Published on *Telsoc* (https://telsoc.org)

The Digital Radio Concentrator System

Simon Moorhead [1]

Telecommunications Association

JTDE - Vol 7, No 4 - December 2019 [2]

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Abstract

A reprint of a technical paper from 1986 which details the design and development of the Digital Radio Concentrator System deployed by Telstra to provide automatic telephone services throughout outback Australia.

Introduction

This historic paper (Martello, Lopes, Worsdell & Bannister, 1986 [5]) details the design and development of the Digital Radio Concentrator System (DRCS), which was deployed by Telstra's predecessor, Telecom Australia, to provide automatic telephone services to customers throughout outback Australia in the 1980s. Prior to DRCS, rural customers were connected to manual exchanges where operators physically connected calls and often relied on the vagaries of high frequency two-way radio.

Telecom's National Rural and Remote Programme at the time aimed to extend automatic telecommunication services to rural and remote areas by 1990. The DRCS was used to convert about 6,000 manual services and connect between 3,000 and 4,000 customers in remote areas.

The DRCS system was initially conceived by Telecom Research Laboratories and purposely designed to suit homestead-based customers and withstand Australian environmental extremes. The DRCS provided a connection from the local exchange to the customer using a pair of duplex, time-division-multiplexed, digital radio bearers. These bearers can carry 15 circuits and are shared between up to 127 customers via a concentrating switch at the exchange, hence the Digital Radio Concentrator name. The bearers are regenerated at repeaters typically 50 km apart, and there is a performance limit of around 13 repeaters in tandem, or a nominal range limit of about 600 km.

Notwithstanding these limitations, Telecom installed about 1,000 repeaters and covered 2.8 million square kilometres by the end of the programme. See the map from Brass (1993 [6]), originally published in *Australian Geographic*, reproduced at the end of this article.

The significant distances encountered in remote Australia between telephone exchanges and subscribers essentially excludes cable connections due to the high cost of connection. This is why Telecom Research Laboratories specified a regenerative digital radio scheme with burst transmission to provide maximum system flexibility and minimal power consumption.

Telecom issued a worldwide tender for the DRCS equipment in 1980, including a staged development programme to industrialise the design and to demonstrate the equipment feasibility. NEC Australia was the successful tenderer; and extensive testing of prototypes and digital transmission studies were undertaken to prove performance. Telecom first trialled the DRCS in Western Australia at Meekatharra and Mt Magnet in 1985.

The paper provides readers with details of the digital frame structures and the switching and control arrangements. It also details the radio path surveys undertaken by helicopter to design the systems. The tower heights and system configurations are given, as well as the functions and responsibilities of the various Telecom installation groups who made this state-of-the-art project successful.

Solar power was provided at both the subscriber and repeater sites, ensuring the system continued to operate independently of the often-unreliable mains power. The DRCS systems operated for about 20 years and during that time went through an evolution to a higher capacity version. As recognition of its achievements in DRCS, Telecom was awarded the 1986 Engineering Excellence Award by the Institute of Engineers Australia, Queensland Division.

References

Martell, P. H., Lopes, P., Worsdell, G., & Bannister, G. P. (1986). The Digital Radio Concentrator System — DRCS, *Telecommunication Journal of Australia*, *36*(3), 3-22.

Brass, K. (1993). The phone goes bush, *Australian Geographic*, *29*, 56-75, January-March. The article was reproduced by Telstra and the Telstra reprint is available at http://www.coxhill.com/trlhistory/media/The%20Phone%20Goes%20Bush.pdf [7]

The TJA Cover from March 1986

The cover of the *Journal* showed an outback family watching a DRCS installation.