

## **Intelligence Base: Strategic Instrument of an Organisation**

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### **ABSTRACT**

*Not only is the speed of delivery of information increasing in this ever faster changing world, but also the amount of information. Moreover, in the fight against international terrorism a nation has to share intelligence and exchange information with other nations. This requires a secure and performing communication system.*

*This paper introduces the concept of the Intelligence Base, which meets the needs of an efficient and effective intelligence system. The Intelligence Base is composed of a Fact Base (storing information), an Interpreted Information Base (storing intelligence), an Unknown Base (to manage the requested information) and an Intelligence Bus (communication system). The underlying architecture is based on Service-Oriented Architecture, already adopted by the business world to integrate business processes and their applications.*

### **1.0 INTRODUCTION**

The Division Concepts of the Assistant Chief of Staff Evaluation are developing a concept of “Intelligence Base” in a study about the information need of the leaders and the managers of a (military) organisation. The purpose is to conceive for each level of the organisation an intelligence system to feed the decision processes with intelligence.

The intelligence process starts already when the leaders define the strategy of their organisation. The first principle of the Art of War [1] by Professor Bernard is the balance between means and goals: too many resources means working inefficiently; too-ambitious goals means ineffectively working. To have a good balance, the organisation needs to seek on a permanent way for information inside and outside the

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organisation (society, market), which is the only rule for this principle. Nevertheless, “War is not an intellectual activity but a brutally physical one” ([2], p369), but good intelligence may improve the chances of success.

This paper introduces the concept of the Intelligence Base, which meets the needs of an efficient and effective intelligence system. The Intelligence Base is composed of a Fact Base (storing information), an Interpreted Information Base (storing intelligence), an Unknown Base (to manage the requested information) and an Intelligence Bus (communication system). The underlying architecture is based on Service-Oriented Architecture, already adopted by the business world to integrate its business processes and the related applications.

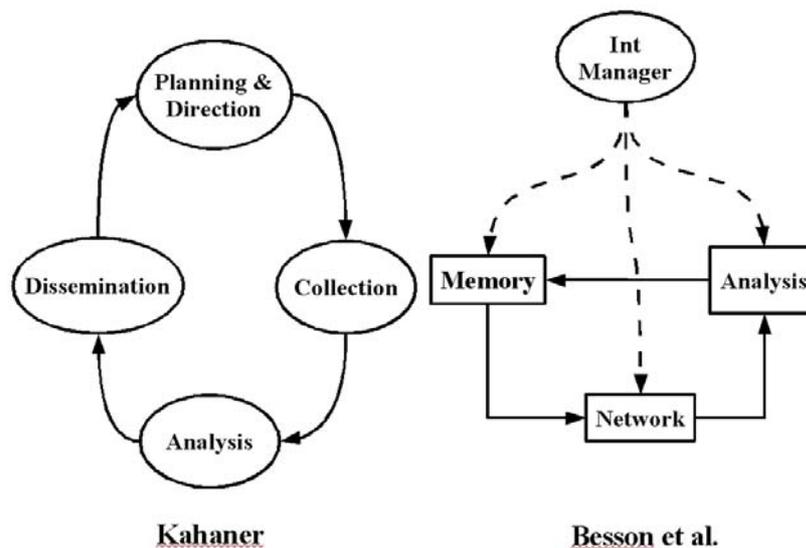
Military organisations may adopt the concept of the Intelligence Base, but business enterprises and other civilian organisations may also. However, this paper will only treat the Intelligence Base Architecture in a military organisation.

The remaining of the paper discusses first the intelligence process. However, before introducing the new concept of “Intelligence Base” and its supporting Intelligence Information system, it is necessary to define clearly the terms used in the concept. We will finish with the conclusions and elements of further research.

**2.0 INTELLIGENCE PROCESS**

**2.1 Intelligence-Cycle**

As mentioned above, collecting intelligence is the only rule of the first principle (Balance between resources and objectives). But what is now intelligence? “Intelligence is the product resulting from the collection, evaluation, analysis, integration, and interpretation of all available information, that concerns one or more aspects of foreign nations or of areas of foreign operations, and that is immediately or potentially significant to military planning and operations.” [3].



**Figure 1 Intelligence Cycles**

The intelligence manager has following resources in the so-called intelligence cycle: the memory (where all acquired information is stored), the network (of sensors) and the analysis capability. The latter analyses all incoming information and processes it into intelligence that will be stored into the memory. In the

scheme of Besson et al. [4] in Figure 1, the 'unknown' drives actively the intelligence cycle, however sensors collect on a permanent base also information, which can be useful for the organisation.

The most difficult task is to formulate and translate the question into clear language, which lead the organisation to the pertinent and relevant information. In other words, it gives the knowledge about opportunities and threats, which the organisation ignores (Besson et al. p. 22, [4]).

Larry Kahaner sees the intelligence cycle as a process instead of a function. "Therefore it should appear in all aspects of your business as one seamless, continuous activity not relegated to one area, division or unit" ([5], p23). This process has four steps: Planning & Direction, Collection, Analysis and Dissemination ([5], p43).

The step "Planning & Direction" starts with a clear understanding of the user's needs and includes his time constraints. Once well understood, further intelligence actions are planned. The "Collection" involves obtaining raw information that can be turned into usable intelligence for the decision making of an organisation (<sup>1</sup>). "Analysis" is the process of taking information and integrating it with other information so that intelligence is created. "Dissemination" is distribution of the intelligence towards the client and other organisations that may also be concerned by this intelligence.

### 2.2 Evolution of Information and Communication Technology (ICT)

If one says processes, then he says also ICT-applications, which support the first. The study of the evolution of the Information and Communication Technology (ICT) in the decision support context shows us that in the beginning database systems were used, mostly on the operational and sometimes tactical levels in an organisation. Applications using these database systems were part of the information system of an organisation.

But, what is information? So far, one of the most complete definitions we have found in a US Office of Management & Budget circular [6]: Information is "Any communication or representation of knowledge, such as facts, data, or opinions in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audio-visual forms."

This definition reflects the new era of ICT, not only data (coming out of Database Management Systems (DBMS)) is information, but also all other media. Consequently, a decision-maker receives now a lot more information and his instruments to handle all sources of information are more complex.

Over time non-DBMS-technologies (<sup>2</sup>) as multimedia stores, document management systems have been added next to the classical database systems (See time axis in Figure 2 Evolution ICT & Components IntB).

### 2.3. Knowledgebase

The next evolutionary step was the knowledgebase (KnB). Guida et al. defines a knowledge-based system (KBS) as a software system capable of supporting the explicit representation of knowledge in some specific competence domain and of exploiting it through appropriate reasoning mechanisms in order to provide high-level problem-solving performance. The knowledgebase stores available knowledge concerning the domain at hand, represented in appropriate explicit form and ready to be used by the reasoning mechanism [7].

Is intelligence also knowledge? For Peter Drucker knowledge is information effective in action so information focuses on results [8]. Sanchez et al. [9] defines "knowledge as the set of beliefs held by an individual about causal relationships among phenomena. Causal relationships in this definition are cause and effect relationships between imaginable events or actions and likely consequences of those events or

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<sup>1</sup> Mainly two types of information exist: primary and secondary. Primary information comes directly from the information sources. Secondary information is coming from other sources than primary sources, which have altered the "raw facts".

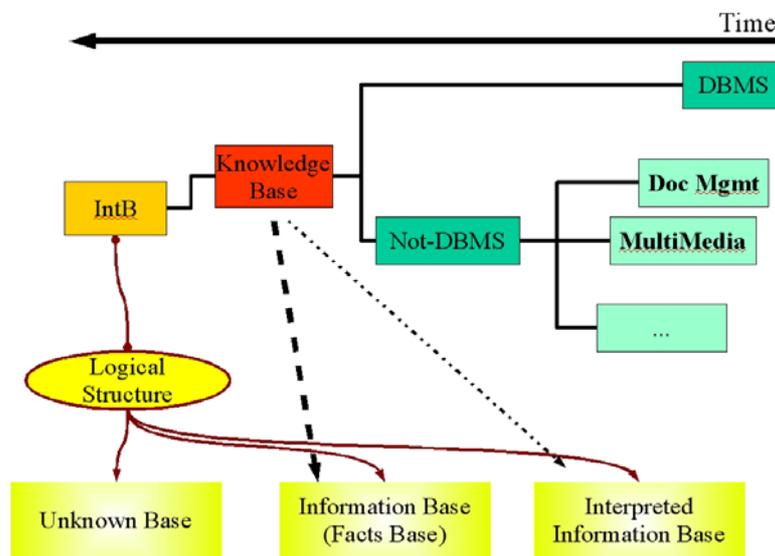
<sup>2</sup> The underlying technological infrastructure may be based on DBMS but the functionalities of the products are different from the classical DBMS functionalities.

actions. Organizational knowledge is then defined as the shared set of beliefs about causal relationships held by individuals within a group.”

Therefore, both terms (intelligence and knowledge) are supporting the decision-making process and these terms are sometimes interchanged (see [5], p.21) or confused with information. It is however clear that interpreted and integrated information becomes intelligence, which enables the person to make a decision using the inference rules of the concerned knowledge domain.

Yet knowledge evolves, facts stay. Therefore, an organisation should store the facts (information) in a “Facts Base” for later re-interpreting the same facts but with other knowledge. Besides tracking the intelligence, an organisation should place the intelligence on a dedicated storage “Interpreted Information Base” to assess the quality of intelligence [10].

In the same logic as intelligence assessment, the decision making process can be assessed [11] and thus the knowledge. Sanchez et al. defines three types of knowledge: factual knowledge (entities, relationships), inferential knowledge (reasoning functions) and strategic knowledge (problem-solving strategies) [9]. In further research, we would like to integrate knowledge and intelligence into a framework so that the process of decision-making can be assessed, simulated, stored and taught.



**Figure 2 Evolution ICT & Components IntB**

## 2.4 Unknown Base

If an organisation knows what it knows, then it knows what it does not know and would like to know <sup>(3)</sup>. The Unknown Base supports the management of the unknown. The whole system of detecting and managing the unknown (and would like to collect information about it) is very strategic for an organisation. If its competitor/enemy knows what the organisation does not know, then the competitor/enemy can take advantage of this. Security should be an important topic (of high concern).

In what follows, the conceptual, strategic and operational level of the Intelligence Base will be discussed.

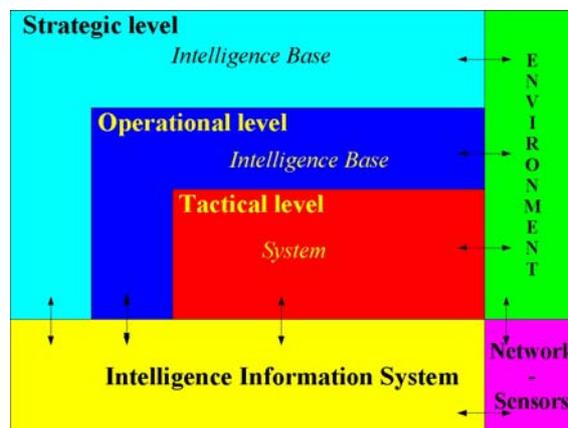
<sup>3</sup> Of course, there is also the complete ignorance of facts, meaning that an organisation is not aware of the existence of these facts.

### 3.0 CONCEPTUAL VIEW ON THE INTELLIGENCE BASE

#### 3.1 Components

The Dictionary of Military Terms [12] defines an Intelligence Data Base as “The sum of holdings of intelligence data and finished intelligence products at a given organization”. The term “data” is too limited in the context of intelligence [6], moreover we have added the management of the Unknown and therefore we suggest the term “Intelligence Base”. The management and the storages of the unknown, the facts and intelligence, and the supporting Intelligence Information system form together the “Intelligence Base” (IntB) (Figure 2).

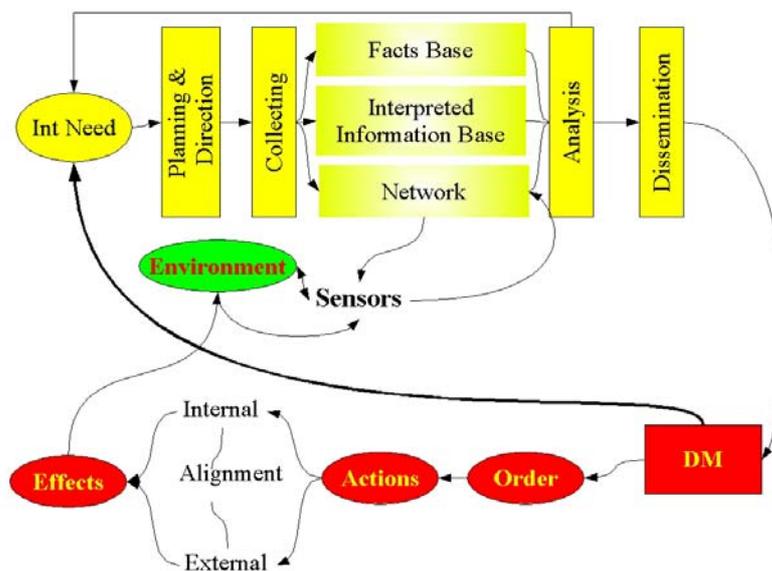
Every level of the organisation -be it strategic, operational or tactical- interacts with its environment, which gives opportunities to collect information (push or pull, see below) about that environment. The collected information should be transferred via a special and dedicated communication system of the intelligence information system (Int IS), which supports the Intelligence Base (Figure 3).



**Figure 3 Relationships**

The sensors and the network of active intelligence collaborators are also connected to the Intelligence Information System (Int IS). Exchange of information between levels cannot be made directly, but indirectly via the intelligence information system. The reasons are security and quality (see below).

### 3.2 Decision making and Intelligence process



**Figure 4 Conceptual view**

Two events can trigger an interaction between the decision making process and the intelligence process (Figure 4). Firstly, the decision maker expresses an intelligence need. The second trigger is the transmission of newly detected facts by the sensors. Of course, the intelligence process can also express intelligence needs.

### 3.3 Network

#### 3.3.1 Information Pull

If the decision maker does not find the necessary intelligence (in the Intelligence Base or outside of it), then he expresses his need to the “Planning & Direction”. The latter will then define the needed intelligence actions. The needed information may be not in the Intelligence Base so that the network has to be instructed (push). The planning of the dynamic search-path is established [4] and the management of the actions are managed in the Unknown Base.

The resulting information (if any) is then analysed. Additional information may be needed if not enough information can be integrated into intelligence. Once the intelligence is acquired, then it will be disseminated to the intelligence client. The information and intelligence are stored respectively in the Facts Base and the Interpreted Information Base, and the Unknown Base is updated.

#### 3.3.2 Information Push

In this case, the sensors are injecting information in the network (push). The transmitted information is then analysed. If the information can be integrated, then the resulting intelligence is pushed to the concerned people and/or organisations. The information and intelligence (if any) are stored respectively in the Facts Base and the Interpreted Information Base.

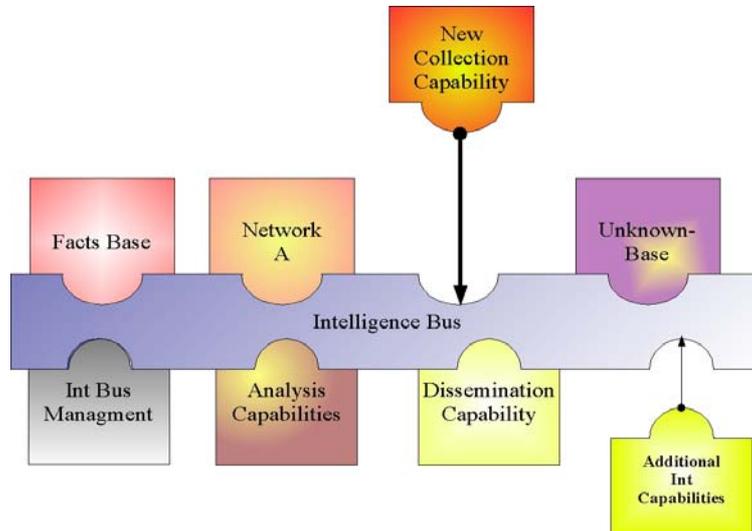
### 3.4 Communication

#### 3.4.1 Bus-structure

A process consists of a logical set of activities organised to attain one or more goals [13]. These activities can be clustered in sub-processes, which can be considered as services for the main process. The

communication in these sub-processes (services) is hidden from the main process; however, the communication between these sub-processes is not.

This configuration can be represented as a communication-bus [14] which connects all services (sub-processes). These services communicate with each other via an interface to the communication-bus (see also [15]).



**Figure 5 Logical Bus-structure**

Regarding the Intelligence Process, the services are those sub-processes described by Kahaner (Planning & Direction, Collection, Analysis, Dissemination [5]), the network management [4] and the components of the Intelligence Base (Fact Base, Interpreted Information Base and Unknown Base).

A special Management module manages the intelligence bus. Its responsibility is the good functioning of the Intelligence bus (like security, availability, interconnectivity). Additional services can be plugged into the bus, as long as they respect the rules of interfacing with the Intelligence bus (Figure 5 Logical Bus-structure).

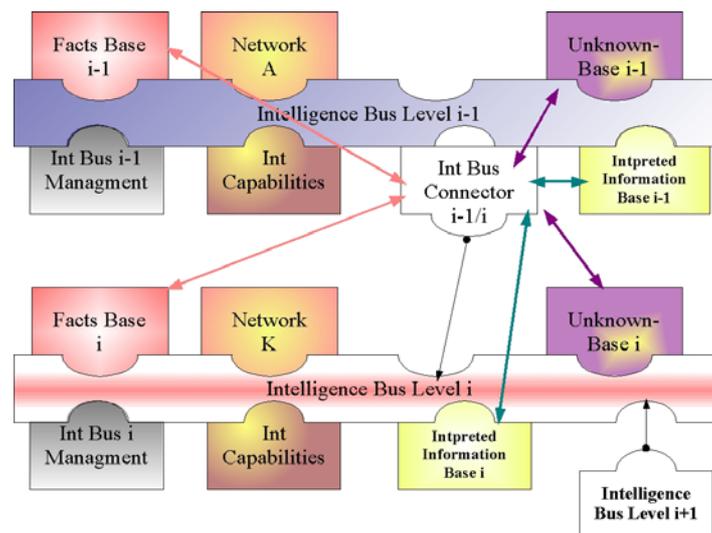
The connection with the Command & Control system is of great importance. The intelligence base is at the service of the commander of the (supported) organisation, so both systems should be tightly (but in a secure way) connected with each other.

### 3.4.2 Multi-level and Collaboration

An intelligence bus should be capable of communicating with other intelligence busses and even with other systems. In that way, pulling and pushing information or intelligence can be done throughout the whole organisation and even outside the organisation with trusted, auditable relations and connections.

Nowadays technically all this is feasible; however competition between intelligence services (national and international) makes it difficult to implement such interconnectivity. “No rivalries are more intense than those between intelligence services working, by different means, on the same side.” ([2], p.385). Likely, this will be the greatest challenge instead of the technical issues.

Figure 6 represents a multi-level organisation where each level disposes of its own Intelligence Base. It is in function of the command structure and connections, how the capabilities and resources will be organised and deployed.



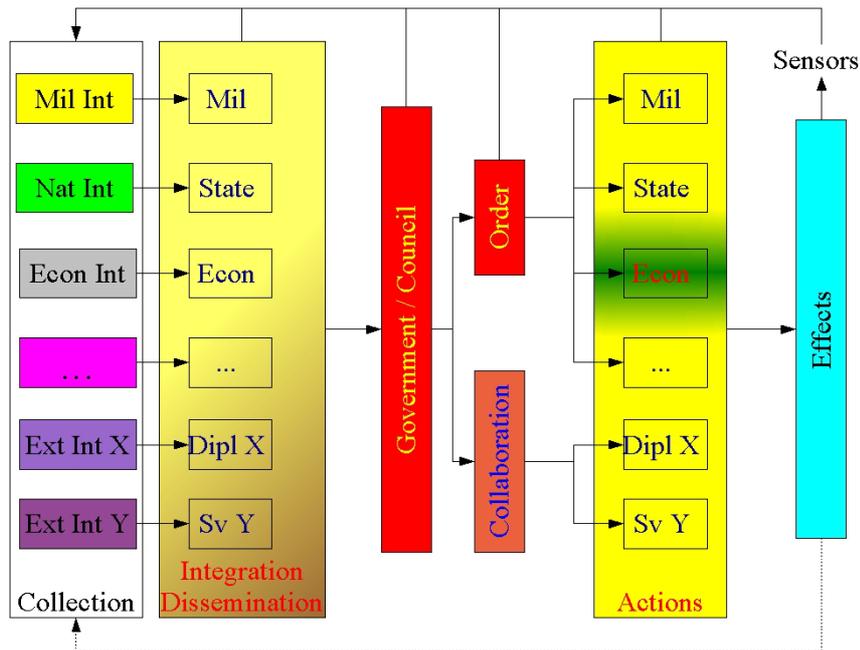
**Figure 6 Connection of cascaded Intelligence Busses**

## 4.0 STRATEGIC LEVEL

### 4.1 Political level

The government has many sources (national and foreign) from which it receives intelligence to determine the politics and strategy of the nation [1]. Therefore, the political power of a nation (or alliance of nations) should enable the communication (in a secure way) between its own intelligence services and their sources (Figure 7 Strategic view).

So national Intelligence is the “integrated departmental intelligence that covers the broad aspects of national policy and national security, is of concern to more than one department or agency, and transcends the exclusive competence of the intelligence community” ([12], p.258). Of course, this does not imply that every department or agency can have free access to the sources of the others. The grand strategy and policy of the nation will determine the priorities, the hierarchy and the conventions of collaboration between the intelligence capabilities of the different departments.



**Figure 7 Strategic view**

## 4.2 Military Strategic Level

### 4.2.1 Strategic Intelligence

“War is simply a continuation of political intercourse, with the addition of other means.” ([16], p.731) Therefore, the government of a nation (or alliance of nations) determines war or any activity in this domain. Strategic Intelligence is the “intelligence that is required for the formulation of military strategy, policy, and military plans and operations at national and theatre levels” ([12], p.361). The reasoning for the strategic political level can be maintained for the level of military strategy. In fact, this system can be cascaded throughout the whole (military) organisation. Mainly this is possible because intelligence is in fact a process.

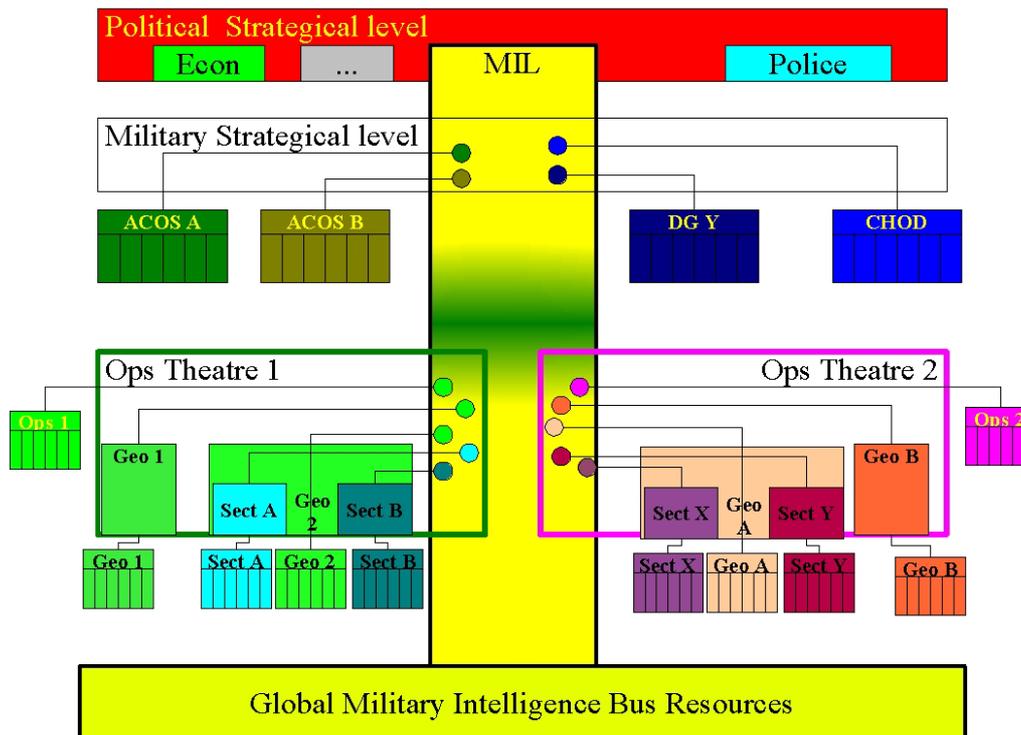
Since 9/11 national security is confronted with a special form of violence: international terrorism. “Intelligence superiority, we are constantly told, is the key to success in war, particularly the war against terrorism” ([2], p.383). Collaboration between national or international Intelligence services is not enough. Some subsets of the different Intelligence Bases should be clustered into one special, logical Intelligence Base to respond to international terrorism. Besson et al. even show that economical intelligence can be used against terrorism ([4], p318), and therefore collaboration and/or integration are necessary.

#### 4.2.1.1 Military Intelligence

Military Intelligence is “Intelligence on any foreign military or military-related situation or activity which is significant to military policy-making or the planning and conduct of military operations and activities ([12], p.244).

In this context, US DOD has its Military Intelligence Integrated Data System / Integrated Data Base (MIIDS/IDB). The purpose of MIIDS/IDB is “an architecture for improving the manner in which military intelligence is analyzed, stored and disseminated” ([12], p244). It is the intelligence repository of worldwide order-of-battle and installation data (see also [17]).

However, the Intelligence Base goes further and supports the whole intelligence process and intelligence management. In Figure 8 a central bus connects every level of the military organisation and interfaces with the Government Intelligence Bus.



**Figure 8 Logical Military Intelligence Bus**

The global Military Intelligence Bus Resources holds at least the same information and intelligence as all the local Intelligence Bases together. By analogy with the data warehouse of the ICT, we can call it the Intelligence Warehouse. Such an Intelligence Warehouse should be capable of creating more intelligence because of the vaster amount of information it has in comparison with the local intelligence bases. Possibly, this is the place where the domain knowledge bases can be integrated with the global intelligence base.

**4.3 Operational level**

Operational intelligence is “Intelligence that is required for planning and conducting campaigns and major operations to accomplish strategic objectives within theatres or areas of operations” ([12], p.278).

Figure 3 shows the position of the operational level. From the higher level, it receives supplementary information and intelligence to execute the mission. Tactical information is coming from the tactical systems or from the higher level (collected by tactical systems from other units). The unit itself transmits also its collected or received information or intelligence to the higher level and/or lower levels.

The different intelligence bases are not permanently connected to the central bus; p.e. for the projected units. The possibility to communicate with the higher or lower levels does not always exist; therefore just like the Command & Control system it supports, an intelligence base must be able to function autonomously from the rest. At the moment of reconnection, the exchange of information and intelligence will not be First-In, First-Out (FIFO), but prioritised (time-critical, mission-critical).

Since the end of the Cold War, new types of operations saw the light; examples are Peace Keeping Operations and humanitarian operations. These new types of operations cause also new types of

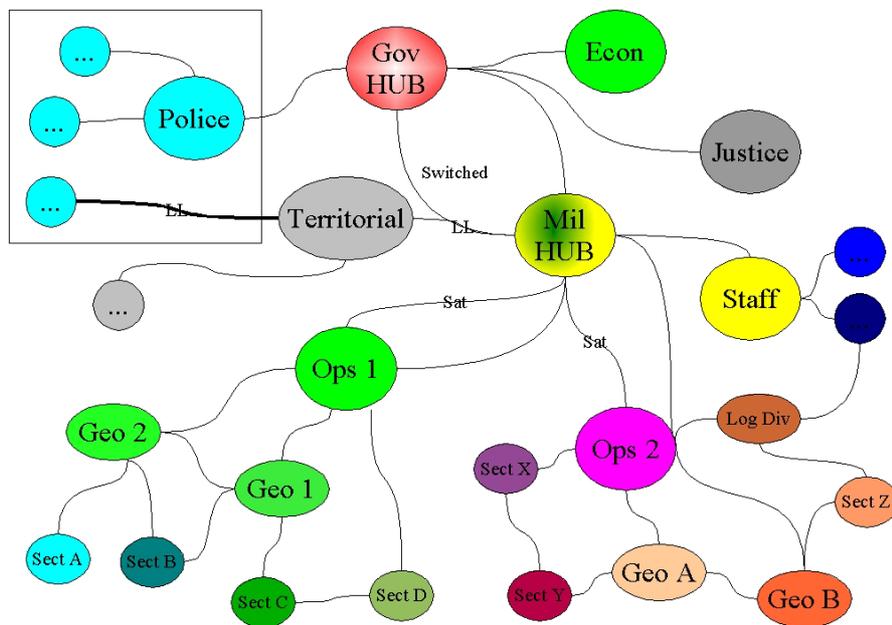
intelligence, or extend the focus onto intelligence that was less important for classical military actions (social, economical, ethical, cultural, religious and so on). Moreover, economical activities with the environment are increasing, which improves the collection of information. As Fuld writes, “Wherever money is exchanged, so is information” ([18], p.28).

## 5.0 ARCHITECTURE

### 5.1 Intelligence Bus

Information has to travel fast, just as the analysis of it, and the distribution of the resulting intelligence. A hierarchically based system or network system could be too slow, therefore we have chosen for a bus infrastructure. In ICT, most of the fast networks or systems have a bus infrastructure as backbone.

This does not imply that Intelligence Bases of the different levels cannot be hierarchal organised<sup>(4)</sup>. The logical bus shown in Figure 8 can be implemented above a physical topology shown in Figure 9. For example, the Military Territorial node serves an element of the Police logical bus (upper left corner in Figure 9).



**Figure 9 Physical network**

Integrating systems like CORBA (Common Object Request Broker Architecture) use also a bus structure. Modules can be plugged into the bus and communicate via an interface. The client chooses the services of the Intelligence Bus from a catalogue of services. Besides serviceability, great attention is given to the security, only if a client is registered to have a specific service, he can get this service (authentication, authorisation).

The Internet virtually connects everybody electronically with everybody. Fast transactions and huge amount of information are typically for this era, which ask for a maximum level of automation. For instance, a particular service is providing information to the Intelligence Information System, in that case the information is transmitted to the “Analysis” service, where it will be analysed by humans or software (examples are intelligent agents, see Rabaey et al. [19]). The information will automatically be stored as

<sup>4</sup> Logically hierarchal, but technically (infrastructure) a bus.

such in the Facts Base, so that later analysis can interpret the information instead of the intelligence derived at a certain point in time (see above).

If for a special reason (such as the war against (international) terrorism), additional national (other government agencies) or international (NATO, UNO, Interpol) analysis capabilities are necessary, then those capabilities can be plugged into the Intelligence Bus. Not only the analysis capabilities, but also allied intelligence services can be connected. Of course, the interface determines in any case the access to the Intelligence Bus (bi-directionally). The question is “How do we connect all this in a flexible, performing and secure way?”

### 5.2. Service Oriented Architecture

For the ICT of an organisation, the biggest challenge is the integration of different information systems inside and outside that organisation, mostly called Enterprise Application Integration (EAI) [14, 20]. The most recent ICT-strategy, which handles this problem, is Service-Oriented Architecture (SOA). Service-oriented architecture organises the discrete functions contained in enterprise applications into interoperable services communicating via standardized connections, called web services.

Because intelligence is a process [5], service-oriented architecture, as we will see, is a suitable solution for the working of the intelligence base and the connection between several intelligence bases. Since a Command & Control system has also many processes, we may even consider interconnecting both systems via service-oriented architecture [19].

The technologies used in service-oriented architectures are suited to give the local intelligent base its autonomy. During the period of disconnection, messages are queued. Once the connection is re-established, messages are exchanged on priority-based criteria [21].

Other intelligence capabilities (services) can replace the existing capabilities without changing the interface. The intelligence bus manager can easily plug additional capabilities into the intelligence bus, so service-oriented architecture improves the flexibility, the agility and the productivity of the intelligence base (server) and thus its client, the Command & Control system.

The intelligence client may have a need for information coming from external applications (legacy systems). In that case, components of the service-oriented architecture may interface and query those applications without the intervention of a human.

We can conclude that service-oriented architecture suites the architecture and fulfil the communication needs of the intelligence base.

## 6.0 CONCLUSION AND FURTHER RESEARCH

### 6.1 Conclusion

The intelligence capability consists of processes. It may not be limited to one part of organisation, on the contrary. We are proposing the Intelligence Base to support the intelligence capability. It consists of:

- A “Facts Base”: to store the information;
- An “Interpreted Information Base”: to store the intelligence;
- An “Unknown Base”: to manage the unknown, which the organisation would like to have information about it;
- An “Intelligence Bus”: to connect the different services of the intelligence capabilities;

The chosen architecture is the Service-Oriented Architecture, which gives the organisation the flexibility and the agility to respond quickly to changes and to connect with other systems.

This architecture provides the technologies to integrate the Intelligence Base with its Command & Control system, so that the quality and quantity of information (and intelligence) fusion is improved. It fulfils also the needs of projected units, which have to operate autonomously.

Regarding the interconnectivity with other national and international Intelligence Services, a cultural change has to take place (rivalry). With the adoption of the Intelligence Base philosophy, intelligence services can enter into clear agreements, so that among others, governments can effectively fight international terrorism.

As a conclusion, the Intelligence Base is a strategic instrument for the organisation and for all of its levels.

## 6.2 FURTHER RESEARCH

Due to the different natures (physical and logical) of information (p.e. data, images, sound) and the ever increasing amount of information, the instruments of the decision makers and intelligence personnel became more complex. Therefore, new technologies, as intelligent agents, have to be examined to reduce this complexity.

The far biggest challenge in the research will be the integration of knowledge and intelligence in our framework. In this framework, we will develop the concept of an Intelligence Warehouse.

We will seek collaboration with universities and other research centres, since the business world may also use all these concepts and technologies.

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