

Application Development for Archiving Data and Operating Status Analysis at KOMAC

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1. Introduction

Korea Multi-purpose Accelerator Complex (KOMAC) has been operating 100MeV proton linear accelerator. The Linear Accelerator (linac) is designed to accelerate a 20mA, 100MeV proton beam. The accelerator is operated from many peripheral devices. The control box including a few devices control specific system such as High-voltage Power Supply (HVPS), Vacuum Control System, Timing System, Radio-frequency System, etc. These Control boxes are located physically apart from each other and have to independent from each other on the network. So the KOMAC control system is based on the Experimental Physics and Industrial Control System (EPICS) framework that is a distributed system. And The KOMAC Operation Interface (OPI) is based on Control System Studio (CSS) tool. The interface based on CSS is a client that communicates with the EPICS Input Output Controller (IOC) using Channel Access (CA) protocol and archiver appliance. This tool provides many powerful functions for design interface and data browsing. However, it hasn't provided the data analysis function, it has just provided data export to file function. So we have been using the developed software for processing the exported data based on Python, Matlab and java, etc. So I have a project about the data management tool and web monitoring service for data analysis. The project has a plan for the development of the management and analysis software based on Python Display Manager (PyDM) and creating web service using the Django framework.[1][4]

This paper introduces software-based on PyDM and explains to the system about the project including web service.

2. The Application Development based on PyDM

The PyDM is based on the PyQt framework that is a Python binding of the cross-platform GUI toolkit. In addition to the function of PyQt, it provides a data plugin that is a channel access protocol and archiver appliance based on pypics, request and the json python library. And the qt designer provided by the PyQt is a fast and convenient graphic design tool. So PyDM Graphical User Interface (GUI) tool makes it faster to develop a python program on the EPICS system than a previous one.[2]

2.1 The Development of Archiving Data Analysis Application

The KOMAC data archiving system provides the service based on the web and saves the data to the database. The data is requested by the URL which includes the information of server address, protocol, process variable name, time from the archiver appliance Application Programming Interface (API). The API can export a variety of formats such as

CSV, MAT, TXT, JSON, etc. and I choose the format of JSON because the python json library is directly matched with the dictionary format. The algorithm for requesting and saving data is shown in Fig1.

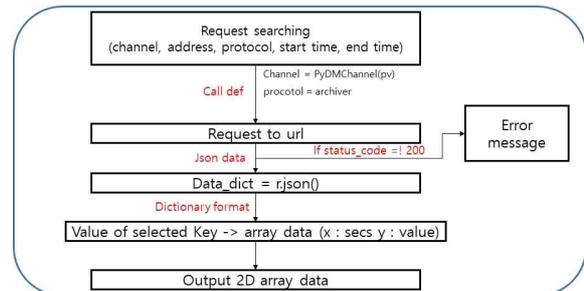


Fig 1. the function call for the data request to KOMAC Archiver Appliance API.

This code is configured based on the original pydm data plugin source code. However, the code is a little different from it. That's because the original code can't get the data if the Process Variable (PV) changed, it also can't receive the data during a specific time of the user selected. The original source code receives that information from the object property. If the function is called, the arguments had to include time, PV. The new code is made considering it. When the function response to a call, it outputs the data that are time, y value, status, etc. For data browsing, the array data is required such as time, y value. So data is extracted using a key address from the dictionary format data.[3]

Every process of data processing and visualizing run with the interface control algorithm. The algorithm is configured by Signal and Slot call. Signal emits call when the specific situation. And slot receives the call from the signal. This mechanism is shown in Fig2.

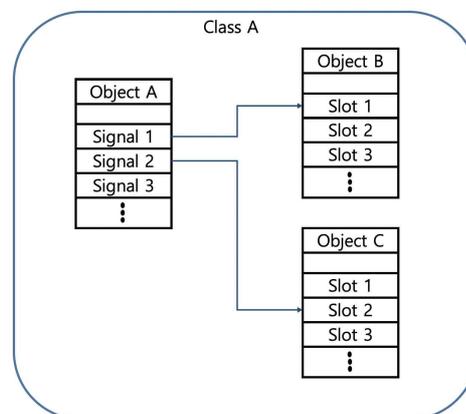


Fig 2. the mechanism of signal and slot

It is similar to the callback function and is used for communication between objects. So the interface works on that. The main interface of the application is shown in Fig3.



Fig 3. The main interface of archiving data processing software

The major functions are autocomplete retrieving, time setting, calculating the data, export the data, data browsing and graphic tool. The working mechanisms of the above functions are shown in Fig4.

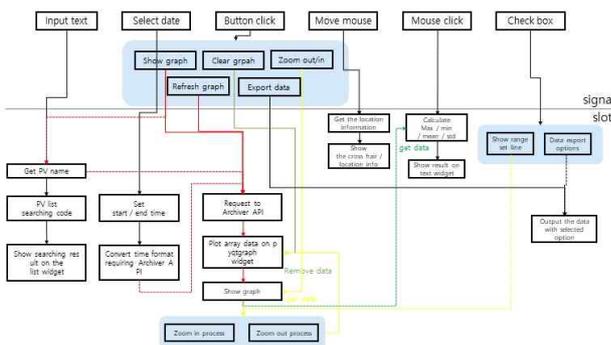


Fig 4. The programming interface for archiver data analysis and processing system.

This version is the first version and it will upgrade gradually with web services.

2.2 The Development of Operating status auto logging Application

Every year, we calculate the operation rate since the KOMAC proton accelerator has been operating. When it was calculated, it had to consider many of the operation parameters. Because the Radio Frequency Cavity (RFQ) Forward power is the major parameter, it is selected as the reference arguments for the conditional statement. And the integrated counting time is saved to the database at a specific time. The interface is implemented based on PyDM and qt designer. The parameter considered on the conditional statement is only one until now. However, Variables that are in each energy and target room will also be reflected in the conditional statement as it upgrading in the future. Fig5 and Fig6 explain the programming interface and the graphic interface for operating status monitoring system.

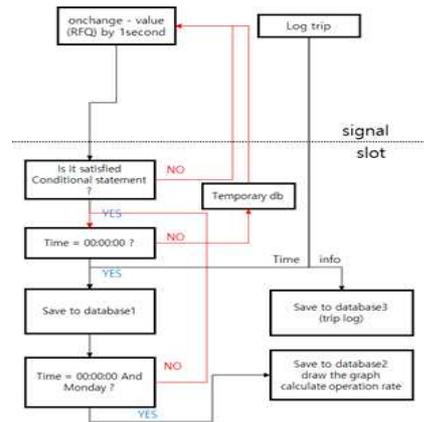


Fig 5. The programming interface for operating status monitoring

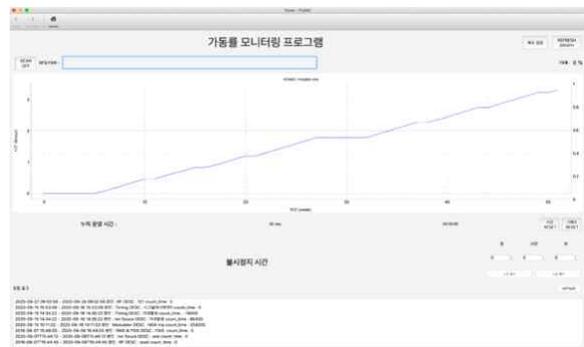


Fig 6. The main interface of operating status monitoring

3. The Development plan of WEB Interface

The developed user tools and the GUIs used CSS tool have problems that include the management of user, access convenience. On the other hand, we can access whenever, wherever onto the web interfaces. And the web service can conveniently manage user lists. It makes it easy to configure an integrated interface that focuses on each user requirement. From now on, The KOMAC web interface will be developed based on the Django framework. It has a benefit that is a using python library, creating server and management, user management, creating a database and management. [5]

4. Conclusions

The applications based on PyDM have been developed and are installed on the monitoring pc of the integrated control room. And the development environment for the web service is being created now. The variety of python programs and web services look forward to providing the convenience of usability, the ability of the data processing for KOMAC.

REFERENCES

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