

1a)

There are 6 possible first events:

- ?b-login on Blue Team
- ?r-login on Read Team
- if the loop iterates zero times, the 4 sending events on Infrastructure within the xalt may also occur as first events

1b)

We get a trace of length 6 if the loop iterates zero times. If the loop iterates once or more the traces will be longer.

1c)

There are four possibilities, namely the four reception events within the xalt.

1d)

There are two positive traces of length 4. One for each alt operand.

1e)

The shortest negative trace for War-2 is the empty trace. If the loop iterates once, we may get the following negative trace

<?b-login, ?r-login, !red-won, ?red-won, !red-won, ?red-won>

1f)

There are infinitely many. It may be any sending event. It may also be a reception event for a message from a gate.

2a)

Yes. Pure supplementing since the only effect of the two asserts is to make inconclusive traces negative.

2b)

It cannot be a refinement since War-1 have two positive traces of length four that are both inconclusive in War-3.

2c)

It is a general as well as a limited refinement since each of the two interaction obligations of War-4 are refinements (supplementing since inconclusive traces are made negative and narrowing since one positive trace is made negative) of the only interaction obligation of War-1.

2d)

It is a general and limited refinement since each of the two interaction obligations of War-4 are refinements (supplementing since inconclusive traces are made negative and positive and narrowing since two positive traces are made negative) of the only interaction obligation of War-1.

2e)

~~Regarding the question the answer is that it depends.~~

It is a general refinement and a limited refinement.

Since the only difference between the two diagrams is that War-1 is replaced by War-2 it follows from 2a) that each interaction obligation it is a pure supplementing of its corresponding interaction obligation, due to the congruence property.

2f)

It is not a refinement. If the loop iterates an odd number of times RedBlueFight-1 will generate traces that cannot be produced by RedBlueFight-3.

3a)

There are many alternatives here. They could have their own botnet. This would be an asset for such a company. Exclusive intelligence about potential victim-organizations could be another. Discriminating information about their criminal activities a third.

3b)

The most natural thing here is to provide a consequence scale. In that case it should capture the consequence of asset loss. But it might also be a frequency scale. In both cases the scale must be ordered. Since this is a quantitative scale each value must be defined in English in such a way that the scale covers every relevant value, has very few overlaps (ideally none) and the definitions reflects the ordering in an intuitive manner.

| | |
|---------------|--|
| Catastrophic | Whole network lost. Unable to conduct attacks. |
| Large | Significant parts lost. Still operating but cannot carry out the largest attacks. |
| Medium | Some parts lost causing delays, but still able to carry out any attack. |
| Minor | Some parts lost with some unfortunate internal effects, but of no relevance for customers. |
| Insignificant | Some nodes lost, but no effect on business, and no increase in workload. |

3c)

One possibility:

- a1 = Discriminating information about criminal activities
- a2 = Botnet
- in2 = loss of Swedish nodes
- in3 = loss of Norwegian nodes

- in1 = discriminating information copied by the police
- tr = police
- ts1 = system hacked by employees of police
- ts2 = police set up eavesdropping
- ts3 = police trace nodes I botnet

Make sure that incident corresponds to loss of asset value, which threat scenarios should not. Threat scenario should describe a scenario and not a vulnerability.

3d)

They may be set in various ways. One strategy might be:

- $f_2=f_1$
- $f_3=f_2*q_1$
- $f_4=f_2*q_2$
- $f_5=f_4*q_4+f_3*q_3$
- $f_6=f_4*q_5$
- $f_7=f_4*q_6$

It is also possible and perhaps more meaningful to use intervals. This holds particularly for f_5 if its is unclear to what extent ts_2 and ts_3 are separate.

3e)

Since in_2 and in_3 are separate, we get

- f_6+f_7
- $(f_6*con_2+f_7*con_3)/(f_6+f_7)$