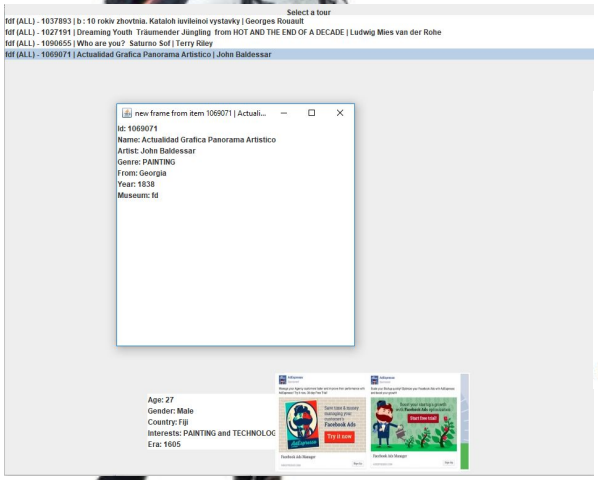
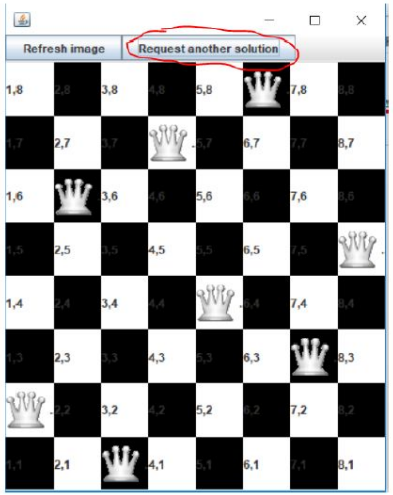
ID2209 - Final Project

Multi agent system for resource delegation
between agents and stations in a high risk/high frequent dynamic 2D environment.

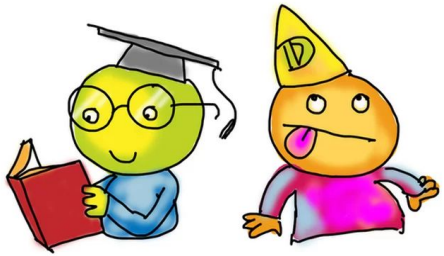
About us





Classic pizza - 11 - 9000 - UNSOLD
Dragon skin - 5 - 14000 - UNSOLD
Old books - 60 - 1500 - UNSOLD
Mona Lisa - 1 - 18000 - UNSOLD

Name: Amount: Price: Start a new auction



Project

Aron: I need 2 more boxes

Johann: On my way with 5 boxes!
Meet you at **X**

Johann

X

Aron

Aron: I need 2 more boxes

Johann: On my way with 5 boxes!
Meet you at **X**

Jimmy: I also need 2 more boxes!

Johann: Alright, I have 3 left.
Meet you at **Y**, because you are
so <u>slow</u>. Aron, come to **Y** instead!

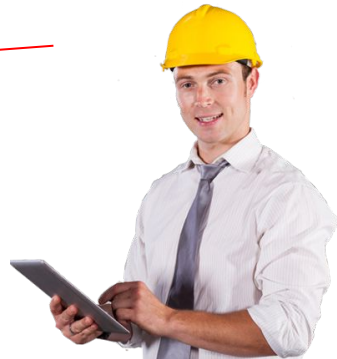
X

Johann

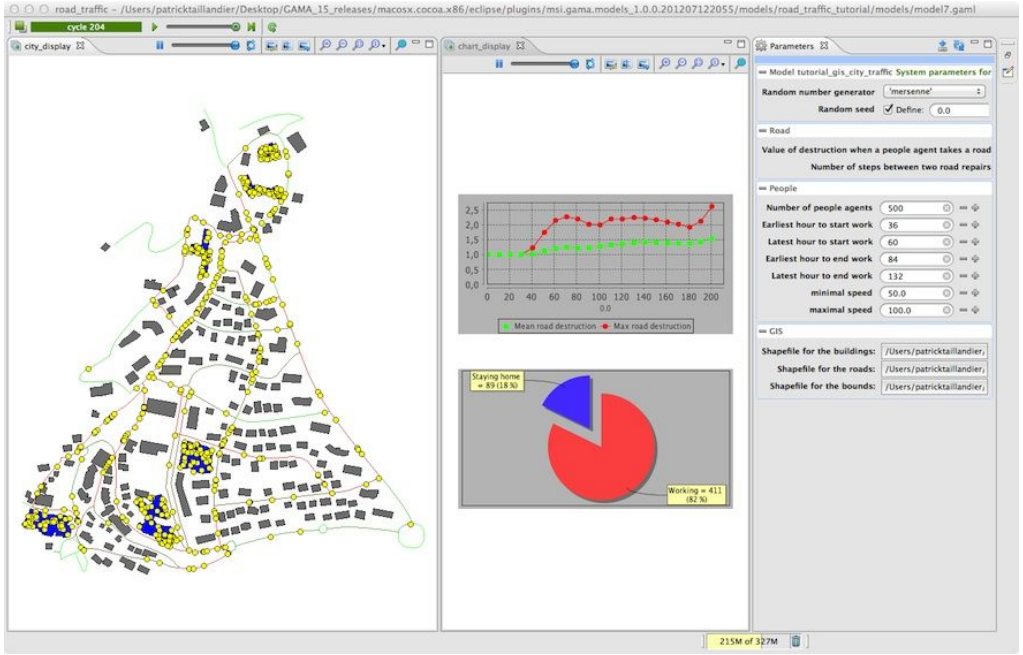
Aron

Y

Jimmy



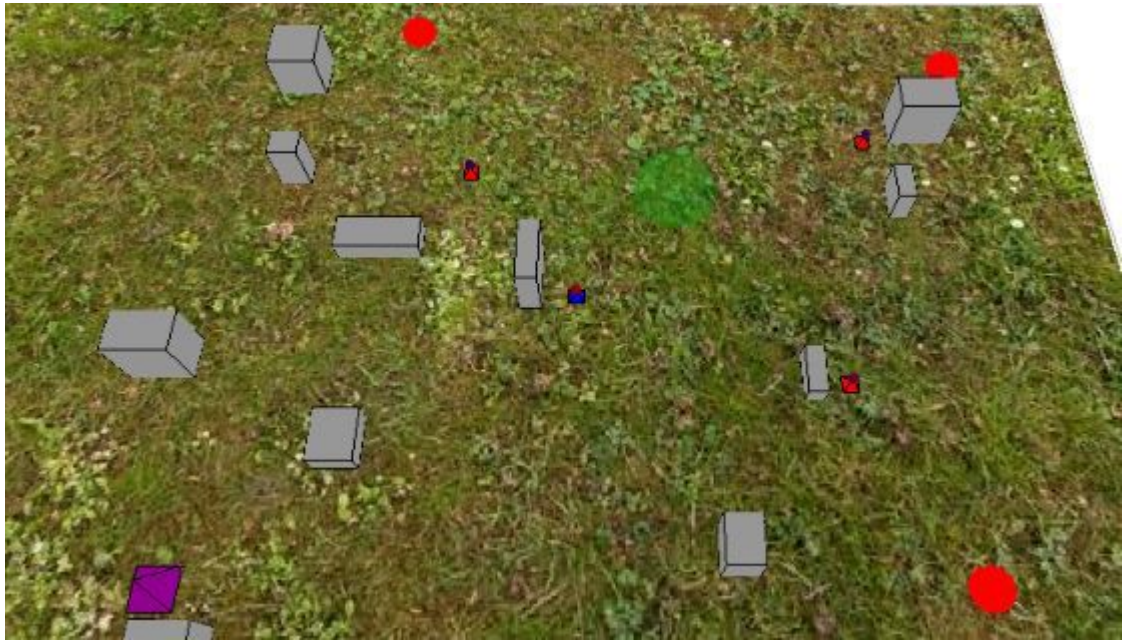
Tool used - GAMA 1.6



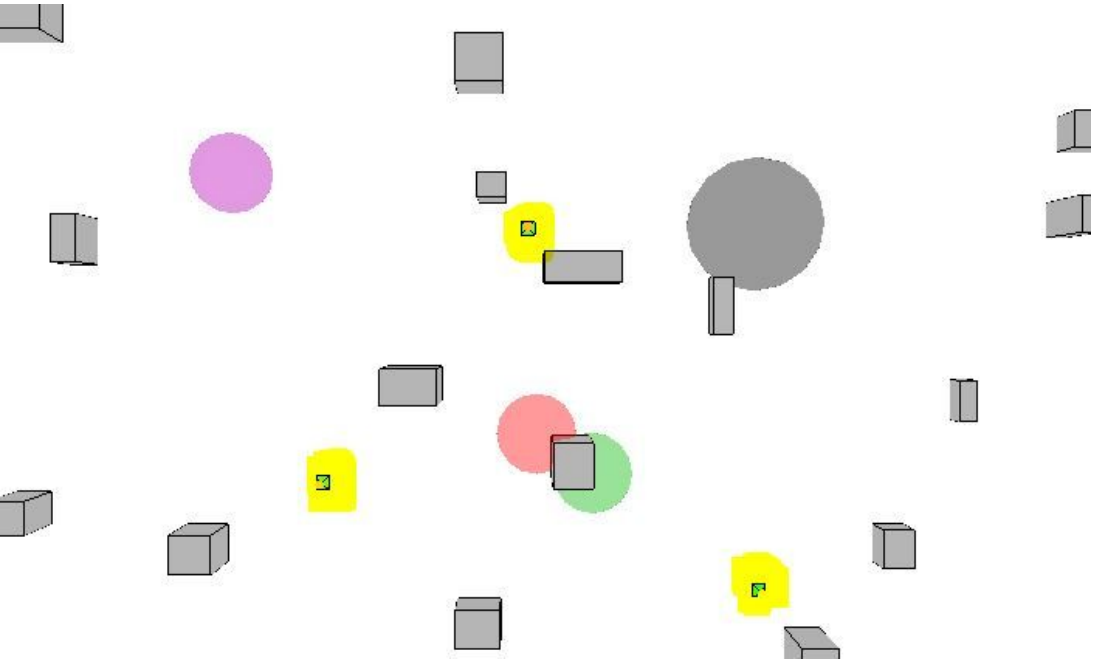
Find best point

Different distance

Different speed



Different algorithms tried



- Purple - Normalized points
- **Red - Inverse weighted point**
- Green - Average point
- Gray - Total time calculation

Inverse weighted point

Agent 1 at {1,1} speed 1 (6/1) / 11 = 0.5454… * {1,1} -> {0.54 ; 0.54}

Agent 2 at {8,3} speed 2 (6/2) / 11 = 0.2727… * {8,3} -> {2.16 ; 0.81}

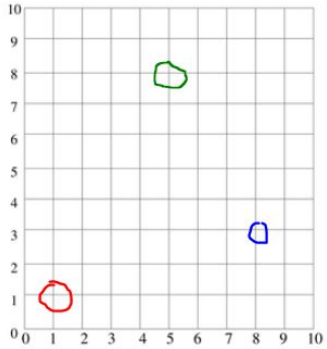
Agent 3 at {5,8} speed 3 (6/3) / 11 = 0.1818… * {5,8} -> {0.90 ; 1.44}

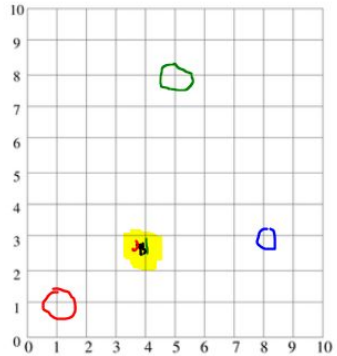
Total speed = 1 + 2 + 3 = 6

{0.54 ; 0.54} + {2.16 ; 0.81} + {0.90 ; 1.44}

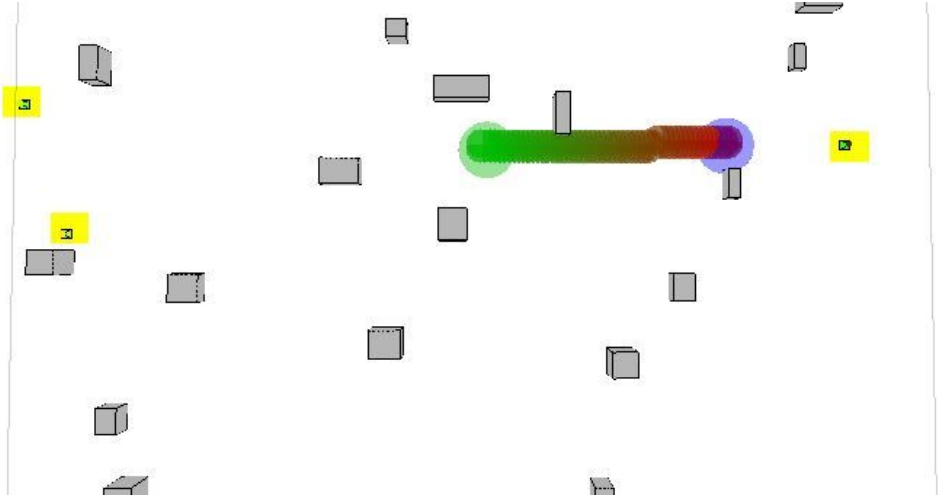
Total factors = 6/1 + 6/2 + 6/3 = 11

Meeting point is {3.60 ; 2.79}





Bonus slide: Inverse factor + time calculation



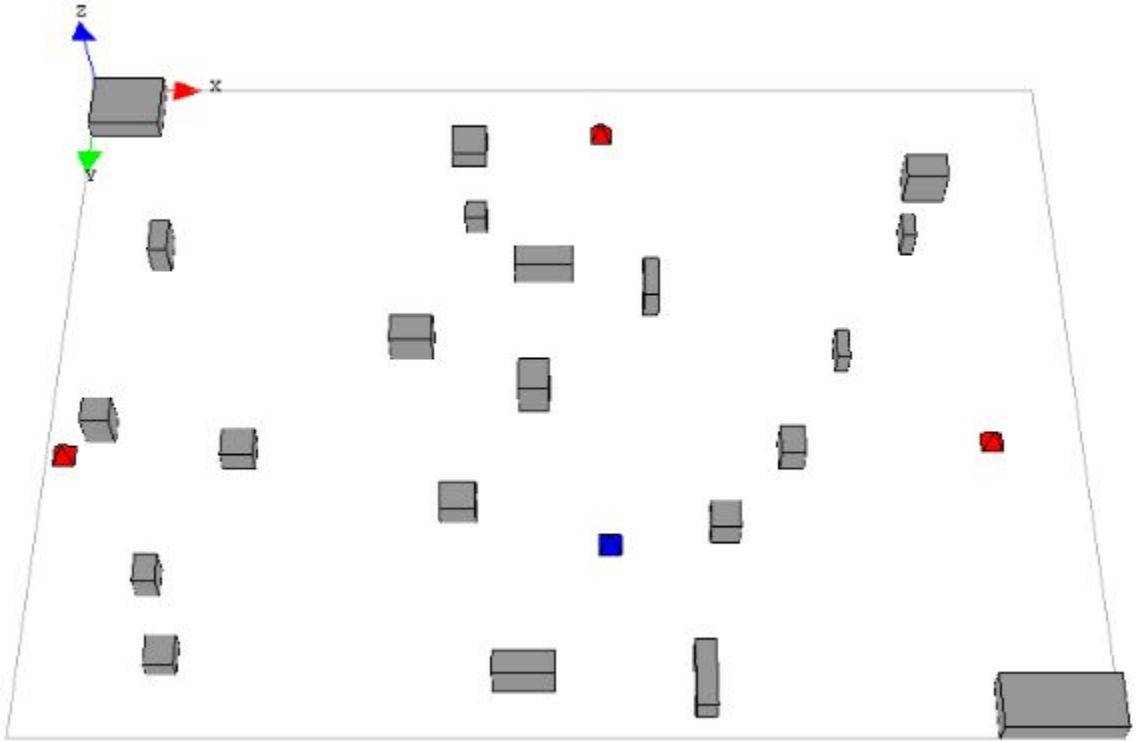
Start by finding inverse weighted point

Calculate total time for points around weighted point and select the lowest time as new point

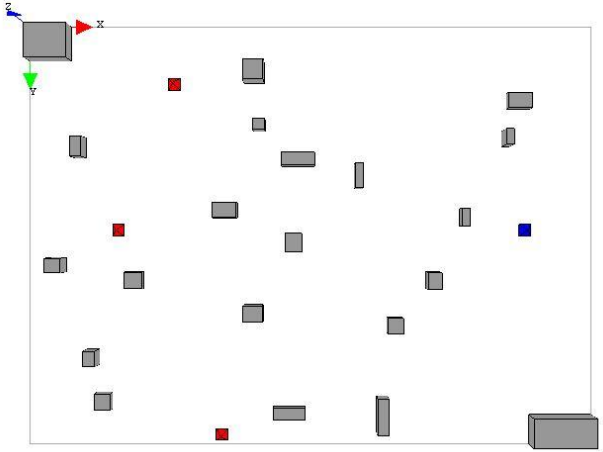
Iterate X times to find lowest time

Ended up being slower

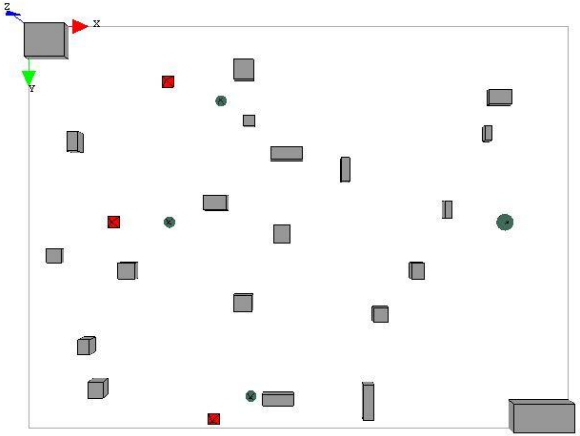
Version 1.0 in action



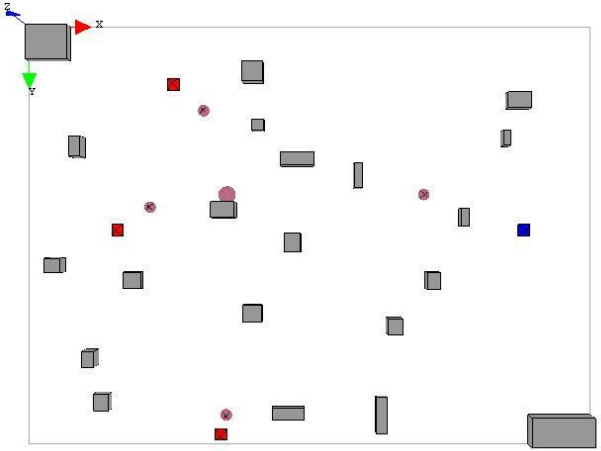
Is this working?



Agent	Location	Speed	Request time
Requester 1	{50, 20, 0}	1	2
Requester 2	{30, 70, 0}	2	5
Requester 3	{66, 140, 0}	3	8
Delivery man 1	{170, 70, 0}	2	



No method				
	Start Cycle	Distance Travelled	End Cycle	Cycles delta
Requester 1	2	262,95	135	133
Requester 2	5	275,51	103	98
Requester 3	8	250,31	72	64
		788,77		295



Inverse factor				
	Start Cycle	Distance Travelled	End Cycle	Cycles delta
Requester 1	2	86,93	58	56
Requester 2	5	76,62	43	38
Requester 3	8	169,58	58	50
DeliveryMan	-	104,16	33	33
		437,29		144

Distance lowered by 45%
Time shortened by up to 62.37%

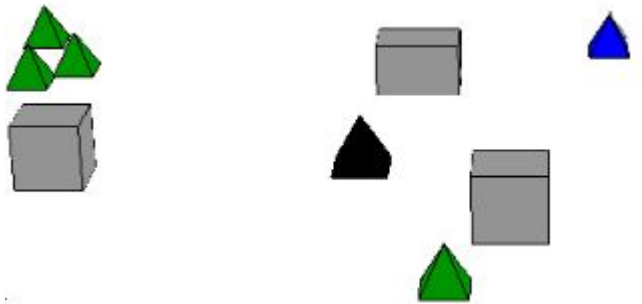
Scaling for bigger simulation

Multiple supply centers

Multiple camps

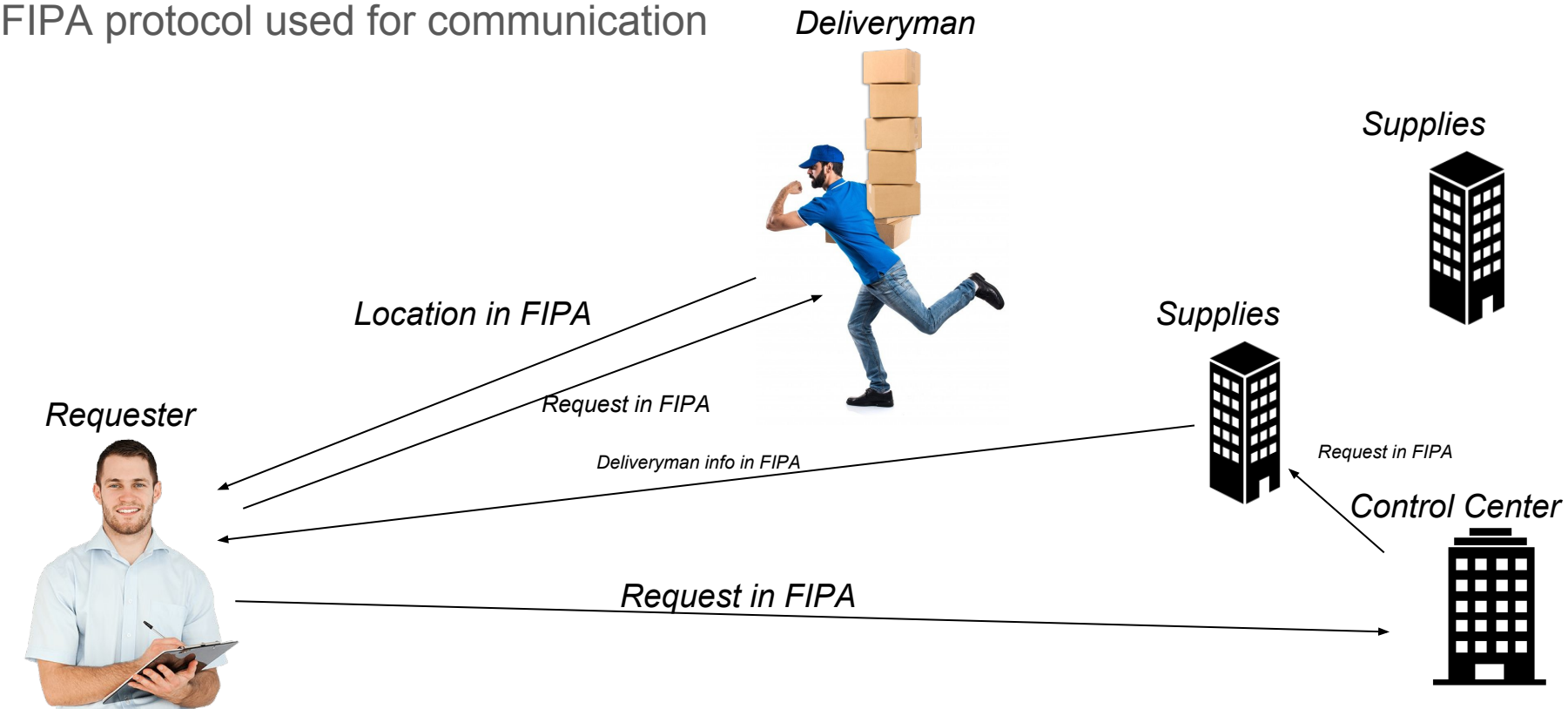
Gets more complicated...

Control center to locate the nearest supply station



FIPA

FIPA protocol used for communication



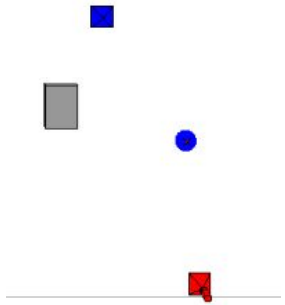
More features

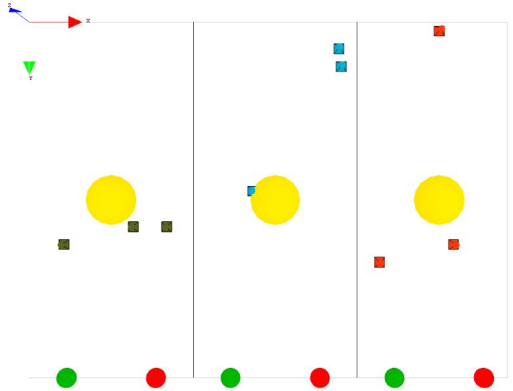
Best delivery man

“Go get it yourself!”

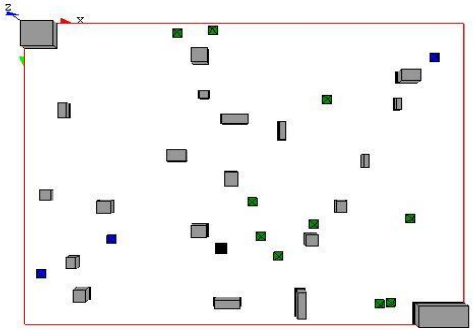
Simulate the interior of supply stations

Let delivery man load at different stations

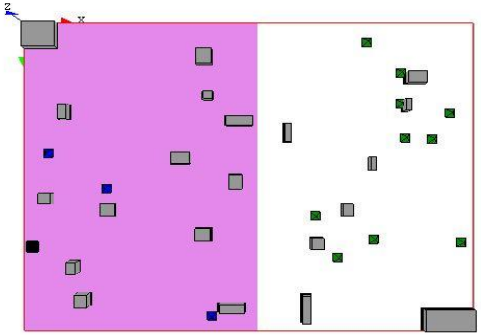




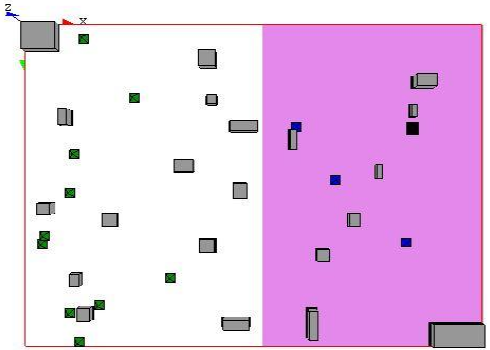
Restriction area



Free for all

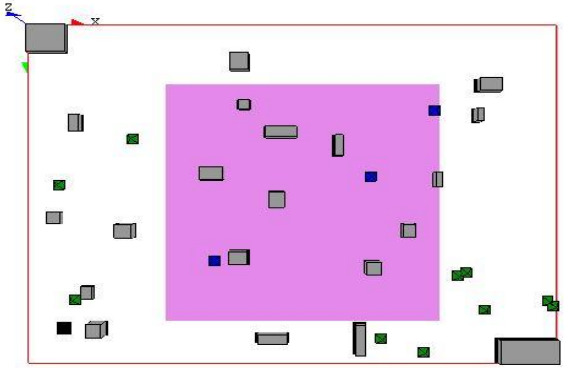


Supplies | Camps

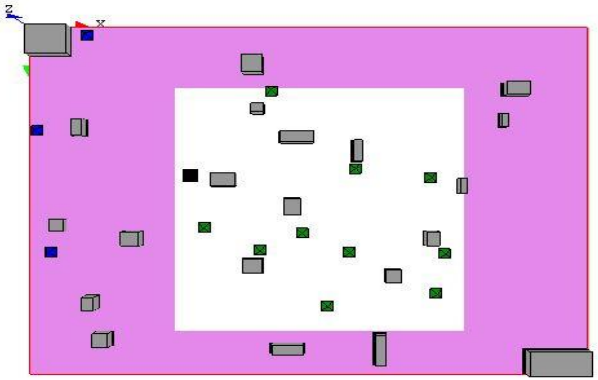


Camps | Supplies

Restriction Factor = 0.5



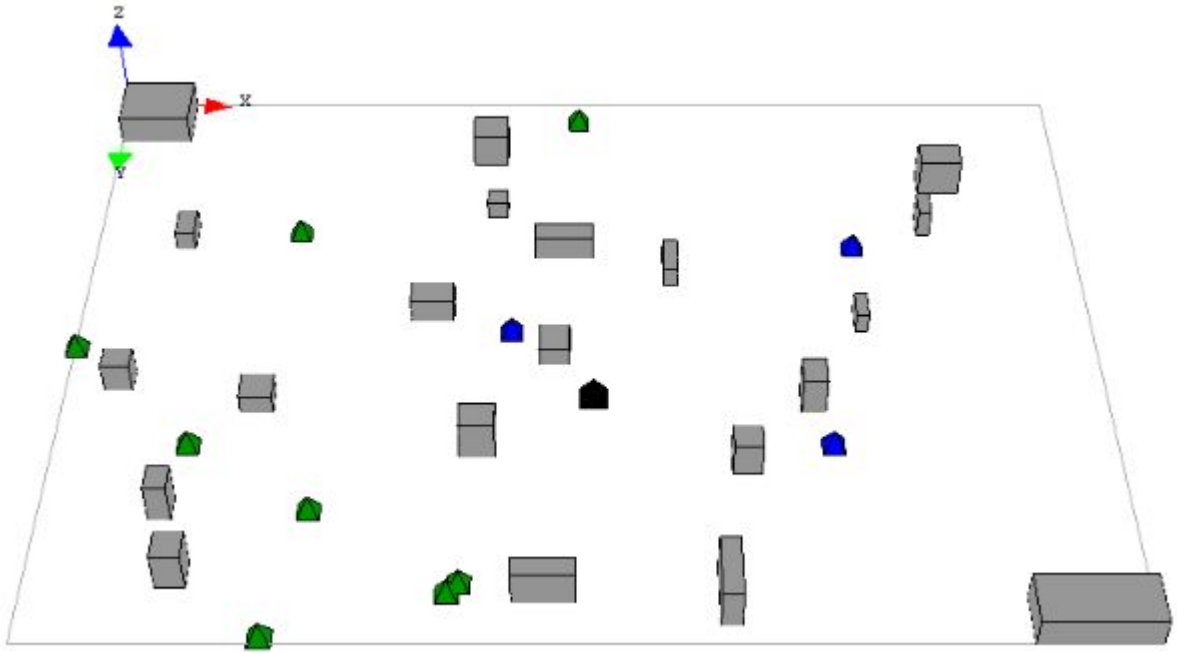
Camps | Supplies | Supplies



Supplies | Camps | Supplies

Restriction Factor = 0.5

Version 2.0 in action



And as always, that extra touch

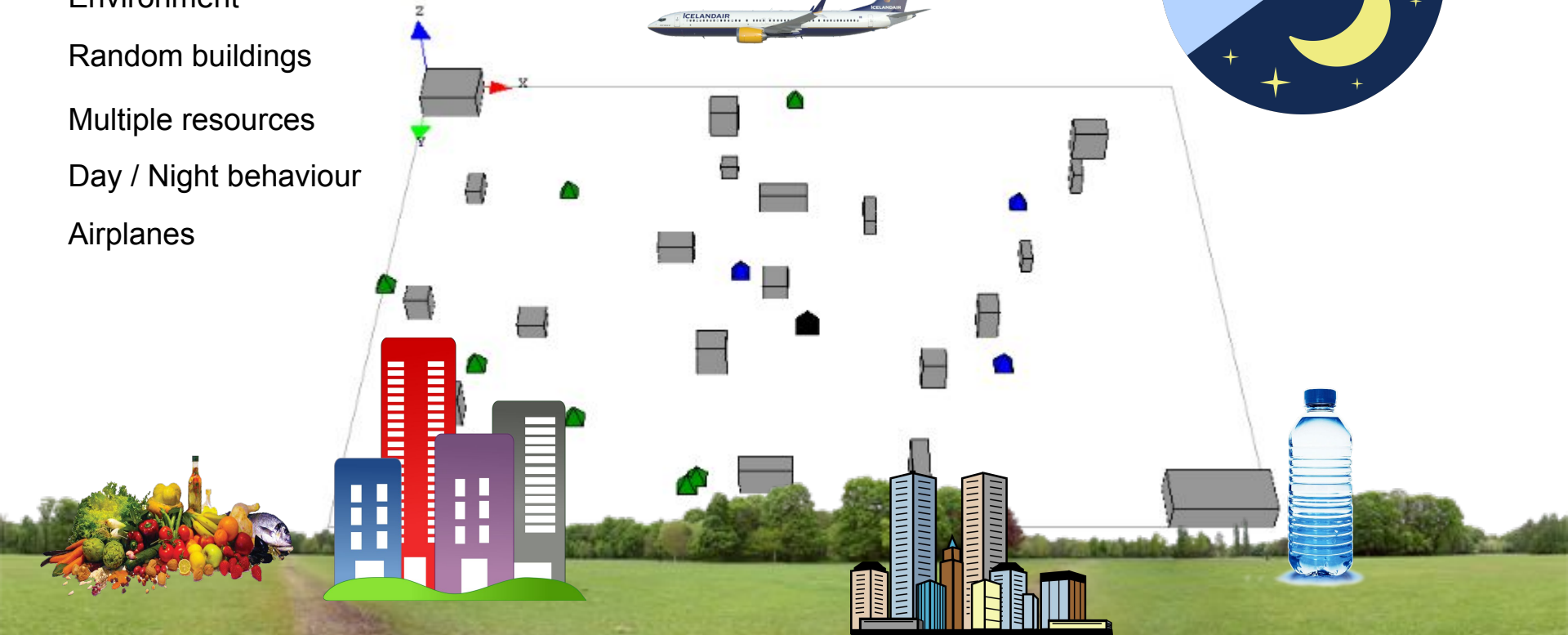
Environment

Random buildings

Multiple resources

Day / Night behaviour

Airplanes



More utility

Delivery man arrives at station and wait in line

Resource 1 has priority 0.05
Resource 2 has priority 0.63
Resource 3 has priority 2.13

Resource 1 = 200
Resource 2 = 100
Resource 3 = 20

Tim

200 * 0.05 = 10.00
100 * 0.63 = 63.00
20 * 2.13 = 42.60

Total utility = 115.60

Resource 1 = 1
Resource 2 = 3
Resource 3 = 180

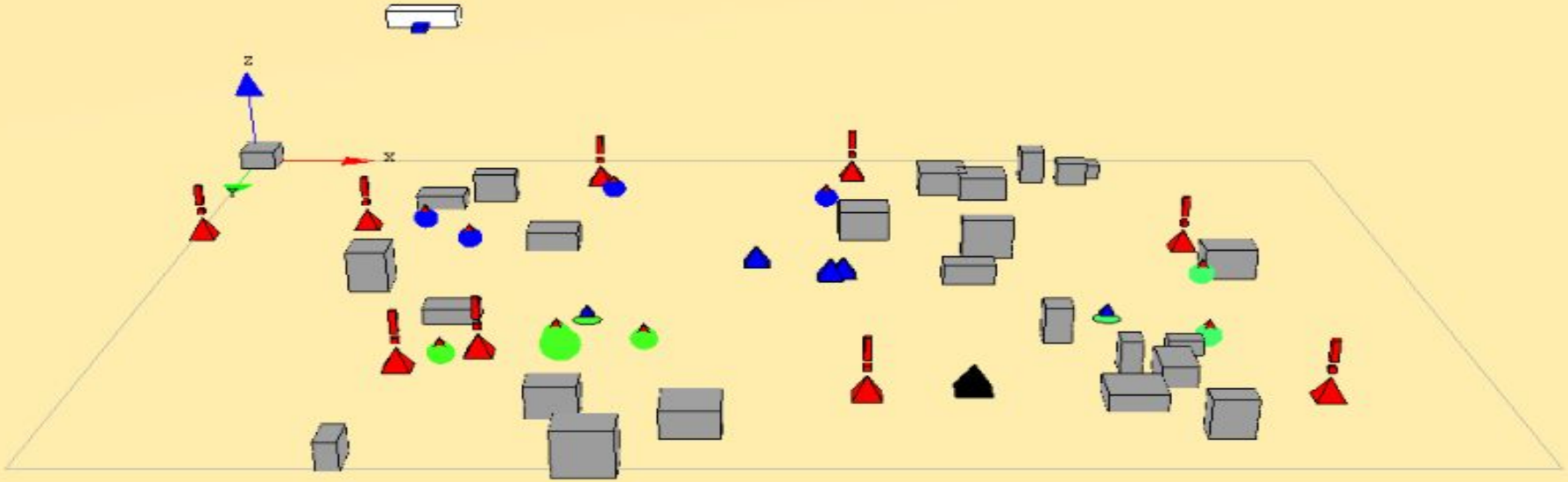
Eric

1 * 0.05 = 0.05
3 * 0.63 = 1.89
180 * 2.13 = 42.60

Total utility = 385.34

We pick Eric since he takes shorter time to load thus
Camps wait shorter duration for priority requests
Note: Lying here decreases total utility

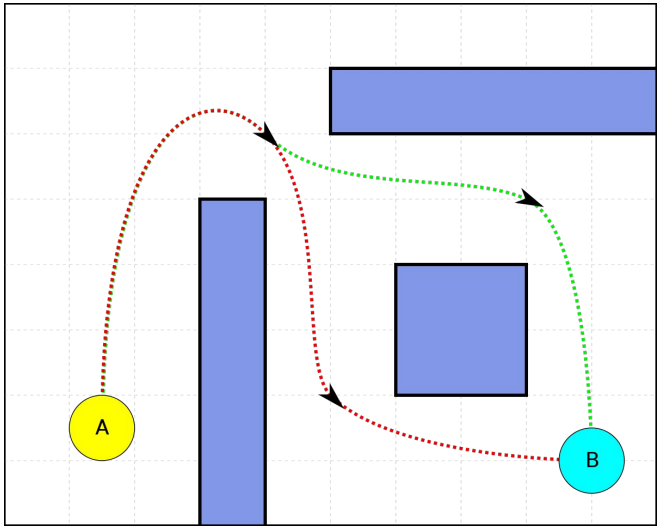
Version 2.1 in action




STOP
HERE

Improvements

Agent walking path (Dijsktra, A*, weighted network)
3D environment and paths
Time taken to deliver to requester
Add priority to inverse weighted point
Supply stations run out of resources
Special entrances at camps/supplies
Supply station only allow X many delivery man
Supplies can weigh, so they slow agents down
Weather effect that slows down everyone
At night, people might get robbed
….



Tack så mycket

Takk fyrir okkur

谢谢


ANY
QUESTIONS
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