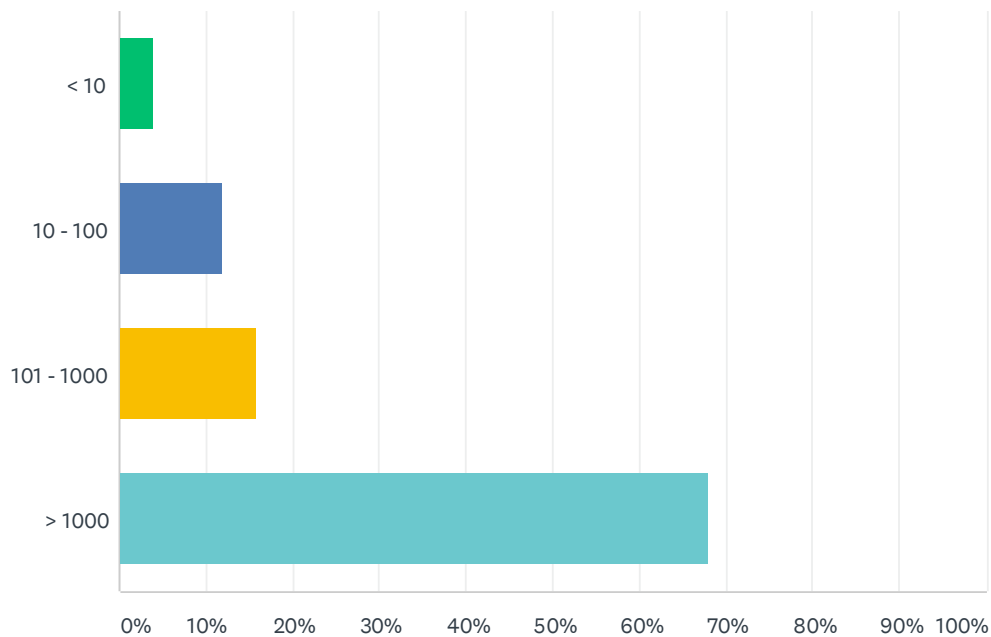


Q1 How many employees does your organization have?

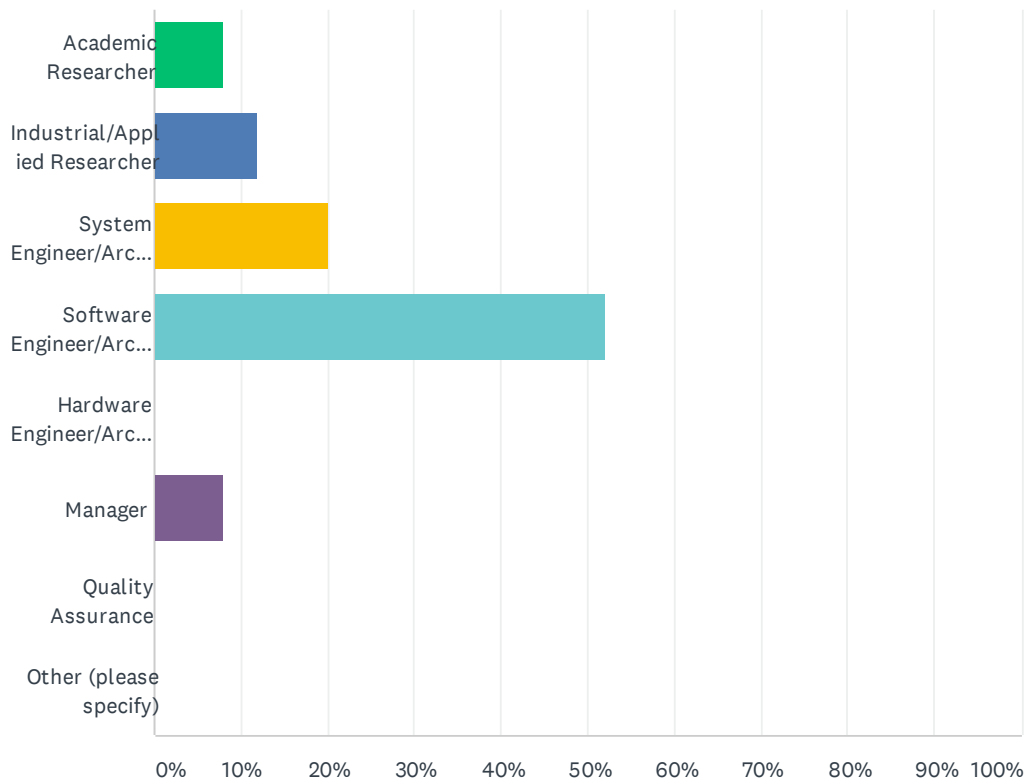
Answered: 25 Skipped: 0



ANSWER CHOICES	RESPONSES	
< 10	4.00%	1
10 - 100	12.00%	3
101 - 1000	16.00%	4
> 1000	68.00%	17
TOTAL		25

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

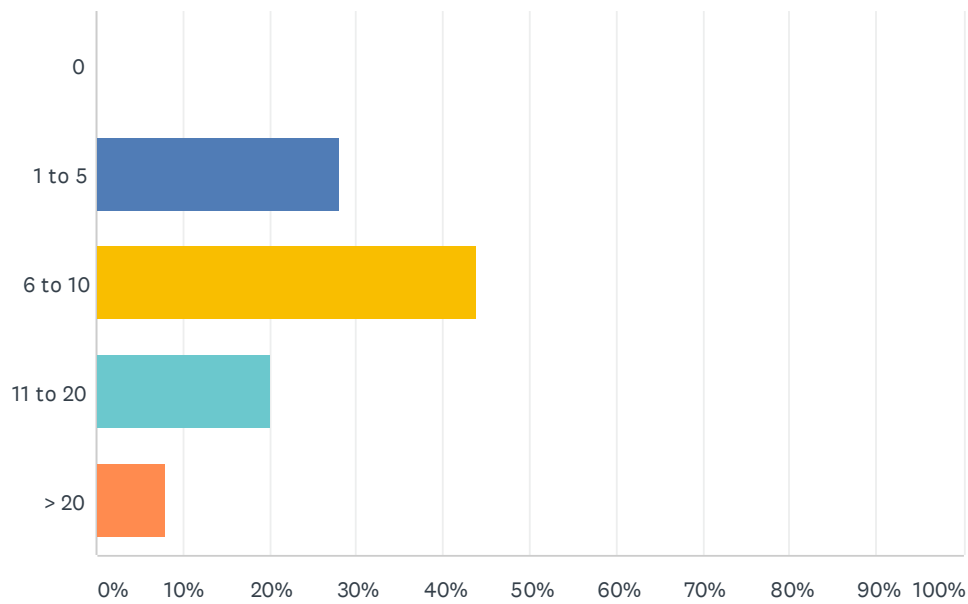
Answered: 25 Skipped: 0



ANSWER CHOICES	RESPONSES	
Academic Researcher	8.00%	2
Industrial/Applied Researcher	12.00%	3
System Engineer/Architect	20.00%	5
Software Engineer/Architect	52.00%	13
Hardware Engineer/Architect	0.00%	0
Manager	8.00%	2
Quality Assurance	0.00%	0
Other (please specify)	0.00%	0
TOTAL		25

Q3 How many years of industrial experience do you have?

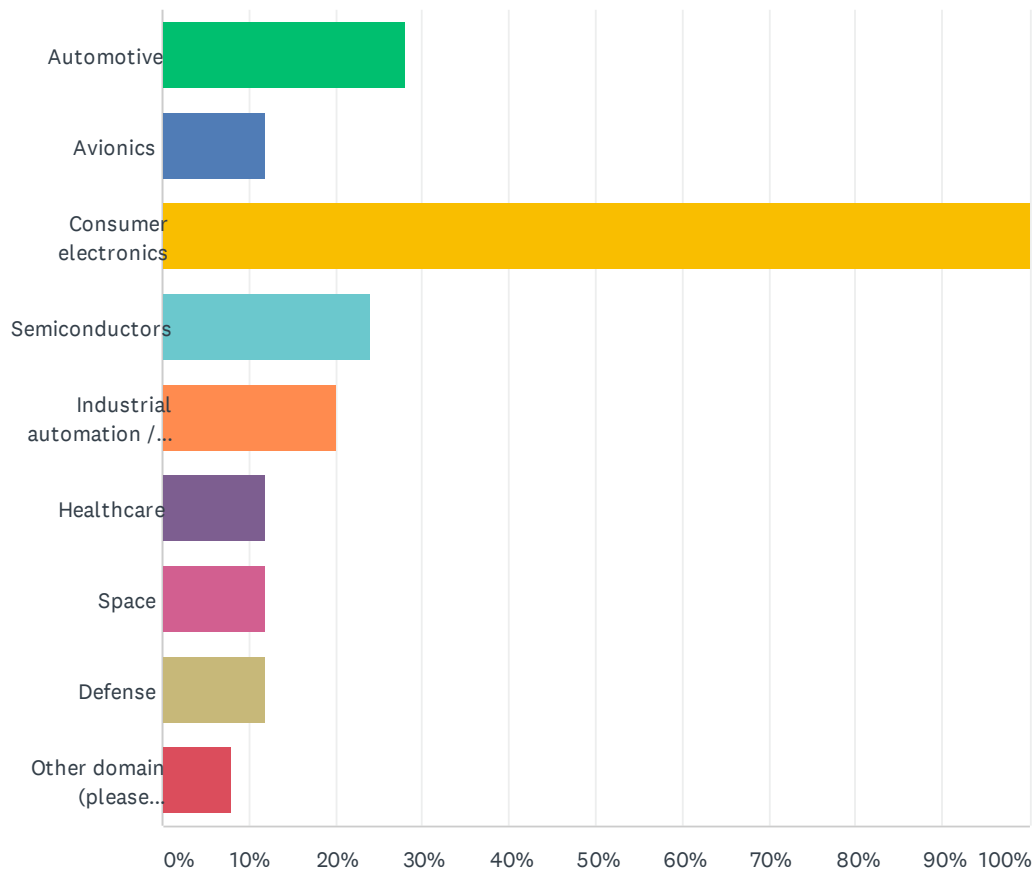
Answered: 25 Skipped: 0



ANSWER CHOICES	RESPONSES	
0	0.00%	0
1 to 5	28.00%	7
6 to 10	44.00%	11
11 to 20	20.00%	5
> 20	8.00%	2
TOTAL		25

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

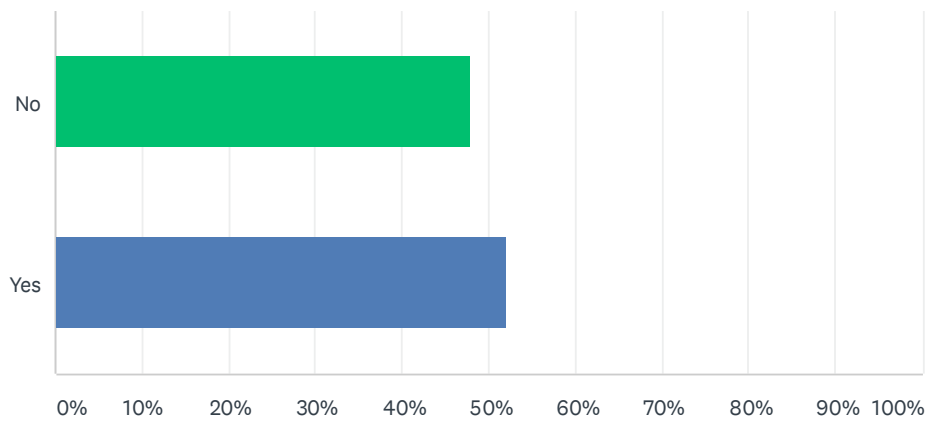
Answered: 25 Skipped: 0



ANSWER CHOICES	RESPONSES	
Automotive	28.00%	7
Avionics	12.00%	3
Consumer electronics	100.00%	25
Semiconductors	24.00%	6
Industrial automation / Manufacturing	20.00%	5
Healthcare	12.00%	3
Space	12.00%	3
Defense	12.00%	3
Other domain (please specify)	8.00%	2
Total Respondents: 25		

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

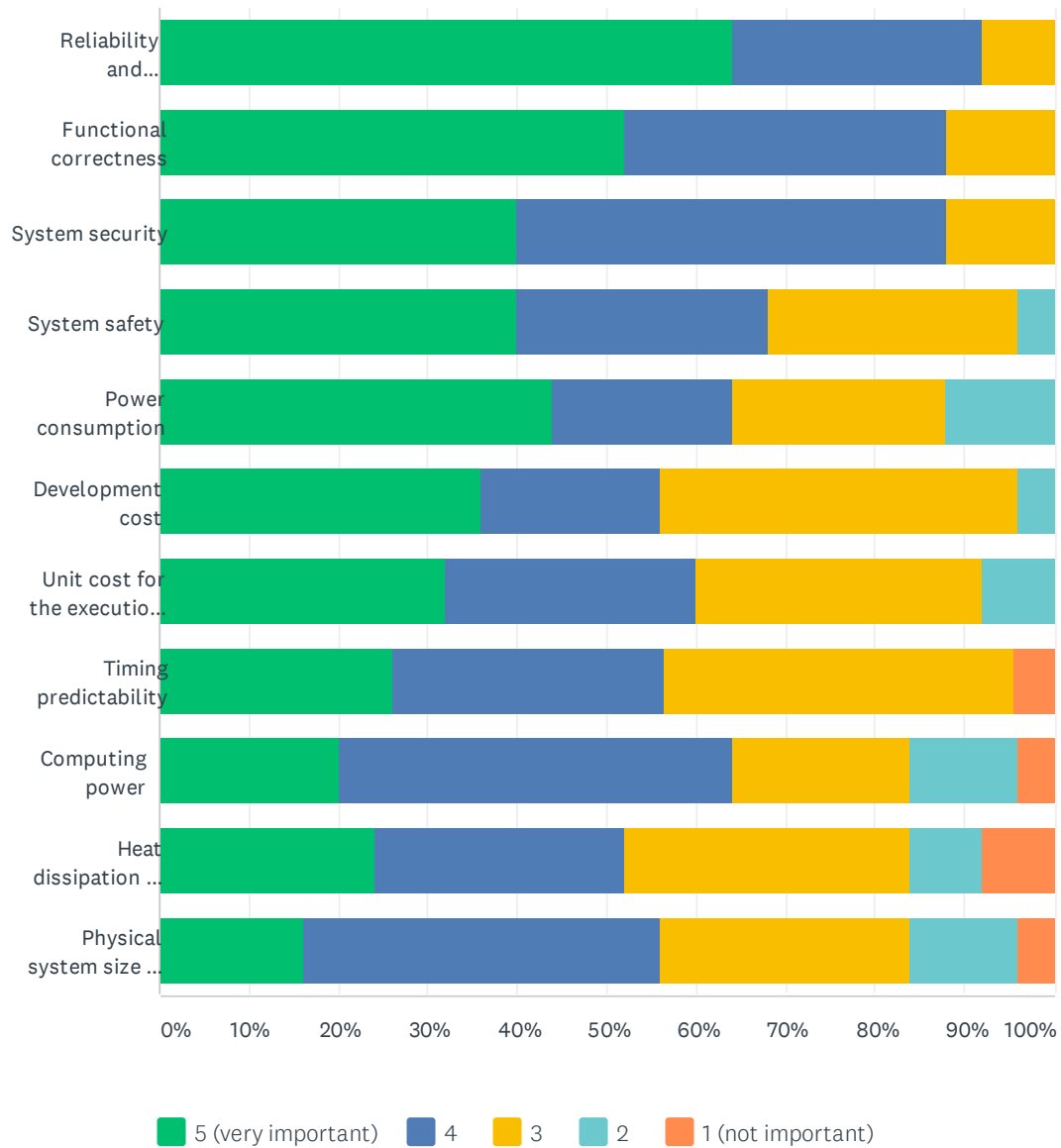
Answered: 25 Skipped: 0



ANSWER CHOICES		RESPONSES	
No		48.00%	12
Yes		52.00%	13
TOTAL			25

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

Answered: 25 Skipped: 0

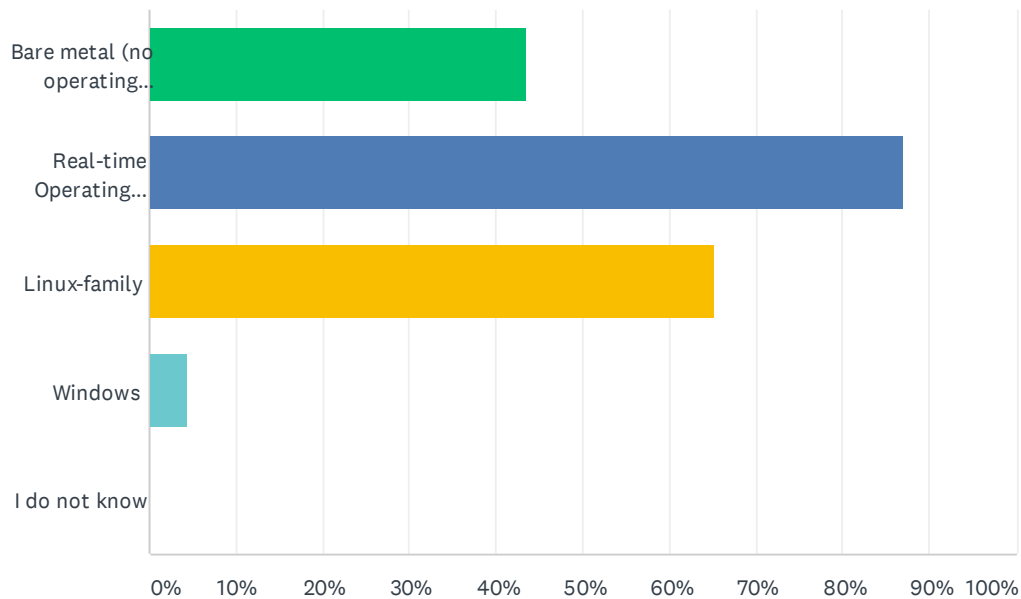


Real-time Systems Survey

	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
Reliability and availability	64.00% 16	28.00% 7	8.00% 2	0.00% 0	0.00% 0	25	4.56
Functional correctness	52.00% 13	36.00% 9	12.00% 3	0.00% 0	0.00% 0	25	4.40
System security	40.00% 10	48.00% 12	12.00% 3	0.00% 0	0.00% 0	25	4.28
System safety	40.00% 10	28.00% 7	28.00% 7	4.00% 1	0.00% 0	25	4.04
Power consumption	44.00% 11	20.00% 5	24.00% 6	12.00% 3	0.00% 0	25	3.96
Development cost	36.00% 9	20.00% 5	40.00% 10	4.00% 1	0.00% 0	25	3.88
Unit cost for the execution platform	32.00% 8	28.00% 7	32.00% 8	8.00% 2	0.00% 0	25	3.84
Timing predictability	26.09% 6	30.43% 7	39.13% 9	0.00% 0	4.35% 1	23	3.74
Computing power	20.00% 5	44.00% 11	20.00% 5	12.00% 3	4.00% 1	25	3.64
Heat dissipation / thermal constraints	24.00% 6	28.00% 7	32.00% 8	8.00% 2	8.00% 2	25	3.52
Physical system size / weight	16.00% 4	40.00% 10	28.00% 7	12.00% 3	4.00% 1	25	3.52

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

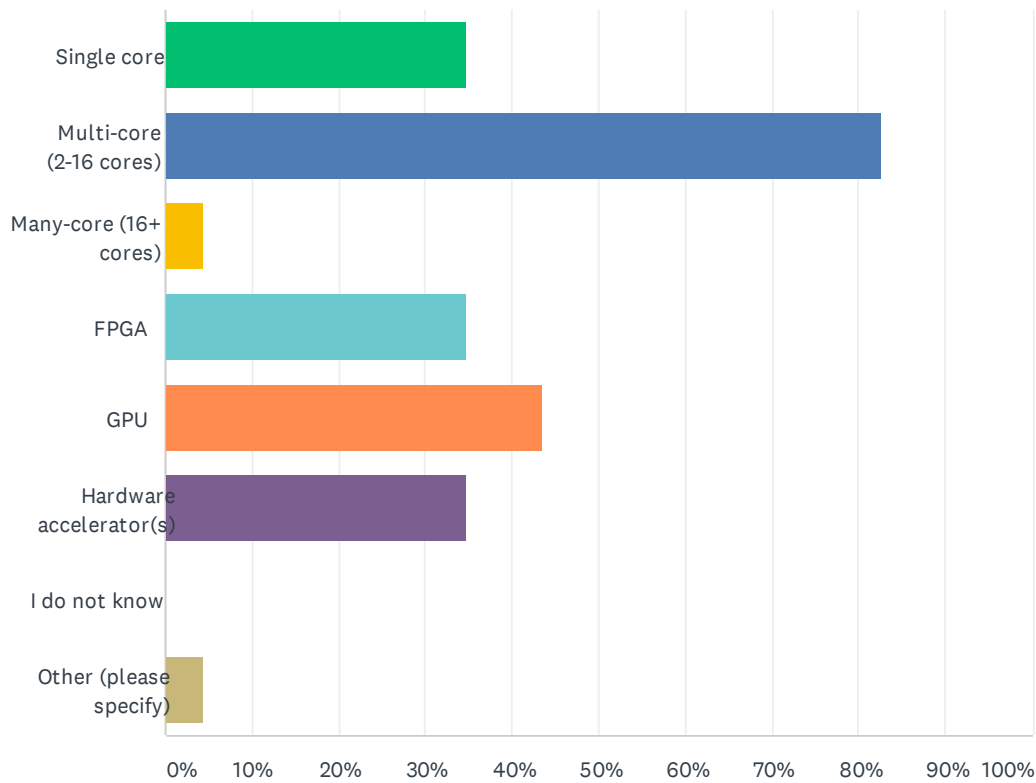
Answered: 23 Skipped: 2



ANSWER CHOICES	RESPONSES	
Bare metal (no operating system)	43.48%	10
Real-time Operating System, Micro kernel, or libraries	86.96%	20
Linux-family	65.22%	15
Windows	4.35%	1
I do not know	0.00%	0
Total Respondents: 23		

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

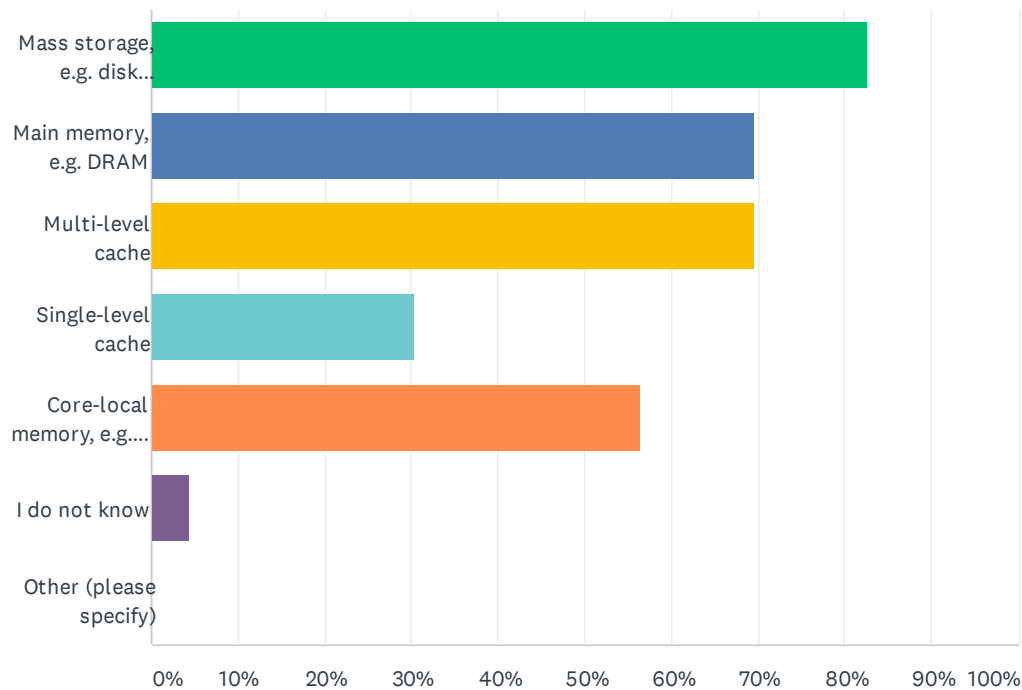
Answered: 23 Skipped: 2



ANSWER CHOICES	RESPONSES	
Single core	34.78%	8
Multi-core (2-16 cores)	82.61%	19
Many-core (16+ cores)	4.35%	1
FPGA	34.78%	8
GPU	43.48%	10
Hardware accelerator(s)	34.78%	8
I do not know	0.00%	0
Other (please specify)	4.35%	1
Total Respondents: 23		

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

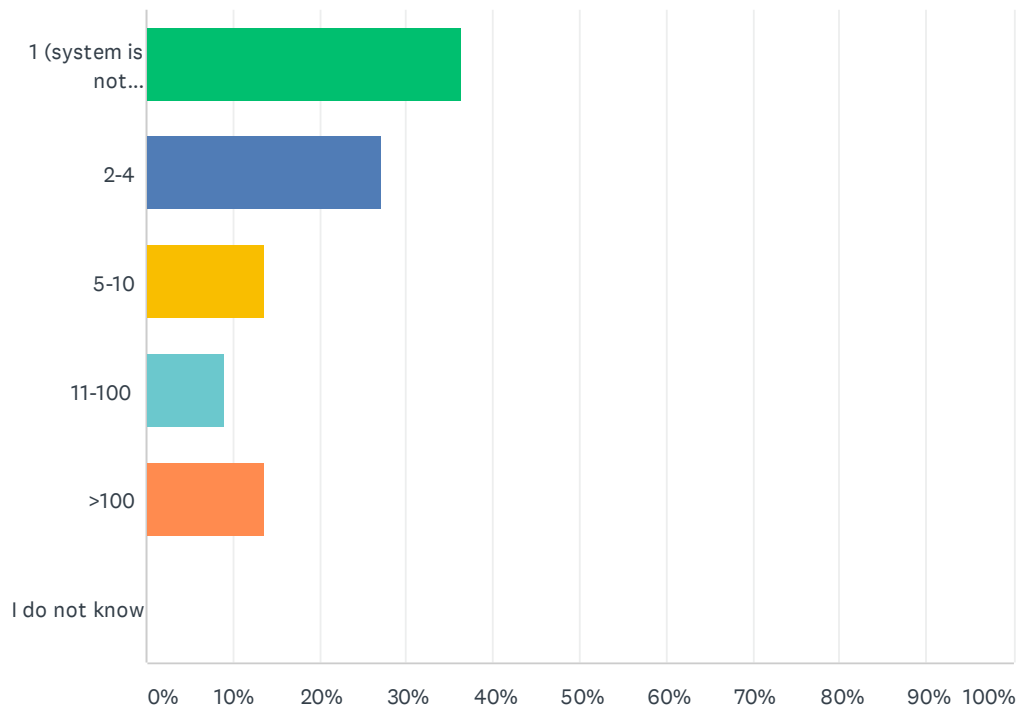
Answered: 23 Skipped: 2



ANSWER CHOICES	RESPONSES	
Mass storage, e.g. disk drive, flash	82.61%	19
Main memory, e.g. DRAM	69.57%	16
Multi-level cache	69.57%	16
Single-level cache	30.43%	7
Core-local memory, e.g. SRAM/BRAM scratchpad(s)	56.52%	13
I do not know	4.35%	1
Other (please specify)	0.00%	0
Total Respondents: 23		

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

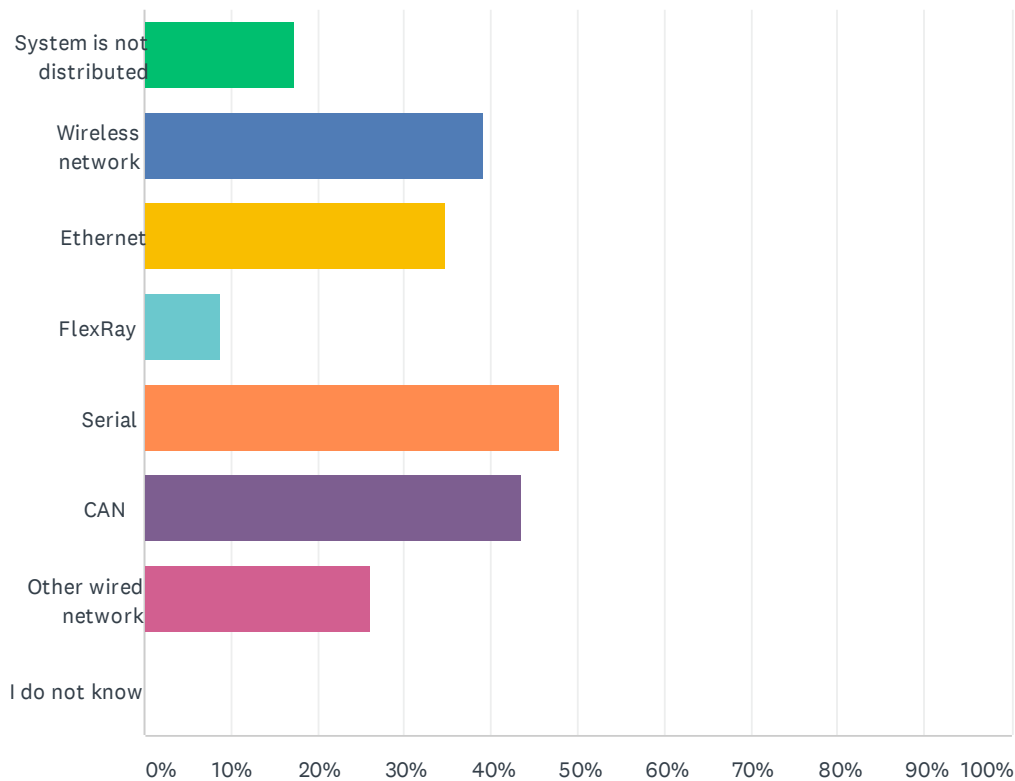
Answered: 22 Skipped: 3



ANSWER CHOICES	RESPONSES	
1 (system is not distributed)	36.36%	8
2-4	27.27%	6
5-10	13.64%	3
11-100	9.09%	2
>100	13.64%	3
I do not know	0.00%	0
TOTAL		22

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

Answered: 23 Skipped: 2

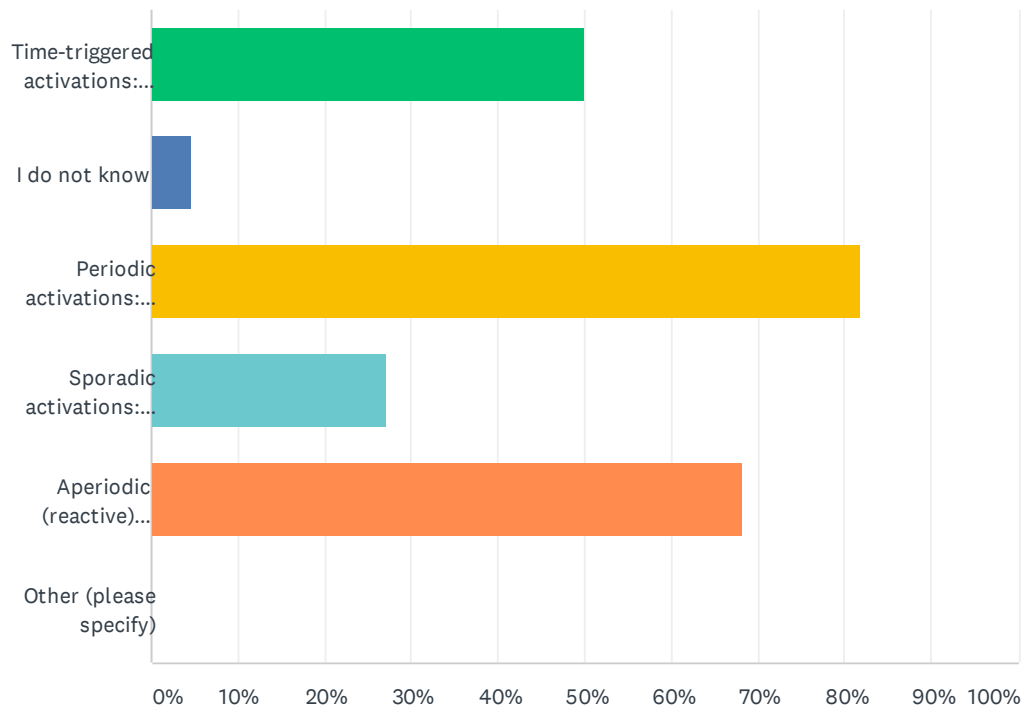


ANSWER CHOICES	RESPONSES	
System is not distributed (1)	17.39%	4
Wireless network (2)	39.13%	9
Ethernet (3)	34.78%	8
FlexRay (4)	8.70%	2
Serial (5)	47.83%	11
CAN (6)	43.48%	10
Other wired network (7)	26.09%	6
I do not know (8)	0.00%	0
Total Respondents: 23		

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	7.00	5.00	4.22	1.91

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

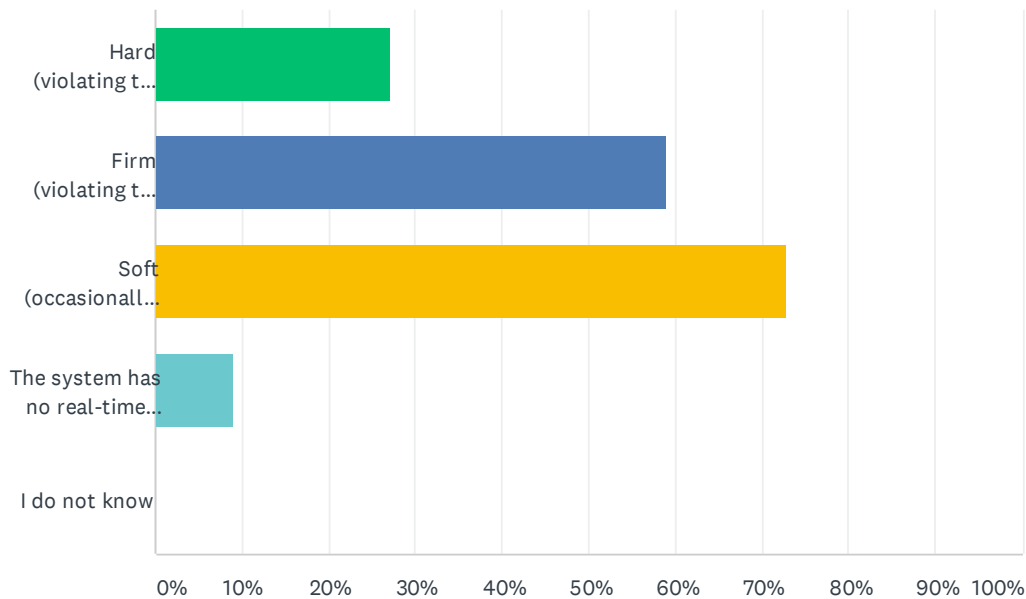
Answered: 22 Skipped: 3



ANSWER CHOICES	RESPONSES	
Time-triggered activations: Functionalities are activated at certain time instants according to a predefined time table.	50.00%	11
I do not know	4.55%	1
Periodic activations: Functionalities are activated periodically (e.g., using a timer interrupt)	81.82%	18
Sporadic activations: Functionalities may be activated at any time. However, every two activations are separated at least by a certain time interval	27.27%	6
Aperiodic (reactive) activations: Functionalities may be activated by internal or external events that may happen at any time (non-deterministic).	68.18%	15
Other (please specify)	0.00%	0
Total Respondents: 22		

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

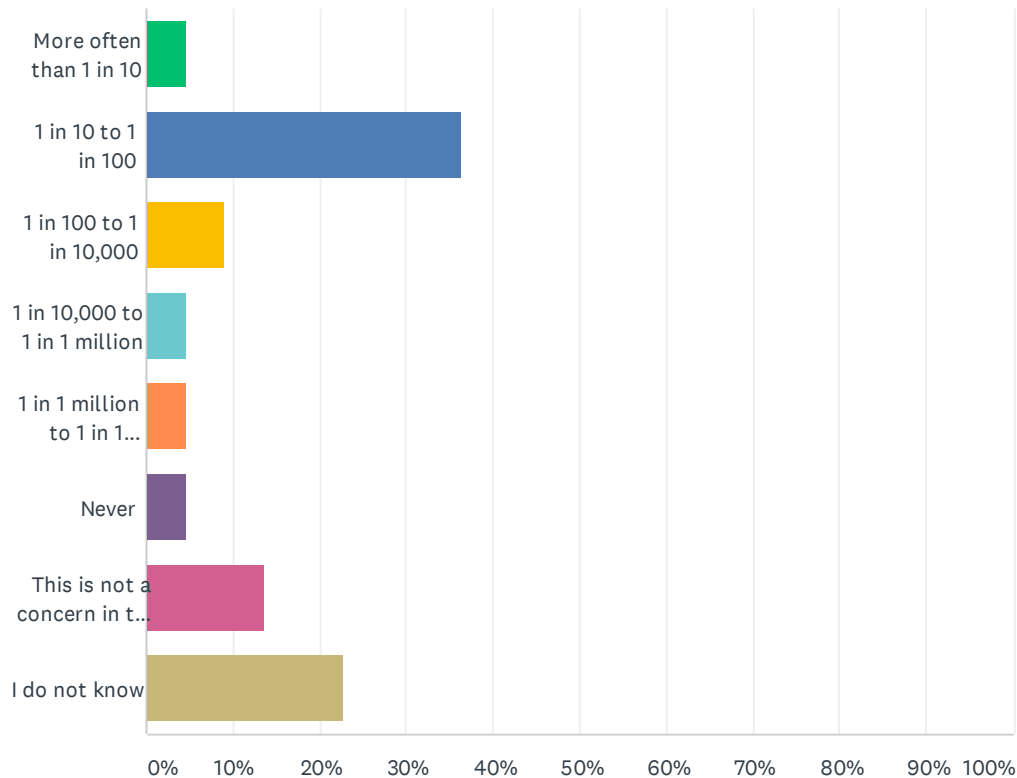
Answered: 22 Skipped: 3



ANSWER CHOICES	RESPONSES	
Hard (violating the timing constraint is considered a failure of the system)	27.27%	6
Firm (violating the timing constraint is highly undesirable)	59.09%	13
Soft (occasionally violating the timing constraint is acceptable, but it negatively impacts the perceived quality of the system)	72.73%	16
The system has no real-time constraints	9.09%	2
I do not know	0.00%	0
Total Respondents: 22		

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?

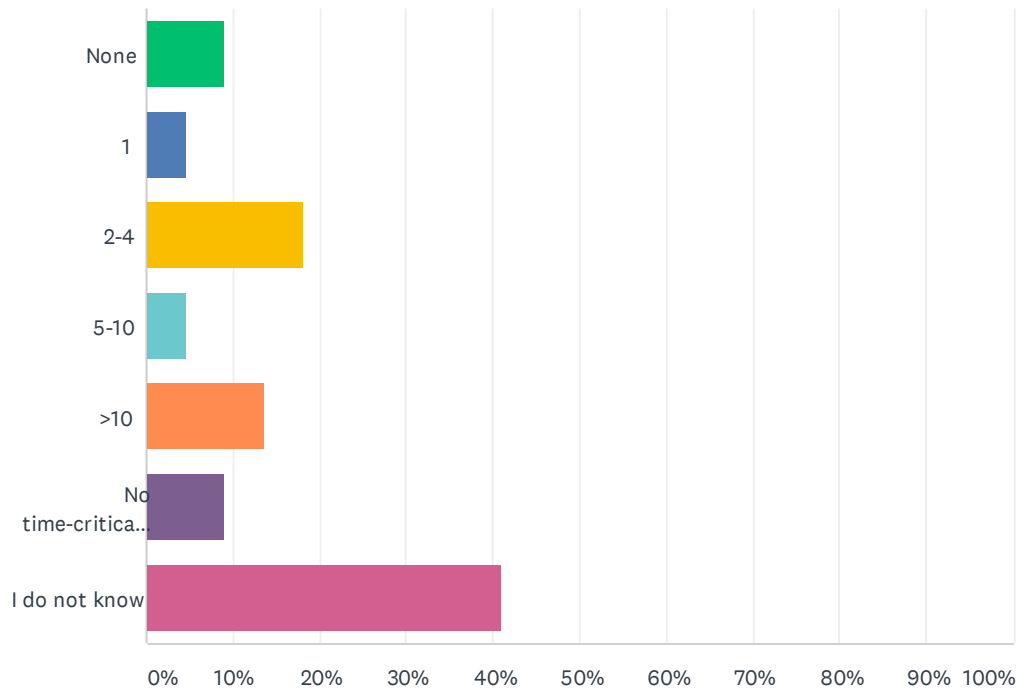
Answered: 22 Skipped: 3



ANSWER CHOICES	RESPONSES	
More often than 1 in 10	4.55%	1
1 in 10 to 1 in 100	36.36%	8
1 in 100 to 1 in 10,000	9.09%	2
1 in 10,000 to 1 in 1 million	4.55%	1
1 in 1 million to 1 in 1 billion	4.55%	1
Never	4.55%	1
This is not a concern in the system	13.64%	3
I do not know	22.73%	5
TOTAL		22

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?

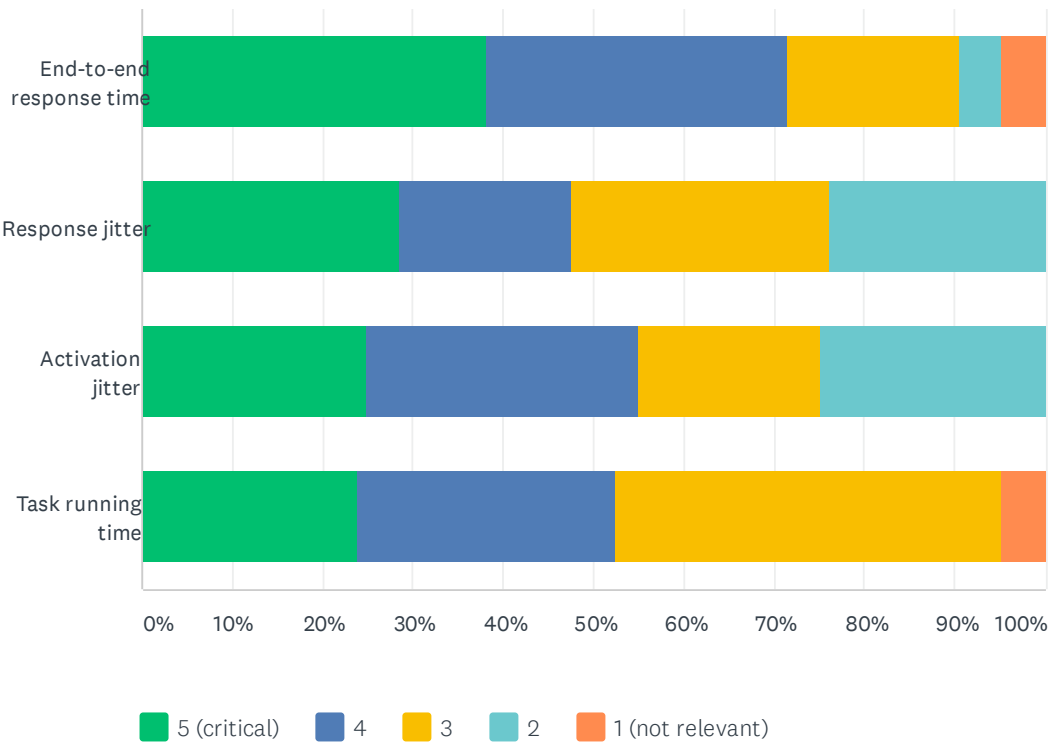
Answered: 22 Skipped: 3



ANSWER CHOICES	RESPONSES	
None	9.09%	2
1	4.55%	1
2-4	18.18%	4
5-10	4.55%	1
>10	13.64%	3
No time-critical functionality present	9.09%	2
I do not know	40.91%	9
TOTAL		22

Q16 What are relevant timing constraints in the considered system?

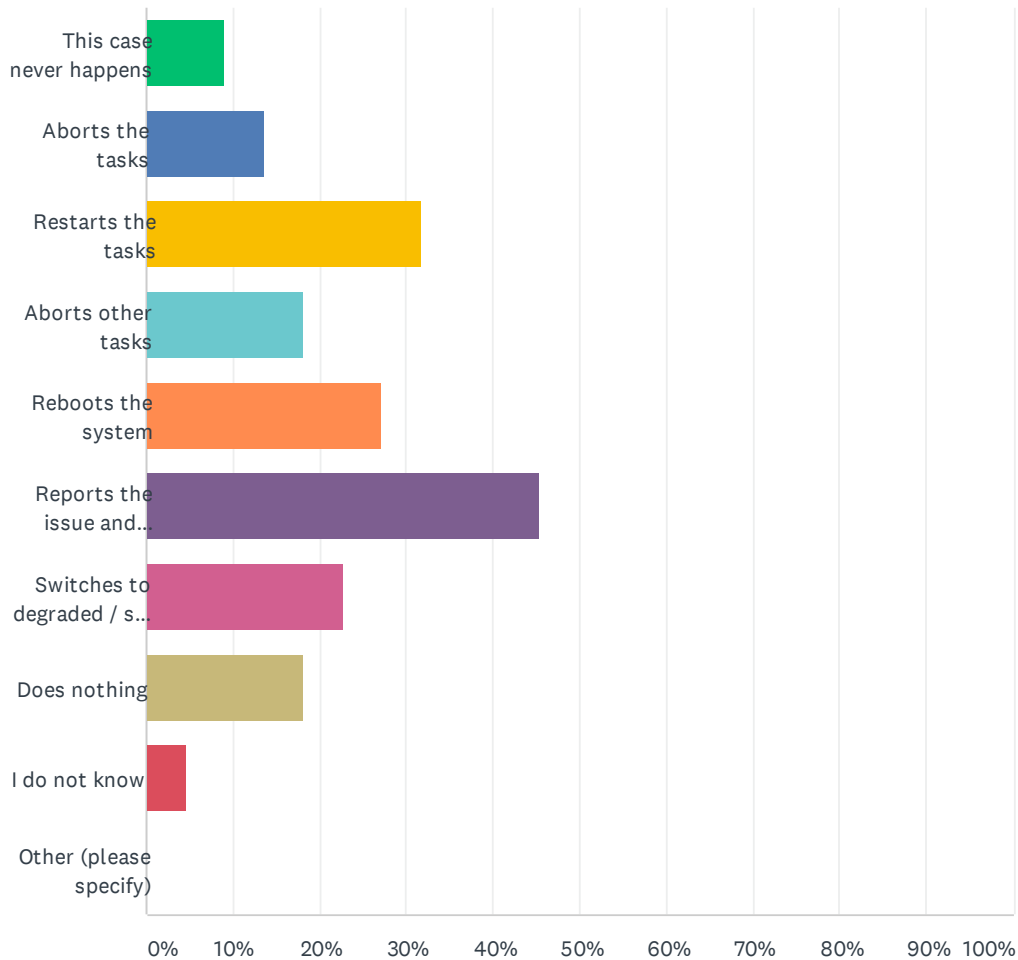
Answered: 22 Skipped: 3



	5 (CRITICAL)	4	3	2	1 (NOT RELEVANT)	TOTAL	WEIGHTED AVERAGE
End-to-end response time	38.10% 8	33.33% 7	19.05% 4	4.76% 1	4.76% 1	21	3.95
Response jitter	28.57% 6	19.05% 4	28.57% 6	23.81% 5	0.00% 0	21	3.52
Activation jitter	25.00% 5	30.00% 6	20.00% 4	25.00% 5	0.00% 0	20	3.55
Task running time	23.81% 5	28.57% 6	42.86% 9	0.00% 0	4.76% 1	21	3.67

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

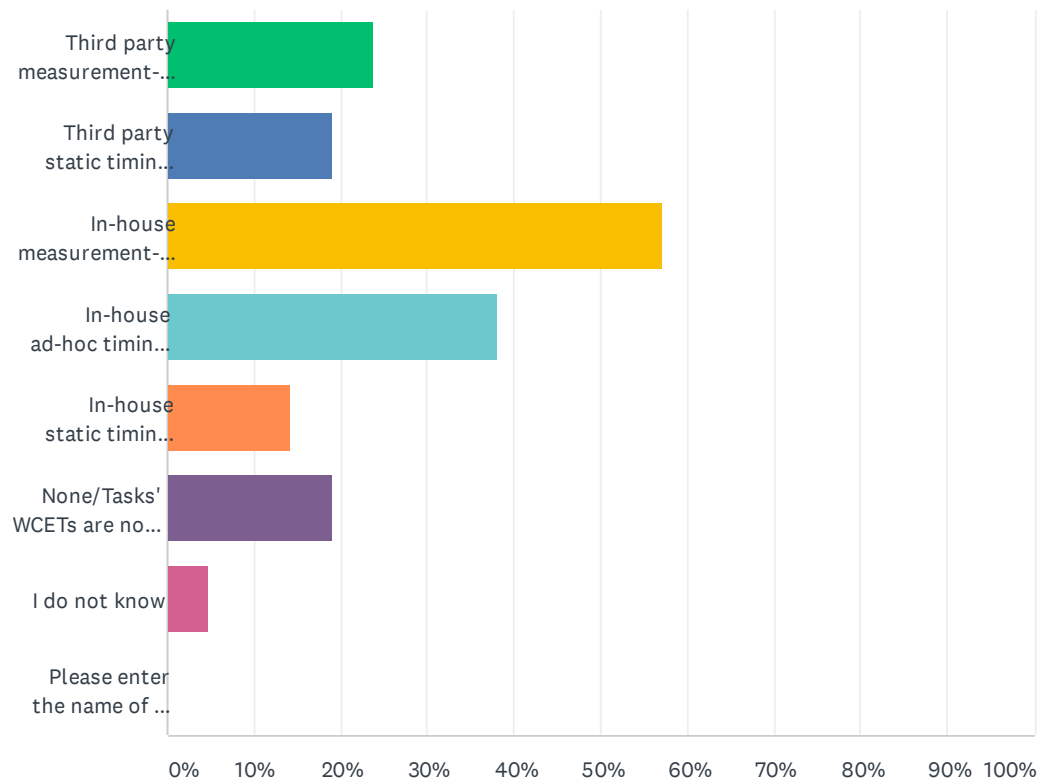
Answered: 22 Skipped: 3



ANSWER CHOICES	RESPONSES	
This case never happens	9.09%	2
Aborts the tasks	13.64%	3
Restarts the tasks	31.82%	7
Aborts other tasks	18.18%	4
Reboots the system	27.27%	6
Reports the issue and continues	45.45%	10
Switches to degraded / safe mode	22.73%	5
Does nothing	18.18%	4
I do not know	4.55%	1
Other (please specify)	0.00%	0
Total Respondents: 22		

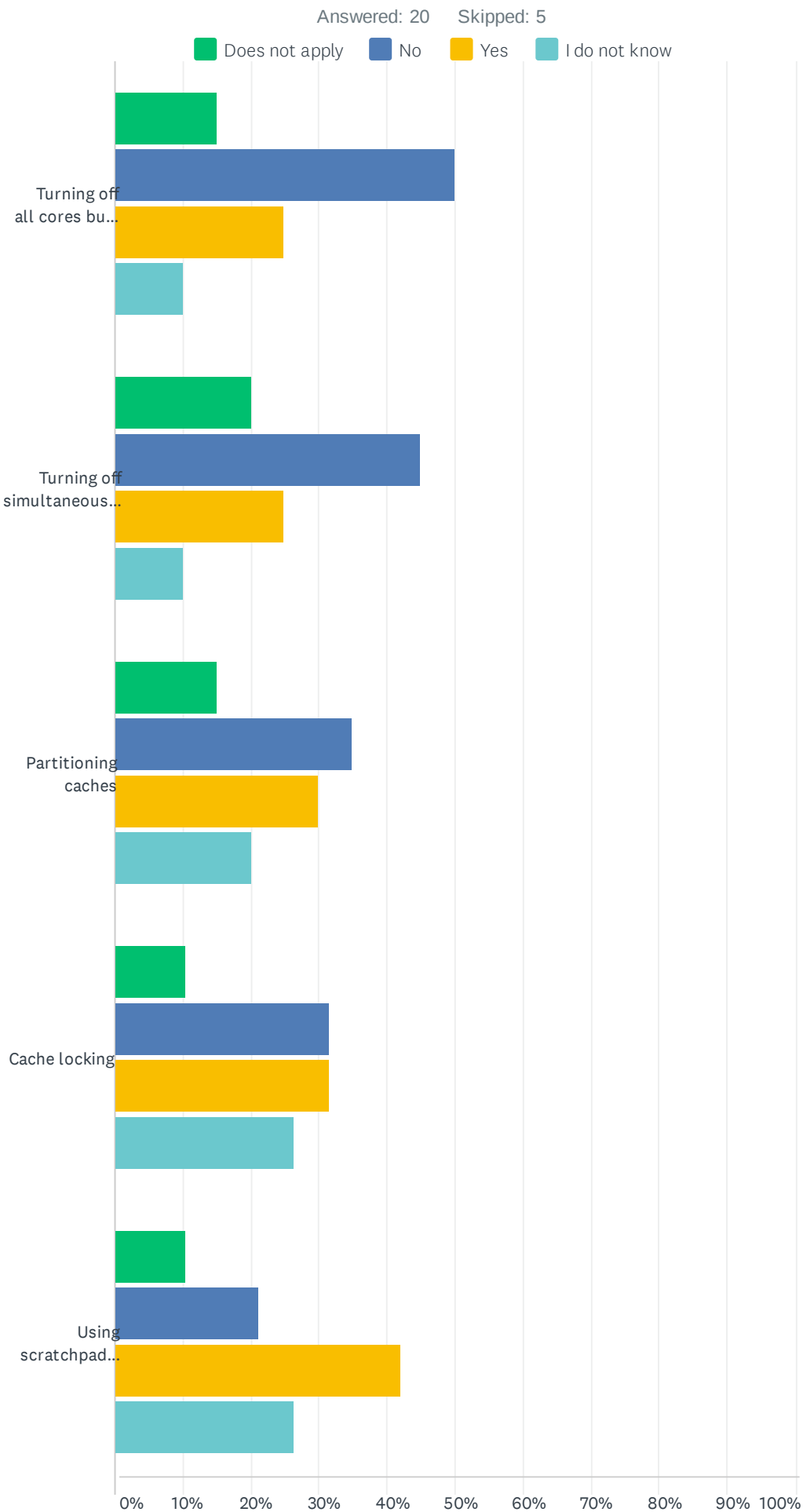
Q18 Which methods are used for Worst-Case Execution Time (WCET) estimation in the considered system? Select all options that apply.

Answered: 21 Skipped: 4

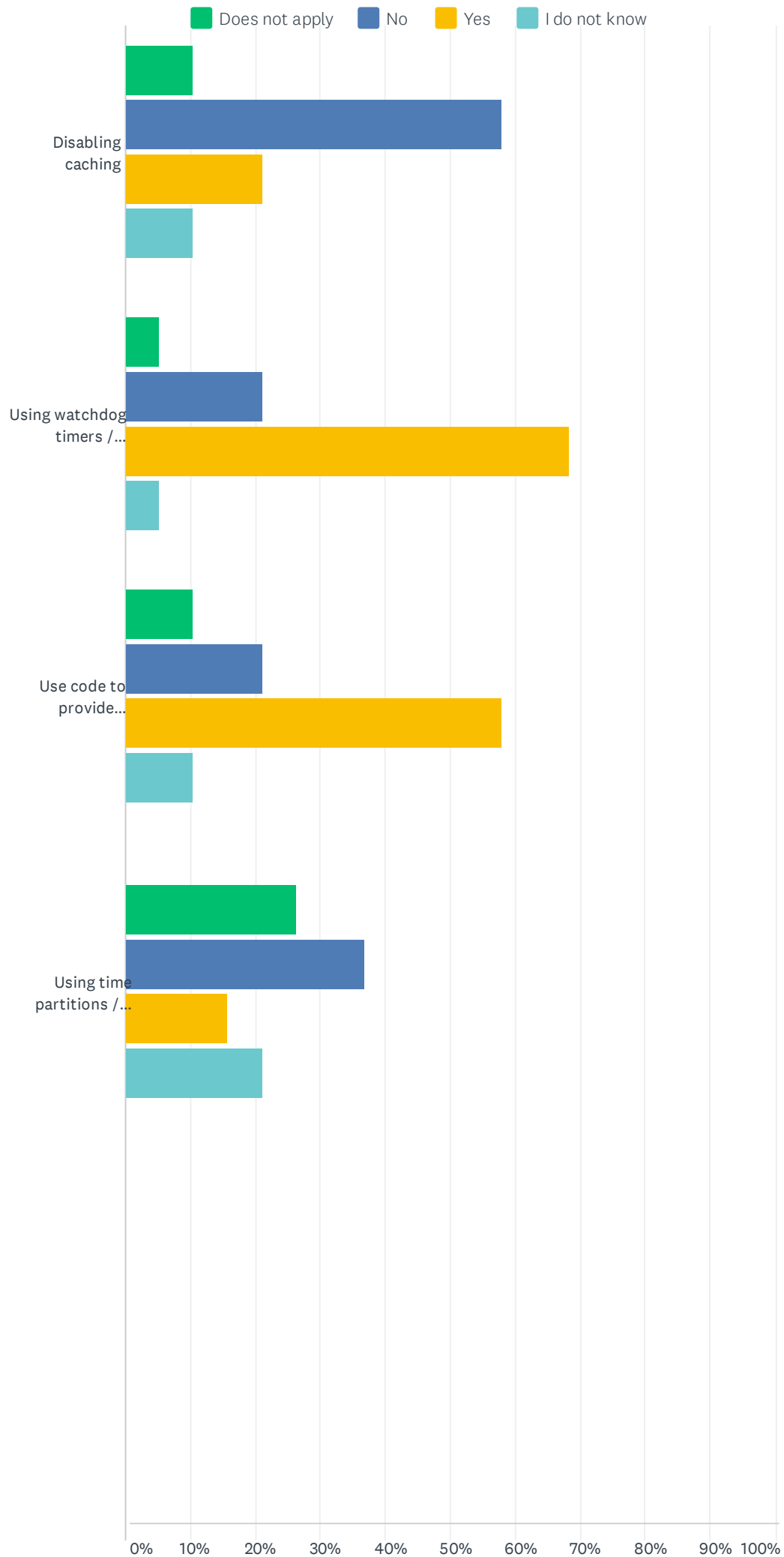


ANSWER CHOICES	RESPONSES	
Third party measurement-based timing analysis tool	23.81%	5
Third party static timing analysis tools	19.05%	4
In-house measurement-based timing analysis tool	57.14%	12
In-house ad-hoc timing measurements	38.10%	8
In-house static timing analysis tool	14.29%	3
None/Tasks' WCETs are not estimated	19.05%	4
I do not know	4.76%	1
Please enter the name of the used WCET estimation tool, if any	0.00%	0
Total Respondents: 21		

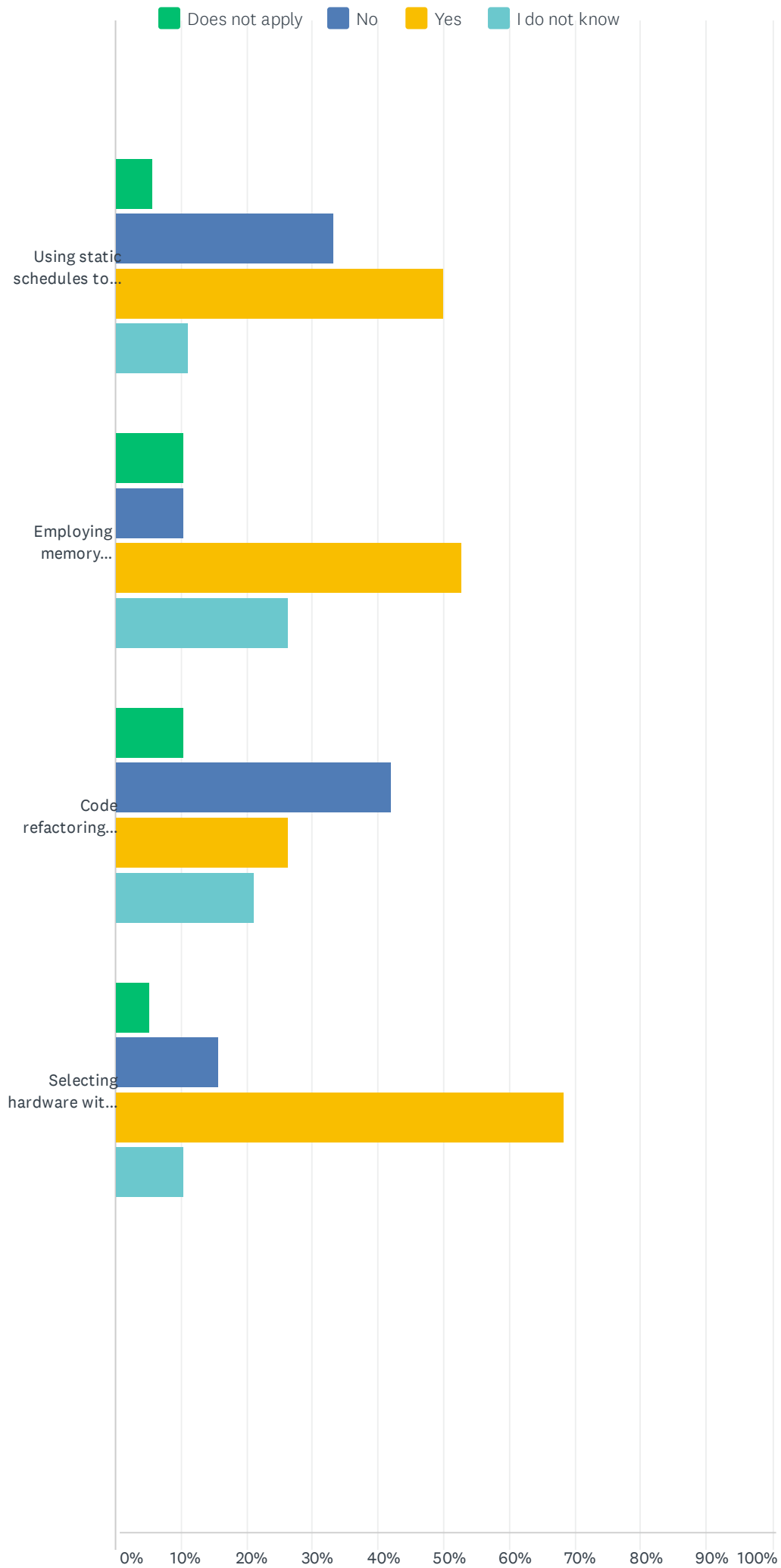
Q19 What steps are taken to help increase timing predictability?



Real-time Systems Survey



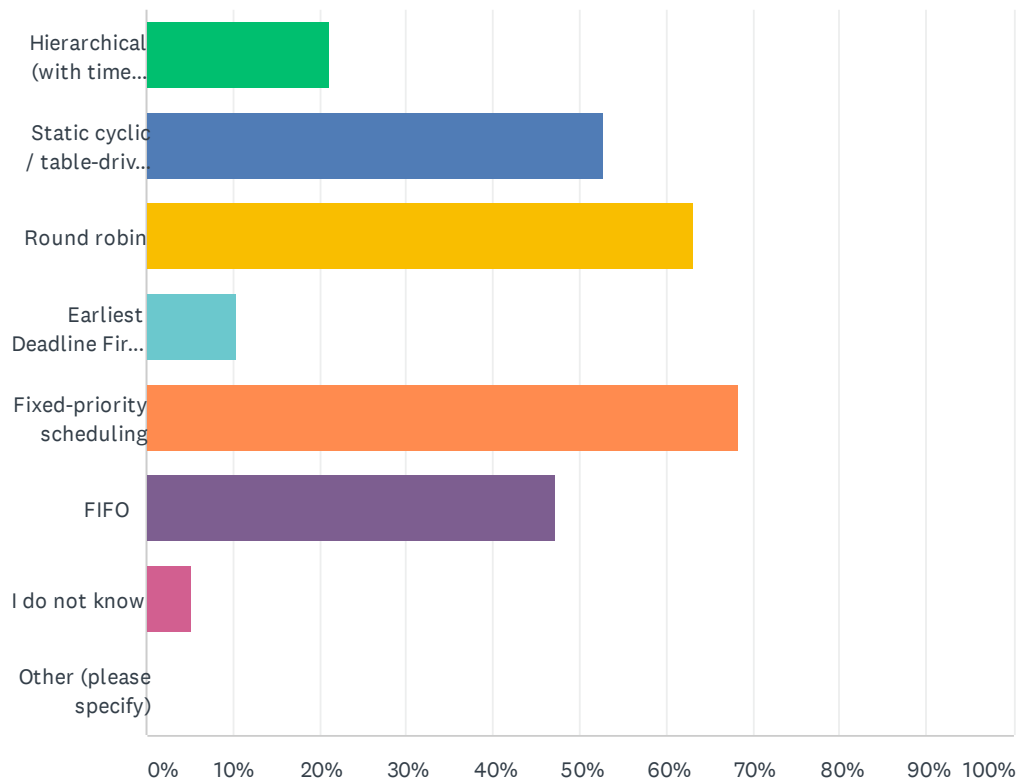
Real-time Systems Survey



	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL
Turning off all cores but one	15.00% 3	50.00% 10	25.00% 5	10.00% 2	20
Turning off simultaneous multi-threading (e.g. Hyperthreading)	20.00% 4	45.00% 9	25.00% 5	10.00% 2	20
Partitioning caches	15.00% 3	35.00% 7	30.00% 6	20.00% 4	20
Cache locking	10.53% 2	31.58% 6	31.58% 6	26.32% 5	19
Using scratchpad memory instead of caches	10.53% 2	21.05% 4	42.11% 8	26.32% 5	19
Disabling caching	10.53% 2	57.89% 11	21.05% 4	10.53% 2	19
Using watchdog timers / runtime monitors	5.26% 1	21.05% 4	68.42% 13	5.26% 1	19
Use code to provide degraded, but usable, outputs in the event of overruns	10.53% 2	21.05% 4	57.89% 11	10.53% 2	19
Using time partitions / reservations / servers	26.32% 5	36.84% 7	15.79% 3	21.05% 4	19
Using static schedules to control execution	5.56% 1	33.33% 6	50.00% 9	11.11% 2	18
Employing memory bandwidth regulation	10.53% 2	10.53% 2	52.63% 10	26.32% 5	19
Code refactoring into separate memory access phases and computation phases	10.53% 2	42.11% 8	26.32% 5	21.05% 4	19
Selecting hardware with better time-predictability	5.26% 1	15.79% 3	68.42% 13	10.53% 2	19

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

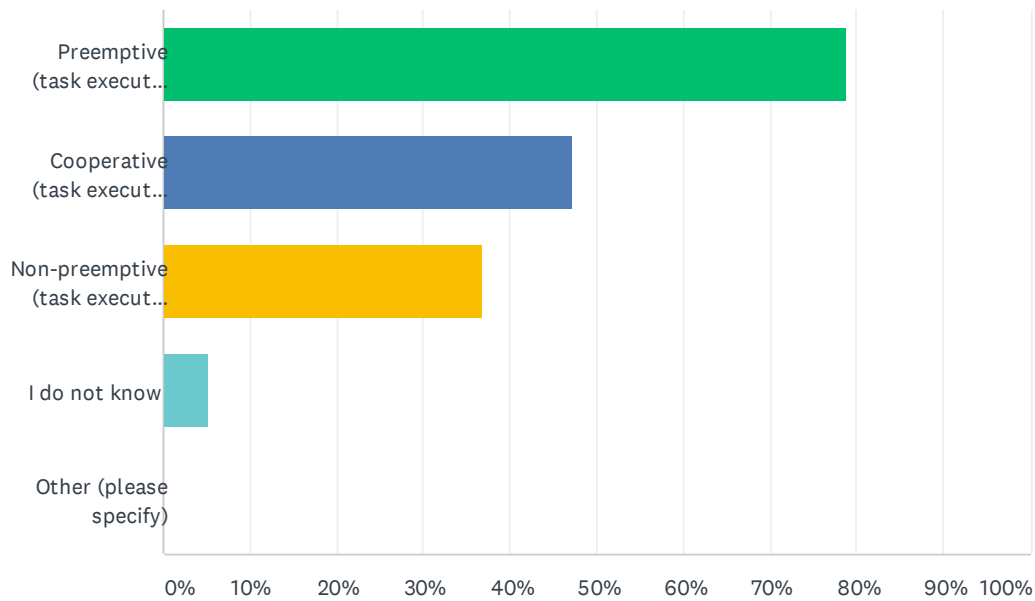
Answered: 19 Skipped: 6



ANSWER CHOICES	RESPONSES	
Hierarchical (with time partitions or reservations)	21.05%	4
Static cyclic / table-driven / time-triggered scheduling	52.63%	10
Round robin	63.16%	12
Earliest Deadline First (EDF)	10.53%	2
Fixed-priority scheduling	68.42%	13
FIFO	47.37%	9
I do not know	5.26%	1
Other (please specify)	0.00%	0
Total Respondents: 19		

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

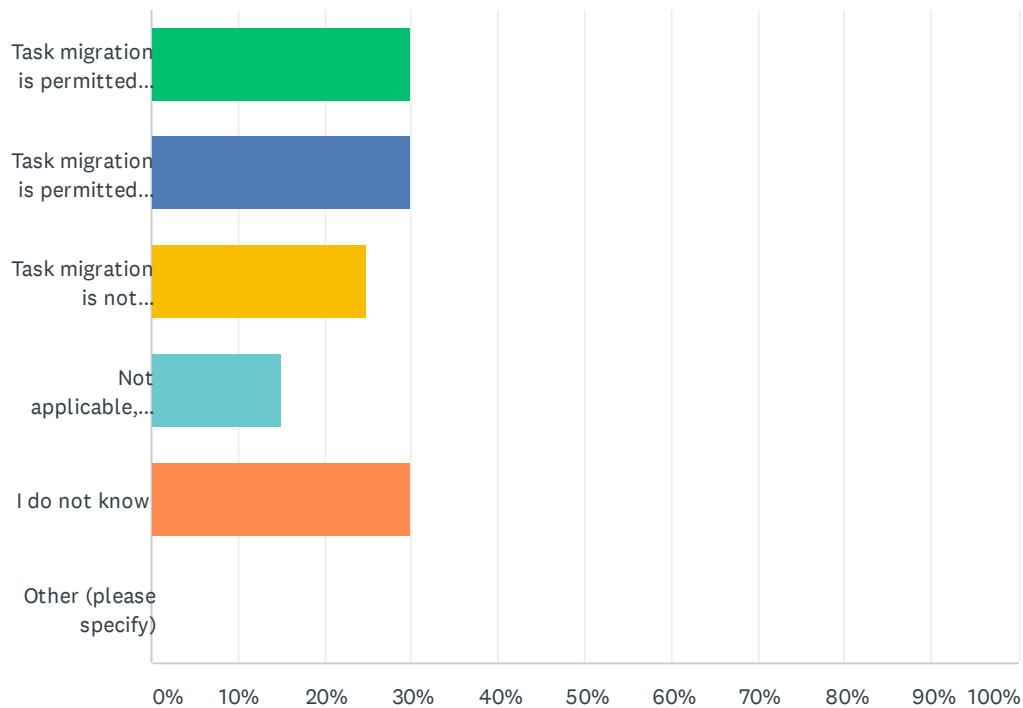
Answered: 19 Skipped: 6



ANSWER CHOICES	RESPONSES	
Preemptive (task execution can be preempted by other tasks at any time)	78.95%	15
Cooperative (task execution can be preempted by other tasks, but only at predefined preemption points)	47.37%	9
Non-preemptive (task execution cannot be preempted by other tasks before completion)	36.84%	7
I do not know	5.26%	1
Other (please specify)	0.00%	0
Total Respondents: 19		

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

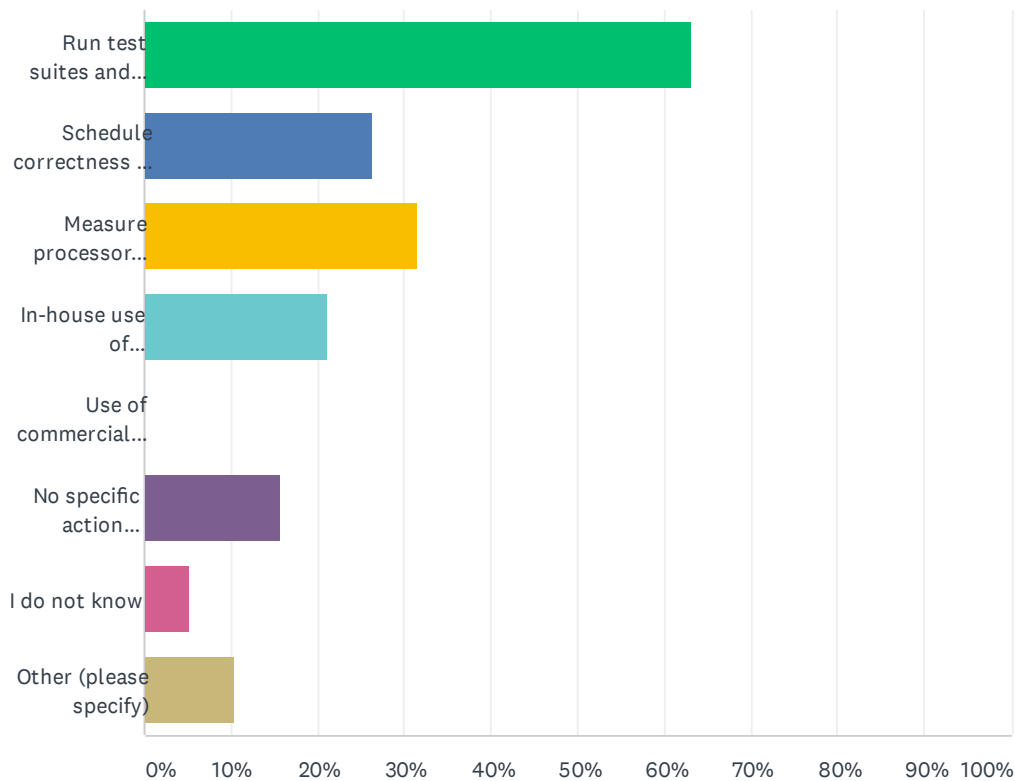
Answered: 20 Skipped: 5



ANSWER CHOICES	RESPONSES	
Task migration is permitted while the task is executing	30.00%	6
Task migration is permitted between two invocations of the function	30.00%	6
Task migration is not permitted	25.00%	5
Not applicable, single core system	15.00%	3
I do not know	30.00%	6
Other (please specify)	0.00%	0
Total Respondents: 20		

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

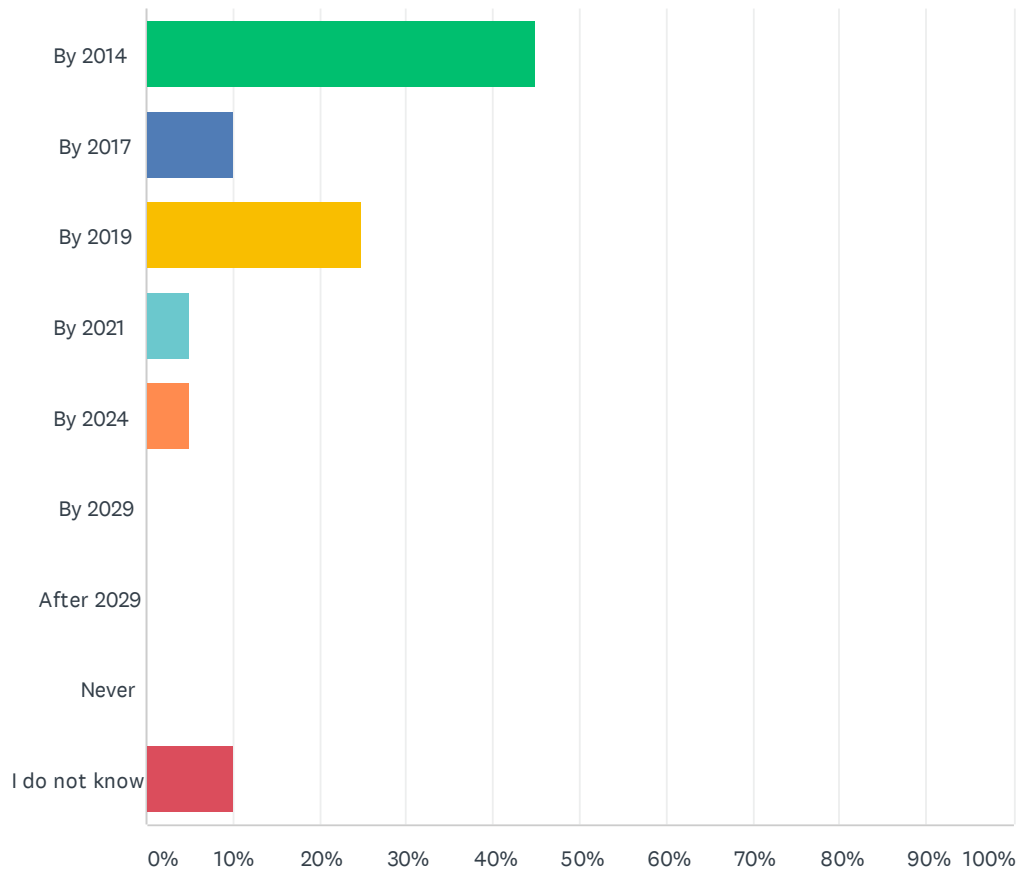
Answered: 19 Skipped: 6



ANSWER CHOICES	RESPONSES	
Run test suites and check for any overruns	63.16%	12
Schedule correctness is by construction. With a static schedule, provided execution time budgets hold for each software component / task, no deadlines will be missed.	26.32%	5
Measure processor utilization and ensure it is always below a predefined threshold, e.g. 50%	31.58%	6
In-house use of schedulability analysis	21.05%	4
Use of commercial schedulability analysis tools	0.00%	0
No specific action undertaken	15.79%	3
I do not know	5.26%	1
Other (please specify)	10.53%	2
Total Respondents: 19		

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)?

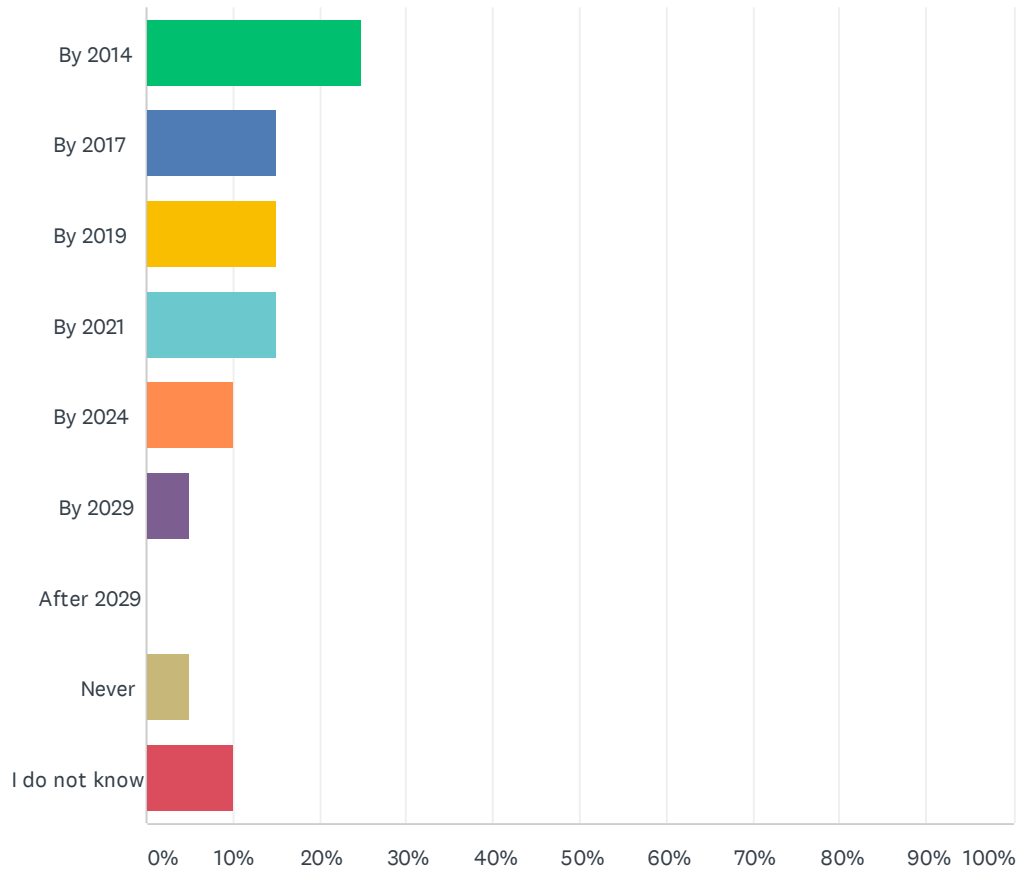
Answered: 20 Skipped: 5



ANSWER CHOICES	RESPONSES	
By 2014	45.00%	9
By 2017	10.00%	2
By 2019	25.00%	5
By 2021	5.00%	1
By 2024	5.00%	1
By 2029	0.00%	0
After 2029	0.00%	0
Never	0.00%	0
I do not know	10.00%	2
TOTAL		20

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?

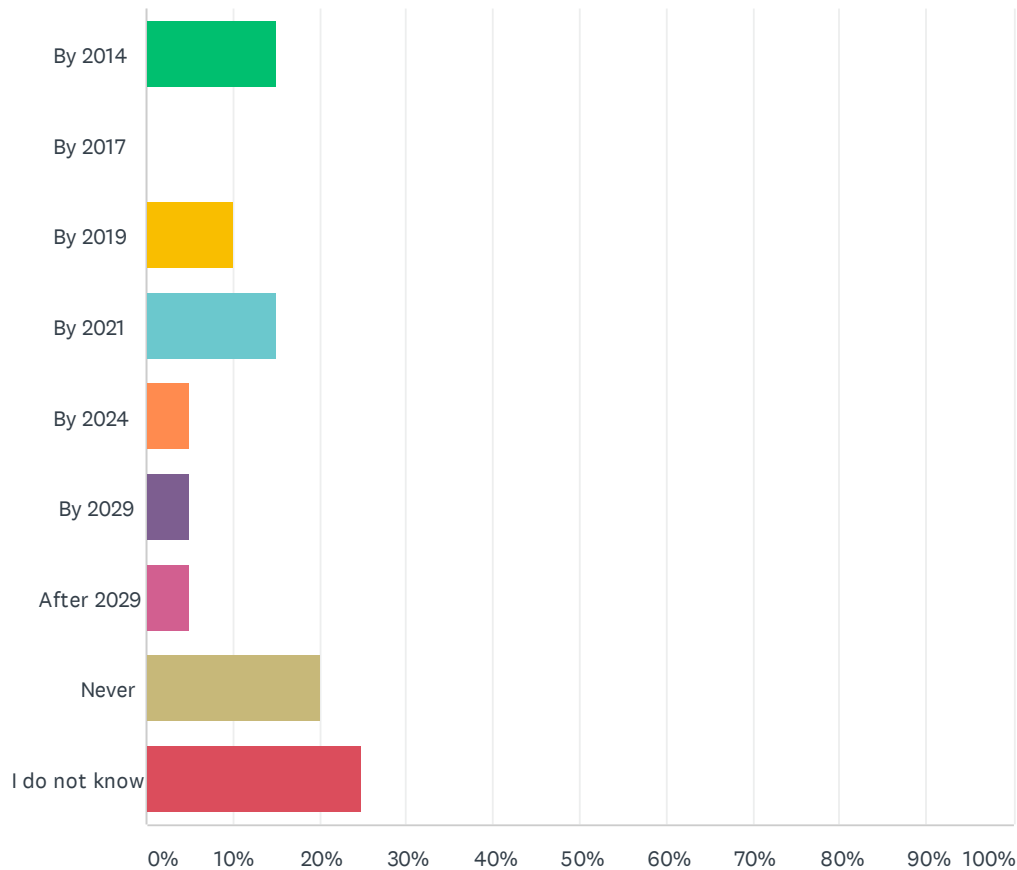
Answered: 20 Skipped: 5



ANSWER CHOICES	RESPONSES	
By 2014	25.00%	5
By 2017	15.00%	3
By 2019	15.00%	3
By 2021	15.00%	3
By 2024	10.00%	2
By 2029	5.00%	1
After 2029	0.00%	0
Never	5.00%	1
I do not know	10.00%	2
TOTAL		20

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)?

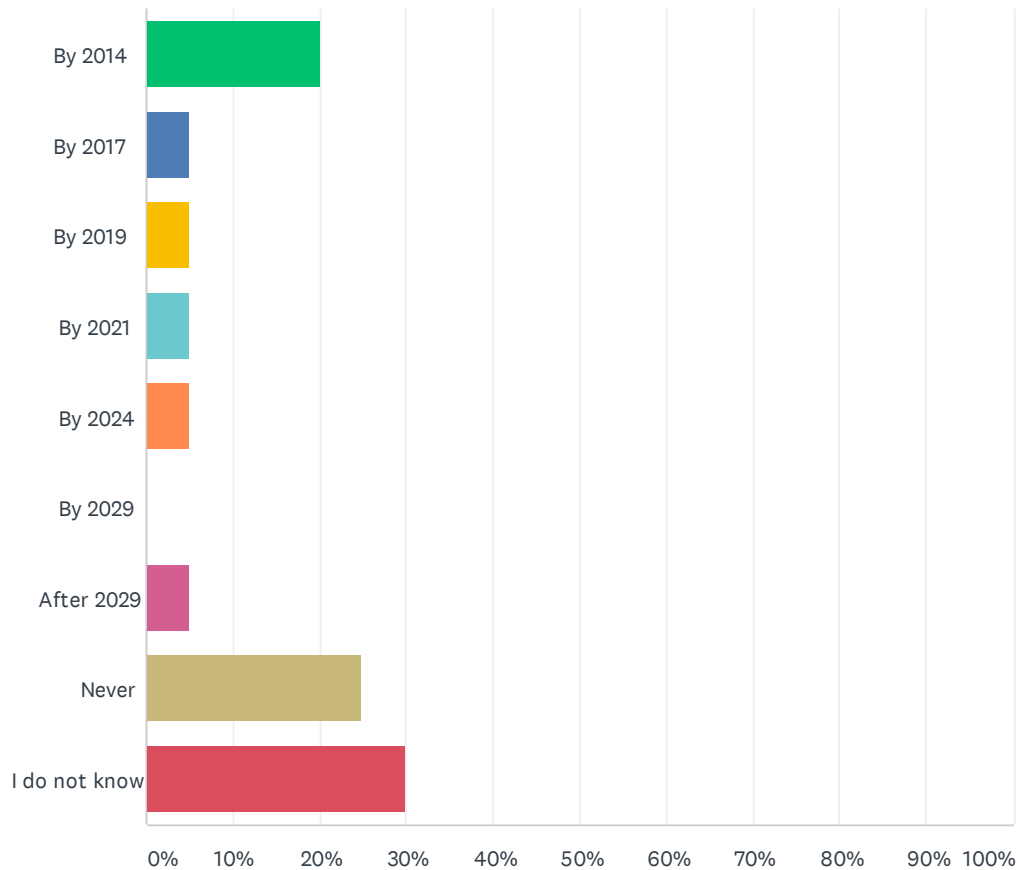
Answered: 20 Skipped: 5



ANSWER CHOICES	RESPONSES	
By 2014	15.00%	3
By 2017	0.00%	0
By 2019	10.00%	2
By 2021	15.00%	3
By 2024	5.00%	1
By 2029	5.00%	1
After 2029	5.00%	1
Never	20.00%	4
I do not know	25.00%	5
TOTAL		20

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)?

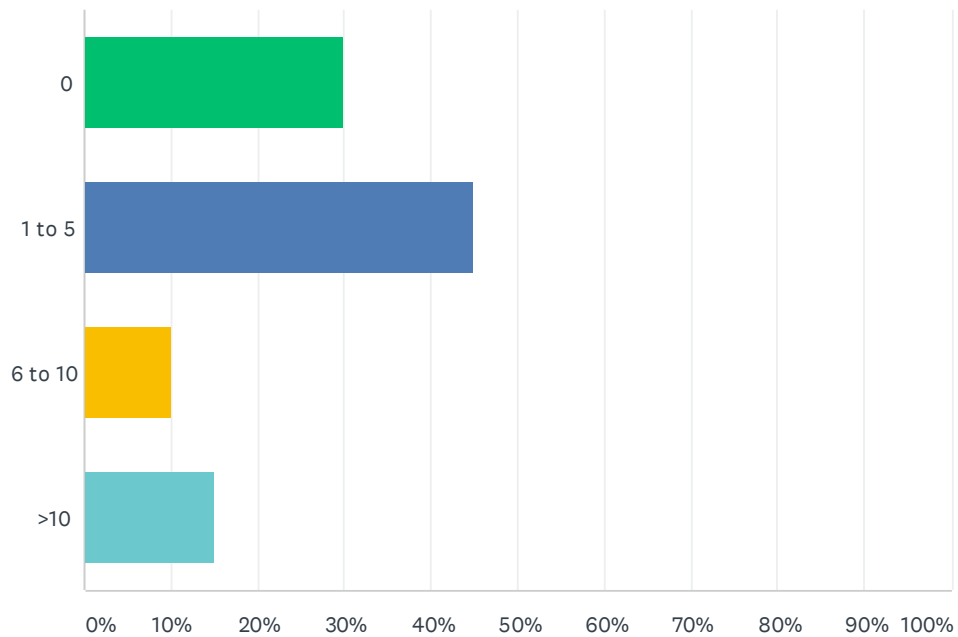
Answered: 20 Skipped: 5



ANSWER CHOICES	RESPONSES	
By 2014	20.00%	4
By 2017	5.00%	1
By 2019	5.00%	1
By 2021	5.00%	1
By 2024	5.00%	1
By 2029	0.00%	0
After 2029	5.00%	1
Never	25.00%	5
I do not know	30.00%	6
TOTAL		20

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

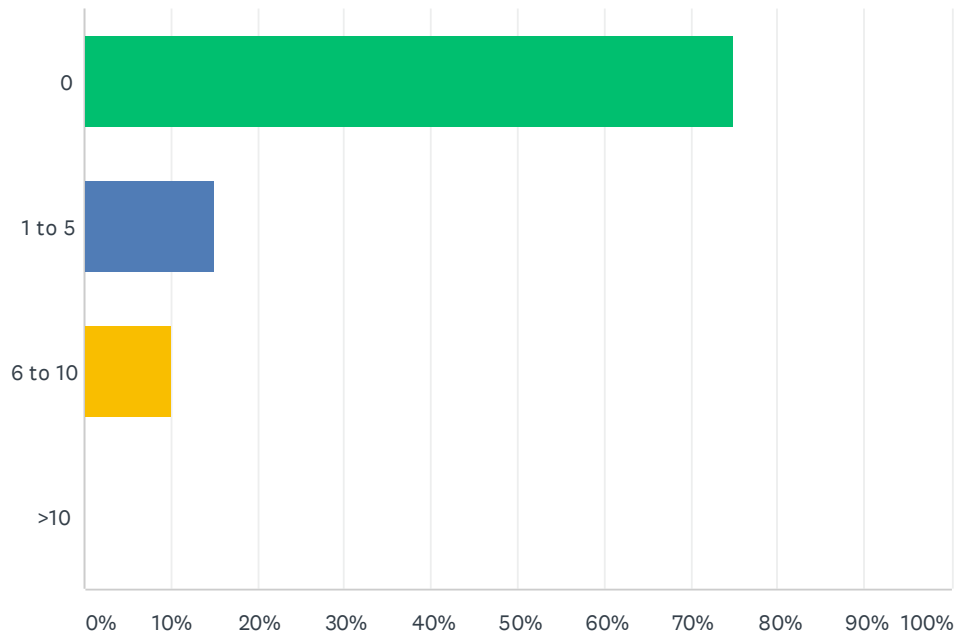
Answered: 20 Skipped: 5



ANSWER CHOICES	RESPONSES	
0	30.00%	6
1 to 5	45.00%	9
6 to 10	10.00%	2
>10	15.00%	3
TOTAL		20

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?

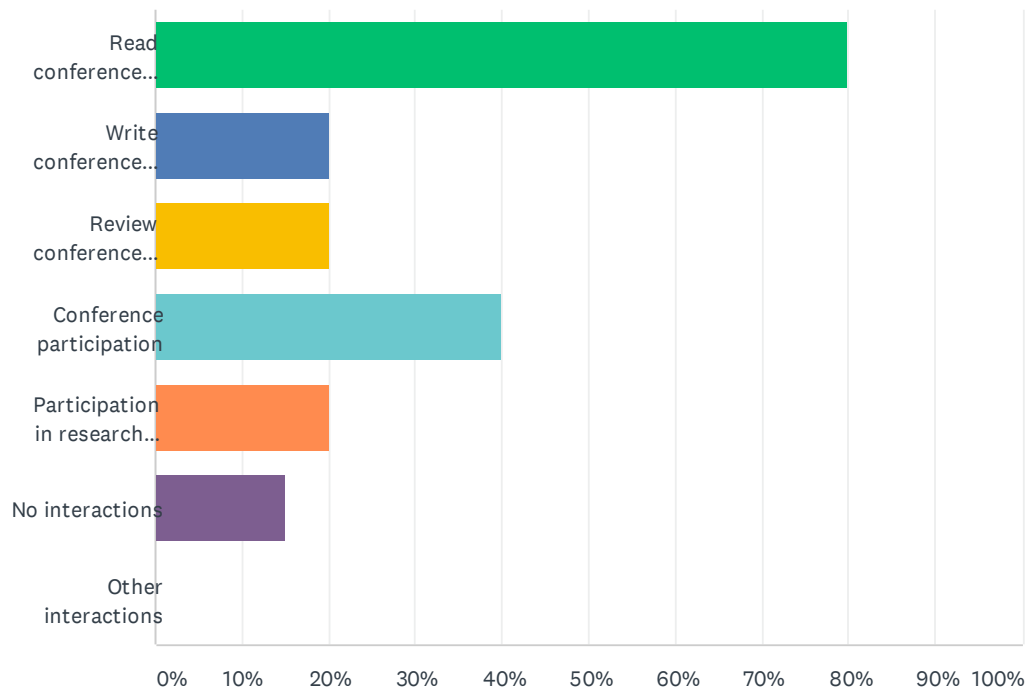
Answered: 20 Skipped: 5



ANSWER CHOICES	RESPONSES	
0	75.00%	15
1 to 5	15.00%	3
6 to 10	10.00%	2
>10	0.00%	0
TOTAL		20

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

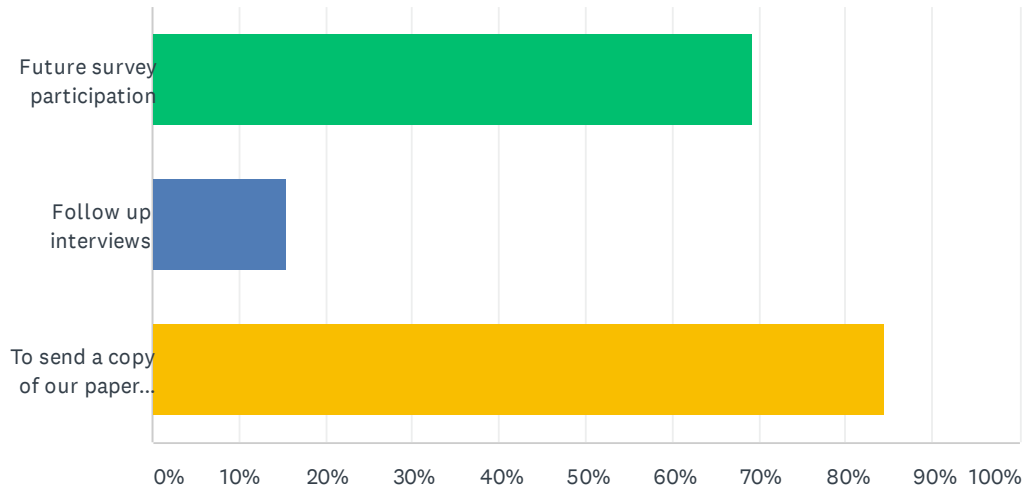
Answered: 20 Skipped: 5



ANSWER CHOICES	RESPONSES	
Read conference papers and journal articles	80.00%	16
Write conference papers and journal articles	20.00%	4
Review conference papers and journal articles	20.00%	4
Conference participation	40.00%	8
Participation in research projects with academics	20.00%	4
No interactions	15.00%	3
Other interactions	0.00%	0
Total Respondents: 20		

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: 13 Skipped: 12



ANSWER CHOICES	RESPONSES	
Future survey participation	69.23%	9
Follow up interviews	15.38%	2
To send a copy of our paper when it is published	84.62%	11
Total Respondents: 13		

Q32 Please enter any feedback or remarks on this survey.

Answered: 4 Skipped: 21