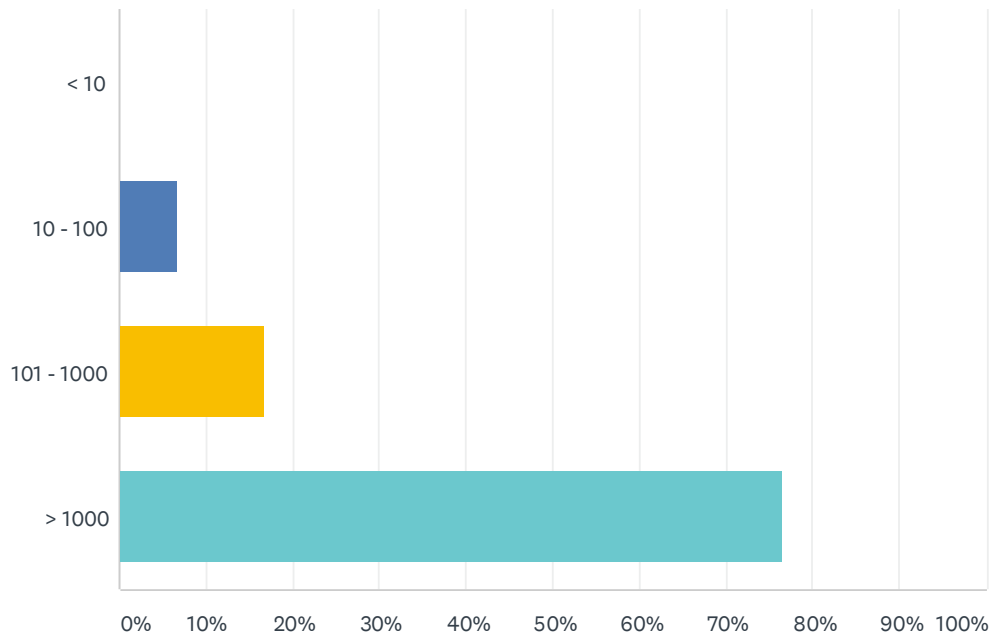


Q1 How many employees does your organization have?

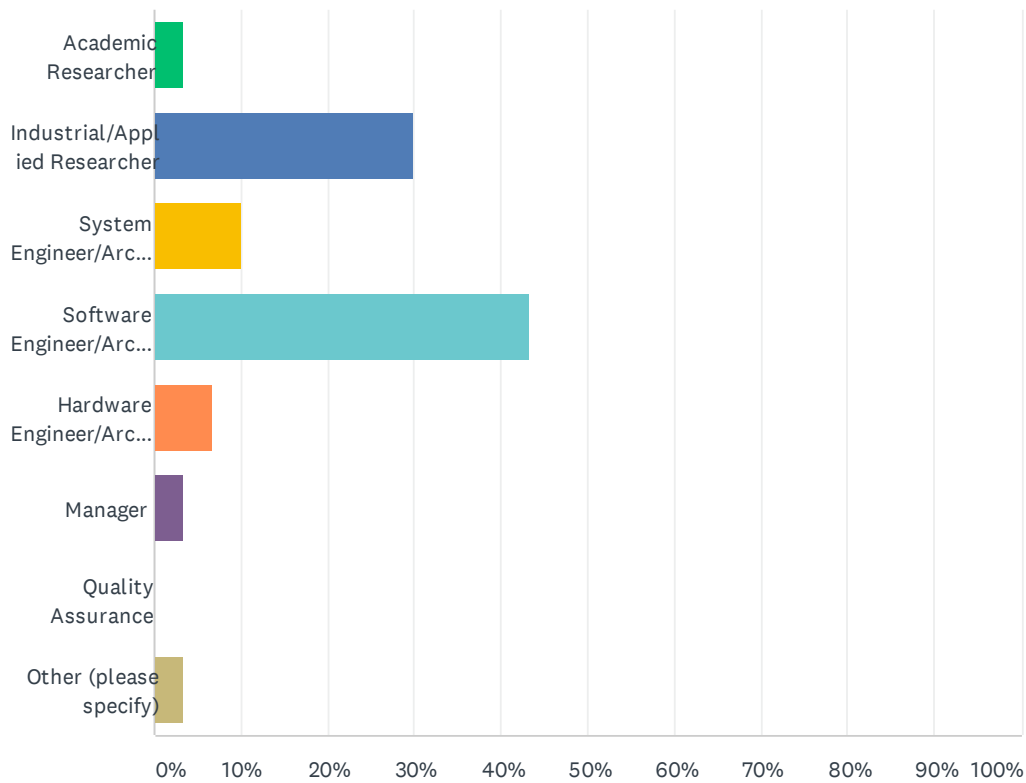
Answered: 30 Skipped: 0



ANSWER CHOICES	RESPONSES	
< 10	0.00%	0
10 - 100	6.67%	2
101 - 1000	16.67%	5
> 1000	76.67%	23
TOTAL		30

Q2 Which position below best describes your current role in your organization?

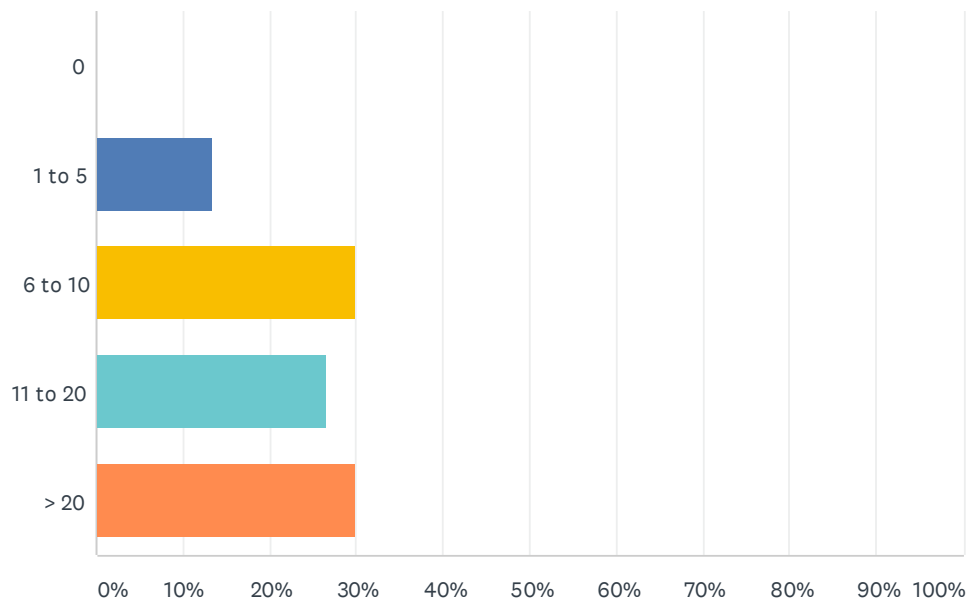
Answered: 30 Skipped: 0



ANSWER CHOICES	RESPONSES	
Academic Researcher	3.33%	1
Industrial/Applied Researcher	30.00%	9
System Engineer/Architect	10.00%	3
Software Engineer/Architect	43.33%	13
Hardware Engineer/Architect	6.67%	2
Manager	3.33%	1
Quality Assurance	0.00%	0
Other (please specify)	3.33%	1
TOTAL		30

Q3 How many years of industrial experience do you have?

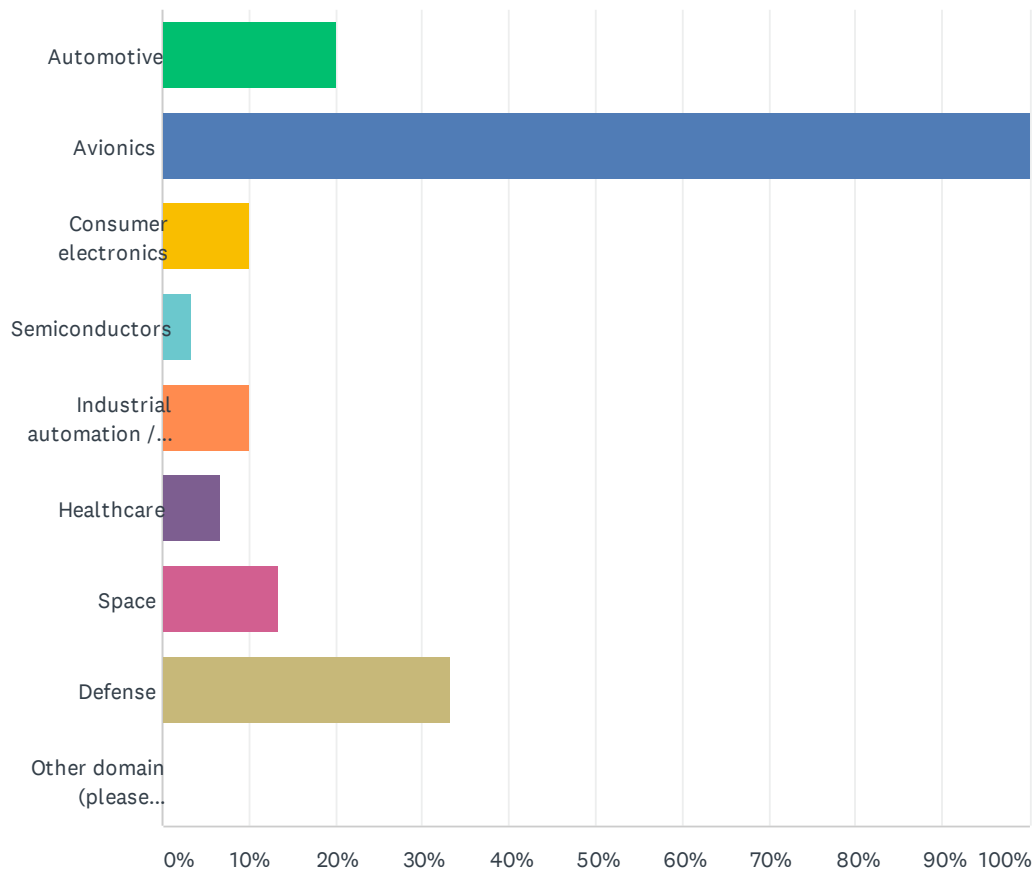
Answered: 30 Skipped: 0



ANSWER CHOICES	RESPONSES	
0	0.00%	0
1 to 5	13.33%	4
6 to 10	30.00%	9
11 to 20	26.67%	8
> 20	30.00%	9
TOTAL		30

Q4 To what domain(s) does the considered system belong? Select all options that apply.

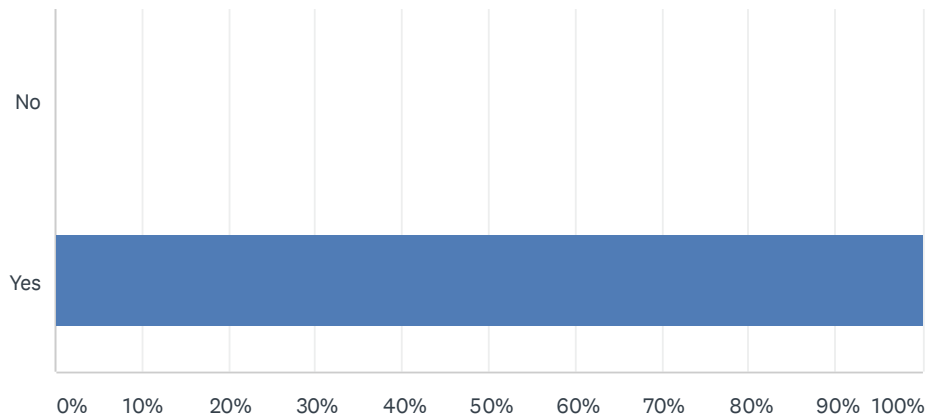
Answered: 30 Skipped: 0



ANSWER CHOICES	RESPONSES	
Automotive	20.00%	6
Avionics	100.00%	30
Consumer electronics	10.00%	3
Semiconductors	3.33%	1
Industrial automation / Manufacturing	10.00%	3
Healthcare	6.67%	2
Space	13.33%	4
Defense	33.33%	10
Other domain (please specify)	0.00%	0
Total Respondents: 30		

Q5 Is (parts of) the considered system safety-critical?

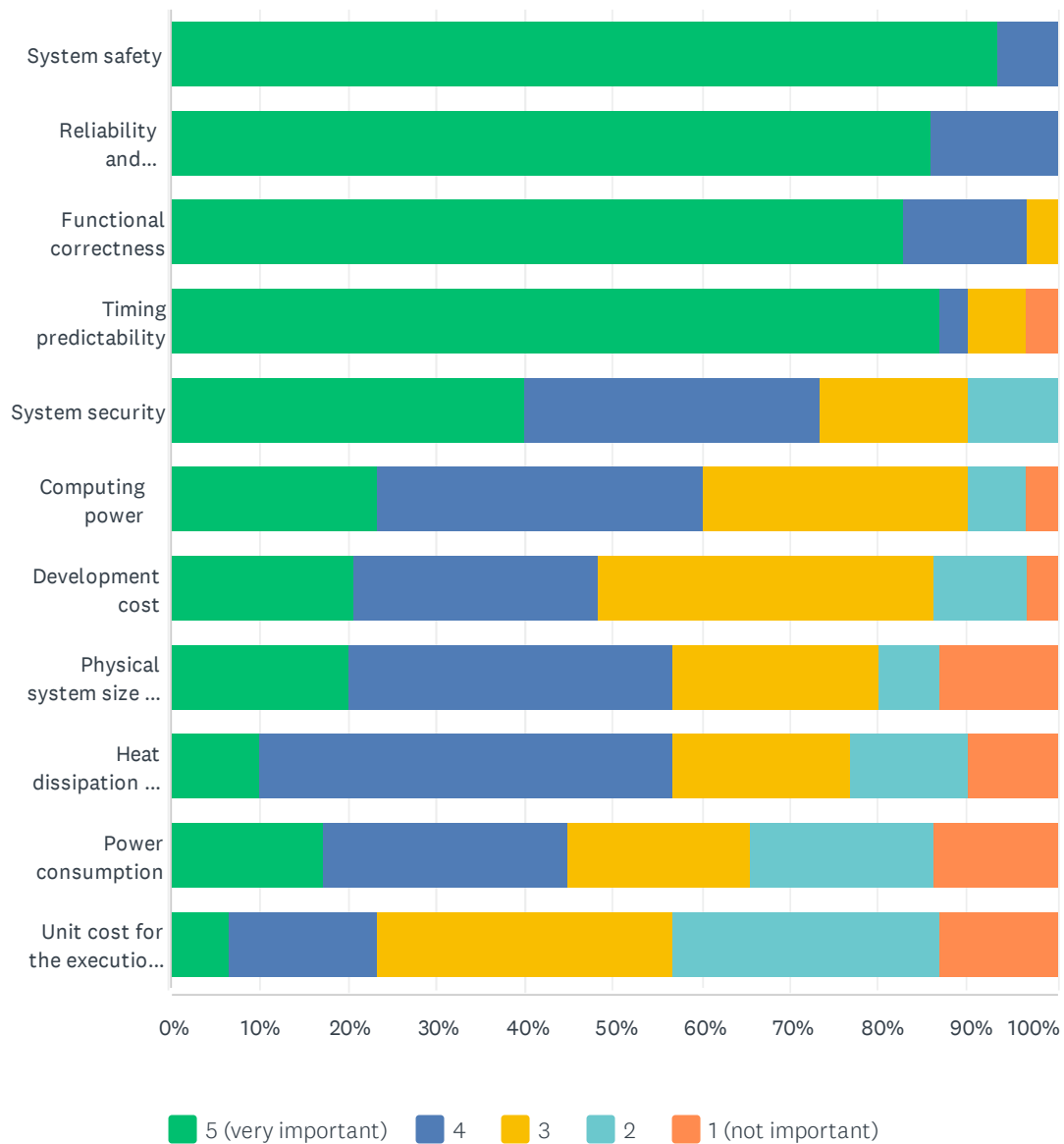
Answered: 30 Skipped: 0



ANSWER CHOICES		RESPONSES	
No		0.00%	0
Yes		100.00%	30
TOTAL			30

Q6 Give a score to the importance of different system aspects for the considered system.

Answered: 30 Skipped: 0

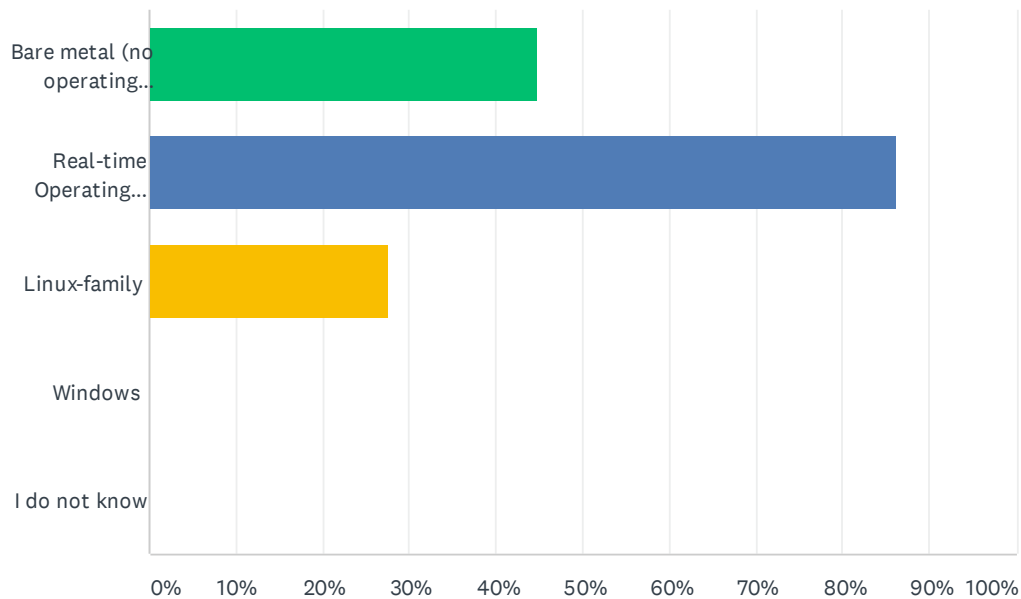


Real-time Systems Survey

	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
System safety	93.33% 28	6.67% 2	0.00% 0	0.00% 0	0.00% 0	30	4.93
Reliability and availability	85.71% 24	14.29% 4	0.00% 0	0.00% 0	0.00% 0	28	4.86
Functional correctness	82.76% 24	13.79% 4	3.45% 1	0.00% 0	0.00% 0	29	4.79
Timing predictability	86.67% 26	3.33% 1	6.67% 2	0.00% 0	3.33% 1	30	4.70
System security	40.00% 12	33.33% 10	16.67% 5	10.00% 3	0.00% 0	30	4.03
Computing power	23.33% 7	36.67% 11	30.00% 9	6.67% 2	3.33% 1	30	3.70
Development cost	20.69% 6	27.59% 8	37.93% 11	10.34% 3	3.45% 1	29	3.52
Physical system size / weight	20.00% 6	36.67% 11	23.33% 7	6.67% 2	13.33% 4	30	3.43
Heat dissipation / thermal constraints	10.00% 3	46.67% 14	20.00% 6	13.33% 4	10.00% 3	30	3.33
Power consumption	17.24% 5	27.59% 8	20.69% 6	20.69% 6	13.79% 4	29	3.14
Unit cost for the execution platform	6.67% 2	16.67% 5	33.33% 10	30.00% 9	13.33% 4	30	2.73

Q7 What operating systems are running on the considered system? Select all options that apply.

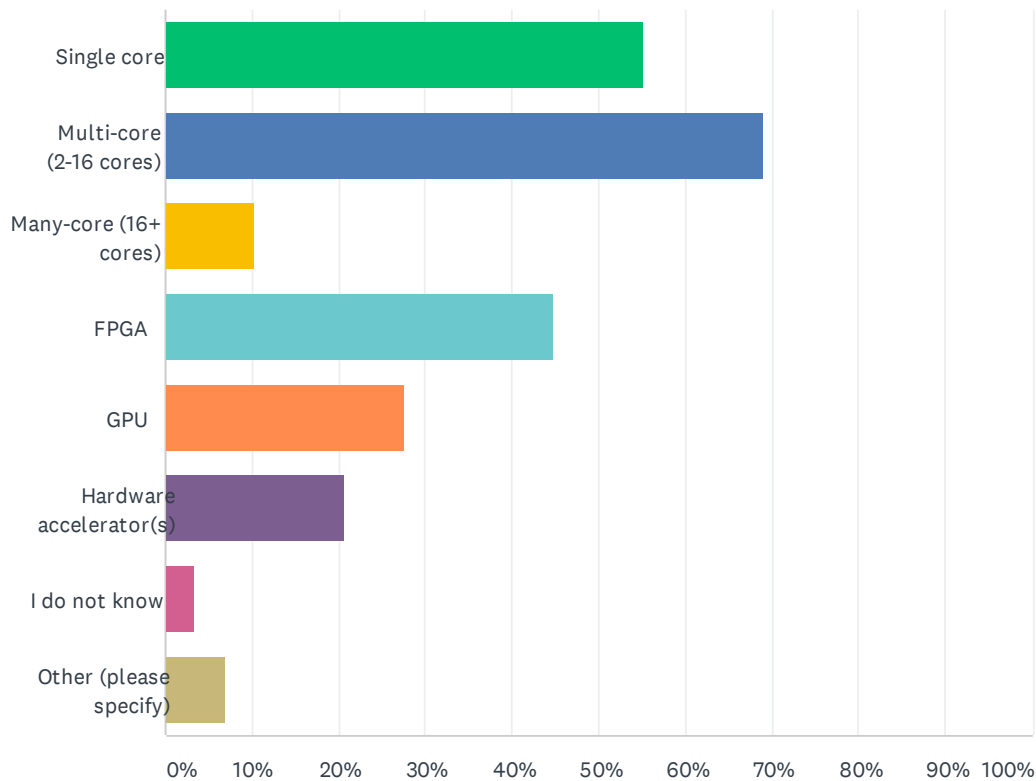
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
Bare metal (no operating system)	44.83%	13
Real-time Operating System, Micro kernel, or libraries	86.21%	25
Linux-family	27.59%	8
Windows	0.00%	0
I do not know	0.00%	0
Total Respondents: 29		

Q8 Please select the options that describe the processing hardware of the considered system. Select all options that apply.

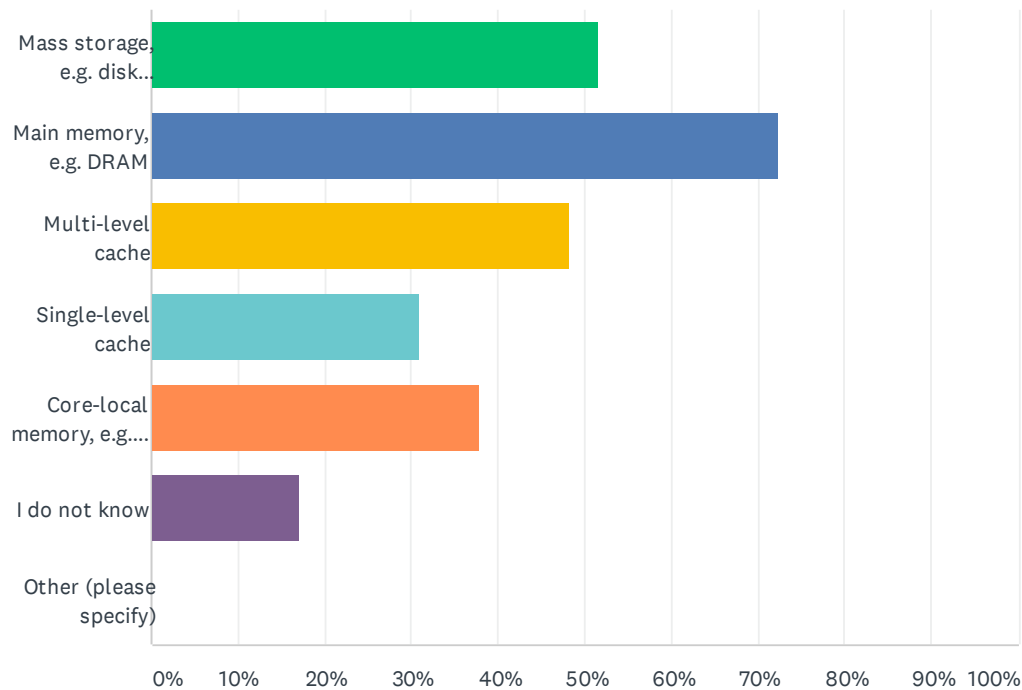
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
Single core	55.17%	16
Multi-core (2-16 cores)	68.97%	20
Many-core (16+ cores)	10.34%	3
FPGA	44.83%	13
GPU	27.59%	8
Hardware accelerator(s)	20.69%	6
I do not know	3.45%	1
Other (please specify)	6.90%	2
Total Respondents: 29		

Q9 Please select the options that describe the memory hierarchy of the considered system. Select all options that apply.

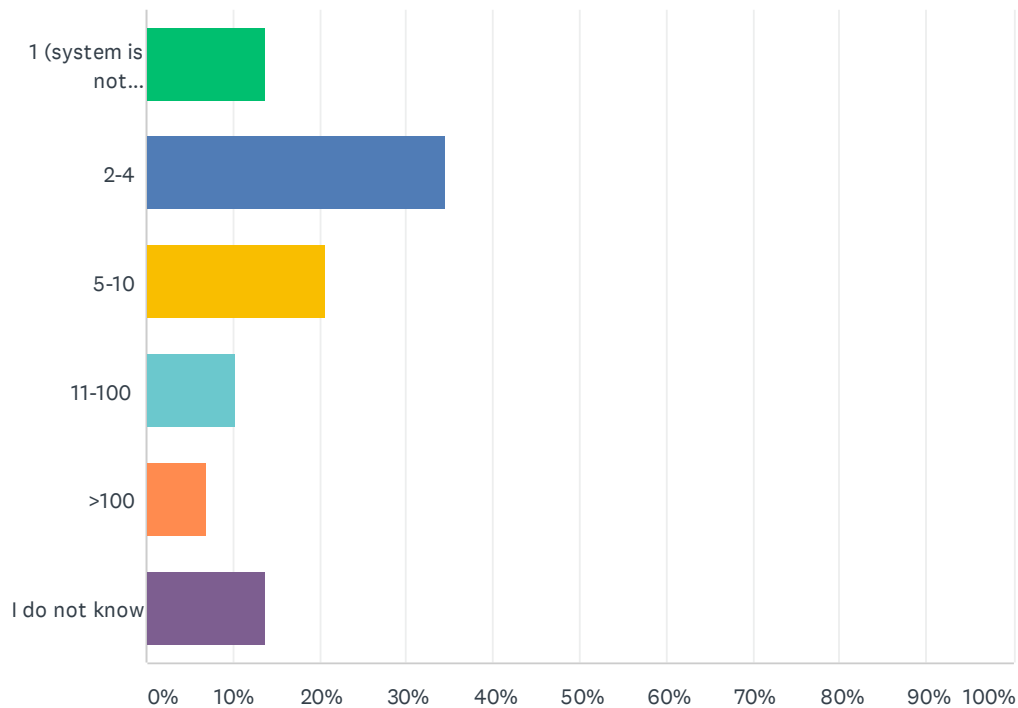
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
Mass storage, e.g. disk drive, flash	51.72%	15
Main memory, e.g. DRAM	72.41%	21
Multi-level cache	48.28%	14
Single-level cache	31.03%	9
Core-local memory, e.g. SRAM/BRAM scratchpad(s)	37.93%	11
I do not know	17.24%	5
Other (please specify)	0.00%	0
Total Respondents: 29		

Q10 How many distributed nodes (e.g. ECUs) are there in the considered system?

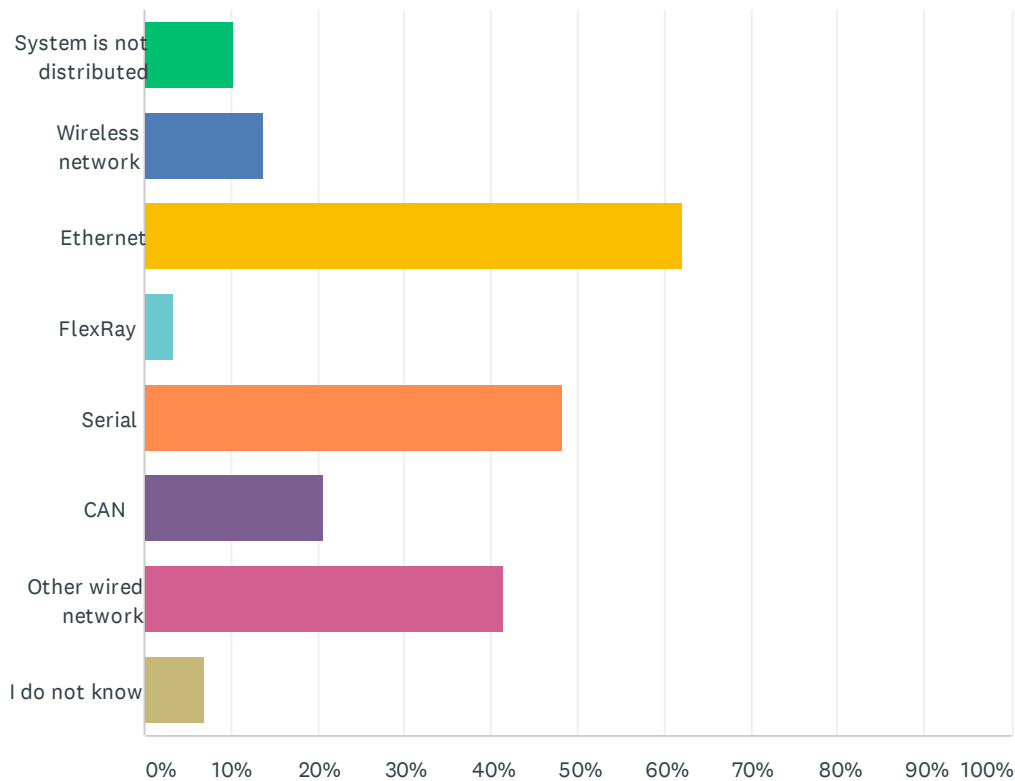
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
1 (system is not distributed)	13.79%	4
2-4	34.48%	10
5-10	20.69%	6
11-100	10.34%	3
>100	6.90%	2
I do not know	13.79%	4
TOTAL		29

Q11 Which of the following options describe the connectivity between the nodes within the (distributed) system? Select all options that apply.

Answered: 29 Skipped: 1

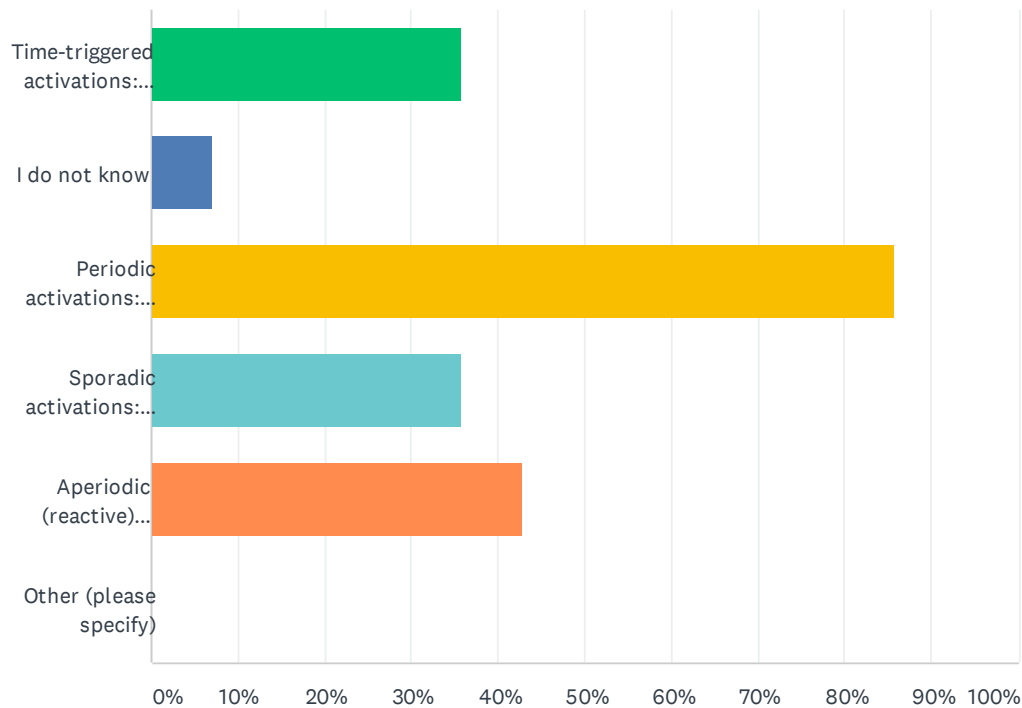


ANSWER CHOICES	RESPONSES	
System is not distributed (1)	10.34%	3
Wireless network (2)	13.79%	4
Ethernet (3)	62.07%	18
FlexRay (4)	3.45%	1
Serial (5)	48.28%	14
CAN (6)	20.69%	6
Other wired network (7)	41.38%	12
I do not know (8)	6.90%	2
Total Respondents: 29		

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	8.00	5.00	4.58	1.91

Q12 Which of the following sentences are true about task activations in your system? Select all options that apply.

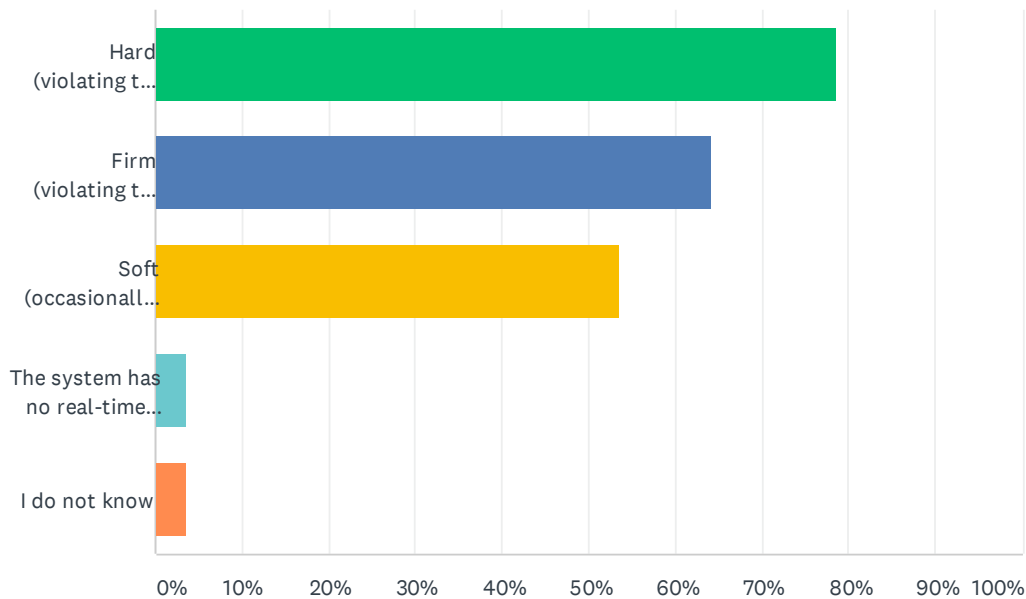
Answered: 28 Skipped: 2



ANSWER CHOICES	RESPONSES	
Time-triggered activations: Functionalities are activated at certain time instants according to a predefined time table.	35.71%	10
I do not know	7.14%	2
Periodic activations: Functionalities are activated periodically (e.g., using a timer interrupt)	85.71%	24
Sporadic activations: Functionalities may be activated at any time. However, every two activations are separated at least by a certain time interval	35.71%	10
Aperiodic (reactive) activations: Functionalities may be activated by internal or external events that may happen at any time (non-deterministic).	42.86%	12
Other (please specify)	0.00%	0
Total Respondents: 28		

Q13 Which of the following types of timing constraints exist(s) in the considered system? Select all options that apply.

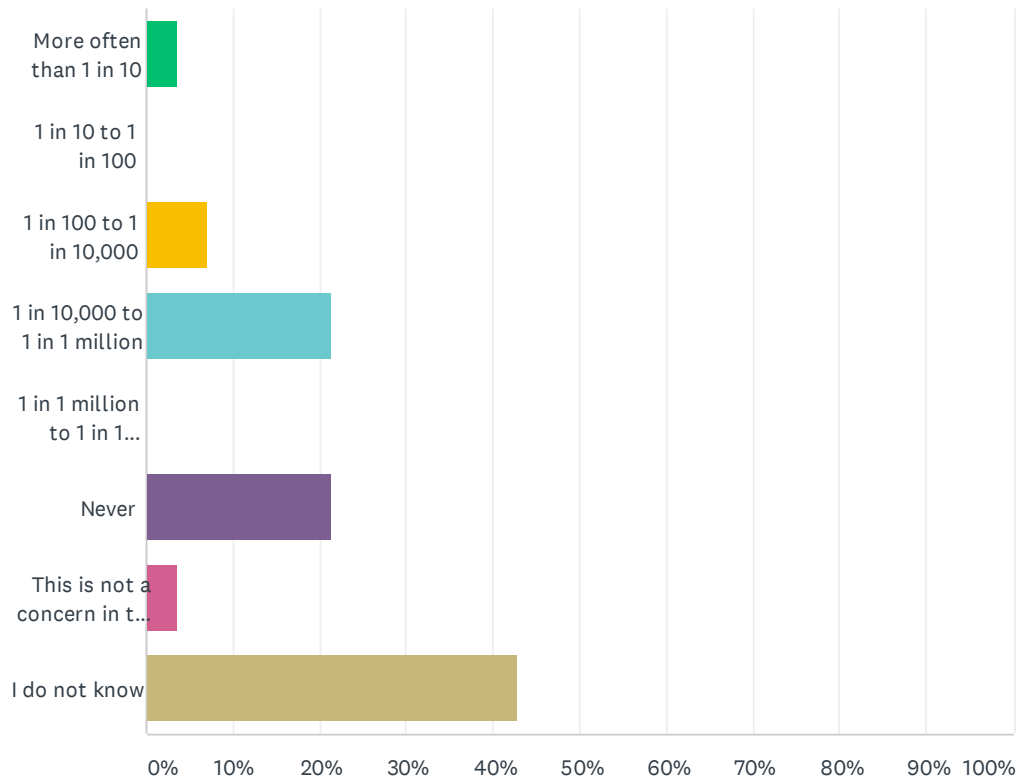
Answered: 28 Skipped: 2



ANSWER CHOICES	RESPONSES	
Hard (violating the timing constraint is considered a failure of the system)	78.57%	22
Firm (violating the timing constraint is highly undesirable)	64.29%	18
Soft (occasionally violating the timing constraint is acceptable, but it negatively impacts the perceived quality of the system)	53.57%	15
The system has no real-time constraints	3.57%	1
I do not know	3.57%	1
Total Respondents: 28		

Q14 For the most time-critical functions in the considered system, roughly how frequently can the deadline of a function be missed without causing a system failure?

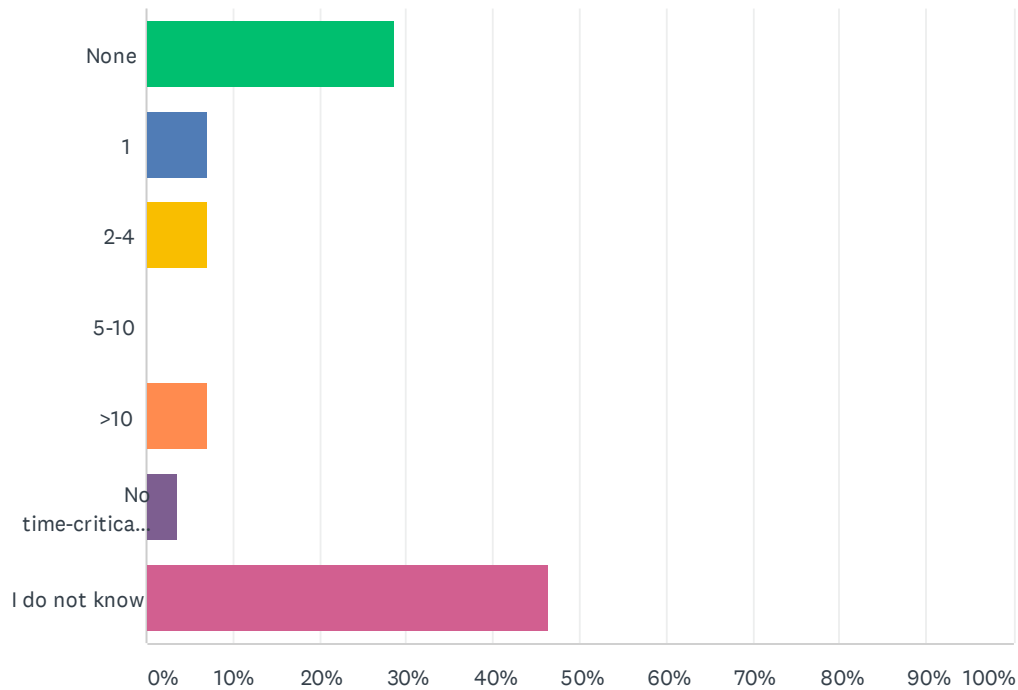
Answered: 28 Skipped: 2



ANSWER CHOICES	RESPONSES	
More often than 1 in 10	3.57%	1
1 in 10 to 1 in 100	0.00%	0
1 in 100 to 1 in 10,000	7.14%	2
1 in 10,000 to 1 in 1 million	21.43%	6
1 in 1 million to 1 in 1 billion	0.00%	0
Never	21.43%	6
This is not a concern in the system	3.57%	1
I do not know	42.86%	12
TOTAL		28

Q15 What is the largest number of consecutive deadline misses that could be tolerated by the most time-critical functions in the system, assuming that such a blackout does not reoccur for a very long time?

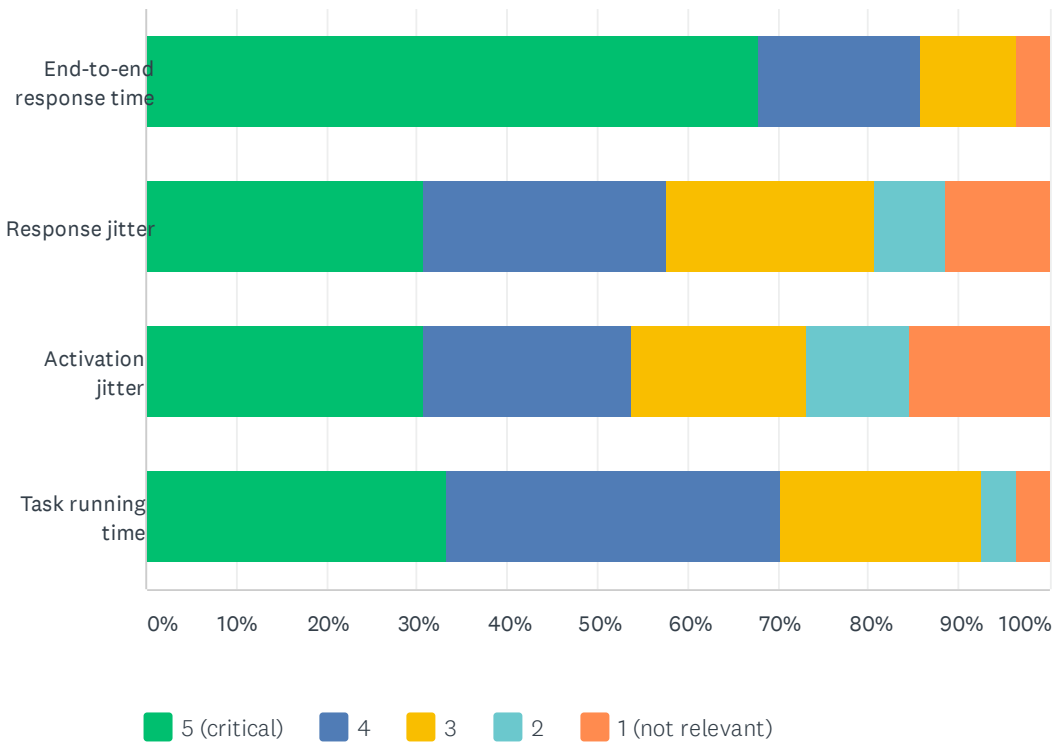
Answered: 28 Skipped: 2



ANSWER CHOICES		RESPONSES	
None		28.57%	8
1		7.14%	2
2-4		7.14%	2
5-10		0.00%	0
>10		7.14%	2
No time-critical functionality present		3.57%	1
I do not know		46.43%	13
TOTAL			28

Q16 What are relevant timing constraints in the considered system?

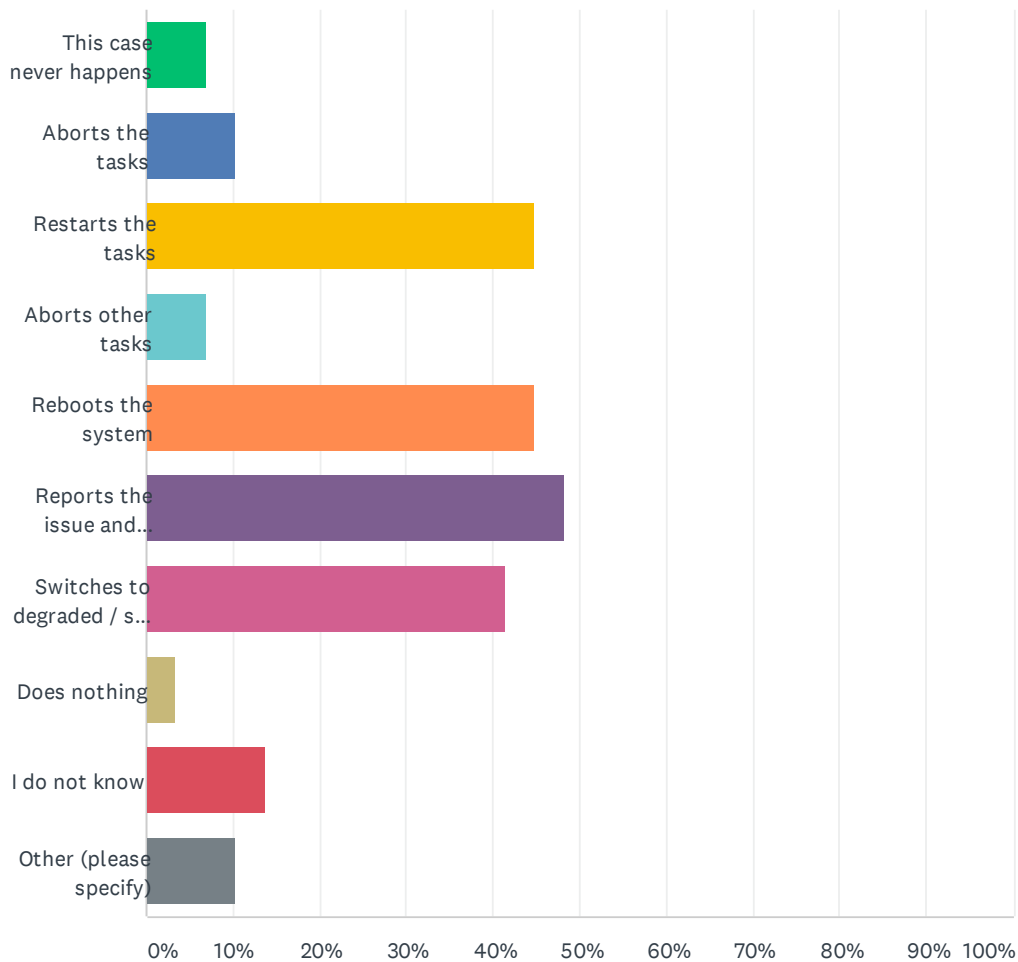
Answered: 29 Skipped: 1



	5 (CRITICAL)	4	3	2	1 (NOT RELEVANT)	TOTAL	WEIGHTED AVERAGE
End-to-end response time	67.86% 19	17.86% 5	10.71% 3	0.00% 0	3.57% 1	28	4.46
Response jitter	30.77% 8	26.92% 7	23.08% 6	7.69% 2	11.54% 3	26	3.58
Activation jitter	30.77% 8	23.08% 6	19.23% 5	11.54% 3	15.38% 4	26	3.42
Task running time	33.33% 9	37.04% 10	22.22% 6	3.70% 1	3.70% 1	27	3.93

Q17 How does the considered system react if tasks miss deadlines? Select all options that apply.

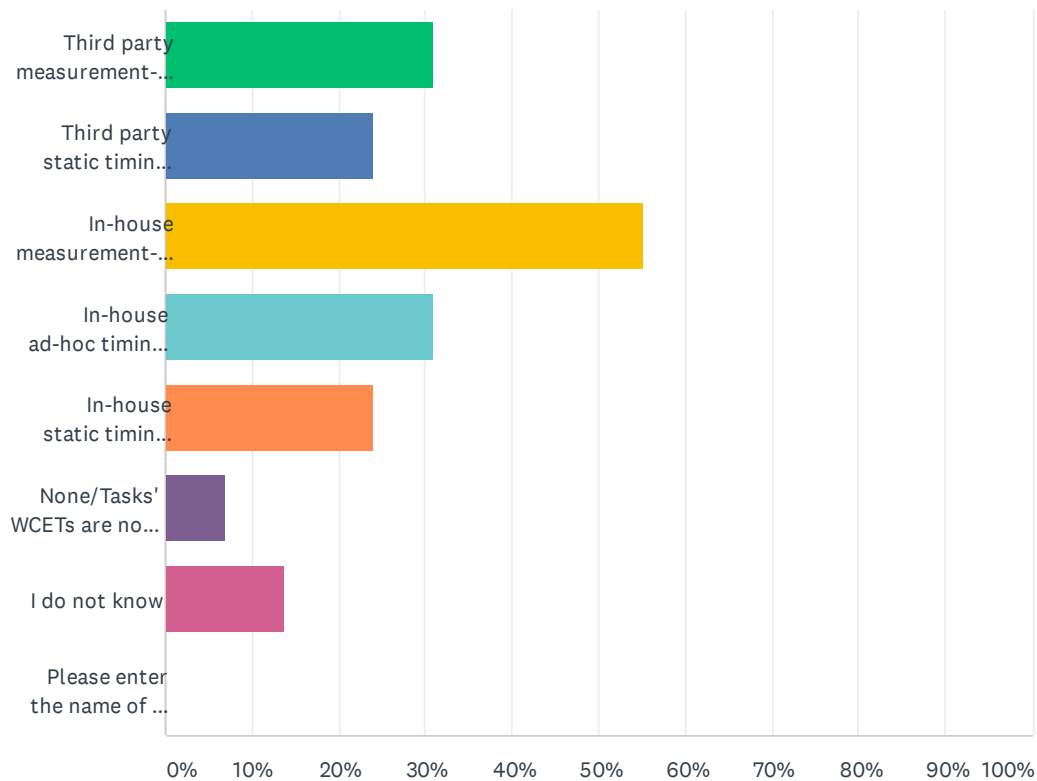
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
This case never happens	6.90%	2
Aborts the tasks	10.34%	3
Restarts the tasks	44.83%	13
Aborts other tasks	6.90%	2
Reboots the system	44.83%	13
Reports the issue and continues	48.28%	14
Switches to degraded / safe mode	41.38%	12
Does nothing	3.45%	1
I do not know	13.79%	4
Other (please specify)	10.34%	3
Total Respondents: 29		

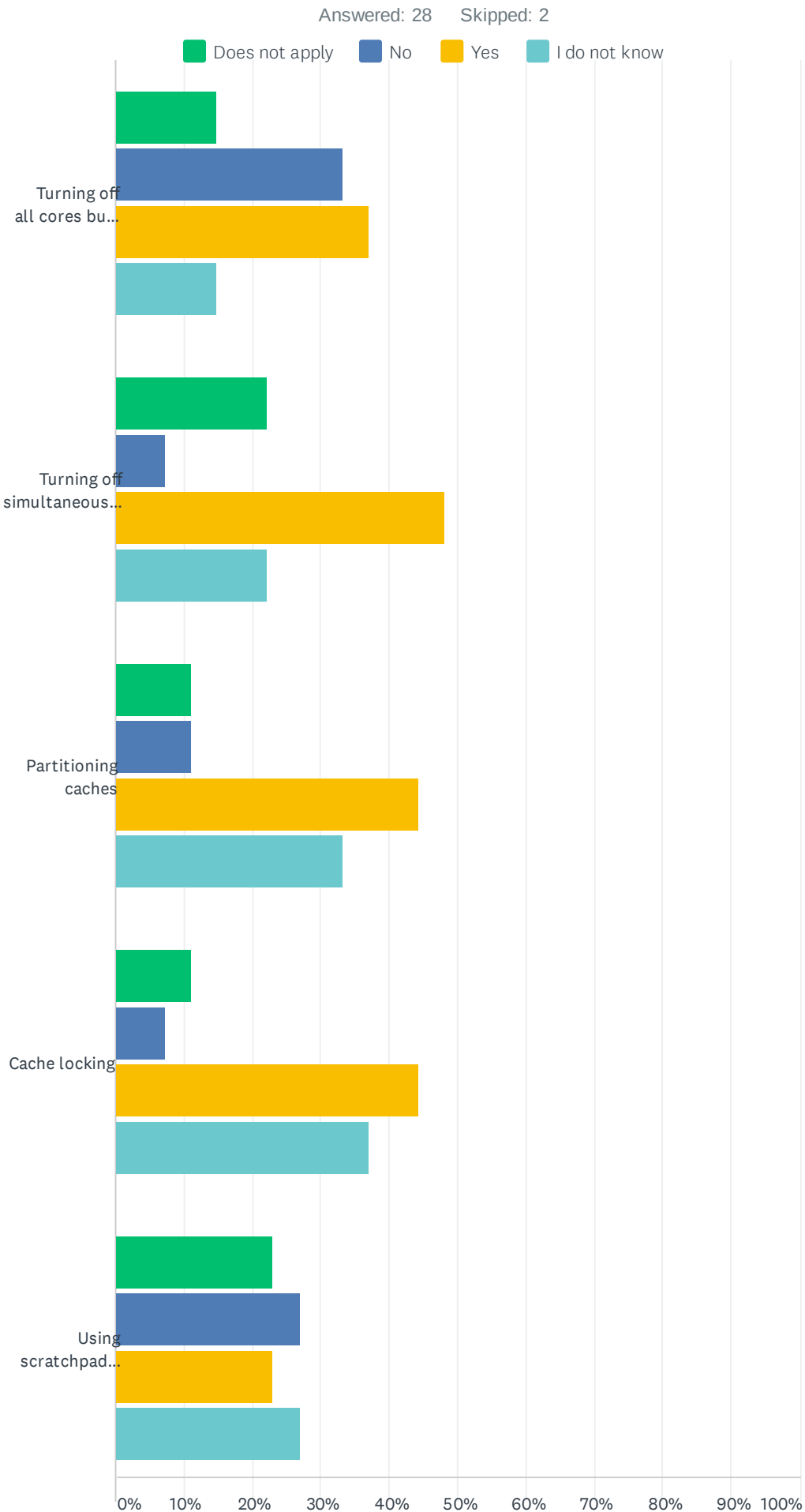
Q18 Which methods are used for Worst-Case Execution Time (WCET) estimation in the considered system? Select all options that apply.

Answered: 29 Skipped: 1

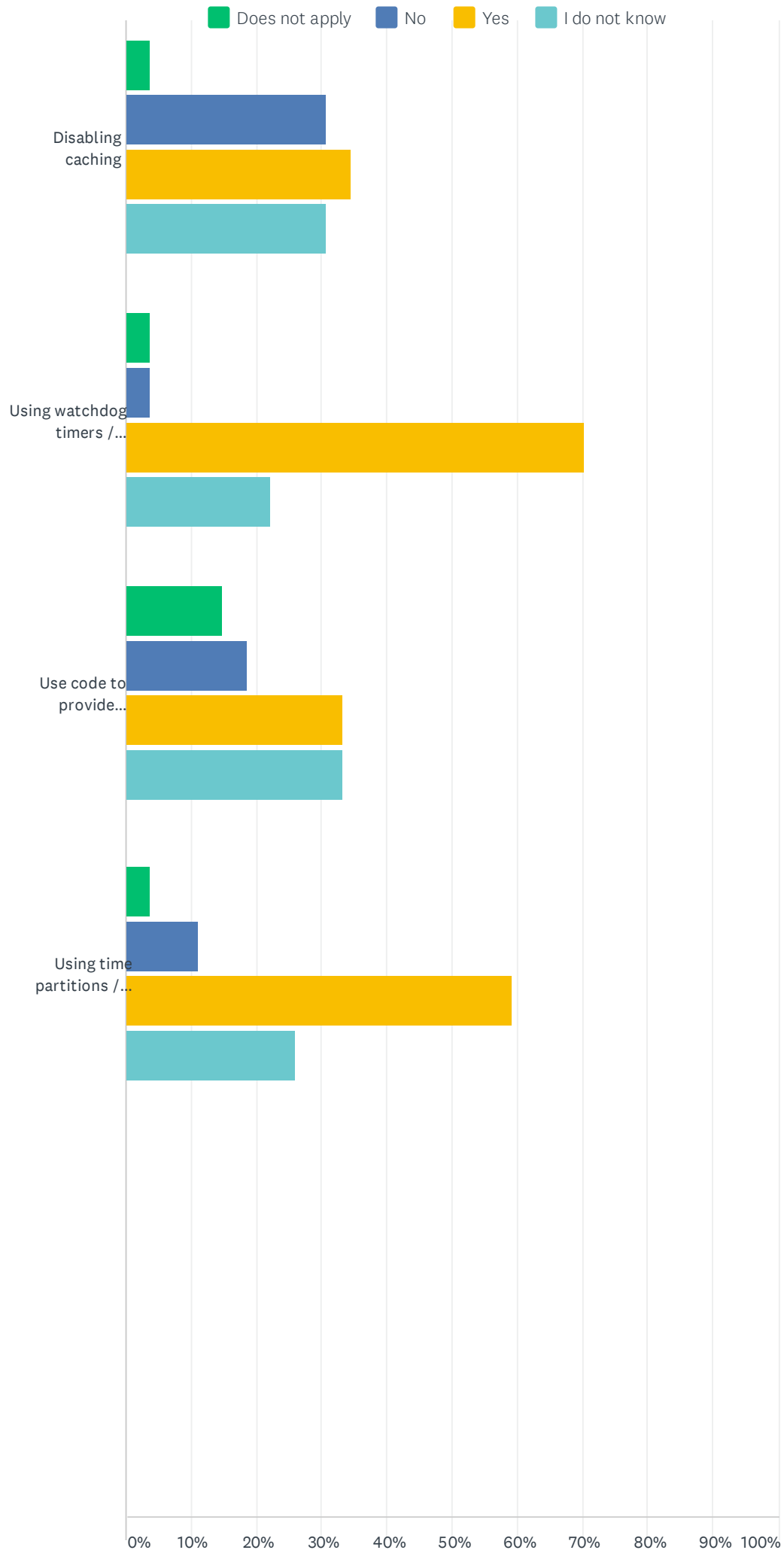


ANSWER CHOICES	RESPONSES	
Third party measurement-based timing analysis tool	31.03%	9
Third party static timing analysis tools	24.14%	7
In-house measurement-based timing analysis tool	55.17%	16
In-house ad-hoc timing measurements	31.03%	9
In-house static timing analysis tool	24.14%	7
None/Tasks' WCETs are not estimated	6.90%	2
I do not know	13.79%	4
Please enter the name of the used WCET estimation tool, if any	0.00%	0
Total Respondents: 29		

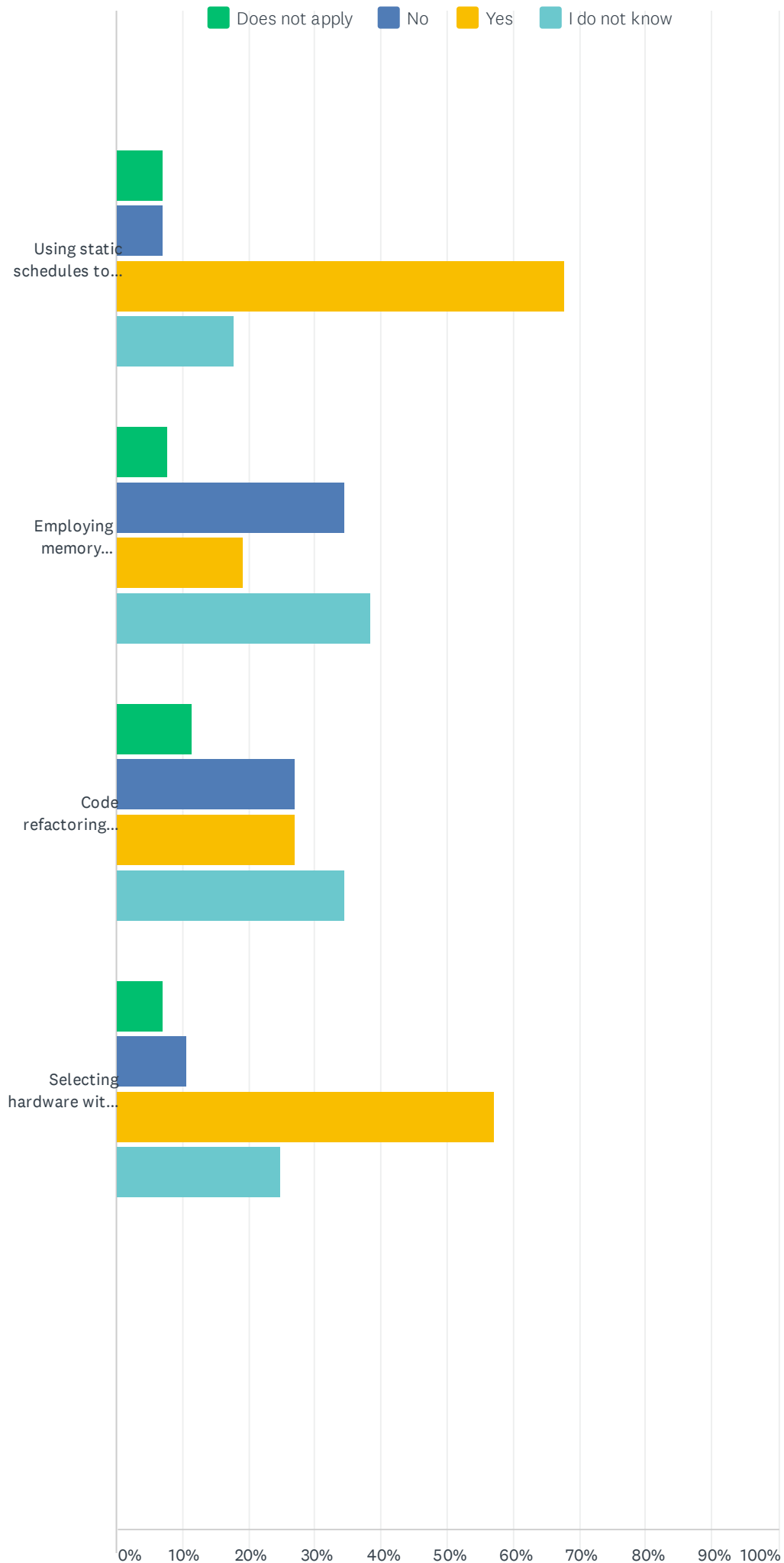
Q19 What steps are taken to help increase timing predictability?



Real-time Systems Survey



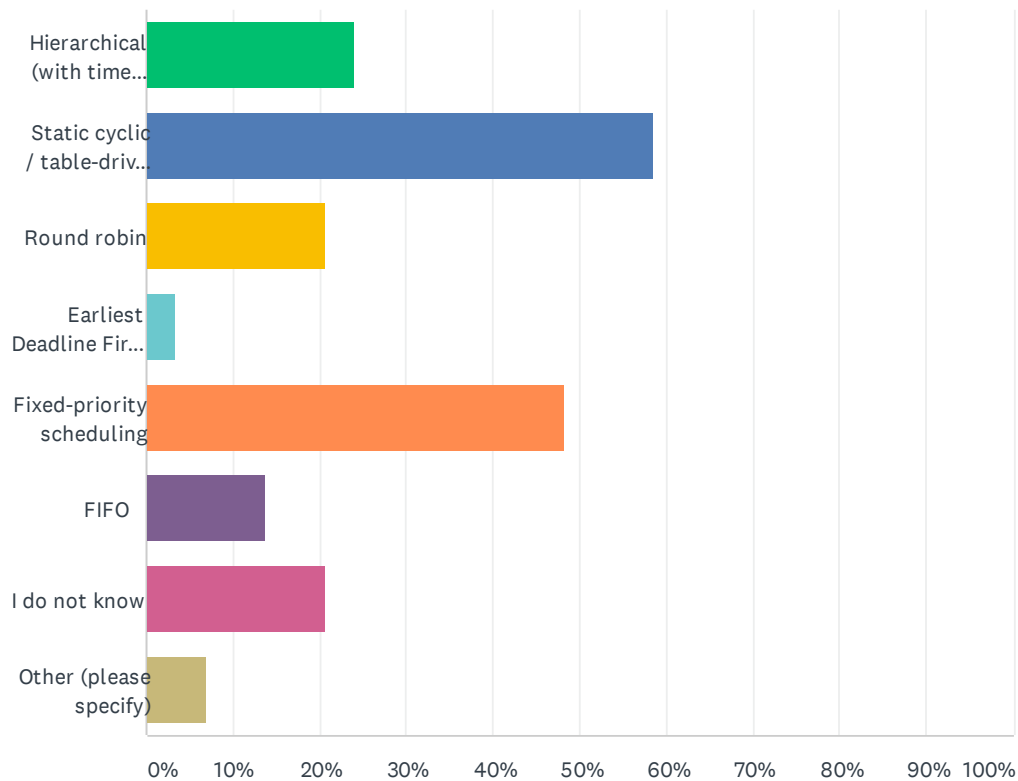
Real-time Systems Survey



	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL
Turning off all cores but one	14.81% 4	33.33% 9	37.04% 10	14.81% 4	27
Turning off simultaneous multi-threading (e.g. Hyperthreading)	22.22% 6	7.41% 2	48.15% 13	22.22% 6	27
Partitioning caches	11.11% 3	11.11% 3	44.44% 12	33.33% 9	27
Cache locking	11.11% 3	7.41% 2	44.44% 12	37.04% 10	27
Using scratchpad memory instead of caches	23.08% 6	26.92% 7	23.08% 6	26.92% 7	26
Disabling caching	3.85% 1	30.77% 8	34.62% 9	30.77% 8	26
Using watchdog timers / runtime monitors	3.70% 1	3.70% 1	70.37% 19	22.22% 6	27
Use code to provide degraded, but usable, outputs in the event of overruns	14.81% 4	18.52% 5	33.33% 9	33.33% 9	27
Using time partitions / reservations / servers	3.70% 1	11.11% 3	59.26% 16	25.93% 7	27
Using static schedules to control execution	7.14% 2	7.14% 2	67.86% 19	17.86% 5	28
Employing memory bandwidth regulation	7.69% 2	34.62% 9	19.23% 5	38.46% 10	26
Code refactoring into separate memory access phases and computation phases	11.54% 3	26.92% 7	26.92% 7	34.62% 9	26
Selecting hardware with better time-predictability	7.14% 2	10.71% 3	57.14% 16	25.00% 7	28

Q20 Which task scheduling policy/policies are used in the considered system? Select all options that apply.

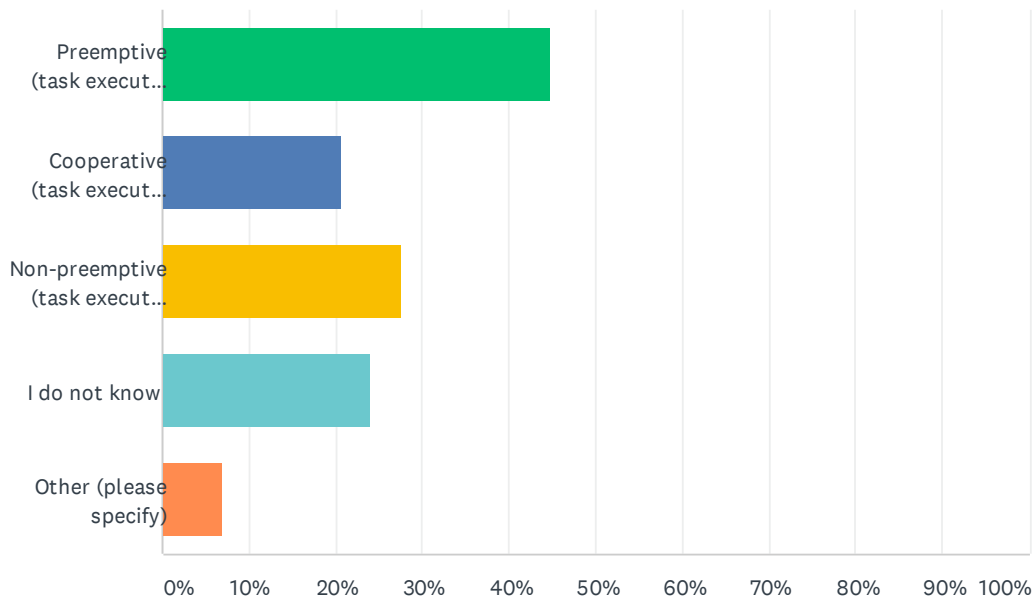
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
Hierarchical (with time partitions or reservations)	24.14%	7
Static cyclic / table-driven / time-triggered scheduling	58.62%	17
Round robin	20.69%	6
Earliest Deadline First (EDF)	3.45%	1
Fixed-priority scheduling	48.28%	14
FIFO	13.79%	4
I do not know	20.69%	6
Other (please specify)	6.90%	2
Total Respondents: 29		

Q21 Please indicate the types of preemption that are supported in the considered system. Select all options that apply.

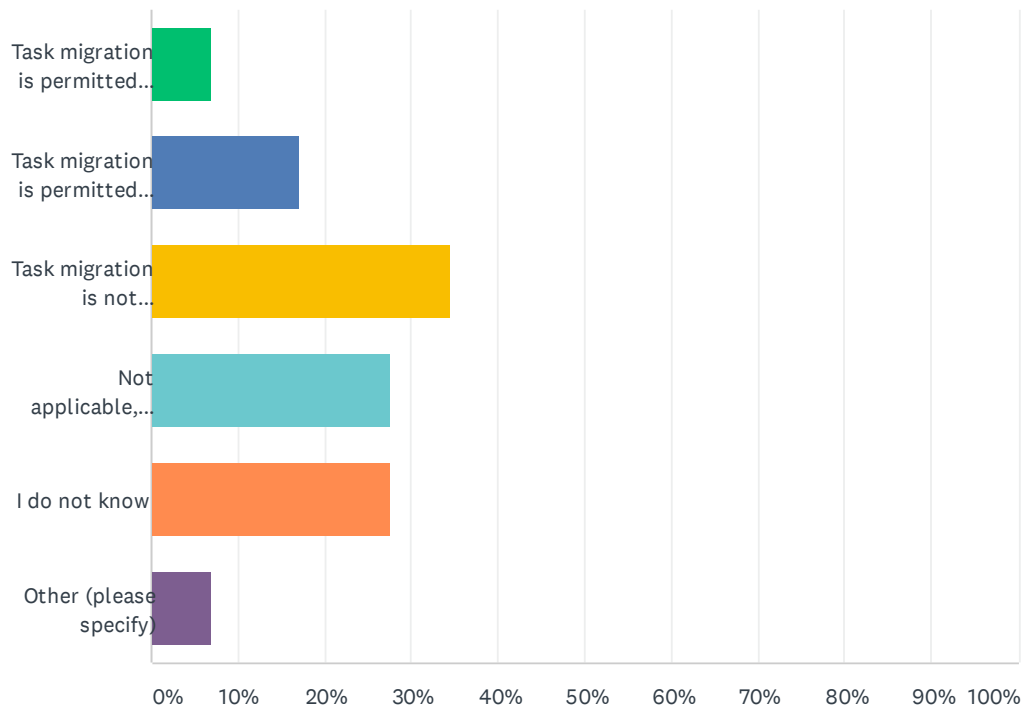
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
Preemptive (task execution can be preempted by other tasks at any time)	44.83%	13
Cooperative (task execution can be preempted by other tasks, but only at predefined preemption points)	20.69%	6
Non-preemptive (task execution cannot be preempted by other tasks before completion)	27.59%	8
I do not know	24.14%	7
Other (please specify)	6.90%	2
Total Respondents: 29		

Q22 Please indicate how task migration can take place between different cores in the considered system. Select all options that apply.

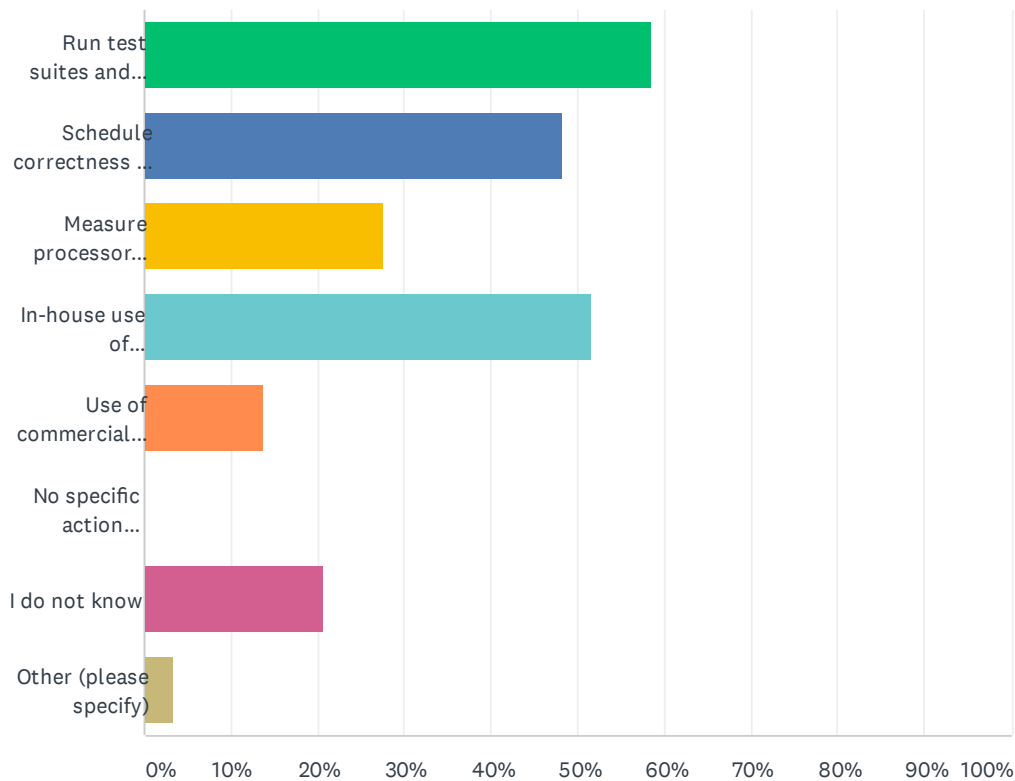
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
Task migration is permitted while the task is executing	6.90%	2
Task migration is permitted between two invocations of the function	17.24%	5
Task migration is not permitted	34.48%	10
Not applicable, single core system	27.59%	8
I do not know	27.59%	8
Other (please specify)	6.90%	2
Total Respondents: 29		

Q23 How do you ensure that the functions in the considered system respect their deadlines? Select all options that apply.

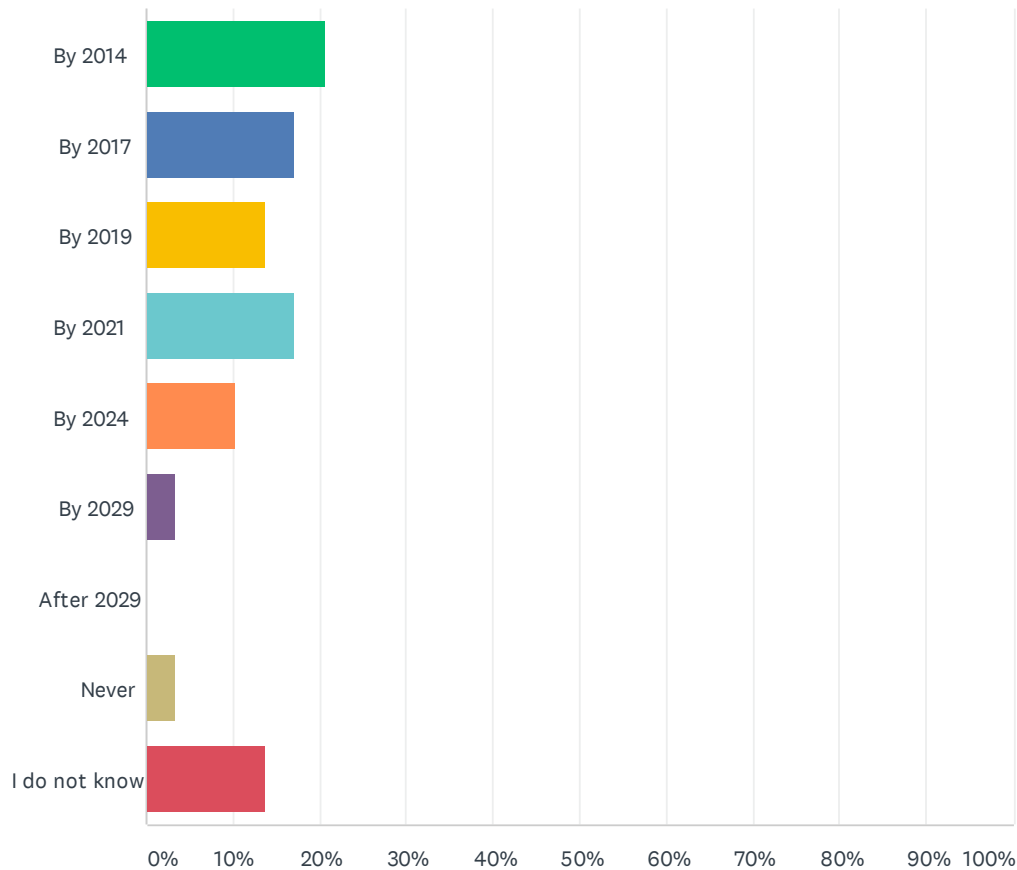
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
Run test suites and check for any overruns	58.62%	17
Schedule correctness is by construction. With a static schedule, provided execution time budgets hold for each software component / task, no deadlines will be missed.	48.28%	14
Measure processor utilization and ensure it is always below a predefined threshold, e.g. 50%	27.59%	8
In-house use of schedulability analysis	51.72%	15
Use of commercial schedulability analysis tools	13.79%	4
No specific action undertaken	0.00%	0
I do not know	20.69%	6
Other (please specify)	3.45%	1
Total Respondents: 29		

Q24 By which year did or do you expect development projects for real-time embedded systems in your department to begin using multi-core embedded processors (i.e. processors with 2 to 16 cores)?

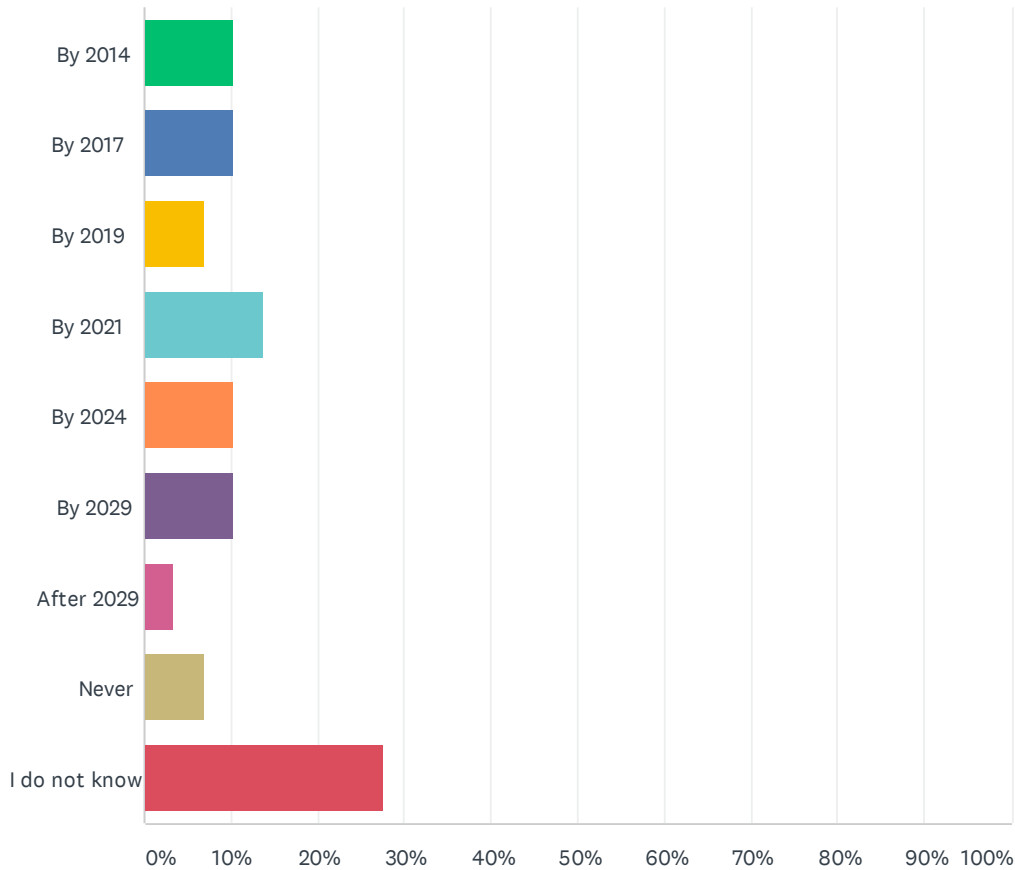
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
By 2014	20.69%	6
By 2017	17.24%	5
By 2019	13.79%	4
By 2021	17.24%	5
By 2024	10.34%	3
By 2029	3.45%	1
After 2029	0.00%	0
Never	3.45%	1
I do not know	13.79%	4
TOTAL		29

Q25 By which year did or do you expect development projects for real-time embedded systems in your department to begin using heterogeneous multi-cores with different types of CPUs, GPUs, and other accelerators?

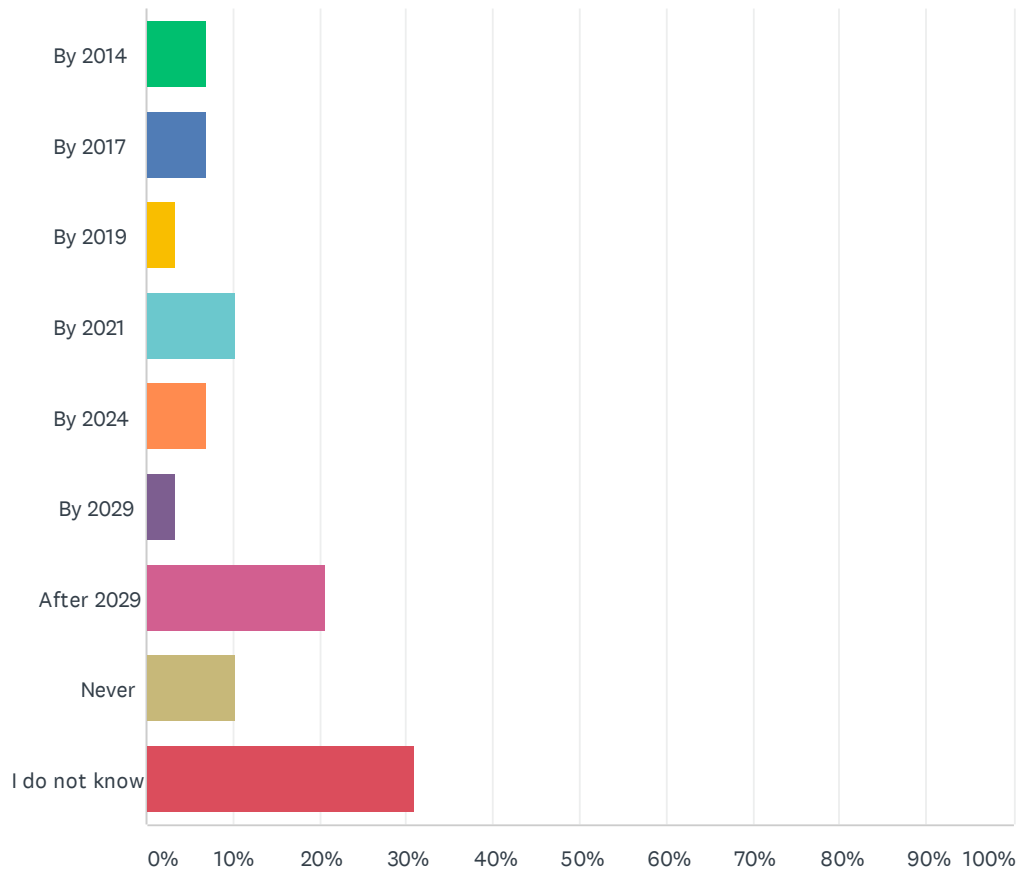
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
By 2014	10.34%	3
By 2017	10.34%	3
By 2019	6.90%	2
By 2021	13.79%	4
By 2024	10.34%	3
By 2029	10.34%	3
After 2029	3.45%	1
Never	6.90%	2
I do not know	27.59%	8
TOTAL		29

Q26 By which year did or do you expect development projects for real-time embedded systems in your department to begin using many-core embedded processors (i.e. processors with more than 16 cores)?

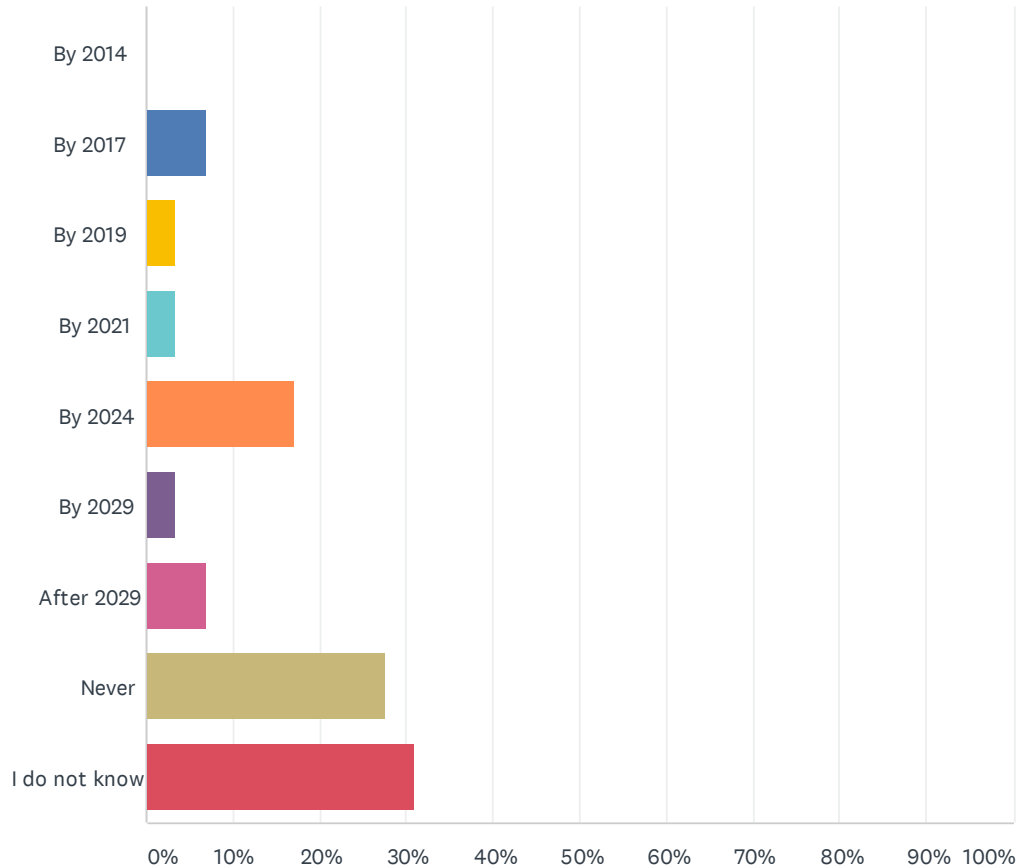
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
By 2014	6.90%	2
By 2017	6.90%	2
By 2019	3.45%	1
By 2021	10.34%	3
By 2024	6.90%	2
By 2029	3.45%	1
After 2029	20.69%	6
Never	10.34%	3
I do not know	31.03%	9
TOTAL		29

Q27 By which year did or do you expect development projects for real-time embedded systems in your department to stop using single-core embedded processors (i.e. processors with 1 core)?

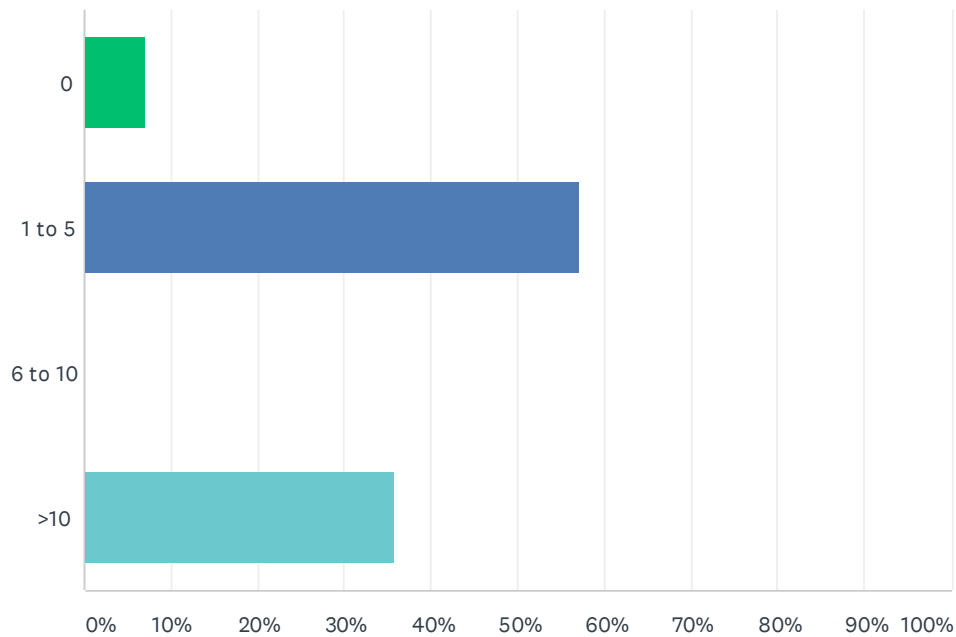
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
By 2014	0.00%	0
By 2017	6.90%	2
By 2019	3.45%	1
By 2021	3.45%	1
By 2024	17.24%	5
By 2029	3.45%	1
After 2029	6.90%	2
Never	27.59%	8
I do not know	31.03%	9
TOTAL		29

Q28 How many research publications (e.g. conference or journal papers) in the real-time systems field have you read in the last year?

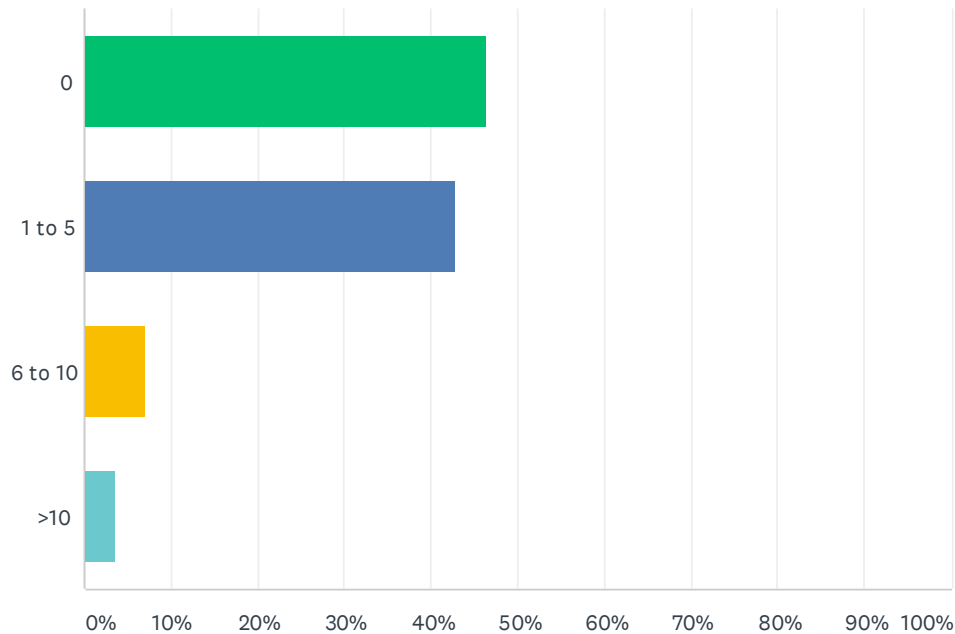
Answered: 28 Skipped: 2



ANSWER CHOICES	RESPONSES	
0	7.14%	2
1 to 5	57.14%	16
6 to 10	0.00%	0
>10	35.71%	10
TOTAL		28

Q29 How many real-time systems research publications (e.g. conference or journal papers) have you published as a (co-)author in the last 5 years?

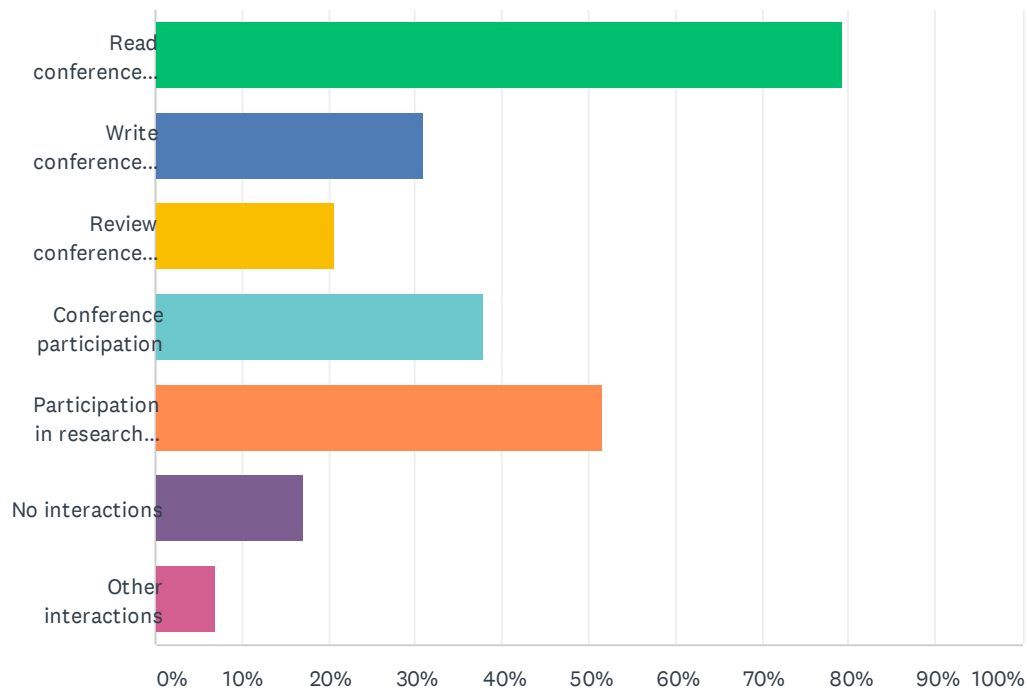
Answered: 28 Skipped: 2



ANSWER CHOICES	RESPONSES	
0	46.43%	13
1 to 5	42.86%	12
6 to 10	7.14%	2
>10	3.57%	1
TOTAL		28

Q30 How do you interact with the real-time research community? Select all options that apply.

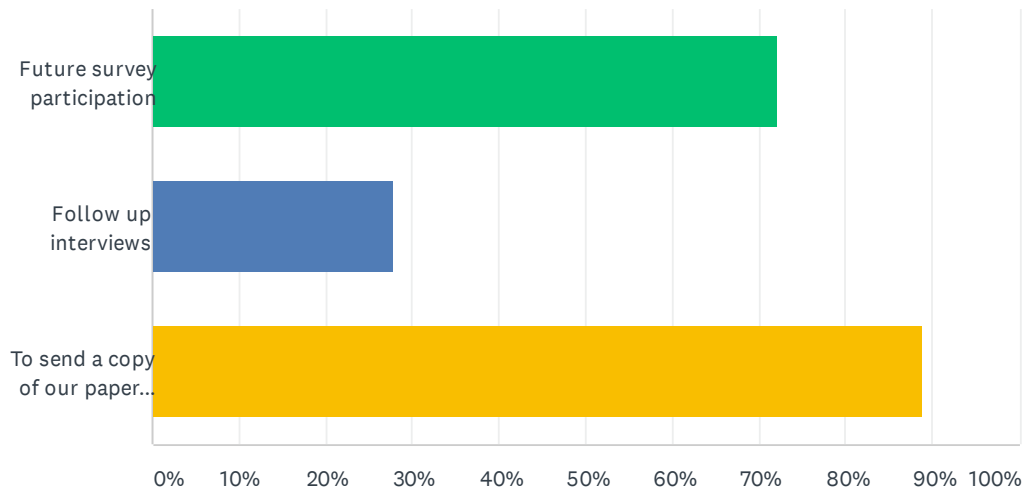
Answered: 29 Skipped: 1



ANSWER CHOICES	RESPONSES	
Read conference papers and journal articles	79.31%	23
Write conference papers and journal articles	31.03%	9
Review conference papers and journal articles	20.69%	6
Conference participation	37.93%	11
Participation in research projects with academics	51.72%	15
No interactions	17.24%	5
Other interactions	6.90%	2
Total Respondents: 29		

Q31 Please indicate the purposes for which we may contact you again, if any. If we may contact you again, but you do not want your e-mail address to identify your responses in the survey, you can instead e-mail your preferences to benny.akesson@tno.nl . We will not share or use your e-mail for any other purposes.

Answered: 18 Skipped: 12



ANSWER CHOICES	RESPONSES	
Future survey participation	72.22%	13
Follow up interviews	27.78%	5
To send a copy of our paper when it is published	88.89%	16
Total Respondents: 18		

Q32 Please enter any feedback or remarks on this survey.

Answered: 10 Skipped: 20