Communications, data transmission on AWS network of Kyrgyzhydromet

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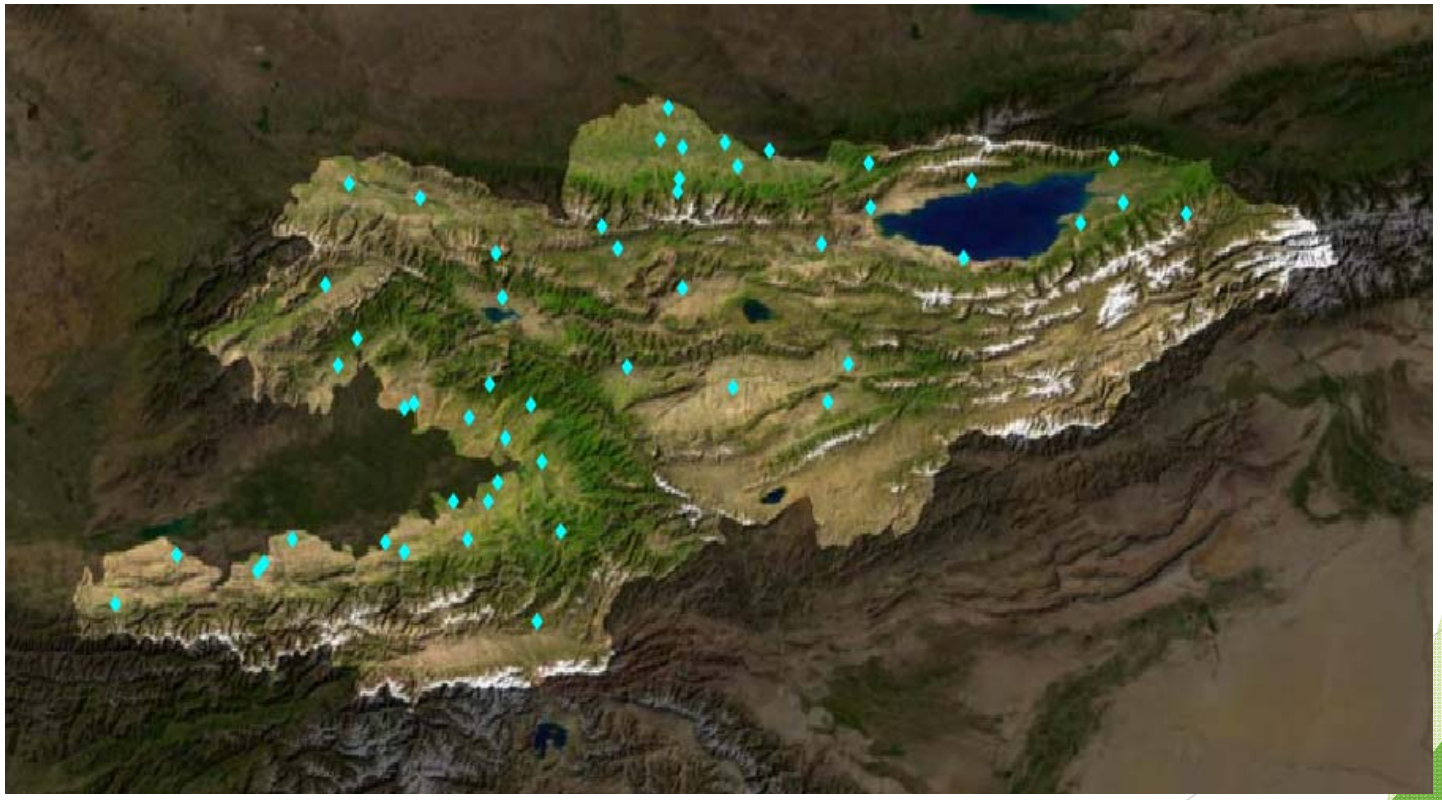
In August 2017, Kyrgyzhydromet had completed the next stage of the modernization of observation facilities and information transmission systems. There were 35 automatic meteorological stations, three automatic hydrology stations and Data Collection Center updated and installed.



Problems and solutions

Problems encountered during the work:

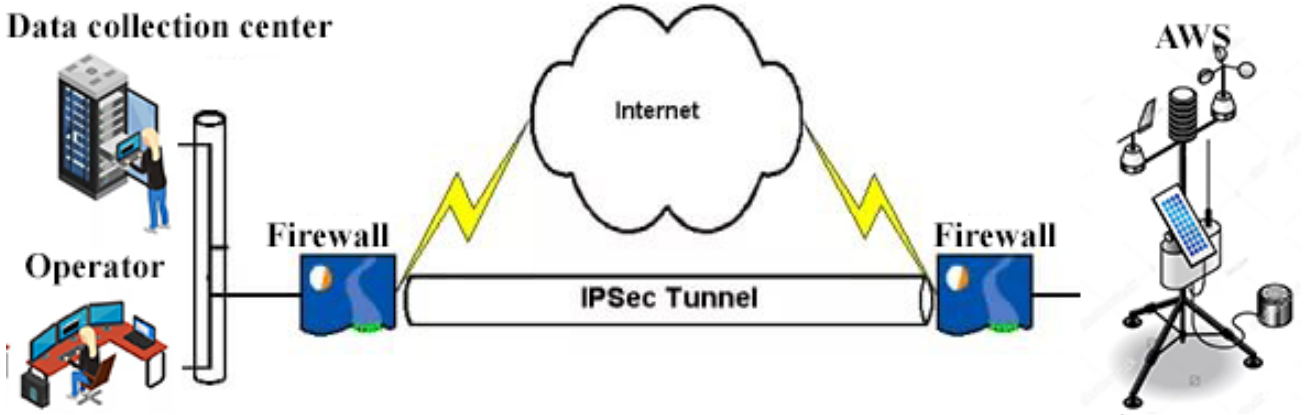
- The nearest station is located in the urban territory, because of the large amount of interference; transmission of information is possible only at certain times, which negatively affects to the collection of information from this station.
- Due to the absence of a representative of the satellite operator IRIDIUM in the country, it is impossible to conclude a contract.

Solution:

- Satellite operators presenting on the market of the Kyrgyz Republic provide services like VSAT, which allows for a two-way exchange for real-time access to the station. We work through the satellite NSS-12, and use a static public IP address.

Data transfer from AWS in the ISP coverage area

- Data transmission from other stations and messages carried out via GPRS-connection from two Internet providers (ISP). IPSec tunnels were built with each ISP. For each device issued static IP addresses. This technology allows to us very easily and quickly access to the stations for setting up and retrieving data.
- If there is no connection to one ISP, the connection automatically switches to the second one.



Problems and solutions

Problems encountered in the course of work

- Because the technology creates a private network that is not accessible from outside, there is no way to access external servers, such as NTP for time synchronization. Synchronizing time manually is possible, but there is a chance of error by the person.

Solution:

- Kyrgyzhydromet purchases an internal NTP server to use a single time space on its network.This server is intended to receive time radio signals, GLONASS / GPS systems, generate and output a sequence of second's pulses synchronized with the UTC (SU) timestamp, and provide information about the current time and date values via the available standard Ethernet interface.

Data control

The data from all AWS is transferring to the FTP server, decrypted and entered into the database.

Decoded data goes through four stages of quality control:

- Inbound monitoring - the transmission time is the same as the observation time
- Timely delivery of data - obtaining data for certain period time.
- Data quality:
  - Completeness of the received data - are all observed parameters
  - Analysis of a number of obtained data - on the invariance of data, on the spread of data, on exceeding the limits of possible values
  - Spatial-temporal management of incoming data
- Technical condition monitoring AWS - in addition to the observed parameters, technical parameters are transmitted: battery voltage, solar cell charge, internal temperature of boxes, etc.

The data received from AWS from hand-held stations is integrated into a single database and provided to specialists through the interface.

Why do we need such a data collection scheme?

- To remote configuration and diagnostic AWS without business trip on station
- To transmit captured storms in real time and tracking the development of phenomena.
  - After reaching one of the fixed criteria the station sends a message about the storm and starts to transmit data every 10 minutes.
  - When the level became lower, the station sends a message about the termination of the phenomenon and the transition in the normal mode.

What events we monitor?

- Gusts – strong winds which cause damages. Stations with manual observations not be able to watch this phenomenon so often and correct.
- A large amount of precipitation, which has fallen over a certain time, can lead to mudflows.
- Technical condition of the station
  - Availability of solar panels
  - Battery low
  - Incorrect values on the sensors
  - Opening the protective container door

Today Kyrgyzhydromet is at the stage of optimizing the algorithms for generating reports of strong gusts of wind.
We tested these algorithms:
If the average values per minute exceed the criteria, AWS sends the message about storm. As result, manual station fixes gusts, but AWS not fixes because several live time of gust are less than averaging period.

If we use current values, AWS sends many messages about storm.
At that moment, we monitor average values per 9 seconds.

If anybody has such solutions, I would be glad to hear what kinds of algorithms is used.

Thanks
Questions and suggestions