

20656 - Methods and Data Analytics for Risk Assessment
Spring 2024

Final Project

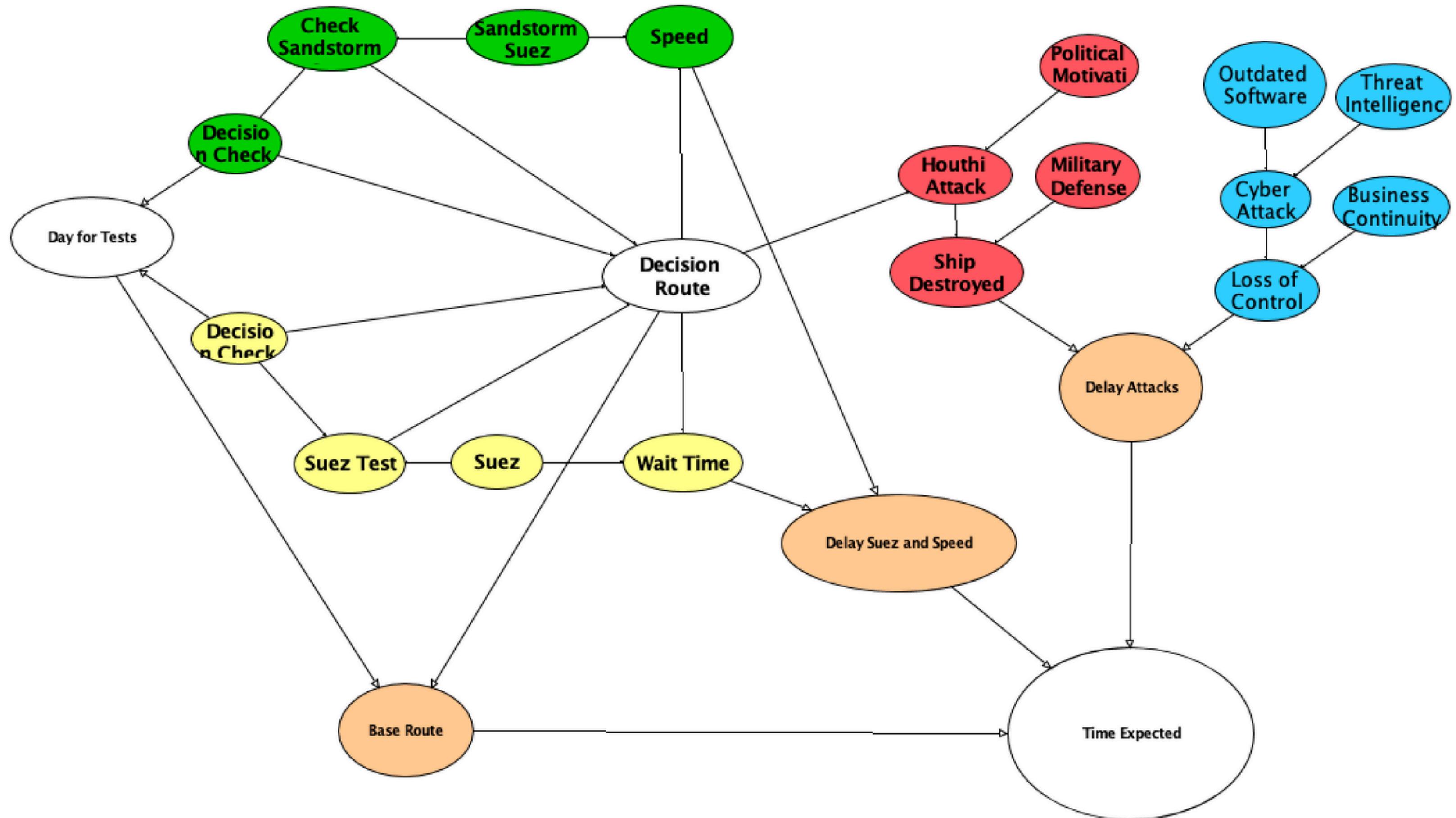
Delay of commercial ships

Group 5:

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General schema



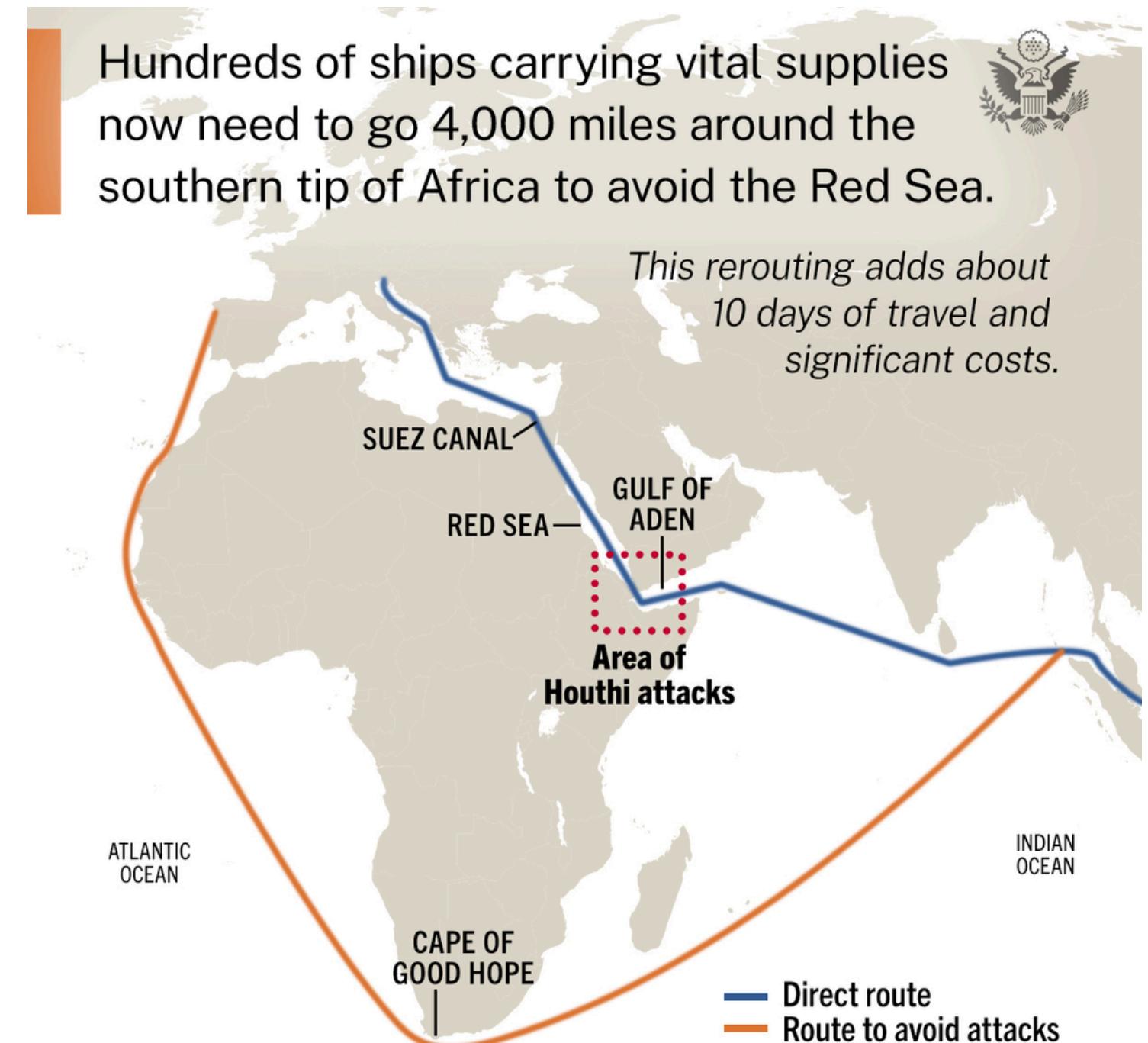
Assumptions

We consider to have only 2 routes: Africa and Suez

Only time: we only took into consideration the time of arrival, not the costs of the shipping (e.g. route around Africa is longer and would require more fuel)

Political motivation: if the ship is Chinese or Russian it doesn't get attacked. Probabilities are assumed (no data available).

If Suez is '**closed**' -> the canal is then closed "indefinitely," hence the ship will be forced to take the Africa route.



Other Assumptions

- **Military defense:** if a ship receives help from a military ship, it cannot be destroyed. Without help, a Houthi attack will cancel the delivery.
- **Weather:** exclusive focus on the sandstorm impact in Suez, disregarding other causes of bad weather.
- **Navigation speed:** navigation around Africa is slower
- **Cyber attacks:** only result in ship delays, not halts.



Delays Assumptions

Base Route:

- 19 days for base suez
- 50 days for base africa
- Plus 1 day if either test is performed
- Plus 2 days if boht tests are performed

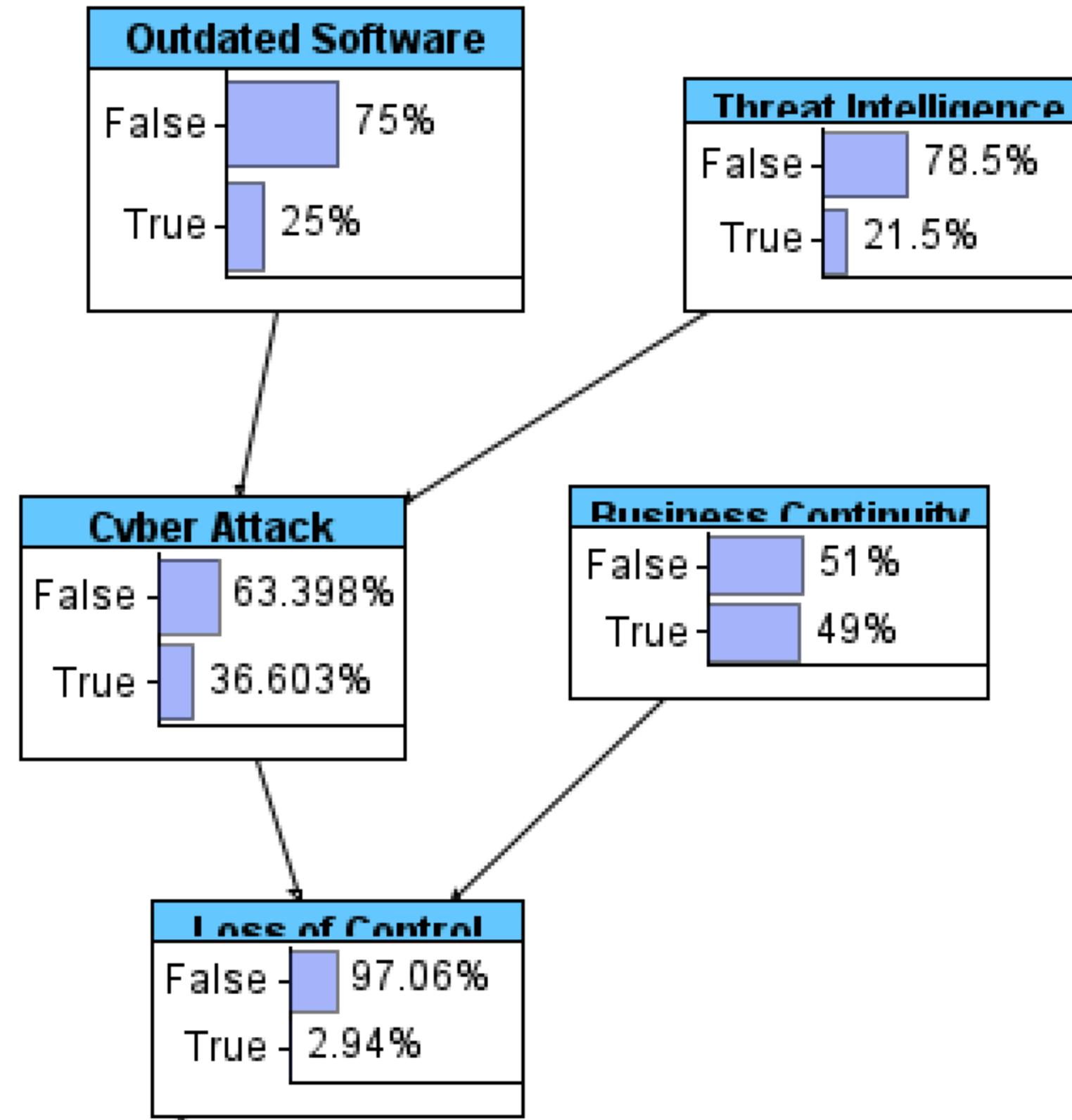
Delay Suez and Speed:

- Plus 5 for Slow Speed
- Plus 10 for Very Slow Speed
- Plus 2 for Short Wait
- Plus 7 for Long Wait

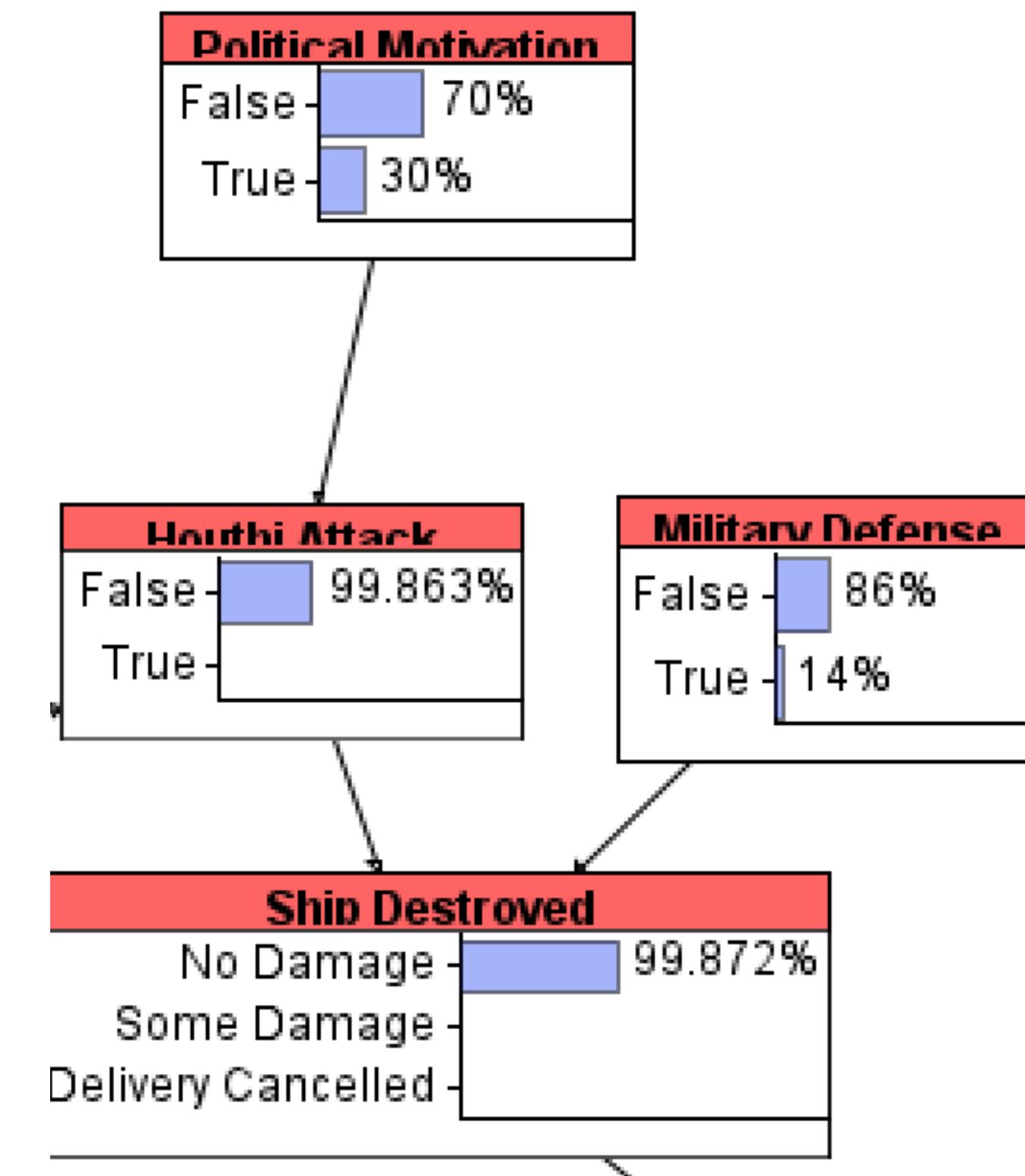
Delay attacks:

- Plus 5 for some damage
- Plus 100 (never delivers) for Delivery Cancelled
- Plus 1 for Loss of Control

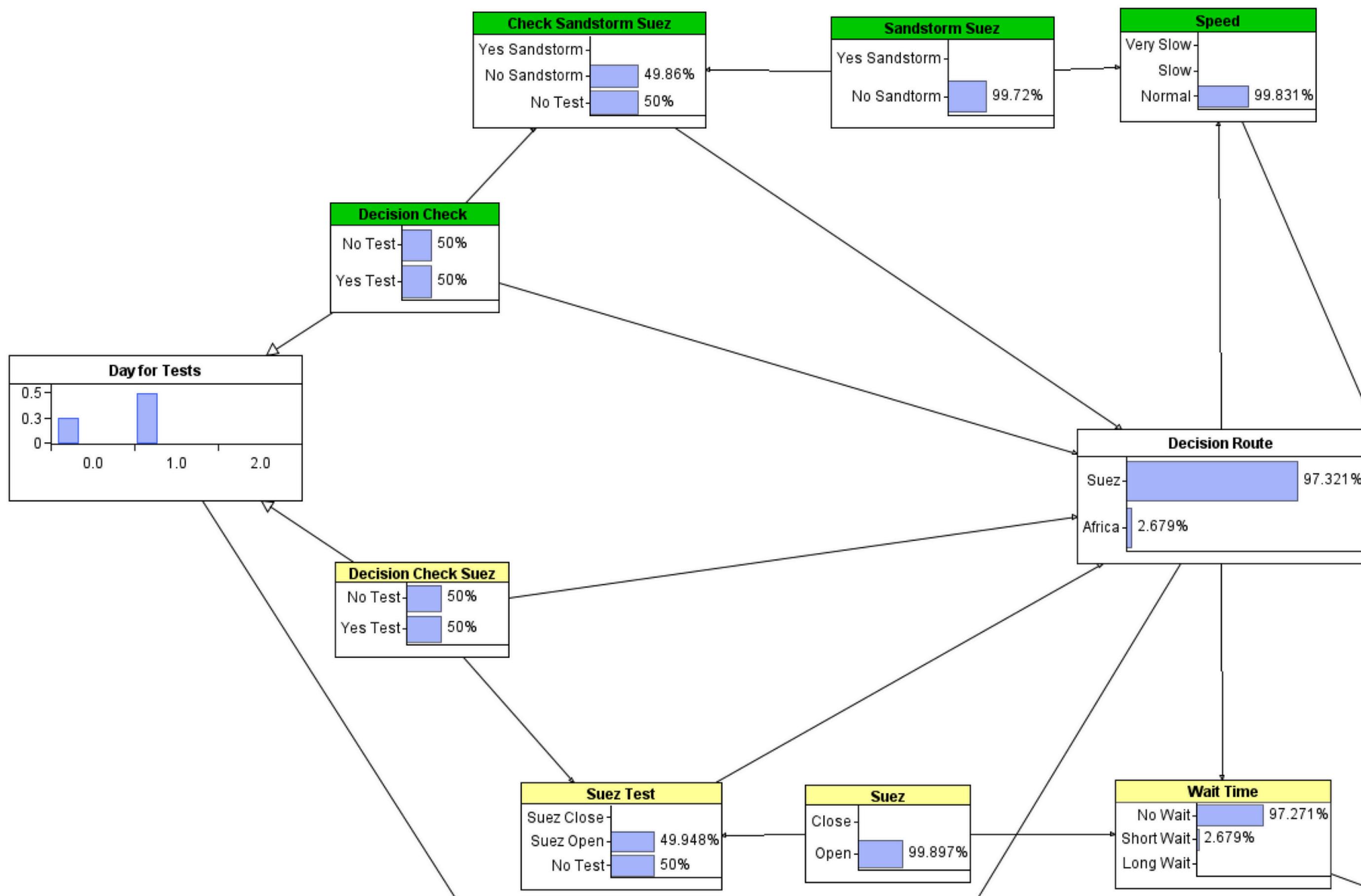
Cyber Attack



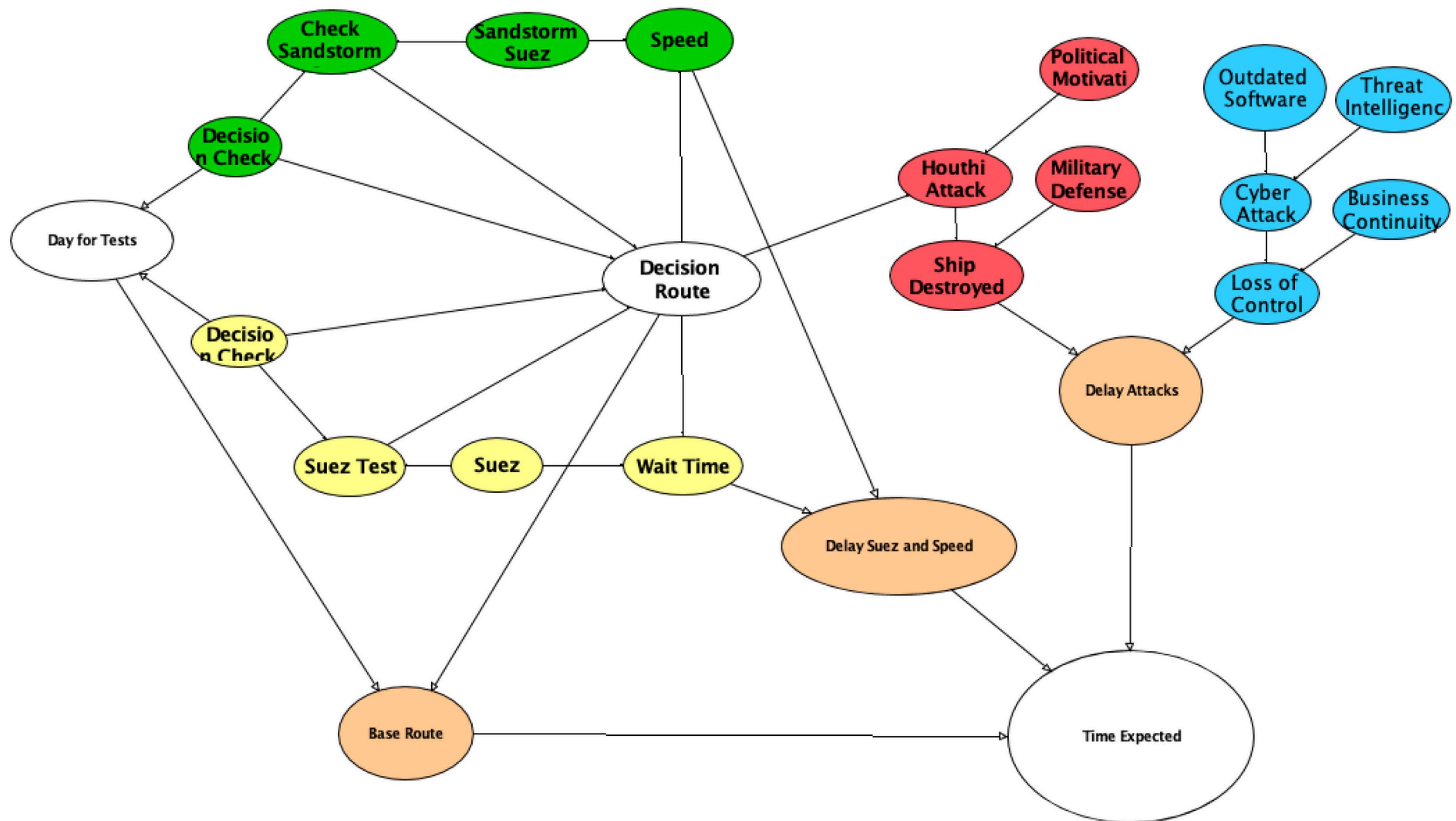
Houthi Attack



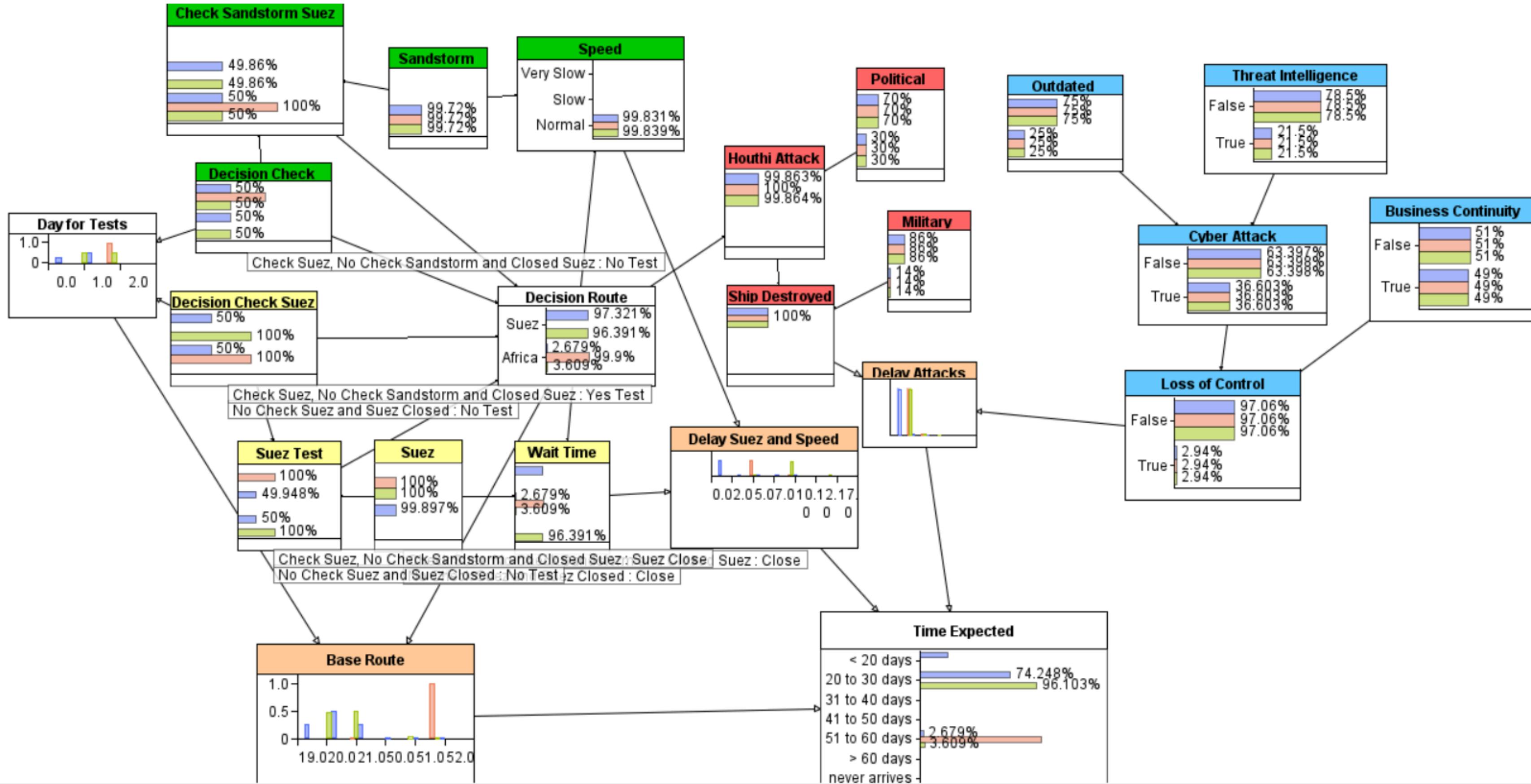
Decision Model



General schema



Cases Schema



Case Analysis - Time Expected



Base Case

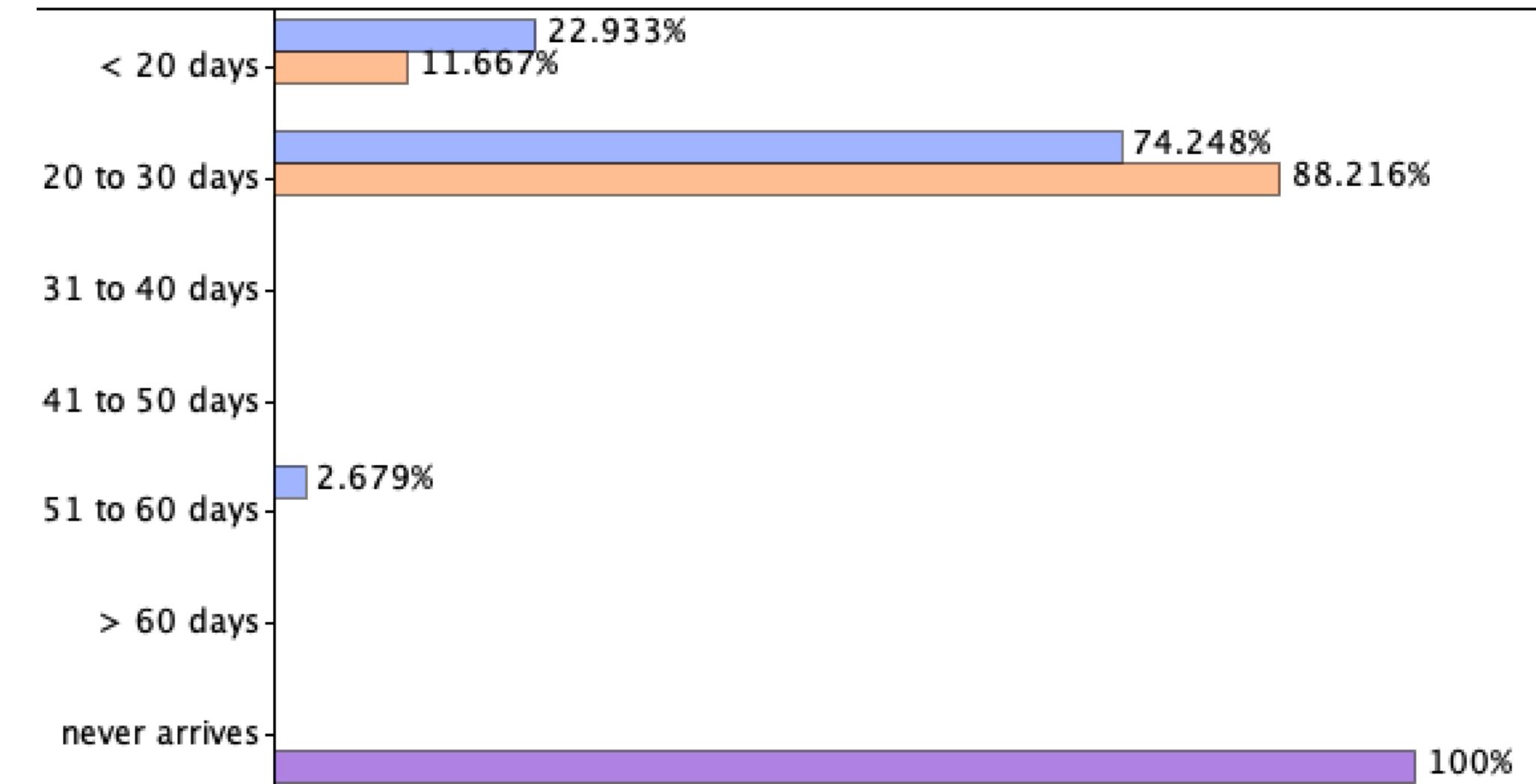


**Both Attacks happen w/
Mitigating Measures**



**Both Attacks happen w/ no
Mitigating Measures**

Time Expected



Case Analysis - Time Expected



Base Case

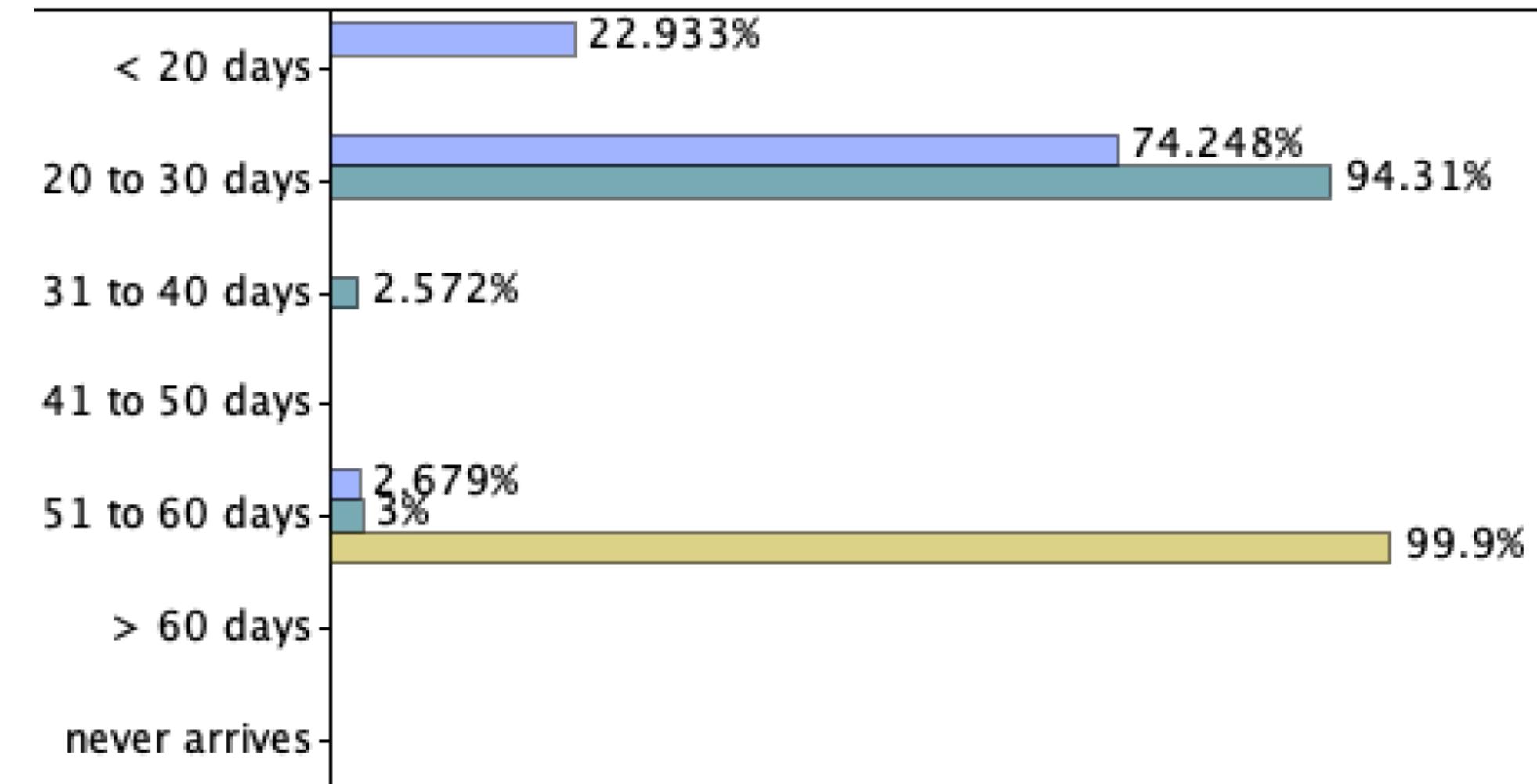


Check Suez,
Sandstorm, Suez
No Check
Sandstorm, Open, with
Sandstorm

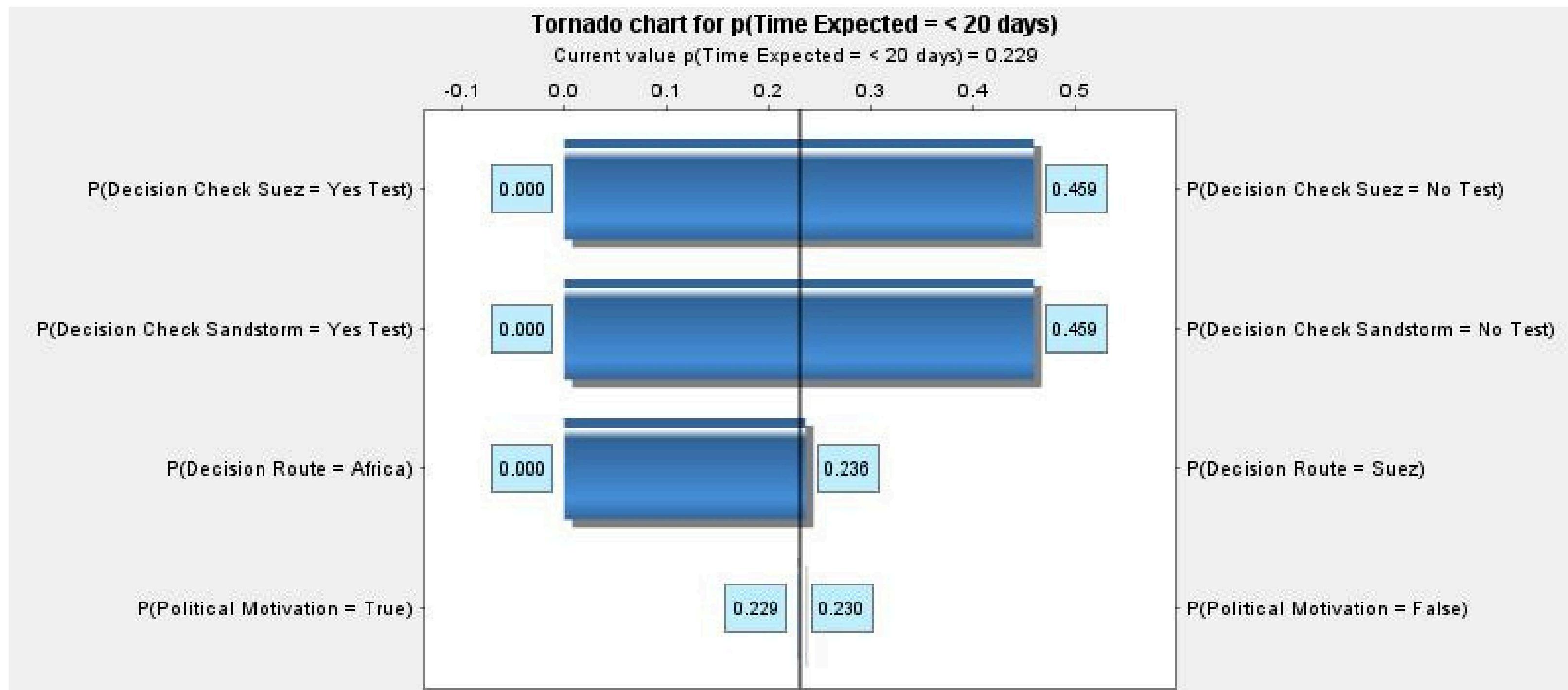


Check Suez, No Check Sandstorm,
Suez Closed

Time Expected



Sensitivity Analysis



Sensitivity Analysis

Sensitivity Analysis of Time Expected

Base Case

$p(\text{Time Expected} \mid \text{Decision Check Sandstorm})$

	< 20 days	20 to 30 days	31 to 40 days	41 to 50 days	51 to 60 days	> 60 days	never arrives
No Test	0.4587	0.4996	0	0	0.0405	0.0012	
Yes Test	0	0.9853	0.0004	0	0.0131	0.0012	

$p(\text{Time Expected} \mid \text{Decision Check Suez})$

	< 20 days	20 to 30 days	31 to 40 days	41 to 50 days	51 to 60 days	> 60 days	never arrives
No Test	0.4587	0.5041	0	0	0.0361	0.0012	
Yes Test	0	0.9809	0.0004	0	0.0175	0.0012	

$p(\text{Time Expected} \mid \text{Decision Route})$

	< 20 days	20 to 30 days	31 to 40 days	41 to 50 days	51 to 60 days	> 60 days	never arrives
Suez	0.2356	0.7629	0.0002	0	0	0.0012	
Africa	0	0	0	0	1	0	

$p(\text{Time Expected} \mid \text{Political Motivation})$

	< 20 days	20 to 30 days	31 to 40 days	41 to 50 days	51 to 60 days	> 60 days	never arrives
False	0.2296	0.7434	0.0002	0	0.0268	0	
True	0.2286	0.7404	0.0002	0	0.0268	0.0039	

Thank
you very
much!

