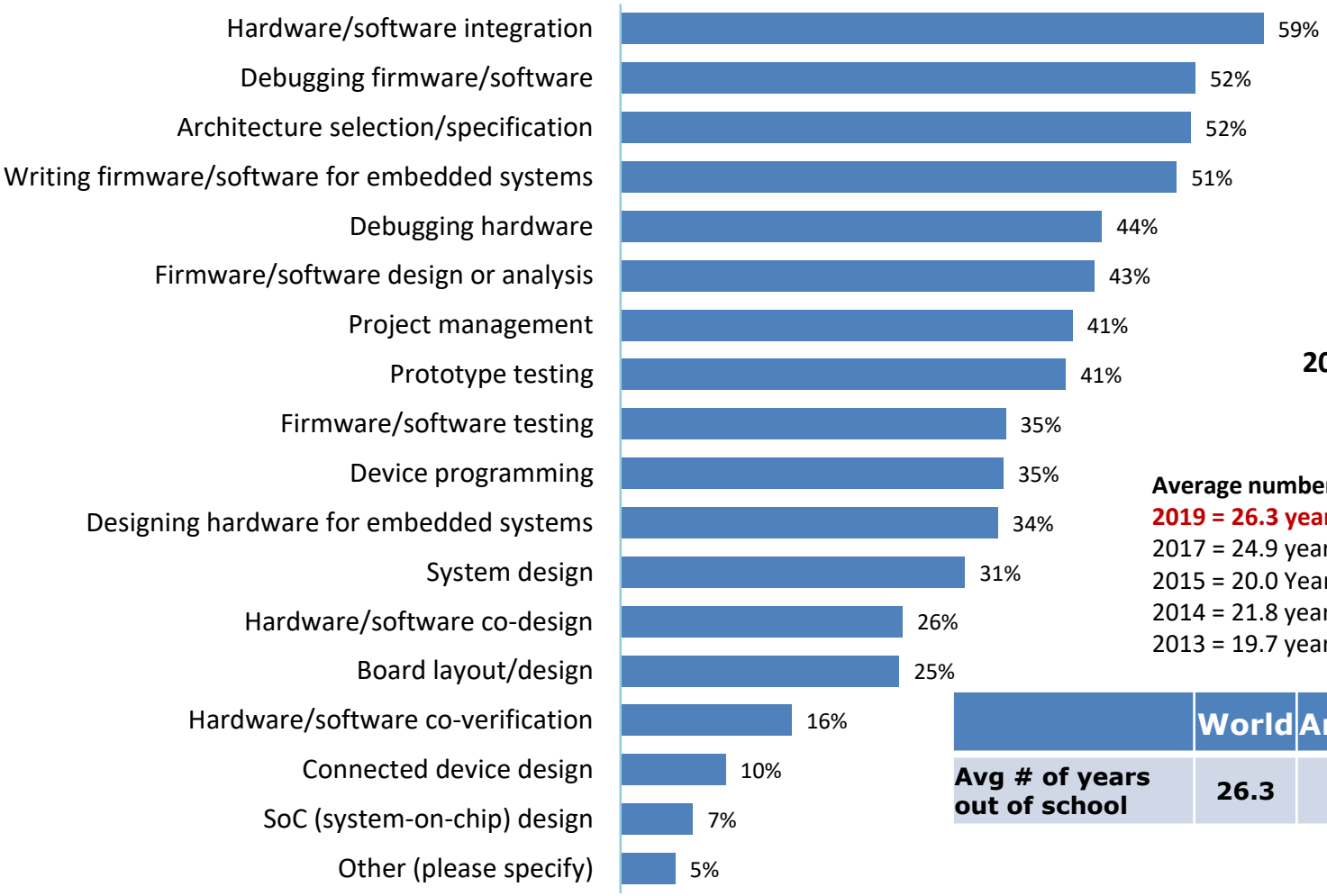
2019 = 3,467

2017 = 3,452

2015 = 3,644

2014 = 3,842

Job Functions



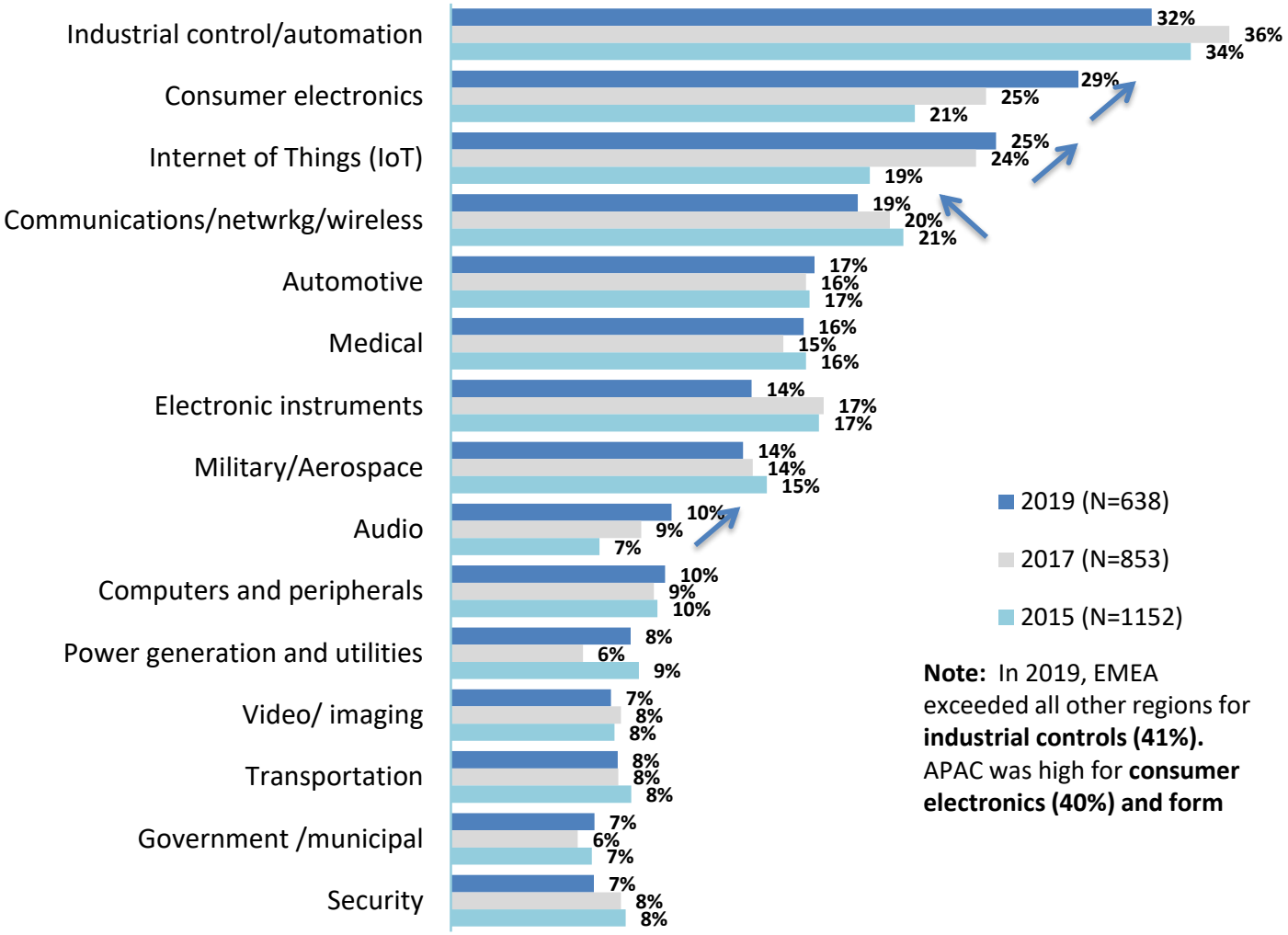
2019 (N = 456)

Average number of years out of school:

2019 = 26.3 years
2017 = 24.9 years
2015 = 20.0 Years
2014 = 21.8 years
2013 = 19.7 years

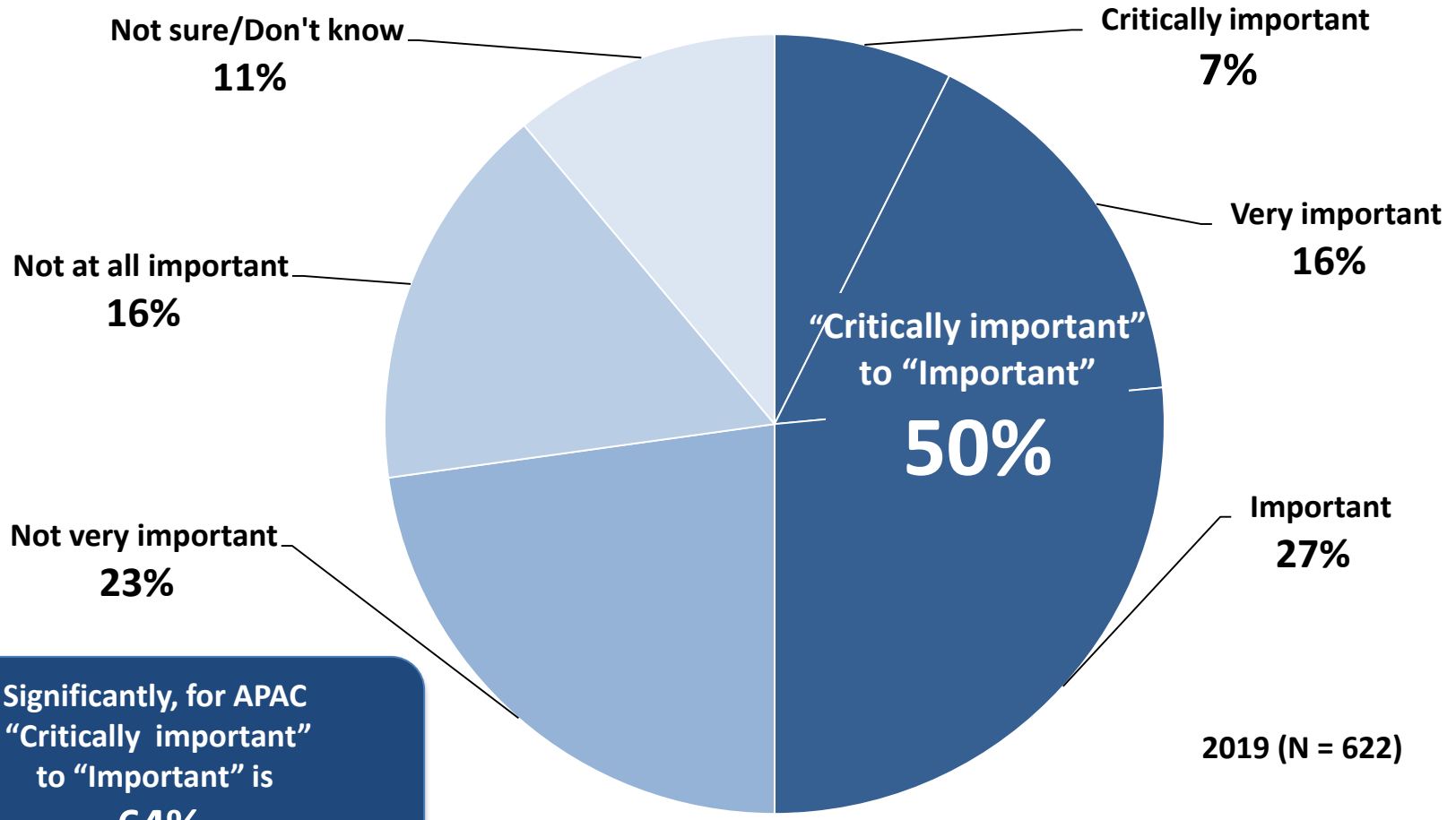
	World	Americas	EMEA	APAC
Avg # of years out of school	**26.3**	**28.3**	**23.2**	**21.9**

For what types of applications are your embedded projects developed?



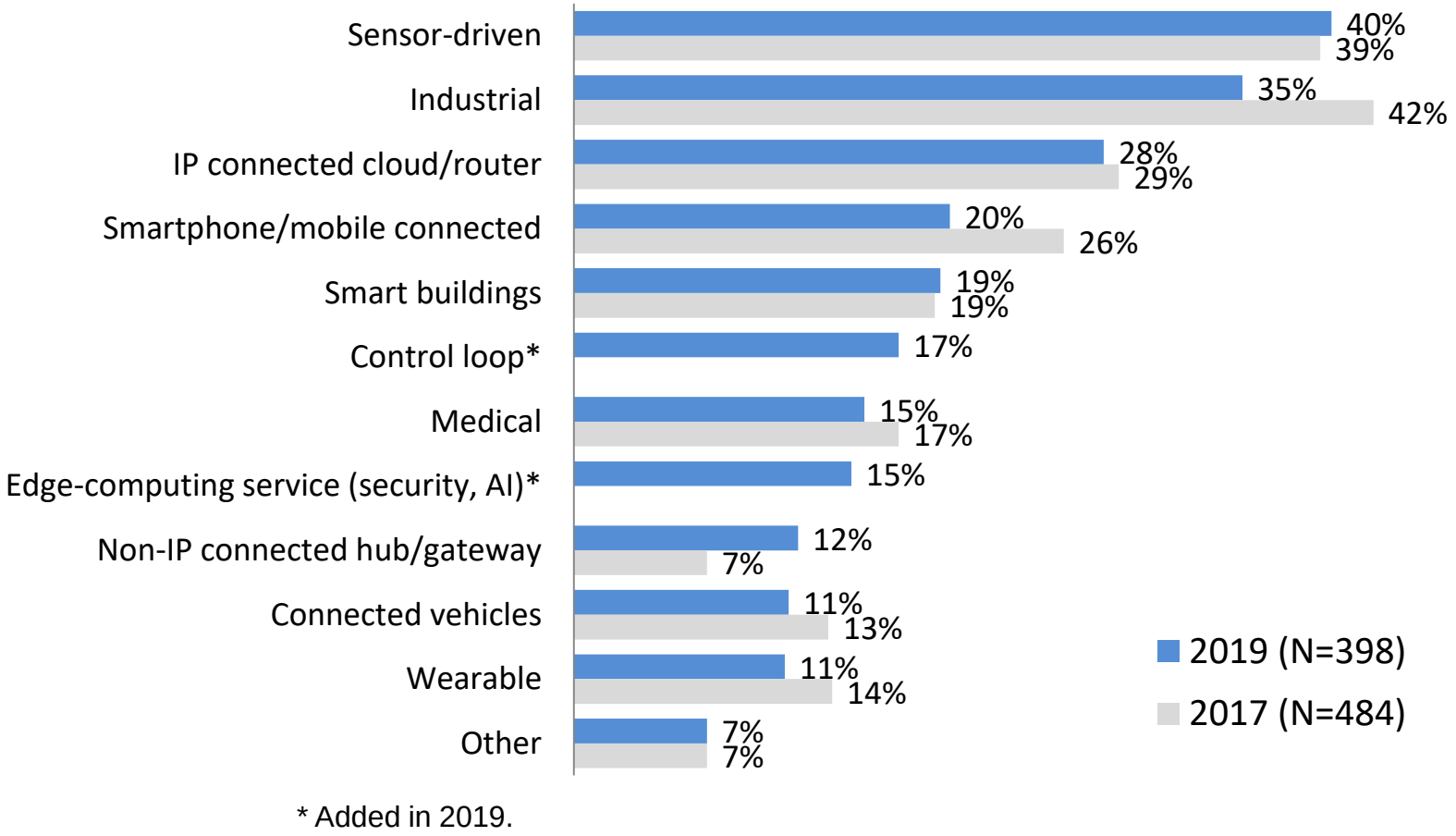
Note: In 2019, EMEA exceeded all other regions for **industrial controls (41%).** APAC was high for **consumer electronics (40%) and form**

How important will IoT development be to you and your organization in the next 12 months?



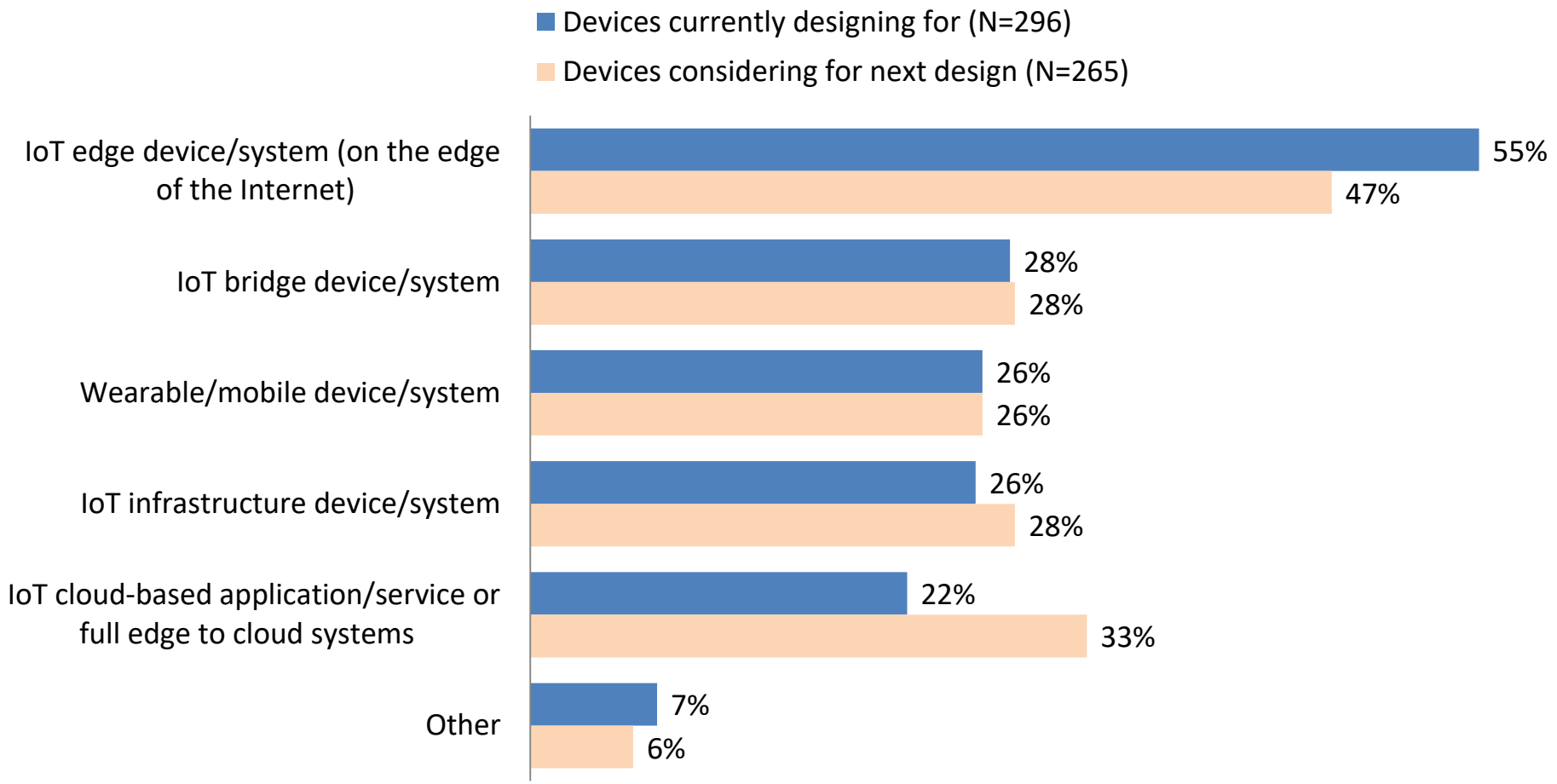
Significantly, for APAC "Critically important" to "Important" is **64%**

If you are developing Internet of Things (IoT) applications, please indicate the type of application.

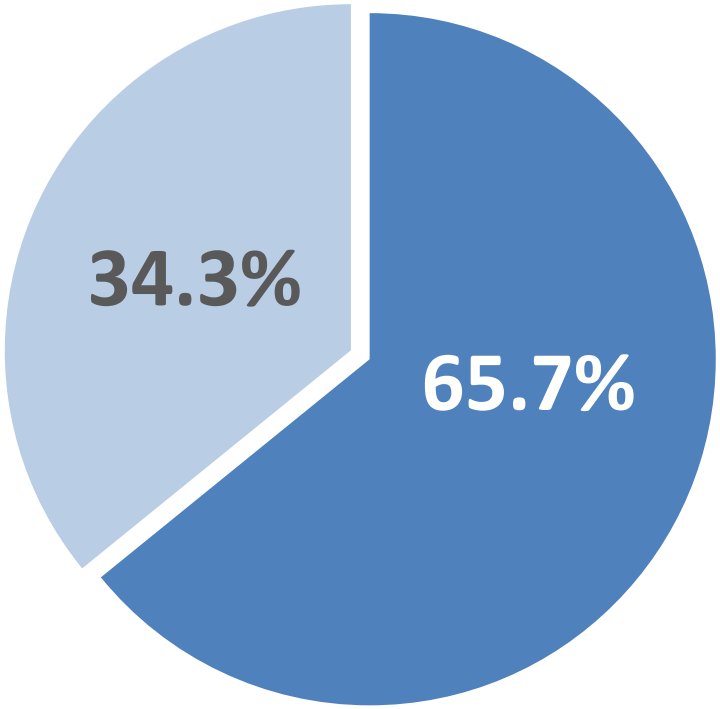


* Added in 2019.

If you are creating Internet of Things (IoT) devices, please indicate the types of devices you are *currently* designing and *considering* for your next design.



Will have one or more projects devoted to IoT.



21% of all projects will be primarily devoted to IoT.

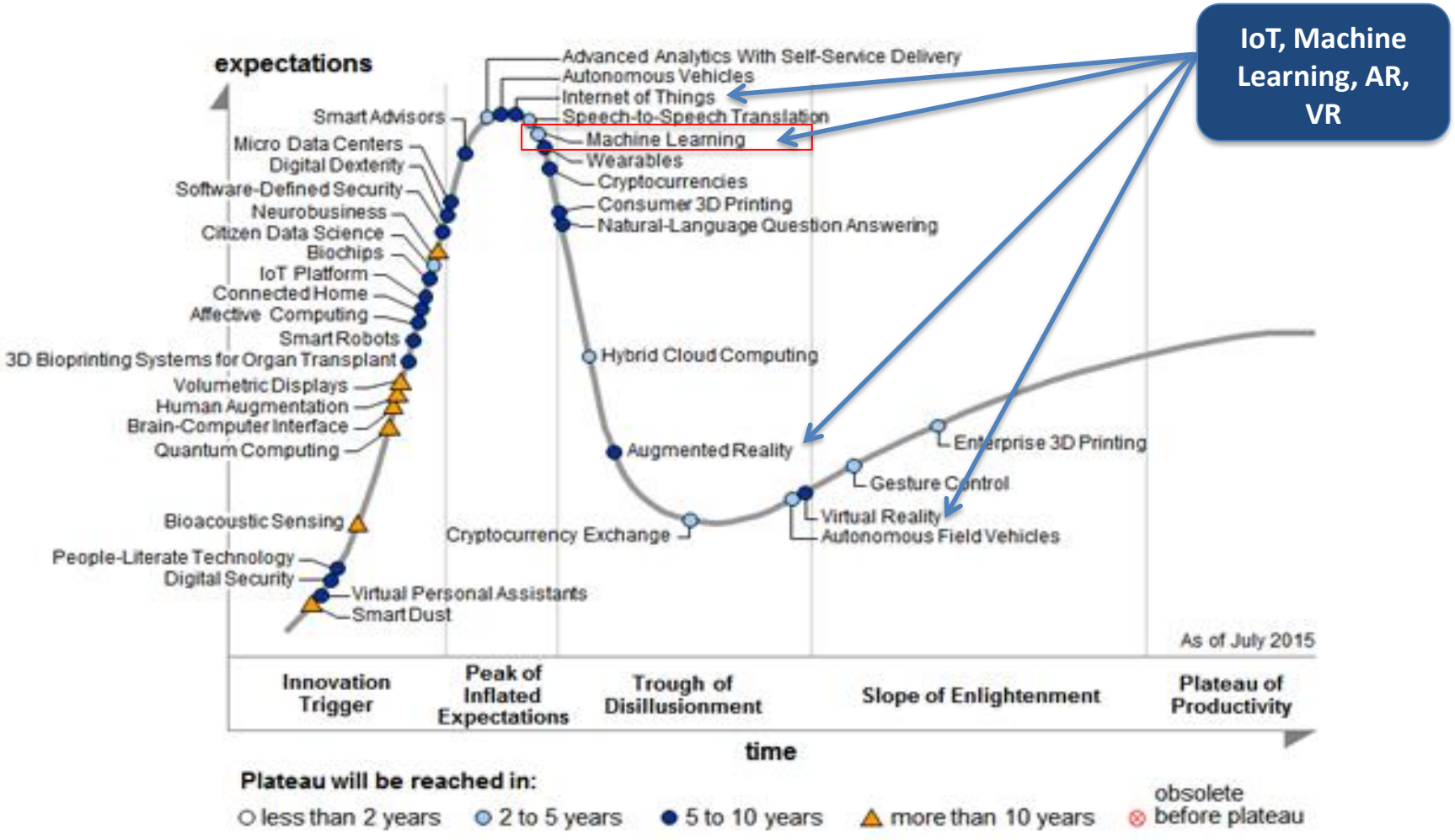
- Will have one or more projects devoted to IoT
- No projects devoted to IoT

2019 (N = 424)

Considering all applications of which you are aware, what do you regard as the most interesting use of the IoT? (Selected write-in responses from 2019 & 2017).

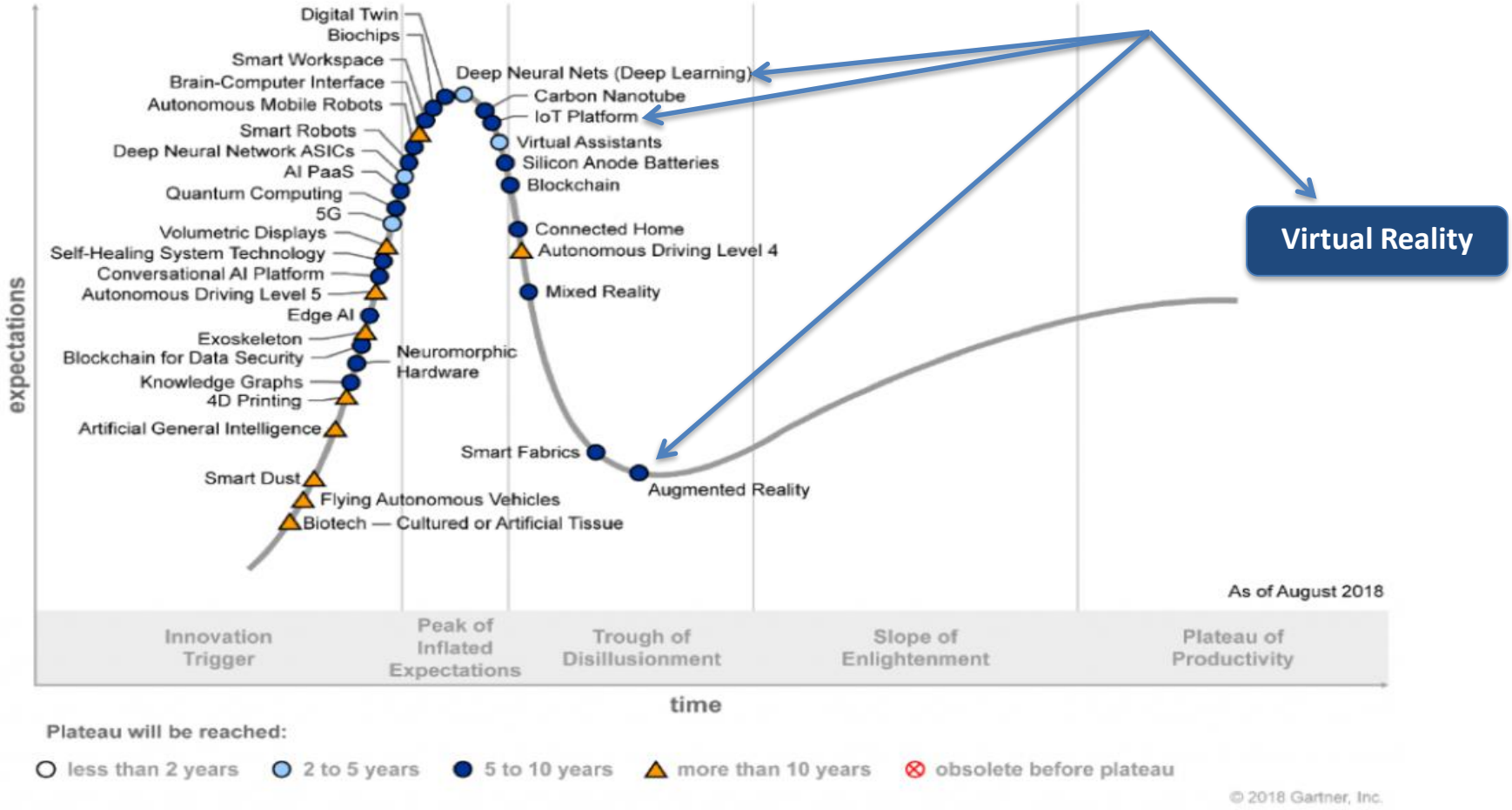
- *Automatic **traffic control.***
- ***AR/VR** -- Augmented Reality/Virtual Reality.*
- *Connected automated **houses/buildings.***
- *Connected/autonomous **vehicles.***
- *Detecting location: providing **original content** by screen, audio, phone.*
- *Distributed sensing for diagnostics and control. Think of sensors that **detect bearing, failures in rotating machinery, bridges, roadways, factory lines** etc.*
- *Environment monitoring/ global electrical **energy consumption reduction.***
- *Intelligent industrial machines, **predictive maintenance** of industrial components.*
- ***Remote medical** information/**diagnostic** integration, medical devices.*
- *Real-time sensing (**road conditions, power grid data, total-plant monitoring**).*
- ***Earthquake/seismic** monitoring signaling building evacuations in time to save lives.*
- ***Drones; remote control** and monitoring.*
- ***Security** within IOT - the technology is totally insecure.*
- *Smart cities, smart factories, **precision agriculture**, pest management in farming.*
- ***Brain waves to control wheelchair** movement. Opportunities endless and scary.*
- *Wireless monitor for **underground** water.*

Gartner Hype Cycle for Emerging Technologies 2015



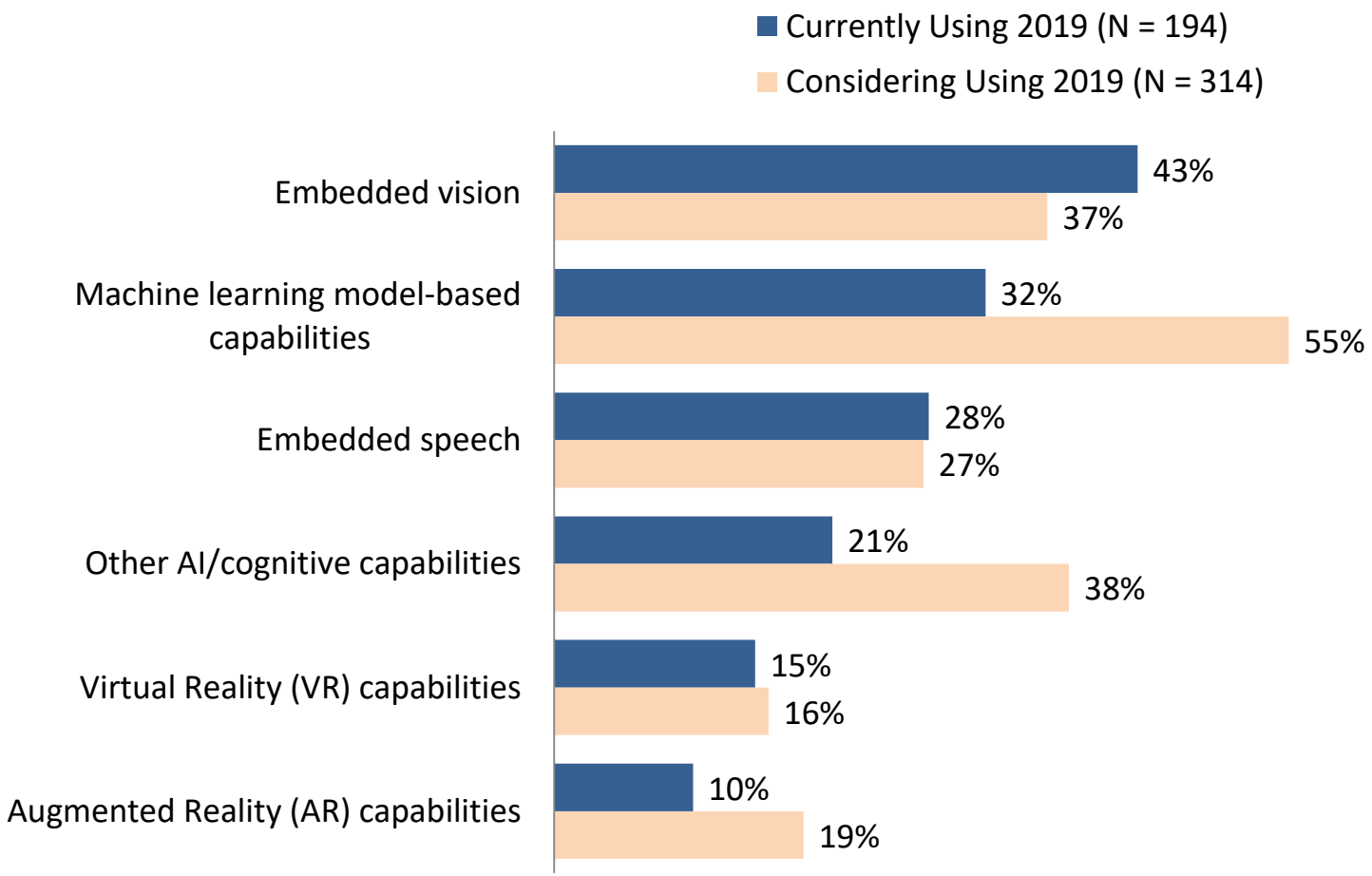
2015: Machine Learning and IoT at peak of hype! AR is in disillusionment, VR moving towards productive implementations!

Gartner Hype Cycle for Emerging Technologies 2018



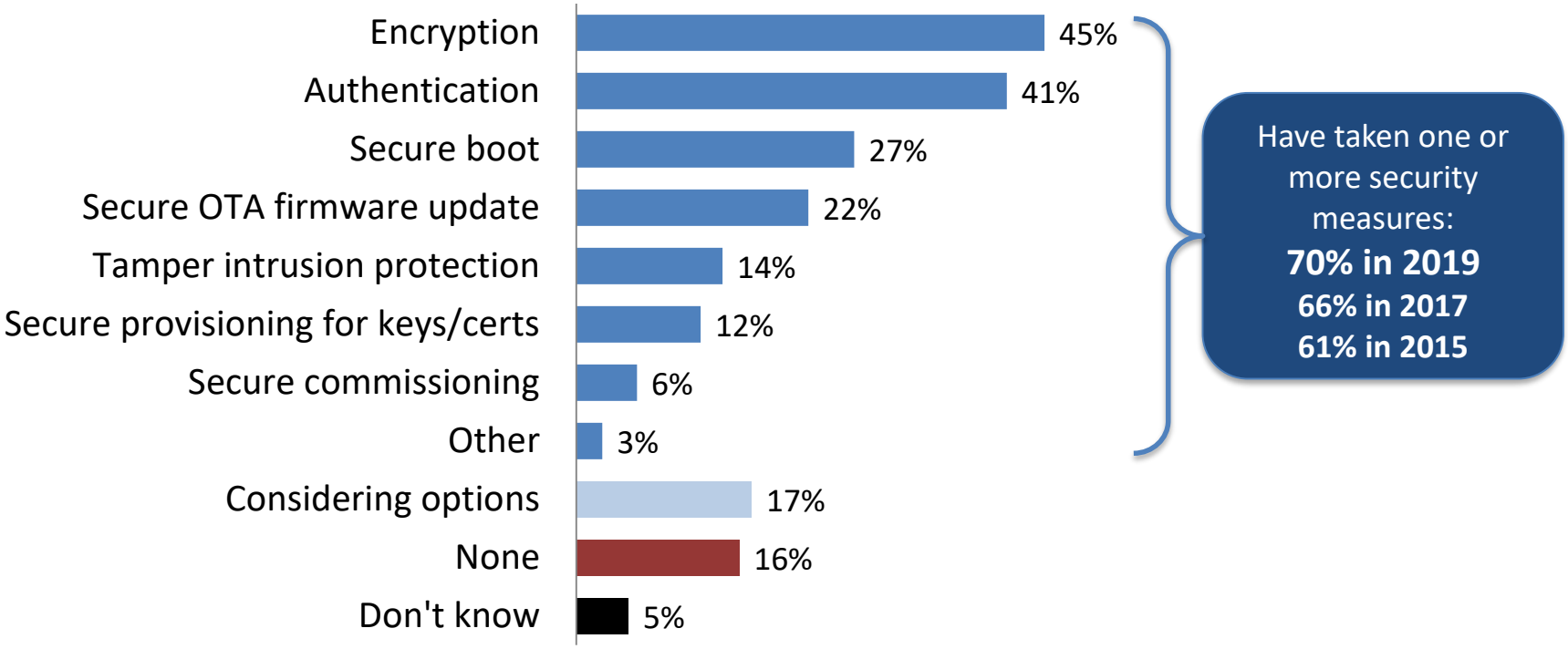
2018: Machine Learning (Deep Neural Nets) and IoT still at Peak Hype! AR has moved along only slightly, and VR is out of hype stage and into productivity.

Are you using any of these advanced technologies in your embedded systems?



68%
of EMEA users are considering using Machine Learning

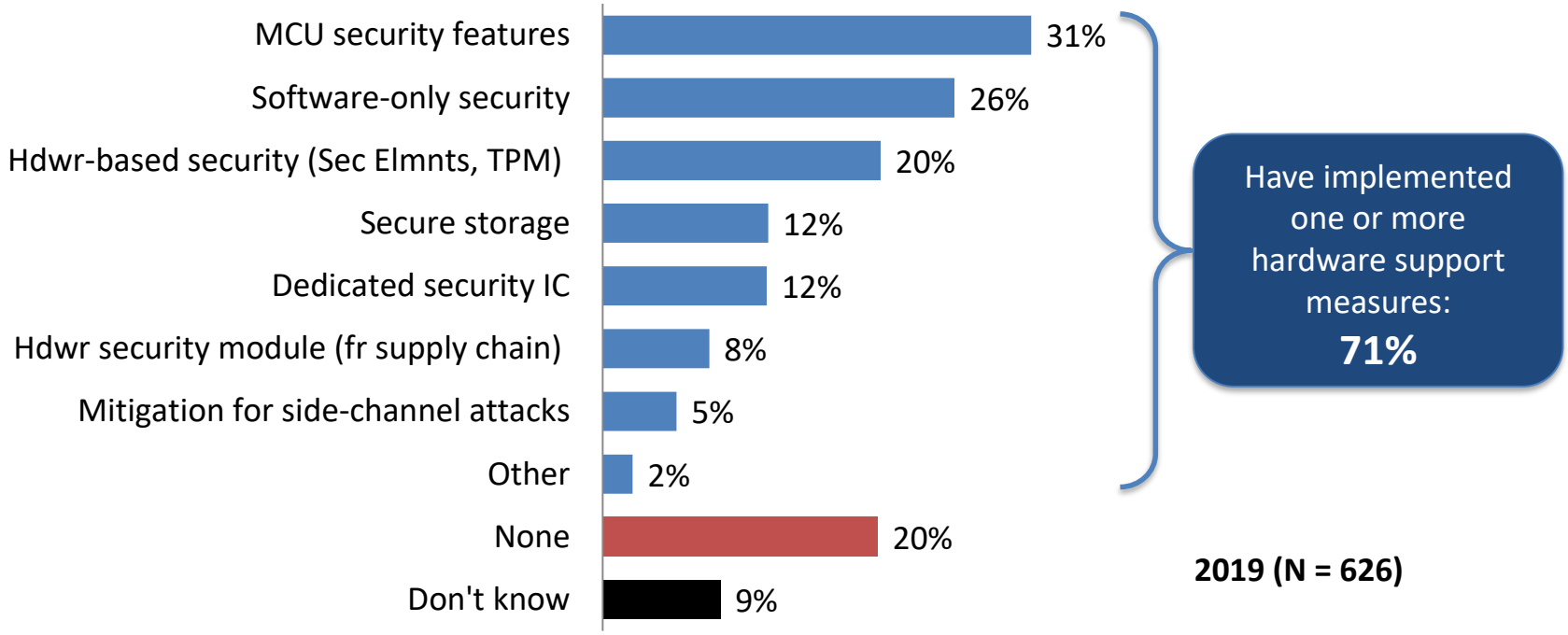
What security measures are you incorporating into your current design?



EMEA uses **Encryption** significantly more than other regions **(49%).**

NEW IN 2019

What hardware support measures are you implementing into your current design?



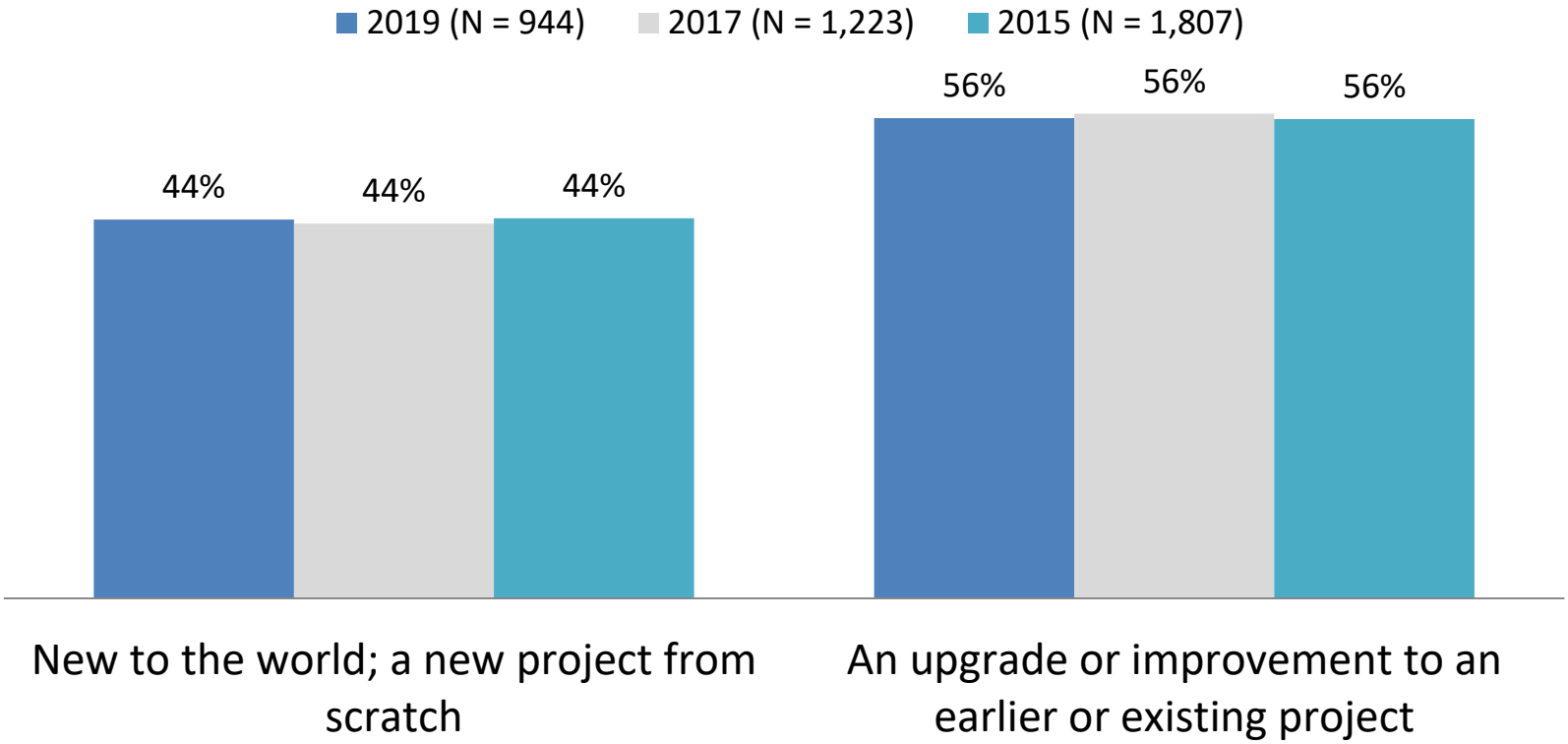
Overall Background

KEY TAKE AWAY

- **Focus –** IoT, AI, AV, AR and other advanced technologies focus.
- **World Regions –**The Americas (58%), EMEA at (21%), and APAC at (21%).
- **Company Size –** Avg of 3,467 employees. Americas (4,091), EMEA (1,858), APAC (3,034).
- **Number of Years Out of School:** Average years out of school for the 2019 is 26.3.
- **Job functions –** Hardware/software integration (59%), debugging (52%), architecture design (52%), writing firmware/software (51%) were top four job functions.
- **Applications Developed –** Top three apps were *Industrial controls (32%)*, *consumer electronics (29%)* and *Internet of Things (25%)* remained even with 2017.
- **IoT Usage/Advanced Technologies –** Half (50%) of users feel IoT will be *important to critically important* in 2019 (same as 2017), but among APAC users it is **64%**. **IoT apps** include *sensor driven (40%)*, *industrial (35%)*, *IP connected cloud (28%)*, *smart phone/mobile (20%)* and *smart buildings (19%)*.
- **Advanced technology** used most was *embedded vision (43%).* M*achine learning (55%)* has greatest potential. 55% are creating IoT edge of the internet devices. 66% will have one or more projects devoted to IoT.
- **Security –** 70% of respondents are taking software security measures: *45% encryption*, *41% authentication*. 71% used hardware support measures, which included MCU security at 31%.

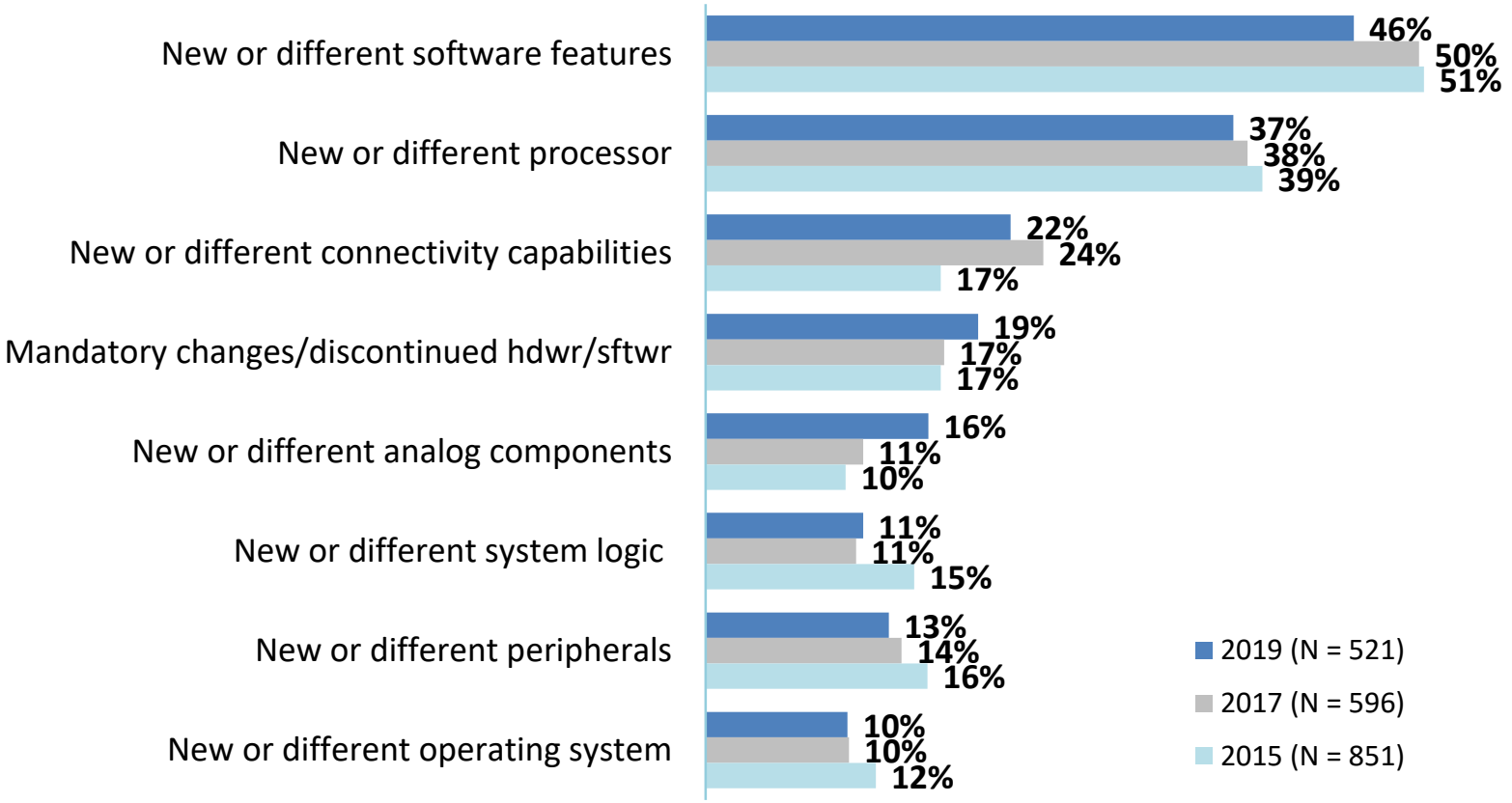
Current Embedded Design Environment

My current embedded project is…



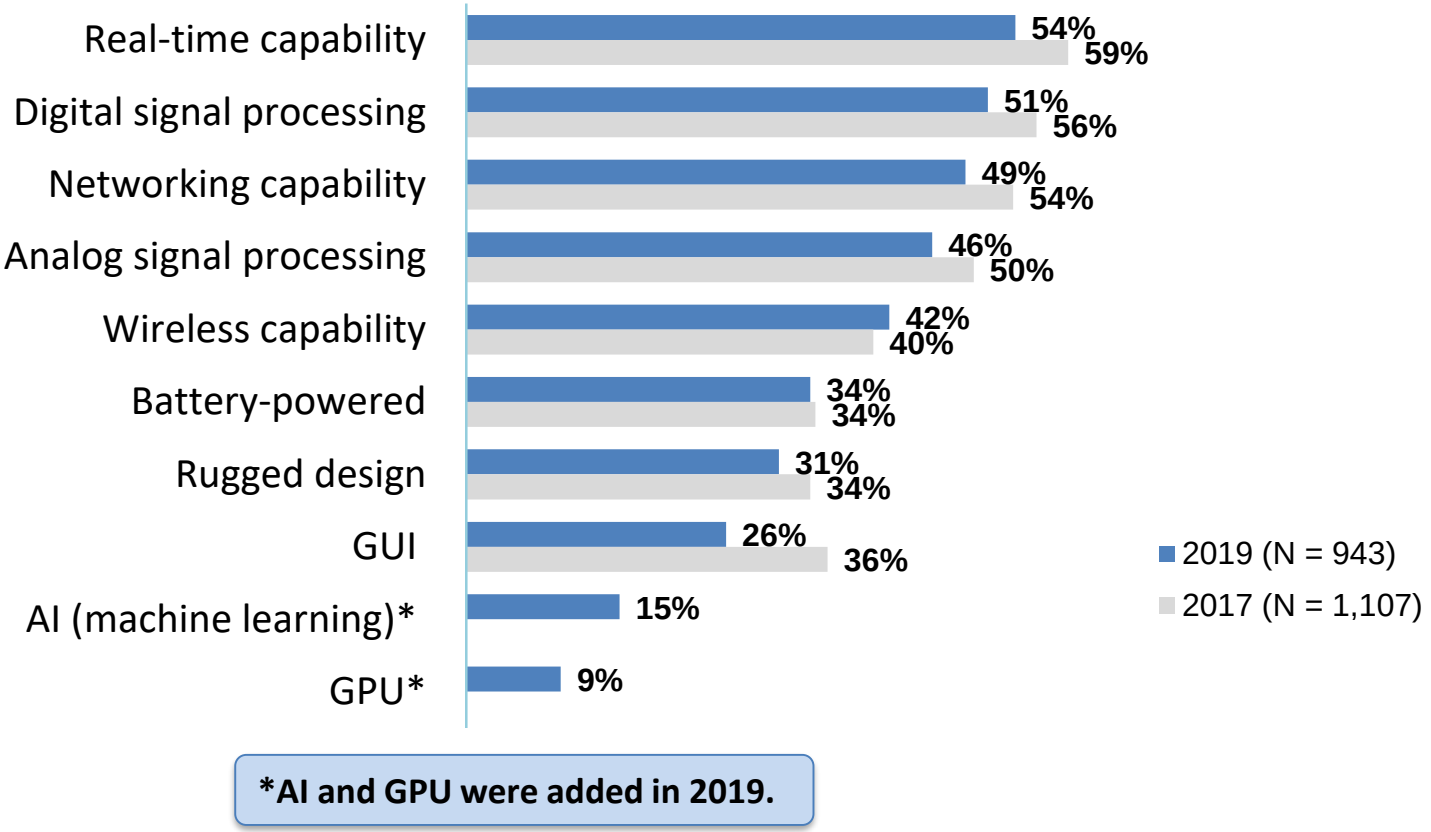
In 2019, APAC ratio of "New to the World" vs "Upgrade" was 40%/60%.

What does the upgrade or improvement include?



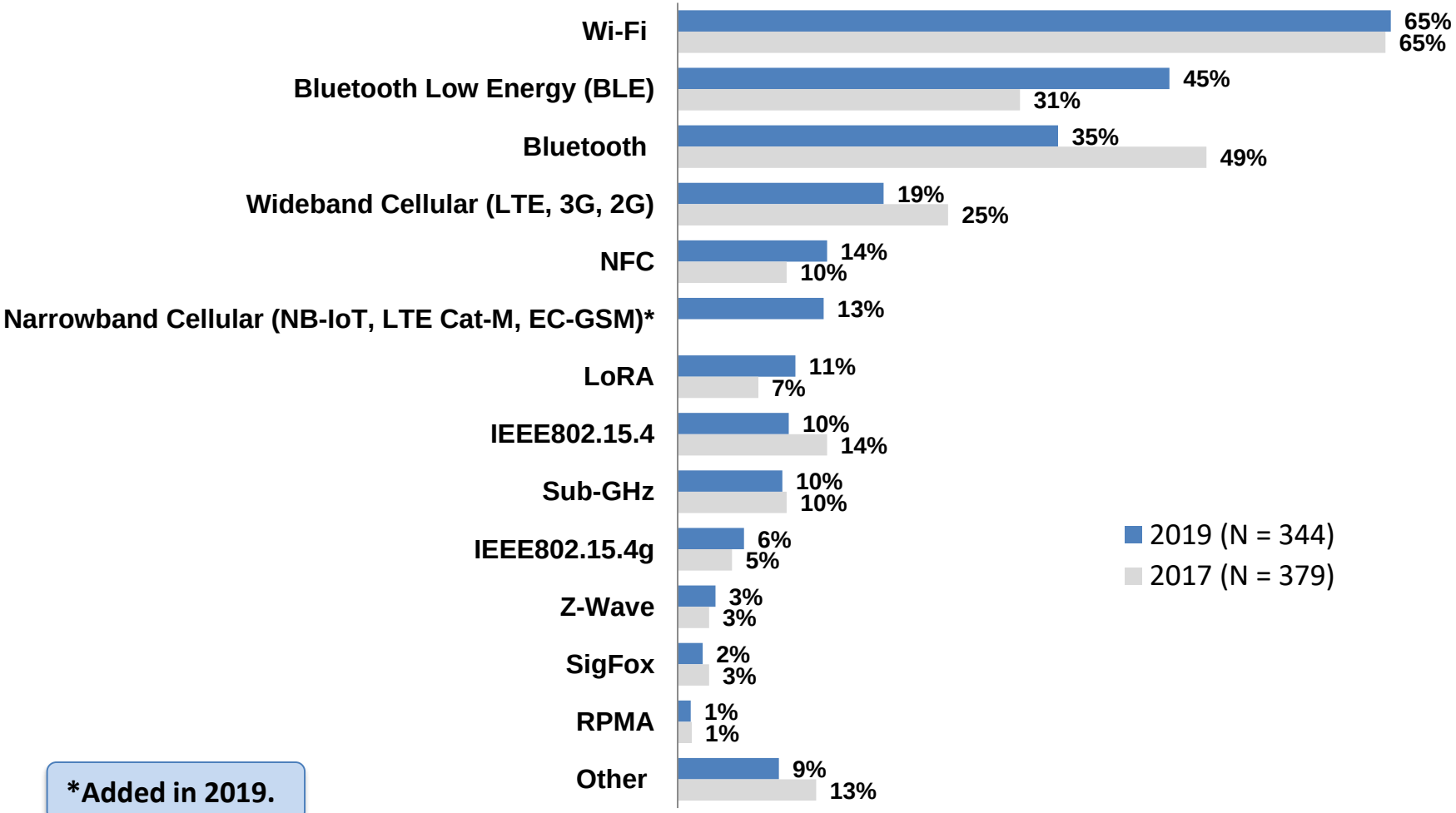
Base = Those whose current project is an upgrade/improvement

Which of the following capabilities are included in your current embedded project?



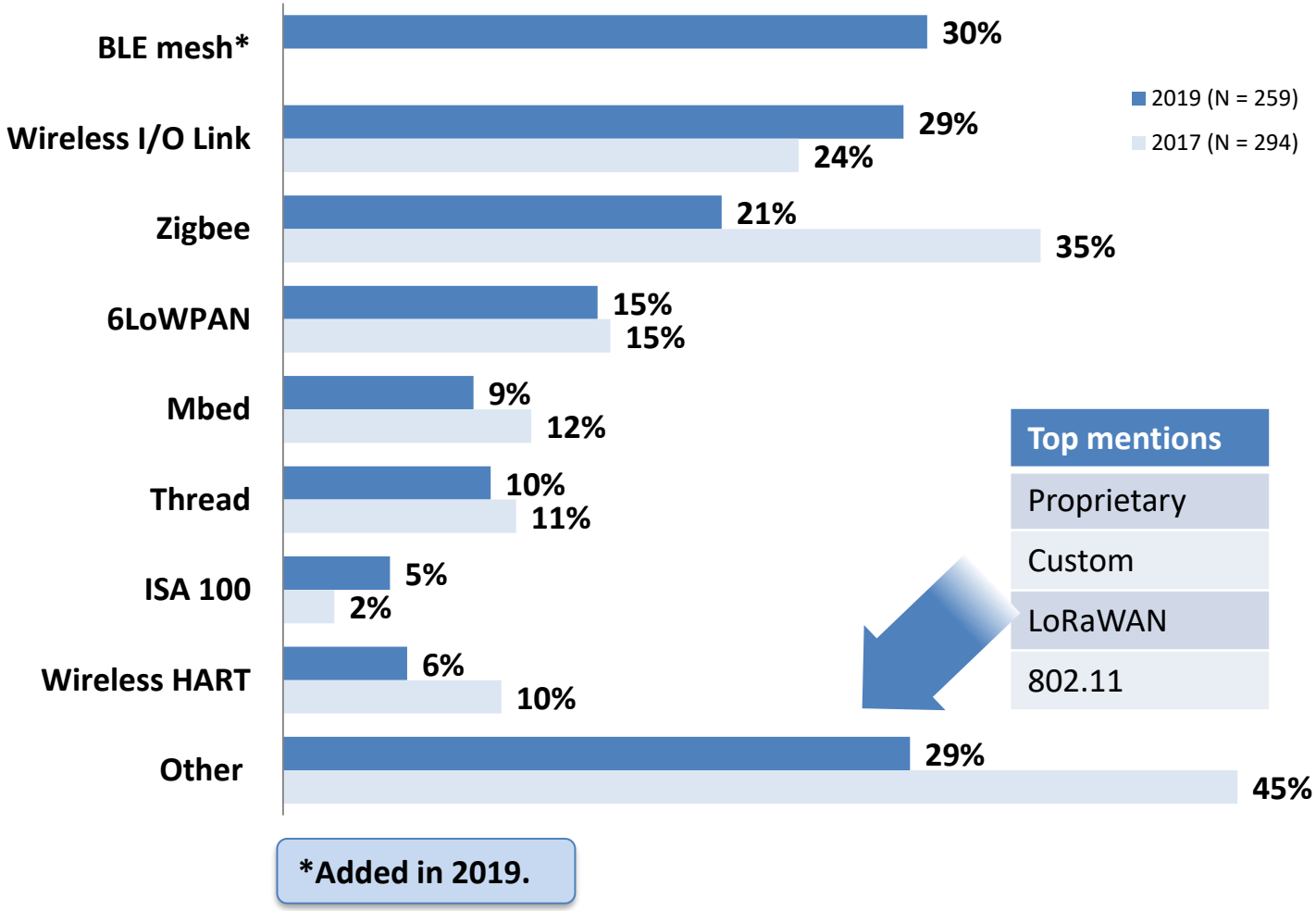
*AI and GPU were added in 2019.

If wireless, what wireless interfaces does your current embedded project include?



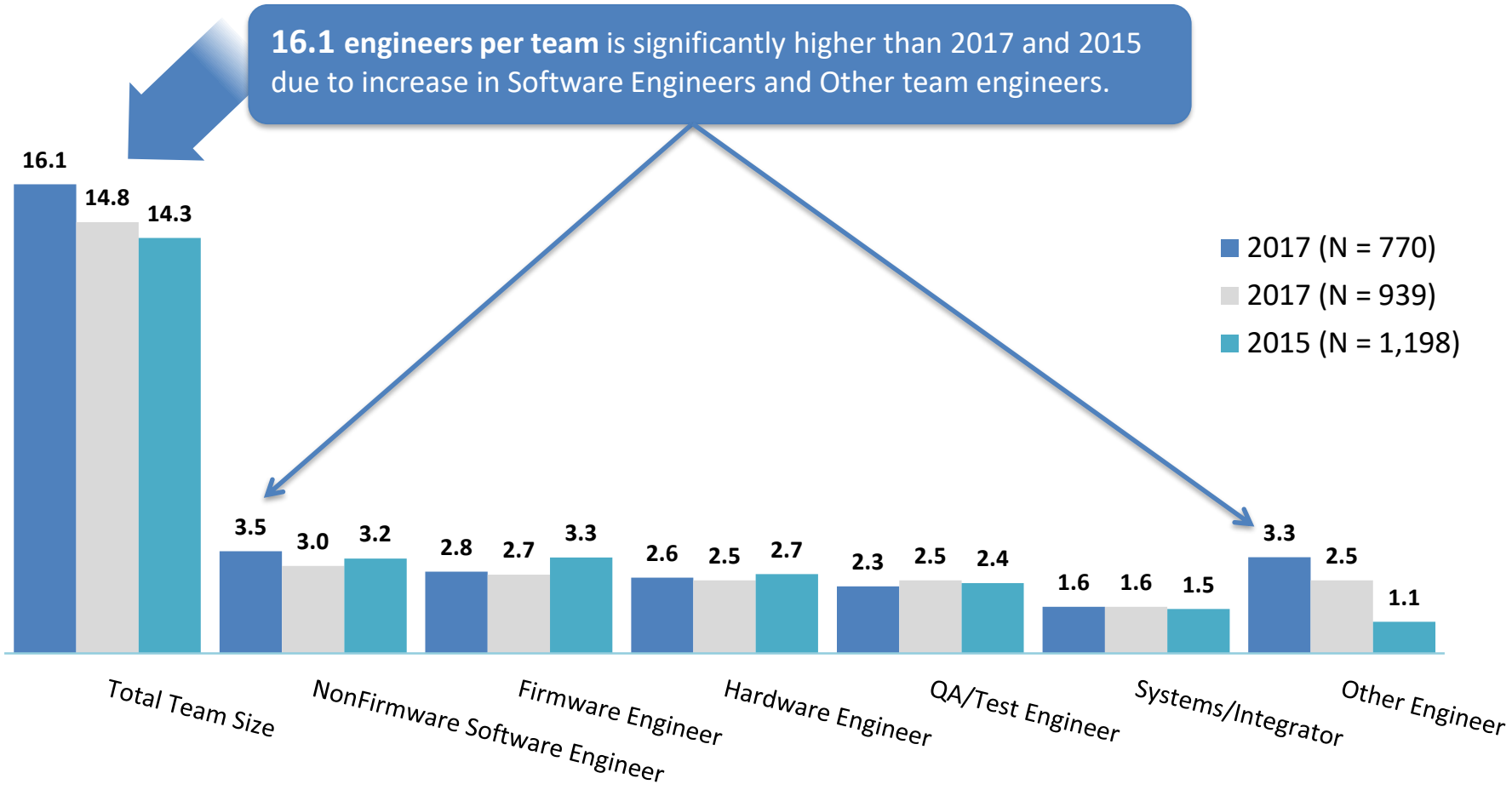
*Added in 2019.

If wireless, what wireless protocols/stacks does your current embedded project include?



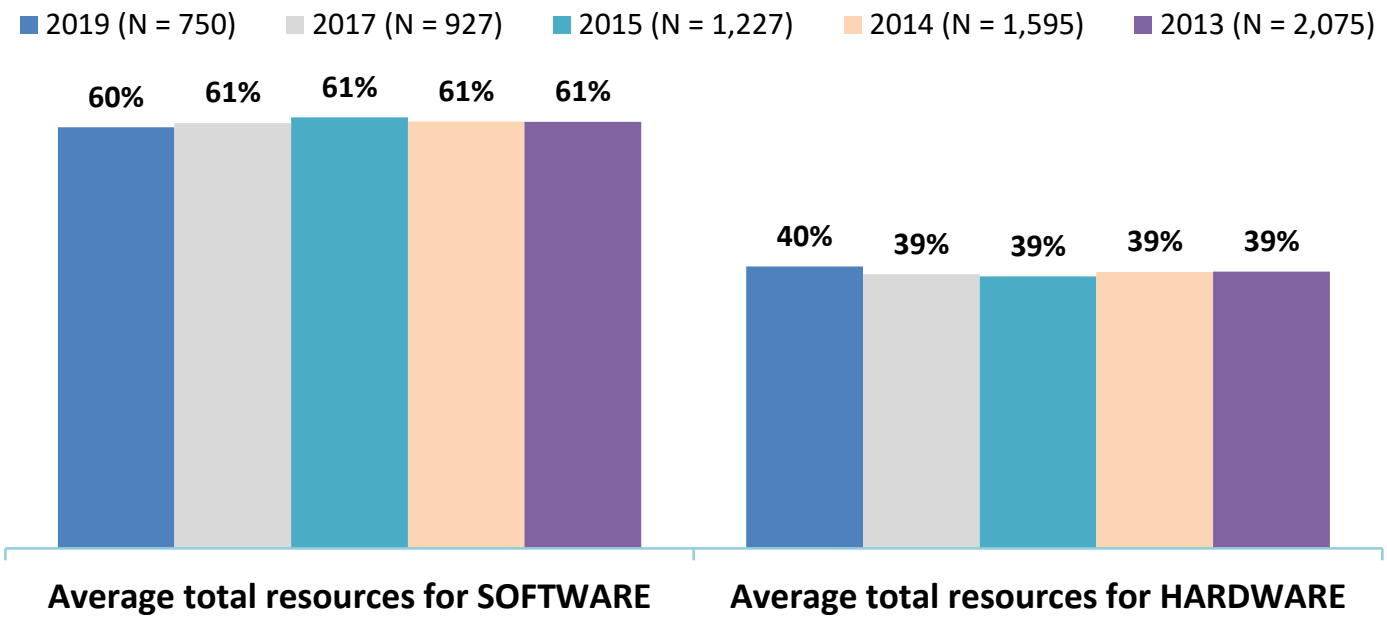
*Added in 2019.

How many people are on your embedded project team?



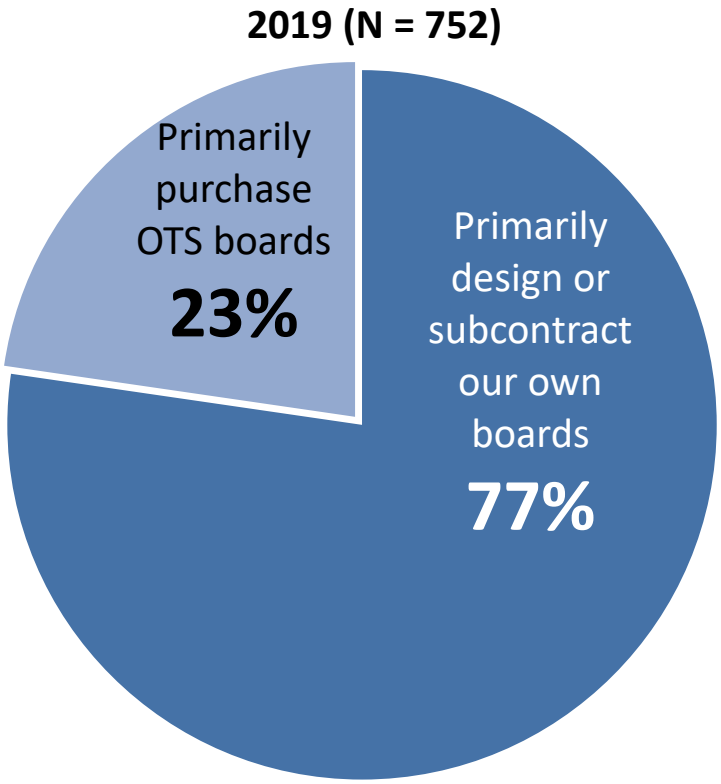
Team size for Americas is **15.1** engineers/ team.
Team size for EMEA is **14.1** engineers/ team.
Team size for APAC is **19.6** engineers/ team.
Teams also work with an average of 2.7 outside vendors on a typical project.

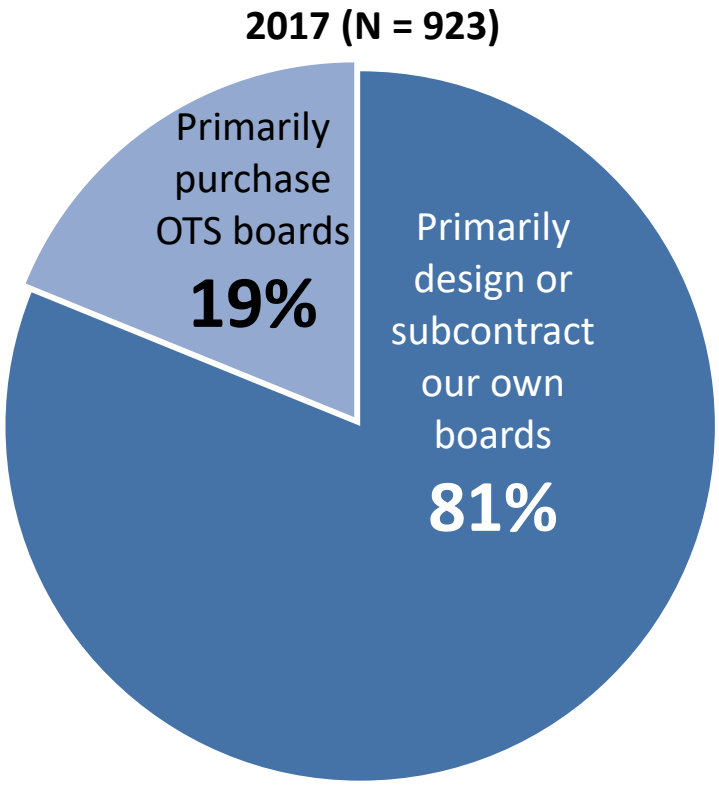
What is your development team's ratio of total resources (including time/dollars/manpower) spent on software vs. hardware for your embedded projects?



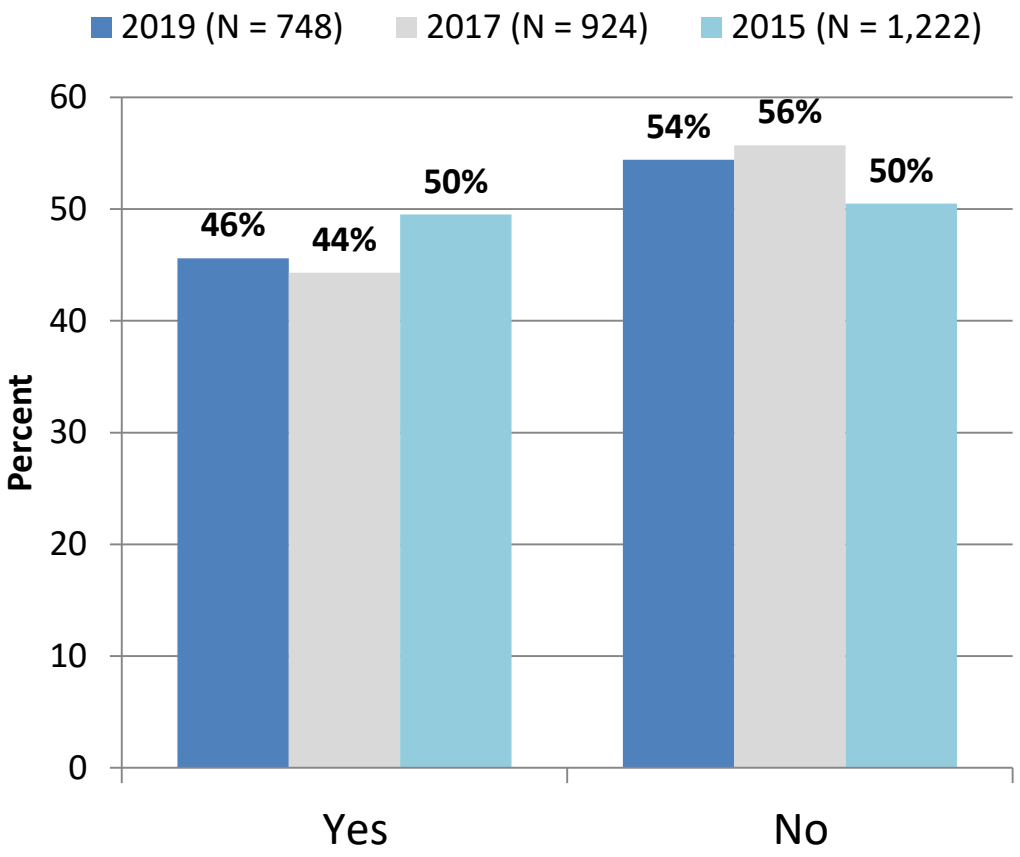
In 2019, respondents averaged working on 2.1 projects at the same time.
In 2017, respondents averaged working on 2.1 projects at the same time.
In 2015, respondents averaged working on 2.1 projects at the same time.
In 2014, respondents averaged working on 2.0 projects at the same time.

Do you primarily design or subcontract the design of custom circuit boards, or do you purchase off-the shelf boards?



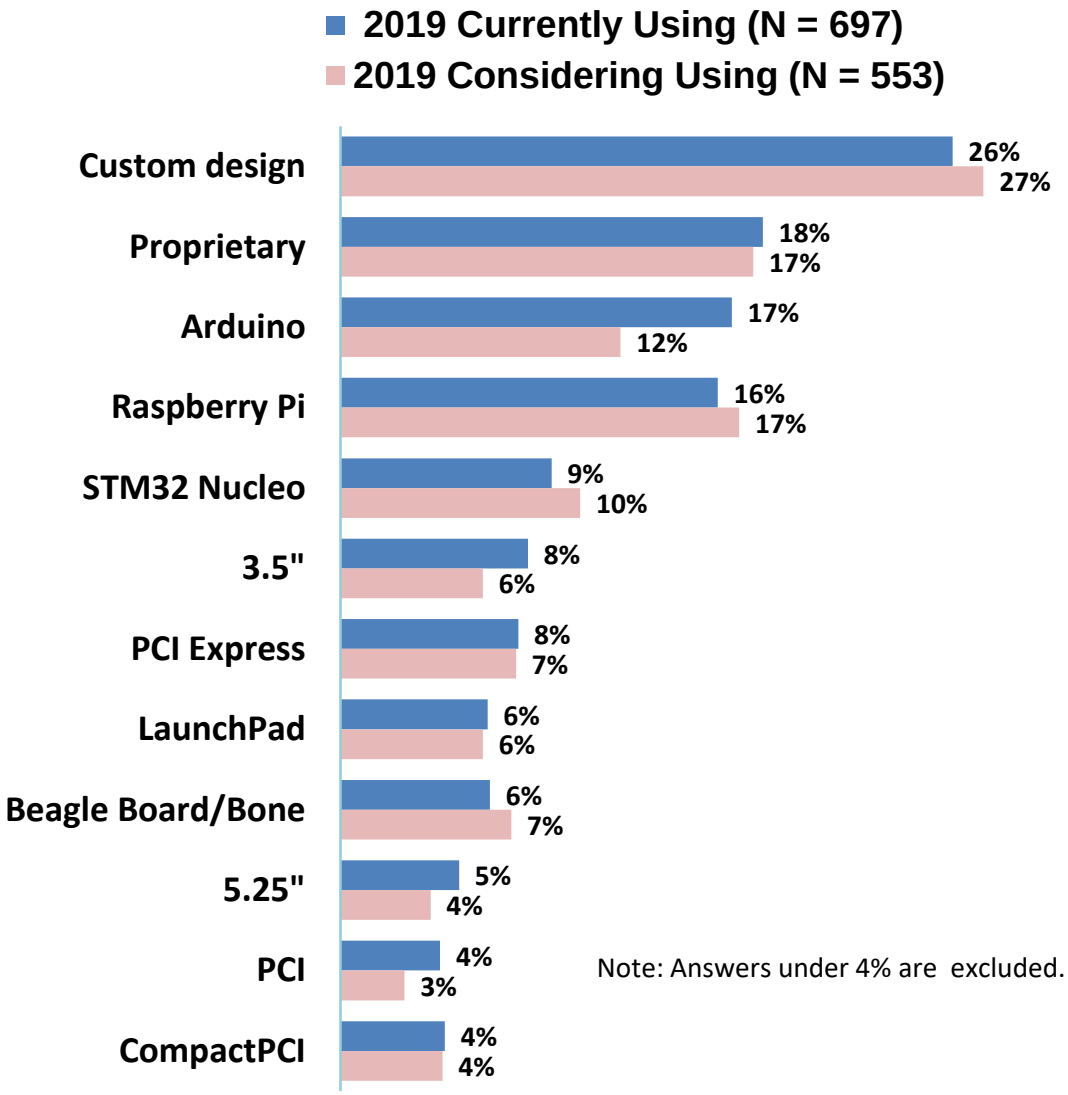


Did you start your current embedded design with a development board?



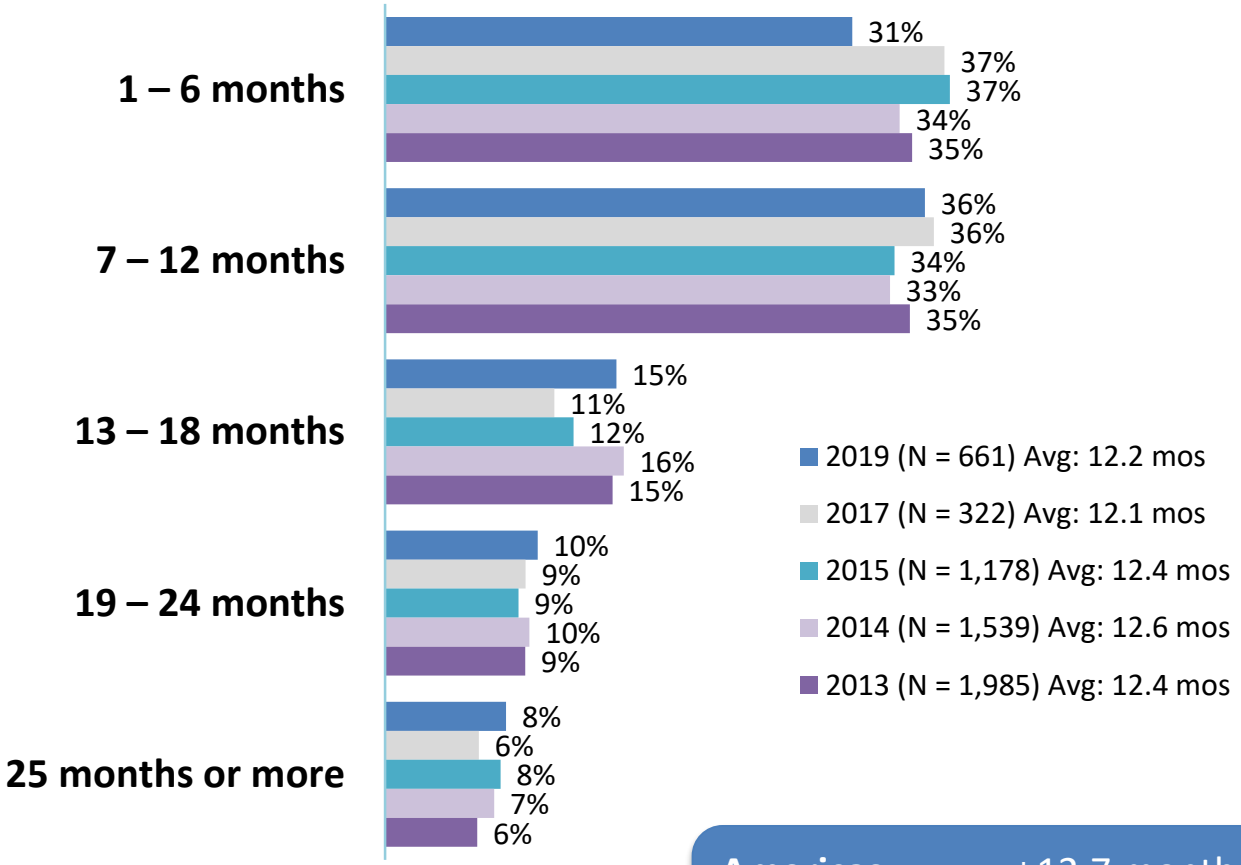
Development Board Started With (Write-in recall answers only)	N=281	%
STMicroelectronics	43	15.3%
TI	30	10.7%
NXP	20	7.1%
Raspberry Pi	19	6.8%
Microchip	14	5.0%
Arduino	13	4.6%
Xilinx	13	4.6%
Atmel	11	3.9%
Espressif ESP-32	7	2.5%
Renesas	7	2.5%
Silicon Labs	6	2.1%
Nordic	5	1.8%
Digilent	4	1.4%
Nucleo Board	4	1.4%
ZedBoard	4	1.4%
Analog Devices	3	1.1%
Beaglebone Black	3	1.1%
Cypress	3	1.1%
AdaFruit 'Feather' Cortex-M4	2	0.7%
ARM	2	0.7%
Atmega	2	0.7%
Avnet Picozed	2	0.7%

Which form factor boards are you currently using, and which are you considering using?



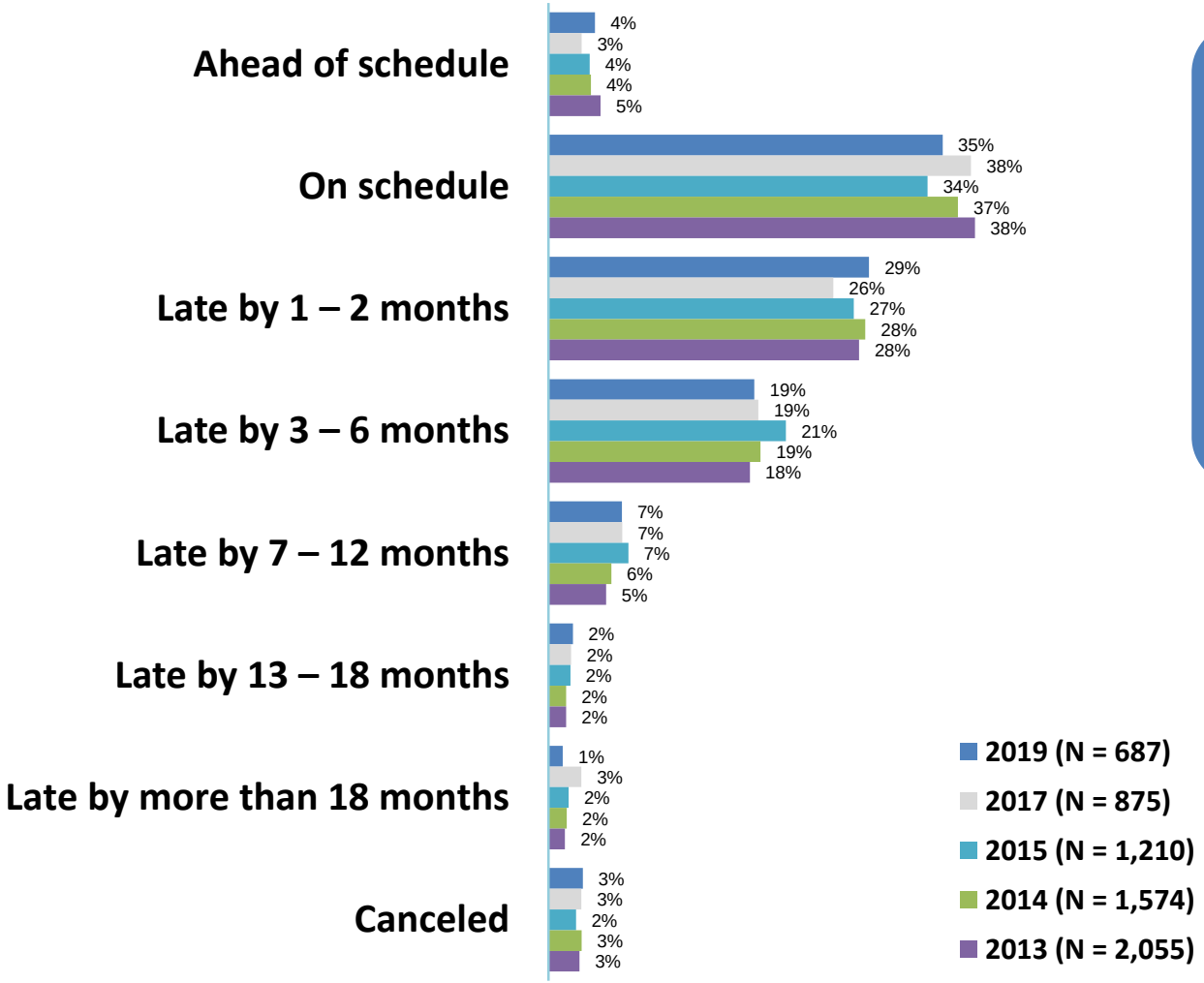
Note: Answers under 4% are excluded.

Thinking now about the last embedded project you completed (no longer in development), how many months did that project take to finish?



Americas averaged 12.7 months
EMEA averaged 12.6 months
APAC averaged 10.1 months

Was that project completed . . .

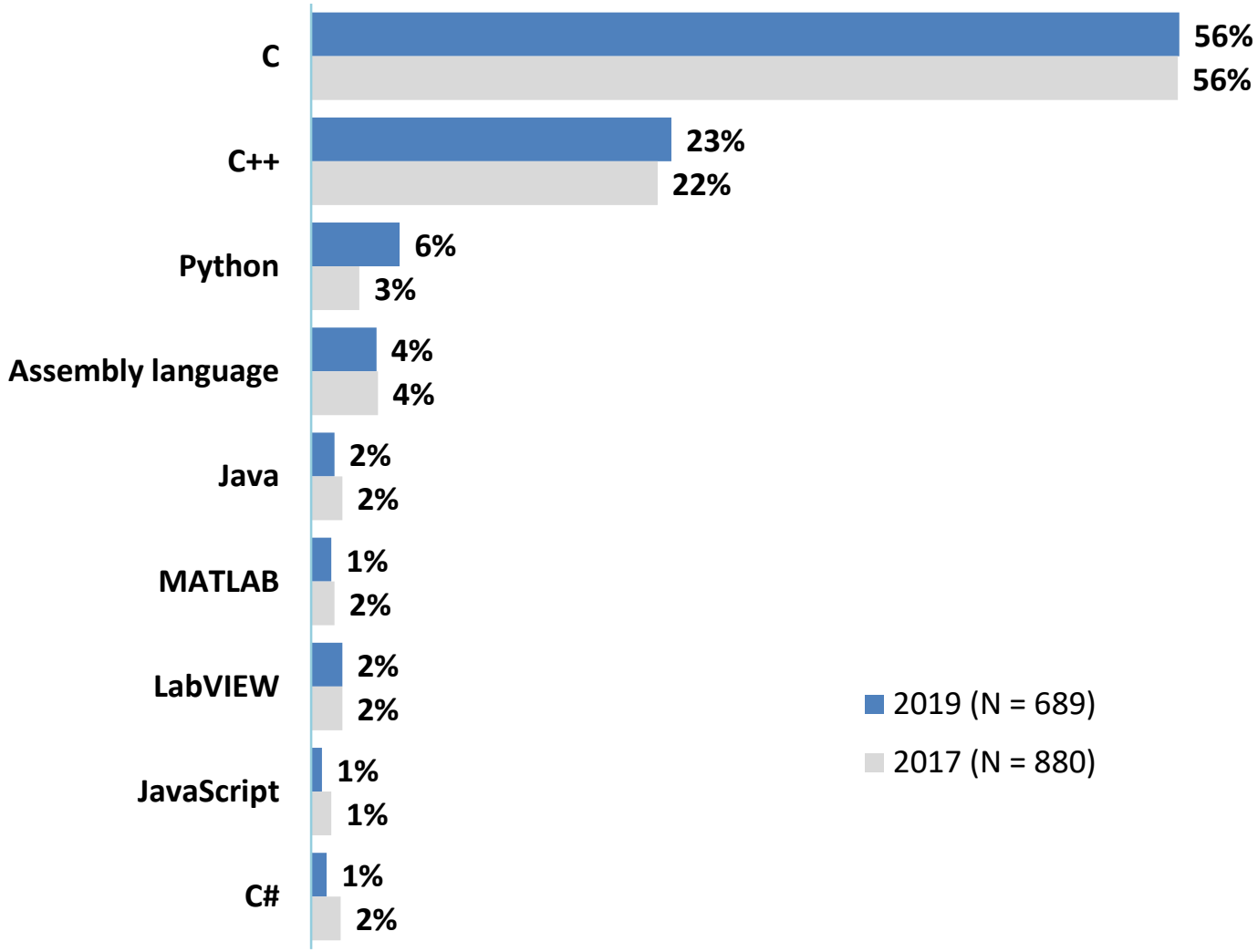


In **2019**, 39% of all projects finished "ahead of" or "on" schedule, and 61% finished "late or cancelled".

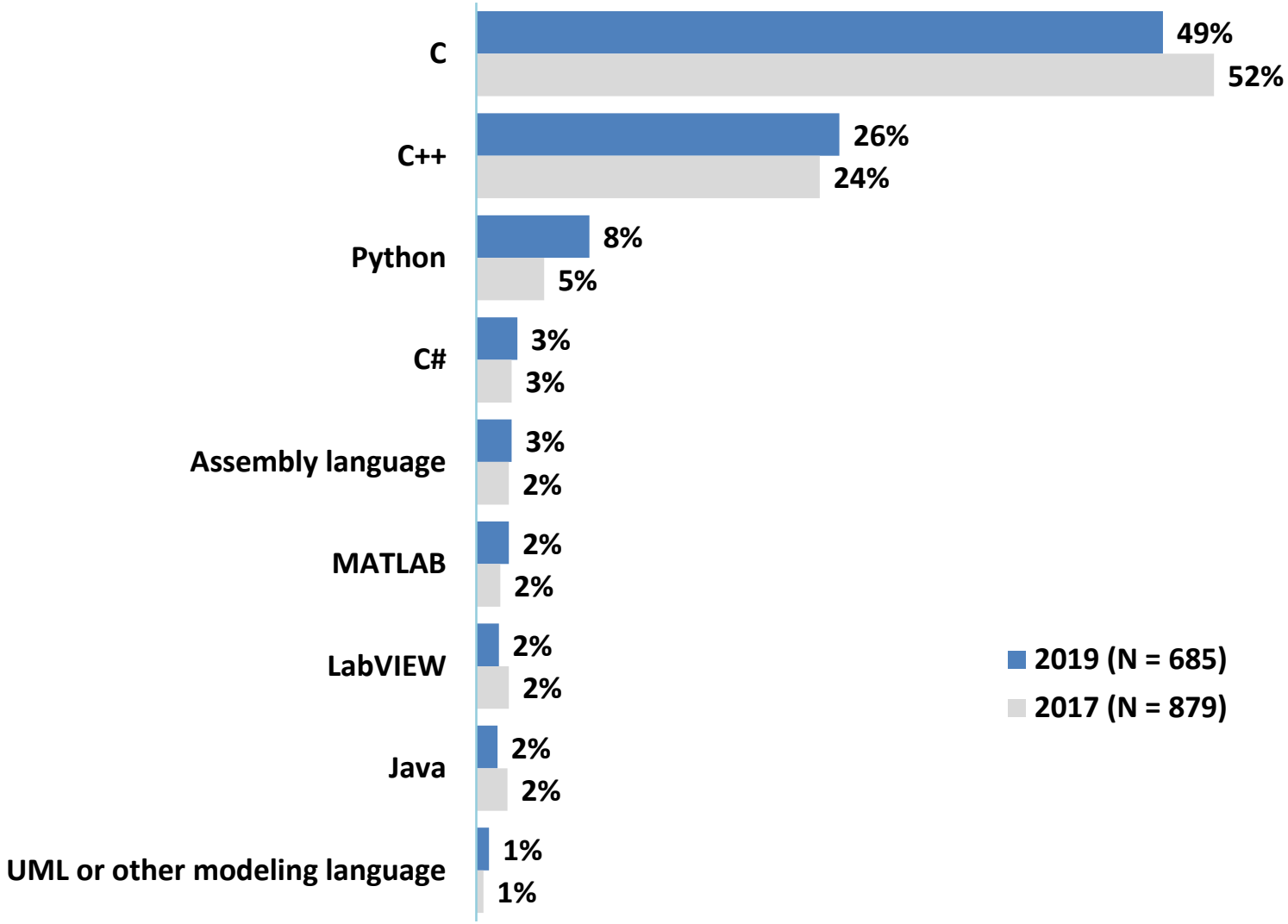
In **2017**, 41% of all projects finished "ahead of" or "on" schedule, and 59% finished "late or cancelled".

In **2015**, 38% of all projects finished "ahead of" or "on" schedule, and 62% finished "late or cancelled".

My *current* embedded project is programmed mostly in:

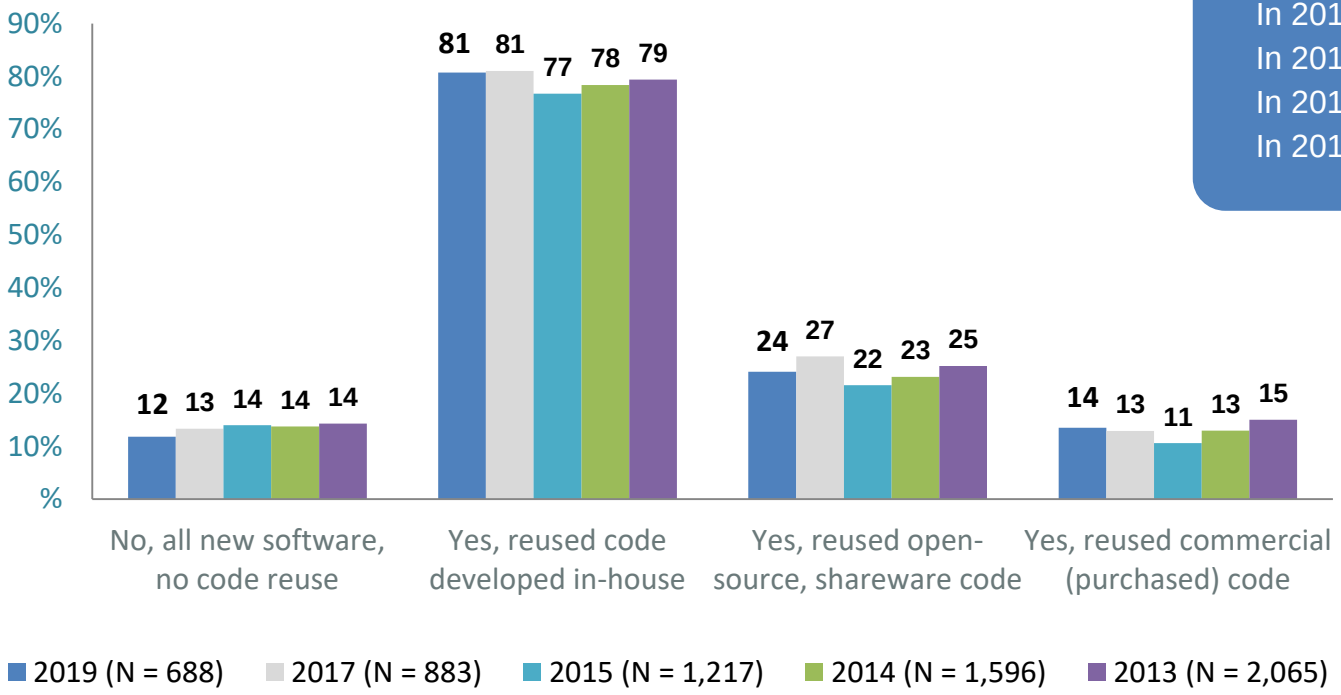


My *next* embedded project will likely be programmed mostly in:



Does your current project reuse code from a previous embedded project?

In 2019, 88% reused code.
In 2017, 87% reused code.
In 2015, 86% reused code.
In 2014, 86% reused code.
In 2013, 86% reused code.



Note 1. Multiple choice for "Yes" answers (a respondents can select more than one type of reused code), therefore will not add to 88%.
Note 2. In 2019, 77% of respondents also reused hardware or hardware IP, up 1% from 2017

Embedded Design Environment

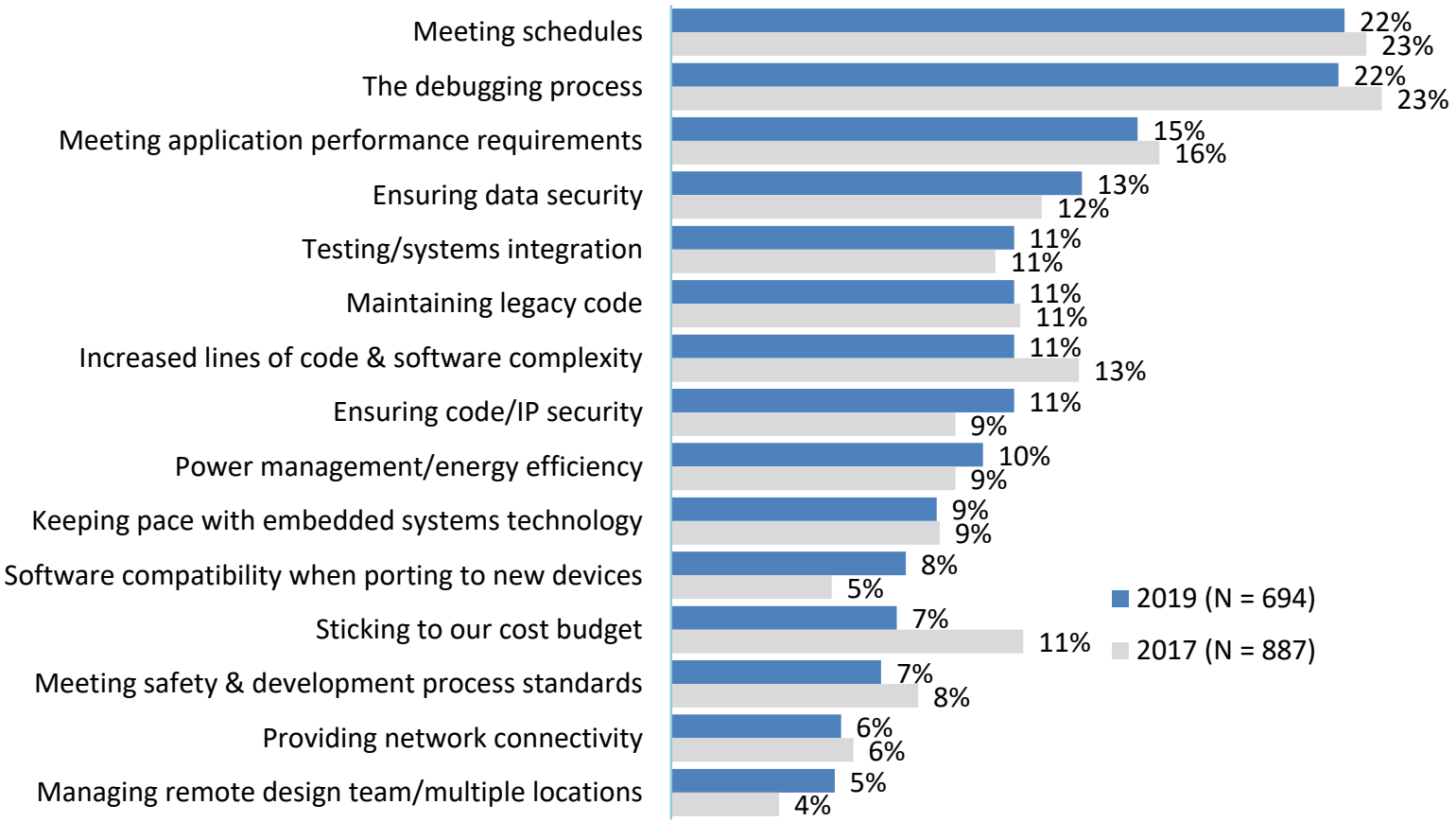
- **New/Upgrade Ratio –** 44% new/56% upgrades. APAC ratio is 40%/60%.

  Upgrades include new software features (46%), processors (37%), connectivity (22%).

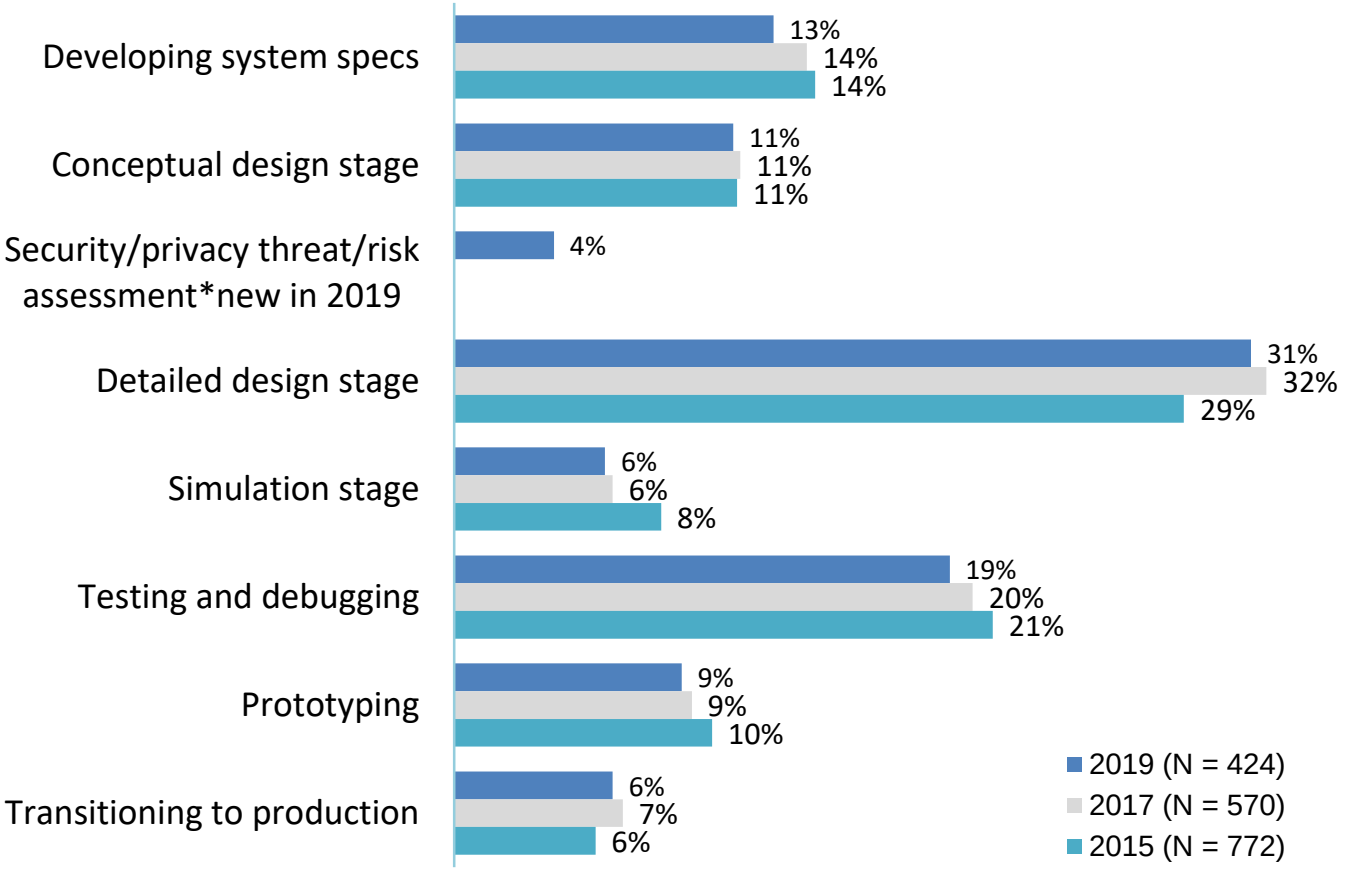
- **Design Capabilities –** Real time (54%), DSP (51%), Networking (49%).
- **Team Size –** 16.1 engineers is up from 14.8. APAC has 19.6 engineers per team.
- **Outside vendors** – Work with an average of 2.7 outside vendors.
- **Resources Used On –** Software (60%), hardware (40%). No change in 5 years.
- **Number of Projects Worked On at the Same Time –** Average of 2.1 projects.
- **Build or Purchase Boards –** 77% build their own boards, 23% purchase OTS.
- **Project Starts with Board –** 46% is up 2% from 2017. STMico, TI, NXP mostly.
- **Form Factor Boards Used –** Custom design (26%), proprietary (18%) top two.
- **Months to Complete Project –** 12.2 mos. on average. APAC was 10.1 mos.
- **On or ahead of schedule –** 39% in 2019 is two ticks down from 2017.
- **Languages –** C usage at 56%, C++ 23%. Python is starting to grow.
- **Code/HW IP Reuse –** 88% code reuse; 77% hardware or hardware IP reuse.

Embedded Design Process

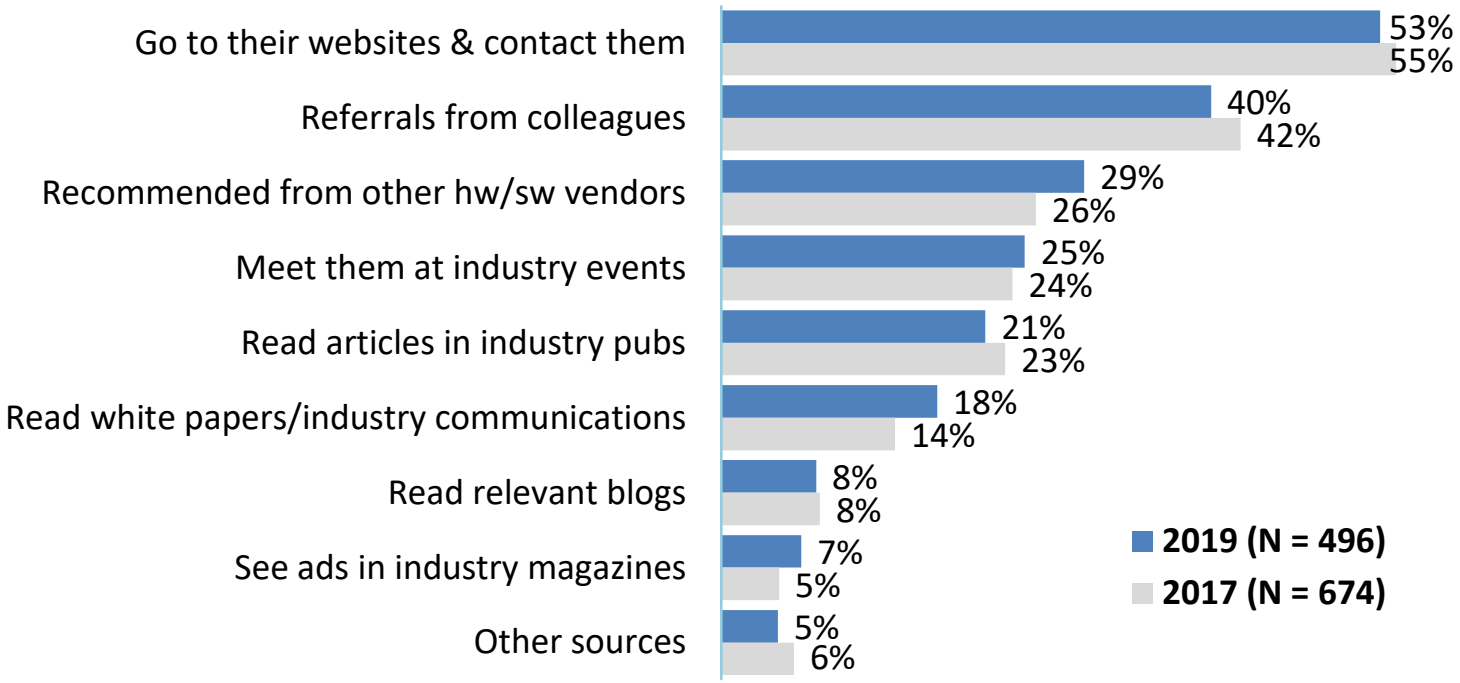
Which of the following challenges are your own or your embedded design team's greatest concerns regarding your current embedded systems development?



What percentage of your design time is spent on each of the following stages?



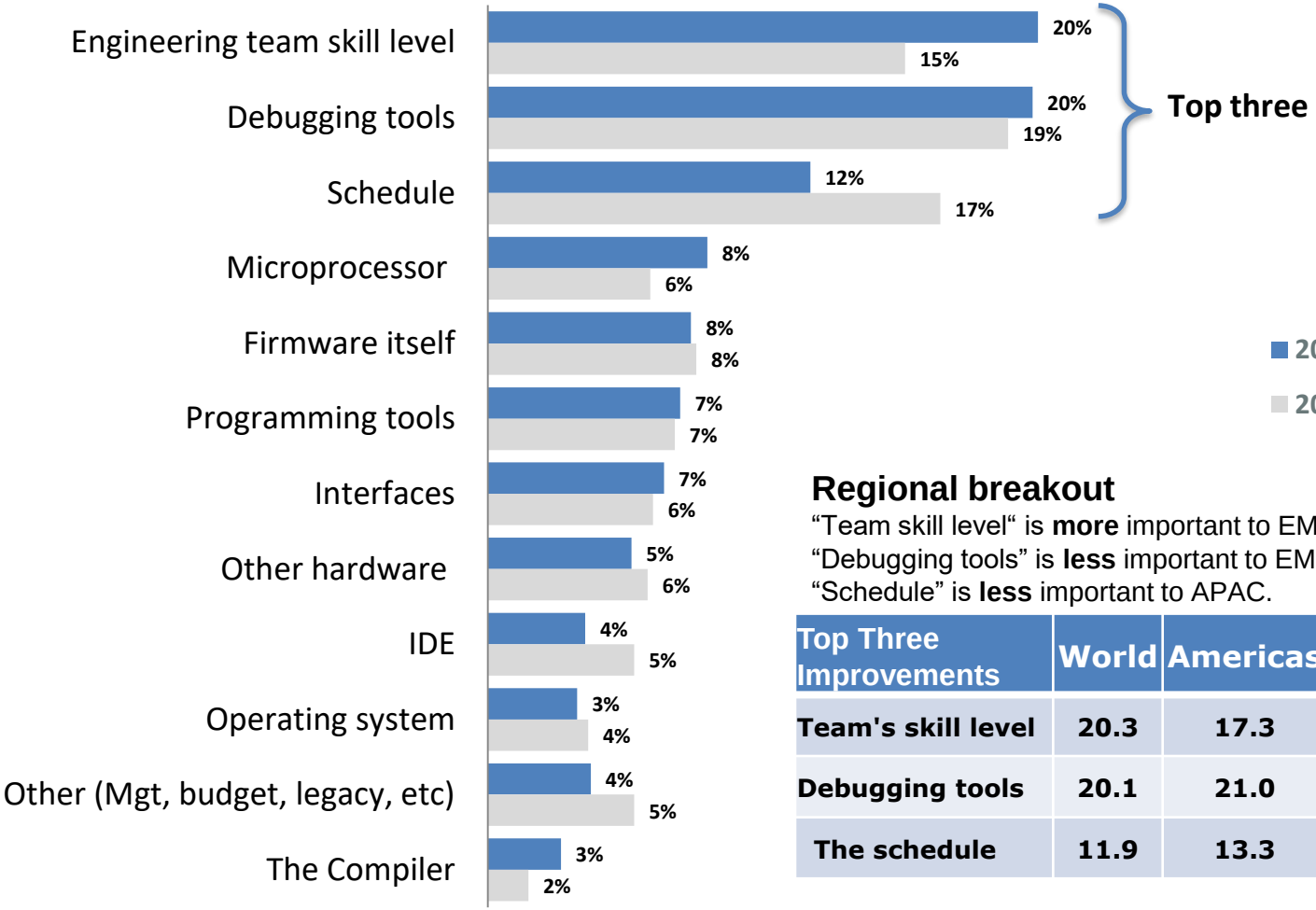
How do you typically find and evaluate partners to work with?



Number of outside partners worked with on average:

- *2.7 vendors in 2019*
- *2.7 vendors in 2017*
- *3.2 vendors in 2015*

If you could improve one thing about your embedded design activities, what would it be?

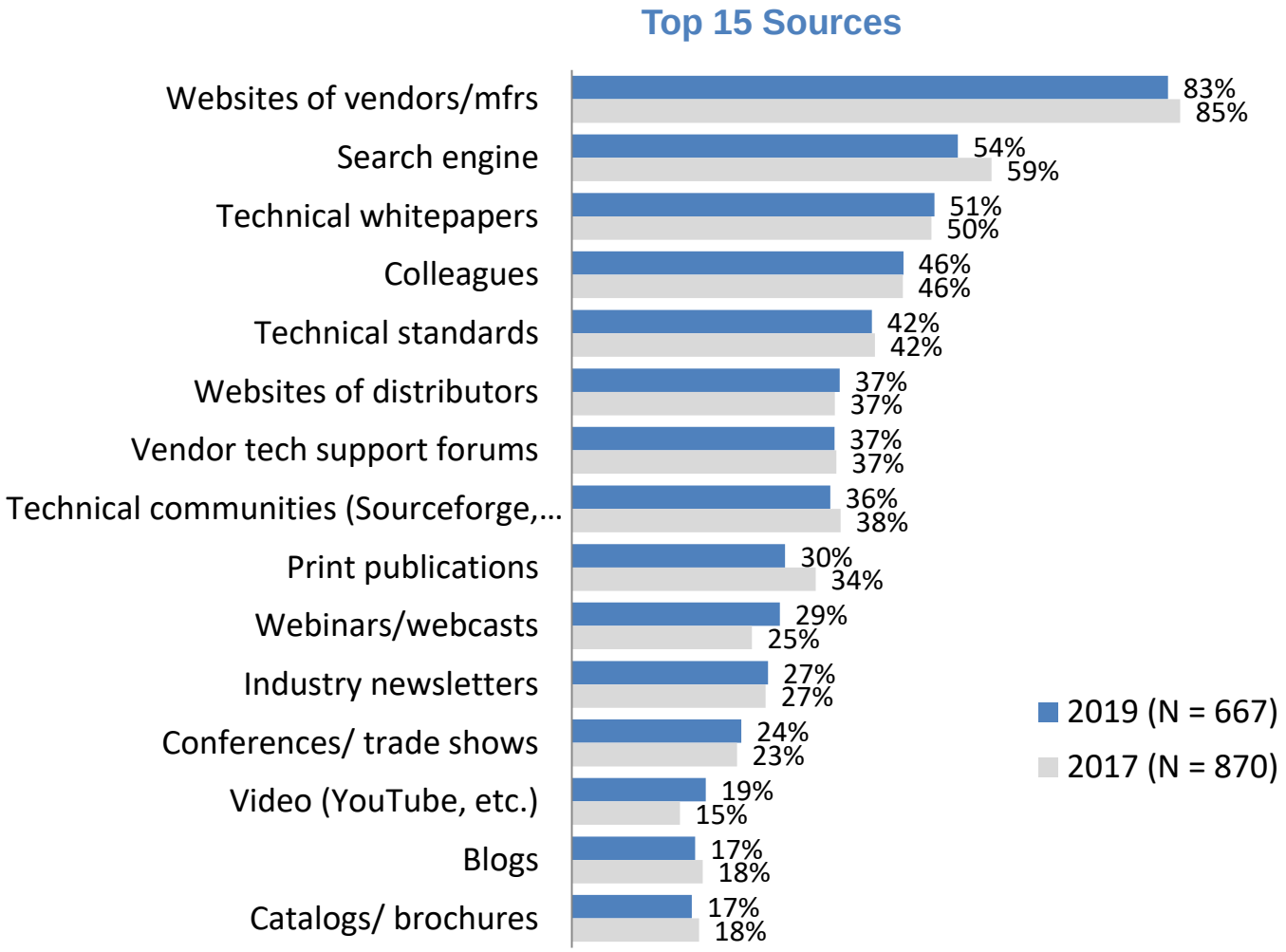


Regional breakout

"Team skill level" is **more** important to EMEA and APAC.
"Debugging tools" is **less** important to EMEA.
"Schedule" is **less** important to APAC.

Top Three Improvements	World	Americas	EMEA	APAC
Team's skill level	20.3	17.3	23.5	26.2
Debugging tools	20.1	21.0	17.6	20.0
The schedule	11.9	13.3	12.5	6.9

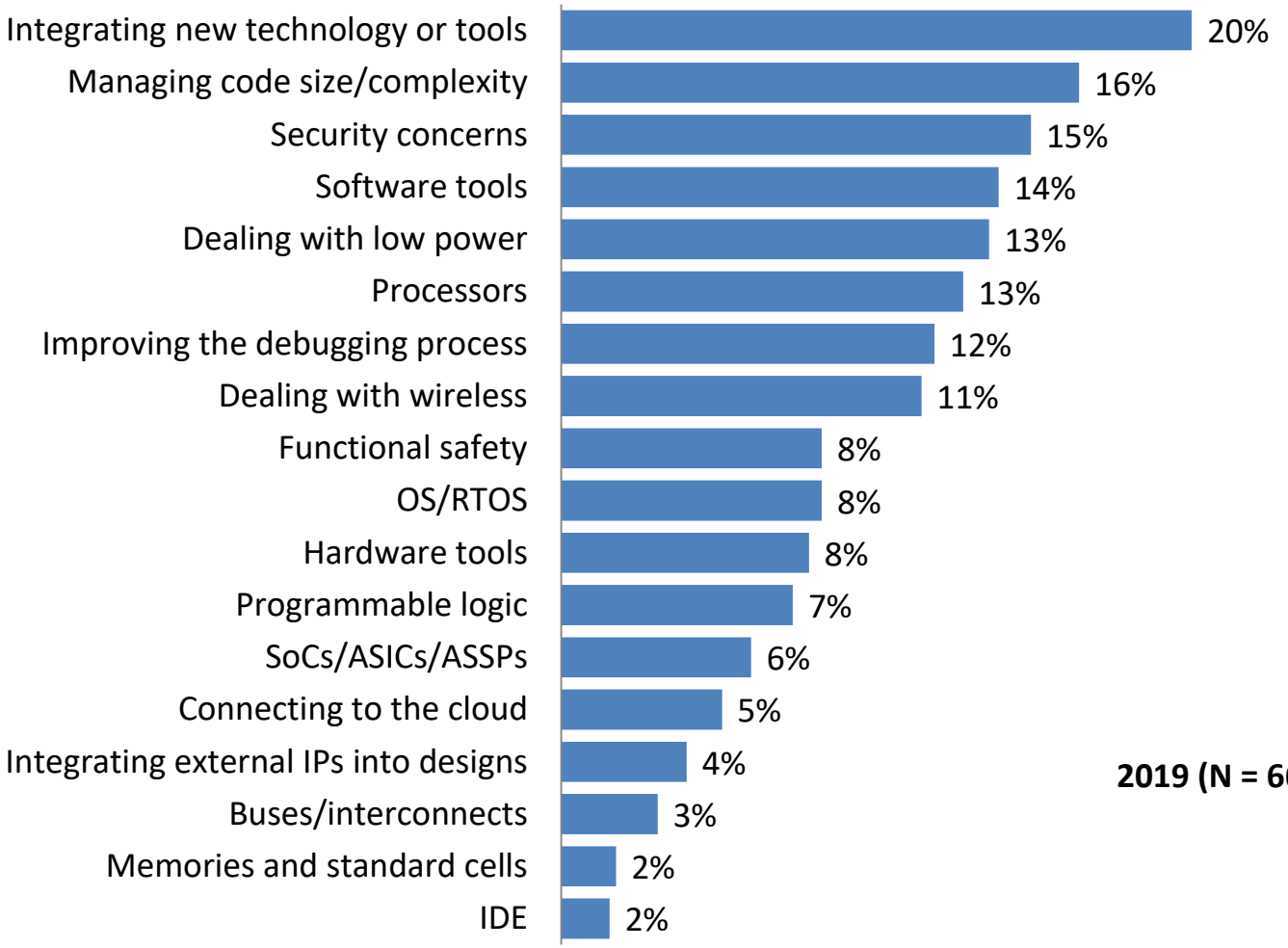
In general, what sources of information do you consult to research your embedded design decisions?



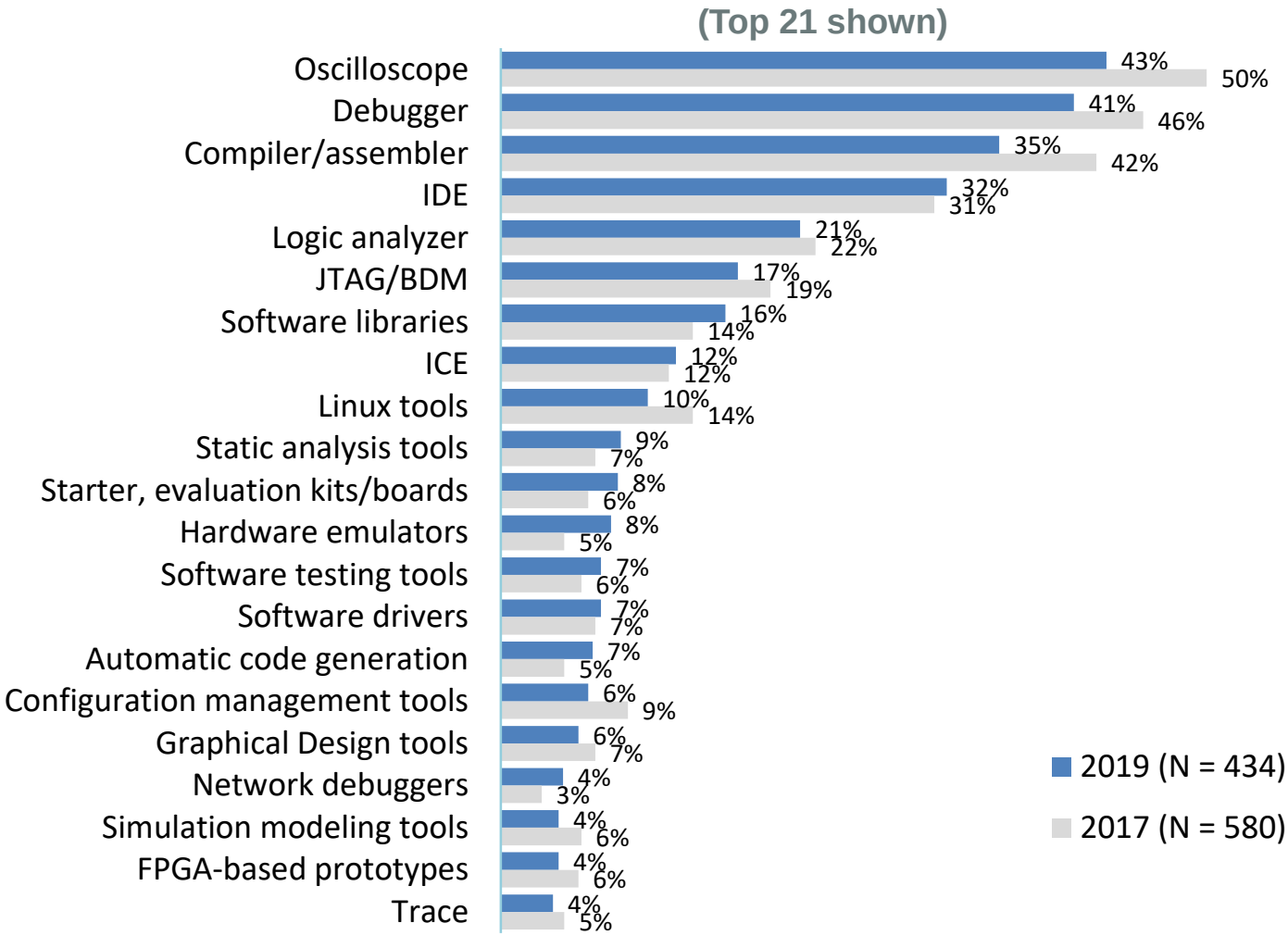
What are your favorite websites related to your professional work? (Write-in responses only)

Favorite Website (Write-in)	N = 350	%
EE Times	53	10.9%
Google	41	8.4%
Embedded.com	37	7.6%
Stack Overflow	26	5.3%
Digikey	23	4.7%
EDN	20	4.1%
IEEE	19	3.9%
TI	19	3.9%
Analog Devices	11	2.3%
Github.com	11	2.3%
LinkedIn	11	2.3%
Stack Exchange	11	2.3%
Microchip	9	1.8%
Wikipedia	9	1.8%
Electronicdesign.com	8	1.6%
Hackaday	6	1.2%
Microsoft	6	1.2%
Mouser	5	1.0%
Xilinx	5	1.0%
Youtube.com	5	1.0%
Texas Instruments	4	0.8%
Embedded Systems Design	3	0.6%
NXP	3	0.6%
Sourceforge	3	0.6%
ST.com	3	0.6%
ADI/LTCC	2	0.4%
Arduino	2	0.4%
Avrfreaks.net	2	0.4%

Thinking about the next year, what areas will be your greatest technology challenges?



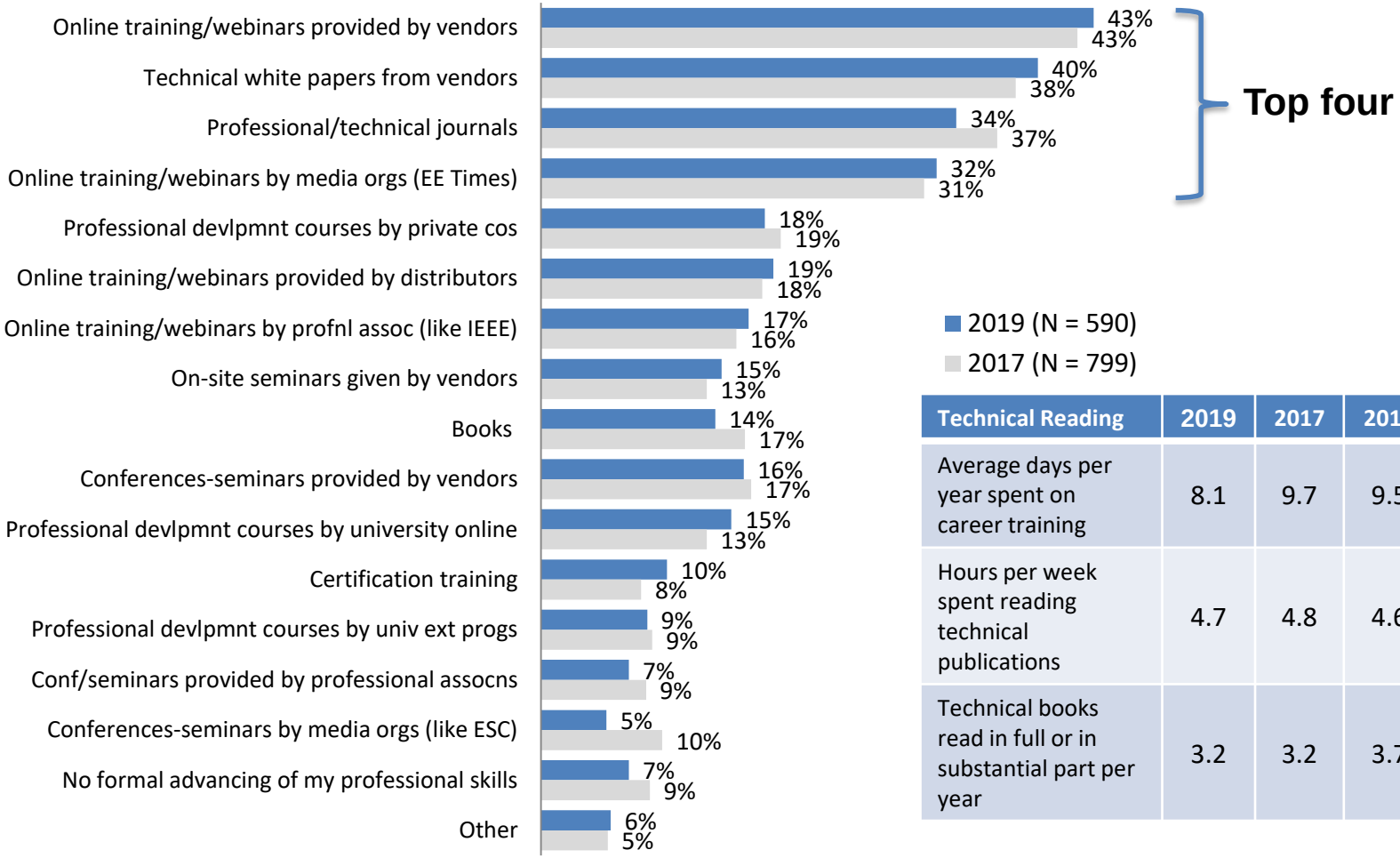
Which of the following are your favorite/most important software/hardware tools?



Which of the following conferences have you attended in the last two years, and which do you plan to attend in the next year?

Conferences	Have Attended	Plan to Attend	Diff
Training/seminars of distributors	40.2	33.2	-7.0
Embedded Systems Conference (USA)	17.5	26.4	+8.9
Vendor technical forums/developer conferences	16.8	12.5	-4.3
Embedded World (Nuremberg)	15.7	19.3	+3.6
CES (Las Vegas)	12.6	16.8	+4.2
Electronica	11.9	13.6	+1.7
DesignCon	11.2	15.4	+4.2
Sensors Expo	9.8	14.6	+4.9
DAC	7.3	7.1	-0.2
IEEE International Conference on Embedded and Real-Time Computing Systems and Applications	7.0	10.4	+3.4
Embedded Linux Conference (ELC)	6.3	7.1	+0.8
CeBIT	5.6	6.8	+1.2
Embedded Systems Conference (India)	5.2	7.5	+2.3
Embedded Systems Expo (Japan)	4.2	2.5	-1.7
Android Builders Summit	3.5	3.2	-0.3
Mobile World Congress	3.1	5.7	+2.6
SAE Convergence	3.1	3.9	+0.8
IIC (China)	2.8	3.9	+1.1
Embedded Systems Conference (Brazil)	1.0	2.5	+1.5
Other	7.3	4.6	-2.7
2019	N = 286	N = 280	

What are the most effective ways that you systematically or formally maintain, educate, and advance your professional skills?



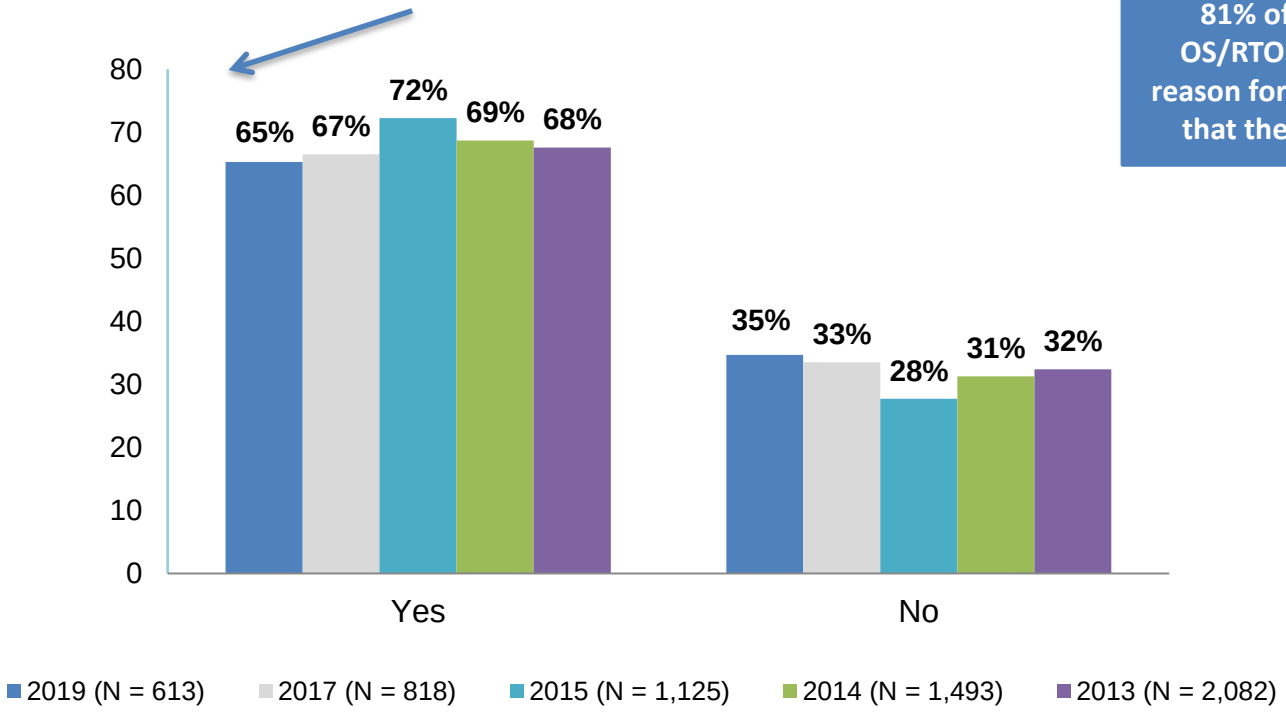
Technical Reading	2019	2017	2015	2014	APAC
Average days per year spent on career training	8.1	9.7	9.5	9.2	9.7
Hours per week spent reading technical publications	4.7	4.8	4.6	5.2	6.5
Technical books read in full or in substantial part per year	3.2	3.2	3.7	3.9	4.5

Embedded Design Challenges

- **Challenges –** Meeting schedules (22%) and debugging (22%).
- **Stages –** Detailed design (31%) & testing/debugging (19%) take most time.
- **Vendors –** Work with 2.7 outside vendors on average (same as 2017).
- **Most Need to Improve** – Engineering team skill level (20%), debugging tools (20%), and schedule (12%). Team skills for EMEA (24%) and APAC (26%).
- **Sources of Info –** Vendor websites (83%) leads all others by far. Search engines (54%) and technical white papers (51%) also important.
- **Technical Challenges for Next Year –** Top three: Integrating new technology (20%), managing code size and complexity (16%) and security (15%).
- **Favorite Tools –** Top four: Oscilloscope (43%), debugger (41%), compiler (35%) and IDE (32%).
- **Maintaining professional skills –** Top four: Vendor online training/webinars (43%), vendor technical white papers (40%), **professional/technical journals** (34%) and online training/webinars by media organizations (32%).
- **Training/reading:** 8.1 days/year career training; 26.3 years out of school; 4.7 hours per week reading technical publications; read 3.1 books per year.

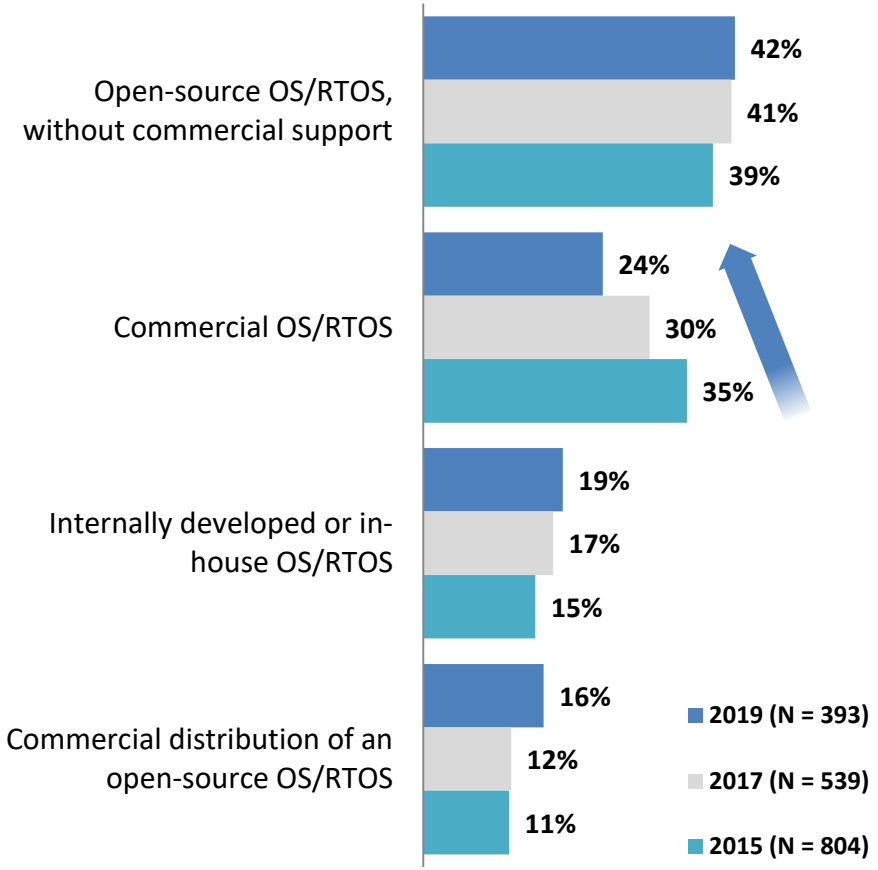
OPERATING SYSTEMS

Does your current embedded project use an operating system, RTOS, kernel, software executive, or scheduler of any kind?

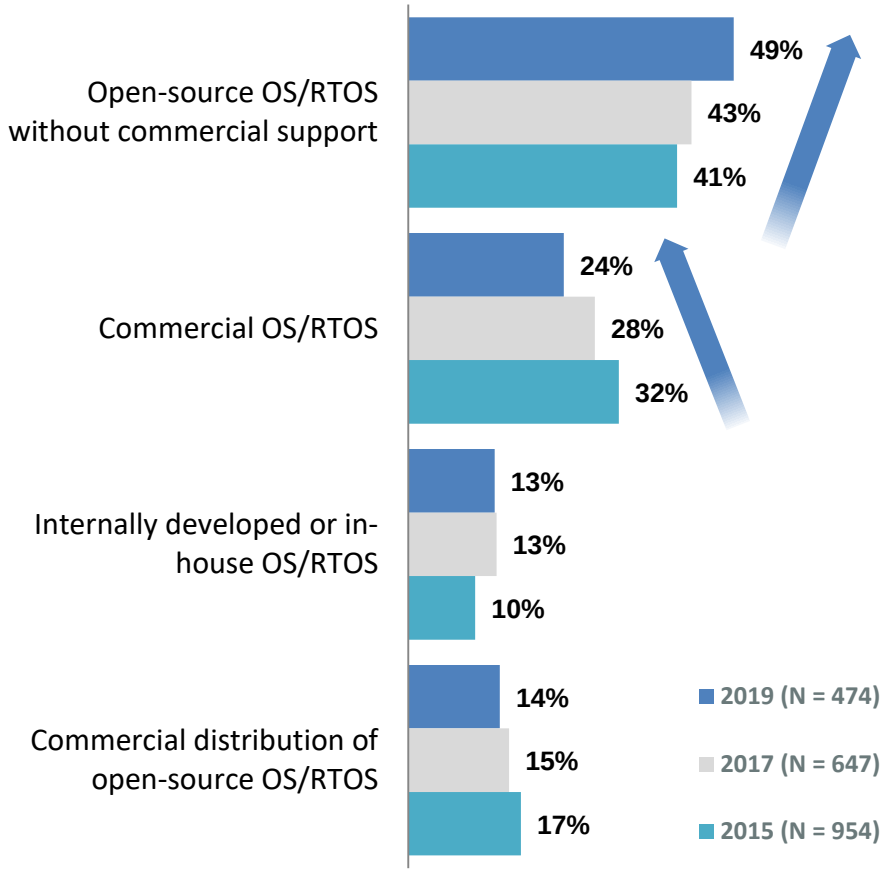


81% of those not using OS/RTOSes, said the main reason for NOT using is simply that they are not needed.

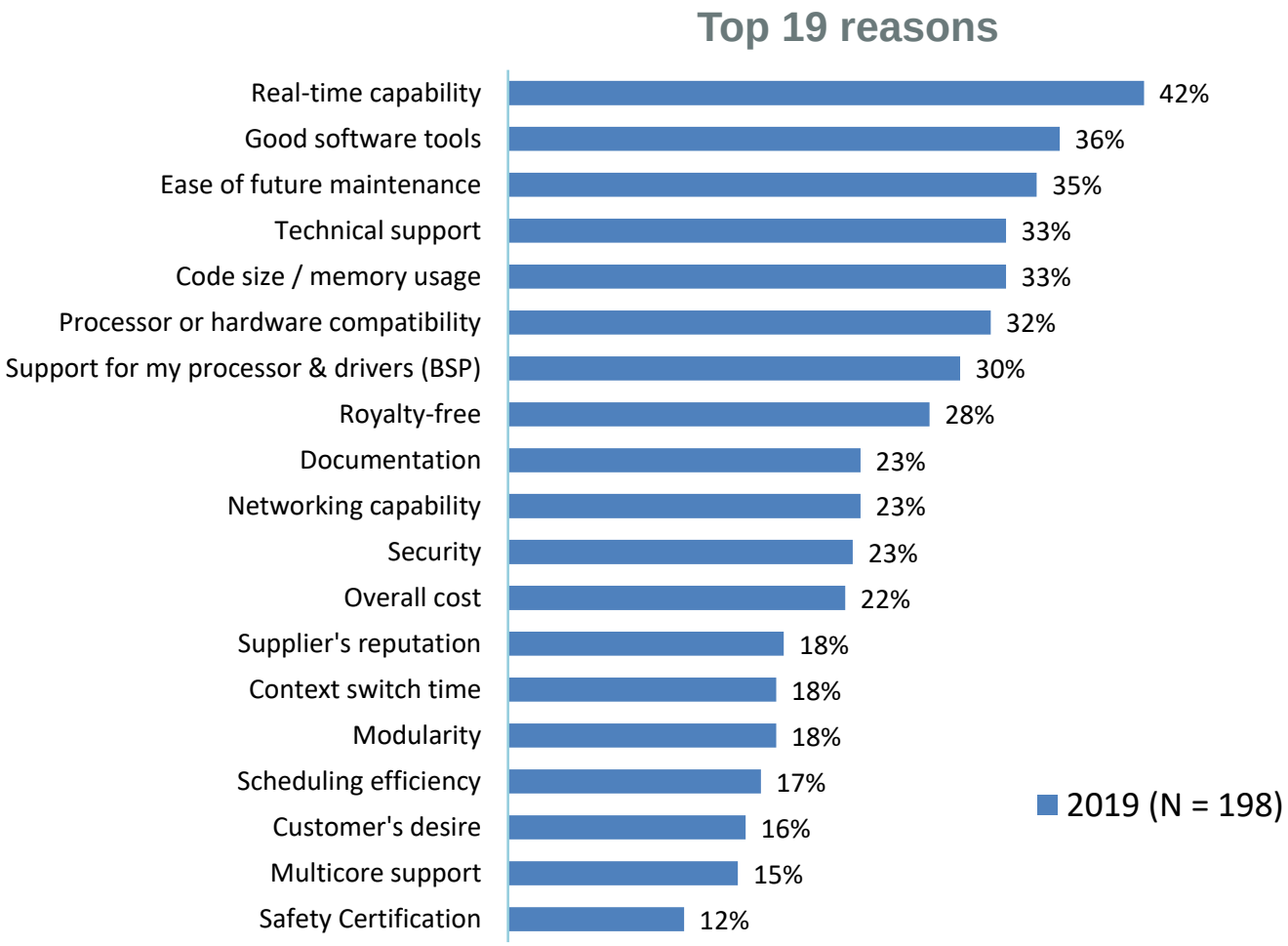
My current embedded project uses:



My next embedded project will likely use:

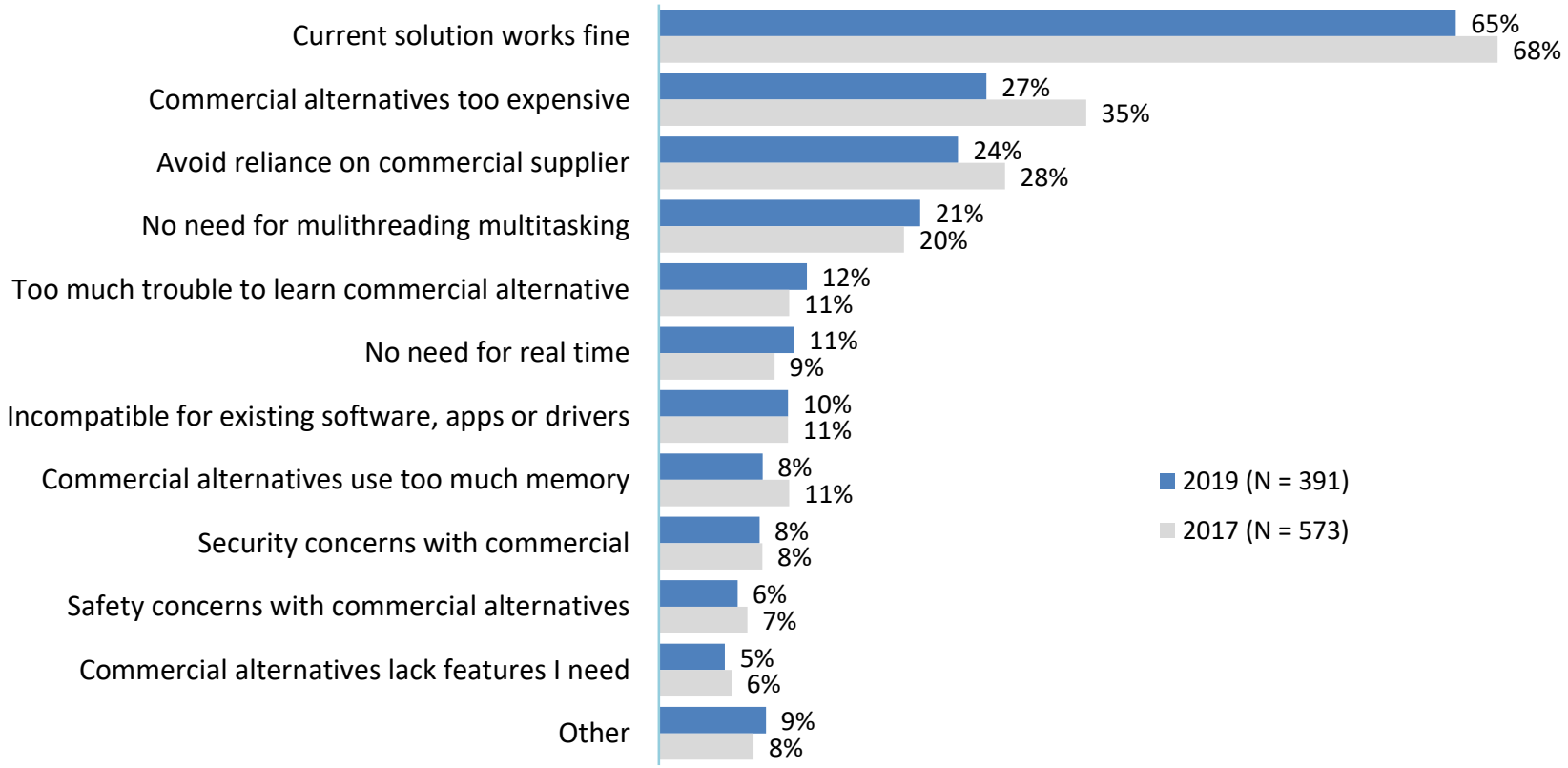


Which factors most influenced your decision to use a commercial operating system?



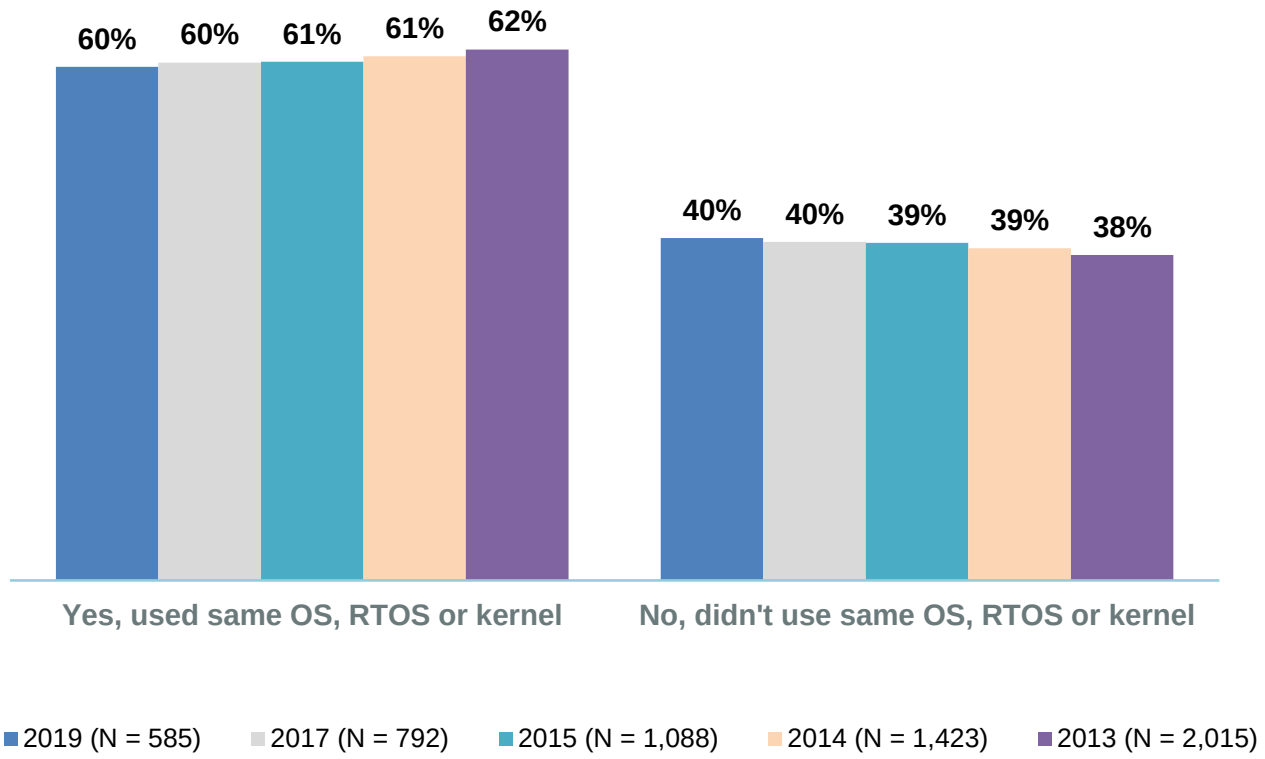
Base = Those who currently use a "Commercial" OS/RTOS

What are your reasons for not using a commercial operating system?



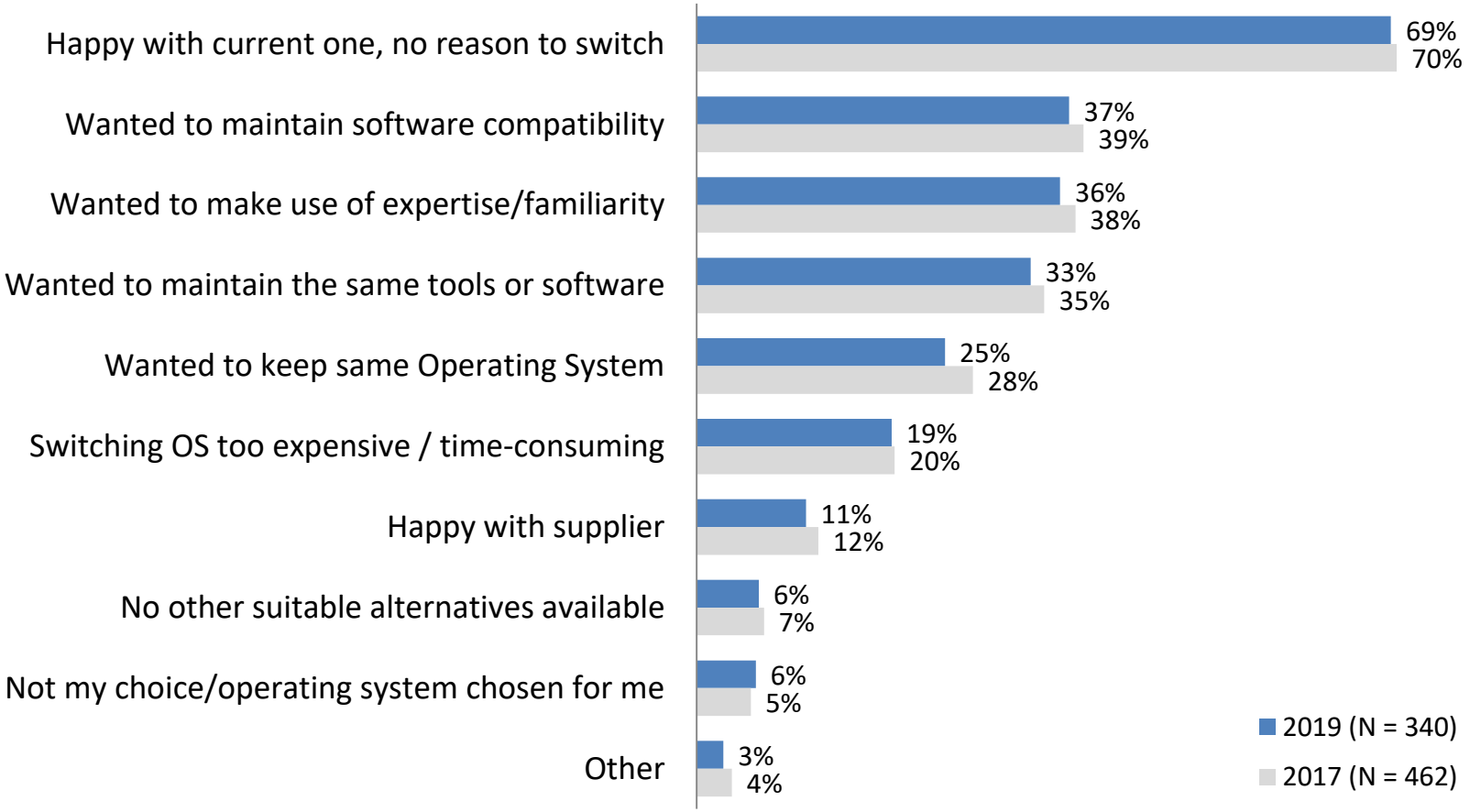
Base = Those who do not currently use a "Commercial" OS/RTOS

Did you use the same operating system, RTOS, or kernel as in your previous project?



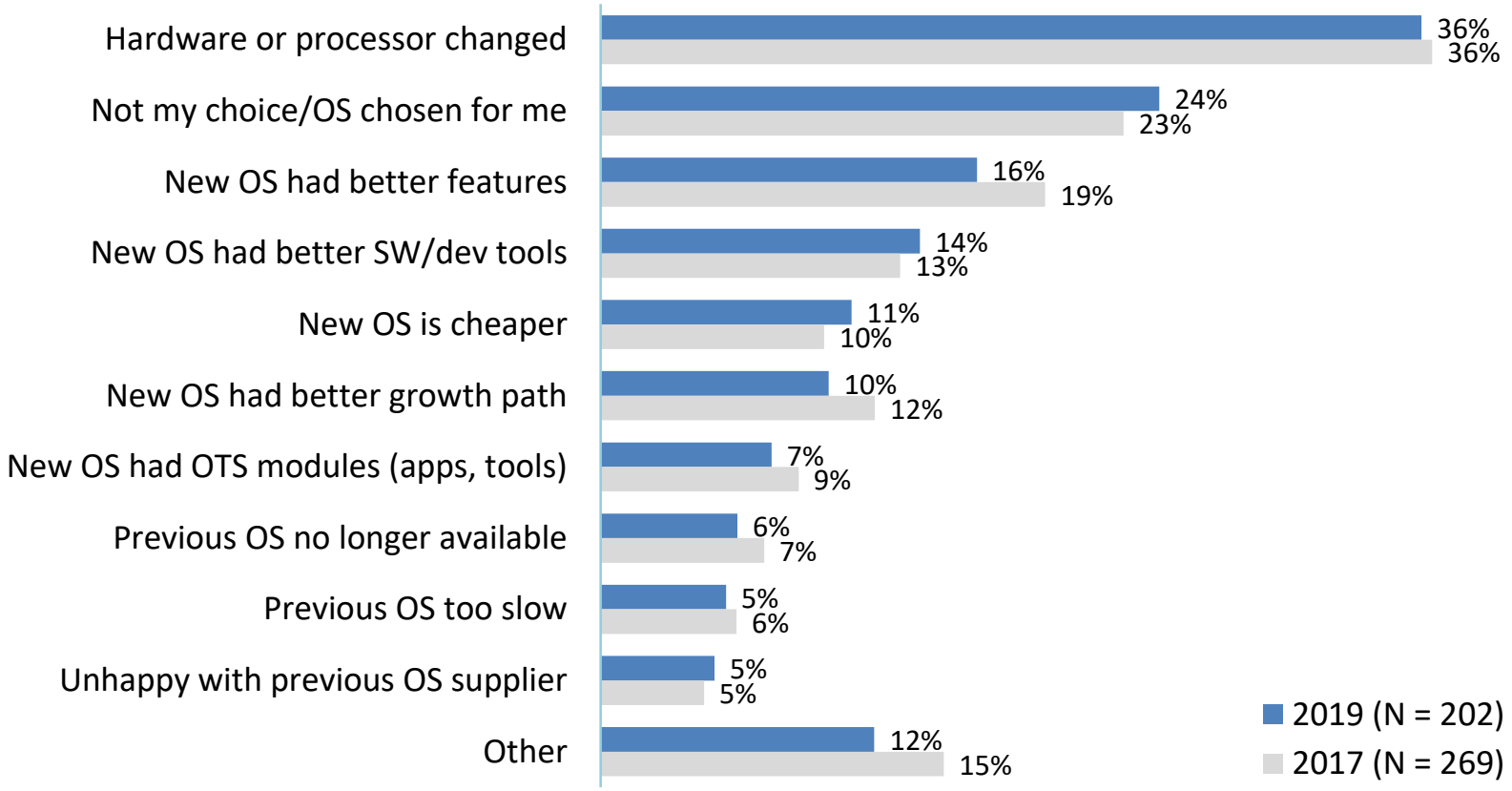
Base: Those who use operating systems

Why did you use the same operating system?

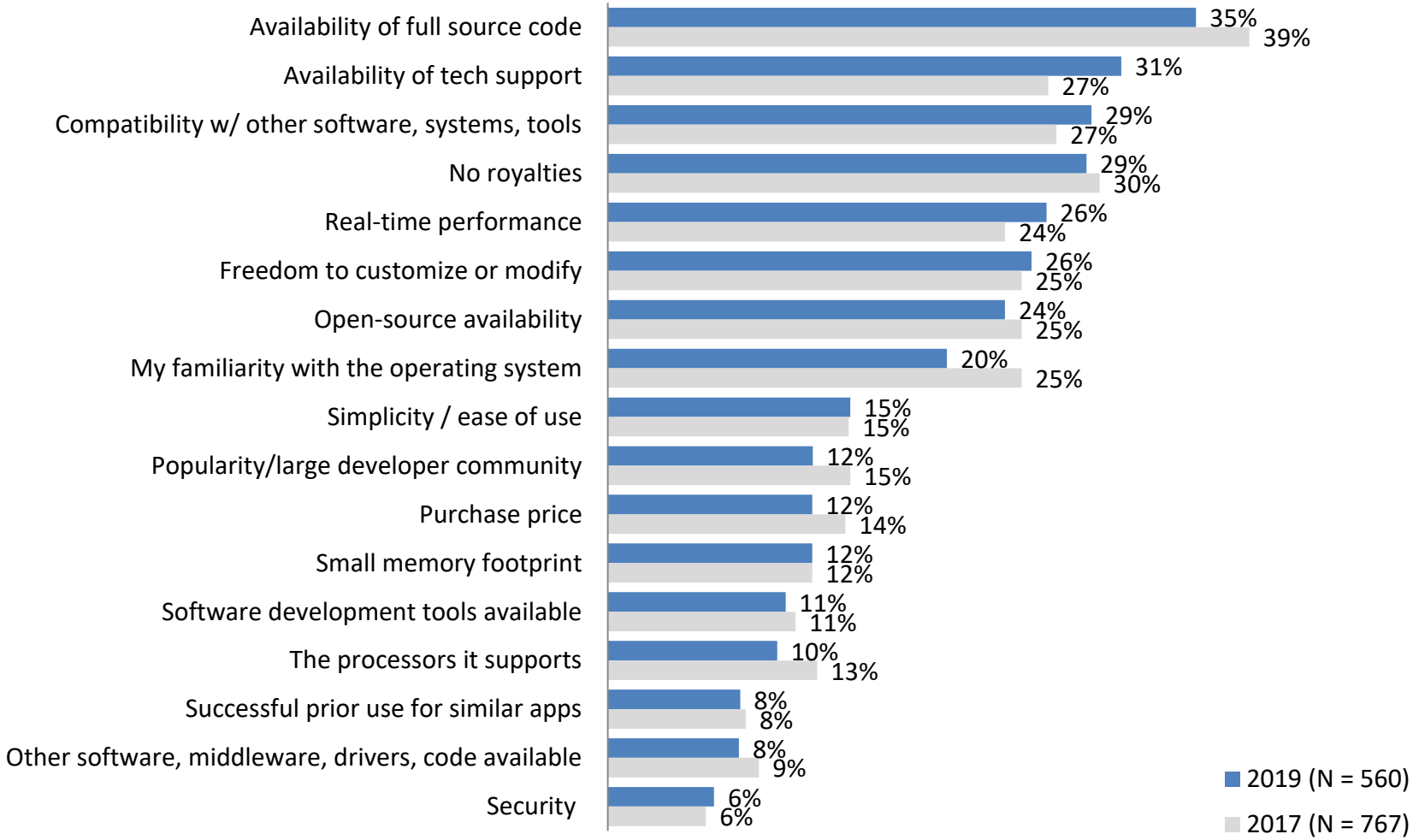


Base = Those who are using the same operating system as in previous project

Why did you switch operating systems?

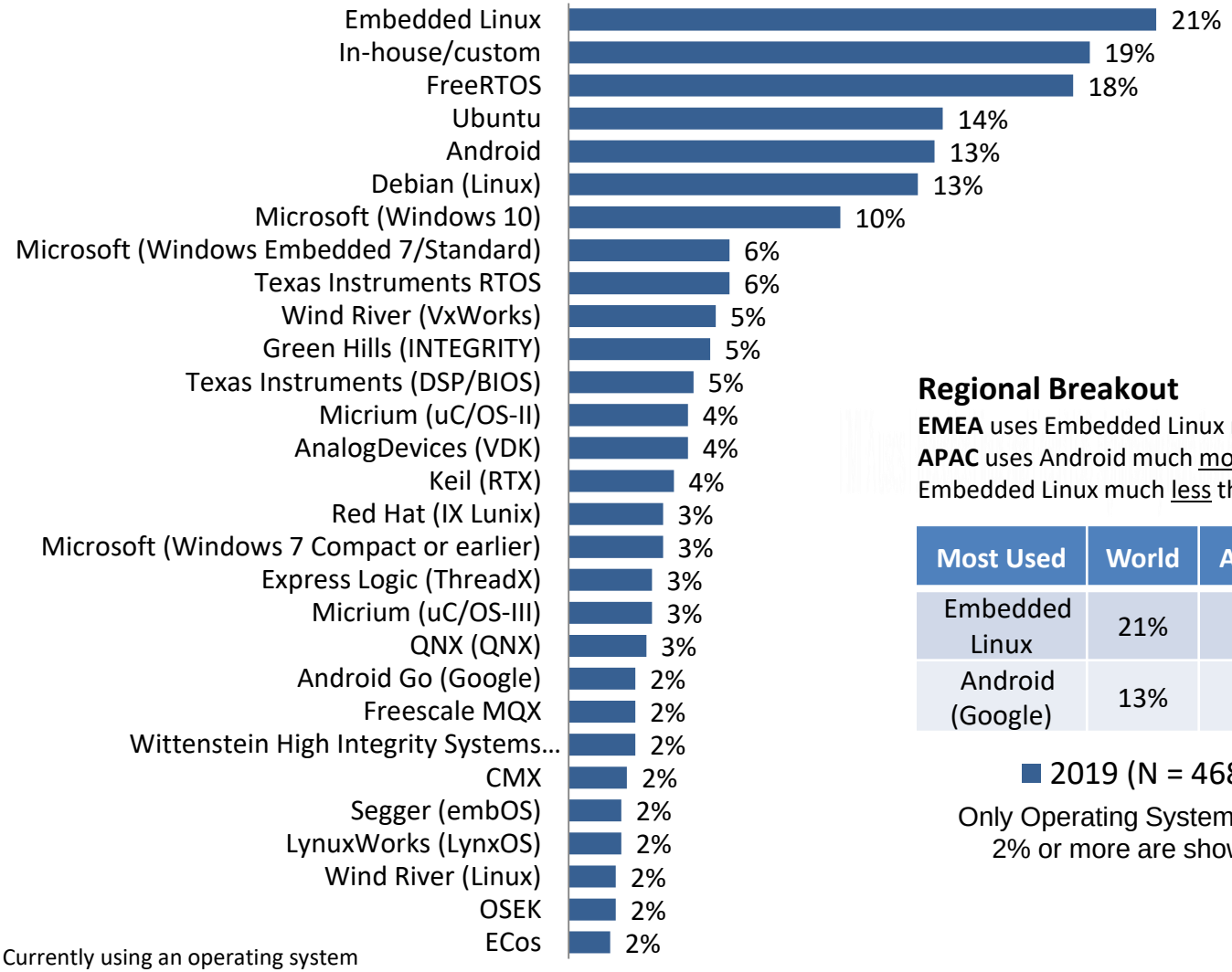


What are the most important factors in choosing an operating system?



Base: Currently using an operating system

Please select ALL of the operating systems you are currently using.



Base: Currently using an operating system

Regional Breakout

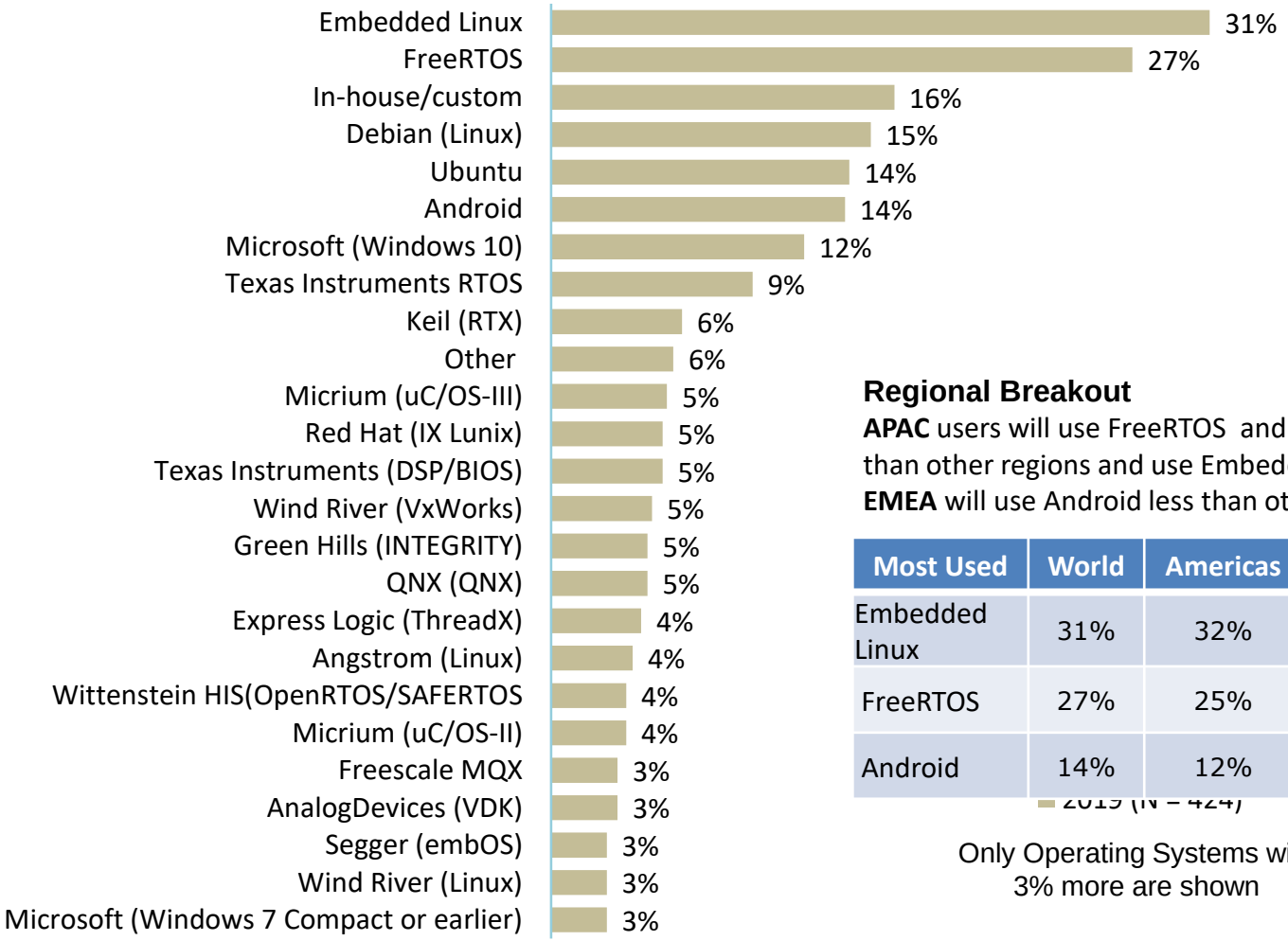
EMEA uses Embedded Linux much more than other regions.
APAC uses Android much more than other regions and uses Embedded Linux much less that others.

Most Used	World	Americas	EMEA	APAC
Embedded Linux	21%	21%	30%	15%
Android (Google)	13%	9%	14%	27%

2019 (N = 468)

Only Operating Systems with 2% or more are shown.

Please select ALL of the operating systems you are considering using in the next 12 months.



Regional Breakout

APAC users will use FreeRTOS and Android much more than other regions and use Embedded Linux much less. **EMEA** will use Android less than other regions.

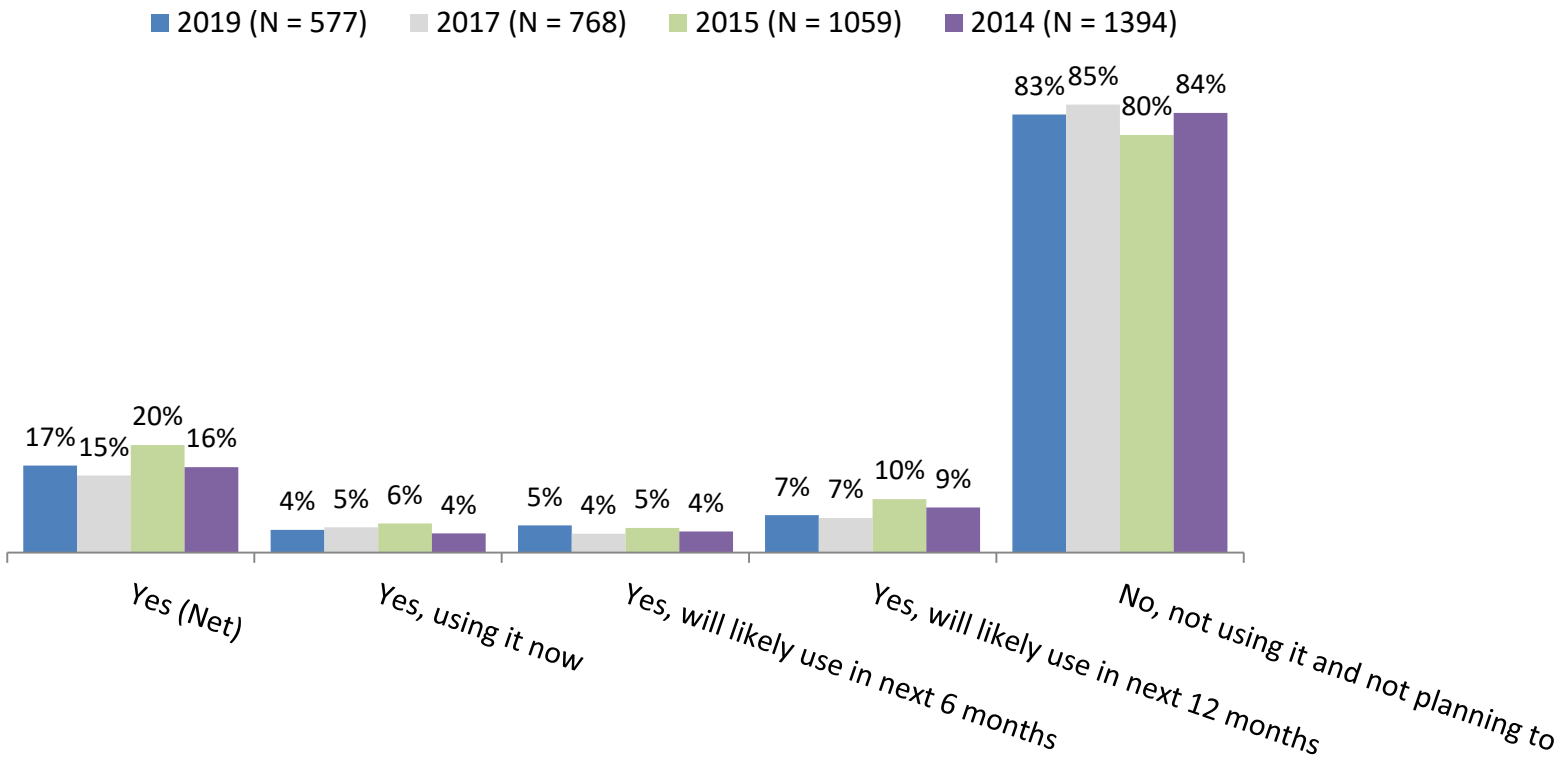
Most Used	World	Americas	EMEA	APAC
Embedded Linux	31%	32%	31%	**26%**
FreeRTOS	27%	25%	24%	**37%**
Android	14%	12%	**10%**	**26%**

2019 (N = 424)

Only Operating Systems with 3% more are shown

Base: Those who are considering an operating system in any project in the next 12 months

Are you currently using embedded virtualization/hypervisors or will you likely use them in the next 12 months?



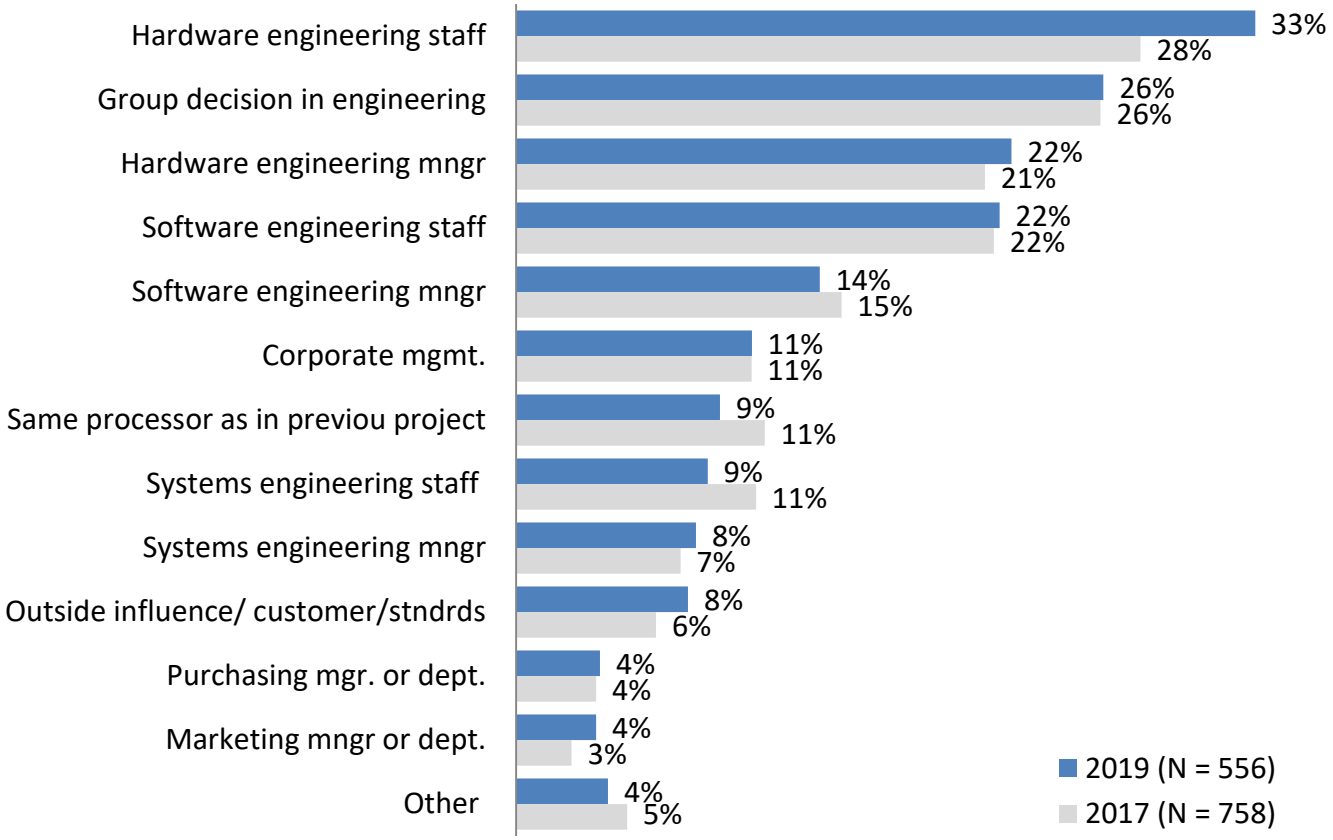
Top reasons for using virtualization/hypervisors	%
Separation of multiple applications	45
Need to support multiple guest operating systems (e.g., Android, VxWorks, Linux)	40
Need to support hard real-time application(s) and guest operating system	32
Processor consolidation	26
Need to support legacy and new applications on the same system	26

Operating Systems

- **OS/RTOS usage –** 65% overall usage, down from 2017 (67%) and 2015 (72%).
- **Open Source OS/RTOS usage –** 41%, projected for next project at 49%. Usage of commercial OSes (24%) dipped to an all time low from 40% in 2012.
- **Used same OS –** 60% used the same OS, same as 2017. Reasons for using the same OS: happy (69%), compatibility (37%), familiarity (37%), same tools (33%).
- **Reasons for Switching OS –** Hardware/processor changed (36%), chosen for me (24%), new one had better features (16%).
- **Reason for choosing OS –** Full source code (35%), tech support (31%), compatibility (29%), no royalties (29%). Same as 2017, slightly different rankings.
- **OS/RTOS used –** Embedded Linux (21%), Inhouse (19%), FreeRTOS (18%). EMEA uses Embedded Linux (30%). APAC uses Android (27%).
- **OS/RTOS considering** – Embedded Linux (31%), FreeRTOS (27%), Inhouse (16%) were top three RTOSes being considered. APAC users will consider FreeRTOS (37%) and Android (26%).
- **Embedded virtualization/hypervisor usage –** 17%, up from 15% in 2017. Use it mostly for separation of multiple applications (45%) and multiple guest OSes (40%).

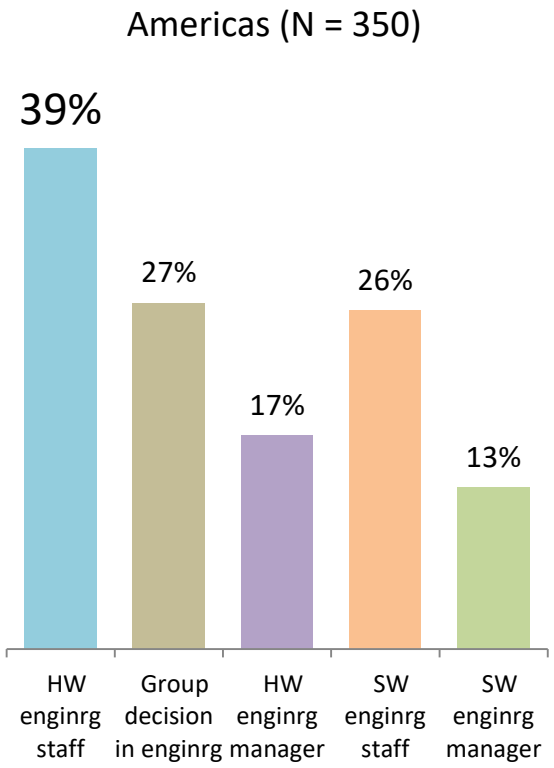
MICROPROCESSORS

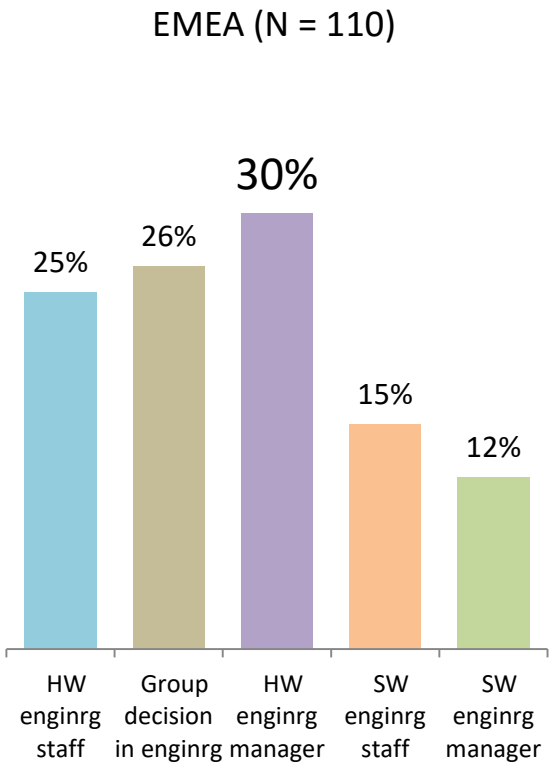
Who were the greatest influences on the choice of the processor for your current project?

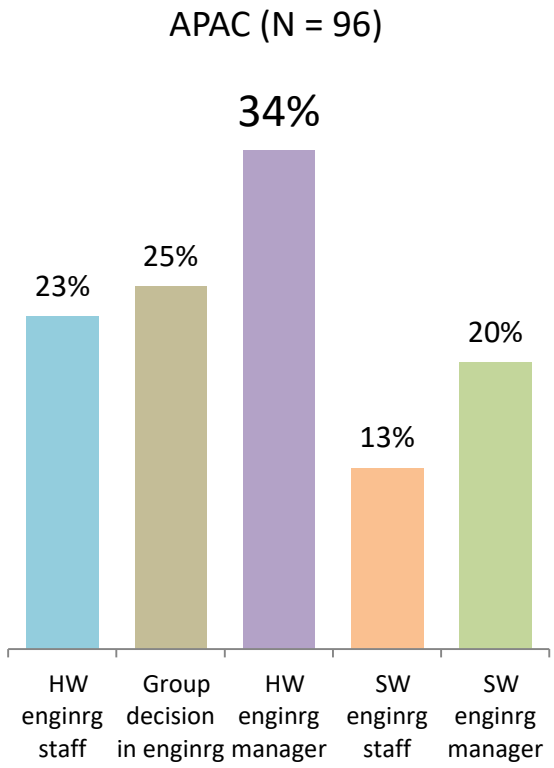


KEY TAKE AWAY

Who were the greatest influences on the choice of the processor for your current project? (Regional Detail)





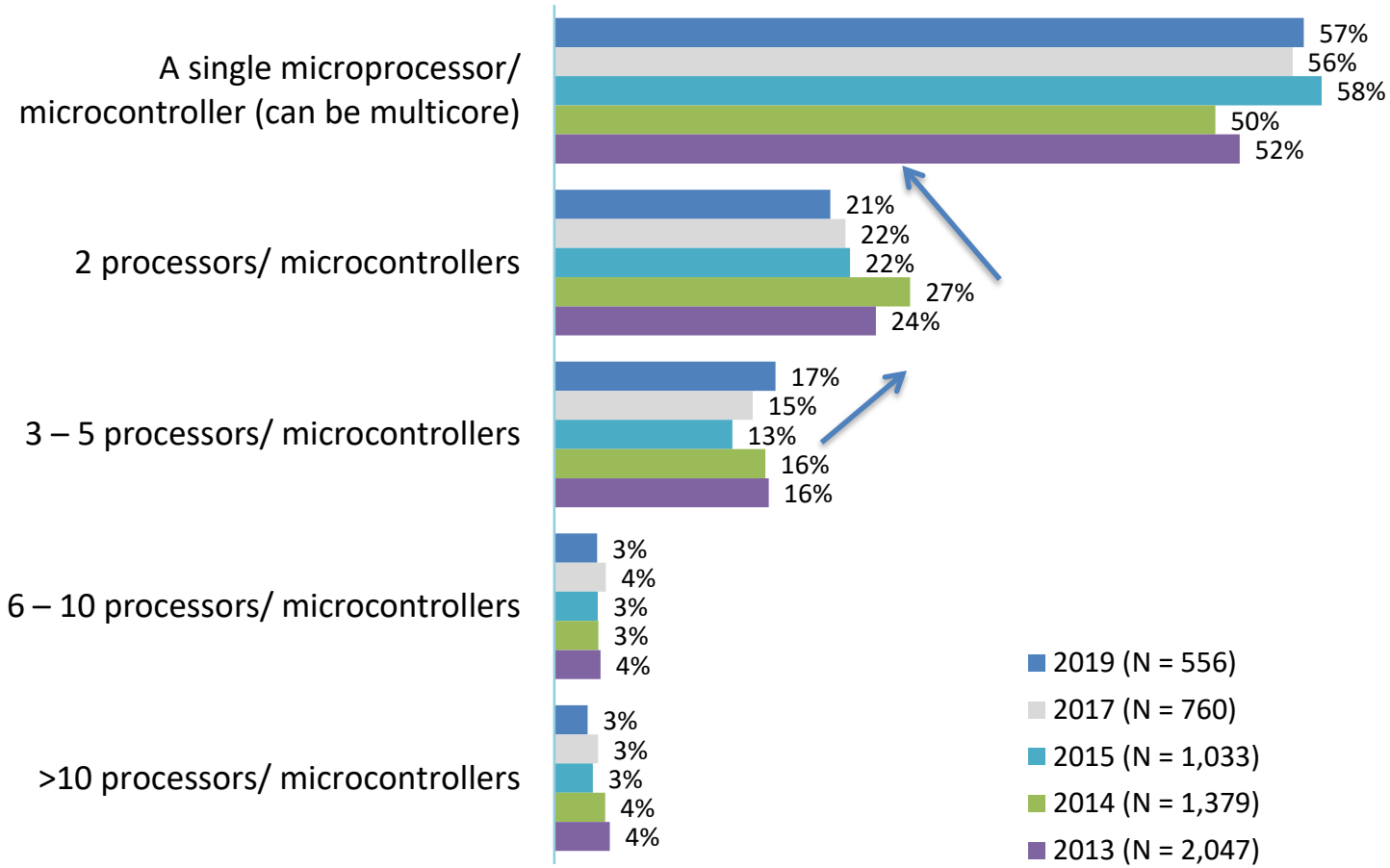


Americas top two influences
1. HW engineering STAFF
2. Group decision in Engineering

EMEA top two influences
1. HW engineering MANAGERS
2. Group decision in Engineering

APAC top two influences
1. HW engineering MANAGERS
2. Group decision in Engineering

My current embedded project contains:

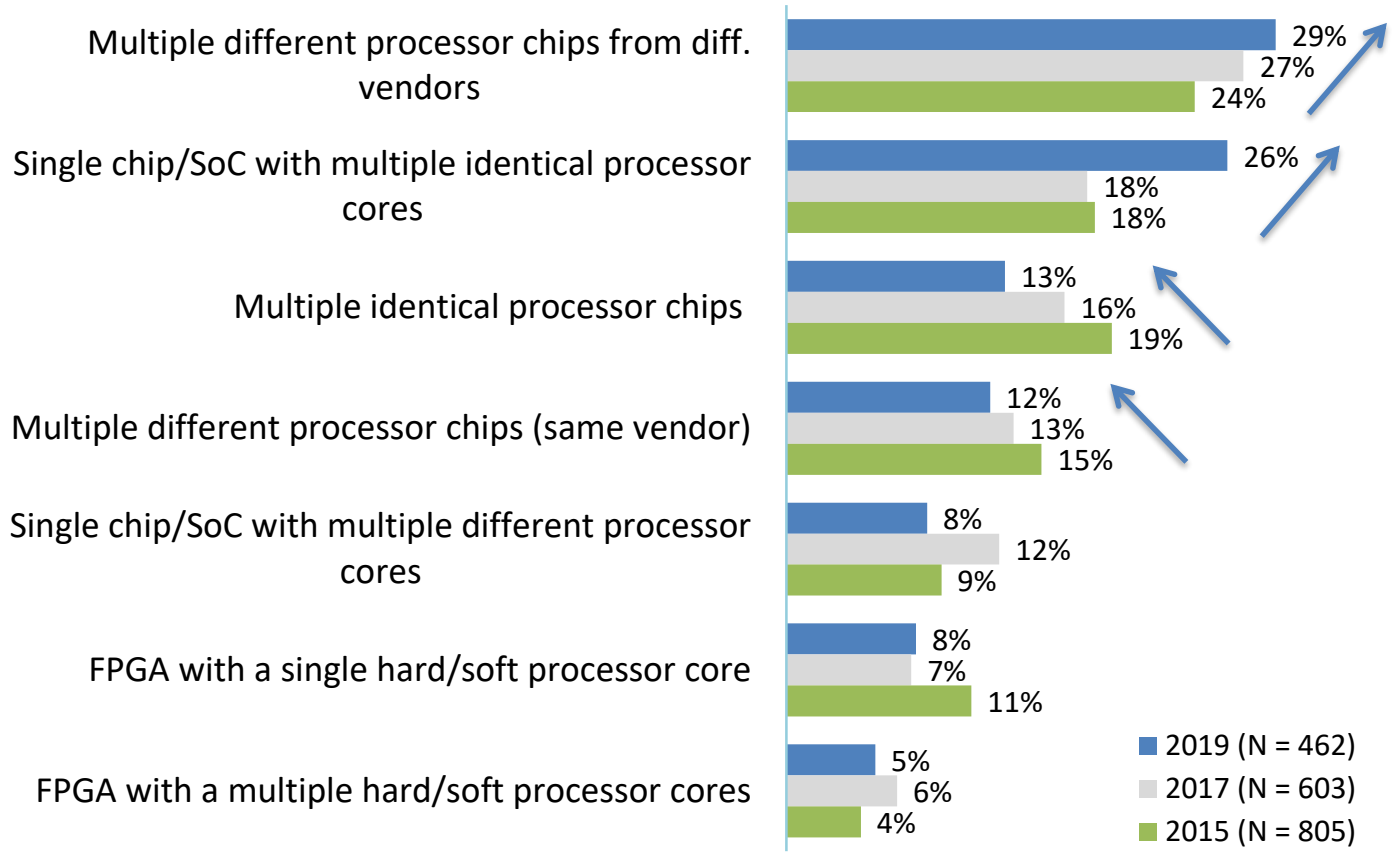


65% of EMEA designs contained a single processor.

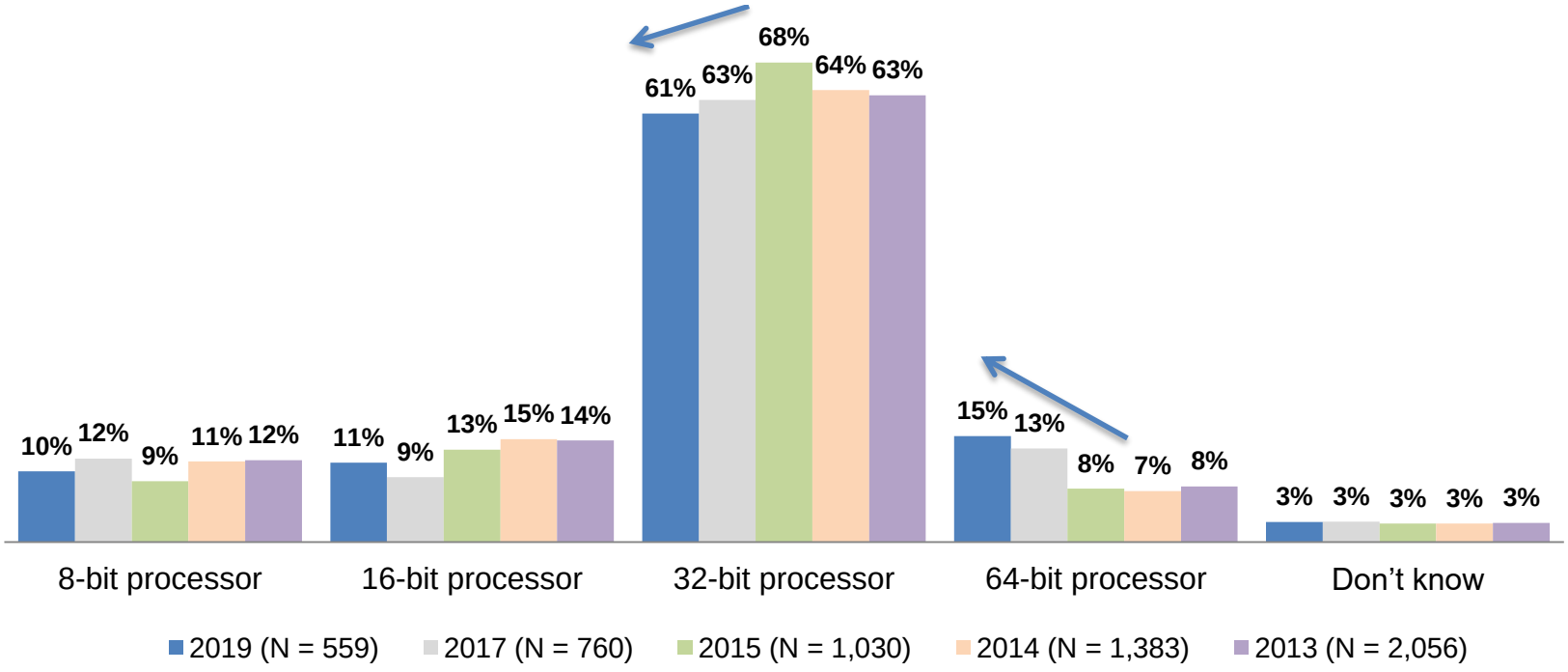
The average number microprocessor/micro controllers per project was:

2.2 in 2019
2.3 in 2017
2.1 in 2015
2.4 in 2014
2.4 in 2013

Does your embedded project contain…



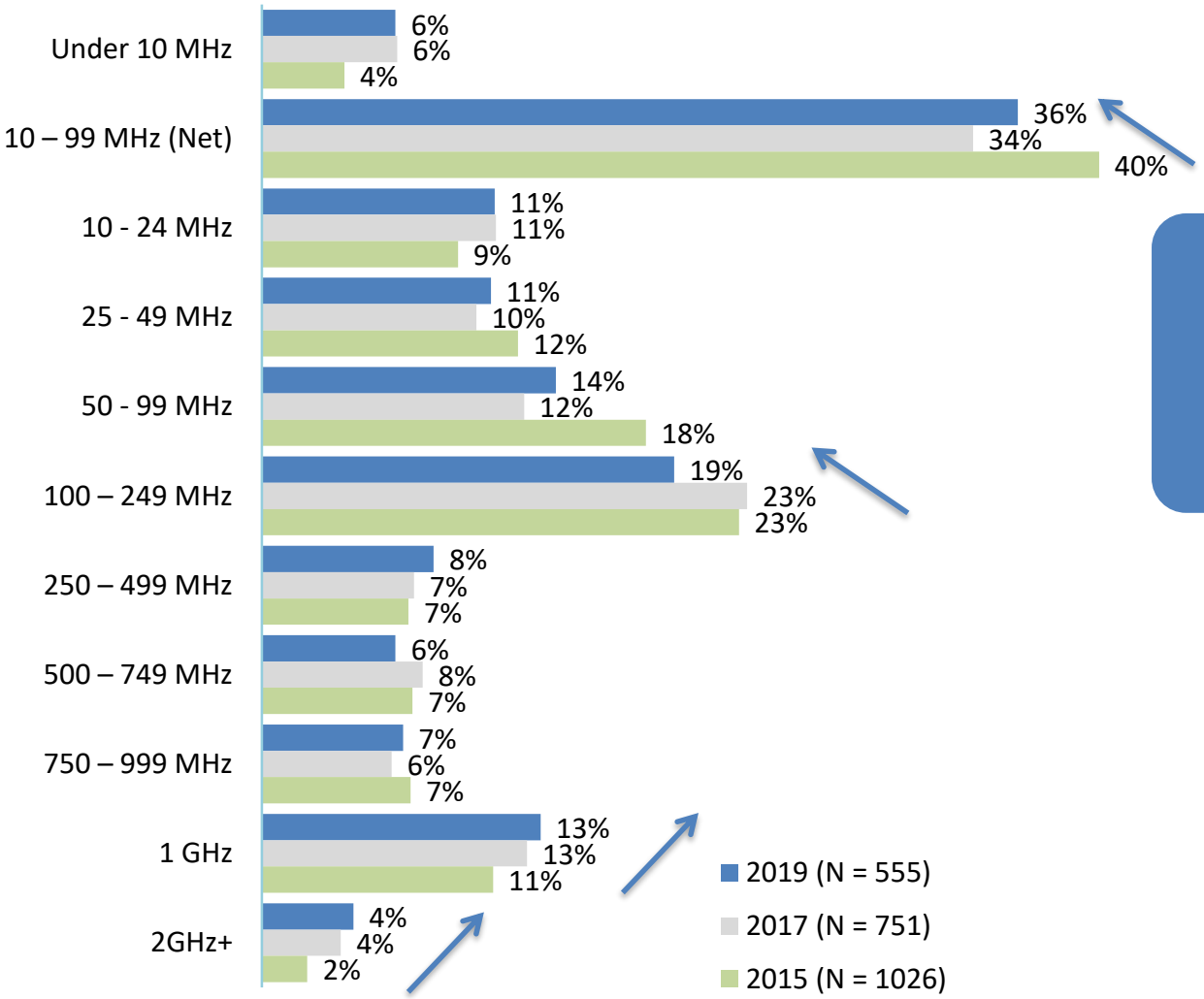
My current embedded project's main processor is a:



71% of **EMEA** users use 32-bit chips as their main processor.

Additional chips to the main processor	
Primarily 8-bit processors	19%
Primarily 16-bit processors	15%
Primarily 32-bit processors	55%
Primarily 64-bit processors	12%

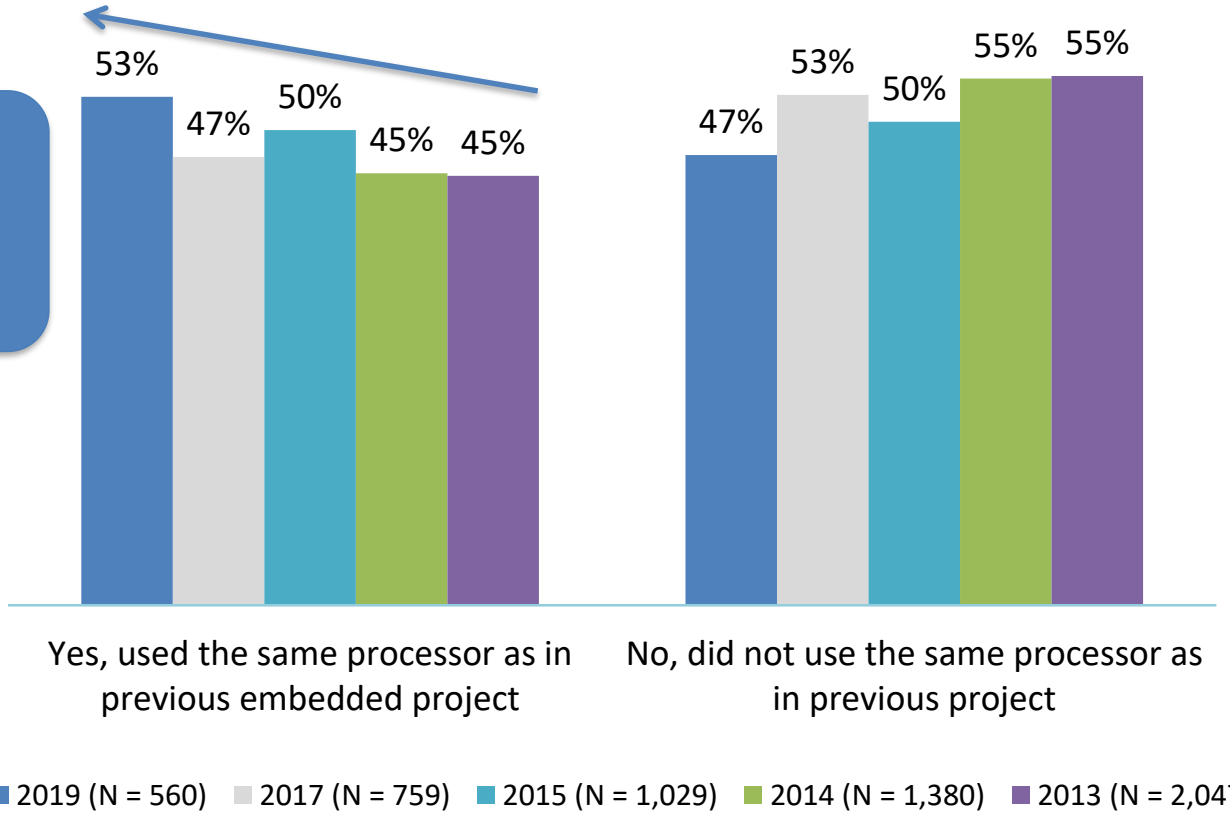
My current embedded project's main processor clock rate is:



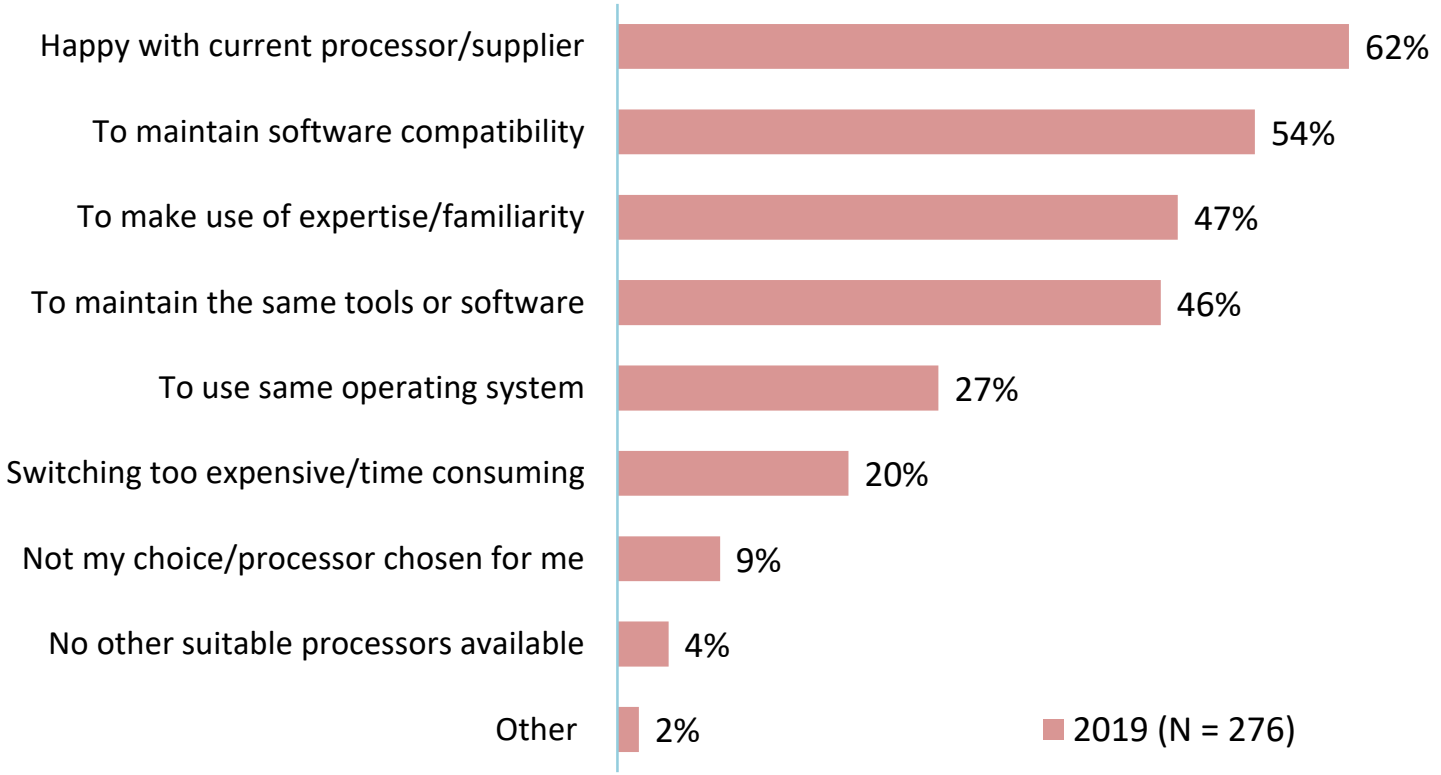
The average processor clock rate was:
462 MHz in 2019
445 MHz in 2017
397 MHz in 2015
428 MHz in 2014

Did you use the same processor as in your previous embedded project?

62% of **APAC** users used the same processor as in their previous project.

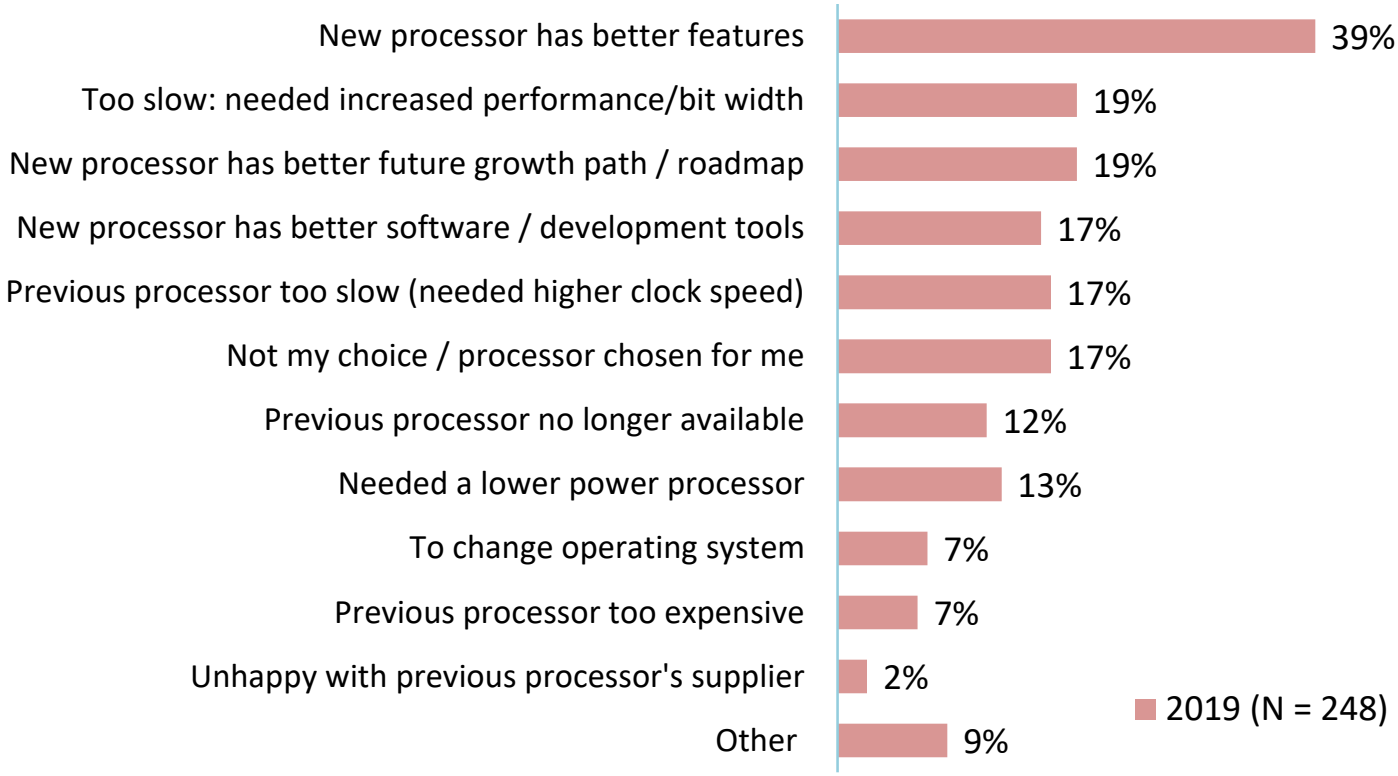


Why did you use the same processor?



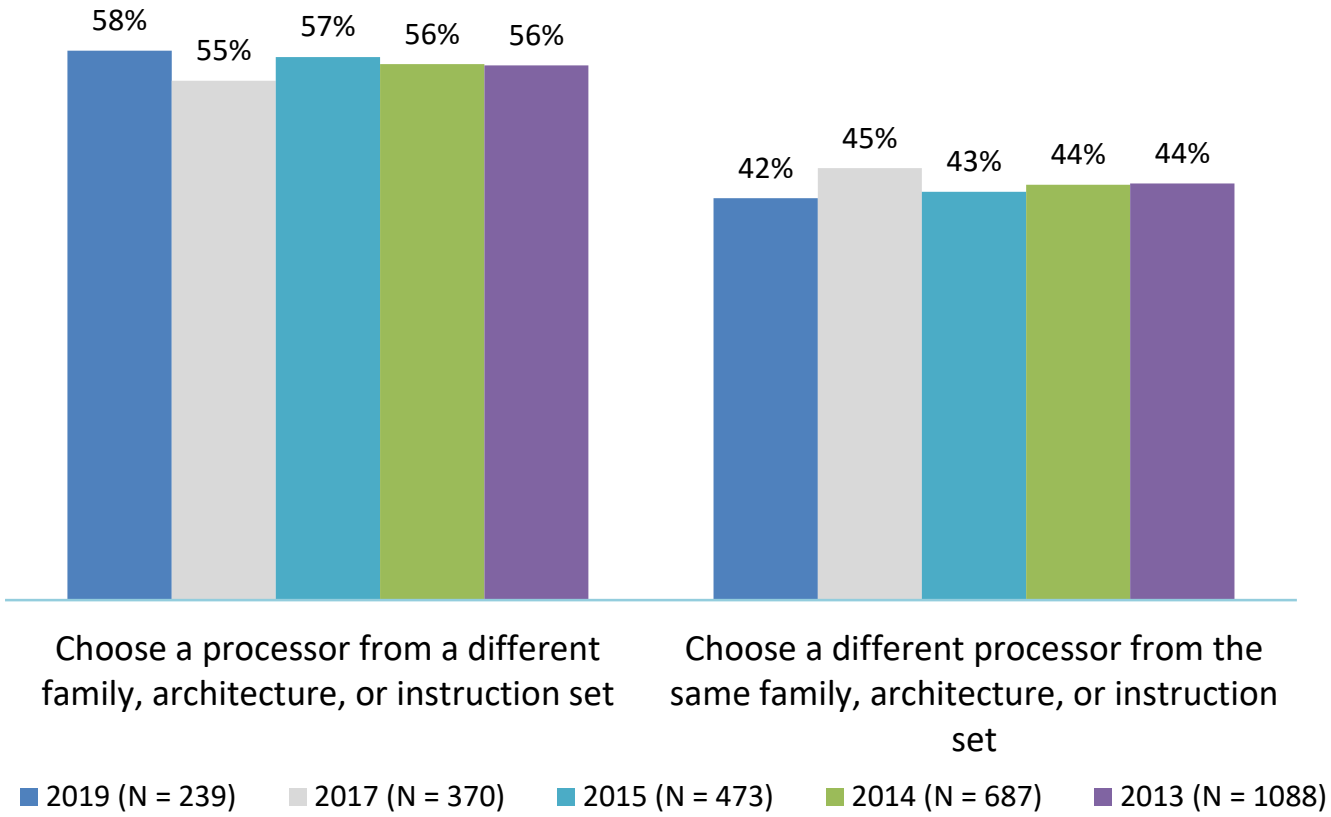
Base = Those who used the same processor as in previous project

What were your reasons for switching processors?



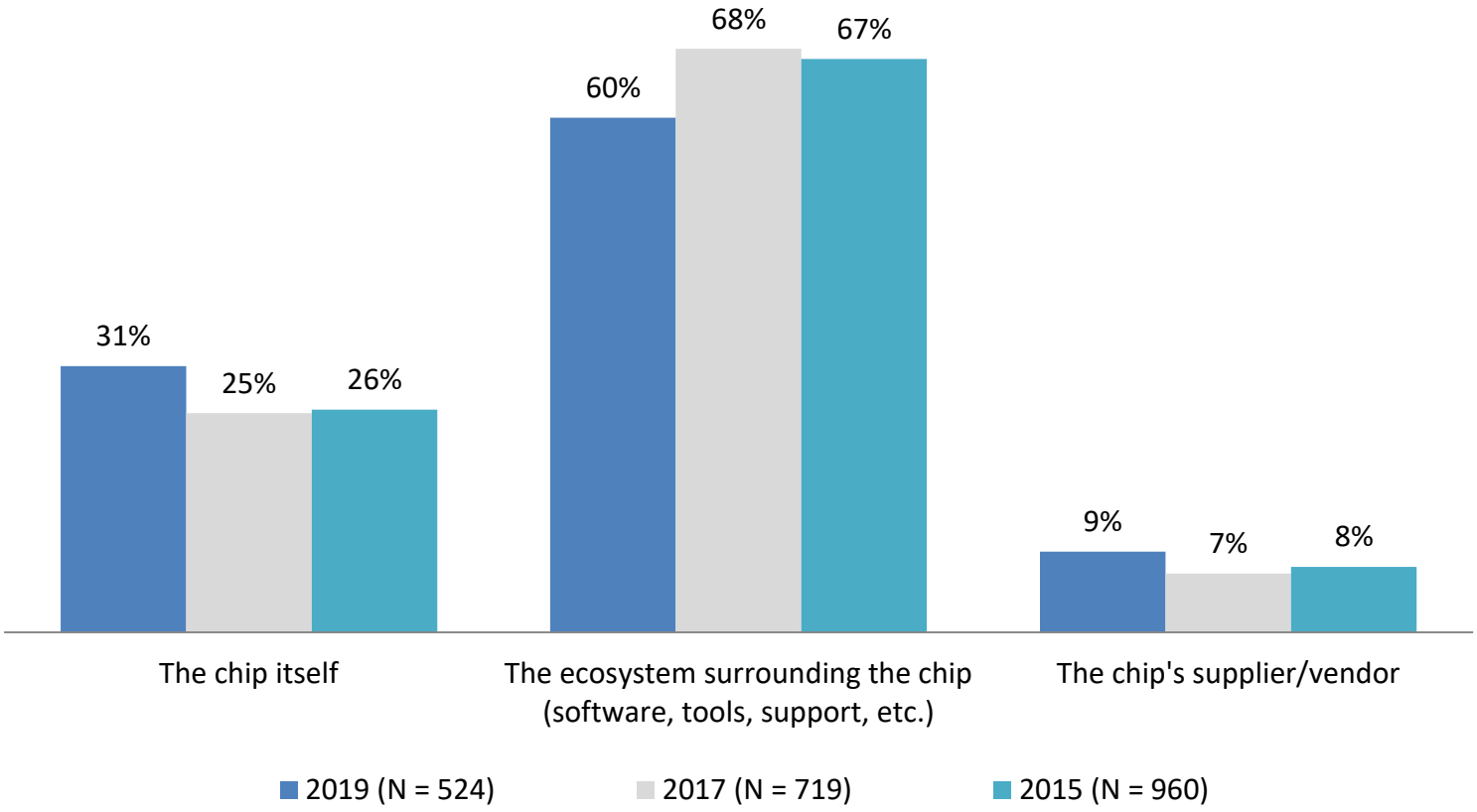
Base = Those who used the same processor as in previous project

Did you…

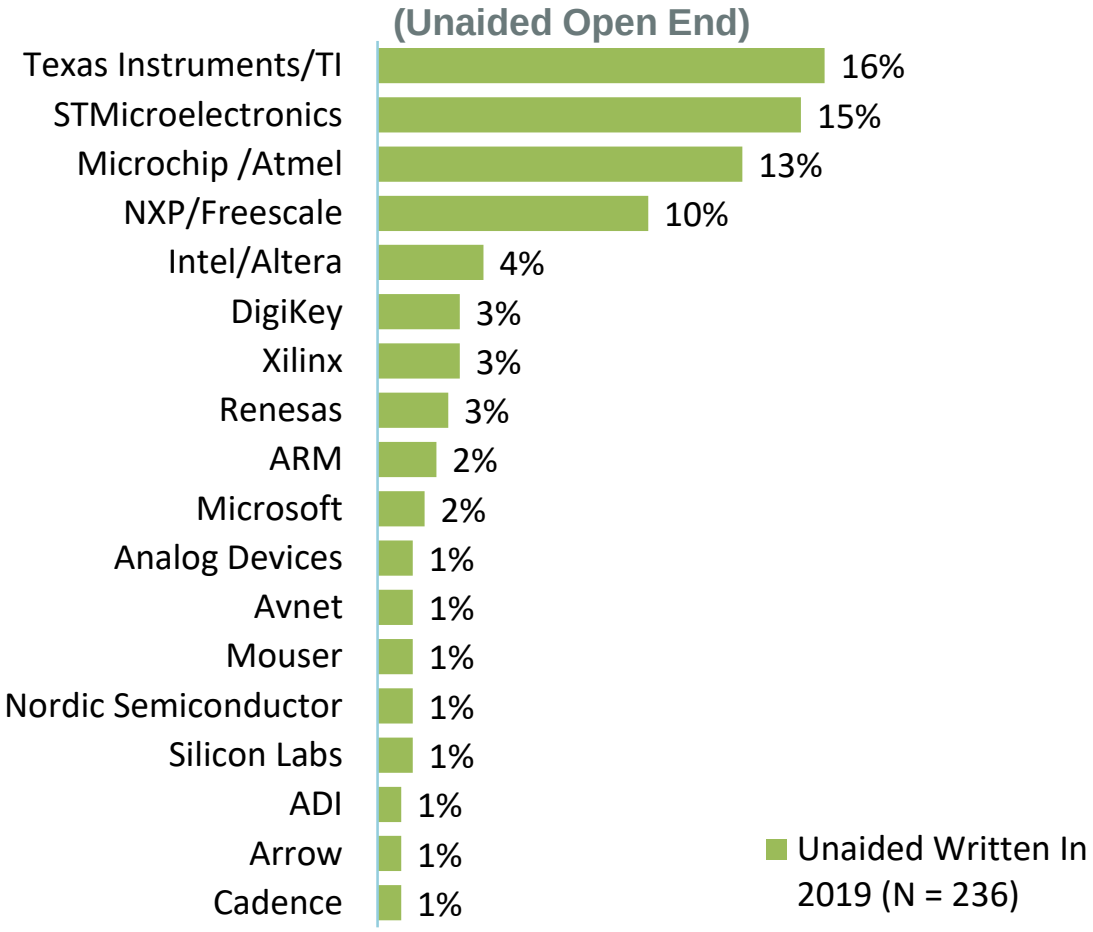


Base = Those who did not use the same processor as in previous project

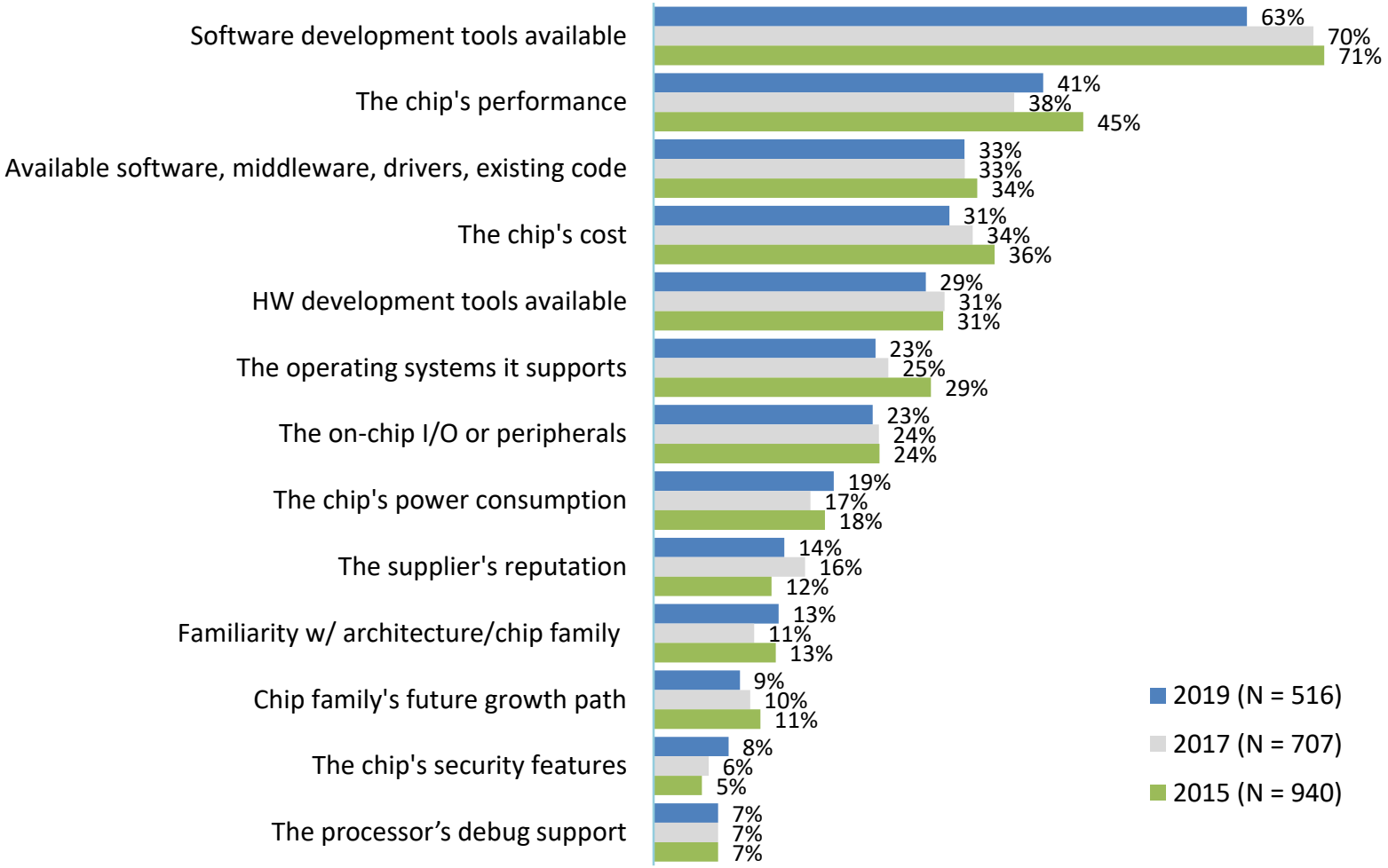
What's most important when choosing a microprocessor?



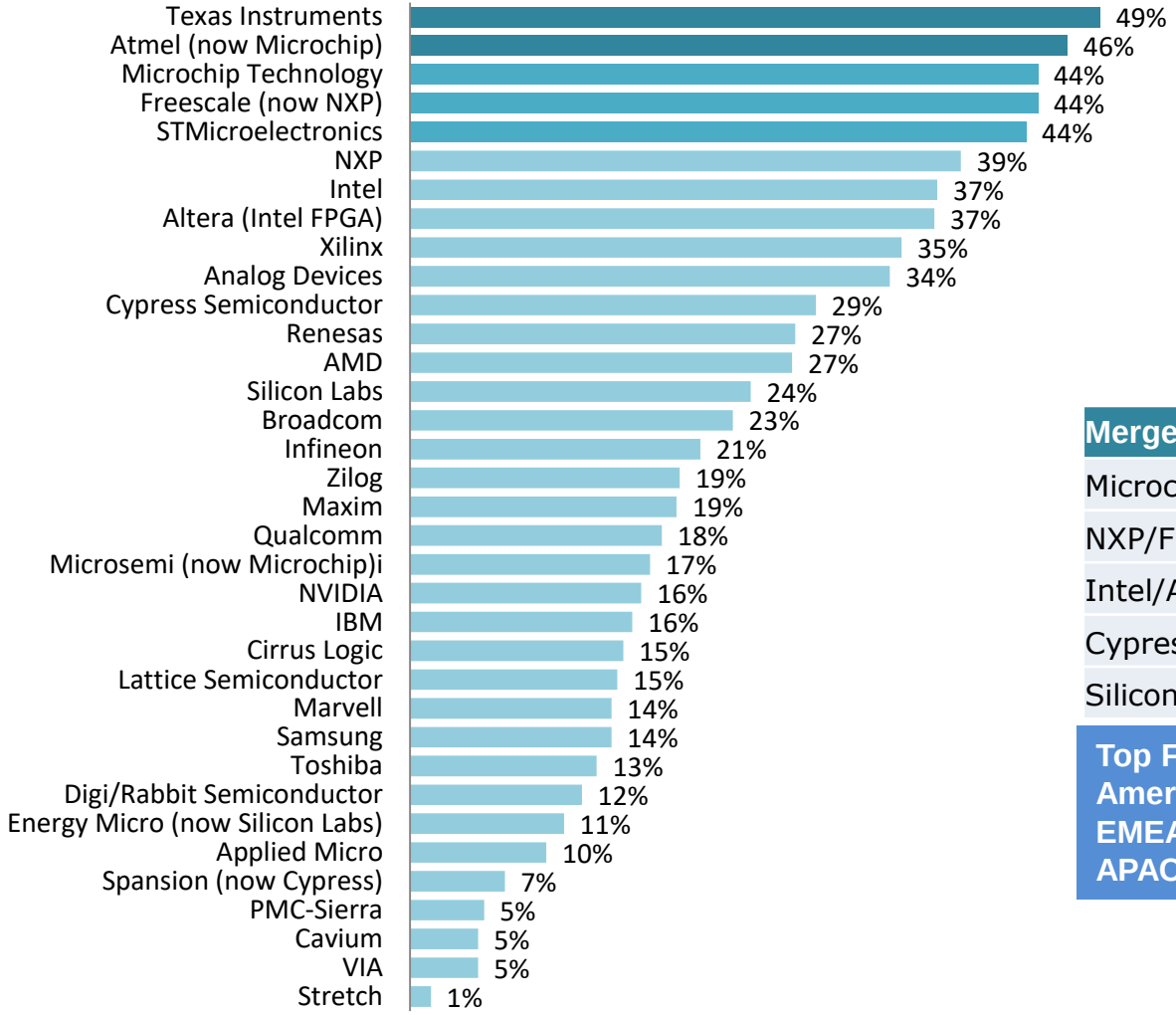
Which vendor has the best ecosystem for your needs?



What are the most important factors in choosing a processor?



Please select the processor vendors you are familiar with.

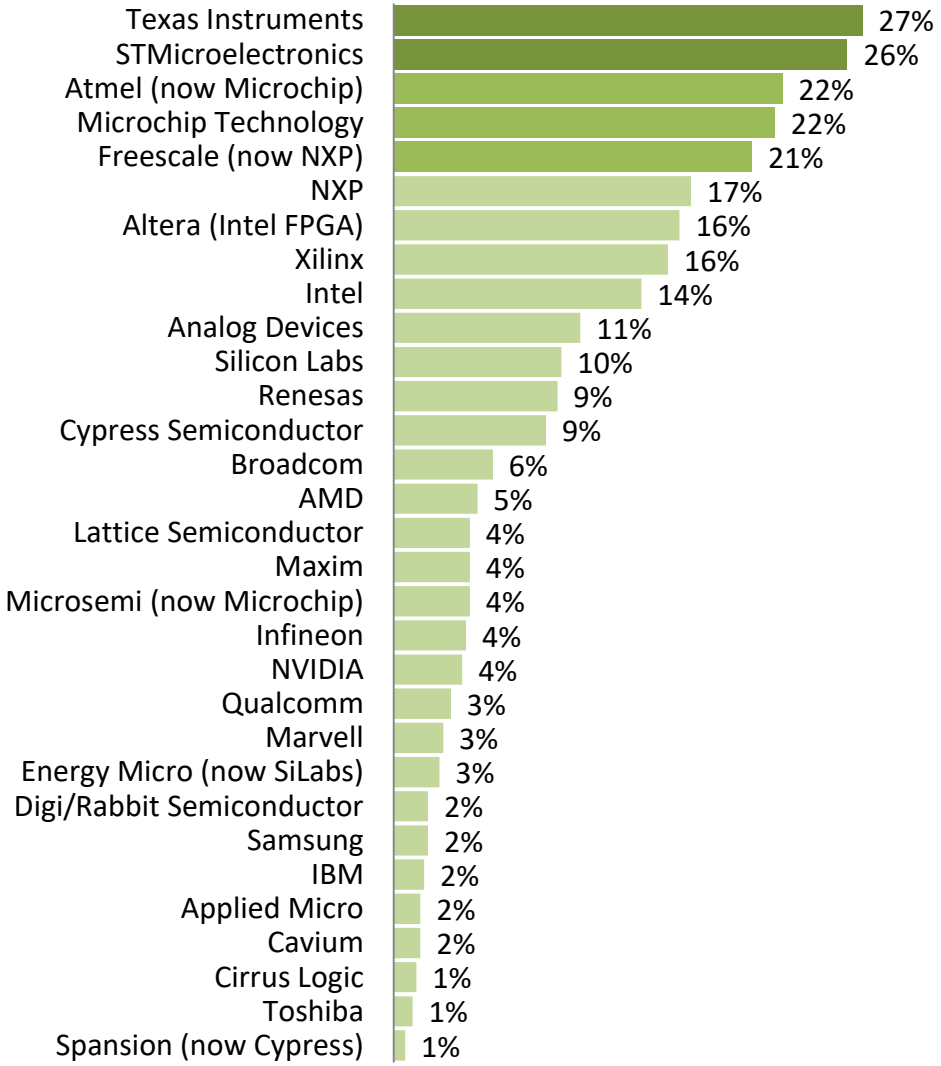


Merged Brands Combined	%
Microchip/Atmel/Microsemi (Net)	63
NXP/Freescale (Net)	56
Intel/Altera (Net)	56
Cypress/Spansion (Net)	30
Silicon Labs/Energy (Net)	25

Top Four Brands by Region:
Americas: TI, Microchip, Atmel, Freescale.
EMEA: STMicro, Atmel, TI, NXP
APAC: TI, Atmel, NXP, Microchip

2019 (N = 478)

Please select the processor vendors you are currently using.

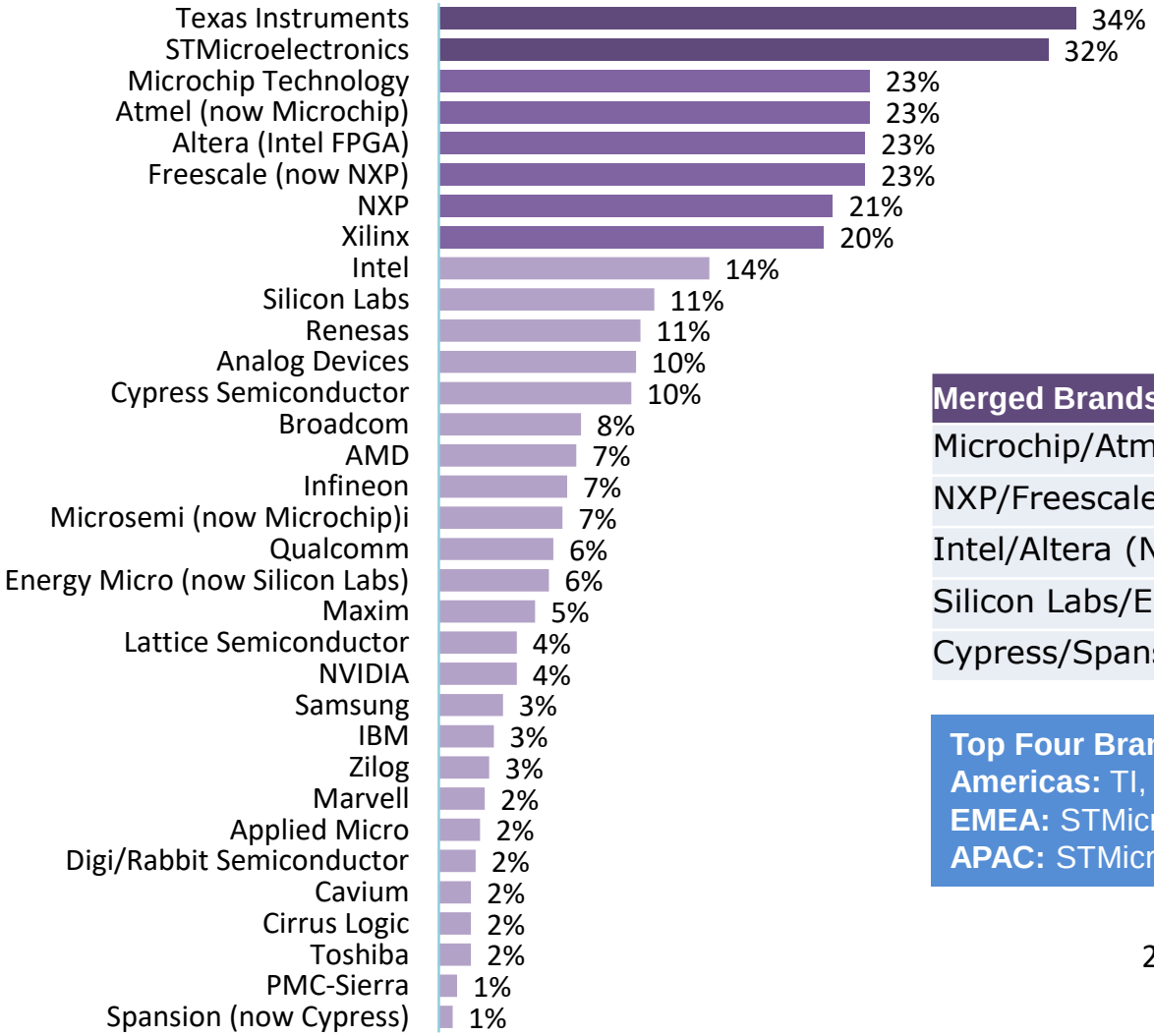


Merged Brands Combined	%
Microchip/Atmel/Microsemi (Net)	40
NXP/Freescale (Net)	28
Intel/Altera (Net)	26
Silicon Labs/Energy (Net)	10
Cypress/Spansion (Net)	9

Top Four Brands by Region:
Americas: TI, Microchip, STMicro, Atmel
EMEA: STMicro, NXP, TI, Atmel
APAC: TI, Atmel, Freescale, STMicro

2019 (N = 458)

Please select the processor vendors you are considering using on your next project.

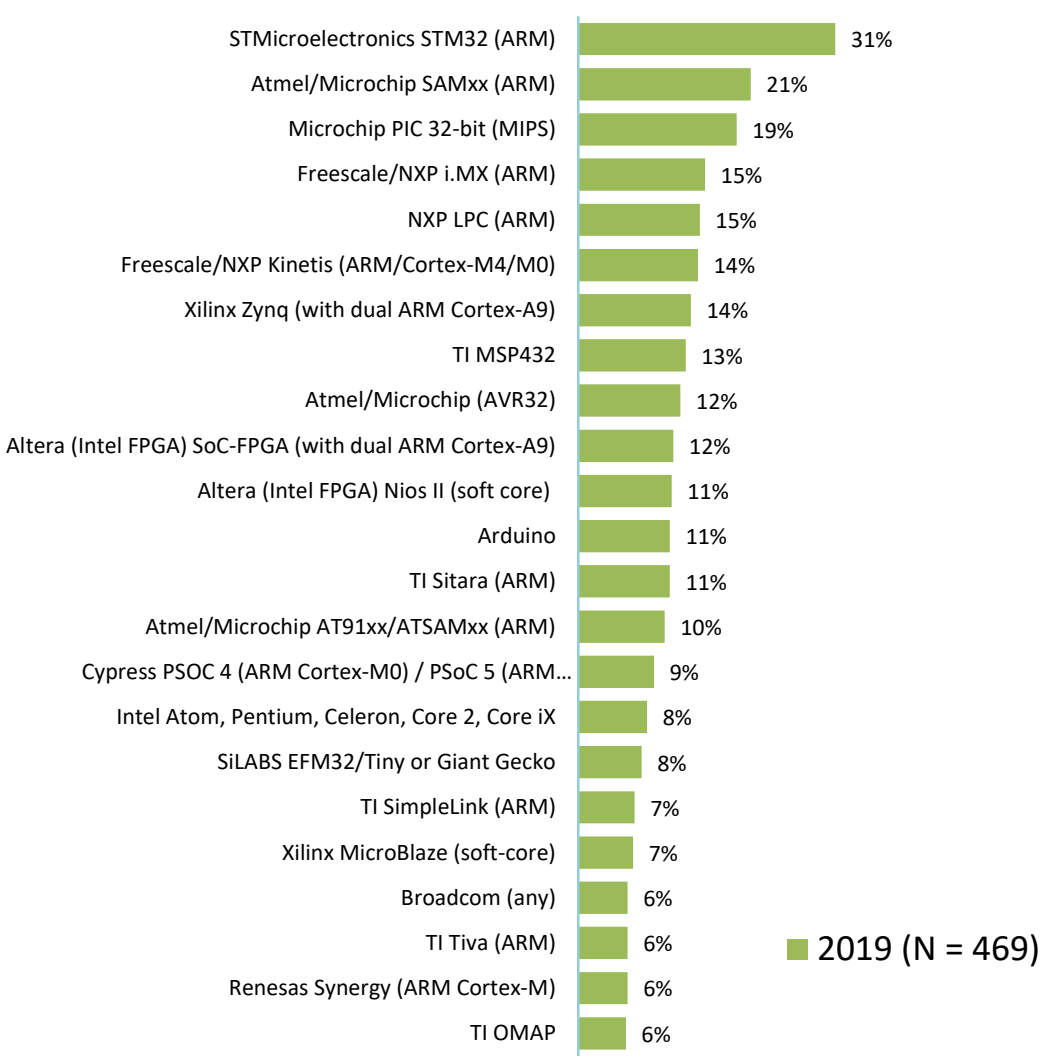


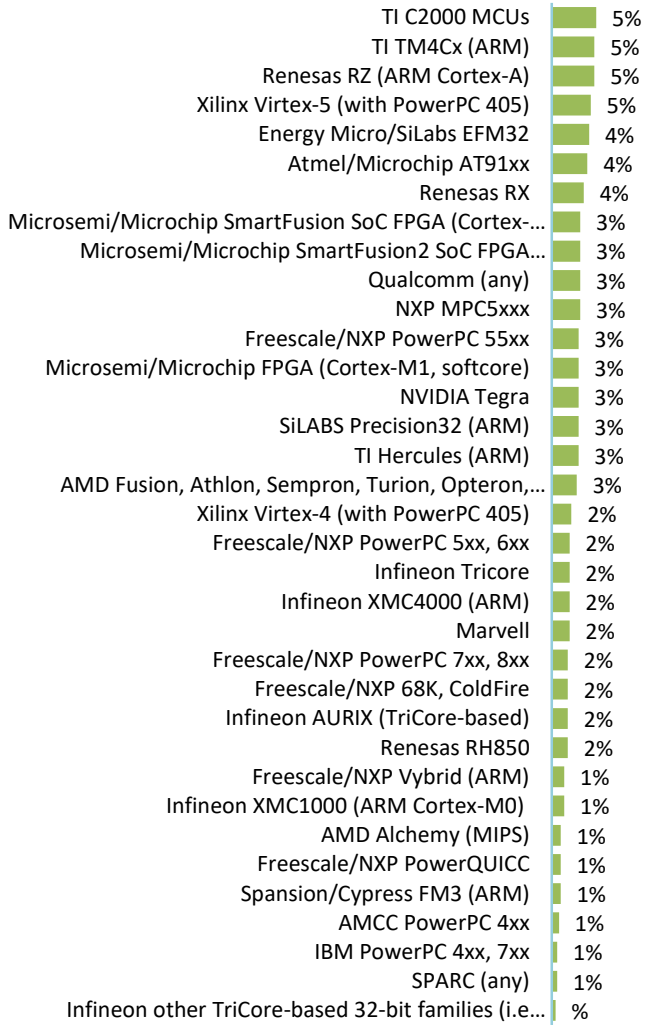
Merged Brands Combined	%
Microchip/Atmel/Microsemi (Net)	39
NXP/Freescale (Net)	33
Intel/Altera (Net)	31
Silicon Labs/Energy (Net)	13
Cypress/Spansion (Net)	10

Top Four Brands by Region:
Americas: TI, STMicro, Microchip, Atmel
EMEA: STMicro, TI, NXP, Altera
APAC: STMicro, TI, Freescale, NXP

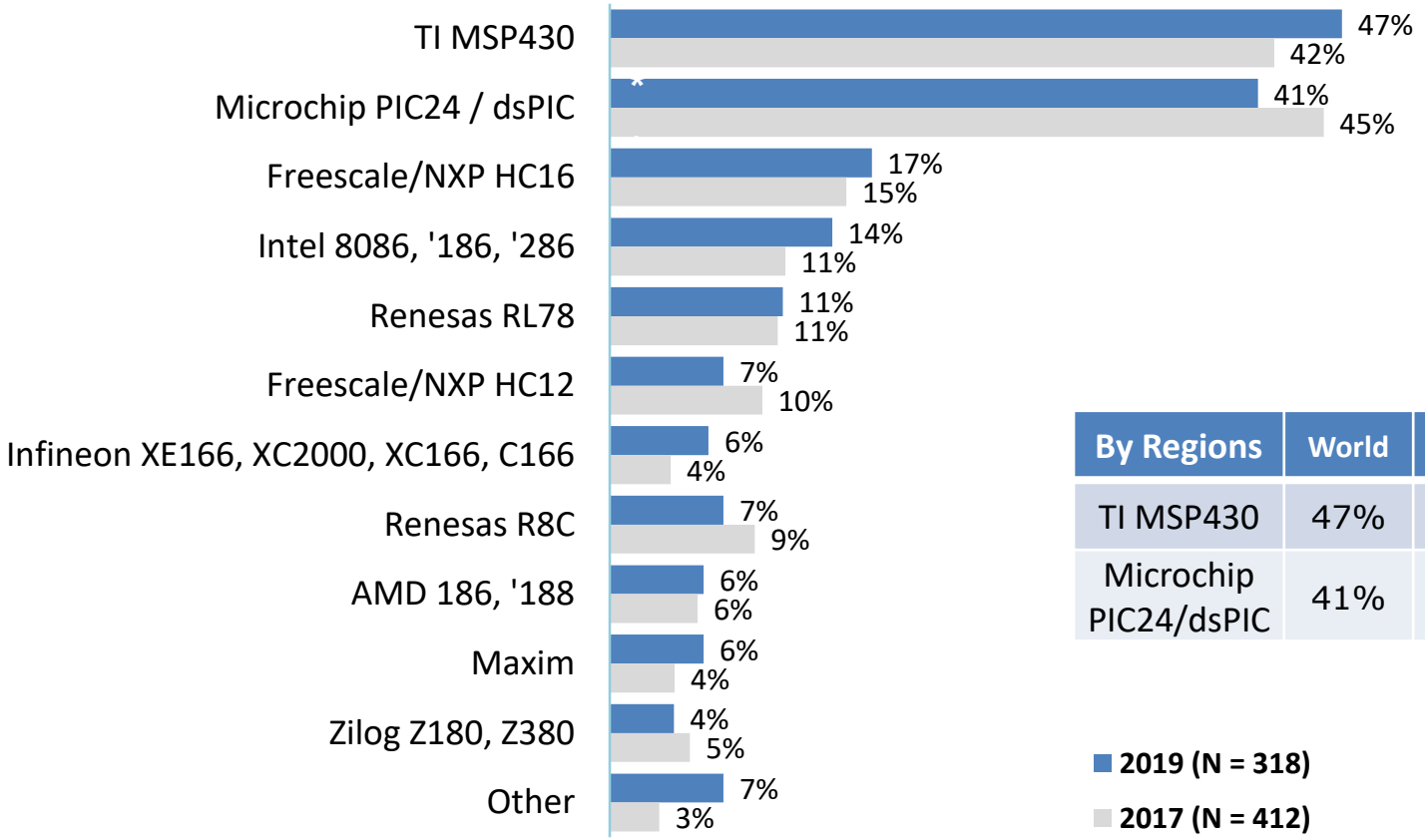
2017 (N = 554)

Which of the following 32-bit chip families would you consider for your next embedded project?



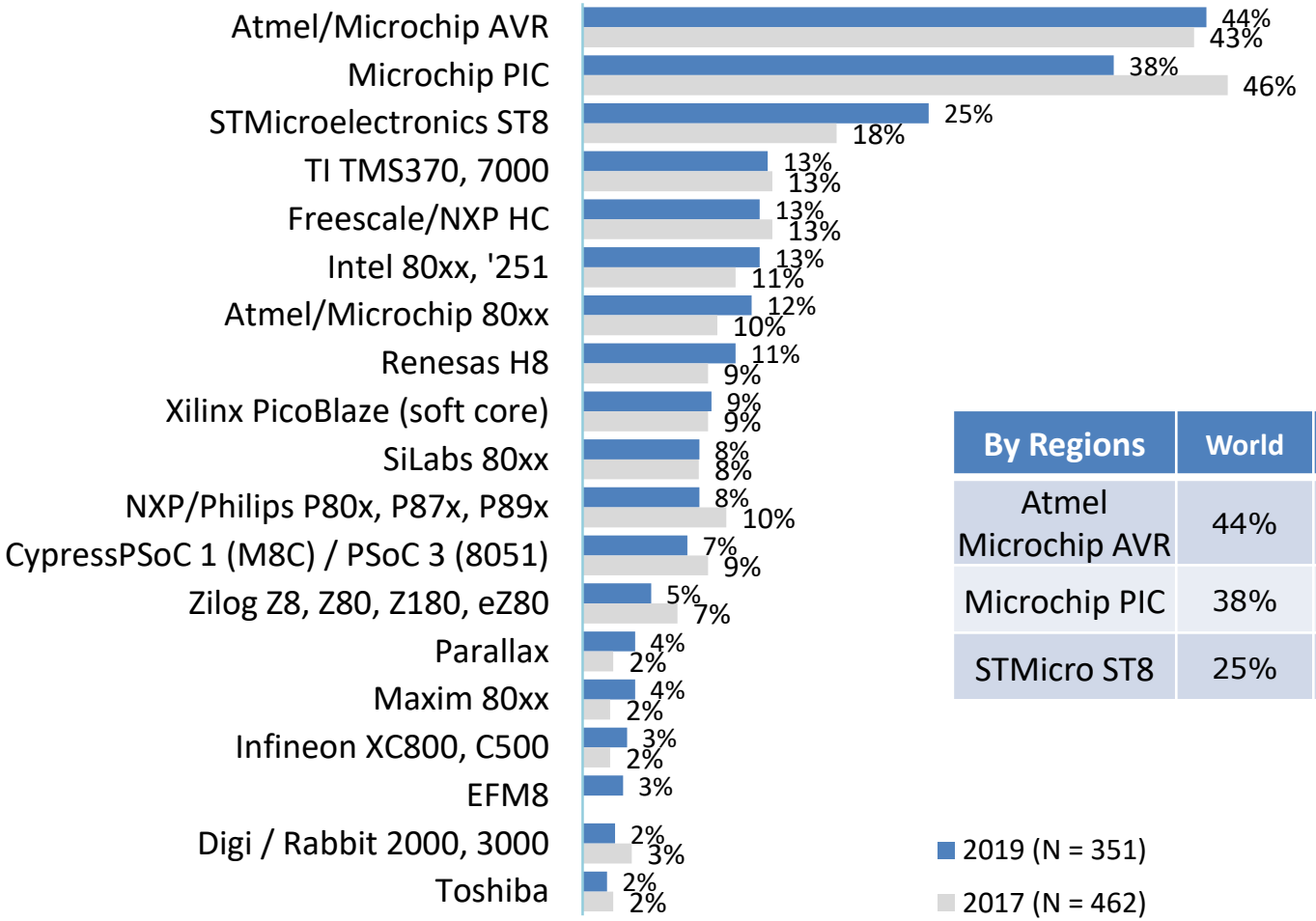


Which of the following 16-bit chip families would you consider for your next embedded project?



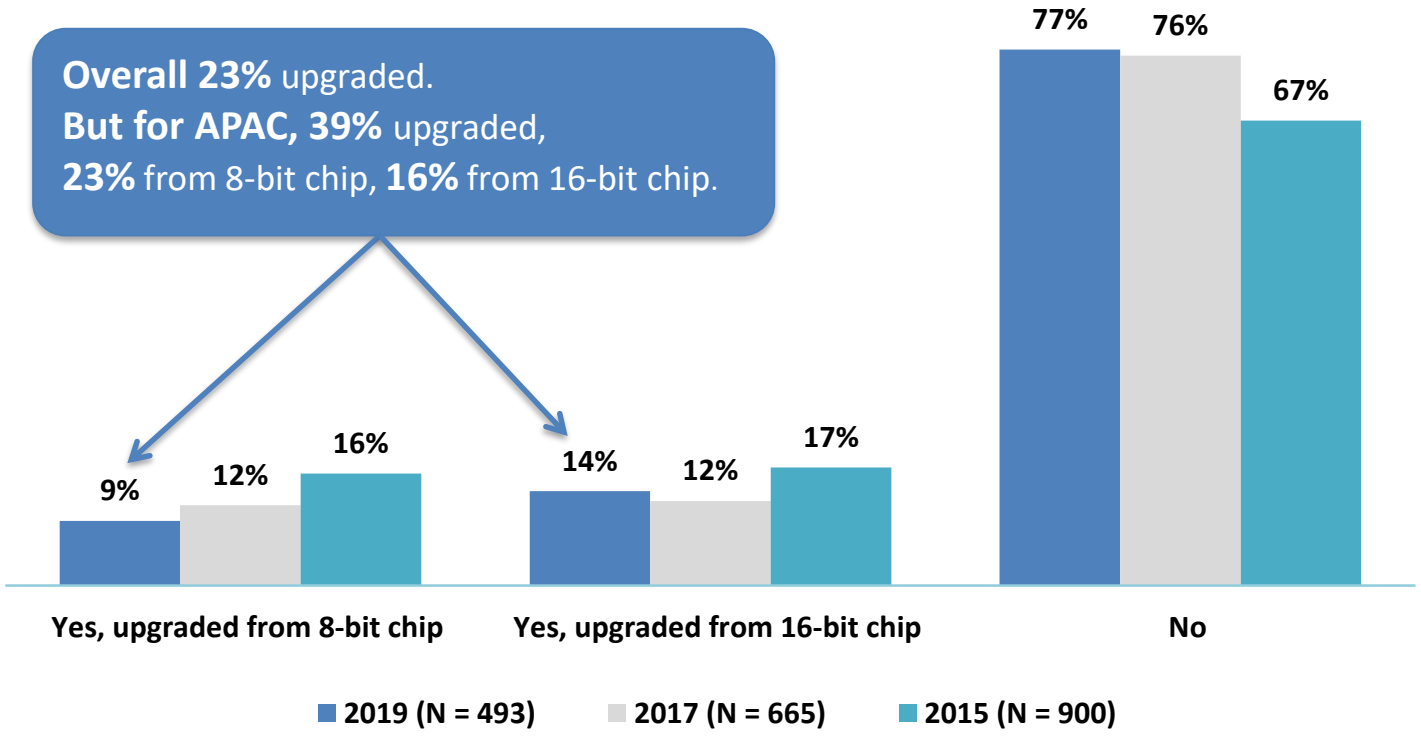
By Regions	World	Americas	EMEA	APAC
TI MSP430	47%	**50%**	**36%**	42%
Microchip PIC24/dsPIC	41%	41%	**44%**	39%

Which of the following 8-bit chip families would you consider for your next embedded project?

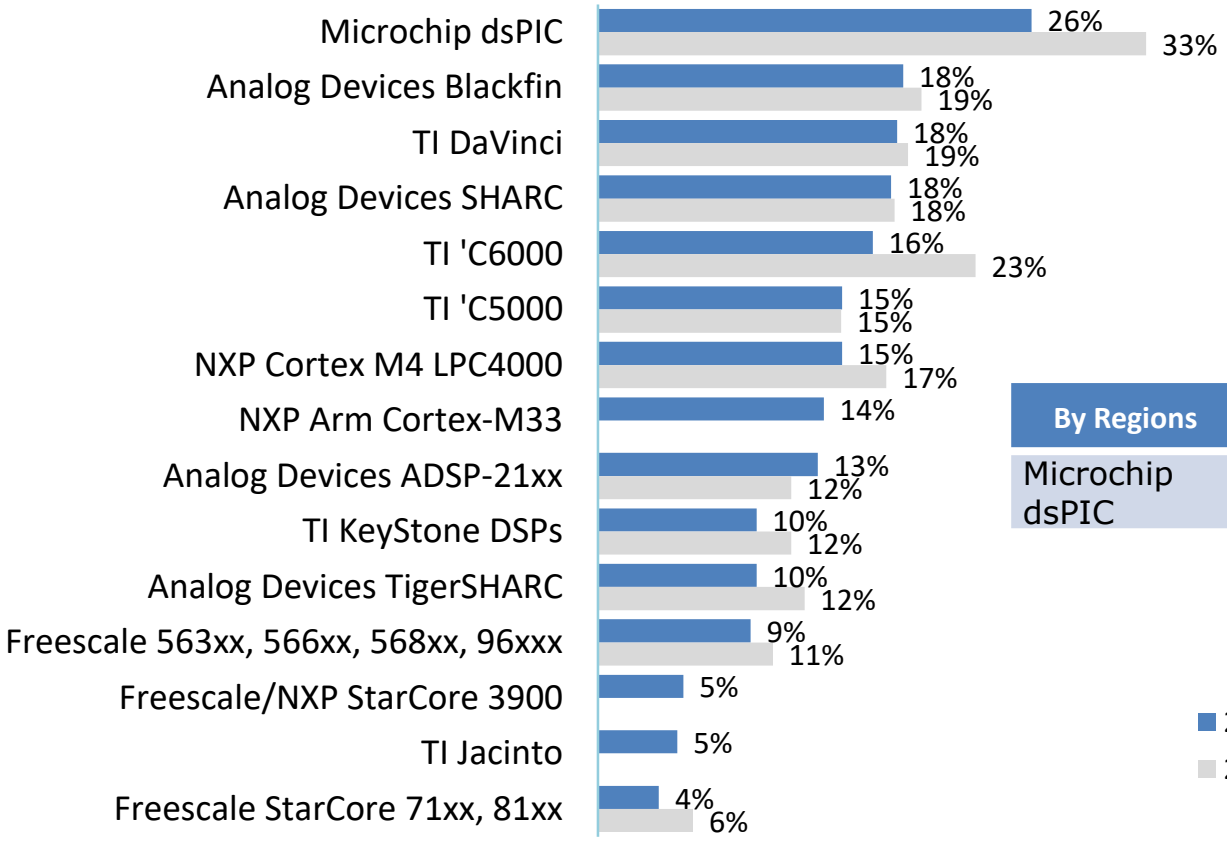


By Regions	World	Americas	EMEA	APAC
Atmel Microchip AVR	44%	44%	**52%**	39%
Microchip PIC	38%	41%	**43%**	**23%**
STMicro ST8	25%	22%	**31%**	28%

Have you upgraded from an 8-bit or 16-bit chip to a 32-bit design in the last 12 months?



Which of the following DSP chip families would you consider for your next embedded project?



By Regions	World	Americas	EMEA	APAC
Microchip dsPIC	26%	26%	**36%**	**19%**

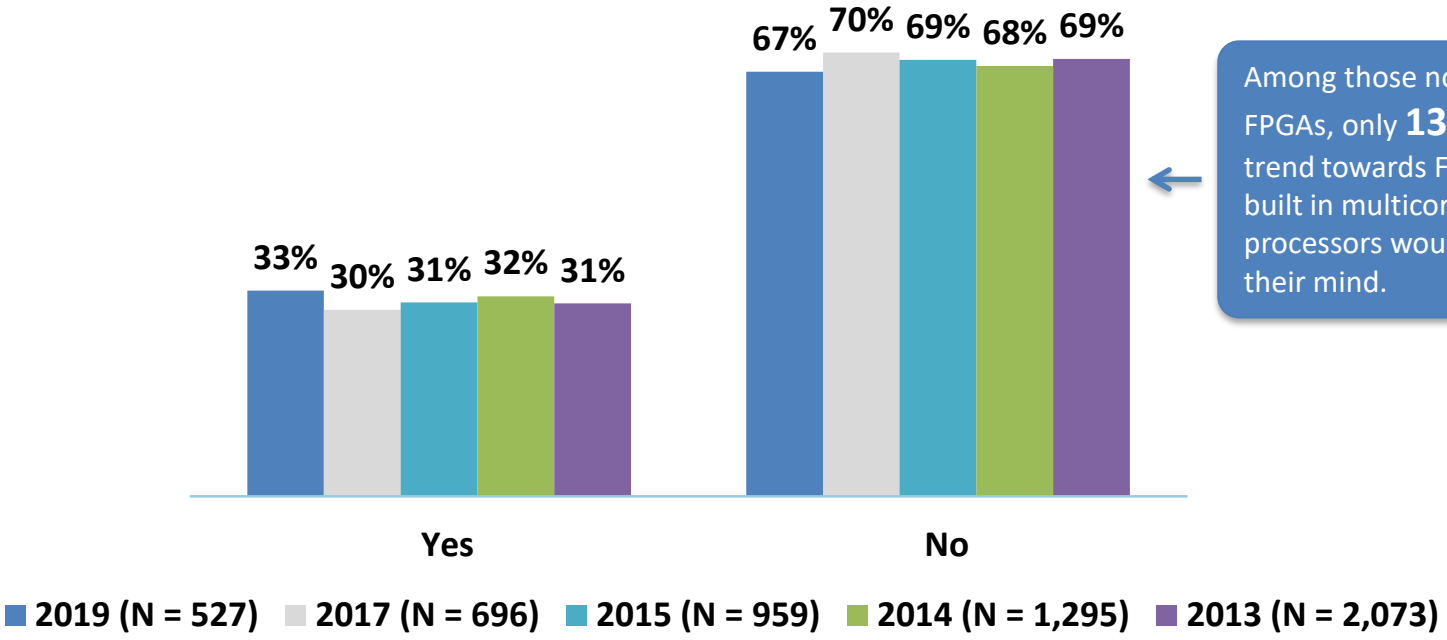
Microprocessors

KEY TAKE AWAY

- **Deciders for chips – Overall:** Hardware engineers (33%) and engineering group (26%).
  - **Americas** top 2 influencers**:** 1. Hardware engineering **staff;** 2. Engineering **group**.
  - **EMEA** top 2 influencers: 1. Hardware engineering **managers**, 2. Engineering **group**.
  - **APAC** top 2 influences: 1. Hardware engineering **managers**, 2. Engineering **group**.
- **Single processor usage –** 57% worldwide (65% in EMEA) with 2.2 processors per design on average.
- **Chip Mix:** Multiple different processors from different vendors (29%). Single chip/multiple cores (26%).
- **Chip Type –** In 2019: 32-bit (61%), 64bit (15%), 16-bit (11%), 8-bit (10%).
- **Clock speeds –** Now averages 462 MHz, up from 445 MHz in 2017.
- **Same processor used –** Now 53%, up 6% from 2017. Reasons: Happy, compatibility, familiarity, same tools.
- **Family –** 58% chose main chip from different family, 42% chose different processor from the same family.
- **Ecosystem –** 60% say "ecosystem" outweighs "the chip" (31%). Best ecosystems are TI (16%), Microchip (15%).
- **Most important in chip decision –** 1. Software development tools (63%), 2. Chip performance (41%).
- **Top five Vendors Familiar With –** TI , Atmel, Microchip, Freescale, STMicroelectronics.
- **Top five Vendors Currently Using –** TI, STMicroelectronics, Atmel, Microchip, Freescale.
- **Top six Vendors Considering Using –** TI, STMicroelectronics, Microchip, Atmel, Altera, Freescale
- **Top three 32-bit chips considering –** STMicro STM32 (ARM), Atmel SAMxx (ARM), Microchip PIC 32-bit.
- **Top two 16-bit chips considering –** TI MSP430 and Microchip PIC 24 (dsPIC) (same, but reversed from 2017).
- **Top two 8-bit chips considering –** Atmel AVR and Microchip PIC (same, but reversed from 2017).
- **Upgraded from 8 or 16-bit to 32-bit –** Overall 23%. For APAC 39% upgraded.
- **Top four DSP chips considering –** Microchip dsPIC, Analog Devices Blackfin, TI DaVinci, Analog Devices SHARC

FPGA CHIPS

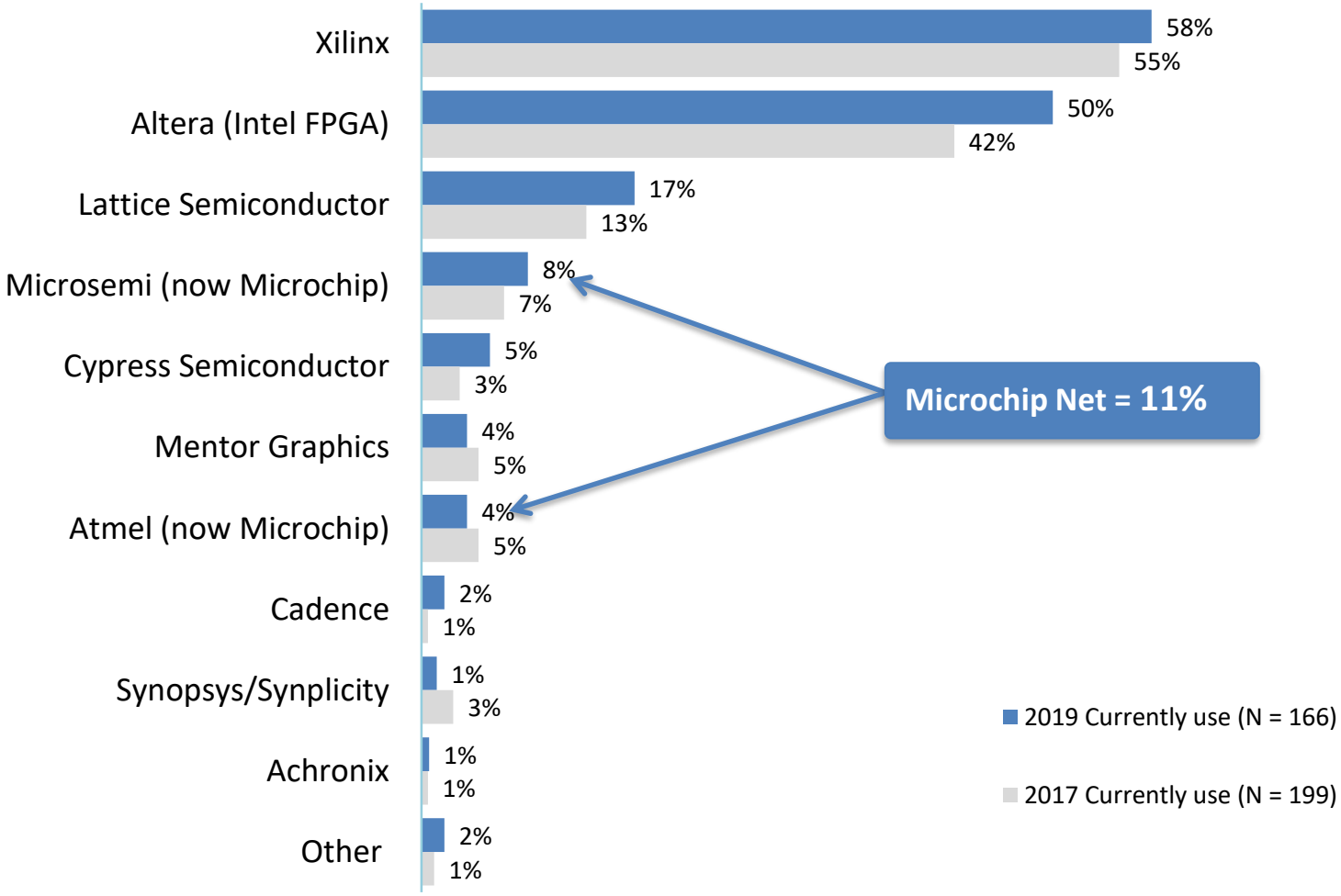
Does your current embedded project incorporate an FPGA chip?



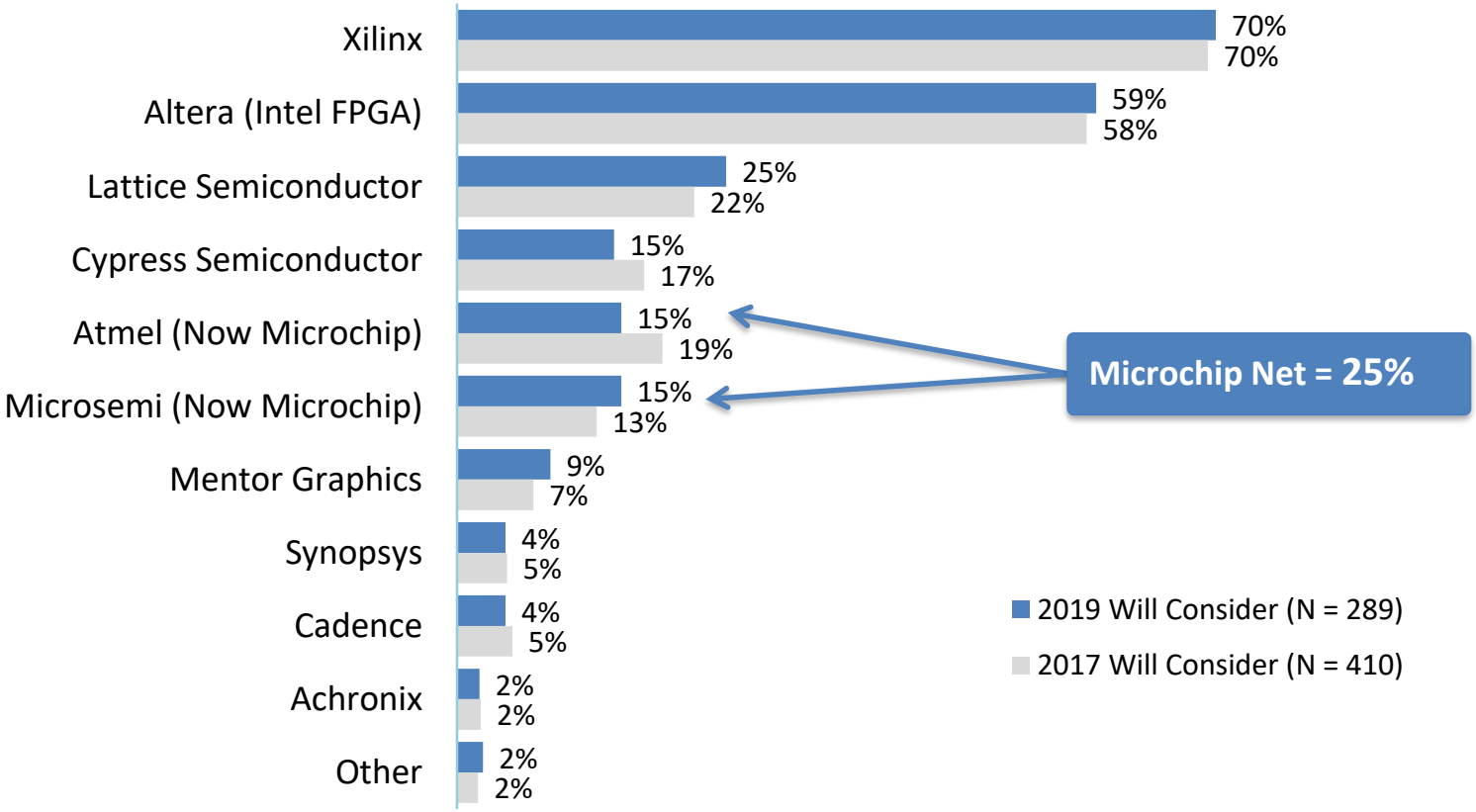
Among those not using FPGAs, only **13%** said the trend towards FPGAs with built in multicore processors would change their mind.

27% of all respondents said they would use an FPGA in their **next** project. Those **not** using FPGAs in the future say they "don't need the functionality," "FPGAs are too expensive," "consume too much power," "are too difficult to program."

Which of the following vendors does your current embedded project use for FPGAs?



Which of the following FPGA vendors will you consider in your next embedded project?

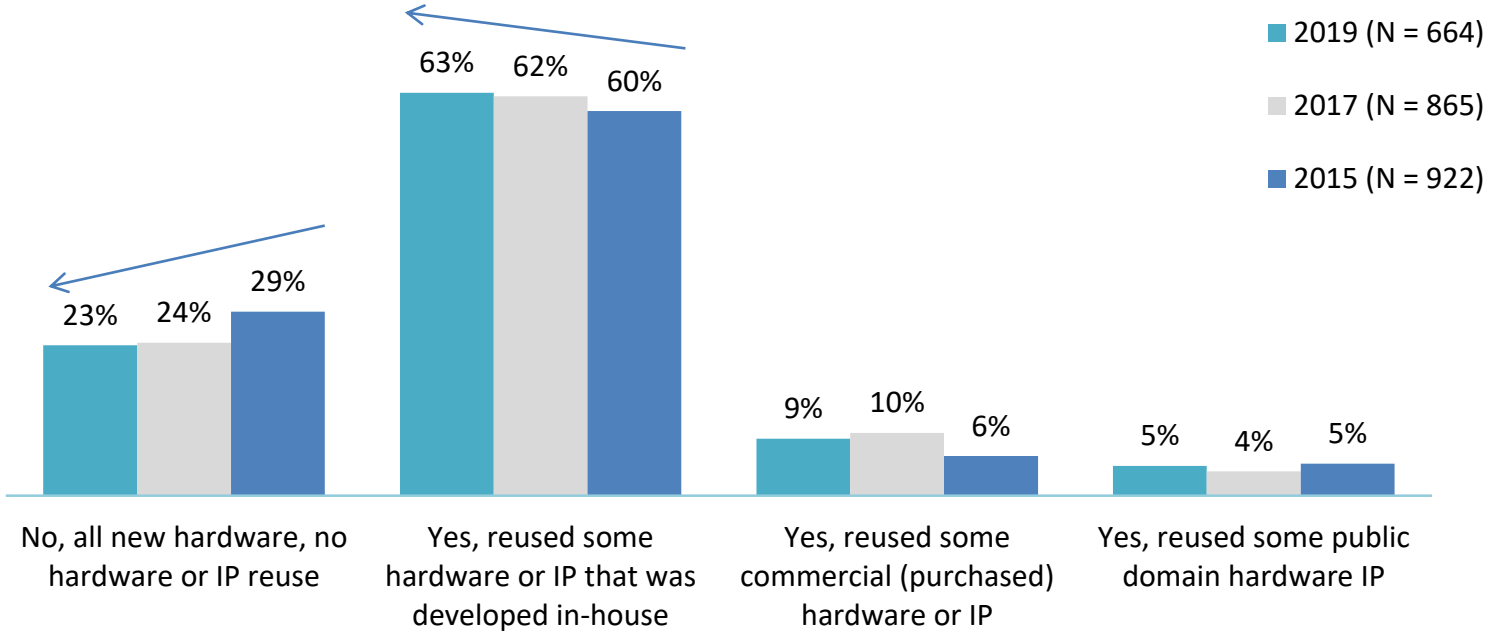


FPGAs, Memories, LCDs

- **Current FPGA usage –** 33% used in current project.
- **Next Project FPGA usage –** 27% will likely use an FPGA in their next project. Again strong competition from Altera and Microchip will heat up this market.
- **Why FPGAs NOT used –** Don't need this functionality, too expensive, use too much power, and too difficult to program – no change from 2017.
- **Built-in Multicore Trend –** 13% say it will encourage them to use FPGAs.
- **Vendors currently used –** Xilinx (58%) and Altera (50%) dominate, but the difference is the tightest its ever been in this study's history. Lattice is a distant third at 17%. Altera has increased its usage, and Microchip is starting to show some gains as well due to its mergers with Atmel and Microsemi
- **Vendors will consider –** Xilinx (70%) and Altera (59%). Altera/Intel and Atmel/Microsemi brands under Microchip portend a possible challenge to Xilinx and Lattice market share.

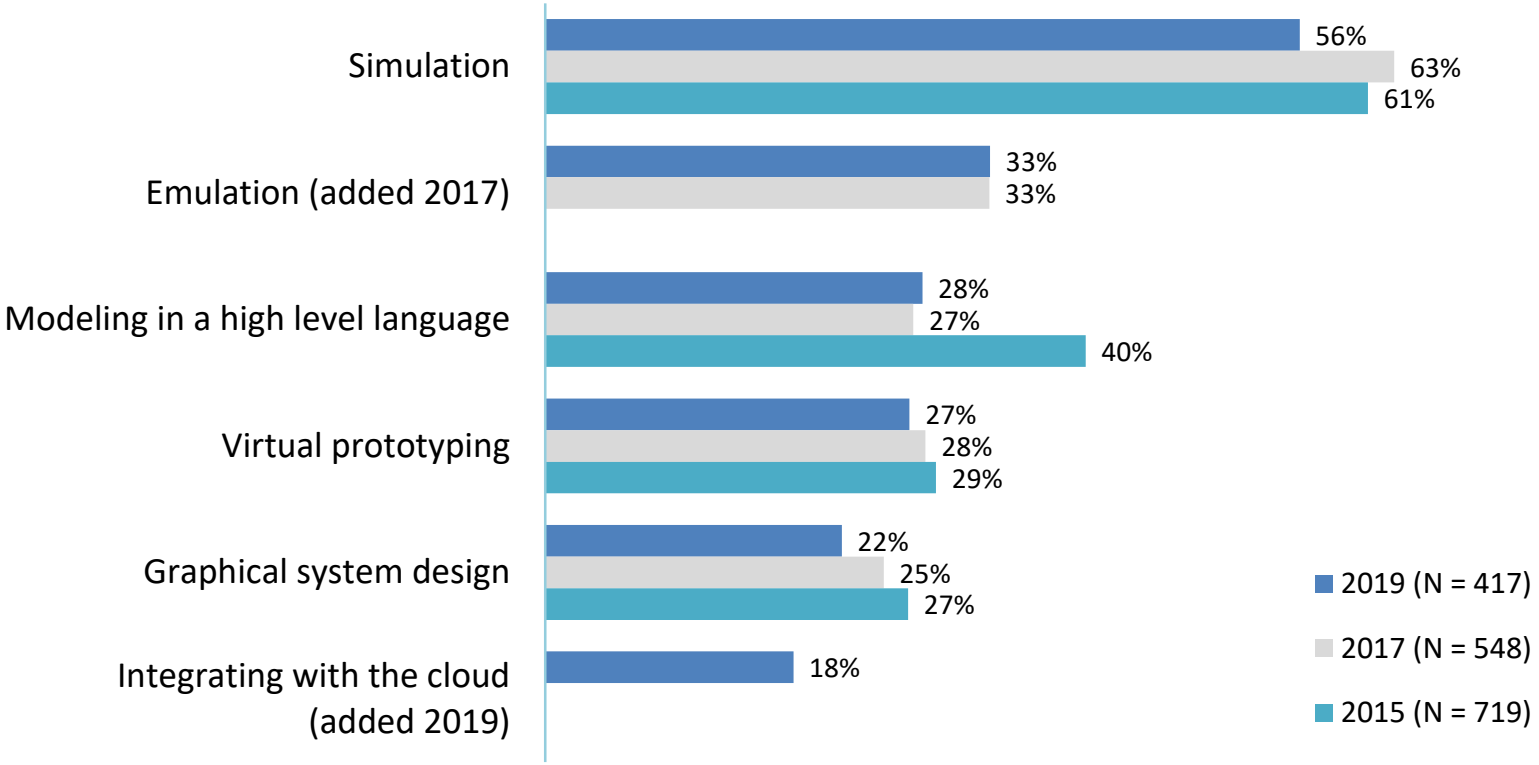
Hardware IP Reuse, Design Techniques, System Level Tools, Project & Version Control

Does your current embedded project reuse hardware or hardware IP from a previous project?

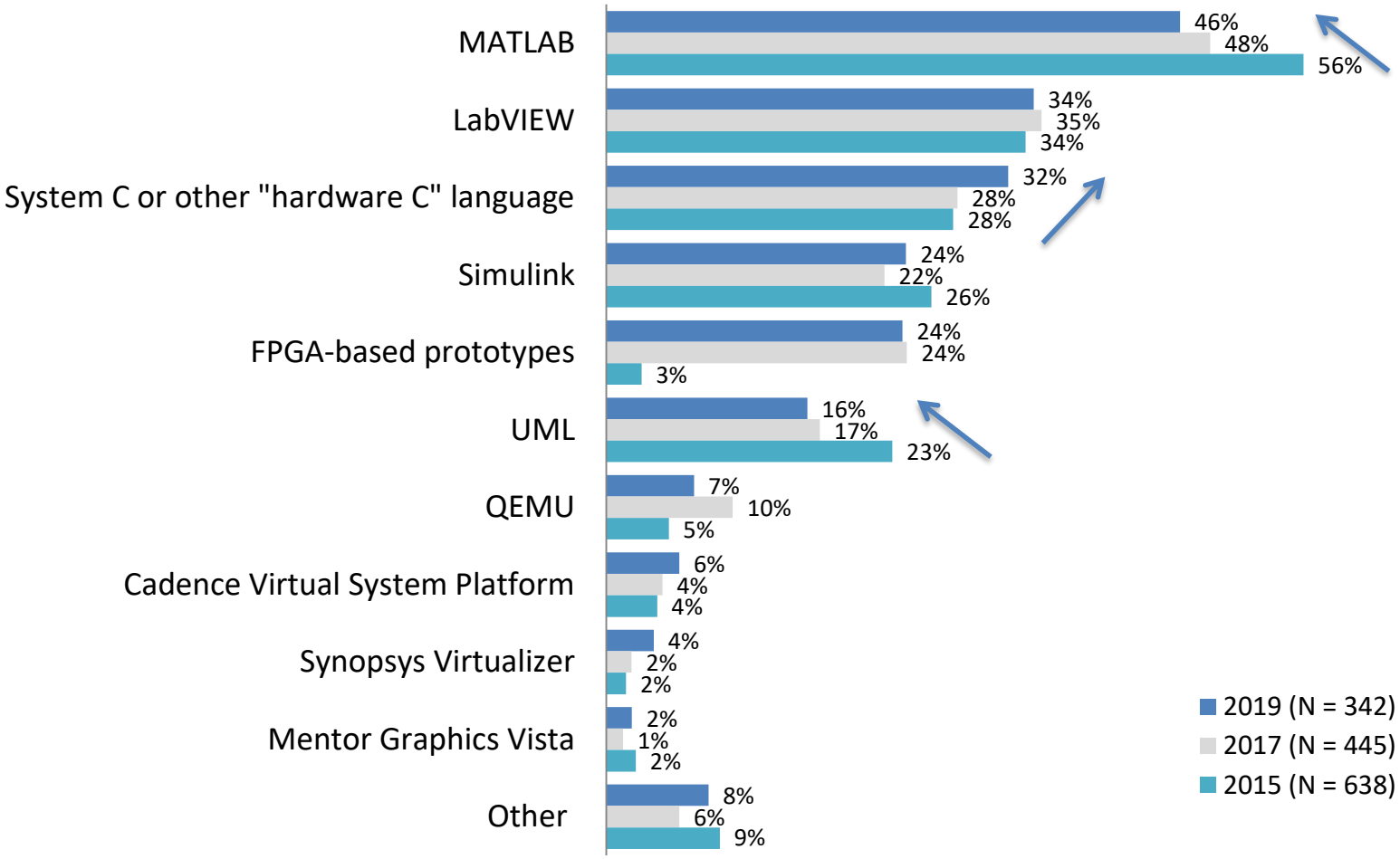


Over three quarters **(77%)** of embedded developers reuse hardware or hardware IP. **63%** reuse hardware or hardware IP that was developed **in house**. Possibly a **slight trend** towards using more in-house hardware or hardware IP in future designs.

Which of the following design techniques will become more important to your designs in the future?

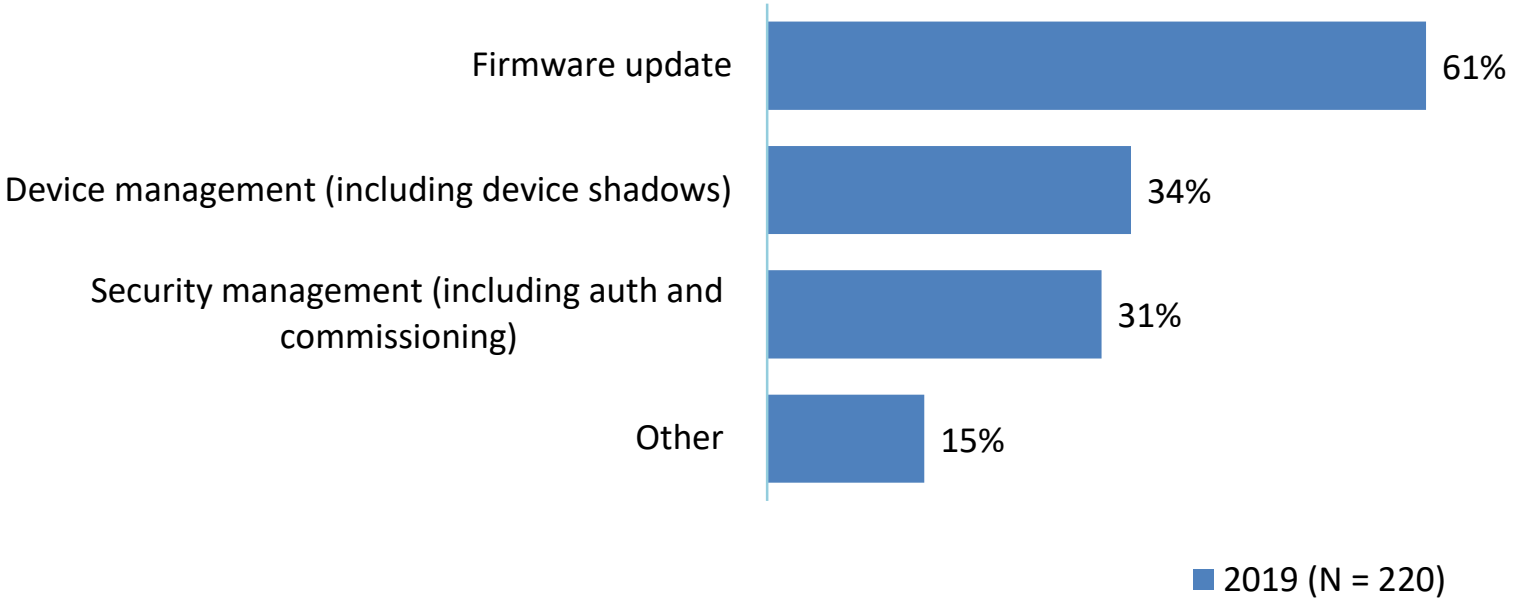


What system level design tools do you or your organization currently use?

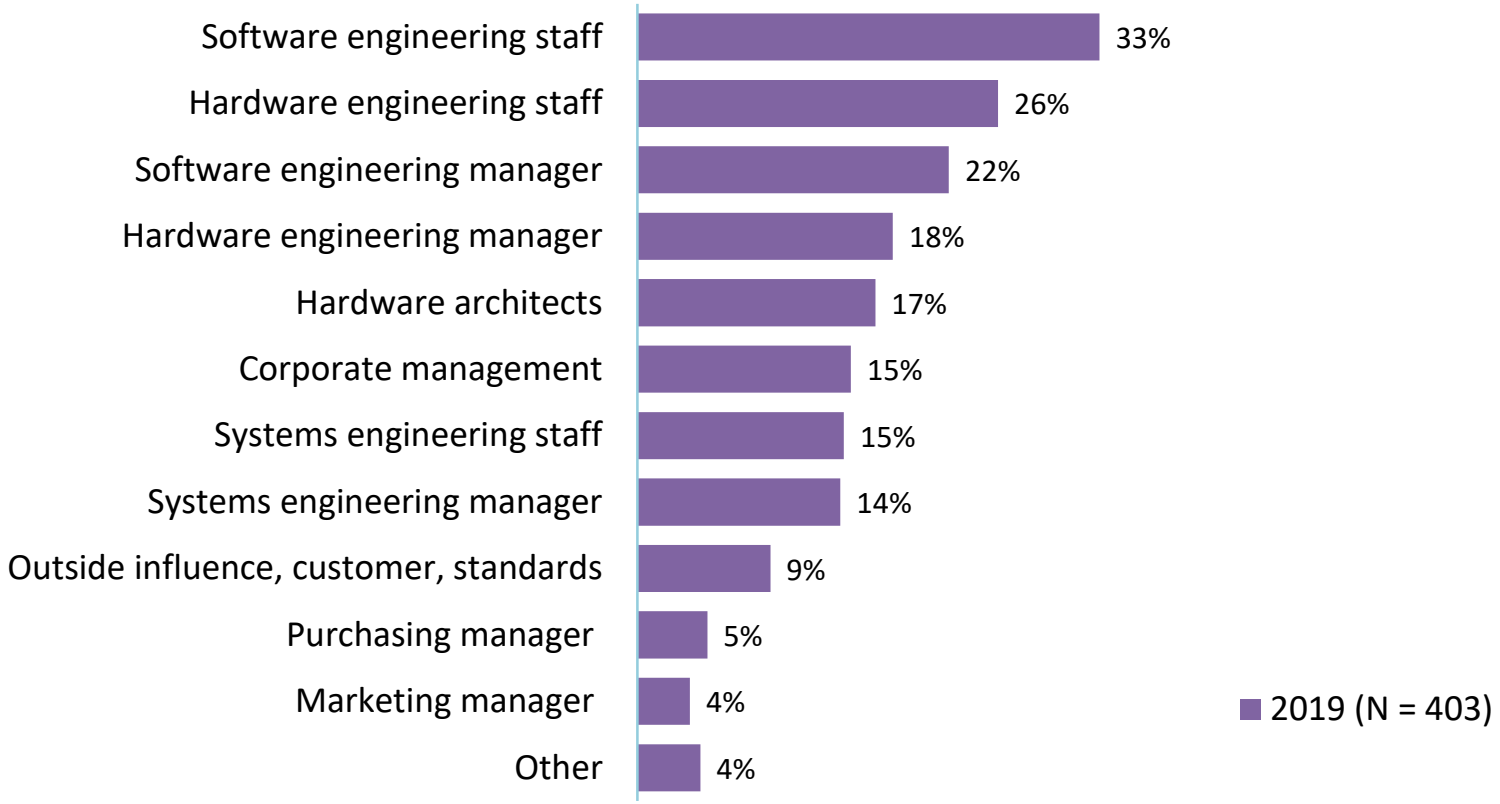


NEW IN 2019

What cloud integration tools do you or your organization currently use?

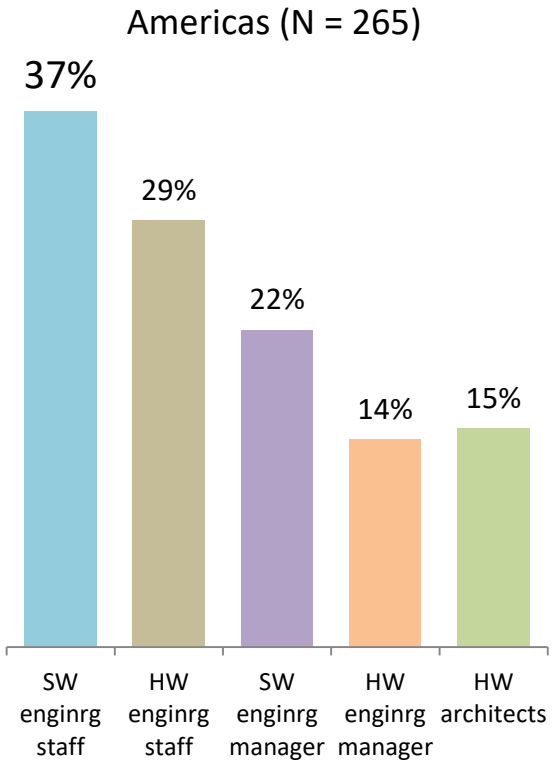


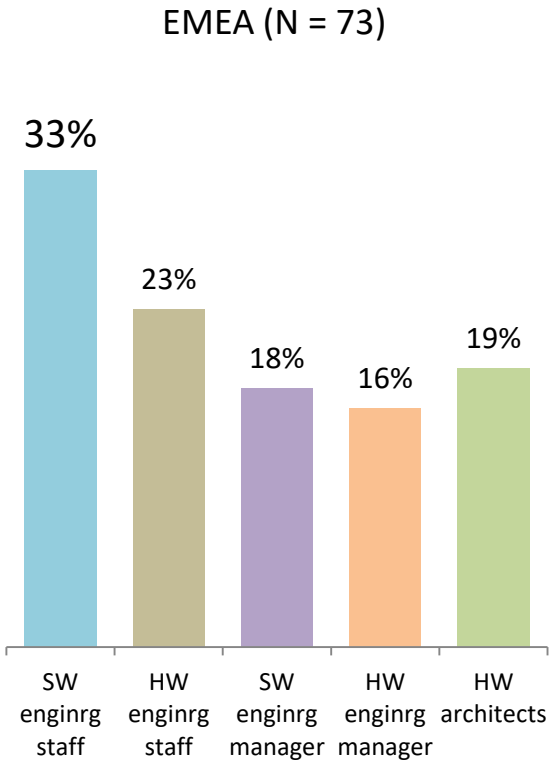
Who were the three greatest influencers on the choice of the system-level tools for your current project?

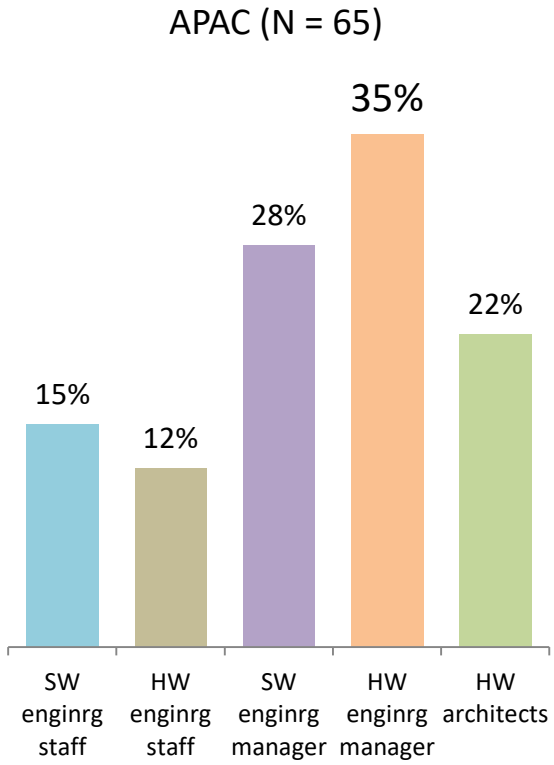


KEY TAKE AWAY

Who were the three greatest influencers on the choice of the system-level tools for your current project? (Regional Detail)





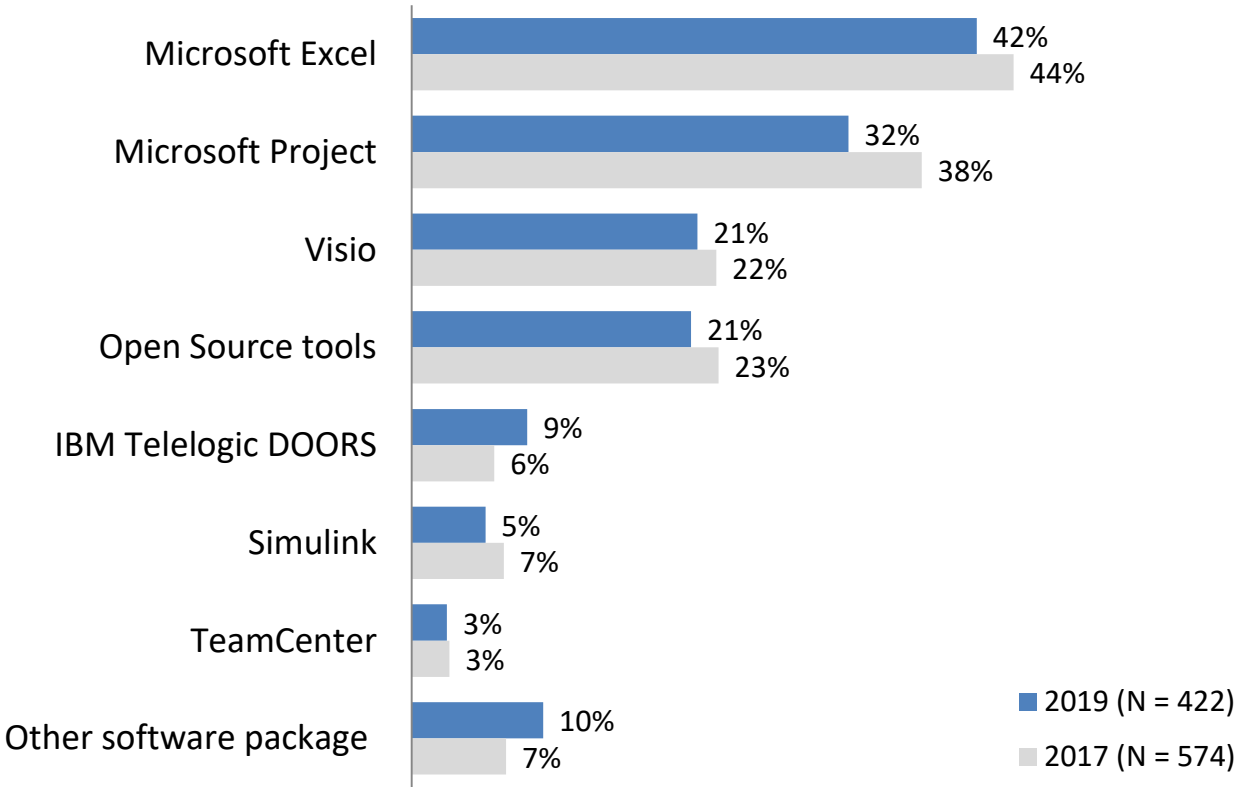


Americas top two influences
1. SW engineering STAFF
2. HW engineering STAFF

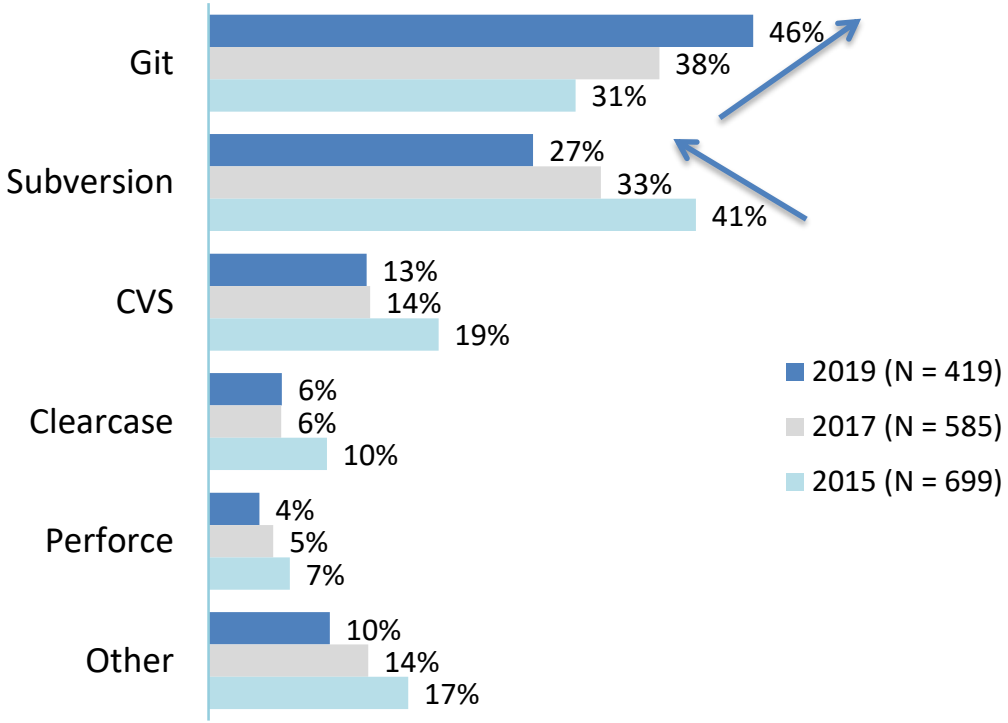
EMEA top two influences
1. SW engineering STAFF
2. HW engineering STAFF

APAC top two influences
1. HW engineering MANAGERS
2. SW engineering MANAGERS

Which of the following project management software packages do you currently use?



Which of the following Version Control software systems do you currently use?



Hardware IPs, System Level Design, GUIs

- **Reuse of Hardware/Hardware IPs –** 77% trending up from 71% reuse in 2015.
- **Design Techniques Becoming More Important –** Top three are Simulation (56% -- down 7 points from 2017), emulation (33%) and modelling (28%).
- **System Level Design Tools Used –** MATLAB (46%) is the big leader, but trending down some, followed by LabVIEW (34%), System C (32%) and Simulink (24%).
- **Cloud Integration Tools Used:** Firmware updates (61%), Device management (34%). Security management (31%).
- **Deciders of Systems Level Tools –** Overall software engineers (33%) and hardware engineers (26%) are the top influencers on system level tools. But **for APAC** region hardware engineering **managers** (35%) and software engineering **managers** (28%) are the two leading influencers. Important when marketing to APAC.
- **Project Management –** Excel (42%) & Microsoft Project (32%) are tops as previously.
- **Version Control Software –** Git (46%) has completely overtaken Subversion (27%), and CVS (13%) is a distant third.

THANK YOU!