The future of Command and Control: Determining force readiness at the push of a button

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our future through science

Introduction

- Introduction of proof of concept for a common data model for greater interoperability in ICT automation to determine force readiness
- Premise: an implemented common data model will provide an adequate platform for future use of automated formulas and algorithms to provide a computer calculated readiness figure at the push of a button
  - Reduce the scope for human error in readiness estimation

Terminology

- Command and control
  - *"The exercise of authority and general direction by a commanding officer over subordinate forces"*
  - Towards the accomplishment of a common goal (defensive or offensive)
  - Consists of situation assessment, planning, tasking and control

Terminology

- Situation assessment
  - To know the readiness of the force at their disposal, for any given scenario
- Readiness
  - Availability, capability and dependability
- Force readiness
  - The upholding of military forces in a state of preparation for immediate deployment (availability)
  - Without additional training (capability)
  - Reinforcement or provisioning (dependability) required

Scenario

- Imagine the Chief of the Military arriving at the office, with his morning cup of coffee in hand, sitting behind the computer
- A press of a button tells the Chief that his military is currently standing at 96%
  - Calculation is automatic, using all available sources
  - Calculation based on specific scenarios
- The Chief can sit back and enjoy his coffee, knowing that the situation assessment of his military indicates a readiness to serve the country

Background

- Obstacle to achieving automatic force readiness calculation: systems running in isolation, not exchanging information
  - Example, 3 different administration systems exist: duty rosters, leave schedules and training records
  - Each system gives a single view of current reality
  - The systems in isolation do not automatically calculate the impact that each system has on another
  - Scenario: John Smith is one of only 10 commanders that have had advanced nuclear training

Background

- Reality: commanders have to rely on sitreps
  - Based on interpretation of available information
  - Information may be incorrect or subjective
  - Calculation requires a great deal of data
  - Human interpretation introduces lag time
- Often no indisputable answer can be given to a specific set of possibilities
- By introducing information systems interoperability within the C2 domain, the level of situational awareness will be raised
- Commanders will have a more accurate view of their resources and readiness

Force readiness

- Defined differently for different scenarios related to availability, capability and dependability
  - Military Chief: how many staff is on duty, levels of munitions stockpiles, operable vehicles, etc.
  - Special task force commander: how quickly his force can be deployed in a threat to National Security
  - Regiment leader: which supporting arms and services are allocated to the battalion below the regiment
- Important metric used to determine aspects such as force deployment, budget allocation and capability development

Force readiness - Driver in force deployment

- Dependent on the condition of available equipment and personnel
  - Status of selected resources measured against the resources required to undertake missions
  - Mental and physical health consequences of service in acts of war
    - PTSD of 4% - 31% in soldiers returning from war
    - Multiple deployments can have a debilitating effect on soldiers
- Administration system may indicate that there are sufficient soldiers to call upon for active duty → do not take actual force readiness into consideration

Force readiness - Driver for budget allocation

- Current calculation of force readiness is subjective
- Example, logistics' information system shows the mechanised battalion at full strength
- Possible decisions made based on sitrep:
  - Buy more armoured vehicles
  - More firing exercises
- Not reflected in sitrep: vehicles can be inoperable due to a lack of parts or a lack of skilled maintenance personnel
- Military budget will be better utilised on
  - Improved delivery line for parts
  - Training of specialised vehicle maintenance mechanics

Force readiness - Driver in capability development

- During non-active war time, the military's focus is on training and capability management
  - Rebuilding depleted resources
  - Recruiting and training more soldiers and staff as reserves for future war activities
  - Correct type of skills and capabilities should be built
- Examples:
  - SA Border War - 1966 to 1989
  - Active recruitment campaign launched before the war
  - Large number of military personnel retire at the same time
  - Result: large gap in military capability

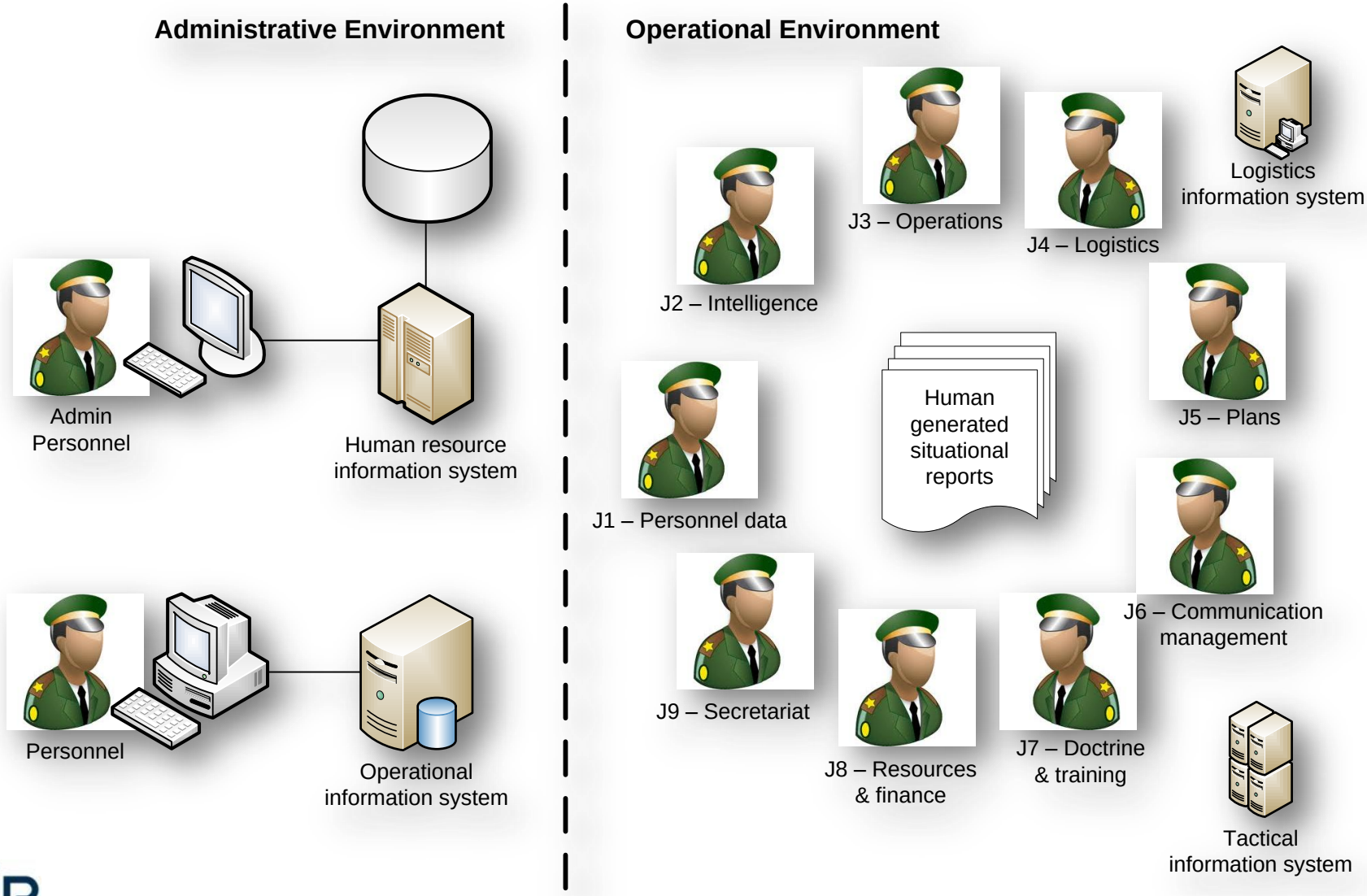
Interoperability in C2

- **The property that allows systems to work together independent of who created them, or how or for what purpose they were implemented**
- The main premise of this paper is to institute interoperability of military systems, not integration
  - Interoperability refers to the ability to exchange and use information in a large network
  - Integration refers to combining existing parts to create a single new entity
- Information advantage often decides the outcome of military missions

Interoperability vs. integration

- In the military environment, interoperability is a much needed capability to facilitate automated, timely communications between different parts of the military
- Unfortunately, many nations and national units each developed and maintain their own C2 systems based on information requirements relevant to that specific unit
- Result: numerous systems with different, incompatible interfaces

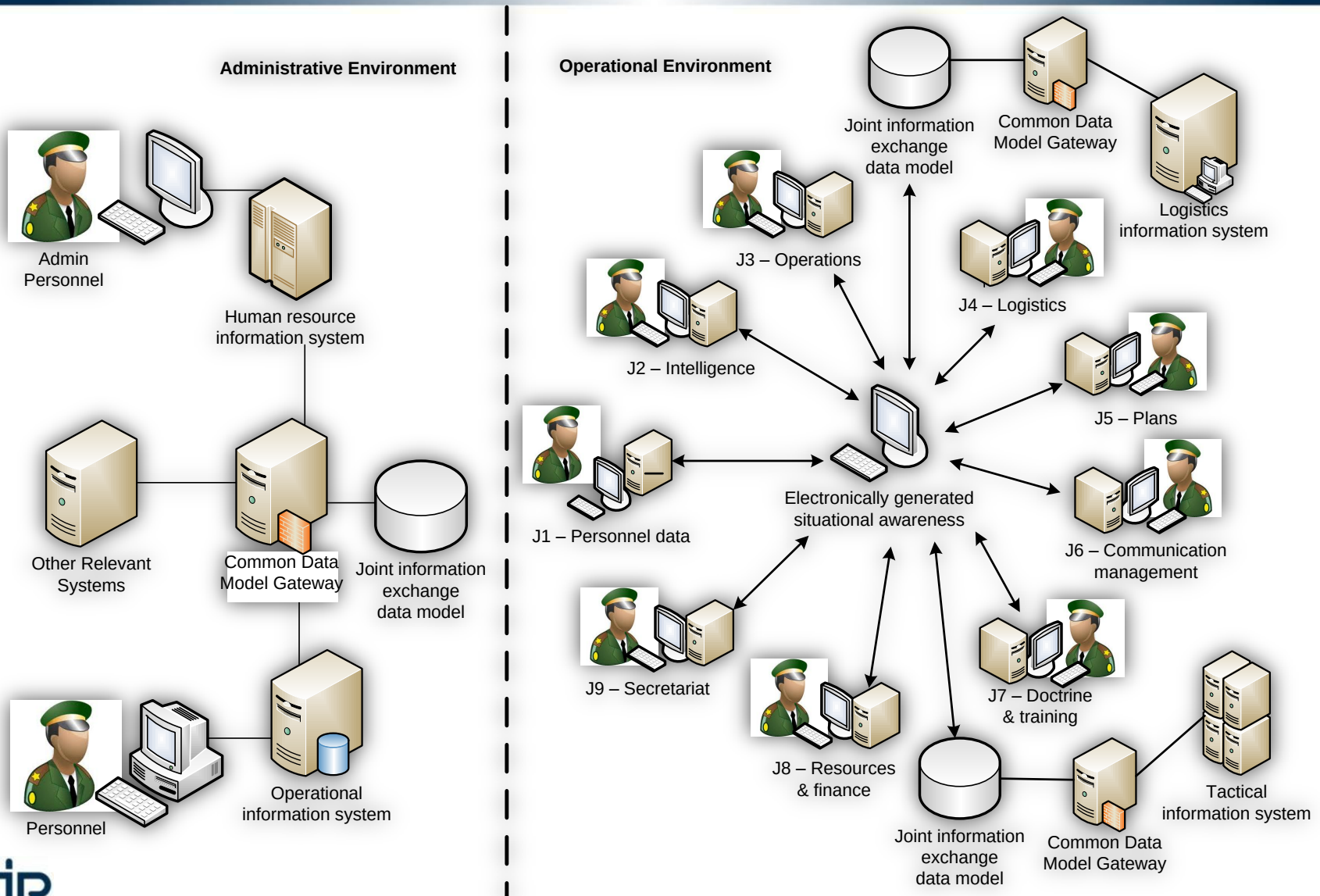
Existing military systems view



Benefits of interoperability in C2

- Allow other systems to leverage the work already done
- ICT can enable the military to do things never done before, towards the betterment of C2
  - Real time blue force tracking
  - Troop movement forecasts
  - Warfare at a distance using remote controlled unmanned aerial vehicles

Proposed military systems view



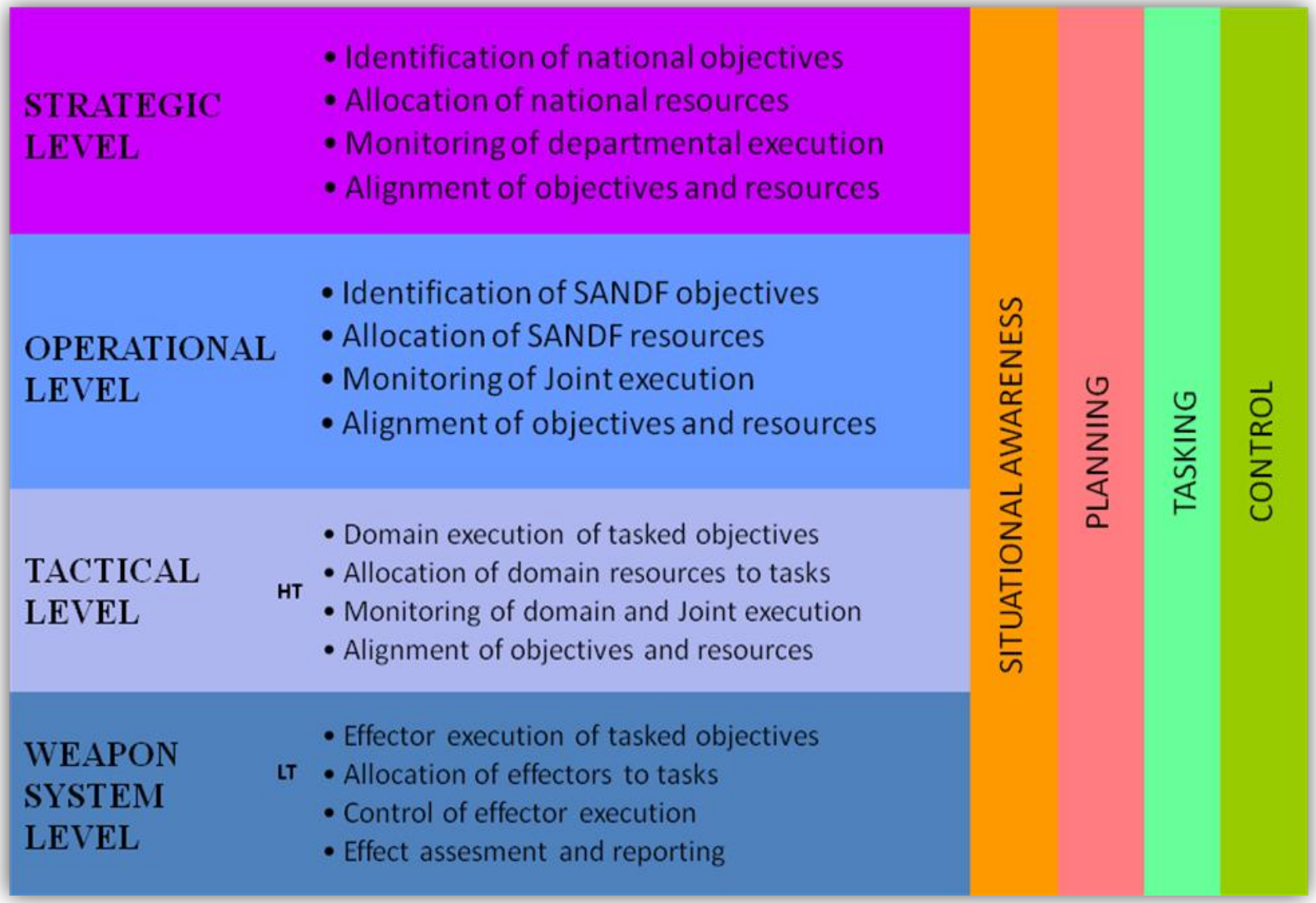
Syntactic and semantic interoperability

- Syntactic interoperability: if two or more systems are capable of communicating and exchanging data through specified data formats and communication protocols
  - XML, SQL and ASCII
- Semantic interoperability: ability to automatically interpret the information exchanged meaningfully and accurately in order to produce useful results as defined by the end users of both systems
  - Both sides must refer to a common data model
  - Content of the information exchange requests are unambiguously defined: what is sent is the same as what is understood

Command chain

- On different levels of command, different decisions are being made, thus the situation assessment will necessarily be different
  - Strategic
  - Operational
  - Tactical
  - Platform (weapon system)
- Commanders at each level will have a different view of the same situation
- If these systems are interoperable, the military can harness the capability of all of these systems, and extract the appropriate views required to make decisions at all levels of command

Military command levels



Common data model

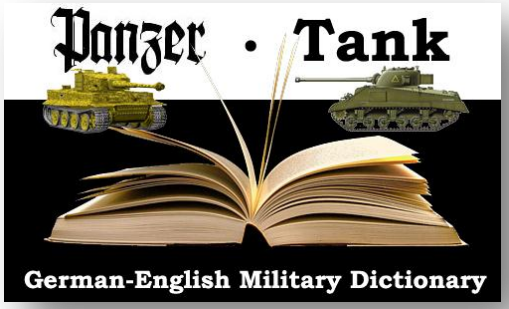
- The complexity of data exchange requires/dictates the use of a common data model to enable full ICT system interoperability
  - Required to describe the structure and semantics of data that is exchanged between systems
  - Analogous to a dictionary, or a common interface between different languages

Common data model

- Example: Two entities want to communicate

Common data model

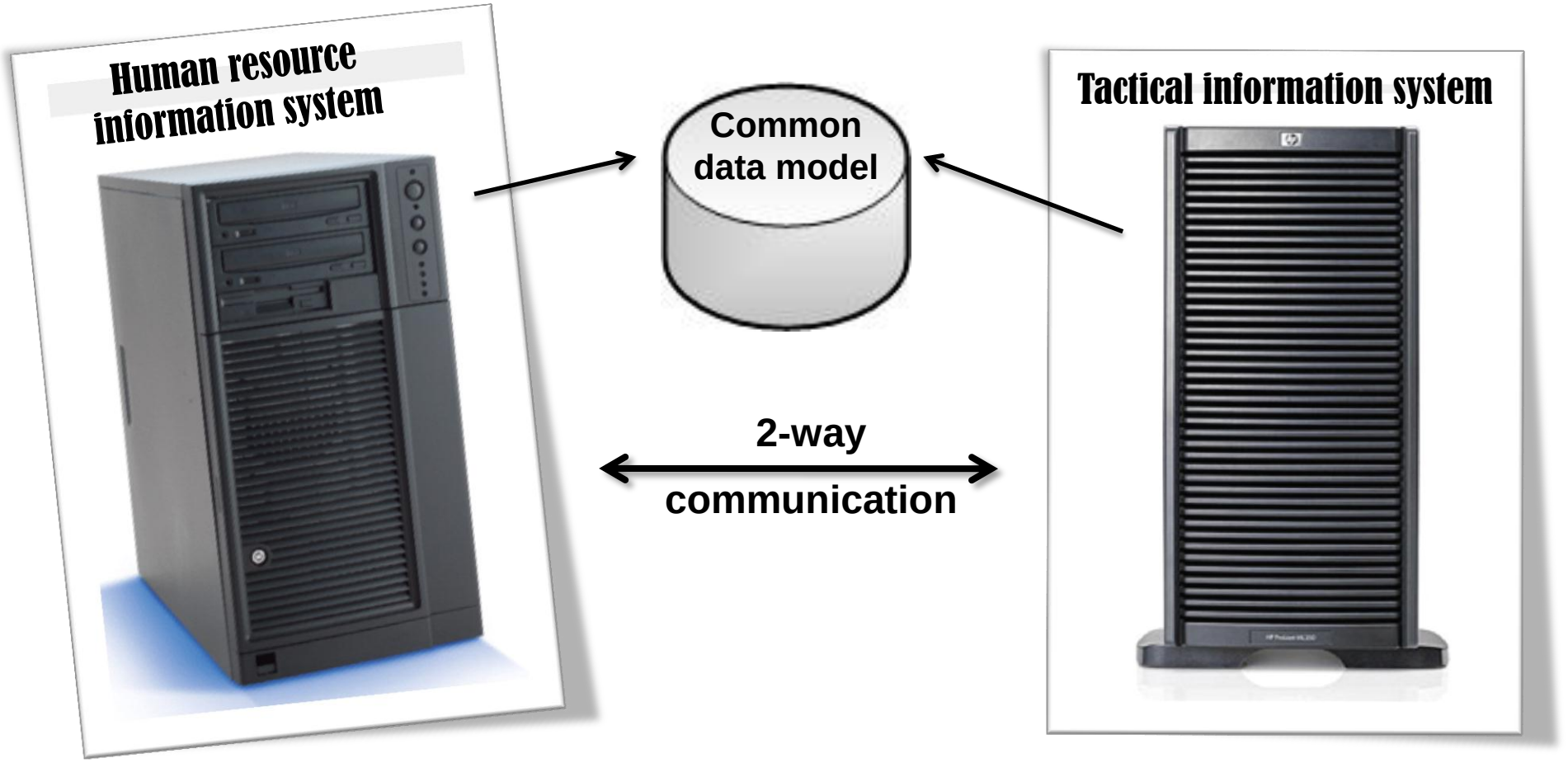
- Introduce an English-German dictionary



2-way communication

Common data model

- Introduce a common data model



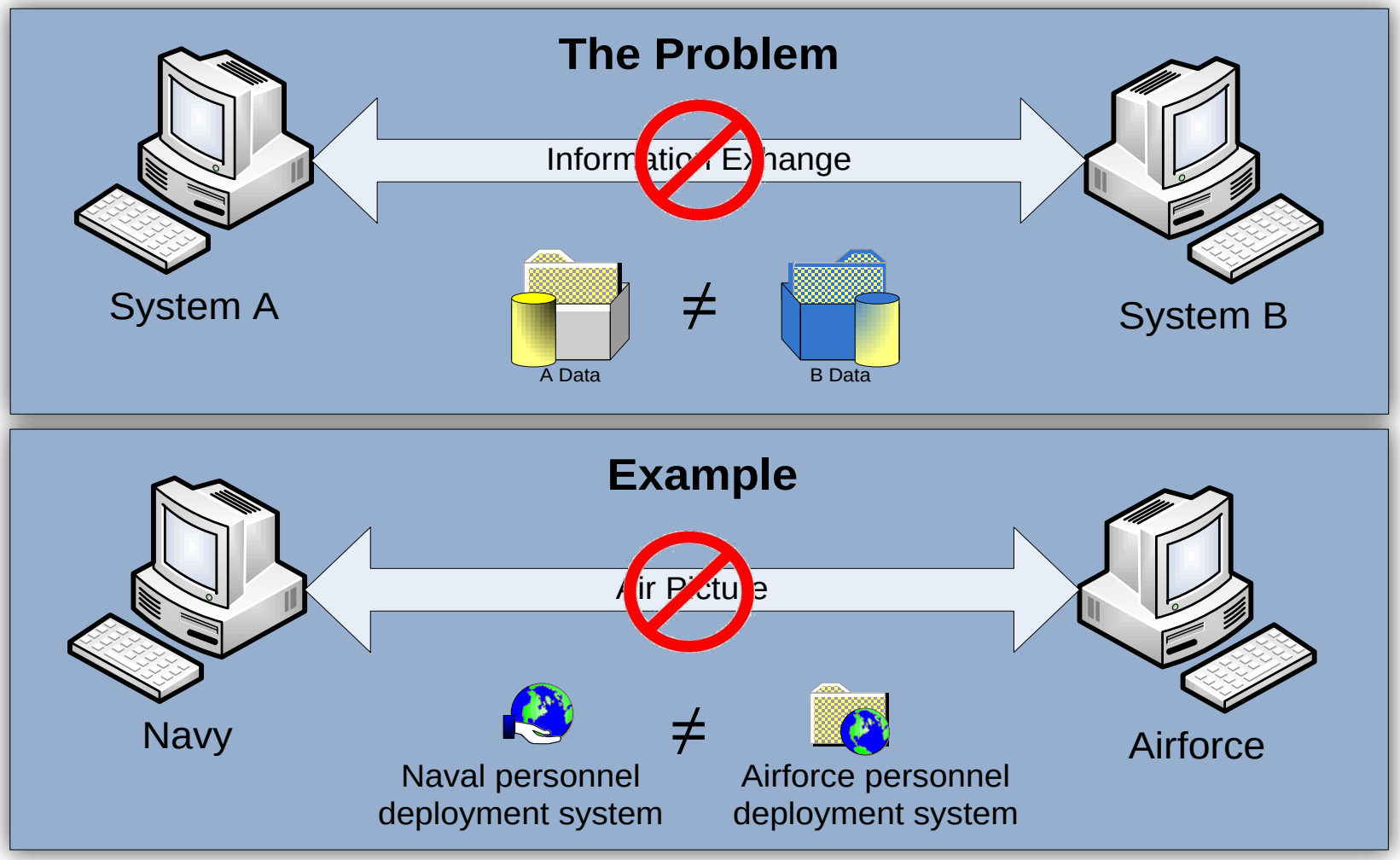
Common data model

- Joint Consultation Command and Control Information Exchange Data Model (JC3IEDM) is regarded as the most well established and supported common data model available
  - Developed and maintained internationally by the Multilateral Interoperability Programme
  - Used to share C2 information in a multilateral or coalition environment
- The implementation of JC3IEDM internationally testifies to the success of a common data model as interoperability solution

Common data model implementation

- Although the benefits of interoperability systems are widely accepted, it is not always practical to move to interoperable system architecture
  - Costly and time consuming
- Although the requirement for interoperability has been identified, the systems involved are not physically able to interoperate with each other

Existing interoperability efforts



Enabling the future of C2

- SANDF's IDE is developing an experimental programme to help create and manage a common data model for military systems
  - Based on JC3IEDM
  - Manage common data model as a standard
- Programme objectives:
  - To become the multinational forum to promote international interoperability of C2IS
  - To further develop and improve interface specifications to reduce the interoperability gap between different C2IS
  - To deliver a C2 interoperability solution in a net-centric environment

Enabling the future of C2

- Address incompatible systems
- Work towards ability to successfully exchange and use information between systems
- Obtain consensus on system-independent specifications to achieve semantic interoperability among distributed and diverse C2 information systems
- Support
  - Information exchange across national domains
  - Automated analysis workflow construction and discovery

Conclusion

- Importance of force readiness in commanding the military (availability, capability and dependability)
  - Current: based on sitreps and information retrieved from isolated information systems, subjective force readiness calculations
  - Proposed: requires complex algorithms with large real time data sets
- Determining force readiness at the push of a button is a viable reality within the military environment → introduction of a common data model