Baltic Astronomy, vol. 9, 527–531, 2000

THE REMOTE ACCESS SYSTEM FOR THE LARGEST RUSSIAN TELESCOPES BTA AND RATAN-600

V. Vitkovskij[1], V. Chernenkov[1], A. Ivanov[1], V. Gurin[1], N. Kalinina[1], V. Komarov[1], S. Moiseev[1], A. Nazarenko[1], V. Shergin[1] and O. Zhelenkova[1]

[1] *Special Astrophysical Observatory, Nizhnij Arkhyz, Karachaevo-Cherkessia 369167, Russian Federation*

Received September 27, 2000.

Abstract. A project for the remote access system to information and technical science resources is described. The system at work allows the preparation and accomplishment of observational programs on the telescopes from the control and acquisition data center or directly from the user terminals. In future, the created system can form the basis for the creation of a Russian Virtual Observatory.

Key words: telescopes: remote control

1. INTRODUCTION

SAO RAS is the main Russian ground-based center for astronomical observations. Two optical telescopes, 6 meter (BTA) and 1 meter (ZEISS) and a radio telescope (RATAN-600) operate in the observatory. BTA and RATAN-600 are the largest astronomical instruments in Russia. The optical and radio telescopes are supplied with computer-based systems for data collection and data processing. The observatory forms and holds an observational data archive, that includes above 10 GB of scientific information (Kononov et al. 1990).

The computer science department of SAO RAS has created the information network of the observatory with an exit into the Internet

by a satellite channel (Vitkovskij et al. 1999). The link among local networks is implemented through ATM network technology.

At the present time the remote access system to the information and technical resources is being implemented. The system allows the preparation and accomplishment of observational programs on the telescopes from the control and acquisition data center or directly from the user terminals. Outer users may apply the Internet link.

2. PURPOSES OF THE REMOTE ACCESS SYSTEM

The project plans to solve the following problems: the remote access to the new and the archive observational data, and the providing of the remote observation mode for BTA and RATAN-600. Additionally, it will make possible the following operations:

– the maintenance of the interaction of academic science and educational processes in higher educational institutes,

– the creation of a system of virtual training with the use of technical and intellectual resources from universities and SAO RAS,

– the realization of an international cooperation with foreign higher educational institutes and research centers,

– the access to experimental data, information resources and databases of various branches of knowledge.

Three variants of the remote access to telescopes will be implemented:

(1) HTTP via the Web-server and external Internet channels,

(2) X-terminal from the main telescope server and the client-server TCP-connection,

(3) ATM service and modem entrances for the local and regional users.

3. PRINCIPAL COMPONENTS OF THE SYSTEM

The system is composed from the following subsystems:

– a subsystem of remote access to observational data acquisition complexes (ADAC),

– a subsystem of remote access to automated control systems of telescopes (ATCS),

– a subsystem of resource scheduling (RSS),

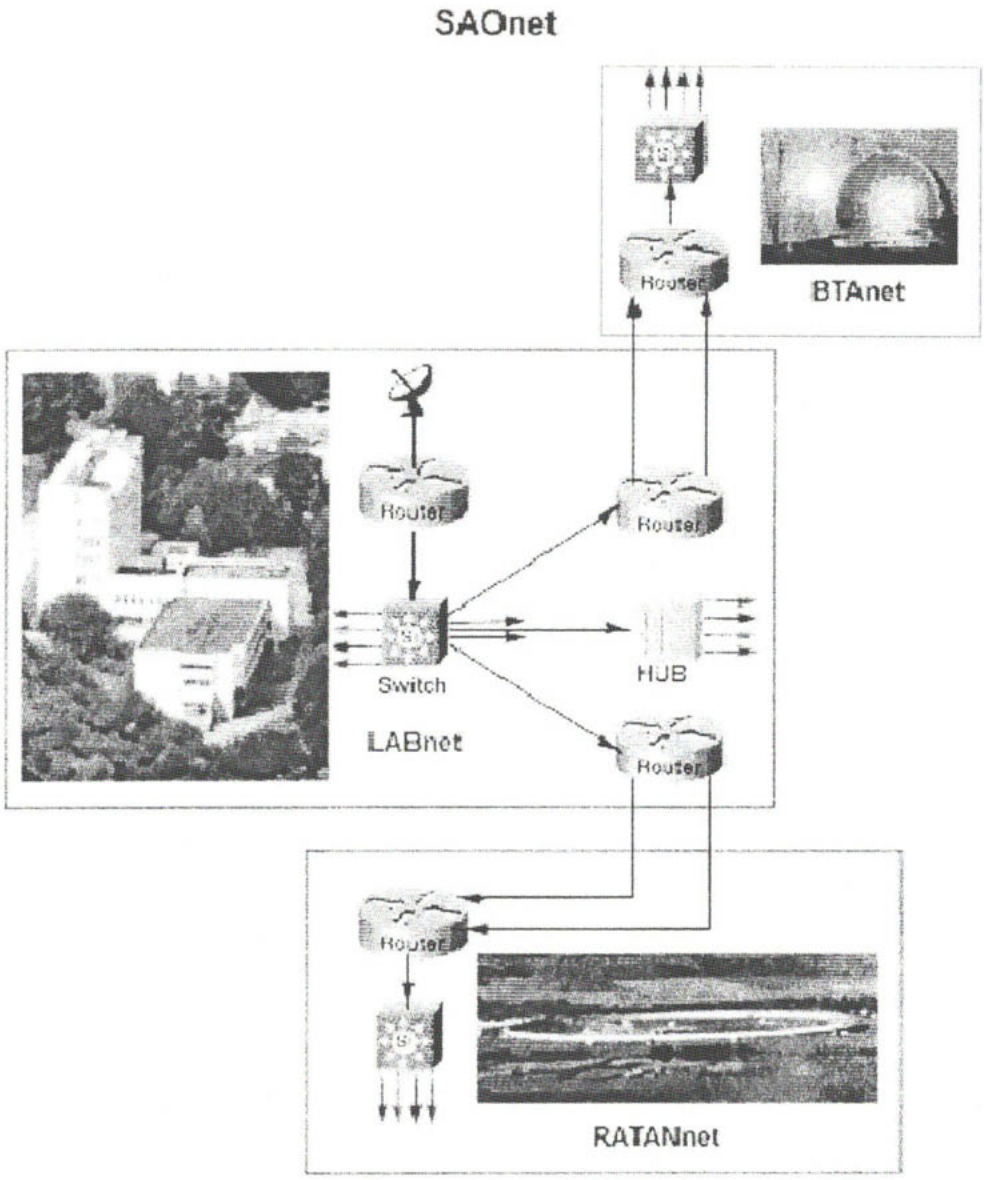

Fig. 1. The information network of SAO RAS.

– a telecommunication subsystem (TS),

– a subsystem of network access to observational data archives (NADA),

– a subsystem of control-acquisition data center (CADC),

– a subsystem of user's terminal handlers (UTH).

The subsystem allowing remote access to the automated control systems of telescopes has three levels of access: (1) monitoring of the observational conditions, (2) transfer of the observation tasks, (3) real-time telescope control.

The telecommunication subsystem includes:

– the communication link CADC-BTANet,

– the communication link CADC-RATANNet,

– the communication link CADC-SAONet,

– the Internet channels (RUNNet/RBNet),

– the communication equipment.

The subsystem performing the resource scheduling will implement the following functions: an operative design of experiments, scheduling of the observational programs, redistribution of channels loads and computational capabilities, monitoring of the system as a whole and accumulation of statistical information.

The subsystem of the network access to archives of observational data will be Based on the Oracle DBMS. It should allow to select data on specific parameters and to create the temporal archives of users.

NADA includes: (1) the submission component – data input and displaying, (2) the applied component – support of data domain functions, (3) the access component – information storage and management.

To carry out the access to the DB, the submission component on the client side is obtained by means of ordinary Web-browsers and the applied component uses stored procedures to function on the data base server are carried out the access to DB.

The control and acquisition data center and the center of management and data collection provide the following:

– a central switching network node,

– a Web/FTP-server,

– a central calculator,

– a data base server,

– full-function terminal handlers of telescopes.

The user terminal handlers subsystem represents a software kit permitting to run experiments on BTA and RATAN-600 telescopes in a remote access mode and to realize the processing of observational data, including archiving. The subsystem enables the accomplishment of experiments in real time on a remote telescope, preliminary data processing by the CADC computer facilities, and the availability of the archival data to process.

Additionally there is a possibility of voice/video connection with both the telescope control and the data acquisition systems and operators.

Compatibility with the world astronomical standards and independent from hardware-software platforms interface is provided (Boroson et al. 2000).

ACKNOWLEDGMENTS. This project has been supported by the Russian Fund of Basic Research, grant 00-07-90014, the Target Program of the Ministry of Industry, Science and Technologies "Nauchnoje priborostrojenije", project 22/4, the Federal Target Program of the Ministry of Education and the Russian Academy of Sciences, project A0007.

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