

An aerial photograph of a vast, snow-covered mountain range under a clear blue sky. A cable car system is visible, with several cables stretching across the valley and a cabin suspended from them. The terrain is rugged and mountainous, with patches of evergreen trees in the lower elevations.

Transport For Verbier

PrTRANS Group Assignment

Group One

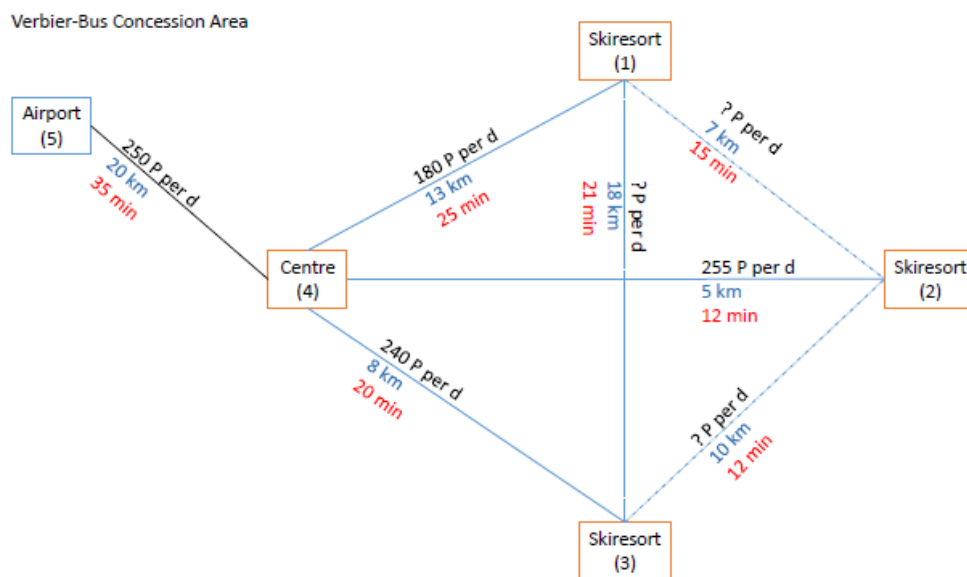
Jelle Mertens, Branco Spaans, Thomas Geier

Introduction

This bus operation plan has been created as part of Principles of Transportation, course of the international study program Traffic and Transport Management at NHTV University of Applied Science Breda, the Netherlands.

It considers a bus operation plan for a seasonal transport service between a central ski village and its three ski resort as well as an airport. The distances and travel times between the different stations can be seen in the graphic below. It is assumed, that the connections are based on a shuttle model, meaning that there are no stop situations between the origin and the destination of the line.

Scheme showing the tendering region



Expectations of the stakeholders

Operator:

Profit oriented, so best possible utilization of assets and necessary employees time.

Customer:

Highest service level in means of number of connections, punctuality and reliability

Transport Authority:

Great degree of customer satisfaction with least possible cost (subsidy).

General operation and employment conditions

The operation season amounts to 26 weeks, the winter season of the region. During this operation time, the following service level standards need to be considered. On Working days the operation starts at 8 o'clock in the morning and provides two connections per hour on each line until the service ends at 7 o'clock in the evening. On weekends the same operation times are used but with three connections per hour on every line.

The restrictions concerning personnel include the following items. The maximal length of a service is in general eight hours. This level may be exceeded twice per week to a maximum of ten hours. The rest time between two services is ten hours as well. Within two weeks of time, the maximum

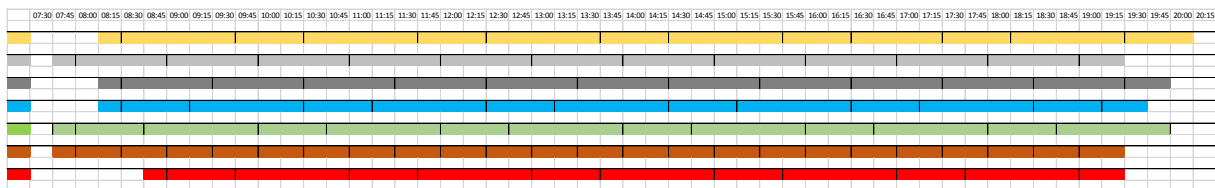
working time per employee is limited to 80 hours. Within the operation service, two weeks of holiday in a row need to be guaranteed to each employee, this represents eight percent of the operation time. A sick day rate of 6 percent needs to be taken into account.

Operational plan weekdays

The roundtrip times of line C (from the centre to skiresort 3) and line D (airport shuttle) allow a mixed usage of busses, since a bus needs two hours to perform these two roundtrips after each other. For this combined service of line C and D, a total of four busses is necessary. The four busses enable us to set the departure times at the centre for line D, the airport shuttle, at the 15th and 45th minute of every hour. Line C, the connection to skiresort 3, leaves the centre at every full and half hour. The roundtrip of Line B, the connection with skiresort two, can be performed twice in one hour by one bus, which enables departures at every full and half hour for this line based on a single bus in operation. Line A requires two busses in order to achieve the set service level, since one roundtrip takes about 50 minutes. For reasons of customer orientation, line A will leave at every full and half hour as well.

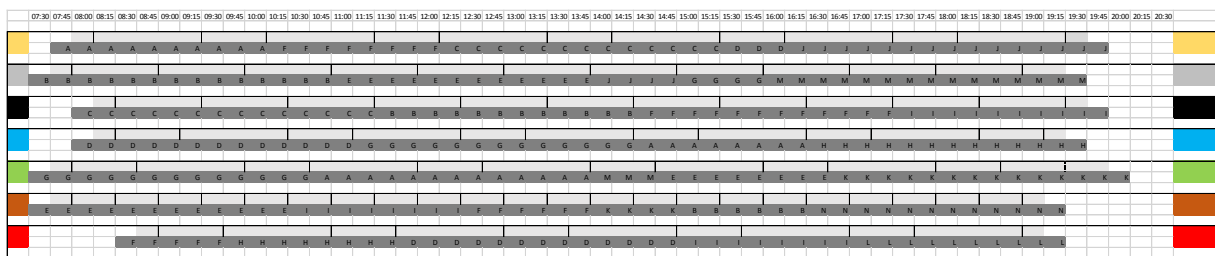
The bus system for the operation during the week is based on 7 busses. The customer service level could be met by providing the connections to all ski resort always at the full and half hour, which also enables interchanging between the different ski resorts. The busses towards the airport leave every 15th and 45th minute of the hour.

Material usage diagram



This diagram shows the times in which the material is utilized, each cell represents 15 minutes. The vertical black lines show, when a bus is present at the central station.

Personnel shifts diagram



This diagram shows the busses allocated with the different shifts (A-O) of driving personnel.

Operational plan weekends

The roundtrip times of line C (from the centre to skiresort 3) and line D (airport shuttle) allow a mixed usage of busses, since a bus needs two hours to perform these two roundtrips after each other. For this combined service of line C and D, a total of six busses are necessary. The six busses enable us to set the departure times at the centre for line C, the airport shuttle, at the 19th, the 39th and the 59th minute of every hour. Line D, the connection to skiresort 3, leaves the centre at at 3, 23 and 43 past the full hour. The roundtrip of Line B, the connection with skiresort two, takes half an hour and will be performed by 3 buses. The bus will leave the centre at the full hour and 20 and 40 past the full hour. Line A requires three busses in order to achieve the set service level, since one round-trip takes about 50 minutes. For reasons of customer orientation, line A will leave as well every full hour, 20 past and 40 past.

The bus system for the operation during the weekend is based on 11 busses. The customer service level could be met by providing the connections to all ski resort always at the full and 20 minutes, which also enables interchanging between the different ski resorts.

Personnel calculation and shift allocation

The total number of shifts amounts to 14 per day during the week and 23 during the weekend. Per week, 116 shifts need to be driven. Considering the described holiday procedures as well as taking illness of employees into account, a total number of 27 bus drivers is necessary.

The following graphic shows a series schedule. Each series is assigned to one employee for one week, the allocation rotates on step further down each week, ensuring that each employee has the two weeks of holidays in a row (series 25 and 26) and to make sure that each employee is having the same working conditions throughout the service season.

Serie	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Hours total
	Shift	Hours	Shift	Hours	Shift	Hours	Shift	Hours	Shift	Hours	Shift	Hours	Shift	Hours	
1	A	7,75	B	8	C	7	Free	0	D	7,25	RESERVE	8	Free	0	38
2	B	8	C	7	D	7,25	Free	0	E	8,25	UU	3,5	Free	0	34
3	C	7	D	7,25	E	8,25	Free	0	F	8	VV	2,5	Free	0	33
4	D	7,25	E	8,25	F	8	Free	0	G	7,5	Free	0	RESERVE	8	39
5	E	8,25	F	8	G	7,5	Free	0	H	5,25	TT	3	TT	3	35
6	F	8	G	7,5	H	5,25	Free	0	I	6,75	SS	2,5	SS	2,5	32,5
7	G	7,5	H	5,25	I	6,75	Free	0	J	5,5	RR	2,5	KK	7,75	35,25
8	H	5,25	I	6,75	J	5,5	K	4,5	K	4,5	QQ	2,5	QQ	2,5	31,5
9	I	6,75	J	5,5	K	4,5	Free	0	L	2,5	PP	3,25	PP	3,25	25,75
10	J	5,5	K	4,5	L	2,5	N	3	M	4,5	OO	8	OO	8	36
11	K	4,5	L	2,5	M	4,5	M	4,5	N	3	NN	6,5	NN	6,5	32
12	L	2,5	M	4,5	N	3	L	2,5	A	7,75	MM	7,75	MM	7,75	35,75
13	M	4,5	N	3	A	7,75	Free	0	B	8	LL	6,5	LL	6,5	36,25
14	N	3	A	7,75	B	8	Free	0	C	7	KK	7,75	RR	2,5	36
15	Free	0	Free	0	Free	0	A	7,75	X	0	JJ	7	JJ	7	21,75
16	Free	0	Free	0	Free	0	B	8	X	0	II	7,75	II	7,75	23,5
17	Free	0	Free	0	Free	0	C	7	X	0	HH	8	HH	8	23
18	Free	0	Free	0	Free	0	D	7,25	X	0	GG	7,75	GG	7,75	22,75
19	Free	0	Free	0	Free	0	E	8,25	X	0	FF	7,5	FF	7,5	23,25
20	Free	0	Free	0	Free	0	F	8	X	0	EE	8	EE	8	24
21	Free	0	Free	0	Free	0	G	7,5	X	0	DD	7,25	DD	7,25	22
22	Free	0	Free	0	Free	0	H	5,25	X	0	CC	8,25	CC	8,25	21,75
23	Free	0	Free	0	Free	0	I	6,75	X	0	BB	8	BB	8	22,75
24	Free	0	Free	0	Free	0	J	5,5	X	0	AA	7,5	AA	7,5	20,5
25	Free	0	Free	0	Free	0	Free	0	Free	0	Free	0	Free	0	0
26	Free	0	Free	0	Free	0	Free	0	Free	0	Free	0	Free	0	0
27	reserve	8	reserve	8	reserve	8	reserve	8	reserve	8	Free	0	Free	0	40

Shift schedules for drivers

The following document is the driving schedule, on base of which the driver will perform the transportation service during his shift. It shows starting and end destination of each line as well as the scheduled arrival and departure times for each bus stop.

Service	A
Starting time	07:45
Starting place	Verbier, bus depot
Start service	08.15
Finish service	15.15
Final stop	Verbier, Centre
commencement date	01.12.2015
Line(s)	1,2,3
Verbier, bus depot	07:45
Verbier, Centre	08:00
1 / 0001 / Centre	
Verbier, Centre	08.15
Airport	08.50
Verbier, Centre	09.30
Resort 3	09.50
Verbier, Centre	10.00
Break	10.00 - 10.45
2 / 0002 / Centre	
Verbier, Centre	10.45
Airport	11.20
Verbier, Centre	12.00
Resort 3	12.20
Verbier	12.45
Airport	13.25
Verbier	13.45
Break	13.45 - 14.30
3 / 0003 / Centre	
Verbier, Centre	14.30
Resort 3	14:50
Verbier, Centre	15.15
Airport	15:49
Verbier, Centre	16:30

Cost of Personnel

The calculations have shown that there are 27 drivers necessary to run the bus system as it is described. The total cost per employee per hour amounts to 35 Euros, giving an amount of ___ working hours for the 26 week period, the total cost for personnel during the operation season amounts to 982.800 Euro.

Cost of fleet

Provided a total depreciations cost for one bus in one year amounts to 40.000 Euro, the cost for one bus during the 26 weeks operation time is 20.000 Euro. The total fleet consist of 11 buses, giving a cost of 220.000 Euro for the fleet during for one season.

The total cost for the operation together amount to 1.202.800 Euro. Based on a ticket price of 2 Euro, this would mean that the turnover meets cost when 601.400 passengers are transported, not taking subsidy into account.

With the 925 costumers per day the total passengers transported is expended to be 168.350, with a turnover of 336.700 Euro. To make the operation possible under these conditions 866.100 euro + profit margin for the transport company have to be subsidised.