

# E

## QIX alternative search heuristic test results

Here we present our runtime statistics when running our implementation of the algorithm in QIX with the alternative search heuristic to solve random instances of the warehouse problem with different attributes. Every attribute is either of the value 'Low' or 'High'. The first table displays what high and low for the different attributes represents.

Attribute \ Value	Low	High
Demands	Demands on $\frac{1}{4}$ of all products	Demands on all products
Sparsity	No warehouses are empty	$\frac{1}{2}$ of all warehouses are empty
Products	Warehouses have at least 0 of each product	Warehouses have at least $\frac{1}{5}$ of the maximum demand of each product

Furthermore a column having the value '\*' means that it did not terminate within a reasonable time frame (>12 hours). A value of '\*\*' means that we did not bother to run the instance at all since the problem is considered harder than a previously unfinished problem.

In our implementation we put the values from the hypercube built by QIX in hashes for easy access, that is we spend some time building the model. This time is represented by Setup time in the tables below, while Algorithm Time is the time spent on the actual algorithm.

*Appendix E. QIX alternative search heuristic test results*

Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
10x10	Low	Low	High	6	0	0	4
	Low	Low	Low	4	0	0	4
	Low	High	High	2	0	0	2
	Low	High	Low	2	0	0	2
	High	Low	High	4	0	0	4
	High	Low	Low	10	0	0	12
	High	High	High	102	0	0	33
	High	High	Low	44	0	0	20

Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
10x100	Low	Low	High	12	0	0	14
	Low	Low	Low	14	0	0	12
	Low	High	High	138	0	0	42
	Low	High	Low	188	0	0	82
	High	Low	High	4	0	0	4
	High	Low	Low	46	0	0	19
	High	High	High	122	0	0	65
	High	High	Low	76	0	0	68

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Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
20x100	Low	Low	High	14	0	0	6
	Low	Low	Low	38	0	0	12
	Low	High	High	152	0	0	15
	Low	High	Low	202	0	0	24
	High	Low	High	26	0	0	6
	High	Low	Low	66	0	0	15
	High	High	High	252	0	0	18
	High	High	Low	3446	0	1	40

Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
30x100	Low	Low	High	6	0	0	6
	Low	Low	Low	26	0	0	7
	Low	High	High	440	0	0	10
	Low	High	Low	482	0	0	13
	High	Low	High	24	1	0	8
	High	Low	Low	28	0	0	4
	High	High	High	7760	0	3	35
	High	High	Low	7316	0	3	27

*Appendix E. QIX alternative search heuristic test results*

Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
40x100	Low	Low	High	22	0	0	7
	Low	Low	Low	68	0	0	8
	Low	High	High	3448	0	1	21
	Low	High	Low	774	0	0	14
	High	Low	High	26	0	0	5
	High	Low	Low	22	1	0	5
	High	High	High	2138	0	1	16
	High	High	Low	6142	0	2	22

Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
50x50	Low	Low	High	8	0	0	3
	Low	Low	Low	38	0	0	4
	Low	High	High	74	0	0	8
	Low	High	Low	326	0	0	13
	High	Low	High	18	0	0	4
	High	Low	Low	22	0	0	3
	High	High	High	1652	0	0	12
	High	High	Low	8838	0	2	20

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Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
50x100	Low	Low	High	6	0	0	2
	Low	Low	Low	36	0	0	5
	Low	High	High	94	0	0	10
	Low	High	Low	2844	0	0	17
	High	Low	High	24	1	0	6
	High	Low	Low	78	1	0	7
	High	High	High	380	0	0	7
	High	High	Low	60282	0	22	29

Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
100x10	Low	Low	High	8	0	0	2
	Low	Low	Low	2	0	0	1
	Low	High	High	2	0	0	1
	Low	High	Low	8	0	0	2
	High	Low	High	6	0	0	2
	High	Low	Low	8	0	0	2
	High	High	High	84	0	0	5
	High	High	Low	208	0	0	5

*Appendix E. QIX alternative search heuristic test results*

Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
100x20	Low	Low	High	4	0	0	2
	Low	Low	Low	16	0	0	3
	Low	High	High	50	0	0	2
	Low	High	Low	20	0	0	3
	High	Low	High	6	0	0	2
	High	Low	Low	24	1	0	3
	High	High	High	232	0	0	7
	High	High	Low	5090	0	1	8

Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
100x30	Low	Low	High	10	0	0	2
	Low	Low	Low	4	0	0	2
	Low	High	High	64	0	0	4
	Low	High	Low	124	0	0	7
	High	Low	High	10	0	0	2
	High	Low	Low	88	0	0	3
	High	High	High	940	1	0	7
	High	High	Low	3432	0	1	7

*Appendix E. QIX alternative search heuristic test results*

Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
100x40	Low	Low	High	6	0	0	1
	Low	Low	Low	14	0	0	3
	Low	High	High	42	0	0	3
	Low	High	Low	744	0	0	7
	High	Low	High	12	0	0	2
	High	Low	Low	90	1	0	5
	High	High	High	3330	0	0	8
	High	High	Low	5888	0	1	9

Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
100x50	Low	Low	High	22	0	0	3
	Low	Low	Low	4	0	0	2
	Low	High	High	198	0	0	5
	Low	High	Low	116	0	0	4
	High	Low	High	12	0	0	3
	High	Low	Low	42	0	0	3
	High	High	High	3182	1	0	6
	High	High	Low	4476	0	1	7



*Appendix E. QIX alternative search heuristic test results*

Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
100x100	Low	Low	High	32	0	0	2
	Low	Low	Low	42	0	0	4
	Low	High	High	504	1	0	5
	Low	High	Low	1272	0	0	8
	High	Low	High	30	0	0	3
	High	Low	Low	180	1	0	6
	High	High	High	4594	0	2	10
	High	High	Low	136650	0	51	15
Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
200x200	Low	Low	High	16	1	0	2
	Low	Low	Low	98	0	0	3
	Low	High	High	2502	0	1	6
	Low	High	Low	99874	1	25	10
	High	Low	High	74	3	0	3
	High	Low	Low	364	3	1	4
	High	High	High	60552	2	44	9
	High	High	Low	321190	3	255	11
Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
500x500	Low	Low	High	48	5	0	2
	Low	Low	Low	570	6	0	3
	Low	High	High	283930	5	138	6
	Low	High	Low	1801056	5	1100	9
	High	Low	High	1272	20	5	3
	High	Low	Low	11680	20	39	4
	High	High	High	3113104	20	5724	8

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Size	Type			Branches	Setup Time(s)	Algorithm Time (s)	Optimal Value
	Demands	Sparsity	Products				
1000x1000	Low	Low	High	2012	20	5	3
	Low	Low	Low	27138	20	59	4
	Low	High	High	14168994	20	17272	6
	Low	High	Low	*	*	*	-
	High	Low	High	2172	78	22	3
	High	Low	Low	99220	79	994	4
	High	High	High	*	*	*	-
	High	High	Low	**	**	**	-