Visualyse Spectrum Manager

The Future of Spectrum Management

Spectrum management software systems that do not align with the emerging business models of many spectrum management organisations stand in the way of progress promised by the development of wireless communications in the 21st century.

Upfront costs of millions of dollars for old, inflexible software – software that will be difficult to use and costly to maintain – are a significant barrier to the development of capability in spectrum management. This threatens only to widen the digital divide.
In this paper we present an alternative.

- *a spectrum management solution developed by one of the worlds leading providers of radio communications software.*
- *a solution based on the leading edge research of one of the world's most progressive and practical Regulators.*
- *a solution that you could be using tomorrow.*
- *a Spectrum Management Solution for the 21st Century*
- *a service whose cost to the Regulator fits with all license revenue models – pay per transaction or purchase outright, run on our servers or install and integrate to your existing administrative systems.*

This paper introduces Visualyse Spectrum Manager and presents a short case study of how you would use the service to plan and license a point to point link

Spectrum Management Today

As we approach the end the first decade of the 21st Century we are aware, more than ever before, of the many benefits of telecommunications.

From Digital TV to mobile internet, the radio spectrum has a key part to play in the development of wireless services.

The rising demand for the radio spectrum is driving the need for efficient and cost effective spectrum management.

However, spectrum management solutions can be expensive to buy, and even more expensive to run. The on-going investment in staff training can outstrip even the large initial cost. There is wide agreement that established engineering software is difficult to learn, hard to remember and unsatisfying to use.

The Spectrum Management industry has become dominated by a few big companies – you may feel that you have limited options. You may reluctantly accept the industry standard of poor usability that prevails in exchange for the engineering functions you get in return. DON'T.

This paper lets you know that there is a new, exciting alternative – from a company with long established reputation in radio interference analysis software. The same company that brings you powerful engineering

software that people can actually enjoy using and be productive with.

That company is Transfinite Systems – developers of the Visualyse range of products for over 15 years.

So please, consider this.

Is it really cost effective to buy an out of date solution using technology a decade old, packed with unnecessary features and which is hard to use?

In this paper we describe how spectrum managers can gain access to the latest technology which is both powerful and easy to use - without spending millions of dollars.

Benefits of Visualyse Spectrum Manager

Visualyse SM is the 21st Century spectrum licence management solution. It is ahead of the field in so many areas.

It brings the power of the internet to spectrum management. There are very many reasons why you should investigate what we have to offer:

- There is a try before buy offer– you can test Visualyse SM fully without having to commit millions of dollars

- Cost of use of the software is flexible and can be matched to your revenue forecast. You

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have the option to buy Visualyse SM or only pay for it as you use it

- Visualyse Spectrum Manager provides a fulfilling and enjoyable user experience, with templates and workflow designed with the latest technology

- It's centralised database provides vigorous data integrity and audit control

- It delivers all the key functionality in one web based application, without the need to switch between desktop programs or export data

- It can manage a single block of spectrum, a set of blocks, or all the spectrum in a country or group of countries

- It is designed to be technology neutral, ready for a liberalised, convergent approach to spectrum management

We are ready and able to provide global spectrum management – via the internet.

Access to Spectrum Management Software

Traditional spectrum management solutions cost millions of dollars, are hard to use, and have to be bought all in one go.

It is not possible to use them on an as-required basis. If you have 10 links to manage or 100,000 the fixed cost is basically the same.

Furthermore, as many systems focus entirely on engineering functionality and are difficult to use, there is a requirement for an on-going and expensive training program.

Unfortunately many usability problems are not clear until *after* the software has been purchased and used for some time

We think there is a better way to deliver Spectrum Management service, one in which the software:

- is available to all, wherever they are

- is satisfying and easier to use

- has web based user interfaces, with integrated Google or Microsoft maps

- includes the latest ideas in spectrum management

- which has a low fixed cost and variable cost that relates to usage and hence the licensing related income of the Spectrum Manager

- has a free trial period

Visualyse Spectrum Manager addresses all the weakness of traditional systems and builds on all their strengths.

Visualyse Spectrum Manager

So what is Visualyse SM?

Visualyse SM is a web based spectrum management solution.

This means, while you have the option to purchase it out-right, you can also access a version running on our servers using our trial service or on a pay per use basis. This removes the need to buy the software immediately – or indeed at all – and means that the cost of using the software will match closely the revenue you can expect from software licensing

You will therefore have the latest in internet based software and spectrum management solutions available for your administration without having to spend millions of dollars, and your system will grow as your industry develops.

Visualyse Spectrum Manager uses familiar web based tools, like Microsoft maps, so your staff will be effective in its use very quickly.

Visualyse Spectrum Manager is a new, innovative approach to management of the radio spectrum.

It handles all the key tasks including:

- Licence application

- Licence processing

- Licence search and display

- Technical analysis

- Management and reporting

- Engineering

What makes Visualyse Spectrum Manager (SM) unique is does all of this over the internet.

Licence Processing

Visualyse Spectrum Manager supports the whole licence processing workflow:

- Licence application including data entry

- Licence examination (checks on parameters, whether it would cause or suffer interference, and international obligations)

- Approval process with workflow varying by licence type

- Revocation and surrender

- Applications for change of use / licence variation

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Our approach is based on an architecture using spectrum product templates.

These make data entry and creation of licence records simple as the templates do all the routine work:

- Only presenting to the user the fields required for that type of license

- Setting suitable default values

- Mapping fields entered to the underlying database, completing all the fields needed (e.g. setting the appropriate spectrum masks)

- Calculating derived values, including in some cases undertaking frequency planning

- Converting units where necessary

The screen shot below shows an example of a template used for defining fixed link parameters in order to initiate the frequency planning process:

We have built in over 20 templates for the common licence classes including Land Mobile, Fixed Service, Radio Astronomy and Satellite Earth Stations.

The benefits of Visualyse SM are greatest when integrated with an assignment database. We have experience in data migration and interfacing to databases including the ITU-R Terrestrial IFIC.

The database can be queried for assignments and the results displayed interactively within the browser.

The screen shot below shows how the results of such database queries are integrated with web based mapping services, in this case Microsoft maps:

About Transfinite

We are one of the leading consultancy and simulation software companies in the field of radio communications.

Our business activities can be broadly categorized into three main areas:

- Consultancy services

- Visualyse software products

- Technical training

We also develop and market other Visualyse based products:

- Visualyse Professional

- Visualyse GSO

- Visualyse Coordinate

Our software has been installed at hundreds of sites, including leading administrations including Ofcom and the ACMA.

More information about these products is available at our web site or by contacting us.

Contact Us

Address: Transfinite Systems Ltd

6C Rathbone Square

24 Tanfield Road

Croydon

Surrey CR0 1BT

Tel: +44 20 8240 6648

Web: http://www.transfinite.com

Email: info@transfinite.com

Contact us for further information and a trial log-in

Case Study: Planning and Licensing Point to Point Links

One common type of licence issued by spectrum managers is a fixed link. A fixed link is used to connect two points together with high data rates.

Typically applications for point to point (PtP) fixed links are to provide backhaul for mobile operators, connecting up their base stations, to connect sites within a single organisation, or to support the core telecommunications network.

The case study is an example of the process of planning and issuing a PtP fixed link. The link is to provide high data rates between two different islands where a wired link would be too expensive.

The key constraints on the wireless link are

- to ensure it meets the quality of service levels,

- it avoids causing interference into other links,

- it doesn't suffer interference from other transmitters, and

- it meets other license constraints in that band.

It is not a good idea to just set up the antennas and set the power at maximum, for a number of reasons:

1) Even maximum power might not be enough to meet the quality of service requirements if the link is long enough

2) Such a high EIRP is more likely to cause interference into other existing links

3) Setting a link to a power above that needed to meet the quality of service requirements will lead to lower spectrum efficiency as it will sterilise a larger area with interference

It is therefore usual to plan the link. Planning takes into account:

- Path profile, ensuring the path is not just line of sight but also that there is Fresnel zone clearance.

- Fade margin required for multi-path and/or rain fade - using a propagation model such as ITU-R Rec.P.530.

  Multi-path terms will dominate for low frequencies, rain for higher ones, and in between iteration will be required to derive the fade depth for which the combined percentages of multi-path and rain meet the unavailability requirements

  The fade depth will depend upon factors such as percentage of time, geoclimatic factors along the link, frequency, and path length.

- Deriving a target receive signal level (RSL) based upon bandwidth, modulation, implementation margin, noise figure, interference margin, additional losses etc

- From the RSL, antenna gains at either end, free space path loss and fade margin derive the transmit power required to close the link

- The tuning range of the equipment and bandwidth required, identifying a suitable channel plan and hence set of suitable frequencies

- Calculation of interference *into* other links.

  Interference must be calculated to all other links including PtP, point to multi-point (PtMP), and satellite earth stations – which are in band or in adjacent channels.

  The calculation takes into account EIRPs, gain patterns, propagation loss using models such as Rec.P.452 and a terrain database (plus clutter if available), interference thresholds, spectrum mask etc.

- Calculate interference *from* other links, including PtP, PtMP, satellite earth stations etc taking into account the factors in the bullet above

- Parameter checks as required (height, EIRP, block edge mask etc)

- High/low sense checking around the transmitters/receivers at either end in the forward/ return directions

- International co-ordination constraints, such as PFD on boundary triggers specified in bi-lateral agreements with adjacent countries.

It can be seen that even planning a single PtP link involves a lot of calculations – and there can be many thousand links!
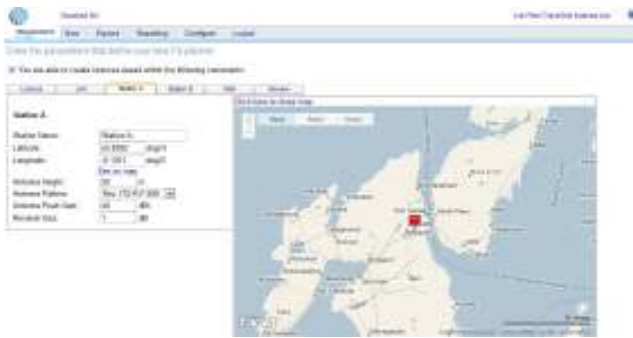
However all these calculations are done automatically by Visualyse SM, as shown in the screen shots below:

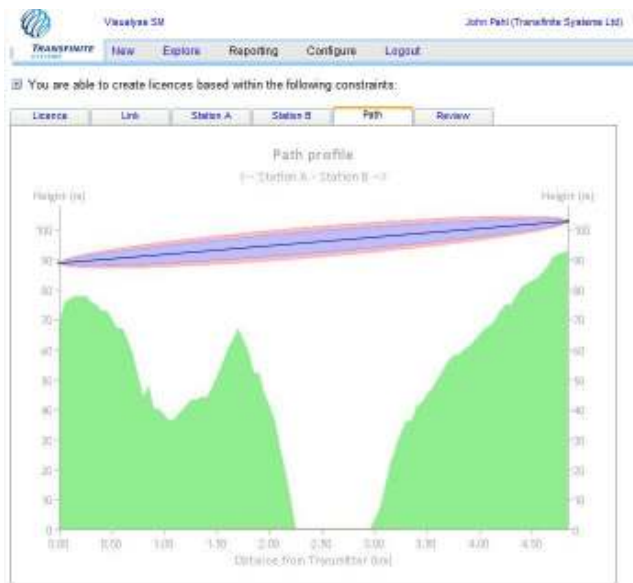1) Select frequency band, equipment, and availability requirements

2) Select start and end station including antenna parameters and locations – and check they are right with a pop-up map:
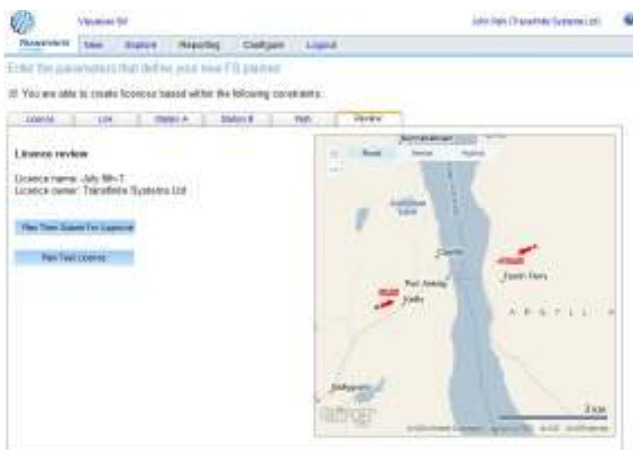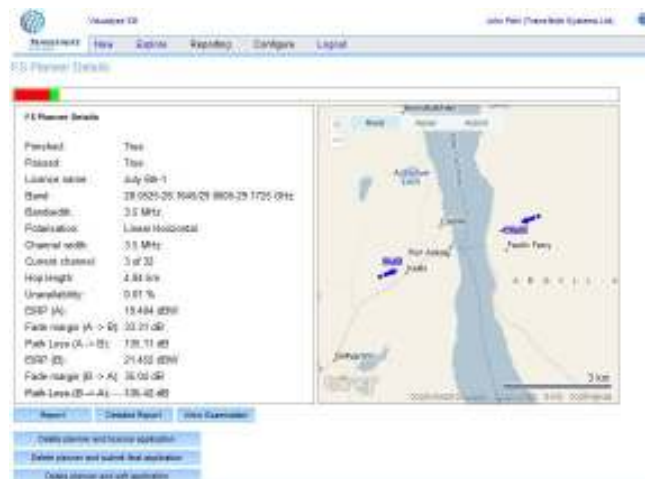

3) Check line of sight and Fresnel zone clearance:

4) Review application and select if want to make a formal application or just try out to see if this link could be accepted:

5) Visualyse SM will then plan the link using the principles described above. At the end a planning summary report will be generated in which the EIRPs and channel selected will be shown:

6) Further information about the calculations undertaken including interference analysis and checks against bi-lateral PFD on the boundary with other countries can be seen by clicking on "View Examination":
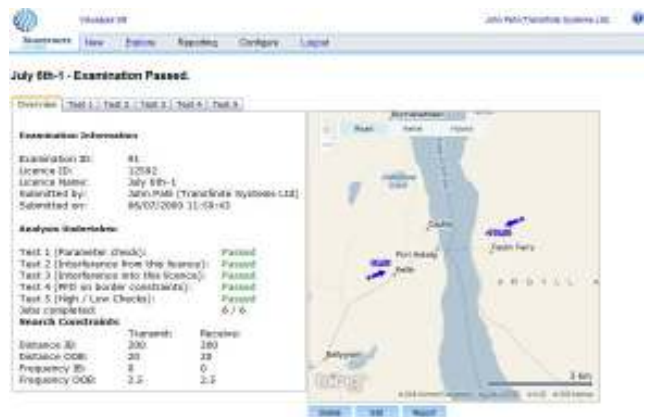
If all looks ok as all the tests passed, then the link can be approved.

Within Visualyse SM there can be control on who has the right to undertake the key tasks such as:

- Search the database and view the results

- Apply for licences (with further controls on type of licence and frequency band)

- Approve or reject licences (with different users having the right to control certain licence types in specific bands).

There will be identified with the Visualyse SM user rights database who can approve or reject this application, and it will appear on their "Actions" list.

As can be seen the Visualyse SM process makes it simple to manage licences: all the tools are available in easy to use on-line forms, all the calculations are automatically undertaken at a single click, and there are controls on who can approve or reject an application.

Contact us for further information and a trial log-in