OpenSCADA — achievements, perspectives and 0.9LTS plans

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Annotation

During the last three years the project OpenSCADA continued in self progress into the mode of deep stability with elements of expanding the allowed functions and it's directing to perform conditions and tasks of releasing a new stable version 0.9, there was done firstly of the OpenSCADA own server deploy, the project's resources planed update and creation of new services. Into the report shows the significant progress at the last three years and the now implementing plans, and the nears future plans.

Introduction

The project OpenSCADA founded in year 2003 by Roman Savochenko as a free implementation of system of Supervisory Control and Data Acquisition (SCADA) or Human Machine Interface (HMI), grounding on an experience into using and developing of commercial SCADA-systems. SCADA or HMI systems in general are appointed and used to operational control by human for working of the complex technological equipment of different production companions.

For now the OpenSCADA project is an advanced SCADA/HMI system it's wide enough used as for the direct appointment and, due to self flexibility, into more adjacent areas that is: realtime dynamic models and imitators of technological processes, environments of execution Programming Logical Controllers (PLC), server hardware monitoring, smart houses and home automation. With some limits and modifications, mostly into the internal environment, OpenSCADA can be used into that areas: billing systems, Enterprise Resources Management (ERP), Accounting and Bookkeeping. Then OpenSCADA we can confidently call in general — the system of working with data in realtme.

Due the project is free, it's mostly provided under GPLv2 license, user can to get free access to source codes of the project, to build and to use it. Ready to use builds and packages of the program are provided now for more known Linux ditributives and environments on the main project's resource http://oscada.org. A free and limited support is provided on the project forum for the free-obtained source codes, binary archives or packages, and mostly for prompt representing and nonspecific to user environment problems. To the full support get user allowed to purchase a package of commercial technical support from the project developers. Besides the commercial support from developers user allowed to purchase services for solutions on OpenSCADA developing, both from the developers and from the third party integrators. Missed functions and extensions, which aren't in the contradictory to the project conception, user also can order to implement for the OpenSCADA developers.

The main process of developing goes by the author and main developer OpenSCADA Roman Savochenko and he's pointed the process respectively. To the last time the developing was mostly going into the work version by the targeting stabilization and extension during the user solutions implementing. From begin of year 2016 the roadmap was updated and the process of preparing and releasing of the stable version 0.9 LTS was started after an achievement of the current work version to some acceptable stability level at introduction of all key changes into the project architecture and conception. Here must to be signed the previous/current stable version 0.8 LTS was continued to updating all the time! Also there must to be signed the team increasing level of participation into the project developing, but that is remains low mostly by the significant specialization of the class software sort.

I must admit next significant extensions of OpenSCADA commonly:

- OpenSCADA core significant stabilization and features of user's configuration expanding. Enabling and control for all processor cores. Internal resources unification. The redundancy mechanism expanding. The mechanism of dynamic translation messages is implemented. The mechanism of call/open of the project documentation is implemented. Moving to the developing scheme Work/LTS, that is developing into the work version and releasing updates to the stable version by back-porting of the compatible changes from the work version. The new mechanism of the program starting from the program-manager of OpenSCADA projects was unified and

developed.

- Significant features expanding of the internal programming language and the interface of user programming in whole.

- Significant stabilization and expanding of the visualization environment both for working into the network through the visualization server and in context of the primitives implementation, mostly it's into UI.Vision. The notifications conception expanding.

- Significant expanding, stabilization and the productivity increasing for transports, archives and data bases of OpenSDADA.

- The supported protocols and hardware list significant appending through implementing its as an user protocol on the internal programming language OpenSCADA.

Recently implemented control system projects

Same by the OpenSCADA author, during the last three years, there were implemented or participated into the five big solutions of control systems based on OpenSCADA. The two solutions implementation going now and the one went to some series with expanding and improvement of each one new solution.

From the finished solutions, which described and published, there allowed to mention two ones implemented into year 2014 and 2015 on the Kramatorsk city CHP once after the de-occupation. That is "ACS of Phosphating, Amination and Hydrazine of boiler BKZ 160–100 PT" and "ACS of the ball drum mills BDM 287/410 of the boiler #8 of BKZ 160–100 PT". The last solution was a continuation of the year 2010 project for boiler #7 and 9. The result of the two solutions is the common network of hardware of correcting of the supply and boiler's water and the dust preparation system, where its at all include three operational stations and six controllers ICP_DAS LP8781 with OpenSCADA internal all its.

The OpenSCADA project's self server and the channel of connection to Internet

On begin the year 2014 a question was acutely set for the project OpenSCADA it's hosting and its connection to Internet but problems and the policy, its miss precisely, of the previous hosting firm DIYA Ltd. Then a fund-rising to the project's server infrastructure was announced and successfully finished. Main and one sponsor was firm "Beams&Plasmas". This year the task of the new server deploy and the OpenSCADA resources moving to it was done: http://wiki.oscada.org/HomePageEn/Server.

Besides the presented services on the new server was deployed next new ones: tunneling connection to provide remote service; automation project's builder; "AGLKS" and "Boiler" models with a demonstration Web-access from outside; smart house on OpenSCADA base with functions of monitoring the server and ERP.

For now the OpenSCADA resources deployed into a cloud of virtual servers with access by domain name OSCADA.ORG and through a channel with the bandwidth 3MB/s.

Automatic builder of the OpenSCADA project

To simplify builds and rebuilds of packages, binary archives and live disks of the distributive of automation based on OpenSCADA there were wrote scripts and deployed the automatic OpenSCADA builder.

For now the builder means checking the repositories of source codes OpenSCADA Subversion and building the two branches, that is: Stable (LTS), for now it's 0.8, and Work, for now it's 0.9. The Stable branch by default builds at a planed update releasing, at 3-6 months and for all targets of the first revision of the stable version. The Work version rebuilds for each changes commit to the SVN-repository and mostly for targets used by the developers and users of the commercial services and the technical support. All buildings by the automatic builder go at nights and finished to midnight of the next day.

For now the automatic builder provides targets:

- form of the source code archives and RPM-packages;

- building packages of the Linux Distributive of Automation based on OpenSCADA: Debian, ALTLinux (old);

- building packages for repositories of Linux distributives of the stable versions and for architectures x86, x86_64, ARM: Debian, Ubuntu, CentOs, SuSE, Mandriva, ALTLinux;

- building firmwares for embedded hardware and PLC;

- building packages for mobile platforms Maemo, MeeGo;

- building live images and archives of live disks for distributives of automation OpenSCADA in basis of Debian and ALTLinux (old).

Due to the now performed the automatic packages building for local repositories of main Linux distributives concrete on the OpenSCADA server then the special building to the primary Linux repositories stopped, early it was being do for ALTLinux and Fedora.

Linux Distributive of Automation Systems based on the OpenSCADA project

To the OpenSCADA project long enough was created the image builds and the archives of live disks and in the year it's decided to split the process and set it formal into the project "Automation Linux distributive of the project OpenSCADA" but in fact the images of created disks build on the additional repositories of packages. The repositories of packages firstly include same OpenSCADA packages and also a series of packages adapted and built specially for the project.

The live disks, and the project "Automation Linux distributive of the project OpenSCADA" now, create:

- to provide a fast method of contact with OpenSCADA;

- as a platform for PLC and paneled PC/PLC of the hardware architecture x86 and x86_64;

- as a platform for solutions of the automation systems in creation of an assembled disk of the automation system project in connection with an installer of the typical, optimized and stabilized environment; with the documentation and other files of the project part's configuration;

- to provide a service functions about the author's program environment and hardware and the solutions of automation systems.

Currently there was replaced the base of the automation distributive from Linux distributive ALTLinux to Debian, in more reasons of the technical a political character. On the Debian base there are provided the live disks' builds for versions 7, 8 and for the hardware architectures x86, x86_64; which also included to the automatic builder of the Work branch. Then to each revision of the OpenSCADA project into the repository of source codes Subversion there are performed building of that live disks and its users allowed immediately to try the fresh features and fixes.

OPC-UA into OpenSCADA

The OPC-UA protocol supported by OpenSCADA from year 2009 and for last three years its implementation got more significant changes and improvements, that is not last due its users' using, feedback and direct orders for improvements. Currently there implemented client and server parts of the protocol, and the server part is more advanced by demanding of the OPC-UA client's from other manufactures. Working and compatibility of the OPC-UA implementation from OpenSCADA tasted for more clients, thanks for its users; and a compatibility table was created. The module DAQ.OPC-UA documentation was significant updated, actualized and translated to all three languages supported by the project author.

In general OPC-UA is multiplatform variant of implementation of protocols OPC, which in view of the deprecated, closed, unsafe and singleplatform OPC-DA used often into the automation of commercial manufacturers; and a question to gate from the presented implementations OPC-DA to OPC-UA all too often rises. In the case of OpenSCADA the direct gate will be possible with its adaptation to work on the MS Windows platform, but that isn't too strong interested for users and integrators but they don't ready to

pay for free accessibility of the adaptation results, according to OpenSCADA it's a free software. But with the 0.9 LTS version releasing planed a public declaration of fundrising for adapting OpenSCADA to work on the platform MS Windows.

From the significant changes into the OPC-UA implementation during the last three years need to note the protocol's part splitting finish to the different library by LGPLv3 license to provide for users a possibility of creation self solution about OPC-UA, and also its significant stabilization and the server part implementation into one thread with the connection, that is the polling mode of input transport, and that's allowed to port of the complete OPC-UA code to the 0.8 LTS version.

OpenSCADA expanding to direct work with buses and low-leveled devices: 1Wire, I2C, GPIO. Smart house.

From the OpenSCADA project funding it's mostly targeted to industrial sort of solutions and the data source protocols. But over time, same after OpenSCADA achieved to the high level of readiness for the industrial automatics, the project's author had been interested and some time appeared to refreshing and actualization of self knowledge and hobbies into the low-level electronics in direction of the lowlevel buses and sensors. For this there was purchased Raspberry Pi2 as a platform for free access to the lowlevel buses from Linux and OpenSCADA environments. The OpenSCADA Automatic Builder appended by the target "Debian_8_armhf" to Debian 8 packages of the hardware architecture ARMHF building, which allowed to direct installation/updating from the repository on RASPBIAN JESSIE.

Currently to OpenSCADA had been created a module DAQ.BCM2835, for direct and fast access to GPIO of Raspbery Pi. Speed of the accessing to this GPIO and the virtual machine of the internal programming language OpenSCADA.JavaLikeCalc is allowed to implement a data show to the text display LCD1602A and poll sensors DHT11, AM2320 in way of the direct implementing their bus ONE-WIRE.

The transport module "Serial" had been adapted to connect and to work with devices on the bus I2C. Through the transport into the I2C mode there were connected and created templates for chips PCF8591 and PCF8574 poll.

For the project "Smart House on base of OpenSCADA" (the author apartments) there were created templates to poll of the network of sensors 1Wire from firm Dallas. On Linux, for pull 1Wire chips from the firm Dallas, presented at last two solutions DIGITEMP and OWNET, but it's mostly limited by the temperature sensors and had problems with its integration, that is for OWNET early there was created to OpenSCADA a module "DAQ.OneWire". The templates for now were created for 1Wire adapters DS9097 and DS9097U on the internal language OpenSCADA and its allowed for automatic detect, connect, poll and control of devices on the bus. Currently there was implemented support for sensors of temperature, two-channel DIO and yet three ones support implementation planed for presented items into author's property. To needs, in the future, there will implemented 1Wire adapters on buses USB, I2C and direct through GPIO.

Currently there is mostly finished the works of preparing and testing about the lowlevel buses and sensors and also there created devices of 1Wire adapters to the interface RS232, that is: DS9097 and DS9097U. The printed circuit boards were designed into KiCAD and produced by help of the photomask and the photoresistive film. Henceforth there planed the wired network 1Wire and RS484 deploy and the temperature sensors DS18B20 installation: to obtain a map of the energy lost, to plan targeting of measures for this energy lost elimination and to estimate of effectivity of the measures.

Actual plans in the context of preparing and releasing of the version 0.9 LTS

Vector of working about the OpenSCADA project is mostly saved and directed to the targeting stabilization in the Work branch and releasing updates to the Stable branch. But in the year beginning and the server moving there started movement to releasing of the new stable version 0.9 LTS and the roadmap was updated and set termless, but with progress of its implementation by the key tasks/conditions of the new stable version releasing to restore the strategic and longterm planing.

That actual conditions/tasks of the new version 0.9 LTS releasing is:

- Finishing of OpenSCADA adaption to direct working with the lowlevel buses and devices like to 1Wire, I2C and initial implementing of the smart house project in volume of the temperature sensors network.

- Revision, actualization and some extension of OpenSCADA Web-modules.

- The base of knowledge and documenting moving to the new engine with its structure unification to the multilanguage with the priority: English, Ukrainian, Russian; and to automatize the ready to print documents generation.

- Adaption to working on the platform "Android".

Of course that users, investors and sponsors have the possibility of correcting of the OpenSCADA project advancing in way of implementing or funding functions/tasks needed to them, and for that there allowed a list of tasks needed to implementing and tasks/conditions of the far plans of the release 1.0:

- Adaption to working on the platform "MS Windows®".

- A function of user's programs building in visual both for blocks, logical, relay diagram and for models of technological processes building.

Conclusion

The integrated SCADA-system OpenSCADA is advanced, ready to using into the complex industrial conditions to perform full spectrum of tasks of automation control of the technological processes and automation in general.

In fact OpenSCADA currently is a system for working in realtime with the dynamic data, and its development directed by the author to extension and folding of near to it adjacent areas, knowledge base (Wiki) unification and the new stable version 0.9 LTS releasing on the background of the common activity of the targeting stabilization, supporting and extension.

The commercial activity about the project OpenSCADA doesn't bring now a significant profits, but that doesn't stops and will not stop the author. But to accelerate the advancing and to increase the quality there needs to involve addition qualified specialists but that is possible only through market payment for their work according to the qualification level. Then you are welcome to any measures for helping and targeting funding of works about and grounding to OpenSCADA!