Assignment # 3

Course: Formal Methods

Uppaal

Submitted to: Sir Sohail Iqbal

Submitted by: Roha Asad

Reg. No: 124691

BESE-6B

Submitted on: 22nd May, 2018

National University of Sciences and Technology

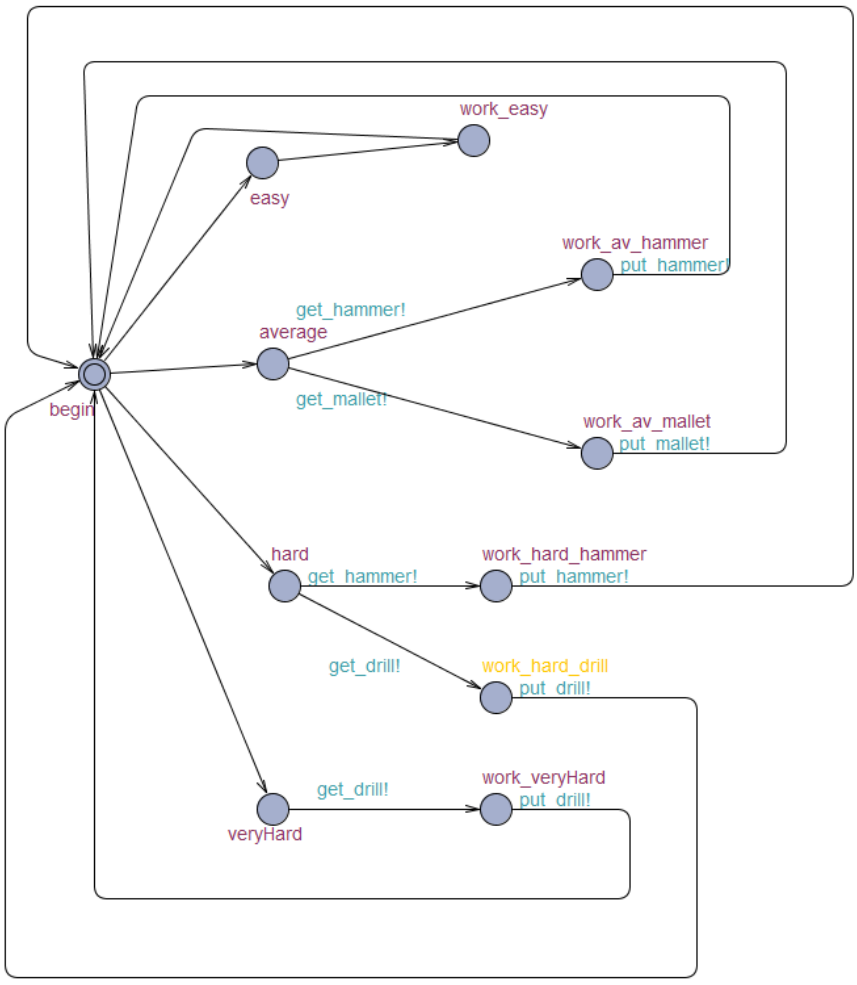
School of Electrical Engineering and Computer Science

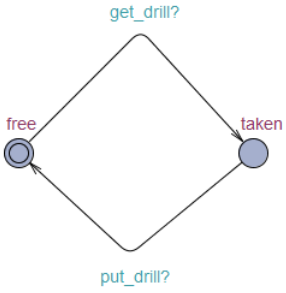
GIT Link: https://github.com/xruonhnay/FM_Asgn3_Roha

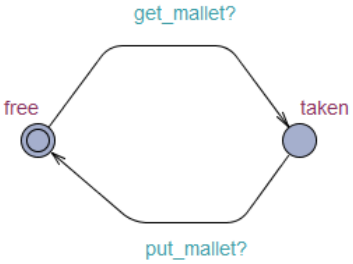
Question#1:

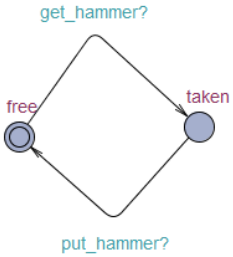
- Part A:

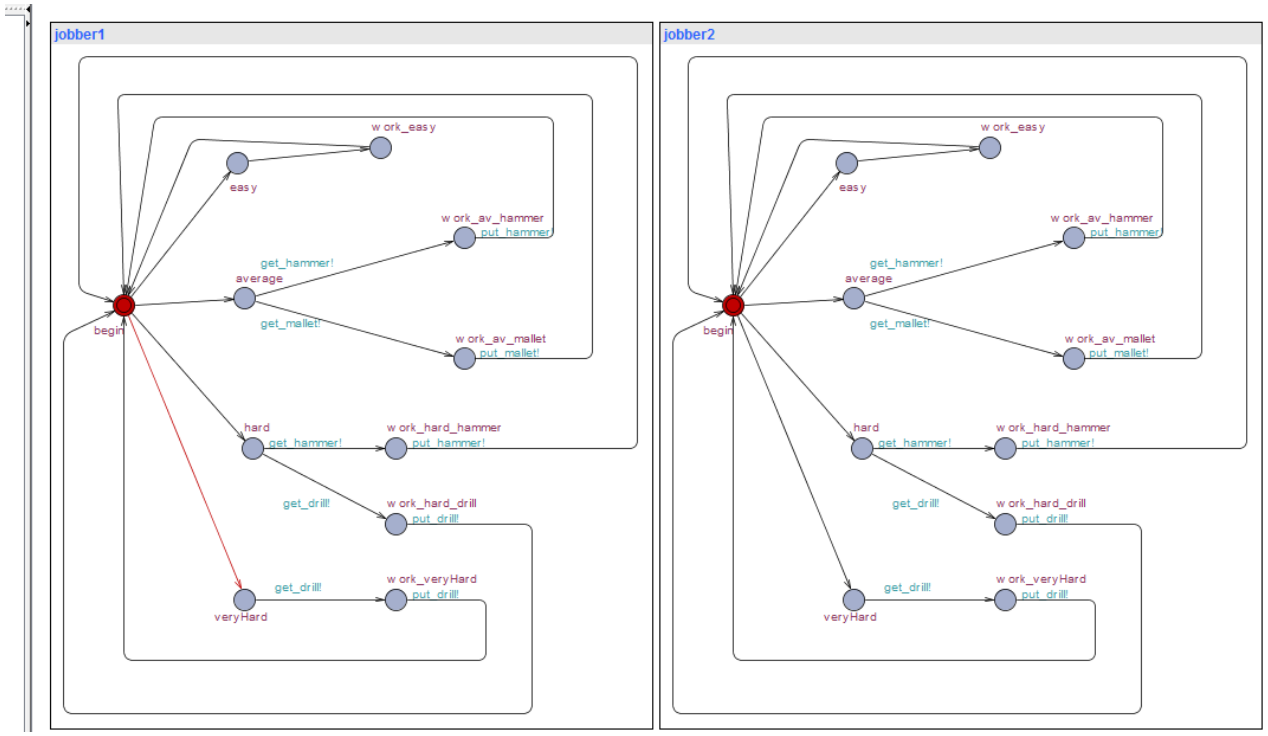
Added one more jobber in the system. Also added a new tool to be used by the jobber i.e.: DRILL. Now hard task can be done with either a HAMMER or a DRILL but introduced a new HARD_WORK which can only be done with the help of drill. The characteristics are same i.e.: once a tool has been acquired, it can't be used until put back by one jobber.



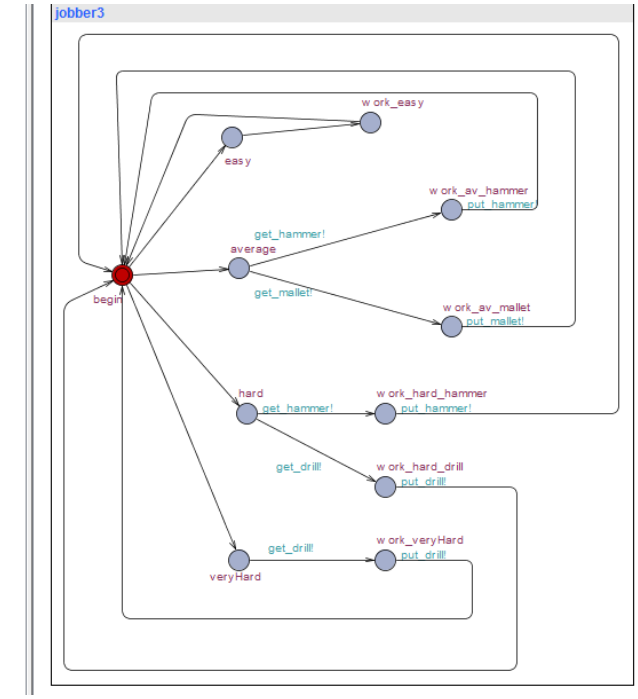


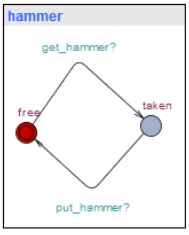


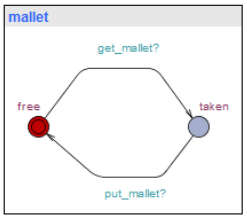


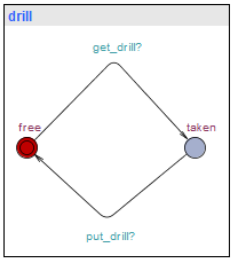

jobber1
w ork_easy
easy
w ork_av_hammer
put_hammer!
get_hammer!
average
get_mallet!
w ork_av_mallet
put_mallet!
begin
hard
get_hammer!
w ork_hard_hammer
put_hammer!
get_drill!
w ork_hard_drill
put_drill!
get_drill!
w ork_veryHard
put_drill!
veryHard

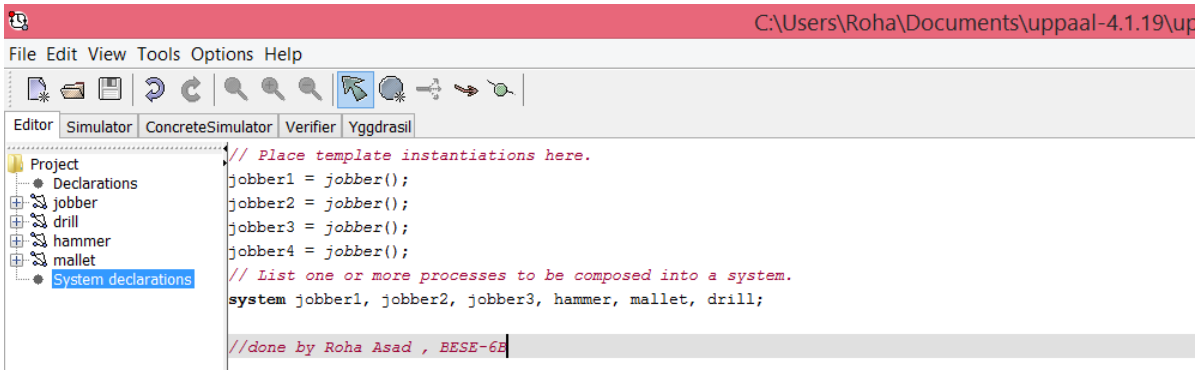
jobber2
w ork_easy
easy
w ork_av_hammer
put_hammer!
get_hammer!
average
get_mallet!
w ork_av_mallet
put_mallet!
begin
hard
get_hammer!
w ork_hard_hammer
put_hammer!
get_drill!
w ork_hard_drill
put_drill!
get_drill!
w ork_veryHard
put_drill!
veryHard


jobber3
w ork_easy
easy
w ork_av_hammer
put_hammer!
get_hammer!
average
get_mallet!
w ork_av_mallet
put_mallet!
begin
hard
get_hammer!
w ork_hard_hammer
put_hammer!
get_drill!
w ork_hard_drill
put_drill!
get_drill!
w ork_veryHard
put_drill!
veryHard


hammer
get_hammer?
free
taken
put_hammer?

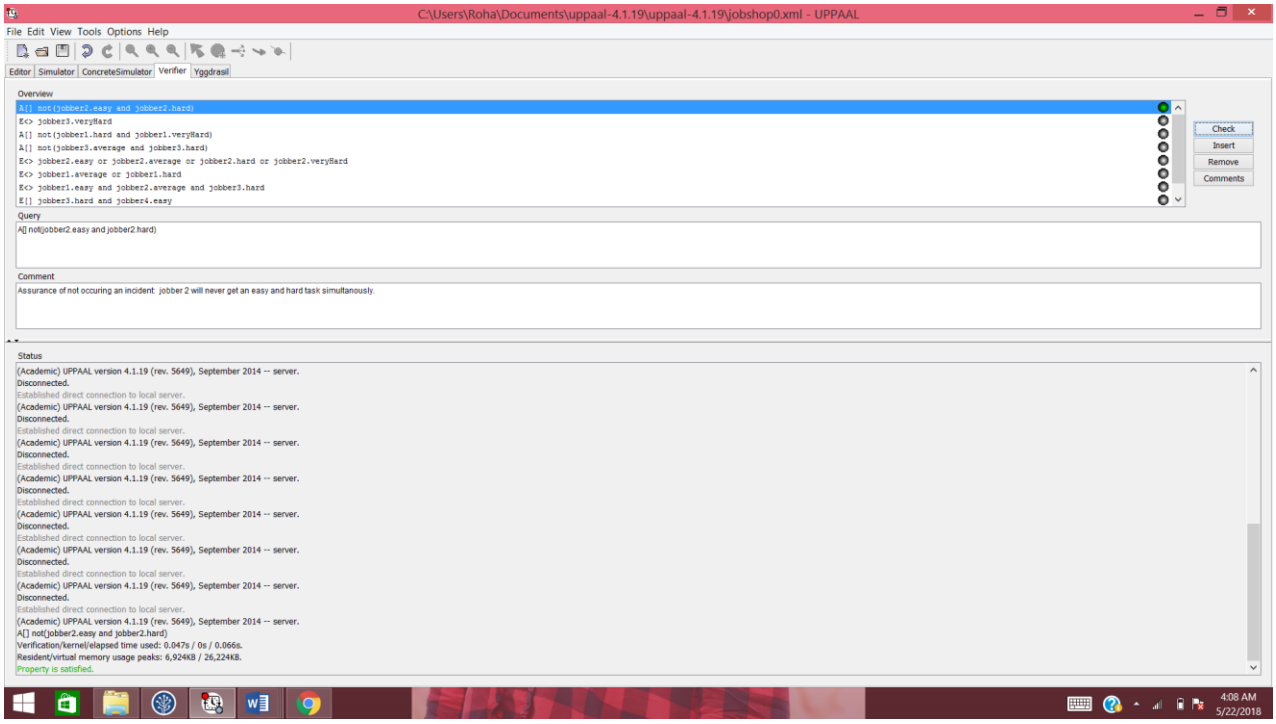

mallet
get_mallet?
free
taken
put_mallet?

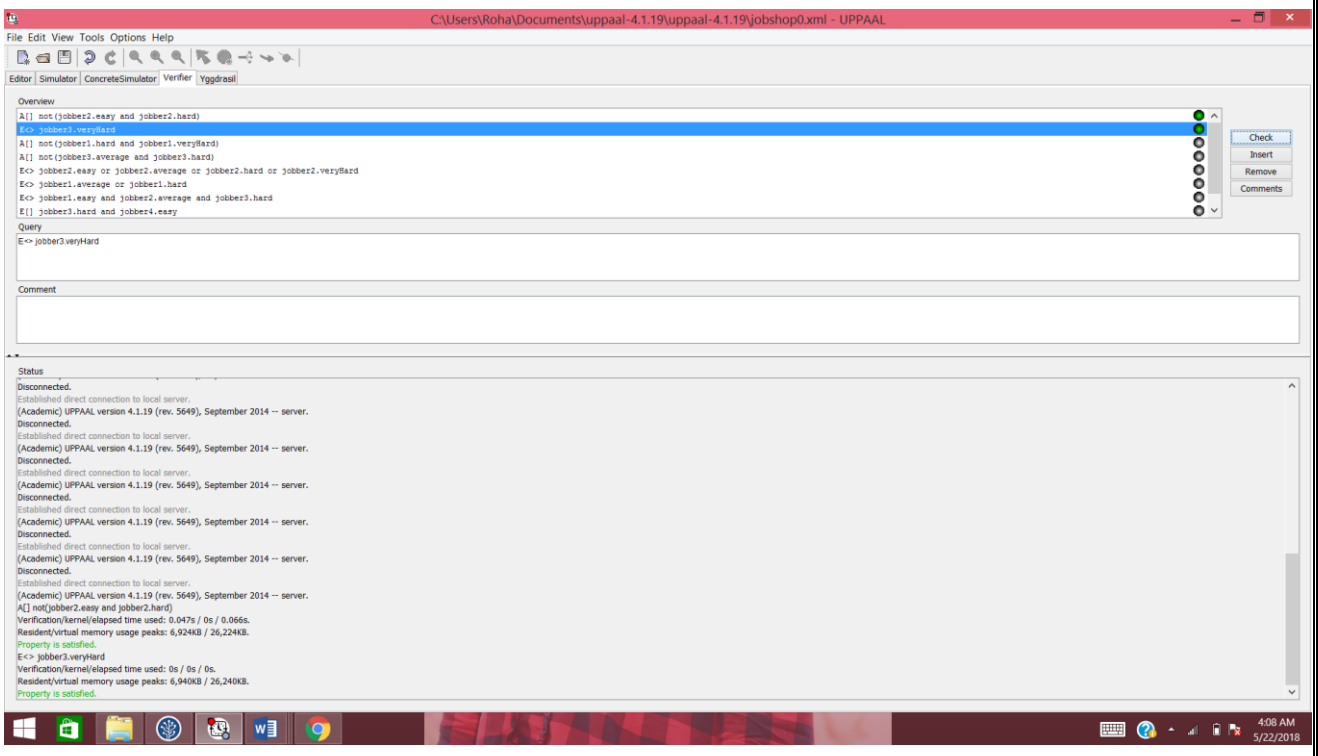

drill
get_drill?
free
taken
put_drill?

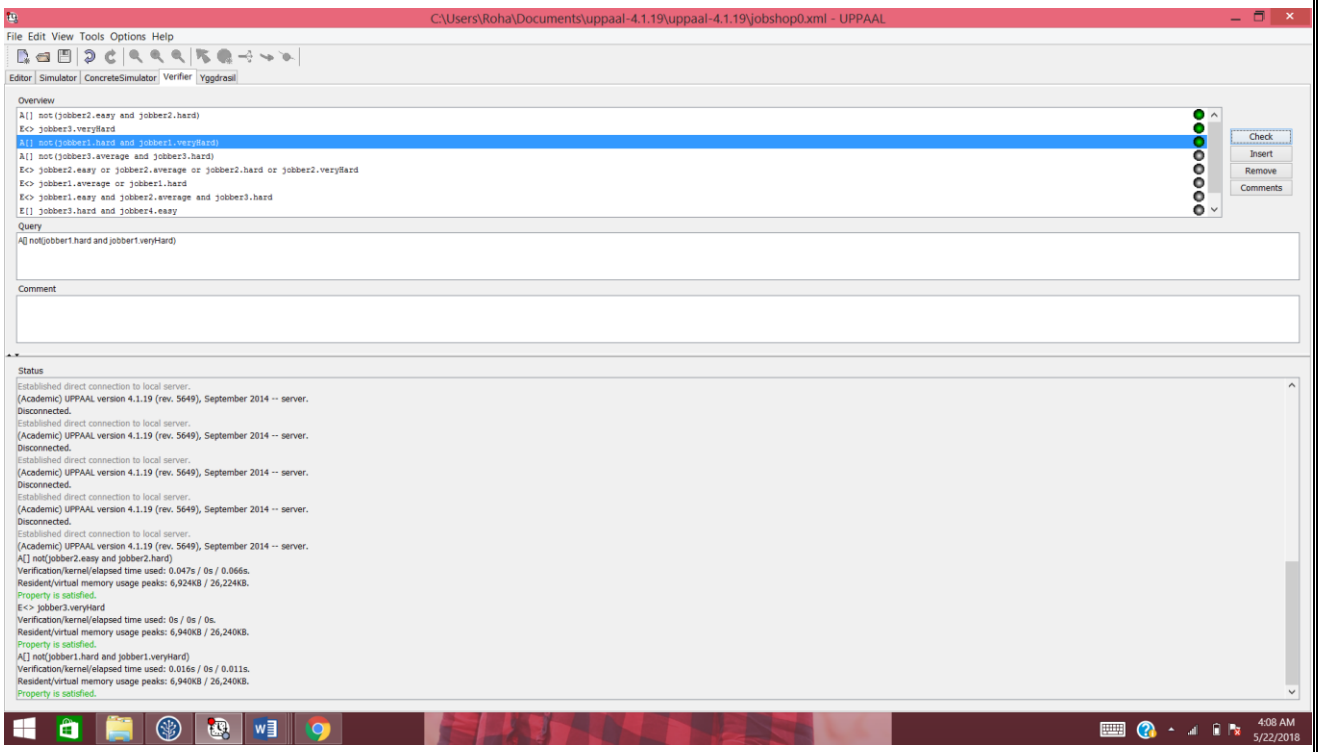

C:\Users\Roha\Documents\uppaal-4.1.19\up
File Edit View Tools Options Help
Editor
Simulator
ConcreteSimulator
Verifier
Yggdrasil
Project
Declarations
jobber
drill
hammer
mallet
System declarations
// Place template instantiations here.
jobber1 = jobber();
jobber2 = jobber();
jobber3 = jobber();
jobber4 = jobber();
// List one or more processes to be composed into a system.
system jobber1, jobber2, jobber3, hammer, mallet, drill;
//done by Roha Asad , BESE-6B

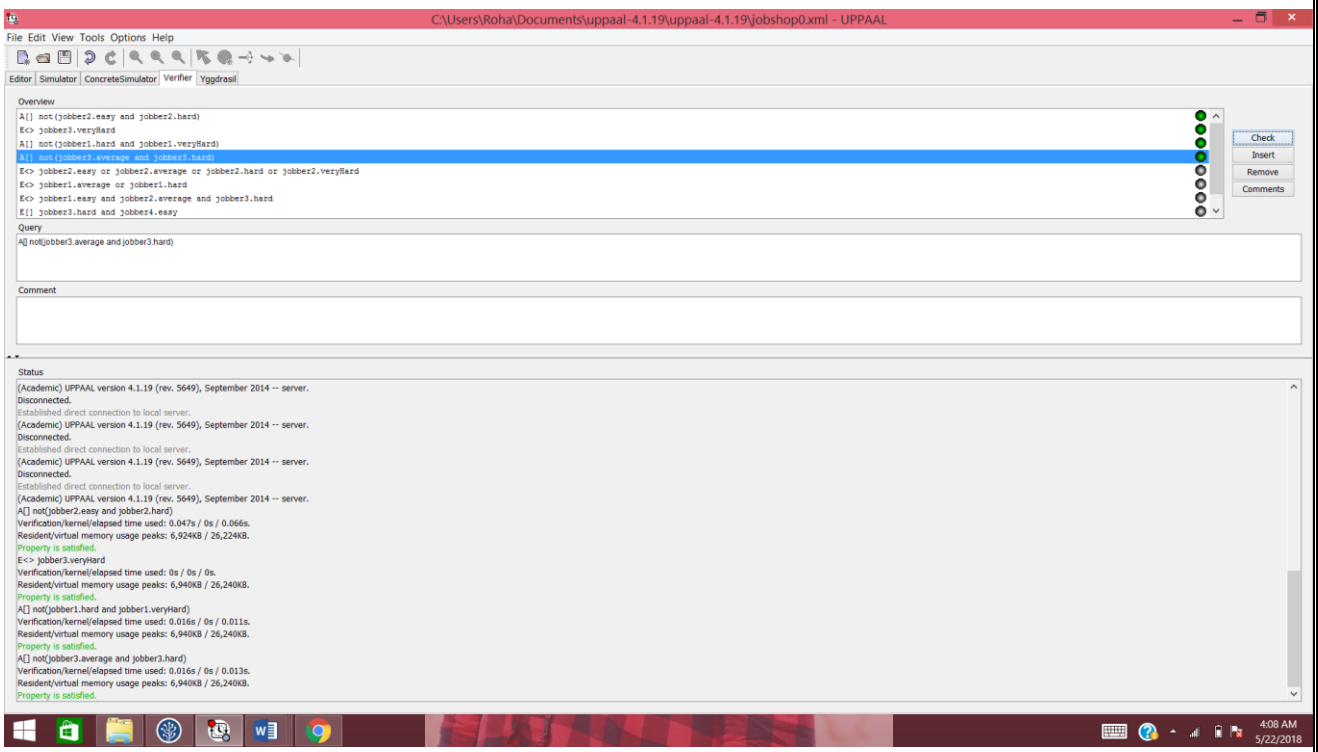
- Part 2:

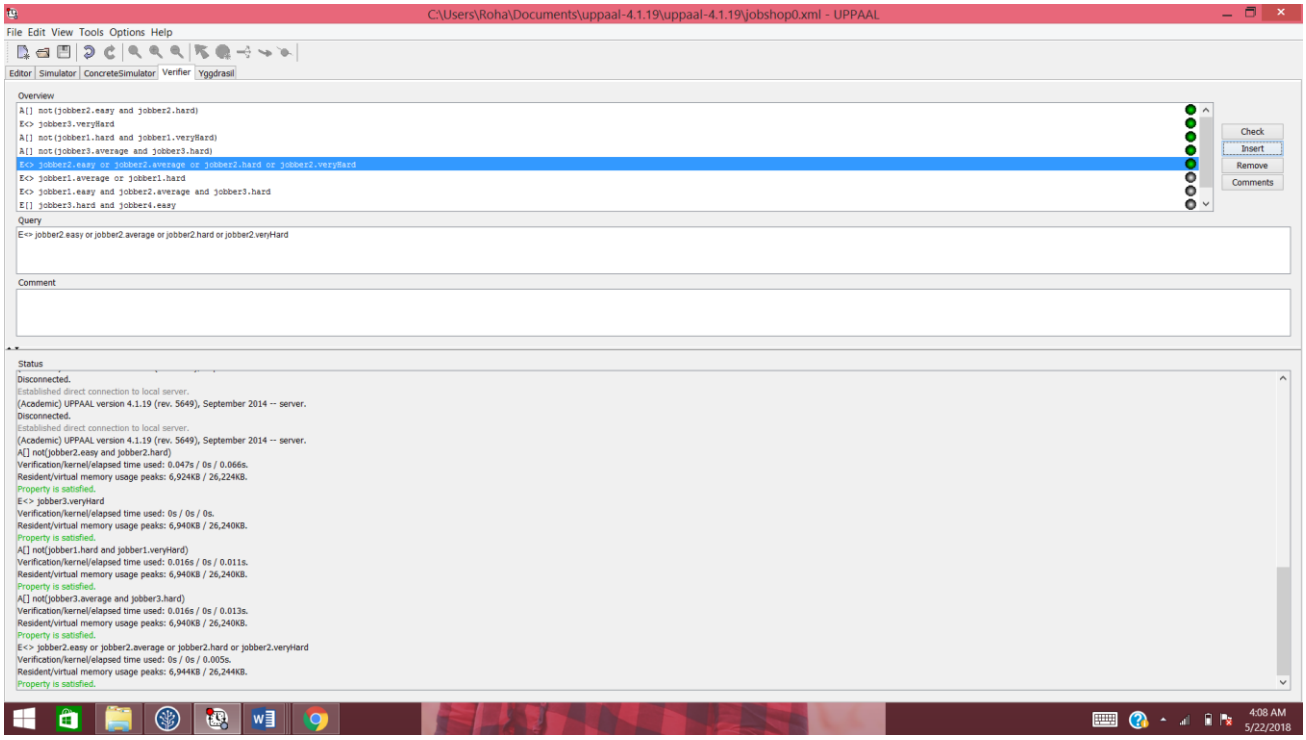
Following properties have been added and verified in UPPAAL.

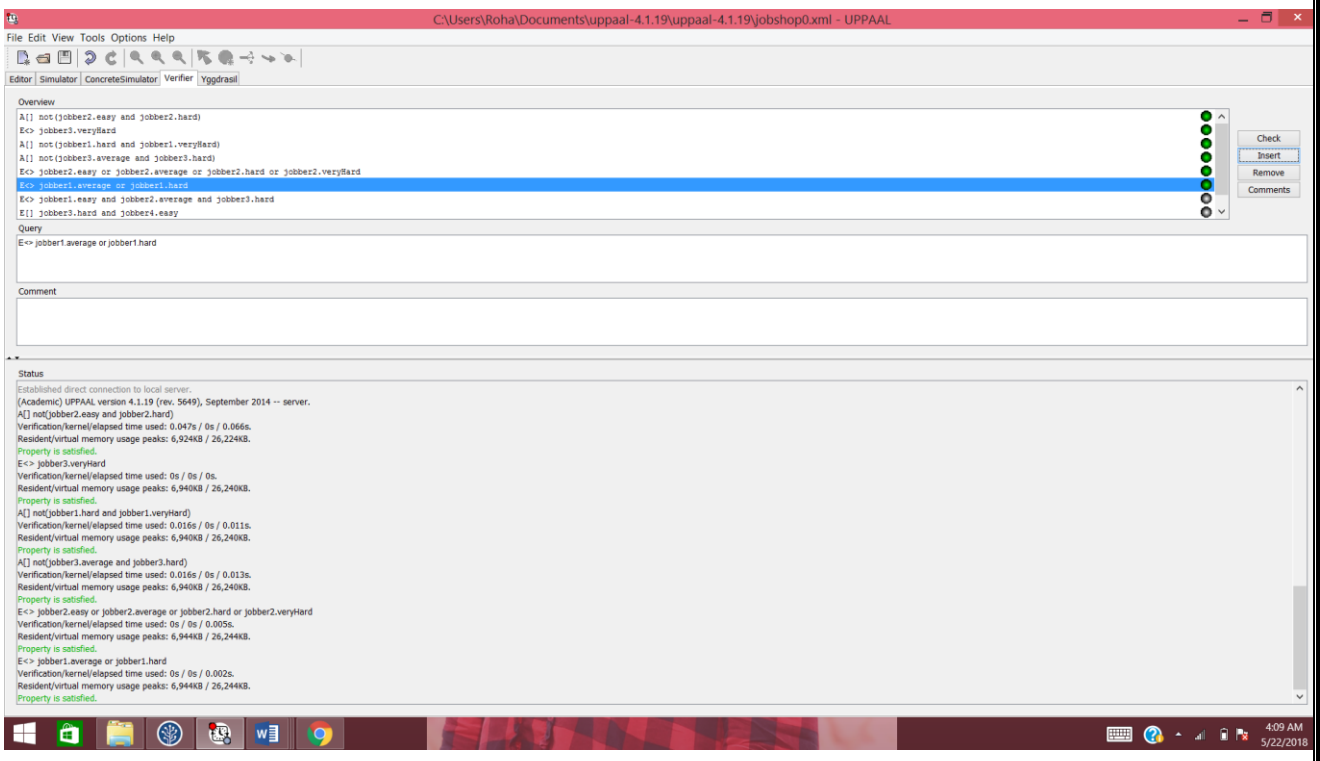





C:\Users\Roha\Documents\uppaal-4.1.19\uppaal-4.1.19\jobshop0.xml - UPPAAL
File Edit View Tools Options Help
Editor Simulator ConcreteSimulator Verifier Yggdrasil
Overview
A[] not (jobber2.easy and jobber2.hard)
E<> jobber3.veryHard
A[] not (jobber1.hard and jobber1.veryHard)
A[] not (jobber3.average and jobber3.hard)
E<> jobber2.easy or jobber2.average or jobber2.hard or jobber2.veryHard
E<> jobber1.average or jobber1.hard
E<> jobber1.easy and jobber2.average and jobber3.hard
E[] jobber3.hard and jobber4.easy
Check
Insert
Remove
Comments
Query
A[] not(jobber1.hard and jobber1.veryHard)
Comment
Status
Established direct connection to local server.
(Academic) UPPAAL version 4.1.19 (rev. 5649), September 2014 -- server.
Disconnected.
Established direct connection to local server.
(Academic) UPPAAL version 4.1.19 (rev. 5649), September 2014 -- server.
Disconnected.
Established direct connection to local server.
(Academic) UPPAAL version 4.1.19 (rev. 5649), September 2014 -- server.
Disconnected.
Established direct connection to local server.
(Academic) UPPAAL version 4.1.19 (rev. 5649), September 2014 -- server.
Disconnected.
Established direct connection to local server.
(Academic) UPPAAL version 4.1.19 (rev. 5649), September 2014 -- server.
A[] not(jobber2.easy and jobber2.hard)
Verification/kernel/elapsed time used: 0.047s / 0s / 0.066s.
Resident/virtual memory usage peaks: 6,924KB / 26,224KB.
Property is satisfied.
E<> jobber3.veryHard
Verification/kernel/elapsed time used: 0s / 0s / 0s.
Resident/virtual memory usage peaks: 6,940KB / 26,240KB.
Property is satisfied.
A[] not(jobber1.hard and jobber1.veryHard)
Verification/kernel/elapsed time used: 0.016s / 0s / 0.011s.
Resident/virtual memory usage peaks: 6,940KB / 26,240KB.
Property is satisfied.
4:08 AM
5/22/2018


C:\Users\Roha\Documents\uppaal-4.1.19\uppaal-4.1.19\jobshop0.xml - UPPAAL
File Edit View Tools Options Help
Editor Simulator ConcreteSimulator Verifier Yggdrasil
Overview
A[] not (jobber2.easy and jobber2.hard)
E<> jobber3.veryHard
A[] not (jobber1.hard and jobber1.veryHard)
A[] not (jobber3.average and jobber3.hard)
E<> jobber2.easy or jobber2.average or jobber2.hard or jobber2.veryHard
E<> jobber1.average or jobber1.hard
E<> jobber1.easy and jobber2.average and jobber3.hard
E[] jobber3.hard and jobber4.easy
Check
Insert
Remove
Comments
Query
A[] not(jobber3.average and jobber3.hard)
Comment
Status
(Academic) UPPAAL version 4.1.19 (rev. 5649), September 2014 -- server.
Disconnected.
Established direct connection to local server.
(Academic) UPPAAL version 4.1.19 (rev. 5649), September 2014 -- server.
Disconnected.
Established direct connection to local server.
(Academic) UPPAAL version 4.1.19 (rev. 5649), September 2014 -- server.
Disconnected.
Established direct connection to local server.
(Academic) UPPAAL version 4.1.19 (rev. 5649), September 2014 -- server.
A[] not(jobber2.easy and jobber2.hard)
Verification/kernel/elapsed time used: 0.047s / 0s / 0.066s.
Resident/virtual memory usage peaks: 6,924KB / 26,224KB.
Property is satisfied.
E<> jobber3.veryHard
Verification/kernel/elapsed time used: 0s / 0s / 0s.
Resident/virtual memory usage peaks: 6,940KB / 26,240KB.
Property is satisfied.
A[] not(jobber1.hard and jobber1.veryHard)
Verification/kernel/elapsed time used: 0.016s / 0s / 0.011s.
Resident/virtual memory usage peaks: 6,940KB / 26,240KB.
Property is satisfied.
A[] not(jobber3.average and jobber3.hard)
Verification/kernel/elapsed time used: 0.016s / 0s / 0.013s.
Resident/virtual memory usage peaks: 6,940KB / 26,240KB.
Property is satisfied.
4:08 AM
5/22/2018

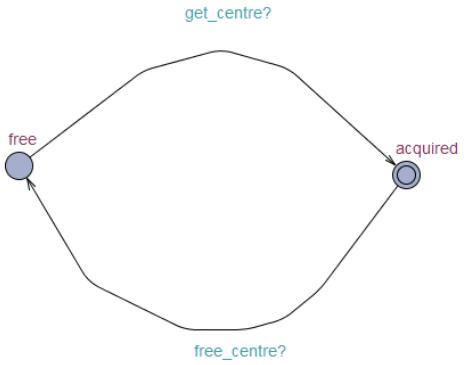


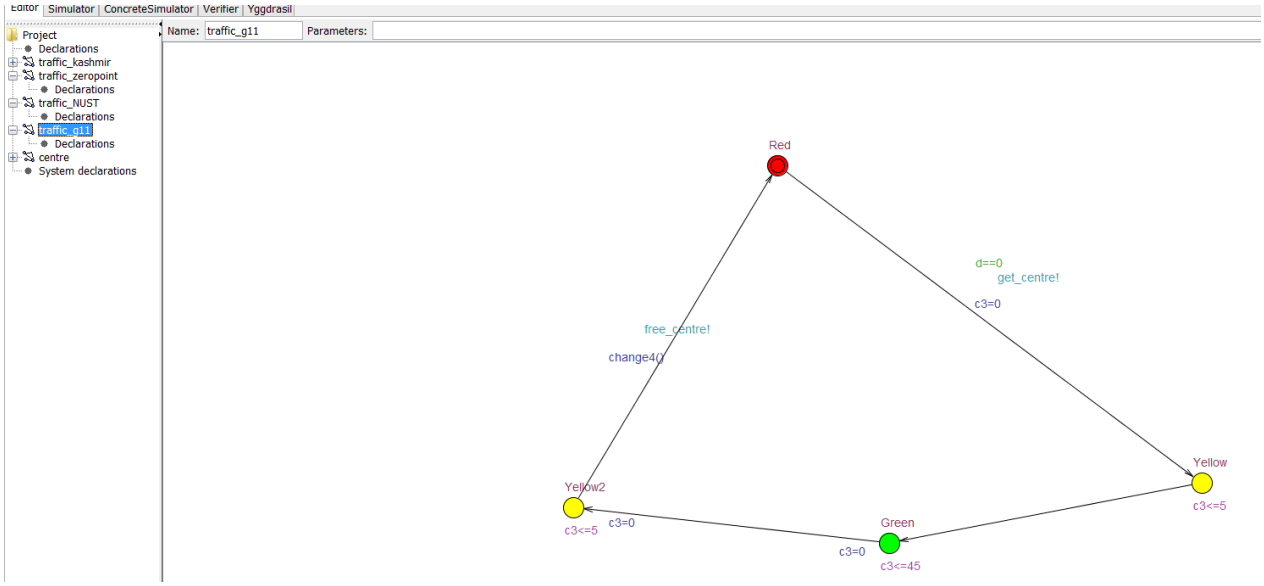


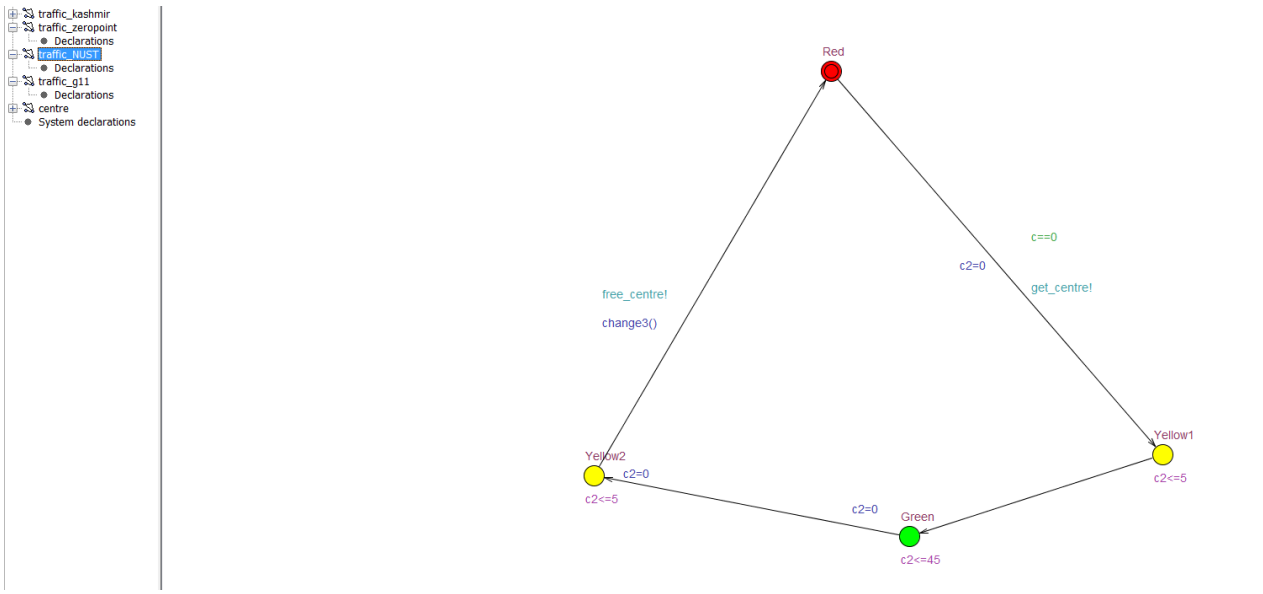
Qustion#2:

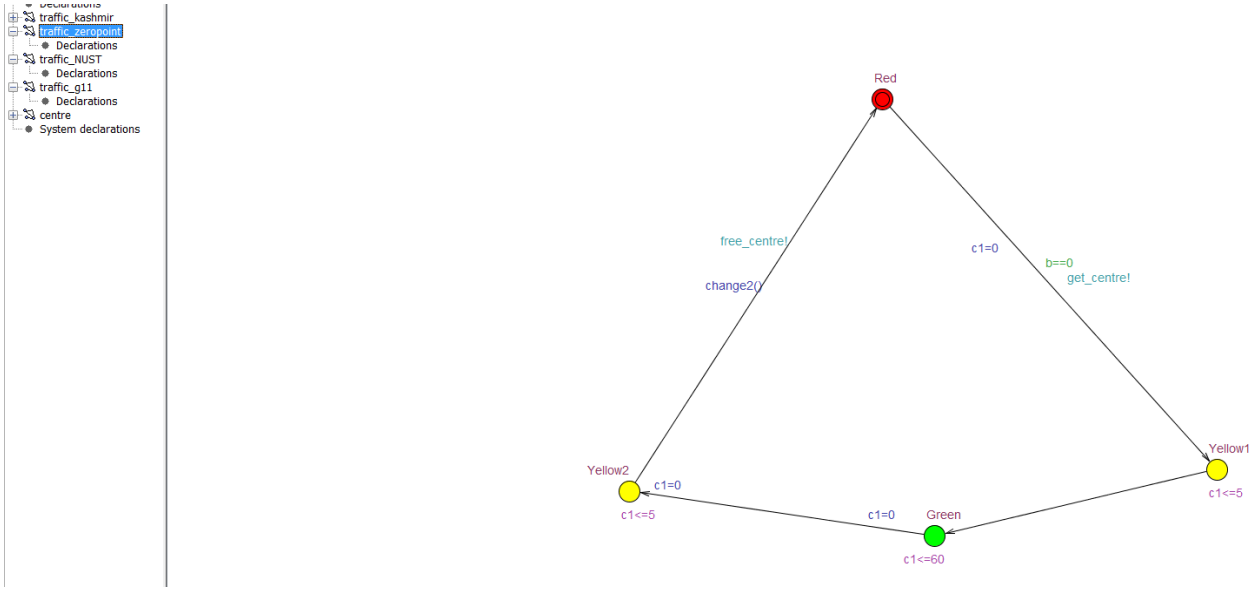
Traffic light system has been designed to manage traffic issues at NUST, Kashmir Highway, G11 signal and Zero-point. A timer has been set to maintain the current light at signal. A function has been created CHANGE() which will manage the change of control between traffic lights at each place. CENTRE has been created which has attributes to be released or acquired.

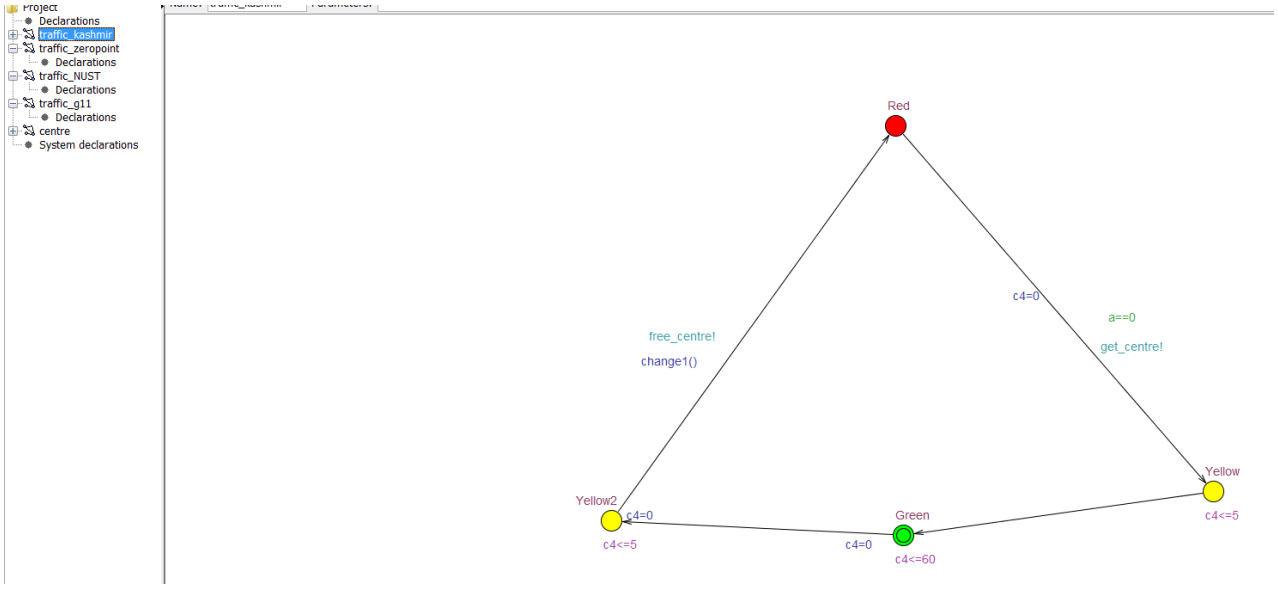
Following is the system:


get_centre?
free
acquired
free_centre?

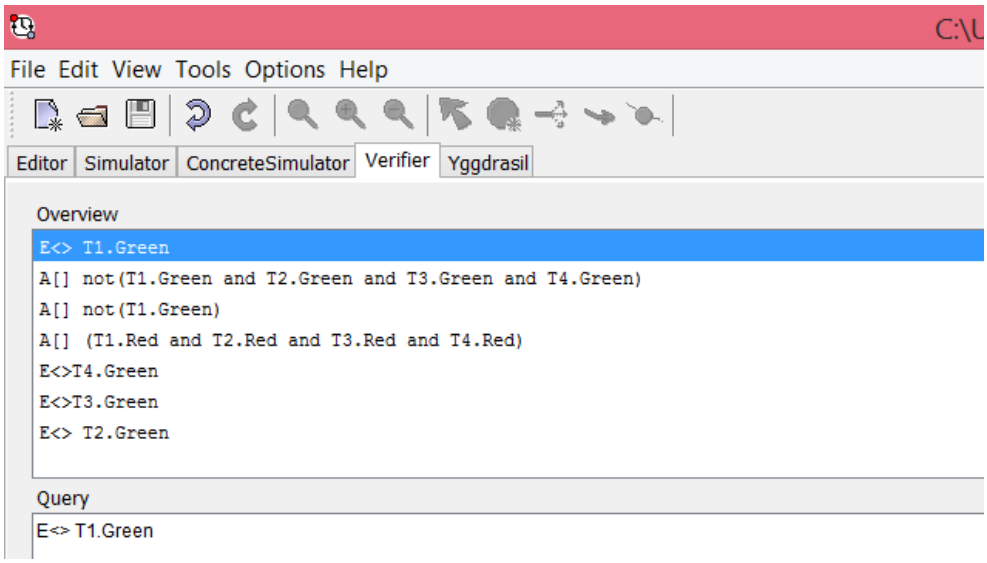

Editor | Simulator | ConcreteSimulator | Verifier | Yggdrasil
Project
Declarations
traffic_kashmir
traffic_zeropoint
Declarations
traffic_NUST
Declarations
traffic_g11
Declarations
centre
System declarations
Name: traffic_g11
Parameters:
Red
d==0
get_centre!
c3=0
free_centre!
change4()
Yellow
c3<=5
Yellow2
c3<=5
c3=0
Green
c3=0
c3<=45


traffic_kashmir
traffic_zeropoint
Declarations
traffic_NUST
Declarations
traffic_g11
Declarations
centre
System declarations
Red
c==0
c2=0
get_centre!
free_centre!
change3()
Yellow1
c2<=5
Yellow2
c2=0
c2<=5
c2=0
Green
c2<=45


traffic_kashmir
traffic_zeropoint
Declarations
traffic_NUST
Declarations
traffic_g11
Declarations
centre
System declarations
Red
free_centre!
change2()
c1=0
b==0
get_centre!
Yellow1
c1<=5
Yellow2
c1=0
c1<=5
c1=0
Green
c1<=60

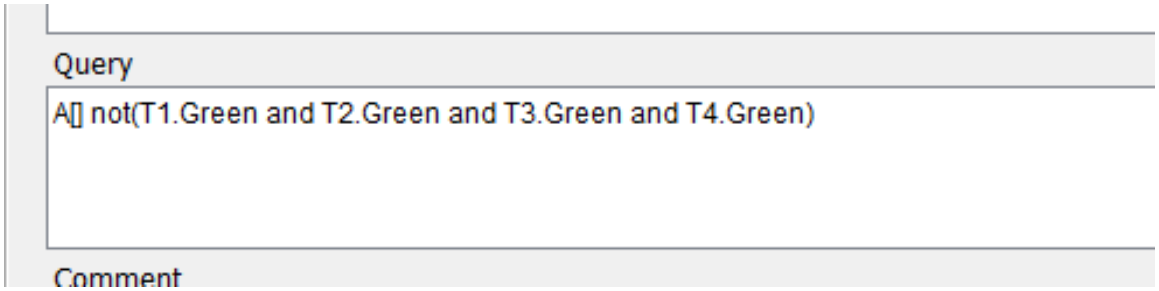

Project
Declarations
traffic_kashmir
traffic_zeropoint
Declarations
traffic_NUST
Declarations
traffic_g11
Declarations
centre
System declarations
Red
c4=0
a==0
get_centre!
free_centre!
change1()
Yellow
c4<=5
Yellow2
c4=0
c4<=5
Green
c4=0
c4<=60

Properties:


File Edit View Tools Options Help
Editor
Simulator
ConcreteSimulator
Verifier
Yggdrasil
Overview
E<> T1.Green
A[] not(T1.Green and T2.Green and T3.Green and T4.Green)
A[] not(T1.Green)
A[] (T1.Red and T2.Red and T3.Red and T4.Red)
E<>T4.Green
E<>T3.Green
E<> T2.Green
Query
E<> T1.Green

A. Mutex Property:

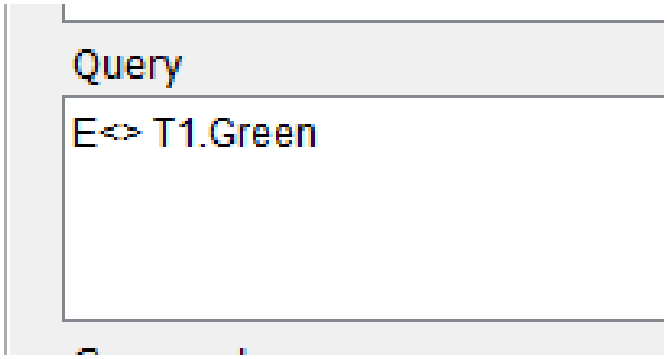
Mutex Property means all signals can't have same light e.g: GREEN at same time. So the system must satisfy this.




```
A[] not(T1.Green and T2.Green and T3.Green and T4.Green)
Verification/kernel/elapsed time used: 0.016s / 0s / 0.016s.
Resident/virtual memory usage peaks: 6,576KB / 25,400KB.
Property is satisfied.
```

B. Bounded Liveness:

This property means that there will exist a time in future when the following condition will be true. i.e.: T1 will be green or T2 will be green. It must be satisfied.




```
E<>T4.Green
E<>T3.Green
E<> T2.Green
```

```
E<> T1.Green
Verification/kernel/elapsed time used: 0s / 0s / 0s.
Resident/virtual memory usage peaks: 6,576KB / 25,400KB.
Property is satisfied.
E<> T2.Green
Verification/kernel/elapsed time used: 0s / 0s / 0s.
Resident/virtual memory usage peaks: 6,576KB / 25,400KB.
Property is satisfied.
E<>T3.Green
Verification/kernel/elapsed time used: 0s / 0s / 0s.
Resident/virtual memory usage peaks: 6,576KB / 25,400KB.
Property is satisfied.
E<>T4.Green
Verification/kernel/elapsed time used: 0s / 0s / 0s.
Resident/virtual memory usage peaks: 6,576KB / 25,400KB.
Property is satisfied.
```

C. Deadlock Avoidance:

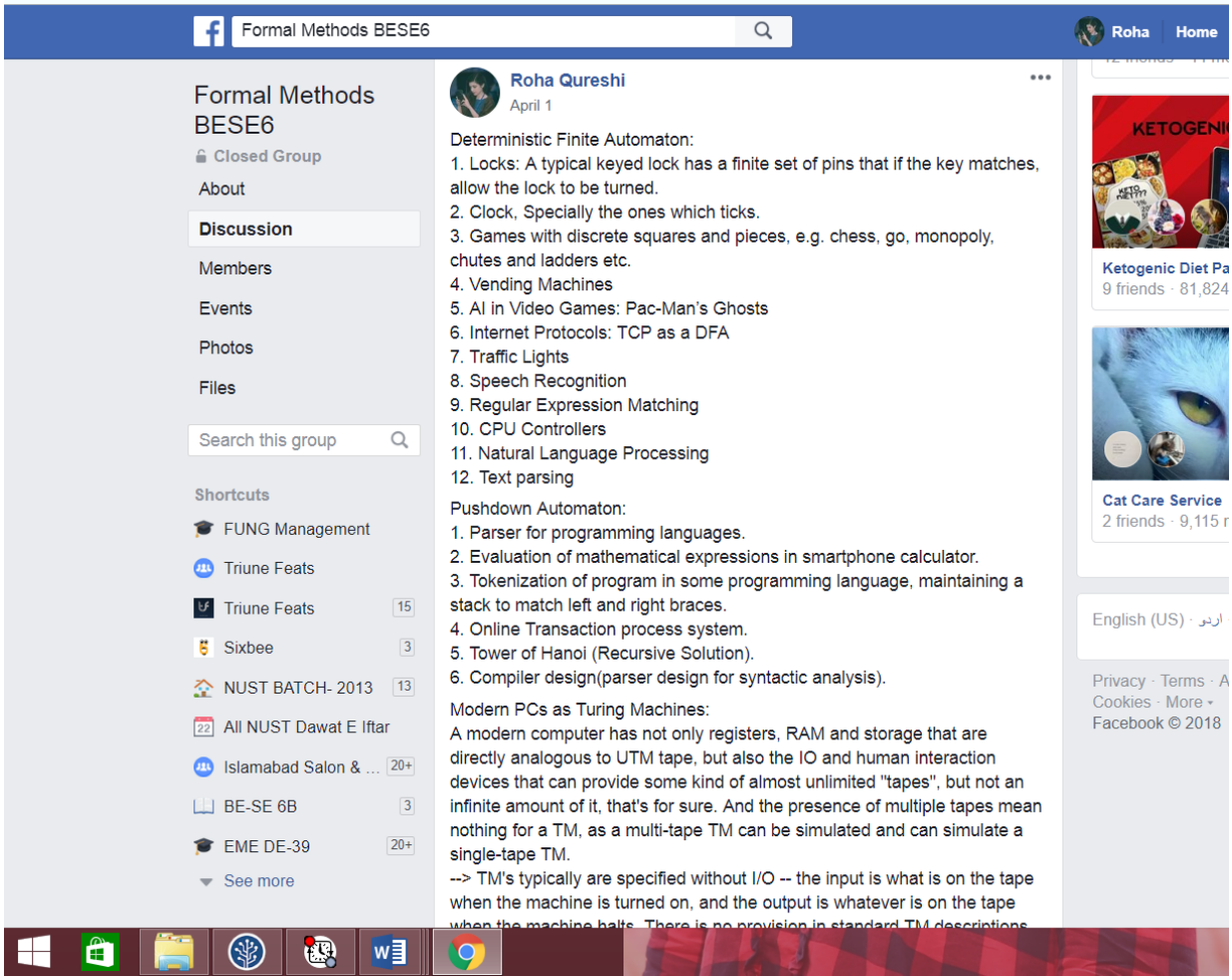
Deadlock must not happen which means all the traffic signal lights can't be RED at one time. One or more will be at YELLOW or GREEN as well. This property and condition must not satisfy.

```
A[] (T1.Green and T2.Green and T3.Green and T4.Green)
A[] (T1.Red and T2.Red and T3.Red and T4.Red)
```

```
A[] (T1.Red and T2.Red and T3.Red and T4.Red)
Verification/kernel/elapsed time used: 0s / 0s / 0s.
Resident/virtual memory usage peaks: 6,576KB / 25,400KB.
Property is not satisfied.
A[] (T1.Green and T2.Green and T3.Green and T4.Green)
Verification/kernel/elapsed time used: 0s / 0s / 0s.
Resident/virtual memory usage peaks: 6,576KB / 25,400KB.
Property is not satisfied.
```

Facebook Knowledge sharing:

- My information with comments:



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- Triune Feats 15
- Sixbee 3
- NUST BATCH- 2013 13
- All NUST Dawat E Iftar
- Islamabad Salon & ... 20+
- BE-SE 6B 3
- EME DE-39 20+
- See more

--> TM's typically are specified without I/O -- the input is what is on the tape when the machine is turned on, and the output is whatever is on the tape when the machine halts. There is no provision in standard TM descriptions to change the machine state externally, or read the machine state externally, while the machine is running. Modern day computers use I/O all the time.
--> Turing Machines have unbounded storage, modern day computers don't. So we can safely say that a modern computer is effectively an optimized, finite and usable real-world implementation of a Turing Machine.

What if we do not consider Turing Machine?
--> Modern day computers have all the inspiration of computation from Turing Machines. If we don't consider Turing Machines, then We'll not be having RANDOM ACCESS PHENOMENON in our devices rather sequential one. Moreover, We'll be in old-age technology then. Slow processing and computing will be done. Limited in fact very limited access.
All the modern-day algos used in computers are inspiration from Turing Machines.

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- Sixbee 3
- NUST BATCH- 2013 13
- All NUST Dawat E Iftar
- Islamabad Salon & ... 20+
- BE-SE 6B 3
- EME DE-39 20+
- See more

Roha Qureshi shared a link.
February 12

In May 2017, a large ransomware attack called WannaCry (also known as WannaCrypt0r and WCry) hit NHS England and various organisations in the UK and around the world.

The attack was due to vulnerabilities found in Microsoft operating systems installed in millions of computers around the world.

According to Microsoft, the Windows versions that were vulnerable to the attack were versions which were no longer supported by Microsoft such as Windows 8 and Windows XP, which the NHS trusts and affected companies seemed to be running.

Link:

WannaCry ransomware timeline: From the NSA to the NHS

What is WannaCry ransomware? We review its timeline.

COMPUTERWORLDUK.COM

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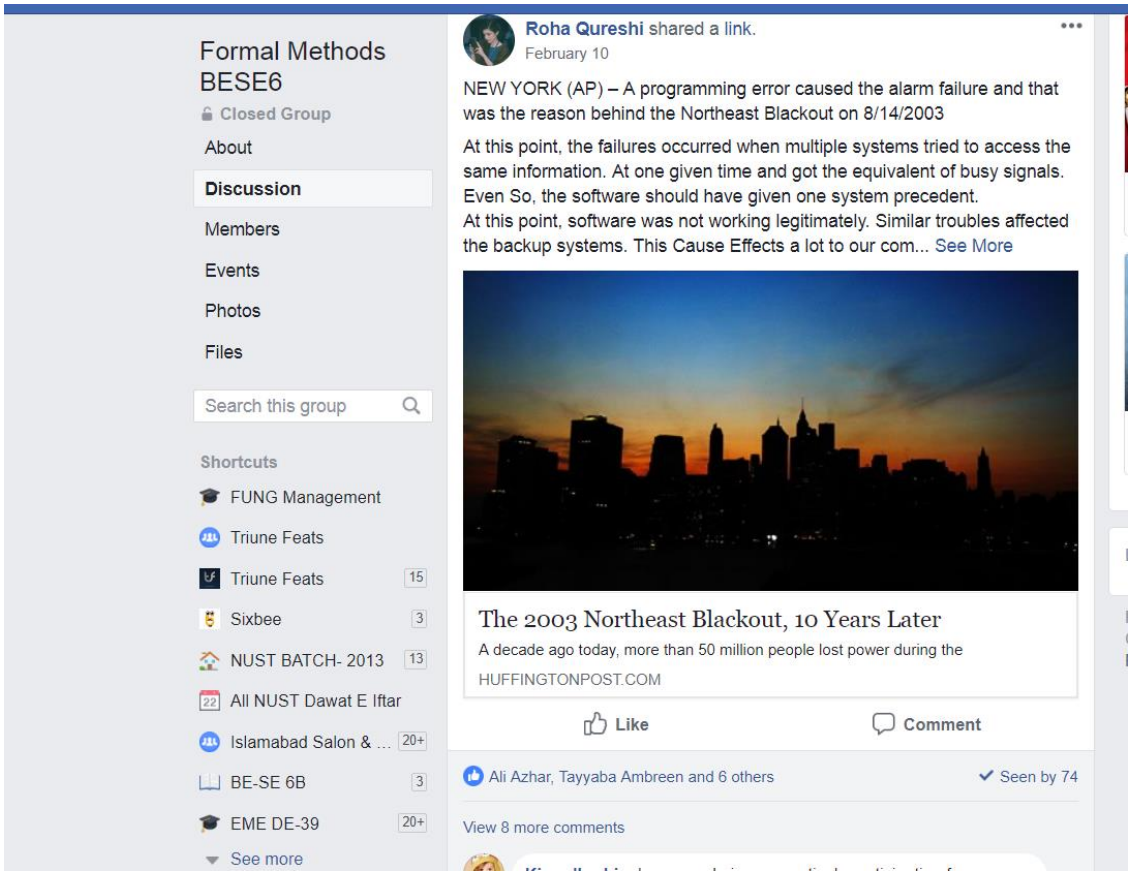
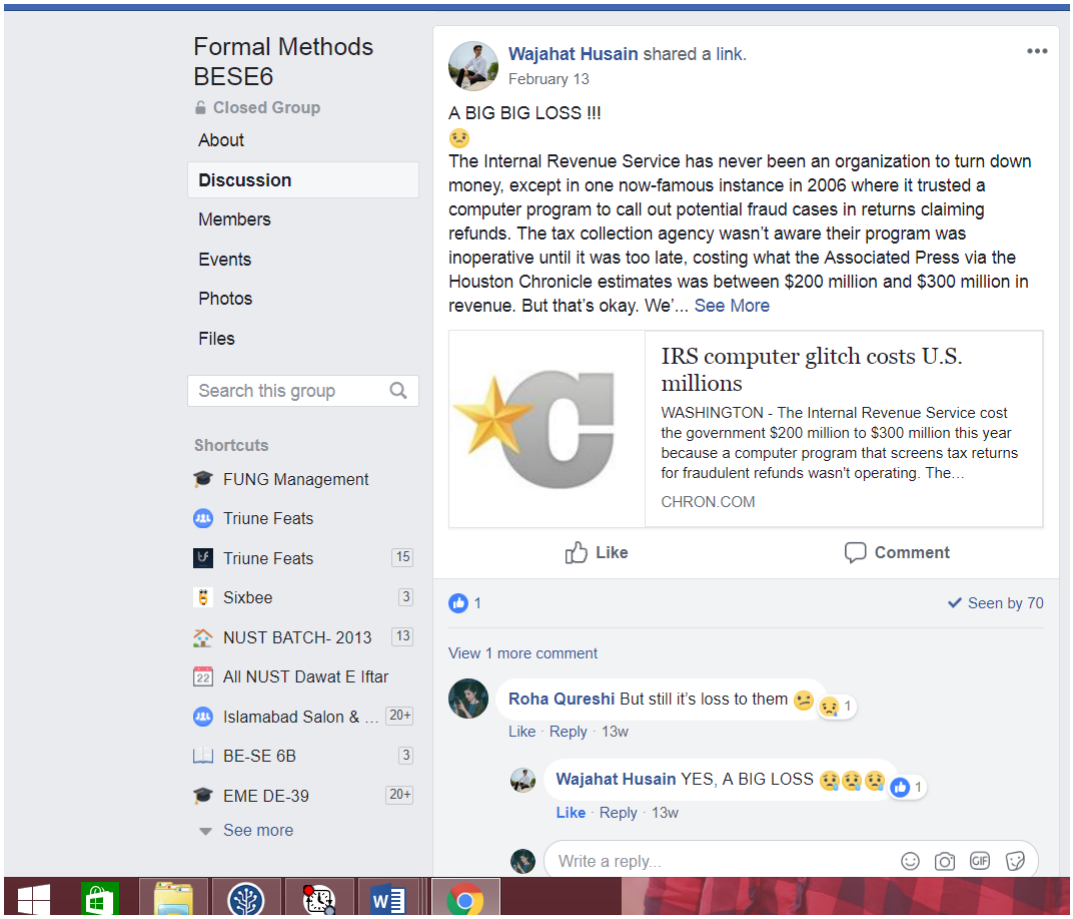
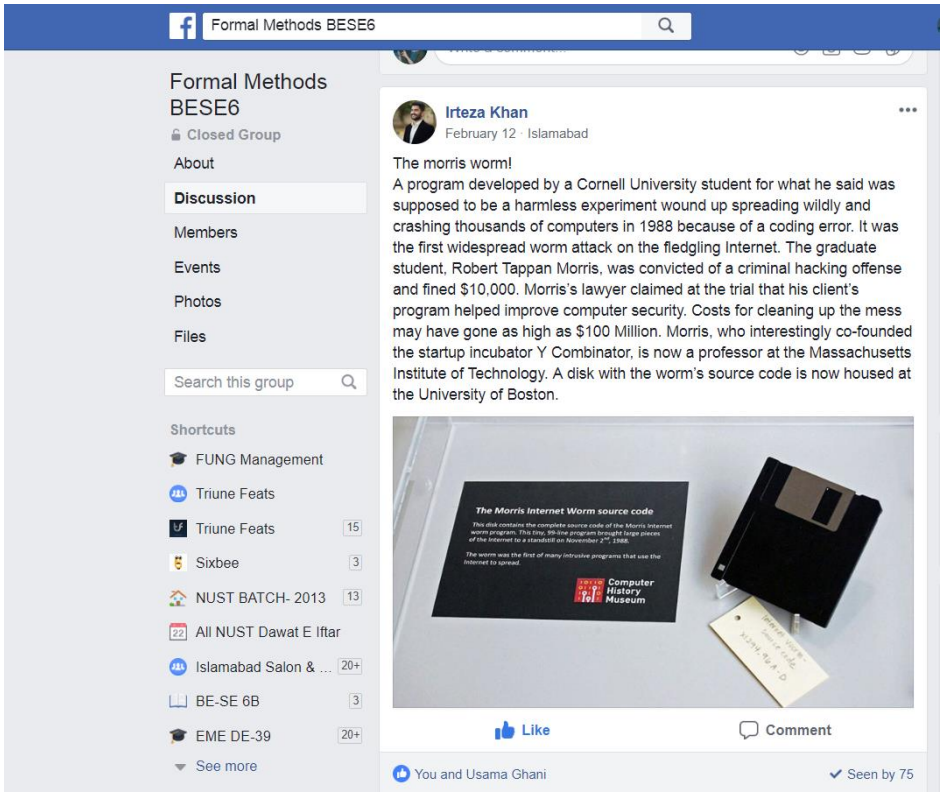
Uneeza Fareed, Asad Nawaz and 6 others Seen by 68



- My comments on others' posts:

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Irteza Khan
February 12 · Islamabad
The morris worm!
A program developed by a Cornell University student for what he said was supposed to be a harmless experiment wound up spreading wildly and crashing thousands of computers in 1988 because of a coding error. It was the first widespread worm attack on the fledgling Internet. The graduate student, Robert Tappan Morris, was convicted of a criminal hacking offense and fined $10,000. Morris's lawyer claimed at the trial that his client's program helped improve computer security. Costs for cleaning up the mess may have gone as high as $100 Million. Morris, who interestingly co-founded the startup incubator Y Combinator, is now a professor at the Massachusetts Institute of Technology. A disk with the worm's source code is now housed at the University of Boston.
The Morris Internet Worm source code
Computer History Museum
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You and Usama Ghani
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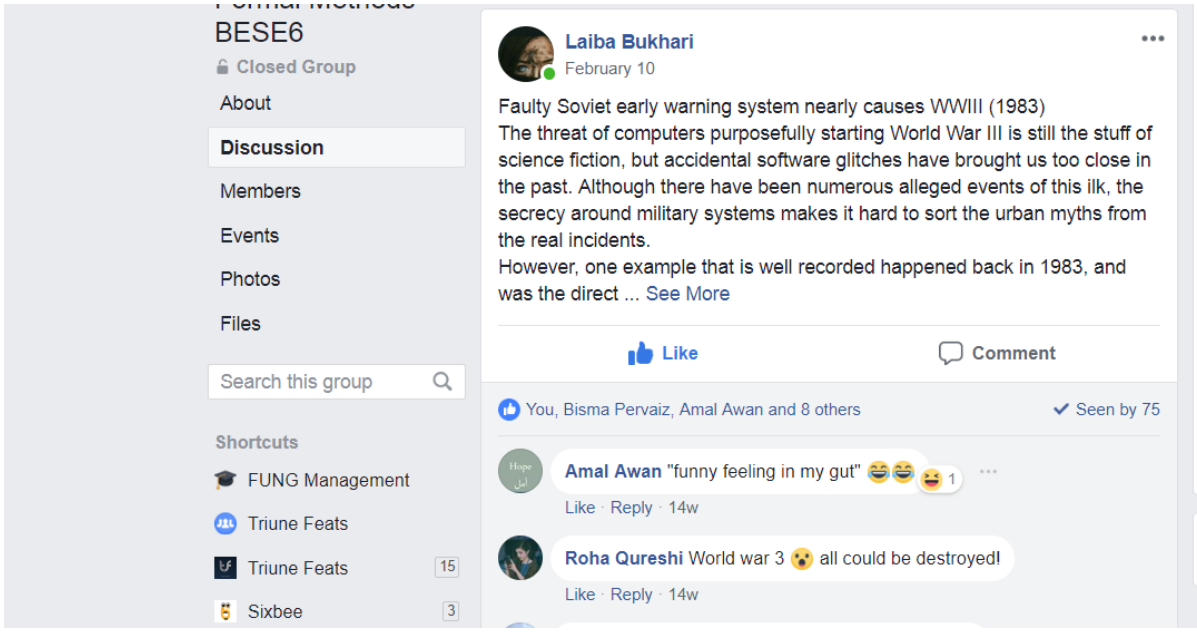
Kiran Ibrahim the lawyer was right....before blaming the hackers...the it teams should make the software secure enough to be hacked
Like · Reply · 13w
Roha Qureshi Such a strong source code
Like · Reply · 13w
Usama Ghani Source cod
Like · Reply · 13w
Ahmed Bajwa Ohhh Myyyy Godddd Noooooo
Shhiiiiitttttttt....
Like · Reply · See Translation · 13w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Laiba Bukhari
February 10
Faulty Soviet early warning system nearly causes WWIII (1983)
The threat of computers purposefully starting World War III is still the stuff of science fiction, but accidental software glitches have brought us too close in the past. Although there have been numerous alleged events of this ilk, the secrecy around military systems makes it hard to sort the urban myths from the real incidents.
However, one example that is well recorded happened back in 1983, and was the direct ... See More
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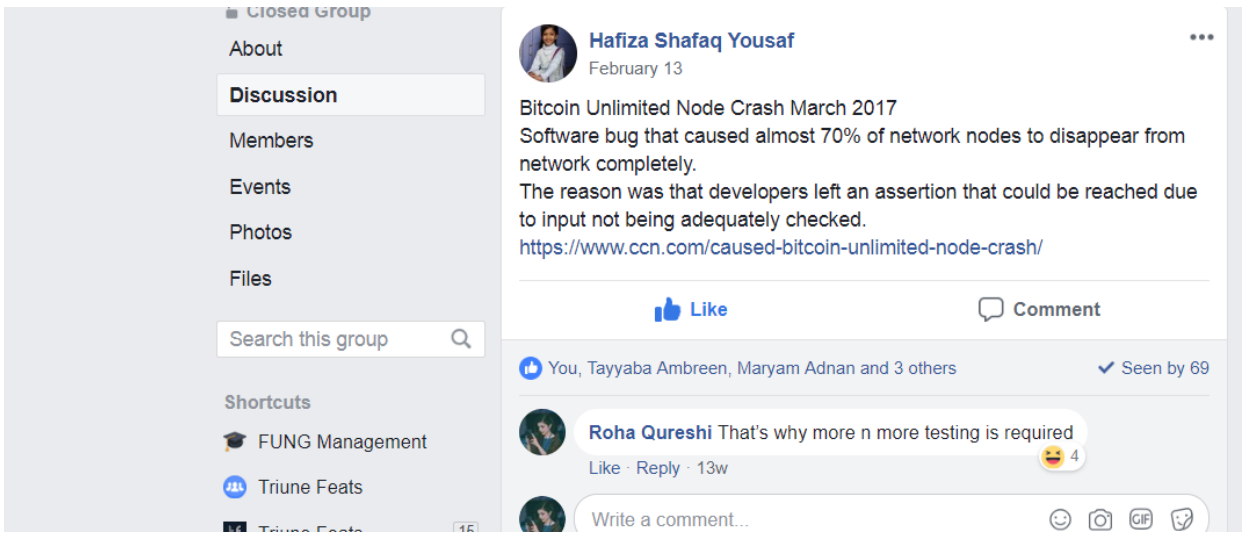
You, Bisma Pervaiz, Amal Awan and 8 others
Seen by 75
Amal Awan "funny feeling in my gut"
Like · Reply · 14w
Roha Qureshi World war 3 all could be destroyed!
Like · Reply · 14w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Hafiza Shafaq Yousaf
February 13
Bitcoin Unlimited Node Crash March 2017
Software bug that caused almost 70% of network nodes to disappear from network completely.
The reason was that developers left an assertion that could be reached due to input not being adequately checked.
https://www.ccn.com/caused-bitcoin-unlimited-node-crash/
Like
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You, Tayyaba Ambreen, Maryam Adnan and 3 others
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Roha Qureshi That's why more n more testing is required
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Sohaib Zahid
February 12 · Islamabad

"The most expensive hyphen in history"

In 1962 the Mariner 1 rocket with a space probe was designed for a planetary flyby of Venus at a cost of $18.5 million. Shortly after takeoff the rocket responded improperly to commands from the guidance systems on the ground & diverted from its intended flight path. With the craft effectively uncontrolled, a range safety officer ordered its destructive abort 294.5 seconds after launch

The launch was aborted due to a combination of two failures.
First, the guidance antenna on the Mariner performed poorly & below specifications. This caused a loss of contact with the ground guidance system.
The rocket's guidance system had an on-board program that could be activated in the event that the ground signal was lost, but it contained a faulty equation. A programmer incorrectly transcribed a handwritten formula into computer code, missing a single superscript bar. Without the smoothing function indicated by the bar, the software treated normal variations of velocity as if they were serious, causing exaggerated corrections that sent the rocket off course

Source: https://en.wikipedia.org/wiki/Mariner_1

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You, Asad Nawaz, Bisma Pervaiz and 6 others Seen by 67

Roha Qureshi Such tragedy

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Uneeza Fareed shared a link.
February 11

A software bug that caused Nest's smart thermostat to stop working left many users both cold and angry.

Nest thermostat bug leaves users cold
A software problem with smart thermostat Nest has angered users and left them with cold houses.
BBC.COM

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Faseih Saad, Syeda Urooj Fatima and 1 other Seen by 64

Muneeba Fatima Warraich Hahah, you should be glad this didn't happen to you in Minnesota
Like · Reply · 14w 2

Uneeza Fareed replied · 1 Reply

Roha Qureshi Ohhh! It could have made users SNOWPEOPLE
Like · Reply · 13w 2

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Syeda Urooj Fatima shared a link.
February 11

NHS Software Glitch:

In 2016, NHS, England's national healthcare system admitted to mis-prescribing medication to over 300,000 heart patients due to a software glitch. The software "SystmOne", that was used to calculate the risk of a heart attack, had been reported to produce inconsistent results since 2009, summing up to a period of approximately 8 years of incorrect prescription to heart patients. Owing to this, patients with little risk of heart disease may had been needle... See More

UP to 300,000 heart patients may have been given the wrong drugs

The long-running error – uncovered by Pulse magazine - may have led to some patients being wrongly advised they did not need statins – and later suffering heart...

DAILYMAIL.CO.UK

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UP to 300,000 heart patients may have been given the wrong drugs

The long-running error – uncovered by Pulse magazine - may have led to some patients being wrongly advised they did not need statins – and later suffering heart...

DAILYMAIL.CO.UK

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Tayyaba Ambreen It could have lead to huge loss of lives..
Like · Reply · 14w 1

Roha Qureshi Oh My! It could have killed so many people
health related systems need more care.
Like · Reply · 14w 1

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Tayyaba Ambreen shared a link.
February 10

FLIGHT CRASHES:

In 1994 in Scotland, a Chinook helicopter crashed and killed all 29 passengers. While initially the pilot was blamed for the crash, that decision was later overturned since there was evidence that a systems error had been the actual cause.

Another example of a software-induced flight crash happened in 1993, when an error in the flight-control software for the Swedish JAS 39 Gripen fighter aircraft was behind a widely publicized crash in Sweden.... See More

10 historical software bugs with extreme consequences - Pingdom Royal

One of the latest software errors that had widely noticed consequences was Google's Gmail outage in February. The problem in that case was, according to...

ROYAL.PINGDOM.COM

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Amal Awan Poor souls murdered by a programmer 😭😭 1

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Maryam Hasnain The consequences are devastating 1

Like · Reply · 14w

Roha Qureshi Bad Programmer :@ 1

Like · Reply · 14w