The SPECTRUM ENERGY BATTLE

March 2019

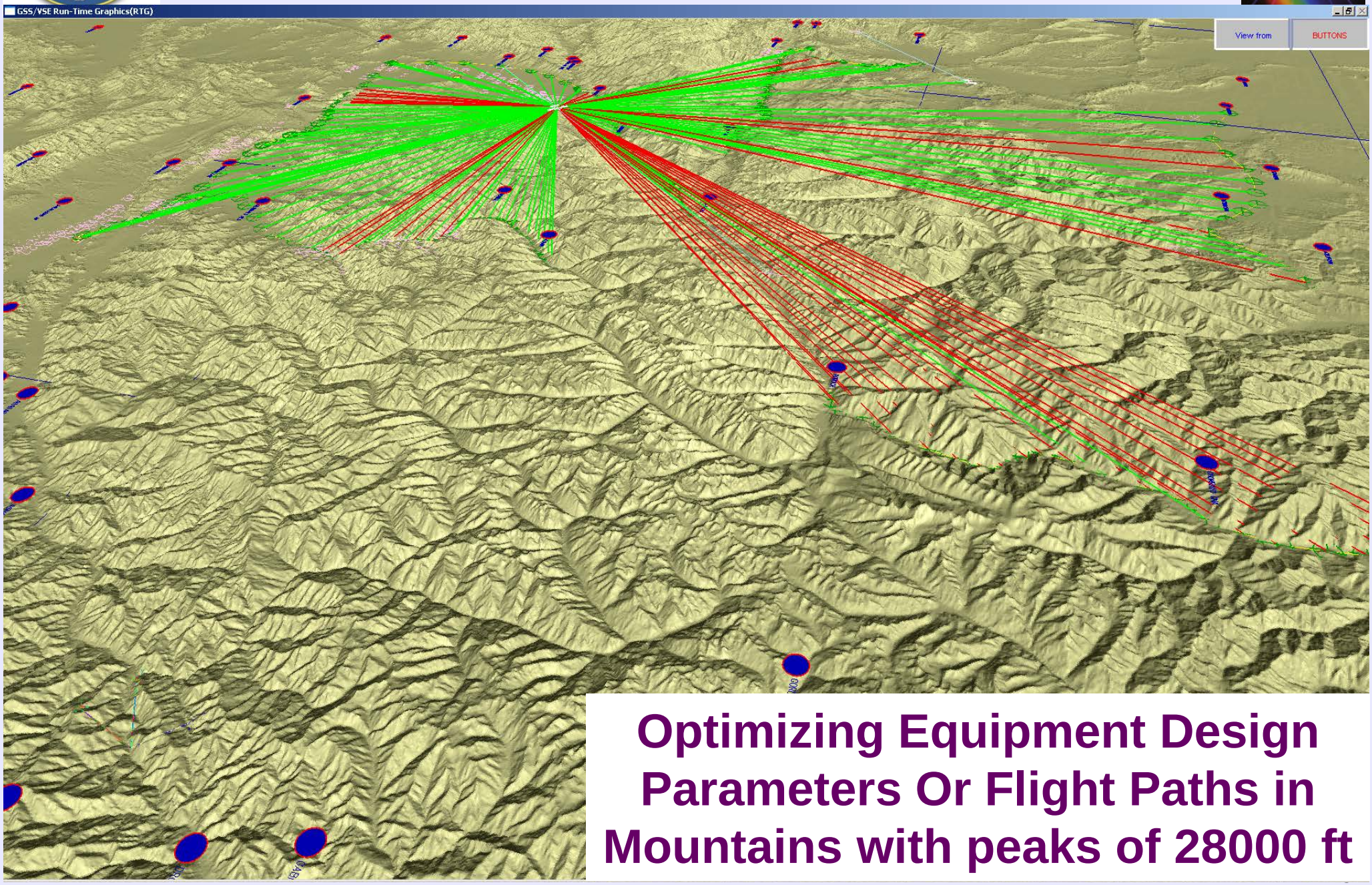
UNCLASSIFIED

The PSI
AI – AJ RADIO
Part 1

January 2019

UNCLASSIFIED

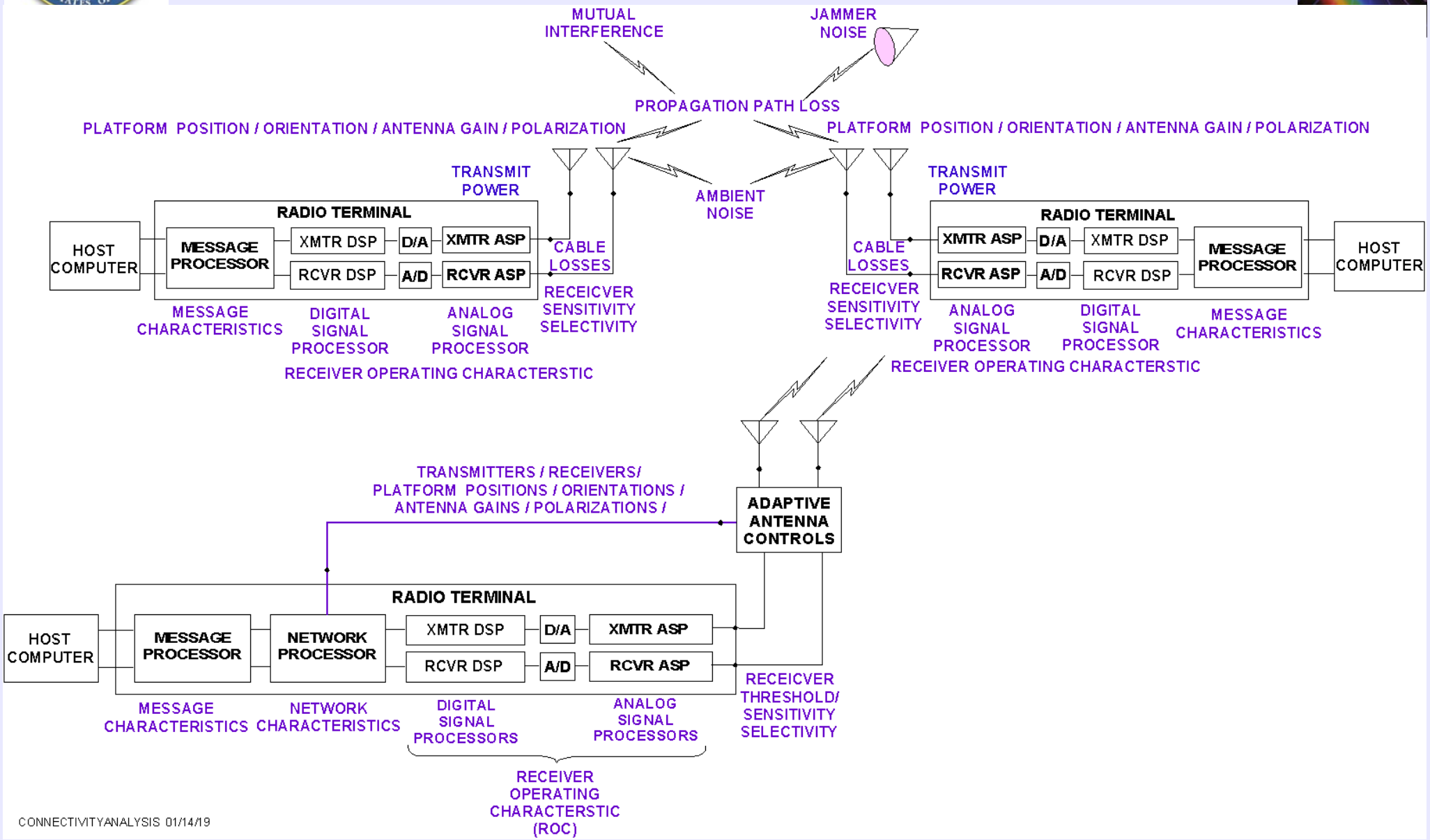
EXAMPLE REQUIREMENTS



Optimizing Equipment Design Parameters Or Flight Paths in Mountains with peaks of 28000 ft

DETERMINING CONNECTIVITY:

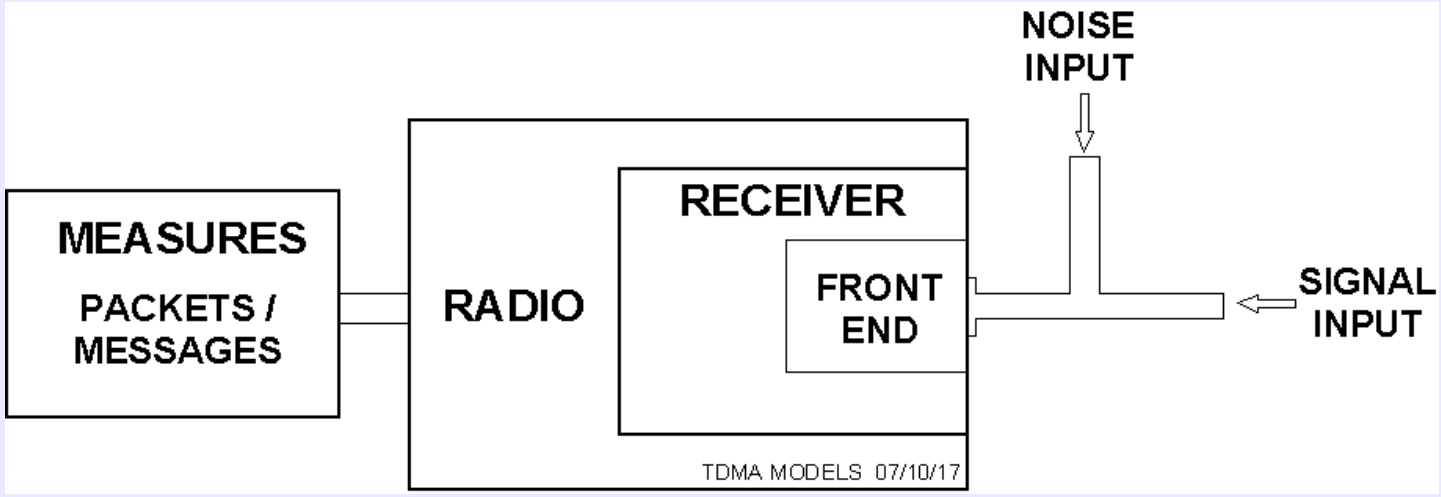
MODELS MUST ACCOUNT FOR MANY FACTORS



DEPENDS UPON: SIGNAL PROCESSING, POWER, ANTENNAS, PROPAGATION PATH LOSS, NOISE & OTHER FACTORS

Current Operational Considerations

Determining Connectivity (examples):

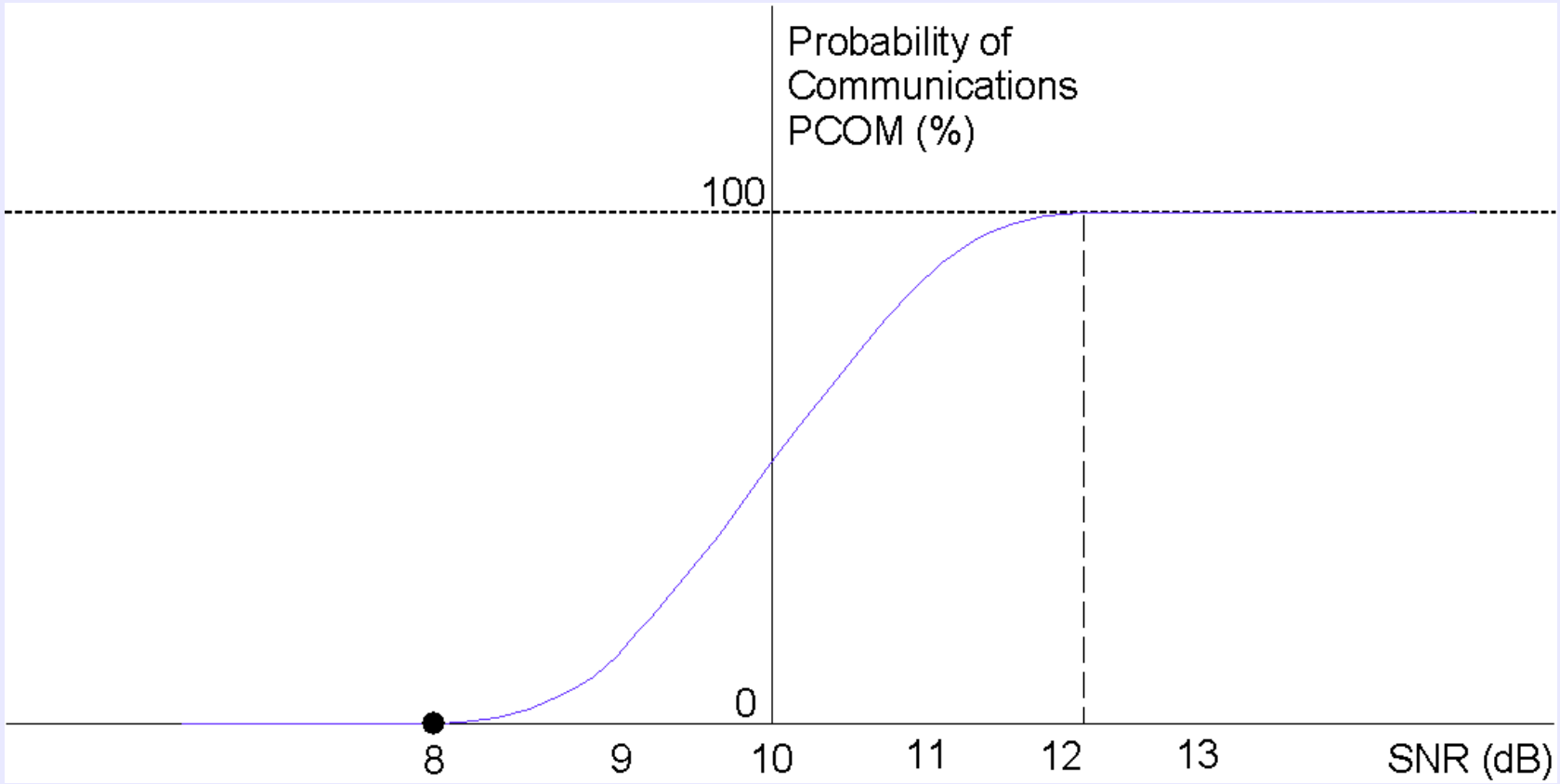


Measuring the Receiver Operating Characteristic (ROC)

(Could have multiple ROCS depending on the design.)

Current Operational Considerations

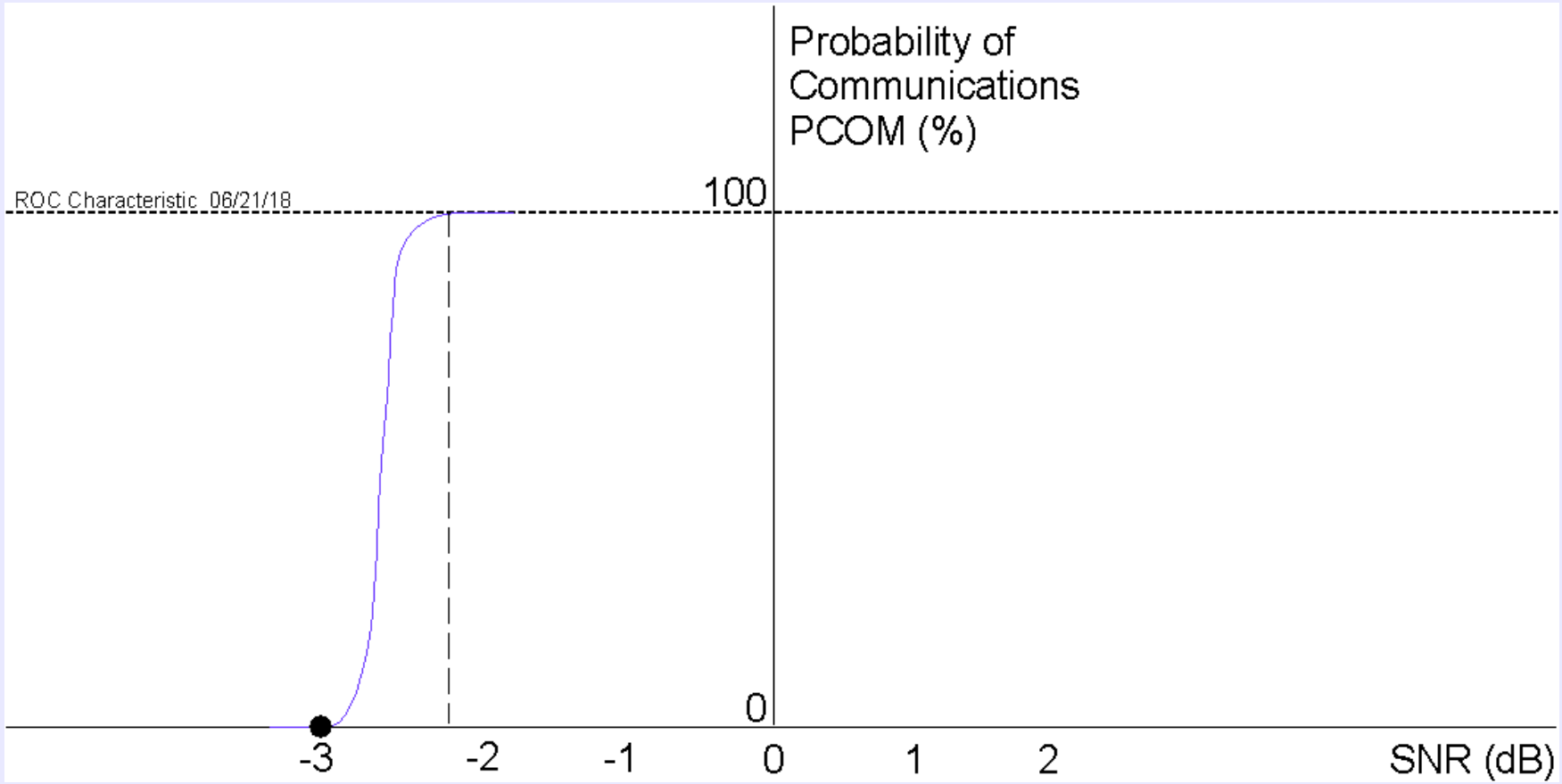
Determining Connectivity (examples):



Receiver Operating Characteristic (ROC)
- for a Soft Decision Receiver (Less DSP)

Current Operational Considerations

Determining Connectivity (examples):



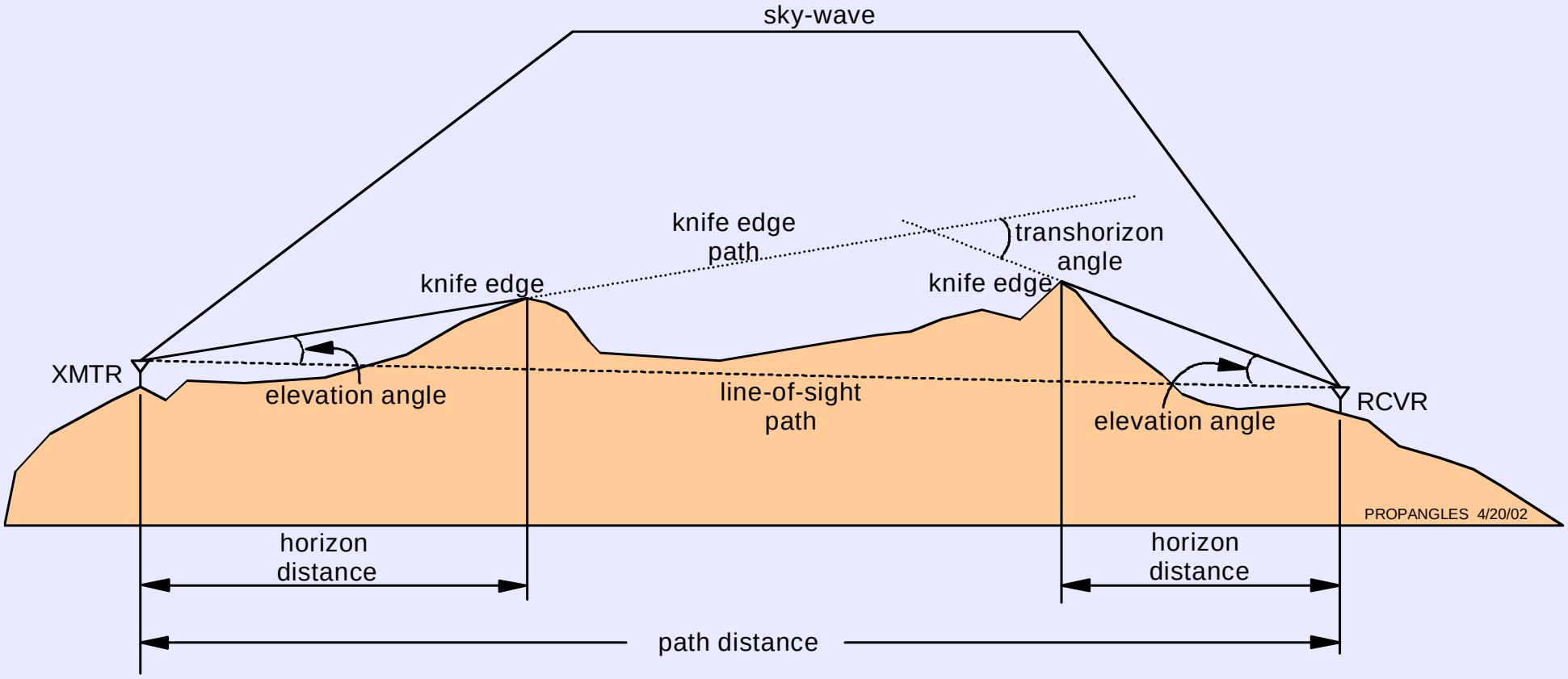
Receiver Operating Characteristic (ROC)

- for a Hard Decision Receiver - (More DSP)

- and Much improved SNR - (Better ASP)

EXAMPLE REQUIREMENTS

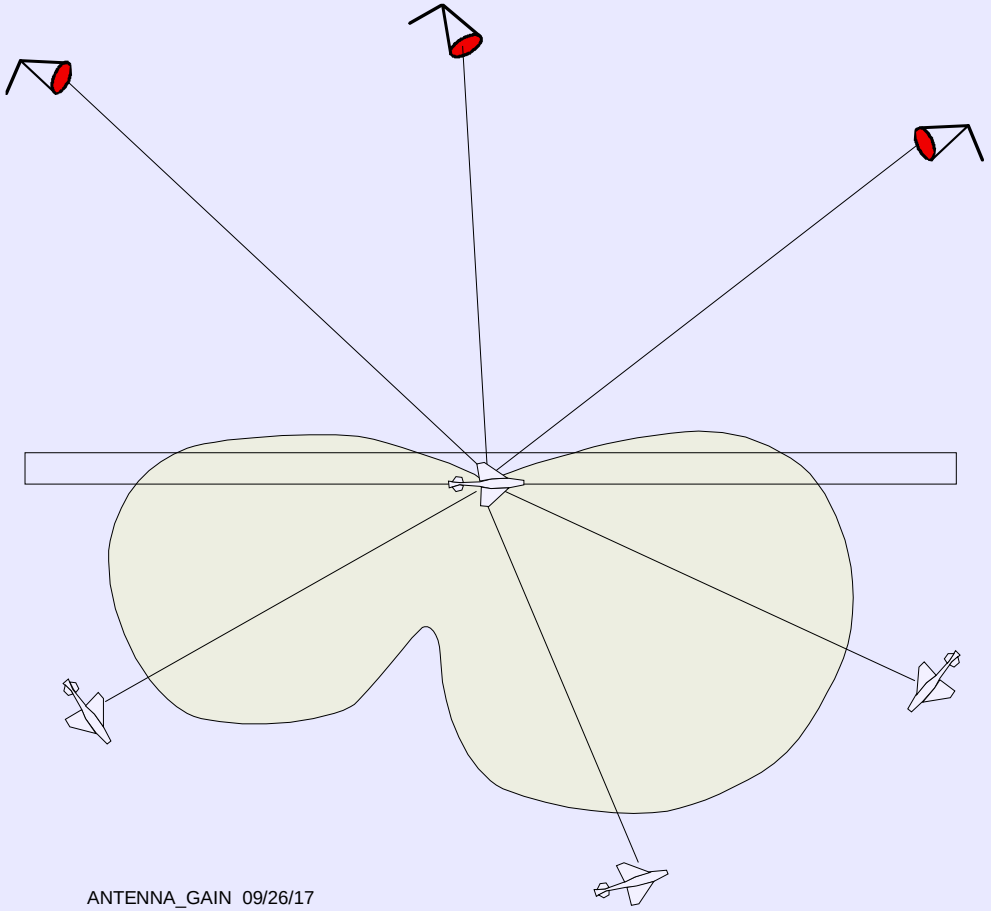
ACCURACY OF PROPAGATION PATH LOSS DEPENDS UPON: DISTANCE, ANTENNAS, TERRAIN, & OTHER FACTORS



CONNECTIVITY IS *NOT SIMPLY LINE-OF-SIGHT (LOS) !*

EXAMPLE REQUIREMENTS

SIGNAL AT FRONT END OF RECEIVER CAN BE ENHANCED BY ANTENNA DESIGN, BOTH ON THE TRANSMITTER AND RECEIVER;



ANTENNA_GAIN 09/26/17

SMART ANTENNAS CAN ADAPT TO THEIR ENVIRONMENT

EXAMPLE REQUIREMENTS

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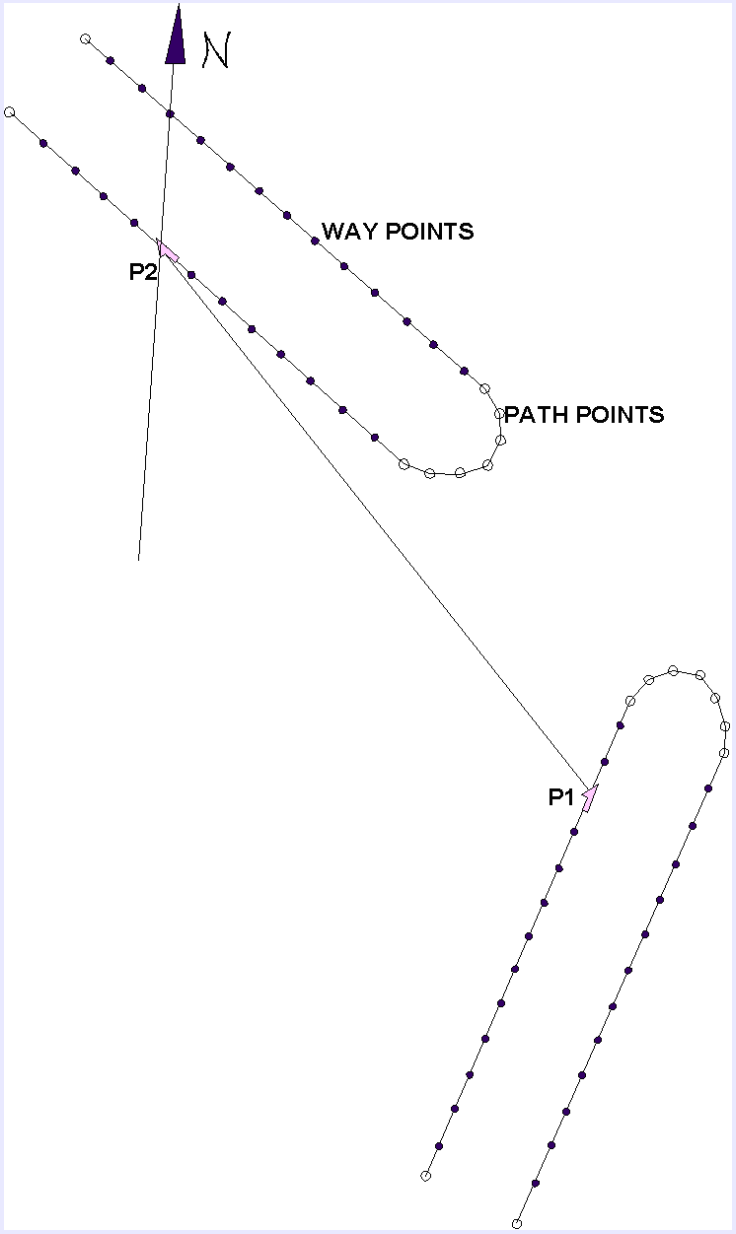
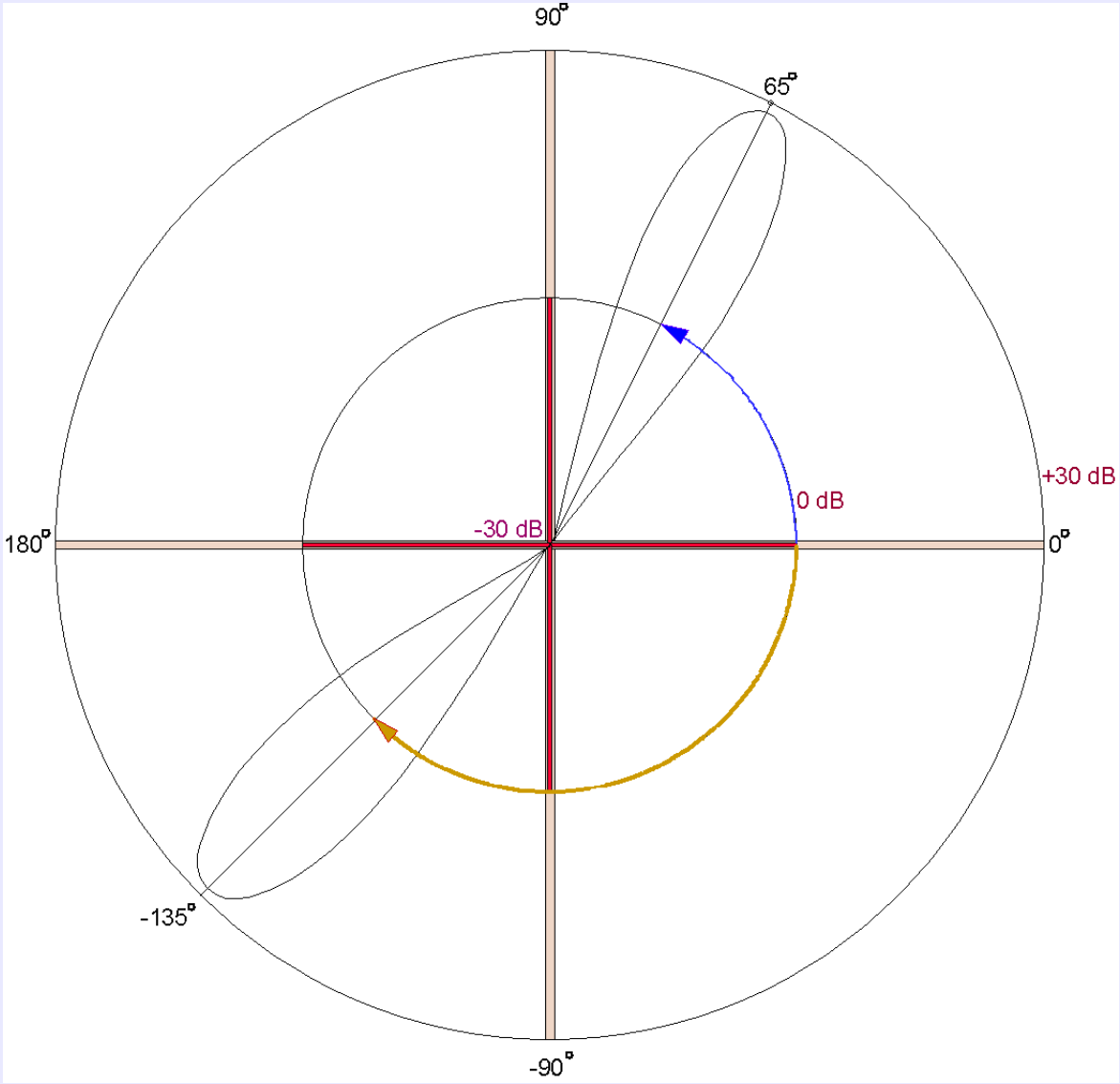


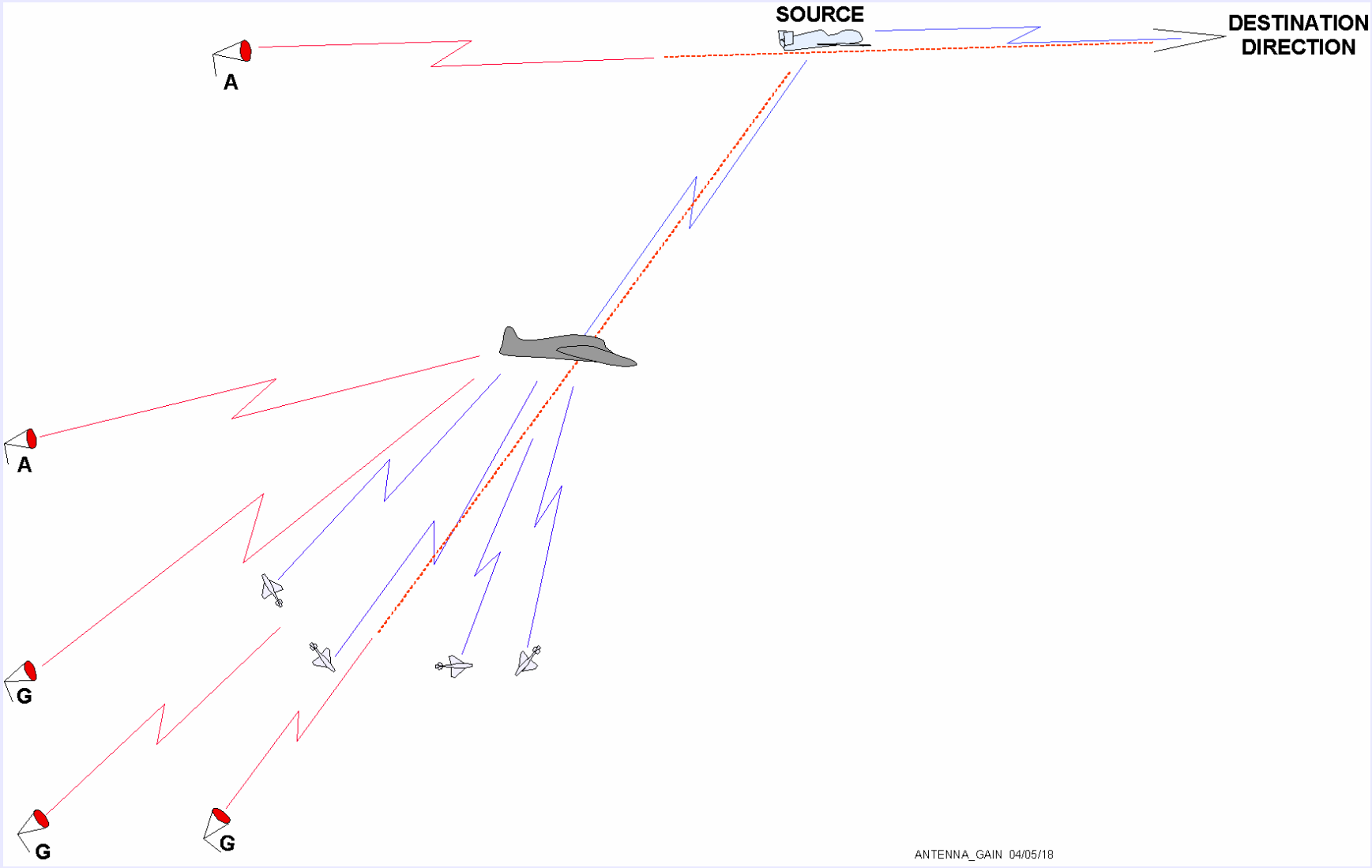
SMART ANTENNAS CAN ADAPT TO THEIR ENVIRONMENT

Current Operational Considerations



Determining Connectivity – Example Factors:

Current Operational Considerations



Determining Connectivity – Example Factors:

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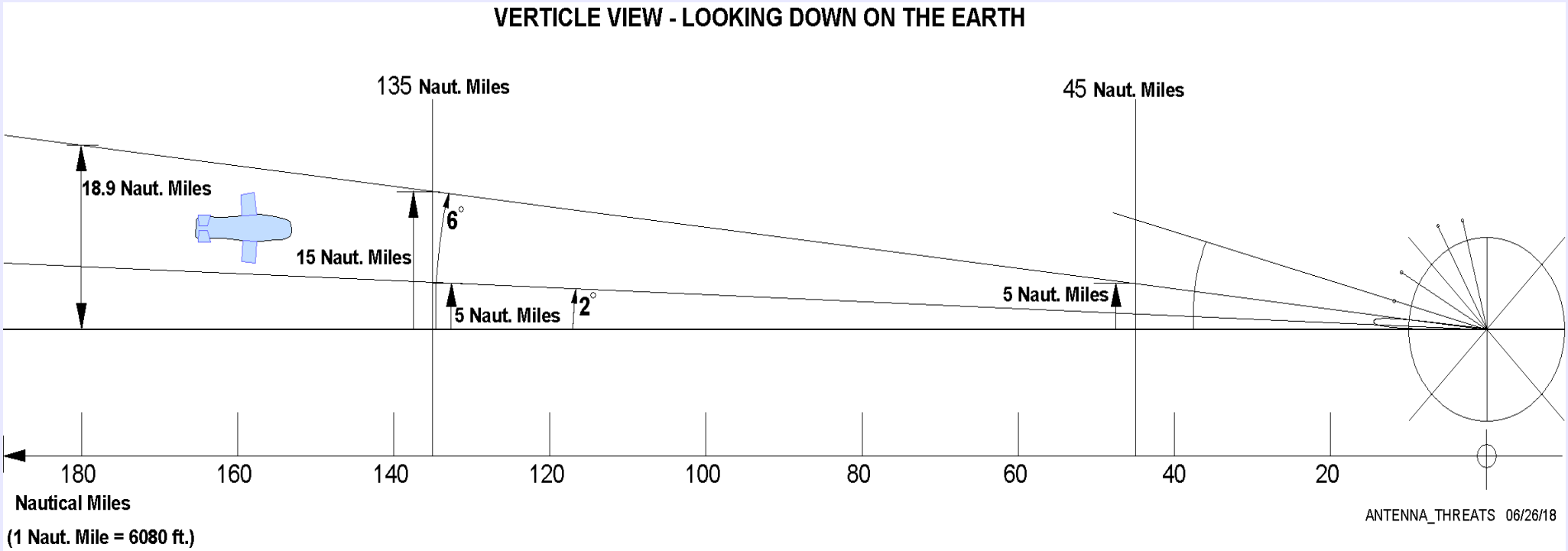
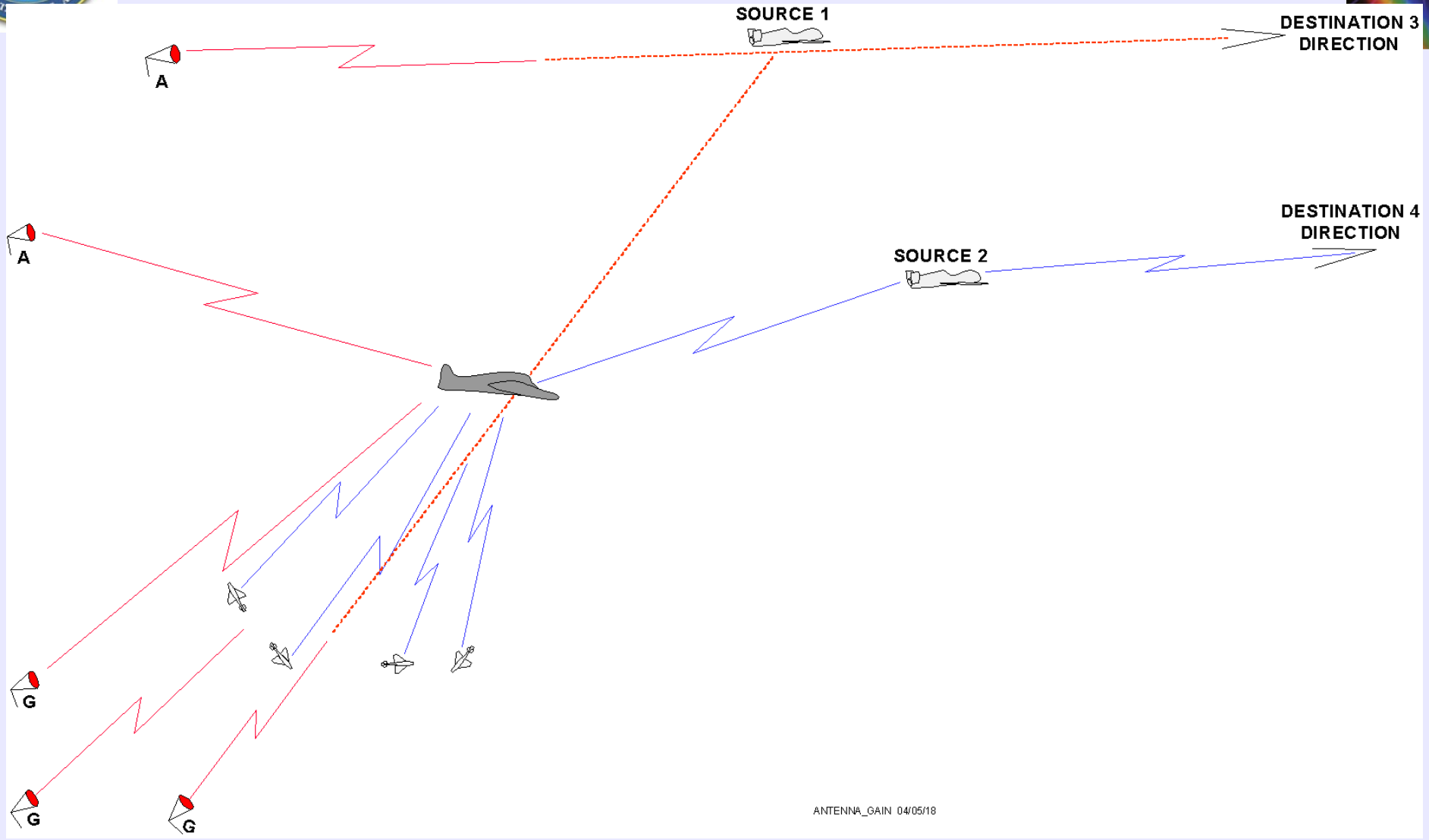


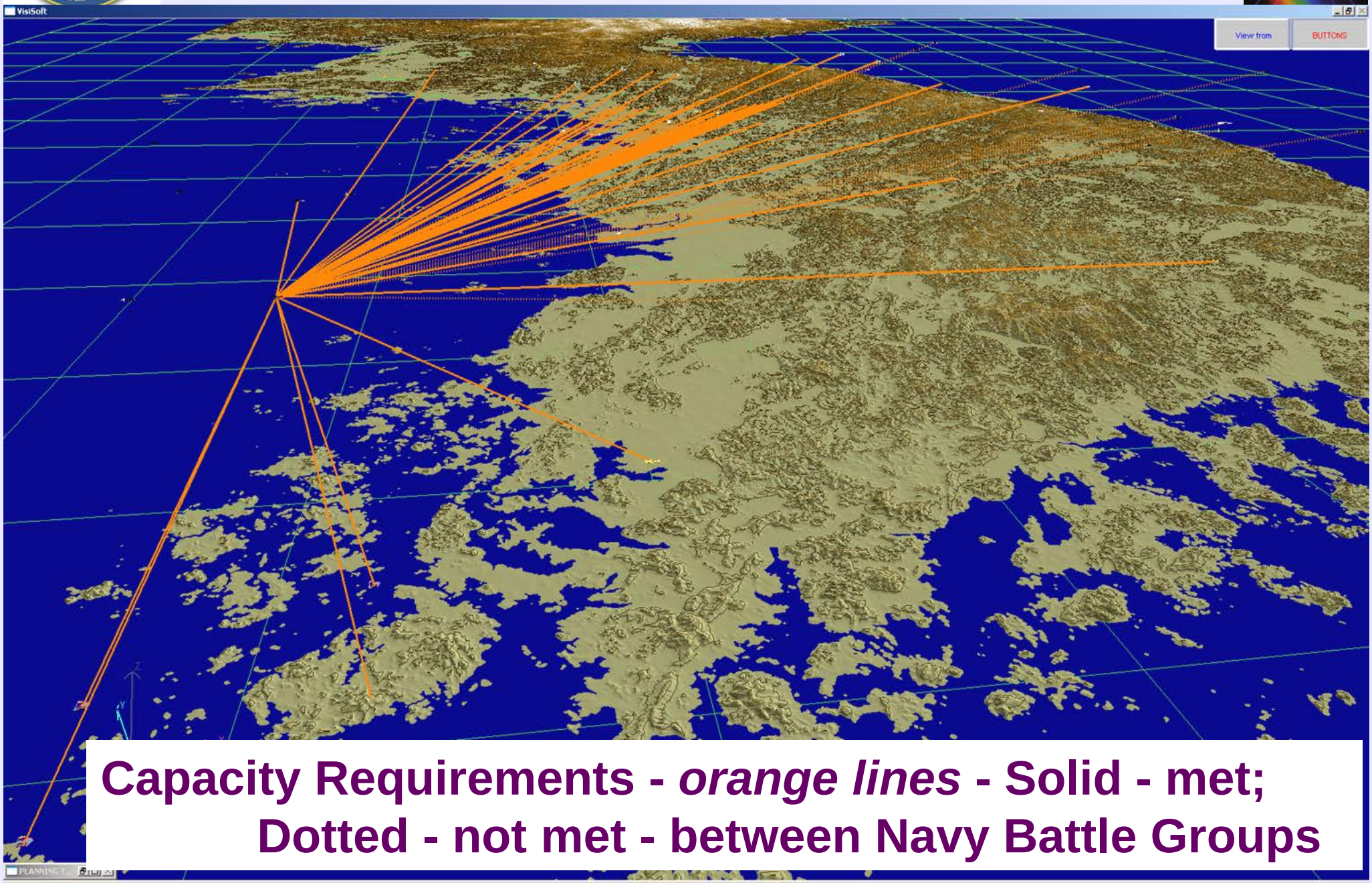
Determining Connectivity – Example Factors:

Current Operational Considerations



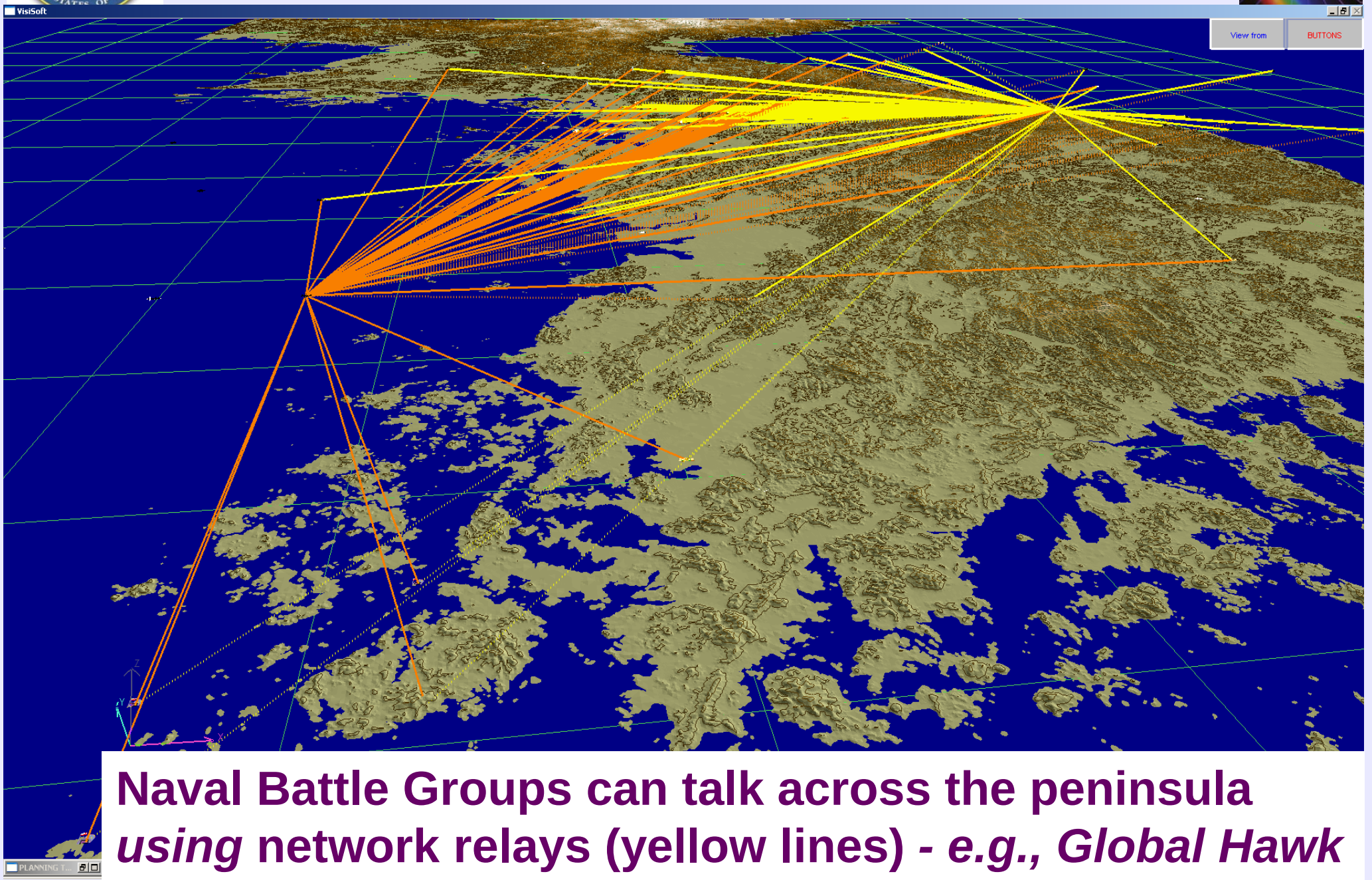
Ensuring Connectivity Requirements are met Using a NETWORK

EXAMPLE REQUIREMENTS



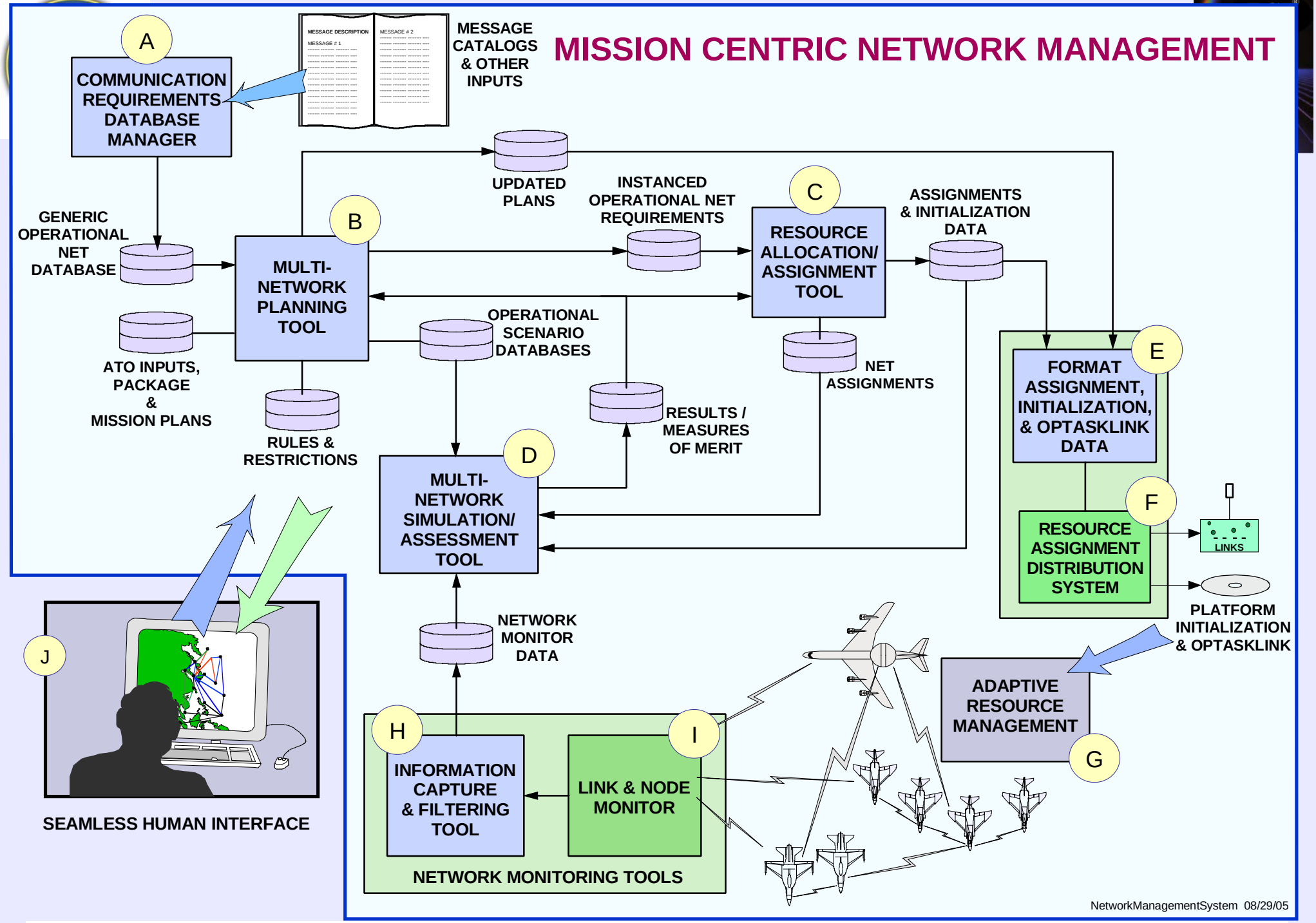
Capacity Requirements - *orange lines* - Solid - met;
Dotted - not met - between Navy Battle Groups

EXAMPLE REQUIREMENTS



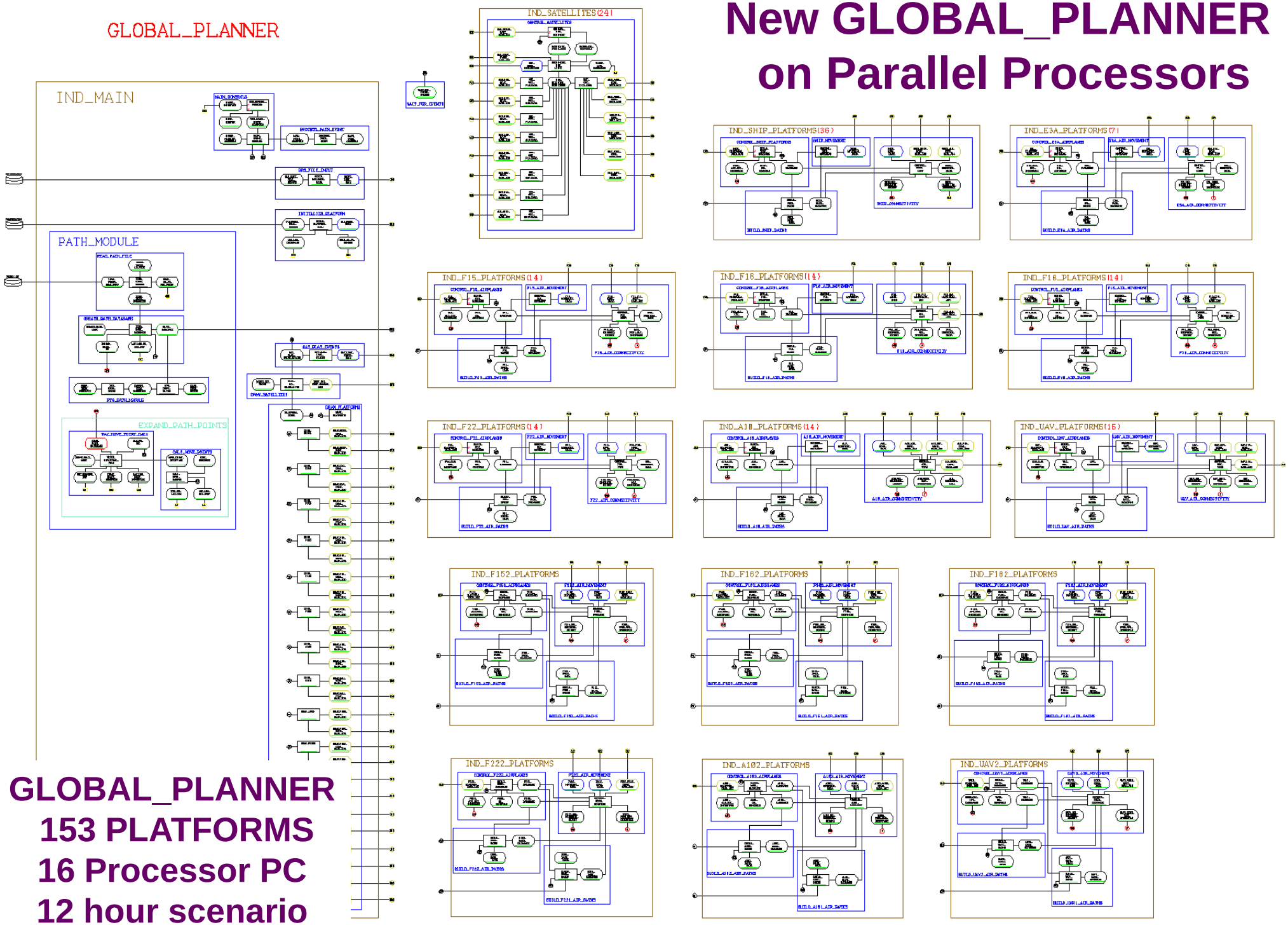
Naval Battle Groups can talk across the peninsula *using* network relays (yellow lines) - *e.g., Global Hawk*

MISSION CENTRIC NETWORK MANAGEMENT



THIS REQUIRES A NETWORK MANAGEMENT SYSTEM

New GLOBAL_PLANNER on Parallel Processors



GLOBAL_PLANNER
153 PLATFORMS
16 Processor PC
12 hour scenario
2.31 seconds

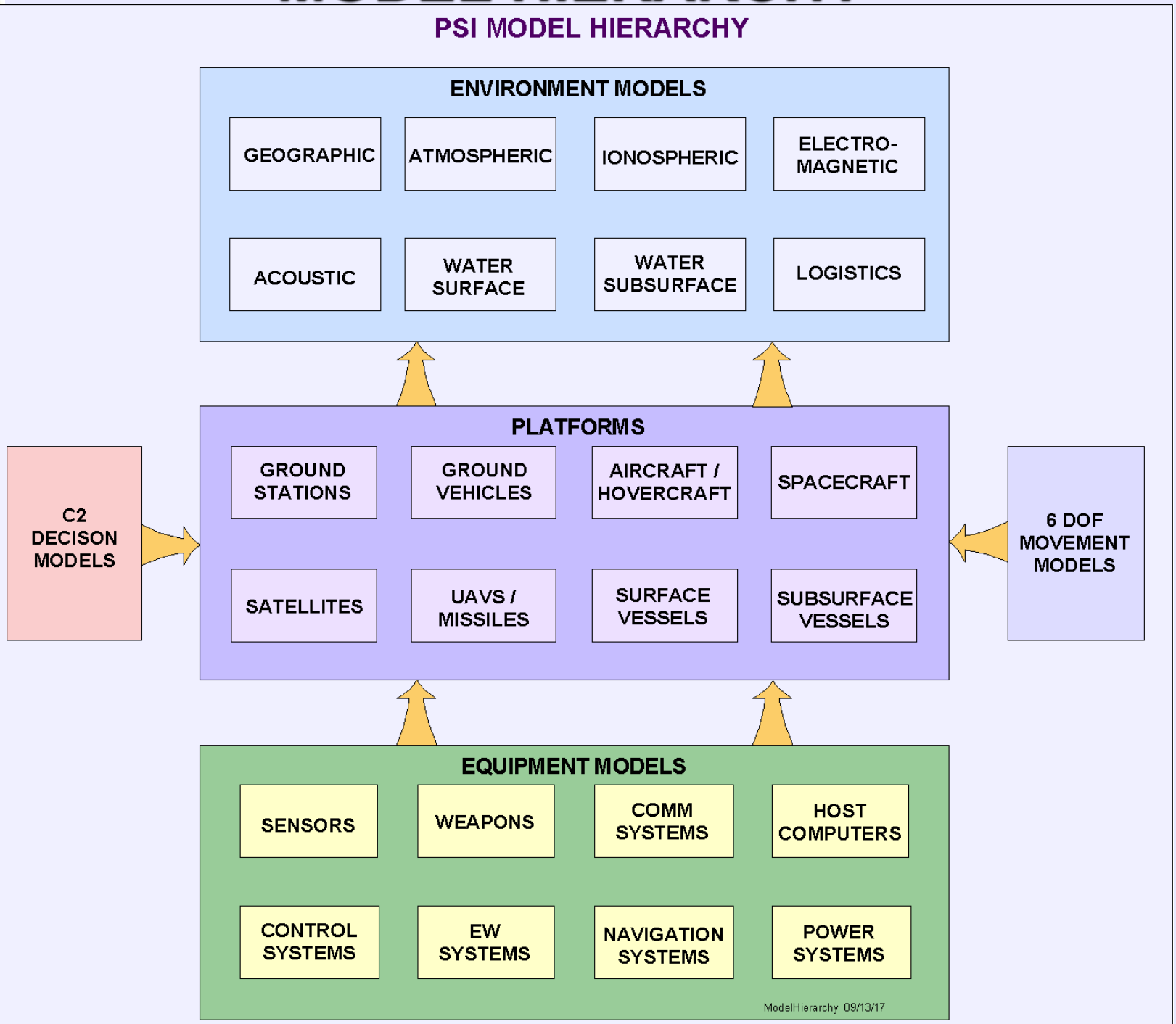
Example Operational Considerations

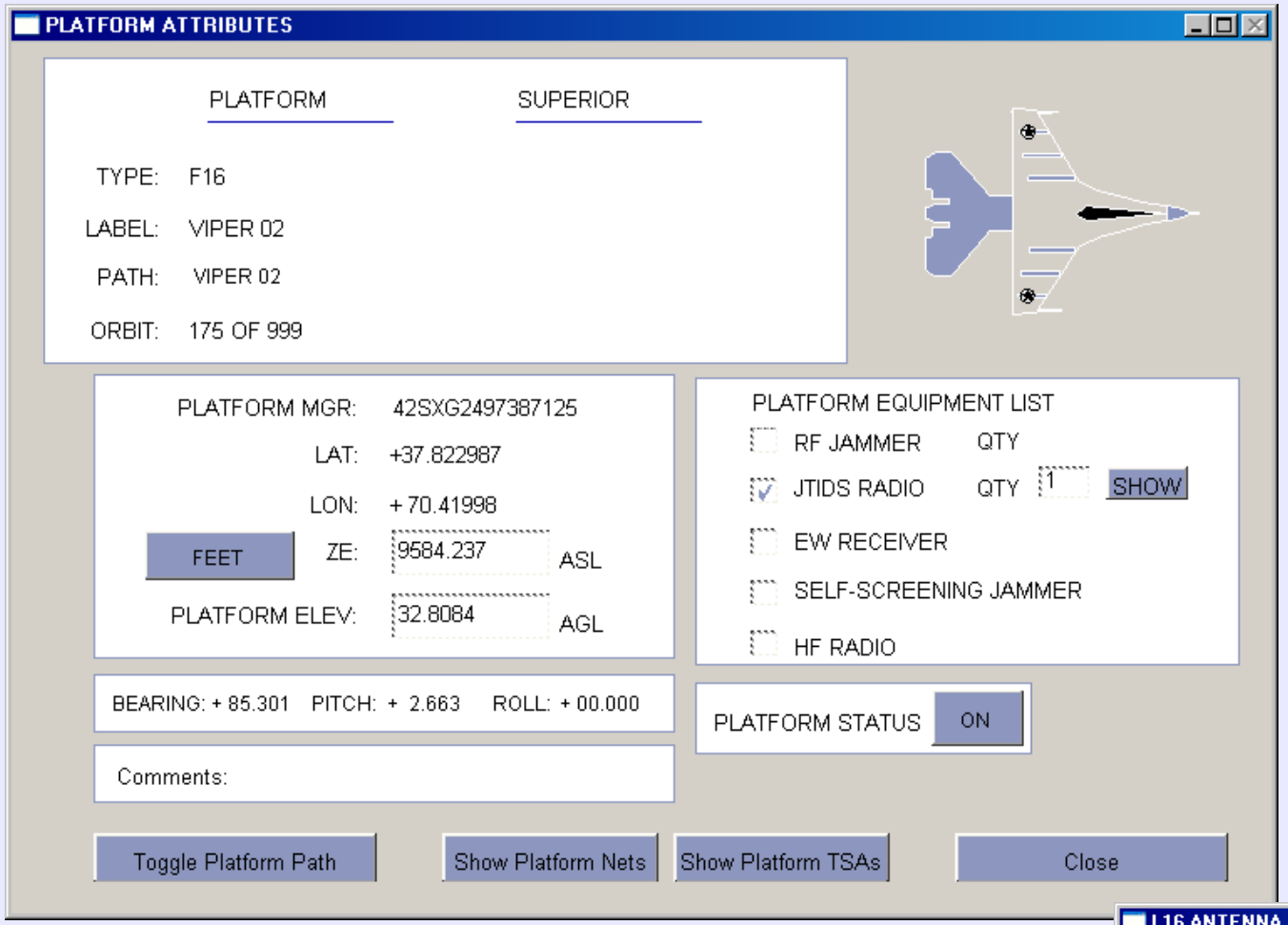
Jammer Power: 10000 Watts, UAV Power: 1000 Watts, ROC: -15 dB														
	U1	U2	U3	U4	U5	U6L	PE	AW	RJ	R1	R2	R3	SH	Total
U1		100%	30%	30%	100%	70%								66%
U2	100%		0%	0%	100%	15%								43%
U3	100%	100%		100%	100%	100%								100%
U4	100%	100%	100%		100%	100%								100%
U5	100%	100%	100%	52%		100%								90%
U6L	100%	100%	100%	100%	100%		0%	0%	0%	0%				56%
PE						100%		100%	100%	100%	52%	0%		75%
AW						100%	100%		100%	100%	100%	0%		83%
RJ						100%	100%	100%		100%	100%	0%		83%
R1						100%	100%	100%	74%					94%
R2							100%	100%	100%			100%	0%	80%
R3							0%	0%	0%		100%		100%	40%
SH											0%	100%		50%
Total	100%	100%	66%	56%	100%	87%	67%	67%	62%	75%	70%	40%	50%	74%

Jammer Power: 10000 Watts, UAV Power: 1000 Watts, ROC: -25 dB														
	U1	U2	U3	U4	U5	U6L	PE	AW	RJ	R1	R2	R3	SH	Total
U1		100%	100%	100%	100%	100%								100%
U2	100%		100%	100%	100%	100%								100%
U3	100%	100%		100%	100%	100%								100%
U4	100%	100%	100%		100%	100%								100%
U5	100%	100%	100%	100%		100%								100%
U6L	100%	100%	100%	100%	100%		0%	0%	0%	33%				59%
PE						100%		100%	100%	100%	100%	0%		83%
AW						100%	100%		100%	100%	100%	0%		83%
RJ						100%	100%	100%		100%	100%	0%		83%
R1						100%	100%	100%	100%					100%
R2							100%	100%	100%			100%	0%	80%
R3							0%	0%	0%		100%		100%	40%
SH											0%	100%		50%
Total	100%	100%	100%	100%	100%	100%	67%	67%	67%	83%	80%	40%	50%	83%

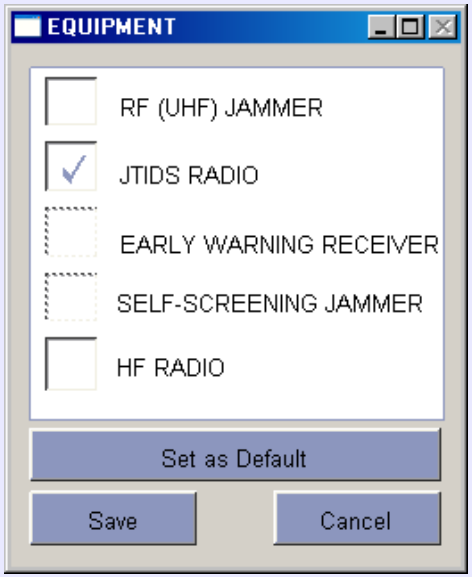
Parametric Analysis of % Connectivity

MODEL HIERARCHY

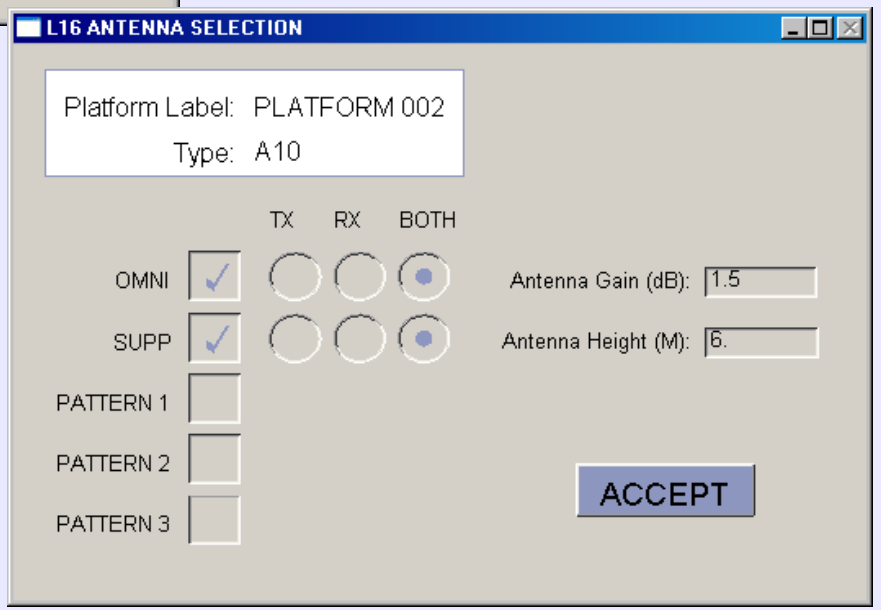




Automatic Development of Simulations



Selecting Models & Parameters



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