

Cisco Data Analysis Part 1

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Overview

I started by analysing a single file in Tableau. It made sense to use the x-axis as 'Time' since the behavior of the machines is meant to be observed over the duration of time.

From my initial observations, the important fields which I came up with were the following:

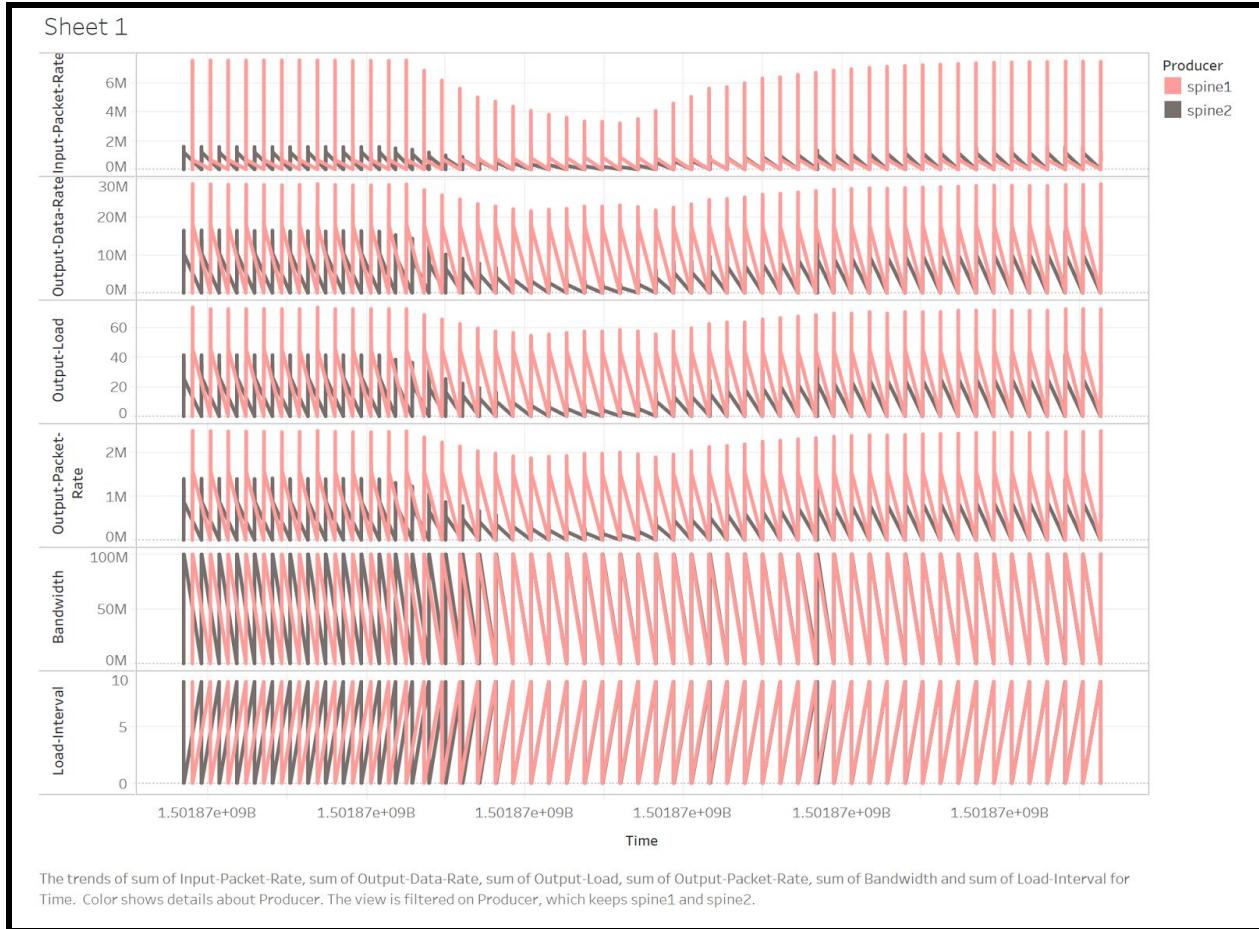
1. Bandwidth
2. Input-Data-Rate
3. Input-Load-Rate
4. Input-Packet-Rate
5. Load Interval
6. Output-Data-Rate
7. Output-Load-Rate
8. Output-Packet-Rate

The first thing I observed when going through file1 was the 3 input fields ' Input-Data-Rate, Input-Load-Rate, Input-Packet-Rate' were showing a similar pattern.





Similarly, the 3 output fields were also showing same pattern while bandwidth and load interval were always showing a consistent pattern in all the files for all the machines.



Thus, my first analysis helped me to figure out the relevant fields out of the numerous available fields. And I concluded that the only two fields which were needed to observe the changes within the patterns were any 3 of the input fields and any 3 of the output fields.

I decided to go with '**Input-Data-Rate**' and '**Output-Data-Rate**' for my further analysis.

File-by-File Analysis

Based upon the analysis, using time vs 'input-data-rate' and 'output-data-rate' for different machines, the files showing **no failure** were:

File 4 and File 7

For the rest of the files there was significant divergence in the normal patterns of a machine to conclude that it was a failure condition.

Note: When I say divergence, I mean a huge dip in the input and output data rates for the machine over a significant period of time which is enough to confirm the failure of the machines (Figure 1 illustrates spine 2 pattern over time). Consequently, we also see a spike in the patterns for the other machines (neighbours) which further reinforces our observations.

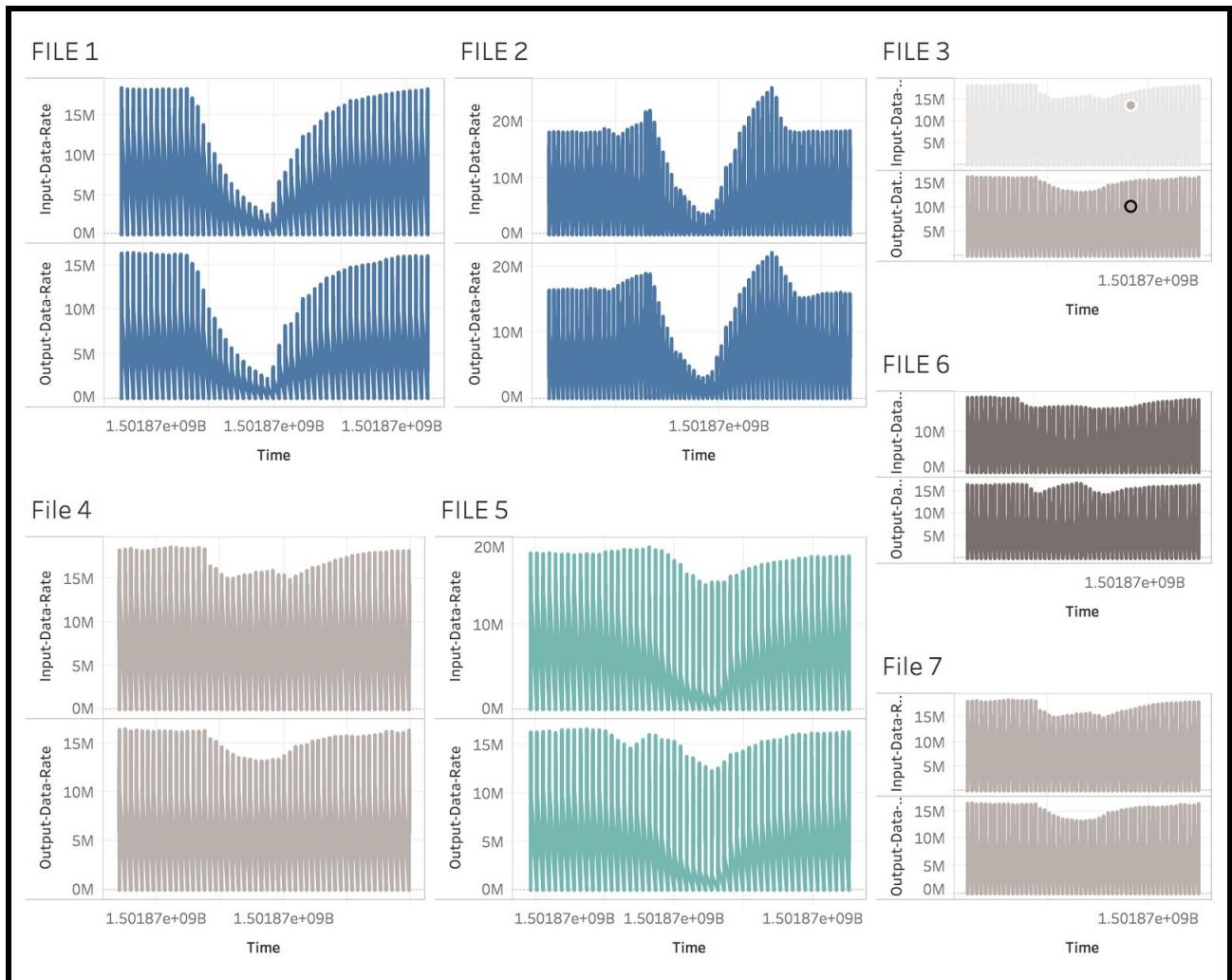
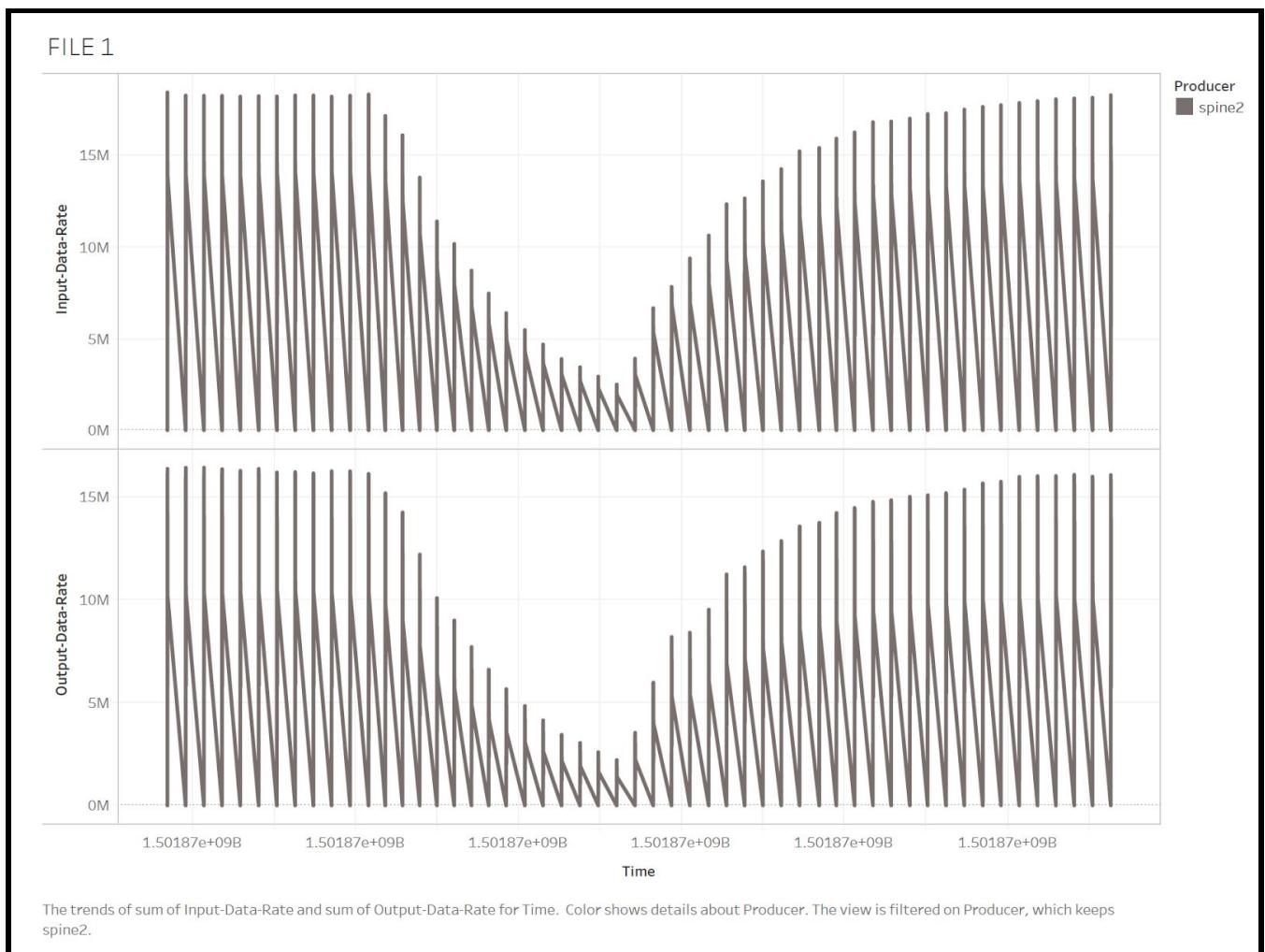


Figure1: *Spine 2 Data Pattern for File 1-7*

File 1

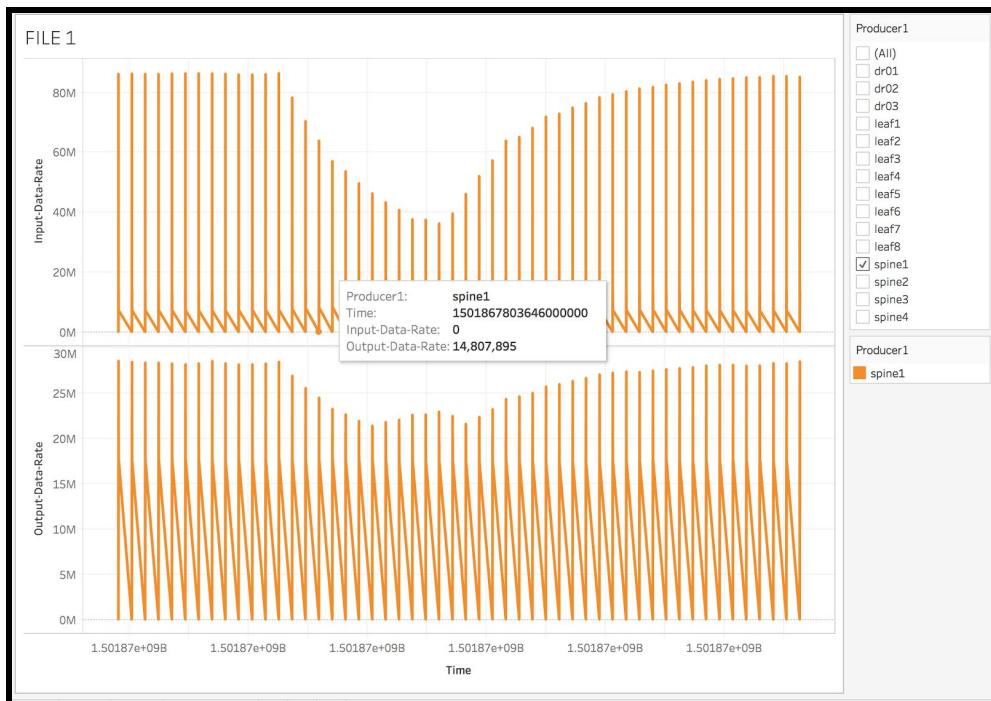
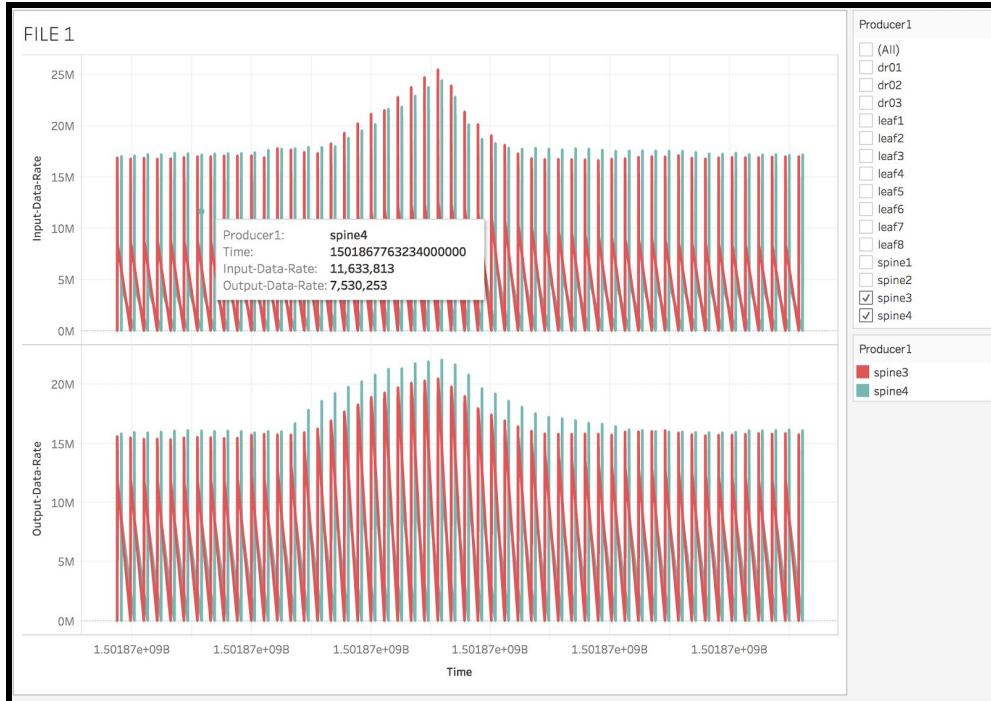
Failing Machine/s - Spine 2

(1) What specific evidence in the data led you to classify the file as you did?



(2) What other machines are most influenced by the failure (or failures), and how? Describe what you “see” in the data.

As seen below failure of Spine 2 causes the traffic in Spine 3 and Spine 4 to rise. We can also see some fluctuation in Spine 1



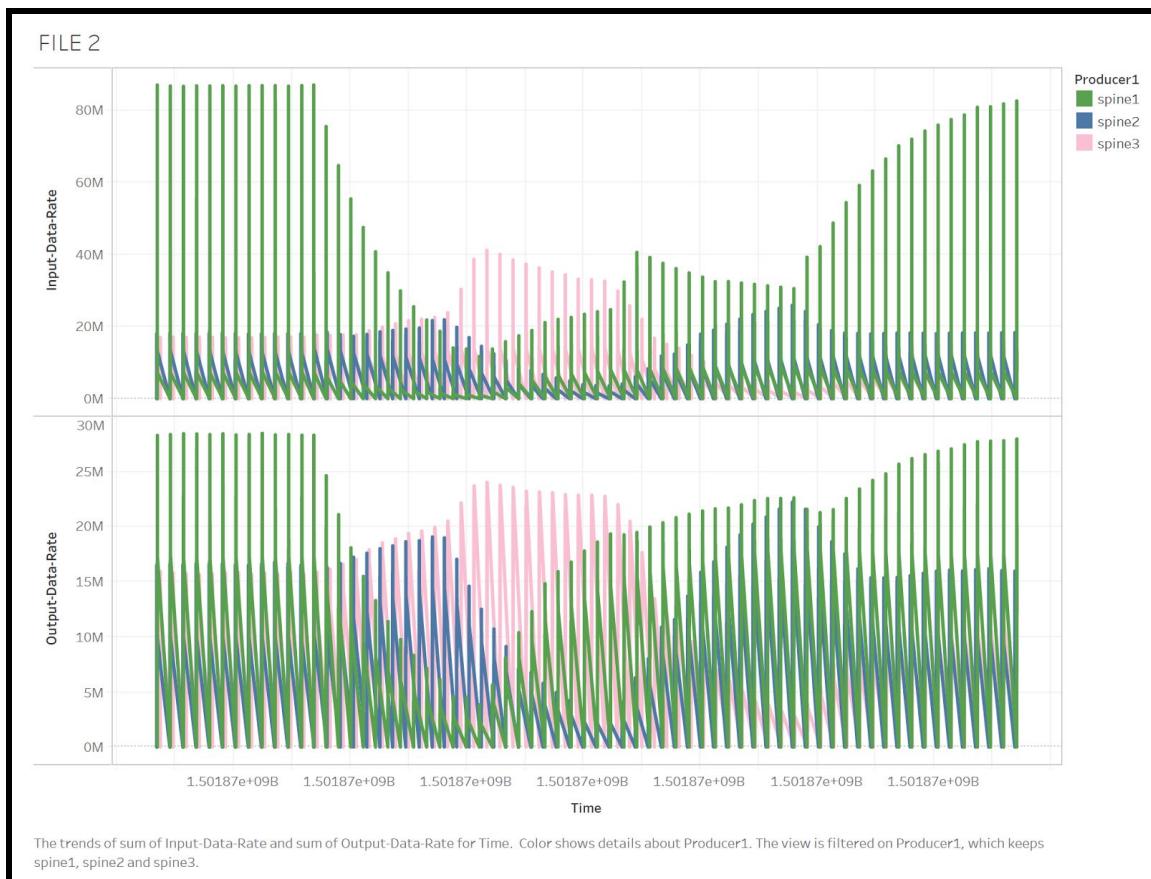
(3) How long did it take the network to return to “normal” functioning after the initial failure?

$$182000 * 10^6$$

File 2

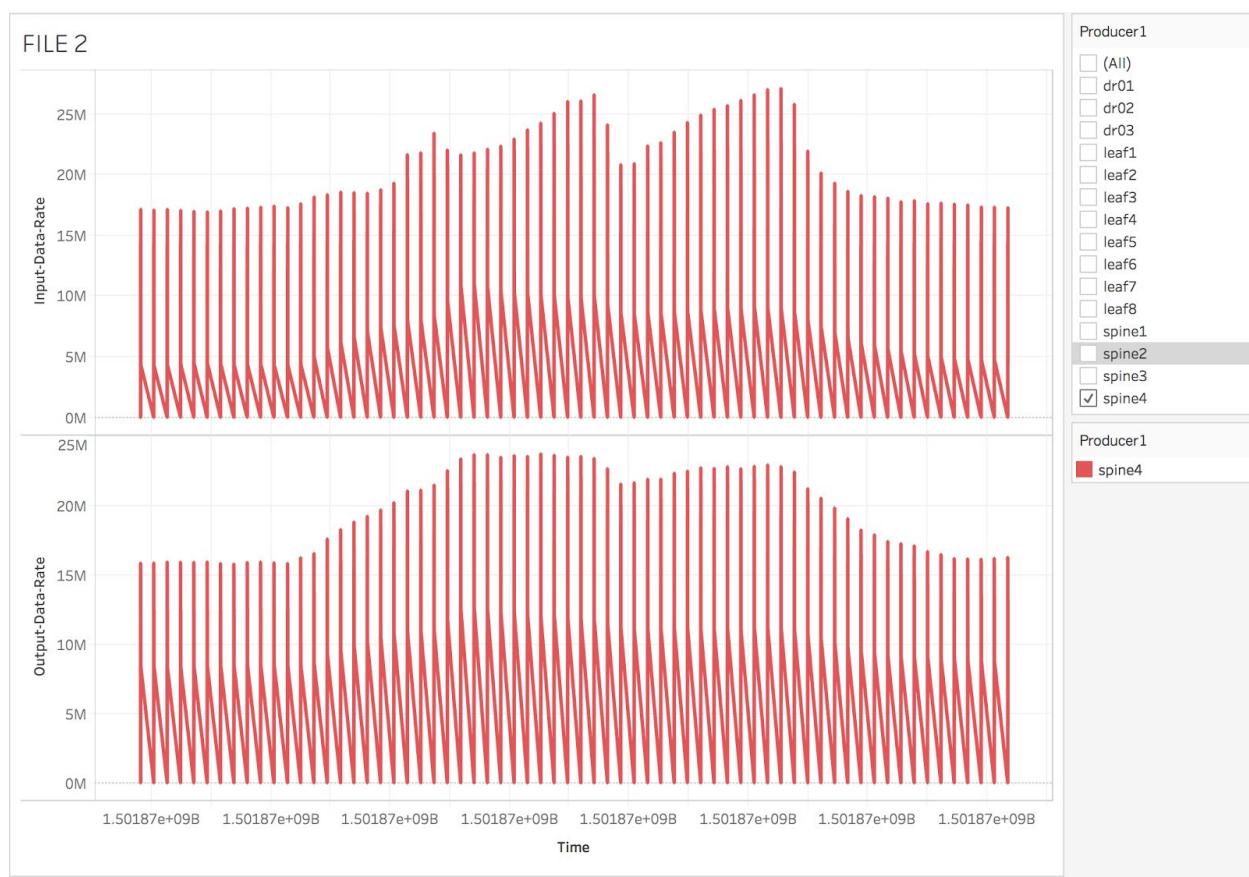
Failing Machine/s - Spine 1, Spine 2 and Spine 3

(1) What specific evidence in the data led you to classify the file as you did?



(2) What other machines are most influenced by the failure (or failures), and how? Describe what you “see” in the data.

As seen below failure of Spines 1,2,3 causes the traffic in Spine 4 to rise. We can also see that failure of each affects the other one.



(3) How long did it take the network to return to “normal” functioning after the initial failure?

Spine 1: $290893 * 10^6$

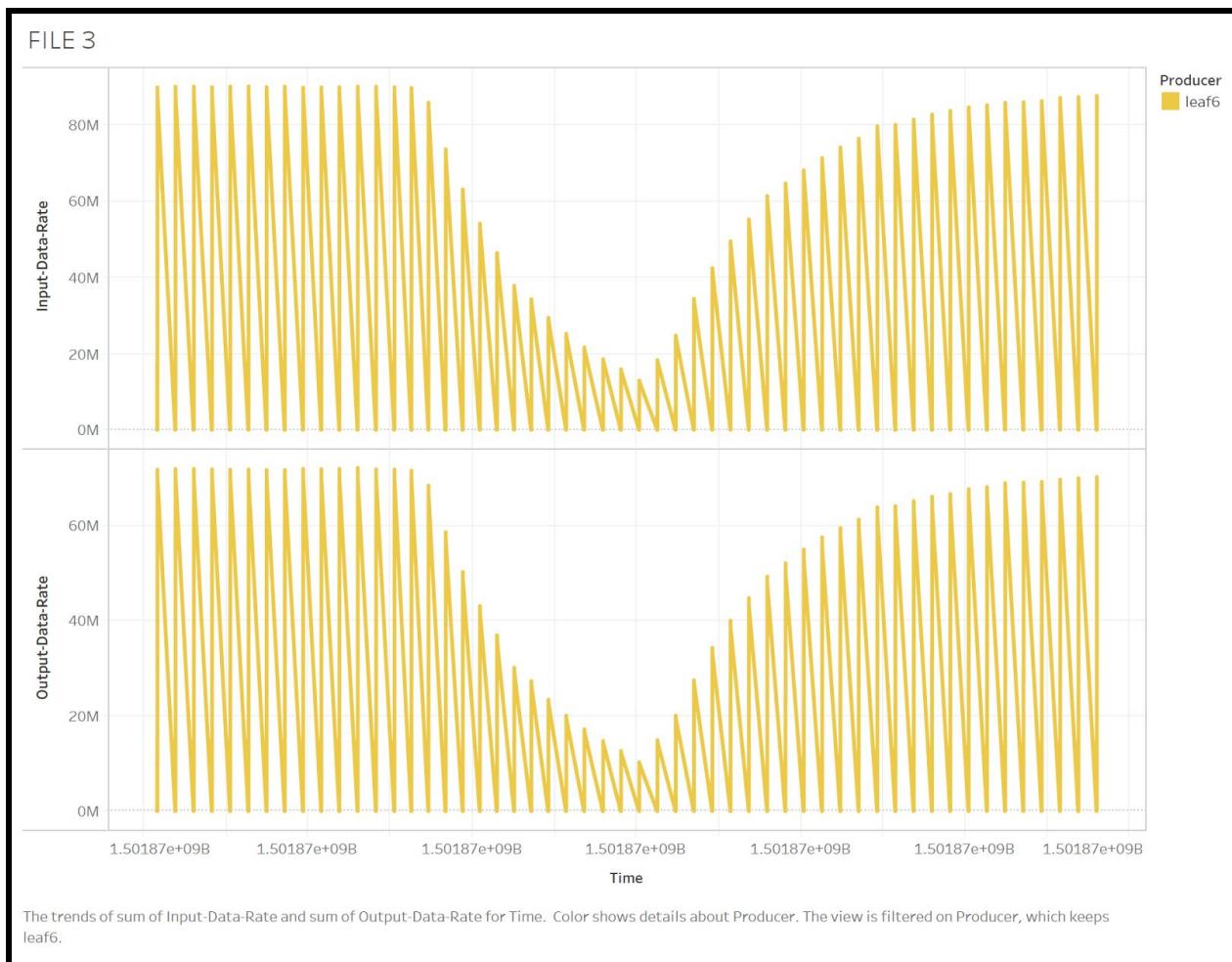
Spine 2: $79327 * 10^6$

Spine 3: $97245 * 10^6$

File 3

Failing Machine/s - Leaf 6

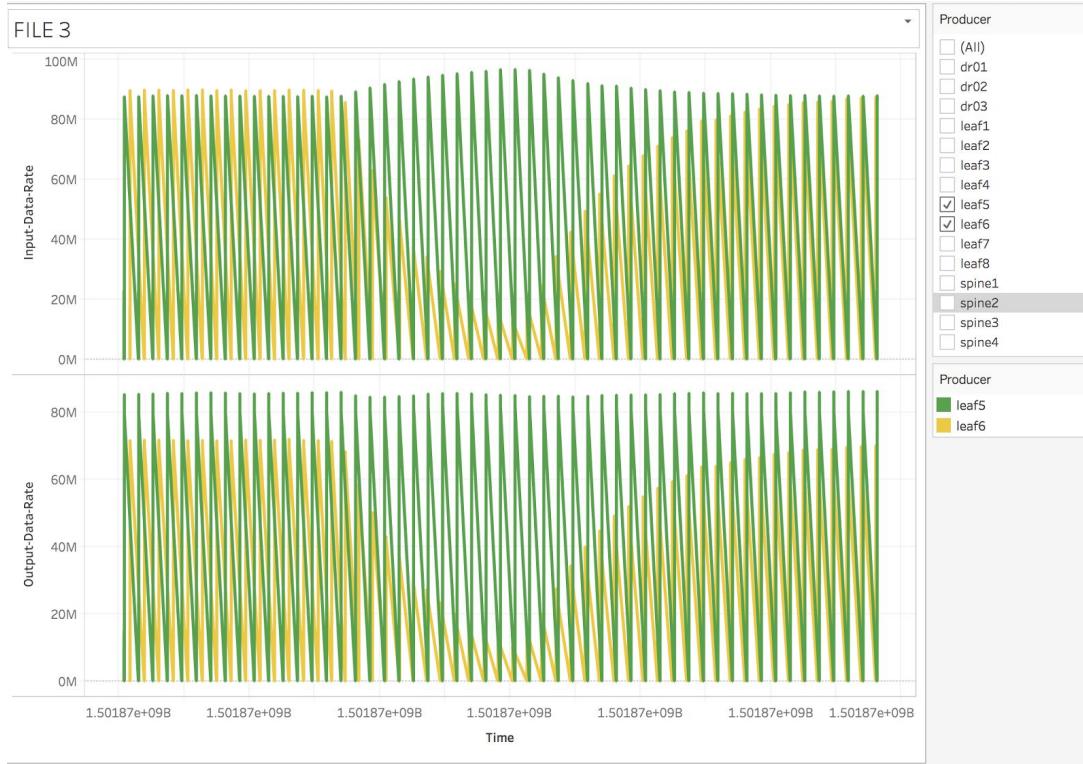
(1) What specific evidence in the data led you to classify the file as you did?

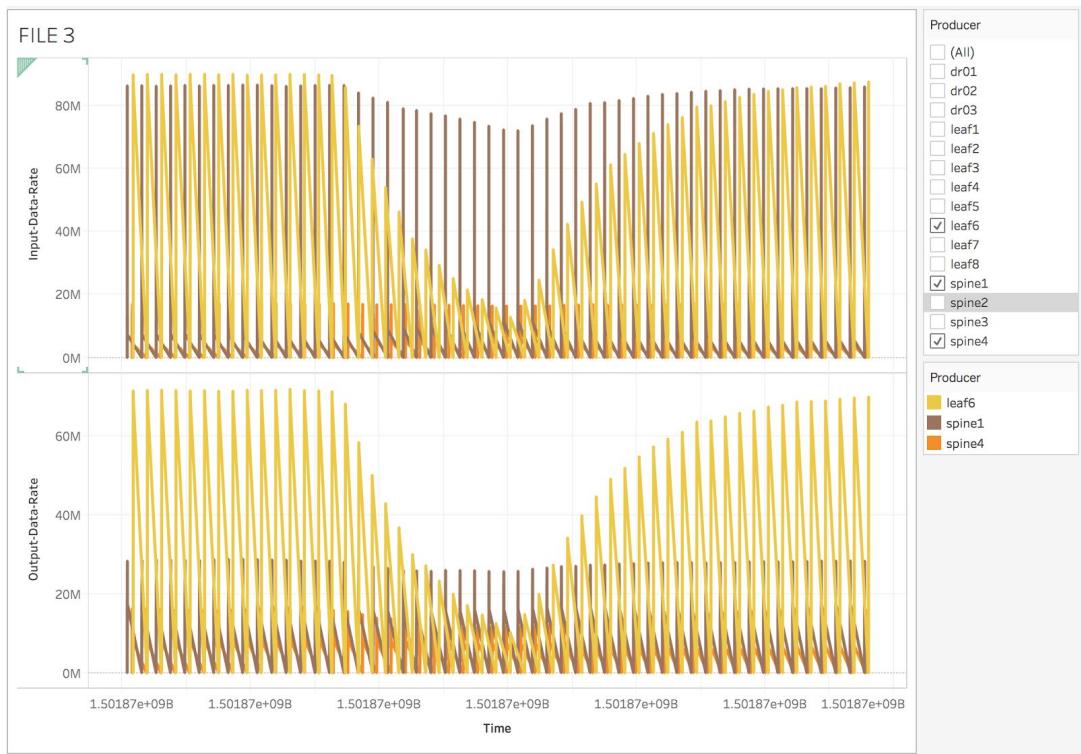
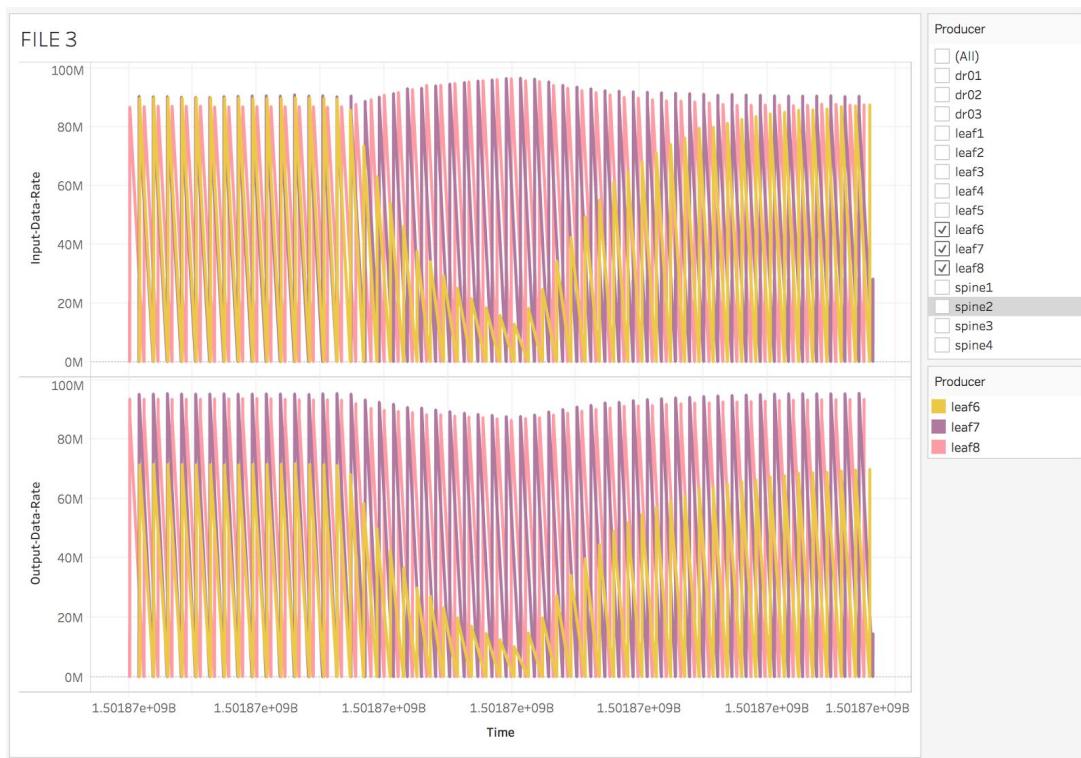




(2) What other machines are most influenced by the failure (or failures), and how? Describe what you “see” in the data.

As seen below failure of a leaf affects its neighbouring leafs. Leaf 6's failure causes a spike in leaf 5, leaf 7 and leaf 8. There are also some fluctuations in input data in spines as the traffic to the spines would change for a while in case of a failure.







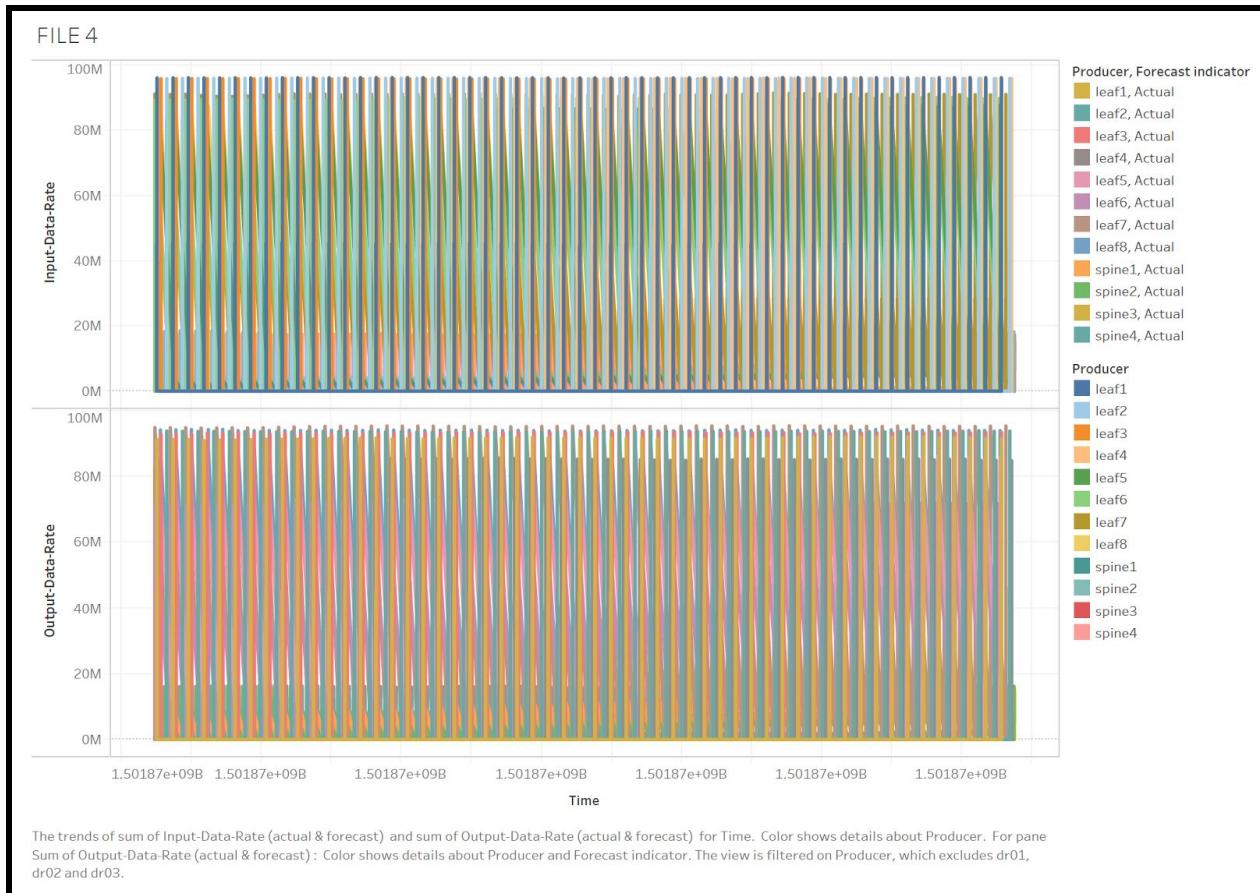
(3) How long did it take the network to return to “normal” functioning after the initial failure?

$$166880 * 10^6$$

File 4

Failing Machine/s - None

(1) What specific evidence in the data led you to classify the file as you did?



(2) What other machines are most influenced by the failure (or failures), and how? Describe what you “see” in the data.

N/A



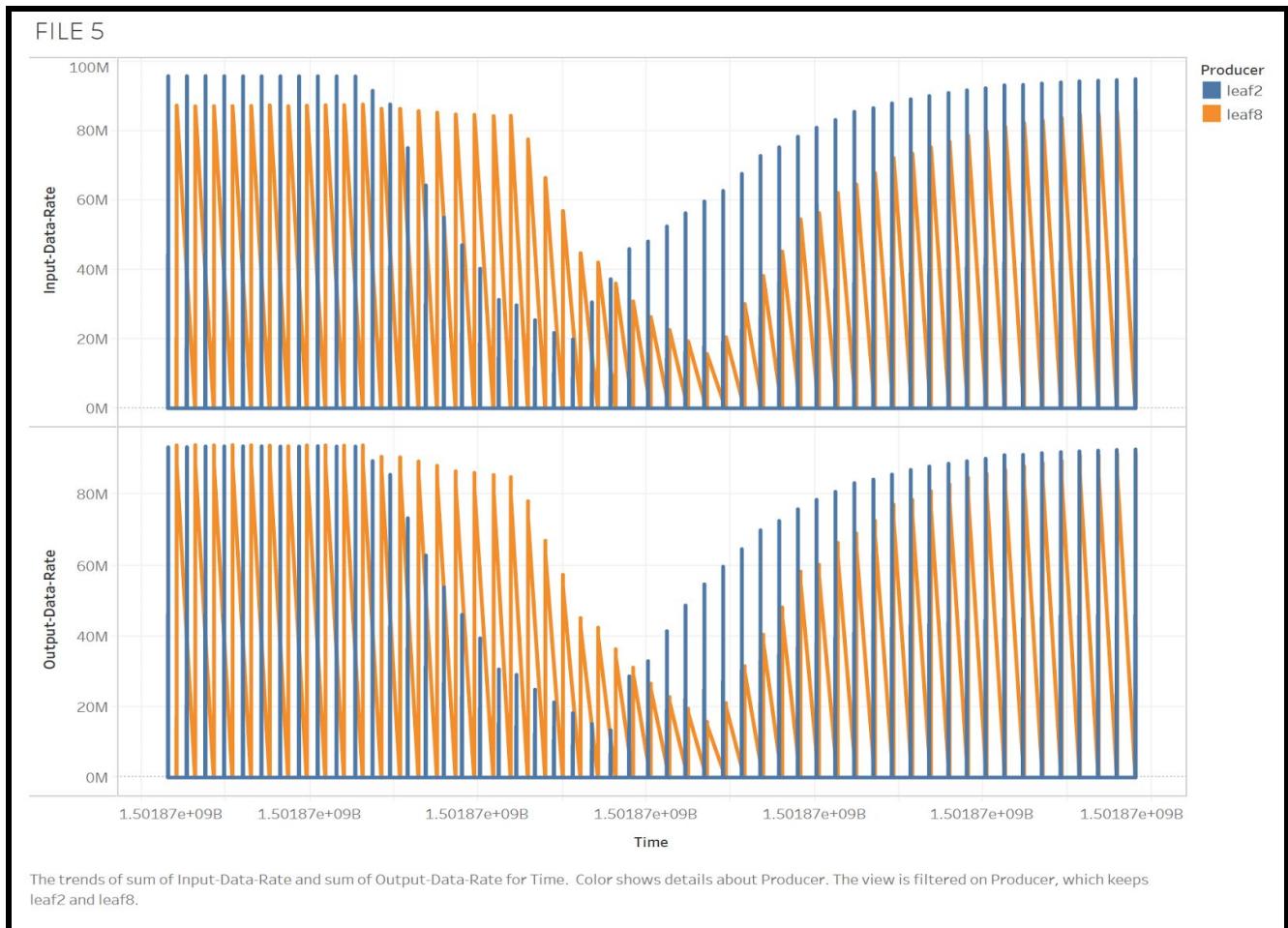
(3) How long did it take the network to return to “normal” functioning after the initial failure?

N/A

File 5

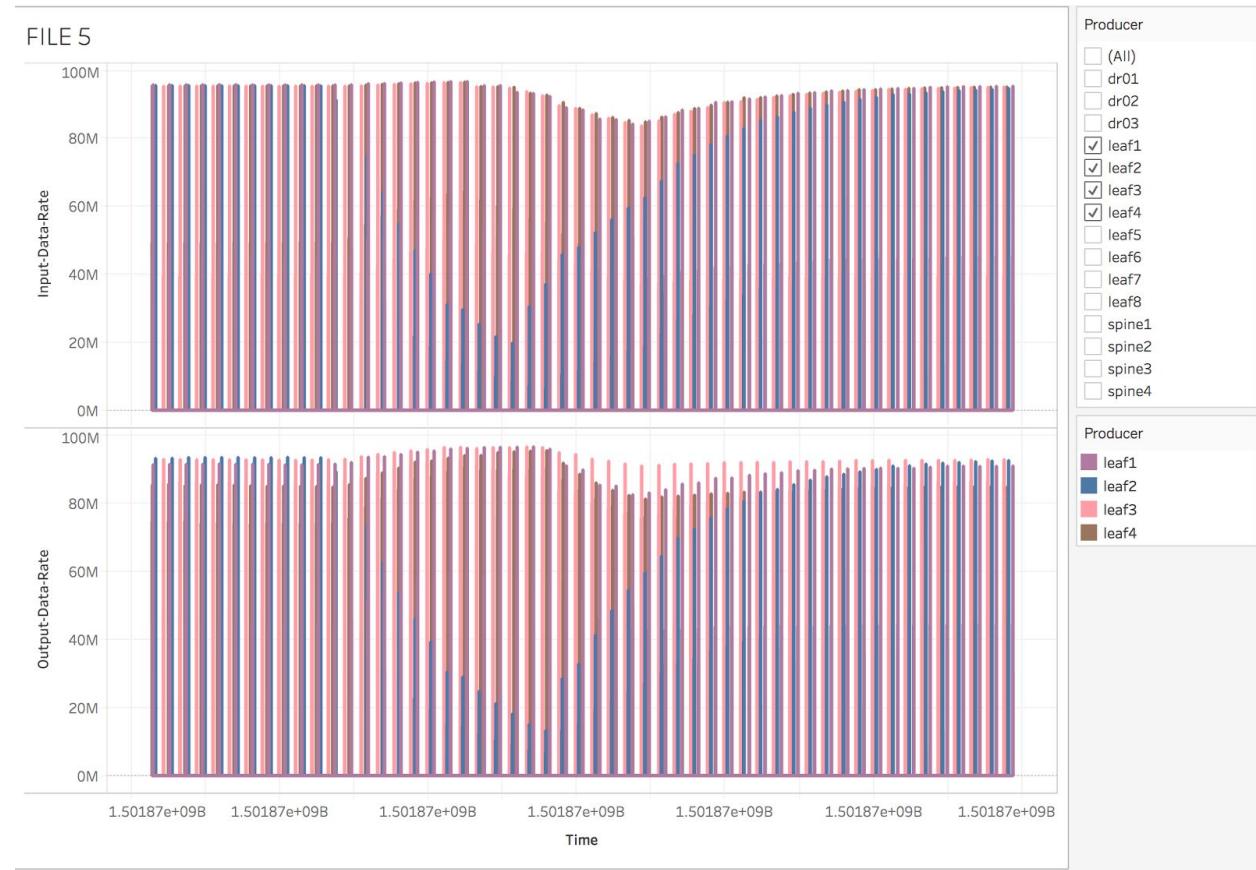
Failing Machine/s - Leaf 2 and Leaf 8

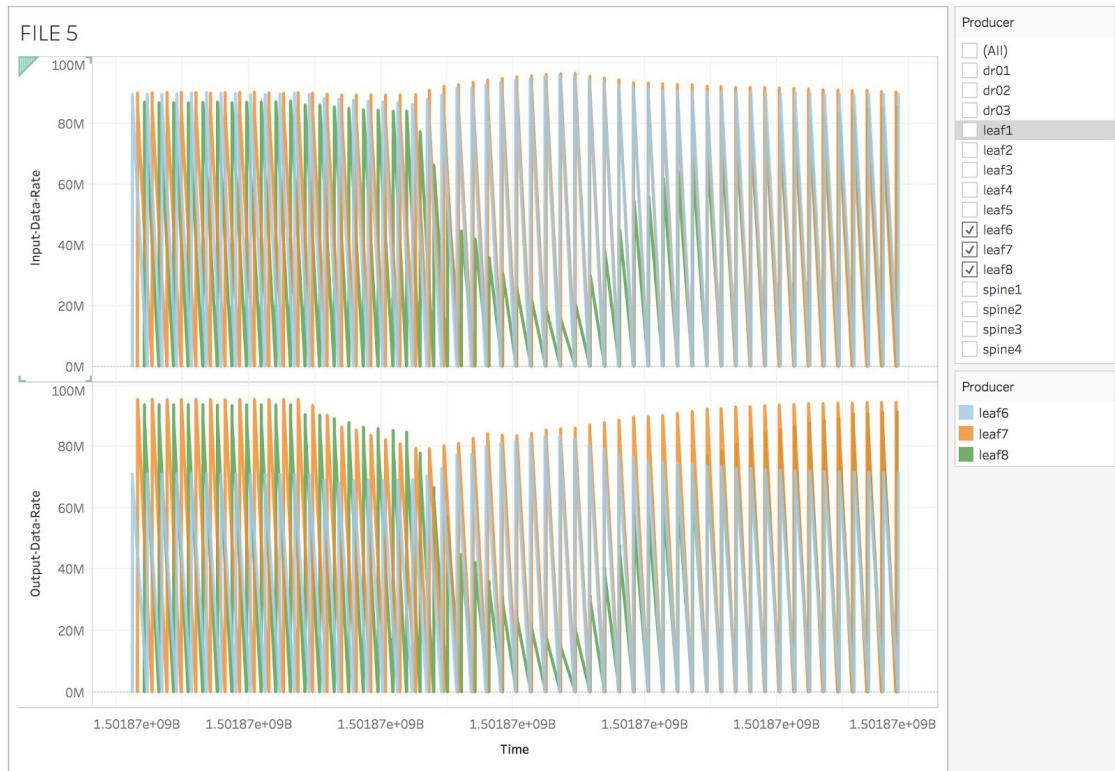
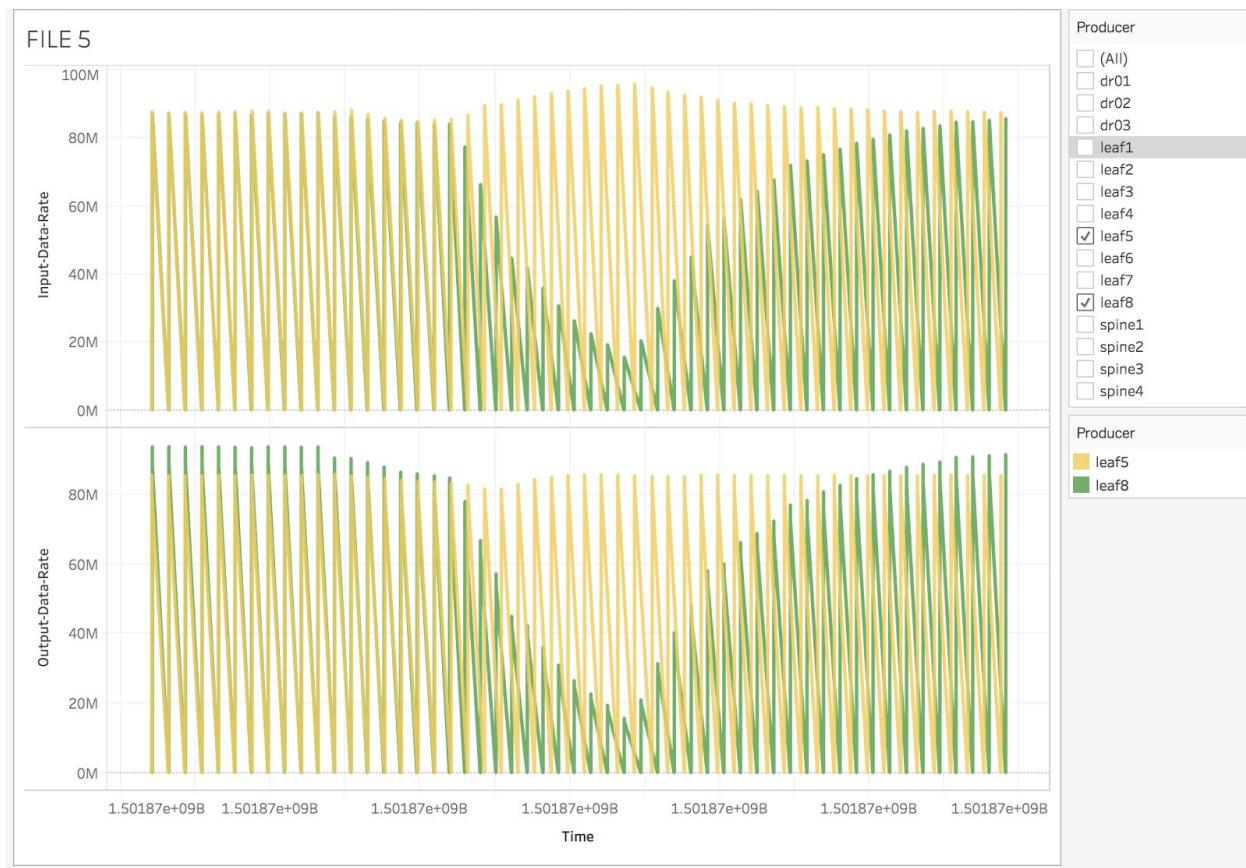
(1) What specific evidence in the data led you to classify the file as you did?

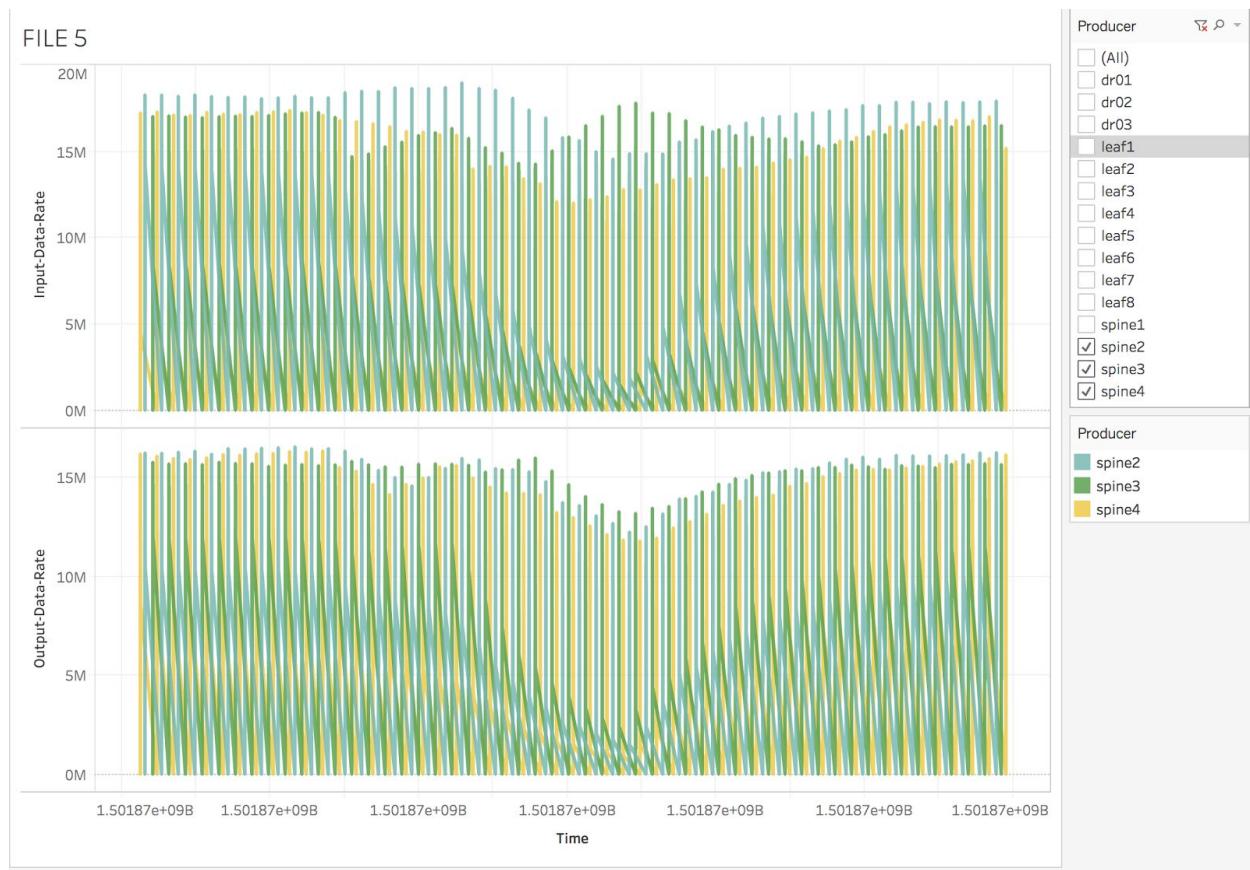


(2) What other machines are most influenced by the failure (or failures), and how? Describe what you “see” in the data.

As seen below failure of a leaf affects its neighbouring leafs. Leaf 2's failure causes a spike in leaf 1, leaf 3 and leaf 4. Similarly, leaf 8's failure causes spike in leaf 5,6 and 7. There are also some fluctuations in input data in spines as the traffic to the spines would change for a while in case of a failure.







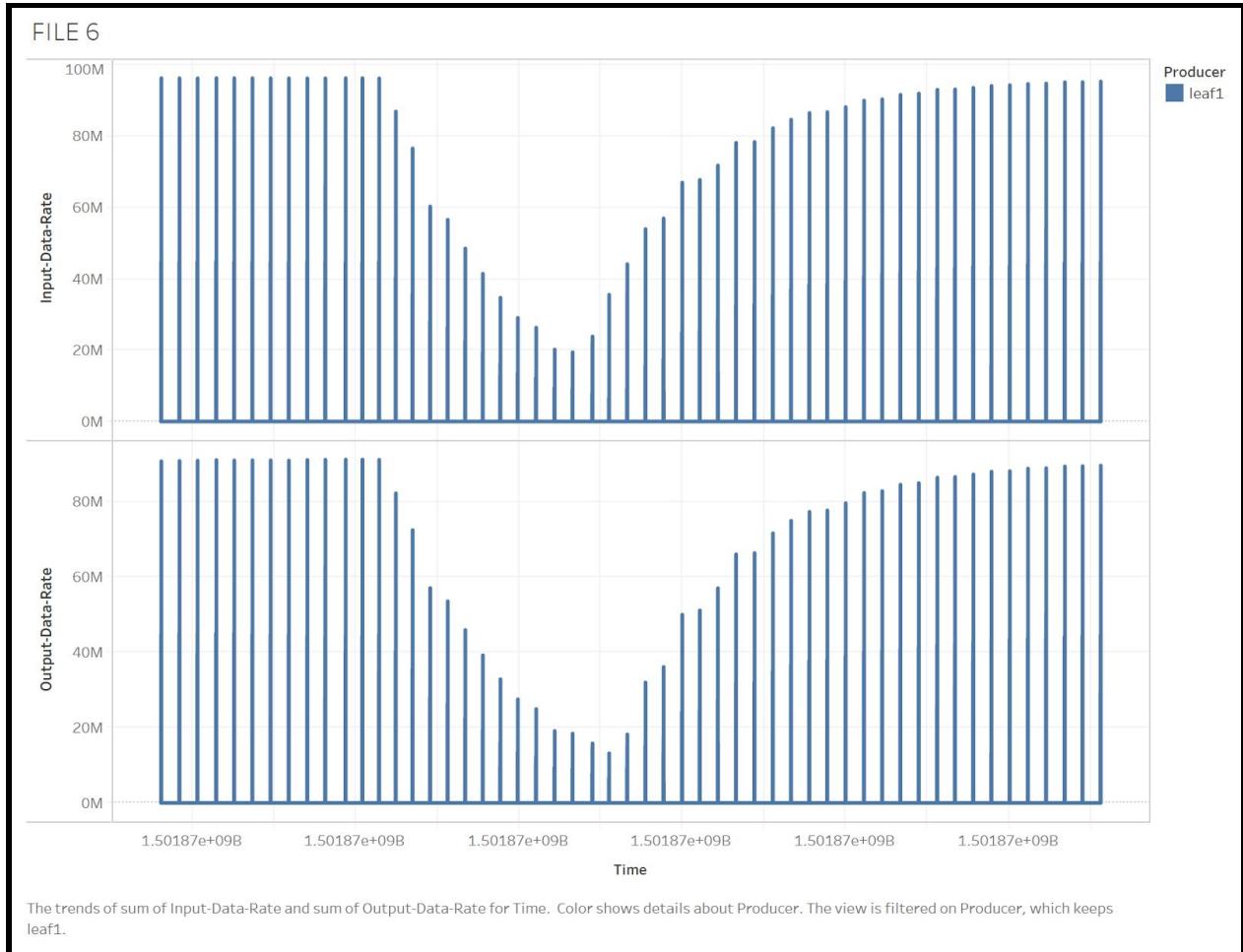
(3) How long did it take the network to return to “normal” functioning after the initial failure?

$185506 * 10^6$

File 6

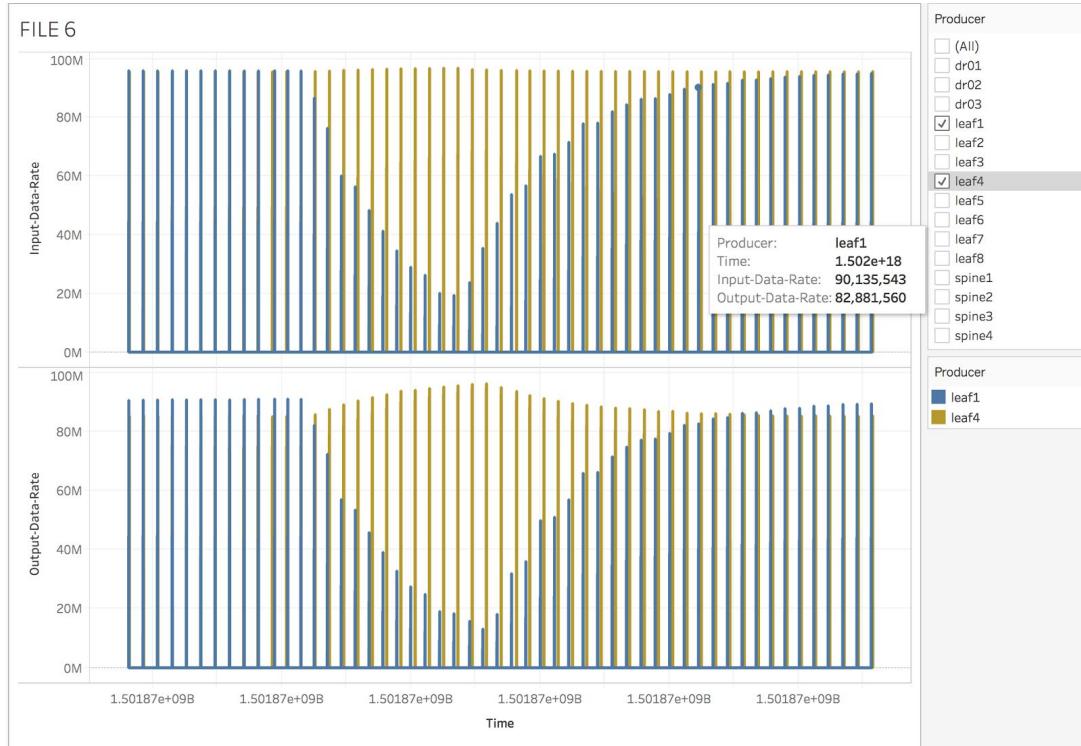
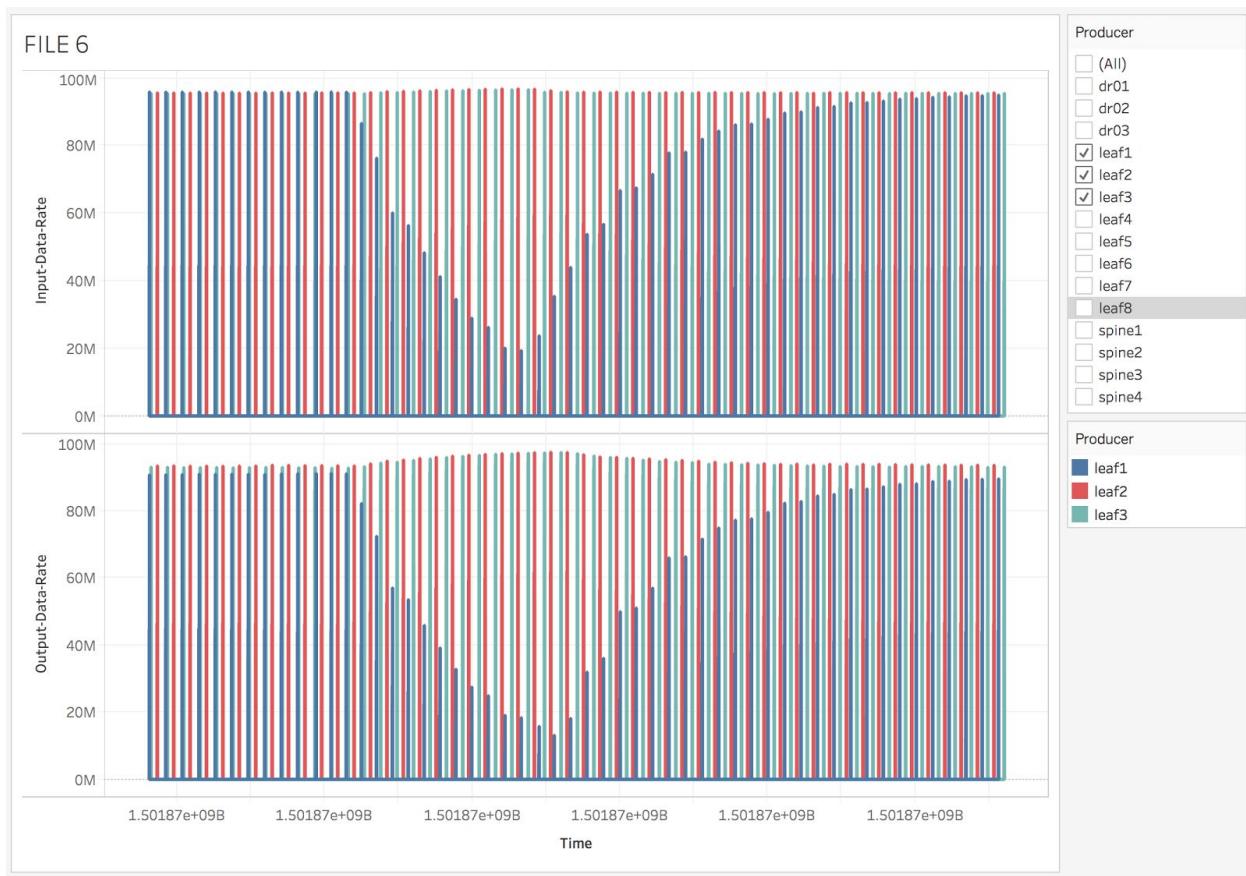
Failing Machine/s - Leaf 1

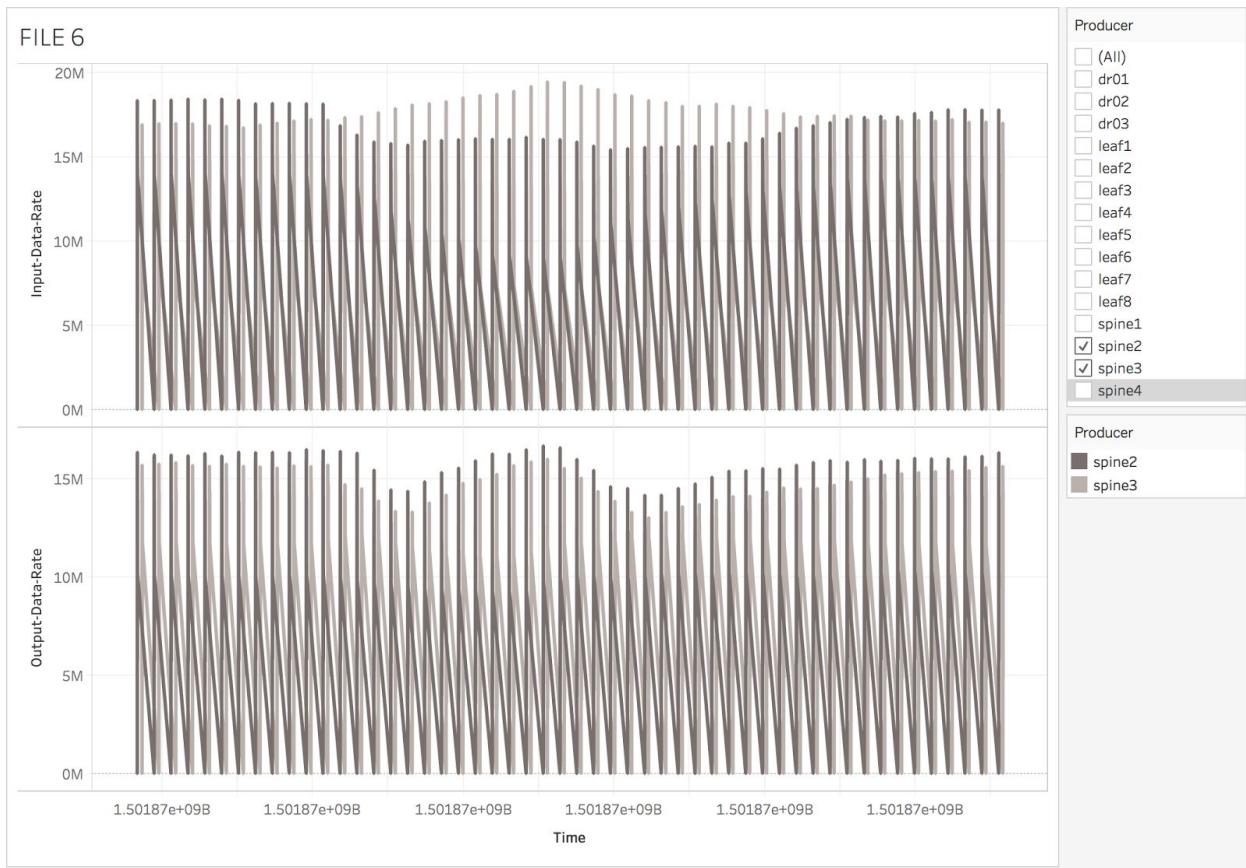
(1) What specific evidence in the data led you to classify the file as you did?



(2) What other machines are most influenced by the failure (or failures), and how? Describe what you “see” in the data.

As seen below failure of a leaf affects its neighbouring leafs. Leaf 1's failure causes a spike in leaf 2, leaf 3 and leaf 4. There are also some fluctuations in input data in spines as the traffic to the spines would change for a while in case of a failure.





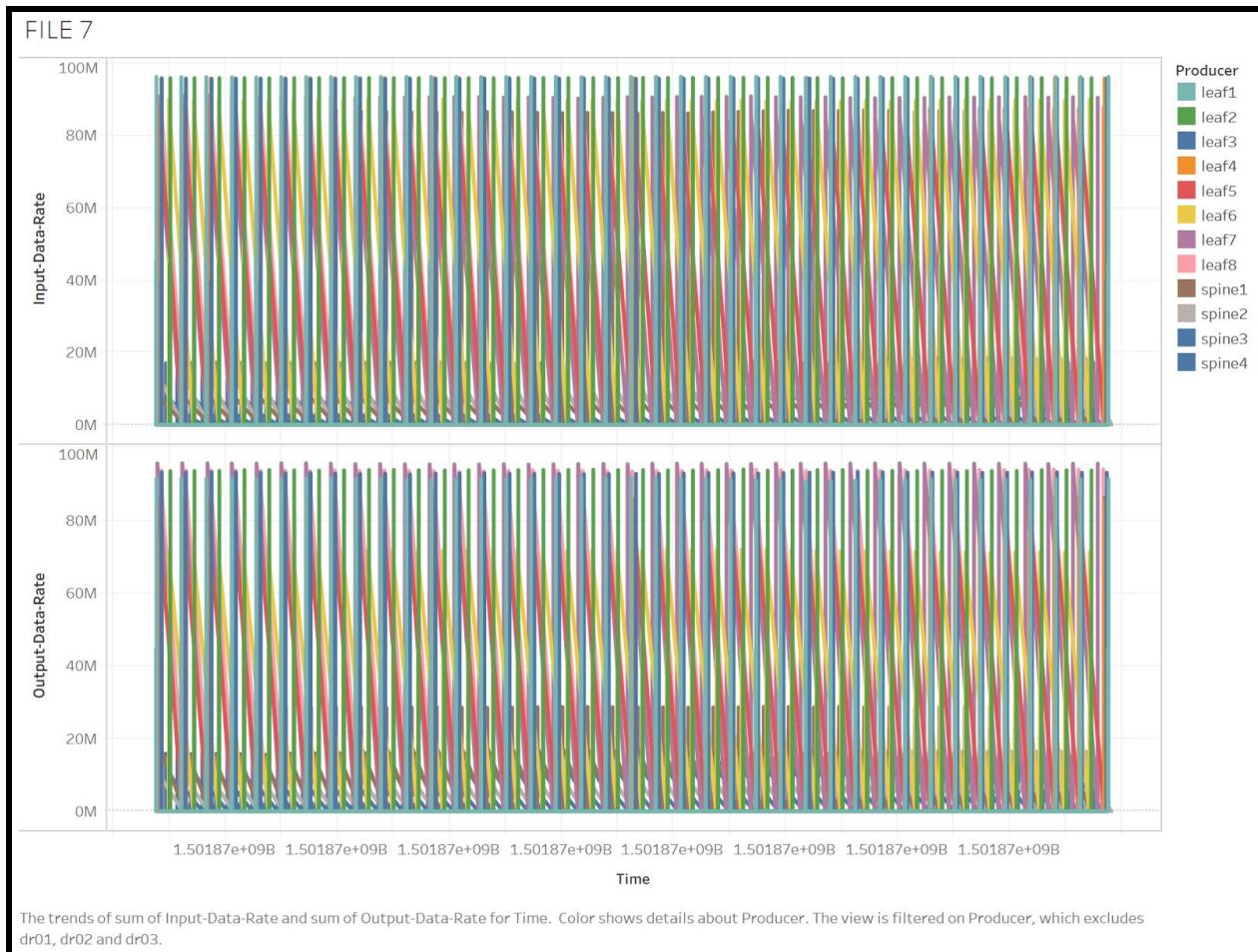
(3) How long did it take the network to return to “normal” functioning after the initial failure?

$176687 * 10^6$

File 7

Failing Machine/s - None

(1) What specific evidence in the data led you to classify the file as you did?



(2) What other machines are most influenced by the failure (or failures), and how? Describe what you “see” in the data.

N/A

(3) How long did it take the network to return to “normal” functioning after the initial failure?

N/A



Failure Sequence



The above figure illustrates the 'input-data-rate' patterns for the machines over the complete time-period i.e. timestamp for File1-File7.

L1-L8 - Leafs 1-8

S1-S4 - Spines 1-4

Failure Sequence: Leaf 1 -> Leaf 6 -> Spine 2 -> Leaf 2 -> Leaf 8 -> Spine 1 -> Spine 2 -> Spine 3

Conclusion

The seven (7) files record five (5) distinct circumstances:

- (i) *Normal operation* of the network, no fault (two examples) - **File 4 and File 7**
- (ii) *One leaf fails* (two examples) - **File 3 (Leaf 6) and File 6 (Leaf 1)**
- (iii) *Two leaves fail in sequence* - **File 5 (Leaf 2 and Leaf 8)**
- (iv) *One spine fails* - **File 1 (Spine 2)**
- (v) *Three spines fail in sequence* - **File 2 (Spine 1, Spine 2 and Spine 3)**