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DEVELOPMENT OF EFFECTIVE ACCESS TO THE DISTRIBUTED SCIENTIFIC AND EDUCATIONAL E-INFRASTRUCTURE

РАЗВИТИЕ ЭФФЕКТИВНОГО ДОСТУПА К НАЦИОНАЛЬНОЙ РАСПРЕДЕЛЕННОЙ НАУЧНО-ОБРАЗОВАТЕЛЬНОЙ Е-ИНФРАСТРУКТУРЕ

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General objectives

- Development of modern national and regional resources of the electronic infrastructure RENAM and the provision of services focused on supporting scientific and educational communities in Moldova, as one of the six countries of the Eastern Partnership.
- The prospects of creating new optical CBF (Cross Border Fibers) links and other components of the electronic platform RENAM with the support of the EU-funded projects: EaPConnect2, GN4-3, NI4OS Europe.
- Evolution and current trends in the development of computing resources and services in the national network of science and education.

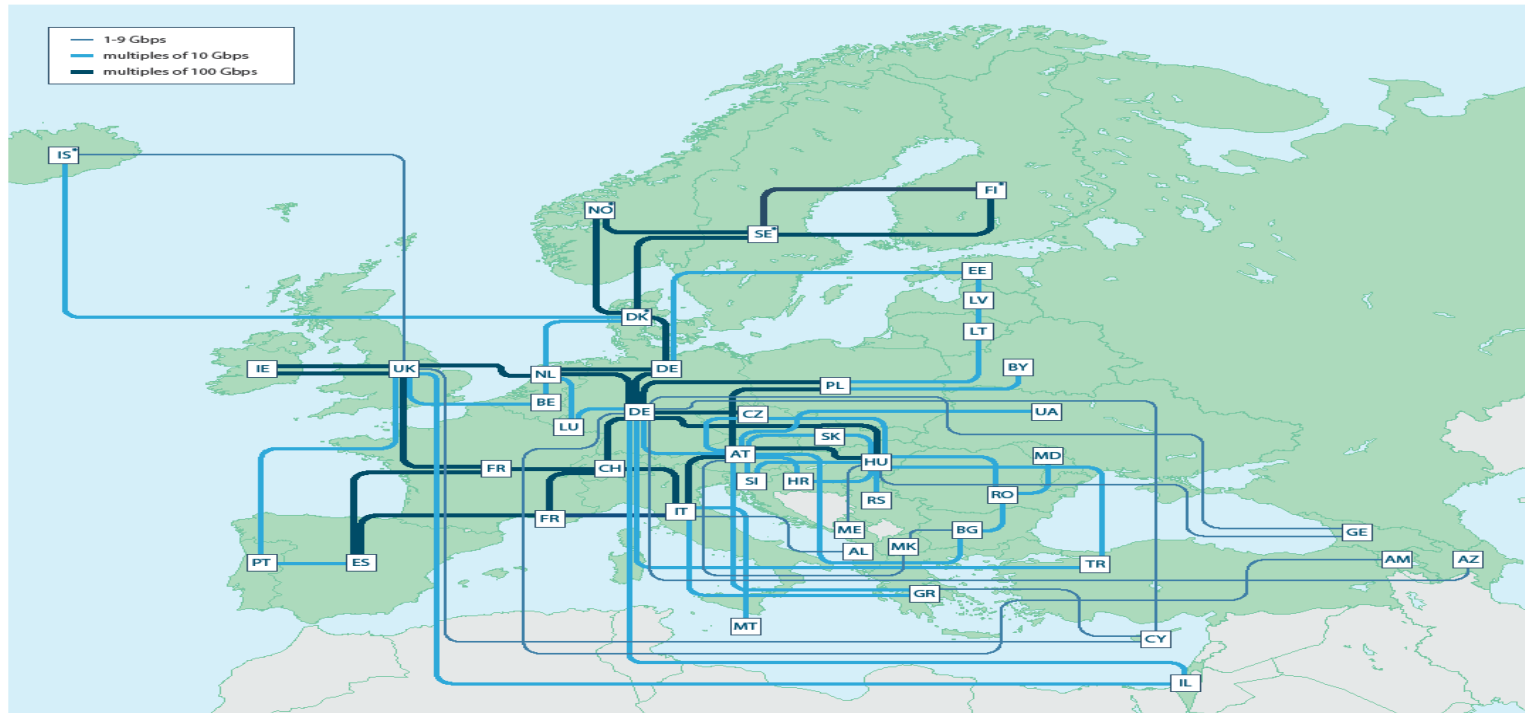
National and regional optical infrastructures of the NREN RENAM network and access channels to the GEANT network



- The operating optical channel: Chisinau (POP GEANT) - Yasi (RoEduNet) - Bucharest (POP GEANT) with a capacity of 10x10 Gbps.
- An optical channel created in 2021 with the support of the EaPConnect2 project: Chisinau (POP GEANT) –Odessa (URAN) –Kiev (POP GEANT) - Poznan (POP GEANT) with a capacity of 100 Gbps.
- In the future, the second channel through the south of Moldova: Chisinau (POP GEANT) - Cahul (RENAM) - Galati (RoEduNet) - Bucharest (POP GEANT)



GÉANT's pan-European **research and education network** interconnects Europe's National Research and Education Networks (NRENs). Together we connect over **50 million users** at 10,000 institutions across Europe.



GÉANT's pan-European network is funded by the GÉANT Project (GN4-2), which received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 731122. Connectivity to the Eastern Partnership countries (AM, AZ, BY, GE, MD, UA) is provided through the EaPConnect project, with 95% funding from the European Commission DG NEAR under grant agreement 2015-356353. The map shows topology as at December 2018. The GN4-2 and EaPConnect partners are listed below.

- | | | | | | | | | | | |
|------------|-------------|----------------|----------|---------|----------|------------|------------------|----------|----------|----------------|
| Albania | Belgium | Cyprus | Estonia | Georgia | Ireland | Lithuania | Montenegro | Norway* | Serbia | Turkey |
| Armenia | Bulgaria | Czech Republic | Spain | Greece | Israel | Luxembourg | F.Y.R. Macedonia | Poland | Sweden* | United Kingdom |
| Austria | Belarus | Germany | Finland* | Croatia | Iceland* | Latvia | Malta | Portugal | Slovenia | Ukraine |
| Azerbaijan | Switzerland | Denmark* | France | Hungary | Italy | Moldova | Netherlands | Romania | Slovakia | |

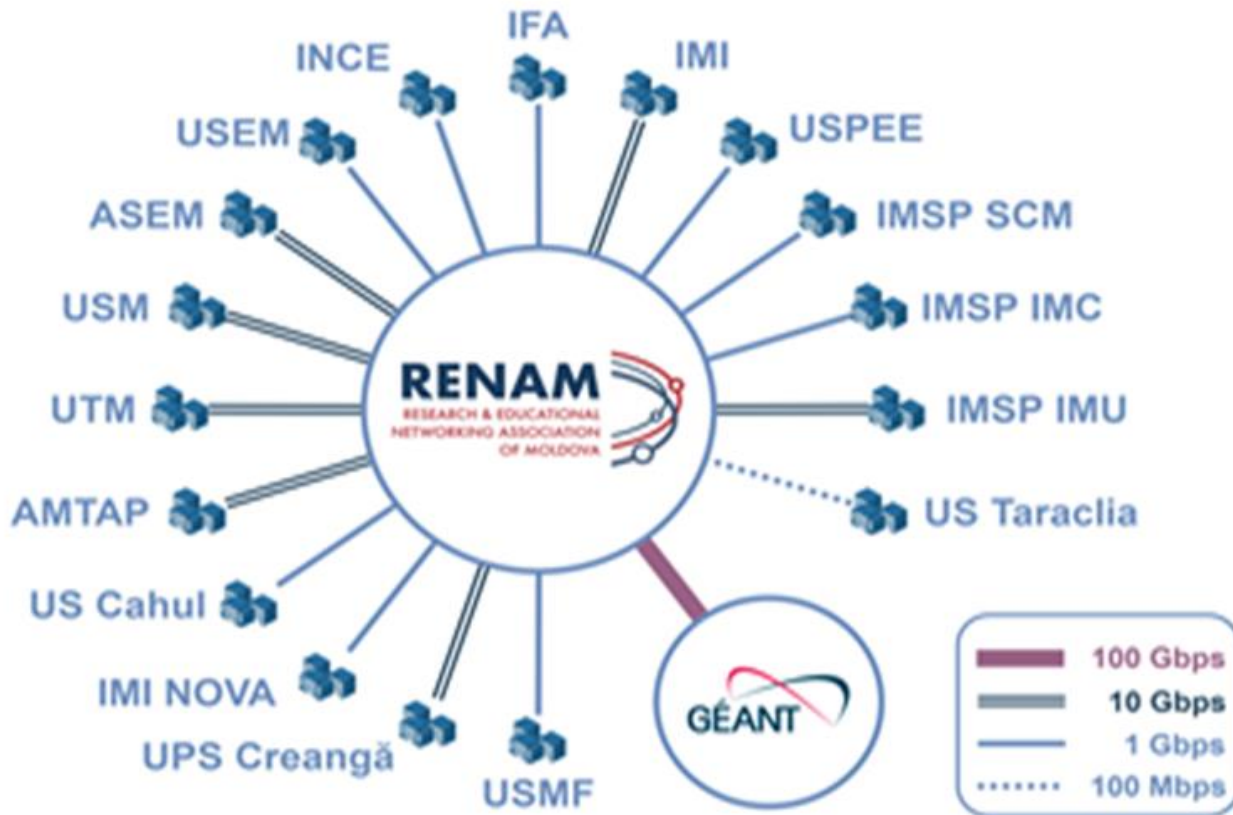
*Connections between these countries are part of NORDUnet (the Nordic regional network)



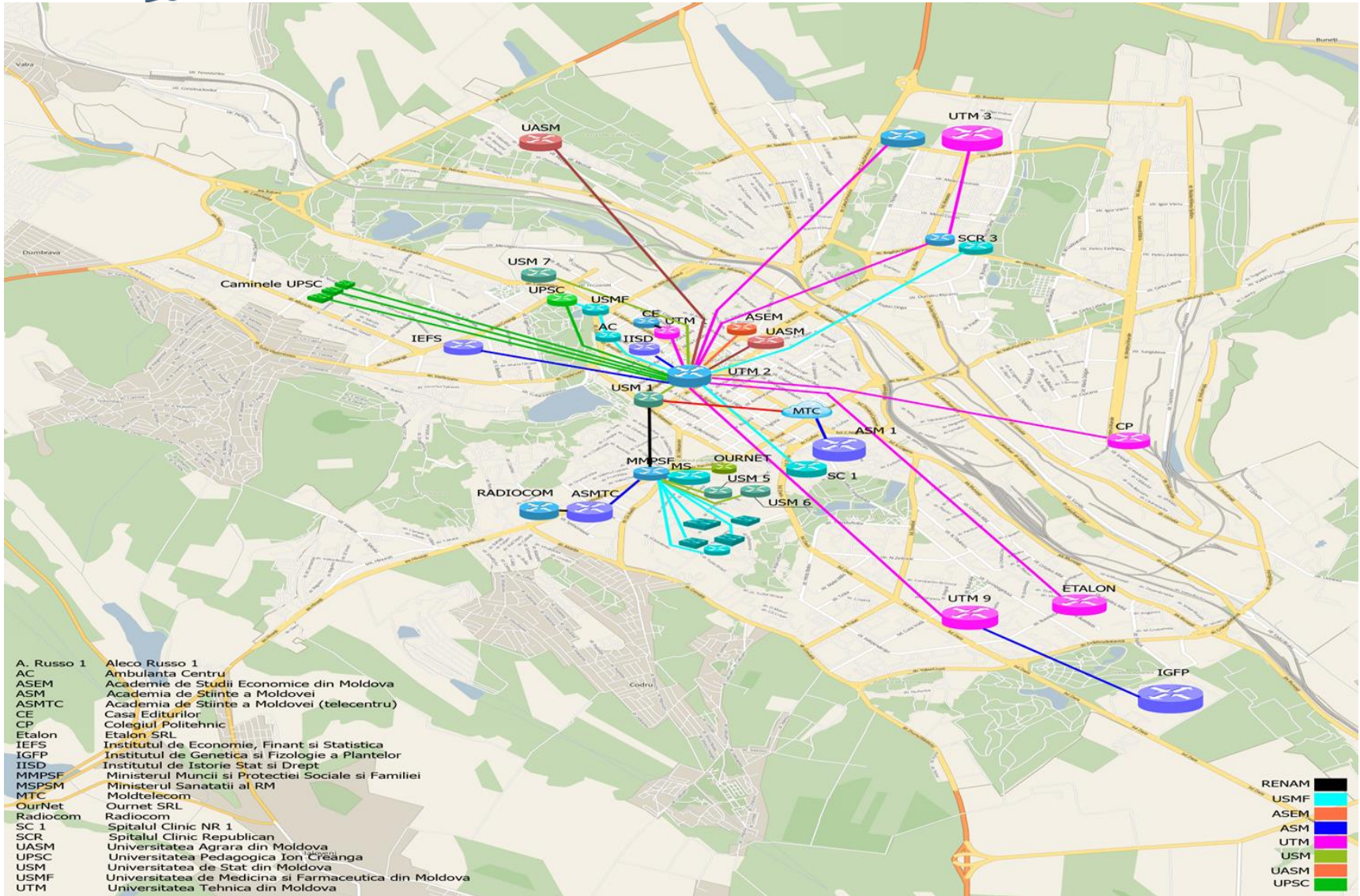
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NATIONAL CONNECTIVITY



Network topology in Chisinau



Connectivity Services

- Access to resources and services of the GEANT platform, as well as to European and global networks and the global Internet through the GEANT network;
- Provision of broadband (high-speed) connections for national research and education institutions;
- Interconnection of national E & R institutions: UTM, ASEM, ASM, USM, UPSC, USEM, State University in Taraclia, State University in Cahul, AMTAP, USPEE, and others;

Other internationally available services

- EDUGAIN - Federated Identity Management Service, using the global inter-federation mechanism;
- EDUROAM (WiFi network mobility service) - Secure Wi-Fi network access worldwide;
- Access to HPC resources of European computing infrastructures that available via regional or/and specific Calls organized by EaPConnect project for porting and running of applications for connected to RENAM institutions;
- Access to world-class cloud infrastructure resources (Amazon, Microsoft, CloudSigma, etc.) through the GEANT Framework Agreement to get different cloud resources using Federated Access.

RENAM provides access to it's RSC IaaS Cloud infrastructure based on OpenStack

- **The main users of the RSC are:** system administrators, programmers, teachers, students, researchers and participants in joint projects from Institutes, Universities and Academic Organizations. RSC is also actively used by RENAM employees;
- **The RSC resources are curently used exclusively for research,** experiments, training, testing IT solutions and preparing services for further use in the activities of Scientific Organizations. Virtual machines with configured services (Production version of service) can be migrated to a cluster with Proxmox virtualization platform.

Near-future plans for RENAM Cloud infrastructure Upgrade:

- Creation of United Cloud Computing infrastructure with main R&E institutions of Moldova;
- Extension of Cloud infrastructure with modern High-Performance servers;
- Complete transition to 10G fiber-optics connections between all availability zones;
- Adding a high-capacity Block Storage service for store project's data;
- Migration to a more flexible self-service networking model;
- Upgrade current OpenStack Mitaka to the latest stable release available.

RENAM Storage Infrastructure

- RENAM Storage Infrastructure consist of 2 high-capacity DELL 740xd storage servers with nearly 50Tb storage on each, distributed between two main RENAM PoPs – NOC and IMI;
- Servers are highly used for storing automated backups of all RENAM and IMI VM instances and servers, provide storage for data repositories of EOSC initiative projects and for high-volume computational data.
- Servers are running on TrueNAS (FreeNAS) opensource middleware.
- Servers are interconnected using 10G Fiber Optics.

Strategy aims of RENAM development in Moldova

- Creation and development of basic infrastructure (nodes and highways) of Nation-wide scientific-educational network and providing a stable access to national and foreign information resources;
- Providing access to resources and services of electronic infrastructures to support modern research, and the implementation of the principles of open science in Moldova and close interaction with the international scientific and educational community;
- Development of e-learning environment for new educational technologies deployment.

Conclusions

Main results:

- RENAM is the only national network connected to the pan-European academic network GEANT, which allows universities and scientific institutions of Moldova to assimilate modern IT resources and services.
- Based on its own optical infrastructure, RENAM connects most universities (14), MECC research institutes, medical institutions, libraries and student residences at a speed of 1-10 Gbps.

Main results:

- For the scientific and educational community of Moldova, constantly:
 - expanded coverage area with eduroam service (new 160 access points installed in 2020),
 - remote work and study is ensured during the COVID-19 pandemic by implementing video conferencing systems,
 - digital certificates are issued, etc.

Спасибо!
Thank you!



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