



Overview about VIRAC, ongoing and future CERN activities



Ventspils International Radio Astronomy Centre (VIRAC)

Ventspils University of Applied Sciences (VUAS), Ventspils, Latvia

www.virac.eu

Insight into history

1967

Irbene radioantenna complex was founded on **June 10, 1967**, as a secret Soviet intelligence and communications center

1994

VIRAC, was founded by the Latvian Academy of Sciences under the name Ventspils International Radio Astronomy Center on **July 22, 1994**

1997

VIRAC was reorganized as a state-owned scientific non-profit organization, a limited liability company (Ltd.).

2004

On **December 16, 2004**, VIRAC was included in the Ventspils University of Applied Sciences (VUAS).

2005

VIRAC was registered on **November 25, 2005** in the Register of Scientific Institutions of the Republic of Latvia.

2010

On **March 18, 2010**, the VIRAC as a VUAS unit was re-registered in the Register of Scientific Institutions of the Republic of Latvia.

2013

VIRAC became a VUAS unit with its Scientific Council, whose activities are determined by the Senate of the VUAS.

2016

VIRAC was admitted to the European VLBI Network (**EVN**) and Latvia – JIV-ERIC.

2017

Latvia's first satellite Venta-1 developed by VIRAC and VUAS was successfully launched into space.

2019

VIRAC was admitted to the International Low Frequency Array (LOFAR) Telescope (**ILT**).

2020

Latvia has become an Associate **ESA** Member State.

2021

Latvia has become an Associate **CERN** Member State.



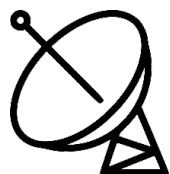


Research

- Research
- Projects
- Publications
- Conferences

Education

- Study courses
- Special courses
 - Seminars
- Summer schools



- Testing
- Laboratories
- Prototyping
- Production

Infrastructure

- Patents
- Services
 - Innovations
- Technology transfer



Commercialization

About VIRAC:

1. VIRAC is an internationally recognized and outstanding Latvian space research and education center, which conducts high-quality research in astronomy and satellite communications, develops space research hardware and software, and provides educational services in the fields of space technology and science.
2. VIRAC aims to become a global research service provider in the field of space technology research, thus speeding up the international growth of companies in Latvian space industry.
3. Number of people: 76 technical, engineering, research and administrative personnel

OBSERVATION INFRASTRUCTURE



Radio telescope **RT-32**
32 meters parabolic antenna



Radio telescope **RT-16**
16 meters parabolic antenna



LOFAR station (LV614)
96 antenna array for low freq. obs.,
96 antenna array for high freq. obs.



EVN network with VIRAC RT-32 and RT-16



The European VLBI Network (EVN) is an **interferometric array of radio telescopes** spread throughout Europe (and beyond) that conducts unique, **high resolution, radio astronomical observations of cosmic radio sources**. It is the most sensitive VLBI array in the world, thanks to the collection of extremely **large telescopes** that contribute to the network.



- L Band (1.6 GHz)
- C Band (5 GHz)
- M Band (6.7 GHz)
- X Band (8.4 GHz)

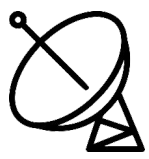
- Fringe tests – 2012
- Data streaming at 1 Gbps and multiantena regime - 2013
- Regular observations – 2015
- EVN member– 2016 October
- Local correlator



Network status as per 2008-05-02. Image created by Paul Boven <boven@jive.nl>. Satellite image: Blue Marble Next Generation, courtesy of Nasa Visible Earth (visibleearth.nasa.gov).

Related projects:

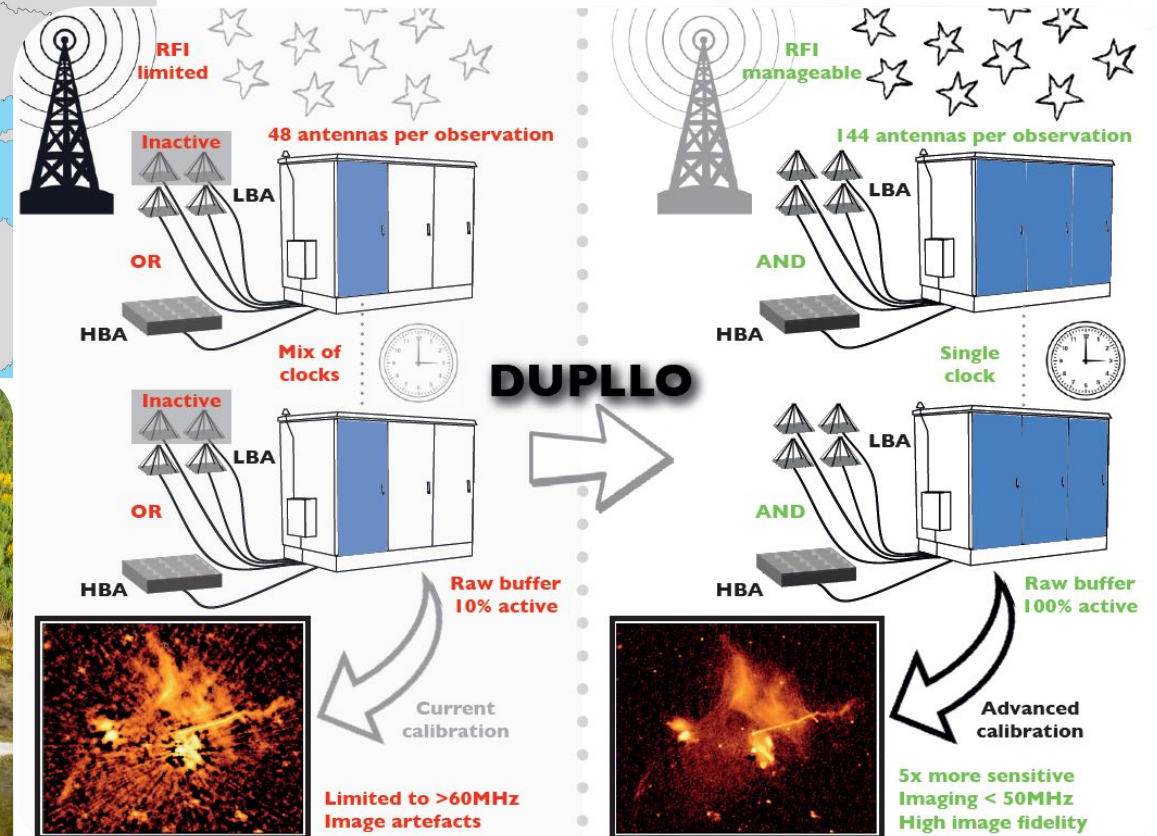
ORP, RadioNet, RadioNet2, Radionet4, Express, Nexpress, Baltics



International LOFAR telescope (ILT)



- In total 52 stations
- 38 in the Netherlands
- 14 in other countries
- LOFAR-Latvia online since 1 November 2019
- LOFAR-ERIC (ILEC) in 2022
- LOFAR 2.0 in 2024





OUR RESEARCH FIELDS



**ASTRONOMY &
ASTROPHYSICS**



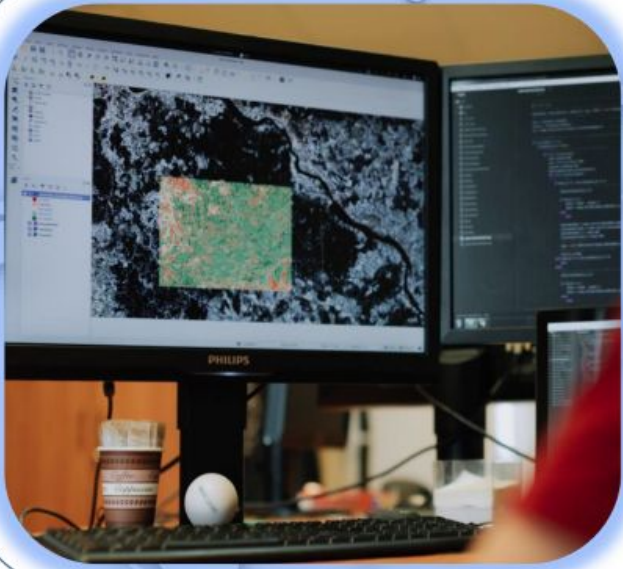
**HIGH
PERFORMANCE
COMPUTING**



**REMOTE
SENSING**



**SATELLITE
ENGINEERING &
ANTENNA
DEVELOPMENT**

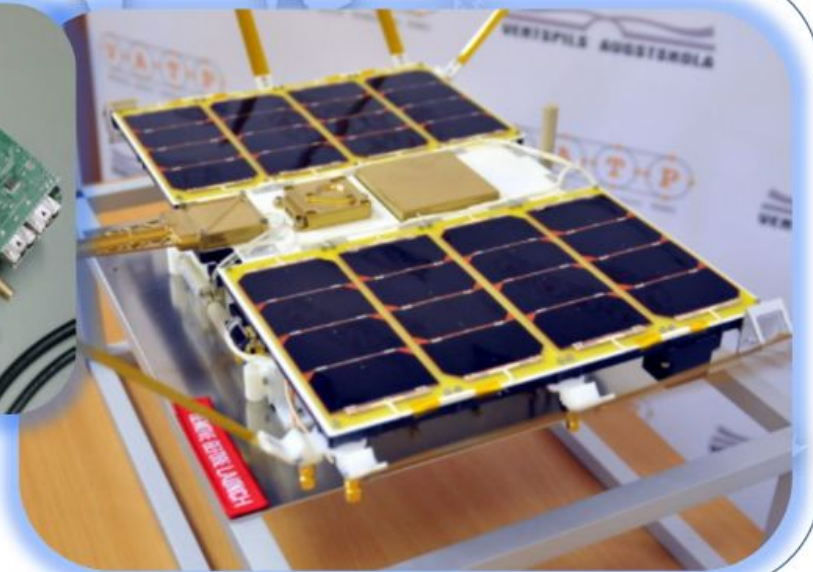
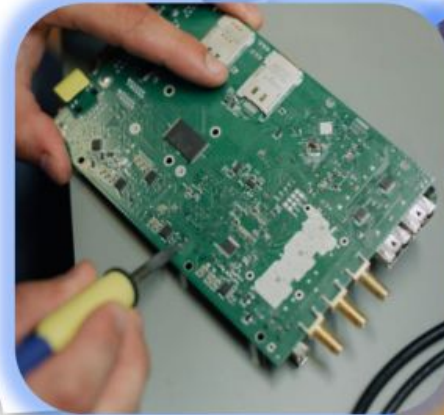


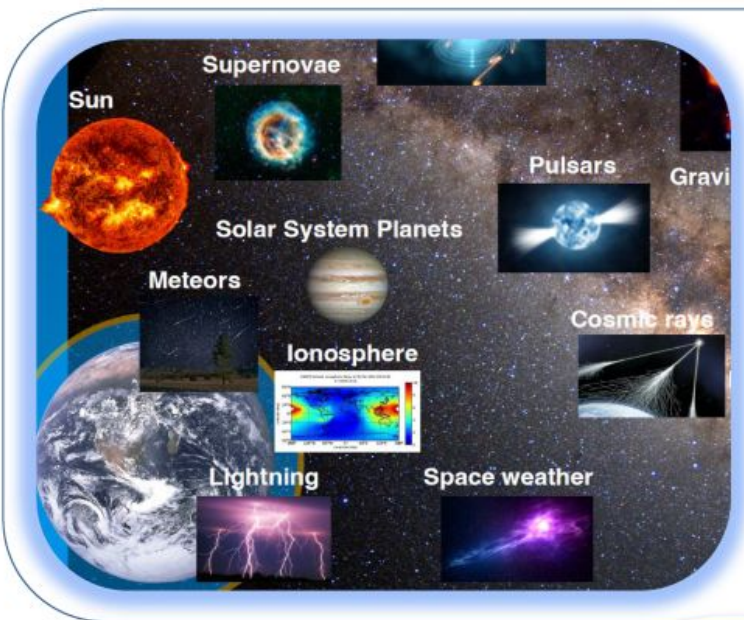
Remote Sensing and Signal Discrete Processing

- Developing specialized methodologies for translating remote sensing data into information products;
- Researching and testing data processing techniques in remote sensing (Forest industry; Environment protection; Urban development; Agriculture);
- Developing software.

Electronics and Satellite Technology

- Satellite engineering and testing
- Advanced antenna technologies
- Cyber-physical and embedded systems
- Smart technologies, renewable energy sources, rapid prototyping and additive manufacturing





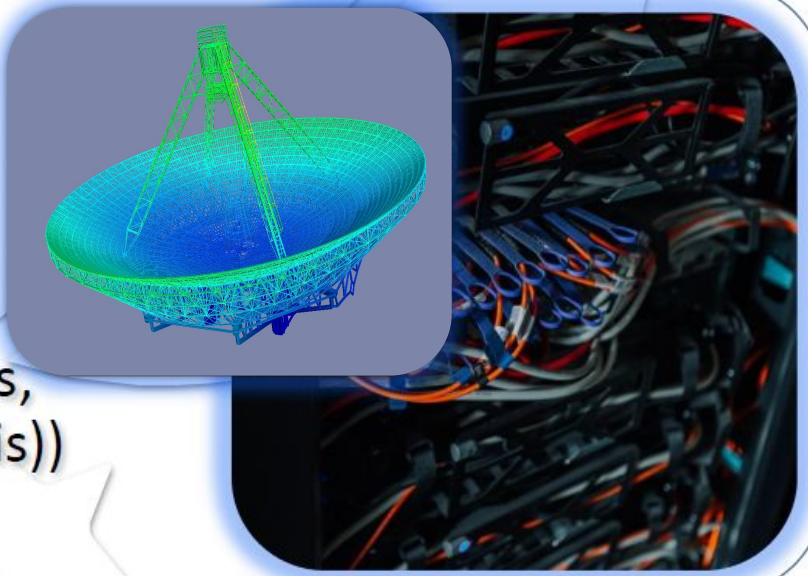
Astronomy and Astrophysics

- Interstellar and circumstellar medium
- Physics of solar atmosphere
- Active galaxy nuclei
- Small bodies of the solar system
- Polarized radiative transfer



High Performance Computing

- Radio astronomical data processing and their methods (single-dish observations; VLBI; radar-VLBI; complementary radar-VLBI and SLR)
- Near space objects research (Planetary Studies (Comets, Asteroids); Earthquake Research (satellites, space debris))
- Research in engineering physics



HIGH PERFORMANCE COMPUTING INFRASTRUCTURE (GEN 1)

30 nodes (2 master, 28 computational) - total 480 cores

Specification of one node (main parameters)	DELL PoweEdge R730	Amount	Total per one node
Processor	Intel Xeon E5-2630 v3, 8 cores	2	16 cores per node
SPECint_rate2006	Average baseline: 110		
SPECfp_rate2006	Average baseline: 68.3		
RAM	128 GB DDR3 1600MHz Dual Rank ECC RDIMM	1	128GB RAM per node
Hard drives	SAS 300 GB HDD	2	600GB HDD per node
Network adapters	<ul style="list-style-type: none"> • Mellanox infinibandcard, 40Gb/s • Ethernet 10/100/1000 Base-TX (full duplex) 	1 4	
Remote Access	Yes		

HIGH PERFORMANCE COMPUTING INFRASTRUCTURE (GEN 2)

**9 nodes - 7 without GPU, 2 with GPU (T4 and V100 cards)
- total 432 cores**

7 without GPU - total 336 cores

Specification of one node (main parameters)	Huawei FusionServer 1288H V5 1U Rack Server	Amount	Total
Processor	Intel Xeon Gold 6252, 24 kodoli	2	48 cores per node
SPECint_rate2017	Average - Baseline: 264		
SPECfp_rate2017	Average - Baseline: 238		
RAM	384 GB DDR4 RDIMM	1	384 GB per node
Hard drives	240GB,SATA 6Gb/s, Read Intensive,S4510 SSD	2	480 GB per node
Network adapters	<ul style="list-style-type: none">• Mellanox infiniband card, 40Gb/s• Ethernet 10Gbps network adapters +SFP• Ethernet 10/100/1000 Base-TX (full duplex)	1 2 4	
Remote Access	Yes		

IZMANTO

Proxmox + CEPH

PLANNED RESOURCE DISTRIBUTION (1)

20x gen. 1 nodes

Specification of one node (main parameters)	DELL PoweEdge R730	Amount	Total per one node
Processor	Intel Xeon E5-2630 v3, 8 cores	2	16 cores per node
SPECint_rate2006	Average baseline: 110		
SPECfp_rate2006	Average baseline: 68.3		
RAM	128 GB DDR3 1600MHz Dual Rank ECC RDIMM\	1	128GB RAM per node
Hard drives	SAS 300 GB HDD	2	600GB HDD per node
Network adapters	Mellanox infiniband card, 40Gb/s	1	
Network adapters	Ethernet 10/100/1000 Base-TX (full duplex)	4	
Remote Access	Yes		

1x gen. 2 standard node

Specification of one node (main parameters)	Huawei FusionServer 1288H V5 1U Rack Server	Amount	Total
Processor	Intel Xeon Gold 6252, 24 cores	2	48 cores per node
SPECint2017	Average - Baseline: 264		
SPECfp2017	Average - Baseline: 238		
RAM	384 GB DDR4 RDIMM	1	384 GB per node
Hard drives	240GB,SATA 6Gb/s,Read Intensive,S4510 SSD	2	480 GB per node
Network adapters	Mellanox infiniband card, 40Gb/s	1	
Network adapters	Ethernet 10Gbps network adapters +SFP	2	
Network adapters	Ethernet 10/100/1000 Base-TX (full duplex)	4	
Remote Access	Yes		

PLANNED RESOURCE DISTRIBUTION (2)

1x gen. 2
GPU node

Specification of one node (main parameters)	Huawei FusionServer 2288H V5 2U Rack Server	Amount	Total
Processor	Intel Xeon Gold 6242, 16 cores	2	32 cores per node
SPECint2017	Average - Baseline: 211		
SPECfp2017	Average - Baseline: 199		
GPU cards	Tesla T4,16GB GDDR6, PCIE 3.0 X16, NVIDIA Turing Tensor Cores 320, Single-Precision 8.1 TFLOPS, Mixed-Precision (FP16/FP32) 65 TFLOPS	2	640 NVIDIA Turing Tensor Cores per node
RAM	384 GB DDR4 RDIMM	1	384 GB per node
Hard drives	240GB,SATA 6Gb/s,Read Intensive,S4510 SSD	2	480 GB per node
Network adapters	Mellanox infiniband card, 40Gb/s	1	
Network adapters	Ethernet 10Gbps network adapters +SFP	2	
Network adapters	Ethernet 10/100/1000 Base-TX (full duplex)	4	
Remote Access	Yes		

Potentially 1x TaiShan 2280 V2 Server V100R001, but since it's an experimental node, more testing may be required.

TOTAL ALLOCATED RESOURCES

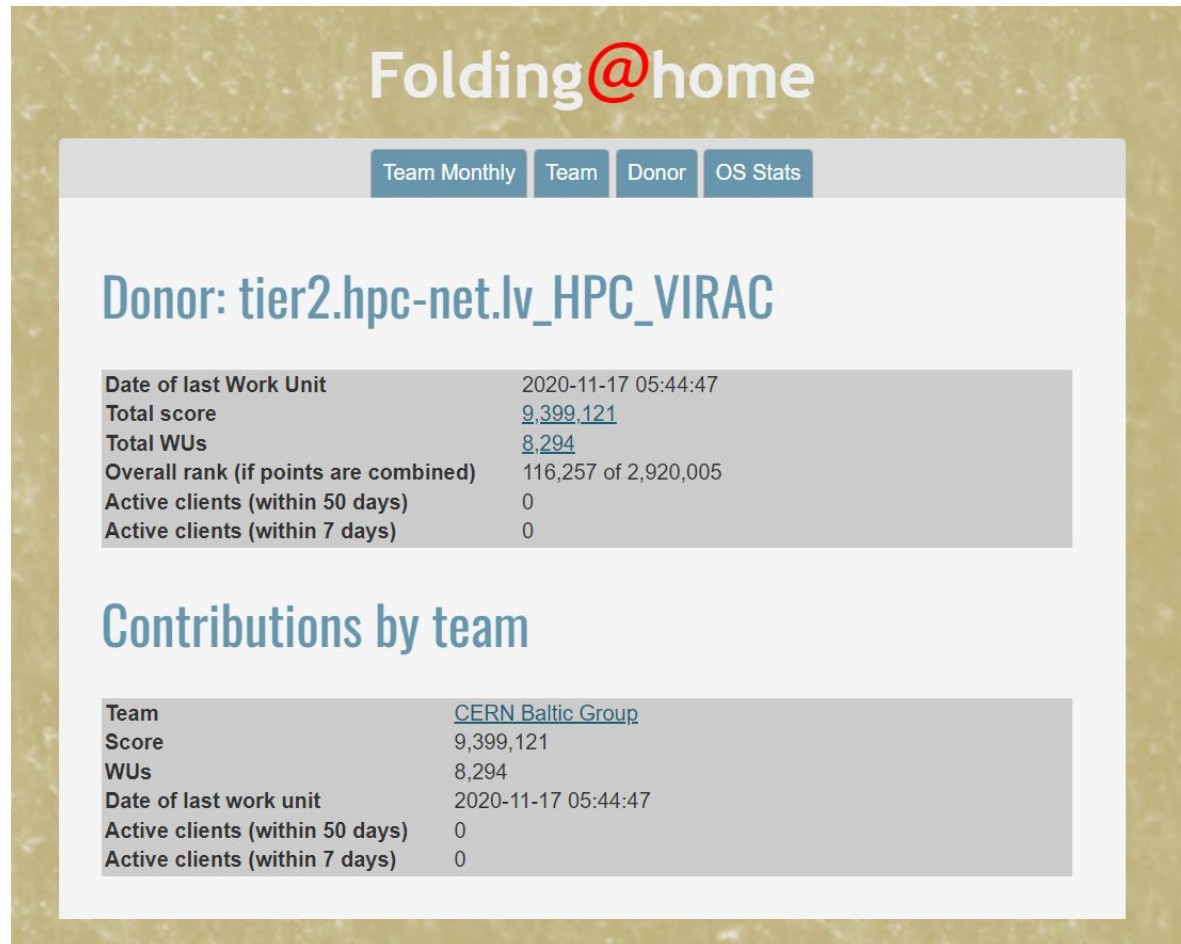
CPU Cores	400
RAM (GB)	3328
Storage (GB)	6480
Tesla T4 GPU	2

Previous involvement in Tier 2 project

VIRAC as one of the sub-networks in the Latvian Tier 2 CERN CMS network with such activities:

- In cooperation with SIA "Dati Group" and RTU, Tier 2 IP table of VIRAC sub-network was created.
- VLAN configuration according to Tier 2 requirements (using infiniband switches).

Participation in the Folding@home Baltic Cern Group



The screenshot shows the Folding@home team stats page for the team 'tier2.hpc-net.lv_HPC_VIRAC'. The page has a navigation bar with 'Team Monthly', 'Team', 'Donor', and 'OS Stats' tabs. The main content area displays the donor name and a table of statistics. Below this is a section for 'Contributions by team' with another table.

Donor: tier2.hpc-net.lv_HPC_VIRAC	
Date of last Work Unit	2020-11-17 05:44:47
Total score	9,399,121
Total WUs	8,294
Overall rank (if points are combined)	116,257 of 2,920,005
Active clients (within 50 days)	0
Active clients (within 7 days)	0

Contributions by team	
Team	CERN Baltic Group
Score	9,399,121
WUs	8,294
Date of last work unit	2020-11-17 05:44:47
Active clients (within 50 days)	0
Active clients (within 7 days)	0

apps.foldingathome.org/teamstats/team263738.html

Folding@home

Team 263738 stats

Fri Mar 04 14:20:02 GMT 2022

Name CERN Baltic Group
Score 3030970677
WUs 279902
Rank 422

Members

Rank	Team Rank	Name	Credit	WUs
1216	1	tier2.hpc-net.lv_National_Library_of_Latvia	1685173527	150594
4382	2	tier2.hpc-net.lv_RTU_HPC_centre	581381243	31563
7507	3	tier2.hpc-net.lv_DATI_Group	346350076	28995
21165	4	KTU-KK	112694780	18971
24408	5	hpc.rtu.lv	95826192	13265
26831	6	KTU-IFB	85016050	6534
30308	7	KTU_IF_VR_Lab	73365959	4222
68915	8	VilniusUniversity_HPC_Sauletekis	23726216	2649
120787	9	tier2.hpc-net.lv_HPC_VIRAC	9399121	8294
137339	10	KTU-IF	7282242	7424
161155	11	KTUIFR	5243633	2125
177305	12	tier2.hpc-net.lv - Riga Technical University	4256869	3918
413271	13	tier2.hpc-net.lv - University of Latvia	467017	386
434420	14	tier2.hpc-net.lv - DATI Group	400349	425
458872	15	tier2.hpc-net.lv - National Library of Latvia	336607	323

ONGOING ACTIVITIES

- Network configuration to fit the requirements
- Additional network tests
- Potential migration to Openstack platform
- Student internships/involvement in collaboration with VUAS
- Additional courses in VUAS information technology field

Latvian Space Centre in Irbene

Young Space Researcher Centre in Ventspils

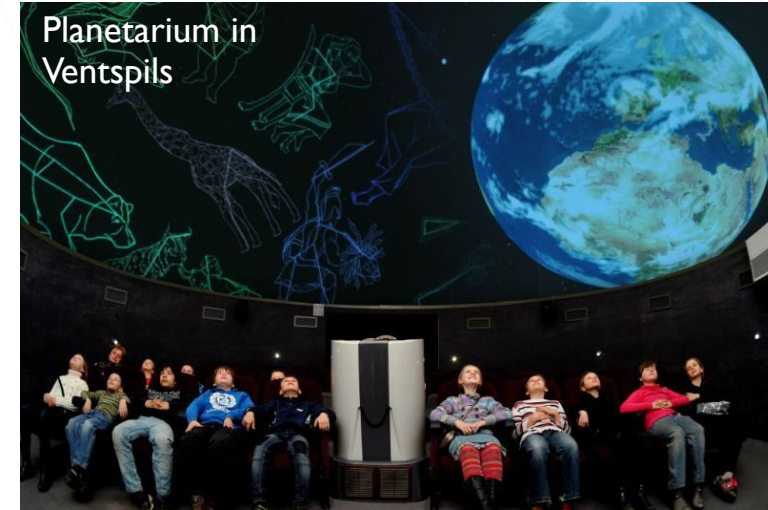
Young Space Researcher Centre
(VIZIUM)



Young Space Researcher Centre
(VIZIUM)



Planetarium in
Ventspils



Latvian Space Centre in Irbene
(VIRAC)



Latvian Space Centre in Irbene
(VIRAC)



Observatory in
Ventspils





THANKS!



virac.irbene



Aleksejs K.



virac_irbene



VIRAC - VSRC

Do you have any questions?

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gints.jasmonts@venta.lv

www.virac.eu

