



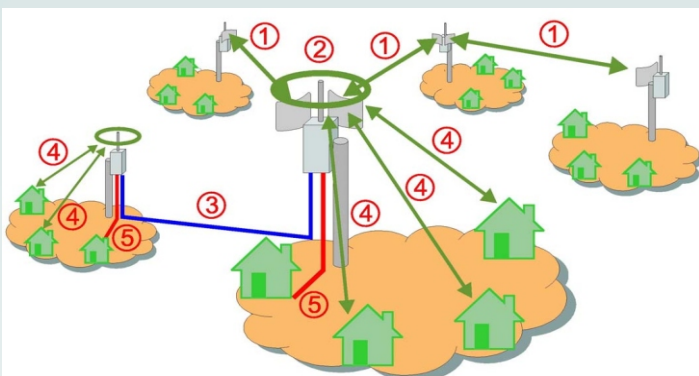
## THE BOTIK TELECOMMUNICATION LABORATORY

### Solutions for Building Regional Networks

#### Peculiarities of Building Rural Networks in Russia:

- Low population density in rural areas, large distances between buildings and settlements.
- Lack of heated places of general use for installing network equipment.
- Poor reliability of power supply: fluctuation in voltage from 150 V to 500 V and frequent outages.

#### Computer Network for Rural Areas of Russia: Structure



- Backbone lines and system nodes based on wireless technologies (1).
- Radio cells (2), backbone nodes permitting wireless access to the network.
- Fiber-optic backbone lines (3).
- Subscriber's kit for wireless access (4).
- Ethernet access subscriber's kit (5).

#### PC Router

Active network nodes — routers, bridges, terminal servers — take a central part in any network. The idea of using IBM PC with a free Unix clone for implementation of such devices is well known. The Botik laboratory has started a serial production of a universal network node called PC Router which costs \$400-1000 and has the following characteristics:

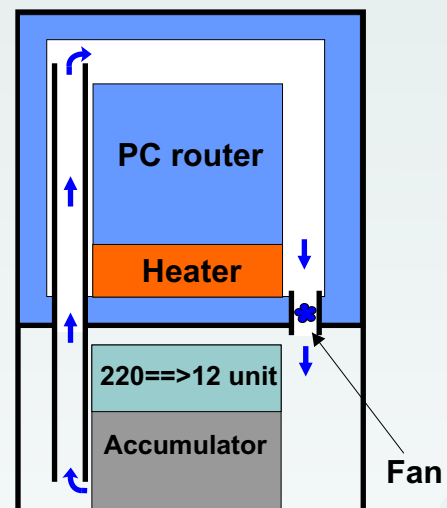
- absence of mechanical moving elements — fans (processor and power unit), and conventional HDDs — that are the most liable to failures;
- low electricity consumption (about 10–15 W), low emission of heat;
- the use of power supply (with accumulator) designed by the Botik Lab. which remains active with an input voltage in the range of 100 to 300 V and is immune to fluctuation at input voltages up to 500V;

- autonomous operation up to 10 hours;
- tolerance to unexpected shutdown;
- functionality: IP-routing, IP-filtering, Ethernet-bridging, caching nameserver, etc.

#### Outdoor Installation of Equipment

The BOTIK laboratory designed a metal container called **Thermobox**. Thermobox has the following characteristics:

- It is damp-proof and insulated.
- It is intruder-proof.
- It permits controlled heating and cooling.
- It is suited to high-altitude installation (masts, poles, buildings, etc).

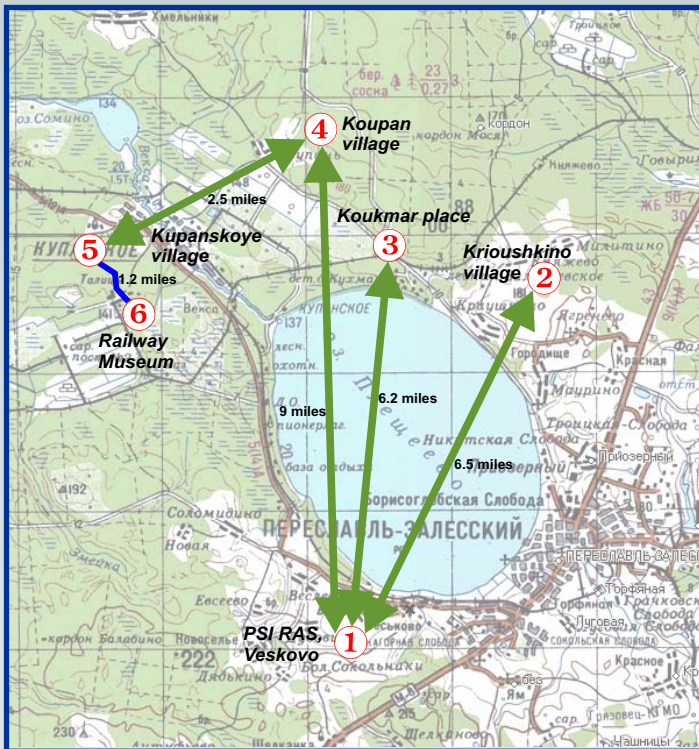


The box has two sections: the first, insulated, contains the network equipment; in the second, uninsulated, the accumulator and the power supply unit are placed. With this design, Thermobox needs neither heater nor fan when the outdoor temperature is between -10 and +25 degrees Celsius, which is typical for central Russia.





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### RURAL NETWORK: PILOT SEGMENT

In 2004, BOTIK conducted a survey and developed technological solutions for building rural networks. A pilot segment of 6 villages in the Pereslavl region was networked. The maximum backbone line span amounts to 9 miles. Among the first subscribers was a village school, the Railway Museum, the International Children's Computer Center, one commercial organization, and private persons.

### Cost Reduction of High-Altitude Installations for Wireless Networks

To reduce the installation cost of high-altitude radio antennas Botik implemented a special solution: instead of installing expensive towers, conventional lamp poles were used. In some cases for providing additional altitude, the poles were augmented by a special construction for fixing antennas. Network equipment was located on the same pole.



### Power Units for PC Routers

Power units of PC Routers have no mechanical moving elements such as fans. A built-in space-saving storage battery remains active when input voltage is in the range of 100 to 300 V and is immune to fluctuation at input voltages up to 500 V. Microcontroller-based power units make possible the following:

- automated choice of an optimal battery charge regime depending on accumulator temperature;
- battery overload and deep discharge protection;
- characteristics of external power supply and battery — charged and discharged — are transmitted to the PC Router allowing the battery to be replaced before it is disabled;
- autonomous operation with battery supply up to 10 hours.

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