Russia: Experience in Using Portable Telemedical Systems

Valery Stolyar, Oleg Atkov and Anton Panfilov

The Beginning: first videoconferences and interactive telelectures were organized in 1997 for some of Russia's regions (TM-project «Moscow – Russia's regions»)

The Bakoulev Cardiovascular Surgery Center runs annually:

- > 1250 teleconsultations
- > 3400 hours of telelectures
- > 60 master classes
- > 1000 hours of conference and symposium broadcasts

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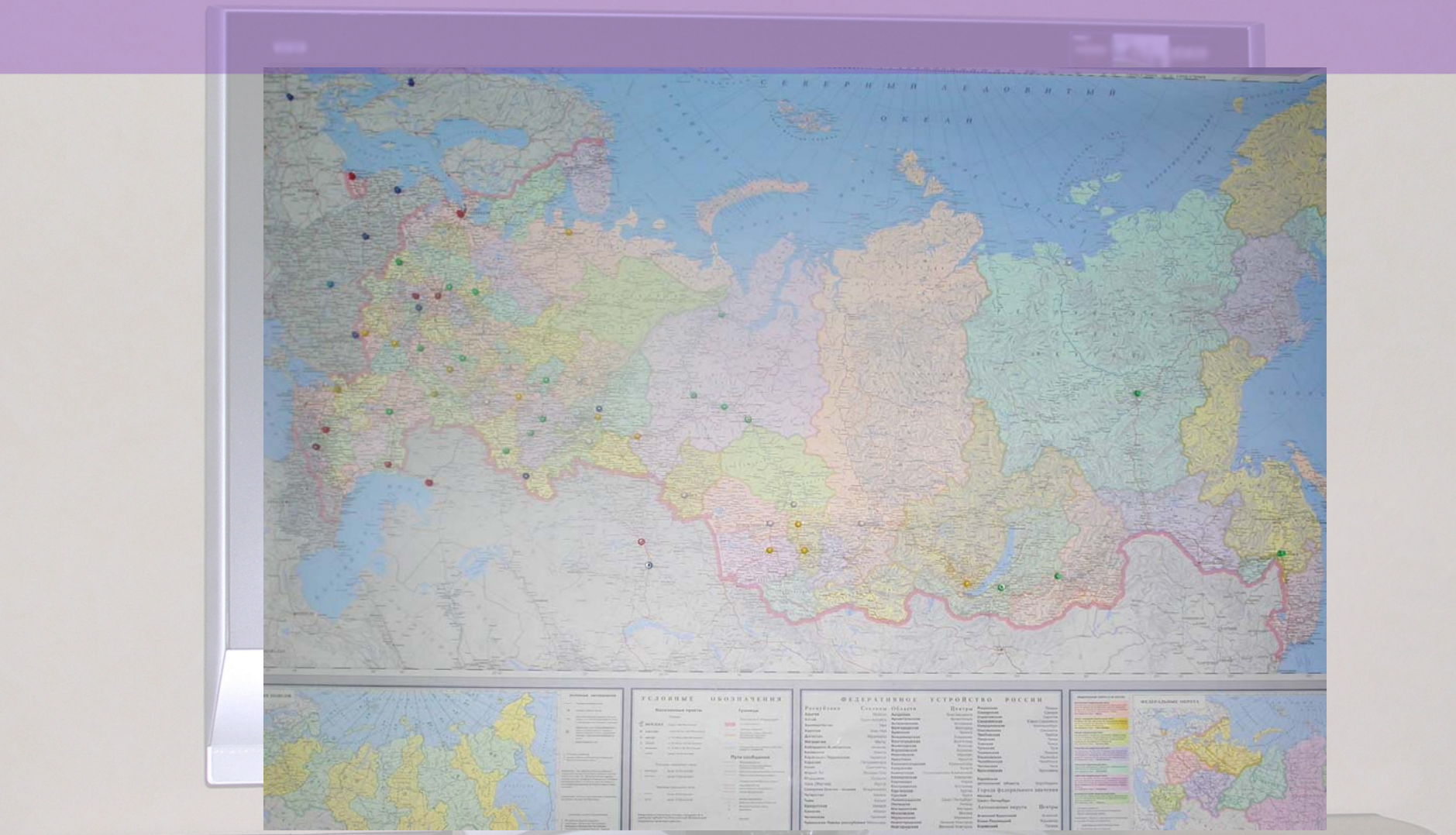
PARTNER TELEMEDICAL CENTERS in RF > 460 TMC , 24 – in Moscow
In Russian Railways: 91 (incl. 7 mobile and 52 portable)



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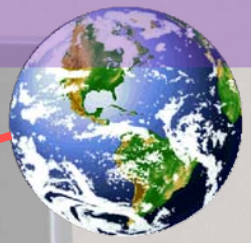
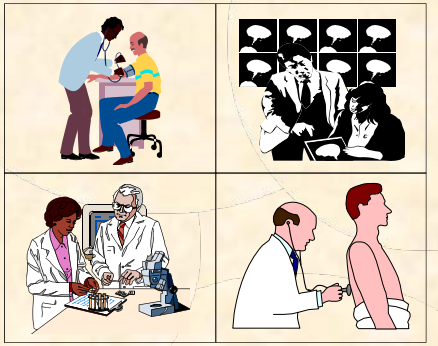
TM network in RF - part of an international TM-network (with support of ITU standards)

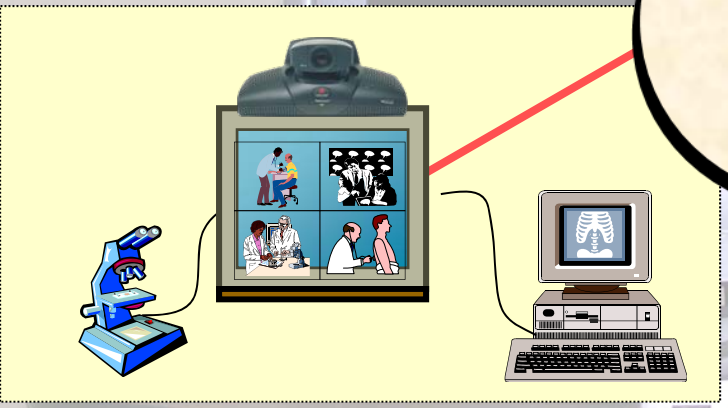
Main medical centers of Russia





Main telemedicine center
Moscow
ISDN/IP

Regional telemedicine center



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Remote videoconsultations

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Remote videoconsultations

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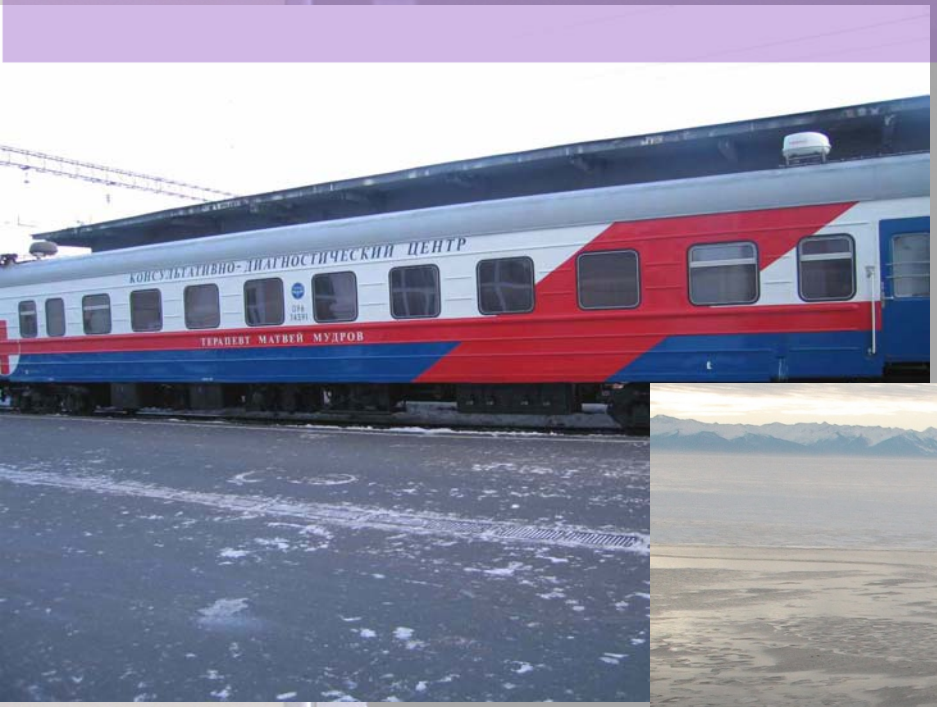
Mobile Solutions: Telemedical System as Part of a Medical Train



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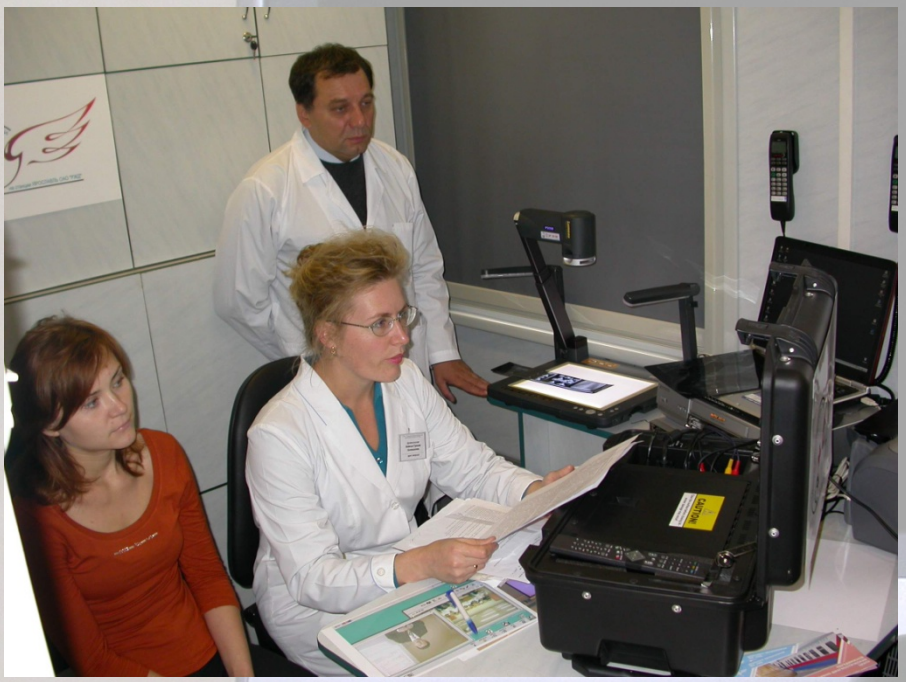
Results: Telemedical System as Part of a Medical Train



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Role Of High Resolution Videoconference in distance learning New Technologies

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Results: Mobile Telemedical Center Based on an Ambulance

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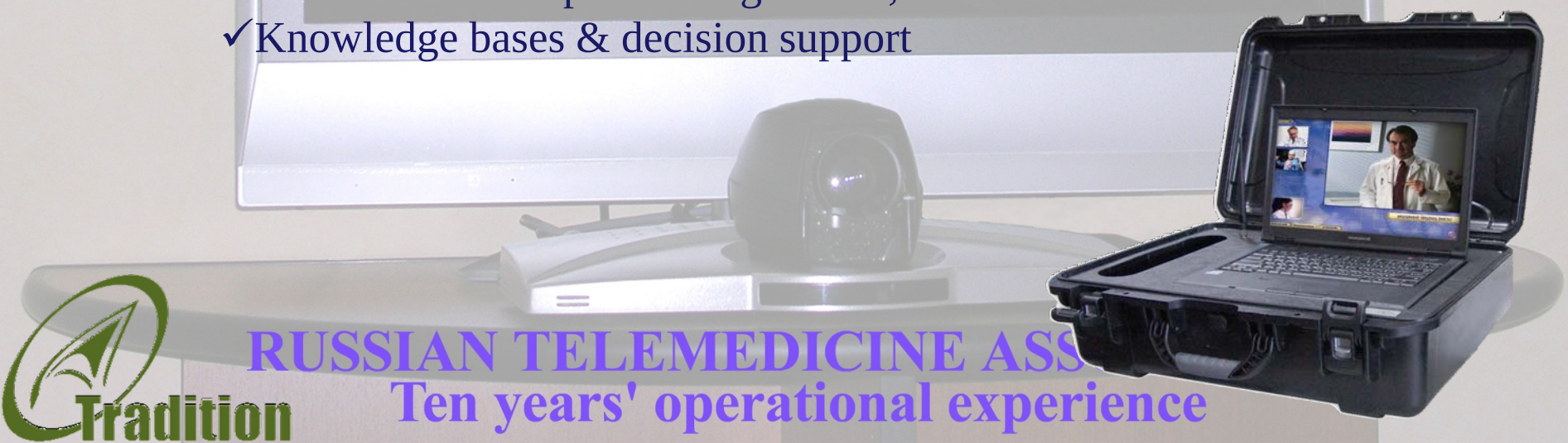
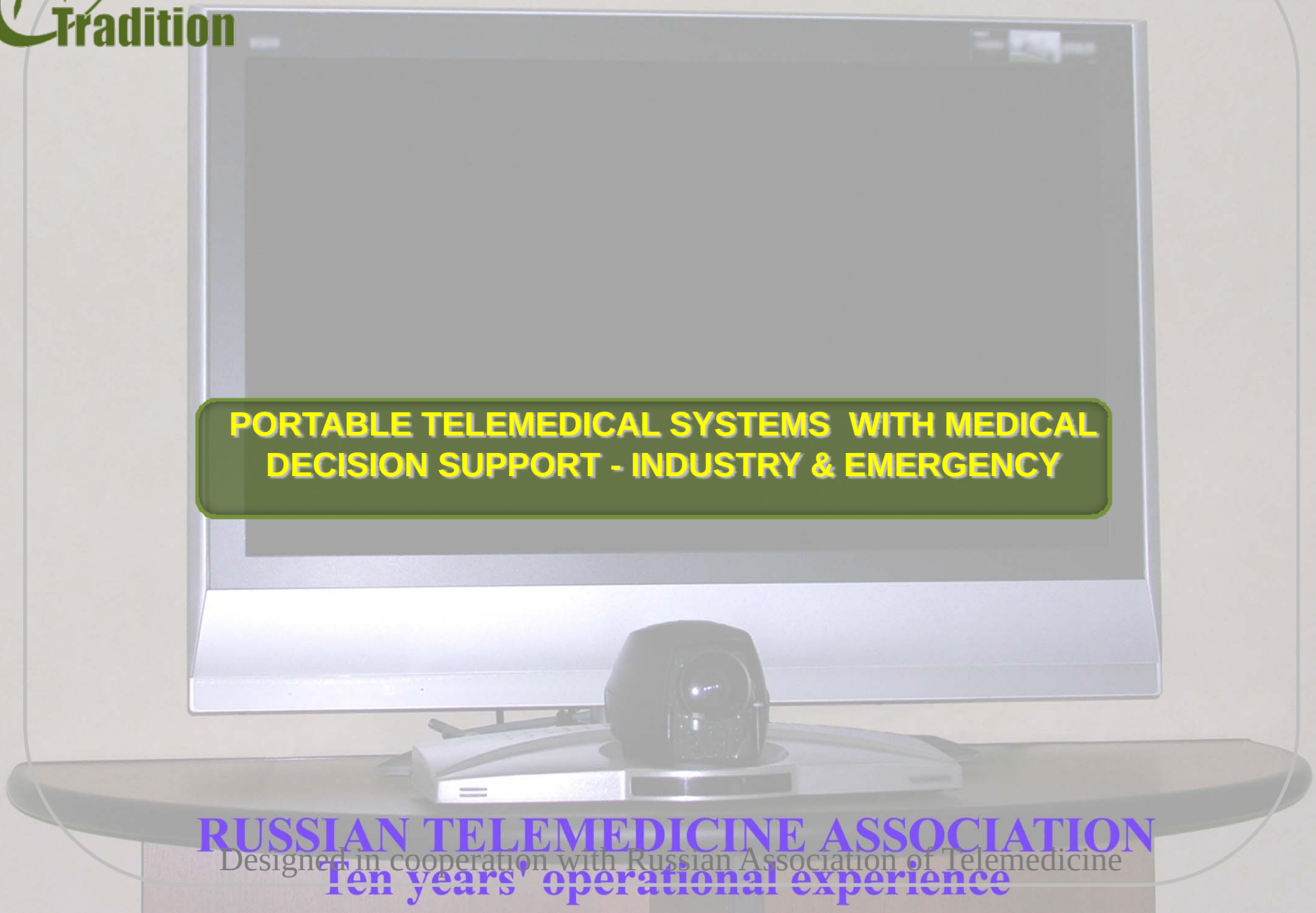
Russian Portable Telemedicine System

System versions: *ARNEGA-VC (telemedical applications*

- Protective suitcase
  - ✓ Includes camera on the inside of the
  - ✓suitcase cover (night vision option)
  - ✓ LCD 15,6” sunreadable display (protected glass)
  - ✓ Coding/decoding module (compatible w/ Cisco Tactical MXP, or Polycom)
  - ✓ Telemedical module includes the following medical equipment (user configurable), connectable via digital interfaces such as USB etc.
    - other equipment may be integrated on request
  - ✓ Remote control (internal power supply)
  - ✓GPS/GLONASS positioning device, etc…
  - ✓Knowledge bases & decision support



Tradition



PORTABLE TELEMEDICAL SYSTEMS WITH MEDICAL DECISION SUPPORT - INDUSTRY & EMERGENCY

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Designed in cooperation with Russian Association of Telemedicine

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Project Goals

Provide advanced technology enabling solutions for paramedical and rescue staff capable to:

- deliver knowledge on demand in operation context and timely fashion
- ensure situation awareness and mission control
- keep high safety and efficiency in critical environments and missions
- support handsfree operation within advanced collaboration and connectivity framework.

Product Line Overview

- **ARNEGA™** is a family of smart wearable & mobile wireless solutions enabling audiovisual communications and telemetry in real time for complete situation awareness & control.

- Designed to meet various equipment needs of **medical & emergency workers**, rescuers and special task forces in industrial and transportation sectors, government and public health and safety sectors.

- The system provides remote video assistance & guidance from experts located off-site and wireless access to expert knowledge bases for quicker and better decision-making.

Watch ARNEGA video: Goal Solution

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Key Functionalities & Features

The system supports ITU videoconferencing that can bring together different experts from anywhere in the world for real time brainstorming and decision-making.

- ✓ modular architecture
- ✓ wide range of options for solving various tasks
- ✓ different vertical markets system versions
- ✓ connection of additional equipment
- ✓ patented technology
- ✓ diverse smart interconnectivity (local or global) supported by MCU's for intercommunications of Radio, Audio, Video over IP
- ✓ Cisco Health & Tele Presence endpoint compatibility.

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Basic System components

- Videoconferencing module + add. equipment inbuilt into a specialized wearable vest, backpack or a belt
- Camera, laser pointer and LED torch are inbuilt into a protective helmet

Such approach keeps hands free providing the worker with a complete freedom of movement.

- Audio/video/Data is transmitted to the coordination center
- Communication is bi-directional
- A micro display may be integrated into the glasses worn by the worker for a duplex video mode

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Overall Solution Structure

- ✓Emergency situation management (vehicles, infrastructure, safety)
- ✓ FR staff operation and health control
- ✓Everywhere, anytime locally and central level situation awareness

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Product family members:

ARNEGA-MAX (semi-rugged, fully rugged)

- Protective helmet equipped with an audio and video device, LP & Torch, GPS/GLONASS t&t.
- Unload vest (protective suit (2-6 ballistic protection category) or backpack with a power supply and additional equipment
- Rugged computer, codec in IP67 protected case;
- Antennas, boosters, cables.

Product family members:

ARNEGA-MINI (basic, semi-rugged)

- Video headset (monocular or stereoscopic) or stripe with LP & Torch, HD camera, embedded MID
- Backpack with a rugged computer and a power supply or waist, belt MID.

Product family members:

ARNEGA-VC (telemedical applications)

- Protective IP67 suitcase
  - ✓ Includes camera on the inside of the
  - ✓suitcase cover (night vision option)
  - ✓ LCD 15,6” sunreadable display (protected glass)
  - ✓ HW Coding/decoding module (based on Cisco codecs)
  - ✓Batteries for in field operation
- Light medical vest + headset stripe w/camera and torch
- Telemedical module includes IPC & the following medical equipment (user configurable):
  - ✓ ECG, oxymeter, e-stethoscope, blood pressure, thermometer, glucometer
  - ✓ Ultrasound sensor or scanner as an option (connectable via digital interfaces such as USB)
  - ✓ other equipment may be integrated on request
- Remote control (internal power supply)

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System versions:

ARNEGA-VCE (technical supervision, telemedicine)

- ARNEGA VC system PLUS:
  - ✓ Protective helmet or Headset w/audio and video devices (HDV+AHS)
  - ✓ Protective vest, GPS/GLONASS positioning device, wearable rugged or wrist computer, batteries
  - ✓ Second external videocamera, external display, additional remote control
  - ✓ Additional medical & metrological equipment
  - ✓ Biofeedback device for monitoring physical and psychological state of the paramedic member
- **Accessories**
  - ✓ 3D Glasses for augmented reality applications
  - ✓ UAV remote control module with situation view system
  - ✓ Inmarsat BGAN or VSAT communication terminal, MESH network

Applications:

In emergency situations ARNEGA™ will help lower casualties by:

✓establishing direct real time contact b/w patient and his doctor

✓Providing access to knowledge base, pre-diagnostic expert system or MIS

✓ providing qualified first aid in case of accidents through remote support of a number of experts

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Applications environment:

- Suitable for use in all working environments, including potentially hazardous environments (ATEX Zone 2 certified)
- Helps guarantee the security & safety of workers and effectiveness of the works conducted

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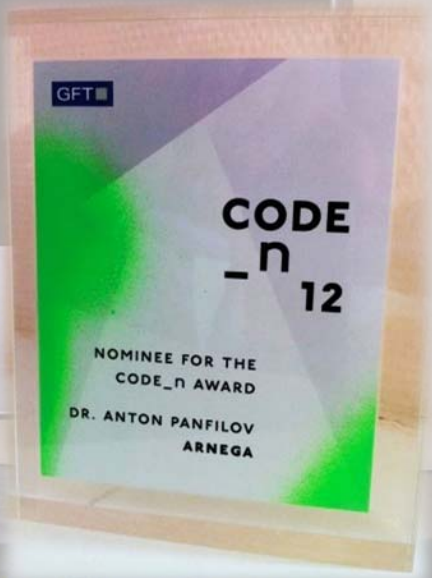
AWARDS

- Skolkovo Foundation grant for research
- GFK Group, Germany 2012 (Cebit)

Award of 10 best innovative projects of the Cebit fair in CODE-n contest.



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http://t-smart.ru/news/7421/

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Ongoing development:

3D vision module: Integrated system of 3D vision with support of augmented reality and in-built or loadable libraries of virtual objects, operation environment;
mission context activated tools according to the worker's specialization and skills.

This module will help, for example, a surgeon located off-site show a medical worker how to perform a particular part of an operation.

Ongoing & Future development:

Trauma detection module: Automated image analysis and anomalies recognition system based on 2D/3D ultrasound images. The recognition methods used are artificial neural networks, fuzzy logic, k-nearest neighbour, their combination.

A CADD system to help detect foreign objects in the body, fractures, internal bleeding and other trauma.

Ongoing development:

Knowledge bases & decision support: Web-service with access to theme or person based expert knowledge and other citizen-oriented services, including:

- Doctor's remote consultation at home or in a move
- Access to medical knowledge bases and the "automated pre-diagnostics" zone – this service allows you to upload medical images and get an automated "diagnosis" based on an image analysis and cognitive features identification;
- Medical dummies integration for visual coaching and simulations
- Standardizations, both MIS (HL7) EMR and device (Continua, ISO X37 based) levels for end-to-end operations.

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