Selecting the best configuration for a Hospital Emergency Center - Solution

a. The first step it to determine the number of tokens for each scenario. This can be done with simple arithmetic, as represented in next pages.

Scenarios

Highlight in diagram

Name	Percent	Cases
OWN & NORED & REL	77%	77
OWN & RED & REL	8%	8
OWN & NORED & ADM	8%	8
OWN & RED & ADM	1%	1
AMB & RED & ADM	1%	1
AMB & RED & REL	5%	5

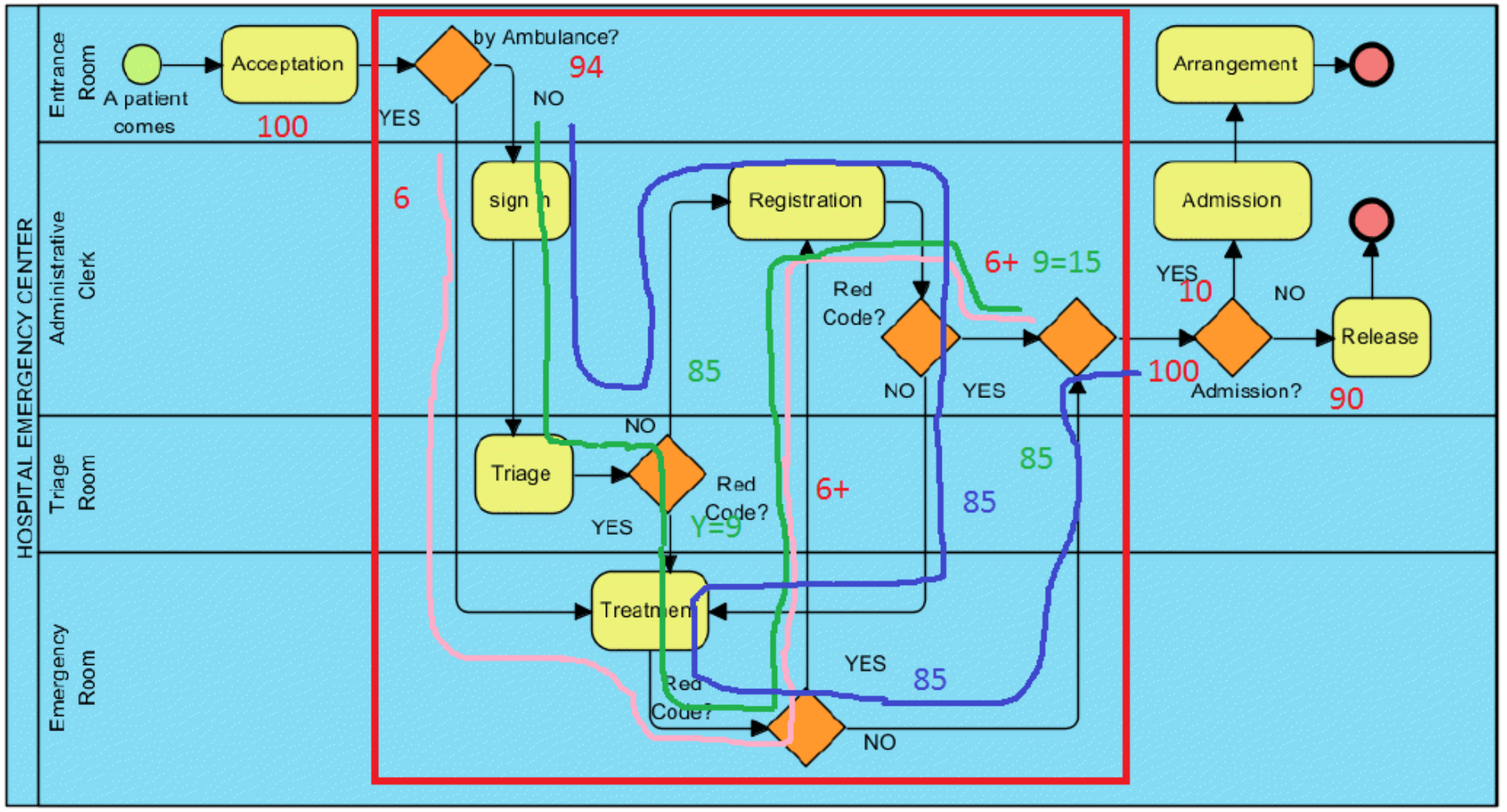
Total: 100

Available resources

Name	Type	Amount
Nurse	Staff	7
Physician	Staff	3
Technician	Staff	4
Administrative Clerk	Staff	4
Medical Room	Room	7
Administrative Room	Room	13

b. The following resources have been assigned to the HEC:

N. of Lanes	**Related Activities and required resources**
1 Entrance	Acceptation, Arrangement: 1 Admin Clerk + 1 Admin Room
3 Administrative Service	Sign in, Registration, Admission, Release: 1 Adm Clerk + 1 Adm Room
1 Triage	Triage: 1 Nurse + 1 Physician + 1 Medical Room
2 Emergency	Treatment: 2 Nurses + 1 Physician + 1 Techn + 1 Med Room



AMB -> RED CODE

TOT RED: 6 + Y = 15 -> y =9

94 85 85*0.9=77

1) OWN & NORED & REL = 77
2) OWN & RED & REL = 9 * 0.9=8
3) OWN & NORED & ADM =85 * 0.1 =8
4) OWN & RED & ADM = 9 * 0.1 = 1
5) AMB & RED & ADM = 6 * 0.1 = 1
6) AMB & RED & REL = 6 * 0.9 = 5

90

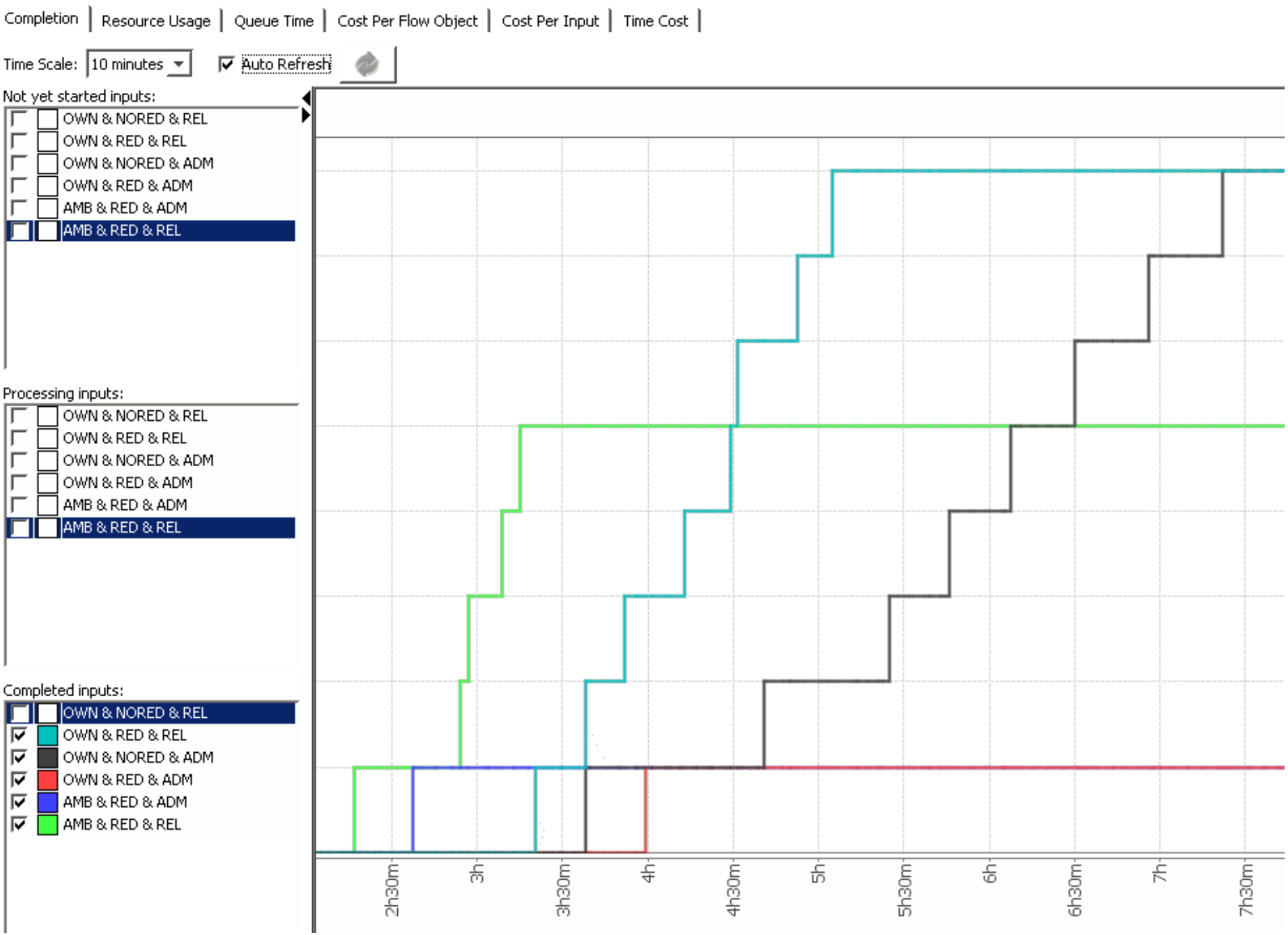
10

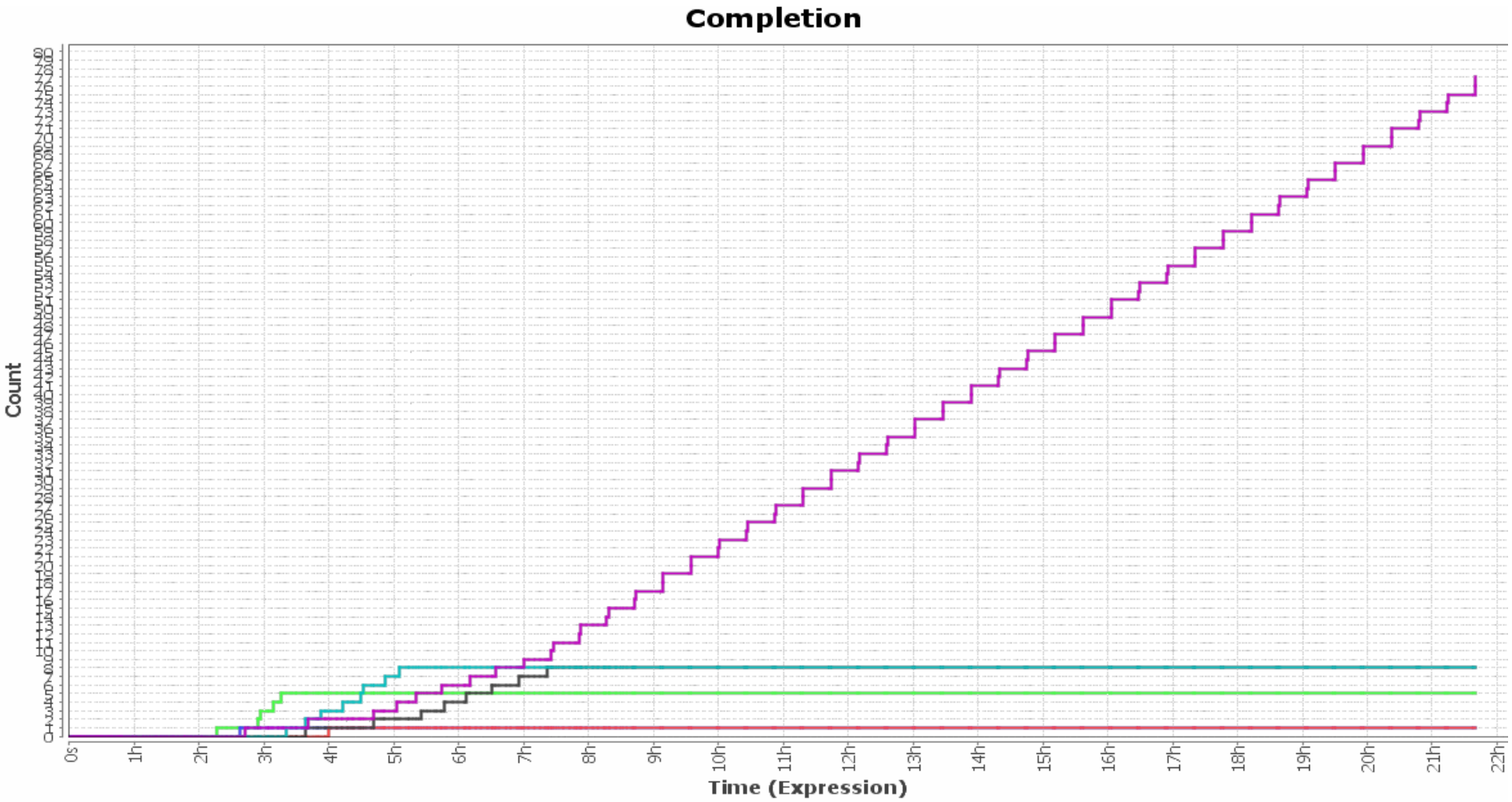
- **Total Duration and Total Variable Cost: 21h 40m 12s 10037$**
- Looking at the Completion chart, it can be assumed that the completion time for each scenario is linearly increasing. Thus, the following completion data can be derived:

Scenario	**First Token exits at**	**Last Token exits at**	**N. of Tokens**	**Average Completion time**
OWN & NORED & REL	2h 40m	21h 40m	77	12h 10m
OWN & RED & REL	3h 25m	5h 5m	8	4h 15m
OWN & NORED & ADM	3h 35m	7h 25m	8	5h 30m
OWN & RED & ADM	4h	4h	1	4h
AMB & RED & ADM	2h 35m	2h 35m	1	2h 35m
AMB & RED & REL	2h 20m	3h 15m	5	2h 47m
AVERAGE TIME				

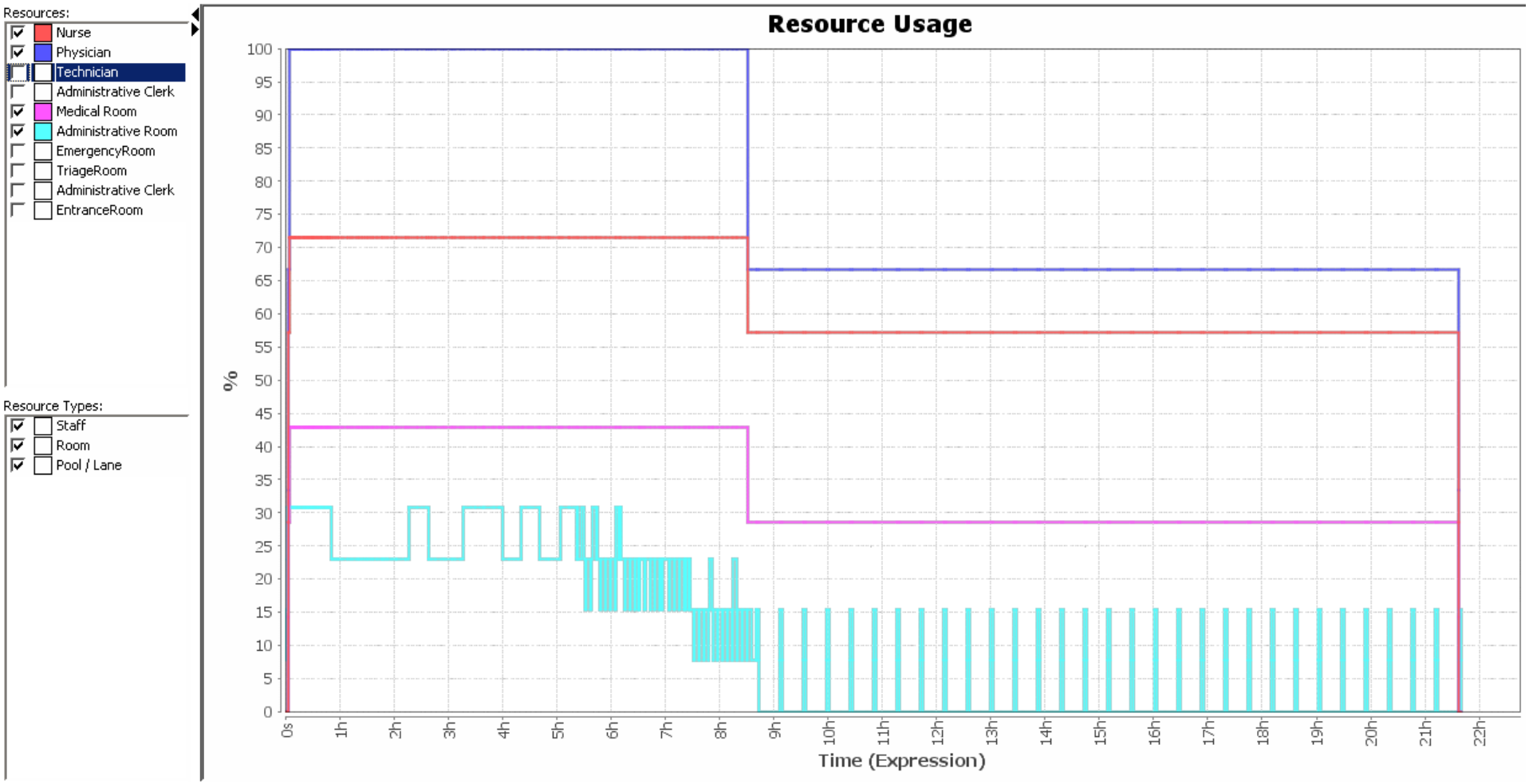
- Using Microsoft Excel, the total average time is **10.35 hours**, **very higher than 2.4!**

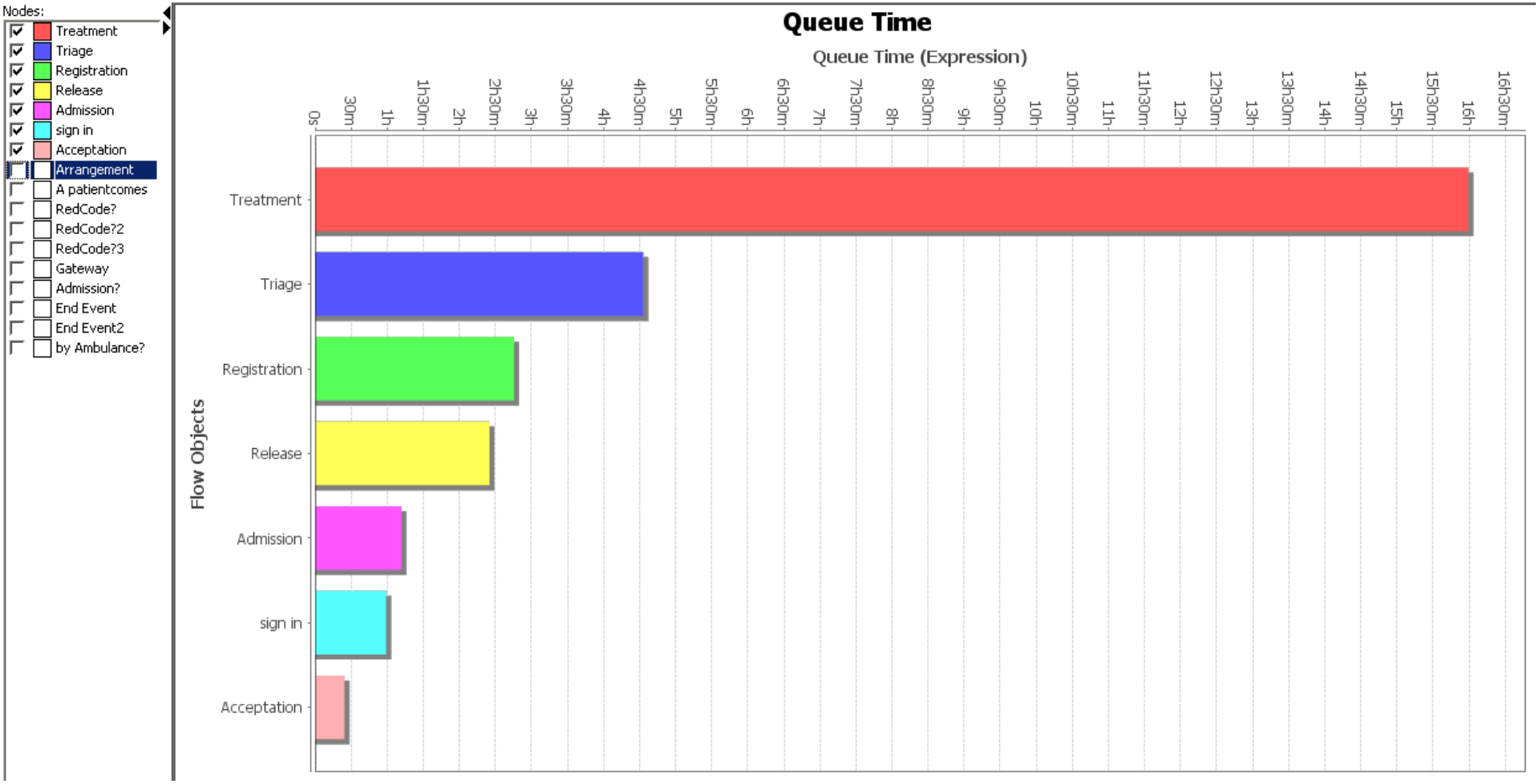
	A	B	C	D	E	F	G
1	START	END	END-START	NUM	(START+END)/2	mm	NUM*mm
2	02:40	21:40	19:00	77	12:10	730	56210
3	03:25	05:05	01:40	8	04:15	255	2040
4	03:35	07:25	03:50	8	05:30	330	2640
5	04:00	04:00	00:00	1	04:00	240	240
6	02:35	02:35	00:00	1	02:35	155	155
7	02:20	03:15	00:55	5	02:47	167	837
8					AVG (mm)	**621**	
9					AVG (hh)	**10,35**	


Completion
Resource Usage
Queue Time
Cost Per Flow Object
Cost Per Input
Time Cost
Time Scale:
10 minutes
Auto Refresh
Not yet started inputs:
OWN & NORED & REL
OWN & RED & REL
OWN & NORED & ADM
OWN & RED & ADM
AMB & RED & ADM
AMB & RED & REL
Processing inputs:
OWN & NORED & REL
OWN & RED & REL
OWN & NORED & ADM
OWN & RED & ADM
AMB & RED & ADM
AMB & RED & REL
Completed inputs:
OWN & NORED & REL
OWN & RED & REL
OWN & NORED & ADM
OWN & RED & ADM
AMB & RED & ADM
AMB & RED & REL
2h30m
3h
3h30m
4h
4h30m
5h
5h30m
6h
6h30m
7h
7h30m



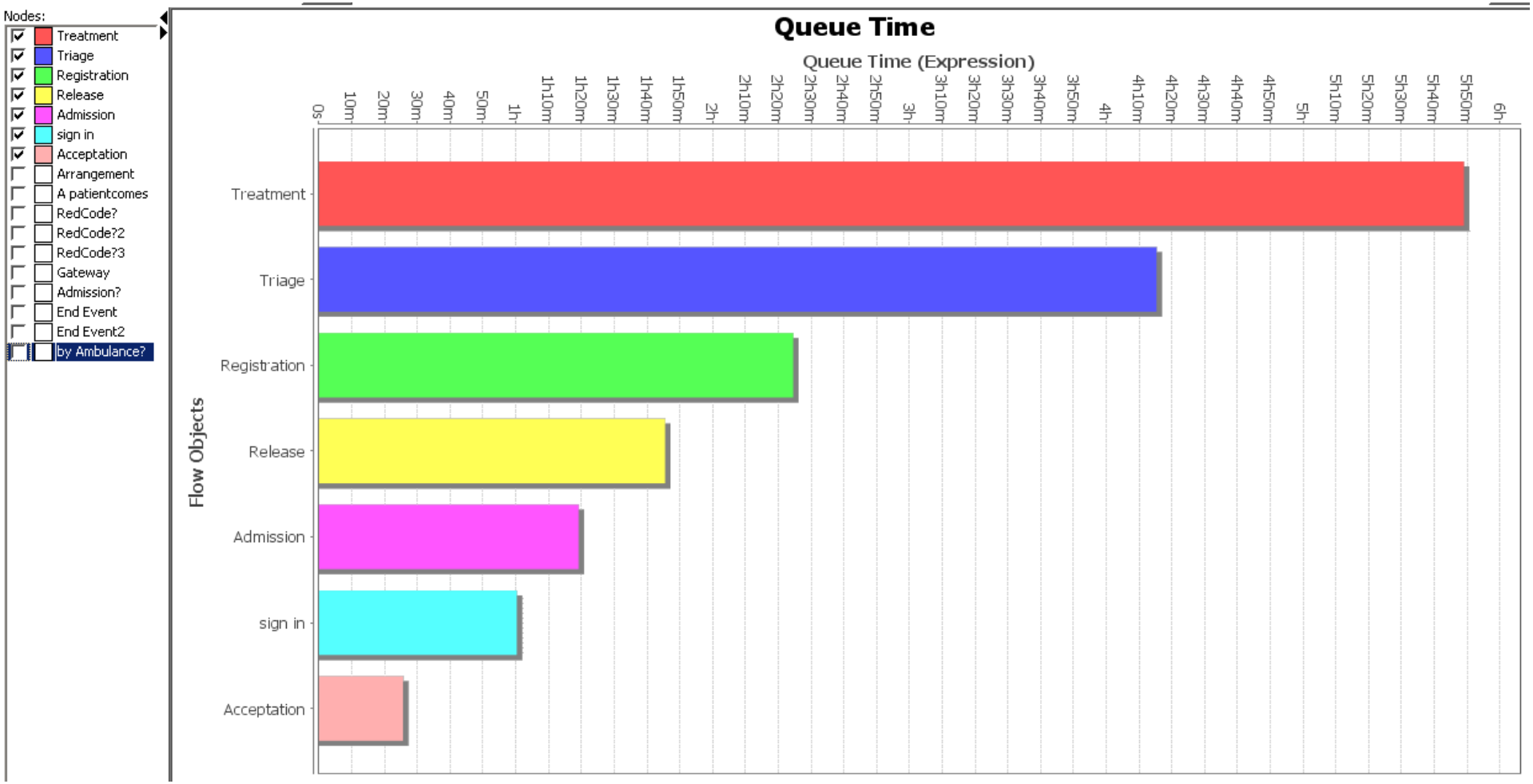
- The maximum resource usage can be also derived. Looking at the Resource Usage diagram (expressed in percentage w.r.t. the available ones) the maximum usage per resource can be easily calculated:
  Nurses: 5/7; Phys: 3/3; Techn: 2/4; Adm: 4/4; Med Rooms: 3/7; Adm Rooms: 4/13;
- Total costs = Fixed costs + Costs per Input =55800*3 + 13200*4 + 10037= **230237$**


Resources:
Nurse
Physician
Technician
Administrative Clerk
Medical Room
Administrative Room
EmergencyRoom
TriageRoom
Administrative Clerk
EntranceRoom
Resource Types:
Staff
Room
Pool / Lane
Resource Usage
%
Time (Expression)



c. Looking at the Queue Time, it can be seen that the bottleneck is at the Treatment activity. Let us increase the number of resource for treatment: 3 Emergency Room.

- **Total Duration and Total Variable Cost: 17h 21m 12s 10037$**
- **Total Average Time: 8.65h**
- The new Queuing situation is more balanced.


Nodes:
Treatment
Triage
Registration
Release
Admission
sign in
Acceptation
Arrangement
A patientcomes
RedCode?
RedCode?2
RedCode?3
Gateway
Admission?
End Event
End Event2
by Ambulance?
Queue Time
Queue Time (Expression)
0s
10m
20m
30m
40m
50m
1h
1h10m
1h20m
1h30m
1h40m
1h50m
2h
2h10m
2h20m
2h30m
2h40m
2h50m
3h
3h10m
3h20m
3h30m
3h40m
3h50m
4h
4h10m
4h20m
4h30m
4h40m
4h50m
5h
5h10m
5h20m
5h30m
5h40m
5h50m
6h
Flow Objects
Treatment
Triage
Registration
Release
Admission
sign in
Acceptation