

Ministry of Defence

CICS Benchmarking: Bachelor for NEC-era Signals Officers

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Outline

Goal:

- To describe benchmarking of bachelor-level course for Signals, IS, & C2 officers against NEC Maturity Level 4

Overview:

- Introduction & motivation
- Doctrinal background
- NLD Signals, IS, & CIS officers
- Existing course
- Knowledge officers need in NEC-era
- Conclusions & recommendations

Introduction

Netherlands Defence Academy (NLDA):

- Initial officer education:
 - All 4 Dutch military services
 - Military forming & academic education (Ba. Level)
- Related scientific research

My appointment:

- Professor, Operational ICT & Communications
- Management:
 - Team of 7.5 fte lecturers
- Education:
 - Bachelors-level course for signals & CIS officer cadets:
Communications-, Information-, & C2 Systems (CICS)
- Research:
 - 6 projects, 5 PhD candidates
 - See also Dick Ooms (paper 123) & Gijs vd Heuvel (paper 044)

Motivation

Argument:

- NEC-era officers are now cadets
- They need scientific grounding
- Educators responsible for providing this
- Courses normally based on current insights
- Hence, we must look ahead 5 to 15 years
- NATO NEC Maturity Levels enable this

This paper:

- Shows how NEC likely to affect Training
- Suggests ways to enhance similar courses

Doctrinal background (1)

Recent trends:

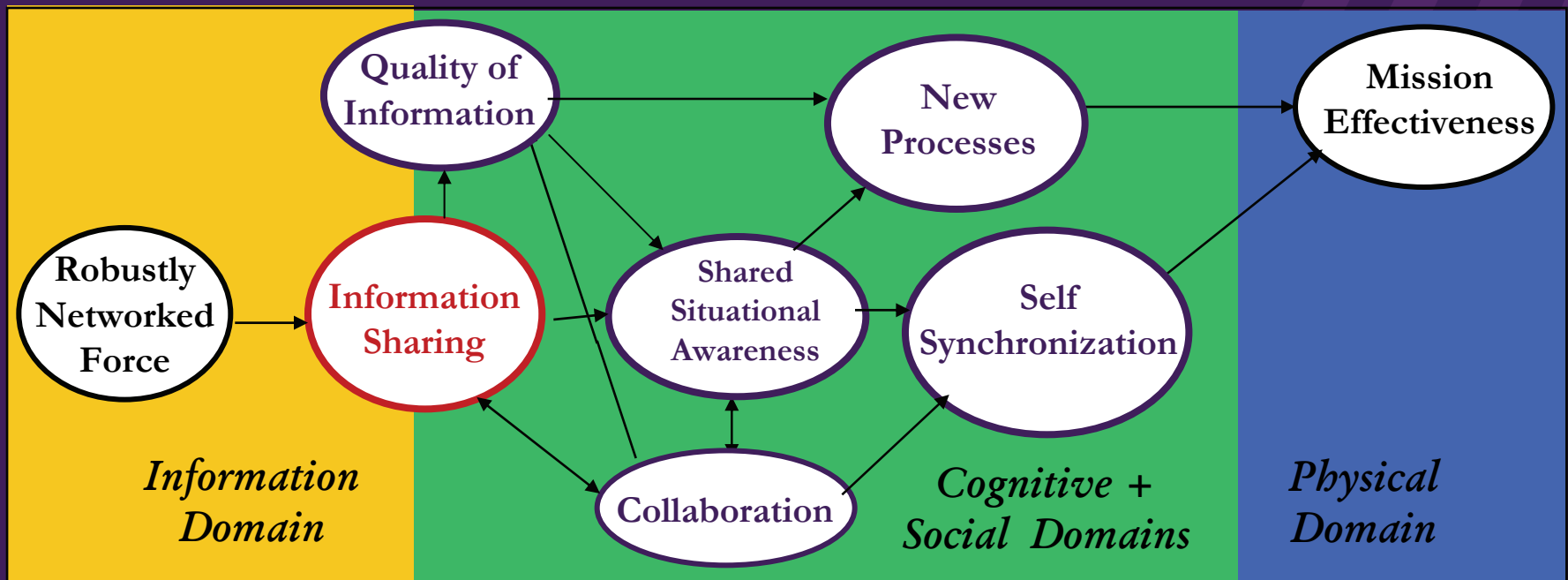
- Complex endeavors, eg Iraq, Afghanistan:
Defence, diplomacy, & development (“3Ds”)
- Officer as “Thinking Warrior”:
Making knowledge-intensive decisions under stress
Develops innovative responses to novel situations
Same skills as needed for scientific research
Hence, needs academic education

From Netherlands Defence Doctrine (2005):

- Information operations
- Effects-based operations
- **Network Enabled Capabilities (NEC)**

Doctrinal background (2)

NEC value chain:



Doctrinal background (3)

C2 as communication:

- Information sharing ...
 - Human – human
 - Human – machine
- ... mediated by information processing

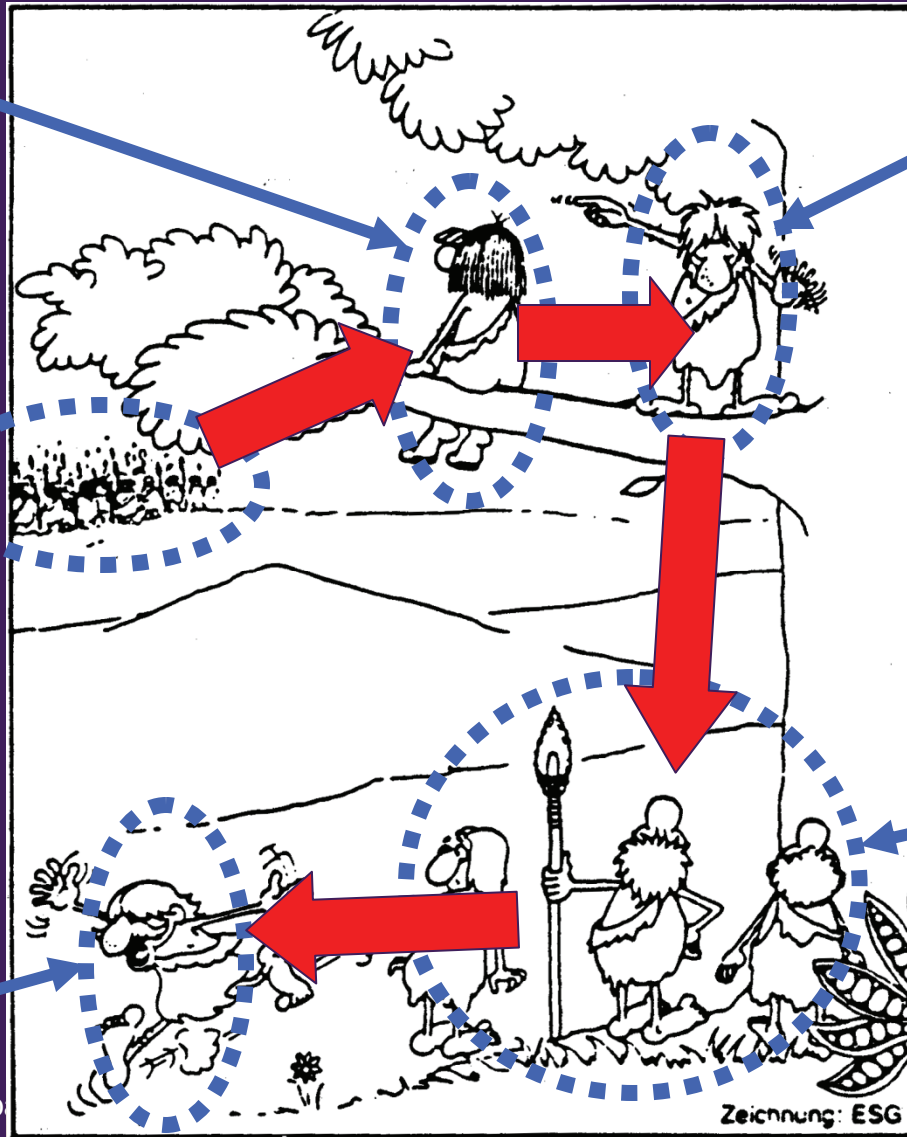
C2 system = Information System (IS):

- Usually technological:
 - Information & Communications Technology (ICT)
- but not always ...

Doctrinal background (4)

Observing
Communication
underlies C2

Assessing situation (Orient)



Event occurring in environment

Deciding

Acting

Doctrinal background (5)



*Example C2 system
(L-frigate CMS)*



Doctrinal background (6)

Another example C2 system (Uruzghan, Jun 07)



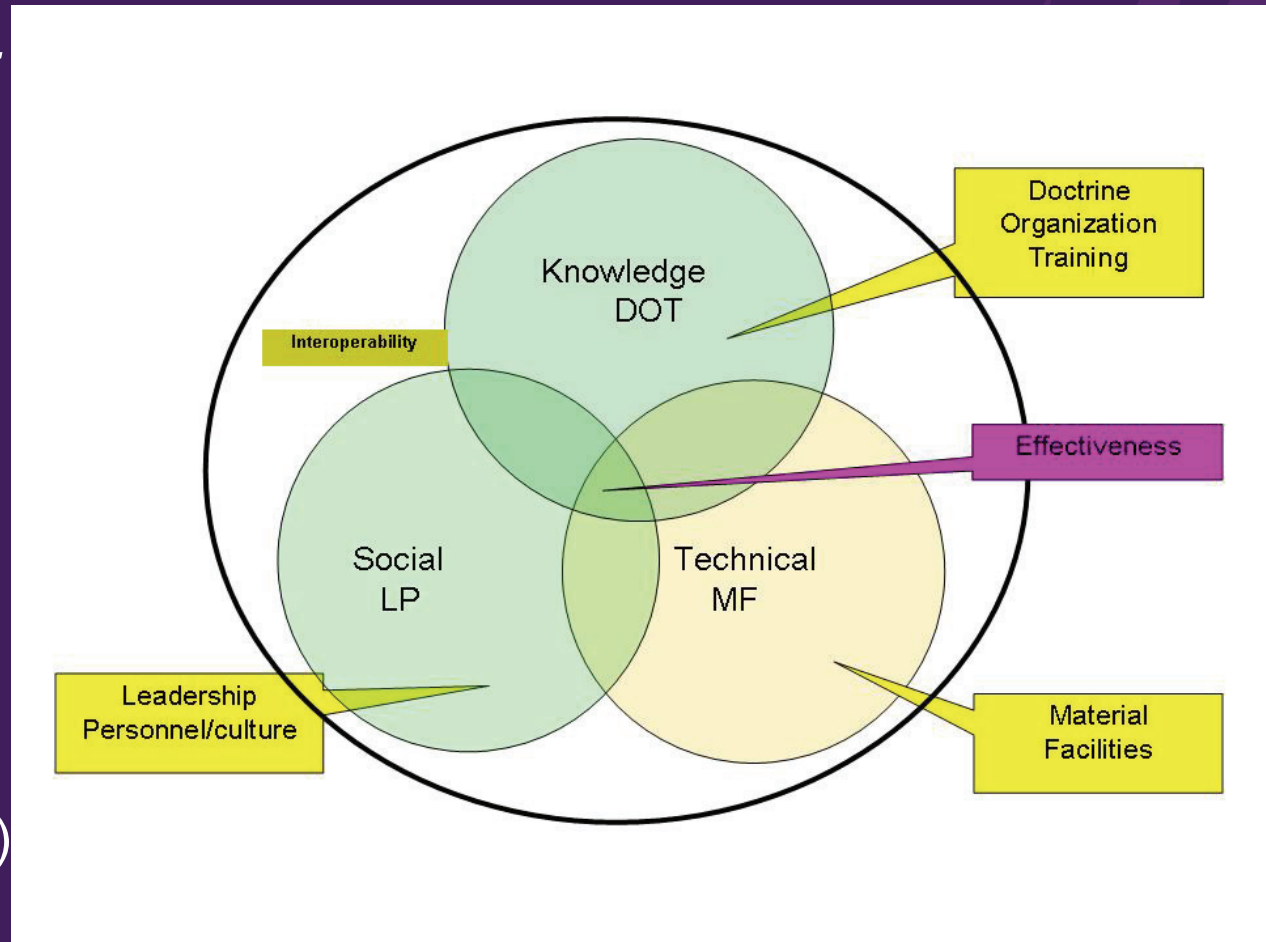
Doctrinal background (7)

DOTMLPFI factors:

- Doctrine & ROE
- Organization
- Training & education
- Materiel
- Leadership
- Personnel
- Facilities
- Interoperability

Three networks:

- Social
- Knowledge (cognitive)
- Technical

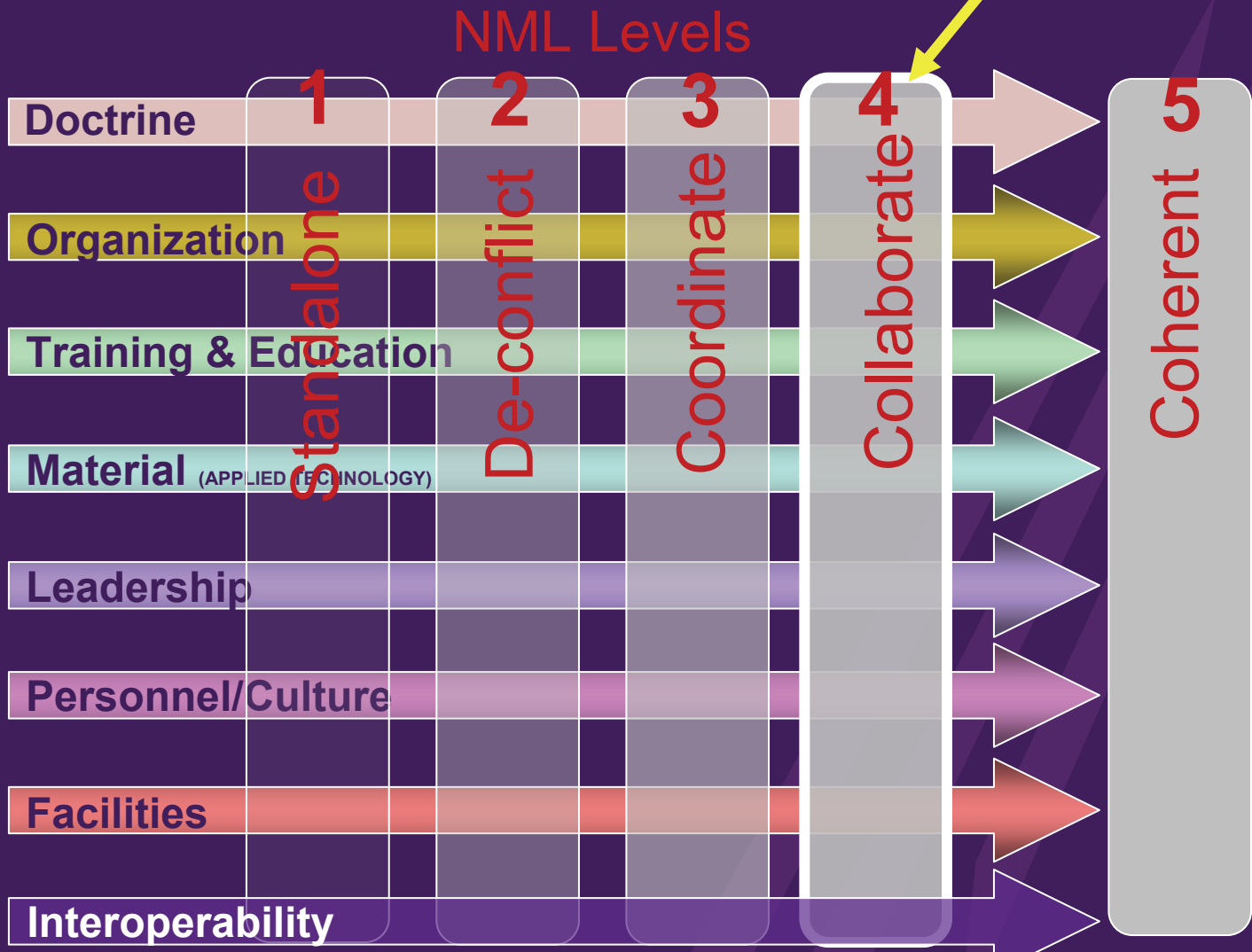


Van Ettinger, 2008

Doctrinal background (8)

Where we want to be in 2016 (NDD)

Lines of Development



NLDA Signals, IS, & C2 officers (1)

Lead & manage activities supporting C2

CICS officer profile:

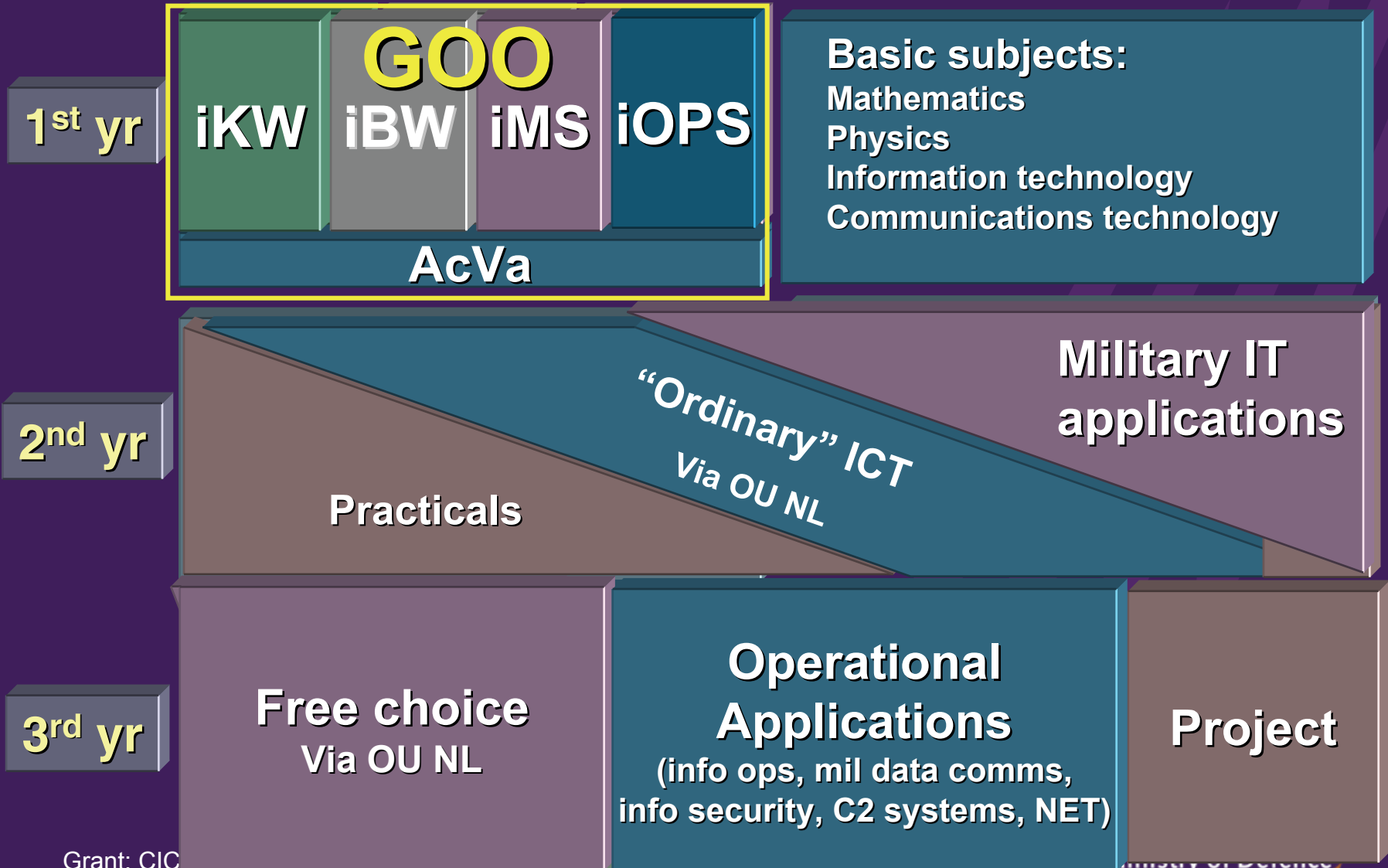
- As commander:
 - Applies IS units, including networks & EW
- As advisor to commander:
 - Analysis of commanders' C2 & IS needs
 - Planning & coordinating application of C2 systems, MIS, & IS networks
- In peacetime, preparing C2 & IS support:
 - Including selection, development, & maintenance of C2 & IS systems & networks

NLDA Signals, IS, & C2 officers (2)

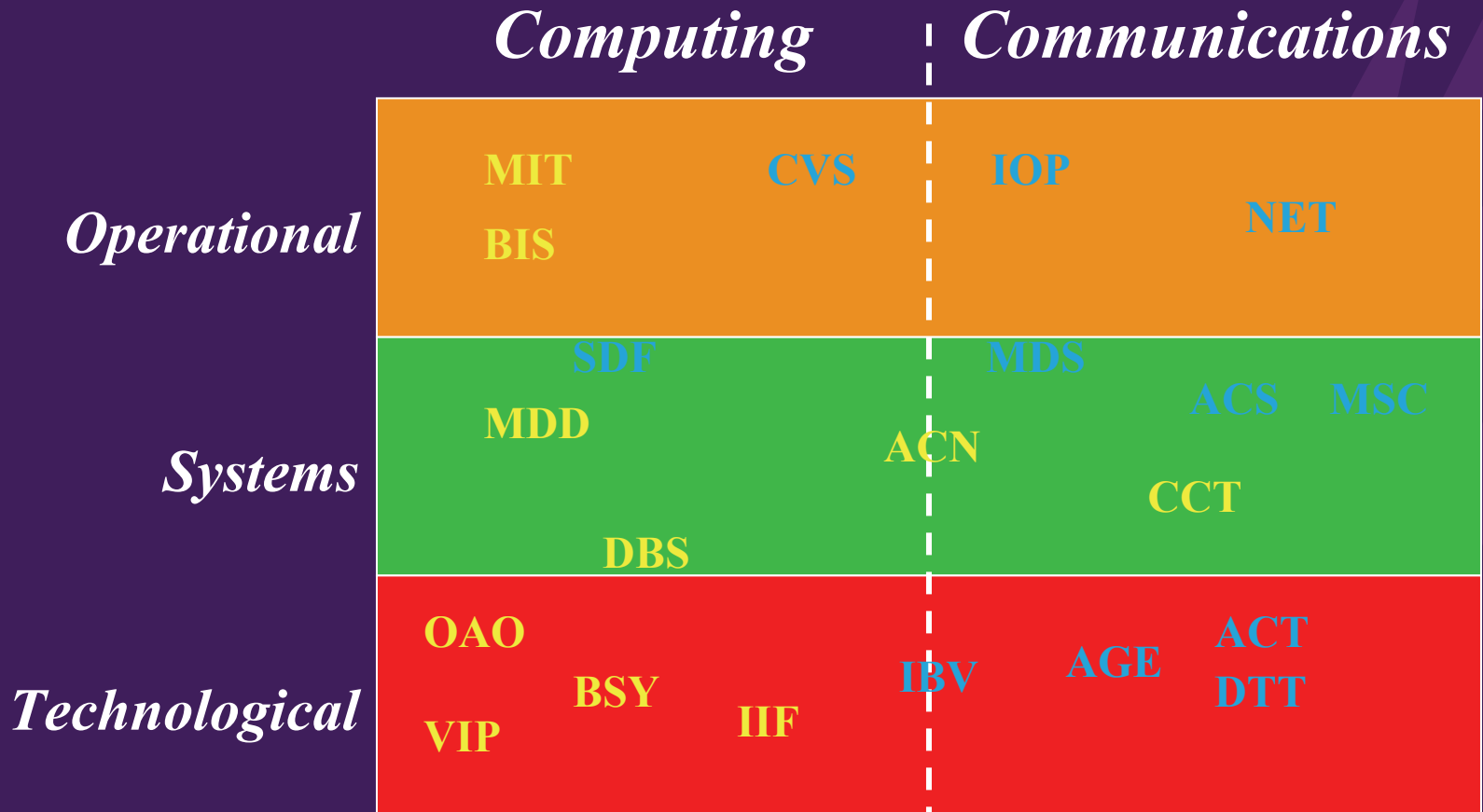
Competencies:

- CICS officer has:
 - Knowledge of current & future operations
 - Insight into C2 & management processes
 - Insight into possibilities for applying ISs
 - Knowledge of capabilities & limitations of ICT
 - Knowledge of IS planning, establishment & control
- CICS officer is able to:
 - Develop, configure, deploy, adjust, maintain & secure IS organization
 - Inventarize, analyze, assess & evaluate users' information needs
 - Realize, combine & synchronize ISs
 - Follow future ICT developments

CICS (1)



CICS (2)



Non-computing subjects:

- Project management

Grant: CICS benchmarking - bachelor for NEC-era Signals officers

Complex numbers
Fourier series

Knowledge needed in NEC era (1)

Benchmarking CICS:

- Against “gold standard”:
Computing Curricula 2005
- Against civil university degrees:
All Dutch universities
Information Systems (IS) bachelors
- Against NEC doctrine:
NATO NEC Maturity Levels (NMLs)

Knowledge needed in NEC era (2)

NATO NEC Maturity Levels:

- Developed by NATO C3 Agency & ACT
- For each NML:
 - Checklist by Lines of Development
 - Descriptive text
- (Version August 2008)

My procedure:

- Take descriptive text for NML4
- Extract key phrases
- Map to scientific bodies of knowledge & fields
- Identify existing CICS subject (if any)

Knowledge needed in NEC era (3)

LoD	NML 2 – Deconflict	NML 3 – Coordinate	NML 4 – Collaborate
Doctrine	<ul style="list-style-type: none"> • Use of organizational entity doctrine and NATO doctrine deconflicted at the commander level. • National doctrinal development to incorporate NNEC in place but not yet fully implemented. • NATO doctrine supporting NNEC is being developed but is not yet fully implemented. • Doctrine describes "need to know." 	<ul style="list-style-type: none"> • Doctrine for combined and joint operations incorporating net enabled capabilities. • Level of mutual understanding allows synergy between entities. • Expand Network interoperability through Info-sec policy • IM doctrine available • Doctrine describes "responsibility to share." 	<ul style="list-style-type: none"> • Doctrine describes mutual development and execution of a common shared plan. • Doctrine describes the net enabled planning and execution of operational capabilities driven by effects based approach to operations. • Doctrine describes "need to share."
Organization	<ul style="list-style-type: none"> • Hierarchical structure with a centralized decision making process. (Vertical J-staff organization). • Organizational flexibility limited by structure. • Organization structure designed to optimize internal processes. • Indirect external interaction through LNO. • LNO's are an "add on" to the receiving entity. • LNOs used to increase SA and coordination among organizational entities. • LNO supports the sending entity. 	<ul style="list-style-type: none"> • Expand interaction across domains through task groups. • LNO empowered by the sending and supporting hosting entities. • Coordinated national operational logistic chain with multi-national solutions. • Flexible organization with robust reach back capability. • Organizational structure allows direct external interactions (including other than LNO). 	<ul style="list-style-type: none"> • Empowered LNO (decision rights) is organic to the staff of the supported entity resulting in an integrated staff. • Transparent organization. • Dynamic organization based on mission requirements (including reach back). • Organizational structure allows continuous dynamic interactions (collaboration).
Training	<ul style="list-style-type: none"> • Trains tactics, techniques and procedures (TTP) focusing on capabilities (not network enabled) for deconflicted operations. • Selected elements (commanders and staff) trained for mutual understanding. 	<ul style="list-style-type: none"> • Force training to develop mutual understanding. • Commander and staff training on joint and combined operations and tactics (not excluding IO/NGO). 	<ul style="list-style-type: none"> • Combined joint integrated staff training (not excluding IO/NGO). • Combined joint operational and tactical force training. • Trained to work in ad hoc and distributed environments.
Materiel	<ul style="list-style-type: none"> • Utilizes equipment providing military capabilities with limited interoperability and little or no net enabled capability. • Adheres to national or component standards (functional stovepipes). • Diversity of technical maturity requires national support (some equipment in net enabled but the majority is not). • Systems support shared Situational awareness and C2 at the individual command level with human intervention. 	<ul style="list-style-type: none"> • Adheres to shared (STANAG) standards. • Systems support shared SA and C2. • Systems share data without human intervention with human interpretation of information required. 	<ul style="list-style-type: none"> • Implementation of all shared (STANAG) standards. • C4I Services federated on a converged network . • C4I Services share information with no human interpretation required.
Leadership	<ul style="list-style-type: none"> • Utilizes methodologies and doctrine focusing on military capabilities, for deconfliction. • Leaders focus on complying within agreed deconfliction constraints. • Communicates vertically within his own organization. 	<ul style="list-style-type: none"> • Manage operations with more extended SA. • Identify gaps as leadership must be educated on capabilities/ organization of other entities. • Communicates vertically and peer-to-peer and translates implications internally. 	<ul style="list-style-type: none"> • Delegation of decision rights supported by technology/infrastructure. • Leadership adapts decision processes based on situation. • Leaders foster interaction between the partners
Personnel	<ul style="list-style-type: none"> • Force recruited and trained to military capabilities for deconfliction. • Commanders and high level staffs trained in cultural and language skills. 	<ul style="list-style-type: none"> • Cultural / language skills required for bridging diversity of combined organizations. 	<ul style="list-style-type: none"> • Integrated staff requires multidisciplinary knowledge.
Facilities	<ul style="list-style-type: none"> • Component oriented facilities. • Support current state of dedicated functionality. 	<ul style="list-style-type: none"> • Common command center tailored to the mission with a smaller deployed force (HQ). 	<ul style="list-style-type: none"> • Mutually shared and distributed facilities support ad hoc mission tailored organizations. • Facilities provide inter-service support and sustainment.
Interoperability	<ul style="list-style-type: none"> • LNOs operate to avoid conflicts. • Technical interoperability (if present) is not architected. • Operational interoperability through stovepipes which are limited to functional areas. • Vertical operational and technical interoperability within components. 	<ul style="list-style-type: none"> • LNOs support operational interoperability. • Architected interoperability achieved by implementing STANAGs • Implemented Interoperability solutions allow improved information sharing. • Vertical operational and technical interoperability within components and horizontal coordination for planning. 	<ul style="list-style-type: none"> • Integral staff supports operational interoperability. • Federated network enables technical interoperability. • Decision rights enable direct interactions between organizational entities. • Semantic interoperability supports shared understanding.

Knowledge needed in NEC era (4)

“**NML 4 – Collaborate**. This level of maturity is characterized by **continued transformational improvements** especially in **situational awareness** and interoperability and **adaptive planning and execution**. Entities at this maturity level demonstrate **collective development and execution of a shared common plan** that establishes interdependent relationships. Joint situational awareness is greatly improved as **multiple independent sensors at all levels are integrated into a joint COP**. A common unified infrastructure based on a **single network** will allow the **seamless sharing of data** and facilitate **large scale advanced horizontal and vertical interactive collaboration** for planning and execution. Major **organizational and process changes** are evident in this level of maturity because of greatly **enhanced information sharing** and **rich and continuous interactions between entities** allowing vertical synchronization through collaboration and planning and horizontal synchronization through **shared situational awareness and understanding of intent**. A force at this level of maturity can **readily adapt to any mission and rapidly plan and synchronize execution of a common intent**. Technically, a force at NML 4 uses **advanced semantic interoperability** as well as **integrated registry and discovery services** and all user services are accessible through **generic portals or workspaces**. In general, a force at this level of maturity has completed many aspects of the transformation to a net enabled capability.”

Knowledge needed in NEC era (5)

Refine existing CICS subjects:

- Project management (PM)
- C2 systems (CVS)
- Military Data Systems (MDS)
- Sensor systems & Data Fusion (SDF)
- Net-centric Experience & Theory (NET)
- Information Security (IBV)
- Information Operations (IOP)
- Data Base Systems (DBS)

Knowledge needed in NEC era (6)

Add new CICS subjects:

- Cross-cultural competences
- Human factors & Human-Computer Interface
- Information sharing & collaboration
- Portals & workspaces
- Organizational agility & adaptability

Conclusions

Conclusions:

- Described benchmarking NLDA's CICS
- Against doctrinal needs for NEC era
- In form of NATO NEC Maturity Levels:
NML 4 required in 2016

Recommendations:

- Refine 8 subjects
- Add 5 new subjects
- Related further research (see paper)

Any questions?