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TECHNOLOGY STORY

Deploying DTT: from start to finish

[OPEN PRECEDE]

'Going digital' means a whole lot more than just a change of exciter in the transmitter. DTT deployments also involve detailed coverage modelling, careful equipment selection, and skilled installation and maintenance teams.

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As digital broadcasting steps up a notch in the Asia Pacific region, broadcasters poised on the verge of deployment can benefit from the experiences of those who have pioneered DTT technology. Over the past six years, Broadcast Australia has been responsible for one of the world's most extensive digital television network deployments—plus its ongoing operation. Comprising over 300 individual DVB-T services, including 85 services in various single frequency networks (SFN), this national network provides an example of what is achievable, given careful planning, system design, build-out, and expertise in digital technologies.

One of the most important criteria is to recognise that digital technology is vastly different from analogue. This necessitates a new approach to almost every facet of network deployment and operation—including the development of new skills, and the ability to adjust to continuously changing technology. It is therefore important to consider the technical challenges associated with the multiple aspects of deploying a digital network—as well as keeping it on-air long-term.

The digital migration

Detailed RF coverage planning using purpose-built computer modelling tools is an essential first step in network deployment. It is usually necessary to work within the framework provided by the government authority responsible for channel allocation and required effective radiated power (ERP) levels. Both have significant implications for planning the network and controlling interference: for example, the use of adjacent RF channels promotes co-siting of services and requires advanced system design; plus electromagnetic emissions (EME) need to fall within local regulations.

The decision to use SFNs (as opposed to multi-frequency networks) introduces a host of additional challenges. Highly spectrum-efficient, SFNs nevertheless require state-of-the-art engineering to achieve the precise site launch timing that enables multiple adjacent broadcast sites to operate on a single frequency. It is most effective to limit the ‘degrees of freedom’ associated with the network—such as location and number of sites, ERP, site launch timing and control over the modulation scheme and guard interval. Even with the most advanced modelling tools, SFN planning is still a ‘best estimate’ and requires post-installation fieldwork to optimise the network.

Another key element of network planning and design is the assessment of existing infrastructure on a site-by-site basis, and working out how the new services can be accommodated. Aspects under review include equipment room floor space, electrical and transmitter power, antenna system capability and analogue equipment performance—all of which impact capital and operational expenditure.

System design and integration is also a crucial issue in a DTV network. The range of program feed types and new technologies make effective equipment evaluation essential to achieve interoperability. It is therefore important to complete as much equipment evaluation and trial integration as possible before network deployment.

The types of system issues that may ultimately be experienced vary widely. For example:

- ‘Burstiness’ of ASI* sources, if excessive, can prevent interface with a following device.
- Receiving program feeds via other off-air DVB-T signals can be problematic, as receivers can be sensitive to changes in path conditions, and generally need extra filtering due to the wideband nature of their first RF stages and the possibility of adjacent channel services.
- For SFNs, the transport stream must not be modified after it has left the head-end SFN adapter, since injudicious use of bitrate adaptation will cause the SFN to fail.
- Power conditioning or redundancy can prevent equipment resets and lengthy start-up times in the more-susceptible microprocessor-based digital equipment.
- Digital systems require different RF redundancy configurations than equivalent analogue services.
- For SFNs, each site’s identical frequency must include any offset used for combiner optimisation purposes.

In light of these considerations (among others), it is important that the installation team is appropriately skilled—not necessarily to be assumed if the network has been relatively constant for a number of years. This will also help maintain tight control over equipment supply, testing, installation and commissioning. The aim should be to minimise mobilisation costs and maximise installation quality by deploying specially trained project teams on a region-by-region basis. System integration is considerably more complex in the digital domain compared with analogue.

On-air and ongoing

Deployment of the digital network is only the first stage. Once on-air, a myriad of ongoing challenges need to be met to ensure the quality of the service, since the change in technology is significant. Staff training is an important part of this—whether engineering, installation, monitoring or maintenance.

DTV monitoring and management is more complicated than for an analogue network, yielding an increased number of indications and 'faults' that need to be assessed and dealt with. The incorporation of multiplexed services fed into a single transmitter may also need to be monitored at the individual service level, representing a change in philosophy.

Monitoring and management in general are improved by the move towards IP networks, which have stimulated a marked leap in the ability for remote identification of system status, interrogation and rectification. But such advanced IT-based functionality requires an equivalent improvement in IT-skills on the part of technical broadcast staff. Whatever is installed will almost certainly demand some aspect of IT network engineering.

Clearly, the migration to digital broadcasting involves multiple deployment stages—including detailed coverage planning, equipment selection, system design and installation, and development of the required skills to effectively operate and maintain the network for the long-term. With ongoing technology developments continuing to provide significant network benefits, broadcasting has entered a new level of dynamism, requiring a high level of technical expertise.

[OPEN FOOTNOTE]
* Asynchronous Serial Interface (ASI) is a serial data transmission delivery method (e.g. the telco pipe from studio/source to transmitter site) for MPEG-2 that permits packet-based delivery of compressed video.
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Mount Wellington near Hobart in Tasmania: Broadcast Australia operates and maintains two DVB-T services for national broadcasters.

DVB-T combiner chain at Broadcast Australia's Gore Hill site in Sydney.

Company background
As the owner and operator of one of the most extensive terrestrial broadcast transmission networks in the world, Broadcast Australia provides transmission services for radio and television (analogue and digital) broadcasters and offers site sharing and infrastructure services.

With over 70 years broadcast transmission experience, Broadcast Australia plays a strategic role in developing new and emerging technologies—including Infocasting, Digital Radio and Mobile TV. The company's aim is to provide world-class broadcasting solutions throughout the Asia Pacific region by working with strategic partners, including wholly owned subsidiary, The Bridge Networks.

Broadcast Australia is a 100% owned subsidiary of Macquarie Communications Infrastructure Group, an entity listed on the Australian Stock Exchange (ASX code: MCG). Its sister company, the UK-based Arqiva, specialises in providing broadcast transmission solutions for fixed and mobile media applications.

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