



SUBMISSION TO THE RADIO SPECTRUM MANAGEMENT, POLICY AND PLANNING BRANCH OF THE MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT ON THE DRAFT TELEVISION WHITE SPACE DEVICES CERTIFICATION AND LICENSING RULES.

30 SEPTEMBER 2014

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1. EXECUTIVE SUMMARY

A trial of cognitive 'TV white space' technologies in New Zealand is timely and appropriate.

TeamTalk acknowledge and applaud the RSM initiative to allow TV White Space (TVWS) trials in the Management Right that it manages on behalf the Crown at 510 - 606 MHz.

It is understood that this is to be the first step towards being able to properly deploy TVWS technology in a New Zealand setting.

We submit that the rules proposed by RSM to for this trial would benefit from the following improvements:

- Provide a better definition of what a successful trial outcome looks like.
- That the licencing rules include the allowance of the cognitive benefits of TVWS technology that have been proven by trial and are mandatory in the US and Europe.

To the first point, without a comprehensive framework that sets out the criteria for success the trials there is a danger of not arriving at a coherent result.

Secondly, the full capability of the sensing, geolocation and ad-hoc interference management techniques that are present in TVWS standards and devices must be incorporated into the trial rules to ensure success. Ensuring TVWS Database/s are a part of the trial is important.

Finally, with respect it appears that a fundamental opportunity presented by TVWS/Cognitive Radio technology has been missed. A well thought out trial, which leads to success - combined with good planning around how elements deployed communicate with a central spectrum registry could lead to:

- Process automation and reduced costs to administer.
- More accurate and up to date records of spectrum utilisation.
- Reduced interference events and/or automatic resolution.

It is not impossible to consider than over a 10 year timeframe, large amounts (i.e. 100's of Mhz.) of spectrum could be automatically managed by the technological approach that this trial considers.

TeamTalk acknowledge the incumbent Spectrum Licence holders in the 510 – 606 MHz range and are keen to work cooperatively to ensure no harmful interference occurs and technical compatibility is maintained.

2. BACKGROUND

TeamTalk

TeamTalk Ltd is a publically listed company on the New Zealand Stock Exchange. It comprises of the following businesses:

TeamTalk Mobile Radio - NZ's leading national two-way mobile radio network provider.

TeamTalk owns and operates a national digital microwave backbone as well as operating at more than 250 "high site" radio transmission facilities. It is the leading Mobile Radio Network Provider in NZ. It has a significant investment program using Fixed/Wireless Broadband technology focused on the Rural/Provincial markets of NZ.

BayCity Communications Ltd (trading as Farmside) - NZ's leading Rural Broadband specialist.

Farmside is NZ's leading Direct to Home (DTH) satellite Internet provider. Farmside is rural New Zealand's leading telecommunications company, providing fast broadband via Satellite, RBI Fixed Wireless and Fixed Line solutions.

Citylink - The pioneering Wellington based fibre provider and operator of NZ's main Internet Exchange Points (IXP).

Citylink has Metropolitan Fibre Network Assets in Wellington and Auckland and has led the way in terms of urban fibre networking since the 1990's. It plays a key role in the telecommunications sector by operating the Internet Exchange Points in Auckland, Wellington, Hamilton, Palmerston North and Christchurch.

Araneo - An independent national wireless broadband and wireless wholesale network.

Araneo focuses on providing rural and provincial wireless IP connectivity solutions from a customer's door to a retail service provider via TeamTalk Group transmission assets. It provides wholesale ethernet backhaul from remote and rural locations to over a dozen Retail Service Providers around the country.

Across the four companies, the TeamTalk group is the 7th highest contributor to the Telecommunications Development Levy for the period July 2012-June 2013.

TeamTalk Ltd would like to thank the Ministry for the opportunity to make this brief submission.

3. TVWS PERSPECTIVES

For over two decades the possibilities and benefits of cognitive radio technologies have been discussed and researched.

This technological evolution has been reflected by the permissibility of devices with some form of cognitive capability.

The most significant and widespread of these are the Wi-Fi.

In an international context New Zealand has had a relatively flexible approach to regulation.

International Experience

Many TVWS trials have already been conducted.

Rather than initiate trials in New Zealand from 'ground zero' it would make sense to take the key outcomes and learnings from overseas before allowing trials.

As the DRAFT rules stand the approach to the trial is focused on the access and transmission capabilities of these cognitive technologies.

Incorporating the cognitive aspects, namely use and interoperability of TVWSDBs, will result in far more valuable trial.

The structure and functionality of TVWS databases is a topic of that is currently generating a great deal of activity. For New Zealand to be able to realise the benefits of TVWS technology the journey towards a TVWSDB architecture and operational rules must be a unified effort by RSM and operators alike.

Trial Outcomes

A trial implies specific and time bound activities with measurable outcomes in order that the trial can be judged a success or a failure.

Neither the RSM study carried out in 2012 or the DRAFT rules outline what would constitute success.

Some clarity around how the trial is considered a success or a failure should be further developed.

The stated Ofcom objectives from the UK trials are useful to consider:

- "...to validate that using the geolocation approach effectively prevents harmful interference" and;
- Having a vision to move towards an implementation of a regime that, in the New Zealand context, would result in a GUL for all TVWS devices.

Technology

Devices are available that conform to the 802.11af standards are available and could be trialed now.

However, potentially of more value to the New Zealand economy is the 802.22 standard for Wireless Rural Area Network (WRAN).

It would be unfortunate to allow an influx of 802.11af compatible technology which then became a blocker for 802.22 in TVWS spectrum bands.

Trials should result in a clearer understanding on how 802.11af and 802.22 can be independently assessed against the economic benefits to rural New Zealand.

Technologies

Several countries have already embarked upon trials of 802.11af Wireless LAN (Wi-Fi) technology for which the standard was formalised in February 2014.

A potentially competing technology is 802.22 Wireless RAN which was standardised in July 2011 but has had a longer gestation period and trials only commenced around 2013.

These two technologies are not particularly compatible with “Upstream performance of 802.22 system being heavily degraded when 802.11af system exists near 802.22 CPE.”¹

The planning rules for New Zealand should take into account of the potential benefits of both of these technologies and not allow one over the other during trials.

Generally speaking 802.11af provides less coverage than 802.22 from a single base station, but it is unclear if this results in a cost advantage or disadvantage or which of the two delivers better outcomes in rural or urban contexts. The trial process should improve this understanding.

¹ *Coexistence between 802.22 and 802.11af over TV white space*, Hyunduk et al, ICT Convergence (ICTC), 2011 International Conference, 28-30 Sept. 2011

Global Perspectives

RSM have signaled that either the FCC or ETSI specifications are acceptable.

However, there are some differences between them and to provide a clear and certain environment RSM will need to take some decisions.

There are several critical areas where RSM have indicated no preference where both the FCC and ETSI have mandated requirements.

It is strongly recommended that RSM consider incorporating the learnings from these jurisdictions into the trial to maximise the opportunities for success.

	FCC (US)	Ofcom/ETSI (UK)	New Zealand
Transit Power Limits			
Master (and all fixed)	1W + 6dBi	Determined from TVWSDB for each location.	Fixed per location
Slave (mobile)	100mW + 0dBi	Determined from TVWSDB for each location.	Fixed per location
Power control	Mandatory	Mandatory	Undecided
Geolocation			
Master	Mandatory	Mandatory	Undecided
Slave	Optional	Optional	Undecided
Trial licence prequalification requirements			
Type of service	N/A	Yes	Yes
Uses of service	N/A	Yes	Yes
Number of devices	N/A	Yes	Yes
Usage / duty cycles	N/A	Yes	Yes
Who are the users	N/A	Yes	Yes
Backhaul network details	N/A	No	Yes
TVWSDB used?	Mandatory	Mandatory	Undecided
Start date of trial	N/A	Yes	No
End date of trial	N/A	Yes	No
Equipment specifications	Unclear	Yes	No

TABLE 1 THIS TABLE HIGHLIGHTS THE DIFFERENCES BETWEEN APPROACHES OF DIFFERENT JURISDICTIONS. GREY AREAS SHOW A DIFFERENCE BETWEEN FCC AND ETSI APPROACHES. RED INDICATES AREAS WHERE RSM HAVE INDICATED NO VIEW YET BOTH US AND UK HAVE A STRONG MANDATED APPROACH.

4. RECOMMENDATIONS

Databases Essential

The use of a TVWS data base (TVWSDB) is an acknowledged and essential component for the proper and optimal operation of this type of technology.

To address the regulatory requirements of the United States and Europe, geolocation databases that utilize maps of all protected services and maps of available frequencies with effective timing information for one to two days need to be created. How to maintain the databases, utilize the databases to manage the usage of the TVWS, and coordinate TVWS usage between a control center and end devices are major issues that need to be resolved in the standards.

Ofcom say that they believe TVWS can be successful because:

- “The... [work since November 2010] ...undertaken by Ofcom and others in defining the geolocation database approach” and;
- “The ultimate ability of the regulator to control the emission levels allowed by databases and to prevent WSDs from transmitting if necessary, so that any harmful interference is avoided.”

That this type of database facility is not yet currently available in New Zealand must not be used as an excuse not to use one. (refer “The databases that TVWS use relies on in some other jurisdictions for the self-management of interference are not implemented in New Zealand at this stage.”)²

Initiating the trial with no agreed database approach is likely to cause the trial be unsuccessful in the near term.

Whilst the Ministry does not need to necessarily provide the central database (or databases), in the event it does not, then at the minimum it should provide or set out an information interchange standard by which decentralized databases can coordinate with each other to achieve a similar outcome to a centralized database or registry. That information interchange could be considered part of what the RSM Web Services Initiative covers.

Draft Rules Contradictory

The licence prequalification questionnaire in the DRAFT rules asks participants seeking licences to say whether or not they are using a TVWS database.

However, the DRAFT rules also mandate that equipment must comply with either the relevant FCC or ETSI standard.

Both these standards mandate the use of a TVWSDB.

Consistency in the rules on the approach towards use of database is desirable to maximise the likelihood of trial success.

² DRAFT TV White Space Certification Rules, RSM, August-September 2014

Draft Rules Deny Transmission

The DRAFT rules specify that equipment must comply with either:

- FCC CFR Title 47, Part 15, Subpart H - Television Band Devices 15.701 – 15.717; or
- ETSI EN 301 598 V1.1.1 '*White Space Devices (WSD); Wireless Access Systems operating in the 470 MHz to 790 MHz TV broadcast band*'

However, both of these standards require that before a TVWS device can commence transmission it either needs to contact a TVWSDB or contact another TVWS device that is in contact with a TVWSDB.

This confusion needs to be clarified.

Database Architecture

The TVWS database architecture and operation is outside the scope of the 802.11af standard.

However, both the FCC and ETSI make the use of a shared or interoperable database a mandatory requirement.

Ofcom are still working on the TVWSDB data and technology architecture with the goal of maximising the effectiveness the database in preventing harmful interference.

It is recommended that RSM include TVWSDB in the trial and facilitate developments in that area.

From the view of incumbent users, the exposure of all the data in the Register of Radio Frequencies (SMART) by web services means that information about these services is already freely available to any TVWSDB.

Trial Objectives

There are no stated objectives for the trial.

RSM have set precedents RSM in the past where trial licences have been permitted and then continue for many years with no resolution to the trial situation.

Digital STL technology is one example where RSM will not permit an end to the trial, nor state what should occur for this to take place.

Trial Phasing

A successful trial is likely to have distinct phases. At each phase lessons learned can be shared to update and improve the overall approach.

Phasing the trial would provide a clearer framework for participants to structure their approaches.

5. SPECIFIC COMMENTS ON DRAFT RULES

Types of Technology Permitted

The DRAFT rules specify that equipment must comply with either:

- FCC CFR Title 47, Part 15, Subpart H - Television Band Devices 15.701 – 15.717; or
- ETSI EN 301 598 V1.1.1 *'White Space Devices (WSD); Wireless Access Systems operating in the 470 MHz to 790 MHz TV broadcast band'*

There are several differences between the two standards.

Refer to Table 1 on page 7.

Licence Acquisition Limit

Placing restrictions on the acquisition of TVWS licences during the trial phase has the potential to limit the potential for success of the trial.

The proposed acquisition limitation of four channels within a TLA is an inappropriate method because:

- TLA boundaries are arbitrary boundaries and do not reflect sensible partitioning of TVWS use.
- To maximise the potential for success the use of TVWS devices must be as flexible as possible.
- The ultimate regime for licencing of TVWS devices could potentially have some TVWS channels being used for 802.22 on a licenced basis and some being used by 802.11af under a GUL, or a combination of both.

During the trial phase no acquisition limit should be placed on licence holdings.

Security of Tenure

RSM suggest the tenure of the licences during the trial is to be unassured.

In a commercial sense this generates a conflict between successfully deploying a network and being able to assure customers of continued service.

In the questionnaire RSM acknowledge that the deployments may indeed be commercial in nature by asking questions around what might be charged for the trial service.

It is recommended that some degree of tenure be assured. The length of this tenure might be less than the standard 5 years for other types of radio licences.

This approach is consistent with our recommendation that the trial has some clear outcome objectives.

Technical Analysis

While the guidelines proposed for an ARE appear to be simplistic and conservative, TeamTalk acknowledge a starting point needs to be established.

However, the trials rules appear to over-reach and suggest protection of fortuitous coverage.

48 dBuV/m Protection Limit

There is an erroneous statement in the guidance on calculation of Interference. The draft rules state “AREs should take care noting that there may be receivers operating satisfactorily in areas with less field strength...” than is protected by the TV broadcast licence criteria.

The Ministry terms this kind of coverage as “fortuitous” and it is not protected by legislation, regulation or Ministry rules. Several RSM documents³ describe “fortuitous” coverage and that it is not protected.

As it is written this section suggests that fortuitous reception of TV should be protected, which is not the case.

The statement should be removed.

³ PIB38, PIB30

6. REVIEW OF RADIOCOMMUNICATIONS ACT 1989

RSM is conducting a review of the Radiocommunications Act 1989 in parallel to this TVWS licencing rules consultation period.

It is unlikely that any TVWS trials will conclude in time to provide learnings that can inform the Act.

TVWS and other cognitive technologies will mean that use can arise without warning and for an arbitrary time and location.

RSM should look to administrations that have overseen trials to see what can be learned from the use of TVWSDBs.

Suitable licence conditions describing the use of TVWSDB or other cognitive techniques may be sufficient.

The review of the Act must take into account whether this approach is the best way of incorporating cognitive techniques into the licencing regime for both Spectrum Rights and Radio Licences.

7. CONCLUSION

TeamTalk are interested in taking part in the proposed trial.

Cognitive technologies, beginning with TVWS, are likely to become increasingly important.

The move towards beginning a trial is welcomed, although a caution is made that without clear objectives trials cannot be judged a success or failure.

TeamTalk look forward to additional clarity in the proposed rules and removal of the requirement to protect fortuitous reception.

Consideration of how cognitive aspects can be regulated under a revised Radiocommunications Act should be taken into account.

The ability for radios to communicate with shared databases and each other in order to organise channel use on an instantaneous basis has significant implications for licence holders, commerce and the spectrum regulator.

RSM must take part in the trials in a capacity that sees them involved with the role of TVWS databases and their integration with the Radio Frequency Register.

8. CONTACT

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