4RF

4RF White Paper

DXR 200 migration

Contents

1   Introduction

For users of the DXR 200 from Harris Stratex Networks, the Aprisa XE from 4RF provides a risk-free migration path to today's best-in-class point-to-point radios: this paper explains why.

4RF was established ten years ago, the company's CTO and Founding Director having been responsible for much of the success of the DXR 200 during his time at MAS Technology, the original developers of the DXR 200. Many other members of the DXR engineering team now work at 4RF, continuing to support and develop Aprisa XE products. Thousands of Aprisa XE units have been shipped to customers in over 130 countries throughout the world.

From a technical perspective, the Aprisa XE provides:

- Support for an increased range of frequency bands

- Increased flexibility in interface options

- Improved RF channel bandwidths and modulations

- A greater range of capacities

- The inclusion of hitless diversity to maximise link availability

- Significant reduction in the form factor and required rack space

- Ease of maintenance and minimal field failure rates

In addition to its superior technical performance, high level of flexibility and ease of management, the Aprisa XE presents customers with a low total cost of ownership and a rapid return on investment, supported by 4RF's range of network planning, support services and commitment to continued product development.

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2 Aprisa XE applications and industries

The Aprisa XE is used to establish point-to-point connections across a broad range of industries, for applications ranging from real-time monitoring and control for utility providers through to the provision of rural broadband access by telecommunications operators.

Typical Aprisa XE deployment
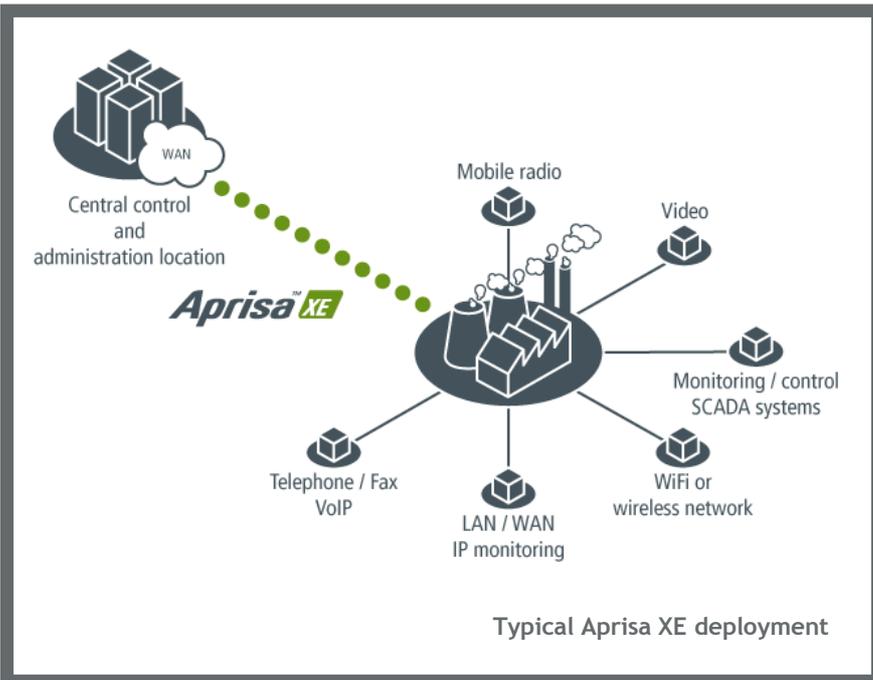
Industries
Oil, gas, mining
Utility
Public safety, military, emergency
Transport: road, rail, air, maritime
Rural telecoms
Mobile cellular telecoms
Fixed wireless / WiMAX telecoms
Enterprise and government
Broadcast

Applications
Remote control and monitoring
Mobile radio backhaul
Private network backhaul
Rural broadband, voice, DSL
Fixed wireless access backhaul
Mobile cellular backhaul
Private links
Transmitter linkage

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3 Aprisa XE performance enhancements

With the same amount of spectrum, the Aprisa XE will always outperform the DXR 200.

The Aprisa XE supports a wide variety of industry-standard interfaces for all types of voice and data traffic, providing up to 65Mbit/s throughput. It can cover distances of up to 250km, minimising transmission degradation from interference and atmospheric or multipath effects.

The Aprisa XE makes best use of the available spectrum by employing sophisticated modulation techniques, enabling the maximum possible data to be transmitted in the least amount of spectrum. Forward Error Correction, interleaving and adaptive equalisation are standard for all channel options.

3.1 Frequency band support

The Aprisa XE provides support for ten licensed frequency bands, giving customers the confidence that it can be deployed throughout the world. This also maximises flexibility, enabling the most appropriate band to be chosen for each installation according to spectrum availability and link requirements.

3.2 Interface options

The Aprisa XE has an integrated multiplexer, cross-connect and Ethernet switch, supporting data, voice and IP traffic, with customer-configurable interfaces enabling straightforward integration with legacy and next-generation network elements.

Band	Spectrum
300 MHz	330 - 400 MHz
400 MHz	400 - 470 MHz
600 MHz	620 - 715 MHz
700 MHz	698 - 806 MHz
800 MHz	805 - 890 MHz
900 MHz	850 - 960 MHz
1400 MHz	1350 - 1550 MHz
1800 MHz	1700 - 2000 MHz
2000 MHz	1900 - 2300MHz
2500 MHz	2300 - 2700MHz
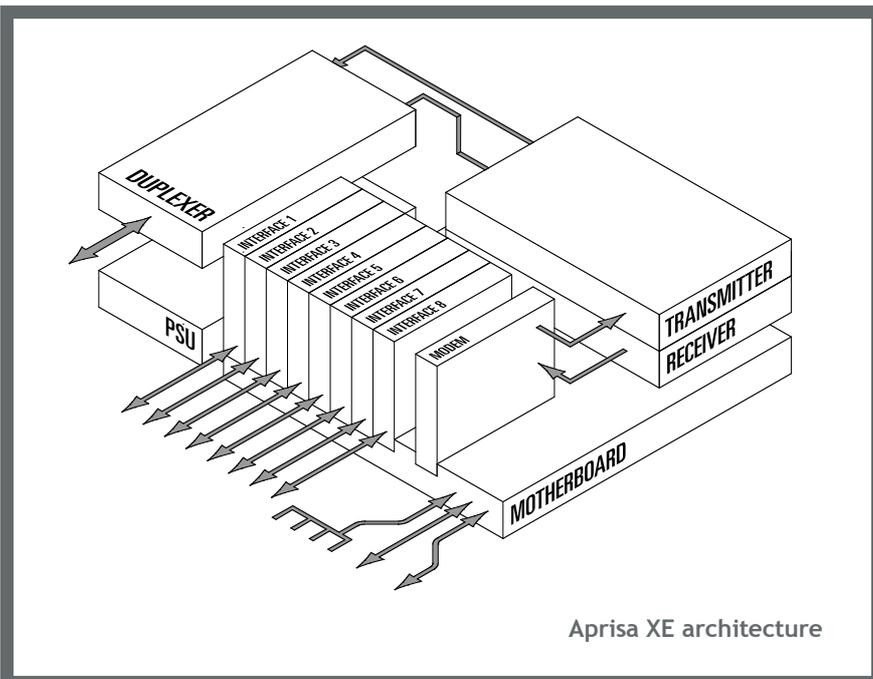
Aprisa XE architecture

Aprisa XE interfaces
E1 / T1 G.703 / 4
2-Wire FXO / FXS
4-Wire E&M
V.24 / RS-232
High-speed synchronous X.21 / V.35 / RS449 / RS530
10 / 100 BaseT

Point-to-point microwave links distance engineered for demanding applications

3.3   Channel bandwidths and modulation

The Aprisa XE supports a number of different channel sizes:

- 500 kHz in 300 and 400 MHz bands

- 2 MHz in 300 and 400 MHz bands

- 3.5 MHz in 300 and 400 MHz bands

- 7 MHz in 600, 700, 800, 900 and 1400 MHz bands

- 14 MHz in 1800, 2000 and 2500 MHz bands

User-selectable modulation schemes supported by the Aprisa XE are QPSK, 16QAM, 32QAM, 64QAM and 128QAM, maximising the performance of the link, compared with the DQPSK and 16QAM modulation supported by the DXR 200 (with 16QAM only available in larger channel options).

3.4   Range of capacities

The Aprisa XE provides a high degree of flexibility, with support from 1 to 840 channels, compared to the DXR 200' s options of 4, 10, 30 or 60 channels. The overall capacity of the Aprisa XE ranges from 32 kbit/s to 65 Mbit/s, enabling customers to select the product options that best suit their deployment requirements and their budget throughout their network.

3.5   Hitless diversity

As well as Monitored Hot Standby (MHSB) the Aprisa XE provides space diversity. This enables the highest possible signal availability, with hitless diversity. The Aprisa XE can therefore be used with confidence in even the most demanding situations such as cellular backhaul, where carrier class performance is essential.

3.6   Form factor

With its compact form factor, the Aprisa XE radio is less than a quarter of the size and weight of the DXR 200, making it easier to deploy and manage.

The Aprisa XE is 89mm high, compared to the DXR 200's 400mm

Point-to-point microwave links distance engineered for demanding applications

3.7 Ease of maintenance and minimal field failure

4RF has a minimal field failure rate for its Aprisa XE family of radios. The company is 100% responsible for its own product design, and ensures complete quality control in all its products.

The Aprisa XE's all indoor single box, front access to interfaces and connectors, and 4RF's SNMP-based management tool mean minimal maintenance, reducing overall network running costs.
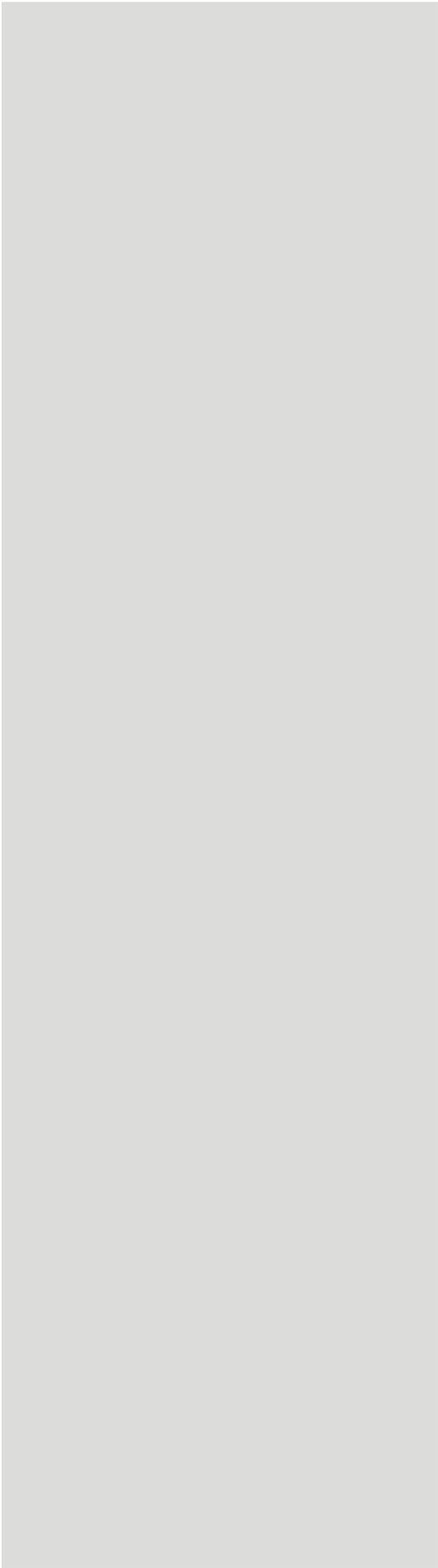
4   Why choose 4RF?

As well as the improved performance the Aprisa XE offers across its wide range of applications and industries, there are other advantages to customers in choosing 4RF for their point-to-point links.

4.1   Risk-Free Migration

4RF, with its pre- and post-sales support teams, works closely with its customers to ensure a seamless transition from existing DXR 200 installations to Aprisa XE installations. The same standards are applied whether for a single link or a network comprising hundreds of links. In some cases, the increased performance of the Aprisa XE means that the need for repeater stations or high gain antennas is eliminated. This further improves the overall business case for customers.

4.2   Ongoing Support Programme

4RF provides a comprehensive package of customer support, which includes:

- Pre-sales support, including link evaluation, RF planning and network planning, whether for a single link or a multiple link network

- Deployment services, from site evaluation through to the physical installation of equipment

- Product training: 4RF offers training courses throughout the world, from product operation through to link planning and installation

- Network monitoring: 4RF can help customers with network monitoring through its SNMP Network Management System integration services

- Technical support and repairs: all customers have access to 4RF's help desk, and repairs, while rare, are carried out with minimal delay

- Warranties: 4RF provides warranties as standard, and extended warranties and service level agreements are available, depending on customer requirements

4.3   Commitment to Continual Product Development

4RF is committed to the future of its Aprisa XE product family and invests substantially in research and development. The product has been designed to be highly flexible and future proof, with support for a large range of interfaces.

4.4   Total Cost of Ownership

4RF is committed to the industry's lowest possible total cost of ownership. This includes not only equipment expenditure but all other issues that contribute to the financial and human resources needed to run a network. These factors include 4RF's ease of network management, maximum support for spectrum bands to lower licensing costs, and the overall reliability and dependability of 4RF's products.

5 Comparison of technical specifications

Characteristic	DXR 200	Aprisa XE
Frequency Ranges	300-470 MHz 620-750 MHz 795-960 MHz 1350-1550 MHz 2000-2700 MHz	330-400 MHz, 400-470 MHz 620-715 MHz, 698-806 MHz 805-890 MHz, 850-960 MHz 1350-1550 MHz, 1700-2000 MHz 2000-2300 MHz, 2300-2700 MHz
Stability	$\pm$ 2.5ppm	$\pm$ 1.5ppm
Step Size	25 kHz below 470 MHz 125 kHz above 470 MHz	5, 6.25, 12.5, 25, 62.5 kHz
Capacities	4, 10, 30, 60 channels	1 to 840 channels
Modulation Scheme	QPSK all capacities; 16 QAM in 30/60 channels	QPSK, 16, 32, 62, 128 QAM (user selects)
Forward Error Correction	Reed-Solomon optional in 30/60 channel option	Reed-Solomon
Equalisation	Adaptive equaliser optional in 30/60 channel option	Adaptive equaliser and interleaver
Transmit Power at TX Port	+33dBm QPSK (all bands) +37dBm (400 & 900 MHz) +33dBm 16 QAM	+37dBm QPSK <1550 MHz +36dBm QPSK >1700 MHz +33dBM 16 QAM
Receive Sens. 6 384 kbit/s 12 768 kbit/s 30 E1 60 2xE1	(10^{-3} BER) -101dBm QPSK -99dBm QPSK -96dBm QPSK, -93dBm 16QAM -93dBm QPSK, -93dBm 16QAM	 -102dBm QPSK -100dBm QPSK -97dBm, -91dBm 16QAM -93dBm, -87dBm 16QAM
Protected options	MHSB	MHSB, space diversity, errorless diversity switching
Alarm I/O	8 inputs, 8 outputs	2 inputs, 4 outputs
Voltage	$\pm$ 24VDC or -48VDC	+ 12 VDC, $\pm$ 24 VDC , $\pm$ 48 VDC , 110 / 220VAC
Power	65 W minimum	39 W minimum
Temperature range	Operational: -10 to +50˚C Storage: -20 to +60˚C	Operational: -10 to +50˚C Storage: -20 to +70˚C
Size	9RU 400mm	2RU 89mm
Standards Compliance	ETS 300 385 ETS 300 630/633	ETS 300 385, ETS 300 630 EN 302 217, EN 301 751 EN 301 489, EN 60950 CE marked FCC-compliant models

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6 For more information

For more information about 4RF and the Aprisa XE product family, including case studies and detailed performance specifications, please visit the 4RF web site, at www.4rf.com.

About 4RF

Operating in more than 130 countries, 4RF solutions are deployed by oil and gas companies, international aid organisations, public safety, military and security organisations, transport companies and utilities, broadcasters, enterprises and telecommunications operators. All 4RF products are optimised for performance in harsh climates and difficult terrain, and support legacy analogue, serial data, PDH and IP applications.

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