

GLOBAL INFORMATION SOCIETY WATCH 2018

Community Networks



ASSOCIATION FOR PROGRESSIVE COMMUNICATIONS (APC)
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This edition of GISWatch came into being alongside a brand new baby boy. Welcome to the world, Ronan Diga!

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Introduction

It was a Thursday winter evening in Melbourne. Around 30 or so people had either walked from nearby tram stops or pedalled across the city to Toy Satellite's¹ two-story warehouse in North Fitzroy. Some, their faces lit by open laptops, were using Netstumbler² to find us. We had emailed GPS coordinates and the name, or SSID, of our now freely open wireless hub. The more intrepid would use our network's signal strength to get them to the front door. It was 11 July 2002 and everyone was gathering for the launch of TS Wireless, a joint project with London-based Free2Air, a free community wireless network. The plan was to stream royalty-free music produced by local artists 24 hours a day to anyone within a three-kilometre radius. It took around 48 hours to have our server hacked and the whole operation halted! But it started off great!

In the beginning we shared

In the beginning BBSes, or Bulletin Board Systems, were the earliest publicly accessible computer, the first one known to have gone online in Chicago in the United States, on 16 February 1978. The Computerized Bulletin Board System (CBBS)³ was based on software written by Ward Christensen and Randy Suess, considered the fathers of public access

networks. The internet's precursor, ARPANET,⁴ was still in its infancy. People would dial in to BBS computers, exchanging software, documents and graphics. Data rates were slow at the time, commonly 300 characters per second, and modems were devices known as "acoustic couplers" which were mounted onto telephone handsets; the ear piece would receive data while the mouthpiece would send it.

Individual BBSes were the earliest equivalent of a website, each supporting communities of common interest. Perhaps the first BBS style of network established for artists was Robert Adrian X's ARTEX,⁵ an electronic mailbox for sharing ideas and organising intercontinental telematic artworks. A Canadian who spent his entire adult life in Vienna, Adrian X had pioneered politically charged artistic practices within electronic and broadcast networks. ARTEX foreshadowed "store and forward", the share and copy potential of the future internet. It was a kind of precursor to the ubiquitous Dropbox, a micro-cloud storage utility when clouds still hung in the sky. It was cheap too, costing artists a few cents a day for data storage only.

By the 1990s the internet was well underway, and artists were not only wanting to share: they were being found. I held the view that an increasing number of people began looking for music beyond radio and music stores. There was plenty available if you knew where to look. The global reach of the internet meant it was easier to share far more music than anyone could possibly hear, and so much more than anyone had ever heard on a radio or found in music shops. The problem, in my opinion, was not piracy that would afflict the music industry, it was diversity. There was so much more diverse music and so many artists appearing online than there would ever be on any of the industry charts listing the 100 most popular recording artists of the day – the measure by which royalties were not only dispersed, but guaranteed.

- 1 Toy Satellite was a multidisciplinary producer of works for screen, installation and performance spaces. Founded in 1995, Toy Satellite was incorporated into APC.au, a non-profit organisation providing hosting and consultancy for communities in Australia and Southeast Asia. This added an international dimension to Toy Satellite's work. It was shuttered in 2005, leaving a vast portfolio of interactives, museum installations, publications, soundworks, video and online initiatives. <https://toysatellite.org>
- 2 NetStumbler is a tool for Windows that facilitates detection of wireless LANs using the 802.11b, 802.11a and 802.11g WLAN standards. It first appeared in 2001, with development of the app continuing up to 2004. It was the de facto tool for "wardrivers", "warbikers" and "warwalkers" – people who searched for Wi-Fi networks with a wireless-equipped device together with a GPS device to record and share the location of unsecured wireless routers. www.stumbler.net
- 3 Christensen, W., & Suess, R. (1989). *The Birth of the BBS*. www.chinet.com/html/cbbs.html

4 Advanced Research Projects Agency Network.

5 ARTEX (Artists' Electronic Exchange System) was conceived in 1979 as a simple "intercontinental" email service for artists. It was used by some 35 artists worldwide between 1980 and 1991. alien.mur.at/rax/ARTEX



We saw an opportunity. How could we share all this independently produced music to people who didn't know where to look for it? How could we make this happen legitimately and accessible to anyone for free? No sooner had we published a white paper describing TS Wireless than we found a partner in the London-based wireless network host, Free2Air.⁶ Enthusiastic about our project, they arranged for an aerial antenna and several metres of specialised cable to be shipped out to us. Things were moving quickly. Now we had to find a server, the technical nous to pull it all together, and permission from the body corporate to mount an antenna onto the roof of the building. There was no shortage of music to share, no shortage of skills to make it happen and a whole lot more to learn. TS Wireless was underway!

Streaming music locally

By 2002 streaming audio had become easy, video less so. However, streaming anything over wireless was still in its technical infancy. With the help of an international network of open source software developers and visiting and local Wi-Fi expertise, we gave it a good, decent, thoroughly robust crack. But before we had the server up and running we encountered our first and most challenging problem.

⁶ free2air.org described itself as “open distributed public network infrastructure.” It was set up in London by Adam Burns in 2001, growing to support a freely accessible and widely distributed cluster of wireless networks and projects. This included ambienttv.net, NewsFilter and RayLab, East End Net, Air Shadow, Wireless Ant Farm and TS Wireless.

The royalty collection agency

The original plan was not to stream ambient music – which we ended up doing – it was to share locally produced music in all its myriad forms. Along with Free2Air, we wanted to make bandwidth a community concern, not a commercial one; we wanted to make access to local music a community concern, not a commercial one. We wanted to share our infrastructure to offer local households and businesses access to music that had yet to find an audience. We wanted to create an online community that could evolve around its own interests with music as the fire around which we would gather. But to do so we had to pay a licensing fee to the Australian Performing Rights Association (APRA). We immediately saw another opportunity. APRA did not.

Around 2000/2001, on behalf of their member composers, authors and songwriters, APRA expanded its performance licensing usage to encompass any venue in which music was publicly heard or performed. This included hair salons, cafés and many work spaces. Even Toy Satellite received a notice from APRA urging us to pay an annual fee for any music we played in our studio. Internet service providers (ISPs) were not immune from such fees either. Any music stored or streamed online was considered a public performance of said works.

We contacted APRA and asked how we could list any of the music heard over TS Wireless so that artists would be paid royalties. If we were to pay an annual performance licence fee, surely we could submit a playlist ensuring all local artists, their own members, would have royalties distributed to them. They replied stating they had not the means to do so. APRA, a national royalty collection agency with an annual turn-over in the millions, did not have the means to allocate royalties to any of the artists being played in any of the venues nor streamed from any ISP being charged an annual performance licence fee. Wow! So, who does? The answer was simple. Royalties are distributed to the popular artists of the day on the assumption that most, if not all music being heard would be popular music; otherwise it wouldn't be popular. That meant that a small number of artists were the beneficiaries of most of the performance licence fees whether they were heard in any local café, which they were not, or streamed over TS Wireless, which they absolutely were not.

We offered APRA an opportunity.

We were prepared to share with APRA all TS Wireless playlists. We would even write software to email them the playlist in a form that could be imported into their database or spreadsheets. These

playlists would be filled with all sorts of fascinating metadata, enabling APRA to apportion royalties to all local artists on our server. That's *all* artists.

APRA replied stating they did not have the means to interpret that data into meaningful outcomes for artists legitimately being heard on our servers nor in any of the venues that would sign to TS Wireless. We had considered adding a feature where custom playlists created by TS Wireless subscribers could be sent to APRA. But given APRA could not make use of this information, no matter what form it could be sent to them in, we had to consider our options. How do we proceed with TS Wireless knowing the music we would have to pay APRA the rights to stream would not result in any additional royalties to the Melbourne music makers we would host?

It was at this point that we decided to only stream generative, ambient music for which APRA had neither the means to register it as being “composed” by anyone, nor an argument to warrant a performance licence. In short, music that was constantly changing was not in APRA's interests to have on their books. Our generative pieces were works that were never heard the same twice; some of them were hours, days and even weeks in length. APRA did not have the means to support such original works no matter how they were composed nor by whom. Even before we got underway, we knew an audience for generative ambient music would be limited. We forged ahead nonetheless.

The team

Visiting Australia at the time was Spanish-born Alberto Escudero-Pascual, who brought with him extensive wireless networking expertise. He had the technical skills and real-world experience and he grew fond of Melbourne, often saying it was the first place he had visited where no one asked where he had come from. At the time Alberto was an associate professor at the Royal Institute of Technology, Sweden, where he was completing a PhD in mass electronic surveillance systems. Alberto knew a thing or two. He also knew how to modify Orinoco network cards so that they would converse with Linux operating systems.

Remote expertise came in the shape of the quietly spoken Adam Burns, who once told me it was through the study of high mathematics that he had come closest to God. Adam was the founder of Free2Air and had worked with me at Pegasus Networks, Australia's first publicly accessible ISP.

Our local team included web coder par excellence Justina Curtis. Justina wrote up most of our documentation, coded our front-end and hosted



with unyielding generosity the many late nights it had taken to construct the entire project. Justina brought expertise in training in information and communication technology (ICT) media literacy, and interaction and accessibility design. She was also a co-founder of Toy Satellite. Every project needs a social binder and Justina was ours.

Supporting us all with no end of bad jokes, rigorous system administrative skills and an ability to work insanely long hours and remain not only focused, but thorough, was Grant McHerron. Both he and our in-house technical director, Bruce Morrison, were determined to not let any problem impede them. Bruce had also worked with me at Pegasus Networks and, like Grant, had the gift of tolerance and fortitude. It is impressive to see people work at problems as if they were puzzles, applying game theory within their deliberations. Another member of our team was Linux aficionado Dennis McGregor. I can't recall much about Dennis other than the long hours we spent together stitching the entire project together with good humour and collaborative ease.

Network design

TS Wireless was accessible from within a three kilometre radius of our 2.4 GHz omnidirectional aerial mounted on the roof of our studio in North Fitzroy, Melbourne. We made use of the full capacity of the aerial, which provided the most extensive coverage for the technology available at the time.⁷ Yes, we did get permission from the body corporate to climb over the top of several premises. We made sure we could provide maximum line of sight to all participants. This included local members of Melbourne

⁷ Had we wanted to extend the reach of our network we would have required repeaters, or wireless network amplifiers, which would necessitate far more infrastructure than the notion of “local” warranted.

Wireless,⁸ arts practitioners (the Melbourne Fringe Festival had their office space nearby), our neighbours and random visitors.

The antenna was mounted to an existing television aerial with U clamps. Waterproof electrical tape was used to insulate the connection between the cable and antenna mounting. Thirty metres of heavily insulated cable was wound around the perimeter of the roof and into the building through a rear window where it was plugged directly into Hermes, our wireless server. Hermes also administered an ADSL connection to our broadband provider as well as a firewalled gateway to the internet.

Hermes was installed with a basic setup of Mandrake Linux.⁹ We used Firewall Builder,¹⁰ an open source application, to create and manage the firewall, and X-Windows¹¹ from which non-tech team members could run diagnostics tools such as KORinoco¹² to generate signal strength charts. A second server, Yuri, was set up to run the generative music software, SSEYO Koan Pro.¹³

For streaming we used ffmpeg¹⁴ and FFmpeg,¹⁵ the latter for its ability to do on-the-fly encoding to multiple formats concurrently, thus avoiding being bound to platform-specific, or rather, biased codecs. FFmpeg does capture and encoding and then outputs to ffmpeg and/or to file(s); ffmpeg then provides streams to clients connecting over a network. Due to limited resources and the heavy processing demands of multiple format encoding, we chose to use the MPEG codec for both audio and video.

We encoded two MPEG streams, one of a high quality, and another of a lower quality for those with less bandwidth. The encoder component of FFmpeg

had the ability to output to multiple destinations, so we sent one stream to a local ffmpeg, to an ffmpeg in Sweden, and to a hard drive for archival purposes.

Free2Air.org had also mirrored our two MPEG streams – or MP2 stream – by running a client from the server in Sweden and then re-serving it over an Icecast¹⁶ server in London. A web server threw up a web page for users who would find a link to the live audio stream, with FAQs and a contact form. It was pretty much a BBS with internet server software and hardware. It was a private internet. It had all the features of the internet without the reach to it. This was a useful backup to our wireless streaming experiment, because, at the time of deployment, it was illegal to provide access to the internet from a wireless node, that is, piggy-backing off a commercial ADSL provider. The Australian Communication Authority regulated all spread spectrum radio communication, including the 2.4-2.4835 GHz radio-frequency band our wireless network would operate in.

TS Wireless on air

Back at the launch, curious and eager, everyone was invited to have their hands scanned as they entered the building. These were hurriedly compiled into a video and projected as large as we could possibly make it onto the interior walls of the Toy Satellite studio at the moment TS Wireless was officially launched. Adam Burns was video streamed live from London gifting us with his wisdom, describing access to free and reliable bandwidth as a fundamental right. Alberto Escudero-Pascual concluded the evening with an impassioned appeal for community as the locus of new ideas, what artist Brian Eno describes as “cooperative intelligence.”¹⁷

Once up and running, at our peak, TS Wireless supported 50 simultaneous users. We have no idea who these users were. We had no need to know; but we knew audio streams were frequently served.

This was after we had secured our servers ensuring they had no internet capacity whatsoever. Initially we had an internet connection via a local ADSL provider. This meant we could have our audio streams mirrored by servers anywhere in the world, including Free2Air. But if you recall, dear reader, within 48 hours of our launch we had been hacked.

8 A non-profit club set up to help the community in setting up publicly owned and operated residential area networks. www.wireless.org.au

9 Mandrake Linux was first released in July 1998, gradually evolving into an extremely user-friendly version of the Linux operating system. Its creator, Gaël Duval, was particularly focused on both first-time Linux and non-tech users.

10 fwbuilder.sourceforge.net

11 X-Windows is a graphical user interface (GUI) for operating systems such as Linux and Unix. It was developed at the Massachusetts Institute of Technology (MIT) in 1984.

12 KORinoco is an open source application used to configure and monitor wireless LAN PC cards. korinoco.sourceforge.net

13 Koan Pro was developed by UK-based brothers Tim and Peter Cole in their studio on the River Thames. It was released in 1994. In 1997 I used the Coles' software in the first streamed broadcast conducted by the Australian Broadcasting Corporation (ABC). Titled “Sensorium Connect”, the sound work was produced in collaboration with the performance artist Stelarc and consisted of a composition six weeks in duration.

14 <https://www.ffmpeg.org/ffmpeg.html>

15 FFmpeg's own website claims it is “able to decode, encode, transcode, mux, demux, stream, filter and play pretty much anything that humans and machines have created.” It's true! It can. It's as widely used today as it was in 2000 when it first appeared. <https://www.ffmpeg.org>

16 Icecast is a streaming media server that is commonly used for internet radio and jukebox services. It was created by Jack Moffitt and Barath Raghavan in 1998 and released in 1999. The authors described it as an “open source audio streaming server that anyone could modify, use, and tinker with.” www.icecast.org

17 Steven Johnson interviews Brian Eno for the public education blog Be You: <https://redefineschool.com/brian-eno>

In short, someone had literally sat in a car opposite the studio and pulled gigabytes of data through our internet connection. It nearly sent us broke. Australia has some of the most expensive broadband charges on the planet. If we breached our cap, which we had after our launch, we were charged for every single byte of data that moved across it. We learned that if someone wants bandwidth badly enough they will come with every means at their disposal to nab it.

A second location was proposed by a small business in a neighbouring suburb where we could trial a semi-commercial operation amid shopkeepers. Every shopkeeper had been approached by APRA to pay that annual licence fee. As such, many were keen to see local music makers benefit from this expense. TS Wireless provided a model many were keen to subscribe to.

Smith Street Wireless was to launch in 2004, but yet again APRA was unable to work with our playlists. Subsequently no one would subscribe to Smith Street Wireless if licence fees paid to APRA did not result in royalties to local artists. Smith Street Wireless was doomed.

Reflections

We didn't bridge any digital divide, we didn't fill a development void nor provide critical information where it could not otherwise be reached. We experimented with a new idea to find that no one was particularly interested in a perpetual music streaming service. Free too! Portable MP3 players were as commonplace then as smartphones are now. Most people we knew were content with curating their players.

There was also no interest in the metadata we offered to share with royalty collection agencies, in spite of all the public spaces, businesses and venues paying annual performance licence fees. This left independent music makers with fewer means to accrue royalties in a marketplace adapting to new technologies. But we did, as we had done so many times prior, find that the community we had sought to nurture had been with us all along.

The community that preceded the network

TS Wireless may not have sustained an online community for more than six months, yet there was community around us, tweaked by a crazy idea all along. It was there, and still exists, through the network of software developers, web coders and designers, passionate wardrivers and NetStumbler aficionados. These are the people we rarely see, who had created some of the more experimental

and wildly innovative networks of their time. We had worked in remote villages in Africa, Southeast Asia and Indochina. We provided training and advice to regional and rural telecentres in Australia, including creating some of the earliest websites for community groups, non-government organisations and small businesses in the country. We had, at personal expense, established the means for anyone interested to learn about wireless networks and how they may foster community, belonging, nurturing curiosity and innovation where it may otherwise languish. Our experiment may have failed on paper, but it succeeded in bringing together a group of people who shared an experience that we had all grown from, and the ripple effect of that gathering expands still.

Epilogue

Sixteen years since TS Wireless rose and stumbled, APRA draws annual performing rights fees from hotels, pubs and taverns, restaurants and cafés, fitness centres, numerous work spaces such as doctors' and dentists' surgeries, corporate reception areas, service stations, salons and nightclubs, motels and other forms of accommodation. They have special licences for skating and ice rinks, community bands and choirs, recreation and leisure centres, schools, universities and colleges, sporting events, local government authorities, transport systems, funeral directors and funeral providers.

APRA now applies music recognition technology described as a "digital fingerprint" that each piece of music carries which is matched against a database containing the work's metadata "enabling the owners of each matched work to be identified and paid accordingly."¹⁸ They still have no clear mechanism for allocating royalties from all the performance licence fees they collect from public spaces, but they do have a term for where such fees reside: "distribution by analogy". This means that "licence fees are added to an existing distribution pool that is most similar in terms of its music content." I'm not sure I understand what this means, but what I do know is that if any of my music is played at Frankie God of Hair where I get my hair cut, I'll get a decent trim, but not a single cent in royalties.

What remains of TS Wireless are its antenna and cables sitting in a Melbourne storage unit. The servers Hermes and Yuri and all our wireless workstations were taken to an e-recycling centre, the CRT monitors thrown into an awesome open bin along with routers, modems, metres of ethernet

¹⁸ APRA Distribution Practices, APRA AMCOS, November 2017. apraamcos.com.au/media/Distribution-Rules-and-Practices/APRADistributionPractices.pdf

cable, keyboards, spare motherboards, and memory cards.

There was nothing graceful about this kind of closure, but there was comfort knowing that much of this gear would find reuse elsewhere.

Action steps

This is a story about how internet service providers, or intermediaries, are being coerced into licensing agreements for the content accessible through them. If the water we drink is foul we do not prosecute the plumber, an intermediary: we head to the source of the contamination. Moreover, we do not require the plumber, an intermediary, to pay a licence fee for the water that will flow through the pipes they install, nor do we license the pot, also an intermediary, in which our rice is cooked.

Author and activist Cory Doctorow's third law for the Internet Age is "information doesn't want to be free, people do."¹⁹ This is about a free and open internet. This is about what we stand to gain from an internet that continues to give us the means to learn from each other through sharing, how the works of artists inhabit and become part of our private lives and our personal stories.

APRA is not at fault here. They are merely protecting the interests of a system that protects its apex inhabitants, from a small number of publishers to the artists that sustain their businesses. What can change are the laws that protect these interests. To change these laws, from how copyright functions to international trade agreements, we

need to know how they function and what alternatives we can advocate for.

As such, what follows is a reading list for how best to inform yourself so that you may come to your own conclusions, and so that you may contribute to the critical debates around these issues. I have then suggested ways you can participate.

Reading list

Free Speech: Ten Principles for a Connected World, Timothy Garton Ash, 2016, Atlantic Books, ISBN 9781848870925

Information Doesn't Want to Be Free: Laws for the Internet Age, Cory Doctorow, 2014, ISBN 9781940450469

Digital Rights Resources for Children and Young People, Angela Daly, Digital Rights Watch, <https://angeladaly.com/resources/digital-rights-resources-for-children-and-young-people>

Ways to participate

Modernising Australia's copyright laws, Department of Communications and the Arts, Australian Government

<https://www.communications.gov.au/departmental-news/modernising-australias-copyright-laws>

Electronic Frontiers Australia
<https://www.efa.org.au/get-involved>

Digital Rights Watch
<https://digitalrightswatch.org.au/join>

¹⁹ Doctorow, C. (2014). *Information Doesn't Want to Be Free: Laws for the Internet Age*. San Francisco: McSweeney's.

Community Networks

THE 43 COUNTRY REPORTS included in this year's Global Information Society Watch (GISWatch) capture the different experiences and approaches in setting up community networks across the globe. They show that key ideas, such as participatory governance systems, community ownership and skills transfer, as well as the "do-it-yourself" spirit that drives community networks in many different contexts, are characteristics that lend them a shared purpose and approach.

The country reports are framed by eight thematic reports that deal with critical issues such as the regulatory framework necessary to support community networks, sustainability, local content, feminist infrastructure and community networks, and the importance of being aware of "community stories" and the power structures embedded in those stories.

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