



# Integrated Analysis in a Synthetic Battle Space

Lessons from  
JPOW 2019



# Collaborative R&D Effort



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**TNO Defence, Safety & Security**

**Royal Netherlands Armed  
Forces**

**German Air Force**

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Maj Alex Mac Lennan, et al (NLD GBADC)  
LtCol Dirk Reinartz, et al (GAF)



# First Proof of Concept

## Integrated Analysis

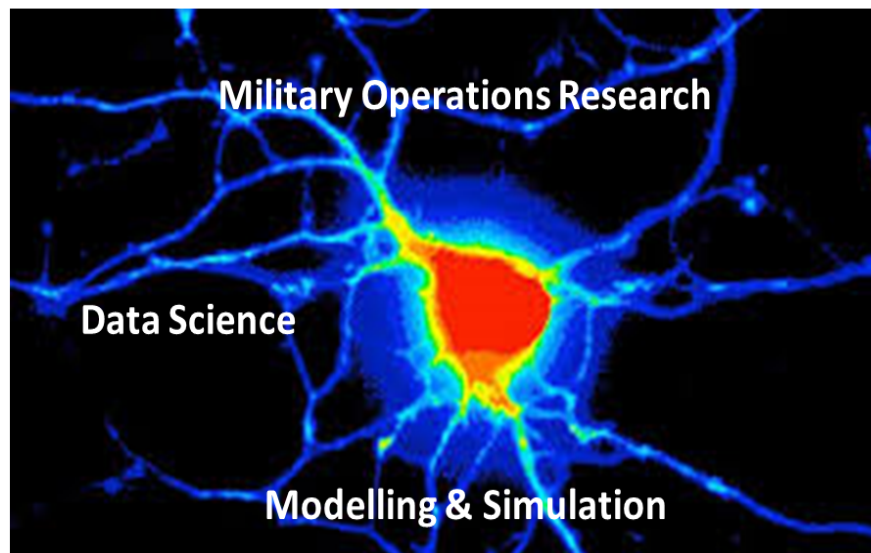
Objectives based analysis

Data driven analysis

Operations analysis

Technical analysis

Deep analysis





# Battle Space

## Integrated Air & Missile Defence





# Interoperability

**If you can't plug, you  
can't play!**





# Synthetic Battle Spaces in IAMD

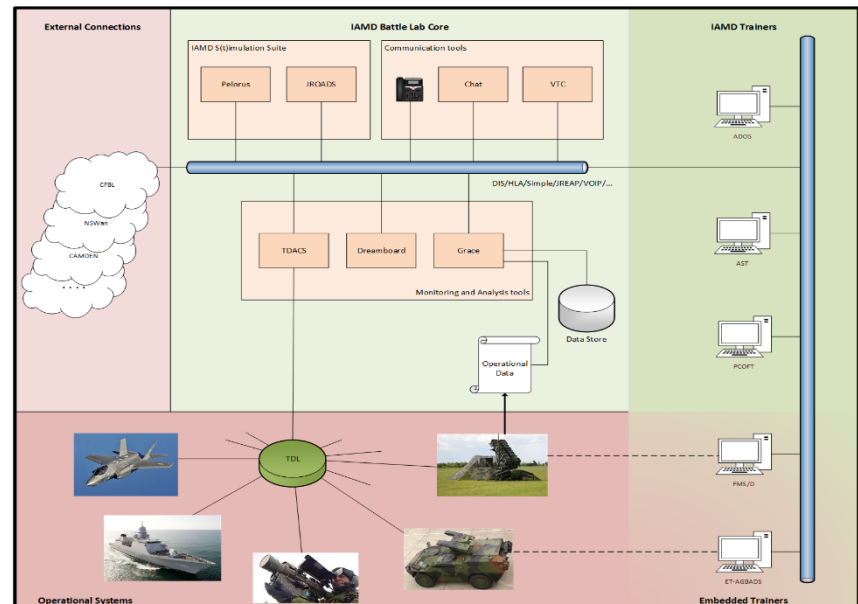
- Ad-hoc Synthetic Battle Space

- JPOW Exercise Series
- COW Exercise Series
- MTDS



- Persistent Synthetic Battle Space

- IAMD Battle Lab
- Maritime Battle Lab
- NATO ITB
- Enhanced Battle Lab
- CCBAMD







Luftwaffe

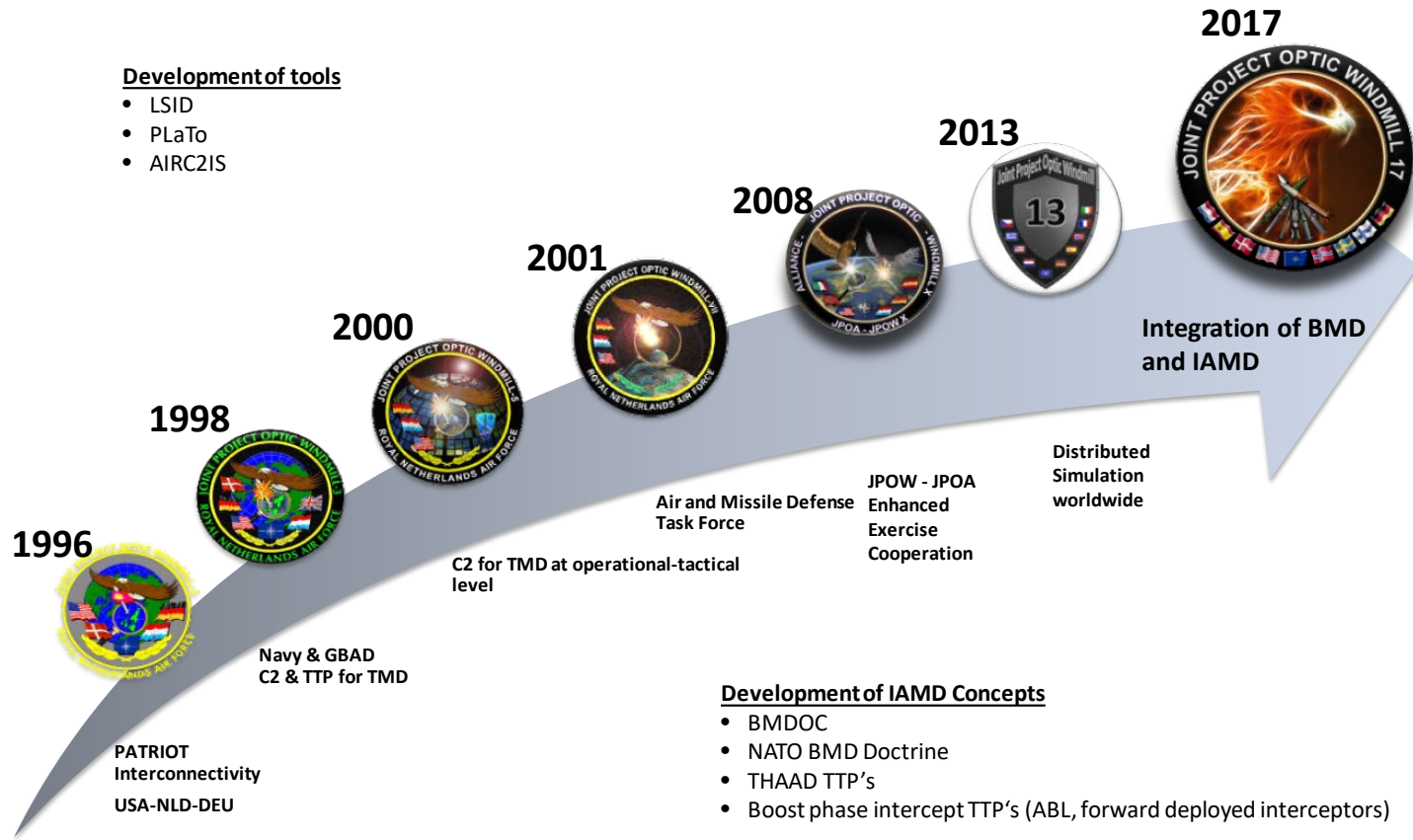
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# 1996





# Joint Project Optic Windmill



Development of tools

- LSID
- PLaTo
- AIRC2IS

Development of IAMD Concepts

- BMDOC
- NATO BMD Doctrine
- THAAD TTP's
- Boost phase intercept TTP's (ABL, forward deployed interceptors)





# Key JPOW Concepts



**Outlook to the future**

**CD&E + Execution Phase**

**Co-located & Distributed Set-Up**

**LVC Players**

**Operational & Tactical level**

**Joint Analysis Effort**



# JPOW19





# Participants JPOW19

## The Netherlands

Air Force (AOCS NM, NDMC)  
Navy (ADCF)  
Army (AGBADS, PATRIOT) (Live)  
TNO (Support)



## C2 JAPCC

Exercise Director



## Norway

NASAMS (Live)



## C2 CC SBAMD

JPOW organisation  
EXCON / HICON Manning



## Denmark

Navy / CD & E (Live)



## United States of America

US STRATCOM  
US 10th AAMDC (PATRIOT, THAAD)  
USAFE  
USEUCOM  
MDA  
IBCS (Northrop Grumman Mission Systems)



## Finland

CD & E (Live)



## Sweden

CD & E (Live)



## NATO

SHAPE  
JFC Brunsum  
ACC Ramstein  
COAC Uedem  
DACC Poggio Renatico  
MARCOM Northwood  
SFN  
NATO C&I Agency



## Germany

Air Force ( PATRIOT, SAMOC) (Live)  
Navy (F124 Sachsen class frigates) (Live)  
ASACS (CRC Element)  
IABG (Saapes, Simburg)  
LinkSystems (PACTOS)  
MBDA  
German National Data Link Cell



## Spain

PATRIOT  
NASAMS



## France

SAMP/T (Live)  
JFACC Manning



## Greece

PATRIOT  
JFACC Manning



## Poland

JFACC Manning  
AMD C2 CPs (Live)



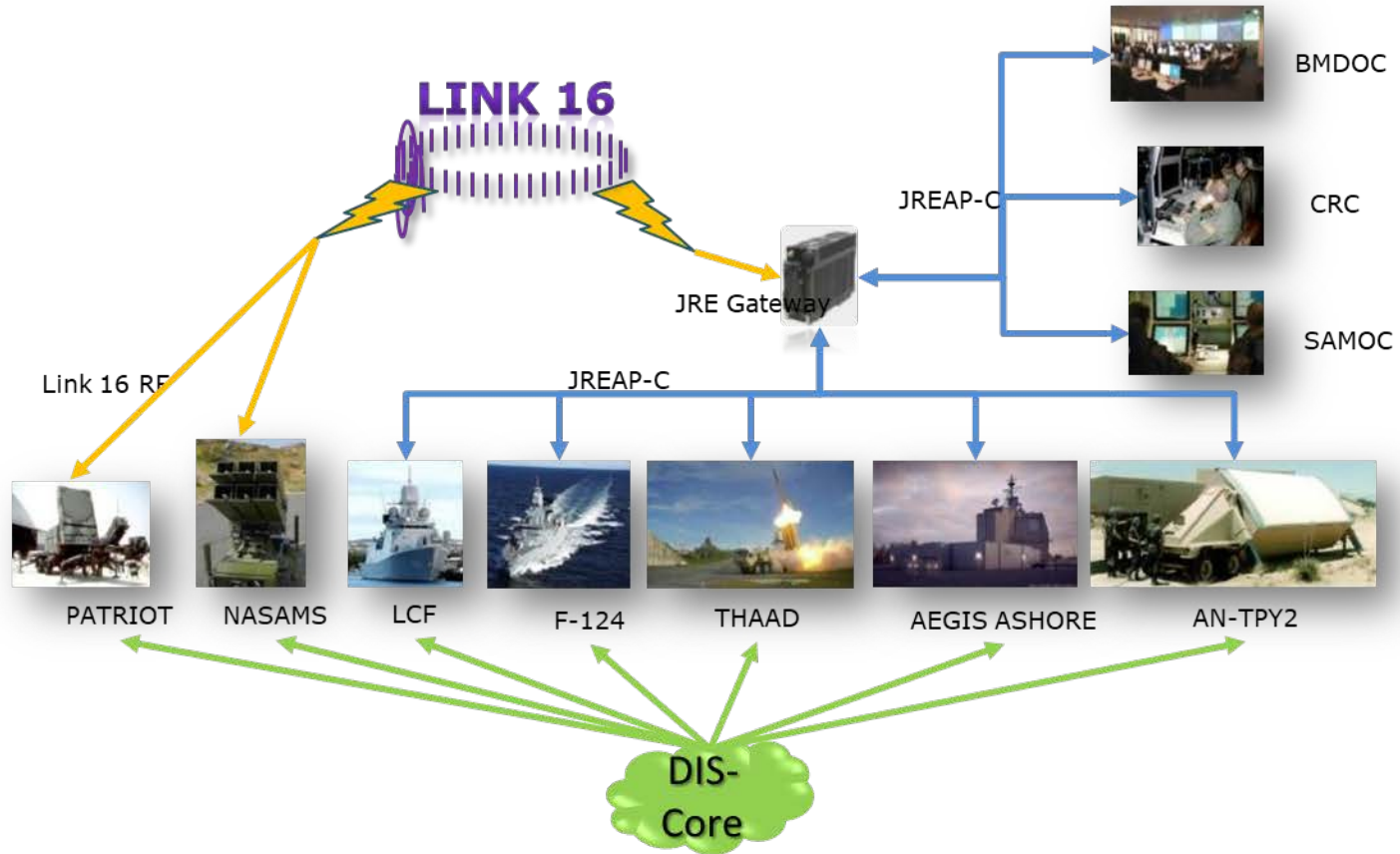


# JPOW19 Organisation





# Typical JPOW Network







# Main Lessons Identified





# The Need for Deep Analysis...





# Integrated Analysis?

## Definitions

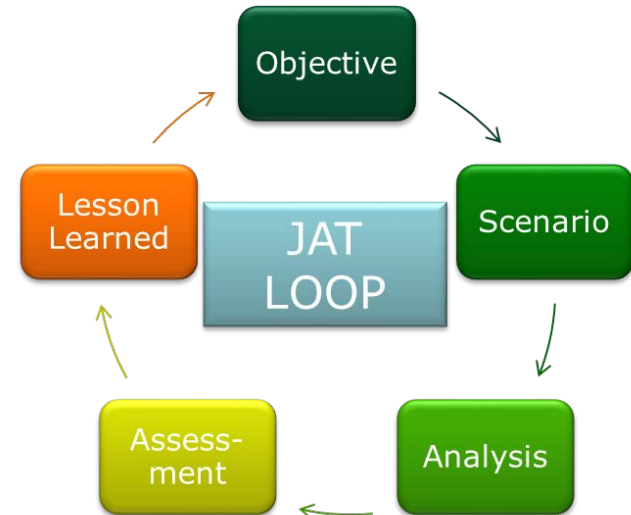
- Trading and investment
  - consider as many perspectives as possible
  - rapid assessment of large volumes of data
  - identifying additional sources of risk and opportunity
  - contributing to better overall investment decision-making
- US National Oceanic and Atmospheric Administration - Fishery:
  - Stock assessment methodology
  - to integrate multiple sources of data into a single estimation framework
  - fit a variety of observation types and model predictions
- Psychology Methods
  - ‘the simultaneous analysis of multiple data sets’.

## Main requirements

- handle large amounts of different types of data
- monitor and analyse (near) real-time
- post-event (off-line) analysis
- compare observations against (M&S) predictions
- assess solutions against multiple criteria
- synthesise and/or perform meta-analysis
- support decision making
- support (organisational) learning

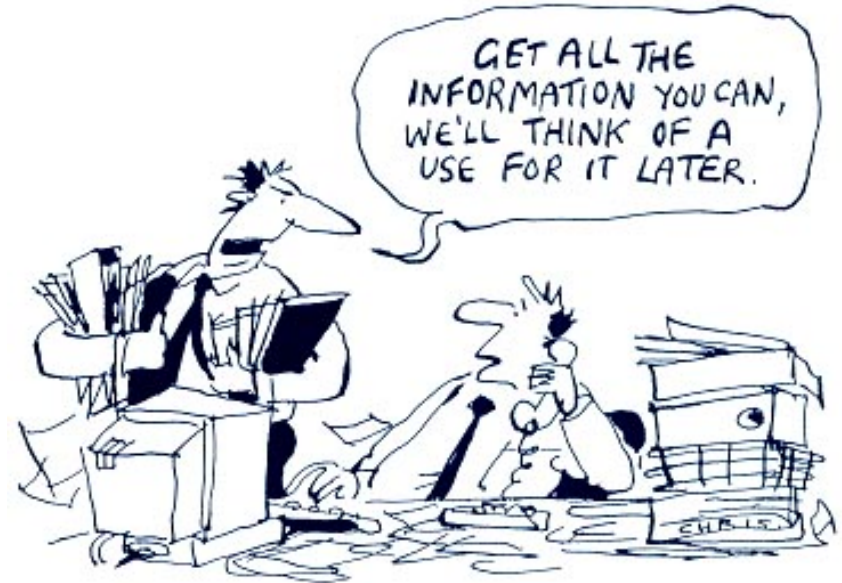


- Participant Objectives
  - Input for the scenario development
  - Focus for analysis by Joint Analysis Team
- Data collection and analysis plan
  - Metrics
    - MOE/MOP
  - Observation forms
    - NATO Lessons Learned format





- Comprehensive
- Synthesis
- Meta-analysis
- Focus on joint level



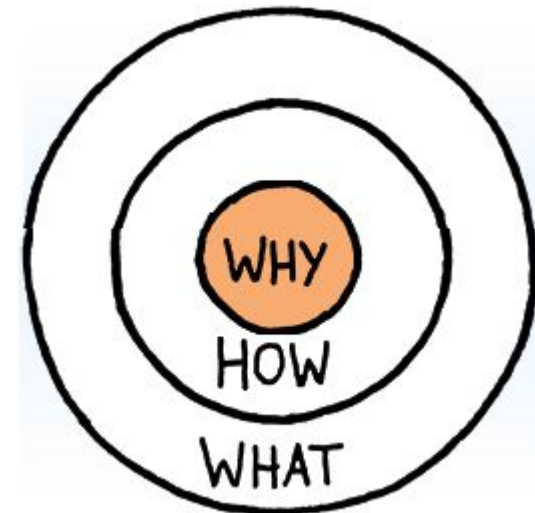
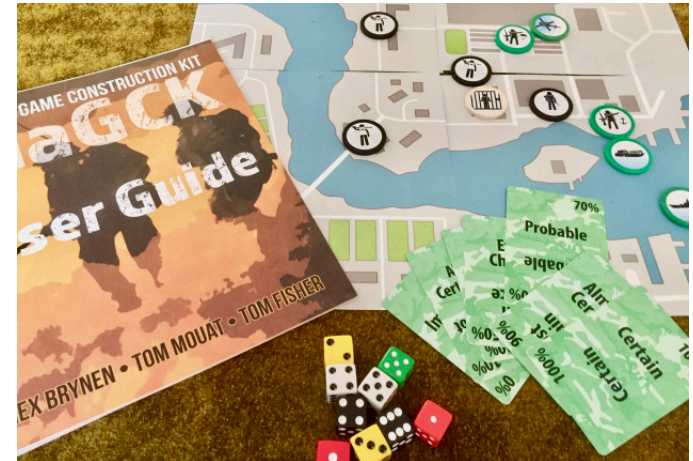
- Variety of
  - Control groups and expertise involved
  - Qualitative data: observation forms, defence designs, ...
  - Quantitative data: data loggings, ....



# Integrating Analysis

- Objectives Based & Data Driven analysis
- Technical & Operations analysis
- Qualitative & Quantitative analysis
- Air Defence & Missile Defence analysis
- Daily process & Exercise loop
  
- Requires organisational & technological innovation

- Adjudication Cell
  - Wargaming
  - Focussing on engagement results (What)
- Integrated Analysis Cell
  - Supporting root-cause analysis (Why)
  - Improving training value
  - Enhancing the EXCON organisation



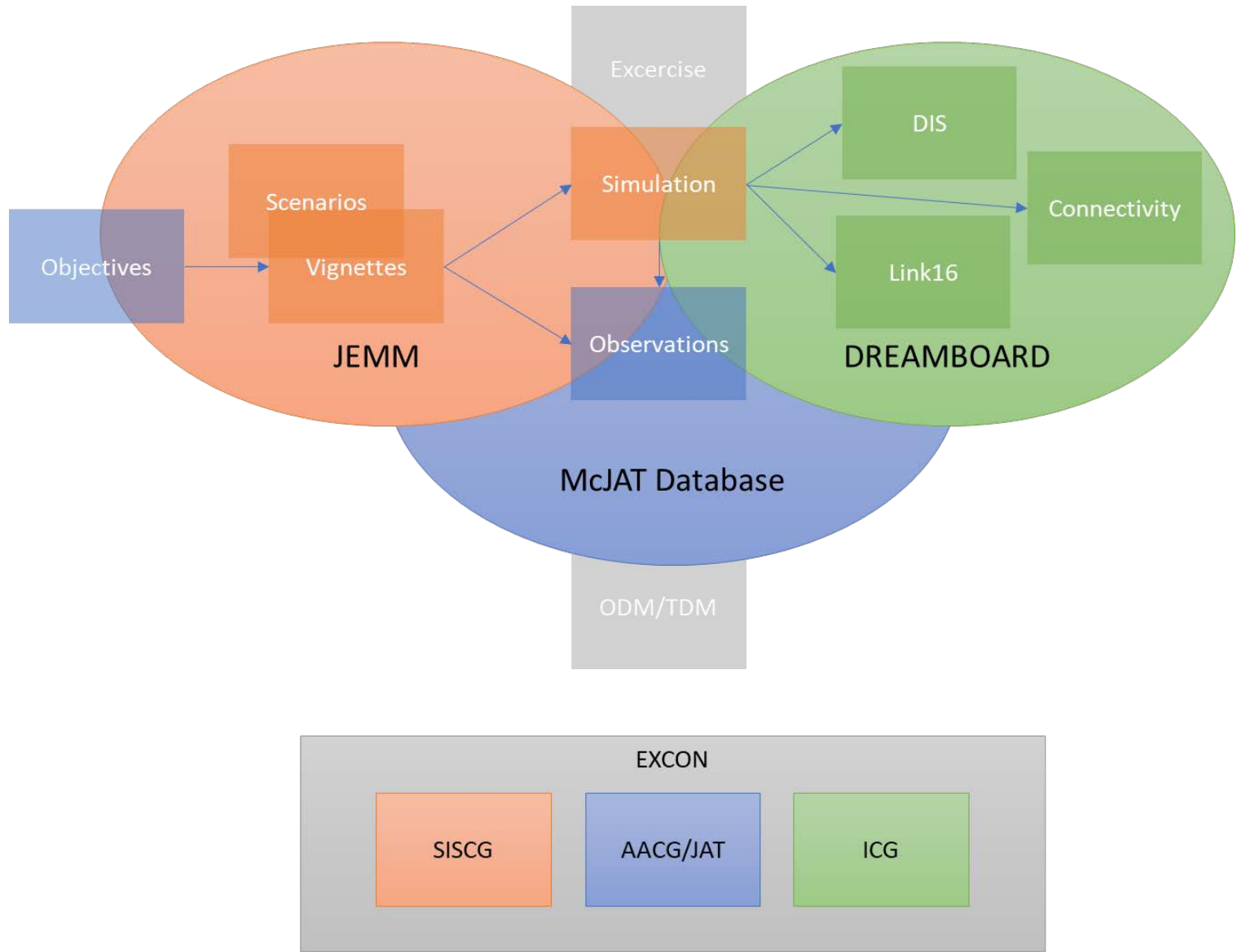
## Building on existing and specialised efforts

- Extensive toolset
  - Typical for ad-hoc synthetic battle spaces
  - Mixture of scientific, industrial, and NATO tools
  - Different purposes
    - monitoring and analysis
    - operations and technical analysis
- EXCON support tools
  - Baseline
  - PELORUS, JROADS, GRACE, GAMEBOARD, JODA, TDACS, and ADIVS





# Integrated Analysis Concept







# Newly introduced tools

- **McJAT**

- Observation forms
- NATO LL format: ODCR
- MS Access database, accessible on SharePoint

- **JEMM**

- NATO Scenario Management Tool
- Improving EXCON situational awareness on scripted scenario events and injects

- **DREAMBOARD**

- Database
- Analysis Application
- Dashboard

**Input Observations - SME -**

Objective Number:  Date planned:

Nation:  Unit / Entity:  Assessment Area:

Name SME:  Date Observation:

Location:  Time Observation:

Status Green  Status Red  
 Status Yellow

Obj. No	Date	Name SME
DEU 001	3-1-2019	Dell, Andreas
NLD 001		
NLD 001	4-1-2019	
ESP 001		
FR 001	5-1-2019	Albin, Woody
ITA 001	11-1-2019	
ITA 001		

Objective

Objective Number:  Date planned:

Nation:  Unit / Entity:  Assessment Area:

Joint Exercise Management Module (JEMM)

Documents | Map | Key Processes | Training Objectives | MELAR | Exercise Script | Reports | EDIT | RFC | OPCAR | Administration

Found 19 entries that meet the selected criteria:

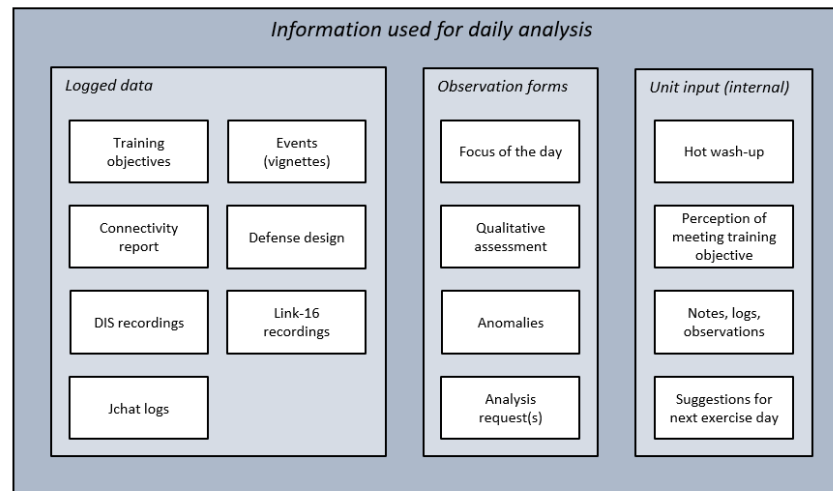
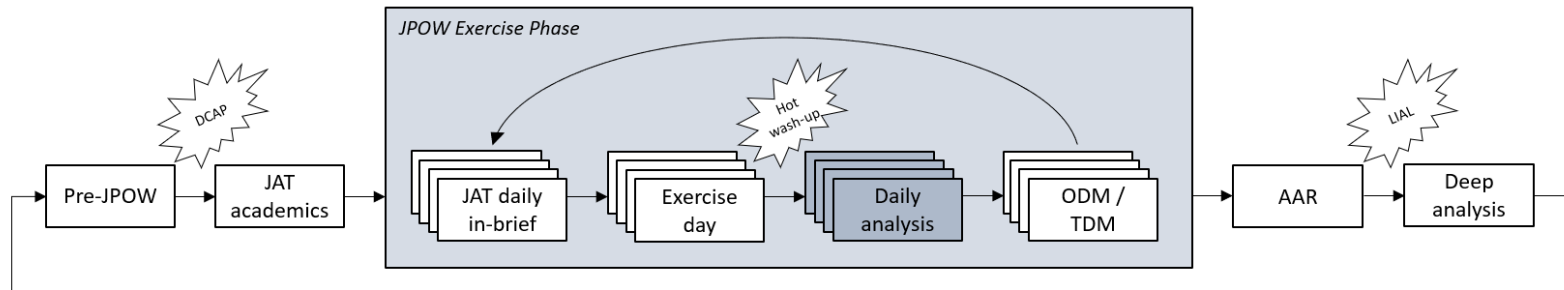
Link	Reference	Subject	Sender / Channel	Reactivity	Means	Date & Time	State
		STARTREX				25 APR 2012 09:00 Z	
	01 01 A02	VAD detector	SITFOR - LAP			26 APR 2012 01:00 Z	Ongoing
	01 01 A03	Water mine located close to Wierds	SITFOR - LAP			04 25 APR 2012 10:30 Z	Scheduled
	01 01 A03	NRF Rescue Operation	WC - INT MEDIA	DUTY COM	E-MAIL	25 APR 2012 02:43 Z	Rejected
	01 01 A01	Contact repetition-LAP Police in local NRF LOC times	SITFOR - LAP	LCC 02	PHONE	25 APR 2012 03:50 Z	Injected
	01 01 A04	Magpie May movement	SITFOR - LAP			25 APR 2012 05:00 Z	Completed
	01 01 R01	STREP	LCC 02		MOCON - INTEL	26 APR 2012 10:23 Z	Heading
	01 01 A08	PHUO Request mission	SITFOR - OPY	DUTY MEDIC	PHU	26 APR 2012 10:56 Z	On hold
	01 01 A02	Reception NRF INTSUM of day 2	LCC 02		MOCON - INTEL	04 25 APR 2012 14:51 Z	Draft
		ARL Level 3				25 APR 2012 17:00 Z	
	01 01 A04	Charge ACC escorted by Two VAD Fighters	LOCON - ACC	ACC ACC	PHONE	26 APR 2012 10:00 Z	Scheduled
		EXCON landing, heading 37				27 APR 2012 10:00 Z	
	01 01 07	HEAVYSTEP	MOCON - INTEL	ACC 02, ACC ACC	US MAIL	27 APR 2012 19:38 Z	To be updated
	01 01 05	Refugee Inland Status Setting	LOCON - MCC SURF	MCC JOC	US MAIL	28 APR 2012 16:12 Z	Draft
	01 01 08	INTREP - Prussia Terminal SH arrival date, OPY	SITFOR - OPY	LCC 02	PHONE	28 APR 2012 13:47 Z	Cancelled
	ESD001	test				14 MAY 2012 15:50 Z	
	01 01 A01	ICRC Members trapped	SITFOR - LAP			15 MAY 2012 08:46 Z	Completed
	01 01 A02	UN informs DUTP trapped USA Field Workers	WC - MGRND	DUTP J9	E-MAIL	15 MAY 2012 15:19 Z	Approved
		ENDEX				20 MAY 2012 12:00 Z	

Apply | Reset





# Integrated Analysis Process





- Proof of concept

*‘via integrated analysis it is possible to translate zeros and ones into common operator language’*

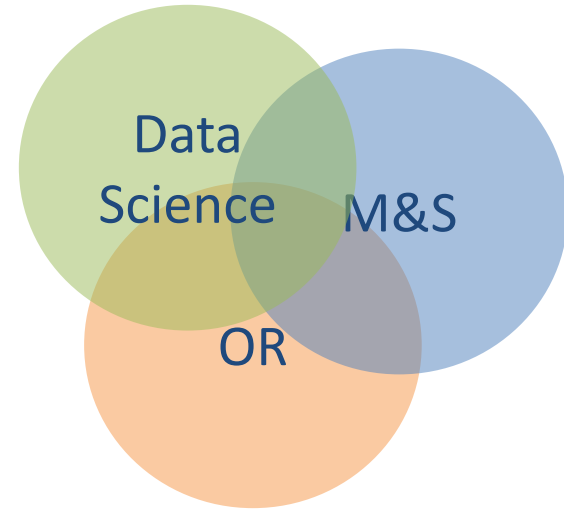
*‘via such an integrated approach the investigation, analysis, and common understanding of why certain events in the scenario played out in the way they did, can be done in a comprehensive manner’*

- Quick realisation at relative low cost and risk, due to:
  - Combination of proven technologies and technological innovations
  - Iterative, collaborative, and multidisciplinary R&D approach
- Focus on integrating the analysis effort, and not necessarily on integrating all tools into one common toolset.





- Further development of the Integrated Analysis Concept & Toolset
- Advancements
  - IAMD domain
  - OR, M&S, Data Science
- Using the DREAMBOARD Database
- Implementation in IAMD Battle Lab – creating persistent IAMD Battle Spaces



# Questions?

