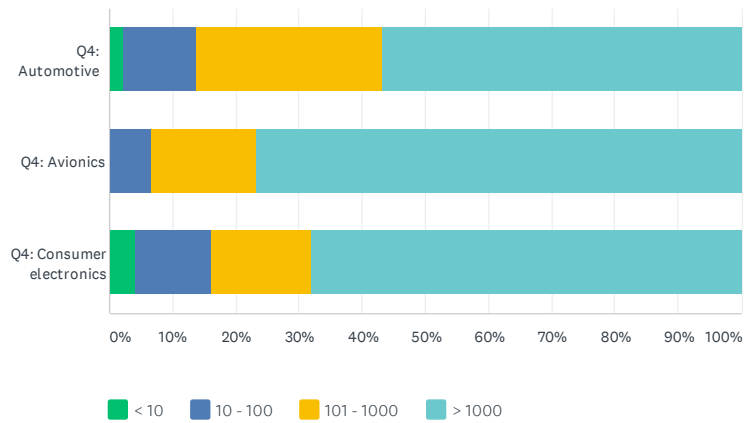


Real-time Systems Survey

Q1 How many employees does your organization have?

Answered: 86 Skipped: 0

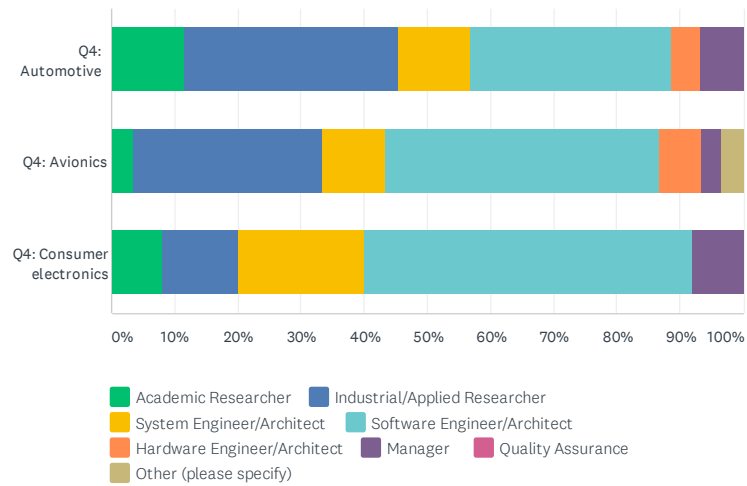


	< 10	10 - 100	101 - 1000	> 1000	TOTAL
Q4: Automotive (A)	2.27% 1	11.36% 5	29.55% 13	56.82% 25	51.16% 44
Q4: Avionics (B)	0.00% 0	6.67% 2	16.67% 5	76.67% 23	34.88% 30
Q4: Consumer electronics (C)	4.00% 1	12.00% 3	16.00% 4	68.00% 17	29.07% 25
Total Respondents	2	10	19	55	86

Real-time Systems Survey

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

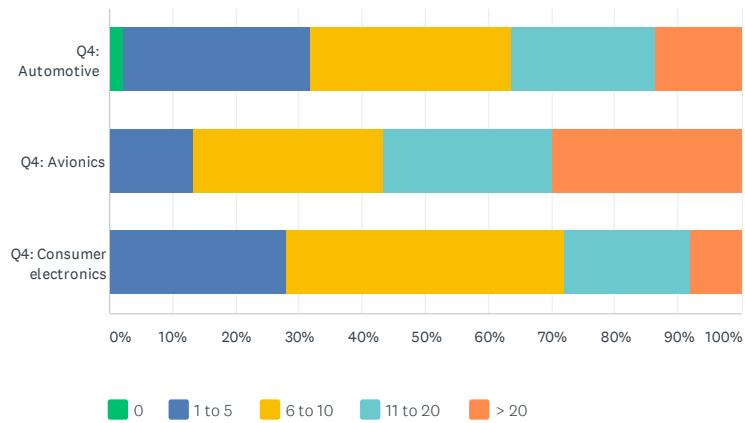
Answered: 86 Skipped: 0



	ACADEMIC RESEARCHER	INDUSTRIAL/APPLIED RESEARCHER	SYSTEM ENGINEER/ARCHITECT	SOFTWARE ENGINEER/ARCHITECT	HARDWARE ENGINEER/ARCHITECT	MANAGER	QUALITY ASSURANCE
Q4: Automotive (A)	11.36% 5	34.09% 15	11.36% 5	31.82% 14	4.55% 2	6.82% 3	
Q4: Avionics (B)	3.33% 1	30.00% 9	10.00% 3	43.33% 13	6.67% 2	3.33% 1	
Q4: Consumer electronics (C)	8.00% 2	12.00% 3	20.00% 5	52.00% 13	0.00% 0	8.00% 2	
Total Respondents	7	25	10	35	4	4	0

Q3 How many years of industrial experience do you have?

Answered: 86 Skipped: 0

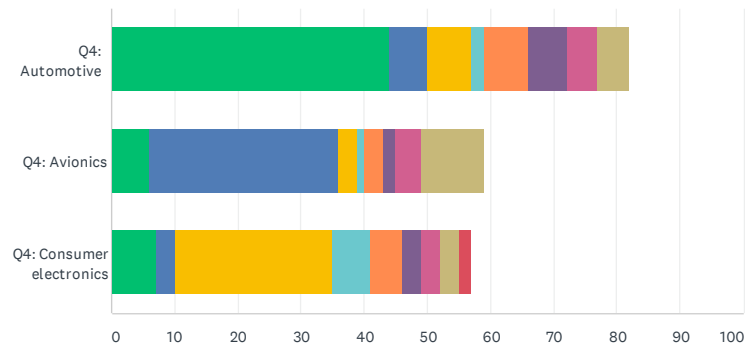


	0	1 TO 5	6 TO 10	11 TO 20	> 20	TOTAL
Q4: Automotive (A)	2.27% 1	29.55% 13	31.82% 14	22.73% 10	13.64% 6	51.16% 44
Q4: Avionics (B)	0.00% 0	13.33% 4	30.00% 9	26.67% 8	30.00% 9	34.88% 30
Q4: Consumer electronics (C)	0.00% 0	28.00% 7	44.00% 11	20.00% 5	8.00% 2	29.07% 25
Total Respondents	1	18	31	20	16	86

Real-time Systems Survey

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

Answered: 86 Skipped: 0

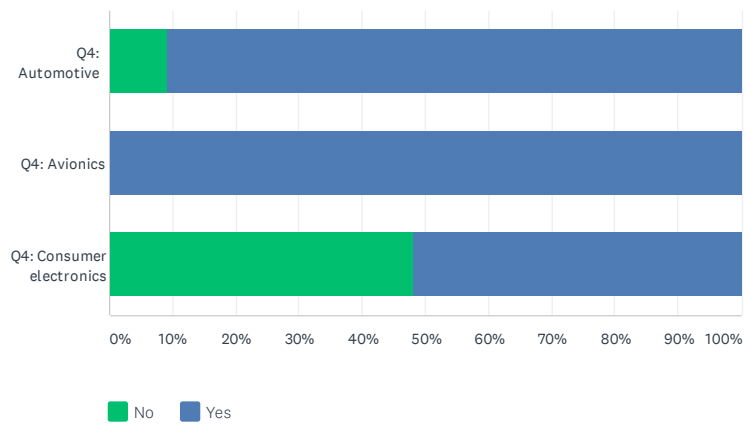


■ Automotive
 ■ Avionics
 ■ Consumer electronics
 ■ Semiconductors
 ■ Industrial automation / Manufacturing
 ■ Healthcare
 ■ Space
 ■ Defense
 ■ Other domain (please specify)

	AUTOMOTIVE	AVIONICS	CONSUMER ELECTRONICS	SEMICONDUCTORS	INDUSTRIAL AUTOMATION / MANUFACTURING	HEALTHCARE	SPACE	DEFENSE	OTHER DOMAIN (PLEASE SPECIFY)	TOTAL
Q4: Automotive (A)	100.00% 44 BC	13.64% 6 B	15.91% 7 C	4.55% 2 C	15.91% 7	13.64% 6	11.36% 5	11.36% 5 B	0.00% 0	95.35% 8
Q4: Avionics (B)	20.00% 6 A	100.00% 30 AC	10.00% 3 C	3.33% 1 C	10.00% 3	6.67% 2	13.33% 4	33.33% 10 AC	0.00% 0	68.60% 5
Q4: Consumer electronics (C)	28.00% 7 A	12.00% 3 B	100.00% 25 AB	24.00% 6 AB	20.00% 5	12.00% 3	12.00% 3	12.00% 3 B	8.00% 2	66.28% 5
Total Respondents	44	30	25	6	9	6	6	12	2	86

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

Answered: 86 Skipped: 0

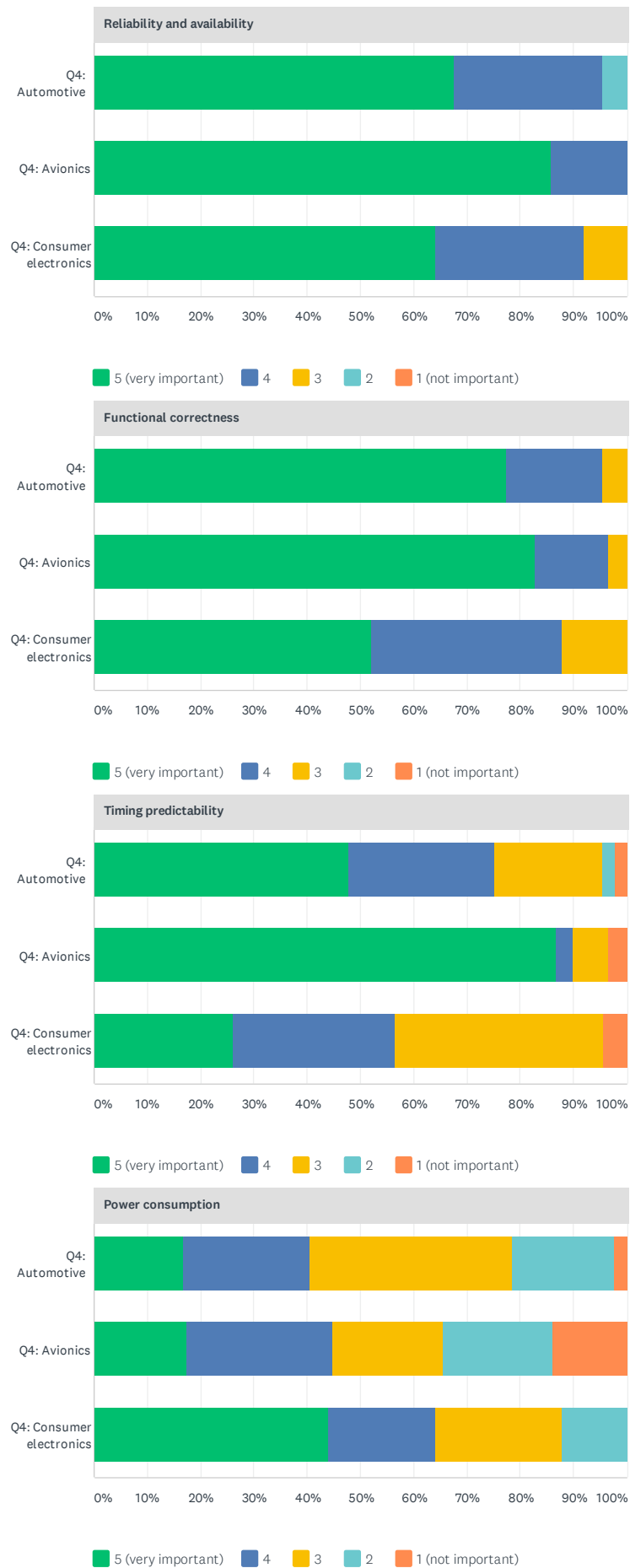


	NO	YES	TOTAL
Q4: Automotive (A)	9.09% 4	90.91% 40	51.16% 44
Q4: Avionics (B)	0.00% 0	100.00% 30	34.88% 30
Q4: Consumer electronics (C)	48.00% 12	52.00% 13	29.07% 25
Total Respondents	15	71	86

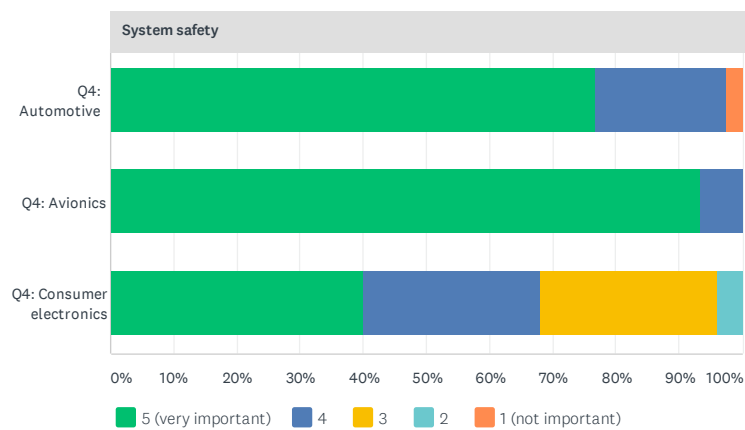
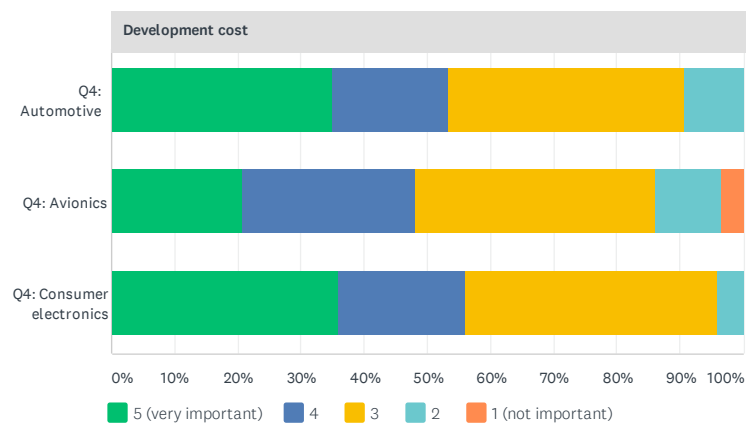
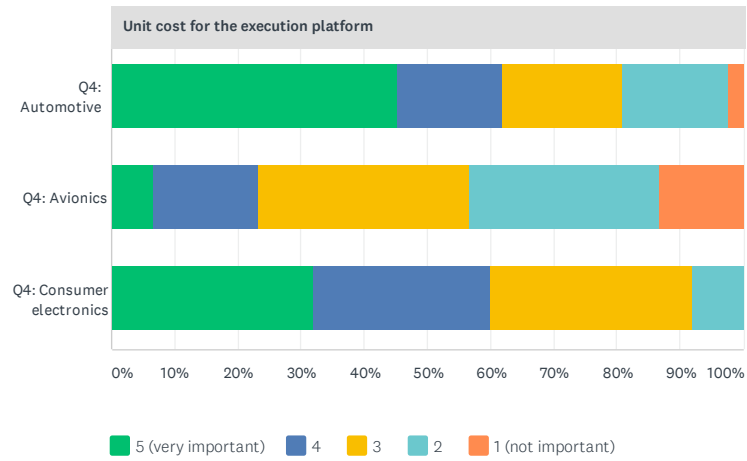
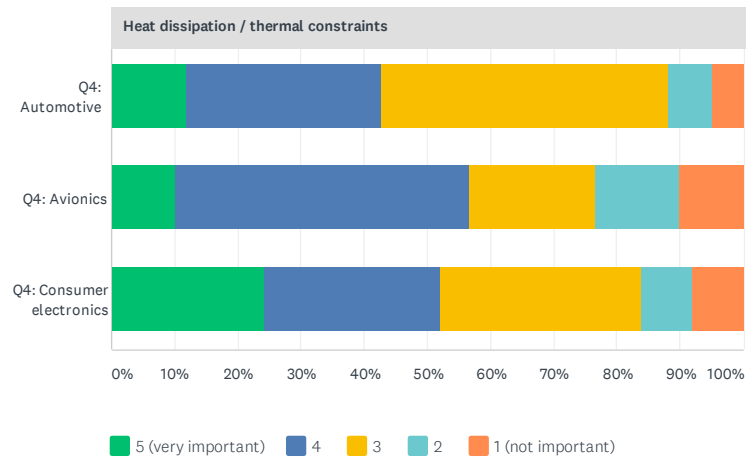
Real-time Systems Survey

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

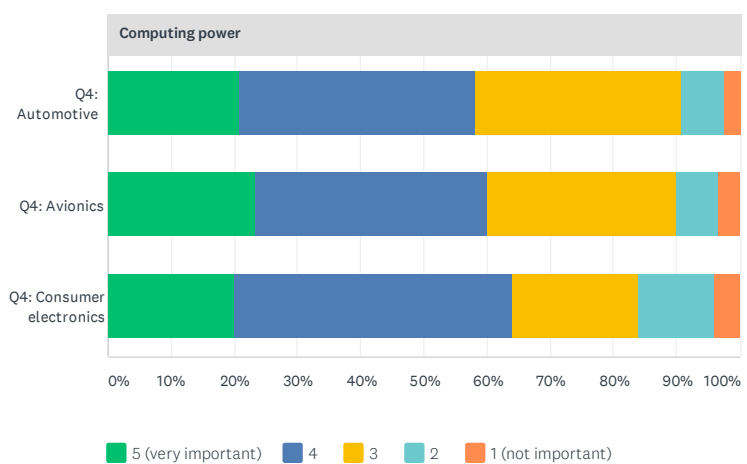
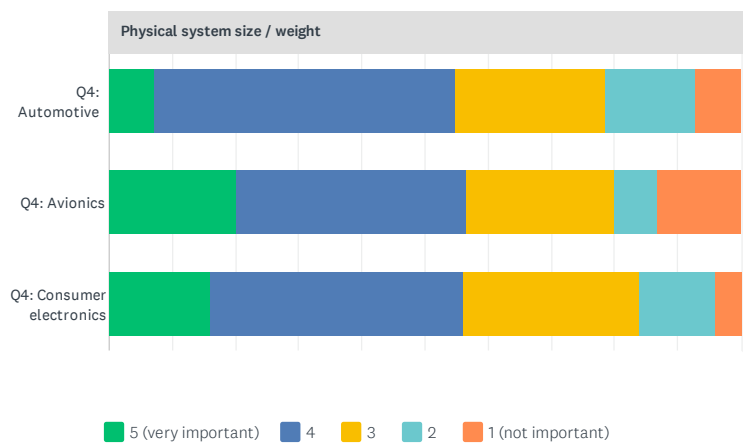
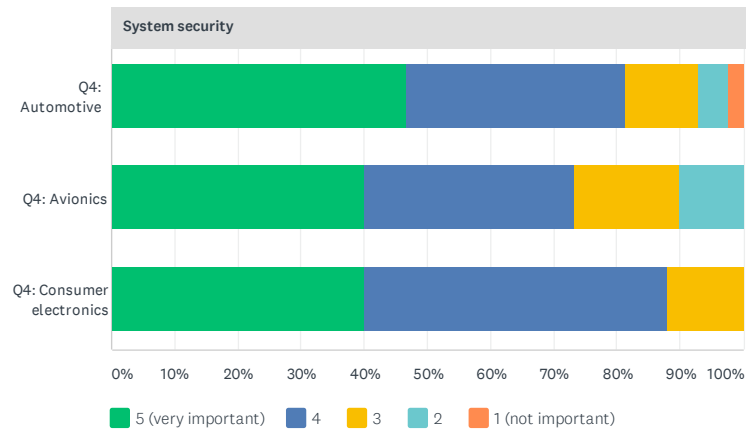
Answered: 86 Skipped: 0



Real-time Systems Survey



Real-time Systems Survey



Real-time Systems Survey

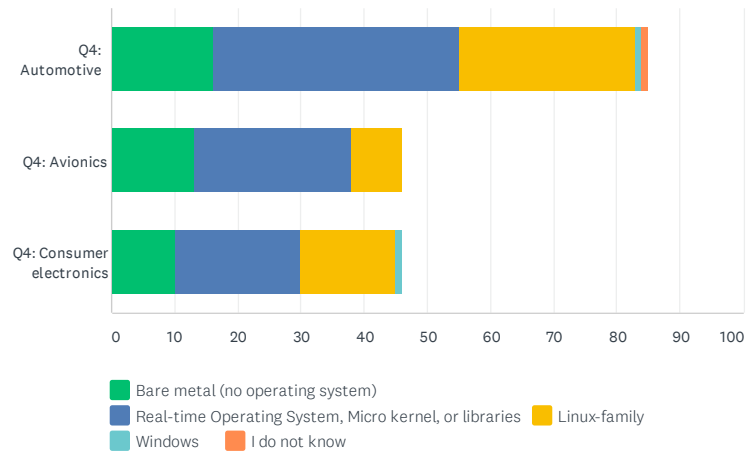
Reliability and availability							
	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	67.44% 29	27.91% 12	0.00% 0	4.65% 2	0.00% 0	50.00% 43	4.58
Q4: Avionics (B)	85.71% 24	14.29% 4	0.00% 0	0.00% 0	0.00% 0	32.56% 28	4.86
Q4: Consumer electronics (C)	64.00% 16	28.00% 7	8.00% 2	0.00% 0	0.00% 0	29.07% 25	4.56
Functional correctness							
	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	77.27% 34	18.18% 8	4.55% 2	0.00% 0	0.00% 0	51.16% 44	4.73
Q4: Avionics (B)	82.76% 24	13.79% 4	3.45% 1	0.00% 0	0.00% 0	33.72% 29	4.79
Q4: Consumer electronics (C)	52.00% 13	36.00% 9	12.00% 3	0.00% 0	0.00% 0	29.07% 25	4.40
Timing predictability							
	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	47.73% 21 B	27.27% 12 B	20.45% 9	2.27% 1	2.27% 1	51.16% 44	4.16
Q4: Avionics (B)	86.67% 26 A	3.33% 1 A	6.67% 2	0.00% 0	3.33% 1	34.88% 30	4.70
Q4: Consumer electronics (C)	26.09% 6	30.43% 7	39.13% 9	0.00% 0	4.35% 1	26.74% 23	3.74
Power consumption							
	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	16.67% 7	23.81% 10	38.10% 16	19.05% 8	2.38% 1	48.84% 42	3.33
Q4: Avionics (B)	17.24% 5	27.59% 8	20.69% 6	20.69% 6	13.79% 4	33.72% 29	3.14
Q4: Consumer electronics (C)	44.00% 11	20.00% 5	24.00% 6	12.00% 3	0.00% 0	29.07% 25	3.96
Heat dissipation / thermal constraints							
	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	11.90% 5	30.95% 13	45.24% 19 B	7.14% 3	4.76% 2	48.84% 42	3.38
Q4: Avionics (B)	10.00% 3	46.67% 14	20.00% 6 A	13.33% 4	10.00% 3	34.88% 30	3.33
Q4: Consumer electronics (C)	24.00% 6	28.00% 7	32.00% 8	8.00% 2	8.00% 2	29.07% 25	3.52
Unit cost for the execution platform							
	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	45.24% 19 B	16.67% 7	19.05% 8	16.67% 7	2.38% 1	48.84% 42	3.86
Q4: Avionics (B)	6.67% 2 A	16.67% 5	33.33% 10	30.00% 9	13.33% 4	34.88% 30	2.73
Q4: Consumer electronics (C)	32.00% 8	28.00% 7	32.00% 8	8.00% 2	0.00% 0	29.07% 25	3.84
Development cost							
	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	34.88% 15	18.60% 8	37.21% 16	9.30% 4	0.00% 0	50.00% 43	3.79
Q4: Avionics (B)	20.69% 6	27.59% 8	37.93% 11	10.34% 3	3.45% 1	33.72% 29	3.52
Q4: Consumer electronics (C)	36.00% 9	20.00% 5	40.00% 10	4.00% 1	0.00% 0	29.07% 25	3.88
System safety							
	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	76.74% 33	20.93% 9	0.00% 0	0.00% 0	2.33% 1	50.00% 43	4.70
Q4: Avionics (B)	93.33% 28	6.67% 2	0.00% 0	0.00% 0	0.00% 0	34.88% 30	4.93
Q4: Consumer electronics (C)	40.00% 10	28.00% 7	28.00% 7	4.00% 1	0.00% 0	29.07% 25	4.04

Real-time Systems Survey

System security							
	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	46.51% 20	34.88% 15	11.63% 5	4.65% 2	2.33% 1	50.00% 43	4.19
Q4: Avionics (B)	40.00% 12	33.33% 10	16.67% 5	10.00% 3	0.00% 0	34.88% 30	4.03
Q4: Consumer electronics (C)	40.00% 10	48.00% 12	12.00% 3	0.00% 0	0.00% 0	29.07% 25	4.28
Physical system size / weight							
	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	7.14% 3	47.62% 20	23.81% 10	14.29% 6	7.14% 3	48.84% 42	3.33
Q4: Avionics (B)	20.00% 6	36.67% 11	23.33% 7	6.67% 2	13.33% 4	34.88% 30	3.43
Q4: Consumer electronics (C)	16.00% 4	40.00% 10	28.00% 7	12.00% 3	4.00% 1	29.07% 25	3.52
Computing power							
	5 (VERY IMPORTANT)	4	3	2	1 (NOT IMPORTANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	20.93% 9	37.21% 16	32.56% 14	6.98% 3	2.33% 1	50.00% 43	3.67
Q4: Avionics (B)	23.33% 7	36.67% 11	30.00% 9	6.67% 2	3.33% 1	34.88% 30	3.70
Q4: Consumer electronics (C)	20.00% 5	44.00% 11	20.00% 5	12.00% 3	4.00% 1	29.07% 25	3.64

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

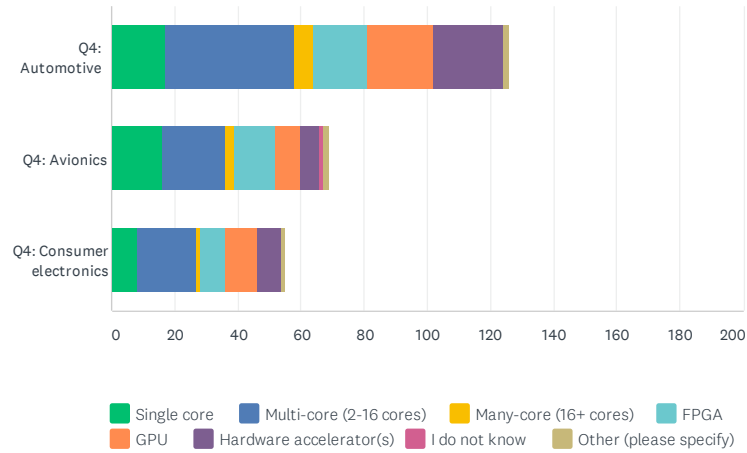
Answered: 82 Skipped: 4



	BARE METAL (NO OPERATING SYSTEM)	REAL-TIME OPERATING SYSTEM, MICRO KERNEL, OR LIBRARIES	LINUX-FAMILY	WINDOWS	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	37.21% 16	90.70% 39	65.12% 28	2.33% 1	2.33% 1	103.66% 85
Q4: Avionics (B)	44.83% 13	86.21% 25	27.59% 8	0.00% 0	0.00% 0	56.10% 46
Q4: Consumer electronics (C)	43.48% 10	86.96% 20	65.22% 15	4.35% 1	0.00% 0	56.10% 46
Total Respondents	32	71	43	2	1	82
	PLEASE NAME THE OPERATING SYSTEMS YOU ARE USING, IF ANY.					TOTAL
Q4: Automotive (A)						0
Q4: Avionics (B)						0
Q4: Consumer electronics (C)						0

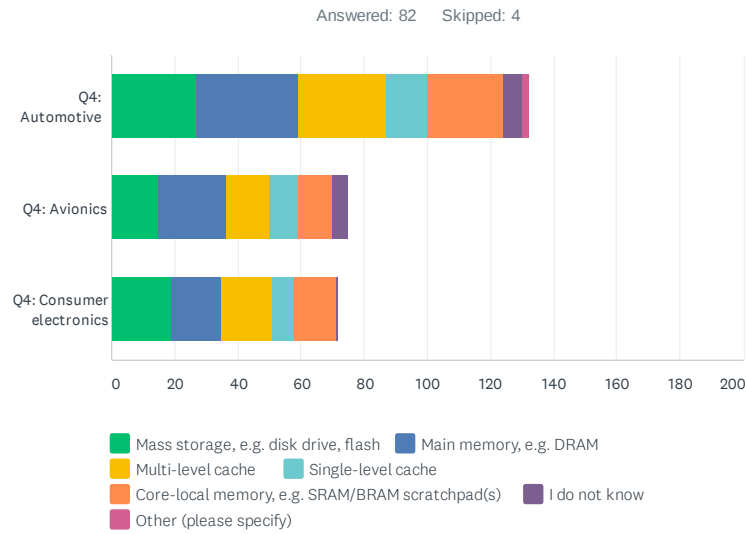
Q8 Please select the options that describe the processing hardware of the considered system. Select all options that apply.

Answered: 82 Skipped: 4



	SINGLE CORE	MULTI-CORE (2-16 CORES)	MANY-CORE (16+ CORES)	FPGA	GPU	HARDWARE ACCELERATOR(S)	I DO NOT KNOW	OTHER (PLEASE SPECIFY)	TOTAL
Q4: Automotive (A)	39.53% 17	95.35% 41	13.95% 6	39.53% 17	48.84% 21	51.16% 22	0.00% 0	4.65% 2	153.66% 126
Q4: Avionics (B)	55.17% 16	68.97% 20	10.34% 3	44.83% 13	27.59% 8	20.69% 6	3.45% 1	6.90% 2	84.15% 69
Q4: Consumer electronics (C)	34.78% 8	82.61% 19	4.35% 1	34.78% 8	43.48% 10	34.78% 8	0.00% 0	4.35% 1	67.07% 55
Total Respondents	36	67	9	32	29	29	1	5	82

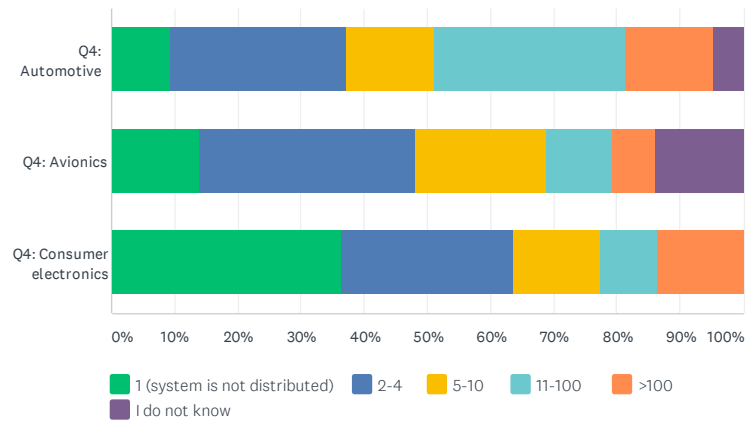
Q9 Please select the options that describe the memory hierarchy of the considered system.
Select all options that apply.



	MASS STORAGE, E.G. DISK DRIVE, FLASH	MAIN MEMORY, E.G. DRAM	MULTI- LEVEL CACHE	SINGLE- LEVEL CACHE	CORE-LOCAL MEMORY, E.G. SRAM/BRAM SCRATCHPAD(S)	I DO NOT KNOW	OTHER (PLEASE SPECIFY)	TOTAL
Q4: Automotive (A)	62.79% 27	74.42% 32	65.12% 28	30.23% 13	55.81% 24	13.95% 6	4.65% 2	160.98% 132
Q4: Avionics (B)	51.72% 15	72.41% 21	48.28% 14	31.03% 9	37.93% 11	17.24% 5	0.00% 0	91.46% 75
Q4: Consumer electronics (C)	82.61% 19	69.57% 16	69.57% 16	30.43% 7	56.52% 13	4.35% 1	0.00% 0	87.80% 72
Total Respondents	52	58	49	25	39	10	2	82

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

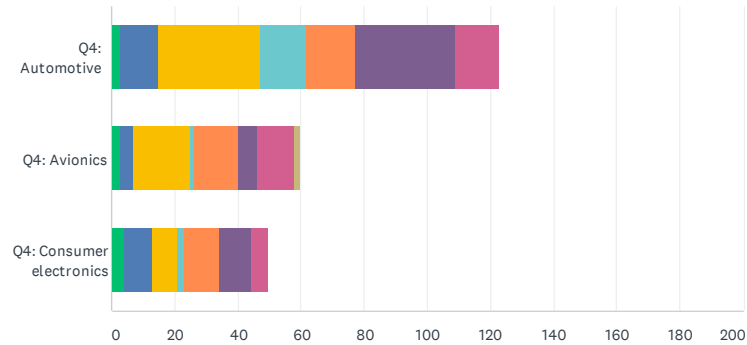
Answered: 81 Skipped: 5



	1 (SYSTEM IS NOT DISTRIBUTED)	2-4	5-10	11-100	>100	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	9.30% 4	27.91% 12	13.95% 6	30.23% 13	13.95% 6	4.65% 2	53.09% 43
Q4: Avionics (B)	13.79% 4	34.48% 10	20.69% 6	10.34% 3	6.90% 2	13.79% 4	35.80% 29
Q4: Consumer electronics (C)	36.36% 8	27.27% 6	13.64% 3	9.09% 2	13.64% 3	0.00% 0	27.16% 22
Total Respondents	15	22	11	18	9	6	81

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

Answered: 82 Skipped: 4



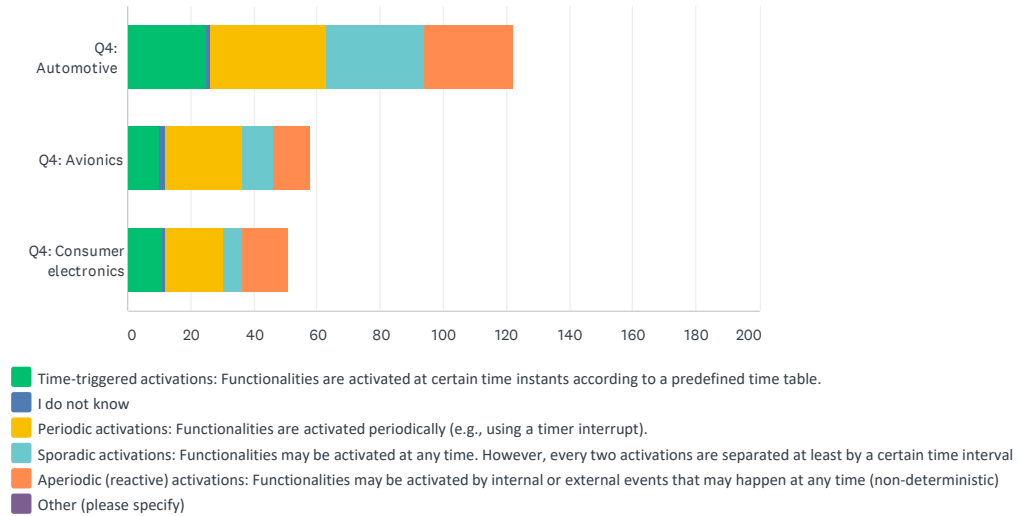
■ System is not distributed
 ■ Wireless network
 ■ Ethernet
 ■ FlexRay
 ■ Serial
 ■ CAN
 ■ Other wired network
 ■ I do not know

	SYSTEM IS NOT DISTRIBUTED (1)	WIRELESS NETWORK (2)	ETHERNET (3)	FLEXRAY (4)	SERIAL (5)	CAN (6)	OTHER WIRED NETWORK (7)	I DO NOT KNOW (8)	TOTAL
Q4: Automotive (A)	6.98% 3	27.91% 12	74.42% 32	34.88% 15 B	34.88% 15	74.42% 32 B	32.56% 14	0.00% 0 B	150.00% 123
Q4: Avionics (B)	10.34% 3	13.79% 4	62.07% 18	3.45% 1 A	48.28% 14	20.69% 6 A	41.38% 12	6.90% 2 A	73.17% 60
Q4: Consumer electronics (C)	17.39% 4	39.13% 9	34.78% 8	8.70% 2	47.83% 11	43.48% 10	26.09% 6	0.00% 0	60.98% 50
Total Respondents	9	21	51	16	31	39	27	2	82

BASIC STATISTICS					
	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Q4: Automotive (A)	1.00	7.00	4.00	4.46	1.69
Q4: Avionics (B)	1.00	8.00	5.00	4.58	1.91
Q4: Consumer electronics (C)	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.

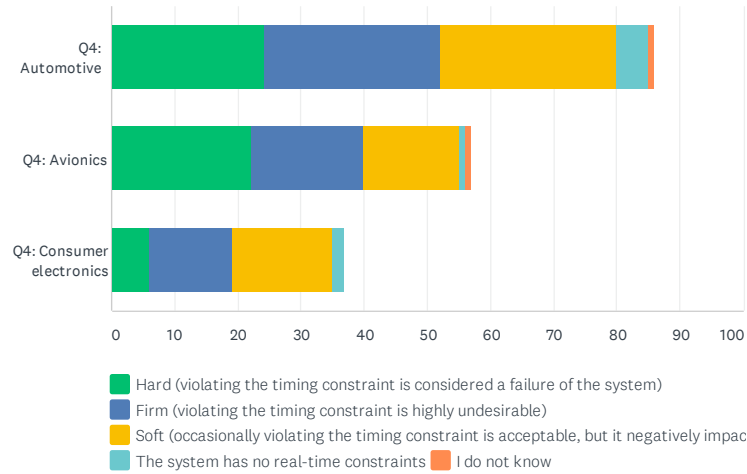
Answered: 80 Skipped: 6



	TIME-TRIGGERED ACTIVATIONS: FUNCTIONALITIES ARE ACTIVATED AT CERTAIN TIME INSTANTS ACCORDING TO A PREDEFINED TIME TABLE.	I DO NOT KNOW	PERIODIC ACTIVATIONS: FUNCTIONALITIES ARE ACTIVATED PERIODICALLY (E.G., USING A TIMER INTERRUPT)	SPORADIC ACTIVATIONS: FUNCTIONALITIES MAY BE ACTIVATED AT ANY TIME. HOWEVER, EVERY TWO ACTIVATIONS ARE SEPARATED AT LEAST BY A CERTAIN TIME INTERVAL	APERIODIC (REACTIVE) ACTIVATIONS: FUNCTIONALITIES MAY BE ACTIVATED BY INTERNAL OR EXTERNAL EVENTS THAT MAY HAPPEN AT ANY TIME (NON-DETERMINISTIC).	OTHER (PLEASE SPECIFY)	TOTAL
Q4: Automotive (A)	20.49% 25	0.82% 1	30.33% 37	25.41% 31	22.95% 28	0.00% 0	152.50% 122
Q4: Avionics (B)	17.24% 10	3.45% 2	41.38% 24	17.24% 10	20.69% 12	0.00% 0	72.50% 58
Q4: Consumer electronics (C)	21.57% 11	1.96% 1	35.29% 18	11.76% 6	29.41% 15	0.00% 0	63.75% 51
Total Respondents	40	2	68	39	48	0	80

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

Answered: 80 Skipped: 6

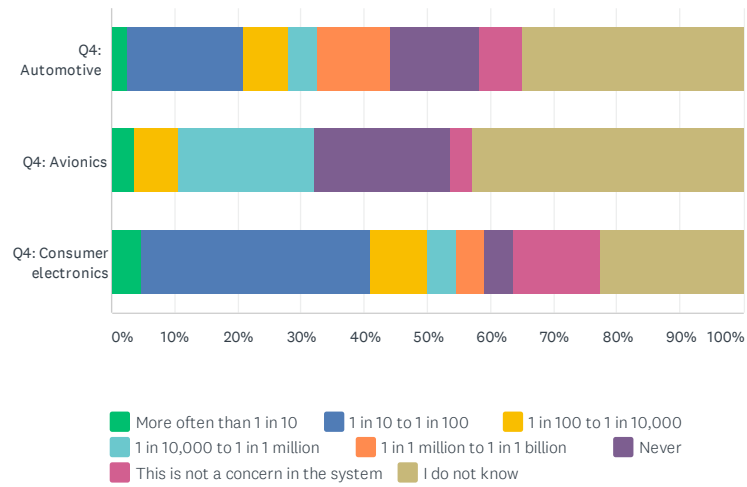


	HARD (VIOLATING THE TIMING CONSTRAINT IS CONSIDERED A FAILURE OF THE SYSTEM)	FIRM (VIOLATING THE TIMING CONSTRAINT IS HIGHLY UNDESIRABLE)	SOFT (OCCASIONALLY VIOLATING THE TIMING CONSTRAINT IS ACCEPTABLE, BUT IT NEGATIVELY IMPACTS THE PERCEIVED QUALITY OF THE SYSTEM)	THE SYSTEM HAS NO REAL-TIME CONSTRAINTS	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	55.81% 24	65.12% 28	65.12% 28	11.63% 5	2.33% 1	107.50% 86
Q4: Avionics (B)	78.57% 22	64.29% 18	53.57% 15	3.57% 1	3.57% 1	71.25% 57
Q4: Consumer electronics (C)	27.27% 6	59.09% 13	72.73% 16	9.09% 2	0.00% 0	46.25% 37
Total Respondents	44	48	49	8	2	80

Real-time Systems Survey

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?

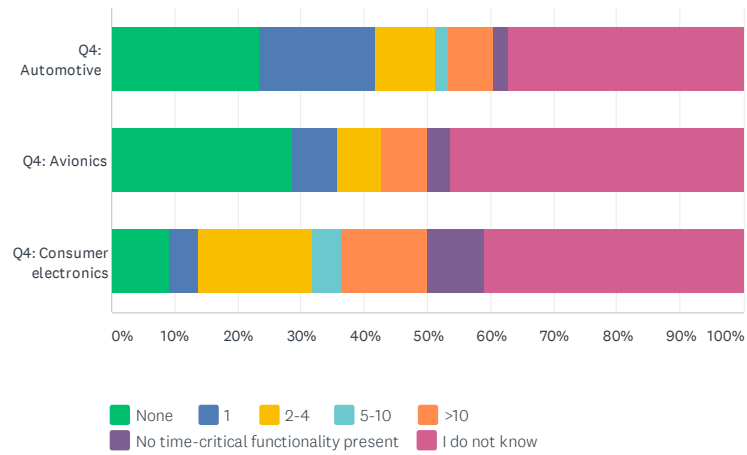
Answered: 80 Skipped: 6



	MORE OFTEN THAN 1 IN 10	1 IN 10 TO 1 IN 100	1 IN 100 TO 1 IN 10,000	1 IN 10,000 TO 1 IN 1 MILLION	1 IN 1 MILLION TO 1 IN 1 BILLION	NEVER	THIS IS NOT A CONCERN IN THE SYSTEM	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	2.33% 1	18.60% 8	6.98% 3	4.65% 2	11.63% 5	13.95% 6	6.98% 3	34.88% 15	53.75% 43
Q4: Avionics (B)	3.57% 1	0.00% 0	7.14% 2	21.43% 6	0.00% 0	21.43% 6	3.57% 1	42.86% 12	35.00% 28
Q4: Consumer electronics (C)	4.55% 1	36.36% 8	9.09% 2	4.55% 1	4.55% 1	4.55% 1	13.64% 3	22.73% 5	27.50% 22
Total Respondents	2	14	3	8	6	12	5	30	80

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?

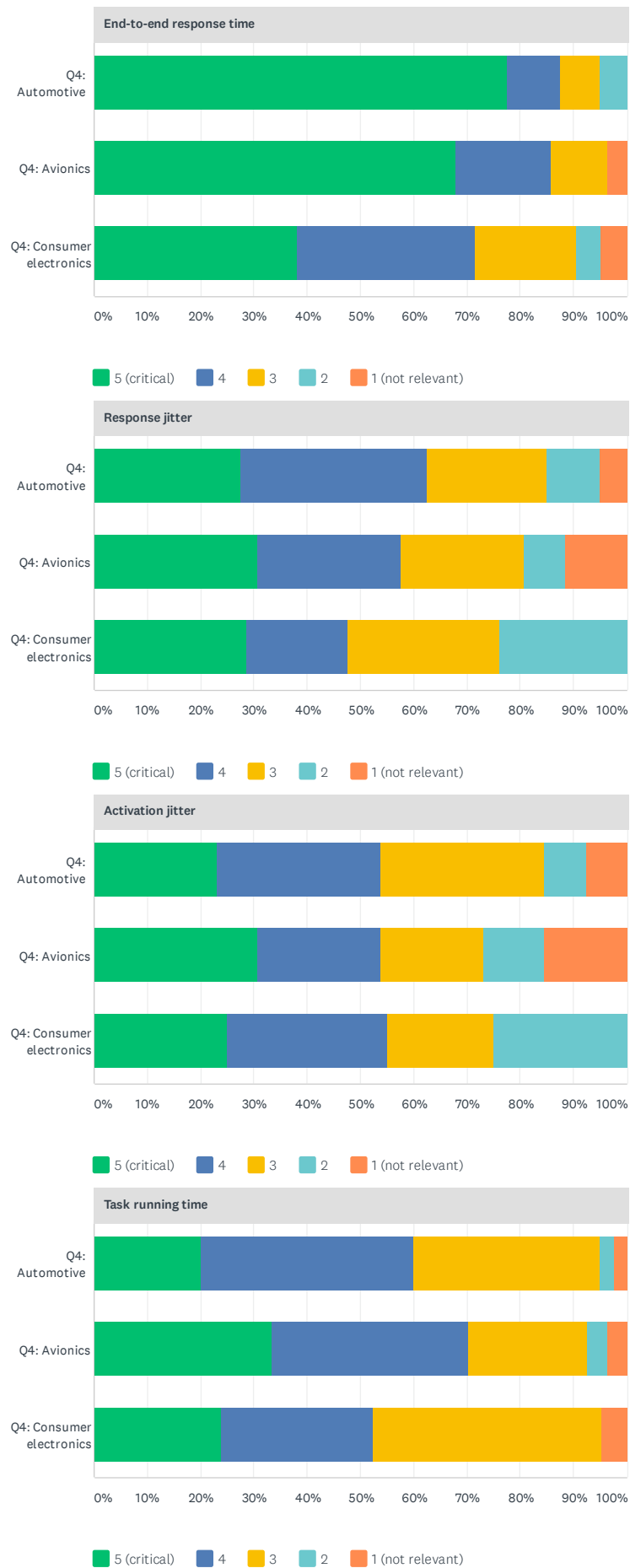
Answered: 80 Skipped: 6



	NONE	1	2-4	5-10	>10	NO TIME-CRITICAL FUNCTIONALITY PRESENT	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	23.26% 10	18.60% 8	9.30% 4	2.33% 1	6.98% 3	2.33% 1	37.21% 16	53.75% 43
Q4: Avionics (B)	28.57% 8	7.14% 2	7.14% 2	0.00% 0	7.14% 2	3.57% 1	46.43% 13	35.00% 28
Q4: Consumer electronics (C)	9.09% 2	4.55% 1	18.18% 4	4.55% 1	13.64% 3	9.09% 2	40.91% 9	27.50% 22
Total Respondents	17	10	8	1	6	4	34	80

Q16 What are relevant timing constraints in the considered system?

Answered: 80 Skipped: 6

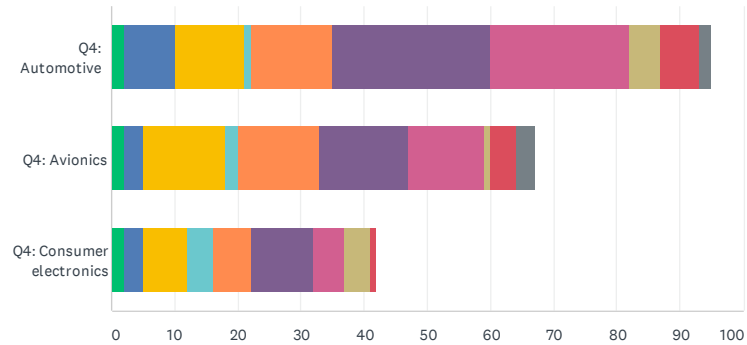


Real-time Systems Survey

End-to-end response time							
	5 (CRITICAL)	4	3	2	1 (NOT RELEVANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	77.50% 31	10.00% 4	7.50% 3	5.00% 2	0.00% 0	50.00% 40	4.60
Q4: Avionics (B)	67.86% 19	17.86% 5	10.71% 3	0.00% 0	3.57% 1	35.00% 28	4.46
Q4: Consumer electronics (C)	38.10% 8	33.33% 7	19.05% 4	4.76% 1	4.76% 1	26.25% 21	3.95
Response jitter							
	5 (CRITICAL)	4	3	2	1 (NOT RELEVANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	27.50% 11	35.00% 14	22.50% 9	10.00% 4	5.00% 2	50.00% 40	3.70
Q4: Avionics (B)	30.77% 8	26.92% 7	23.08% 6	7.69% 2	11.54% 3	32.50% 26	3.58
Q4: Consumer electronics (C)	28.57% 6	19.05% 4	28.57% 6	23.81% 5	0.00% 0	26.25% 21	3.52
Activation jitter							
	5 (CRITICAL)	4	3	2	1 (NOT RELEVANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	23.08% 9	30.77% 12	30.77% 12	7.69% 3	7.69% 3	48.75% 39	3.54
Q4: Avionics (B)	30.77% 8	23.08% 6	19.23% 5	11.54% 3	15.38% 4	32.50% 26	3.42
Q4: Consumer electronics (C)	25.00% 5	30.00% 6	20.00% 4	25.00% 5	0.00% 0	25.00% 20	3.55
Task running time							
	5 (CRITICAL)	4	3	2	1 (NOT RELEVANT)	TOTAL	WEIGHTED AVERAGE
Q4: Automotive (A)	20.00% 8	40.00% 16	35.00% 14	2.50% 1	2.50% 1	50.00% 40	3.73
Q4: Avionics (B)	33.33% 9	37.04% 10	22.22% 6	3.70% 1	3.70% 1	33.75% 27	3.93
Q4: Consumer electronics (C)	23.81% 5	28.57% 6	42.86% 9	0.00% 0	4.76% 1	26.25% 21	3.67
	Q4: AUTOMOTIVE		Q4: AVIONICS		Q4: CONSUMER ELECTRONICS		TOTAL
Other (please specify)	0		0		0		0

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

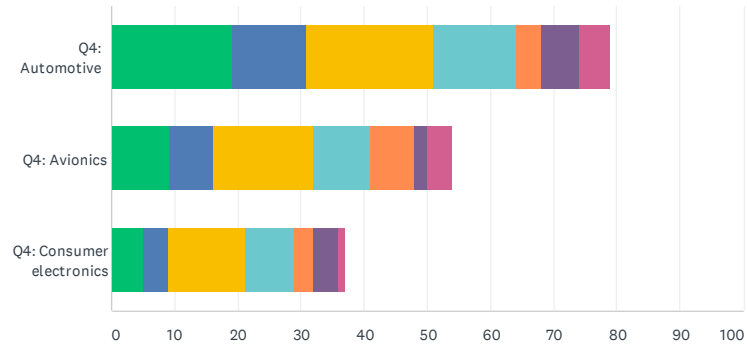
Answered: 81 Skipped: 5



	THIS CASE NEVER HAPPENS	ABORTS THE TASKS	RESTARTS THE TASKS	ABORTS OTHER TASKS	REBOOTS THE SYSTEM	REPORTS THE ISSUE AND CONTINUES	SWITCHES TO DEGRADED / SAFE MODE	DOES NOTHING	I DO NOT KNOW	OTHER (PLEASE SPECIFY)	TOTAL
Q4: Automotive (A)	4.65% 2	18.60% 8	25.58% 11	2.33% 1 C	30.23% 13	58.14% 25	51.16% 22	11.63% 5	13.95% 6	4.65% 2	117.28% 95
Q4: Avionics (B)	6.90% 2	10.34% 3	44.83% 13	6.90% 2	44.83% 13	48.28% 14	41.38% 12	3.45% 1	13.79% 4	10.34% 3	82.72% 67
Q4: Consumer electronics (C)	9.09% 2	13.64% 3	31.82% 7	18.18% 4 A	27.27% 6	45.45% 10	22.73% 5	18.18% 4	4.55% 1	0.00% 0	51.85% 42
Total Respondents	6	14	24	5	28	40	36	9	10	4	81

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

Answered: 78 Skipped: 8

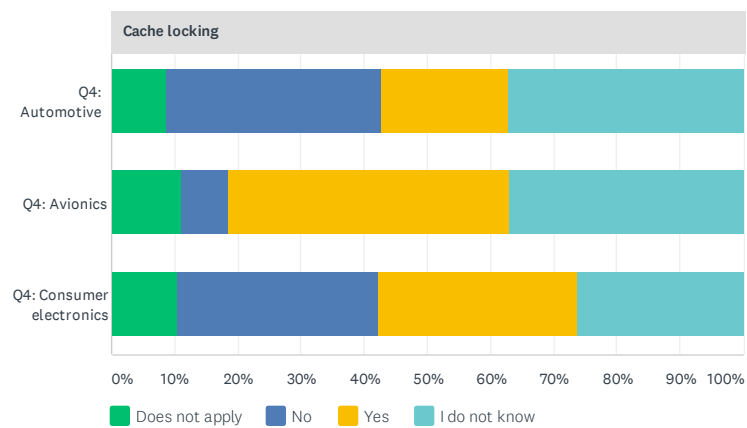
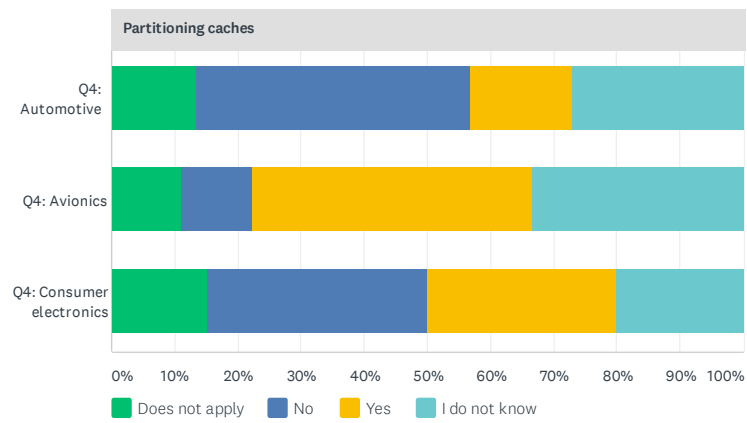
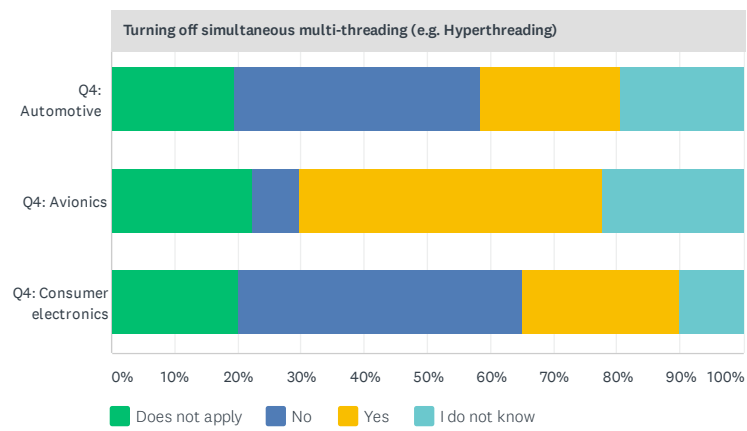
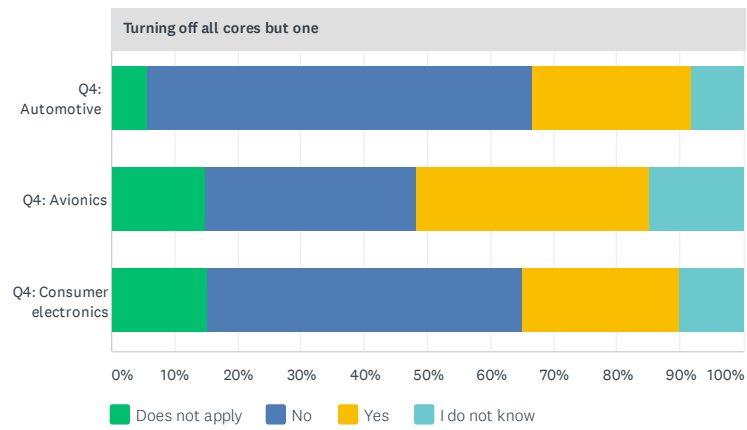


- Third party measurement-based timing analysis tool
- Third party static timing analysis tools
- In-house measurement-based timing analysis tool
- In-house ad-hoc timing measurements
- In-house static timing analysis tool
- None/Tasks' WCETs are not estimated
- I do not know
- Please enter the name of the used WCET estimation tool, if any

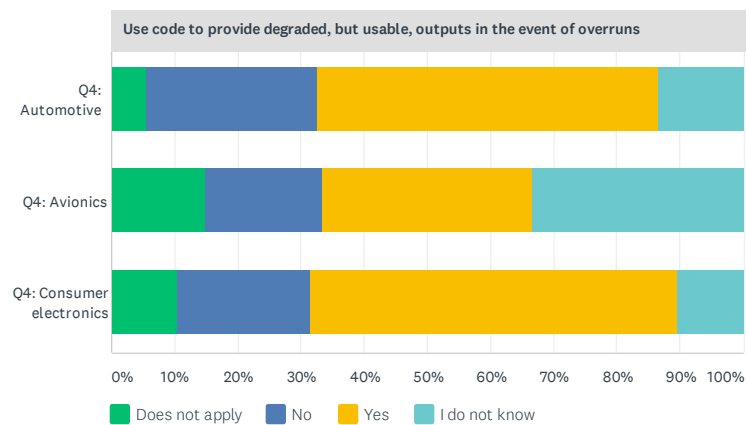
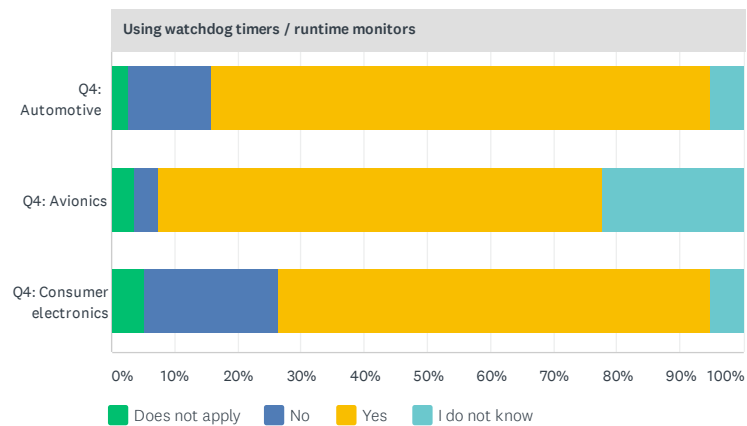
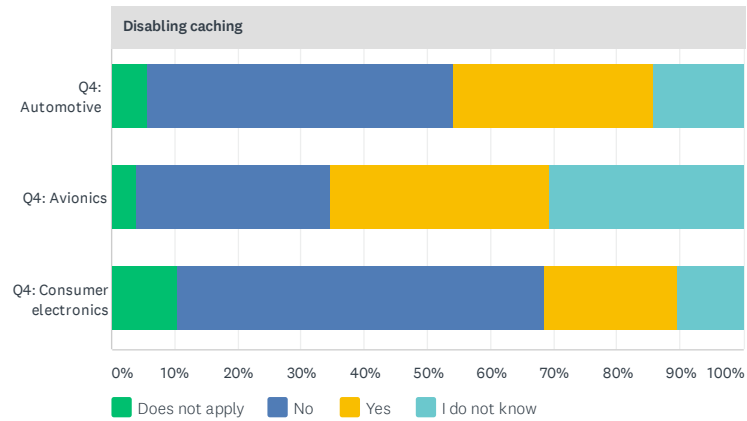
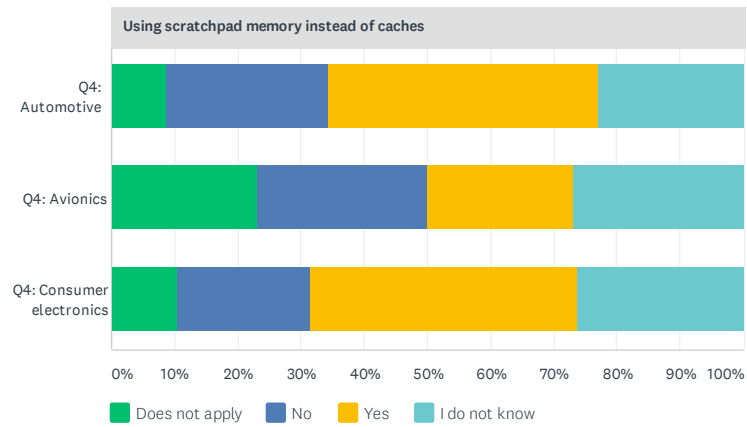
	THIRD PARTY MEASUREMENT-BASED TIMING ANALYSIS TOOL	THIRD PARTY STATIC TIMING ANALYSIS TOOLS	IN-HOUSE MEASUREMENT-BASED TIMING ANALYSIS TOOL	IN-HOUSE AD-HOC TIMING MEASUREMENTS	IN-HOUSE STATIC TIMING ANALYSIS TOOL	NONE/TASKS' WCETS ARE NOT ESTIMATED	I DO NOT KNOW	PLEASE ENTER THE NAME OF THE USED WCET ESTIMATION TOOL, IF ANY	TOTAL
Q4: Automotive (A)	46.34% 19	29.27% 12	48.78% 20	31.71% 13	9.76% 4	14.63% 6	12.20% 5	0.00% 0	101.28% 79
Q4: Avionics (B)	31.03% 9	24.14% 7	55.17% 16	31.03% 9	24.14% 7	6.90% 2	13.79% 4	0.00% 0	69.23% 54
Q4: Consumer electronics (C)	23.81% 5	19.05% 4	57.14% 12	38.10% 8	14.29% 3	19.05% 4	4.76% 1	0.00% 0	47.44% 37
Total Respondents	30	19	40	30	12	11	8	0	78

Q19 What steps are taken to help increase timing predictability?

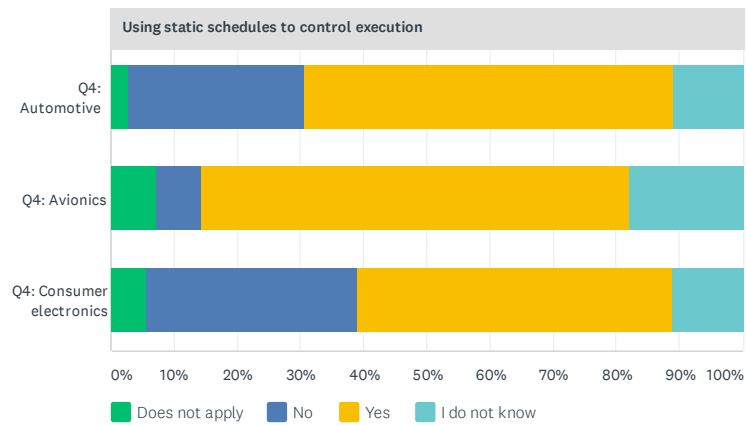
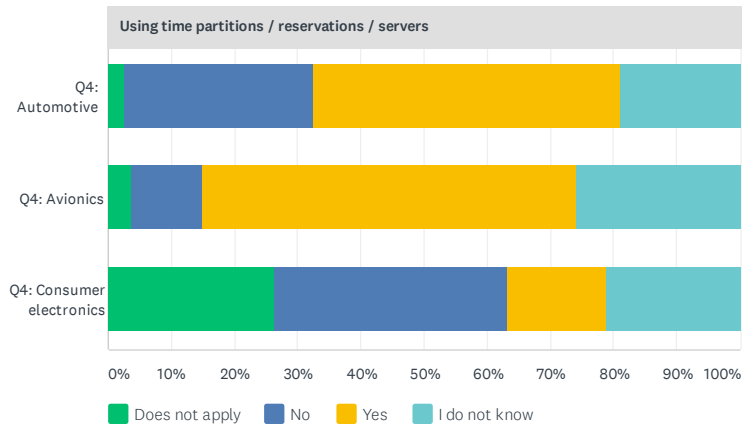
Answered: 76 Skipped: 10



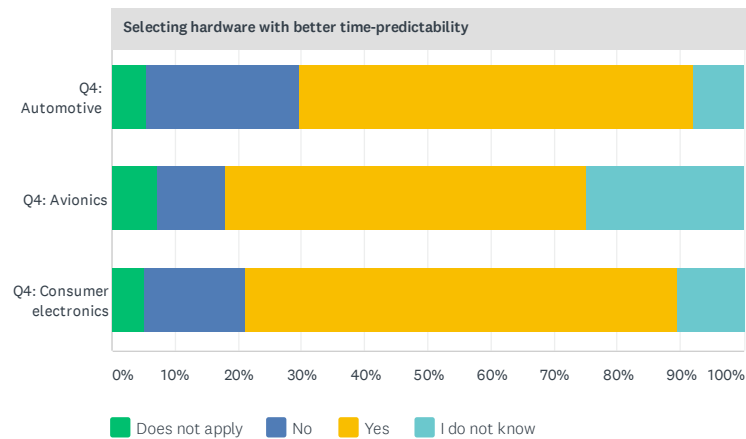
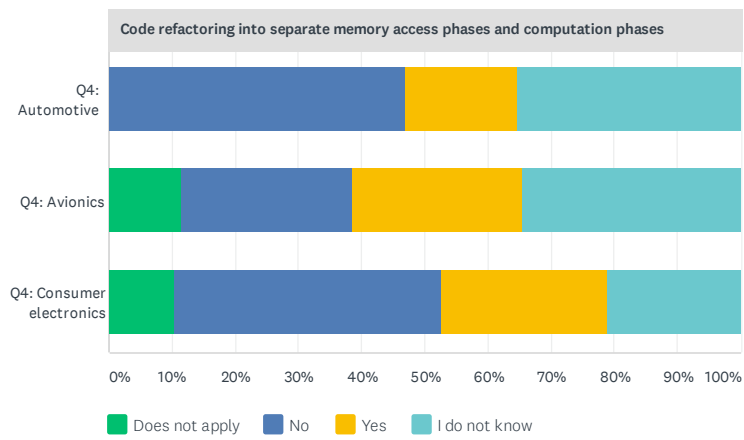
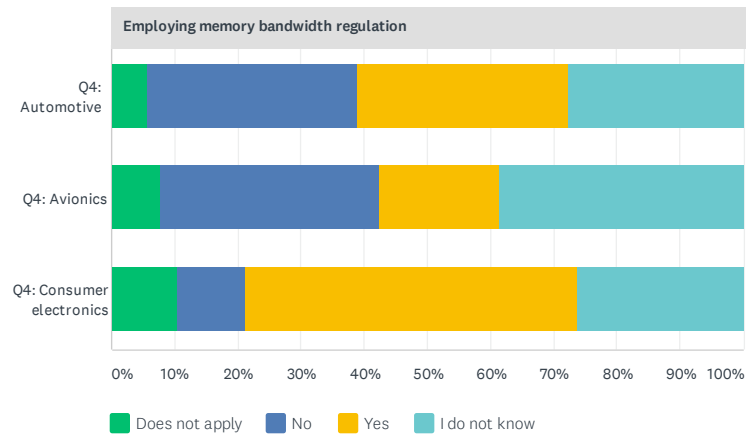
Real-time Systems Survey



Real-time Systems Survey



Real-time Systems Survey



Real-time Systems Survey

Turning off all cores but one					
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	5.56% 2	61.11% 22	25.00% 9	8.33% 3	47.37% 36
Q4: Avionics (B)	14.81% 4	33.33% 9	37.04% 10	14.81% 4	35.53% 27
Q4: Consumer electronics (C)	15.00% 3	50.00% 10	25.00% 5	10.00% 2	26.32% 20
Turning off simultaneous multi-threading (e.g. Hyperthreading)					
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	19.44% 7	38.89% 14	22.22% 8	19.44% 7	47.37% 36
Q4: Avionics (B)	22.22% 6	7.41% 2	48.15% 13	22.22% 6	35.53% 27
Q4: Consumer electronics (C)	20.00% 4	45.00% 9	25.00% 5	10.00% 2	26.32% 20
Partitioning caches					
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	13.51% 5	43.24% 16	16.22% 6	27.03% 10	48.68% 37
Q4: Avionics (B)	11.11% 3	11.11% 3	44.44% 12	33.33% 9	35.53% 27
Q4: Consumer electronics (C)	15.00% 3	35.00% 7	30.00% 6	20.00% 4	26.32% 20
Cache locking					
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	8.57% 3	34.29% 12	20.00% 7	37.14% 13	46.05% 35
Q4: Avionics (B)	11.11% 3	7.41% 2	44.44% 12	37.04% 10	35.53% 27
Q4: Consumer electronics (C)	10.53% 2	31.58% 6	31.58% 6	26.32% 5	25.00% 19
Using scratchpad memory instead of caches					
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	8.57% 3	25.71% 9	42.86% 15	22.86% 8	46.05% 35
Q4: Avionics (B)	23.08% 6	26.92% 7	23.08% 6	26.92% 7	34.21% 26
Q4: Consumer electronics (C)	10.53% 2	21.05% 4	42.11% 8	26.32% 5	25.00% 19
Disabling caching					
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	5.71% 2	48.57% 17	31.43% 11	14.29% 5	46.05% 35
Q4: Avionics (B)	3.85% 1	30.77% 8	34.62% 9	30.77% 8	34.21% 26
Q4: Consumer electronics (C)	10.53% 2	57.89% 11	21.05% 4	10.53% 2	25.00% 19

Real-time Systems Survey

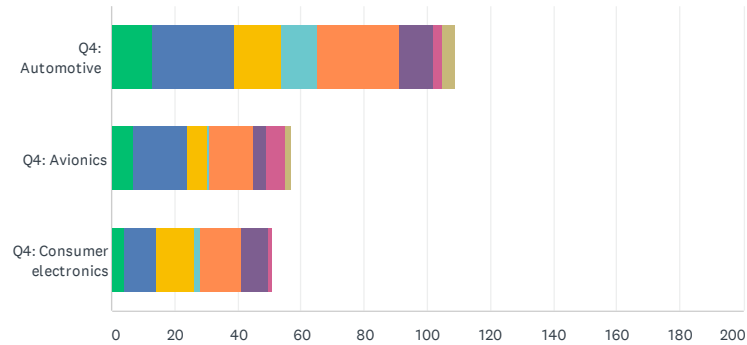
Using watchdog timers / runtime monitors						
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL	
Q4: Automotive (A)	2.63% 1	13.16% 5	78.95% 30	5.26% 2	50.00% 38	
Q4: Avionics (B)	3.70% 1	3.70% 1	70.37% 19	22.22% 6	35.53% 27	
Q4: Consumer electronics (C)	5.26% 1	21.05% 4	68.42% 13	5.26% 1	25.00% 19	
Use code to provide degraded, but usable, outputs in the event of overruns						
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL	
Q4: Automotive (A)	5.41% 2	27.03% 10	54.05% 20	13.51% 5	48.68% 37	
Q4: Avionics (B)	14.81% 4	18.52% 5	33.33% 9	33.33% 9	35.53% 27	
Q4: Consumer electronics (C)	10.53% 2	21.05% 4	57.89% 11	10.53% 2	25.00% 19	
Using time partitions / reservations / servers						
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL	
Q4: Automotive (A)	2.70% 1	29.73% 11	48.65% 18	18.92% 7	48.68% 37	
Q4: Avionics (B)	3.70% 1	11.11% 3	59.26% 16	25.93% 7	35.53% 27	
Q4: Consumer electronics (C)	26.32% 5	36.84% 7	15.79% 3	21.05% 4	25.00% 19	
Using static schedules to control execution						
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL	
Q4: Automotive (A)	2.78% 1	27.78% 10	58.33% 21	11.11% 4	47.37% 36	
Q4: Avionics (B)	7.14% 2	7.14% 2	67.86% 19	17.86% 5	36.84% 28	
Q4: Consumer electronics (C)	5.56% 1	33.33% 6	50.00% 9	11.11% 2	23.68% 18	
Employing memory bandwidth regulation						
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL	
Q4: Automotive (A)	5.56% 2	33.33% 12	33.33% 12	27.78% 10	47.37% 36	
Q4: Avionics (B)	7.69% 2	34.62% 9	19.23% 5	38.46% 10	34.21% 26	
Q4: Consumer electronics (C)	10.53% 2	10.53% 2	52.63% 10	26.32% 5	25.00% 19	
Code refactoring into separate memory access phases and computation phases						
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL	
Q4: Automotive (A)	0.00% 0	47.06% 16	17.65% 6	35.29% 12	44.74% 34	
Q4: Avionics (B)	11.54% 3	26.92% 7	26.92% 7	34.62% 9	34.21% 26	
Q4: Consumer electronics (C)	10.53% 2	42.11% 8	26.32% 5	21.05% 4	25.00% 19	

Real-time Systems Survey

Selecting hardware with better time-predictability					
	DOES NOT APPLY	NO	YES	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	5.41% 2	24.32% 9	62.16% 23	8.11% 3	48.68% 37
Q4: Avionics (B)	7.14% 2	10.71% 3	57.14% 16	25.00% 7	36.84% 28
Q4: Consumer electronics (C)	5.26% 1	15.79% 3	68.42% 13	10.53% 2	25.00% 19
Q4: AUTOMOTIVE	Q4: AVIONICS		Q4: CONSUMER ELECTRONICS		TOTAL
Other (please specify)	0	0		0	0

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

Answered: 76 Skipped: 10

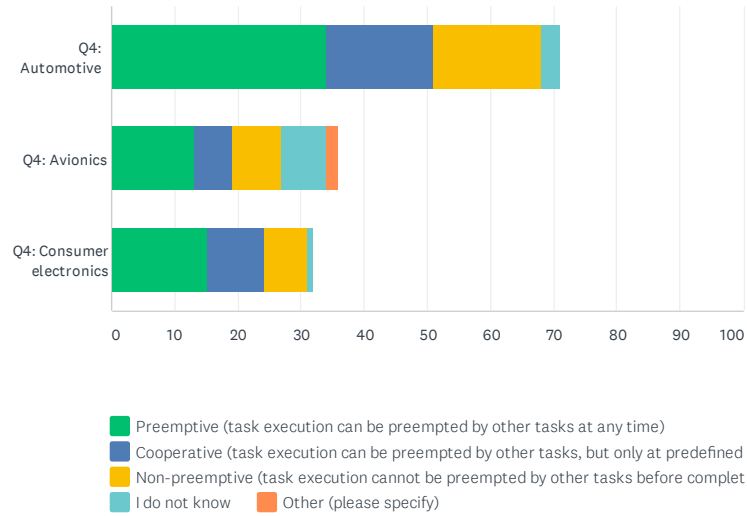


■ Hierarchical (with time partitions or reservations)
 ■ Static cyclic / table-driven / time-triggered scheduling
 ■ Round robin
 ■ Earliest Deadline First (EDF)
 ■ Fixed-priority scheduling
 ■ FIFO
 ■ I do not know
 ■ Other (please specify)

	HIERARCHICAL (WITH TIME PARTITIONS OR RESERVATIONS)	STATIC CYCLIC / TABLE-DRIVEN / TIME-TRIGGERED SCHEDULING	ROUND ROBIN	EARLIEST DEADLINE FIRST (EDF)	FIXED-PRIORITY SCHEDULING	FIFO	I DO NOT KNOW	OTHER (PLEASE SPECIFY)	TOTAL
Q4: Automotive (A)	31.71% 13	63.41% 26	36.59% 15	26.83% 11 B	63.41% 26	26.83% 11	7.32% 3 B	9.76% 4	143.42% 109
Q4: Avionics (B)	24.14% 7	58.62% 17	20.69% 6	3.45% 1 A	48.28% 14	13.79% 4	20.69% 6 A	6.90% 2	75.00% 57
Q4: Consumer electronics (C)	21.05% 4	52.63% 10	63.16% 12	10.53% 2	68.42% 13	47.37% 9	5.26% 1	0.00% 0	67.11% 51
Total Respondents	23	44	25	14	41	18	10	5	76

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

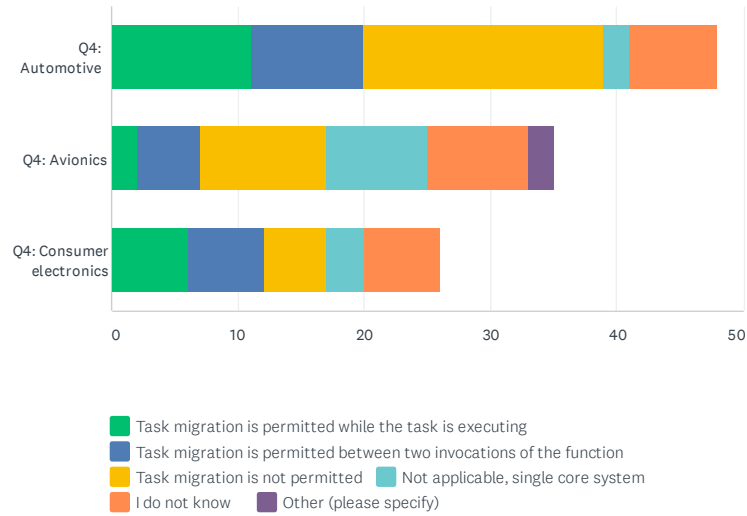
Answered: 76 Skipped: 10



	PREEMPTIVE (TASK EXECUTION CAN BE PREEMPTED BY OTHER TASKS AT ANY TIME)	COOPERATIVE (TASK EXECUTION CAN BE PREEMPTED BY OTHER TASKS, BUT ONLY AT PREDEFINED PREEMPTION POINTS)	NON-PREEMPTIVE (TASK EXECUTION CANNOT BE PREEMPTED BY OTHER TASKS BEFORE COMPLETION)	I DO NOT KNOW	OTHER (PLEASE SPECIFY)	TOTAL
Q4: Automotive (A)	82.93% 34	41.46% 17	41.46% 17	7.32% 3 B	0.00% 0 B	93.42% 71
Q4: Avionics (B)	44.83% 13	20.69% 6	27.59% 8	24.14% 7 AC	6.90% 2 A	47.37% 36
Q4: Consumer electronics (C)	78.95% 15	47.37% 9	36.84% 7	5.26% 1 B	0.00% 0	42.11% 32
Total Respondents	52	26	29	9	2	76

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

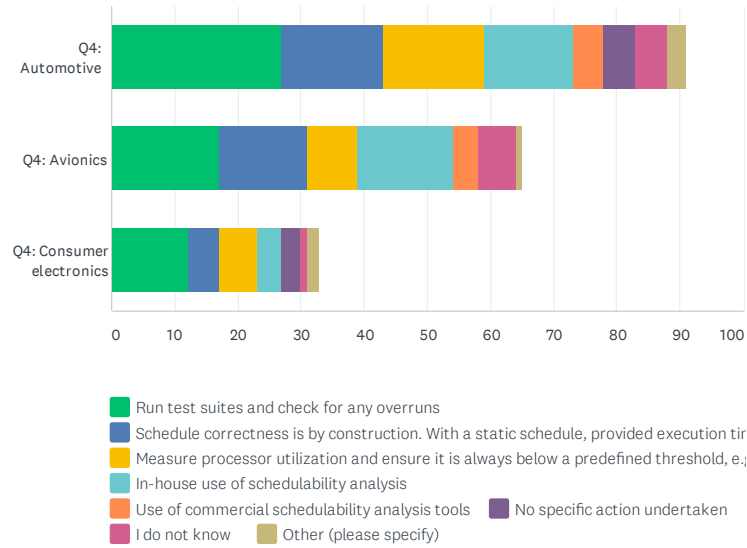
Answered: 77 Skipped: 9



	TASK MIGRATION IS PERMITTED WHILE THE TASK IS EXECUTING	TASK MIGRATION IS PERMITTED BETWEEN TWO INVOCATIONS OF THE FUNCTION	TASK MIGRATION IS NOT PERMITTED	NOT APPLICABLE, SINGLE CORE SYSTEM	I DO NOT KNOW	OTHER (PLEASE SPECIFY)	TOTAL
Q4: Automotive (A)	26.83% 11 B	21.95% 9	46.34% 19	4.88% 2 B	17.07% 7	0.00% 0	62.34% 48
Q4: Avionics (B)	6.90% 2 A	17.24% 5	34.48% 10	27.59% 8 A	27.59% 8	6.90% 2	45.45% 35
Q4: Consumer electronics (C)	30.00% 6	30.00% 6	25.00% 5	15.00% 3	30.00% 6	0.00% 0	33.77% 26
Total Respondents	17	14	31	11	18	2	77

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

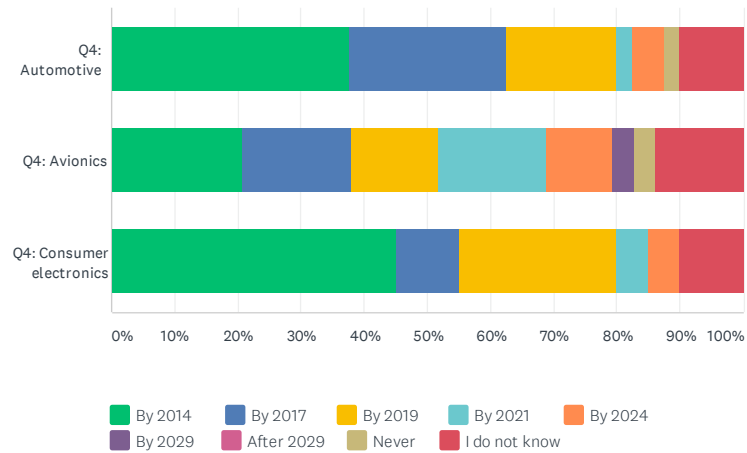
Answered: 76 Skipped: 10



	RUN TEST SUITES AND CHECK FOR ANY OVERRUNS	SCHEDULE CORRECTNESS IS BY CONSTRUCTION. WITH A STATIC SCHEDULE, PROVIDED EXECUTION TIME BUDGETS HOLD FOR EACH SOFTWARE COMPONENT / TASK, NO DEADLINES WILL BE MISSED.	MEASURE PROCESSOR UTILIZATION AND ENSURE IT IS ALWAYS BELOW A PREDEFINED THRESHOLD, E.G. 50%	IN-HOUSE USE OF SCHEDULABILITY ANALYSIS	USE OF COMMERCIAL SCHEDULABILITY ANALYSIS TOOLS	NO SPECIFIC ACTION UNDERTAKEN	I DO NOT KNOW	OTHER (PLEASE SPECIFY)	TOTAL
Q4: Automotive (A)	65.85% 27	39.02% 16	39.02% 16	34.15% 14	12.20% 5	12.20% 5	12.20% 5	7.32% 3	119.74% 91
Q4: Avionics (B)	58.62% 17	48.28% 14	27.59% 8	51.72% 15	13.79% 4	0.00% 0 C	20.69% 6	3.45% 1	85.53% 65
Q4: Consumer electronics (C)	63.16% 12	26.32% 5	31.58% 6	21.05% 4	0.00% 0	15.79% 3 B	5.26% 1	10.53% 2	43.42% 33
Total Respondents	47	30	27	26	9	7	10	6	76

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)?

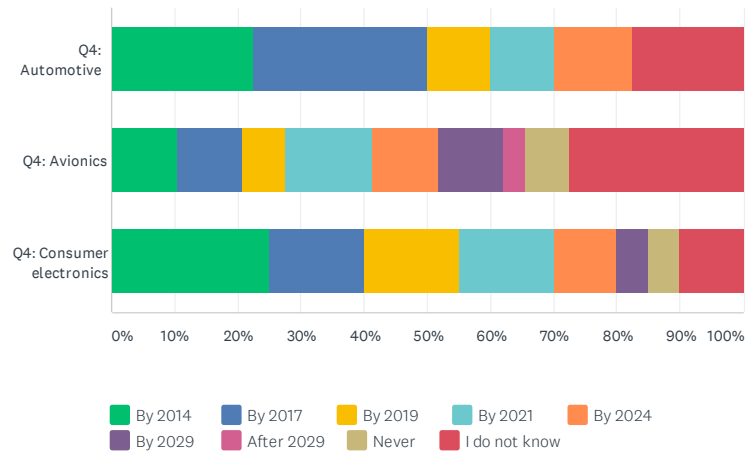
Answered: 76 Skipped: 10



	BY 2014	BY 2017	BY 2019	BY 2021	BY 2024	BY 2029	AFTER 2029	NEVER	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	37.50% 15	25.00% 10	17.50% 7	2.50% 1	5.00% 2	0.00% 0	0.00% 0	2.50% 1	10.00% 4	52.63% 40
Q4: Avionics (B)	20.69% 6	17.24% 5	13.79% 4	17.24% 5	10.34% 3	3.45% 1	0.00% 0	3.45% 1	13.79% 4	38.16% 29
Q4: Consumer electronics (C)	45.00% 9	10.00% 2	25.00% 5	5.00% 1	5.00% 1	0.00% 0	0.00% 0	0.00% 0	10.00% 2	26.32% 20
Total Respondents	25	16	12	7	5	1	0	2	8	76

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?

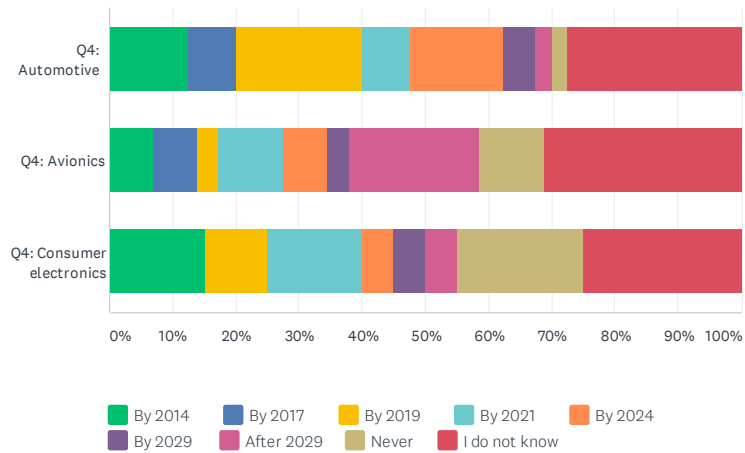
Answered: 76 Skipped: 10



	BY 2014	BY 2017	BY 2019	BY 2021	BY 2024	BY 2029	AFTER 2029	NEVER	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	22.50% 9	27.50% 11	10.00% 4	10.00% 4	12.50% 5	0.00% 0	0.00% 0	0.00% 0	17.50% 7	52.63% 40
Q4: Avionics (B)	10.34% 3	10.34% 3	6.90% 2	13.79% 4	10.34% 3	10.34% 3	3.45% 1	6.90% 2	27.59% 8	38.16% 29
Q4: Consumer electronics (C)	25.00% 5	15.00% 3	15.00% 3	15.00% 3	10.00% 2	5.00% 1	0.00% 0	5.00% 1	10.00% 2	26.32% 20
Total Respondents	15	14	5	10	9	4	1	3	15	76

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)?

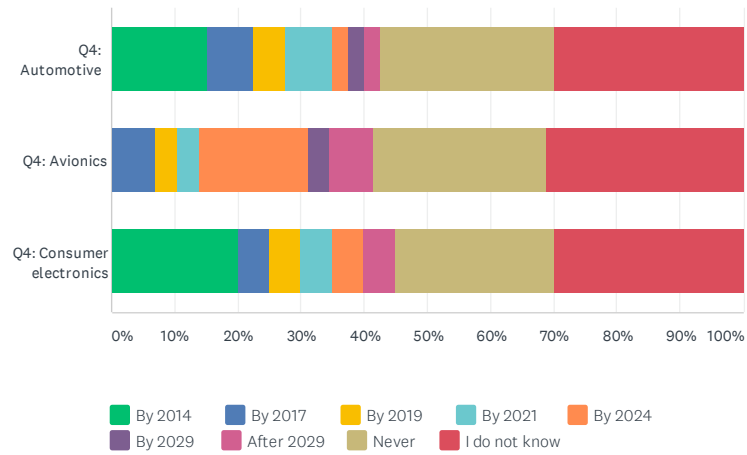
Answered: 76 Skipped: 10



	BY 2014	BY 2017	BY 2019	BY 2021	BY 2024	BY 2029	AFTER 2029	NEVER	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	12.50% 5	7.50% 3	20.00% 8	7.50% 3	15.00% 6	5.00% 2	2.50% 1	2.50% 1	27.50% 11	52.63% 40
Q4: Avionics (B)	6.90% 2	6.90% 2	3.45% 1	10.34% 3	6.90% 2	3.45% 1	20.69% 6	10.34% 3	31.03% 9	38.16% 29
Q4: Consumer electronics (C)	15.00% 3	0.00% 0	10.00% 2	15.00% 3	5.00% 1	5.00% 1	5.00% 1	20.00% 4	25.00% 5	26.32% 20
Total Respondents	6	5	8	7	8	4	8	7	23	76

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)?

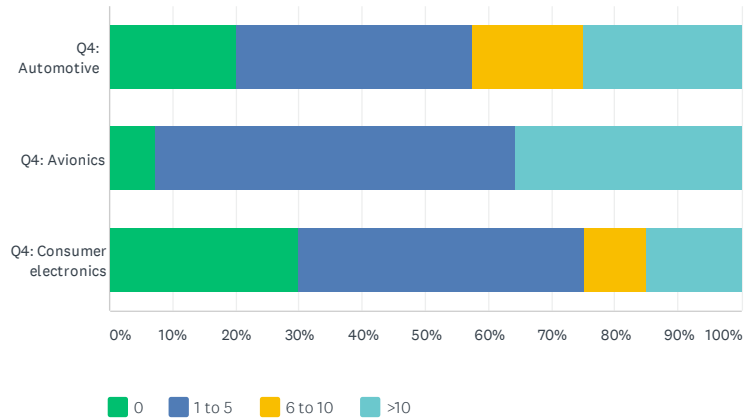
Answered: 76 Skipped: 10



	BY 2014	BY 2017	BY 2019	BY 2021	BY 2024	BY 2029	AFTER 2029	NEVER	I DO NOT KNOW	TOTAL
Q4: Automotive (A)	15.00% 6	7.50% 3	5.00% 2	7.50% 3	2.50% 1	2.50% 1	2.50% 1	27.50% 11	30.00% 12	52.63% 40
Q4: Avionics (B)	0.00% 0	6.90% 2	3.45% 1	3.45% 1	17.24% 5	3.45% 1	6.90% 2	27.59% 8	31.03% 9	38.16% 29
Q4: Consumer electronics (C)	20.00% 4	5.00% 1	5.00% 1	5.00% 1	5.00% 1	0.00% 0	5.00% 1	25.00% 5	30.00% 6	26.32% 20
Total Respondents	8	5	3	3	6	1	4	23	23	76

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

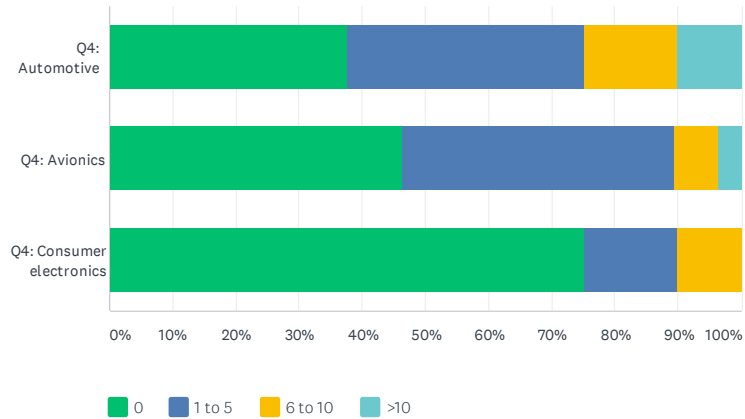
Answered: 75 Skipped: 11



	0	1 TO 5	6 TO 10	>10	TOTAL
Q4: Automotive (A)	20.00% 8	37.50% 15	17.50% 7	25.00% 10	53.33% 40
Q4: Avionics (B)	7.14% 2	57.14% 16	0.00% 0	35.71% 10	37.33% 28
Q4: Consumer electronics (C)	30.00% 6	45.00% 9	10.00% 2	15.00% 3	26.67% 20
Total Respondents	13	36	8	18	75

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?

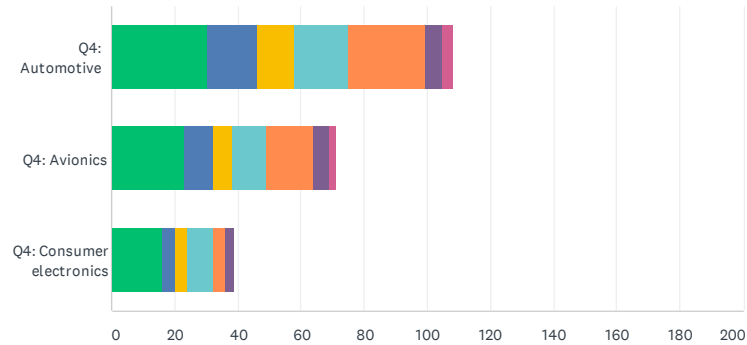
Answered: 75 Skipped: 11



	0	1 TO 5	6 TO 10	>10	TOTAL
Q4: Automotive (A)	37.50% 15	37.50% 15	15.00% 6	10.00% 4	53.33% 40
Q4: Avionics (B)	46.43% 13	42.86% 12	7.14% 2	3.57% 1	37.33% 28
Q4: Consumer electronics (C)	75.00% 15	15.00% 3	10.00% 2	0.00% 0	26.67% 20
Total Respondents	33	30	8	4	75

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

Answered: 76 Skipped: 10

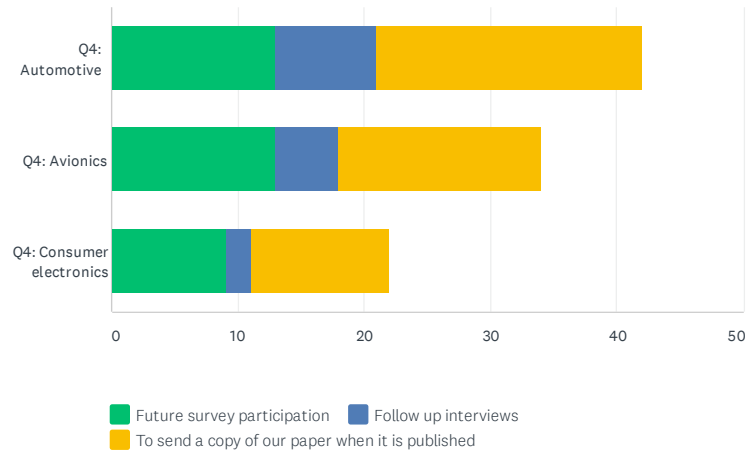


■ Read conference papers and journal articles
■ Write conference papers and journal articles
■ Review conference papers and journal articles
■ Conference participation
■ Participation in research projects with academics
■ No interactions
■ Other interactions

	READ CONFERENCE PAPERS AND JOURNAL ARTICLES	WRITE CONFERENCE PAPERS AND JOURNAL ARTICLES	REVIEW CONFERENCE PAPERS AND JOURNAL ARTICLES	CONFERENCE PARTICIPATION	PARTICIPATION IN RESEARCH PROJECTS WITH ACADEMICS	NO INTERACTIONS	OTHER INTERACTIONS	TOTAL
Q4: Automotive (A)	75.00% 30	40.00% 16	30.00% 12	42.50% 17	60.00% 24	15.00% 6	7.50% 3	142.11% 108
Q4: Avionics (B)	79.31% 23	31.03% 9	20.69% 6	37.93% 11	51.72% 15	17.24% 5	6.90% 2	93.42% 71
Q4: Consumer electronics (C)	80.00% 16	20.00% 4	20.00% 4	40.00% 8	20.00% 4	15.00% 3	0.00% 0	51.32% 39
Total Respondents	60	28	19	33	40	10	5	76

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: 48 Skipped: 38



	FUTURE SURVEY PARTICIPATION	FOLLOW UP INTERVIEWS	TO SEND A COPY OF OUR PAPER WHEN IT IS PUBLISHED	TOTAL
Q4: Automotive (A)	50.00% 13	30.77% 8	80.77% 21	87.50% 42
Q4: Avionics (B)	72.22% 13	27.78% 5	88.89% 16	70.83% 34
Q4: Consumer electronics (C)	69.23% 9	15.38% 2	84.62% 11	45.83% 22
Total Respondents	31	14	42	48
	E-MAIL ADDRESS			TOTAL
Q4: Automotive (A)	0			0
Q4: Avionics (B)	0			0
Q4: Consumer electronics (C)	0			0

Q32 Please enter any feedback or remarks on this survey.

Answered: 18 Skipped: 68

	PLEASE ENTER ANY FEEDBACK OR REMARKS ON THIS SURVEY.	TOTAL
Q4: Automotive	100.00% 10	55.56% 10
Q4: Avionics	100.00% 10	55.56% 10
Q4: Consumer electronics	100.00% 4	22.22% 4
Total Respondents	24	18