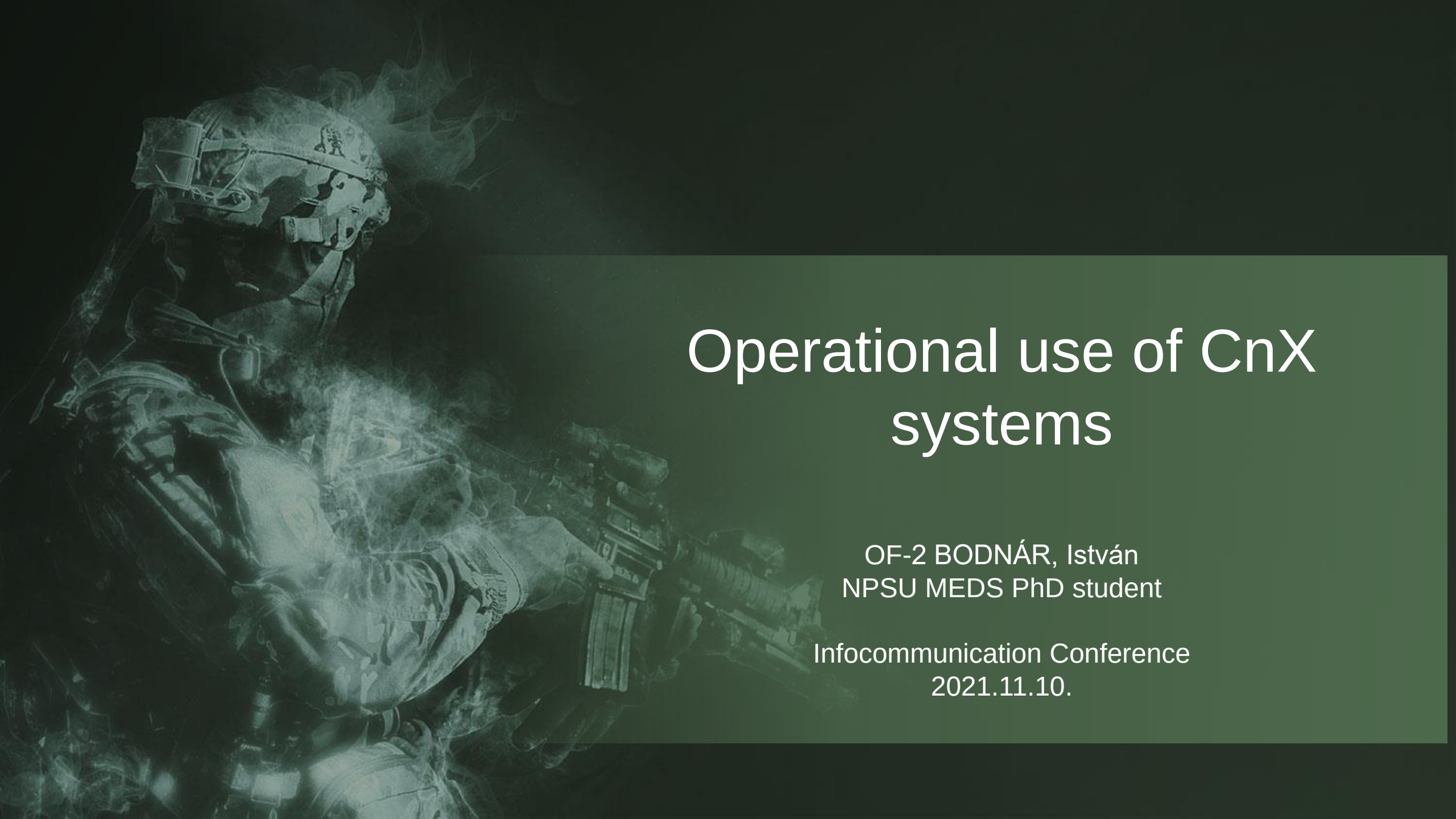

Operational use of CnX systems

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Infocommunication Conference
2021.11.10.

Content

Historical background

(from not so far…)

Due to the exponential development trend of recent decades, the size of computing devices has decreased and computing capacity has increased.

1960’s

Begining of the IT revolution

The Results have completely changed our world today

1970’s

Changed technical trasfer way

Following the globalization, the direction of technology transfer between companies and the state has changed direction

1990’s

Industrial revolution

the advent of Industry 4.0 has also given a new pace of development to production

2010’s

BigData and IoT systems

Emergence of the concept of BigData and IoT systems and proliferation of devices

2015

NATO és HHP

NATO 2% and Zrínyi Defense and Force Development Program (DFDP)

Today

Latest development generations

Industry 5.0 as a new way of thinking

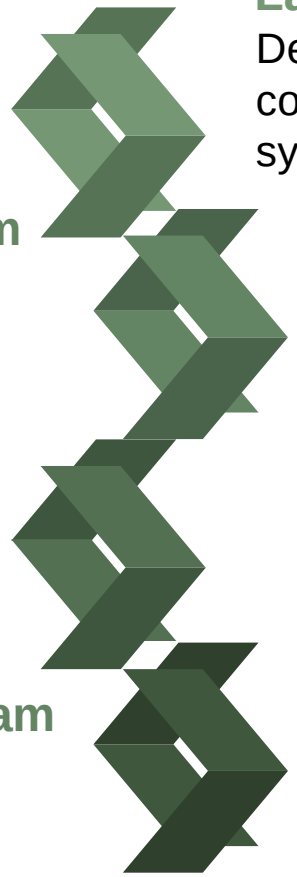
Scientifical problems

Lack of special purpose equipment

Defence sector and law enforcement perform increasingly complex tasks, relying on age-appropriate digital device systems.

Helping of the DFD Program

It is necessary to prepare the improvements. C4ISR system Preference for domestic innovations and the revival of the Hungarian military industry.



Over the comatibility

Interoperability with devices in and designed into the system.

Areas outsid of DFD Program

As of now, we do not plan to acquire or upgrade equipment for all capabilities and tasks.

Research objectives

Examination of application area

Identification of law and order areas whose equipment system does not currently meet the requirements of the age;

Examination of embedded systems suitability

Search for new embedded technology solutions;
Technical examination of the viability of embedded system applications;

Application of STEM specializations

S cience
T echnology
E ngineering
M athematics

Application of new and modern specialties

Programming, PCB making, additive production technology (3D printing and design), Industry (4)(5).0, Io(M)(B)T device systems, BigData; Artificial Intelligence?.

(Own) Concepts and hypotheses

Concepts:

- IoT: A technical device that can transmit values from its sensors over a short-range (XAN *) network protocol.

- BigData: A technology environment that stores, organizes, and processes large amounts of data.

Hypotheses:

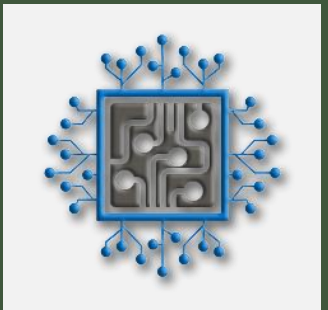
Due to the complexity of existing systems, new concepts had to be introduced.

The latest level of industrial development uses essentially the same procedures and tool systems as systems for tactical purposes.

Tactical applications can be called the CnX ** system.

*X - C - Controller, V-Vehicle, B-Body, P-Personal; AN - Area Network

**C - component beginning with C in the English alphabet; n - number of factors C in the system; x - other system element not starting with C.

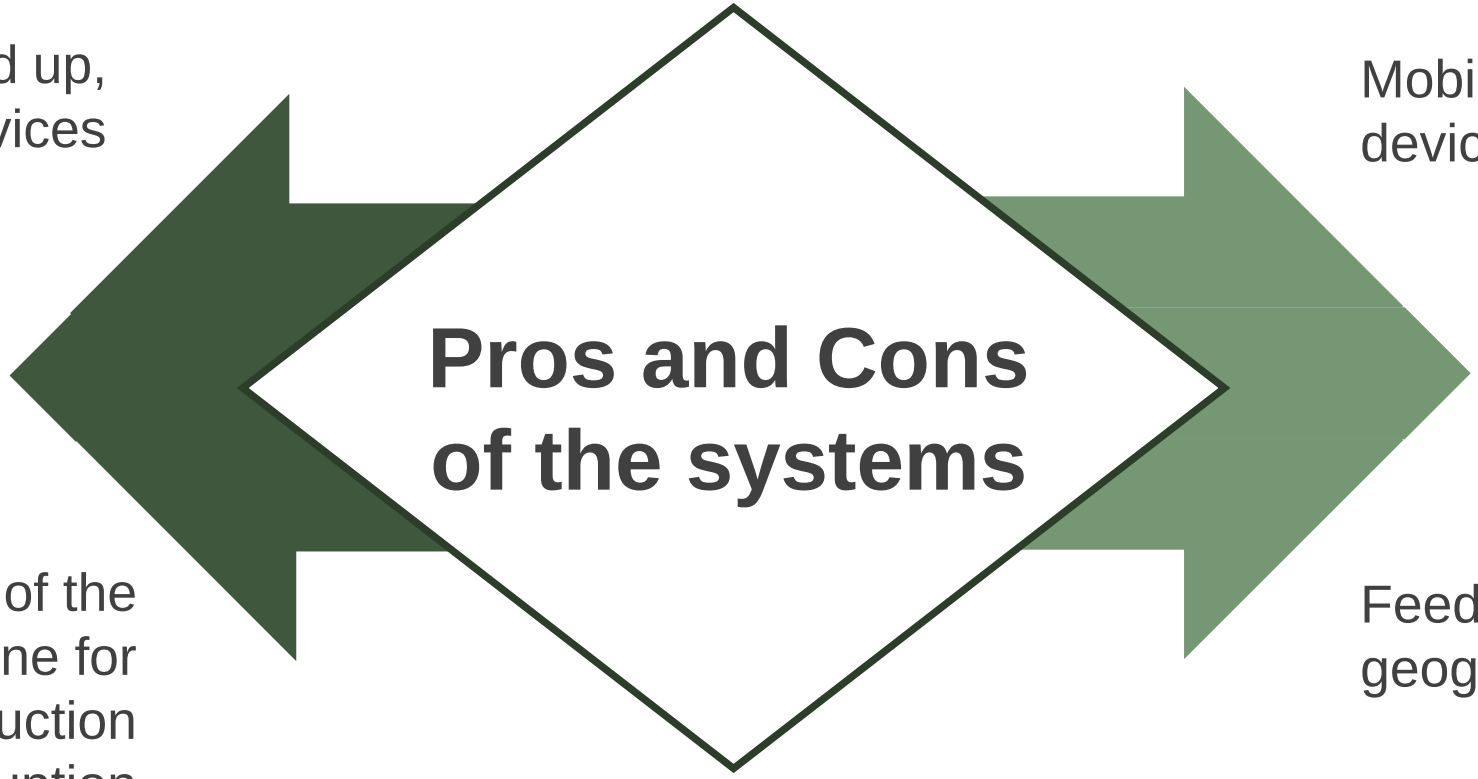


Industry

Statically setted up, mainly large devices

Battlefield

Mobile, usually small devices

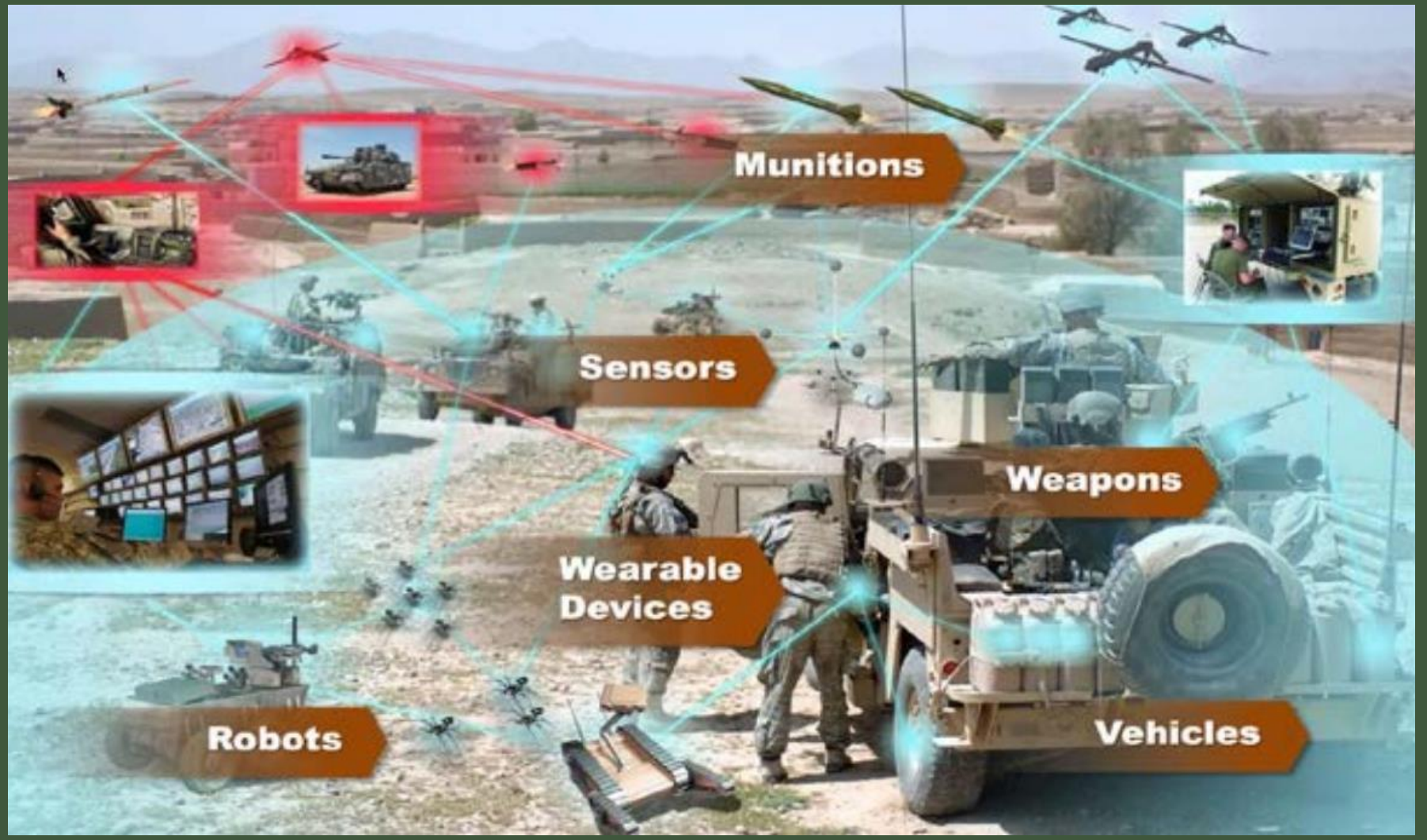


Exact accordancy of the production line for scheduled production and interruption

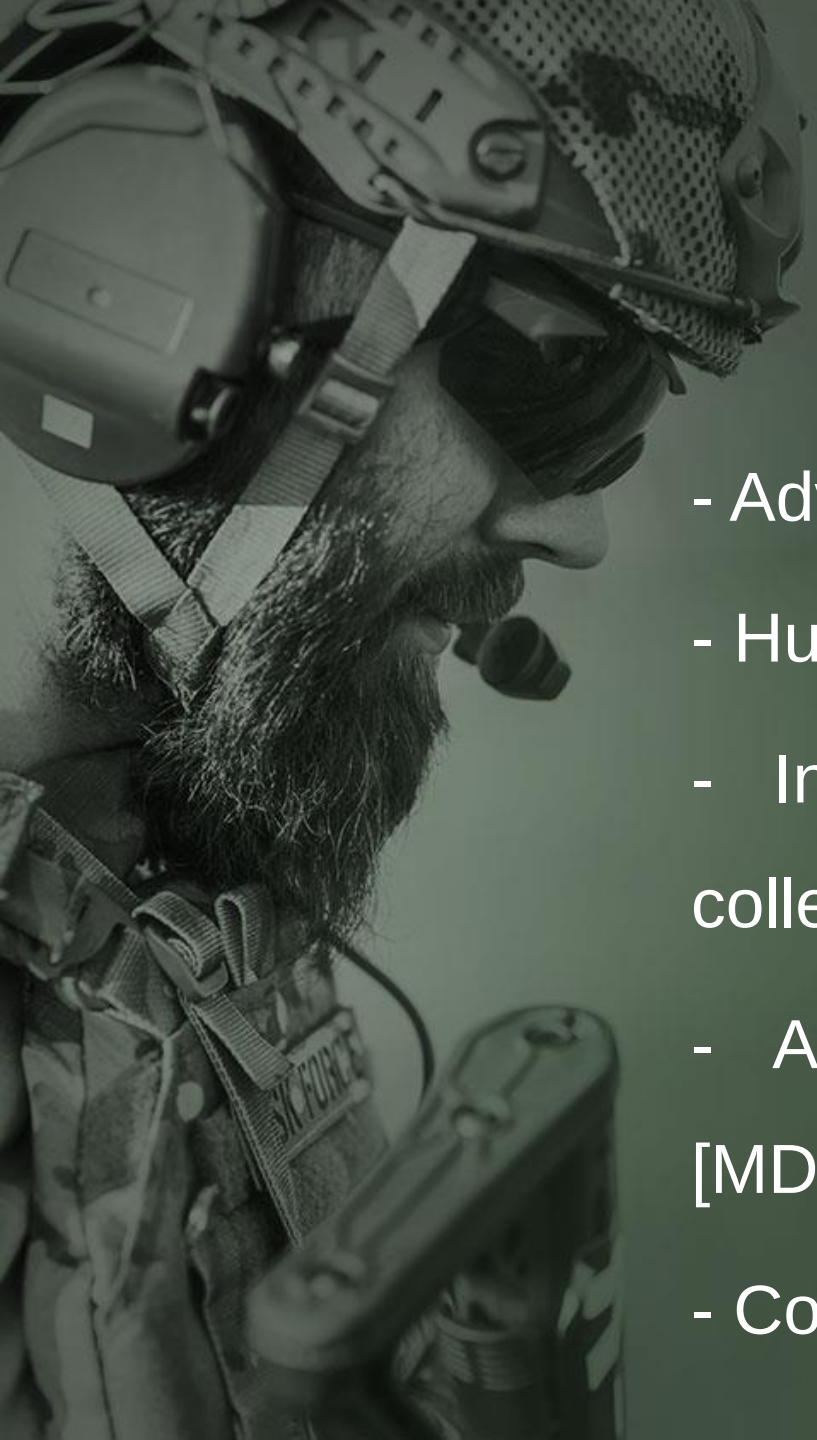
Feedback of motion and geographic coordinates

Real-time immediate feedback
Database architecture
Server farm
In addition to AI integration, field elements are able to interact with human elements and co-bots
Predictable events, including possible shutdowns, failures

Io(M)(B)T
(Industry 4(5).0 Cnx)



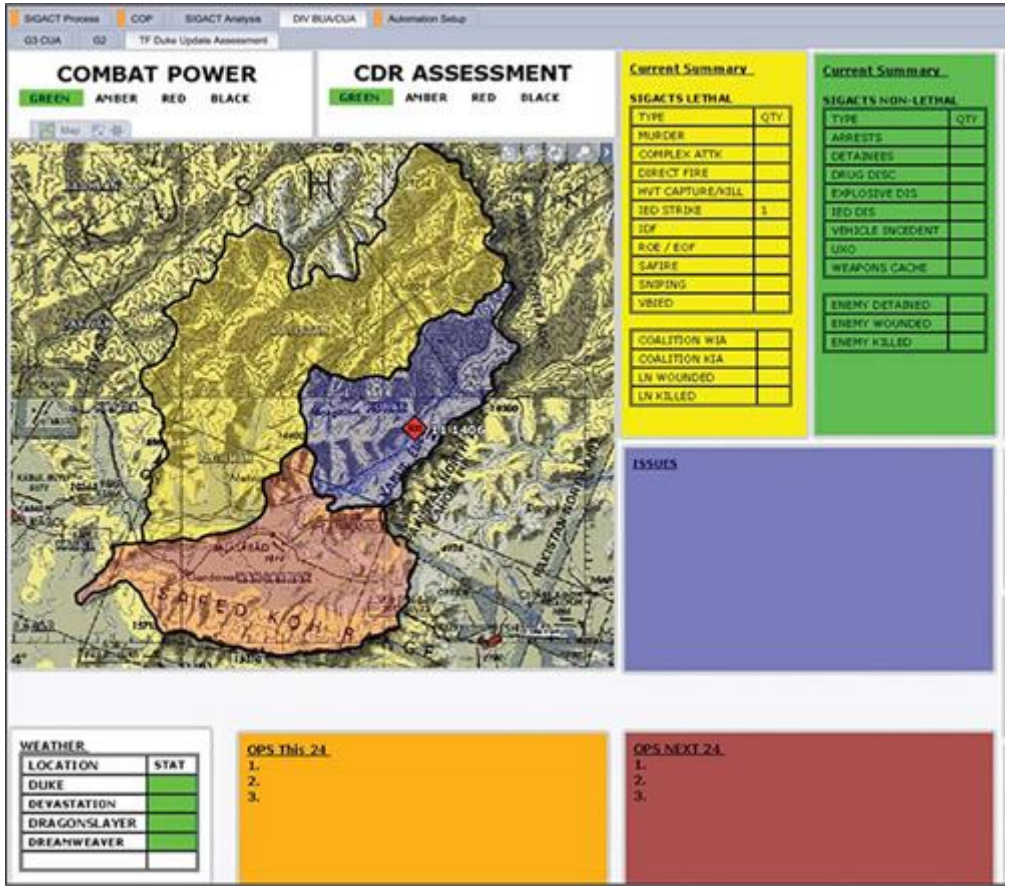
The Internet of Military/Battlefield Things is a network of sensors, wearables, and IoT devices that use cloud and edge computing to create a cohesive fighting force. (Photo credit: U.S. Army, Internet of Battlefield Things (IoBT) Collaborative Research Alliance (CRA) Opportunity Day, March 27, 2017.)



General structure of CnX systems

- Advanced central IT system. (Hardware and software).
- Human computer interface (HCI).
- Information collection and management. (BigData collector part).
- Aggregation, analysis and decision support tools [MDMP] (BigData data processor part).
- Communication network.

US ARMY ABCS & CPOF



ABCS
Army Battle Communication System

Central system including "Future Control Point" (CPOF) and system users (HCI)

Tactical Ground Reporting System (TIGR) and Common Hardware System (CHS)

Tactical Information Network - Tactical (WIN-T)

CPOF: Command Post of the Future, in: https://gdmissionsystems.com/command-and-control/command-post-of-the-future (Letöltve: 2021.06.27.)
TGIR: Tactical Ground Reporting System, in: https://gdmissionsystems.com/command-and-control/tactical-ground-reporting-system (Letöltve: 2021.06.27.)
CHS: Common Hardver System, in: https://gdmissionsystems.com/contract-vehicles/common-hardware-systems (Letöltve: 2021.06.27.)
WIN: Warfighter Information Network, T: Tactical, in: https://gdmissionsystems.com/communications/warfighter-information-network-tactical (Letöltve: 2021.06.27.)

From IoT to BigData

A system can collect and transmit multiple types of data at the same time.

Control Area Network (CAN)
Vehicle Area Network (VAN)

Location coordinate,
Motion data,
Wheel pressure,
Engine temperature,
Telemetry data, etc.…

Body Area Network (BAN)
Personal Area Network (PAN)

Physiological data,
Blood pressure,
Blood oxygen level, etc.…

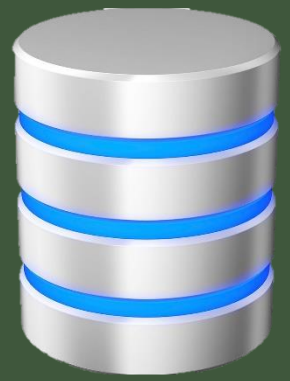
The system records the data received in the databases

Database conforming to 3rd normal form
Data processing, analysis and evaluation units

Fuel consumption measurement

The path of the sensor value toward to the database.

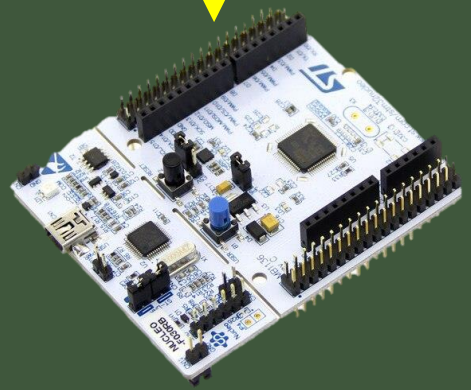
Ultrasonic fuel level sensor



CnX Server database

INFOSEC problems, but mesh or directional antenna devices may be the solution

Wireless transmission network

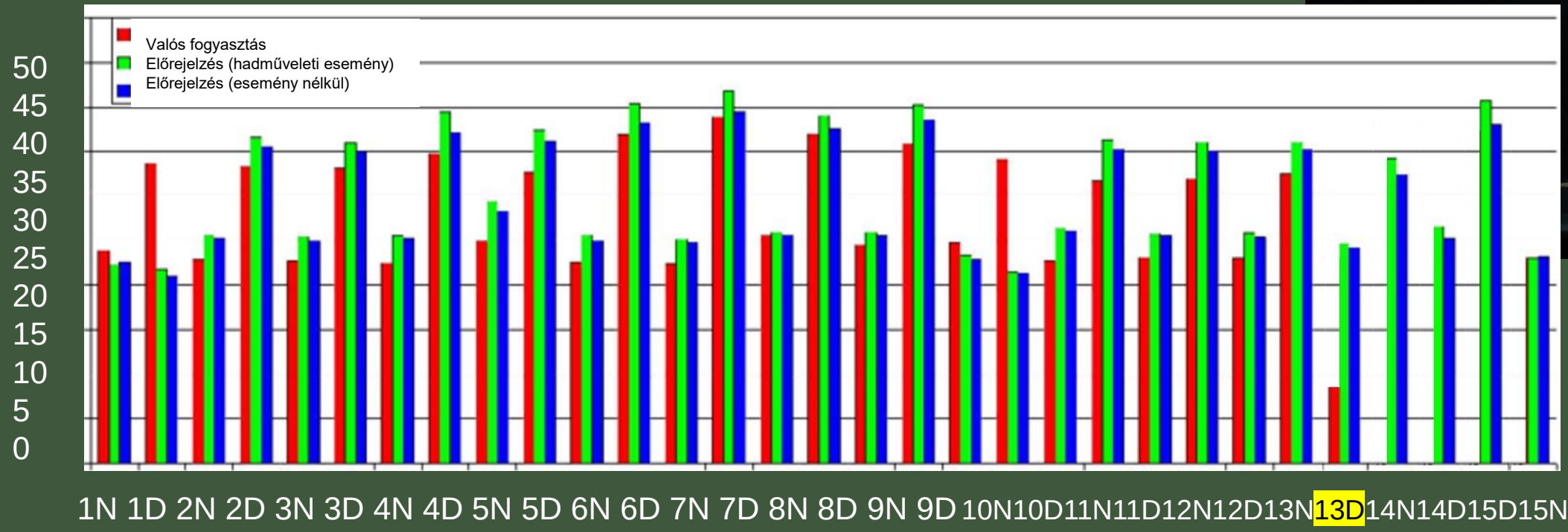


Embedded device or CAN system

CnX Server

Evaluation of patrol car consumption data in CnX system

Consumption of a patrol car participating in cross-border tasks
consumption / 12 hour service (night and day)
The CnX system also uses data from other modules during evaluation



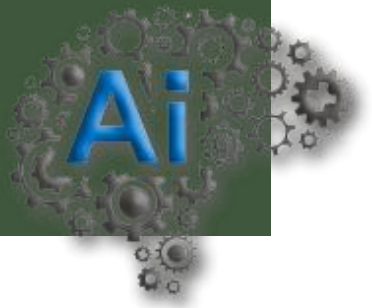
Why good?

In real time:

- fuel consumption can be monitored,
- the use becomes predictable,
- it is planned to provide replenishment.

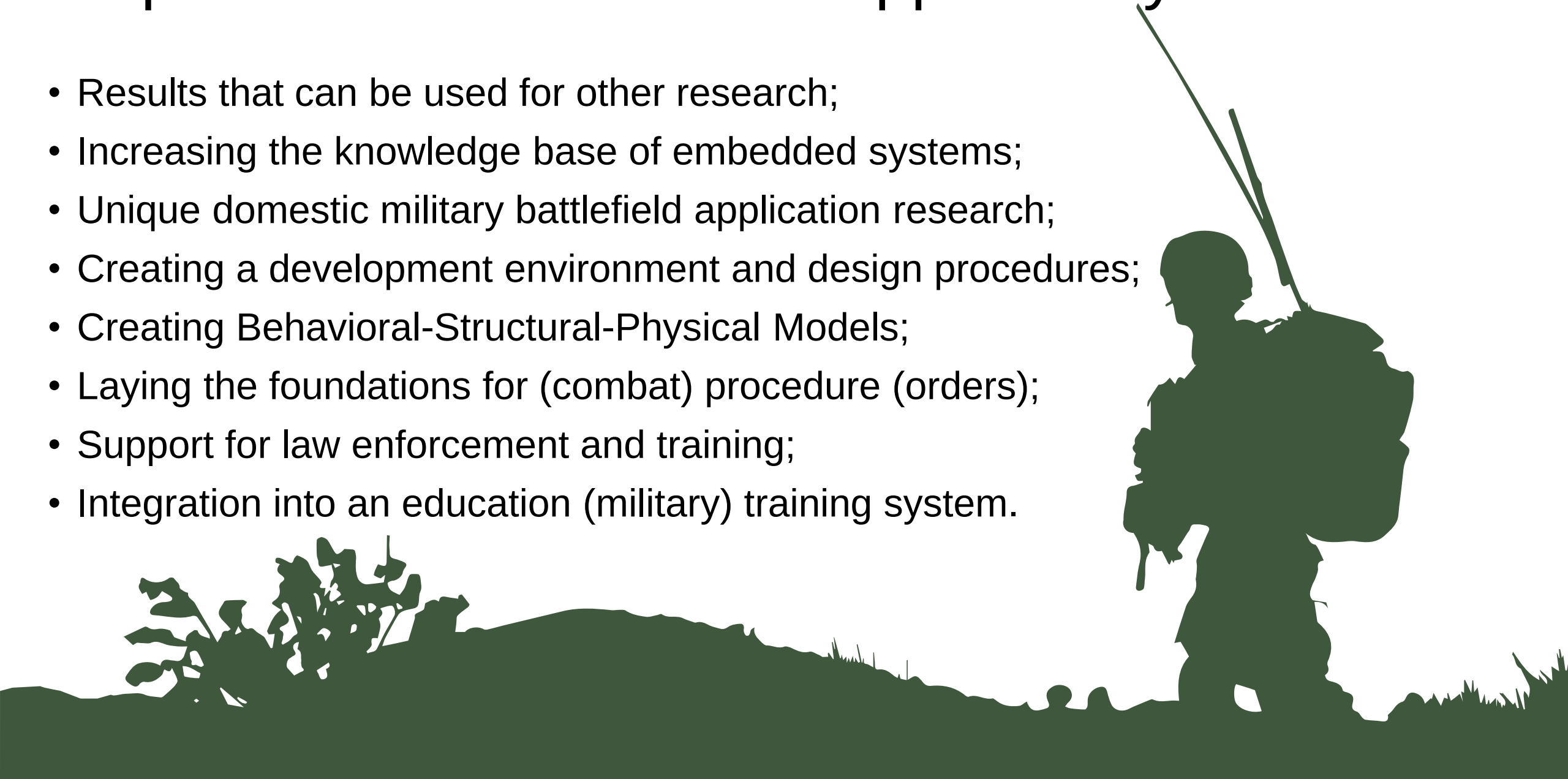
Regarding other data as well:

- Collection of telemetry data (service, maintenance);
- Collection of movement data (team movement, evaluation);
- Can be combined with AI system;
- Can be combined with human interface



Expected results and their applicability

- Results that can be used for other research;
- Increasing the knowledge base of embedded systems;
- Unique domestic military battlefield application research;
- Creating a development environment and design procedures;
- Creating Behavioral-Structural-Physical Models;
- Laying the foundations for (combat) procedure (orders);
- Support for law enforcement and training;
- Integration into an education (military) training system.




Thank you for your attention