2018-04

Combat Supply Logistics Network Modeling & Simulation System

Gordis, Joshua H.

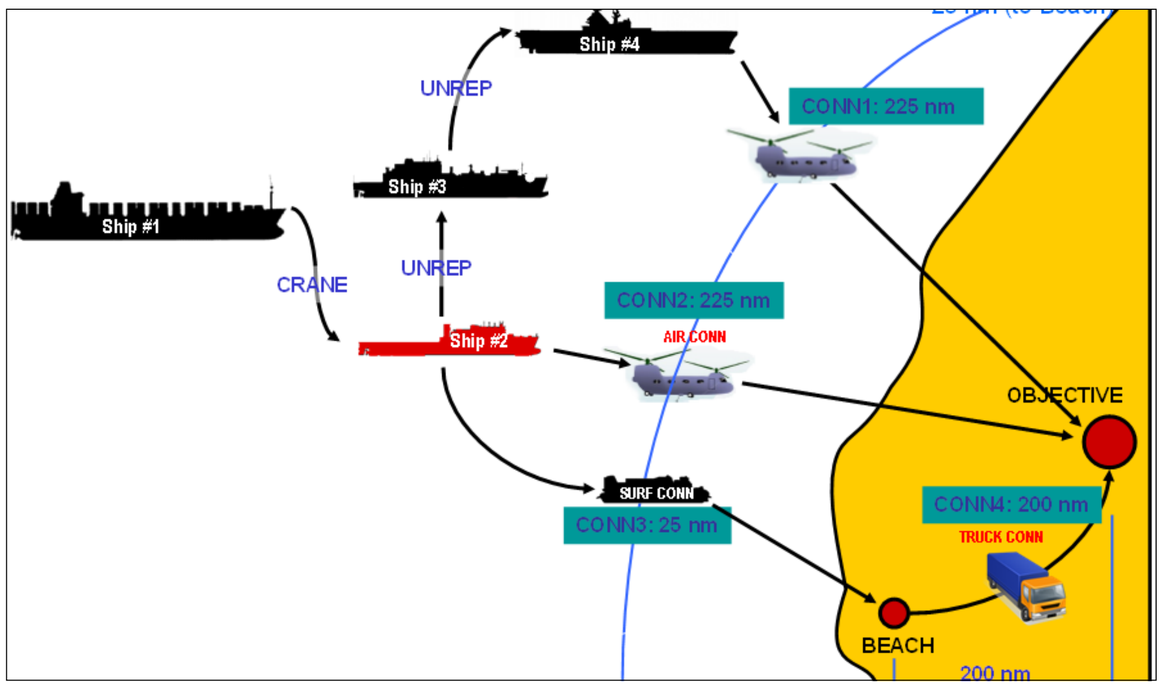
Monterey, California. Naval Postgraduate School

Combat Supply Logistics Network Modeling & Simulation System

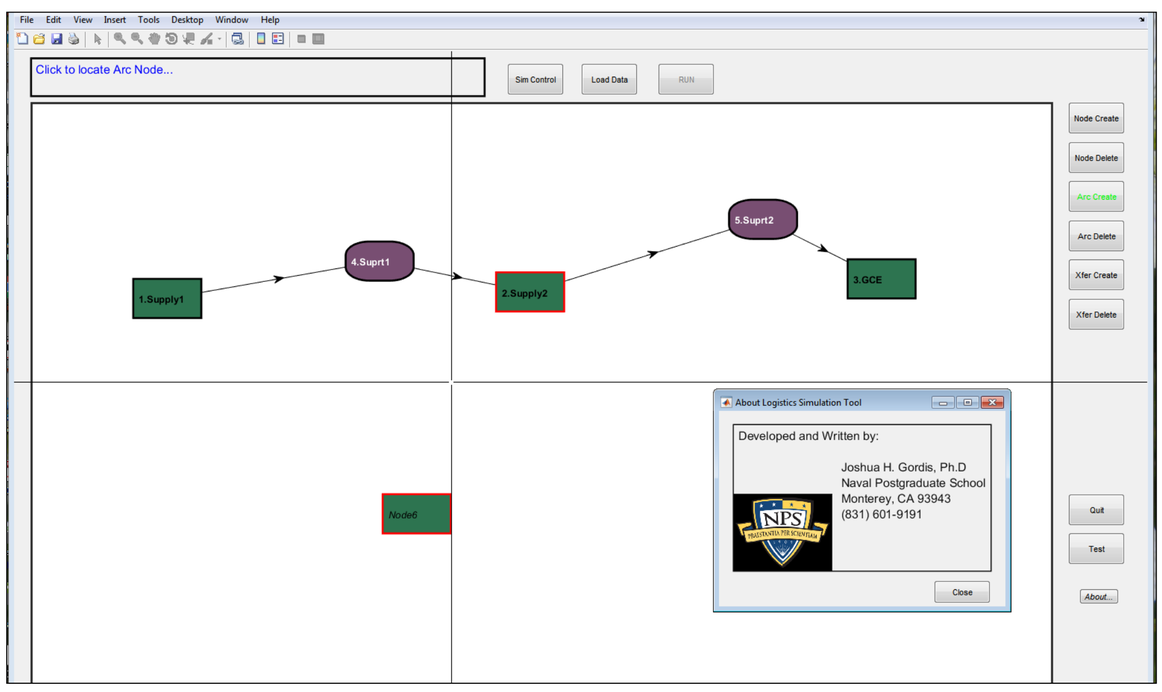
Naval Postgraduate School

Simulate and Predict Performance of Supply Networks

- Predict network throughput and time required to deliver cargo to objective
- Ensure adequate delivery rate of mission-critical supplies (e.g. Fuel, water, ammo, food, etc.)
- Predict energy use by network
- Provide chokepoint/bottleneck analysis



Land, sea, and air elements can be represented



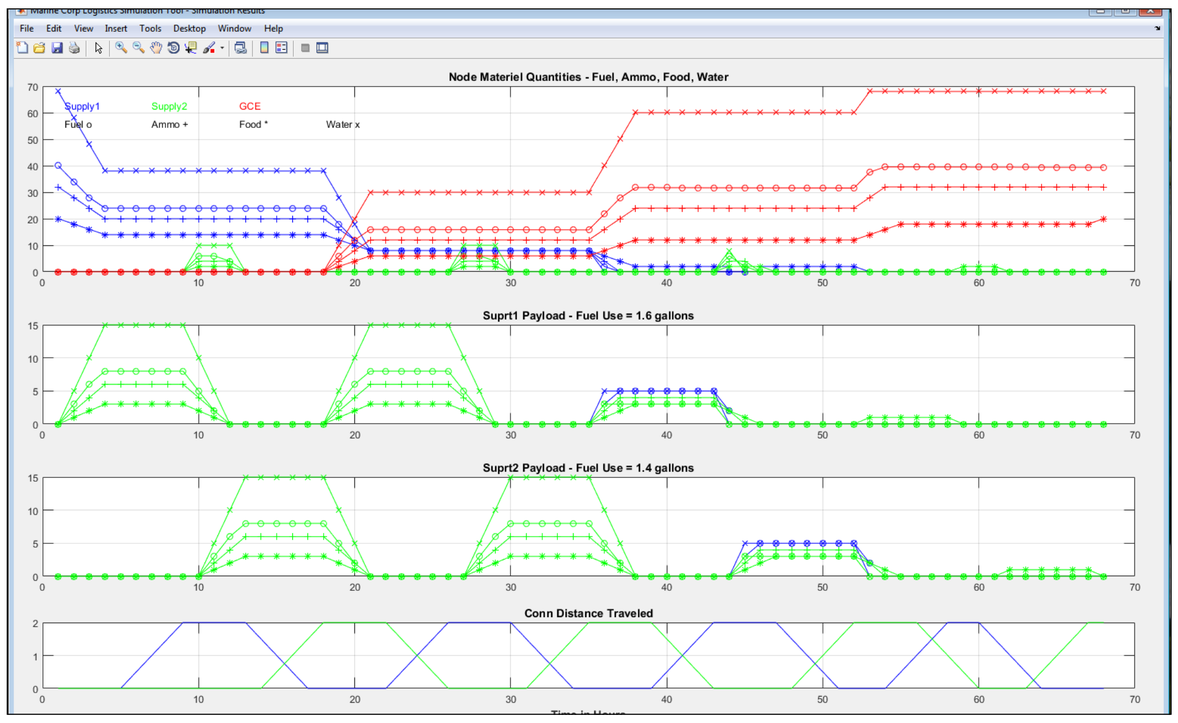
Graphical user interface for network definition

Modeling of Supply Networks

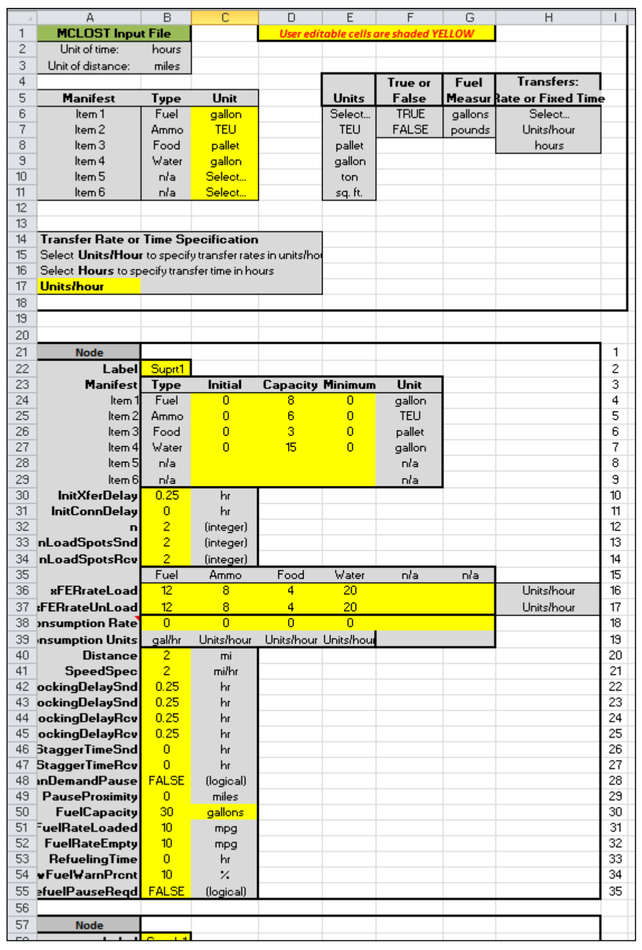
- Insight into behavior of supply networks during logistics planning.
- User-friendly interface for defining network nodes
- Ships and land bases can be modeled
- Connectors are modeled (sets of air, land, or sea vehicles) - Number, payload, distance, speed
- Connector behavior modeled:
  - Deployment criteria, Transfer rates

Time-Domain Network Performance

- The time-domain performance of the supply network is simulated
- Supplies-on-hand versus time calculated (Connector loads versus time calculated
- Connector position versus time calculated



Network performance simulated



	A	B	C	D	E	F	G	H	I
1	**MCLOST Input File**			User editable cells are shaded YELLOW					
2	Unit of time:	hours							
3	Unit of distance:	miles							
4									
5	**Manifest**	**Type**	**Unit**		**Units**	**True or False**	**Fuel Measur**	**Transfers: Rate or Fixed Time**	
6	Item 1	Fuel	gallon		Select...	TRUE	gallons	Select...	
7	Item 2	Ammo	TEU		TEU	FALSE	pounds	Units/hour	
8	Item 3	Food	pallet		pallet			hours	
9	Item 4	Water	gallon		gallon				
10	Item 5	n/a	Select...		ton				
11	Item 6	n/a	Select...		sq. ft.				
12									
13									
14	**Transfer Rate or Time Specification**								
15	Select **Units/Hour** to specify transfer rates in units/ho								
16	Select **Hours** to specify transfer time in hours								
17	**Units/hour**								
18									
19									
20									
21	**Node**								1
22	**Label**	Suprt1							2
23	**Manifest**	**Type**	**Initial**	**Capacity**	**Minimum**	**Unit**			3
24	Item 1	Fuel	0	8	0	gallon			4
25	Item 2	Ammo	0	6	0	TEU			5
26	Item 3	Food	0	3	0	pallet			6
27	Item 4	Water	0	15	0	gallon			7
28	Item 5	n/a				n/a			8
29	Item 6	n/a				n/a			9
30	**InitXferDelay**	0.25	hr						10
31	**InitConnDelay**	0	hr						11
32	**n**	2	(integer)						12
33	**nLoadSpotsSnd**	2	(integer)						13
34	**nLoadSpotsRcv**	2	(integer)						14
35		Fuel	Ammo	Food	Water	n/a	n/a		15
36	**xFERrateLoad**	12	8	4	20			Units/hour	16
37	**tFERrateUnLoad**	12	8	4	20			Units/hour	17
38	**onsumption Rate**	0	0	0	0				18
39	**nsumption Units**	gal/hr	Units/hour	Units/hour	Units/hour				19
40	**Distance**	2	mi						20
41	**SpeedSpec**	2	mi/hr						21
42	**ockingDelaySnd**	0.25	hr						22
43	**ockingDelaySnd**	0.25	hr						23
44	**ockingDelayRcv**	0.25	hr						24
45	**ockingDelayRcv**	0.25	hr						25
46	**StaggerTimeSnd**	0	hr						26
47	**StaggerTimeRcv**	0	hr						27
48	**nDemandPause**	FALSE	(logical)						28
49	**PauseProximity**	0	miles						29
50	**FuelCapacity**	30	gallons						30
51	**FuelRateLoaded**	10	mpg						31
52	**FuelRateEmpty**	10	mpg						32
53	**RefuelingTime**	0	hr						33
54	**wFuelWarnPrcnt**	10	%						34
55	**efuelPauseReqd**	FALSE	(logical)						35
56									
57	**Node**								

Excel-Based User Input

- Define network cargo manifest
- Define node properties
  - Capacities, payloads, transfer rates, speed, distance, cargo consumption rates, fuel consumption,

Researcher: Dr. Joshua H. Gordis
Graduate School of Engineering and Applied Sciences,
Department of Mechanical and Aerospace Engineering
Topic Sponsor: Marine Corps Logistics Operations Group

NRP Project ID: NPS-17-M005-A