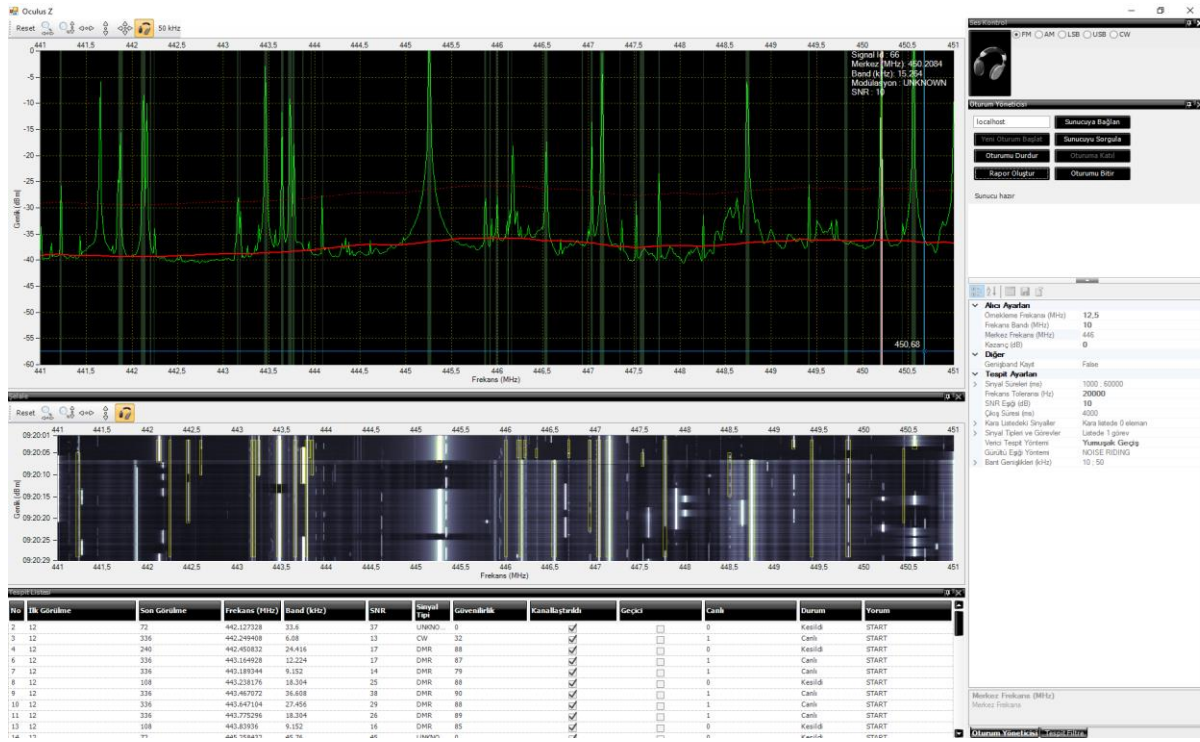


Oculus Z

Fully Automated Network- Centric Spectrum Analysis and Signal Intelligence System

Oculus Z from Zeta Defense is the next generation of SIGINT technology. Leveraging fully automated signal detection and channelization, Oculus Z, lets SIGINT professionals to automate the signal collection tasks and focus on content of the signals of interest by effectively reducing the need for human interaction for signal collection.



Philosophy

Zeta understands the limited resources and dynamic environment in the SIGINT field. We provide extensive set of features to win the "intelligence war". Oculus Z starts a signal collection session to enable the automatic detection and sorting of signals in the operating band according to predefined rules. Detected signals are processed via digital down conversion and demodulation operations and outcome of each stage is recorded to for post-analysis by the operator. In addition to legacy signal collection plans based on frequency mask definition and manual channel assignment, Oculus Z allows operator to use target signal characteristics (frequency, SNR, bandwidth, duration, signal type (FM, AM, TETRA, DMR etc.)) to define the rules for signal collection task.

Oculus Z uses GPU processing and network centric approach to increase scalability of the system. Network Centric approach provides the ability for adding multiple servers and clients, both in local or remote sides while employing compression techniques to use the connection bandwidth more efficiently. The multi-client approach enables multiple-operators to connect to the signal collection session and allowing concurrent analysis signals of interest. Integrated wideband record capability provides the ability to go back in time and reanalyze the IF data with alternative parameters. Advanced set of visualization tools are designed in collaboration with SIGINT operators and they provide intuitive ways to gather intelligence.

Digital RF Frontend

Oculus Z employs a VITA-49 capable digital double stage super heterodyne receiver connected over 10GbE, covering between 20MHz to 6.0 GHz with a max IFBW of 100 MHz. The Digital RF frontend employs sub-octave preselectors for robust performance in strong signal environments. Double conversion heterodyne topology maximizes image rejection and advanced filtering improves dynamic range and group delay performance. 10GbE data connection over fibre and wide operating temperature range lets the receiver to be located near the antenna and signal processing server in the air-conditioned server room.

Client-Server Architecture

Oculus Z comes with an advanced messaging system to implement client-server topology. Server software runs on the SIGINT field and connected clients receive the data. Clients can be run on the server side or they can be connected over a network.

Oculus Z Server stores and processes the wideband data in the field, and it only sends the resulting valuable data when it is necessary. To reduce connection bandwidth requirements, **Oculus Z** uses effective compression techniques on the sent data, thus leaving your other applications more bandwidth in the limited resources settings of the SIGINT field

Session Based Analysis

Oculus Z manages SIGINT field in a session based fashion. When instructed, a new session is started on the server and the session information is shared with the connected clients. Session includes all the transmitters detected with the detection timestamps, SNR, frequency and signal/modulation type. It also includes the file information if any DDC resource is allocated and narrowband data is recorded.

SIGINT operator is able to use a live session or load a closed session to analyze the data and keep the findings and added comments within the session data.

Automated Signal Detection

Using specific algorithms for each frequency region, **Oculus Z**, detects noise floor and provides an SNR based analysis to determine signal frequency and bandwidth.

Oculus Z detects the Noise Floor of the band of interest and uses a predefined "Noise Riding" SNR threshold to detect signals. Detected signals are further analyzed to determine bandwidth and frequency.

Multi-Channel DDC

Oculus Z employs a GPGPU based multi-channel DDC structure to cope with the crowded spectrum. DDCs filter each detected signal according to the estimated bandwidth and enables multichannel real-time collection of baseband data. In standard configuration **Oculus Z** provides 128 channels and number of channels can be increased further with optional DSP blocks. Since data is buffered prior to DDC operation, baseband signals are recorded from the start of the signal transmission.

Signal Classification

With **Oculus Z** signals can be automatically classified according to signal features (burst, modulation, symbol rate, voice modulated, sync symbols and preamble symbols). Currently Analog Voice (AM, FM, LSB, USB, CW) and DVB T/T2, DAB, LTE-TDD, WiMax, Wifi-802.11, GSM, 3G, APCO P25, DMR, TETRA are classified. After classification is done, signal classification results are stored within the session information.

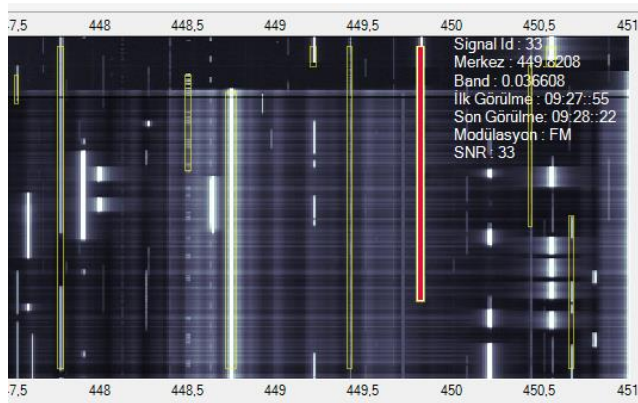


Intelligent Resource Management

Oculus Z prioritizes detected signals according to predefined criterion. Operator is able to define lists to ignore or give priority to, frequency bands, modulation types or spectral shapes. Multi-Channel DDC and the following blocks are allocated with transmitters according to these criterions. If operator does not provide criterions **Oculus Z** favors the greatest SNR to allocate resources.

Metadata over Spectrogram

Oculus Z visualizes spectrum activity over an advanced spectrogram graph. Oculus Z's spectrogram provides visualized information on all the spectral activity with tools to filter the spectral information using frequency, time, modulation type information, helping SIGINT operator get an in depth view of hours of activity data visually.



Wideband Signal Recording

Oculus Z optionally records the wideband data and associates it with the session. Using wideband signal recordings SIGINT professionals are able to go back in time and repeat the analysis with different parameters. The recorded wideband signal may be interfaced to 3rd party analysis tools for specialized analysis.

3rd Party Analysis Tools Integration

Options

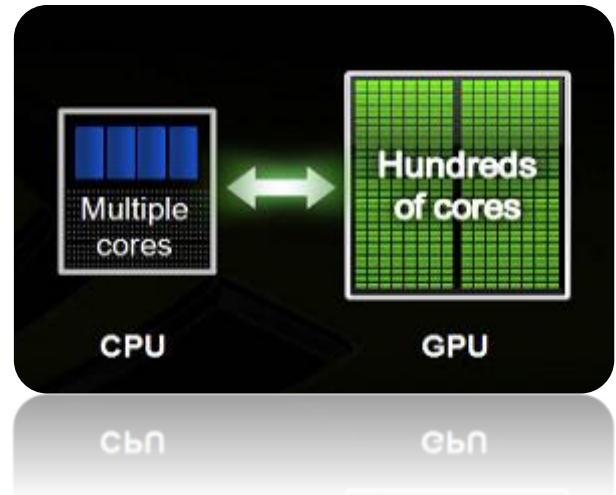
Every SIGINT system has its advantages and SIGINT professionals might want to use them on the field. **Oculus Z** provides VITA-49 compliant sockets based data sharing techniques to interface baseband data to other analysis software.

Reporting Tools

Oculus Z provides reporting tools to summarize the contents of a session. Microsoft Excel and PDF formats are supported.

GPU Based Processing

Leveraging the thousands of cores located inside the GPGPU's, **Zeta** is able to equip **Oculus Z** with an unparalleled Multi-Channel DDC capability.



Use of GPU's enables Zeta to optimize **Oculus Z** for specific fields with differing RF spectrum characteristics.



Specifications

Base System

Multi-Channel DDC's (Digital Down Converters)	GPGPU based 128 Channels
Connectivity	1GbE 10GbE
Mechanical	1U, Rackmount, typical (changes with the options or customer request)
Storage Capacity	8 TBytes
Storage Interface	SAS3 12Gb/s

Signal Detection Capability

Signal Types	APCO P25 (Phase I, II) DMR (Base, Terminal) TETRA (Base, Terminal) NXDN, D-STAR, dPMR, Yaesu Fusion Analog Voice (FM, AM, LSB, USB, CW)
Required SNR	7 dB min for digital and 10 dB min for Analog Signals
Duration	1 sec for digital signals, max 1 sec for analog signals (depending on voice activity duration)
Bandwidth for Analog Signals	50 kHz max

Channelizer

Input Sample Rate	250 Msps max, Complex IQ
Output Sample Rate	3-300 ksps max, Complex IQ
Input Data Type	Complex IQ
Input Channel Number of Bits	16, 32 bit floating
Channel Center Tuning Resolution	32 bit floating point resolution
Output Channel Sample Resolution	32 bit floating point resolution
Output Channel Number of Bits	16, 32 bit floating

Warranty

All hardware and software procured from Zeta is under warranty against manufacturing or design failures for 2 years. Customers specific demands for warranty may also be arranged.

Disclaimer

Due to ongoing R&D, Zeta reserves the right to change the product specification without notice.

Custom Services & Solutions

Zeta Defense provides customers with solutions optimized to their specific needs. This includes feasibility reports; customized training sessions on Spectrum Monitoring and SIGINT related issues and complete turnkey solutions.



About Zeta Defense

Zeta Defense is a young company developing solutions for RF Spectrum Monitoring & Management, ELINT, COMINT fields. Our capabilities include digital signal processing, highly parallel computation architectures (FPGAs and GPUs), high and low level software development, client-server architectures based on high performance reliable messaging structures, RF hardware simulation and design and systems engineering,

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