SOUTH AFRICAN INSTRUMENTATION AND CONTROL

SCADA REVIEW 2016

CONTENTS

OVERALL GUIDELINES FOR THE REVIEW

1. The onus is on each vendor to select a worthy target project and 'nominate' the relevant SI and end-user to complete their sections of the review questionnaire. Where a project has been engineered by the end-user, the SI and end-user may be from the same organisation. The end-user respondent may not hold a financial or other interest in the product or vendor. Where the SI is part of (or a subsidiary of) the vendor organisation then this must be explicitly stated.
2. The end-user portion of the review must be completed by an employee of the end-user. Reviews where the end-user section is completed by the vendor will not be considered for inclusion.
3. Before the end-user commences writing the review, SA Instrumentation & Control must approve the nomination. Please do this by emailing the full SI and end-user reviewer details (name, designation, company, telephone number) to scadareview@technews.co.za with subject line: Scada review nomination for approval.
4. The review must be of an application installed in South Africa or elsewhere in Africa south of the equator, unless no such installation exists (e.g. in the case where a brand new system is being introduced to the southern African market), in which case the respondent must clearly state this.
5. For the SI and end-user sections, please answer questions in respect of the actual subject application, not in respect of the product. I.e. if the question reads "Q. Do you run the scada intercommunicating with any third party software?" The answer "A. No, but it is possible to do so." Should simply read "A. No."
6. Should the end-user respondent clearly indicate in his/her response a preference to remain anonymous in the published article, SA Instrumentation & Control will respect this.
7. The reviews will be published in the order in which they are received by SA Instrumentation & Control (i.e. the first completed review received will be placed at the front of the feature and the last received at the back etc.).
8. Completed reviews must be emailed, together with system architecture image, to SA Instrumentation & Control by no later than the date indicated in the following timeline. Late submissions will not be included. The system architecture diagram should be of sufficiently high resolution for printing – typically a minimum of approximately 1500 pixels wide by approximately 1000 pixels high.
9. Reviews must follow the format laid out on page 5ff.

(Please do not alter the form other than to include the appropriate response to each question)

QUESTIONNAIRE – GENERAL SECTION

The reviews use a *Question & Answer* format. The appropriate respondent (end-user / SI / vendor) should complete the responses to the questions given below. Respondents may omit any questions that they do not wish to answer. Each respondent may also add up to *three* questions that they feel are particularly relevant. ***Each vendor may also add up to three questions and answers that they feel are particularly relevant and help to differentiate their offering from those of other vendors.***

SECTION 1: Vendor, SI & end-user details		
Product & vendor details		
	Question	**Response**
Q1.1	**Product name and version**	Adroit 8
Q1.2	**Product Vendor**	Adroit Technologies
Q1.3	**Vendor switchboard telephone number**	011 658 8100
Q1.4	**Vendor generic email address to be published with review**	info@adroit.co.za
Q1.5	**Vendor URL**	www.adroit.co.za
Vendor contact details for editor clarification (not for publishing)		
Q1.6	**Contact person**	Johan Nieuwenhuizen
Q1.7	**Contact person's telephone**	011 658 8100
Q1.8	**Contact person's email**	johann@adroit.co.za
System Integrator respondent details		
Q1.9	**Name**	Leon Bouttell
Q1.10	**Position/Designation**	Managing Director
Q1.11	**Company**	Le Roux, Bouttell & Associates (Pty) Ltd (LBA)
Q1.12	**Telephone**	011 514 0909
Q1.13	**Email**	leon@lbaa.co.za
End-user respondent details		
Q1.14	**Name**	Adrian Viljoen
Q1.15	**Position/Designation**	Member
Q1.16	**Company**	Prentec
Q1.17	**Telephone**	011 976 5234
Q1.18	**Email**	prentec@iafrica.co.za
Q1.19	**Do you wish your details to be withheld when the review is printed?**	[Enter your response here] Yes/No

SECTION 2: End-user questionnaire		
Project details (i.e. these questions pertain to the specific subject application)		
Q2.1	**Application site location. Town, Province, Country**	Boekenhouthoek, Mpumalanga, South Africa
Q2.2	**In what industry is the scada application?**	Water
Q2.3	**Date project started**	October 2015
Q2.4	**Date project completed**	March 2016
Q2.5	**What is the fundamental purpose of the system?**	Community based off-grid water treatment plant
Q2.6	**Briefly describe the application including information on any pre-existing control system or scada system that was in place, etc. If there was a pre-existing system, please describe the switchover from the previous system.**	
	The solution is an off-grid mini water treatment plant. Driven by solar the Aquastation system can use any water source (borehole/river) and produces potable water. The process uses a Mitsubishi membrane / Mitsubishi Electric FX5 PLC, a Mitsubishi Electric D720 VSD and Mitsubishi Electric ME-RTU as well as Adroit SCADA. It treats, doses, backwashes, all fully automatically and is driven from PV panels on top of the unit.	
Q2.7	**What was the primary motivation for the project?**	
	To provide potable water to the Boekenhouthoek community.	
Q2.8	**What were the main goals established for the project?**	
	To provide potable water to previously disadvantaged communities based on the World Health Organisation's guidelines for basic needs. These guidelines defines a 7.5 liters minimum per day per person where the source is located more than 1km away or that the roundtrip to fetch the water is more than 30 minutes. It also points out that basic access right should be around 25 liters per day per person.	
Q2.9	**In the procurement decision making process what were the primary considerations that influenced the product selection?**	
	Machine-2-machine remote monitoring as well as the centralised hosted SCADA system	
Q2.10	**What Project Management principles and/or methodologies did you employ as end-user to mitigate risk, ensuring the project came out on time and within budget?**	
	Internal Prentec project management was used.	
Licensing, maintenance & support model		
Q2.11	**What licences have been purchased for this particular application?**	750 I/O Adroit with the built-in DNP3 driver to communicate to the Mitsubishi Electric ME-RTU using GPRS
Q2.12	**What upgrade agreements are in place on this particular application?**	Annual Maintenance and Technology Agreements
Q2.13	**How is the after-sales support handled on this particular application?**	
	Firstly through the system integrator LBA and secondly through Adroit Technologies' support team using Teamviewer.	
Q2.14	**Do you have a documented process in place to manage, test and install OS and scada system software patches? If so, please describe.**	
	This is handled through the Adroit update mechanism	
Integration and management reporting		
Q2.15	**Is the scada system integrated onto an intranet or the Internet? If so, does the configuration allow**	

	simple remote monitoring by clients, or is it configured to allow full remote control by clients?
	Both. Operator is internet enabled and allows the client, Prentec or LBA to logon. Security rights determine what functionality is available to which party. Adroit hosted standard operators and login on internet.
Q2.16	**Does the system include or interface with an expert system? If so, please describe.**
	No
Q2.17	**Does the system include any form of augmented cognition (AC) or augmented reality (AR)? If so, please describe.**
	No
Q2.18	**Is the system integrated with an MES / ERP or other management reporting or control system (e.g. Baan, SAP, SYSPRO…)? If so then what integration methodology was used? (e.g. .NET, XML, Web Services, etc.)**
	No
Q2.19	**Has any GIS (Geographic Information Systems) functionality been configured in the application? If so, please describe its functionality and how it was achieved.**
	Yes – through the standard GIS functionality in Adroit SCADA. Sites are displayed geographically on a map that show the statuses of each site.
Q2.20	**Has any asset management functionality been configured in the application (for software assets, control system assets or for plant assets)? If so, please describe its functionality and how it was achieved.**
	All running times and performance of plant assets are monitored in the SCADA.
Q2.21	**Do you run the scada in conjunction with any third-party application software (Other than expert system, AC, AR, MES, GIS or asset management system)? If so, please describe.**
	No
Q2.22	**Does the application include data archiving / historian capabilities with an historical data reporting system? Please elaborate.**
	Yes. All plant history is continually used to improve the efficiency and operation.
	Maintenance, reliability and asset optimisation
Q2.23	**Have any operational or production benchmarking tools been configured as part of the scada system? If so, please describe.**
	No
Q2.24	**What maintenance, reliability, asset optimisation and/or continuous improvement criteria relating to this system and the plant monitored / controlled by this system, were included in the user requirements specification for this project?**
	Off-grid continuous optimisation of solar operation including storage and real-time operation directly from solar power.
	Mobile device support
Q2.25	**Are you currently using tablets, mobile phones or other smart mobile devices to interact with the scada system? If so, for what purposes?**
	No
Q2.26	**Do you allow users to interface with the scada system via their own personal smart devices? (BYOD)**
	This is possible with Adroit, however it has not been configured.
	Conclusion
Q2.27	**What was the predominant feature (or features) that made you decide to purchase this scada product over all others for this application?**
	This SCADA is a world-class product locally developed and supported. The pricing was good and the provider's teams have excellent knowledge and expertise within the industry and with the product and its

	capabilities. The provider is trusted as we have used them a number of times. The technology of the product is of great quality and value and the provider had an understanding of the challenges of this project and environment.
Q2.28	**What was the most significant change that you implemented in SCADA engineering practice / technology in this project? If the answer is other than None, what motivated you to implement that change?**
	Using the Mitsubishi Electric ME-RTU system with DNP3 which required using Open VPN to facilitate communication over GPRS. In addition the control technology used to optimise the use of the implementation of the pump control system with the Mitsubishi Electric VSD.
Q2.29	**What single operational feature most impresses you about the product now that it is in operation? Please elaborate.**
	The ability to do online program changes for the PLC, VSD and SCADA over GPRS. This reduces the time and cost of having to make these changes on site being able to manage the system remotely is of great value.
Q2.30	**What impresses you most about the architecture? Please elaborate.**
	The ability to host on the cloud and access from anywhere as well as online program changing.

SECTION 3: SI questionnaire		
Project details (i.e. these questions pertain to the specific subject application)		
Q3.1	**How many tags are configured?**	140 Tags per site – 100 analogues, 15 integers, 15 reals, 10 marshalls (per site) 7 sites are configured
Q3.2	**How many updates per day are recorded in the archive / historian for this particular project?**	432 000 logs per day (100 tags per 20 seconds) 40 Tags per plant @ 5 sec
Q3.3	**How much disk space do one day's updates for this particular project occupy?**	5MB
Q3.4	**How many I/O does the installation have? Analog, digital, other? And across how many front-end devices? Make & Model of front ends?**	I/O details 1200 digital I/O, 800 analogue I/O, 40 Expression I/O and 40 Script I/O 8 Mitsubishi FX5 PLCs with ME-RTUs
Q3.5	**Approximately how many man-hours did the scada configuration take?**	Interface design 40 hours. Database design 40 hours.
Q3.6	**What tools were used to minimise the man-hours taken?**	Bulk Excel Configuration tool. Wizards and Templates were used. CSV import/export for scanning, datalogs and the creation of all Tags
Q3.7	**Do the operator interfaces on this project use multi-touch gestures?**	No
Q3.8	**What human factors were taken into consideration as principles or development standards in the HMI design process?**	Realistic graphical representation of site. Standard navigation format.
Q3.9	**For the graphics development process did you use standard library images, or did you have to draw images from scratch?**	Standard library together with customised graphics.
Q3.10	**How would you describe the library of graphic images?**	Simple, yet powerful
Q3.11	**Did you use any 'special' images?**	Yes, 3D images
Q3.12	**Did you use any video or multimedia technology in the application? If so, please describe.**	
	None	
Q3.13	**What alarm management standards or best practices were adopted in configuring the scada system?**	
	Standard Adroit Best Practices Alarming	
Q3.14	**What structured processes were followed to determine expected performance under full load, and during abnormal failure conditions (such as network interruptions, node failures, power outages, controller failures, etc.)?**	
	In house testing with demo unit.	
Q3.15	**What are the key physical communication layers and communication protocols employed in the system? Fibre, Ethernet, EtherCAT, wireless, Modbus, etc.**	
	Public IP Internet connection to PLC via GSM network.	

Q3.16	**What is the network speed and communications medium of the slowest link in this project's scada network?**
	Normal GSM network speed. Depends on physical elements.
Q3.17	**What is the network speed and communications medium of the fastest link in this project's scada network?**
	50 kbps – GSM Network
Q3.18	**What levels of redundancy are incorporated in this scada application? (Client side, server side, DB server, communications server, web server, etc.)**
	Stand-Alone system, but PLC driver code has history buffer memory, so when SCADA link is back on again, all data is polled from PLC history buffer
Q3.19	**Was any specific custom code or scada scripting written for this project? If so, for what purpose?**
	Yes, history buffering and automated process control. User input minimum. Process control and initial setup values calculated in VBScript, kwh counting, flow calculations and dosing calculations done in VBScript. Some operator information determined through VBScript to allow the operator more data without putting too much traffic on the GSM network and to use fewer Tags.
Maintenance, reliability and asset optimisation	
Q3.20	**In engineering this project, what steps were taken to address maintenance, reliability, asset optimisation and/or continuous improvement aspects relating to this system and the plant monitored / controlled by this system?**
	SCADA control was develop to continuously monitor and control remote site. This monitoring is done on a 24 hour, 7 days a week basis. This ensures that the product delivered is always of the highest quality.
Project management	
Q3.21	**What Project Management principles and/or methodologies did you as SI employ to mitigate risk, ensuring the project came out on time and within budget?**
	N/A
Security and data protection	
Q3.22	**How have authentication, authorisation & role management been configured? Please elaborate.**
	Standard Windows OS Security as user interaction will be minimum.
Q3.23	**Does the design make provision for a DMZ and firewall segregation of process (scada) network and business networks (LAN, WAN, GAN, Internet, etc.? If so, please briefly describe how this has been achieved.**
	Yes, the solution required a Fixed Public IP to enable communication. This fixed IP could either be a PC connected directly onto the internet or a modem/router to a company network. However, port forwarding and firewalls had to be configured correctly. This static public IP is required as the ME-RTU solution uses the Open VPN protocol which requires a static IP address.
Q3.24	**What intrusion detection has been incorporated on the plant network(s) on which this scada system exists?**
	An input on the PLC is for intrusion detection. When this is triggered, it gets sent to the PLC after 30 seconds if not acknowledged by a key in a digital lock
Q3.25	**Is the security model employed based on a standard? If so, please state the standard used.**
	No

Q3.26	**In what ways is this project's hardware architecture optimised for:** **1. Patch management and** **2. Antivirus management?**
	AntiVirus updates and Firewall firmware patches.
Q3.27	**What configuration back-up and data archive backup methodologies have been adopted?**
	Historical data logging. Using the Adroit logging agents. These are exported as .CSVS when analysis is required.
Q3.28	**Did you use any integrated or 3rd party configuration control system for the scada configuration during the engineering of this application? If so, please describe.**
	No
	Conclusion
Q3.29	**How would you rate the ease of use of the historical reporting system?**
	Easy
Q3.30	**What impresses you the most about the engineering / configuration aspects of the product now that it is in operation? Please elaborate.**
	The initital engineering required some detailed planning but following the initial commissioning it was a matter of copy and paste for the rest. The PLC/network setup was also just a copy and paste. The only thing that changed is the IP address per PLC on installation. The datascope that Adroit has written – if you know where to look, this system gives a large amount of information regarding the scanning, updating, etc., of configured Tags. When using a system like this one (GSM, connection in a rural area), it is critical to know that your information is being communicated correctly across the protocols used. The ease of configuring additional client connections to the server. If the client PC is on the network and we have the required access to the client, it is very simple to connect to this server. Additionally, by using the Open VPN architecture we are able to connect client PCs from other buildings. Most importantly with this, because the security is so secure, you can do this without any risk of malicious or accidental "attacks" on your system.
Q3.31	**What impresses you most about the architecture? Please elaborate.**
	The communication architecture that is used, is very robust. The communication speed is also at times impressive. One key feature is the fact that you can access the PLC program via the GSM network, so there is no need to drive to site to make 1 change.

SECTION 4: Vendor questionnaire			
Product details **(NB the difference between the Product related column, which is in respect of (iro) the product in general and the Subject project related column, which is iro of the project covered by this scada review)**			
		Product related	**Subject project related**
Product			
Q4.1	**Product version / Module versions**	Adroit 8.4.2	Adroit 8.4.2
Q4.2	**Vendor comments on product / modules**		
	Adroit 8.4.2 in this project offers more robust communication.		
Operating systems / VMWare			
		Product – supported / available	**Subject project - used**
Q4.3	**Operating systems – client side run-time?**	Windows 7 Windows 8 Windows 10	Windows 7
Q4.4	**Operating systems – client side configuration?**	Windows 7 Windows 8 Windows 10	Windows 7
Q4.5	**Operating systems – server side?**	Windows 7 Windows 8 Windows 10 Windows Server 2008 Windows Server 2012	Windows 7
Q4.6	**Browser based?**	Some modules	None
Q4.7	**Front end device communications protocols**	Mitsubishi PLCs OPC Modbus DNP3 M2M Adroit has over 120 protocol drivers available	Mitsubishi PLCs DNP3 M2M
Q4.8	**Does the scada system rely on Java plug-ins to exploit the full functionality of its core and additional modules?**	No, Adroit offers web-interfacing through web services	No, support web services
Q4.9	**Vendor comments (e.g. Java based, Microsoft CLR, Mobile OS support, etc.)**		
	Microsoft .Net, Microsoft SQL, Microsoft Scripting HTML5 widget for building operational dashboards		
Licensing, maintenance & support model			
Q4.10	**What sort of licensing agreement options are offered? Does one licence cover all modules, or can**		

	the purchaser buy only those modules that he requires?		
	Licensing is scanned I/O based – all internal logs are free, including alarms and historical log tags with databases. Base licence comprises core modules. This however differ for the size of system you have. Additional value adding modules can be purchased separately.		
Q4.11	**Are licences sold outright or subject to periodic (e.g. annual) renewal?**		
	Outright with technology support/maintenance agreement optional. Licence is a once-off purchase per major version release. Small version updates are free.		
Q4.12	**What upgrade agreements are offered? Are patches and version upgrades free, covered under annual maintenance or managed in some other way (describe)?**		
	Groupwide support and sales arrangements are available along with maintenance agreements. Minor version and patch upgrades are free.		
Q4.13	**What after-sales offerings iro support and maintenance are available, and which technologies are used to deliver them?**		
	FTP, E-mail (remote) Site Auditing and onsite support can be offered as an annual agreement. Telephonic and remote desktop support is offered free during office hours.		
Q4.14	**Do you have a documented process in place to manage and test OS patches and to release scada system software patches? If so, please describe.**		
	Yes, internally driven Yes, our testing department has a testing procedure to test Adroit products against latest Windows releases and upgrades.		
Technology incorporated			
		Product related	**Subject project related**
Q4.15	**Product uses Web Services?**	Yes	Yes
	If the subject application uses Web Services, please describe what this technology is used for.		
	All data within Adroit SCADA available via web services to build web based services		
Q4.16	**Cloud computing supported?**	Yes Azure Any Microsoft Server Cloud Hosted	No
	If the subject application uses cloud computing, please describe how this technology is implemented on the subject project.		
	Server hosted at client and access ME-RTU using DNP protocol – digitally certified and authenticated using open VPN.		
Q4.17	**Virtualisation models supported?**	Yes, soft license	Yes, soft license
	If the subject application uses virtualisation, please describe how this technology is implemented on the subject project.		
	N.A		
Q4.18	**Do the operator interfaces (supported hardware + OS + scada software) support multi-touch gestures?**	Yes	No
Q4.19	**What changes have been introduced into the product in the last 12 months?**		
	Smaller HMI package module, Mitsubishi FX5 M2M support, GIS, EMS solutions based on the product.		

Integration and management reporting	
Q4.20	**What generic and/or product specific interfaces does the product have iro well-known MES packages? Please elaborate including comment on relevant certifications.**
	Excell, SQL Server, MS Reporting Services – built on MS Business Intelligence technologies is the Adroit Smart Intelligence product.
Q4.21	**What native (application or OS) historical data reporting options are available? Please elaborate.**
	Our trends support export to Excell, PDF, jpg and CSV formats. Adroit has its standard flat file data logging that is used for trending and charts. Adroit can also log to multiple different databases. Microsoft SQL, Oracle, etc. Adroit SCADA interface can then also be used to create simple data queries to report data in the interface. Microsoft Reporting Services can then also be hosted in the user interface via url tool.
Maintenance, reliability and asset optimisation	
Q2.22	**What maintenance, reliability, asset optimisation and/or continuous improvement related modules or capabilities does the product incorporate relating to the IT and/or control system of which this product forms a part and/or the plant monitored / controlled by such system?**
	SNMP capability – possible to monitor LAN performance and IT infrastructure All software changes and processes are logged to Microsoft Windows Events with a unique ID for Adroit. Adroit can also log this data to SQL if need be. Adroit offers Report Suite which comes with free audit reports for the system.
PLC configuration and programming	
Q4.23	**What capabilities, if any, does the scada offer in terms of generation and/or management of either PLC configuration files or PLC application code? Please elaborate**
	MAPS supports object-based generation of function blocks and SCADA objects in Mitsubishi Electric range of PLCs
Security and data protection	
Q4.24	**If the scada system generates application files that are transferred to the PLC, how are PLC virus attacks prevented in this process? Please elaborate**
	Handled within Mitsubishi Electric secure program transfer mechanism.
Q4.25	**What authentication, authorisation & role management models are available for the runtime environment? Please elaborate**
	Supports full MS security and all data encrypted between Adroit SCADA and client
Unique selling proposition (USP)	

Q4.26	**List the top five feature/benefit pairs that contribute to this product's USP**	Feature [Web enabled interface] [Advanced logging options] [Simplified bulk configuration] [New and enhanced graphic libraries] [Brillian graphics can now be imported]	Benefit [Designing and operating can be done remotely through the internet enabled web interface] [Extended datalog system for complete control of how to log and keep backups of data – DBLog agent makes bulk logging to SQL a breeze] [Has simpler bulk configuration utiity to configure Adroit Agent Server from Excel] [Controls such as gauges, charts and an intelligent navigation menu are available to assist engineering process – many equipmanet graphics] [Supports importing of 3rd party xaml graphics such as 3D images and CAD drawings for advanced graphical requirements]

Reminder: Each vendor may also add up to three questions and answers that they feel are particularly relevant and help to differentiate their offering from those of other vendors.

END