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Data overload in the digital oilfield

The quantity and range of real time sensor data in the digital oilfield provides opportunities to improve operations and production, but gaining this insight requires a planned approach to data processing.

By David Dungate

Data overload in the digital oilfield

The digital oilfield is awash with modern sensor technologies providing real-time readings of a range of indicators from bottom hole assembly all the way up to the Christmas Tree and beyond. The huge volume of data generated by acoustic and fibre optic sensors means that operators cannot directly interpret readings into real-time, actionable information. Furthermore, moving the ever increasing volume of data from the rig to the remote operating centre can be challenging in real-time even with current high speed networks.

From data overload to insight

The integration of pre-processing / data reduction techniques into the sensor data pipeline provides one solution. This allows the extraction of useful information at source, thus facilitating the real-time transmission of data to remote control centres. It also enables operators to focus on actionable information rather than a deluge of largely unimportant data. Finally, it also reduces data centre storage requirements.

Developing successful data reduction methods that significantly reduce data volumes by pinpointing pertinent data but that do not throw away information that might be of value is complex. Below we outline the steps you need to address and their critical success criteria.

Understand the language of the engineers

Standard data compression algorithms are rarely satisfactory. Effective data compression requires a good understanding of what various sensor data means in engineering terms. Work with the operators to find out how that information is used in context, and what is already known as significant trend information. In this activity it is critical that the IT team are fluent in the underlying engineering language so that they can engage with the operators and understand the context the data is used in to support decision making.

Pick appropriate mathematical and visualization techniques

Define a core set of data reduction and visualization techniques to apply to the data, then work with stakeholders to explore what



combinations and configurations of these techniques provide insight. The key to this activity is having a firm grasp of a range of mathematical data reduction methods and visualization techniques, as well as an understanding of how the techniques can be used in the context of the problem.

Use a platform approach

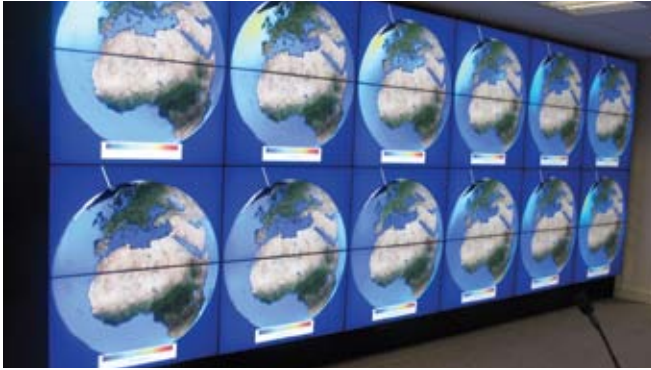
Whatever useful mathematical and reduction techniques you have discovered, they may not cover all your future needs. The system, therefore, needs to be flexible enough to allow the rapid addition, testing and deployment of new techniques as well as the combination of existing techniques. Determining the most appropriate architecture, the best technology components and the functionality to be made available to the user will vary from organisation to organisation. Making the right choices in this phase depends on experience.

Next steps

To learn more about how Tessella can help you develop a solution to your needs visit: www.tessella.com/oil

CEDA and Tessella collaboration brings Earth observation data to life

By Richard Wilkinson



Tessella helped develop the framework that allows scientists to display data on the ISIS video wall facility

Background and Challenge

CEDA (Centre for Environmental Data Archival), based at the STFC (Science and Technology Facilities Council) Rutherford Appleton Laboratory in the United Kingdom, hosts a large number of environmental data archives, including extensive Earth observation and atmospheric data which play an important role in furthering climate related research around the world.

Dr. Victoria Bennett, Earth Observation Data Scientist at CEDA explains: "Our vision is to make our extensive archives accessible to the global scientific community, especially those involved in climate research. We already had a portal application for visualising the data, but it was too slow and not user friendly to open up to the wider global community. More importantly, it lacked certain key functions, such as catalogue information about the data, animation features to enable scientists to observe changes over days, months or years, and support for output formats like Google Earth, virtual globe applications and large video walls."

The team decided to co-ordinate the release of the new visualization service with the opening of the prestigious ISIC (International Space Innovation Centre) on the Harwell Science and Innovation Campus, which was created to draw together a critical mass of space-related activities by linking existing pockets of expertise in UK industry, academia and Government.

Victoria continues: "This gave us a very ambitious deadline, but we wanted to provide scientists and visitors to ISIC with a unique and powerful way of viewing the Earth observation data by displaying it on a large video wall in the ISIC visualization suite." Having set themselves aggressive timescales, Victoria and the team set about selecting a suitable partner to bring their vision to life. Tessella were chosen for their scientific software expertise and track-record of delivering successful projects for other organisations on the Rutherford Appleton site.

Victoria continues: "Tessella's strength in science meant we all spoke the same language, which gave us confidence they could rapidly translate our ideas and requirements into a robust and professionally developed application."

Solution & Benefits

Collaborating with the CEDA team, Tessella wrote an initial specification for the visualization service, which was then

iteratively developed to meet the challenging deadline of the ISIC launch.

The Science Visualization Service for Earth Observation (SVSeo) is a web application (available at <http://isicvis.badc.rl.ac.uk/viewdata/>) that uses an OGC (Open Geospatial Consortium) standard Web Map Service (WMS) to display datasets as maps. Scientists can visually explore large and complex environmental datasets from observations and models, view, step through and zoom into gridded datasets on a map view, export images as figures and create animations. Different views can be easily overlaid, e.g. different parameters in the same data, or different datasets.

The images and animations can also be exported for viewing on the ISIC video wall, on Google Earth, and other viewing software. The visualization service catalogue currently includes a selection of the Earth observation and atmospheric archives, such as satellite derived products relating to clouds, plankton, air-sea gas exchange and fire, as well as model output, which makes it an ideal environment for climate research. And as planned, the SVSeo can also be used at the ISIC facility in conjunction with a large video wall to create impressive animations on a virtual globe, or multiple, synchronised virtual globes.

Summary & Future

Victoria concludes: "We are delighted with the new visualization service and the work that Tessella have done to help us bring our data to life. As well as delivering the new viewing and export functions against aggressive milestones, Tessella were also able to help us significantly speed up the user experience by reengineering parts of the web map data service. We certainly would not have met the ISIC launch date without their extensive scientific software and data analysis expertise."

CEDA plans to add more datasets to the service as new Earth observation data is produced and provided for long-term archiving. Other providers can also make their data available through the service using industry standard formats.

Requirements

- A fast and user-friendly way of making CEDA's Earth observation archives accessible to the global scientific community, especially those involved in climate related research.
- Robust, professionally developed web based visualization application that will also support data catalogue information, data animation and output to Google Earth, virtual globes and large video wall.
- A software development partner with an extensive background in science and the visualization of large datasets.
- Visualization service available on large video wall in time for the launch of the ISIC facility.

WWARN software tools provide global insight into the emergence of antimalarial resistance

By David Hughes

Background and Challenge

With malaria claiming thousands of lives every day, one of the biggest challenges facing the global community is the emergence of parasites resistant to the latest effective antimalarial treatments. Working with Tessella, WWARN (Worldwide Antimalarial Resistance Network) have built a global data repository and user friendly web application that provides researchers and policy makers with insights that may prevent or slow the spread of antimalarial resistance. Planned and initiated by a core group of scientists from over 50 institutions and 28 countries, WWARN is a global collaboration with the mission of providing timely, quality-assured intelligence on the emergence and spread of antimalarial drug resistance. WWARN has a base in the Center for Tropical Medicine and Clinical Vaccinology at Oxford University, scientific groups in Oxford, South Africa, France, and the USA, and regional centers in Asia, and East and West Africa.

Despite recent progress, malaria still remains a major public health problem, claiming thousands of lives daily. The widespread adoption of artemisinin combination therapies (ACTs), the globally recommended first-line treatment, has helped to decrease morbidity and mortality from malaria in many countries. However, one of the major challenges to making further progress is the emergence of parasites that are resistant to the artemisinin component of the drug. With no new effective replacement for artemisinin on the horizon it has become vital for the global community to prevent or slow the spread of antimalarial resistance.

Richard Cooksey, Senior Informatics Architect at WWARN takes up the story: “Central to preventing or slowing the spread of antimalarial resistance is the need for timely, quality-assured intelligence that is easily accessible to the global malaria community. WWARN was founded to provide a focal point for the integration of data from a multitude of global studies into a standardized format that would enable researchers, scientist and practitioners to perform cross-comparisons and analysis.”

At the time, this posed a real challenge because much of the information on antimalarial efficacy was fragmented across different studies, reports and publications, with clinical investigators reporting results based on analysis using a range of methods. This meant that clinical study outcomes were difficult or impossible to compare, there was no simple way for scientists to monitor trends or for government policy makers to get information on the big picture of antimalarial resistance to help them decide which treatment was the most effective for patients in any given region.

Richard continues: “To achieve our vision we needed to create a software platform that would support the submission of data in different formats, a set of curation tools to help standardize and quality assure the data, and an easy-to-use web-based analysis and visualization front-end. We also realized we needed outside expertise to help us rapidly build this environment.”

After a short selection process, Tessella was chosen based on their previous successful involvement with the Wellcome Trust Center for Human Genetics at Oxford University and expertise in scientific data management and analysis.

Solution and Benefits

Starting with an initial database of 86 clinical studies, Tessella built the first public facing preview release of the WWARN Explorer, a user-friendly web-application that allows researchers and policy makers to view aggregated, standardized data from multiple studies and compare the results using an interactive mapping tool. Users can search for studies in several different ways, e.g. by geographical region or drug treatment. Key graphical outputs can be viewed, such as survival curves, for each study. Data aggregated across studies in a given region can also be visualized, for example to spot changes in drug efficacy outcome over a period of years.



By making it easy for the global malaria community to securely submit and share data, the original WWARN database has grown into a more comprehensive Data Repository that holds curated data on five complementary scientific aspects of antimalarial resistance:

- **Clinical efficacy** - responses of malaria patients following antimalarial treatment
- **Pharmacology** - accurate antimalarial concentration measurement to distinguish resistance from inadequate drug exposure
- **In Vitro** – drug sensitivity of malaria parasites collected from infected patients
- **Molecular markers** – validation and application for monitoring parasite antimalarial resistance
- **Antimalarial quality** – monitoring impact of poor quality antimalarials on treatment outcomes

Richard continues: “Tessella’s expertise in scientific data analysis and professional software development has been a great asset in helping us to rapidly establish the WWARN Data Repository and the WWARN Explorer as unique sources of global intelligence on antimalarial resistance. This in turn plays a vital role in ensuring that anyone infected with the disease receives the safest and most effective treatment.”

Along with Explorer, other tools developed by WWARN such as the Parasite Clearance Estimator and In Vitro Analysis and Reporting Tool are also making a real difference to the malaria research community, providing infrastructure for researchers and empowering them in the fight against malaria.

Meet us at these events

Email info@tessella.com to organise a meeting at any of these events.

SPE Intelligent Energy International; March 27th to 29th 2012, Jaabeurs, Utrecht, The Netherlands

Tessella is once again sponsoring the successful SPE Intelligent Energy International conference and exhibition, taking place on the 27th to 29th March 2012 in Jaabeurs, Utrecht, The Netherlands.

Meet the Tessella team at exhibition stand number B60. To find out more or to register online, visit:

www.intelligentenergyevent.com

Bio-IT World Conference 2012; April 24th to 26th, 2012, World Trade Centre, Boston, US

Tessella is a gold sponsor of the 2012 Bio-IT World Conference taking place at the World Trade Centre in Boston on the 24th to 26th of April 2012.

To find out more about Bio-IT World Conference 2012, visit:

<http://www.bio-itworldexpo.com/>

Drug Discovery Leaders Summit 2012; June 11th and 12th, 2012, Zurich, Switzerland

Tessella is proudly sponsoring the Drug Discovery Leaders Summit taking place on June 11th to 12th 2012, in Zurich, Switzerland.

To find out more about this event visit:

<http://www.drugdiscovery-summit.com/>

ICA Congress 2012; August 20 to 25th 2012, Brisbane, Australia

Tessella is going down under and is pleased to sponsor ICA Congress 2012, taking place on the 20th to 25th of August 2012, in Brisbane Australia.

To find out more about ICA Congress 2012 or to register online, visit:

<http://www.ica2012.com/index.php>

On demand webinar: Running Adaptive Clinical Trials - Myth and Reality

Clinical trials that employ frequent adaptation offer great opportunity but pose specific challenges. In this on demand webinar Tom Parke and Martin Kimber share their experience gained on over 30 adaptive trials and discuss: what these trials are, why people run them, how they are designed, how the logistics to run them are put together, what it's like to run one as well as observed benefits both expected and unexpected. Watch the webinar:

http://youtu.be/w2R_vBvaLwo

Guardian Supplement: Search and deploy

Whether it's libraries, business or education, in today's world it's not just what you know but how you use it that really counts. Read more:

<http://www.tessella.com/?p=4517>

Tessella Associate VP Thuman Trains Library of Congress' First Corps of Digital Preservation Teachers

Michael Thuman, Associate Vice President of Digital Archiving at Tessella Inc., served as an expert instructor and content developer for the Library of Congress' inaugural workshop on teaching digital preservation. The event took place at the Library's James Madison Building, in Washington, D.C. Read more:

<http://www.tessella.com/?p=4380>

Tessella re-organises to maximise client value in 2012

2012 sees a new organisation at Tessella aimed at maximizing the value of its technology and consulting services to clients through greater business focus and geographical alignment.

Board member Jon Tilbury takes on global responsibility for Tessella's archiving business. He will continue to develop Tessella's world class archiving software SDB, already in use at many national archives and libraries, as well directing the development of a new "on demand" service based on the same technology.

The creation of four sector Sales Directors reporting to Director Alan Gaby will enable Tessella to develop the services needed by clients to support their industry specific business objectives. Grant Stephen, CEO Tessella Inc. and board member of parent Tessella plc, will work alongside the sector directors in the U.S. to ensure that they address the global needs of Tessella's clients.

Kevin Gell, Chairman, commented, "Alan, Grant and Jon are hugely experienced executives with long and successful track records of leading world class technology and consulting services. Our growth plans are ambitious but we couldn't have better leaders to take on the challenge. This is an exciting time for Tessella."

UK OFFICES

Abingdon	+44 (0)1235 555511
Burton upon Trent	+44 (0)1283 559150
Stevenage	+44 (0)1438 749886
Warrington	+44 (0)1925 286800

NETHERLANDS OFFICE

Den Haag	+31 70 392 7101
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US OFFICES

Boston	+1 617 454 1220
Washington DC	+1 240 403 7502



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Tessella – successfully delivering IT and consulting services to world leaders in R&D, science and engineering.

Founded in 1980, Tessella is the international provider of science powered technology and consulting services. World leading organisations choose our unique blend of science, engineering and sector expertise to deliver innovative and cost-effective solutions to complex real-world commercial and technical challenges. Our people are high achievers from leading universities and are passionate about delivering value to clients. We are proud that our work makes the world a better place to live in: developing smarter drug trials; preserving the digital heritage of nations across the globe; minimizing risk in oil and gas exploration; controlling the orbit and attitude of satellites; researching fusion energy.

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