UBM

EDN NETWORK

EE Times

2015 Embedded Markets Study

Changes in Today's Design, Development & Processing Environments

Rich Quinnell
EDN/EE Times

Purpose and Methodology

- **Purpose:** To profile the findings of the 2015 results of UBM Tech's annual comprehensive survey of the **embedded systems markets worldwide**. Findings include types of technology used, all aspects of the embedded development process, IoT emergence, tools used, work environment, applications, methods/ processes, operating systems used, reasons for using chips and technology, and brands and chips being considered by embedded developers. Many questions in this survey are trended over three to five years.
- **Methodology**: A web-based online survey instrument based on the previous year's survey was developed and implemented by independent research company Wilson Research Group from January 14, 2015 to March 31, 2015 by email invitation.
- **Sample:** E-mail invitations were sent to subscribers to UBM Tech Embedded Brands with reminder invitations sent later. Each invitation included a link to the survey.
- **Returns: 1,807** valid respondents for an overall confidence of 95% +/-2.29%. Confidence levels vary by question. As a guide, confidence for questions with:
  - 1807 respondents = 95% +/- **2.29%** vs. 95% +/- **2.05%** in 2014
  - 1050 respondents = 95% +/- 3.0%
  - 600 respondents = 95% +/- 4.0%
  - 400 respondents = 95% +/- 5.0%

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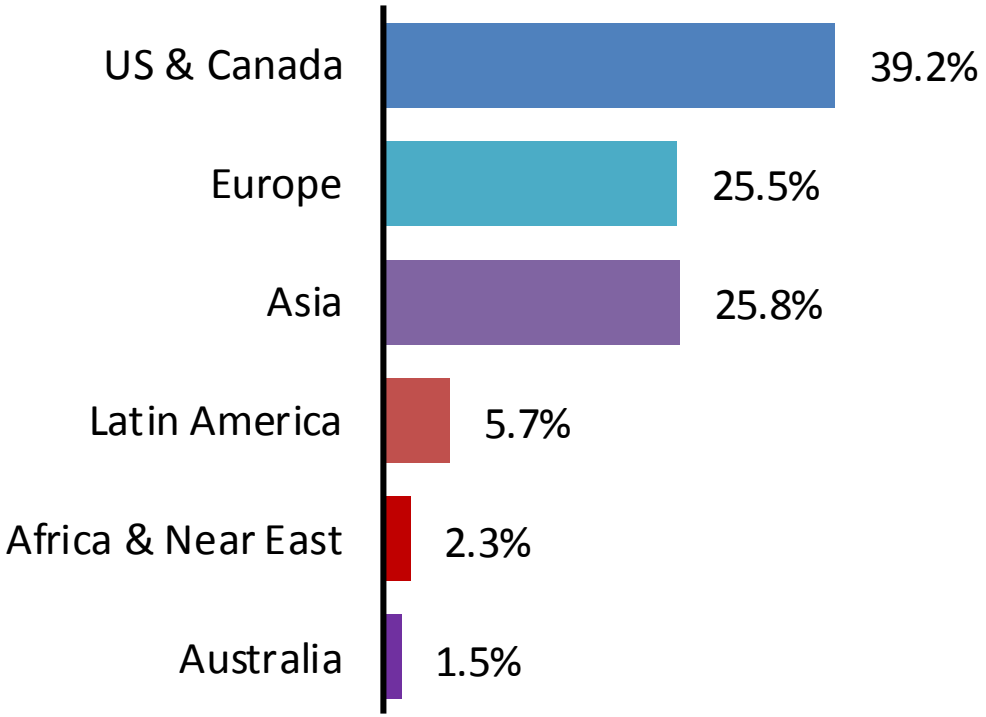
In which region of the world do you reside?



Up 12% from 2014
Significant affect on all data

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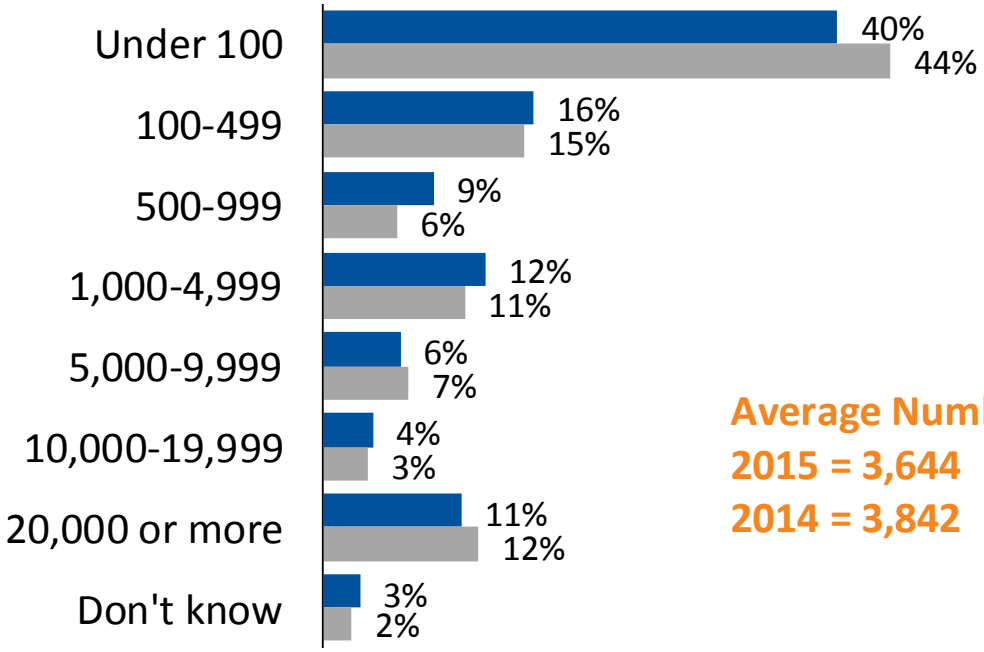
How many employees does your company have at all locations?



Average Number of Employees:
2015 = 3,644
2014 = 3,842

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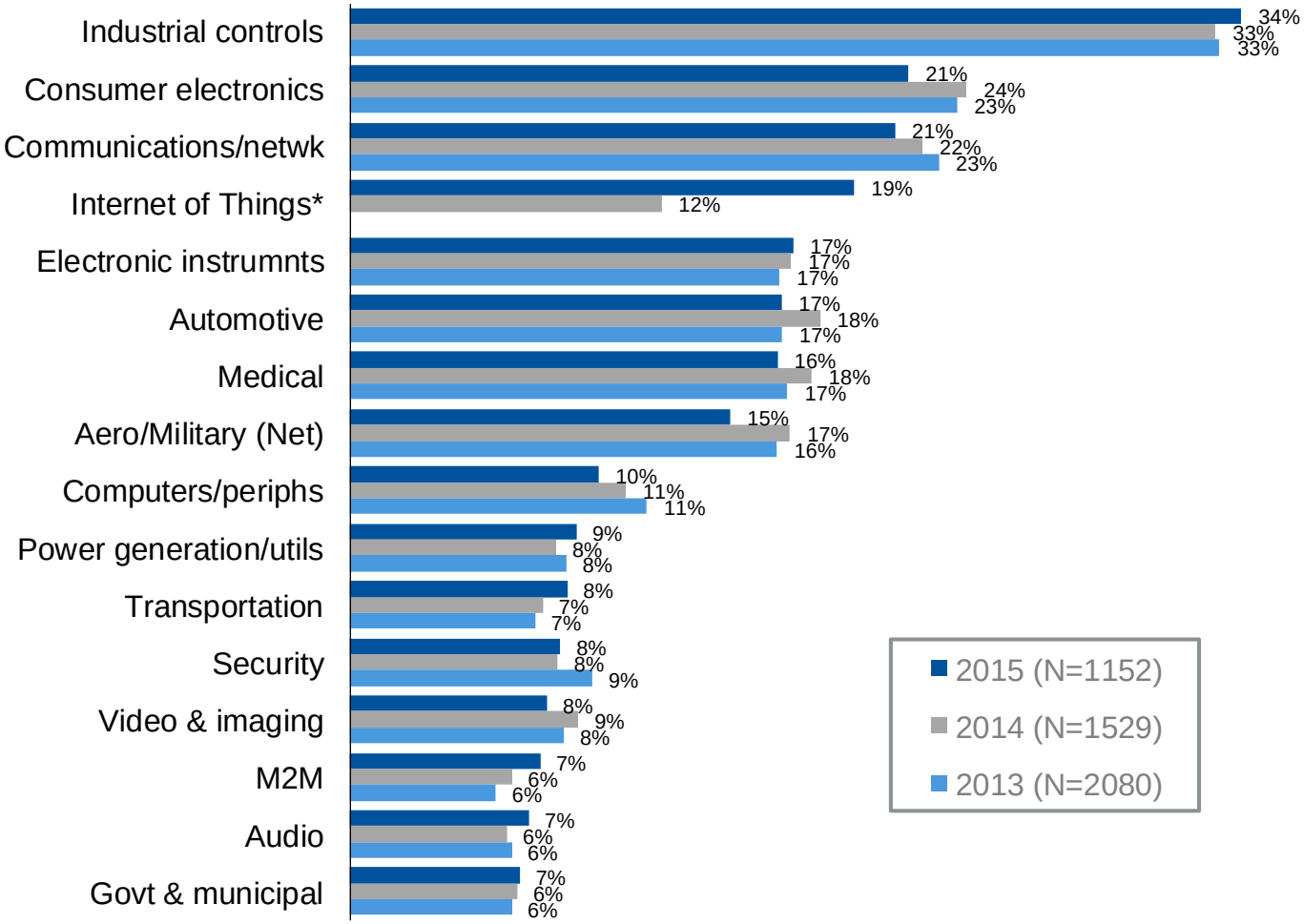
For what types of applications are your embedded projects developed?



* Added in 2015

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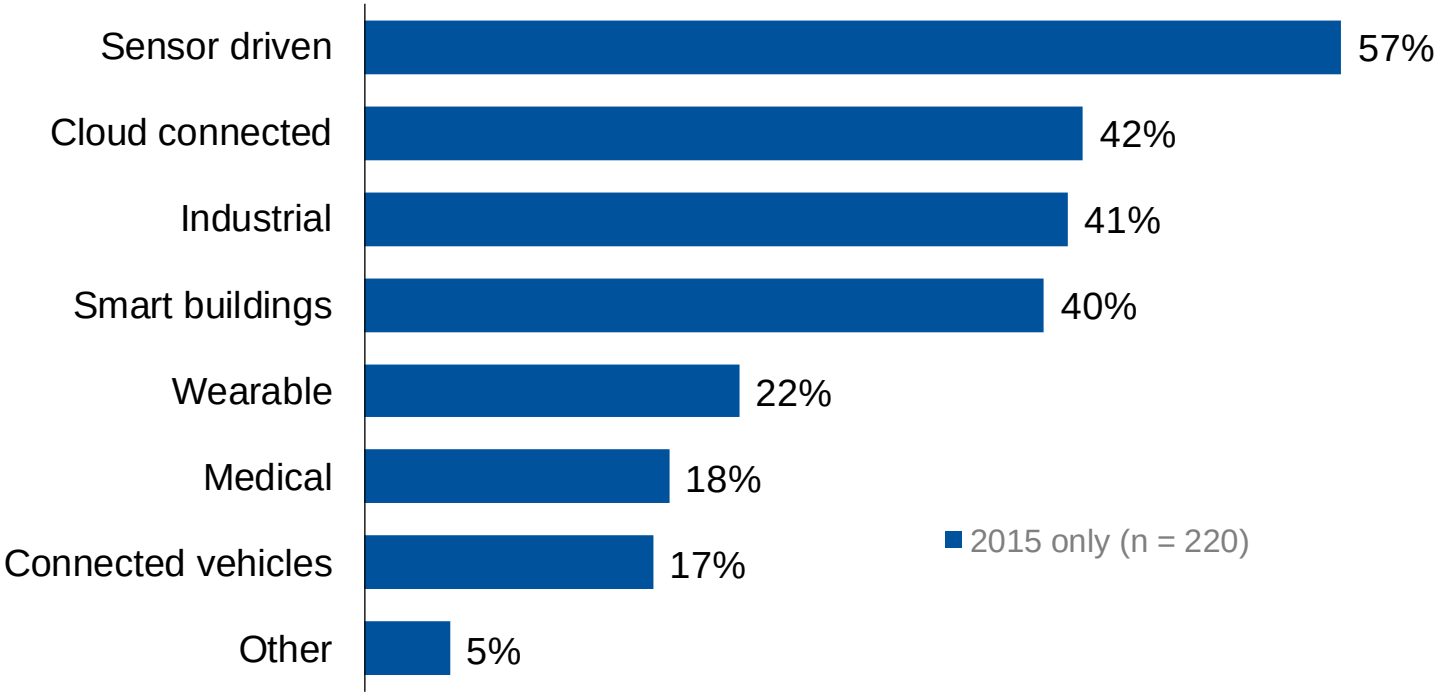
New in 2015

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



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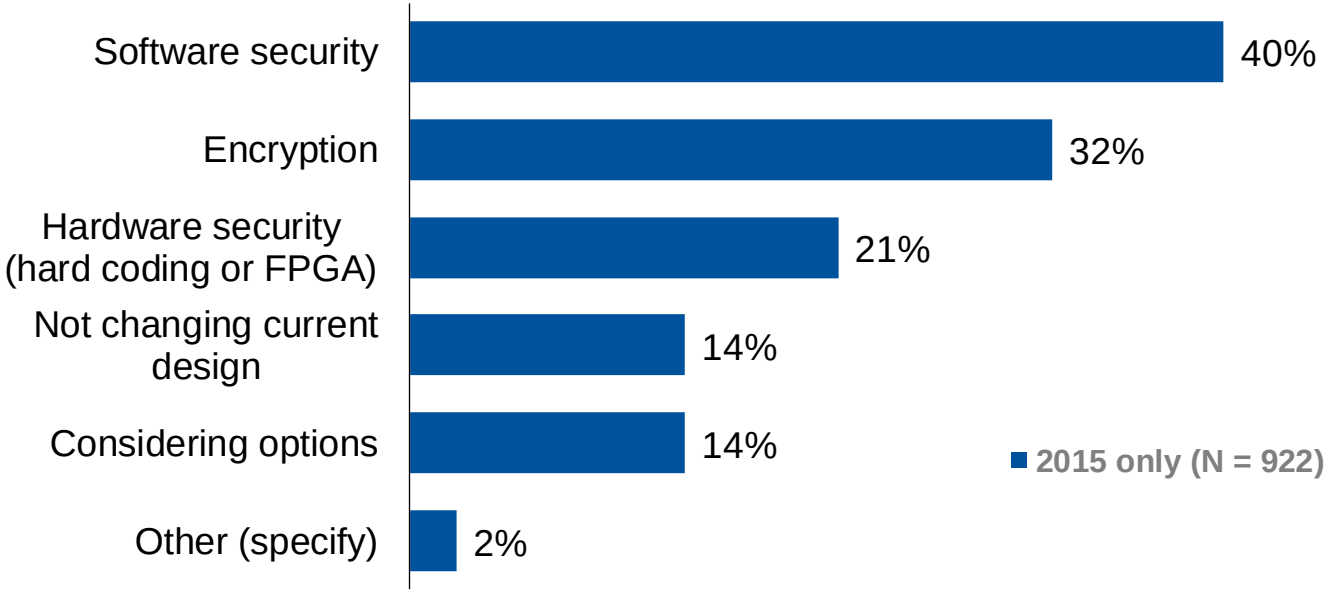
New in 2015
What security measures are you taking with your current design?



Note 1: Base is those taking security measures
Note 2: 16% of respondents answering this question said they are taking no security measures.

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Current Embedded Design Environment

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Embedded Design Environment

- **Upgrades vs. New –** 56% upgrade 44% new project split, steady.
- **Team Size –** 14.3 after looking like it was getting smaller
- **Resource allocation –** 61/39 software/hardware; 64/36 build/buy
- **Project Start –** 50% start with a board, usually custom/proprietary
- **Development cycles –** 12.4 mos on average down from 12.6 mos
- **Meeting deadlines:** Still getting more and more difficult
- **On or ahead of schedule:** 38% in 2015 continues 5 year downward trend, 41% in 2014, 42-44% in 2011-13
- **Languages –** Very stable C usage at 60%, no change expected (3x C++, 20x assy)
- **Recode Use –** 86% was identical to 2014, and expected to continue

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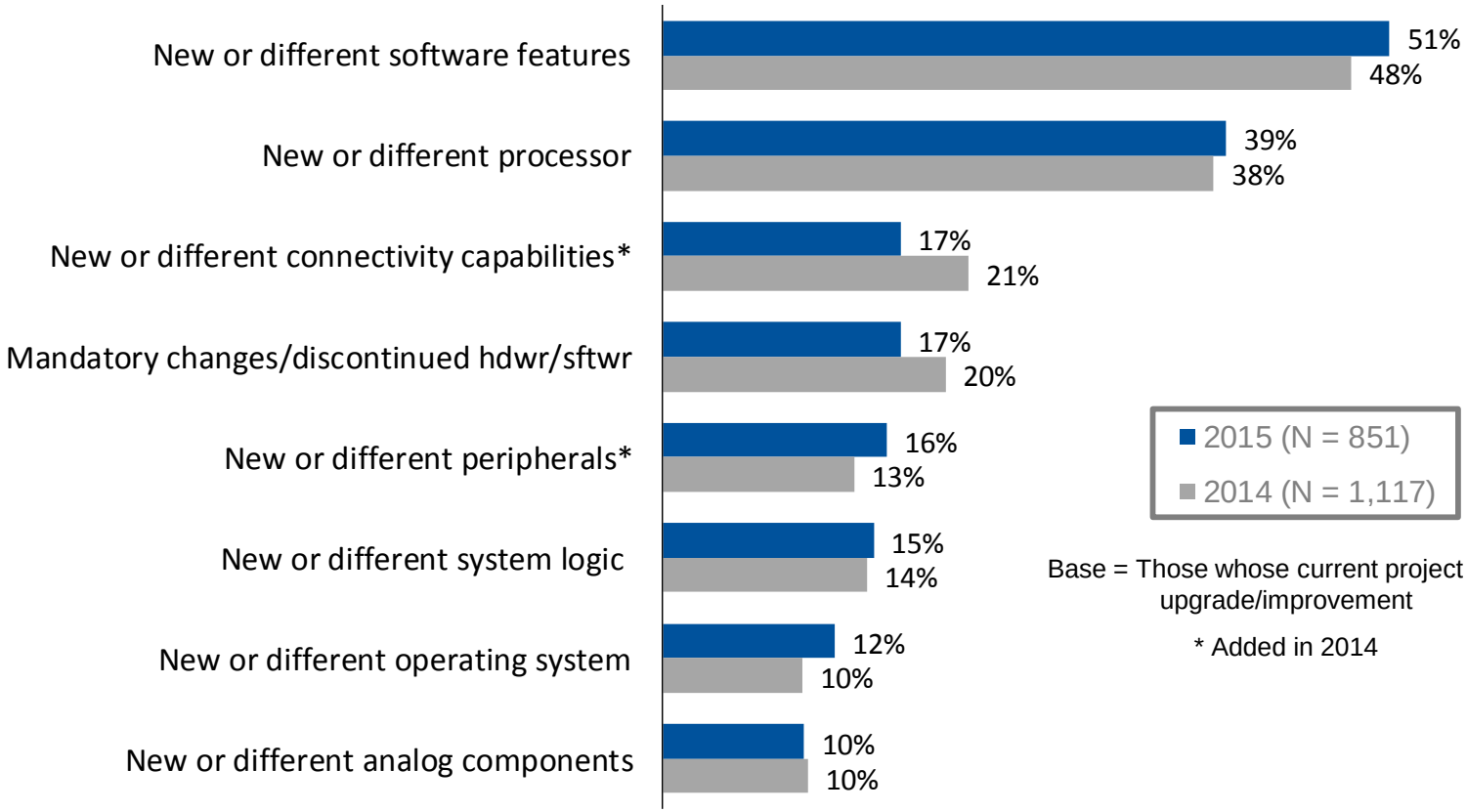
What does the upgrade or improvement include?



Base = Those whose current project is an upgrade/improvement

* Added in 2014

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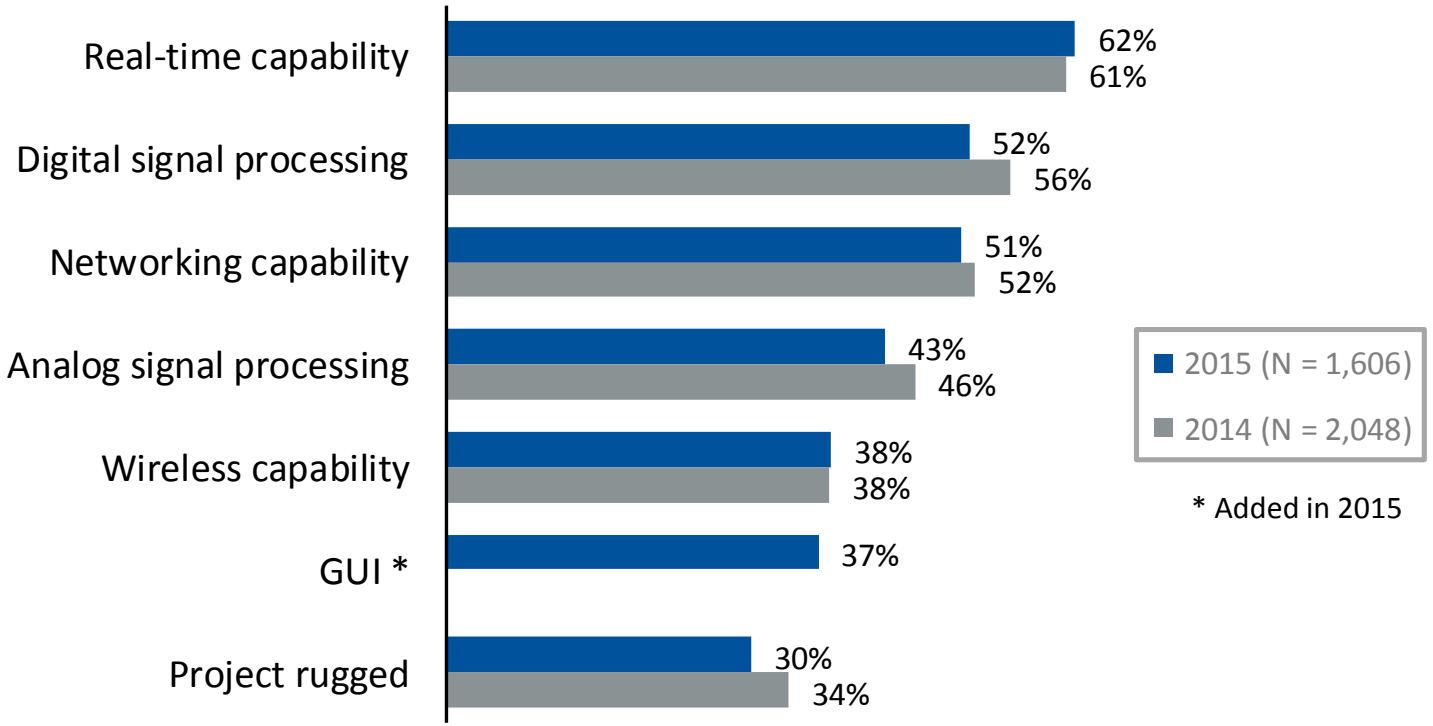
Which of the following capabilities are included in your current embedded project?



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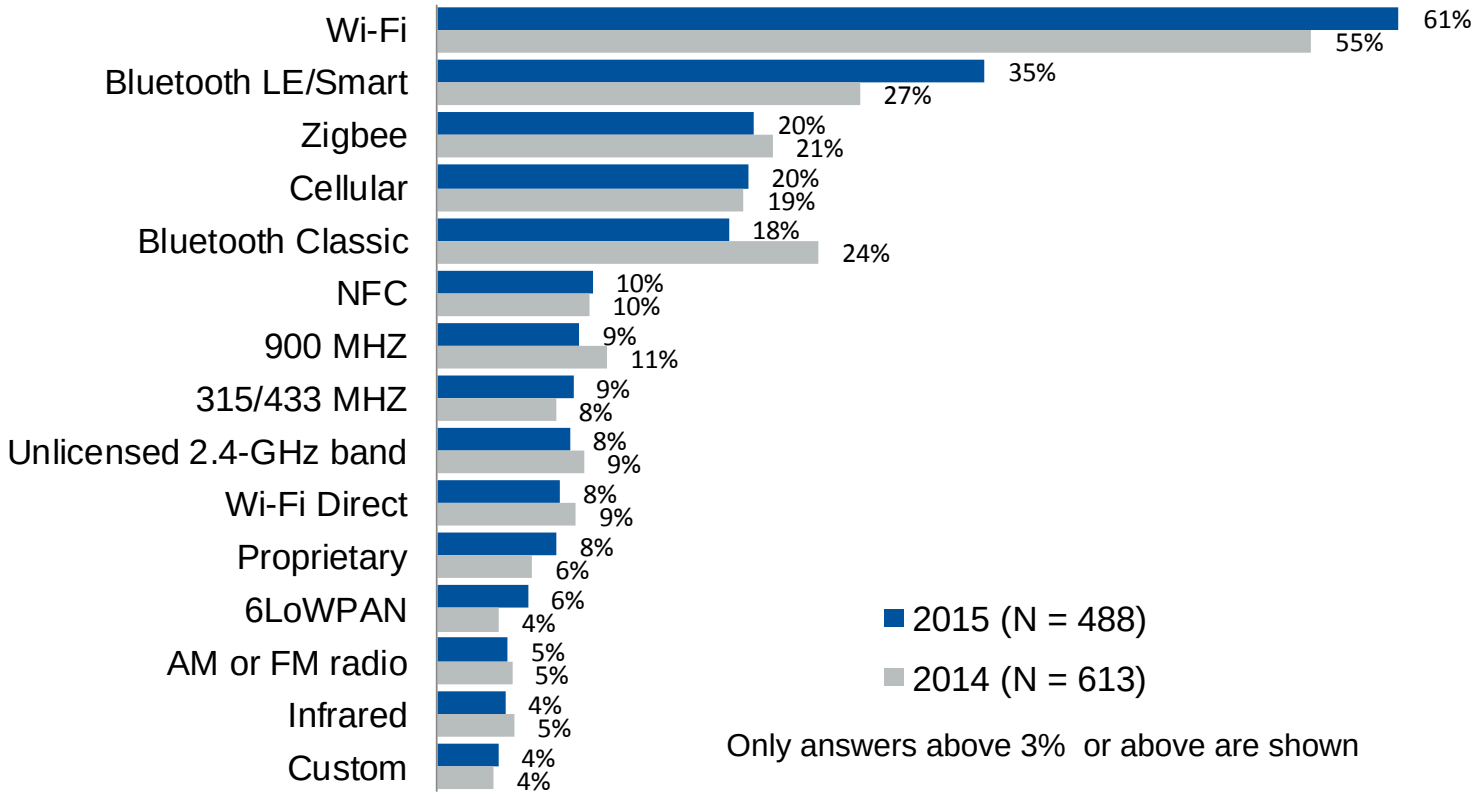
If wireless, what wireless interfaces does your current embedded project include?



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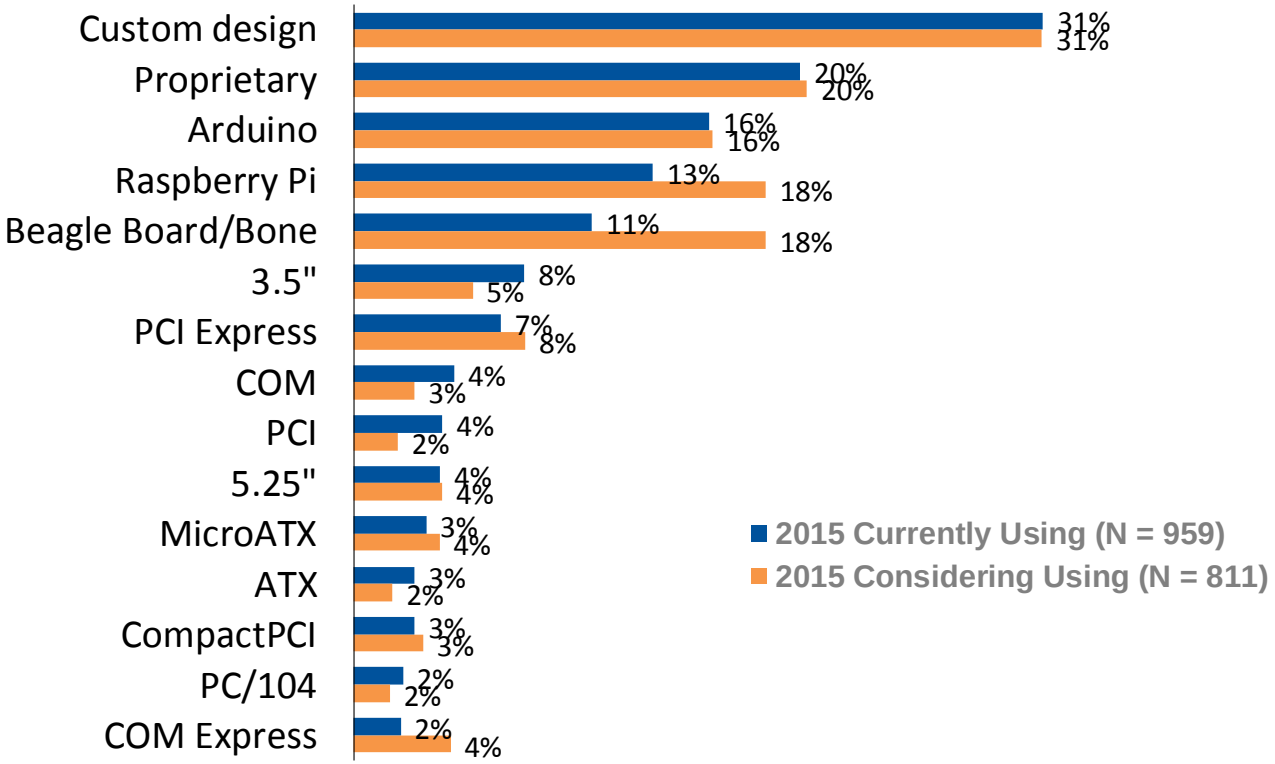
New in 2015

Which form factor boards are you currently using?

Which form factor boards are you considering using in next embedded design?



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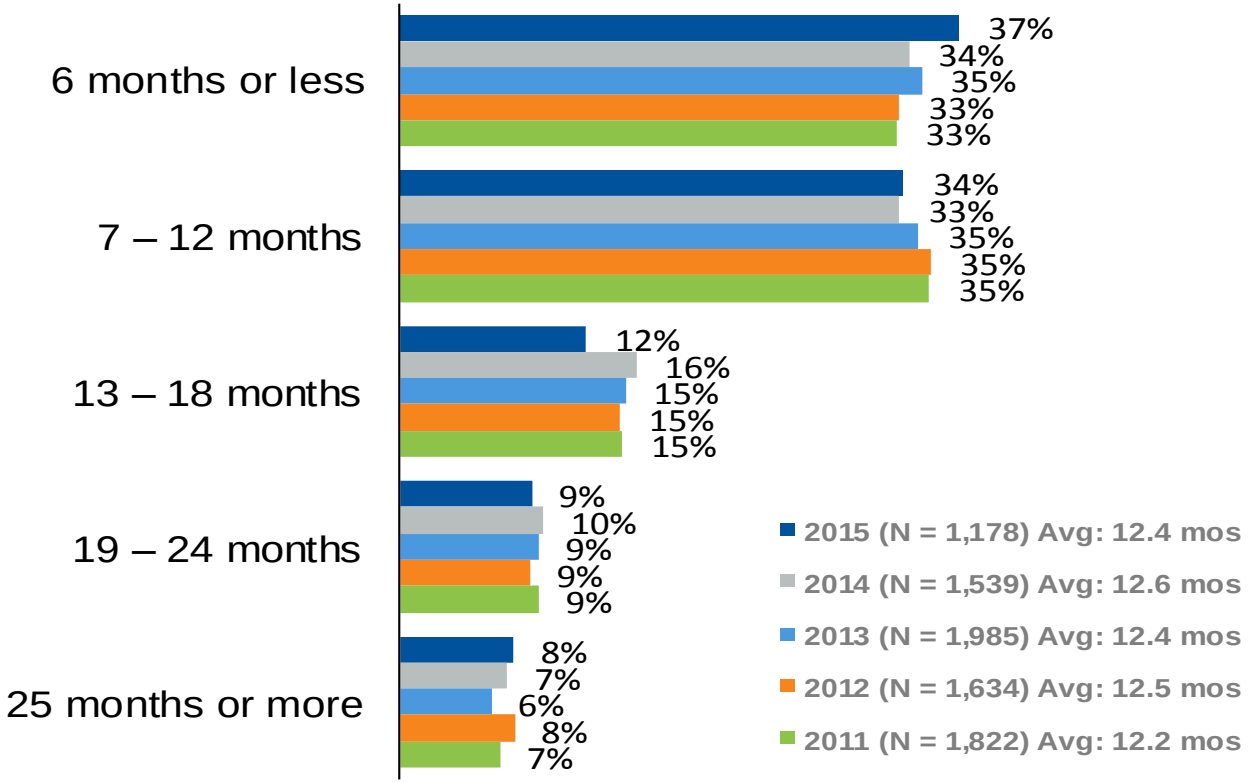
Thinking now about the last embedded project you completed (no longer in development), how many months did that project take to finish?



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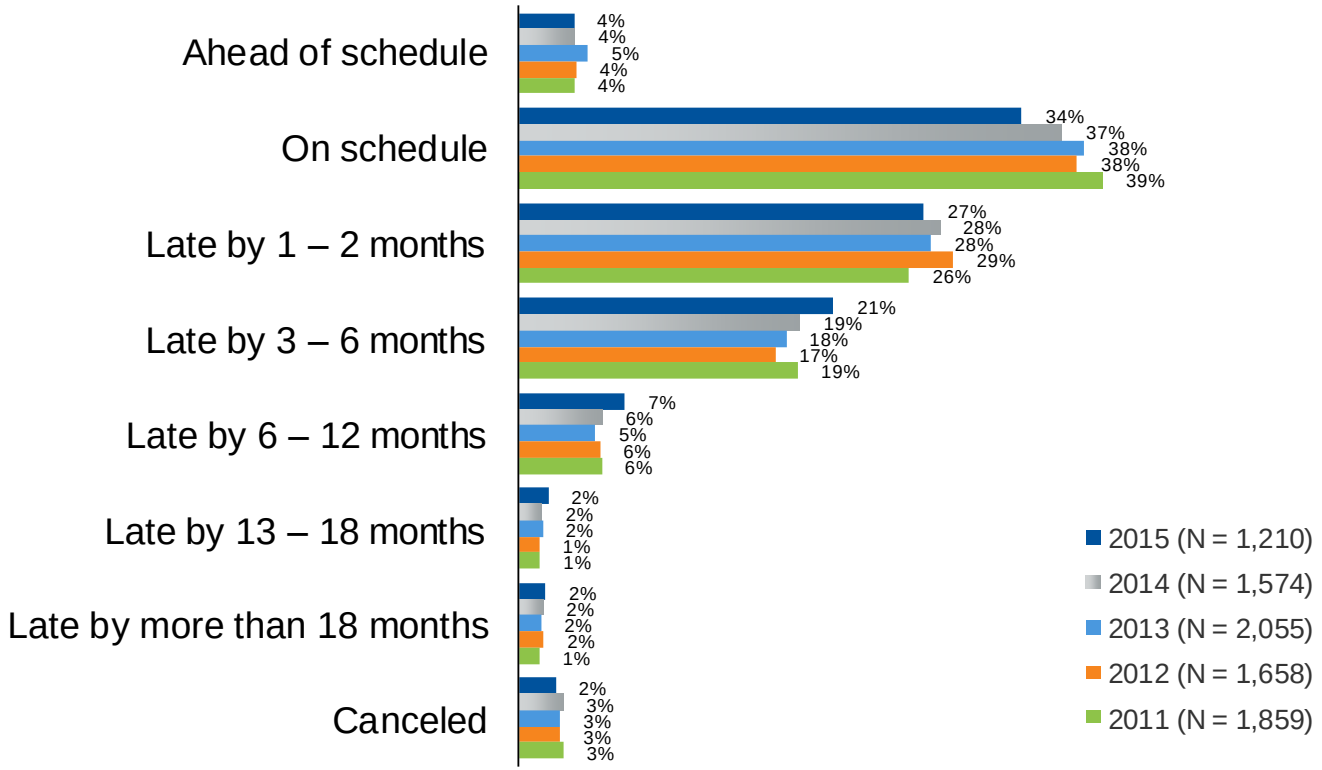
Was that project completed . . .



In 2015, 38% of all projects finished "ahead of" or "on" schedule, and 62% finished "late or cancelled".
In 2014, 41% of all projects finished "ahead of" or "on" schedule, and 59% finished "late or cancelled".
This downward trend in performance is worse than the previous 4 years that averaged 42%-44% "on/ahead of" schedule.

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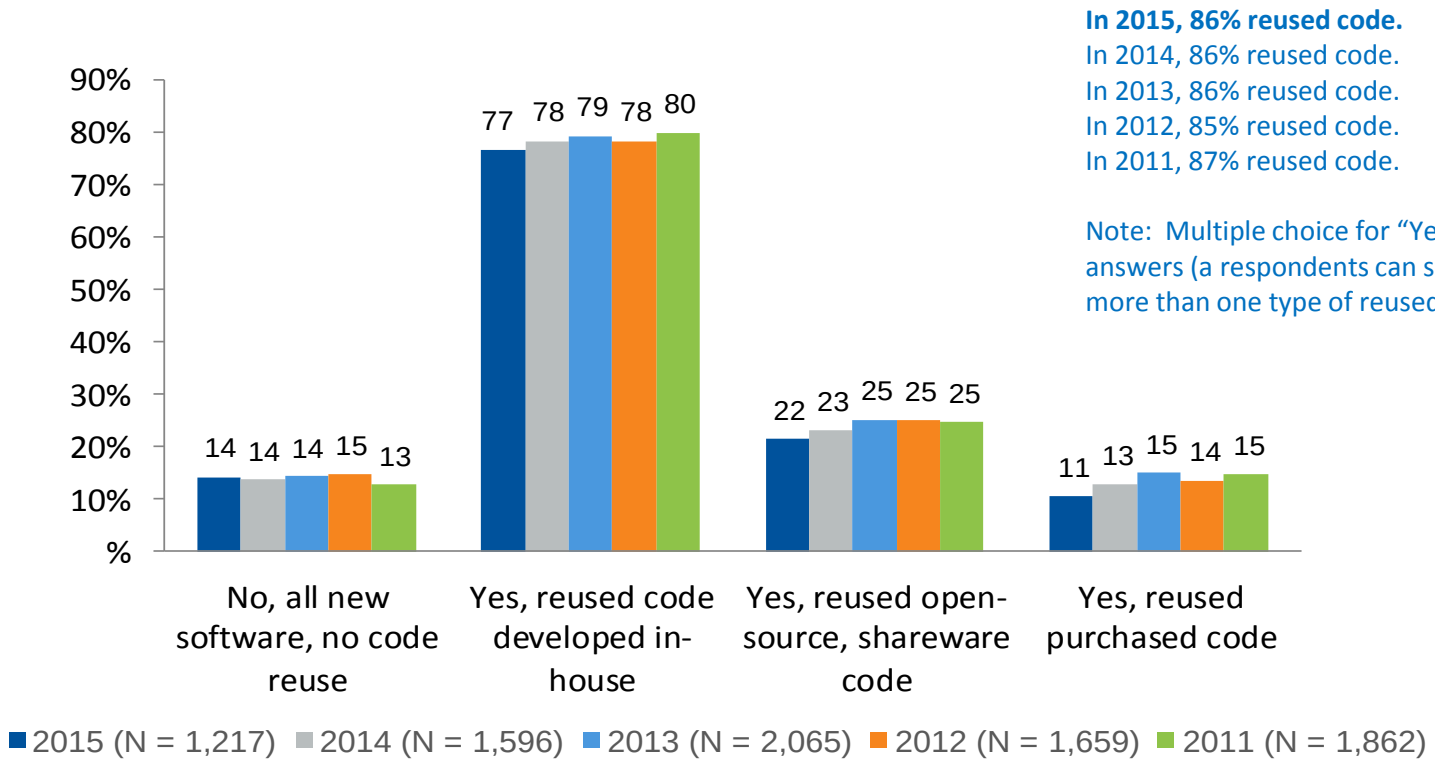
Does your current project reuse code from a previous embedded project?



In 2015, 86% reused code.
In 2014, 86% reused code.
In 2013, 86% reused code.
In 2012, 85% reused code.
In 2011, 87% reused code.

Note: Multiple choice for "Yes" answers (a respondents can select more than one type of reused code).

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Embedded Design Process

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Embedded Design Process

- **Challenges:** Debugging and meeting schedules, neck and neck
- **Stages:** Detailed design (29%) & debugging (21%) take most time
- **Vendors:** Work with 3.3 outside vendors on average
- **Improve:** Debugging tools, engineering team skills, schedule
- **Sources of Info:** Vendor websites leads all others by far
- **Managers Tech Challenges:** OS/RTOS (due to Asia), integrating new technology, software tools, code size/complexity are top four
- **Maintaining professional skills:** Training courses offered online; technical/white papers; webinars by vendors; reading professional journals, webinars by media orgs are at the top of the list.

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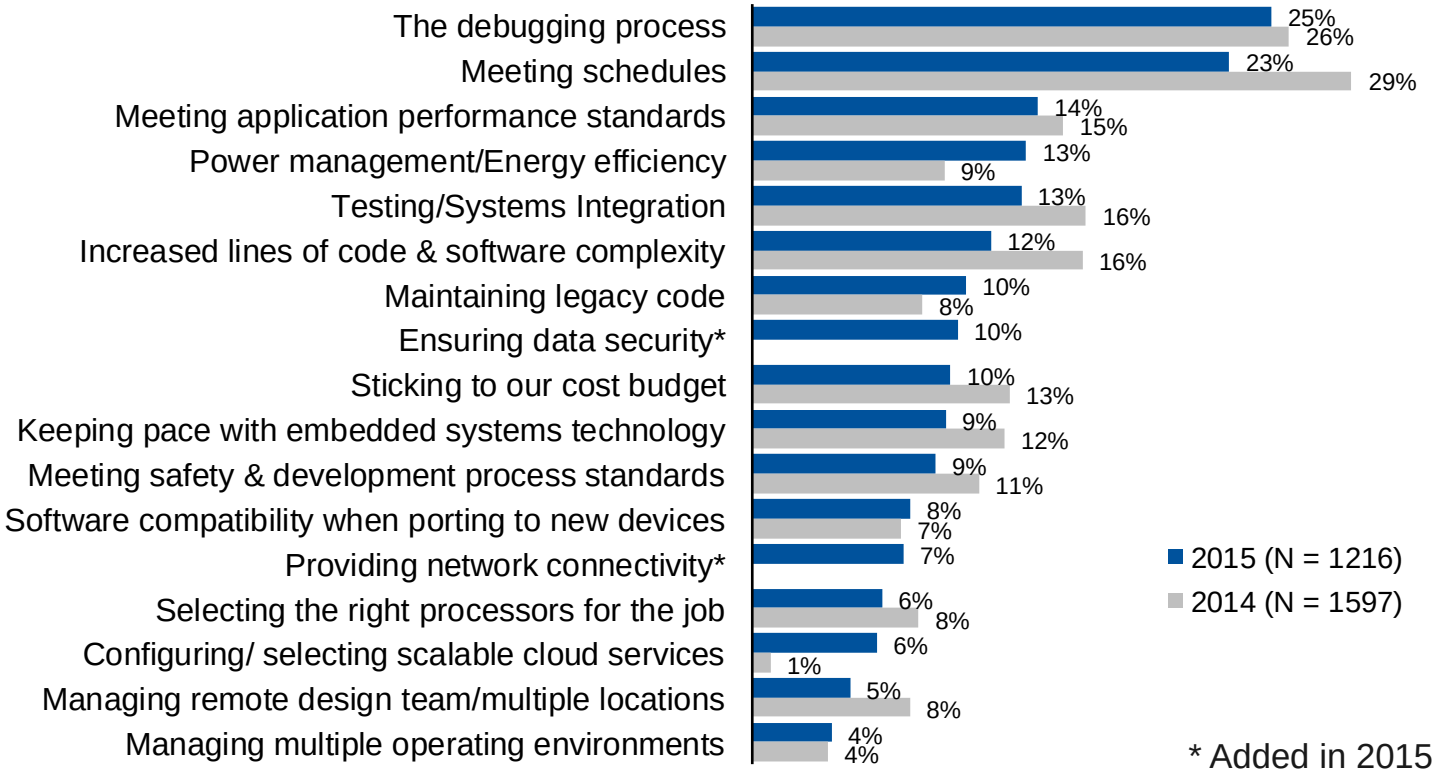
Which of the following challenges are your own or your embedded design team's greatest concerns regarding your current embedded systems development?



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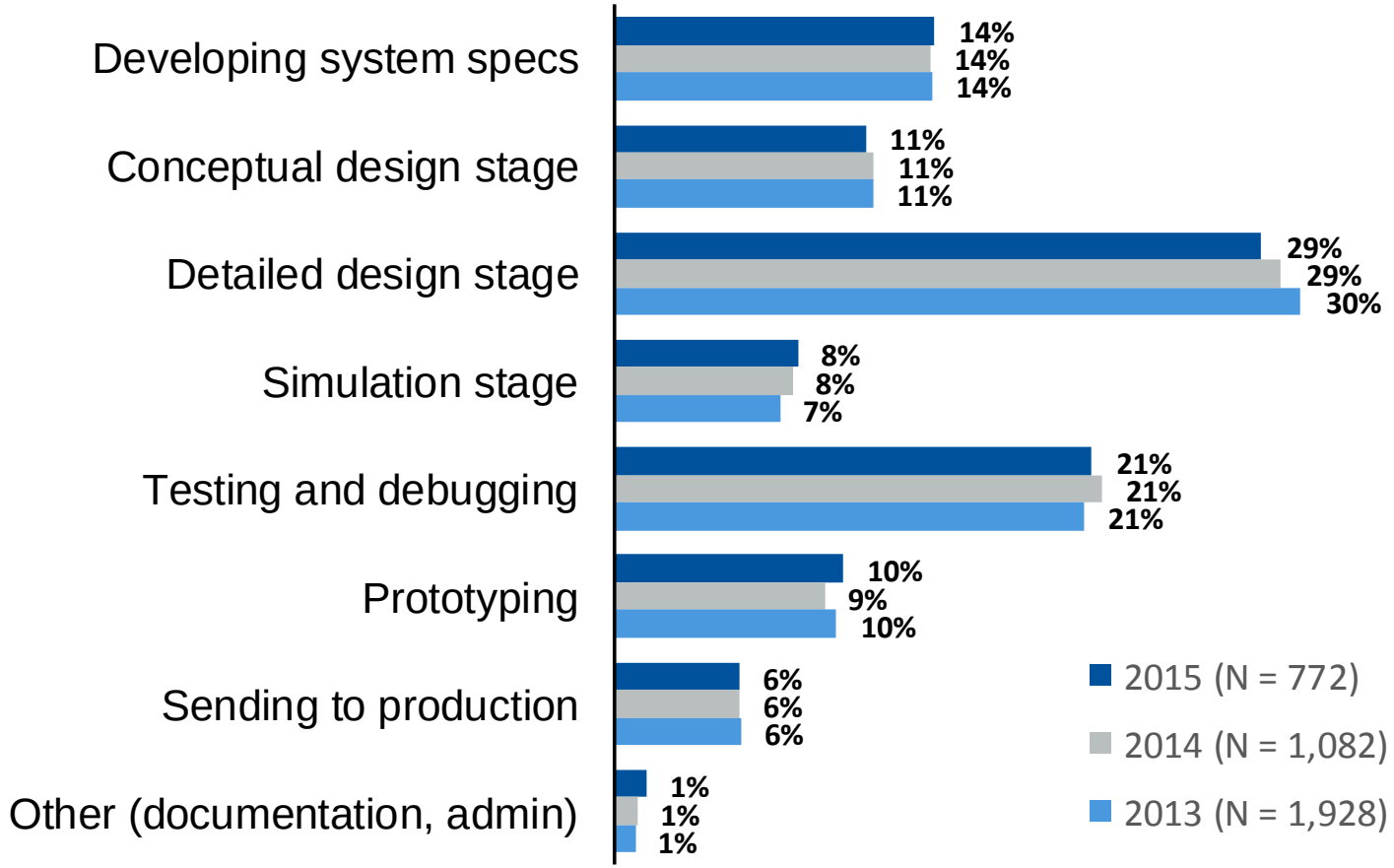
What percentage of your design time is spent on each of the following stages?



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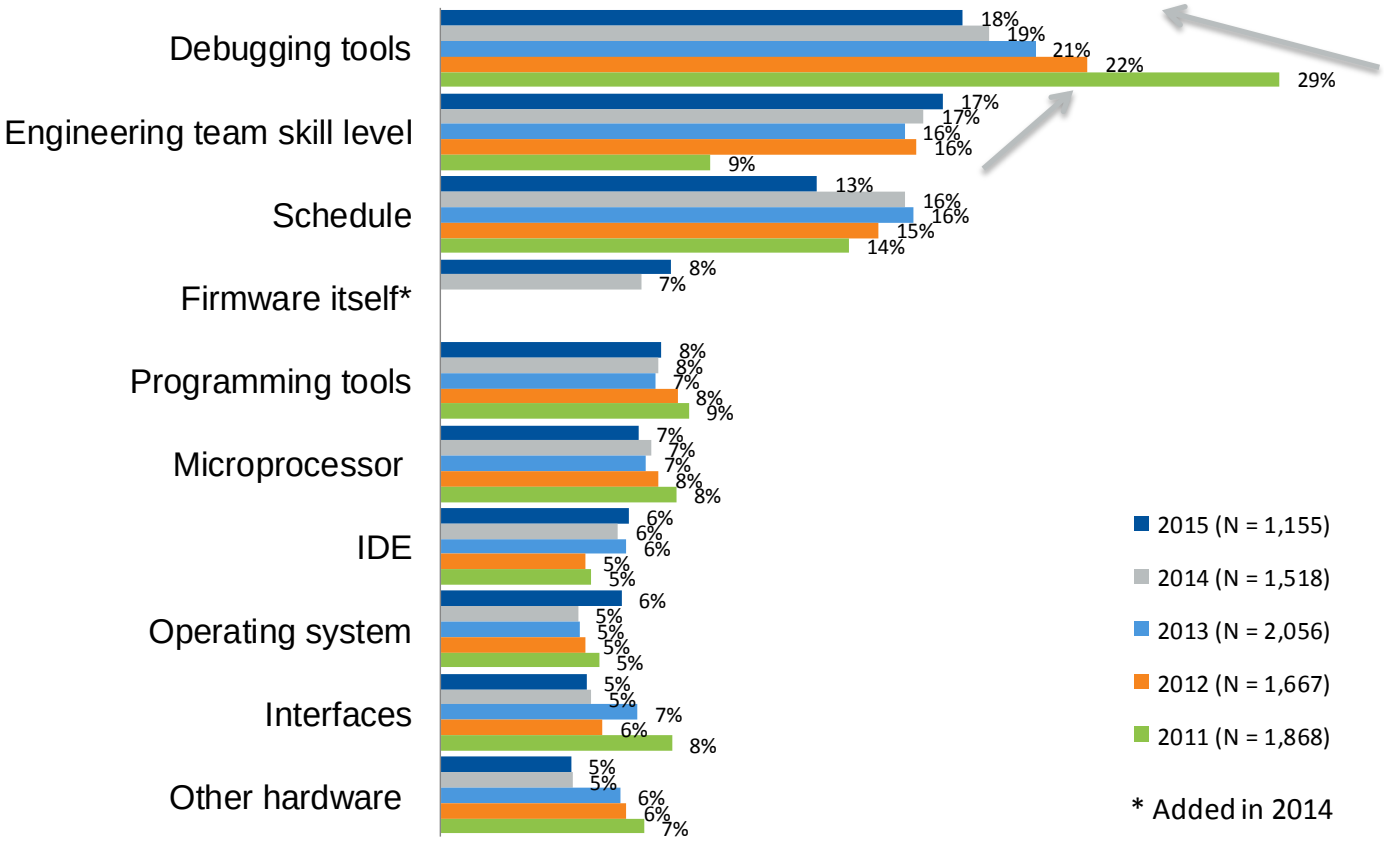
If you could improve one thing about your embedded design activities, what would it be?



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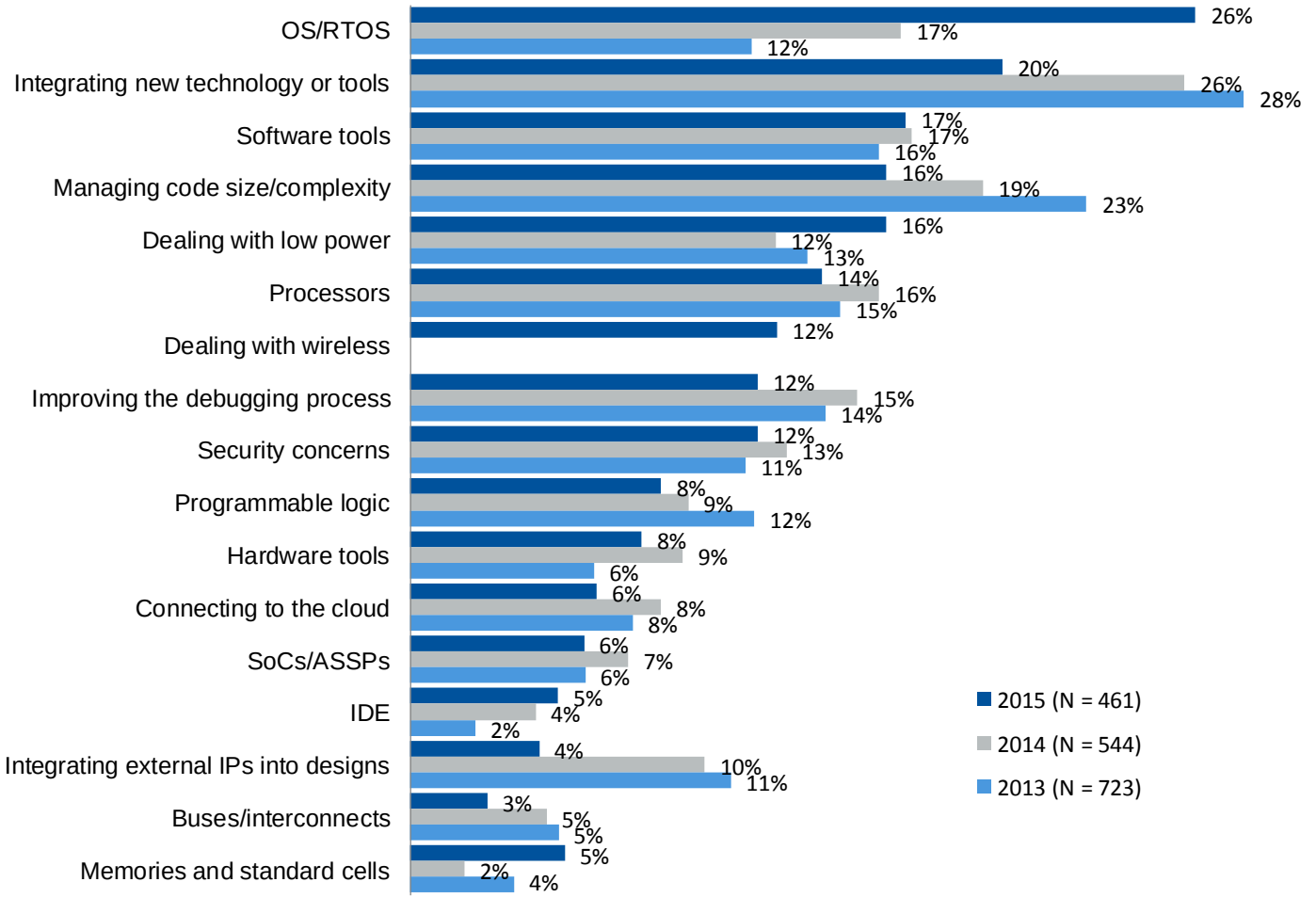
Thinking about the next year, what areas will be your greatest technology challenges?

Managers Only



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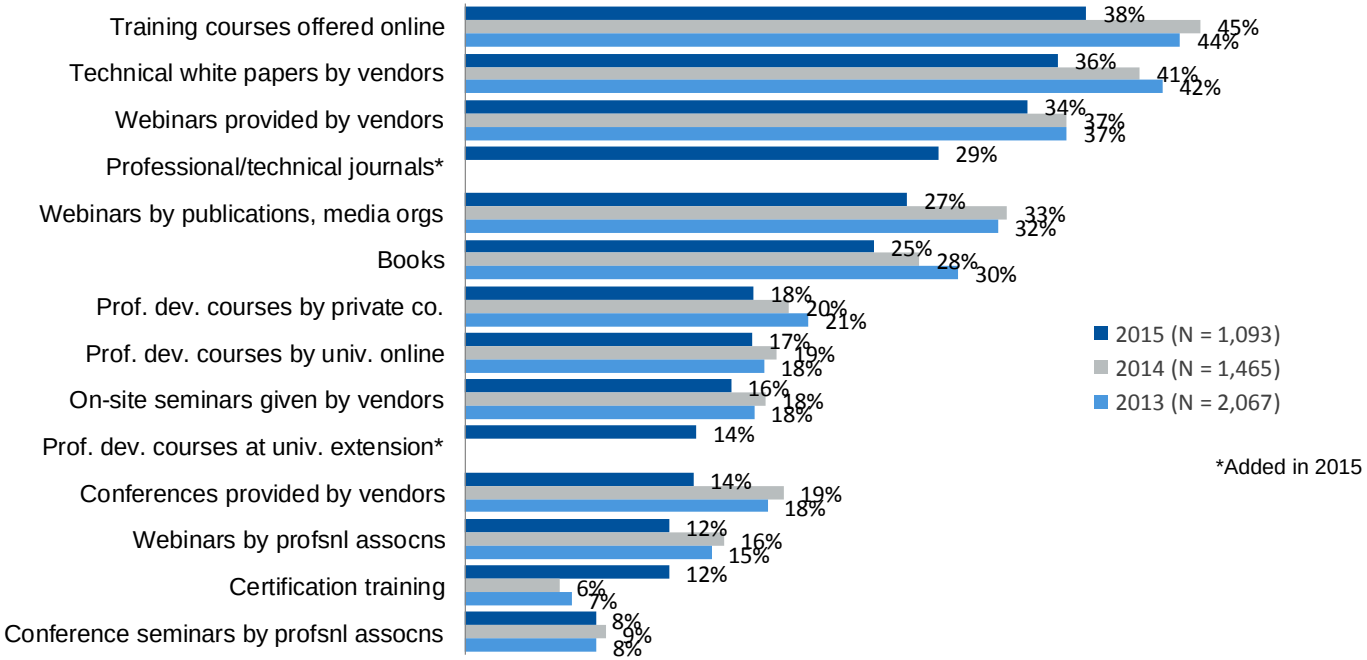
What are the most effective ways that you systematically or formally maintain, educate, and advance your professional skills?



Other Related Demographics	2015	2014	2013
Average days per year spent on career training	9.5	9.2	9.0
Average number of years out of school	20.0	21.6	19.7
Hours per week spent reading technical pubs	4.6	5.2	4.8
Books read in full or in substantial part per year	3.7	3.9	3.9

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Presented by UBM Electronics Group

Operating Systems

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Operating Systems

- **OS/RTOS usage –** Slight uptick of 3% to 71% overall usage (Europe/Asia were even higher in usage)
- **Open Source OS usage –** Now 39% up from 31% four years ago.
- **Commercial OS usage –** Now 35%, up slightly, after four yr. decline
- **Deciders of OS –** Software engineers and their managers mostly
- **Used same OS –** 61% used the same OS, no change from 2014
- **OS/RTOS used –** Big gainers were FreeRTOS and Micrium (Asia influence). Android fell off some after gain in 2014.
- **OS/RTOS considering –** FreeRTOS, Android and Micrium were top three RTOSes being considered, showing gains largely from Asia.
- **Embedded virtualization/hypervisor usage –** Up a tick to 20%

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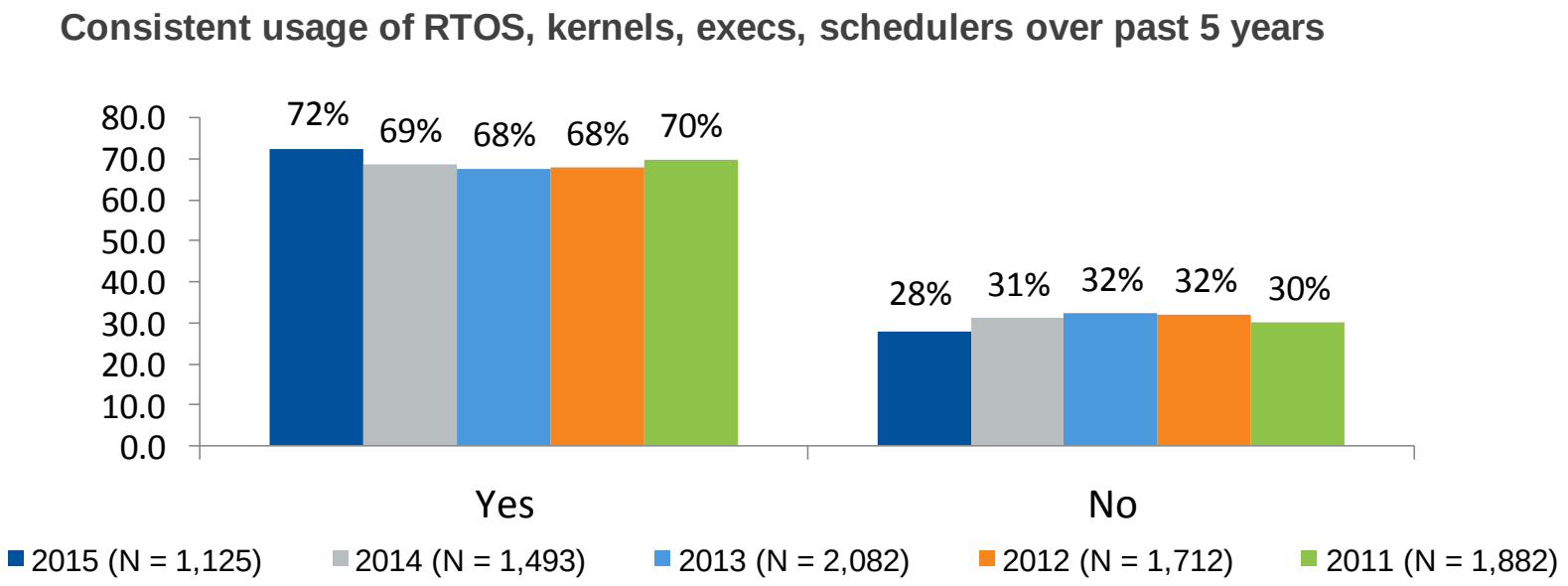
Does your current embedded project use an operating system, RTOS, kernel, software executive, or scheduler of any kind?



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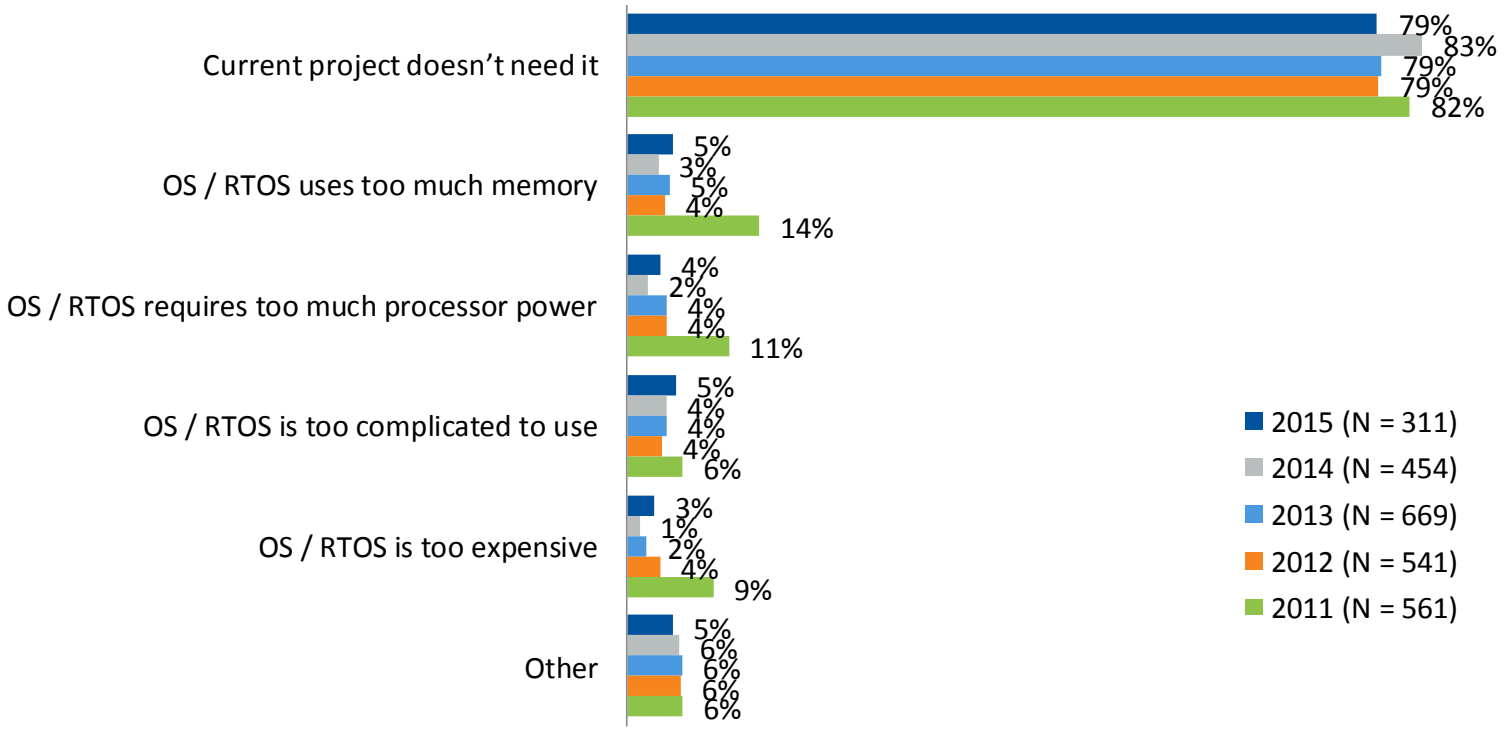
If current embedded project does not use an operating system, RTOS, kernel, software executive, or scheduler of any kind, why not?



41
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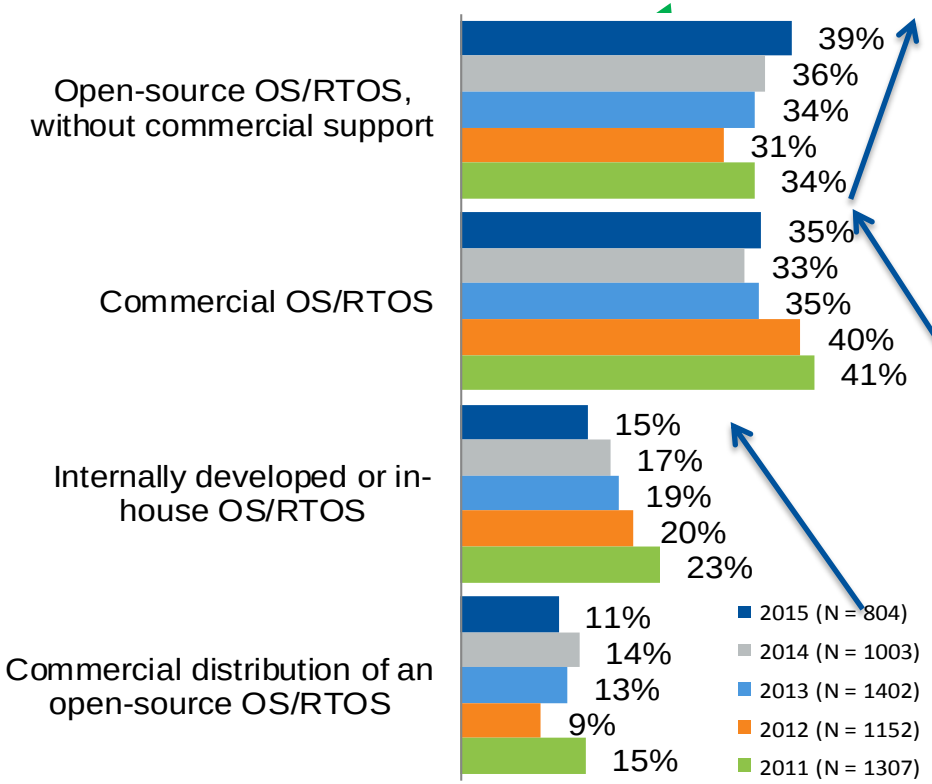
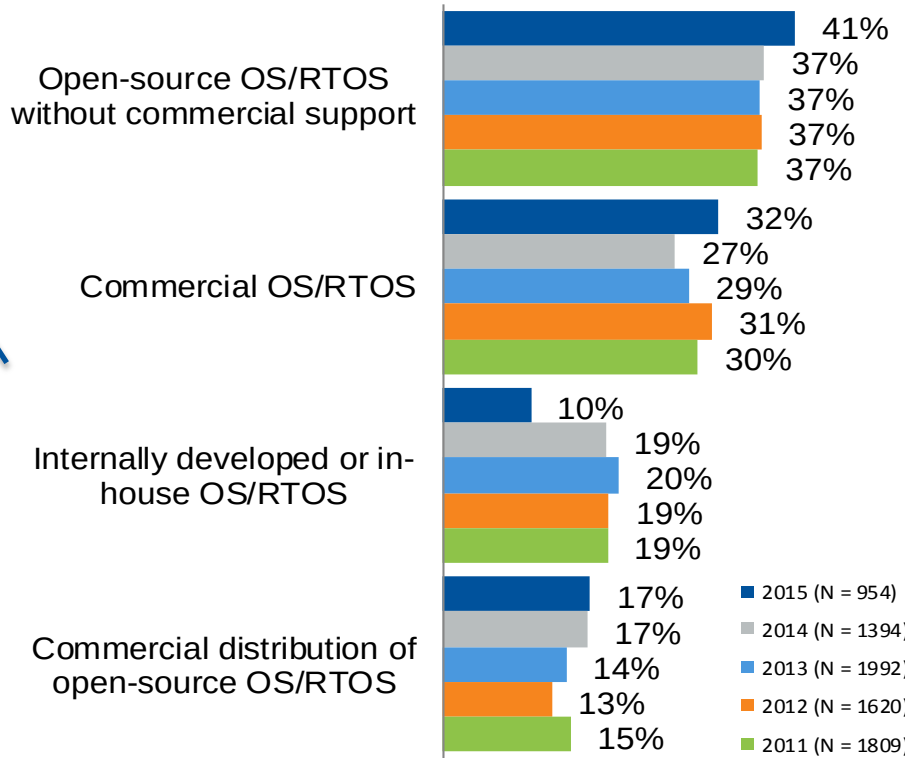
My current embedded project uses:



My next embedded project will likely use:



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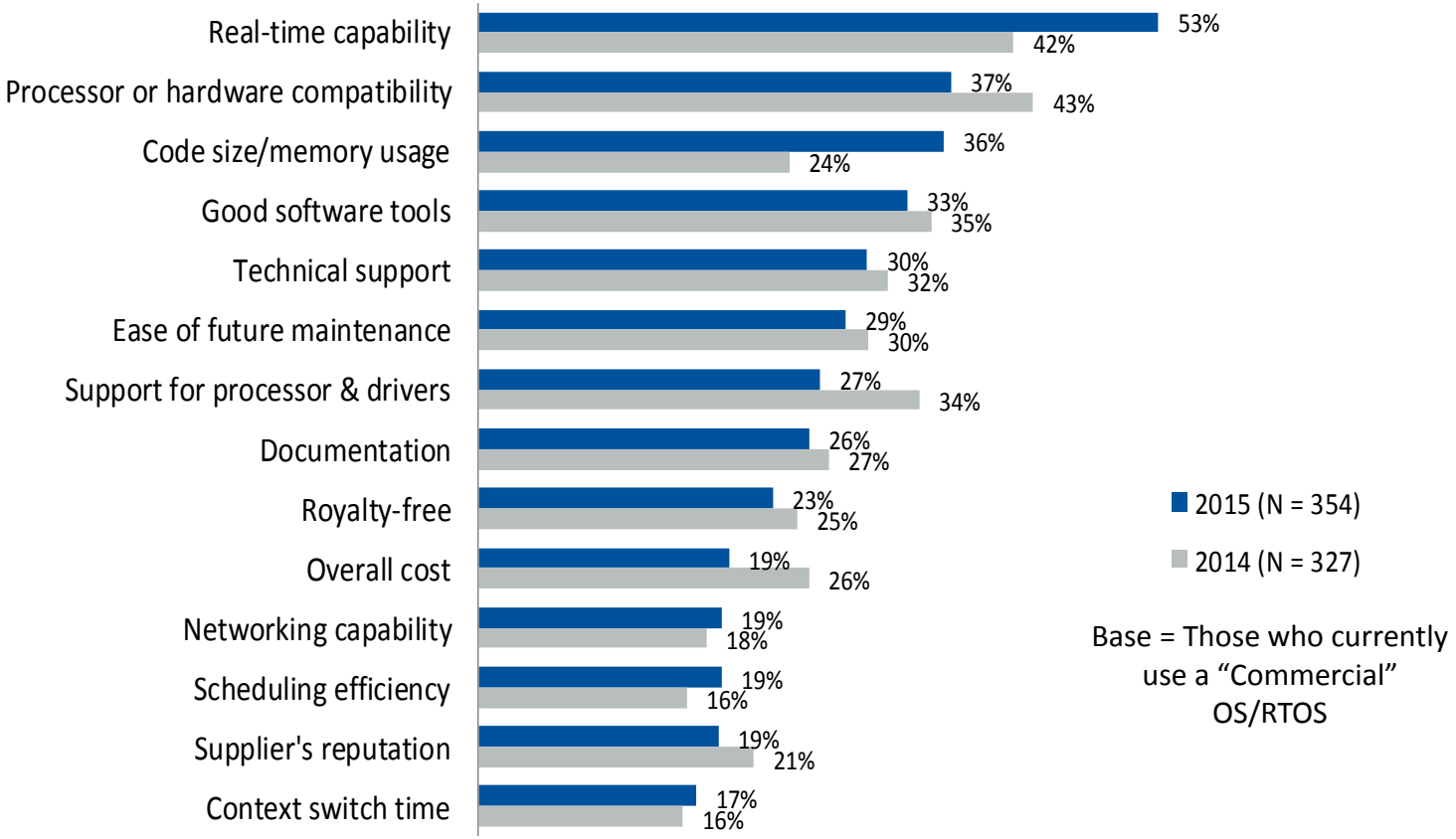
Which factors most influenced your decision to use a commercial operating system?

(Top 14 reasons)



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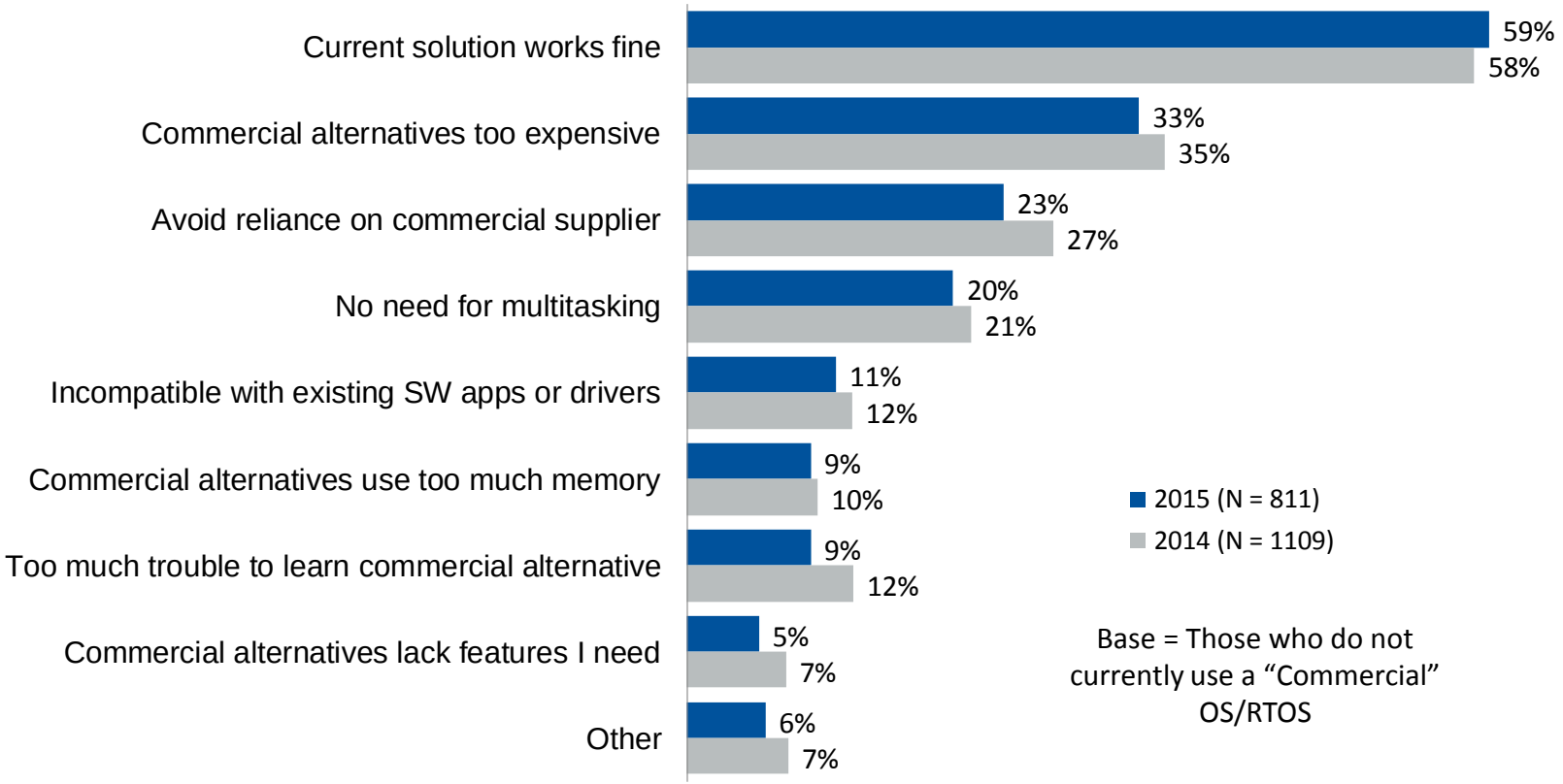
What are your reasons for not using a commercial operating system?



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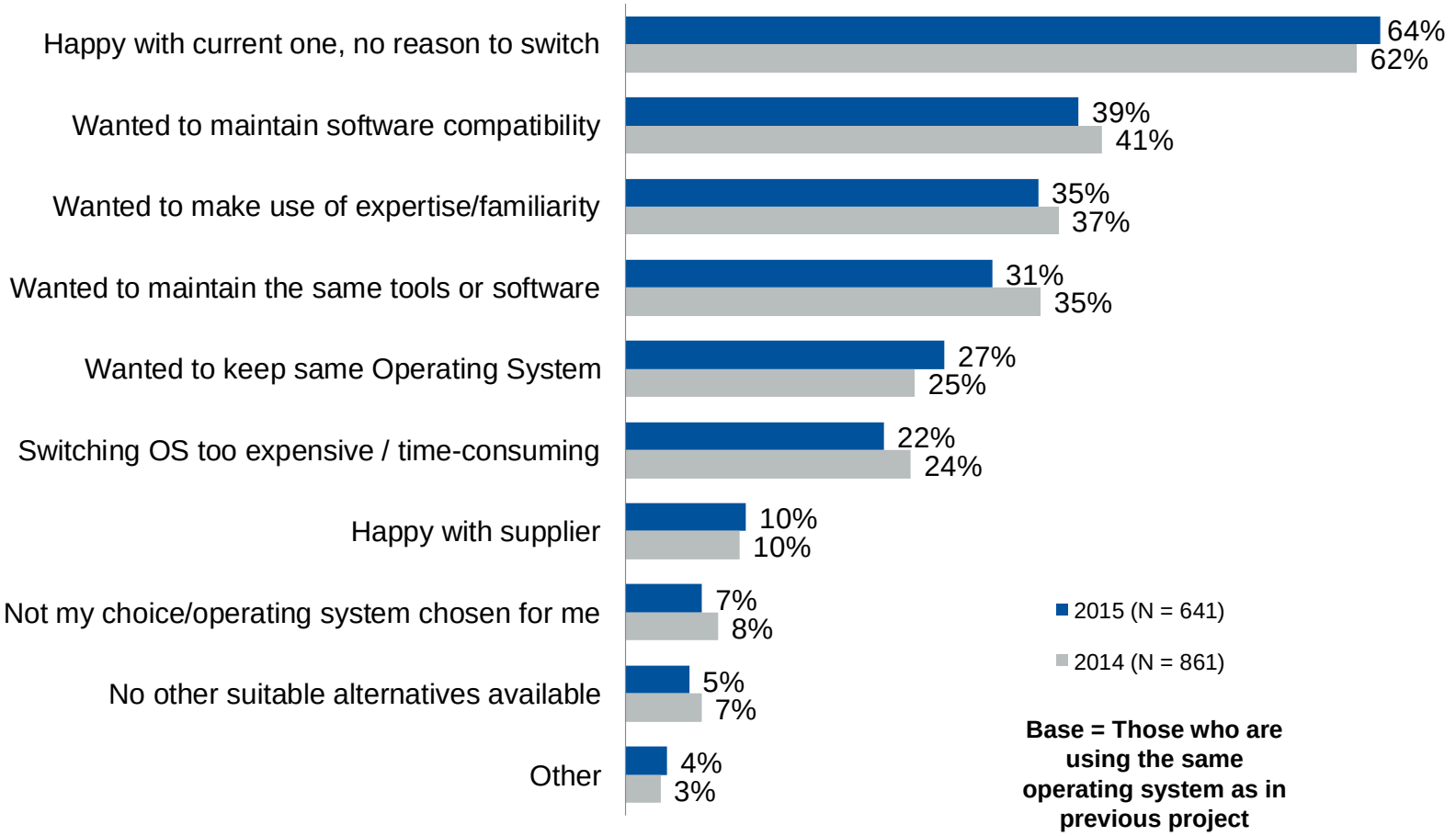
Why did you use the same operating system?



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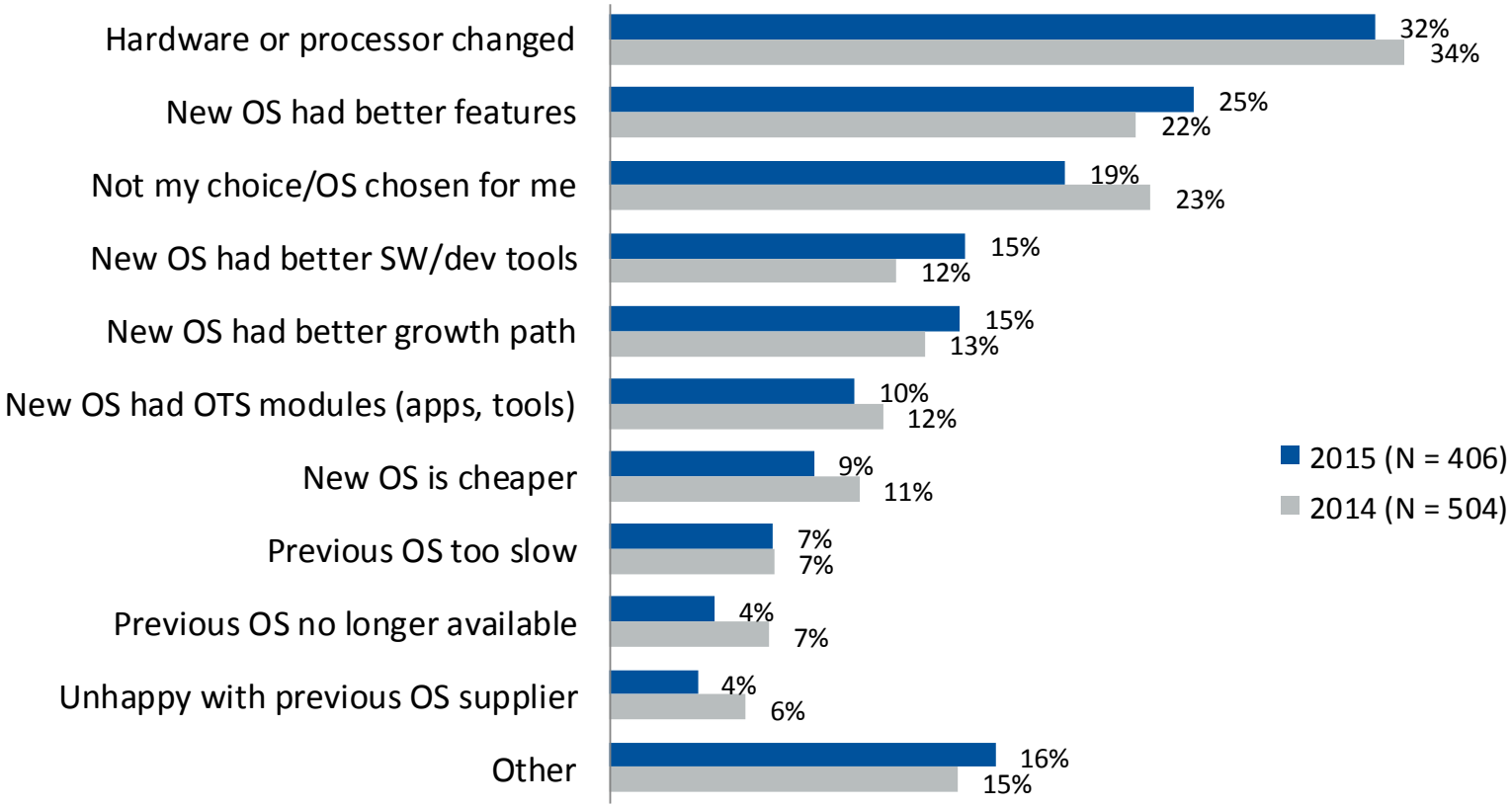
Why did you switch operating systems?



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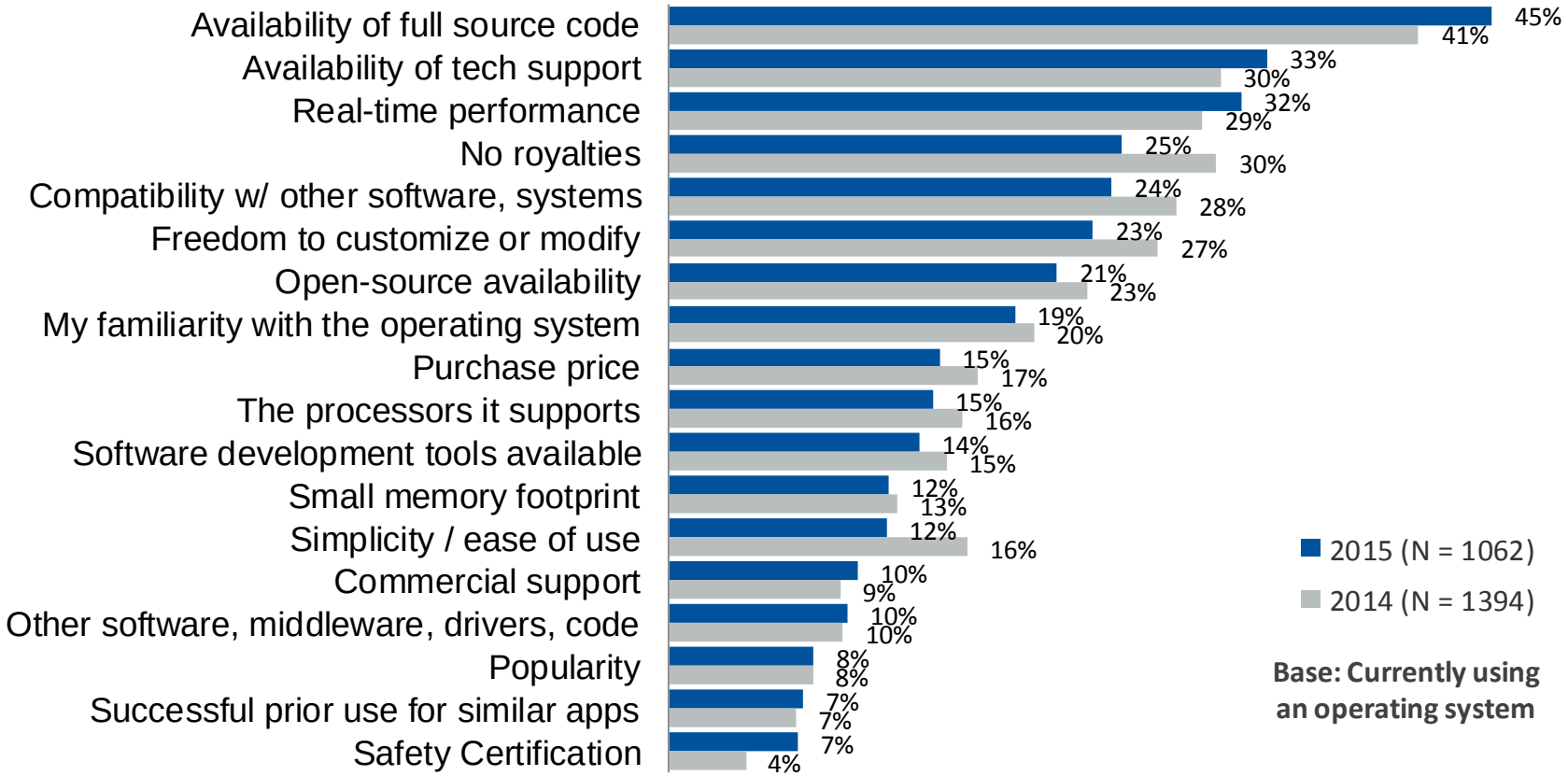
What are the most important factors in choosing an operating system?



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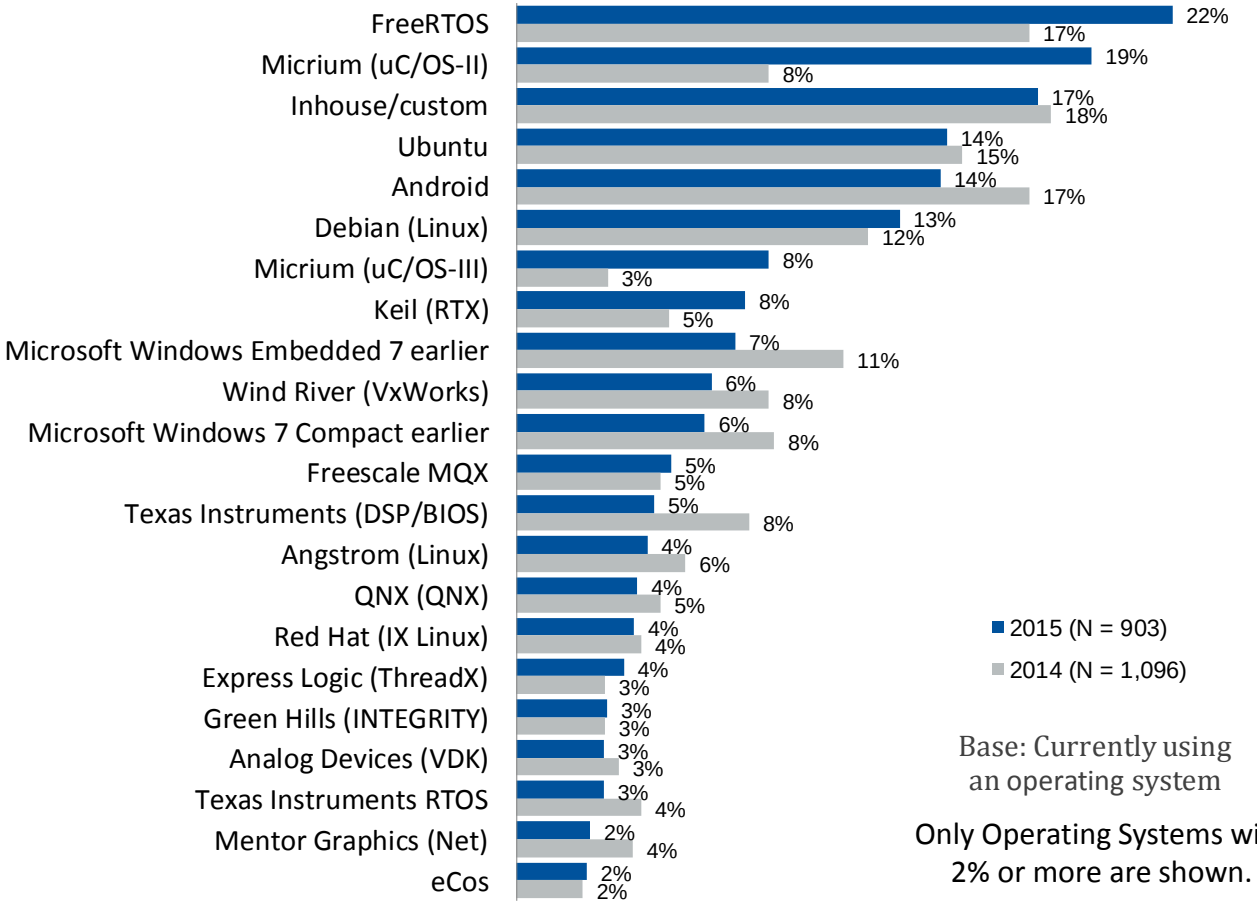
Please select ALL of the operating systems you are currently using



Base: Currently using an operating system

Only Operating Systems with 2% or more are shown.

FreeRTOS was 30%, Micrium uC/OS-II was 29% and Micrium uC/OS-III was 13% in **Asia**, influencing the ranking of this years OS leaders.

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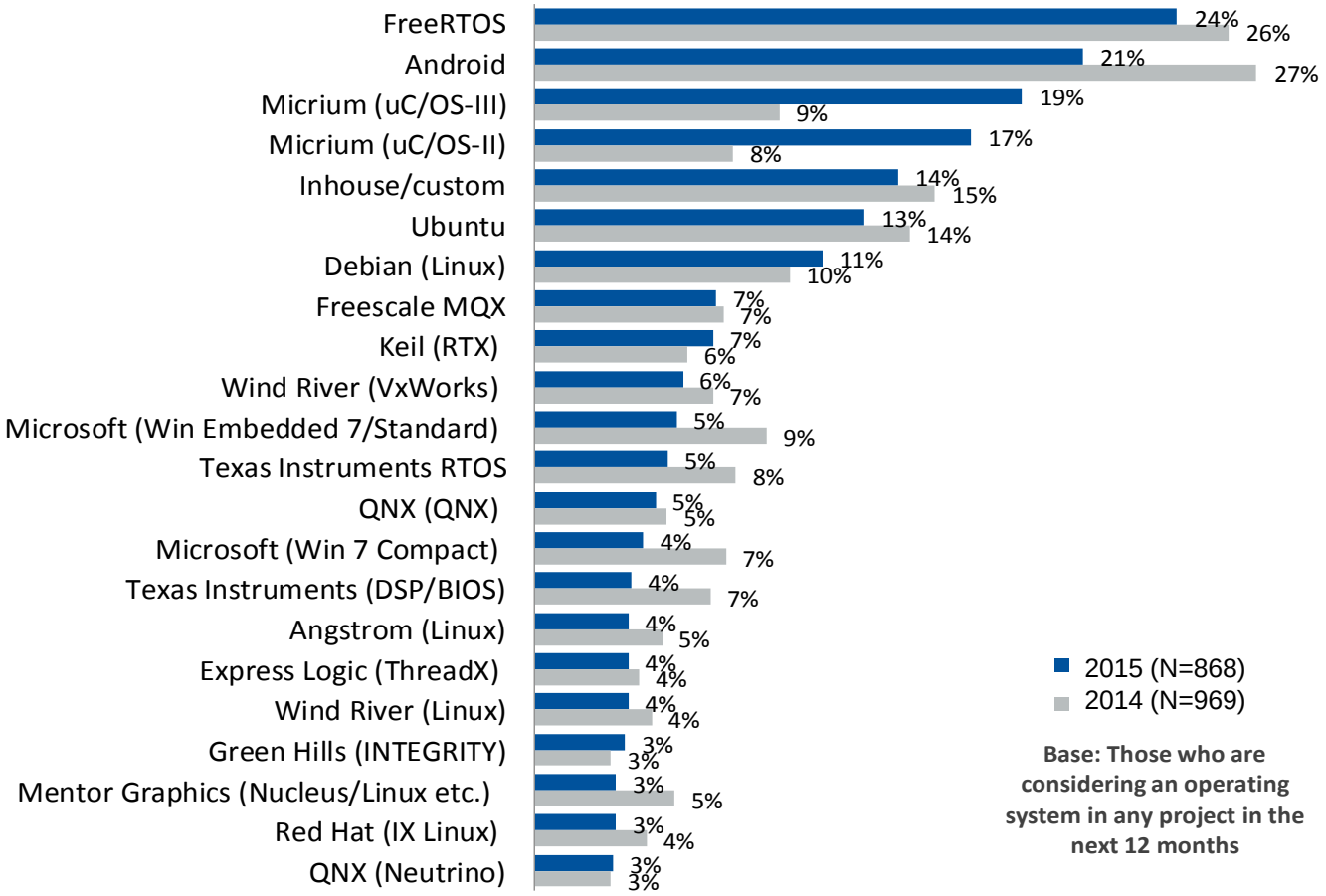
Please select ALL of the operating systems you are considering using in the next 12 months.



Only Operating Systems 3% or over are shown

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Microprocessors

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Microprocessors

- **Deciders for chips –** Hardware engineers and their managers
- **Single chip usage –** Now 58% up from 50%. 2.1 chips per design on average.
- **Chip Type –** Now 68%, 32-bit has steadily risen from 62% over five years
- **Clock speeds –** Now 397 MHz, steady downward trend from 485 MHz in 2013
- **Same processor used –** Now 50% (Asia influence) up from 45% in 2014
- **Family –** 57% chose main chip from different family, 43% from same family
- **Ecosystem –** 67% say "ecosystem" outweighs "the chip". TI's ecosystem is best.
- **Most important in chip decision –** Software development tools
- **Top 5 Vendors Familiar With –** TI, Atmel, Freescale, Microchip, STMicro
- **Top 5 Vendors Currently Using –** TI, Freescale, Atmel, Microchip, STMicro
- **Top 5 Vendors Considering Using –** TI, Freescale, STMicro, Microchip, Atmel
- **Top two 32-bit chips considering –** STMicro STM32 (ARM), Microchip PIC 32-bit
- **Top two 16-bit chips considering –** TI MSP430 and Microchip PIC 24 (dsPIC)
- **Top two 8-bit chips considering –** Microchip PIC and Atmel AVR same as 2014
- **Top two DSP chips considering –** Microchip dsPIC and TI DaVinci
- **Upgraded to 32-bit chip –** Now 33%, up 4% from 29% in 2014 due to Asia.

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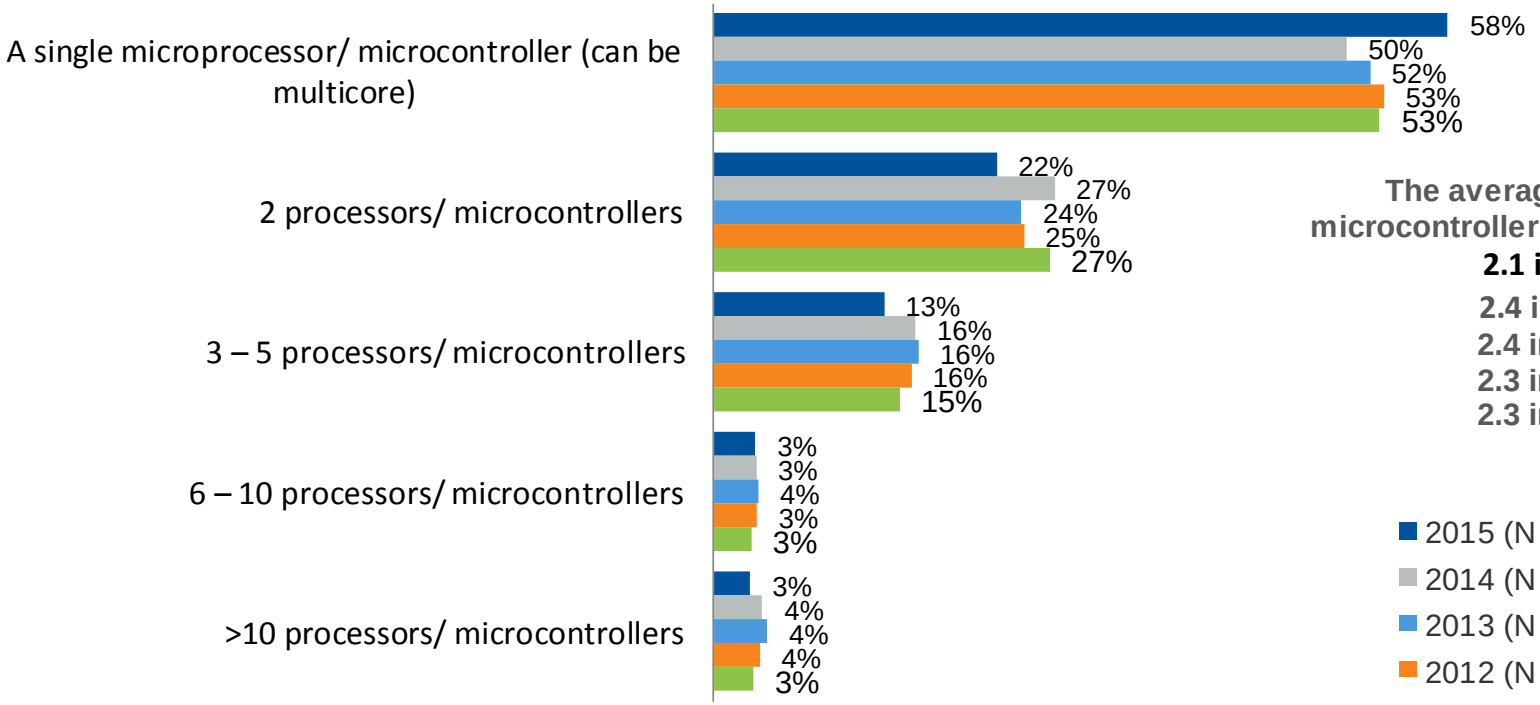
My current embedded project contains:



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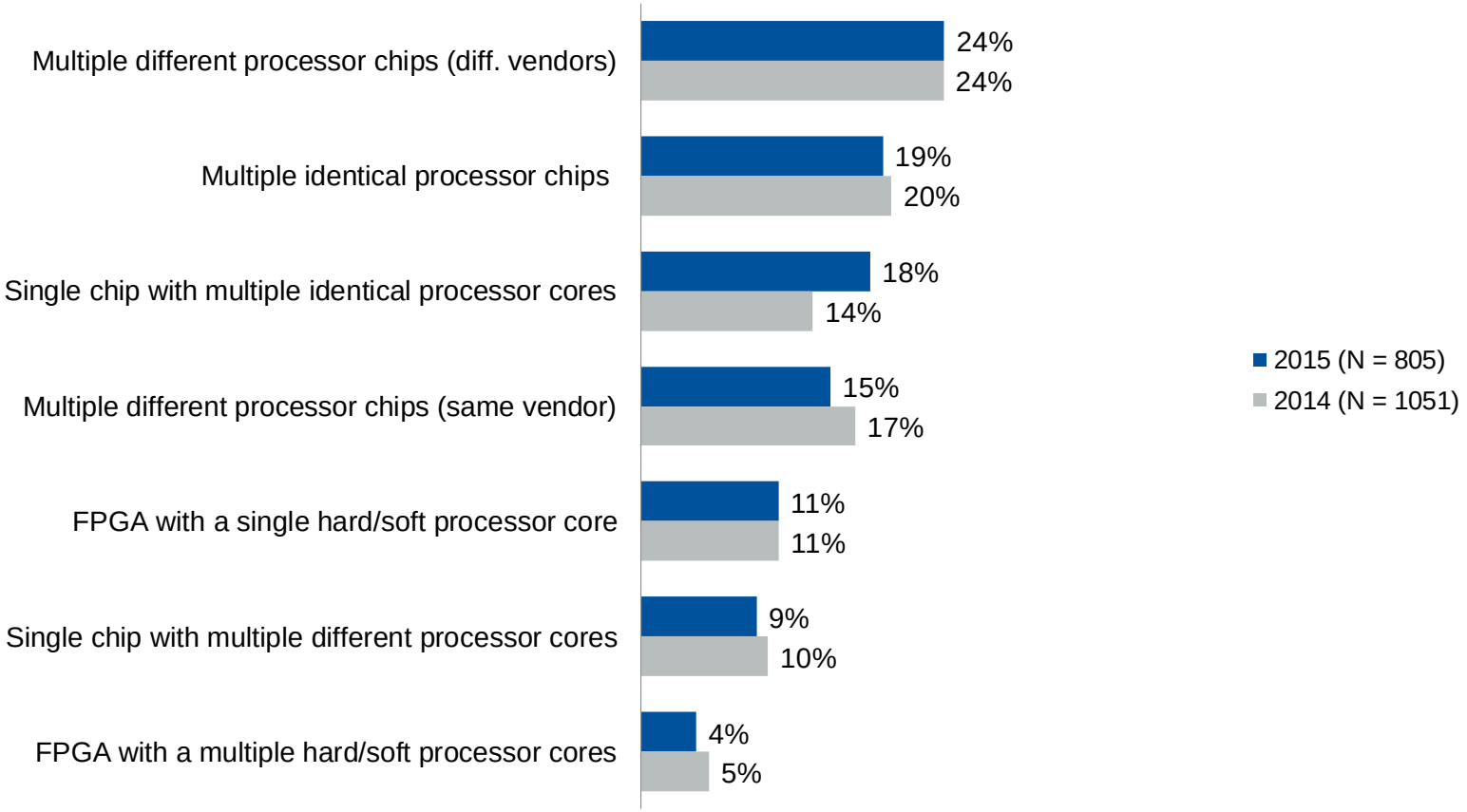
Does your embedded project contain . . .



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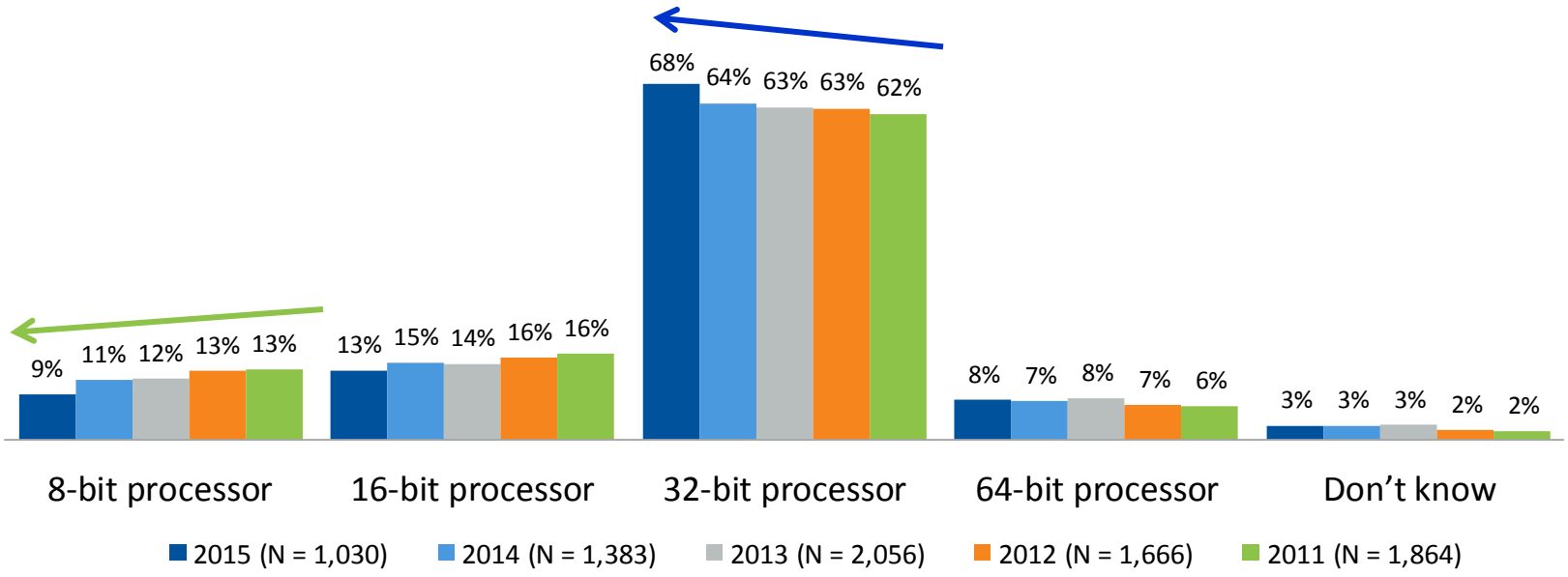
My current embedded project's main processor is a:



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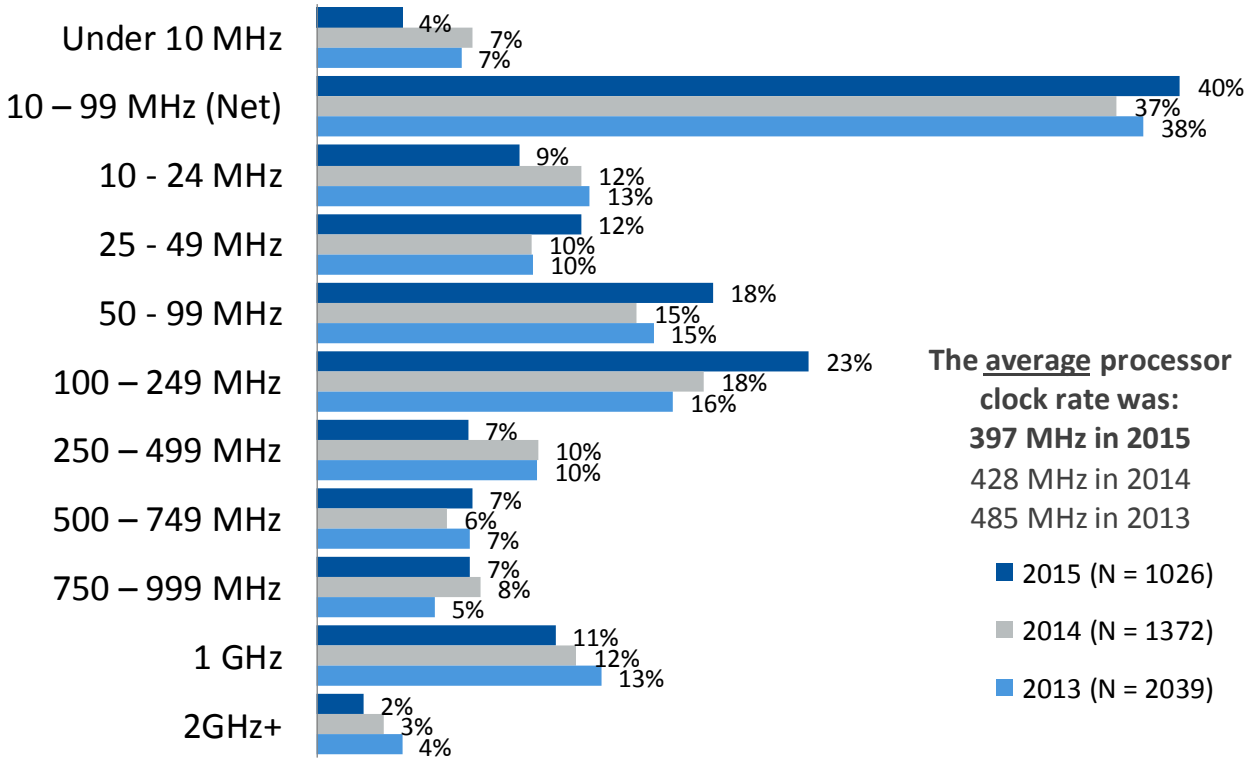
My current embedded project's main processor clock rate is:



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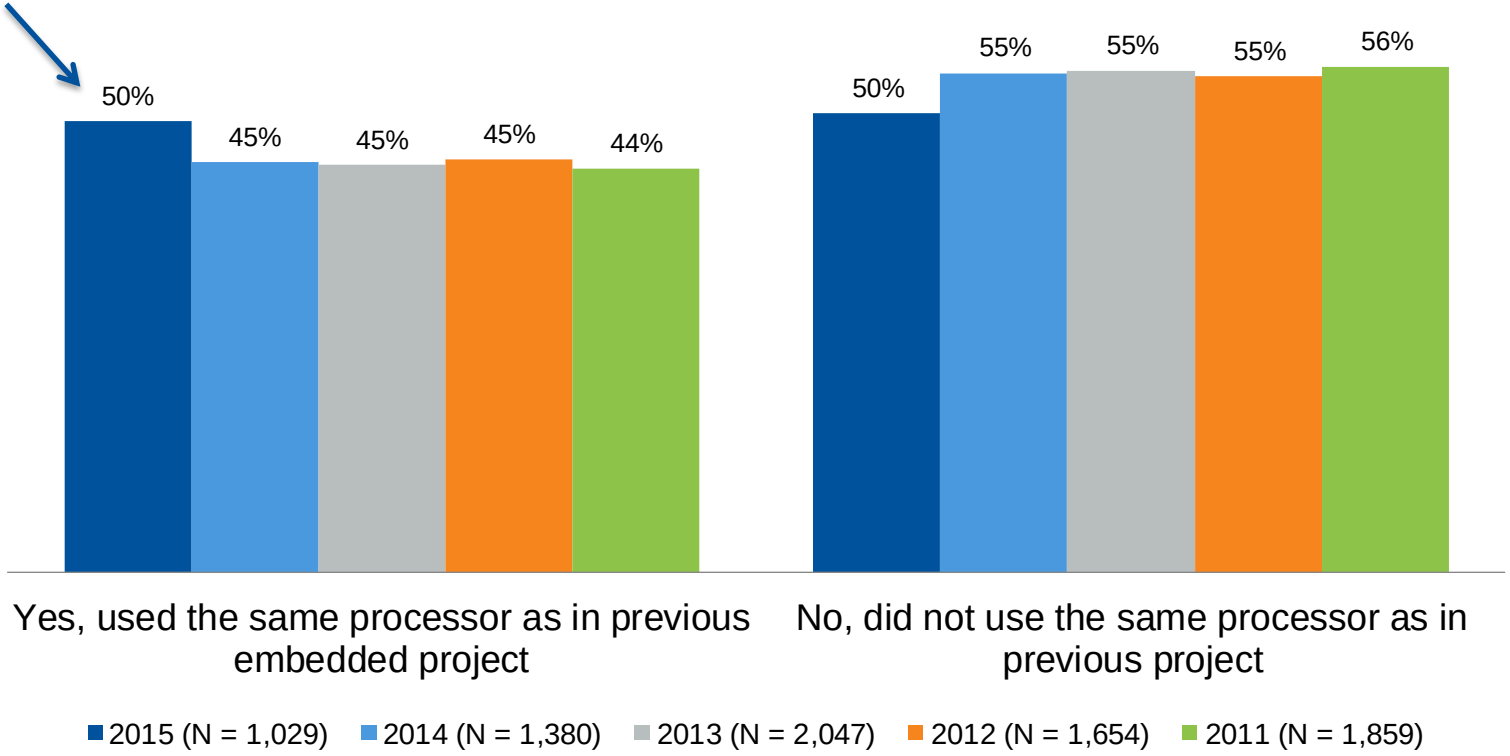
Did you use the same processor as in your previous embedded project?

Asia used same processor 57%



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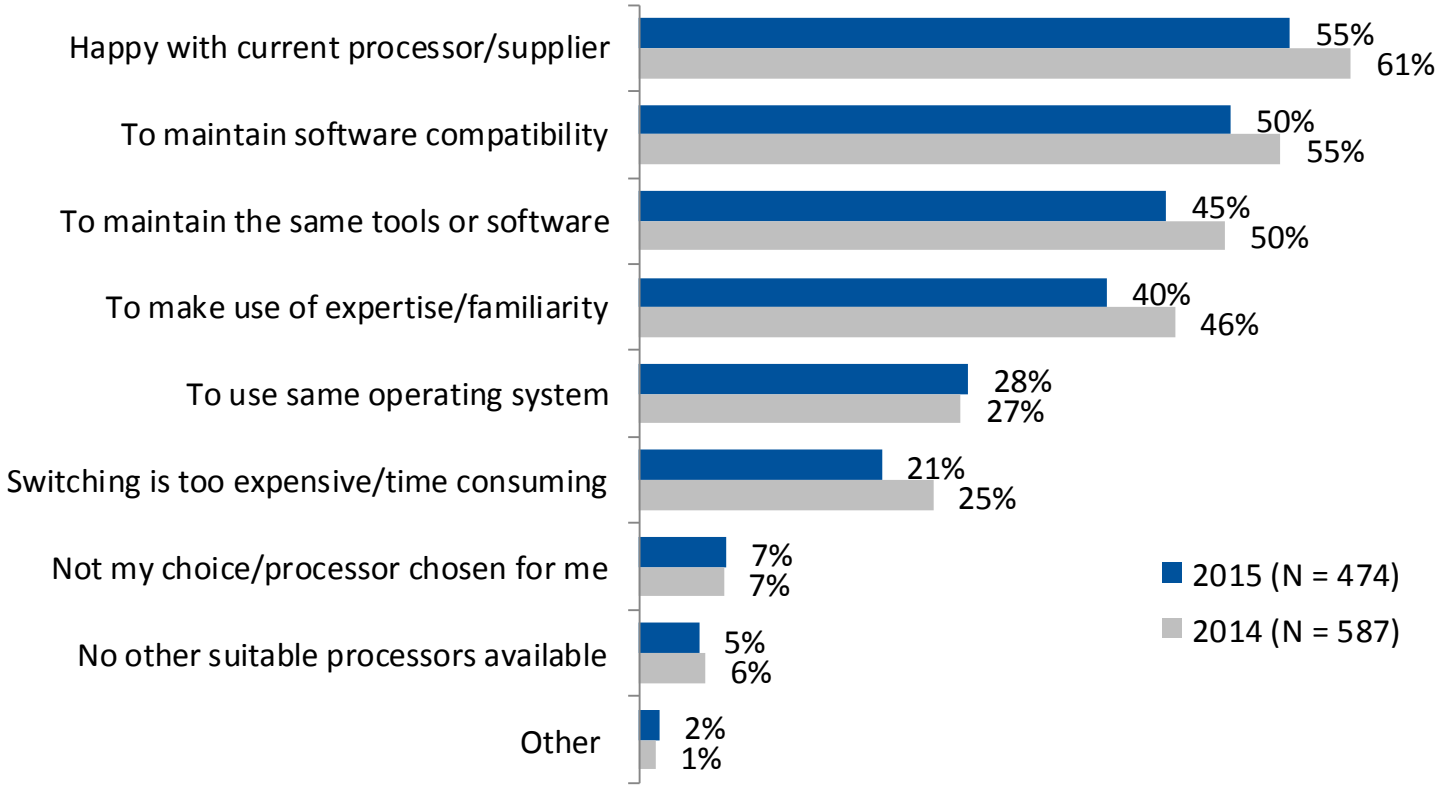
Why did you use the same processor?



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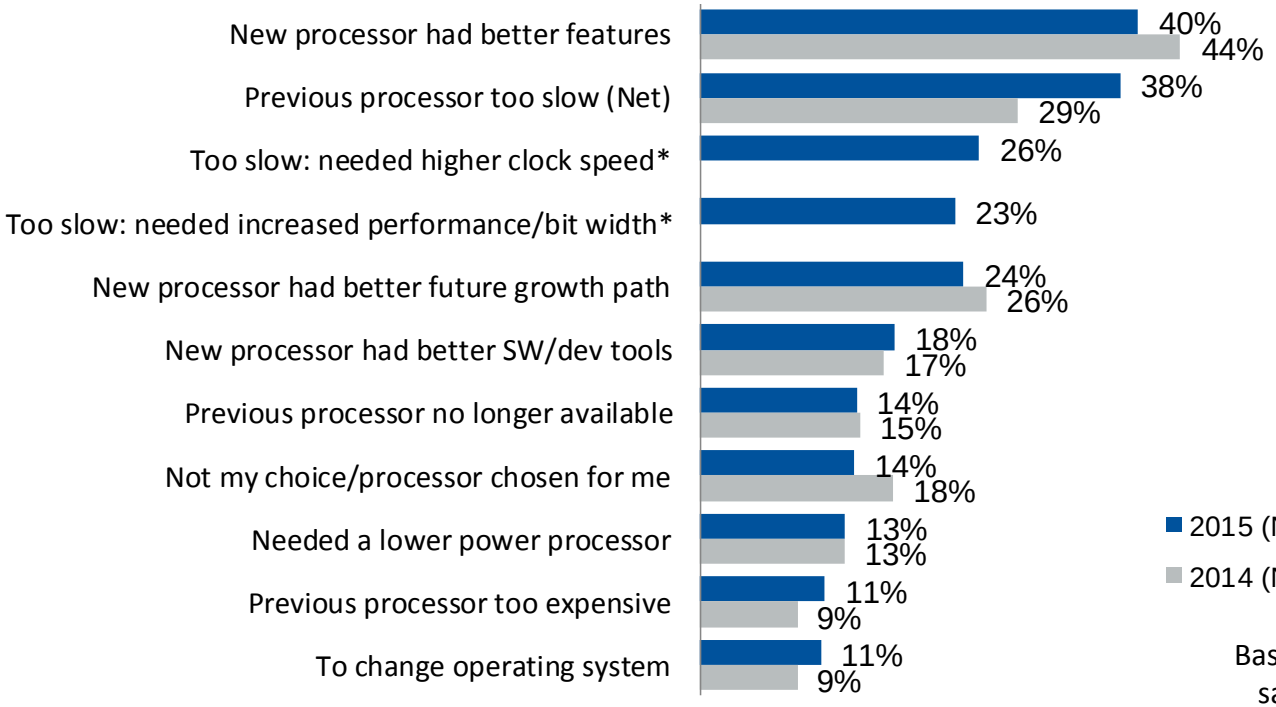
What were your reasons for switching processors?



*"Previous processor too slow" in 2014, was broken into two separate answers in 2015. The Net answer recombines them for comparison to 2014.

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

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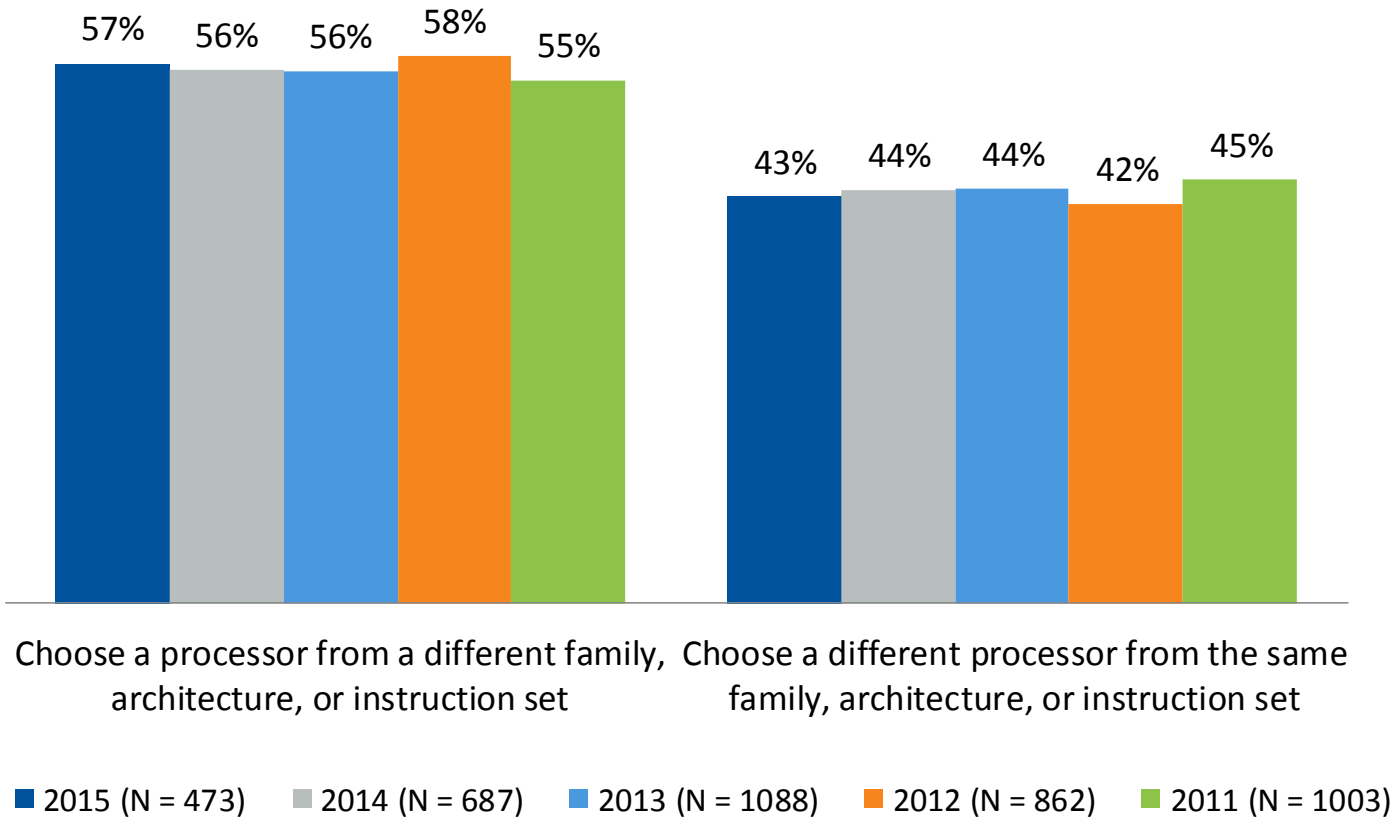
Did you . . .



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

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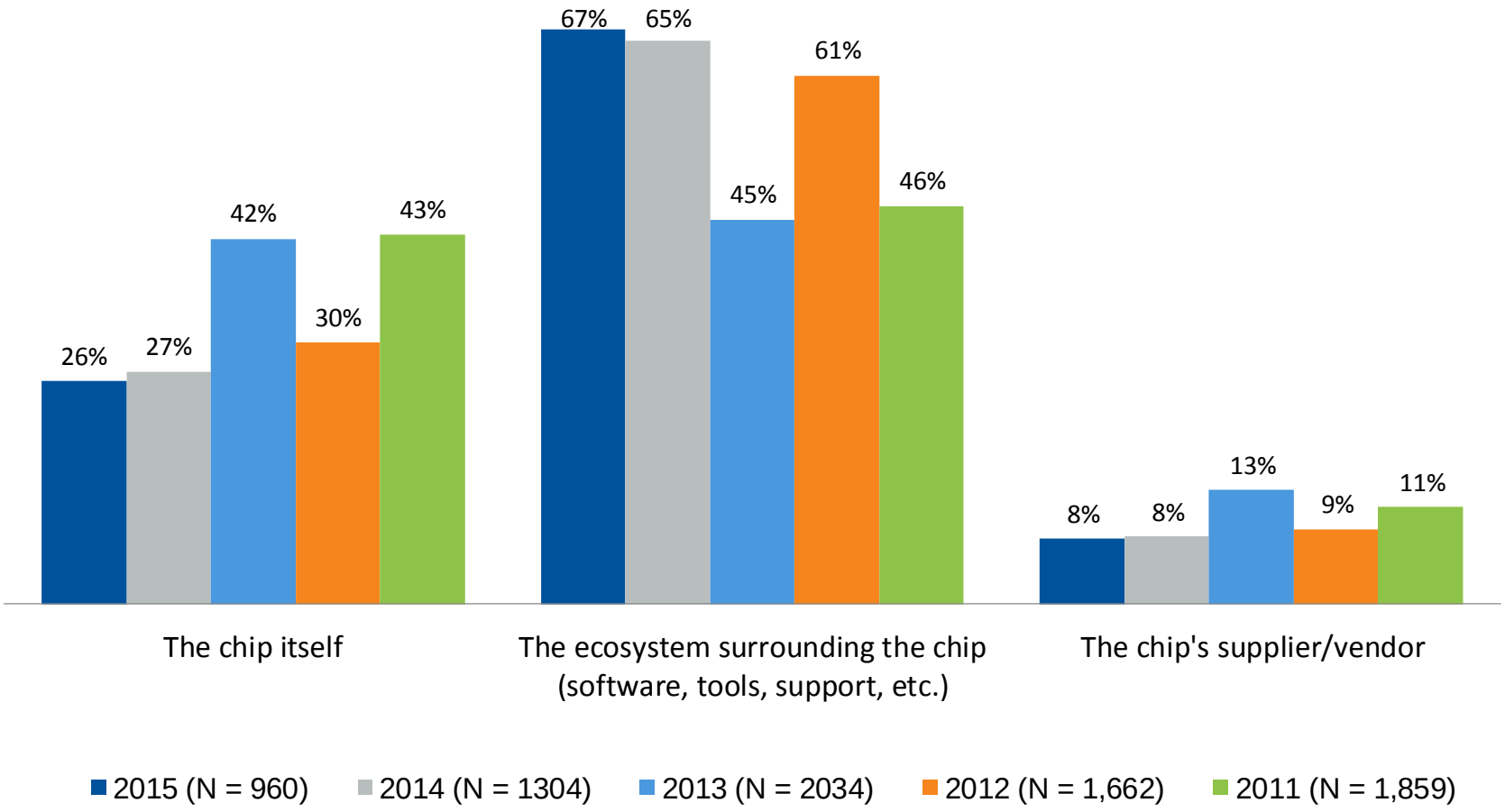
What's most important when choosing a microprocessor?



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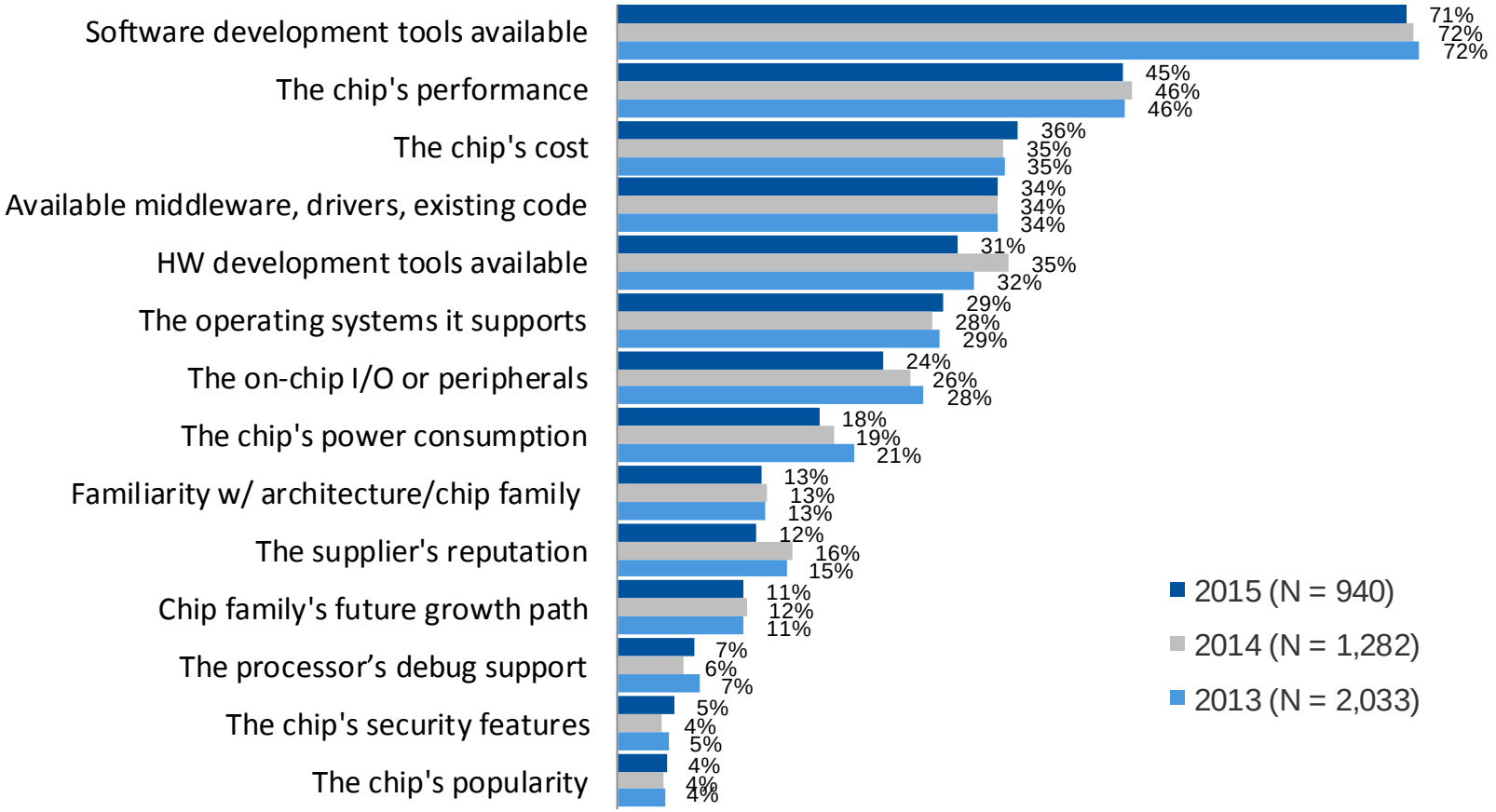
What are the most important factors in choosing a processor?



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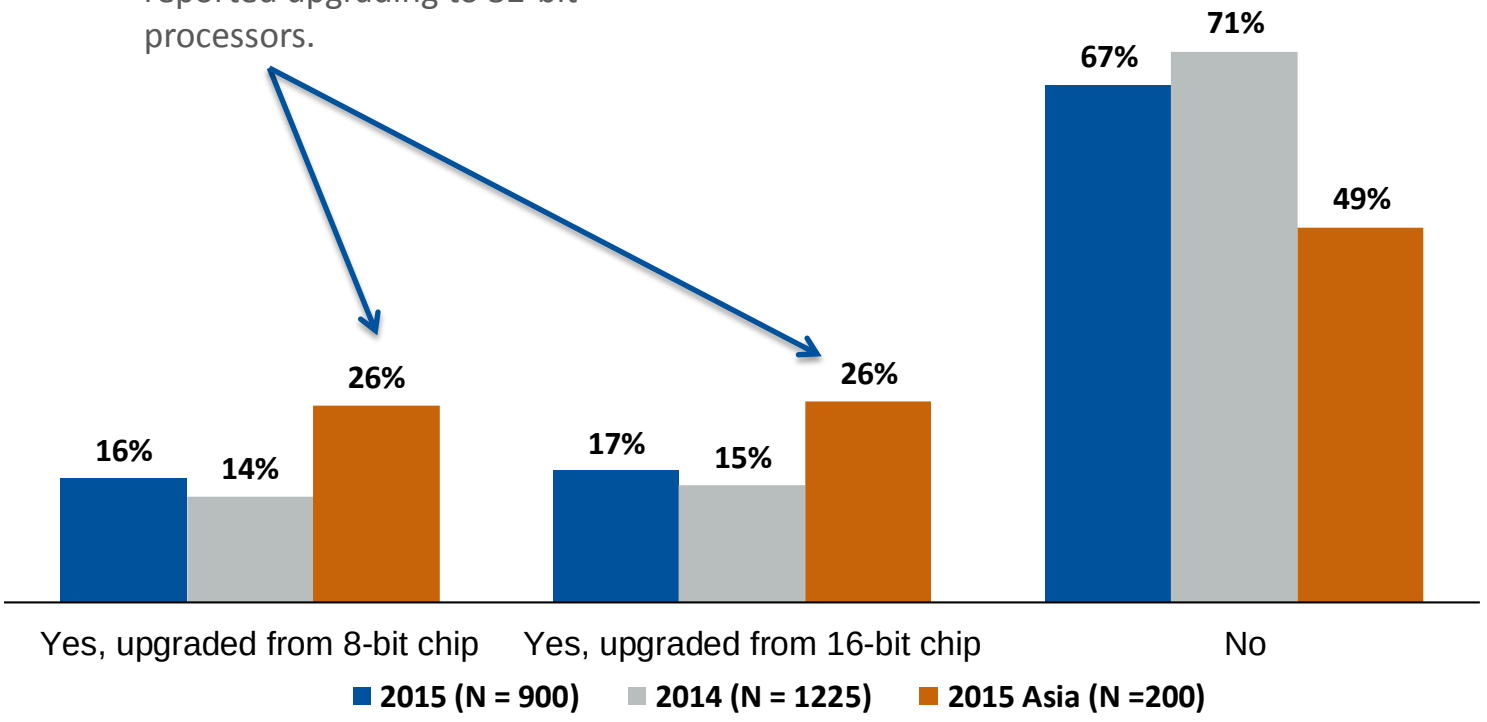
Have you upgraded from an 8-bit or 16-bit chip to a 32-bit design in the last 12 months?

In Asia **over half** (52%) reported upgrading to 32-bit processors.



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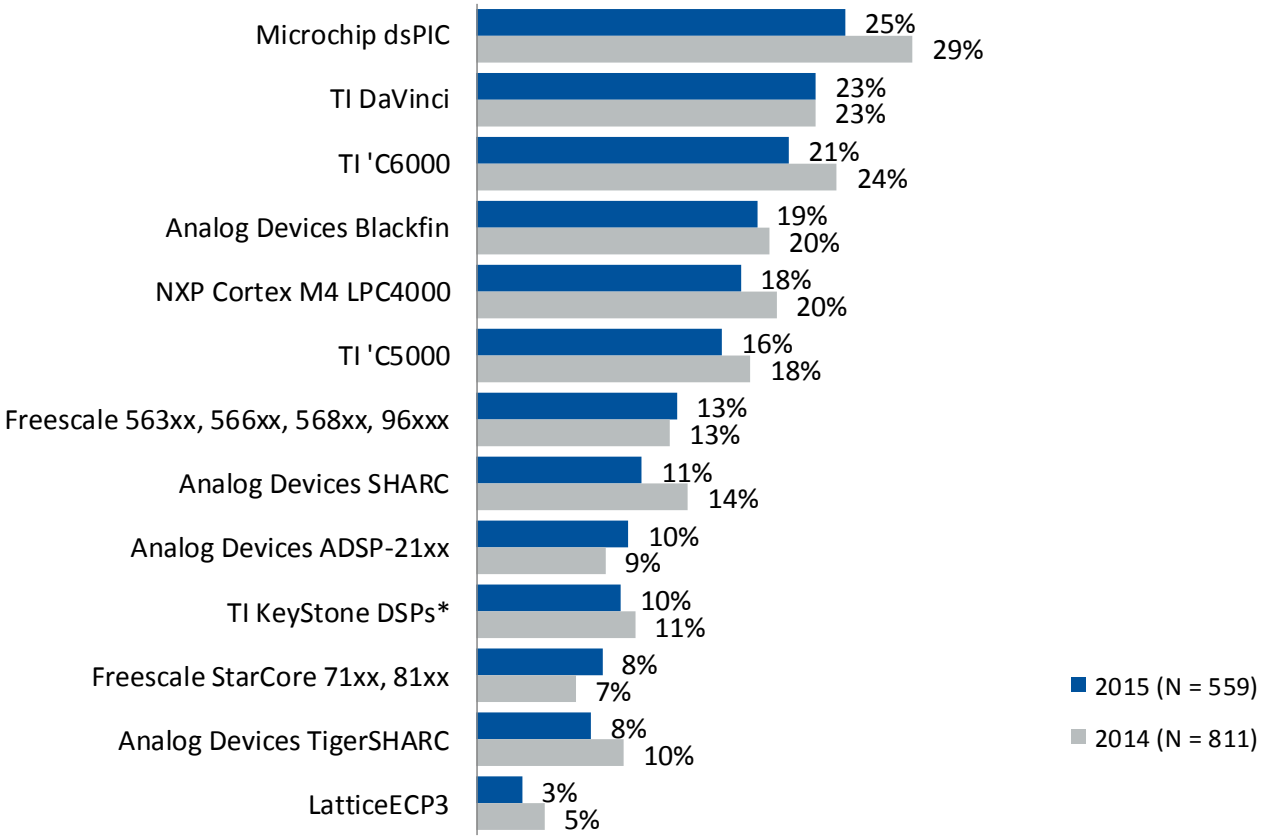
Which of the following DSP chip families would you consider for your next embedded project?



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FPGAs, MEMORY, LCDs

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FPGAs, Memories, LCDs

- **Current FPGA usage –** 31% used current project, holding steady for three years after previous years of downward trending.
- **Next Project FPGA usage –** 41% will likely use an FPGA in their next project, same as 2014. But, 2015 usage did not match 2014 projections.
- **Why FPGAs NOT used –** Don't need this functionality, too expensive, use too much power, and too difficult to program.
- **Built in Multicore Trend –** 33% say encourages use of FPGAs
- **Vendors used –** Xilinx (63%) and Altera (44%) dominate. Lattice has fallen some from third to sixth place for unknown reasons.
- **Vendors will consider –** Xilinx (70%) and Altera (59%). No changes in sight for this market, except changes among the minor players.

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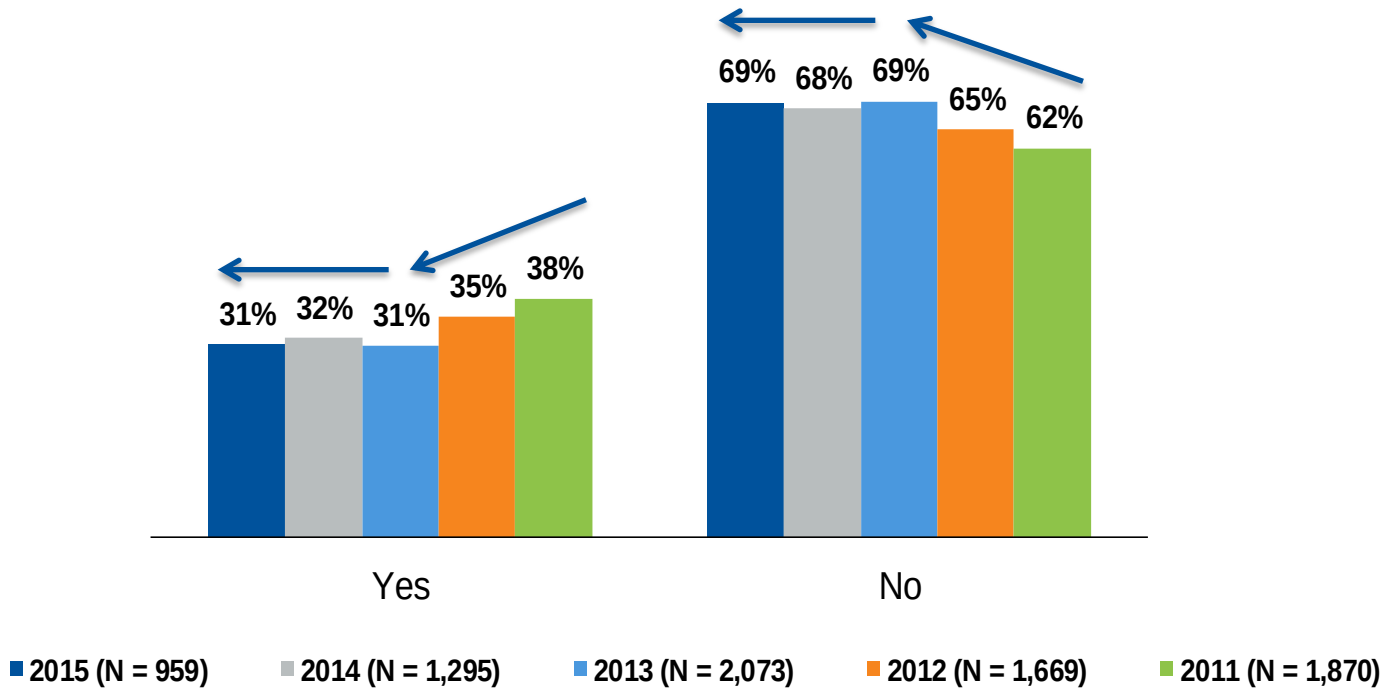
Does your current embedded project contain FPGAs/programmable logic?



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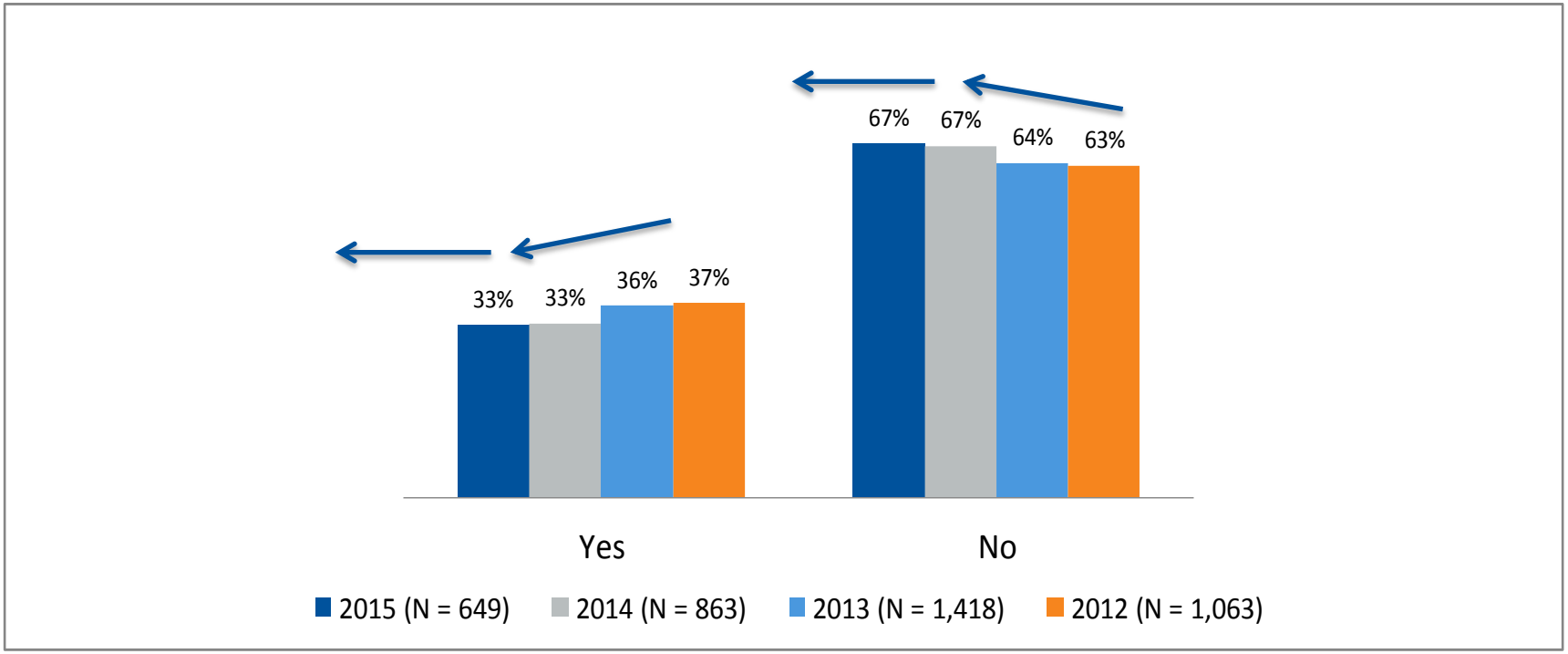
If project doesn't contain any FPGAs, will the trend towards FPGAs with built in multicore processors change your mind?



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HARDWARE IPs, SYSTEM LEVEL DESIGN, & USE OF GUIs

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Hardware IPs, System Level Design, GUIs

- **Reuse of Hardware/Hardware IPs –** 71% reuse, same for five years
- **Design Techniques Becoming More Important –** Simulation (61%) and modeling (40%) have remained stable for 4 years.
- **System Level Design Tools Used –** MATLAB (56%) is the big leader followed by LabVIEW (34%), System C (28%) and Simulink (26%).
- **Deciders of Systems Level Tools –** Software engineers (33%) and software managers (29%) are the top influencers
- **Project Management –** Excel (47%) & Microsoft Project (45%) rule.
- **Version Control Software –** Subversion (41%) and Git (31%) gain, and CVS (19%) drops slightly.
- **GUI usage –** Rose to 49% in 2015 from 41% in 2014, based on a rise in usage in Europe to 57%. It is not clear why Europe reported this large gain.

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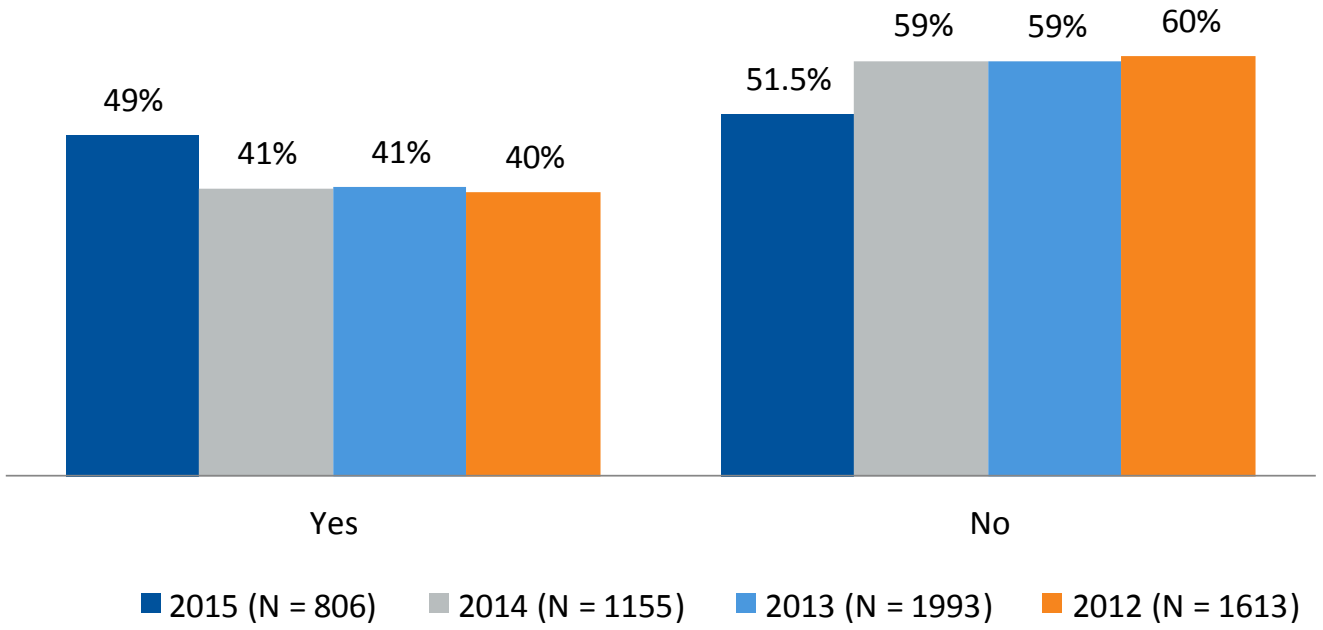
Does your current design use a graphical user interface?



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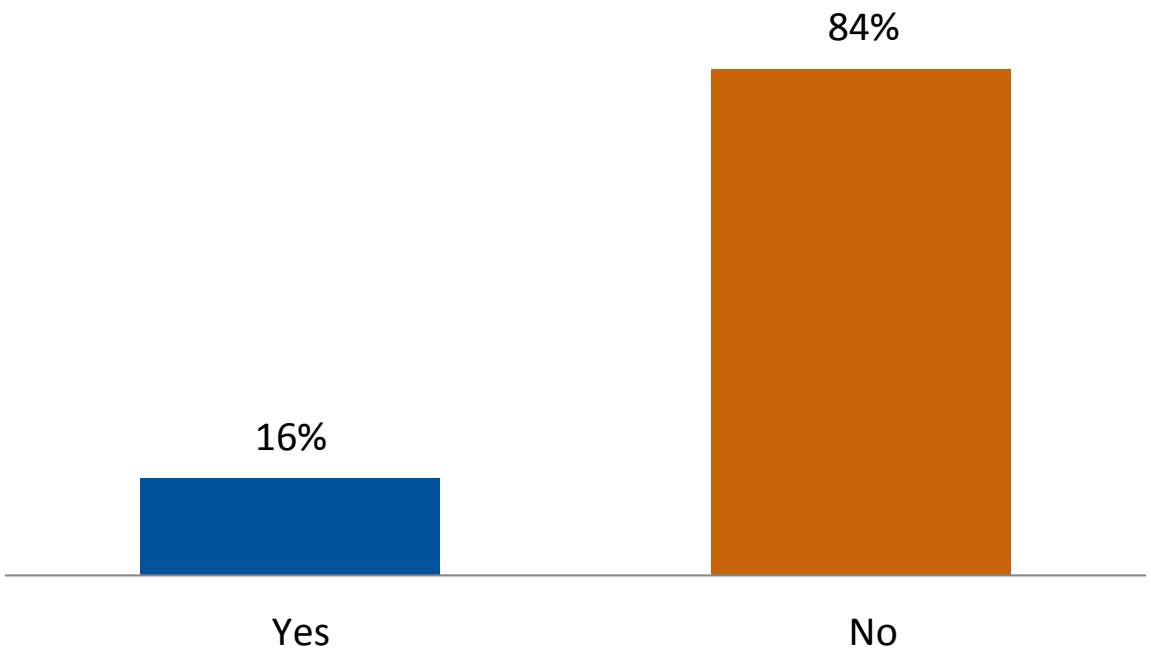
Do you use a requirements tracing tool?



2015 (N = 804)

Which tools? DOORS by far was the most mentioned. Polarion, Excel, Trace 32, Team Center, In-house, Test Track, and Caliber were mentioned more than once.

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