



DLR SERVICE AFFECTING INCIDENTS

FOR B92 FLEET (BY RAHUL DABAWALA)



THE DATA

- The data provided was from a data-sample containing train timing events.
- Operational incidents from 2014-2015
- Each incident is assigned a Planner Group

Service Date	Incident numb	Departure Losse	Responsible Manager	Planner Grou	Notification Item Short Text	Problem Code Group Text	Vehicles	Vehicle : Vehicle : Vehicle : Run No	Period Number	Vehicle 1 Type
17/08/2014	259975	0	Senior Rolling Stock Engineer	RS	R704/V49/89/BED PERV cover missing	Doors	V49/89	49 89	704 2014/15 P06	B92
17/08/2014	259976	0	Senior Rolling Stock Engineer	RS	R601/V53/79/POD inhibit when moving	Auxiliaries	V53/79	53 79	601 2014/15 P06	B92
17/08/2014	259977	0	CARE	ES		Sump Pumps			2014/15 P06	-
17/08/2014	259978	0	Senior Rolling Stock Engineer	RS	R705/V127/115/WOA3 low air pressure	AIR	V127/115	127 115	705 2014/15 P06	B2007
17/08/2014	259980	1	Senior Rolling Stock Engineer	RS	R107/V92/72/47/SHA1 smell of burning	Brakes	V92/72/47	92 72 47	107 2014/15 P06	B92
17/08/2014	259982	2	Senior Rolling Stock Engineer	RS	R107/V93/58/57/SYS DBF	Traction	V93/58/57	93 58 57	107 2014/15 P06	B92
17/08/2014	259983	0	CARE	WA		Lifts			2014/15 P06	-
17/08/2014	259985	0	Senior Rolling Stock Engineer	RS	R110/V148/131/135/LIM1 temp disturbance	Traction	V148/131/135	148 131 135	110 2014/15 P06	B2007
17/08/2014	259988	0	Senior Rolling Stock Engineer	RS	R105/V145/101/152 Door Issue 87/8 V152	Doors	V145/101/152	145 101 152 R105	2014/15 P06	B2007
17/08/2014	259989	0	E & M Manager	EI		Escalators			2014/15 P06	-
18/08/2014	259991	0	WARE	ES	WOA Escalator 2 OOS	Escalators			2014/15 P06	-
18/08/2014	259992	0	Senior Rolling Stock Engineer	RS	R303/V75/91/80/TV43/Failed Entry Checks	ATO	V75/91/80	75 91 80 R303	2014/15 P06	B92
18/08/2014	259993	0	CARE	WA	LCA Escalator 2 OOS	Escalators			2014/15 P06	-
18/08/2014	259994	0	Senior Rolling Stock Engineer	RS	R506/V98/34/53/POD/Erratic movement	Traction	V98/34/53	98 34 53 R506	2014/15 P06	B92
18/08/2014	259995	2	Senior Rolling Stock Engineer	RS	R203/V39/26/59/SHA2-BAN10/Loss of integ	Couplers	V31/26/59	31 26 59 R203	2014/15 P06	B92
18/08/2014	259996	1	Senior Rolling Stock Engineer	RS	R214/V93/63/55/TV42 failed entry checks	ATO	V93/63/55	93 63 55	214 2014/15 P06	B92
18/08/2014	259997	0	Senior Rolling Stock Engineer	RS	R203/V116/124/105/TV42 FEC	ATO	V116/124/105	116 124 105	203 2014/15 P06	B2007
18/08/2014	259998	0	Senior Rolling Stock Engineer	RS	R305/V60/46/70/TV41 failed entry checks	ATO	V60/46/70	60 46 70	305 2014/15 P06	B92
18/08/2014	260002	0	CARE	EI		Lifts			2014/15 P06	-
18/08/2014	260003	0	Senior Rolling Stock Engineer	RS	R206/V134/147/132/SYS DCP Issue	Doors	V134/147/132	134 147 132	206 2014/15 P06	B2007
18/08/2014	260006	0	Senior Rolling Stock Engineer	RS	R704/V126/125/149 No ADC WES	Doors	V126/125/149	126 125 149 R704	2014/15 P06	B2007
18/08/2014	260007	0	Senior Rolling Stock Engineer	RS	R403/V36/65 V36 A7/8 Slow Closing LOOU	Doors	V36/65	36 65 R403	2014/15 P06	B92
18/08/2014	260008	0	Senior Rolling Stock Engineer	RS	R301/V145/101/152 No ADC WES2 V152	Doors	V145/101/152	145 101 152 R301	2014/15 P06	B2007
18/08/2014	260010	0	Senior Rolling Stock Engineer	RS	R201/V62/37/44 E8 FC15/2/7/12 W/Q4-WES2	ATO	V62/37/44	62 37 44 R201	2014/15 P06	B92
18/08/2014	260013	0	Senior Rolling Stock Engineer	RS	R401/V48/73 V43A LEDP PA Inop	Auxiliaries	V48/73	48 73 R401	2014/15 P06	B92
18/08/2014	260014	0	Senior Rolling Stock Engineer	RS	R703/V10/97/12 Wire From Seat V10	CarBody	V10/97/12	10 97 12 R703	2014/15 P06	B92
18/08/2014	260015	0	Signalling Engineering Manager	RS	R622/V40/49/89 NCT LAP2-ALS2	ATO	V40/49/89	40 49 89 R622	2014/15 P06	B92
18/08/2014	260018	0	SIEMC	CA		Lifts			2014/15 P06	-
18/08/2014	260019	0	Senior Rolling Stock Engineer	RS	R625/V23/94 Water Ingress V23 B7/8	Doors	V23/94	23 94 R625	2014/15 P06	B92
18/08/2014	260020	0	Senior Rolling Stock Engineer	RS	R302/V4/95/41 Air Leak Under A5/6 V4	Bogie	V4/95/41	4 95 41 R302	2014/15 P06	B92
18/08/2014	260021	1	Senior Rolling Stock Engineer	RS		Doors	V86/15/86	86 15 86 R204	2014/15 P06	B92
18/08/2014	260023	0	Signalling Manager	SG	1175 points CAW disturbed reverse	Mainline Points	V53/121/139	153 121 139 R622	2014/15 P06	B2007
19/08/2014	260026	0	Senior Rolling Stock Engineer	RS	R213/V133/143/129/BED/Half Lighting	Auxiliaries	V133/143/129	133 143 129 R213	2014/15 P06	B2007
19/08/2014	260027	0	Senior Rolling Stock Engineer	RS	R308/V42/22/35/TV43/Failed Entry Checks	ATO	V42/22/35	42 22 35 R308	2014/15 P06	B92

DATA CLEANING

The data was initially cleaned in Python, using VS Code (as a Jupyter Notebook).

The pandas library was used to read the excel file.

Cleaning and preparing the data for analysis:

```
# Libraries required:
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

[2]

✓ 2.4s

Python

```
# Loading the csv file into a pandas dataframe
data = pd.read_csv(r'C:\Users\rahul\OneDrive\Desktop\Trackbase\data-sample
```

[3]

✓ 3.5s

Python

... [C:\Users\rahul\AppData\Local\Temp\ipykernel_1832\4150959096.py:2: DtypeWarni](#)
data = pd.read_csv(r'C:\Users\rahul\OneDrive\Desktop\Trackbase\data-sample

```
# Covertng columns to datetime format
data['event_datetime'] = pd.to_datetime(data['event_datetime'], errors='c
data['scheduled_event_datetime'] = pd.to_datetime(data['scheduled_event_c
```

[4]

✓ 1.4s

Python

DATA CLEANING

First only instances of B92 were filtered.

The data frame was then assigned to a new variable called 'incidents_b92'

Cleaning and preparing the data for analysis:

```
# Libraries required:
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

[2] ✓ 2.4s

Python

```
# Loading the csv file into a pandas dataframe
data = pd.read_csv(r'C:\Users\rahul\OneDrive\Desktop\Trackbase\data-sample.csv')
```

[3] ✓ 3.5s

Python

... [C:\Users\rahul\AppData\Local\Temp\ipykernel_1832\4150959096.py:2: DtypeWarning](#)
data = pd.read_csv(r'C:\Users\rahul\OneDrive\Desktop\Trackbase\data-sample.csv')

```
# Converting columns to datetime format
data['event_datetime'] = pd.to_datetime(data['event_datetime'], errors='coerce')
data['scheduled_event_datetime'] = pd.to_datetime(data['scheduled_event_datetime'], errors='coerce')
```

[4] ✓ 1.4s

Python

DATA CLEANING

The data frame was filtered further to now only include Rolling Stock Incidents (RS)

```
#Filtering only Rolling Stock Incidents
rs_incidents_b92 = incidents_b92[incidents_b92['Planner Group'] == 'RS']
rs_incidents_b92
```

	Service Date	Incident number	Departure Losses	Responsible Manager	Planner Group	Notification Item Short Text	Problem Code Group Text	Vehicles	Vehicle 1	Vehicle 2	Vehicle 3	Run No	Period Number
0	2014-08-17	259975	0	Senior Rolling Stock Engineer	RS	R704/V49/89/BED PERV cover missing	Doors	V49/89	49.0	89.0	NaN	704	2014/15 P06
1	2014-08-17	259976	0	Senior Rolling Stock Engineer	RS	R601/V53/79/POD inhibit when moving	Auxiliaries	V53/79	53.0	79.0	NaN	601	2014/15 P06
4	2014-08-17	259980	1	Senior Rolling Stock Engineer	RS	R107/V92/72/47/SHA1 smell of burning	Brakes	V92/72/47	92.0	72.0	47.0	107	2014/15 P06
5	2014-08-17	259982	2	Senior Rolling Stock Engineer	RS	R107/V93/58/57/SYS DBF	Traction	V93/58/57	93.0	58.0	57.0	107	2014/15 P06

DATA CLEANING

Finally, the data frame was filtered to only include instances where the Departure Losses were greater than 0.

```
#Filtering data to only include instances where departure losses are 1 or higher
service_rs_incidents_b92 = rs_incidents_b92[rs_incidents_b92['Departure Losses'] > 0]
service_rs_incidents_b92
```

	Service Date	Incident number	Departure Losses	Responsible Manager	Planner Group	Notification Item Short Text	Problem Code Group Text	Vehicles	Vehicle 1	Vehicle 2	Vehicle 3	Run No	Period Number	Vehicle 1 Typ
4	2014-08-17	259980	1	Senior Rolling Stock Engineer	RS	R107/V92/72/47/SHA1 smell of burning	Brakes	V92/72/47	92.0	72.0	47.0	107	2014/15 P06	B9
5	2014-08-17	259982	2	Senior Rolling Stock Engineer	RS	R107/V93/58/57/SYS DBF	Traction	V93/58/57	93.0	58.0	57.0	107	2014/15 P06	B9
14	2014-08-18	259995	2	Senior Rolling Stock Engineer	RS	R203/V39/26/59/SHA2-BAN10/Loss of integ.	Couplers	V31/26/59	31.0	26.0	59.0	R203	2014/15 P06	B9
15	2014-08-18	259996	1	Senior Rolling Stock Engineer	RS	R214/V93/63/55/TVA2 failed entry checks	ATO	V93/63/55	93.0	63.0	55.0	214	2014/15 P06	B9
30	2014-08-18	260021	1	Senior Rolling Stock Engineer	RS	NaN	Doors	V86/15/86	86.0	15.0	86.0	R204	2014/15 P06	B9

DATA CLEANING

The data frame was then saved as a new excel file so that the original data is not unintentionally altered.

```
# Save the filtered DataFrame to the specified directory
service_rs_incidents_b92.to_excel(r'C:\Users\rahul\OneDrive\Desktop\PowerBI Analyst\Filtered_RS_B92_Incident_Data.xlsx', sheet_name = 'dat
```

✓ 0.1s

Python

DATA CLEANING

The data frame was then checked for duplicate entries of instance numbers (none were found):

```
#Checking for duplicate entries
test = pd.read_excel(r'C:\Users\rahul\OneDrive\Desktop\PowerBI Analyst\Filtered_RS_B92_Incident_Data.xlsx', sheet_name = 'data')
```

✓ 0.1s

Python

```
duplicate_incidents = test[test.duplicated(subset=['Incident number'], keep=False)]
```

✓ 0.0s

Python

```
print("Duplicate Entries:")
print(duplicate_incidents)
```

✓ 0.0s

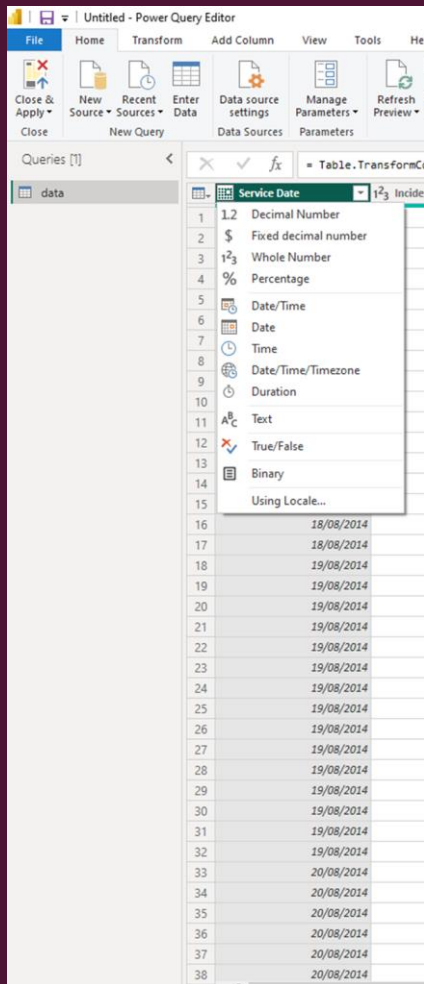
Python

Duplicate Entries:

Empty DataFrame

Columns: [Service Date, Incident number, Departure Losses, Responsible Manager, Planner Group, Notification Item Short Text, Problem Code Grc

Index: []



POWER BI

- The new excel file was then imported into Power BI and transformed using Power Query.
- The first change made was to ensure that the Service Date Column was set to the correct format

POWER QUERY

- The following columns were removed as they were not relevant to the analysis and visualisation:

Table.TransformColumnTypes(#Promoted Headers,{{"Service Date", Int64.Type}, {"Incident number", Int64.Type}, {"Departure Losses", Int64.Type}, {"Responsible Manager", type text}, {"Planner

A	B	C	D	E	F	G	H
Responsible	Notification Item Short Text	Problem Code Group Text	Vehicles	Vehicle 1	Vehicle 2	Vehicle 3	ABC
1 Senior Rolling St	R107/V92/72/47/SHA1 smell of burning	Brakes	V92/72/47		92	72	47
2 Senior Rolling St	R107/V93/58/57/SYS DBF	Traction	V93/58/57		93	58	57
3 Senior Rolling St	R203/V39/26/59/SHA2-BAN10/Loss of integ.	Couplers	V31/26/59		31	26	59 R
4 Senior Rolling St	R214/V93/63/55/TVA2 failed entry checks	ATO	V93/63/55		93	63	55
5 Senior Rolling St		Doors	V86/15/86		86	15	86 R
6 Senior Rolling St							
7 Senior Rolling St	R207/V62/37/44/PRR2/FC2 System Hold	ATO	V62/37/44		62	37	44 R
8 Senior Rolling St	R707/V78/99/16/BED LEDP PA issue	Auxiliaries	V78/99/16		78	99	16
9 Senior Rolling St	R305/V68/93/41 BED Inhibit wont release	Auxiliaries	V68/93/41		68	93	41
10 Senior Rolling St	R357/V65/57/7 BED-BEC FC7 loss of tracti	Traction	V65/57/7		65	57	7
11 Senior Rolling St	R209/V53/34/98 CUS SDO doors enabled	Doors	V53/34/98		53	34	98
12 Senior Rolling St	R202/V12/97/10 Unusual Noise BAN9	CarBody	V12/97/10		12	97	10 R
13 Senior Rolling St	R306/V30/29/77 Inhibit WES2	ATO	V30/29/77		30	29	77 R
14 Senior Rolling St	R306 V2/8/32/POP1 NCT	ATO		11727	2	8	32
15 Senior Rolling Stock Engineer	R210 V2/34/53/WES1 FC13/NCT	ATO	2/34/53		2	34	53
16 Senior Rolling Stock Engineer	R704/V48/36 NCT BAN9	ATO	V36/48		36	48	null R
17 Senior Rolling Stock Engineer	R702/V8/33 EB FC7 SHA	Traction	V8/33		8	33	null R
18 Signalling Engineering Manager	R105/V29/34/53/LIM3-WES1 power trip	Traction	V29/34/53		29	34	53
19 Senior Rolling Stock Engineer	R407/V72/9/TVA1/Failed Entry Checks	ATO	V72/9		72	9	null R
20 Senior Rolling Stock Engineer	R202/V38/24/51/HEQ1 door irreg	Doors	V38/24/51		38	24	51
21 Team Manager	R207/V16/56/14 In Power Trip Area	Traction	V16/56/14		16	56	14
22 Senior Rolling Stock Engineer	R602/V92/40/POP2 Inhibit wont release	Doors	V92/40		92	40	null
23 Senior Rolling Stock Engineer	R204/25/31/67 SYS B end coupler defect	Couplers	V25/31/67		25	31	67
24 Senior Rolling Stock Engineer	R115/V76/1/2/CRO1-MUD1/FC5 EB app	ATO	V76/1/2		76	1	2 R
25 Signalling Engineering Manager	R807/V76/1/2/STI1-STR17/Inhibit	Auxiliaries	V76/1/2		76	1	2 R
26 Senior Rolling Stock Engineer	R702/V1/96/55/TVA2/Failed Entry Checks	ATO	V1/96/55		1	96	55 R
27 Senior Rolling Stock Engineer	R705/V6/80/83/POD/Doors dont enable	Doors	V6/80/83		6	80	83 R
28 Senior Rolling Stock Engineer	R203/90/45/52 BAN10 FC13 EB test failure	Brakes	V90/45/52		90	45	52
29 Senior Rolling Stock Engineer	R505/V37/39/75/POD/Inhibit wont release	Auxiliaries	V37/39/75		37	39	75 R
30 Senior Rolling Stock Engineer	R708/V55/1/96/WOA3/Prop Fault A & B	Traction	V55/1/96		55	1	96 R
31 Senior Rolling Stock Engineer	R405 V88/93/71/WEH1 V88 DBF	Traction	V88/93/71		88	93	71
32 Senior Rolling Stock Engineer	R215/V51/81/53 No ADC V51 A1/2 GRE3	Doors	V53/81/51		53	81	51 R
33 Senior Rolling Stock Engineer	R708/V2/46/92 End Door Issue V2 LCA-PDK	Doors	V2/46/92		2	46	92 R
34 Senior Rolling Stock Engineer	R703/V56/16/14 FC8 WOA3	ATO	V56/16/14		56	16	14 R
35 Senior Rolling Stock Engineer	R405/V16/55/ROV2 doors not enabling	Doors	V16/55		16	55	null
36 Senior Rolling Stock Engineer	R708/V2/46/95/LCA end door opened	Doors	V2/46/95		2	46	95
37 Senior Rolling Stock Engineer	R209/V34/9/7/BAN-DOM power trip	Traction	V34/9/7		34	9	7
38 Senior Rolling Stock Engineer	R203/V41/51/82SHA2 Doors failed to close	Doors	V41/51/82		41	51	82
	R111 V56/47/77/SHA2-BAN10 FC8 Overspeed	ATO	V56/47/77		56	47	77

POWER QUERY

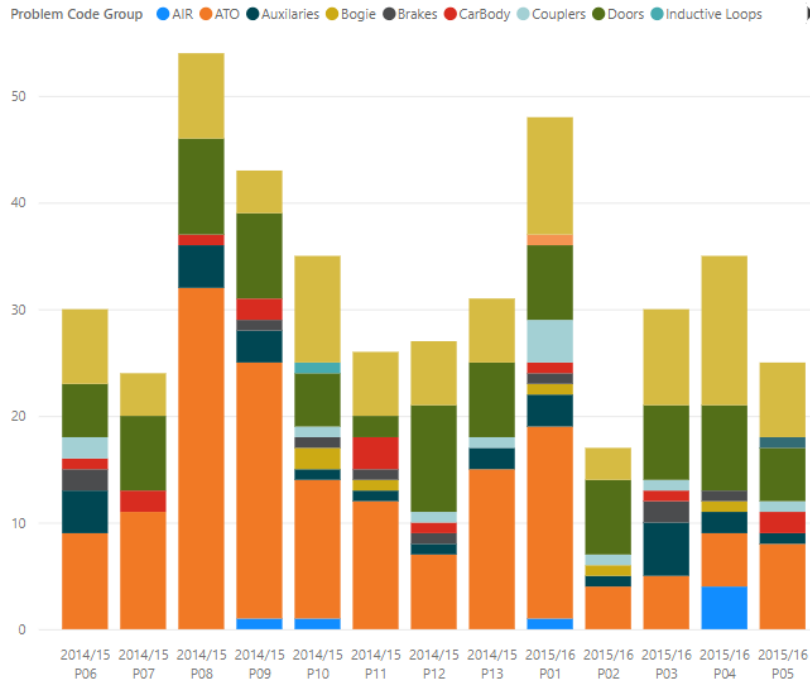
- These were the remaining columns:

Service Date	Incident number	Departure Losses	Planner Group	Problem Code Group Text	Period Number	Vehicle 1 Type
17/08/2014	259980	1	RS	Brakes	2014/15 P06	B92
17/08/2014	259982	2	RS	Traction	2014/15 P06	B92
18/08/2014	259995	2	RS	Couplers	2014/15 P06	B92
18/08/2014	259996	1	RS	ATO	2014/15 P06	B92
18/08/2014	260021	1	RS	Doors	2014/15 P06	B92
19/08/2014	260028	2	RS	ATO	2014/15 P06	B92
19/08/2014	260031	1	RS	Auxiliaries	2014/15 P06	B92
20/08/2014	260064	2	RS	Auxiliaries	2014/15 P06	B92
20/08/2014	260075	4	RS	Traction	2014/15 P06	B92
20/08/2014	260076	2	RS	Doors	2014/15 P06	B92
22/08/2014	260121	2	RS	CarBody	2014/15 P06	B92
22/08/2014	260126	9	RS	ATO	2014/15 P06	B92
25/08/2014	260159	1	RS	ATO	2014/15 P06	B92
26/08/2014	260205	2	RS	ATO	2014/15 P06	B92
30/08/2014	260315	1	RS	ATO	2014/15 P06	B92
31/08/2014	260335	3	RS	Traction	2014/15 P06	B92
31/08/2014	260337	1	RS	Traction	2014/15 P06	B92
01/09/2014	260342	1	RS	ATO	2014/15 P06	B92
01/09/2014	260344	3	RS	Doors	2014/15 P06	B92
01/09/2014	260359	1	RS	Traction	2014/15 P06	B92
02/09/2014	260379	3	RS	Doors	2014/15 P06	B92
05/09/2014	260455	1	RS	Couplers	2014/15 P06	B92
06/09/2014	260498	2	RS	ATO	2014/15 P06	B92
07/09/2014	260524	2	RS	Auxiliaries	2014/15 P06	B92
08/09/2014	260529	2	RS	ATO	2014/15 P06	B92
08/09/2014	260530	5	RS	Doors	2014/15 P06	B92
08/09/2014	260552	18	RS	Brakes	2014/15 P06	B92
09/09/2014	260570	1	RS	Auxiliaries	2014/15 P06	B92
11/09/2014	260617	2	RS	Traction	2014/15 P06	B92
13/09/2014	260671	2	RS	Traction	2014/15 P06	B92
17/09/2014	260764	2	RS	Doors	2014/15 P07	B92
17/09/2014	260766	2	RS	Doors	2014/15 P07	B92
17/09/2014	260767	2	RS	ATO	2014/15 P07	B92
20/09/2014	260834	1	RS	Doors	2014/15 P07	B92
22/09/2014	260857	1	RS	Doors	2014/15 P07	B92
23/09/2014	260894	1	RS	Traction	2014/15 P07	B92
24/09/2014	260919	1	RS	Doors	2014/15 P07	B92
28/09/2014	260995	2	RS	ATO	2014/15 P07	B92
28/09/2014	260999	2	RS	ATO	2014/15 P07	B92

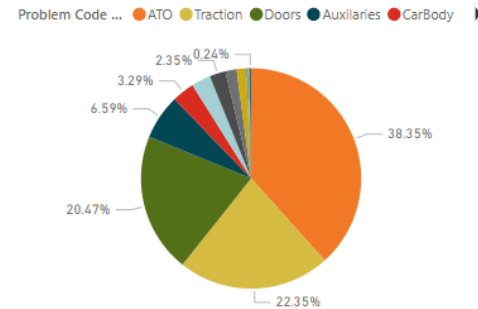
NUMBER OF SERVICE AFFECTING INCIDENTS CAUSED BY RS FAULTS ON B92 FLEET, BY PERIOD AND PROBLEM GROUP

Rolling Stock Incidents Dashboard:

Number of Incidents caused by Rolling Stock Faults by Period Number and Problem Code Group

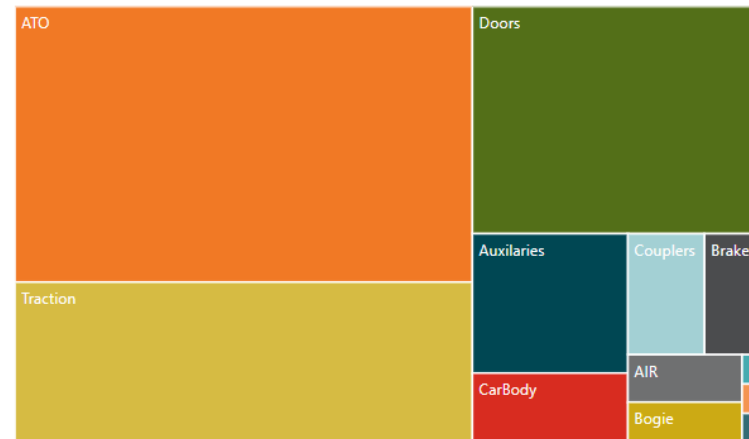


Count of Incident number by Problem Code Group



425
Total number of Rolling
Stock Faults

Problem Code Group

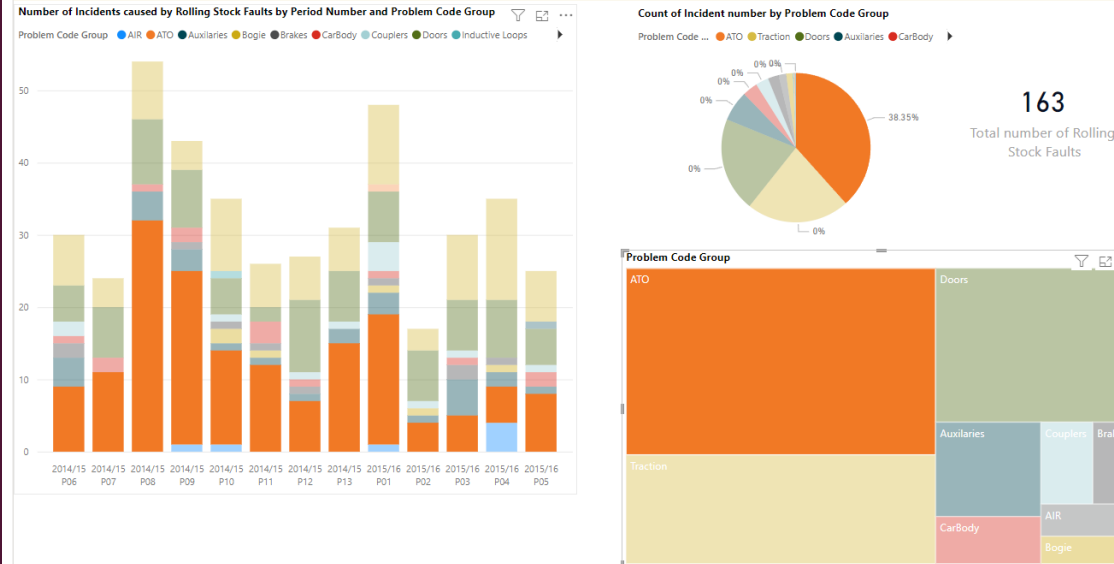


A dashboard
containing various
charts was then
produced.

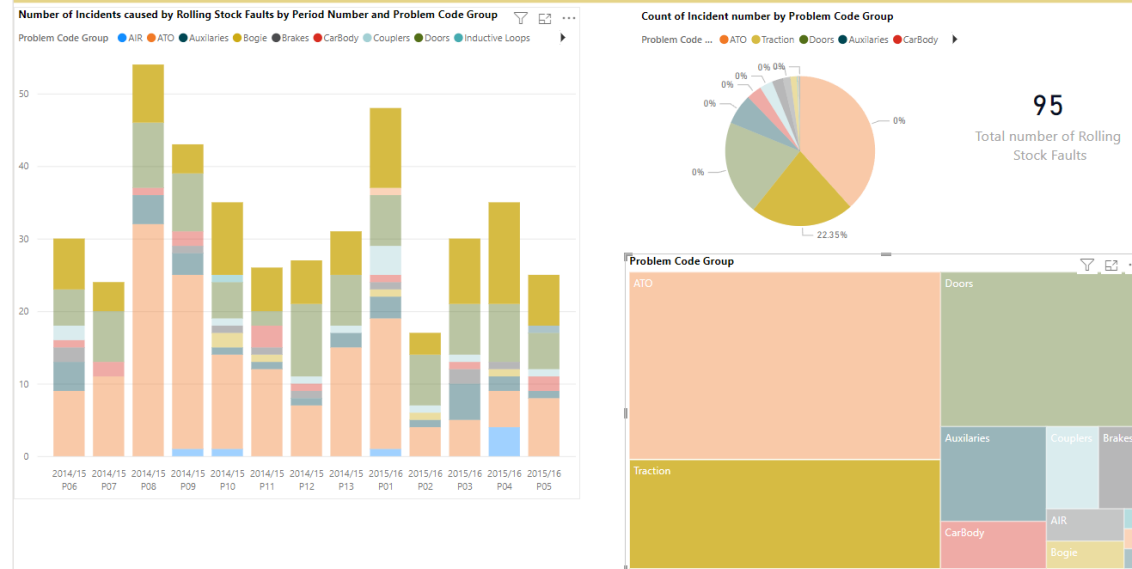
RS FAULTS

- ATO was the group with the highest number of Rolling Stock faults followed by Traction
- The lowest amount of RS faults can be attributed to RS External issues, Inductive Loops and Service Adjustment, each with a value of one.

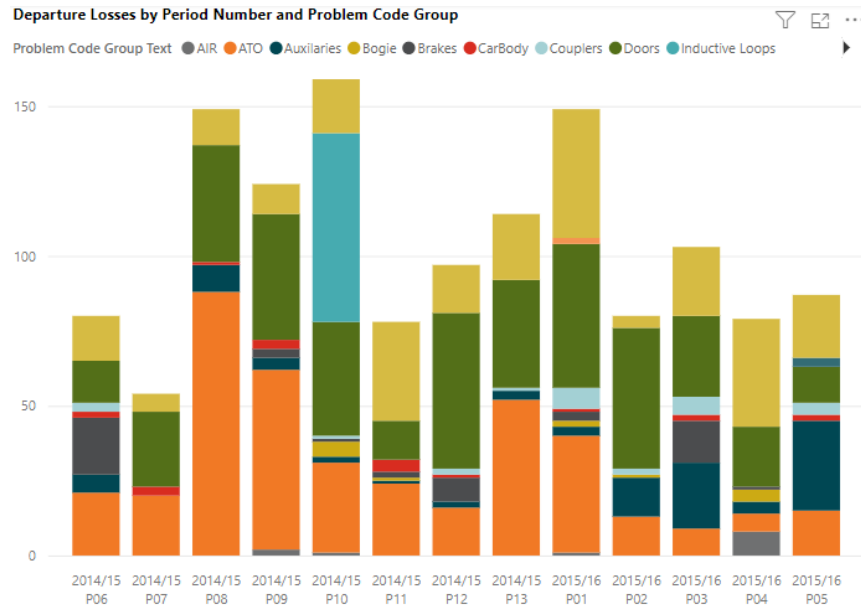
Rolling Stock Incidents Dashboard:



Rolling Stock Incidents Dashboard:

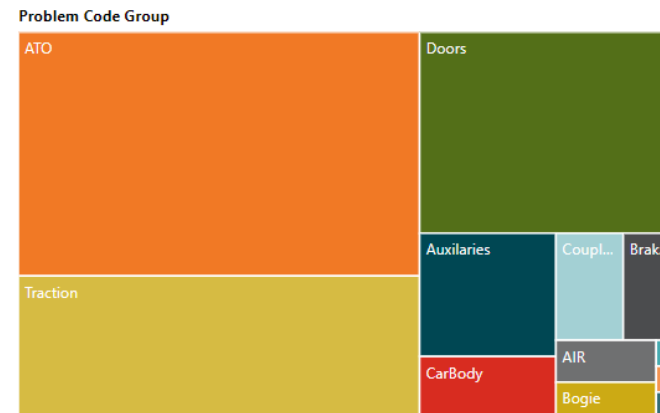


DEPARTURE LOSS



Summary Table

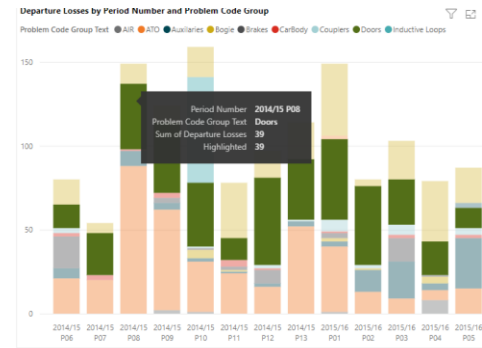
Number of Departure Losses	Number of Rolling Stock Incidents	Year	Month
37	17	2014	August
85	19	2015	May
76	20	2015	August
97	27	2015	February
68	28	2014	September
114	31	2015	March
105	31	2015	June
88	32	2015	January
86	38	2015	July
190	40	2014	December
125	46	2014	October
146	47	2015	April
136	49	2014	November
1353	425		



On the second page, a dashboard containing stacked bar chart of Departure Losses by Period and Problem Group was plotted. Alongside this a summary table detailing the number of departure losses and RS incidents per year/quarter/month/day was produced (this can be adjusted).

- Doors was the group with the highest number of Departure Losses followed by ATO.

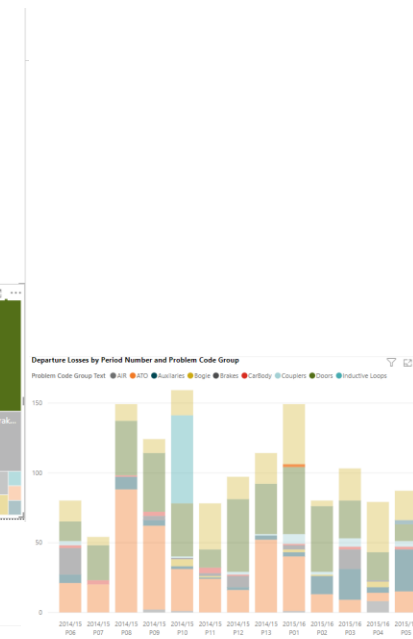
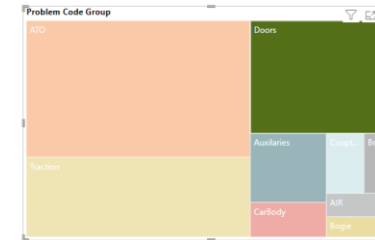
- The lowest amount of Departure Losses can be attributed to RS External issues.



413
Total Departure Losses

Summary Table

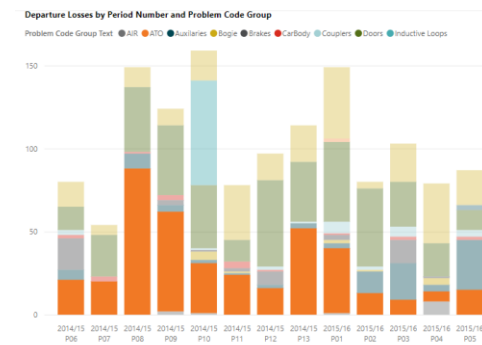
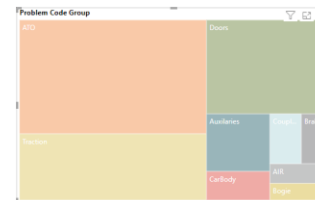
Number of Departure Losses	Number of Rolling Stock Incidents	Year	Month
3	2	2014	August
15	3	2015	January
12	5	2015	August
27	7	2014	October
36	7	2015	March
48	7	2015	April
47	7	2015	May
18	7	2015	July
18	8	2014	September
44	8	2014	November
64	8	2014	December
29	8	2015	June
52	10	2015	February
413	87		



2
Total Departure Losses

Summary Table

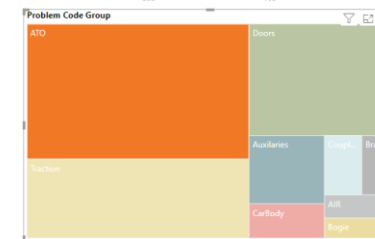
Number of Departure Losses	Number of Rolling Stock Incidents	Year	Month
2	1	2015	April
2	1		



393
Total Departure Losses

Summary Table

Number of Departure Losses	Number of Rolling Stock Incidents	Year	Month
13	4	2015	May
9	5	2015	June
18	6	2014	August
12	6	2015	August
16	7	2015	February
9	7	2015	July
22	12	2014	September
34	14	2014	December
29	15	2015	January
52	15	2015	March
39	18	2015	April
77	25	2014	October
65	28	2014	November
393	163		



CONCLUSIONS

- In response to the RS faults, the DLR should focus on regular maintenance and upgrades to RS.
- As a large number of Departure Losses were attributed to *ATO/Doors*, the focus should be on improving these.
- Future Actions: Regular review of yearly trends to monitor if there are any further spikes in faults due to these issues.