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Appendix A: Detailed Description of Routing Strategies

In the following, we thoroughly describe the routing strategies return, midpoint, traversal, largest gap, composite, combined, and optimal for the rectangular parallel-aisles single-block warehouse specified in Section 2.The descriptions provide all necessary details to clarify our exact interpretation of the strategies and to allow reproduction of our results. For completeness, we also provide a description of the mixed strategy that has recently been proposed by Bahçeci and Öncan (2022). We use the terms *required location* and *required aisle* for those storage locations and picking aisles, respectively, in which there is at least one item to pick, given a set of orders. Figures EC.1a–EC.1i depict exemplary picker routes for picking the batch comprising orders 2, 4, and 5 and each routing strategy. The items and corresponding storage locations are highlighted in blue and the picker route following each strategy is shown with a dashed line.

Return Starting at the depot, the picker moves along the front cross aisle to the rightmost required aisle, i.e., the required aisle furthest from the depot. On the way, the picker enters each required aisle from the front cross aisle, travels towards the required location closest to the back cross aisle, makes a U-turn, and exits the aisle again to the front cross aisle. After exiting the rightmost required aisle, the picker returns to the depot on the front cross aisle.

Midpoint The warehouse is virtually divided into a front and a back part such that all storage locations closer to the front (back) cross aisle are assigned to the front (back) part. Storage locations that are exactly in the middle between front and back cross aisle are assigned to the front part. Starting at the depot, the picker moves along the front cross aisle to the leftmost required aisle, i.e., the required aisle closest to the depot. This aisle is traversed completely by entering from the front and exiting to the back cross aisle. The picker then moves along the back cross aisle to the rightmost required aisle. Similar to the return strategy, the picker enters from the back cross aisle all aisles that contain at least one required location in the back part of the warehouse, travels towards the required location closest to the middle, makes a U-turn, and exits the aisle again to the back cross aisle. The rightmost required aisle is traversed completely and the picker returns along the front cross aisle to the depot. All aisles between the left- and rightmost that contain at least one required location in the front part of the warehouse are visited from the front cross aisle in the analog fashion as those of the back part. In the special case that there is only a single required aisle, the route is the same as in the return strategy.

Traversal Starting at the depot, the picker moves horizontally to the rightmost required aisle. Each required aisle is traversed completely so that the picker enters from and exits to different cross aisles. After each traversal, the horizontal movement to the rightmost required aisle is continued on the opposite cross aisle. If the number of required aisles is even, the picker traverses the last one from the back to the front cross aisle and travels back to the depot on the front cross aisle. If the number of required aisles is odd, the picker visits the last one in a return fashion entering from and exiting to the front cross aisle and travels back to the depot on the front cross aisle.

Largest Gap This strategy is similar to the midpoint strategy. If there is only a single required aisle, the route is the same as in the return strategy. Otherwise, the picker travels horizontally on the front cross aisle from the depot to the leftmost required aisle, traverses this aisle completely, continues horizontally on the back cross aisle to the rightmost required aisle, traverses this aisle completely, and travels back to the depot on the front cross aisle. The other required aisles are visited on the way from/to the depot in a return fashion either from and to only one of the cross aisles or from and to both cross aisles, depending on the largest gap in this aisle. The largest gap in an aisle is the largest value of any of the following: (i) the distance between the front cross aisle and its closest required location, (ii) the distance between the back cross aisle and its closest required location, or (iii) the distance between any pair of required locations for which no third required location is closer to both locations. The aisle is then visited such that the largest gap in this aisle is not traversed. In Figure EC.1d, the largest gaps are highlighted in orange. If the largest gap is between the front (back) cross aisle and the required location closest to it as in the second (fourth) aisle, then a return from and to the back (front) cross aisle is performed. If the largest gap is between any two required locations (third aisle), then returns from and to both cross aisles are performed.

Composite The composite strategy combines elements of the traversal and return strategies. Starting from the depot and on the front cross aisle, the picker moves horizontally to the rightmost required aisle visiting all required aisles on the way and returns on the front cross aisle to the depot. Each required aisle is either traversed completely (changing from the front to the back cross aisle and vice versa) or visited in a return fashion entering from and exiting to the same cross aisle. The choice on how to visit an aisle is made individually for each aisle in a pure greedy fashion. There are two interpretations in the literature. For a given required aisle and the cross aisle on which the picker arrives at this aisle, Petersen (1995) chooses traversal or return based on which of the two gives a shorter distance between the farthest required location from the current cross aisle in the current aisle and the farthest required location from the current cross aisle in the next required aisle. Roodbergen (2001) and Scholz and Wäscher (2017), on the other hand, choose traversal whenever the distance between the farthest required location and the current cross aisle is more than half of the distance of a full traversal. Otherwise, they choose a return visit. In both interpretations, the rightmost required aisle has to be visited such that the picker exits to the front cross aisle, i.e., performing a traversal if the picker arrives at the rightmost require aisle on the back cross aisle and performing a return visit otherwise.

Combined The combined strategy is an enhanced version of the composite strategy. The only difference is that the choice whether an aisle is visited with a traversal or a return is not made individually for each aisle in a greedy fashion. Instead, these visits are performed such that the best possible route using only these in-aisle visits results. To this end, a simple DP algorithm can be used. We refer to Roodbergen (2001) for details.

Mixed The mixed routing strategy is similar to the midpoint and largest gap strategies. It adds elements of the return strategy to the midpoint strategy. The only difference from the midpoint strategy is that the required aisles between the leftmost and rightmost required aisles can be visited according to either the midpoint strategy, i.e., return visits to and from both cross aisles up to the middle of the aisles, or the return strategy, i.e., a single return visit to and from the same cross aisle. An alternative description is as follows. The mixed strategy differs from the largest gap strategy by allowing visits from and to both cross aisles only in the case that the gap that is not traversed is between two required locations that are on different parts (front and back) of the warehouse. We refer to Bahçeci and Öncan (2022) for details.

Optimal The optimal strategy follows a distance-minimal route of all possible picker routes which can in principle be computed by solving a traveling salesman problem (TSP) over the required locations. For a rectangular parallel-aisles single-block warehouse, the problem can be solved in linear time (linear in the sum of the number of aisles and the number of required locations) by means of a DP approach. We refer to Ratliff and Rosenthal (1983) for a detailed description of this DP algorithm. Note that the optimal strategy allows all possible in-aisle visits, i.e., traversal, a single return visit from the front or back cross aisle, and a double return visit from the front and back cross aisles as in the largest gap strategy, as well as all possible traversals from one required aisle to the next.

Appendix B: Proof of Proposition 1

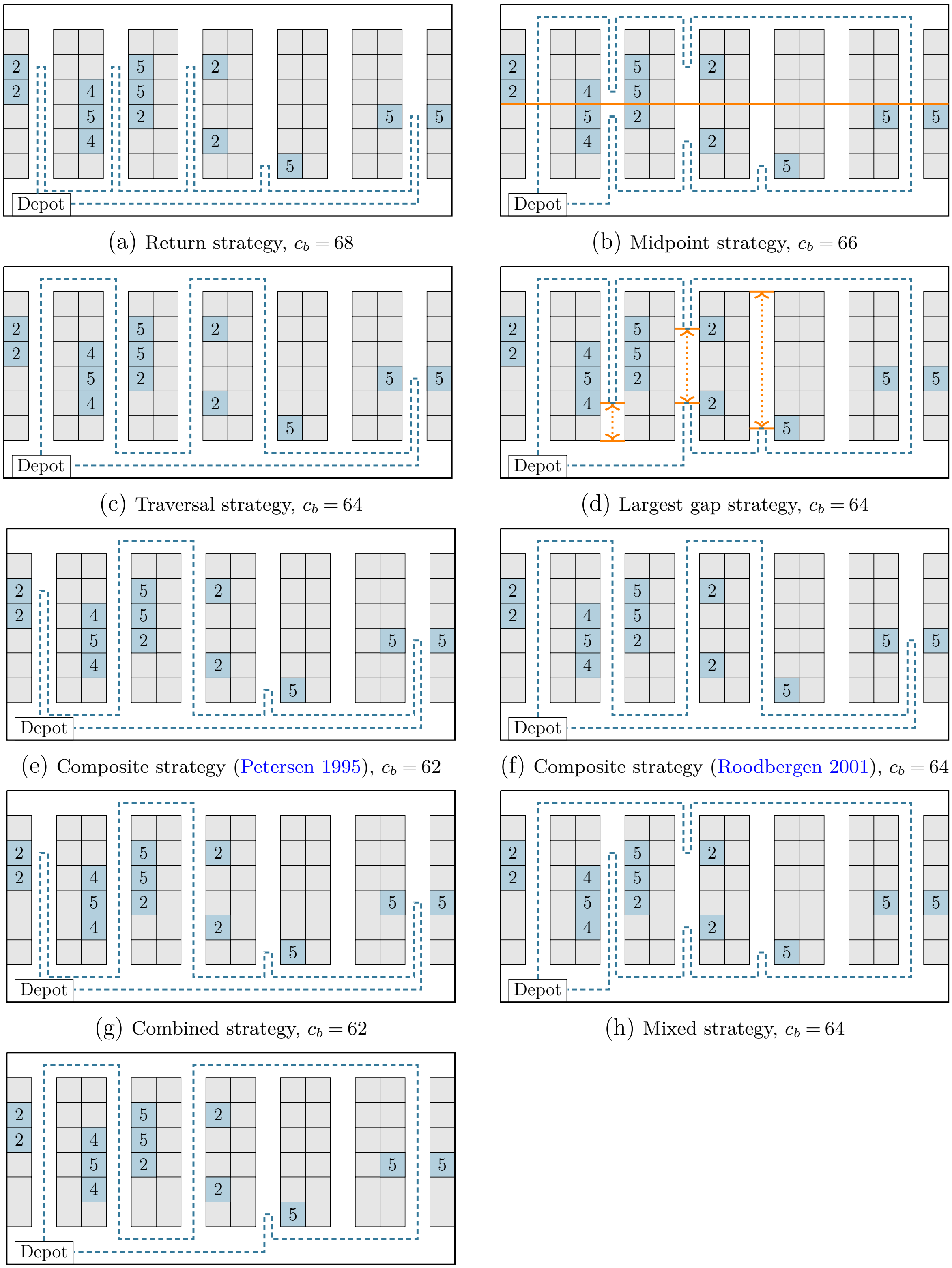
PROPOSITION 1. *The routing strategies return, midpoint, traversal, largest gap, combined, mixed, and optimal are monotone.*

Proof. Let b_1 and b_2 be two feasible batches with $b_1 \subseteq b_2$. We need to show that $c_{b_1} \leq c_{b_2}$ holds for the routing strategies.

Let R denote the set of additional required locations of b_2 compared to b_1. Without loss of generality, we assume in the following that $R \neq \varnothing$ (otherwise $c_{b_1} \leq c_{b_2}$ obviously holds for all routing strategies). Note further that for any batch and all strategies except optimal, the total horizontal distance traveled on the cross aisles is exactly twice the distance from the depot to the rightmost required aisle. Thus, this distance strictly increases if there is an additional required location in R located in an aisle further from the depot than the rightmost required aisle of b_1. Otherwise it stays the same. For these strategies, it suffices to consider the distances traveled within the required aisles (including the distances to enter from/exit to the cross aisles) in the following.

Return Any additional required location in R that is located in a required aisle of b_1 but not closer to the back cross aisle than each required location of b_1 in this aisle does not change the distance traveled within the respective aisle. Any additional required location in R that is located either in a required aisle of b_1 and closer to the back cross aisle than each required location of b_1 in this aisle or in an aisle that is not required in b_1 strictly increases the distance traveled within the respective aisle. Thus, $c_{b_1} \leq c_{b_2}$ obviously holds for the return strategy.

Midpoint Consider first the special case of a single required aisle in b_1. If all additional required locations in R are also located in this aisle, then $c_{b_1} \leq c_{b_2}$ follows with the same arguments as for the return strategy. If there is at least one additional required location in R located in a different aisle, then the left- and rightmost required aisles are both traversed completely for b_2 implying a traveled distance of $2(L + 2a)$ within these



(a) Return strategy, $c_b = 68$

(b) Midpoint strategy, $c_b = 66$

(c) Traversal strategy, $c_b = 64$

(d) Largest gap strategy, $c_b = 64$

(e) Composite strategy (Petersen 1995), $c_b = 62$

(f) Composite strategy (Roodbergen 2001), $c_b = 64$

(g) Combined strategy, $c_b = 62$

(h) Mixed strategy, $c_b = 64$

(i) Optimal strategy, $c_b = 60$

Figure EC.1 **Picker routes for batch** $b = \{2, 4, 5\}$ **and different routing strategies**

aisles. The maximum possible distance traveled within the single required aisle of b_1 is $2(L - \ell/2 + a)$ if a required location is the one closest to the back cross aisle, so that $c_{b_1} \leq c_{b_2}$ also holds in this case.

Consider now the general case with multiple required aisles in b_1. If the left- or rightmost required aisles are not identical for b_1 and b_2, then different aisles are traversed completely in b_1 and b_2. The distances traveled, however, do not change. Then, $c_{b_1} \leq c_{b_2}$ immediately follows with similar arguments as in the return strategy.

Traversal We need to distinguish several cases:

(i) If the number of required aisles is even for b_1 and b_2, then any aisle traversed in b_1 is also traversed in b_2 and $c_{b_1} \leq c_{b_2}$ obviously holds.

(ii) If the number of required aisles is odd for b_1 and b_2 and the rightmost required aisle is identical for b_1 and b_2, then any aisle traversed in b_1 is also traversed in b_2 and, with the same arguments as for the return strategy, the distance traveled in the rightmost required aisle for b_2 cannot be smaller than the distance for b_1 so that $c_{b_1} \leq c_{b_2}$ has to hold.

(iii) If the number of required aisles is odd for b_1 and b_2 but the rightmost required aisle is not identical for b_1 and b_2, then any aisle traversed in b_1 is also traversed in b_2 and there are at least two additional required aisles in b_2. At least one of these is also traversed completely in b_2 (the other might be the rightmost required aisle of b_2 which is not traversed completely). In addition, the rightmost required aisle of b_1 is also traversed completely in b_2 instead of the return visit in b_1. For b_2, the total distance traveled within these two aisles is thus $2(L+2a)$. For b_1, the maximum possible distance traveled within its rightmost required aisle is $2(L - \ell/2 + a)$ if a required location is the one closest to the back cross aisle, so that $c_{b_1} \leq c_{b_2}$ also holds in this case.

(iv) If the number of required aisles is odd for b_1 but even for b_2, then any aisle traversed in b_1 is also traversed in b_2, there is at least one additional required aisle in b_2, and the rightmost aisle is traversed completely for b_2 instead of the return visit for b_1. This additional required aisle as well as the rightmost required aisle of b_1 are traversed completely in b_2 resulting in a traveled distance of $2(L+2a)$ within these two aisles. For b_1, the maximum possible distance traveled within its rightmost required aisle is $2(L - \ell/2 + a)$ if a required location is the one closest to the back cross aisle, so that $c_{b_1} \leq c_{b_2}$ also holds in this case.

(v) If the number of required aisles is even for b_1 but odd for b_2, then any aisle traversed in b_1 is also traversed in b_2 except for the rightmost required aisle of b_1, there is at least one additional required aisle in b_2, and the rightmost aisle is visited in return fashion for b_2 instead of the complete traversal for b_1. The traversal of the additional required aisle in b_2 obviously implies the same distance as the complete traversal of the rightmost required aisle in b_1, and it immediately follows that $c_{b_1} \leq c_{b_2}$.

Largest Gap The special case of a single required aisle in b_1 follows with the exact same arguments as for the midpoint strategy. For the general case of multiple required aisles in b_1, recall that required aisles are visited such that the largest gap between pairs of required locations or cross aisles and required locations is not traveled. Any additional required location in R can clearly only decrease the largest gap in the corresponding aisle so that the distance traveled within this aisle can only increase. The relation $c_{b_1} \leq c_{b_2}$ then follows with similar arguments as for the midpoint strategy.

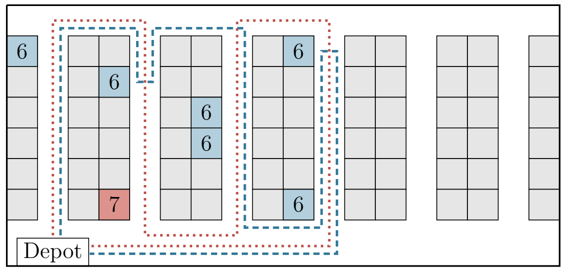


Figure EC.2 **Picker routes for both interpretations of the composite strategy and batches $b_1 = \{6\}$ (in blue) and $b_2 = \{6, 7\}$ (in red), $c_{b_1} = 48$, $c_{b_2} = 46$**

Combined The combined strategy allows visiting aisles either in return fashion or by complete traversal. It chooses the distance-minimal picker route using only these two in-aisle visits. Now, any additional required location in R does not impact the distance of a complete traversal and can only increase the distance traveled in a return visit of the corresponding aisle. Thus, $c_{b_1} \leq c_{b_2}$ obviously holds for the combined strategy.

Mixed The mixed strategy allows visiting aisles either in return or in midpoint fashion choosing for each aisle the shorter of the two possibilities. Any additional required location within an aisle can only increase the distance traveled for visiting this aisle in both return and midpoint fashion. Then, $c_{b_1} \leq c_{b_2}$ follows by the same arguments as for the midpoint and the largest gap strategies.

Optimal Recall that the optimal strategy follows a distance-minimal route that is equivalent to an optimal TSP tour over the required locations. Because the distances between all storage locations satisfy the triangle inequality, any additional required location in R can never decrease the length of an optimal TSP tour and we immediately have $c_{b_1} \leq c_{b_2}$. □

Appendix C: Non-Monotonicity of Composite Routing Strategy

Figure EC.2 provides a small example showing that the composite strategy is not monotone, for neither of the interpretations by Petersen (1995) and by Roodbergen (2001) and Scholz and Wäscher (2017). For batch b_1 comprising only order 6, both variants of the composite strategy result in a picker route of length $c_{b_1} = 48$ depicted with a blue dashed line. For batch $b_2 = \{6, 7\}$, the corresponding picker route of both variants is indicated with a red dotted line and has a length of $c_{b_2} = 46$. Because $b_1 \subseteq b_2$ but $c_{b_1} > c_{b_2}$, the composite strategy is obviously not monotone.

Appendix D: Algorithm Design Choices

In the following, we give some details on additional design choices made in our BPC algorithm. We also present the specific values used for the parameters of the algorithm. These values were obtained in pretests on a small subset of the instances used in our main computational study.

Initialization of RMP. We initialize the RMP with a subset Ω' of feasible batches obtained from a variant of the well-known savings heuristic by Clarke and Wright (1964). The heuristic first calculates for each pair of customer orders, the savings in travel distance if the customer orders are picked in one picking route instead of two individual routes. Starting with individual batches for each order, the heuristic then iterates over the savings in non-decreasing order and combines the current batches of the two corresponding customer orders to one larger batch, if feasible. To randomize the heuristic, the savings are multiplied with a number randomly drawn from the interval $[0.85, 1.15]$. The heuristic is run several times and all batches contained in any of the heuristic solutions are added to Ω'.

We further initialize the RMP with a lower bound on the number of pickers needed by adding the corresponding inequality (6) for $S = O$ using $\kappa^3(O)$. Notice that in this case, no additional resource is needed in the labeling algorithm because the dual price ρ_O has to be subtracted once from all batches.

Pricing Problem Solution. In principle, any sorting of the orders can be used when constructing graph G for the SPPRC representation of the pricing problem. The sorting, however, has a substantial impact on the solution time of the pricing problem. In our BPC, the orders are sorted non-increasingly by relative profit π_o/q_o or, after branching, by a generalized version that takes the maximum relative profit multiplied by the maximum capacity consumption of the feasible combinations of an order group. With this sorting, negative reduced-cost batches can often be identified early in the labeling allowing an early termination. Moreover, labels with positive reduced costs tend to be discarded early because of the small-valued completion bounds resulting from this sorting.

Cutting and Branching Strategy. In the BPC, branching on the number of pickers, if fractional, is given priority over cutting. Furthermore, cuts are only separated in the root node or in its two child nodes if they result from a branching on the number of pickers.

The overall separation strategy is to first separate CCs with the greedy and connected-component heuristics. If they fail to identify any violated cuts, we separate SRCs by enumeration. The computationally costly MIP-based separation of CCs is only invoked when the other separation procedures fail. Moreover, we set a hard time limit of five seconds for each call to the MIP.

To contain the size of the B&B tree, we apply strong branching at the second stage of the branching scheme. The strong branching procedure considers a candidate set of order pairs (o_1, o_2) with fractional $f_{o_1 o_2}$. For each pair, a rough evaluation of both child nodes is performed solving only the RMP with the corresponding branching constraint without any column generation. The decision on which candidate branching is performed is taken according to the product rule (Achterberg 2007). At the root node, the maximum size of the candidate set is 25 and we decrease the size by two for each level of the B&B tree. We select the pairs (o_1, o_2) for which $f_{o_1 o_2}$ is closest to 0.5 to enter the candidate set.

Appendix E: Benchmark Instances

In the following, we provide a description of the considered benchmark sets by Henn and Wäscher (2012) (`H&W`), Muter and Öncan (2015) (`M&Ö` and `M&Ö-ext`), and Žulj, Kramer, and Schneider (2018) (`ZKS`) as well as the newly introduced instances (`W&G-g` and `W&G-u`). The same warehouse layouts are shared by the `H&W` and `ZKS` instances and by the `M&Ö`, `M&Ö-ext`, `W&G-g`, and `W&G-u` instances, respectively.

The `H&W` and `ZKS` benchmarks consider a rectangular single-block warehouse with 10 parallel picking aisles and 45 storage locations on both sides of each aisle. Each storage location has a length of one unit. Picking an item takes place in the vertical middle of the corresponding storage location and does not require any horizontal distance to be traveled. When entering/leaving an aisle from/to one of the cross aisles, the order picker moves one unit in vertical direction. Thus, a complete traversal of a picking aisle amounts to 47 units. The depot is located on the front cross aisle in front of the leftmost aisle. There is no additional distance to enter/leave the depot to/from the front cross aisle. The distance between two consecutive picking aisles is 5 units.

The `M&Ö`, `M&Ö-ext`, `W&G-g`, and `W&G-u` benchmark sets assume a single-block layout with 10 parallel picking aisles, 10 storage locations of length one on both sides of each aisle, and a single depot located on the front cross aisle in front of the leftmost aisle. Picking is performed as in the `H&W` and `ZKS` instances. The horizontal distance between two consecutive picking aisles is 2.4 units. Unfortunately, we were not able to get any information about the distances needed to enter/leave an aisle from/to one of the cross aisles or to enter/leave the depot for the `M&Ö` instances. We interpreted these distances as specified for the `H&W` and `ZKS` instances also for the benchmark sets `M&Ö`, `M&Ö-ext`, `W&G-g`, and `W&G-u`.

The `H&W` benchmark considers two different scenarios with respect to storage assignment: class-based demand (CBD) and uniformly distributed demand (UDD). For CDB, items are assigned to storage locations according to their demand frequencies: high-demand items in the leftmost aisle, medium-demand items in subsequent aisles, and low-demand items in the right half of the warehouse. For UDD, items are randomly assigned to storage locations. Henn and Wäscher (2012) originally introduced separate instances for strategies traversal and largest gap resulting in the four subclasses CBD/traversal, CBD/largest gap, UDD/traversal and UDD/largest gap. Obviously, all instances can be used for all routing strategies. For all subclasses, there are 40 instances for each combination of capacity $Q \in \{30, 45, 60, 75\}$ and number of orders $n \in \{20, 30, ..., 100\}$. The number of items per order is uniformly distributed in $\{5, ..., 25\}$. The complete benchmark comprises 5760 instances.

The `ZKS` benchmark comprises groups of 10 instances for the (n, Q)-pairs $(200, 6)$, $(200, 9)$, $(200, 12)$, $(200, 15)$, $(300, 6)$, $(400, 6)$, $(500, 6)$, and $(600, 6)$ and order sizes uniformly distributed in $\{1, ..., 5\}$.

The original `M&Ö` benchmark consists of instance groups characterized by capacity $Q \in \{24, 36, 48\}$ and number of orders $n \in \{20, 30, ..., 100\}$. The sizes of the orders are randomly drawn from $\{2, ..., 10\}$ and the individual items are randomly distributed in the warehouse. Each group comprises 10 instances resulting in a total of 270 instances. We additionally consider the `M&Ö` instances with larger values for the capacities, namely $Q \in \{60, 72\}$, referred to as benchmark set `M&Ö-ext` which comprises another 180 instances.

The `W&G-g` benchmark comprises groups of 10 instances where each group is characterized by a capacity $Q \in \{24, 36, 48, 60, 72\}$ and a number of orders $n \in \{125, 150, ..., 250\}$. The order sizes are randomly drawn from $\{2, ..., 10\}$ and the individual items are randomly distributed in the warehouse. The benchmark comprises a total of 300 instances.

The `W&G-u` benchmark comprises groups of 10 instances where each group is characterized by a capacity $Q \in \{24, 36, 48, 60, 72\}$ and a number of orders $n \in \{100, 150, 200, 250\}$. The orders have a uniform size of six items and the individual items are randomly distributed in the warehouse. The benchmark comprises a total of 200 instances.

Appendix F: Detailed Computational Results

In this section, we report detailed computational results of our BPC algorithm and the BPC-based heuristics for the six considered routing strategies traversal, return, midpoint, largest gap, combined and optimal. We report results for the three benchmark sets from the literature by Muter and Öncan (2015) (`M&Ö`), Henn and Wäscher (2012) (`H&W`), and Žulj, Kramer, and Schneider (2018) (`ZKS`). Furthermore, we report results for the extended Muter and Öncan (2015) instances with enlarged capacities (`M&Ö-ext`) and the newly created benchmark instances with general (`W&G-g`) and uniform (`W&G-u`) order weights. Finally, we provide a comparison of the routing strategies in terms of total traveled distances. Instance-by-instance results of our main BPC and the two BPC-based heuristics together with the best-known solutions (BKS) are provided at `https://logistik.wiwi.uni-kl.de/obp-bpc-detailedresults`.

F.1. Summary Results of BPC Algorithm

Tables EC.1–EC.6 provide summary results for the six benchmark sets and all routing strategies aggregated by capacity Q and number of orders n. They report the number of instances solved to optimality within the time limit of one hour (*Opt*) and the average solution time in seconds ($t[s]$).

Table EC.1 Summary results of our BPC algorithm for the M&Ö instances

			Traversal		Return		Midpoint		Largest gap		Combined		Optimal	
Q	n	Inst	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]
24	20	10	10	0.2	10	0.1	10	0.0	10	0.1	10	0.1	10	0.1
	30	10	10	0.7	10	1.1	10	0.4	10	0.9	10	0.4	10	0.7
	40	10	10	8.6	10	1.9	10	1.6	10	2.3	10	3.7	10	2.2
	50	10	10	14.8	10	13.0	10	3.0	10	8.1	10	9.2	10	6.3
	60	10	10	11.5	10	3.0	10	5.2	10	12.5	10	8.3	10	7.1
	70	10	10	37.9	10	73.8	10	17.3	10	53.3	10	118.5	10	59.3
	80	10	10	392.4	10	128.3	10	39.2	10	69.5	10	51.0	10	40.5
	90	10	8	1097.6	10	570.1	10	269.3	9	457.4	10	406.2	9	557.6
	100	10	10	493.0	10	274.8	9	582.6	10	186.5	10	376.6	9	508.3
Subtotal		90	88	228.5	90	118.5	89	102.1	89	87.8	90	108.2	88	131.3
36	20	10	10	2.1	10	0.6	10	0.3	10	0.2	10	0.4	10	0.4
	30	10	10	25.4	10	5.6	10	2.5	10	3.2	10	2.8	10	6.5
	40	10	10	43.5	10	30.8	10	7.2	10	14.7	10	26.1	10	29.7
	50	10	9	649.2	10	59.3	10	27.1	10	116.2	10	163.2	10	59.9
	60	10	10	805.8	10	137.9	10	85.1	10	71.5	10	272.1	10	156.3
	70	10	8	1125.5	10	791.9	10	160.4	10	373.2	10	737.4	10	359.3
	80	10	5	2141.7	8	1829.8	10	989.0	10	929.4	8	1977.1	8	1755.7
	90	10	6	2295.7	10	1098.1	10	1402.3	7	1941.4	9	1425.8	7	1969.3
	100	10	4	2394.8	5	2971.8	8	2107.6	3	2977.9	4	3150.5	4	2881.0
Subtotal		90	72	1053.7	83	769.5	88	531.3	80	714.2	81	861.7	79	802.0
48	20	10	10	3.6	10	1.2	10	0.5	10	1.0	10	1.4	10	0.9
	30	10	10	146.5	10	21.8	10	46.4	10	35.6	10	49.1	10	96.5
	40	10	9	612.7	10	32.0	10	57.3	10	47.8	10	41.3	10	134.2
	50	10	6	2285.0	10	613.0	10	187.0	10	402.9	9	1202.6	9	1030.0
	60	10	6	1677.9	10	363.6	10	268.6	10	589.4	10	539.0	10	560.2
	70	10	3	2951.5	5	2208.9	6	2286.7	5	2254.9	7	1746.4	7	1887.1
	80	10	1	3316.5	5	2381.6	7	2197.2	5	3031.7	7	2345.8	7	2471.7
	90	10	1	3276.8	1	3387.3	3	3160.0	3	2828.2	0	3600.0	1	3574.5
	100	10	2	3039.8	3	3140.0	1	3387.8	3	3004.0	0	3600.0	1	3305.2
Subtotal		90	48	1923.4	64	1349.9	67	1287.9	66	1355.1	63	1458.4	65	1451.2
Total		270	208	1068.5	237	746.0	244	640.4	235	719.0	234	809.4	232	794.8

Table EC.2 Summary results of our BPC algorithm for the H&W instances

Q	n	Inst	Traversal Opt	Traversal t[s]	Return Opt	Return t[s]	Midpoint Opt	Midpoint t[s]	Largest gap Opt	Largest gap t[s]	Combined Opt	Combined t[s]	Optimal Opt	Optimal t[s]
30	20	160	160	0.0	160	0.0	160	0.0	160	0.0	160	0.0	160	0.0
	30	160	160	0.0	160	0.0	160	0.0	160	0.0	160	0.0	160	0.0
	40	160	160	0.1	160	0.1	160	0.0	160	0.0	160	0.0	160	0.0
	50	160	160	0.1	160	0.0	160	0.0	160	0.0	160	0.0	160	0.0
	60	160	158	45.2	160	0.1	160	0.1	160	0.1	160	0.1	160	0.1
	70	160	158	45.2	160	0.2	160	0.1	160	0.1	160	0.2	160	0.1
	80	160	155	129.2	160	0.2	160	0.1	160	0.2	159	22.9	160	13.9
	90	160	154	157.5	160	0.2	160	0.1	160	0.2	159	22.8	160	0.2
	100	160	155	123.1	160	0.3	160	0.1	160	0.3	160	0.3	160	0.4
Subtotal		1440	1420	55.6	1440	0.1	1440	0.1	1440	0.1	1438	5.2	1440	1.6
45	20	160	160	0.2	160	0.1	160	0.1	160	0.1	160	0.1	160	0.1
	30	160	160	11.0	160	0.8	160	0.4	160	0.7	160	1.0	160	0.5
	40	160	160	34.1	160	1.6	160	1.1	160	2.6	160	1.7	160	2.1
	50	160	157	113.5	160	6.6	160	2.3	159	24.5	160	17.2	160	5.7
	60	160	152	221.5	159	35.2	160	6.9	160	7.9	159	81.6	160	15.7
	70	160	150	334.3	158	80.2	160	10.7	160	24.9	158	105.2	159	56.4
	80	160	145	491.4	156	146.5	160	22.0	160	32.1	157	157.0	157	142.6
	90	160	136	745.1	158	178.9	160	37.2	159	78.9	157	176.0	157	140.7
	100	160	132	818.8	148	432.2	158	105.9	156	182.5	148	396.6	151	346.6
Subtotal		1440	1352	307.8	1419	98.0	1438	20.7	1434	39.3	1419	104.1	1424	78.9
60	20	160	160	1.3	160	0.3	160	0.2	160	0.2	160	0.3	160	0.3
	30	160	159	49.5	160	1.9	160	1.9	160	1.9	160	2.2	160	2.0
	40	160	149	325.4	160	8.0	160	5.0	160	8.3	160	12.9	160	11.9
	50	160	138	657.8	159	53.5	160	25.0	160	45.2	158	70.5	159	64.7
	60	160	130	932.1	159	132.8	158	127.6	159	142.9	157	212.4	159	130.8
	70	160	102	1503.0	155	333.3	153	283.7	154	323.7	153	411.9	152	403.6
	80	160	79	2031.4	146	626.3	147	501.5	142	693.6	147	671.5	135	951.9
	90	160	64	2432.1	134	890.4	147	608.5	143	765.3	137	1018.8	141	996.3
	100	160	39	2898.1	123	1381.1	139	932.1	136	1152.7	123	1456.0	120	1542.8
Subtotal		1440	1020	1203.4	1356	380.8	1384	276.2	1374	348.2	1355	428.5	1346	456.0
75	20	160	160	36.8	160	0.4	160	0.3	160	0.5	160	0.8	160	0.9
	30	160	140	598.3	160	4.8	160	3.7	160	4.0	160	5.9	160	5.4
	40	160	130	881.6	160	28.3	160	18.8	160	26.0	160	29.4	160	36.1
	50	160	93	1731.2	160	139.2	160	100.4	159	157.5	158	153.5	160	162.9
	60	160	83	2031.8	155	360.1	157	304.6	155	382.2	155	375.6	157	457.1
	70	160	50	2633.9	152	721.9	144	778.8	143	892.4	139	898.9	144	878.2
	80	160	36	2966.8	122	1473.2	134	1088.1	125	1426.8	129	1364.3	108	1835.8
	90	160	15	3362.6	111	1901.0	109	1857.3	101	2036.9	111	1854.2	98	2099.8
	100	160	13	3399.2	67	2758.6	78	2441.8	65	2712.8	77	2499.2	57	2838.7
Subtotal		1440	720	1960.2	1247	820.8	1262	732.6	1228	848.8	1249	798.0	1204	923.9
Total		5760	4512	881.8	5462	325.0	5524	257.4	5476	309.1	5461	333.9	5414	365.1

Table EC.3 Summary results of our BPC algorithm for the ZKS instances

			Traversal		Return		Midpoint		Largest gap		Combined		Optimal	
Q	n	Inst	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]
6	200	10	2	2884.8	6	1648.2	2	2978.5	4	2172.0	4	2513.2	3	2524.3
	300	10	1	3253.7	2	3011.2	1	3250.6	0	3600.0	1	3243.9	1	3257.2
	400	10	1	3259.1	0	3600.0	0	3600.0	1	3265.4	0	3600.0	0	3600.0
	500	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	1	3384.2	0	3600.0
	600	10	1	3581.2	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
9	200	10	0	3600.0	1	3344.2	0	3600.0	0	3600.0	3	2675.6	2	2991.5
12	200	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
15	200	10	0	3600.0	1	3510.9	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Total		80	5	3422.4	10	3239.3	3	3478.6	5	3379.7	9	3277.1	6	3346.6

Table EC.4 Summary results of our BPC algorithm for the M&Ö-ext instances

			Traversal		Return		Midpoint		Largest gap		Combined		Optimal	
Q	n	Inst	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]
60	20	10	10	13.3	10	1.2	10	2.3	10	1.7	10	4.5	10	7.7
	30	10	10	330.1	10	99.2	10	38.6	10	60.6	10	215.0	10	444.3
	40	10	6	1590.0	10	139.1	10	81.7	10	169.9	10	294.5	9	745.6
	50	10	7	1791.3	9	535.5	10	850.1	10	557.8	8	1387.5	8	1112.2
	60	10	4	2596.3	5	2358.5	6	1760.1	6	2339.4	5	2389.4	6	2403.0
	70	10	2	3090.8	7	1685.2	3	2823.2	3	3145.2	5	2645.1	2	3220.8
	80	10	0	3600.0	1	3371.3	2	3054.8	0	3600.0	2	3107.1	0	3600.0
	90	10	1	3262.8	2	3063.7	1	3357.8	0	3600.0	1	3317.4	1	3402.8
	100	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Subtotal		90	40	2208.3	54	1650.4	52	1729.8	49	1897.2	51	1884.5	46	2059.6
72	20	10	10	3.8	10	4.4	10	5.0	10	7.0	10	9.8	10	29.8
	30	10	10	368.8	10	74.6	10	226.4	10	249.0	10	195.5	10	1010.6
	40	10	8	841.6	10	980.8	9	509.8	10	717.2	9	901.6	10	487.2
	50	10	4	2728.1	6	1760.4	8	1525.1	7	1798.4	6	1692.2	8	1417.6
	60	10	6	2141.7	3	2863.8	5	2326.9	2	3272.1	2	3074.3	6	2216.9
	70	10	2	2903.7	2	3227.4	2	3187.4	0	3600.0	3	2825.8	0	3600.0
	80	10	0	3600.0	1	3462.0	1	3529.1	0	3600.0	0	3600.0	0	3600.0
	90	10	1	3356.4	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	100	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	1	3316.4	0	3600.0
Subtotal		90	41	2171.6	42	2174.8	45	2056.6	39	2271.5	41	2135.1	44	2173.6
Total		180	81	2189.9	96	1912.6	97	1893.2	88	2084.4	92	2009.8	90	2116.6

Table EC.5 Summary results of our BPC algorithm for the W&G-g instances

			Traversal		Return		Midpoint		Largest gap		Combined		Optimal	
Q	n	Inst	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]
24	125	10	5	2259.2	8	1423.7	6	1694.5	7	1557.1	7	1974.4	7	1730.9
	150	10	4	2564.5	7	1845.8	7	2458.0	7	2043.3	5	2624.6	5	2410.4
	175	10	3	2733.7	1	3508.7	5	3076.1	3	3169.5	3	3164.7	4	2671.1
	200	10	0	3600.0	0	3600.0	1	3484.8	0	3600.0	0	3600.0	0	3600.0
	225	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	250	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	1	3576.3	0	3600.0
Subtotal		60	12	3059.6	16	2929.7	19	2985.6	17	2928.3	16	3090.0	16	2935.4
36	125	10	0	3600.0	1	3489.9	4	2985.8	1	3367.5	1	3518.5	0	3600.0
	150	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	175	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	200	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	225	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	250	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Subtotal		60	0	3600.0	1	3581.6	4	3497.6	1	3561.3	1	3586.4	0	3600.0
48	125	10	1	3445.3	0	3600.0	1	3561.2	0	3600.0	0	3600.0	0	3600.0
	150	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	175	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	200	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	225	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	250	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Subtotal		60	1	3574.2	0	3600.0	1	3593.5	0	3600.0	0	3600.0	0	3600.0
60	125	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	150	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	175	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	200	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	225	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	250	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Subtotal		60	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
72	125	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	150	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	175	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	200	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	225	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	250	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Subtotal		60	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Total		300	13	3486.8	17	3462.3	24	3455.3	18	3457.9	17	3495.3	16	3467.1

Table EC.6 Summary results of our BPC algorithm for the W&G-u instances

			Traversal		Return		Midpoint		Largest gap		Combined		Optimal	
Q	n	Inst	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]	Opt	t[s]
24	100	10	10	77.8	10	34.0	10	37.8	10	24.5	10	28.5	10	54.0
	150	10	7	1447.1	10	777.8	10	577.4	9	679.2	8	1538.9	10	1118.0
	200	10	6	2896.3	9	1399.0	8	1908.6	5	2548.2	6	2394.1	3	3150.8
	250	10	1	3391.7	1	3290.1	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Subtotal		40	24	1953.2	30	1375.2	28	1531.0	24	1713.0	24	1890.4	23	1980.7
36	100	10	7	2235.3	6	2793.7	8	1737.4	9	1809.8	5	2249.7	7	2174.5
	150	10	2	3006.6	1	3336.6	0	3600.0	1	3380.1	1	3415.4	0	3600.0
	200	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	250	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Subtotal		40	9	3110.5	7	3332.6	8	3134.4	10	3097.5	6	3216.3	7	3243.6
48	100	10	2	3320.0	3	3251.1	1	3538.3	0	3600.0	1	3577.4	0	3600.0
	150	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	200	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	250	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Subtotal		40	2	3530.0	3	3512.8	1	3584.6	0	3600.0	1	3594.3	0	3600.0
60	100	10	1	3542.6	0	3600.0	0	3600.0	0	3600.0	1	3423.7	0	3600.0
	150	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	200	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	250	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Subtotal		40	1	3585.6	0	3600.0	0	3600.0	0	3600.0	1	3555.9	0	3600.0
72	100	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	150	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	200	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
	250	10	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Subtotal		40	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0	0	3600.0
Total		200	36	3155.9	40	3084.1	37	3090.0	34	3122.1	32	3171.4	30	3204.9

F.2. Detailed Results of BPC Algorithm

Tables EC.7–EC.42 provide detailed results for the six benchmark sets and all routing strategies aggregated by capacity Q and number of orders n. They report the number of instances solved to optimality within the time limit of one hour (Opt), the average solution time in seconds ($t[s]$), the average time for solving the LP-relaxation in seconds (t^{LP}), the average optimality gap with respect to the best known solution of the LP-relaxation (Gp), the average optimality gap with respect to the best known solution before the first node resulting from a Ryan-and-Foster branching is solved (Gp^{RF}), the average number of B&B nodes solved (Nds), and the average number of CCs (CC) and SRCs (SRC) added. In cases where no average could be computed for a given group, e.g., because the LP-relaxation could not be solved for one of the comprised instances, the respective cell is left blank.

Table EC.7 Detailed results of our BPC algorithm for the M&Ö instances and the traversal strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	20	10	10	0.2	0.0	1.68	0.25	5	13	12
	30	10	10	0.7	0.0	1.81	0.31	12	21	30
	40	10	10	8.6	0.0	1.01	0.28	258	18	37
	50	10	10	14.8	0.1	1.11	0.44	107	33	41
	60	10	10	11.5	0.1	0.82	0.32	95	10	43
	70	10	10	37.9	0.2	0.77	0.30	212	32	53
	80	10	10	392.4	0.2	0.62	0.31	5047	17	53
	90	10	8	1097.6	0.3	0.56	0.35	13403	22	48
	100	10	10	493.0	0.4	0.44	0.22	1977	27	59
Subtotal		90	88	228.5	0.2	0.98	0.31	2346	21	42
36	20	10	10	2.1	0.0	4.57	0.26	6	29	48
	30	10	10	25.4	0.1	2.13	0.60	47	41	70
	40	10	10	43.5	0.3	2.17	0.49	54	44	86
	50	10	9	649.2	0.6	2.18	0.73	1129	58	98
	60	10	10	805.8	0.9	2.16	0.65	2457	35	88
	70	10	8	1125.5	1.3	1.54	0.54	2714	41	101
	80	10	5	2141.7	2.0	1.66	0.54	4834	50	104
	90	10	6	2295.7	2.5	1.46	0.53	5530	42	116
	100	10	4	2394.8	3.1	1.20	0.56	6922	29	110
Subtotal		90	72	1053.7	1.2	2.12	0.54	2633	41	91
48	20	10	10	3.6	0.1	6.29	0.14	5	33	60
	30	10	10	146.5	0.4	5.00	0.50	50	81	101
	40	10	9	612.7	0.9	2.65	0.60	1297	37	118
	50	10	6	2285.0	2.3	3.06	0.84	2539	72	112
	60	10	6	1677.9	3.7	1.64	0.70	1885	22	122
	70	10	3	2951.5	5.2	2.28	0.89	2344	62	126
	80	10	1	3316.5	7.7	2.02	0.90	4711	41	123
	90	10	1	3276.8	13.4	2.33	0.82	1333	85	127
	100	10	2	3039.8	14.0	1.56	0.74	1590	63	128
Subtotal		90	48	1923.4	5.3	2.98	0.68	1750	55	113
Total		270	208	1068.5	2.2	2.03	0.51	2243	39	82

Table EC.8 Detailed results of our BPC algorithm for the M&Ö instances and the return strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	20	10	10	0.1	0.0	1.38	0.10	3	6	11
	30	10	10	1.1	0.0	1.67	0.30	18	25	30
	40	10	10	1.9	0.0	0.87	0.24	24	16	36
	50	10	10	13.0	0.1	0.83	0.24	62	32	41
	60	10	10	3.0	0.1	0.59	0.16	18	9	41
	70	10	10	73.8	0.2	0.68	0.27	305	34	44
	80	10	10	128.3	0.3	0.54	0.28	932	14	47
	90	10	10	570.1	0.3	0.52	0.29	7851	10	44
	100	10	10	274.8	0.4	0.46	0.25	1209	27	45
Subtotal		90	90	118.5	0.2	0.84	0.24	1158	19	38
36	20	10	10	0.6	0.0	3.61	0.11	4	28	38
	30	10	10	5.6	0.1	1.69	0.20	9	41	48
	40	10	10	30.8	0.3	2.14	0.33	31	45	62
	50	10	10	59.3	0.5	1.61	0.36	41	67	76
	60	10	10	137.9	0.9	1.85	0.42	166	42	80
	70	10	10	791.9	1.3	1.30	0.44	450	65	80
	80	10	8	1829.8	2.0	1.53	0.50	3322	67	86
	90	10	10	1098.1	2.6	1.22	0.40	2111	46	76
	100	10	5	2971.8	3.3	1.21	0.55	5732	53	90
Subtotal		90	83	769.5	1.2	1.79	0.37	1318	51	71
48	20	10	10	1.2	0.1	5.04	0.00	2	37	25
	30	10	10	21.8	0.5	4.04	0.17	6	69	70
	40	10	10	32.0	1.2	2.26	0.31	14	49	86
	50	10	10	613.0	2.8	2.70	0.51	72	111	106
	60	10	10	363.6	4.3	1.47	0.39	60	60	103
	70	10	5	2208.9	6.7	2.02	0.65	354	101	105
	80	10	5	2381.6	11.4	1.93	0.87	1478	79	109
	90	10	1	3387.3	13.0	2.43	1.00	1090	112	122
	100	10	3	3140.0	16.7	1.75	0.92	1000	88	118
Subtotal		90	64	1349.9	6.3	2.63	0.54	453	78	94
Total		270	237	746.0	2.6	1.75	0.38	976	49	67

Table EC.9 Detailed results of our BPC algorithm for the M&Ö instances and the midpoint strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	20	10	10	0.0	0.0	0.81	0.04	2	4	3
	30	10	10	0.4	0.0	1.08	0.13	6	12	21
	40	10	10	1.6	0.0	0.70	0.22	23	9	28
	50	10	10	3.0	0.1	0.63	0.21	17	12	33
	60	10	10	5.2	0.1	0.70	0.23	31	8	42
	70	10	10	17.3	0.2	0.64	0.25	82	14	38
	80	10	10	39.2	0.3	0.49	0.25	276	6	43
	90	10	10	269.3	0.4	0.49	0.28	2429	16	42
	100	10	9	582.6	0.4	0.47	0.31	5873	8	42
Subtotal		90	89	102.1	0.2	0.67	0.21	971	10	32
36	20	10	10	0.3	0.0	2.58	0.10	3	15	26
	30	10	10	2.5	0.2	1.09	0.13	4	21	41
	40	10	10	7.2	0.3	1.62	0.26	16	25	56
	50	10	10	27.1	0.8	1.36	0.31	30	34	68
	60	10	10	85.1	1.2	1.50	0.43	140	22	68
	70	10	10	160.4	1.9	1.09	0.46	254	26	73
	80	10	10	989.0	2.8	1.42	0.52	2111	37	80
	90	10	10	1402.3	3.7	1.19	0.48	3509	25	86
	100	10	8	2107.6	4.0	0.94	0.50	6743	16	77
Subtotal		90	88	531.3	1.7	1.42	0.35	1423	24	64
48	20	10	10	0.5	0.1	4.19	0.01	2	32	30
	30	10	10	46.4	0.7	3.41	0.33	13	73	84
	40	10	10	57.3	1.7	1.89	0.36	25	44	80
	50	10	10	187.0	4.6	2.44	0.51	73	71	100
	60	10	10	268.6	6.9	1.46	0.62	272	21	100
	70	10	6	2286.7	12.8	2.00	0.91	1819	67	104
	80	10	7	2197.2	18.9	1.64	0.78	1602	38	109
	90	10	3	3160.0	25.6	2.13	1.01	1385	65	112
	100	10	1	3387.8	31.9	2.11	1.53	2451	47	106
Subtotal		90	67	1287.9	11.5	2.36	0.67	849	51	92
Total		270	244	640.4	4.4	1.48	0.41	1081	28	63

Table EC.10 Detailed results of our BPC algorithm for the M&Ö instances and the largest gap strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	20	10	10	0.1	0.0	1.16	0.02	2	7	9
	30	10	10	0.9	0.0	1.22	0.19	12	14	27
	40	10	10	2.3	0.1	0.77	0.19	34	12	28
	50	10	10	8.1	0.1	0.74	0.29	51	13	38
	60	10	10	12.5	0.2	0.67	0.25	94	6	41
	70	10	10	53.3	0.2	0.63	0.26	261	16	42
	80	10	10	69.5	0.3	0.49	0.27	487	6	46
	90	10	9	457.4	0.4	0.49	0.28	5550	12	43
	100	10	10	186.5	0.5	0.41	0.26	1114	8	43
Subtotal		90	89	87.8	0.2	0.73	0.22	845	10	35
36	20	10	10	0.2	0.1	2.46	0.00	1	12	14
	30	10	10	3.2	0.2	1.22	0.20	6	23	41
	40	10	10	14.7	0.4	1.72	0.23	22	30	59
	50	10	10	116.2	1.2	1.48	0.42	166	40	70
	60	10	10	71.5	1.5	1.49	0.38	167	24	69
	70	10	10	373.2	2.5	1.16	0.51	444	27	73
	80	10	10	929.4	3.8	1.45	0.50	1712	40	78
	90	10	7	1941.4	4.4	1.21	0.51	6519	22	73
	100	10	3	2977.9	5.8	1.23	0.76	6745	18	78
Subtotal		90	80	714.2	2.2	1.49	0.39	1754	26	62
48	20	10	10	1.0	0.2	4.16	0.04	2	24	26
	30	10	10	35.6	1.1	3.59	0.24	10	65	84
	40	10	10	47.8	2.5	1.97	0.32	23	38	80
	50	10	10	402.9	7.2	2.52	0.60	187	60	99
	60	10	10	589.4	12.4	1.48	0.69	448	26	99
	70	10	5	2254.9	18.9	1.99	0.88	1162	62	100
	80	10	5	3031.7	31.2	1.60	0.79	2119	32	101
	90	10	3	2828.2	37.2	2.44	1.28	1580	67	103
	100	10	3	3004.0	50.5	1.80	1.26	1290	44	105
Subtotal		90	66	1355.1	17.9	2.40	0.68	758	46	89
Total		270	235	719.0	6.8	1.54	0.43	1119	28	62

Table EC.11 Detailed results of our BPC algorithm for the M&Ö instances and the combined strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	20	10	10	0.1	0.0	1.53	0.19	5	8	14
	30	10	10	0.4	0.0	1.50	0.11	6	16	18
	40	10	10	3.7	0.0	0.93	0.32	38	18	34
	50	10	10	9.2	0.1	0.92	0.33	54	25	34
	60	10	10	8.3	0.1	0.65	0.29	63	5	38
	70	10	10	118.5	0.2	0.73	0.33	1320	22	40
	80	10	10	51.0	0.3	0.56	0.28	229	12	47
	90	10	10	406.2	0.4	0.46	0.27	3806	11	47
	100	10	10	376.6	0.4	0.43	0.24	1208	24	53
Subtotal		90	90	108.2	0.2	0.86	0.26	748	16	36
36	20	10	10	0.4	0.0	3.50	0.06	3	24	28
	30	10	10	2.8	0.1	1.53	0.24	8	29	50
	40	10	10	26.1	0.3	2.13	0.43	40	46	62
	50	10	10	163.2	0.6	1.93	0.51	121	65	78
	60	10	10	272.1	0.9	1.95	0.52	510	49	82
	70	10	10	737.4	1.4	1.39	0.53	1499	46	85
	80	10	8	1977.1	2.3	1.66	0.61	4992	47	87
	90	10	9	1425.8	2.6	1.25	0.45	2761	38	88
	100	10	4	3150.5	3.3	1.34	0.69	8890	39	95
Subtotal		90	81	861.7	1.3	1.86	0.45	2092	43	73
48	20	10	10	1.4	0.1	5.48	0.09	3	34	45
	30	10	10	49.1	0.5	4.66	0.40	19	72	100
	40	10	10	41.3	1.1	2.29	0.38	32	48	95
	50	10	9	1202.6	2.9	3.14	0.72	315	98	109
	60	10	10	539.0	4.1	1.59	0.57	311	48	112
	70	10	7	1746.4	6.7	2.03	0.64	518	82	115
	80	10	7	2345.8	9.1	1.78	0.68	3816	48	118
	90	10	0	3600.0	12.0	2.62	1.17	2247	91	120
	100	10	0	3600.0	15.2	1.96	1.21	2587	55	125
Subtotal		90	63	1458.4	5.8	2.84	0.65	1094	64	104
Total		270	234	809.4	2.4	1.85	0.45	1311	41	71

Table EC.12 Detailed results of our BPC algorithm for the M&Ö instances and the optimal strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	20	10	10	0.1	0.0	1.36	0.15	3	8	14
	30	10	10	0.7	0.0	1.53	0.20	9	15	25
	40	10	10	2.2	0.1	0.89	0.27	22	14	37
	50	10	10	6.3	0.2	0.75	0.23	38	18	36
	60	10	10	7.1	0.2	0.59	0.24	42	7	36
	70	10	10	59.3	0.3	0.69	0.26	342	20	44
	80	10	10	40.5	0.5	0.51	0.23	163	10	45
	90	10	9	557.6	0.6	0.49	0.29	6205	7	46
	100	10	9	508.3	0.7	0.41	0.23	2803	13	41
Subtotal		90	88	131.3	0.3	0.80	0.23	1070	12	36
36	20	10	10	0.4	0.1	3.30	0.05	2	24	22
	30	10	10	6.5	0.3	1.48	0.20	8	38	50
	40	10	10	29.7	0.7	2.04	0.37	30	47	64
	50	10	10	59.9	1.4	1.61	0.42	74	38	69
	60	10	10	156.3	1.9	1.76	0.44	199	38	76
	70	10	10	359.3	2.9	1.35	0.47	443	43	82
	80	10	8	1755.7	4.8	1.56	0.51	4018	46	76
	90	10	7	1969.3	5.3	1.31	0.49	4764	34	84
	100	10	4	2881.0	6.8	1.26	0.65	5905	30	94
Subtotal		90	79	802.0	2.7	1.74	0.40	1716	38	69
48	20	10	10	0.9	0.2	4.89	0.01	2	34	22
	30	10	10	96.5	1.4	4.31	0.31	11	83	87
	40	10	10	134.2	3.4	2.45	0.45	38	55	95
	50	10	9	1030.0	7.2	3.07	0.73	228	96	110
	60	10	10	560.2	10.3	1.50	0.55	283	43	100
	70	10	7	1887.1	17.7	2.16	0.79	466	83	114
	80	10	7	2471.7	27.7	1.67	0.58	1498	54	123
	90	10	1	3574.5	38.3	2.51	1.18	1091	84	118
	100	10	1	3305.2	43.5	2.07	1.35	1401	67	121
Subtotal		90	65	1451.2	16.6	2.74	0.66	558	67	99
Total		270	232	794.8	6.5	1.76	0.43	1114	39	68

Table EC.13 Detailed results of our BPC algorithm for the H&W instances and the traversal strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
30	20	160	160	0.0	0.0	0.71	0.04	3	1	0
	30	160	160	0.0	0.0	0.42	0.04	5	2	1
	40	160	160	0.1	0.0	0.30	0.04	14	6	1
	50	160	160	0.1	0.0	0.28	0.02	7	4	1
	60	160	158	45.2	0.0	0.27	0.03	966	8	1
	70	160	158	45.2	0.0	0.21	0.03	387	10	2
	80	160	155	129.2	0.0	0.20	0.03	1295	12	2
	90	160	154	157.5	0.0	0.16	0.02	1230	10	1
	100	160	155	123.1	0.0	0.17	0.02	888	16	2
Subtotal		1440	1420	55.6	0.0	0.30	0.03	533	8	1
45	20	160	160	0.2	0.0	1.15	0.28	13	8	10
	30	160	160	11.0	0.0	0.73	0.29	933	9	15
	40	160	160	34.1	0.0	0.61	0.24	1845	14	19
	50	160	157	113.5	0.0	0.58	0.26	5001	22	26
	60	160	152	221.5	0.1	0.47	0.23	7458	21	29
	70	160	150	334.3	0.1	0.43	0.21	10293	25	31
	80	160	145	491.4	0.2	0.41	0.20	10162	27	36
	90	160	136	745.1	0.2	0.38	0.19	13483	33	38
	100	160	132	818.8	0.3	0.36	0.19	14740	30	41
Subtotal		1440	1352	307.8	0.1	0.57	0.23	7103	21	27
60	20	160	160	1.3	0.0	2.03	0.35	71	15	25
	30	160	159	49.5	0.0	1.33	0.36	2911	12	31
	40	160	149	325.4	0.1	1.05	0.39	11555	16	43
	50	160	138	657.8	0.2	0.88	0.36	21302	15	50
	60	160	130	932.1	0.3	0.80	0.34	21348	21	55
	70	160	102	1503.0	0.4	0.73	0.34	29825	24	60
	80	160	79	2031.4	0.6	0.66	0.32	33341	26	68
	90	160	64	2432.1	0.9	0.61	0.31	33915	25	75
	100	160	39	2898.1	1.2	0.59	0.29	30792	32	81
Subtotal		1440	1020	1203.4	0.4	0.96	0.34	20562	21	54
75	20	160	160	36.8	0.0	2.30	0.29	1512	18	45
	30	160	140	598.3	0.1	1.79	0.39	16026	17	53
	40	160	130	881.6	0.2	1.55	0.38	19846	21	67
	50	160	93	1731.2	0.4	1.41	0.42	27441	27	72
	60	160	83	2031.8	0.7	1.12	0.40	26043	26	83
	70	160	50	2633.9	1.1	0.99	0.36	28428	30	93
	80	160	36	2966.8	1.5	0.87	0.35	27565	35	96
	90	160	15	3362.6	2.2	0.86	0.36	24390	39	105
	100	160	13	3399.2	2.8	0.75	0.33	22555	39	108
Subtotal		1440	720	1960.2	1.0	1.29	0.36	21534	28	80
Total		5760	4512	881.8	0.4	0.78	0.24	12433	19	41

Table EC.14 Detailed results of our BPC algorithm for the H&W instances and the return strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
30	20	160	160	0.0	0.0	0.50	0.02	2	1	0
	30	160	160	0.0	0.0	0.27	0.01	3	1	1
	40	160	160	0.1	0.0	0.23	0.03	9	3	1
	50	160	160	0.0	0.0	0.19	0.01	3	2	1
	60	160	160	0.1	0.0	0.17	0.01	5	3	1
	70	160	160	0.2	0.0	0.13	0.01	7	4	1
	80	160	160	0.2	0.0	0.12	0.01	17	3	1
	90	160	160	0.2	0.0	0.10	0.01	10	3	2
	100	160	160	0.3	0.0	0.11	0.01	7	4	2
Subtotal		1440	1440	0.1	0.0	0.20	0.01	7	3	1
45	20	160	160	0.1	0.0	0.90	0.15	8	7	7
	30	160	160	0.8	0.0	0.62	0.19	64	9	14
	40	160	160	1.6	0.0	0.50	0.19	61	10	16
	50	160	160	6.6	0.0	0.50	0.21	262	16	20
	60	160	159	35.2	0.1	0.39	0.19	1294	12	24
	70	160	158	80.2	0.1	0.37	0.18	2553	17	25
	80	160	156	146.5	0.1	0.33	0.17	3636	15	27
	90	160	158	178.9	0.2	0.30	0.16	3526	15	28
	100	160	148	432.2	0.2	0.31	0.17	8045	12	32
Subtotal		1440	1419	98.0	0.1	0.47	0.18	2161	13	21
60	20	160	160	0.3	0.0	1.70	0.18	8	17	19
	30	160	160	1.9	0.0	1.14	0.26	72	19	28
	40	160	160	8.0	0.1	0.89	0.28	106	20	34
	50	160	159	53.5	0.2	0.77	0.31	1209	21	40
	60	160	159	132.8	0.3	0.70	0.31	2314	27	43
	70	160	155	333.3	0.4	0.65	0.30	5415	26	45
	80	160	146	626.3	0.6	0.61	0.31	7452	24	48
	90	160	134	890.4	0.8	0.54	0.30	8265	23	53
	100	160	123	1381.1	1.0	0.56	0.33	10414	27	54
Subtotal		1440	1356	380.8	0.4	0.84	0.29	3917	23	40
75	20	160	160	0.4	0.0	2.11	0.09	4	21	24
	30	160	160	4.8	0.1	1.68	0.26	22	27	45
	40	160	160	28.3	0.3	1.45	0.34	102	33	53
	50	160	160	139.2	0.5	1.31	0.37	992	38	56
	60	160	155	360.1	0.8	1.07	0.38	2263	39	59
	70	160	152	721.9	1.3	0.95	0.38	3866	37	65
	80	160	122	1473.2	1.9	0.94	0.43	5625	44	70
	90	160	111	1901.0	2.7	0.91	0.46	6157	42	71
	100	160	67	2758.6	3.3	0.99	0.59	9209	42	77
Subtotal		1440	1247	820.8	1.2	1.26	0.37	3138	36	58
Total		5760	5462	325.0	0.4	0.69	0.21	2306	18	30

Table EC.15 Detailed results of our BPC algorithm for the H&W instances and the midpoint strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
30	20	160	160	0.0	0.0	0.48	0.03	3	1	0
	30	160	160	0.0	0.0	0.26	0.01	2	1	0
	40	160	160	0.0	0.0	0.20	0.01	2	1	1
	50	160	160	0.0	0.0	0.16	0.01	2	1	0
	60	160	160	0.1	0.0	0.16	0.01	3	2	1
	70	160	160	0.1	0.0	0.12	0.01	3	2	1
	80	160	160	0.1	0.0	0.11	0.01	5	3	1
	90	160	160	0.1	0.0	0.09	0.00	3	2	1
	100	160	160	0.1	0.0	0.08	0.00	3	3	1
Subtotal		1440	1440	0.1	0.0	0.18	0.01	3	2	1
45	20	160	160	0.1	0.0	0.69	0.12	5	5	6
	30	160	160	0.4	0.0	0.49	0.15	17	6	11
	40	160	160	1.1	0.0	0.40	0.15	45	6	16
	50	160	160	2.3	0.0	0.40	0.15	72	8	19
	60	160	160	6.9	0.1	0.33	0.16	227	6	21
	70	160	160	10.7	0.1	0.32	0.16	218	5	23
	80	160	160	22.0	0.2	0.30	0.15	332	7	27
	90	160	160	37.2	0.2	0.30	0.15	529	6	27
	100	160	158	105.9	0.3	0.29	0.16	1683	5	30
Subtotal		1440	1438	20.7	0.1	0.39	0.15	347	6	20
60	20	160	160	0.2	0.0	1.08	0.11	4	13	15
	30	160	160	1.9	0.0	0.88	0.25	43	12	26
	40	160	160	5.0	0.1	0.72	0.30	57	13	31
	50	160	160	25.0	0.2	0.63	0.30	586	12	36
	60	160	158	127.6	0.3	0.63	0.34	2784	16	40
	70	160	153	283.7	0.5	0.58	0.33	5145	13	40
	80	160	147	501.5	0.6	0.54	0.32	6486	12	42
	90	160	147	608.5	0.9	0.50	0.31	5916	14	46
	100	160	139	932.1	1.2	0.49	0.32	7246	11	48
Subtotal		1440	1384	276.2	0.4	0.67	0.29	3141	13	36
75	20	160	160	0.3	0.0	1.48	0.08	3	18	21
	30	160	160	3.7	0.1	1.32	0.24	23	20	39
	40	160	160	18.8	0.3	1.17	0.34	128	26	47
	50	160	160	100.4	0.6	1.09	0.43	684	30	50
	60	160	157	304.6	0.9	0.94	0.44	2179	27	56
	70	160	144	778.8	1.5	0.86	0.47	5038	24	57
	80	160	134	1088.1	2.2	0.78	0.45	4933	29	59
	90	160	109	1857.3	3.1	0.84	0.52	7098	28	62
	100	160	78	2441.8	4.0	0.90	0.61	8481	27	66
Subtotal		1440	1262	732.6	1.4	1.04	0.40	3174	25	51
Total		5760	5524	257.4	0.5	0.57	0.21	1666	11	27

Table EC.16 Detailed results of our BPC algorithm for the H&W instances and the largest gap strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
30	20	160	160	0.0	0.0	0.49	0.01	2	1	0
	30	160	160	0.0	0.0	0.26	0.00	2	1	0
	40	160	160	0.0	0.0	0.22	0.01	2	1	1
	50	160	160	0.0	0.0	0.19	0.01	3	2	0
	60	160	160	0.1	0.0	0.18	0.01	4	2	1
	70	160	160	0.1	0.0	0.12	0.01	3	2	1
	80	160	160	0.2	0.0	0.12	0.01	28	2	1
	90	160	160	0.2	0.0	0.11	0.01	6	3	1
	100	160	160	0.3	0.0	0.11	0.01	12	3	1
Subtotal		1440	1440	0.1	0.0	0.20	0.01	7	2	1
45	20	160	160	0.1	0.0	0.71	0.12	6	6	7
	30	160	160	0.7	0.0	0.50	0.17	55	6	12
	40	160	160	2.6	0.0	0.40	0.14	214	8	16
	50	160	159	24.5	0.1	0.37	0.15	1097	8	19
	60	160	160	7.9	0.1	0.31	0.14	220	7	21
	70	160	160	24.9	0.1	0.29	0.15	779	8	24
	80	160	160	32.1	0.2	0.28	0.15	635	7	26
	90	160	159	78.9	0.2	0.28	0.14	1488	7	27
	100	160	156	182.5	0.3	0.27	0.15	3177	6	30
Subtotal		1440	1434	39.3	0.1	0.38	0.15	852	7	20
60	20	160	160	0.2	0.0	1.15	0.13	5	13	16
	30	160	160	1.9	0.1	0.90	0.29	43	12	25
	40	160	160	8.3	0.1	0.75	0.30	132	14	32
	50	160	160	45.2	0.2	0.63	0.30	1021	12	35
	60	160	159	142.9	0.4	0.60	0.32	2380	15	39
	70	160	154	323.7	0.6	0.55	0.31	4587	13	40
	80	160	142	693.6	0.9	0.53	0.32	7339	15	41
	90	160	143	765.3	1.2	0.48	0.30	6327	13	47
	100	160	136	1152.7	1.5	0.48	0.32	7115	12	47
Subtotal		1440	1374	348.2	0.6	0.67	0.29	3217	13	36
75	20	160	160	0.5	0.0	1.56	0.11	4	18	23
	30	160	160	4.0	0.2	1.31	0.26	22	19	40
	40	160	160	26.0	0.4	1.19	0.37	165	25	46
	50	160	159	157.5	0.8	1.10	0.42	1008	28	49
	60	160	155	382.2	1.4	0.91	0.42	2170	26	53
	70	160	143	892.4	2.4	0.86	0.46	4194	27	56
	80	160	125	1426.8	3.0	0.79	0.47	5623	29	57
	90	160	101	2036.9	4.7	0.87	0.55	5710	27	60
	100	160	65	2712.8	6.1	0.88	0.60	6904	30	64
Subtotal		1440	1228	848.8	2.1	1.05	0.41	2867	25	50
Total		5760	5476	309.1	0.7	0.58	0.21	1736	12	27

Table EC.17 Detailed results of our BPC algorithm for the H&W instances and the combined strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
30	20	160	160	0.0	0.0	0.57	0.02	2	0	0
	30	160	160	0.0	0.0	0.34	0.02	2	2	0
	40	160	160	0.0	0.0	0.24	0.02	5	2	1
	50	160	160	0.0	0.0	0.23	0.01	2	3	1
	60	160	160	0.1	0.0	0.21	0.01	10	4	1
	70	160	160	0.2	0.0	0.17	0.01	24	4	1
	80	160	159	22.9	0.0	0.16	0.01	123	5	1
	90	160	159	22.8	0.0	0.14	0.01	35	5	1
	100	160	160	0.3	0.0	0.14	0.01	14	5	1
Subtotal		1440	1438	5.2	0.0	0.24	0.02	24	3	1
45	20	160	160	0.1	0.0	0.93	0.20	18	7	8
	30	160	160	1.0	0.0	0.60	0.22	77	7	12
	40	160	160	1.7	0.0	0.52	0.19	58	10	18
	50	160	160	17.2	0.1	0.49	0.23	933	12	21
	60	160	159	81.6	0.1	0.40	0.20	3769	13	24
	70	160	158	105.2	0.1	0.35	0.19	3345	14	24
	80	160	157	157.0	0.2	0.35	0.19	3995	13	29
	90	160	157	176.0	0.2	0.31	0.17	3176	17	29
	100	160	148	396.6	0.3	0.30	0.17	7161	10	31
Subtotal		1440	1419	104.1	0.1	0.47	0.20	2504	12	22
60	20	160	160	0.3	0.0	1.76	0.17	7	16	20
	30	160	160	2.2	0.1	1.22	0.30	68	17	29
	40	160	160	12.9	0.1	0.98	0.32	200	22	36
	50	160	158	70.5	0.2	0.76	0.29	1958	20	40
	60	160	157	212.4	0.4	0.73	0.32	4234	24	44
	70	160	153	411.9	0.5	0.66	0.30	6443	28	48
	80	160	147	671.5	0.7	0.61	0.29	6860	27	51
	90	160	137	1018.8	1.0	0.56	0.31	9098	23	57
	100	160	123	1456.0	1.3	0.53	0.30	10721	27	58
Subtotal		1440	1355	428.5	0.5	0.87	0.29	4399	23	43
75	20	160	160	0.8	0.0	2.23	0.15	8	21	31
	30	160	160	5.9	0.2	1.73	0.29	34	23	47
	40	160	160	29.4	0.3	1.43	0.34	99	30	55
	50	160	158	153.5	0.6	1.34	0.35	980	35	61
	60	160	155	375.6	1.0	1.09	0.37	2474	38	65
	70	160	139	898.9	1.7	0.96	0.37	5198	36	74
	80	160	129	1364.3	2.4	0.88	0.35	5179	45	79
	90	160	111	1854.2	3.0	0.83	0.36	6282	44	82
	100	160	77	2499.2	4.3	0.85	0.43	7245	42	89
Subtotal		1440	1249	798.0	1.5	1.26	0.34	3055	35	65
Total		5760	5461	333.9	0.5	0.71	0.21	2495	18	32

Table EC.18 Detailed results of our BPC algorithm for the H&W instances and the optimal strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
30	20	160	160	0.0	0.0	0.55	0.02	2	1	0
	30	160	160	0.0	0.0	0.28	0.00	2	1	0
	40	160	160	0.0	0.0	0.22	0.01	4	2	1
	50	160	160	0.0	0.0	0.20	0.00	2	1	0
	60	160	160	0.1	0.0	0.19	0.01	3	3	1
	70	160	160	0.1	0.0	0.14	0.01	9	2	1
	80	160	160	13.9	0.0	0.14	0.01	360	3	1
	90	160	160	0.2	0.0	0.13	0.01	5	3	1
	100	160	160	0.4	0.0	0.12	0.01	17	3	1
Subtotal		1440	1440	1.6	0.0	0.22	0.01	45	2	1
45	20	160	160	0.1	0.0	0.79	0.16	9	7	7
	30	160	160	0.5	0.0	0.51	0.17	25	8	13
	40	160	160	2.1	0.0	0.43	0.15	82	10	17
	50	160	160	5.7	0.1	0.41	0.18	204	13	20
	60	160	160	15.7	0.1	0.34	0.18	393	10	23
	70	160	159	56.4	0.2	0.31	0.16	1487	11	24
	80	160	157	142.6	0.2	0.29	0.16	3175	10	26
	90	160	157	140.7	0.3	0.28	0.15	2121	12	27
	100	160	151	346.6	0.4	0.27	0.16	5071	9	31
Subtotal		1440	1424	78.9	0.2	0.40	0.16	1396	10	21
60	20	160	160	0.3	0.0	1.48	0.15	6	17	20
	30	160	160	2.0	0.1	1.03	0.26	36	17	28
	40	160	160	11.9	0.2	0.84	0.31	174	22	34
	50	160	159	64.7	0.3	0.69	0.30	1164	19	38
	60	160	159	130.8	0.5	0.66	0.31	1272	23	44
	70	160	152	403.6	0.7	0.60	0.31	4359	26	44
	80	160	135	951.9	1.0	0.58	0.32	8010	23	48
	90	160	141	996.3	1.4	0.51	0.31	5375	22	51
	100	160	120	1542.8	1.8	0.51	0.31	7930	24	55
Subtotal		1440	1346	456.0	0.7	0.77	0.29	3147	22	40
75	20	160	160	0.9	0.1	1.98	0.12	5	25	26
	30	160	160	5.4	0.2	1.56	0.25	21	28	41
	40	160	160	36.1	0.5	1.35	0.35	100	36	53
	50	160	160	162.9	0.9	1.22	0.38	798	36	54
	60	160	157	457.1	1.5	1.03	0.39	1759	40	60
	70	160	144	878.2	2.3	0.91	0.40	3246	38	64
	80	160	108	1835.8	3.2	0.88	0.43	5349	47	69
	90	160	98	2099.8	4.5	0.88	0.48	5230	43	71
	100	160	57	2838.7	5.7	0.95	0.59	6614	44	77
Subtotal		1440	1204	923.9	2.1	1.19	0.38	2569	37	57
Total		5760	5414	365.1	0.7	0.65	0.21	1789	18	30

Table EC.19 Detailed results of our BPC algorithm for the ZKS instances and the traversal strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
6	200	10	2	2884.8	0.1	0.18	0.06	19134	128	76
	300	10	1	3253.7	0.3	0.13	0.03	9538	147	77
	400	10	1	3259.1	0.6	0.15	0.03	6987	140	101
	500	10	0	3600.0	1.3	0.16	0.03	3615	152	123
	600	10	1	3581.2	1.9	0.15	0.02	1088	151	128
9	200	10	0	3600.0	0.6	0.38	0.18	3905	140	121
12	200	10	0	3600.0	3.9	0.80	0.55	8663	39	128
15	200	10	0	3600.0	11.9	1.54	1.09	3531	61	128
Total		80	5	3422.4	2.6	0.44	0.25	7058	120	110

Table EC.20 Detailed results of our BPC algorithm for the ZKS instances and the return strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
6	200	10	6	1648.2	0.1	0.24	0.07	10474	92	63
	300	10	2	3011.2	0.3	0.15	0.04	11391	133	82
	400	10	0	3600.0	0.7	0.15	0.05	4407	155	120
	500	10	0	3600.0	1.2	0.13	0.05	2706	150	128
	600	10	0	3600.0	1.9	0.13	0.04	1080	138	128
9	200	10	1	3344.2	0.5	0.41	0.15	4235	92	123
12	200	10	0	3600.0	1.6	0.60	0.34	3552	35	128
15	200	10	1	3510.9	5.8	0.82	0.49	1862	20	128
Total		80	10	3239.3	1.5	0.33	0.15	4963	102	112

Table EC.21 Detailed results of our BPC algorithm for the ZKS instances and the midpoint strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
6	200	10	2	2978.5	0.1	0.18	0.06	29924	111	71
	300	10	1	3250.6	0.4	0.16	0.03	19045	147	76
	400	10	0	3600.0	0.8	0.16	0.04	10661	147	112
	500	10	0	3600.0	1.6	0.16	0.04	3335	160	127
	600	10	0	3600.0	2.5	0.16	0.04	1597	160	128
9	200	10	0	3600.0	0.9	0.38	0.20	5817	128	128
12	200	10	0	3600.0	3.8	0.55	0.31	6797	41	128
15	200	10	0	3600.0	13.2	1.46	1.05	2573	64	128
Total		80	3	3478.6	2.9	0.40	0.22	9969	120	112

Table EC.22 Detailed results of our BPC algorithm for the ZKS instances and the largest gap strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
6	200	10	4	2172.0	0.2	0.19	0.06	20578	110	80
	300	10	0	3600.0	0.3	0.17	0.04	21082	160	77
	400	10	1	3265.4	0.9	0.16	0.04	5841	147	113
	500	10	0	3600.0	1.6	0.17	0.04	3282	160	128
	600	10	0	3600.0	2.5	0.15	0.04	1402	160	128
9	200	10	0	3600.0	0.8	0.35	0.18	7359	128	128
12	200	10	0	3600.0	4.2	0.55	0.30	8070	37	128
15	200	10	0	3600.0	14.2	1.47	1.06	2533	76	128
Total		80	5	3379.7	3.1	0.40	0.22	8768	122	114

Table EC.23 Detailed results of our BPC algorithm for the ZKS instances and the combined strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
6	200	10	4	2513.2	0.2	0.16	0.07	15785	116	57
	300	10	1	3243.9	0.4	0.15	0.04	17634	120	71
	400	10	0	3600.0	0.8	0.13	0.03	8213	146	112
	500	10	1	3384.2	1.4	0.12	0.03	3880	158	120
	600	10	0	3600.0	2.3	0.12	0.04	1155	159	128
9	200	10	3	2675.6	0.8	0.40	0.16	8015	75	117
12	200	10	0	3600.0	3.0	0.50	0.29	6920	37	128
15	200	10	0	3600.0	9.9	1.15	0.83	3238	33	128
Total		80	9	3277.1	2.4	0.34	0.19	8105	106	108

Table EC.24 Detailed results of our BPC algorithm for the ZKS instances and the optimal strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
6	200	10	3	2524.3	0.2	0.20	0.08	17991	105	58
	300	10	1	3257.2	0.5	0.16	0.05	20512	129	80
	400	10	0	3600.0	0.9	0.13	0.04	11327	146	118
	500	10	0	3600.0	1.8	0.10	0.04	3772	147	120
	600	10	0	3600.0	2.7	0.12	0.04	1568	155	128
9	200	10	2	2991.5	1.1	0.34	0.12	4529	108	116
12	200	10	0	3600.0	4.9	0.52	0.33	5249	37	128
15	200	10	0	3600.0	18.5	1.19	0.89	2203	39	128
Total		80	6	3346.6	3.8	0.35	0.20	8394	108	109

Table EC.25 Detailed results of our BPC algorithm for the M&Ö-ext instances and the traversal strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
60	20	10	10	13.3	0.1	6.16	0.06	4	41	48
	30	10	10	330.1	0.9	3.35	0.34	144	60	85
	40	10	6	1590.0	2.0	3.20	0.41	298	75	126
	50	10	7	1791.3	4.8	4.40	0.84	827	64	128
	60	10	4	2596.3	9.6	3.98	0.94	999	71	124
	70	10	2	3090.8	15.7	2.15	0.75	1266	72	128
	80	10	0	3600.0	26.2	2.39	0.97	1203	56	128
	90	10	1	3262.8	36.7	2.35	0.68	1126	44	128
	100	10	0	3600.0	48.0	2.24	0.88	683	73	128
Subtotal		90	40	2208.3	16.0	3.36	0.65	728	62	114
72	20	10	10	3.8	0.2	7.55	0.02	3	60	23
	30	10	10	368.8	1.3	8.97	0.48	25	108	126
	40	10	8	841.6	3.8	6.59	0.48	47	86	116
	50	10	4	2728.1	13.6	5.92		224	100	93
	60	10	6	2141.7	24.9	4.58	0.63	234	83	128
	70	10	2	2903.7	42.8	3.00		275	89	120
	80	10	0	3600.0	60.1	3.61	0.91	386	91	128
	90	10	1	3356.4	84.4	3.03	0.84	226	114	128
	100	10	0	3600.0	104.4	1.99	0.51	344	69	128
Subtotal		90	41	2171.6	37.3	5.03		196	89	110
Total		180	81	2189.9	26.6	4.19		462	75	112

Table EC.26 Detailed results of our BPC algorithm for the M&Ö-ext instances and the return strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
60	20	10	10	1.2	0.2	4.34	0.00	2	29	5
	30	10	10	99.2	1.5	3.15	0.06	4	83	86
	40	10	10	139.1	4.6	2.67	0.24	13	66	102
	50	10	9	535.5	11.2	3.33	0.36	29	83	121
	60	10	5	2358.5	23.2	3.85	0.66	121	130	124
	70	10	7	1685.2	32.5	1.93	0.57	133	102	124
	80	10	1	3371.3	62.0	2.64	1.25	457	114	127
	90	10	2	3063.7	76.6	2.33	0.82	730	73	127
	100	10	0	3600.0	95.2	2.58	1.25	428	114	128
Subtotal		90	54	1650.4	34.1	2.98	0.58	213	88	105
72	20	10	10	4.4	0.4	7.30	0.00	2	81	14
	30	10	10	74.6	4.2	7.75	0.06	3	121	72
	40	10	10	980.8	17.2	6.01	0.31	32	117	97
	50	10	6	1760.4	62.7	4.45	0.56	60	133	128
	60	10	3	2863.8	131.0	4.86		135	127	128
	70	10	2	3227.4	169.6	3.20	1.14	142	130	128
	80	10	1	3462.0	321.3	4.21	1.56	166	131	128
	90	10	0	3600.0	496.7	4.50	2.29	89	146	128
	100	10	0	3600.0	545.9	4.63	2.87	115	132	128
Subtotal		90	42	2174.8	194.3	5.21		83	124	106
Total		180	96	1912.6	114.2	4.10		148	106	105

Table EC.27 Detailed results of our BPC algorithm for the M&Ö-ext instances and the midpoint strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
60	20	10	10	2.3	0.3	3.96	0.00	2	35	24
	30	10	10	38.6	2.5	2.02	0.07	5	62	60
	40	10	10	81.7	8.8	2.36	0.30	18	52	102
	50	10	10	850.1	26.8	3.32	0.58	65	72	114
	60	10	6	1760.1	49.7	3.47	0.84	207	91	119
	70	10	3	2823.2	87.0	2.15	0.90	472	80	117
	80	10	2	3054.8	146.5	2.42	1.27	472	68	123
	90	10	1	3357.8	196.5	2.53	1.15	658	58	120
	100	10	0	3600.0	227.6	2.69	1.63	405	101	123
Subtotal		90	52	1729.8	82.8	2.77	0.75	256	69	100
72	20	10	10	5.0	0.6	6.02	0.00	2	63	15
	30	10	10	226.4	8.5	6.34	0.16	7	110	87
	40	10	9	509.8	34.0	4.67	0.25	23	93	104
	50	10	8	1525.1	169.4	4.00	0.50	42	123	127
	60	10	5	2326.9	332.7	4.67	1.39	90	120	124
	70	10	2	3187.4	539.2	3.39		84	115	117
	80	10	1	3529.1	1050.3	4.95	2.53	87	114	128
	90	10	0	3600.0	1395.7	4.73	2.74	47	143	128
	100	10	0	3600.0	1656.8			71	114	114
Subtotal		90	45	2056.6	576.4			50	110	105
Total		180	97	1893.2	329.6			153	90	103

Table EC.28 Detailed results of our BPC algorithm for the `M&Ö-ext` instances and the largest gap strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
60	20	10	10	1.7	0.4	4.08	0.00	2	23	23
	30	10	10	60.6	4.4	2.15	0.12	4	49	73
	40	10	10	169.9	16.1	2.55	0.37	19	50	113
	50	10	10	557.8	49.8	3.43	0.66	98	62	110
	60	10	6	2339.4	87.4	3.62	0.94	360	98	112
	70	10	3	3145.2	148.0	2.35		457	88	110
	80	10	0	3600.0	319.2	2.57	1.38	368	64	117
	90	10	0	3600.0	314.9	2.75	1.42	694	54	112
	100	10	0	3600.0	392.3	2.57	1.48	361	95	120
Subtotal		90	49	1897.2	148.0	2.90		263	65	99
72	20	10	10	7.0	0.8	6.04	0.00	2	69	11
	30	10	10	249.0	18.7	6.48	0.11	9	100	66
	40	10	10	717.2	60.4	4.59	0.27	16	90	91
	50	10	7	1798.4	300.1	4.38		63	113	116
	60	10	2	3272.1	723.2	4.79		148	105	111
	70	10	0	3600.0	1109.0	3.92		103	106	103
	80	10	0	3600.0	2192.1			44	95	93
	90	10	0	3600.0	2614.2			8	118	69
	100	10	0	3600.0	2880.7			18	74	62
Subtotal		90	39	2271.5	1099.9			46	97	80
Total		180	88	2084.4	624.0			154	81	90

Table EC.29 Detailed results of our BPC algorithm for the M&Ö-ext instances and the combined strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
60	20	10	10	4.5	0.2	5.77	0.02	2	43	33
	30	10	10	215.0	1.6	3.58	0.27	9	75	122
	40	10	10	294.5	3.9	3.09	0.33	25	72	122
	50	10	8	1387.5	9.7	4.00	0.63	152	82	122
	60	10	5	2389.4	17.3	3.99	0.60	360	112	125
	70	10	5	2645.1	27.3	2.33	0.75	560	109	128
	80	10	2	3107.1	42.3	2.33	0.82	623	98	126
	90	10	1	3317.4	52.3	2.51	0.95	1205	60	125
	100	10	0	3600.0	66.7	2.33	0.95	563	110	128
Subtotal		90	51	1884.5	24.6	3.33	0.59	389	84	114
72	20	10	10	9.8	0.4	7.60	0.00	2	71	34
	30	10	10	195.5	4.2	8.45	0.18	7	109	71
	40	10	9	901.6	10.9	6.52	0.39	48	123	104
	50	10	6	1692.2	39.7	4.51	0.56	144	106	128
	60	10	2	3074.3	78.3	4.80	0.78	220	116	128
	70	10	3	2825.8	118.0	3.14	0.92	116	119	128
	80	10	0	3600.0	190.8	3.95	0.92	221	119	128
	90	10	0	3600.0	234.9	4.60	2.22	120	146	128
	100	10	1	3316.4	280.2	3.08	1.37	149	114	128
Subtotal		90	41	2135.1	106.4	5.18	0.82	114	114	109
Total		180	92	2009.8	65.5	4.25	0.70	252	99	112

Table EC.30 Detailed results of our BPC algorithm for the M&Ö-ext instances and the optimal strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
60	20	10	10	7.7	0.5	5.44	0.00	2	44	24
	30	10	10	444.3	4.0	3.35	0.29	10	78	116
	40	10	9	745.6	12.1	3.14	0.57	80	68	110
	50	10	8	1112.2	32.3	3.67	0.53	68	82	108
	60	10	6	2403.0	61.0	3.85	0.67	244	110	121
	70	10	2	3220.8	79.6	2.44		522	103	123
	80	10	0	3600.0	155.5	2.58	1.15	464	95	124
	90	10	1	3402.8	154.1	2.44	0.98	721	66	127
	100	10	0	3600.0	215.7	2.44	1.09	311	120	128
Subtotal		90	46	2059.6	79.4	3.26		269	85	109
72	20	10	10	29.8	1.1	7.90	0.00	2	95	42
	30	10	10	1010.6	13.8	8.16	0.34	42	127	84
	40	10	10	487.2	38.7	5.81	0.26	15	116	127
	50	10	8	1417.6	154.9	4.31	0.50	54	112	126
	60	10	6	2216.9	306.0	4.59		60	117	115
	70	10	0	3600.0	377.1	3.67		148	122	94
	80	10	0	3600.0	734.3	4.50		124	125	116
	90	10	0	3600.0	883.5	5.06		59	146	112
	100	10	0	3600.0	1070.4	5.25		91	112	115
Subtotal		90	44	2173.6	397.7	5.47		66	119	104
Total		180	90	2116.6	238.6	4.37		168	102	106

Table EC.31 Detailed results of our BPC algorithm for the W&G-g instances and the traversal strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	125	10	5	2259.2	0.7	0.57	0.30	19047	20	71
	150	10	4	2564.5	1.1	0.44	0.26	14542	23	81
	175	10	3	2733.7	2.0	0.36	0.24	12180	18	83
	200	10	0	3600.0	2.5	0.44	0.30	6009	38	92
	225	10	0	3600.0	5.6	0.45	0.32	5569	36	113
	250	10	0	3600.0	5.0	0.48	0.36	2742	60	123
Subtotal		60	12	3059.6	2.8	0.46	0.30	10015	32	94
36	125	10	0	3600.0	5.9	1.12	0.57	6002	51	119
	150	10	0	3600.0	9.6	0.95	0.51	5023	28	126
	175	10	0	3600.0	15.0	1.29	0.98	3349	27	128
	200	10	0	3600.0	21.1	1.21	0.89	1936	51	128
	225	10	0	3600.0	35.0	1.07	0.83	1303	38	128
	250	10	0	3600.0	43.2	1.22	0.94	994	41	128
Subtotal		60	0	3600.0	21.6	1.15	0.79	3101	39	126
48	125	10	1	3445.3	32.9	1.72	0.82	1579	69	128
	150	10	0	3600.0	47.5	1.48	1.03	1625	50	128
	175	10	0	3600.0	74.4	1.25	0.98	1873	39	128
	200	10	0	3600.0	106.0	1.44	1.03	510	84	128
	225	10	0	3600.0	178.6	1.84	1.43	550	44	128
	250	10	0	3600.0	222.9	1.50	1.29	627	25	128
Subtotal		60	1	3574.2	110.4	1.54	1.10	1127	52	128
60	125	10	0	3600.0	99.2	2.04	0.88	483	87	128
	150	10	0	3600.0	168.2	2.23	1.21	462	70	128
	175	10	0	3600.0	263.6	2.59		220	86	111
	200	10	0	3600.0	385.6	3.13		281	84	102
	225	10	0	3600.0	971.7			105	97	115
	250	10	0	3600.0	808.0	3.48	2.87	96	87	128
Subtotal		60	0	3600.0	449.4			275	85	119
72	125	10	0	3600.0	290.4	2.90	1.53	194	85	128
	150	10	0	3600.0	816.3			134	76	102
	175	10	0	3600.0	2194.3			75	25	64
	200	10	0	3600.0	2100.3			68	39	64
	225	10	0	3600.0	3130.3			8	38	38
	250	10	0	3600.0	2840.8			33	22	64
Subtotal		60	0	3600.0	1895.4			85	48	77
Total		300	13	3486.8	495.9			2921	51	109

Table EC.32 Detailed results of our BPC algorithm for the W&G-g instances and the return strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	125	10	8	1423.7	0.7	0.48	0.27	5781	23	61
	150	10	7	1845.8	1.1	0.39	0.25	5286	16	62
	175	10	1	3508.7	1.5	0.43	0.29	9694	40	68
	200	10	0	3600.0	2.1	0.44	0.32	5054	48	76
	225	10	0	3600.0	4.2	0.46	0.34	3945	38	84
	250	10	0	3600.0	4.9	0.48	0.38	3494	35	83
Subtotal		60	16	2929.7	2.4	0.45	0.31	5542	33	72
36	125	10	1	3489.9	5.8	1.14	0.56	2254	81	111
	150	10	0	3600.0	9.5	1.34	0.84	2239	61	112
	175	10	0	3600.0	14.9	1.27	0.92	2074	56	115
	200	10	0	3600.0	21.2	1.48	1.12	884	71	123
	225	10	0	3600.0	33.3	1.43	1.17	765	52	127
	250	10	0	3600.0	39.8	1.49	1.26	660	56	128
Subtotal		60	1	3581.6	20.7	1.36	0.98	1479	63	119
48	125	10	0	3600.0	39.9	1.74	0.94	1015	98	124
	150	10	0	3600.0	58.9	1.46	1.00	1114	69	124
	175	10	0	3600.0	103.1	1.82	1.48	596	74	126
	200	10	0	3600.0	130.7	1.99	1.58	284	117	128
	225	10	0	3600.0	222.6	2.91	2.44	236	93	128
	250	10	0	3600.0	260.9	1.94	1.66	168	96	128
Subtotal		60	0	3600.0	136.0	1.98	1.52	569	91	126
60	125	10	0	3600.0	242.5	3.07	2.00	275	131	128
	150	10	0	3600.0	461.2	2.82	1.94	367	83	128
	175	10	0	3600.0	1203.4			106	103	102
	200	10	0	3600.0	1405.8			136	70	102
	225	10	0	3600.0	2814.4			14	43	38
	250	10	0	3600.0	3046.7			10	35	38
Subtotal		60	0	3600.0	1529.0			151	77	90
72	125	10	0	3600.0	1938.5			68	92	90
	150	10	0	3600.0	2974.9			18	56	38
	175	10	0	3600.0	3408.6			10	10	26
	200	10	0	3600.0	3600.0			0	0	0
	225	10	0	3600.0	3600.0			0	0	0
	250	10	0	3600.0	3600.0			0	0	0
Subtotal		60	0	3600.0	3187.0			16	26	26
Total		300	17	3462.3	975.0			1552	58	87

Table EC.33 Detailed results of our BPC algorithm for the `W&G-g` instances and the midpoint strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	125	10	6	1694.5	0.8	0.50	0.32	9695	16	54
	150	10	7	2458.0	1.2	0.37	0.23	11454	22	59
	175	10	5	3076.1	2.0	0.34	0.24	7997	25	66
	200	10	1	3484.8	2.6	0.36	0.27	7086	23	71
	225	10	0	3600.0	5.3	0.43	0.34	6644	11	80
	250	10	0	3600.0	5.6	0.42	0.33	3475	21	95
Subtotal		60	19	2985.6	2.9	0.40	0.29	7725	19	71
36	125	10	4	2985.8	8.4	0.92	0.52	3840	29	96
	150	10	0	3600.0	12.9	1.12	0.70	3319	29	101
	175	10	0	3600.0	19.7	1.25	0.94	2121	33	110
	200	10	0	3600.0	28.8	1.10	0.81	1444	23	117
	225	10	0	3600.0	47.0	1.23	1.02	1284	20	124
	250	10	0	3600.0	52.7	1.41	1.18	826	26	123
Subtotal		60	4	3497.6	28.3	1.17	0.86	2139	27	112
48	125	10	1	3561.2	67.0	1.47	0.86	1670	36	113
	150	10	0	3600.0	95.2	1.98	1.54	1115	39	122
	175	10	0	3600.0	150.9	2.03	1.79	825	36	125
	200	10	0	3600.0	238.1	1.97	1.61	360	68	128
	225	10	0	3600.0	348.8	2.46	2.12	390	31	128
	250	10	0	3600.0	425.2	2.18	1.91	248	54	128
Subtotal		60	1	3593.5	220.9	2.01	1.64	768	44	124
60	125	10	0	3600.0	593.4	2.42	1.55	287	97	126
	150	10	0	3600.0	941.7	3.10	2.37	280	50	125
	175	10	0	3600.0	1993.7			76	83	102
	200	10	0	3600.0	2026.9	7.16	6.69	77	73	127
	225	10	0	3600.0	3393.6			5	12	20
	250	10	0	3600.0	3452.8			2	16	26
Subtotal		60	0	3600.0	2067.0			121	55	88
72	125	10	0	3600.0	3055.6			32	38	49
	150	10	0	3600.0	3591.8			0	2	13
	175	10	0	3600.0	3600.0			0	0	0
	200	10	0	3600.0	3600.0			0	0	0
	225	10	0	3600.0	3600.0			0	0	0
	250	10	0	3600.0	3600.0			0	0	0
Subtotal		60	0	3600.0	3507.9			5	7	10
Total		300	24	3455.3	1165.4			2152	30	81

Table EC.34 Detailed results of our BPC algorithm for the W&G-g instances and the largest gap strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	125	10	7	1557.1	0.9	0.45	0.25	7845	15	49
	150	10	7	2043.3	1.3	0.42	0.27	7625	14	62
	175	10	3	3169.5	2.1	0.42	0.32	7396	22	66
	200	10	0	3600.0	2.9	0.36	0.27	8043	17	73
	225	10	0	3600.0	4.8	0.44	0.33	4892	14	86
	250	10	0	3600.0	6.6	0.43	0.37	4093	10	87
Subtotal		60	17	2928.3	3.1	0.42	0.30	6649	16	70
36	125	10	1	3367.5	10.3	1.01	0.60	4941	26	88
	150	10	0	3600.0	15.3	1.15	0.76	3505	19	94
	175	10	0	3600.0	24.9	1.38	1.08	1838	26	109
	200	10	0	3600.0	33.1	1.26	0.99	1360	24	118
	225	10	0	3600.0	51.2	1.32	1.13	1139	24	121
	250	10	0	3600.0	61.8	1.41	1.20	729	20	125
Subtotal		60	1	3561.3	32.8	1.26	0.96	2252	23	109
48	125	10	0	3600.0	96.6	2.05	1.42	1181	48	113
	150	10	0	3600.0	142.8	1.93	1.48	964	34	122
	175	10	0	3600.0	219.2	1.78	1.52	542	37	127
	200	10	0	3600.0	318.2	1.91	1.55	327	58	128
	225	10	0	3600.0	662.2	2.52	2.17	314	30	126
	250	10	0	3600.0	578.8	2.31	2.06	191	53	128
Subtotal		60	0	3600.0	336.3	2.08	1.70	587	43	124
60	125	10	0	3600.0	985.3	3.15	2.33	227	79	122
	150	10	0	3600.0	1520.5	3.48	2.74	166	52	128
	175	10	0	3600.0	2421.3			57	91	103
	200	10	0	3600.0	3035.0			16	65	70
	225	10	0	3600.0	3555.9			0	7	13
	250	10	0	3600.0	3600.0			0	0	0
Subtotal		60	0	3600.0	2519.7			78	49	72
72	125	10	0	3600.0	3542.2			3	4	26
	150	10	0	3600.0	3600.0			0	0	0
	175	10	0	3600.0	3600.0			0	0	0
	200	10	0	3600.0	3600.0			0	0	0
	225	10	0	3600.0	3600.0			0	0	0
	250	10	0	3600.0	3600.0			0	0	0
Subtotal		60	0	3600.0	3590.4			0	1	4
Total		300	18	3457.9	1296.4			1913	26	76

Table EC.35 **Detailed results of our BPC algorithm for the W&G-g instances and the combined strategy**

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	125	10	7	1974.4	0.8	0.56	0.30	8877	32	57
	150	10	5	2624.6	1.2	0.41	0.25	9788	26	76
	175	10	3	3164.7	1.8	0.37	0.25	7062	26	77
	200	10	0	3600.0	2.8	0.41	0.29	5734	34	85
	225	10	0	3600.0	5.1	0.46	0.34	4413	29	93
	250	10	1	3576.3	6.0	0.46	0.36	2895	53	112
Subtotal		60	16	3090.0	2.9	0.45	0.30	6462	33	84
36	125	10	1	3518.5	6.9	1.15	0.59	3545	55	117
	150	10	0	3600.0	10.4	1.20	0.67	2953	48	117
	175	10	0	3600.0	15.6	1.38	1.01	2443	28	128
	200	10	0	3600.0	22.2	1.39	1.01	962	57	126
	225	10	0	3600.0	35.6	1.11	0.87	1012	33	128
	250	10	0	3600.0	42.0	1.31	1.07	784	36	128
Subtotal		60	1	3586.4	22.1	1.26	0.87	1950	43	124
48	125	10	0	3600.0	30.3	1.72	0.93	1351	71	128
	150	10	0	3600.0	50.4	1.36	0.92	1278	52	126
	175	10	0	3600.0	76.1	1.83	1.48	771	46	128
	200	10	0	3600.0	112.7	1.73	1.34	386	80	128
	225	10	0	3600.0	181.2	2.55	2.07	326	75	128
	250	10	0	3600.0	205.2	2.18	1.91	303	60	128
Subtotal		60	0	3600.0	109.3	1.90	1.44	736	64	128
60	125	10	0	3600.0	142.0	2.41	1.33	446	108	128
	150	10	0	3600.0	543.7			442	46	115
	175	10	0	3600.0	992.0			185	77	102
	200	10	0	3600.0	1137.3			151	57	102
	225	10	0	3600.0	1332.3			56	98	102
	250	10	0	3600.0	1913.5			46	56	77
Subtotal		60	0	3600.0	1010.1			221	74	105
72	125	10	0	3600.0	849.0			125	113	113
	150	10	0	3600.0	1495.6			60	110	90
	175	10	0	3600.0	2158.2			49	55	77
	200	10	0	3600.0	2425.2			27	66	77
	225	10	0	3600.0	3514.7			0	2	13
	250	10	0	3600.0	3299.9			4	18	51
Subtotal		60	0	3600.0	2290.4			44	61	70
Total		300	17	3495.3	687.0			1882	55	102

Table EC.36 Detailed results of our BPC algorithm for the `W&G-g` instances and the optimal strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	125	10	7	1730.9	1.2	0.48	0.24	8323	19	59
	150	10	5	2410.4	2.0	0.38	0.24	8146	13	69
	175	10	4	2671.1	2.9	0.43	0.30	5237	25	66
	200	10	0	3600.0	3.9	0.46	0.34	5483	26	84
	225	10	0	3600.0	7.0	0.44	0.32	4440	20	89
	250	10	0	3600.0	8.1	0.52	0.44	3172	23	98
Subtotal		60	16	2935.4	4.2	0.45	0.31	5800	21	78
36	125	10	0	3600.0	12.5	1.21	0.65	2387	65	112
	150	10	0	3600.0	19.2	1.22	0.72	2138	44	113
	175	10	0	3600.0	28.2	1.41	1.03	1552	31	123
	200	10	0	3600.0	39.3	1.40	1.05	861	45	124
	225	10	0	3600.0	59.7	1.26	1.03	871	27	128
	250	10	0	3600.0	70.2	1.59	1.36	647	32	128
Subtotal		60	0	3600.0	38.2	1.35	0.97	1409	41	122
48	125	10	0	3600.0	79.8	1.86	1.13	915	68	127
	150	10	0	3600.0	110.1	1.55	1.12	818	54	128
	175	10	0	3600.0	184.6	2.12	1.77	528	50	128
	200	10	0	3600.0	263.8	2.07	1.65	266	81	128
	225	10	0	3600.0	385.8	3.15	2.69	268	60	128
	250	10	0	3600.0	473.1	2.19	1.92	175	70	128
Subtotal		60	0	3600.0	249.5	2.16	1.71	495	64	128
60	125	10	0	3600.0	1051.2			210	90	102
	150	10	0	3600.0	729.0	2.69	1.78	248	62	128
	175	10	0	3600.0	1806.6			84	68	90
	200	10	0	3600.0	2131.9			59	64	90
	225	10	0	3600.0	2829.9			10	66	60
	250	10	0	3600.0	3209.1			2	49	31
Subtotal		60	0	3600.0	1959.6			102	66	83
72	125	10	0	3600.0	2676.0			37	52	39
	150	10	0	3600.0	3094.1			19	34	38
	175	10	0	3600.0	3530.3			2	8	26
	200	10	0	3600.0	3600.0			0	0	0
	225	10	0	3600.0	3600.0			0	0	0
	250	10	0	3600.0	3600.0			0	0	0
Subtotal		60	0	3600.0	3350.1			10	16	17
Total		300	16	3467.1	1120.3			1563	42	86

Table EC.37 **Detailed results of our BPC algorithm for the W&G-u instances and the traversal strategy**

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	100	10	10	77.8	0.3	0.36	0.21	688	0	61
	150	10	7	1447.1	1.0	0.37	0.18	4133	28	74
	200	10	6	2896.3	3.1	0.21	0.12	10114	2	102
	250	10	1	3391.7	5.4	0.20	0.10	2057	84	122
Subtotal		40	24	1953.2	2.5	0.28	0.15	4248	28	90
36	100	10	7	2235.3	2.3	1.12	0.57	4202	31	118
	150	10	2	3006.6	7.0	0.62	0.47	6439	0	128
	200	10	0	3600.0	17.0	0.87	0.55	3571	19	128
	250	10	0	3600.0	35.5	0.72	0.59	2368	10	128
Subtotal		40	9	3110.5	15.4	0.83	0.54	4145	15	125
48	100	10	2	3320.0	9.7	1.59	0.70	1478	33	128
	150	10	0	3600.0	30.7	1.41	0.89	607	65	128
	200	10	0	3600.0	84.6	1.05	0.90	957	0	128
	250	10	0	3600.0	172.2	1.56	1.21	487	13	128
Subtotal		40	2	3530.0	74.3	1.40	0.93	882	28	128
60	100	10	1	3542.6	27.9	0.94	0.62	1000	1	128
	150	10	0	3600.0	117.5	1.07	0.83	597	0	128
	200	10	0	3600.0	278.4	1.65	1.44	365	0	128
	250	10	0	3600.0	599.2	4.97	4.84	241	0	128
Subtotal		40	1	3585.6	255.7	2.16	1.93	551	0	128
72	100	10	0	3600.0	58.4	2.25	0.90	317	38	128
	150	10	0	3600.0	253.6	2.94	2.07	160	44	128
	200	10	0	3600.0	670.7	4.37	3.71	56	78	128
	250	10	0	3600.0	1438.7	6.65	6.29	21	109	128
Subtotal		40	0	3600.0	605.3	4.05	3.24	139	67	128
Total		200	36	3155.9	190.7	1.75	1.36	1993	28	120

Table EC.38 Detailed results of our BPC algorithm for the W&G-u instances and the return strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	100	10	10	34.0	0.3	0.30	0.19	118	0	42
	150	10	10	777.8	0.8	0.42	0.18	856	43	57
	200	10	9	1399.0	2.2	0.24	0.15	3727	1	71
	250	10	1	3290.1	3.5	0.38	0.24	1186	50	88
Subtotal		40	30	1375.2	1.7	0.33	0.19	1472	24	65
36	100	10	6	2793.7	2.3	1.06	0.52	2544	61	97
	150	10	1	3336.6	7.6	0.63	0.50	4493	0	98
	200	10	0	3600.0	15.9	1.09	0.71	1478	18	120
	250	10	0	3600.0	30.9	1.11	0.88	513	54	126
Subtotal		40	7	3332.6	14.2	0.97	0.65	2257	33	110
48	100	10	3	3251.1	11.9	1.79	0.77	786	85	124
	150	10	0	3600.0	39.1	1.72	1.29	429	92	126
	200	10	0	3600.0	94.9	1.42	1.26	626	0	126
	250	10	0	3600.0	168.6	1.95	1.65	339	14	128
Subtotal		40	3	3512.8	78.6	1.72	1.24	545	48	126
60	100	10	0	3600.0	60.1	1.47	1.16	597	0	125
	150	10	0	3600.0	193.2	1.66	1.47	368	0	126
	200	10	0	3600.0	494.8	2.20	2.02	212	0	128
	250	10	0	3600.0	873.5	2.40	2.26	127	0	128
Subtotal		40	0	3600.0	405.4	1.93	1.73	326	0	127
72	100	10	0	3600.0	287.2	3.53	1.71	123	101	128
	150	10	0	3600.0	984.1	5.73	4.66	55	144	128
	200	10	0	3600.0	2408.6	9.80		3	151	103
	250	10	0	3600.0	3600.0			0	0	0
Subtotal		40	0	3600.0	1820.0			45	99	90
Total		200	40	3084.1	464.0			929	41	104

Table EC.39 Detailed results of our BPC algorithm for the `W&G-u` instances and the midpoint strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	100	10	10	37.8	0.4	0.34	0.19	176	0	42
	150	10	10	577.4	1.0	0.44	0.18	1381	14	58
	200	10	8	1908.6	3.0	0.27	0.17	5843	0	68
	250	10	0	3600.0	4.6	0.38	0.25	2710	22	90
Subtotal		40	28	1531.0	2.3	0.36	0.20	2528	9	65
36	100	10	8	1737.4	3.4	0.96	0.50	2719	38	88
	150	10	0	3600.0	11.1	0.90	0.76	4311	0	92
	200	10	0	3600.0	23.9	1.30	0.99	1713	9	105
	250	10	0	3600.0	44.3	1.31	1.11	778	19	123
Subtotal		40	8	3134.4	20.7	1.12	0.84	2380	17	102
48	100	10	1	3538.3	23.4	1.75	0.94	1370	50	120
	150	10	0	3600.0	79.4	2.06	1.60	618	54	122
	200	10	0	3600.0	172.2	1.95	1.80	424	0	122
	250	10	0	3600.0	353.7	2.53	2.27	247	13	128
Subtotal		40	1	3584.6	157.2	2.07	1.65	665	29	123
60	100	10	0	3600.0	152.7	1.79	1.50	315	0	114
	150	10	0	3600.0	578.8	2.45	2.26	146	0	121
	200	10	0	3600.0	1348.5	3.17	3.01	86	0	125
	250	10	0	3600.0	2522.8	7.98	7.83	28	0	128
Subtotal		40	0	3600.0	1150.7	3.85	3.65	144	0	122
72	100	10	0	3600.0	994.5	4.57	3.14	83	72	126
	150	10	0	3600.0	3600.0			0	0	0
	200	10	0	3600.0	3600.0			0	0	0
	250	10	0	3600.0	3600.0			0	0	0
Subtotal		40	0	3600.0	2948.6			21	18	32
Total		200	37	3090.0	855.9			1148	15	89

Table EC.40 Detailed results of our BPC algorithm for the W&G-u instances and the largest gap strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	100	10	10	24.5	0.4	0.28	0.14	77	0	48
	150	10	9	679.2	1.2	0.36	0.14	1834	20	60
	200	10	5	2548.2	3.3	0.30	0.21	6710	0	74
	250	10	0	3600.0	5.9	0.35	0.22	2674	24	91
Subtotal		40	24	1713.0	2.7	0.32	0.18	2824	11	68
36	100	10	9	1809.8	4.7	0.93	0.48	2302	35	80
	150	10	1	3380.1	14.7	0.77	0.63	2994	0	99
	200	10	0	3600.0	31.9	1.32	0.98	1357	12	111
	250	10	0	3600.0	57.9	1.28	1.09	643	24	123
Subtotal		40	10	3097.5	27.3	1.08	0.80	1824	18	103
48	100	10	0	3600.0	40.6	2.02	1.21	1070	56	118
	150	10	0	3600.0	132.3	2.07	1.61	465	52	126
	200	10	0	3600.0	282.9	2.00	1.85	323	0	123
	250	10	0	3600.0	514.8	2.66	2.43	183	9	126
Subtotal		40	0	3600.0	242.7	2.19	1.78	510	29	123
60	100	10	0	3600.0	321.2	2.13	1.89	182	0	105
	150	10	0	3600.0	1181.9	2.93	2.77	99	0	112
	200	10	0	3600.0	2612.8	19.71	19.59	18	0	122
	250	10	0	3600.0	3600.0			0	0	0
Subtotal		40	0	3600.0	1929.0			75	0	85
72	100	10	0	3600.0	2386.0	17.64		7	65	82
	150	10	0	3600.0	3600.0			0	0	0
	200	10	0	3600.0	3600.0			0	0	0
	250	10	0	3600.0	3600.0			0	0	0
Subtotal		40	0	3600.0	3296.5			2	16	21
Total		200	34	3122.1	1099.6			1047	15	80

Table EC.41 Detailed results of our BPC algorithm for the W&G-u instances and the combined strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	100	10	10	28.5	0.4	0.27	0.15	119	0	45
	150	10	8	1538.9	1.0	0.46	0.20	5158	26	56
	200	10	6	2394.1	3.0	0.26	0.17	7607	0	75
	250	10	0	3600.0	5.0	0.39	0.25	3206	25	100
Subtotal		40	24	1890.4	2.3	0.35	0.19	4022	13	69
36	100	10	5	2249.7	2.6	1.05	0.52	2736	40	112
	150	10	1	3415.4	8.0	0.67	0.53	4927	0	110
	200	10	0	3600.0	18.0	1.14	0.76	1532	13	124
	250	10	0	3600.0	35.1	1.21	0.98	592	37	128
Subtotal		40	6	3216.3	15.9	1.02	0.70	2447	23	119
48	100	10	1	3577.4	10.2	2.01	0.98	1581	60	127
	150	10	0	3600.0	34.1	1.67	1.14	538	78	128
	200	10	0	3600.0	75.5	1.18	1.04	850	0	128
	250	10	0	3600.0	141.2	1.62	1.28	384	17	128
Subtotal		40	1	3594.3	65.3	1.62	1.11	838	38	128
60	100	10	1	3423.7	39.9	1.39	1.10	776	0	126
	150	10	0	3600.0	128.2	1.72	1.49	472	0	128
	200	10	0	3600.0	290.3	1.72	1.55	297	0	128
	250	10	0	3600.0	555.7	2.08	1.95	175	0	128
Subtotal		40	1	3555.9	253.5	1.73	1.52	430	0	127
72	100	10	0	3600.0	123.4	3.44	1.64	153	70	128
	150	10	0	3600.0	452.7	3.94	2.67	66	128	128
	200	10	0	3600.0	1132.2	5.50	4.78	34	144	128
	250	10	0	3600.0	2168.1	6.48	6.15	16	142	128
Subtotal		40	0	3600.0	969.1	4.84	3.81	67	121	128
Total		200	32	3171.4	261.2	1.91	1.47	1561	39	114

Table EC.42 Detailed results of our BPC algorithm for the W&G-u instances and the optimal strategy

Q	n	Inst	Opt	t[s]	t^{LP}	Gp	Gp^{RF}	Nds	CC	SRC
24	100	10	10	54.0	0.7	0.29	0.17	183	0	54
	150	10	10	1118.0	1.9	0.41	0.17	2564	28	54
	200	10	3	3150.8	4.7	0.28	0.19	7668	0	73
	250	10	0	3600.0	8.0	0.43	0.29	2241	34	85
Subtotal		40	23	1980.7	3.8	0.35	0.20	3164	16	66
36	100	10	7	2174.5	5.8	1.02	0.49	1810	50	102
	150	10	0	3600.0	19.2	0.83	0.67	2292	0	112
	200	10	0	3600.0	37.2	1.14	0.79	1008	17	127
	250	10	0	3600.0	67.9	1.24	1.04	505	36	128
Subtotal		40	7	3243.6	32.5	1.06	0.75	1404	26	117
48	100	10	0	3600.0	32.4	1.83	0.84	820	76	124
	150	10	0	3600.0	108.5	1.84	1.36	373	85	128
	200	10	0	3600.0	223.9	1.55	1.40	343	0	128
	250	10	0	3600.0	406.4	2.35	2.06	202	14	128
Subtotal		40	0	3600.0	192.8	1.89	1.42	434	44	127
60	100	10	0	3600.0	161.4	1.57	1.28	261	0	121
	150	10	0	3600.0	532.4	2.04	1.85	153	0	128
	200	10	0	3600.0	1126.5	2.08	1.92	91	0	128
	250	10	0	3600.0	2035.2	4.32	4.18	43	0	128
Subtotal		40	0	3600.0	963.9	2.50	2.31	137	0	126
72	100	10	0	3600.0	648.4	3.72	1.88	67	92	128
	150	10	0	3600.0	2437.4	15.16		10	136	115
	200	10	0	3600.0	3600.0			0	0	0
	250	10	0	3600.0	3600.0			0	0	0
Subtotal		40	0	3600.0	2571.5			19	57	61
Total		200	30	3204.9	752.9			1032	29	100

F.3. Detailed Results of BPC-based Heuristics

Tables EC.43–EC.48 provide aggregated results per capacity Q for the proposed BPC-based heuristics on the six benchmark sets and all considered routing strategies. They compare variants of the set-covering heuristic (*SC*) and the depth-first heuristic (*BPC-DF*) with hard time limits of 2, 3, and 5 minutes (*-2*, *-3*, *-5*). The average gap with respect to the best known solution (*Gp*) and the average computation time in seconds ($t[s]$) are reported. In cases where no average could be computed for a given group, e.g., because no lower bound was available for one of the comprised instances, the corresponding cell is left blank.

Table EC.43 Comparison of the BPC-based heuristics on the M&Ö instances

		SC heuristic						BPC-DF heuristic					
		SC-2		SC-3		SC-5		BPC-DF-2		BPC-DF-3		BPC-DF-5	
Routing	Q	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]
Traversal	24	0.09	5.6	0.09	5.6	0.09	5.6	0.02	40.4	0.02	54.8	0.01	78.1
	36	0.50	52.6	0.40	68.2	0.33	92.9	0.22	80.4	0.17	115.6	0.11	181.3
	48	1.63	64.5	1.58	87.8	1.07	129.7	0.67	89.5	0.40	131.8	0.29	214.7
	Subtotal	0.74	40.9	0.69	53.9	0.50	76.1	0.30	70.1	0.20	100.8	0.14	158.1
Return	24	0.08	6.1	0.08	6.7	0.08	7.0	0.04	30.3	0.03	38.8	0.01	55.0
	36	0.44	49.9	0.33	65.8	0.31	88.0	0.20	64.2	0.16	91.4	0.08	141.9
	48	2.02	64.7	1.50	89.7	1.41	136.1	1.19	75.2	0.70	108.5	0.36	168.6
	Subtotal	0.85	40.2	0.64	54.1	0.60	77.0	0.48	56.6	0.30	79.6	0.15	121.8
Midpoint	24	0.06	4.7	0.06	4.7	0.06	4.7	0.01	24.1	0.01	31.7	0.01	46.5
	36	0.61	45.6	0.56	62.4	0.42	87.1	0.17	60.0	0.15	83.3	0.09	127.5
	48	2.30	70.4	1.89	100.9	1.61	152.0	1.02	77.8	0.62	112.4	0.32	176.4
	Subtotal	0.99	40.2	0.84	56.0	0.70	81.3	0.40	54.0	0.26	75.8	0.14	116.8
Largest Gap	24	0.06	4.1	0.06	4.1	0.06	4.1	0.02	30.6	0.01	38.8	0.01	51.1
	36	0.62	49.9	0.54	65.8	0.44	96.1	0.16	65.8	0.14	93.8	0.09	146.6
	48	2.47	72.4	2.01	100.5	1.75	153.7	1.19	82.0	0.75	117.6	0.45	187.5
	Subtotal	1.05	42.1	0.87	56.8	0.75	84.6	0.45	59.4	0.30	83.4	0.18	128.4
Combined	24	0.10	7.4	0.10	7.5	0.10	7.5	0.02	30.7	0.02	39.4	0.01	56.8
	36	0.68	53.9	0.59	71.4	0.50	99.4	0.20	70.9	0.14	100.3	0.11	155.1
	48	2.52	68.7	2.27	97.6	1.91	150.6	0.66	79.7	0.47	115.5	0.28	186.2
	Subtotal	1.10	43.4	0.99	58.8	0.84	85.8	0.29	60.5	0.21	85.1	0.13	132.7
Optimal	24	0.09	4.9	0.09	4.9	0.09	4.9	0.02	31.5	0.02	42.0	0.01	56.9
	36	0.75	53.7	0.61	72.7	0.52	104.4	0.27	70.3	0.21	99.1	0.16	152.4
	48	2.31	73.0	2.17	101.3	1.82	151.5	1.73	88.3	1.12	127.9	0.67	204.8
	Subtotal	1.05	43.9	0.96	59.6	0.81	86.9	0.67	63.4	0.45	89.7	0.28	138.0
Total		0.96	41.8	0.83	56.5	0.70	82.0	0.43	60.7	0.29	85.7	0.17	132.6

Table EC.44 Comparison of the BPC-based heuristics on the H&W instances

		SC heuristic						BPC-DF heuristic					
		SC-2		SC-3		SC-5		BPC-DF-2		BPC-DF-3		BPC-DF-5	
Routing	Q	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]
Traversal	30	0.00	0.1	0.00	0.1	0.00	0.1	0.00	4.3	0.00	6.0	0.00	9.4
	45	0.06	1.7	0.06	1.7	0.06	1.7	0.02	38.0	0.02	52.3	0.02	78.0
	60	0.10	14.5	0.10	15.8	0.10	16.9	0.11	72.8	0.09	104.9	0.08	166.0
	75	0.23	33.1	0.20	40.2	0.18	49.3	0.25	90.7	0.21	133.4	0.18	216.2
Subtotal		0.10	12.3	0.09	14.4	0.08	17.0	0.10	51.5	0.08	74.2	0.07	117.4
Return	30	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1
	45	0.06	1.4	0.06	1.4	0.06	1.4	0.01	14.3	0.01	18.5	0.00	25.8
	60	0.15	21.0	0.14	24.0	0.13	27.6	0.08	45.8	0.06	61.7	0.05	89.4
	75	0.51	48.0	0.44	64.1	0.36	90.4	0.21	64.1	0.16	90.7	0.12	139.5
Subtotal		0.18	17.6	0.16	22.4	0.14	29.9	0.07	31.1	0.06	42.7	0.05	63.7
Midpoint	30	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
	45	0.04	1.0	0.04	1.0	0.04	1.0	0.00	7.9	0.00	9.5	0.00	11.8
	60	0.15	15.6	0.14	17.6	0.13	20.0	0.05	41.2	0.04	55.5	0.03	79.9
	75	0.52	44.5	0.46	58.5	0.39	81.3	0.18	63.3	0.14	89.6	0.11	136.7
Subtotal		0.18	15.3	0.16	19.3	0.14	25.6	0.06	28.1	0.05	38.6	0.04	57.1
Largest gap	30	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.2	0.00	0.3	0.00	0.5
	45	0.04	1.1	0.04	1.1	0.04	1.1	0.00	9.6	0.00	11.5	0.00	14.6
	60	0.14	18.5	0.13	21.0	0.12	23.1	0.06	44.6	0.05	61.4	0.04	90.7
	75	0.57	47.1	0.50	62.7	0.43	88.5	0.25	67.0	0.20	95.1	0.15	147.0
Subtotal		0.19	16.7	0.17	21.2	0.15	28.2	0.08	30.4	0.06	42.1	0.05	63.2
Combined	30	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.6	0.00	0.8	0.00	1.2
	45	0.05	1.6	0.05	1.6	0.05	1.7	0.01	17.5	0.01	22.3	0.01	29.9
	60	0.14	22.8	0.13	26.1	0.12	29.4	0.10	50.6	0.08	69.6	0.06	103.8
	75	0.42	43.6	0.35	56.8	0.28	77.0	0.22	65.8	0.18	93.7	0.13	145.6
Subtotal		0.15	17.0	0.13	21.2	0.11	27.0	0.08	33.6	0.07	46.6	0.05	70.1
Optimal	30	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.2	0.00	0.2	0.00	0.3
	45	0.05	1.5	0.05	1.5	0.05	1.5	0.01	15.1	0.01	18.2	0.01	24.1
	60	0.17	25.4	0.15	30.1	0.13	35.2	0.09	52.3	0.07	72.2	0.06	107.9
	75	0.58	51.3	0.50	68.4	0.42	95.8	0.29	70.0	0.23	99.6	0.16	154.5
Subtotal		0.20	19.6	0.17	25.0	0.15	33.1	0.10	34.4	0.08	47.6	0.06	71.7
Total		0.17	16.4	0.15	20.6	0.13	26.8	0.08	34.8	0.07	48.6	0.05	73.9

Table EC.45 Comparison of the BPC-based heuristics on the ZKS instances

			SC heuristic						BPC-DF heuristic					
			SC-2		SC-3		SC-5		BPC-DF-2		BPC-DF-3		BPC-DF-5	
Routing	Q	n	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]
Traversal	6	200	0.05	2.3	0.05	2.3	0.05	2.3	0.08	108.1	0.07	162.1	0.07	270.1
	6	300	0.03	8.0	0.03	8.0	0.03	8.0	0.11	108.1	0.06	162.1	0.05	270.1
	6	400	0.03	18.6	0.03	18.8	0.03	18.9	0.23	109.8	0.17	163.8	0.15	271.7
	6	500	0.02	40.2	0.02	41.8	0.02	41.8	0.48	120.0	0.44	180.0	0.38	300.0
	6	600	0.02	53.7	0.02	59.5	0.02	60.0	1.04	120.0	0.62	180.1	0.38	300.0
	9	200	0.16	28.3	0.16	28.2	0.16	28.3	1.48	120.0	1.25	180.0	1.06	300.0
	12	200	1.49	119.6	1.14	179.4	1.07	293.8	1.73	120.0	1.46	180.0	1.09	300.0
	15	200	3.41	119.6	2.98	179.4	2.69	298.9	3.68	120.0	2.20	180.0	1.67	300.0
	Subtotal		0.65	48.8	0.55	64.7	0.51	94.0	1.10	115.8	0.78	173.5	0.61	289.0
Return	6	200	0.02	2.2	0.02	2.2	0.02	2.2	0.16	108.4	0.15	162.4	0.09	270.4
	6	300	0.02	4.6	0.02	4.6	0.02	4.6	0.16	120.0	0.15	180.0	0.13	300.0
	6	400	0.04	37.9	0.03	39.8	0.03	39.6	0.25	120.0	0.21	180.0	0.19	300.0
	6	500	0.04	52.5	0.03	59.6	0.03	71.6	0.50	120.0	0.34	180.0	0.29	300.0
	6	600	0.04	71.0	0.03	90.3	0.03	120.8	0.51	120.0	0.49	180.0	0.37	300.0
	9	200	0.12	30.3	0.12	30.3	0.12	30.2	0.67	120.0	0.51	180.0	0.50	300.0
	12	200	0.70	116.8	0.40	170.5	0.35	255.7	1.19	120.0	1.16	180.0	0.81	300.0
	15	200	1.52	119.6	1.36	179.3	1.04	298.8	1.60	120.0	1.21	180.0	1.07	300.0
	Subtotal		0.31	54.4	0.25	72.1	0.21	102.9	0.63	118.6	0.53	177.8	0.43	296.3
Midpoint	6	200	0.06	2.5	0.06	2.5	0.06	2.5	0.08	120.0	0.08	180.0	0.07	300.0
	6	300	0.03	8.0	0.03	7.9	0.03	8.0	0.14	108.5	0.12	162.5	0.10	270.5
	6	400	0.03	17.5	0.03	17.6	0.03	17.2	0.40	120.0	0.24	180.0	0.21	300.0
	6	500	0.04	52.8	0.04	64.7	0.04	79.2	0.42	120.0	0.33	180.0	0.29	300.0
	6	600	0.05	79.2	0.03	96.2	0.03	120.0	0.65	120.0	0.55	180.0	0.47	300.0
	9	200	0.18	33.2	0.18	33.1	0.18	33.1	0.89	120.0	0.79	180.0	0.55	300.0
	12	200	1.18	119.6	0.80	174.7	0.41	270.3	1.16	120.0	0.85	180.0	0.63	300.0
	15	200	2.88	119.7	2.56	179.5	2.28	299.1	3.11	120.0	2.09	180.0	1.70	300.0
	Subtotal		0.56	54.1	0.47	72.0	0.38	103.7	0.86	118.6	0.63	177.8	0.50	296.3
Largest gap	6	200	0.05	2.8	0.05	2.8	0.05	2.8	0.10	108.6	0.09	162.6	0.08	270.6
	6	300	0.04	7.3	0.04	7.3	0.04	7.3	0.17	120.0	0.13	180.0	0.10	300.0
	6	400	0.03	18.9	0.03	19.0	0.03	18.8	0.25	120.0	0.24	180.0	0.22	300.0
	6	500	0.03	41.9	0.03	42.8	0.03	42.8	0.56	120.0	0.48	180.0	0.36	300.0
	6	600	0.03	67.4	0.03	80.0	0.03	101.6	1.44	120.0	0.58	180.0	0.52	300.0
	9	200	0.15	47.1	0.15	53.3	0.15	65.1	1.03	120.0	0.81	180.0	0.64	300.0
	12	200	0.85	112.9	0.49	166.7	0.51	251.5	1.14	120.0	1.07	180.0	0.85	300.0
	15	200	2.54	119.6	2.30	179.3	1.86	298.8	2.71	120.0	2.42	180.0	1.69	300.0
	Subtotal		0.47	52.2	0.39	68.9	0.34	98.6	0.93	118.6	0.73	177.8	0.56	296.3
Combined	6	200	0.04	2.7	0.04	2.7	0.04	2.7	0.13	106.0	0.12	153.9	0.11	250.7
	6	300	0.03	7.3	0.03	7.2	0.03	7.2	0.28	120.0	0.20	180.0	0.19	300.0
	6	400	0.03	16.7	0.03	16.7	0.03	16.7	0.23	120.0	0.22	180.0	0.13	300.0
	6	500	0.03	36.6	0.03	41.2	0.03	40.9	0.36	120.0	0.28	180.0	0.22	300.0
	6	600	0.03	82.0	0.03	94.0	0.03	109.6	0.64	120.0	0.53	180.0	0.36	300.0
	9	200	0.13	36.2	0.13	40.6	0.13	40.5	0.65	120.0	0.55	180.0	0.50	300.0
	12	200	0.58	112.0	0.32	156.6	0.24	240.3	1.04	120.0	0.84	180.0	0.72	300.0
	15	200	2.23	119.7	2.20	179.4	2.10	299.0	2.55	120.0	2.01	180.0	1.59	300.0
	Subtotal		0.39	51.7	0.35	67.3	0.33	94.6	0.73	118.3	0.59	176.7	0.48	293.9
Optimal	6	200	0.05	2.8	0.05	2.8	0.05	2.8	0.13	111.3	0.13	165.1	0.10	273.1
	6	300	0.05	12.1	0.05	12.0	0.05	12.2	0.16	120.0	0.15	180.0	0.12	300.0
	6	400	0.03	17.0	0.03	17.0	0.03	16.9	0.27	120.0	0.21	180.0	0.15	300.0
	6	500	0.03	31.3	0.03	31.2	0.03	31.2	0.32	120.0	0.29	180.0	0.24	300.0
	6	600	0.03	78.0	0.03	95.9	0.03	111.3	1.20	120.0	0.47	180.0	0.33	300.0
	9	200	0.09	33.0	0.08	33.2	0.08	33.2	0.87	120.0	0.61	180.0	0.59	300.0
	12	200	0.88	119.3	0.63	177.0	0.41	273.5	1.24	120.0	1.03	180.0	1.02	300.0
	15	200	2.71	119.6	2.51	179.4	2.27	299.0	2.13	120.0	1.37	180.0	1.18	300.0
	Subtotal		0.48	51.6	0.43	68.6	0.37	97.5	0.79	118.9	0.53	178.2	0.46	296.6
Total			0.48	52.1	0.41	68.9	0.36	98.6	0.84	118.1	0.63	177.0	0.51	294.7

Table EC.46 Comparison of the BPC-based heuristics on the M&Ö-ext instances

		SC heuristic						BPC-DF heuristic					
		SC-2		SC-3		SC-5		BPC-DF-2		BPC-DF-3		BPC-DF-5	
Routing	Q	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]
Traversal	60	4.52	84.6	3.99	120.3	3.55	185.3	1.71	94.5	0.98	139.8	0.50	226.4
	72	7.51	87.1	6.18	122.9	5.18	190.8	6.56	100.6	4.05	147.1	1.57	234.8
	Subtotal	6.02	85.8	5.08	121.6	4.36	188.1	4.14	97.5	2.51	143.4	1.04	230.6
Return	60	5.93	79.4	4.77	108.8	3.88	161.4	4.61	81.7	2.84	117.3	1.06	181.6
	72	10.23	89.8	9.61	128.8	8.87	201.6	10.63	96.7	9.68	140.7	7.57	226.7
	Subtotal	8.08	84.6	7.19	118.8	6.38	181.5	7.62	89.2	6.26	129.0	4.31	204.2
Midpoint	60	8.43	81.3	6.97	115.8	4.75	174.6	8.36	86.2	5.56	123.9	2.95	198.5
	72		95.4		135.5		211.1		98.8		142.0		227.0
	Subtotal		88.3		125.7		192.8		92.5		132.9		212.8
Largest gap	60	10.20	89.3	9.48	126.4	7.14	197.7	9.51	91.9	8.73	133.8	6.33	212.9
	72		99.0		143.5		229.3		102.1		148.7		238.8
	Subtotal		94.2		135.0		213.5		97.0		141.2		225.9
Combined	60	6.51	87.2	5.56	122.9	4.40	186.7	2.96	88.3	1.93	127.3	0.88	202.9
	72	8.79	86.7	8.64	121.4	8.00	190.4	8.55	97.8	7.41	141.6	4.92	227.9
	Subtotal	7.65	86.9	7.10	122.1	6.20	188.6	5.75	93.1	4.67	134.4	2.90	215.4
Optimal	60	9.04	89.6	7.74	129.3	5.36	201.1	7.62	94.3	6.24	137.2	3.41	219.9
	72	10.74	112.9	10.18	154.1	9.29	229.8	10.62	106.1	10.05	154.8	8.68	247.5
	Subtotal	9.89	101.3	8.96	141.7	7.33	215.4	9.12	100.2	8.15	146.0	6.04	233.7
Total			90.2		127.5		196.7		94.9		137.8		220.4

Table EC.47 Comparison of the BPC-based heuristics on the W&G-g instances

		SC heuristic						BPC-DF heuristic					
		SC-2		SC-3		SC-5		BPC-DF-2		BPC-DF-3		BPC-DF-5	
Routing	Q	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]
Traversal	24	1.08	111.0	0.81	158.8	0.56	240.3	2.10	120.0	0.96	179.4	0.47	297.0
	36	3.69	119.8	3.10	179.5	2.94	299.1	7.75	120.0	4.44	180.0	1.88	300.0
	48	15.73	119.9	13.63	179.9	7.75	299.6	16.66	120.0	14.36	180.0	9.33	300.1
	60		120.0		180.0		299.9		120.0		180.0		300.0
	72		120.0		180.0		300.0		120.0		180.0		300.0
Subtotal			118.1		175.6		287.8		120.0		179.9		299.4
Return	24	0.90	104.2	0.71	148.9	0.52	229.0	0.67	120.0	0.42	179.0	0.34	297.0
	36	4.76	119.8	3.22	179.7	2.93	299.3	7.33	120.1	5.25	180.0	2.38	300.0
	48	15.68	120.0	13.78	179.9	10.90	299.7	16.81	120.0	14.99	180.0	11.09	300.1
	60		120.0		180.0		300.0		120.0		180.0		300.0
	72		120.0		180.0		300.0		120.0		180.0		300.1
Subtotal			116.8		173.7		285.6		120.0		179.8		299.5
Midpoint	24	0.94	107.5	0.80	151.1	0.67	226.4	0.52	118.7	0.38	177.4	0.33	293.3
	36	5.41	119.8	3.18	179.6	3.08	299.2	7.33	120.1	4.35	180.0	1.82	300.0
	48	18.96	120.0	15.90	179.9	12.85	299.7	20.38	120.0	17.61	180.0	12.83	300.1
	60		120.0		180.0		300.0		120.0		180.0		300.0
	72		120.0		180.0		300.0		120.0		180.0		300.0
Subtotal			117.5		174.1		285.1		119.8		179.5		298.7
Largest gap	24	1.02	104.2	0.93	148.6	0.70	228.5	0.59	119.2	0.48	178.2	0.31	294.4
	36	5.93	119.8	3.32	179.2	3.20	296.8	7.69	120.0	5.85	180.0	2.30	300.0
	48	18.53	120.0	17.36	180.0	13.38	299.8	19.23	120.0	17.90	180.0	14.79	300.0
	60		120.0		180.0		300.0		120.0		180.0		300.0
	72		120.0		180.0		300.0		120.0		180.0		300.0
Subtotal			116.8		173.6		285.0		119.9		179.7		298.9
Combined	24	1.08	112.8	0.89	163.1	0.67	255.0	1.21	120.0	0.73	179.4	0.46	297.5
	36	4.01	119.8	3.45	179.5	3.17	299.1	8.09	120.0	4.05	180.0	2.19	300.0
	48	15.03	119.9	12.41	179.8	9.49	299.6	16.58	120.0	14.19	180.1	10.53	300.1
	60		120.0		180.0		299.9		120.0		180.0		300.0
	72		120.0		180.0		300.0		120.0		180.1		300.0
Subtotal			118.5		176.5		290.7		120.0		179.9		299.5
Optimal	24	0.98	111.4	0.90	157.8	0.75	244.2	1.00	120.0	0.58	180.0	0.39	299.5
	36	6.84	119.9	3.68	179.7	3.26	299.3	9.76	120.2	6.72	180.0	2.50	300.0
	48	18.01	120.0	16.48	180.0	13.06	299.8	18.01	120.0	17.33	180.0	14.53	300.1
	60		120.0		180.0		300.0		120.0		180.0		300.0
	72		120.0		180.0		300.0		120.0		180.0		300.4
Subtotal			118.2		175.5		288.7		120.1		180.0		300.0
Total			117.7		174.8		287.1		120.0		179.8		299.3

Table EC.48 Comparison of the BPC-based heuristics on the W&G-u instances

		SC heuristic						BPC-DF heuristic					
		SC-2		SC-3		SC-5		BPC-DF-2		BPC-DF-3		BPC-DF-5	
Routing	Q	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]	Gp	t[s]
Traversal	24	0.15	61.7	0.09	75.7	0.06	90.0	1.04	103.5	0.62	151.9	0.13	247.0
	36	3.63	116.7	3.35	172.4	3.05	278.7	6.00	120.0	1.22	180.0	0.90	299.1
	48	12.79	119.9	11.84	179.7	7.47	299.4	13.26	120.0	8.54	180.1	5.59	300.0
	60	21.50	119.9	19.53	179.8	18.34	299.6	20.10	120.0	16.44	180.0	14.64	300.0
	72	23.12	120.0	22.99	179.9	21.46	299.8	24.17	120.0	22.00	180.0	20.51	300.0
Subtotal		12.24	107.6	11.56	157.5	10.08	253.5	12.91	116.7	9.76	174.4	8.35	289.2
Return	24	0.31	76.0	0.27	102.8	0.14	141.4	0.23	94.6	0.18	138.0	0.12	221.5
	36	4.18	119.6	2.96	179.3	2.60	297.4	5.32	120.0	4.16	180.0	1.51	300.0
	48	12.79	119.9	10.01	179.8	6.47	299.4	13.31	120.0	10.75	180.2	6.65	300.0
	60	20.09	120.0	19.84	179.9	17.12	299.8	18.03	120.0	17.84	180.0	14.28	300.0
	72		120.0		180.0		300.0		120.0		180.0		300.0
Subtotal			111.1		164.4		267.6		114.9		171.6		284.3
Midpoint	24	0.38	78.5	0.32	105.7	0.20	157.2	0.21	97.7	0.17	140.0	0.12	217.8
	36	7.26	117.2	3.71	169.8	3.59	272.8	5.96	120.2	4.36	180.0	1.06	298.3
	48	19.30	120.0	17.18	179.9	11.55	299.7	19.09	120.0	17.18	180.0	13.59	300.0
	60	26.44	120.0	25.48	180.0	23.20	299.9	26.44	120.0	26.44	180.0	21.16	300.0
	72		120.0		180.0		300.0		120.0		180.0		300.0
Subtotal			111.1		163.1		265.9		115.6		172.0		283.2
Largest gap	24	0.39	74.0	0.32	103.8	0.22	158.7	0.22	89.2	0.17	131.1	0.14	208.2
	36	7.28	119.8	3.66	178.4	3.49	292.0	6.73	120.2	5.38	180.0	0.99	300.1
	48	19.34	120.0	18.52	179.9	15.60	299.8	19.71	120.0	18.33	180.0	14.73	300.0
	60		120.0		180.0		300.0		120.0		180.0		300.0
	72		120.0		180.0		300.0		120.0		180.0		300.0
Subtotal			110.8		164.4		270.1		113.9		170.2		281.7
Combined	24	0.55	80.5	0.42	114.7	0.26	170.5	0.34	93.9	0.18	136.1	0.12	219.9
	36	3.72	119.8	3.51	178.9	3.17	294.2	6.07	120.0	4.50	180.0	1.51	299.4
	48	11.54	119.9	11.25	179.7	7.57	299.4	14.04	120.0	8.01	180.2	5.47	300.0
	60	22.41	119.9	19.55	179.9	18.67	299.7	20.06	120.0	17.12	180.0	14.28	300.0
	72	25.59	120.0	24.53	180.0	23.39	299.9	25.59	120.0	25.59	180.0	23.87	300.0
Subtotal		12.76	112.0	11.85	166.6	10.61	272.7	13.22	114.8	11.08	171.3	9.05	283.9
Optimal	24	0.61	79.2	0.40	113.5	0.29	172.3	0.90	101.8	0.24	143.9	0.14	225.6
	36	6.94	119.0	4.44	175.9	3.29	285.6	8.40	120.1	5.55	180.0	3.09	300.0
	48	17.79	120.0	17.17	179.9	12.48	299.8	18.97	120.0	17.39	180.0	13.30	300.0
	60	22.10	120.0	21.51	180.0	20.17	299.9	22.10	120.0	22.10	180.0	17.78	300.0
	72		120.0		180.0		300.0		120.0		180.0		300.0
Subtotal			111.6		165.9		271.5		116.4		172.8		285.1
Total			110.7		163.6		266.9		115.4		172.1		284.6

F.4. Comparison of Routing Strategies

Tables EC.49–EC.52 provide a comparison of the different routing strategies with respect to the total traveled distances for the benchmark sets `M&Ö`, `H&W`, and `ZKS` aggregated by capacity Q and number of orders n. The `H&W` instances are further subdivided into the two groups *uniformly distributed demand* (UDD) and *class-based demand* (CBD). The columns report the percentage increase in the total traveled distances for the respective routing strategy compared to the optimal strategy. For the comparison, we use the best known solution for each instance and routing strategy.

Table EC.49 Percentage increase in total traveled distances compared to the optimal strategy for the `M&Ö` instances

Q	n	Traversal	Return	Midpoint	Largest gap	Combined
24	20	11.8%	33.3%	9.5%	5.6%	4.3%
	30	10.3%	32.3%	9.9%	5.4%	3.3%
	40	11.0%	31.8%	10.3%	6.0%	4.2%
	50	10.8%	34.0%	10.1%	6.3%	4.0%
	60	9.3%	32.2%	10.0%	5.8%	3.3%
	70	10.3%	32.9%	9.3%	5.4%	3.9%
	80	10.1%	32.9%	9.8%	5.9%	3.6%
	90	10.0%	32.7%	9.7%	5.6%	3.3%
	100	9.8%	33.1%	10.1%	5.8%	3.2%
Subtotal		10.4%	32.8%	9.9%	5.8%	3.7%
36	20	8.7%	35.7%	14.1%	7.7%	3.0%
	30	7.1%	35.2%	14.2%	8.4%	2.3%
	40	7.6%	34.2%	13.7%	8.4%	2.9%
	50	7.6%	35.7%	13.7%	8.6%	2.8%
	60	6.6%	34.2%	13.6%	8.2%	2.2%
	70	7.0%	34.8%	13.0%	7.9%	2.6%
	80	6.6%	34.9%	13.2%	8.3%	2.5%
	90	6.6%	34.4%	13.0%	8.0%	2.1%
	100	6.3%	34.7%	13.1%	8.1%	2.2%
Subtotal		7.1%	34.9%	13.5%	8.2%	2.5%
48	20	7.0%	37.0%	18.2%	10.8%	2.6%
	30	5.4%	36.3%	18.0%	11.1%	1.9%
	40	5.6%	35.5%	17.3%	10.9%	1.8%
	50	5.2%	37.2%	16.8%	10.8%	1.9%
	60	4.9%	36.3%	17.8%	11.3%	1.4%
	70	5.2%	36.8%	16.5%	10.5%	1.8%
	80	5.4%	37.2%	16.8%	10.8%	2.0%
	90	4.4%	36.1%	15.9%	10.5%	1.6%
	100	4.1%	36.3%	16.7%	10.4%	1.6%
Subtotal		5.3%	36.5%	17.1%	10.8%	1.8%
Total		7.6%	34.7%	13.4%	8.2%	2.7%

Table EC.50 Percentage increase in total traveled distances compared to the optimal strategy for the H&W UDD instances

Q	n	Traversal	Return	Midpoint	Largest gap	Combined
30	20	18.8%	52.9%	15.0%	8.5%	7.6%
	30	17.7%	53.1%	15.2%	8.8%	7.6%
	40	17.1%	52.0%	15.7%	9.1%	7.2%
	50	17.6%	52.6%	15.4%	8.8%	7.1%
	60	17.3%	52.5%	15.5%	8.9%	7.1%
	70	17.4%	52.8%	15.3%	8.9%	7.1%
	80	16.9%	52.5%	15.6%	9.0%	7.0%
	90	17.0%	52.9%	15.5%	8.9%	7.1%
	100	17.2%	52.9%	15.5%	9.0%	7.0%
Subtotal		17.4%	52.7%	15.4%	8.9%	7.2%
45	20	10.4%	53.6%	20.7%	12.5%	4.5%
	30	10.3%	54.1%	20.8%	12.8%	4.3%
	40	10.2%	54.1%	20.7%	12.5%	4.3%
	50	10.0%	54.0%	20.5%	12.7%	4.2%
	60	9.9%	54.2%	20.6%	12.6%	4.2%
	70	10.0%	54.0%	20.5%	12.5%	4.3%
	80	9.8%	53.7%	20.3%	12.4%	4.1%
	90	9.5%	53.6%	20.5%	12.5%	4.0%
	100	9.7%	53.5%	20.1%	12.4%	4.1%
Subtotal		10.0%	53.9%	20.5%	12.5%	4.2%
60	20	7.8%	56.0%	24.7%	15.9%	3.3%
	30	8.0%	56.1%	25.2%	16.1%	3.1%
	40	7.7%	55.4%	25.1%	16.2%	2.8%
	50	7.6%	55.8%	24.6%	16.0%	3.0%
	60	7.5%	55.2%	24.4%	15.7%	3.0%
	70	7.5%	55.2%	24.5%	15.8%	2.9%
	80	7.3%	54.9%	24.6%	15.8%	2.8%
	90	7.1%	55.2%	24.2%	15.7%	2.8%
	100	7.2%	55.2%	24.2%	15.6%	2.8%
Subtotal		7.5%	55.4%	24.6%	15.9%	2.9%
75	20	6.2%	56.8%	28.9%	19.1%	2.6%
	30	6.9%	57.4%	28.8%	19.3%	2.5%
	40	6.6%	57.2%	28.7%	19.2%	2.3%
	50	6.6%	57.0%	27.9%	18.9%	2.3%
	60	6.4%	57.0%	28.1%	19.0%	2.2%
	70	6.3%	57.1%	27.9%	19.0%	2.2%
	80	6.1%	56.8%	27.8%	18.9%	2.0%
	90	5.8%	56.5%	27.6%	18.8%	1.9%
	100	5.7%	56.7%	27.5%	18.7%	1.9%
Subtotal		6.3%	56.9%	28.1%	19.0%	2.2%
Total		10.2%	54.7%	22.1%	14.0%	4.1%

Table EC.51 Percentage increase in total traveled distances compared to the optimal strategy for the H&W CBD instances

Q	n	Traversal	Return	Midpoint	Largest gap	Combined
30	20	19.4%	51.9%	9.6%	5.4%	8.9%
	30	19.7%	52.7%	9.2%	5.3%	8.9%
	40	18.7%	52.4%	9.2%	5.3%	8.6%
	50	19.3%	52.1%	9.3%	5.3%	8.7%
	60	19.6%	52.1%	9.4%	5.4%	8.9%
	70	19.1%	52.2%	9.6%	5.4%	8.6%
	80	19.0%	52.4%	9.5%	5.4%	8.7%
	90	18.7%	51.7%	9.5%	5.4%	8.4%
	100	18.9%	52.2%	9.4%	5.3%	8.4%
Subtotal		19.2%	52.2%	9.4%	5.4%	8.7%
45	20	12.7%	52.3%	12.7%	7.4%	5.8%
	30	12.8%	53.2%	12.9%	7.4%	6.1%
	40	11.9%	52.2%	12.3%	7.2%	5.8%
	50	12.1%	52.4%	12.5%	7.3%	5.7%
	60	12.0%	52.6%	12.7%	7.3%	5.7%
	70	11.7%	52.2%	12.5%	7.2%	5.4%
	80	11.8%	52.3%	12.2%	7.0%	5.6%
	90	11.6%	52.1%	12.0%	7.0%	5.3%
	100	11.8%	52.3%	11.9%	7.1%	5.5%
Subtotal		12.0%	52.4%	12.4%	7.2%	5.7%
60	20	9.8%	52.7%	15.7%	9.3%	4.3%
	30	9.7%	53.6%	15.5%	9.4%	4.3%
	40	9.2%	53.9%	15.5%	9.4%	4.1%
	50	9.0%	53.2%	15.3%	9.3%	4.2%
	60	8.9%	52.8%	15.1%	9.1%	4.2%
	70	8.7%	53.3%	15.1%	9.3%	4.1%
	80	8.6%	52.9%	15.1%	9.2%	4.0%
	90	8.7%	53.1%	15.2%	9.3%	4.0%
	100	8.8%	53.2%	14.8%	9.1%	4.0%
Subtotal		9.1%	53.2%	15.2%	9.3%	4.1%
75	20	8.6%	54.6%	19.0%	11.6%	3.7%
	30	8.0%	53.7%	18.7%	11.7%	3.3%
	40	7.7%	54.4%	17.9%	11.4%	3.1%
	50	7.5%	54.2%	18.2%	11.4%	3.2%
	60	6.9%	53.8%	17.9%	11.4%	2.9%
	70	7.1%	54.3%	17.8%	11.3%	3.0%
	80	7.1%	54.2%	17.7%	11.2%	3.1%
	90	7.2%	54.0%	17.4%	11.1%	3.1%
	100	7.1%	53.7%	17.0%	11.0%	3.1%
Subtotal		7.5%	54.1%	18.0%	11.3%	3.2%
Total		11.8%	53.0%	13.7%	8.3%	5.4%

Table EC.52 Percentage increase in total traveled distances compared to the optimal strategy for the ZKS instances

Q	n	Traversal	Return	Midpoint	Largest gap	Combined
6	200	21.1%	30.7%	6.5%	6.2%	5.5%
	300	21.0%	29.2%	6.8%	6.5%	5.3%
	400	20.8%	28.9%	6.6%	6.3%	5.3%
	500	21.2%	28.5%	6.6%	6.3%	5.3%
	600	20.9%	28.0%	6.6%	6.2%	5.3%
9	200	17.4%	34.1%	6.1%	5.4%	5.2%
12	200	15.3%	38.8%	5.6%	4.5%	4.9%
15	200	14.2%	40.4%	6.1%	4.6%	4.5%
Total		19.0%	32.2%	6.4%	5.7%	5.2%

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