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Ukrainian-Russian Warfare in Cyberspace: Technological and Psychological Aspects



DEEPSEC
IN-DEPTH SECURITY

Sergiy Gnatyuk

State Scientific and Research Institute of Cybersecurity
Technologies and Information Protection

Scientific Cyber Security Association of Ukraine

National Aviation University, Kyiv, Ukraine



DEEPSEC



Sergiy Gnatyuk holds a PhD and DSc (second academic research degree in Ukraine) in Cyber Security, he is a Full Professor in Computer Science. Sergiy is a Professor and the Vice-Dean of the Faculty of Cybersecurity, Computer and Software Engineering at National Aviation University as well as Scientific Advisor of the NAU Cybersecurity R&D Lab <https://cyberlab.fccpi.nau.edu.ua> as well as he is Chief Researcher in State Scientific and Research Institute of Cybersecurity Technologies and Information Protection.

Co-Founder and President of the Scientific Cyber Security Association of Ukraine (SCSA-UA) <https://scsa.org.ua> Also, Sergiy is a Cyber Security expert and consultant for state and private Ukrainian and international organizations. He is a speaker and organizer of many international cyber security events as well as an author of many books, patents and papers.

Main research interests are cyber security, cryptography, QKD, 5G security, incidents response, CIIP and others.

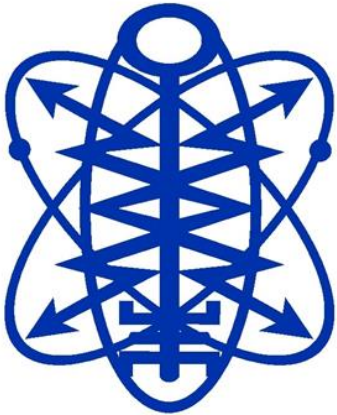
+380971934425

s.gnatyuk@nau.edu.ua

sergio.gnatyuk@gmail.com

<https://www.facebook.com/sergiy.gnatyuk>

#affiliations



State Scientific and Research Institute of Cybersecurity Technologies and Information Protection is Ukrainian scientific center including advanced research activities directed to cybersecurity of the state providing (cryptography, network and Internet security, special communications, complex information security systems etc).

Scientific Cyber Security Association of Ukraine is professional organization in cybersecurity directed to increasing the general level of cyber security of Ukrainian society through the implementation of scientific, scientific and technical and educational activities (projects) in the field of cyber security.

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National Aviation University (Kyiv, Ukraine) is one of the most powerful technical higher educational facilities in Ukraine, with about 25 000 students. It contains 3 specialized academic department and research laboratory in cybersecurity (more than 1400 students study on 4 BSc, 3 MSc and 1 PhD educational programs).

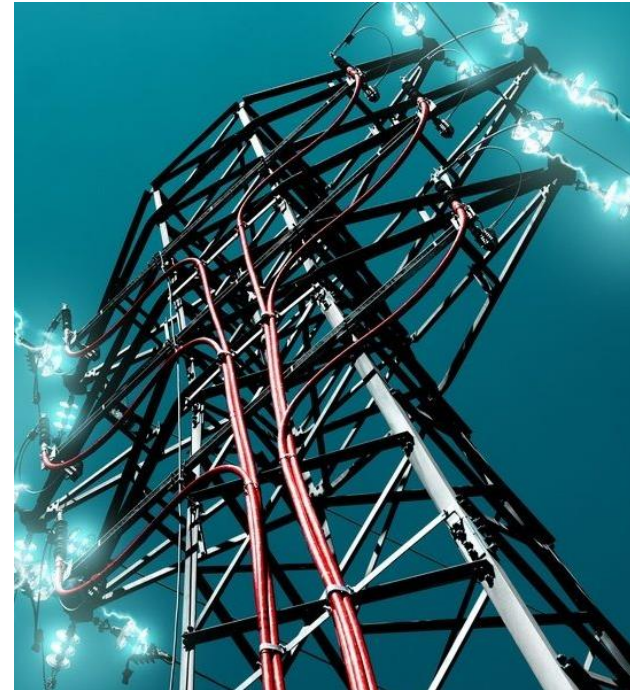
Prehistory of Russian-Ukrainian war

- 1991 – disintegration of the Union of Soviet Socialist Republic (USSR);
- 1994 – Budapest Memorandum (Ukraine signed Treaty on the Non-Proliferation of Nuclear Weapons, Russia, UK and USA provided security assurances);
- 2004 – Orange Revolution in Ukraine;
- 2010 – Kharkiv Pact on the Black Sea Fleet in Ukraine till 2042;
- 2013/2014 – Revolution of Dignity (Euromaidan) in Ukraine;
- 2014 – annexation of Crimea by Russia and escalation the military confrontation in Donbas;
-
- 2022 – Russian large-scale invasion of Ukraine.



Ukrainian-Russian cyber war chronology

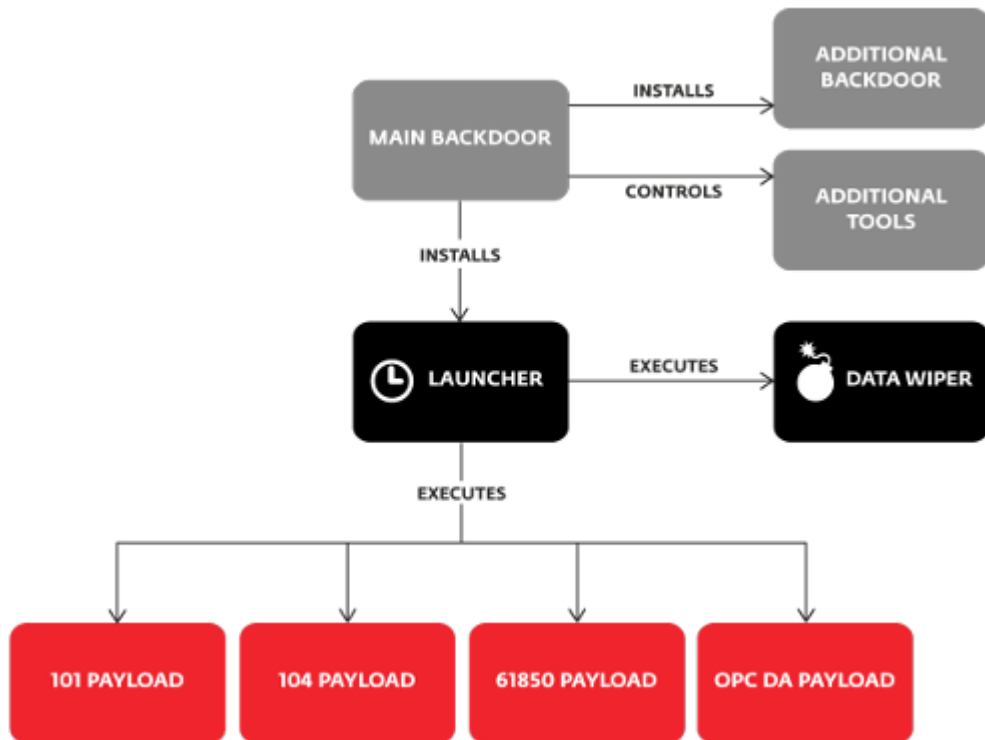
Dec 23, 2015 – BlackEnergy APT attack (blackout in Ukraine, 230 k consumers, 6 hours)



The third version of the BlackEnergy Trojan was used to carry out the world's first confirmed attack on power system failure: on December 23, 2015, Russian attackers managed to successfully attack computer control systems in the control room of “Prykarpattiaoblenergo”, almost 30 substations, about 230 thousand people were turned off remained without light for one to six hours.

Ukrainian-Russian cyber war chronology

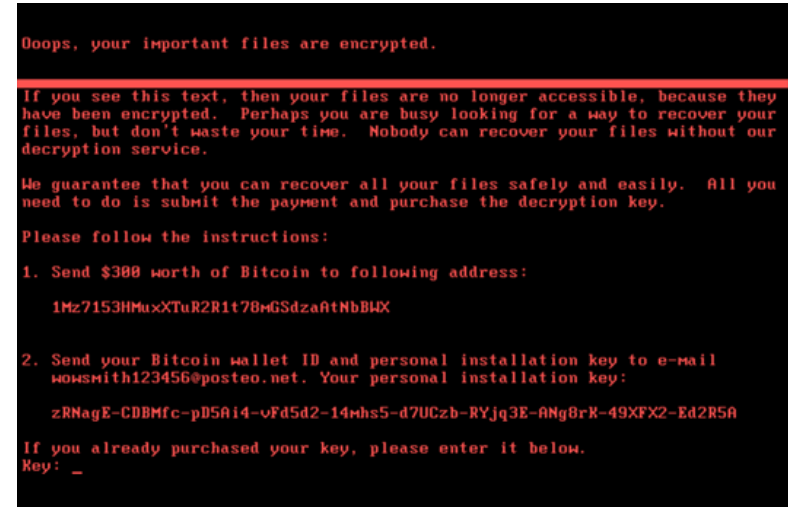
Dec 17, 2016 – Industroyer APT attack (blackout in Ukraine)



The cyber attack on the automated system for controlling the technological processes of the Ukrenergo company became the second known case of a successful cyber attack on the energy system with its failure. The malware used, called Industroyer, had modules for direct connection and control with microcontrollers using industrial protocols. Consumers in the northern part of Kyiv and some districts of the Kyiv region were left without electricity.

Ukrainian-Russian cyber war chronology

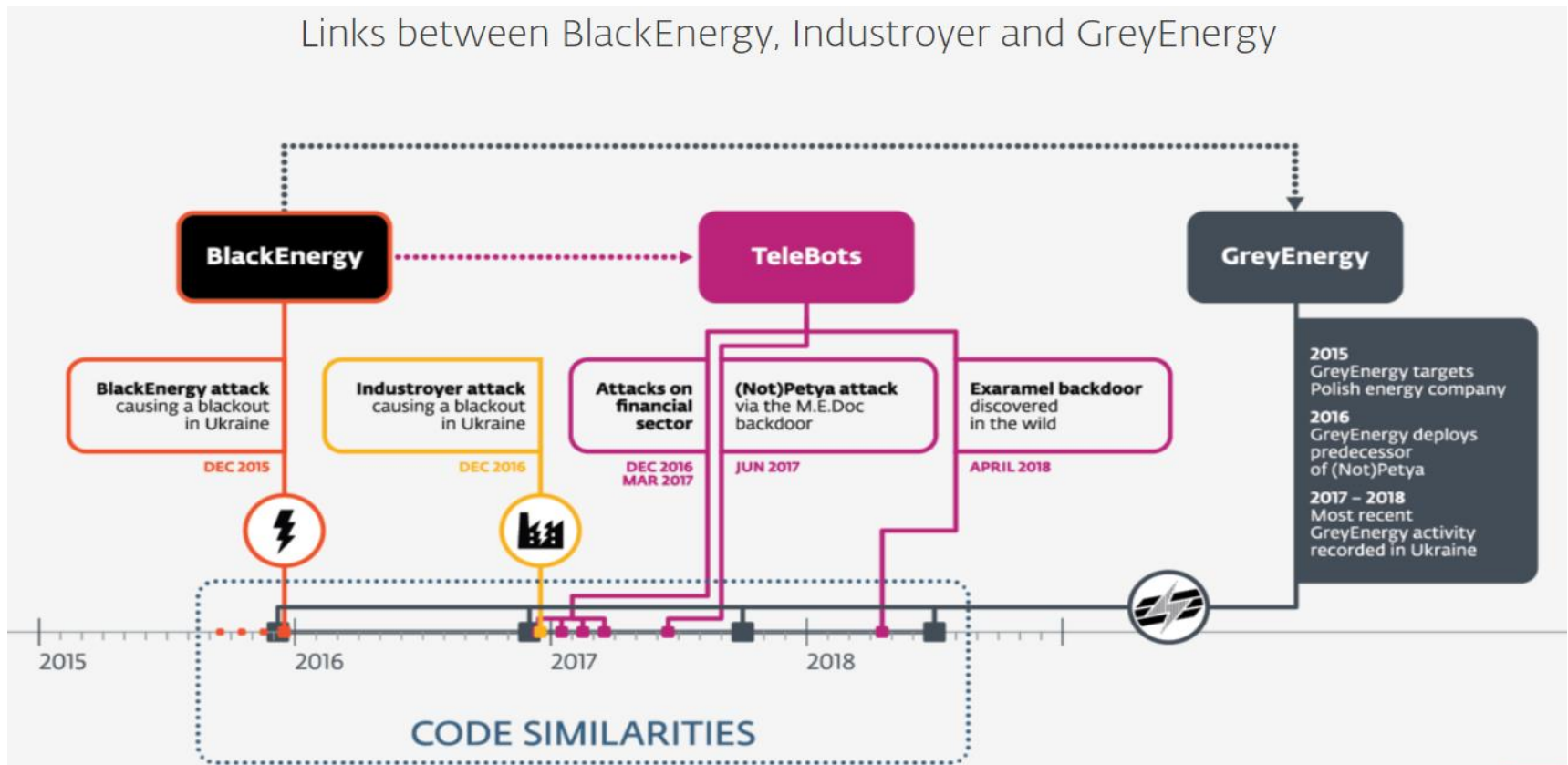
Jun 27, 2017 – NotPetya APT attack (outbreak in Ukraine)



A large-scale destructive attack by a variant of the Petya virus (also known as NotPetya, Eternal Petya, Petna, ExPetr, etc.) was made possible by compromising the M.E.Doc update system and installing a hidden backdoor. Thus, with a large-scale destructive attack, the attackers closed access to computers and computer networks in about 80% of Ukrainian enterprises (government, airports, nuclear power plants, banks etc.)

Ukrainian-Russian cyber war chronology

Oct 18, 2018 – GreyEnergy APT attack (successfully prevented)



The GreyEnergy is closely related to the BlackEnergy and TeleBots malware. It has a modular structure, so its functionality depends on the specific combination of modules that the operator loads into the victim's systems. ESET noted that GreyEnergy attackers were strategically targeting the workstations of ICS operators that manage SCADA software and servers.

Ukrainian-Russian cyber war chronology

Jan 14, 2022 – Deface attack

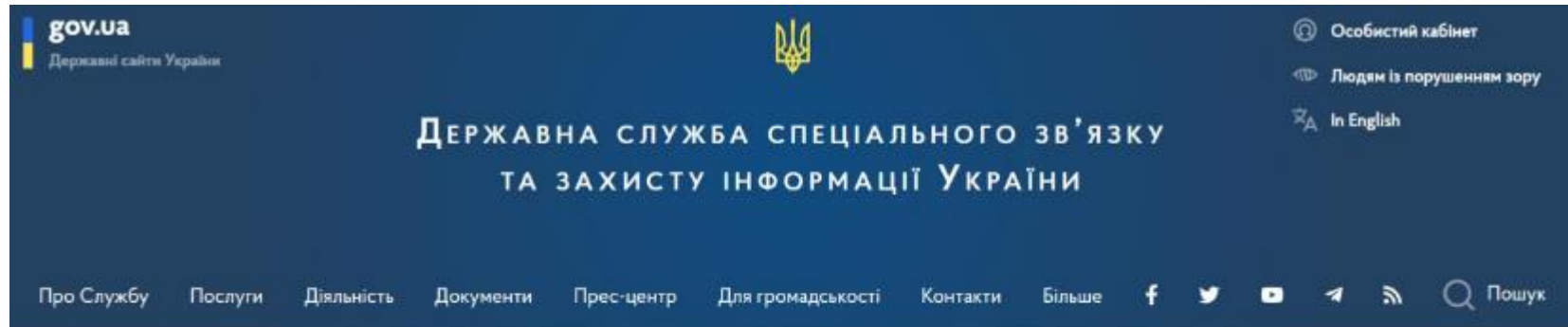
An attack on the night of January 13-14 on more than 15 government websites took place due to a vulnerability in the site's content management system. Probably, the attack took place centrally through one private IT company that created all these sites.

Were hacked Diya, the websites of the State Emergency Service, the Ministry of Foreign Affairs, the Ministry of Health, the Ministry of Education, the Ministry of Youth and Sports, the Ministry of Energy, the Ministry of Agrarian Policy, the Cabinet of Ministers, the State Treasury Service and others.



Ukrainian-Russian cyber war chronology

Feb 23, 2022 – HermeticWiper attack + DDoS attack



Another cyberattack on government websites and banks

News

23.02.2022 16:50

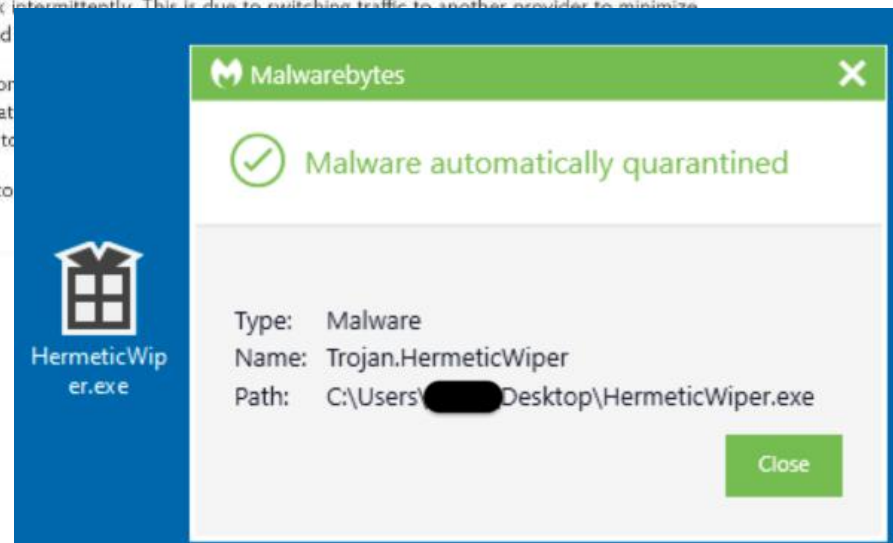
Today, websites of a number of government and banking institutions have undergone a massive DDoS attack again. Some of the attacked information systems are not available or work intermittently. This is due to switching traffic to another provider to minimize damage. Other websites effectively resist the attack and

Currently, the State Service of Special Communication cybersecurity system are working on countering the attack. Websites that have been attacked or are suspected to have been attacked to

The State Service of Special Communications and Information Protection of Ukraine will continue to ensure the security of communication channels: the website of the SSSCIP, our Facebook, and Twitter.



- Government websites
- Largest Ukrainian banks etc



Large-scale invasion of Ukraine 24.02.2022



My personal war story



Future Today's warfare

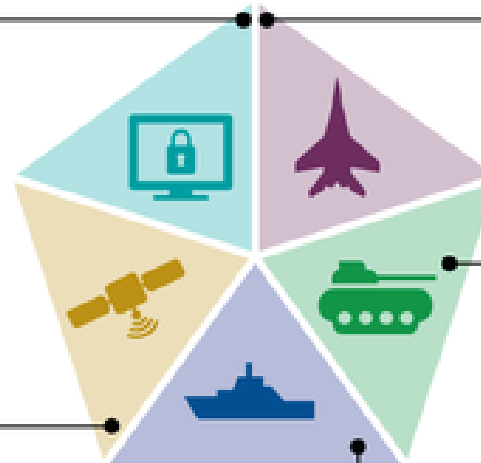
Five Warfighting Domains

Cyber

A global domain within the information environment consisting of the interdependent networks of information technology infrastructures and resident data, including the Internet, telecommunications networks, computer systems, and embedded processors and controllers.

Space

The area above the altitude where atmospheric effects on airborne objects become negligible.



Air

The atmosphere, beginning at the Earth's surface, extending to the altitude where its effects upon operations become negligible.

Land

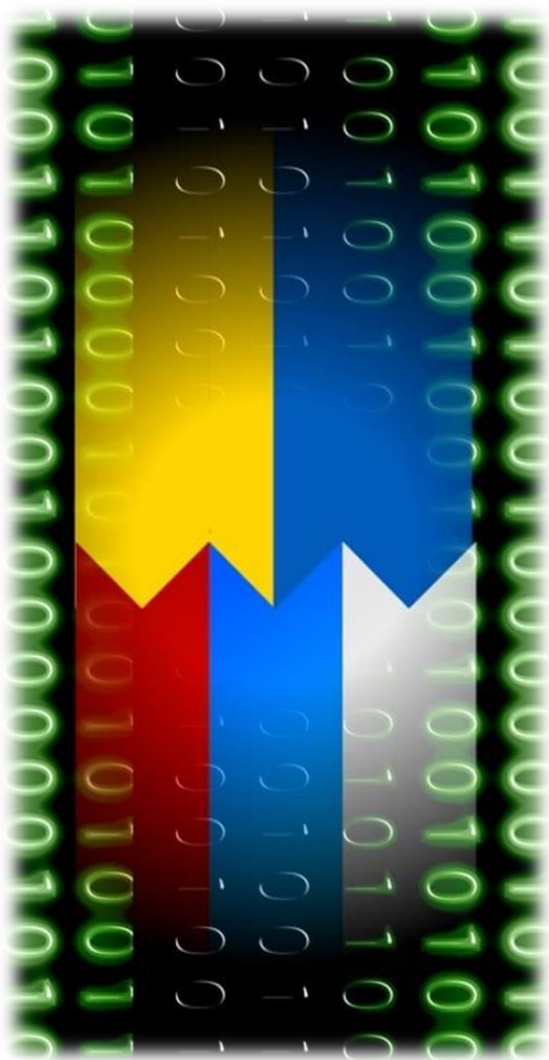
The area of the Earth's surface ending at the high-water mark and overlapping with the sea domain in the landward segment of the shoreline.

Sea

The oceans, seas, bays, estuaries, islands, coastal areas, and the airspace above these, including the areas adjacent to the shoreline.

Source: GAO analysis of Department of Defense information. | GAO-19-570

Cyber attacks



17:49
02.06.2022



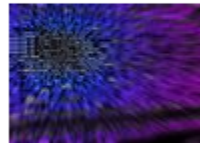
Russian hackers carry out new cyber attack on Ukrainian govt agencies using topic of salaries

20:26
12.05.2022



Russian hackers carrying out new cyberattack on Ukraine using theme of occupied Kherson

19:34
25.04.2022



Russian hackers increasingly attacking ordinary Ukrainians

17:56
27.03.2022



Russian hackers attack Ukrainian charitable and volunteer organizations - Special Communication Service

09:50
28.02.2022



Denysenko: Ukrainian hackers down Kremlin.ru site

Cyber attacks

1,123

**enemy cyber attacks registered against
Ukraine since Feb 24**

Sectors:

- Government – 260
- Security and Defense -154
- Commercial – 83
- Financial – 72
- Others – 554

Attacks categories:

- Unauthorized data gathering – 306
- Malware – 267
- Intrusion – 149
- Vulnerability exploitation – 100
- Others – 301



**State Service of Special
Communications and Information
Protection of Ukraine**

Cyberspace

*complex environment resulting from the interaction of **people**, software and services on the Internet by means of technology devices and networks connected to it, which does not exist in any physical form.*



ISO 27032

Psychological aspect

Psychological operations (PSYOP) are operations to convey selected information and indicators to audiences to influence their emotions, motives, and objective reasoning, and ultimately the behavior of governments, organizations, groups, and individuals.



A person is the weakest link in any system. Cyberspace is no exception.

Myths of the Russian propaganda about Ukraine

MYTH 1. Ukraine doesn't exist, it is part of Russia



USSR Subdivision	Present Day Country	Seceded from the USSR
Estonian SSR	Estonia	8 May 1990
Lithuanian SSR	Lithuania	11 March 1990
Latvian SSR	Latvia	4 May 1990
Azerbaijan SSR	Azerbaijan	30 August 1991
Georgian SSR	Georgia	9 April 1991
Russian SFSR	Russian Federation	12 December 1991
Uzbek SSR	Uzbekistan	31 August 1991
Moldavian SSR	Moldova	27 August 1991
Ukrainian SSR	Ukraine	24 August 1991
Byelorussian SSR	Belarus	10 December 1991
Turkmen SSR	Turkmenistan	27 October 1991
Armenian SSR	Armenia	21 September 1991
Tajik SSR	Tajikistan	9 September 1991
Kazakh SSR	Kazakhstan	16 December 1991
Kirghiz SSR	Kyrgyzstan	31 August 1991

Ukrainians and Russians share a common history, have similar languages and are mostly Orthodox Christian believers. Many neighboring European nations have a common history, linguistic similarity and religious affinity as well. Although some of them were parts of other, bigger states at some point in history, all modern European nations are now equal and independent states, and none of them claims their neighbors' territory.

Ukraine, Russia and all other ex-Soviet republics gained independence in 1991 after the disintegration of the USSR.

Myths of the Russian propaganda about Ukraine

MYTH 2. Ukraine is conducting genocide against the Russian-speaking population



Of all the regions of Ukraine, Crimea and the city of Sevastopol have the largest Russian-speaking populations — 77% of residents there identified their native language as Russian (Donetsk — 74.9% and Luhansk — 68%). Russian is least spoken in the western region of Ternopil, where only 1.2 % said that it was their native language.

Myths of the Russian propaganda about Ukraine

MYTH 3. Kyiv is the capital of fascism



"If a russian says that they love their country, they are patriots. If a Ukrainian confers their state with the same dignity, they are a nationalist. You can speak russian in russia, but speaking Ukrainian in Ukraine means oppressing the russian language."

Oleksii "yXo" Maletskiy

Media talent

During the parliamentary elections of 2019, several nationalist parties, including the Right Sector, the Organization of Ukrainian Nationalists, and the National Corps, decided to unite, but that didn't help much. The newly created party got only 2.15% of votes and didn't even pass the threshold for further participation in the elections.

Myths of the Russian propaganda about Ukraine

MYTH 4. USA finances biological laboratories in Ukraine

Russian mass media distributed (mis) information that there are biological laboratories in Ukraine for the development of viruses that will kill only Russians. Ukrainian birds and animals will spread the virus in Russia.



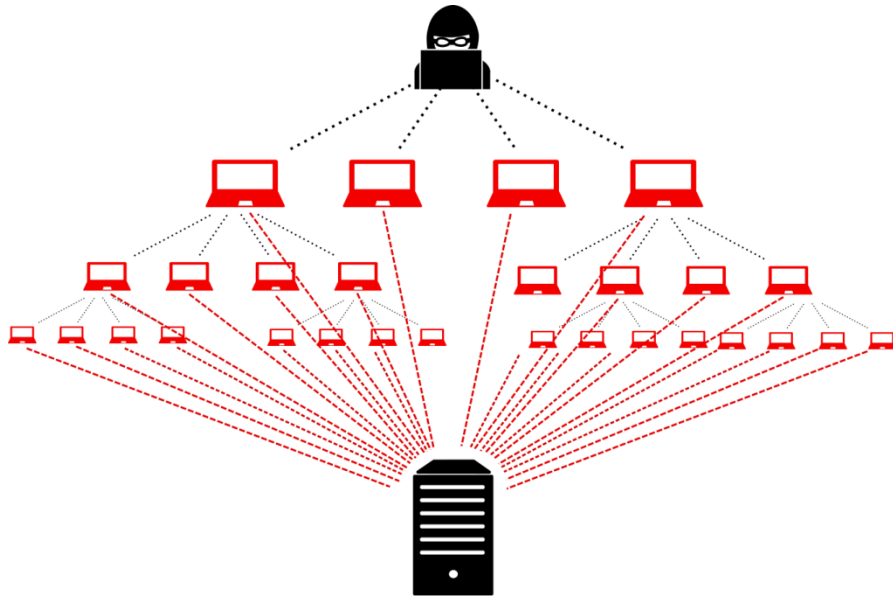
Other myths of the Russian propaganda

- Russia has the second army in the world;
- There are two world superpowers – Russia and the USA;
- The main value of the EU is gay parades and same-sex families;
- Russia single-handedly won the Second World War;
- Russia is the only one legal successor (assign) of Kyiv (Kievan) Rus.

... ..



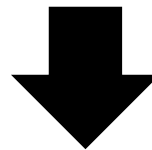
Synergistic effect



Information-technological influence
(data, information infrastructure,
communication channels, ICT etc)

+

Information psychological influence
(consciousness and sub-consciousness
of a person, changing behavior,
causing a reaction etc)



SYNERGISTIC EFFECT
(2+2=5)

International reaction [1/3]



Hackers from the Anonymous community released a video message to Russian President Vladimir Putin, in which they announced their intention to reveal all the secrets that the Russian government hides from its citizens.

International reaction [2/3]

Ukraine to be accepted
as a Contributing
Participant to NATO
CCDCOE



State Service of Special
Communications and Information
Protection of Ukraine

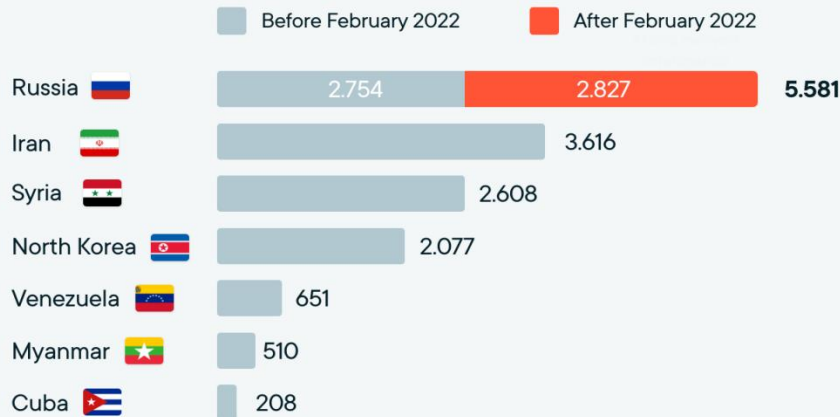
In the March, 2022 the NATO Cooperative Cyber Defence Centre of Excellence (CCDCOE) held its 30th Steering Committee. With a unanimous vote, the 27 Sponsoring Nations in the Steering Committee of the CCDCOE agreed to Ukraine's membership in the NATO CCDCOE as a Contributing Participant.

International reaction [3/3]



The World's Most Sanctioned Countries

Number of currently active sanctions by target country*



Voting Ended

12-Oct-22

16:13:07

Item 5 - Draft resolution A/ES-11/L.5 | Territorial integrity of Ukraine: defending the principles of the Charter of the United Nations

United Nations

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<div><div><div></div></div><div>BULGARIA</div></div>	<div><div><div></div></div><div>ERITREA</div></div>	<div><div><div></div></div><div>JAPAN</div></div>	<div><div><div></div></div><div>MOROCCO</div></div>	<div><div><div></div></div><div>SAINT LUCIA</div></div>	<div><div><div></div></div><div>TUNISIA</div></div>	
<div><div><div></div></div><div>BURKINA FASO</div></div>	<div><div><div></div></div><div>ESTONIA</div></div>	<div><div><div></div></div><div>JORDAN</div></div>	<div><div><div></div></div><div>MOZAMBIQUE</div></div>	<div><div><div></div></div><div>SAINT VINCENT-GR...</div></div>	<div><div><div></div></div><div>TURKMENISTAN</div></div>	
<div><div><div></div></div><div>BURUNDI</div></div>	<div><div><div></div></div><div>ESWATINI</div></div>	<div><div><div></div></div><div>KAZAKHSTAN</div></div>	<div><div><div></div></div><div>MYANMAR</div></div>	<div><div><div></div></div><div>SAMOA</div></div>	<div><div><div></div></div><div>TUVALU</div></div>	
<div><div><div></div></div><div>CABO VERDE</div></div>	<div><div><div></div></div><div>ETHIOPIA</div></div>	<div><div><div></div></div><div>KENYA</div></div>	<div><div><div></div></div><div>NAMIBIA</div></div>	<div><div><div></div></div><div>SAN MARINO</div></div>	<div><div><div></div></div><div>TURKIYE</div></div>	
<div><div><div></div></div><div>CAMBODIA</div></div>	<div><div><div></div></div><div>FIJI</div></div>	<div><div><div></div></div><div>KIRIBATI</div></div>	<div><div><div></div></div><div>NAURU</div></div>	<div><div><div></div></div><div>SAO TOME-PRINCE</div></div>	<div><div><div></div></div><div>UGANDA</div></div>	

IN FAVOUR:143

AGAINST:5

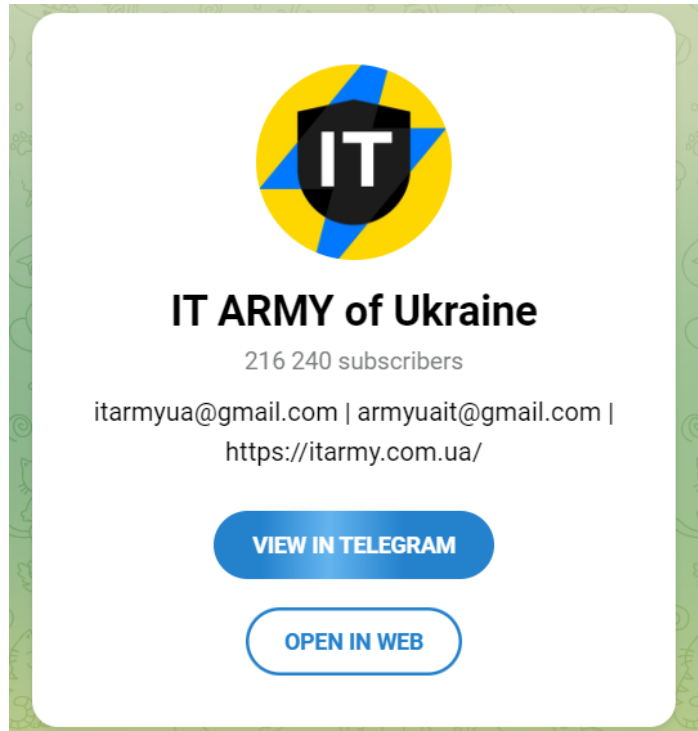
ABSTENTION:35

Ukraine response

- Integration of peoples, government, business etc;
- **Cyber volunteers' initiatives;**
- Continuation of digital transformation;
- Novel cyber security strategy of the state;
- New post-quantum cryptography standards;
- Scientific and social projects.

Cyber volunteers' initiatives

IT ARMY of Ukraine <https://itarmy.com.ua>



The most popular instruments:

- DDoS Ripper
- Distress
- MHDDOS
- UAShield

Initiative of the Ministry of Digital Transformation, Ukrainian IT-community and Volunteers! During its existence, the IT army attacked more than 6,000 web resources of the Russia and Belarus. Among them: websites of state institutions, universities, banking systems, departments, regional mass media, military merchants, CRM systems etc.

Cyber volunteers' initiatives

Gamification

Play for Ukraine: A Game to Attack Russian Websites Gains Popularity

• By: [Bhaswati Guha Majumder](#) • [News18.com](#) • Last Updated: MARCH 20, 2022, 11:25 IST • New Delhi



The makers don't reveal the names of the Russian websites they're targeting for security and strategic reasons. However, the Play for Ukraine Twitter account has recorded a number of victories, which is Russian site takedowns

• Follow us: [Facebook](#) [Twitter](#) [Instagram](#)
[Telegram](#) [Google News](#)

Cyber volunteers' initiatives

MRIYA Platform <https://mriya.social>



Головна

Проекти ▼

FAQ

Українська ▼



**STOP
RUSSIA**

MRIYA

Платформа MRIYA

синергія Кіберполіції України та волонтерів у протидії російським окупантам у медіа-просторі



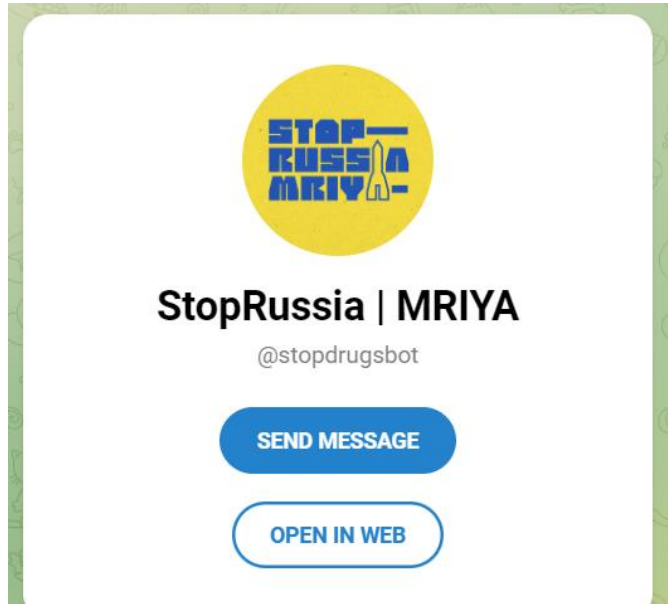
**STOP
RUSSIA**

MRIYA

Synergy of Cyber Police and Volunteers to counteract Russian occupants in media.
It consist of the following few interconnected application (projects)

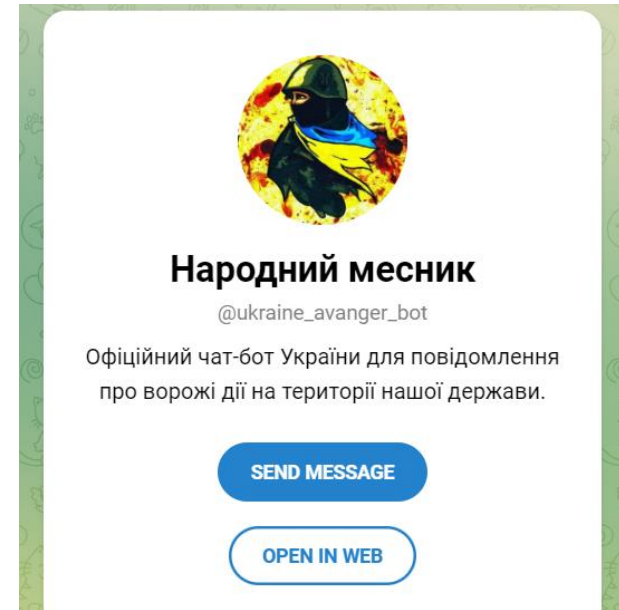
Cyber volunteers' initiatives

MRIYA Platform <https://mriya.social>



StopRussia Channel

The ability to add information about fake resources that are checked by our moderators and sent to be blocked by interested citizens



People's avenger

Notification of any hostile actions of the aggressor on the territory of Ukraine. Information is sent here about the movement of enemy equipment, Russian soldiers and their henchmen, detected looters, or found unexploded ammunition.

Cyber volunteers' initiatives

MRIYA Platform <https://mriya.social>

АВТОМАТИЧНЕ БЛОКУВАННЯ «MRIYA AUTOMATIC»

Qlixer Social

Автоматичне блокування в Інстаграм

ЛінкедІн та Твіттер

Розпочати

BANWAR

Автоматичне блокування в Ютуб,

Інстаграм, Телеграм та Твіттер

Розпочати



StopRussiaChannel | MRIYA

279 418 subscribers

Unread Messages

!! БЛОКУЄМО Instagram

⚡ **Завдання:** Подати скарги, на ТікТок акаунти, за кожним посиланням нижче 📌

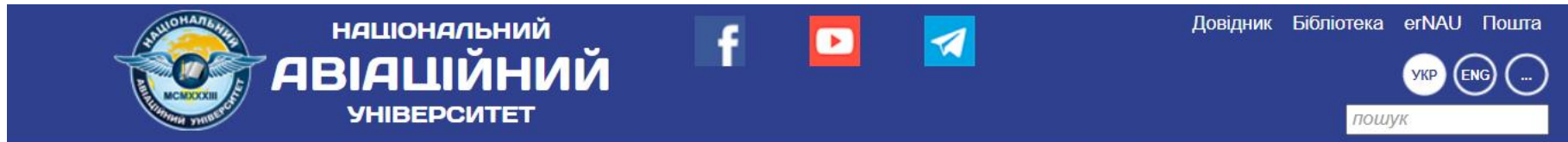
#1 <https://www.instagram.com/oldschool.spn>

#2 https://www.instagram.com/volonter_za_pobedy

#3 https://www.instagram.com/jack_the_ripper232

Cyber volunteers' initiatives

MRIYA Platform <https://mriya.social> – Example of the university participation



Університет Навчальні підрозділи Навчальний процес Наука Забезпечення якості Студенту Вступ - 2022

Головна > Новини > Студенти та викладачі НАУ долучилися до платформи MRIYA

12.08.2022, 16:51

Студенти та викладачі НАУ долучилися до платформи MRIYA

Розмір тексту: A A A Друквати

Останні новини

18/10/2022	Факультет архітектури, будівництва та дизайну НАУ провів чемпіонат з боулінгу
17/10/2022	До уваги студентів Факультету кібербезпеки, комп'ютерної та програмної інженерії НАУ
17/10/2022	НАУвці здобули перемогу в конкурсі «Молодий вчений року»
17/10/2022	Лекції для спільноти НАУ провели представники наукової спільноти та стейкхолдери країн Європейського Союзу
17/10/2022	У НАУ відбувся Кубок першокурсника з футзалу
17/10/2022	Декан Факультету міжнародних відносин НАУ провів зустріч зі студентами першого курсу магістратури
17/10/2022	У НАУ провели симпозіум «Просторова організація аеропортових комплексів та приаеродромних територій»
14/10/2022	14 жовтня в Україні відзначають День захисників і захисниць України
14/10/2022	Студенти НАУ зустрілись з керівником Центру стратегічних комунікацій та інформаційної безпеки НАУ Міністерства внутрішніх справ України

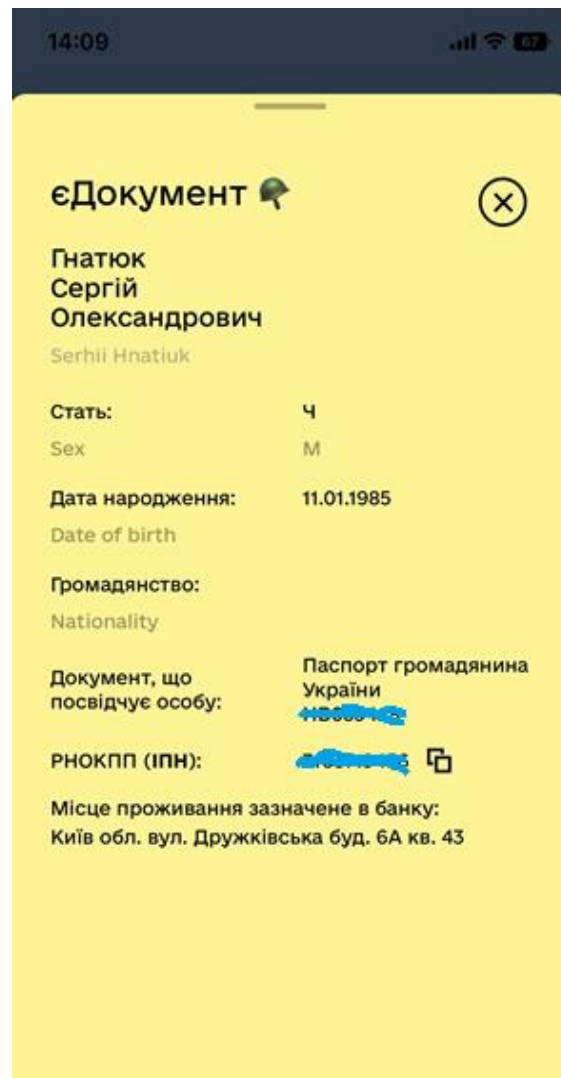


Ukraine response

- Integration of peoples, government, business etc;
- Cyber volunteers' initiatives;
- **Continuation of digital transformation;**
- Novel cyber security strategy of the state;
- New post-quantum cryptography standards;
- Scientific and social projects.

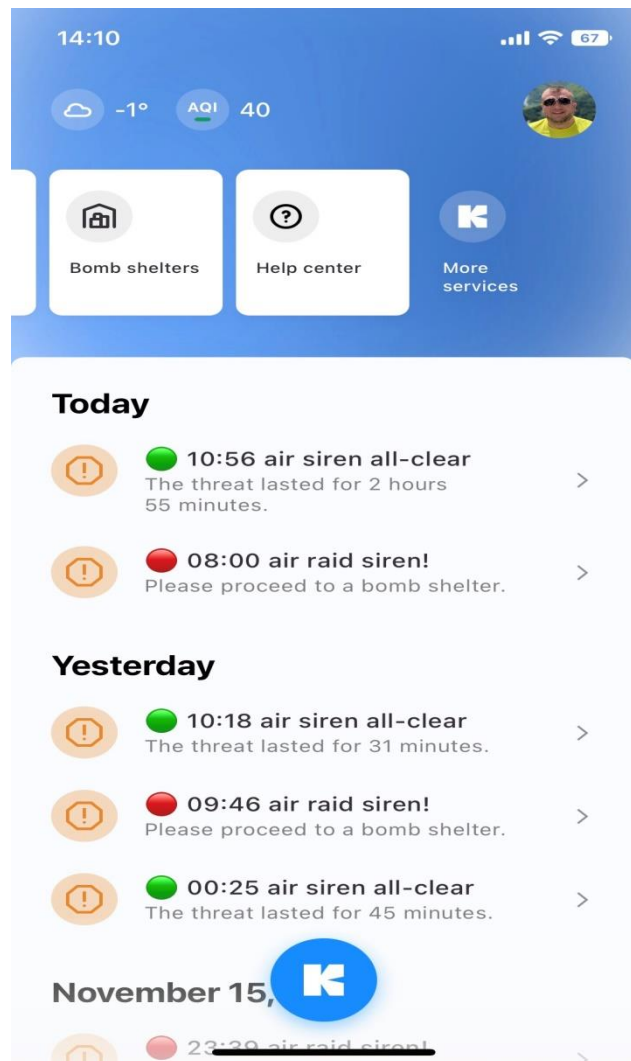
Continuation of digital transformation

DIIA Platform <https://diia.gov.ua/> - State in the smartphone!



Continuation of digital transformation

KYIV DIGITAL <https://kyiv.digital> - City in your pocket!



16.11.2022 – during Smart City Expo in Barcelona
Kyiv won special recognition for Kyiv Digital Application

Ukraine response

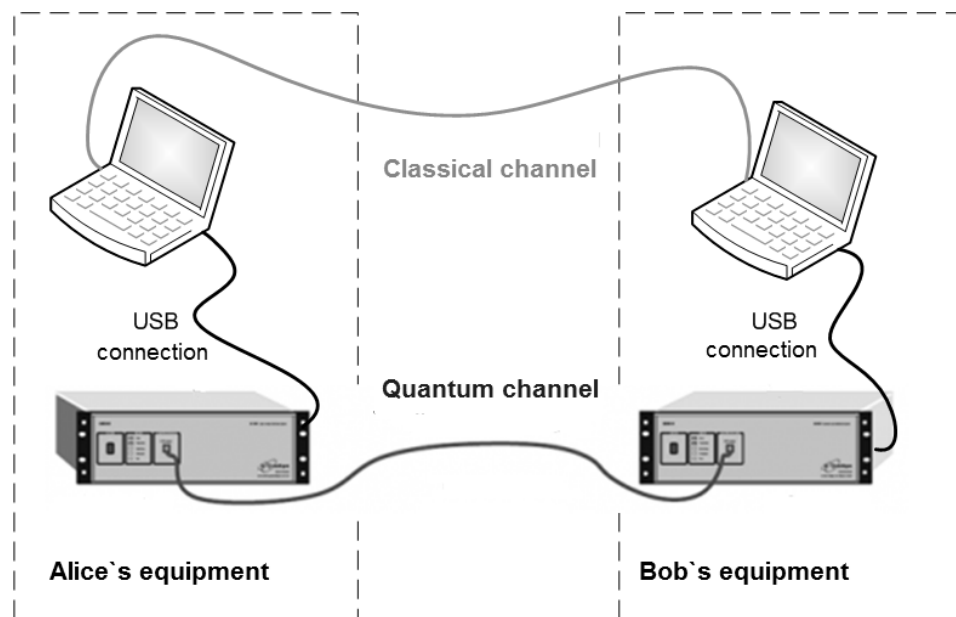
- Integration of peoples, government, business etc;
- Cyber volunteers' initiatives;
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- Novel cyber security strategy of the state;
- New post-quantum cryptography standards;
- **Scientific and social projects.**

Scientific projects [1/3]

Quantum-safe security system based on QKD and post-quantum encryption

- State Scientific and Research Institute of Cybersecurity Technologies and Information Protection
- National Aviation University (NAU R&D Cybersecurity Lab)
- Institute of Physics of the NAS of Ukraine
- Cybersecurity and Cryptography companies and R&D centers

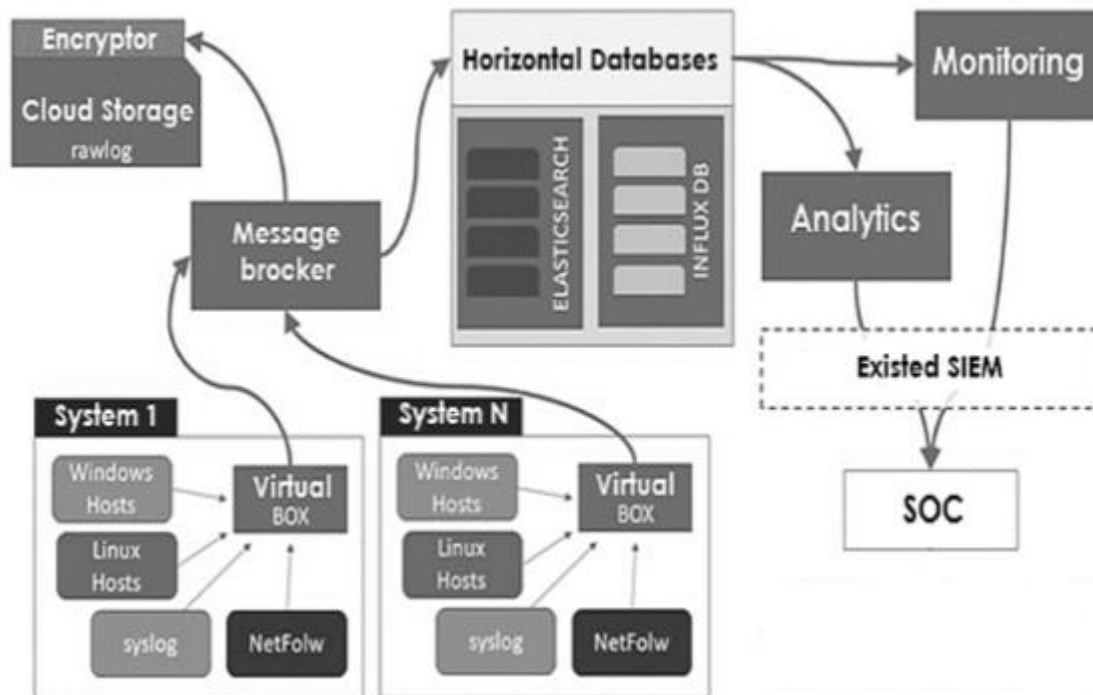
QKD + PQ Symmetrical Algorithm +
Additional Procedures (Authentication,
Privacy Amplification, PRNG etc.)



Scientific projects [2/3]

Methods, models and tools for security events and incidents management for detecting and preventing cyber attacks on critical infrastructures of digital economics

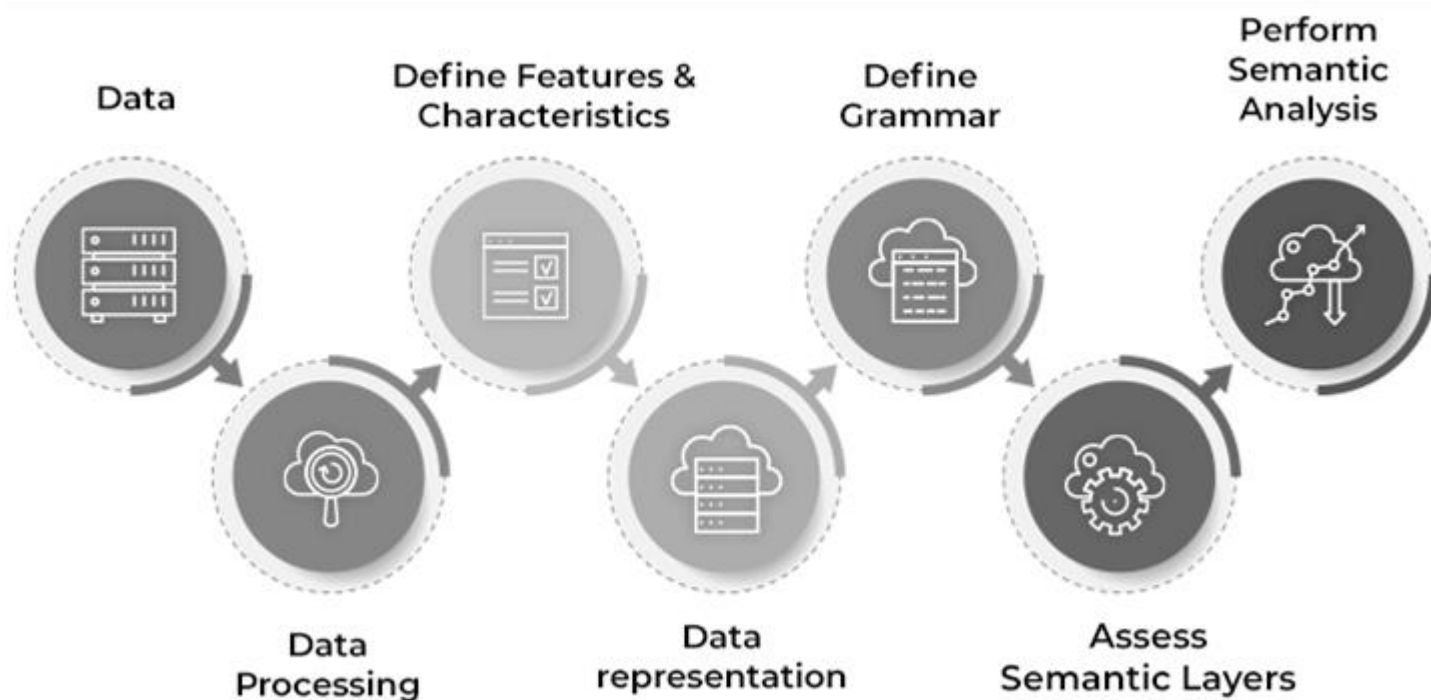
- Almaty University of Power Engineering and Telecommunication
- National Aviation University (NAU R&D Cybersecurity Lab)



Scientific projects [3/3]

Semantic analysis of web resources for detection of Russian disinformation activities (grant number G-202210-69388) funded by CRDF Global USA

- National Aviation University (NAU R&D Cybersecurity Lab)



Social projects [1/2]

Veterano Cyber Cluster funded by IREX USA

- Scientific Cyber Security Association of Ukraine
- Ministry of Veteran Affairs
- IT-companies



The goal of the project is to create a comprehensive ecosystem of reintegration of veterans through career guidance, training, internships and employment in a company specializing in cyber security.

Social projects [2/2]

Digital independence of senior citizens in wartime not funded yet

- Scientific Cyber Security Association of Ukraine
- Ukrainian universities



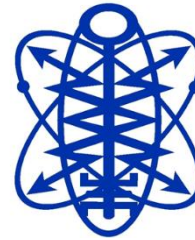
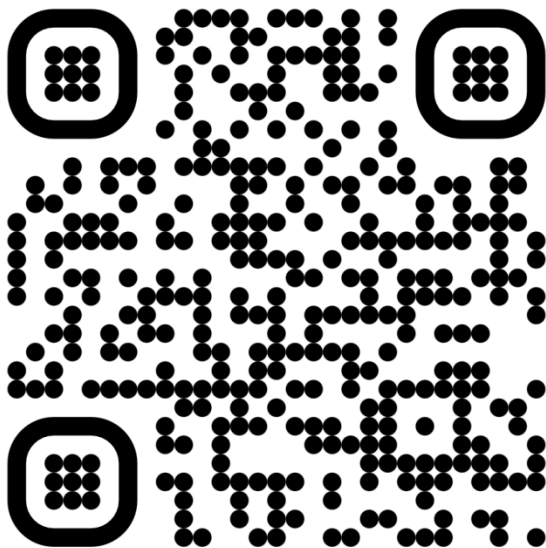
Computer literacy and education in ICT and cyber hygiene for representatives of the older generation are extremely important today, and especially for people from deoccupied territories, who saw and experienced military actions in their hometown or village.

DEEPSEC

IN-DEPTH SECURITY CONFERENCE EUROPE
15TH TO 18TH OF NOVEMBER 2022
THE RENAISSANCE HOTEL VIENNA

FROM
UKRAINE
WITH
LOVE

Thank you for your attention! Stand with Ukraine!



SCIENTIFIC
CYBER SECURITY
ASSOCIATION



Sergiy Gnatyuk

+380971934425

s.gnatyuk@nau.edu.ua

sergio.gnatyuk@gmail.com

<https://www.facebook.com/sergiy.gnatyuk>