WiSyn- Wideband Frequency Synthesizer

Emulator for Data Acquisition and Wave Generation

- **Generate data from user text input file**
- **Feed into user processing subsystem via Ethernet (up to 100Gbps)**
- **Acquired data generated in burst and in sequence**
- **Processed results send out via high-speed Ethernet (up to 100Gbps)**
- **Support long data sequence of timed data**
- **Data can be generated from different seed values**
- **Ethernet output keeps characteristics of data for accurate reconstruction**

In **data acquisition** (Figure 1, below) applications, analog waves (or signals) are captured, digitized for analysis and processing, and stored in digital form or transmitted out to remote data center for further processing. For example, in imaging applications, CMOS image-sensor pixel-arrays convert light into signals. These are fed into column analog to digital converters (ADCs) to digitize the signals. Similarly in RF applications, RF signatures of drones can be sensed and converted into digital form. The resulting data may be preprocessed locally after being digitized using digital signal processing (DSP), filtering and other signal processing techniques. The large amount of data may then be transmitted to a remote data center (or from space to Earth) for further, more complex analysis such as image recognition.

In the development of such applications, it's very cumbersome and time consuming to use real hardware for development, especially if different hardware types are required. It's much easier to develop using an emulated data acquisition system to emulate the analog front-end and only feed the digitized data into the processing system. The issue is that the different analog data acquisition front-ends generate digital streams in varying formats, at different rates, the data may be in burst, but timed and the data acquired may be out in the field far from the processing sub-system (ex: data center) and must be transported via the network to the data processing center.

Figure 1: Data Aquisition System Illustration

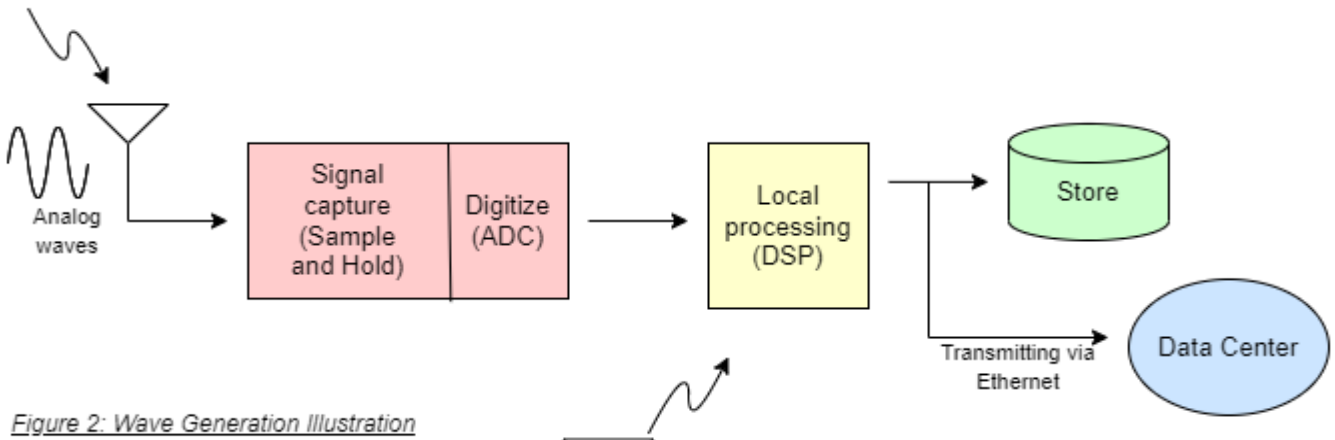
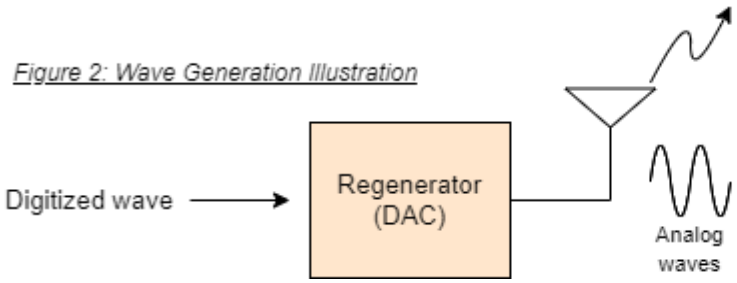


Figure 2: Wave Generation Illustration



Other applications may require the **digitized wave to be regenerated** (Figure 2) from digital into analog signals which can be applied in the medium. For example, RF signal generation which can be transmitted out from RF antennas out in the field. In this case, the digitized stream(s) are fed into DACs to regenerate the analog signal. Examples are tone generation, RF wave transmission, and others. Signal generation may require the data to be provided in burst or formatted sequence and thus, may also have similar issues as the analog to digital conversion counterpart.

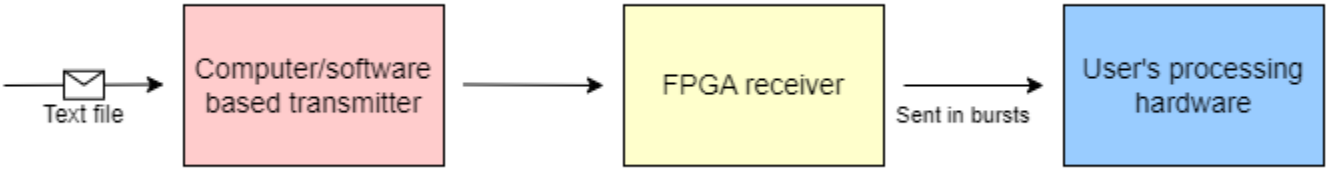


Figure 3: Front End Subsystem

WiSyn is a wideband frequency synthesizer developed to emulate (1) the front-end of the data acquisition sub-system (**Front-End**) and (2) a digital wave generation (**Wave Generator**). The **Front-End** (Figure 3) consists of 2 parts: a computer/software-based transmitter (red) and an FPGA-based receiver (FPGA Receiver) (yellow). The output of the FPGA Receiver is fed into the user's processing hardware (blue). Using FPGA, it enables the user's processing code to be done in FPGA hardware. The computer/software-based transmitter accepts user input data in the form of a text file which makes it easy for the user to construct, make changes and feed into the emulation system.

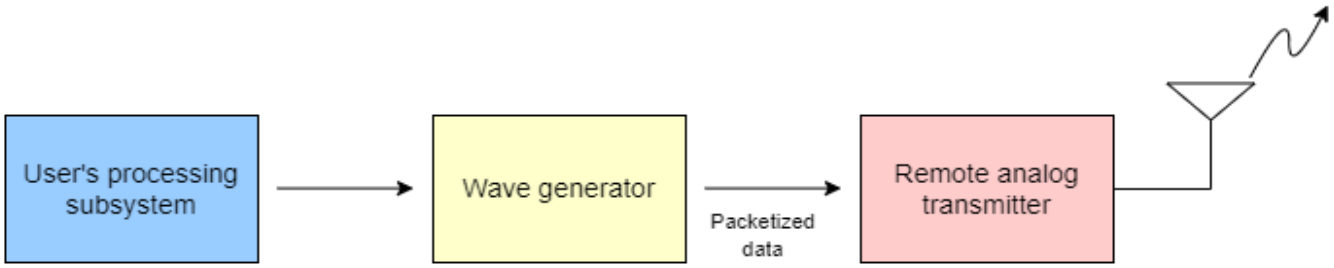


Figure 4: Digital Wave Generator

In the Digital Wave Generator (Figure 4), the **Wave Generator** (yellow) receives data from the user's processing subsystem (blue) then packetizes the data and sends out to the remote analog transmitter (red) for transmission. An example of the analog transmitter is a combination of DAC/RF antennas. The Wave Generator can receive multiple data streams from the user processing subsystem. It sends data to the analog transmitter in packetized form via the Ethernet network. For low latency, the Wave Generator is developed in FPGA hardware. Thus, it can receive data streams from the user FPGA processing subsystem directly.

LeWiz developed this Front-End and Wave Generator for licensing. The code can be customized to user's specific application or format and adaptable to user's application hardware or network environment. For further information or discuss your specific application, please contact us below.

LeWiz Communications, Inc.
1296 Kifer Road, #606
Sunnyvale, CA 94086 USA
info@LeWiz.com
www.LeWiz.com