# Z7HP

## OVERVIEW

Z7HP is a very flexible **XILINX** based platform for a wide range of applications. The ultimate **XILINX ZYNQ 7045** with different high speed connections allows Z7HP to be the right platform for the next generation of LTE terminal.

The possibility to use 2 different daughterboards with an **innovative MP-MB** bus (typically one Tx and one Rx) over a wide range of frequencies (from 500 Mhz to 4GHz) makes it easier to implement standards for Telecom, Wireless or Satellite applications.

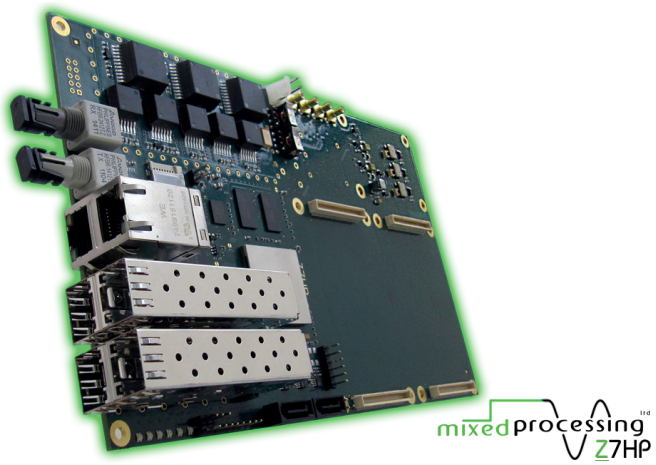
A wide variety of daughterboards are available for different applications (see details below).

An **ARM Cortex-A9 XILINX** based microprocessor implementing Linux OS allow for easy management of the components connected to the MP-MB bus.

A very **high stable reference frequency** using an OCXO and an integrated GPS receiver allows the Z7HP to be time referenced for every kind of processing requiring accurately timestamped signals.

The Z7HP is also equipped by two GigaEthernet connections and two **RTX FSP 2.5G (over FPGA) for every kind of remote link**. A double SATA 3.0 link is also available for a easy connections between multiple Z7HPs allowing for daisy-chaining of data.

An extremely **compact unit (19"/1U mechanical chassis)** the Z7HP can also be equipped with a dual Power Supply that, with the multi-reference input, makes the equipment ultra-reliable. Furthermore, the unit can be easily managed remotely with SNMP or a user-friendly GUI-on-the-web interface.




## DB PORTFOLIO

- MP-BRX: DC to 30 MHz receiver
- MP-BTX: DC to 30 MHz transmitter
- MP-WRX: 500 MHz to 4.0 GHz receiver
- MP-WTX: 500 MHz to 4.0 GHz transmitter
- MP-SPH: Synchrophasor Acquisition Module
- MP-AVB-I/O-E: AVB endpoint for synchronous I/O

**Z7HP is fully compatible with V6HP daughterboards .**

## FEATURES

- Internal high stability OCXO aging rate of ± 1*10 -10 /day
- 12 channel GPS receiver with automatic tracking and timing error management system.
- New generation DPLL fast lock
- 2x 1Giga Ethernet synchronous (copper)
- 2x 1Giga Ethernet synchronous (optical FSP)
- 2x RTX FSP 2.5G (over FPGA)
- 2x SATA 3.0 Serial Fast Link
- 1x 10 MHz Low Noise output
- 1x 1PPS TTL Output
- 2x PSU (AC or DC)
- 2x MP-Mezzanine BUS LVDS/TTL

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# APPLICATIONS

Z7HP is in use all over the world in a wide variety of applications. While the Z7HP is often used for rapid prototyping and research applications, it has been deployed in many real-world commercial and defense systems.

## Commercial Applications

There are many applications for the Z7HP in commercial systems. System development and prototyping is ideally done on a software radio. When an application does not have the volume to justify a custom hardware design, the flexibility of the Z7HP enables a cost effective, deployable system.

As an example Z7HP is used to track pedestrian foot traffic in shopping malls. The phased-array capabilities of the Z7HP allow equipment to determine the locations of shoppers by receiving the control-channel transmission of their cell phones.

## Defense and Homeland Secutity

The Z7HP can be used in all branches of the military and intelligence services. Z7HP motherboard and daughterboards enable rapid prototyping and deployment of sophisticated wireless systems. Some applications include:

- JTRS research
- Synthetic Aperture RADAR
- Passive RADAR
- SIGINT/COMINT
- Public safety communications bridges
- Emergency low-power beacons
- Mine safety
- Underground communications
- Battlefield networks
- Survivable networks

## Wireless Research

Numerous researchers in wireless networks are using the Z7HP to study such diverse topics as:

- MIMO systems
- MAC-layer protocols
- PHY-layer design
- Ad-hoc and mesh networking
- Spectrum occupancy and sensing
- Cognitive radio

The open and easy to use Z7HP enables rapid prototyping of innovative new communications systems. The low cost allows deployment of significant numbers of nodes in a testbed for studying large-scale network effects.

## Teaching

Many universities within Europe and around the world have equipped student labs with Z7HP systems. The low cost, extreme flexibility, and open-source nature of the Z7HP and GNU Radio make them ideal for use in teaching:

- Software radio
- Signals and systems
- Digital signal processing (DSP)
- Communication systems
- FPGA design

## Other Uses

Z7HP has been used in many innovative systems. Some of the more interesting examples include radio astronomy, wildlife tracking, RFIDs, medical imaging, sonar and last but not least customizable test equipment.

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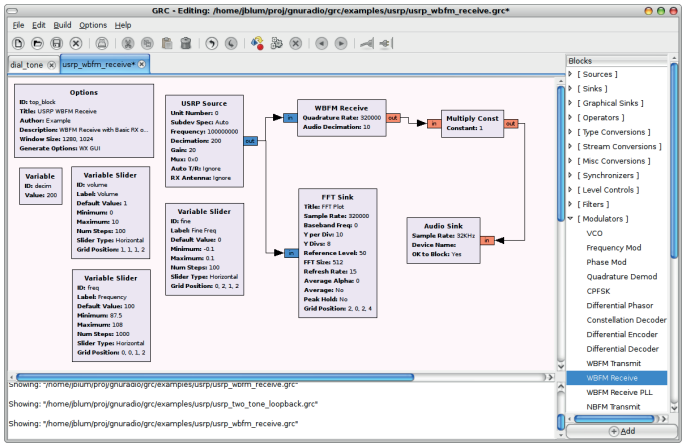
# SOFTWARE

## GNU Radio

GNU Radio is an open-source software defined radio (SDR) platform. It has a large worldwide community of developers and users who have contributed to a substantial code base and provided many practical applications for the hardware and software. It provides a complete development environment to create your own radios, handling all of the hardware interfacing, multithreading, and portability issues for you.

GNU Radio has libraries for all common software radio needs, including various modulation schemes (GMSK, PSK, QAM, OFDM, etc.), error-correcting codes (Reed-Solomon, Viterbi, Turbo Codes), signal processing constructs (optimized filters, FFTs, equalizers, timing recovery), and scheduling. It is a very flexible system, and it allows applications to be developed in C++ or Python.




*a GUI Radio Design system with GNU Radio*

## AVB

IEEE 802.1AS (PTP): Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks. One device is selected to be the master clock, which then distributes time throughout the bridged LAN/IP subnet to all other nodes. The 802.1AS clock is not used as a media clock. Rather, the 802.1AS time is used as a shared clock reference between nodes which is used to transfer a media clock from talker to listener.

Such a reference removes the need to fix the latency of packet delivery, or compute long running averages in order to estimate the actual media rate of the transmitter in the presence of substantial network jitter. IEEE 802.1AS is based on the ratified IEEE 1588-2008 standard.

IEEE 802.1Qat (SRP): Virtual Bridged Local Area Networks - Amendment 9: Stream Reservation Protocol (SRP) . This allows a stream reservation to be established between a talker and a listener in a bridged LAN/IP subnet.

IEEE 802.1Qav (Qav): Virtual Bridged Local Area Networks - Amendment 11: Forwarding and Queuing for Time-Sensitive Streams. This describes a token-bucket method for shaping network traffic such that the latency and bandwidth of reserved
streams can be controlled.

IEEE 802.1BA: Audio/Video Bridging
(AVB) Systems. There are also two draft standards that rely on IEEE 802.1 AVB to provide professional quality Audio/Video.

IEEE 1722: Layer 2 Transport Protocol for Time-Sensitive Streams. Allows easier porting of applications currently using IEEE 1394 (FireWire®) to AVB.

IEEE 1733 - extends RTCP for RTP streaming over AVB-supported networks.

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## HARDWARE

### Frequency Reference
· Signal: 10 MHz sine wave.
· Spectral purity: -70 dBc at full output power. (harmonics), -75 dBc at full output power (non-harmonics).
· Phase noise: -125 dBc at 1kHz.
· Output: N° 1.
· Output level: 13 dBm.
· Output impedance: 50 ohms.
· Output connectors: BNC.
· Stability: 1e-12 daily average (OCXO locked to GPS in SA), 1e-10 daily average (OCXO in free run).

### Time reference
· Signal: 1 PPS, 100µs Duty, Rising Edge.
· Output: N° 1.
· Output level: TTL 5 Vpp, Square wave.
· Output impedance: 50 ohms.
· Output connectors: BNC.

### GPS Section
· Receiver: 12 Channels L1 1575.42 MHz.
· Tracking: correlation over 12 satellites.
· PPS precision: < 50 ns on SA.
· Antenna connector: TNC
· Capture time: < 4 min.

### Rubidium Section
· External Rubidium Reference.

### PTP Section
· Protocol: IEEE 1588-2008 (PTPv2) - PTPv1 optional
· Role: Grandmaster clock source (GPS) or Slave
· Timestamping: Hardware
· Precision: < 1 µs.

### NTP Section
· Protocol: NTP Version 4
· Role: Grandmaster clock source (GPS)
· Timestamping: Software
· Precision: < 10 ms
· Stratum: 1

### AVB Section
· IEEE 1722: "Layer 2 Transport Protocol for Time-Sensitive Streams." Allows easier porting of applications currently using IEEE 1394 (FireWire®) to AVB.
· IEEE 1733 - extends RTCP for RTP streaming over AVB-supported networks.

### Signaling
· Network connection: N° 2 Ethernet interface 10/100/1000, TCP/IP protocol.
· Signaling: N° 8 LED on main panel.

### Supply
· Input: N° 2 independent supplies.
· Network: 95 Vac – 240 Vac, Plug IEC320 integrated, filter EMI/RFI.
· Battery: 20 Vdc - 50 Vdc filter EMI/RFI integrated.

### Sizes
· Width: 1 Unit 19".
· Depth: 300 mm connectors excluded.
· Weight: 1.5 Kg~.

### Certification
· CE: Yes.
· Ghost-R: Yes.