

BIG DATA AND DEEP LEARNING FOR LOGISTICS IN SUPPORT OF THE FLEET'S DISTRIBUTED LETHALITY CONCEPT



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Objectives

- Develop Big Data and Deep Learning (BDDL) models which include tools, systems to match the Distributed Lethality (DL) requirements, i.e.
 - Globally distributed resources in geographical regions need to be constantly fused, indexed, cataloged and analyzed.
 - The fused data will be used for building Deep Learning models towards the capability of search, match and optimize the logistics requirements in real-time for the DL concept.
- E.g., Fig. 1 shows an existing system LOGCOP capable of displaying Big Data and situation awareness for logistics requests, but it does not provide the analytics needed for the DL concept.

Tab. 1 Current Logistics Support Systems

	Supply Sources	Managed by Databases	Mechanisms
Food	US sourced food services, foreign certified contractors for market ready, local fruit & vegetable.	ShipCLIP, BirdTrack	
Fuel	DLA, MSC	Replenishment at Sea Planner (RASP)	
Munitions	Ashore bases or Vertical Launching System	OIS, SIPR LOGCOP	
Parts	Military Sealift Command (MSC) ships	BirdTrack	Casualty Reports (CASREP)
Platforms	ShipCLIP	SIPR LOGCOP	Five Centralized Logistics Office (CLO), i.e. Norfolk, 3 rd , 7 th , 5 th and 6 th fleets

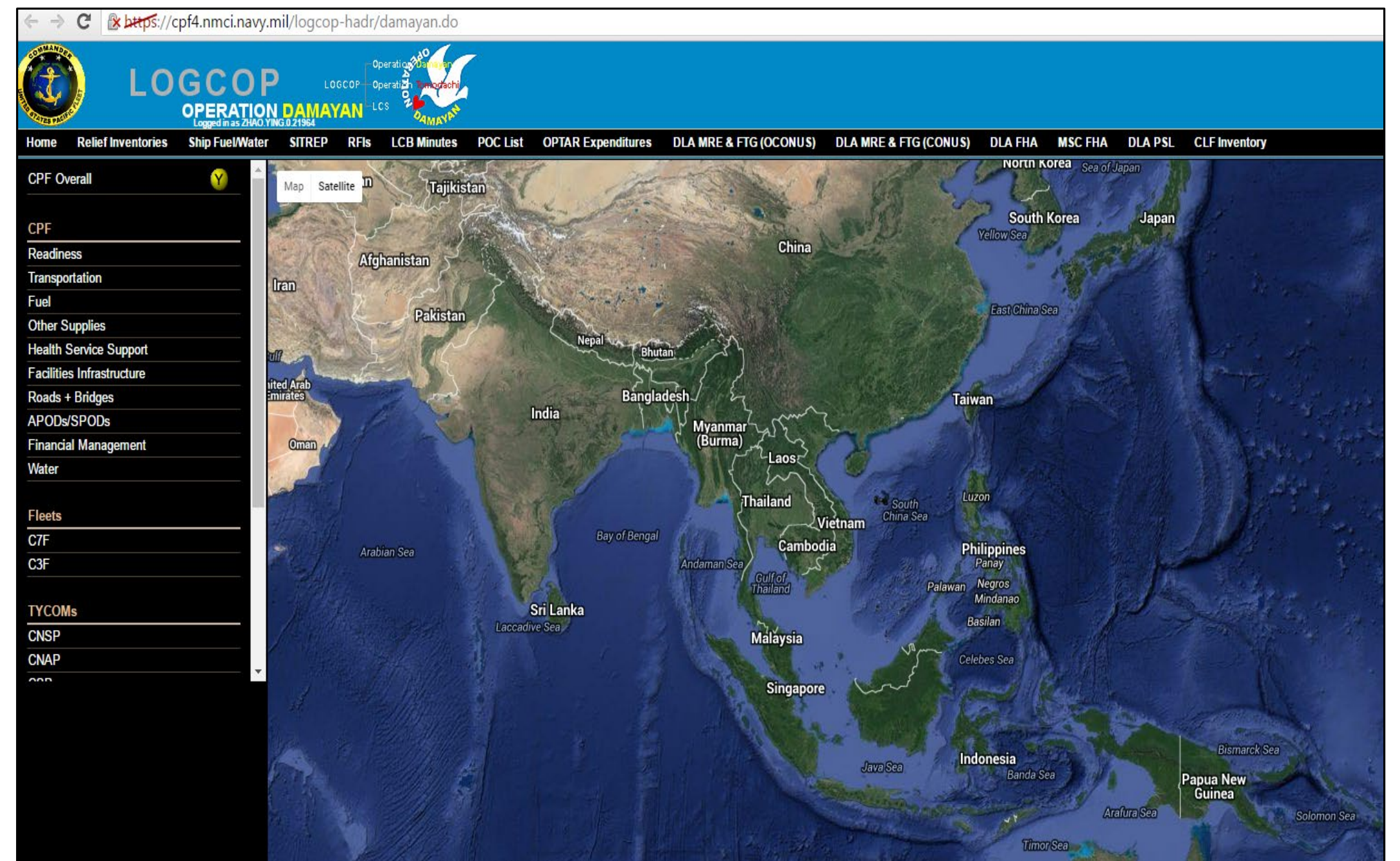


Fig. 1 NIPR LOGCOP

The Logistics Requirements for the DL Concept/Challenges

- A typical DL mission may need logistics to support the platforms, munitions, parts for the capabilities such as LCS, DDG, LHA, JHSVS, PBFM and P8. Can they be supported from the current sea based and shore based logistics operations?
- The DL concept may also require relocating logistics sources that are not usually in the current logistics resources, for example, partner nations and remote islands (e.g. the Wake island).
- The DL concept requires new ways of organizing, training, programming, maintaining, equipping, and operating the surface force for combat readiness, material and personal readiness. New combat conditions such as the A2AD environment which challenges the current logistics systems and they are addressed in the DL concept.

Findings and Conclusions

- We researched the current logistics processes and capabilities in conjunction with the requirements with the DL warfighting concept:
 - The core DL warfighting concept involves moving offensive capabilities in distributed locations and weaponizing new platforms that previously have no weapons.
 - The DL warfighting concept requires support of food, fuel, munitions, parts and platforms from a wide range of databases highlighted in Tab. 1
- We extracted three years (8/2013 to 8/2016) of 84 Aegis ships about ~1 million requisition documents from the BirdTrack or ACWT to demonstrate that incorporating BDDL is critical and feasible for the Logistics Innovation for the DL concept highlighted in Fig. 2

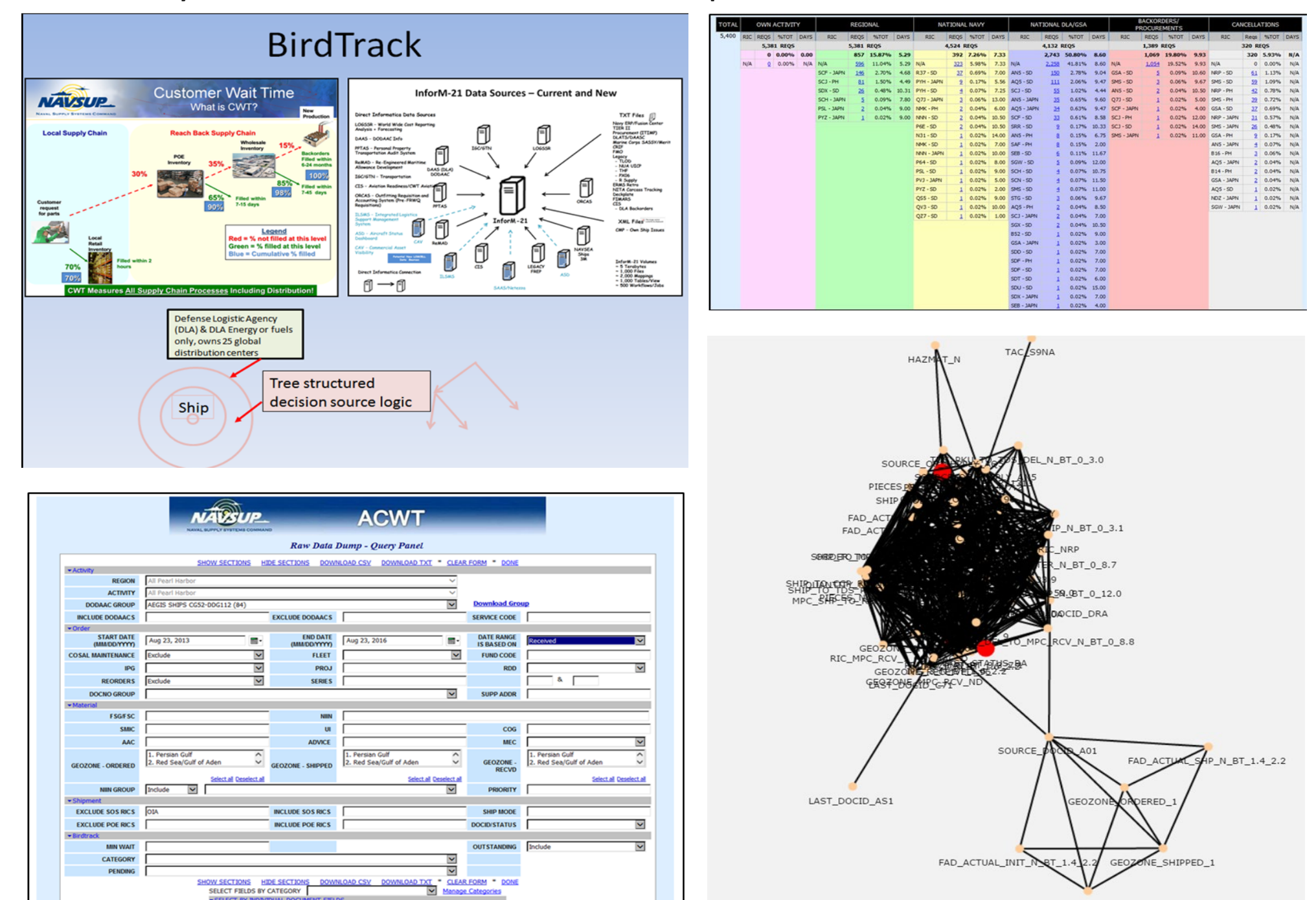


Fig. 2 BirdTrack or Average Customer Waiting Time (ACWT) Demonstrating BDDL

Future Work

- Design the DL logistics support data models using LOGCOP together with BirdTrack host at the NAVSUP InforM-21 which already contain many DL relevant data feeds. The data models need to gradually expand to include MSC, OIS, FIMARS, FSM & Navy ERP to address the needs of the DL scenarios.

- Extend the existing analytic capabilities such as the Google earth interface and real-time reports to include the BDDL models as Data-Driven Documents (D3) and Deep Learning such as Lexical Link Analysis (LLA).
- Research on how the results from the BDDL, e.g., patterns, associations, correlations and trends that are discovered in the historical data, can be applied to optimize the real-time DL logistics support, with respect to the current logistic measures.



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