Métodos de Apoio à Decisão – Assignment 3

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The Delivery Game

UPzon, a new UP startup, is starting the business of lockers for facilitating deliveries of packets. UPzon customers may choose to have their packets delivered at home or in a locker in their neighborhood. Packets for home delivery are initially put in a locker. This way, home deliveries can be done by "crowdsourcing": UPzon asks customers who go to a locker to bring a packet to a neighbor (*i.e.*, to act as *occasional couriers, OCs*), in exchange for a discount in the next purchase. In case the OC does not accept the offer, UPzon has to deliver the packet on the next day with a professional fleet (PF), at the cost of 1€ per packet up to 10 daily deliveries, 2€ per packet for the remaining ones. (See figure representing flow conservation at each period in the next page.)

UPzon is now simulating the market in area PT-N05. The number of expected deliveries in this area is a random value between 10 and 50, with uniform distribution. Each of these deliveries may be requested at the locker or a home, with 50%/50% probability.

Every day, a parcel in the locker (for delivery there) has a constant probability of 75% of being picked by its recipient. The day the recipient goes pick it up, he or she will act as OC with the following probabilities, dependent on the compensation.

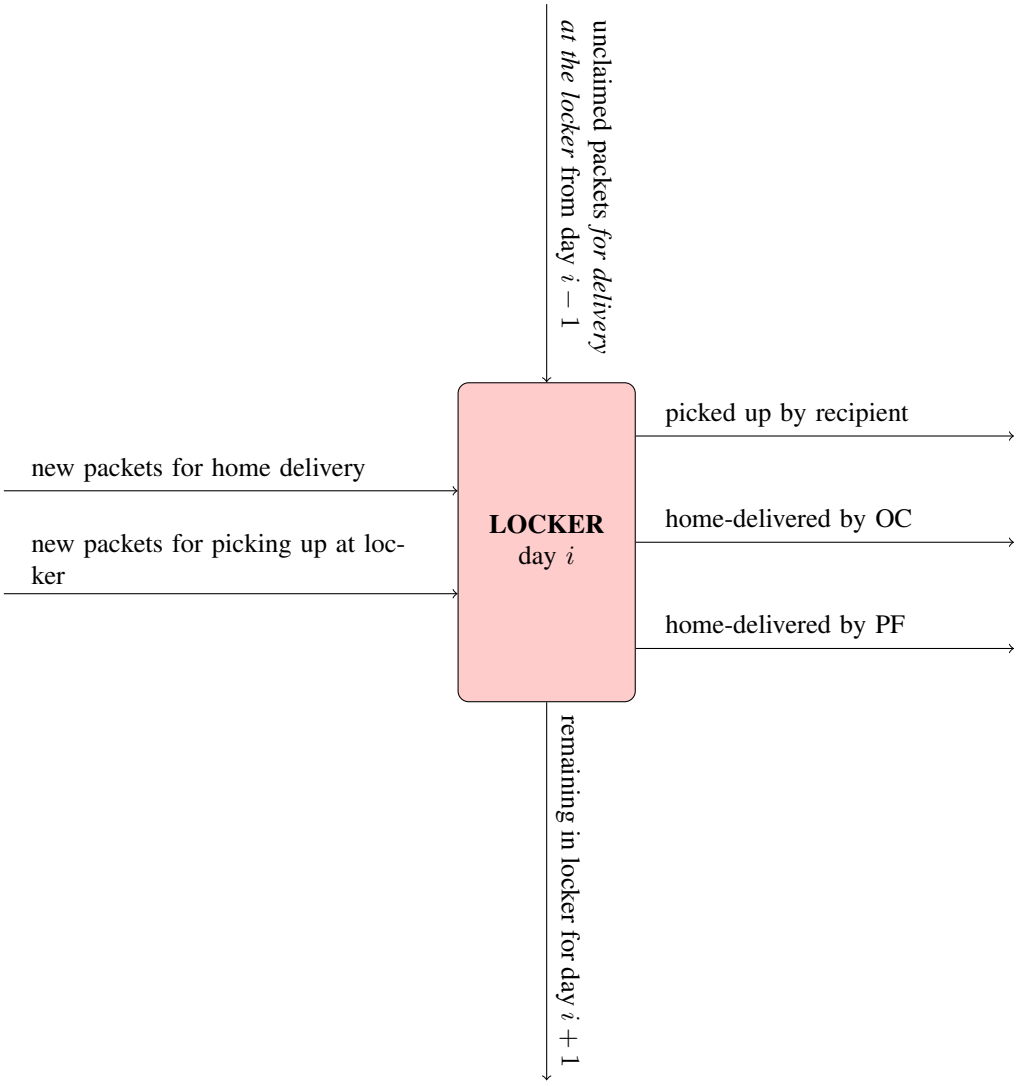
Compensation	Probability
0.0€	1%
0.5€	25%
1.0€	50%
1.5€	60%
1.8€	75%

(See next page for a suggested output of one simulation.)

1. Implement a simulation model for this system over 120 days, for each of the scenarios concerning the compensation offered to OCs. Identify 99% confidence intervals for a sample of 10000 observations for:
   (a) the expected total cost, for each compensation value;
   (b) the expected maximum number of items stored in the locker in these 120 days.
2. Determine which compensation should UPzon offer to OCs.

Note: *the deadline for handing the report is 7/June. Your report should ideally have 4 pages. Each working group should use the Moodle pages of this class to submit a report and the programs used as tar/zip archive. Please use students code in the name (e.g., up201900001up201900002.tgz).*

Flow conservation at each period



Sample output

Sample output for compensation of 1.8 and probability of acceptance of 0.75:

DAY	NEW PACKAGES		DELIVERIES			ACCUMULATED DELIVERIES			COSTS			LOCKER STATUS	
t	home	lckr	pf	oc	lckr	pf	oc	lckr	pf	oc	ACC	home	lckr
1	8	22	0	0	0	0	0	0	0	0	0	8	22
2	9	15	0	8	18	0	8	18	0	14.4	14.4	9	19
3	14	13	0	9	15	0	17	33	0	16.2	30.6	14	17
4	30	17	0	14	16	0	31	49	0	25.2	55.8	30	18
5	22	21	21	9	14	21	40	63	32	16.2	104.0	22	25
[...]													
118	6	12	0	13	16	516	1249	1773	0	23.4	2816.2	6	14
119	13	14	0	6	14	516	1255	1787	0	10.8	2827.0	13	14
120	22	27	4	9	10	520	1264	1797	4	16.2	2847.2	22	31