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VLBI-In-a-Box

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XCube

- A nimble team with many years of experience with a focus on R&D
- Offices located in US and Sweden.
- Incorporated in 2003
- Customer base in USA, Sweden, Germany, Japan, and Australia.

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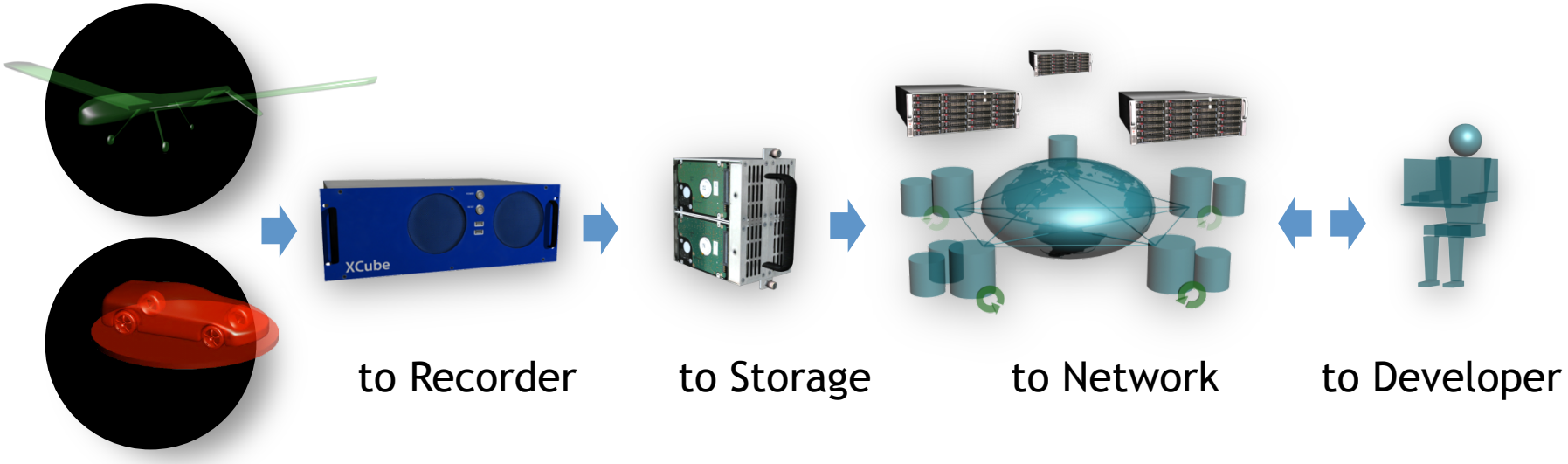
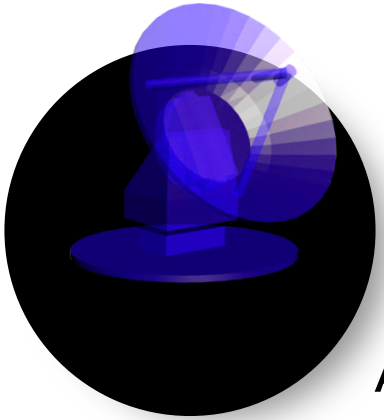
Wall of Experience

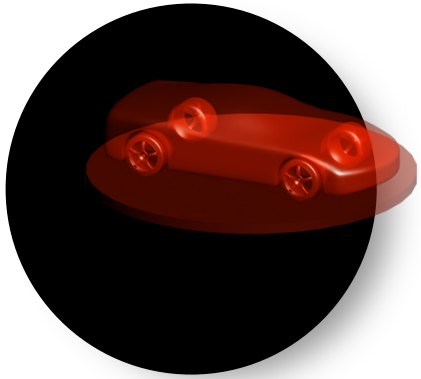
- Focus on Research & Development of high performance sensor systems.
- Key area is systems engineering and tools for develpment and deployement of challenging signal and image processing systems.
- Developed a world class suite of tools to support an efficient development process for high performance or large data set systems.

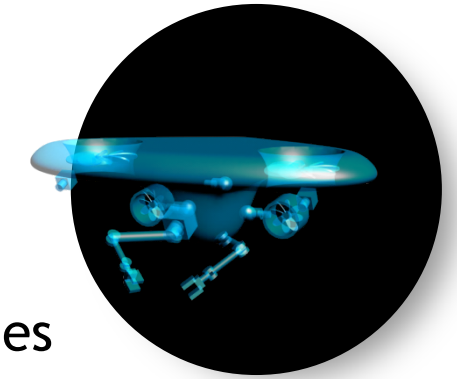
Supported Process



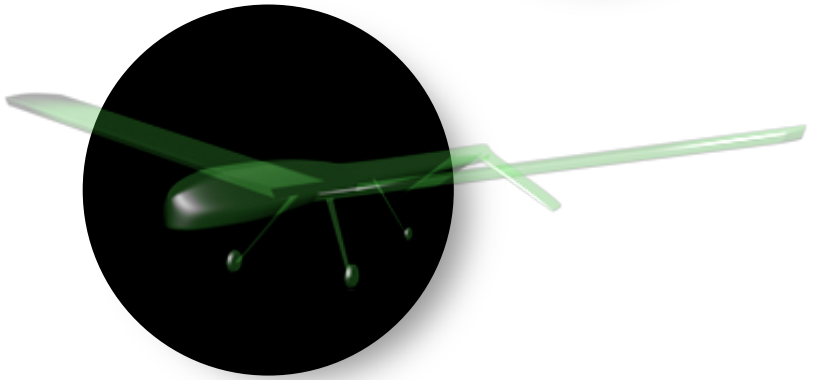
Many Application Areas







Applicable across may industries



StreamX-Base Recorder

- Continuous Streaming Data Recorder
  - Up to 4GByte/s Continuous recording and 8GByte/s burst mode available
  - Burst storage up to 250GByte (250 sec at 8gbps)
- Interfaces
  - USB, Ethernet, IEEE-1394, CAN, GigEVision, NTSC/PAL, GPS, 10GEthernet, Multi-drop 1394, Custom Radar, vision interfaces, PCI-Express direct
  - Most computer interfaces can be supported
- Streaming Storage
  - External replaceable disk pack (12, 16, 32TByte data packs)
  - SSD disk pack (4 - 16TByte)
  - Internal storage version (48TB, 108TB)
- Rugged and Resilient
  - Automotive and Airborne Power Options
  - Temperature (0 – 50C, -20C with pre-heat)
  - Altitude 10,00ft, 15,000ft(option)
- Standards based hardware
  - Intel based hardware, Standard file-systems
  - Rugged chassis, and real-time software

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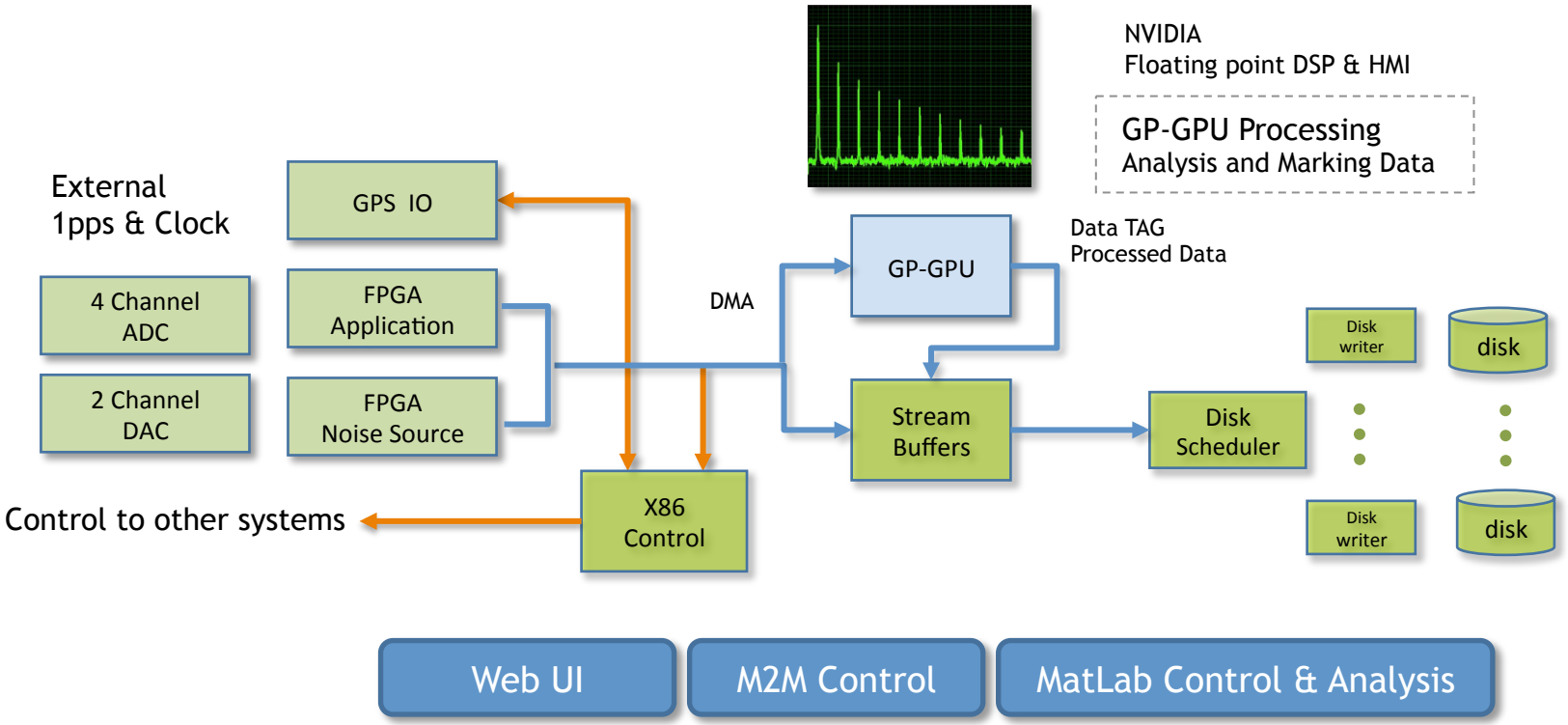
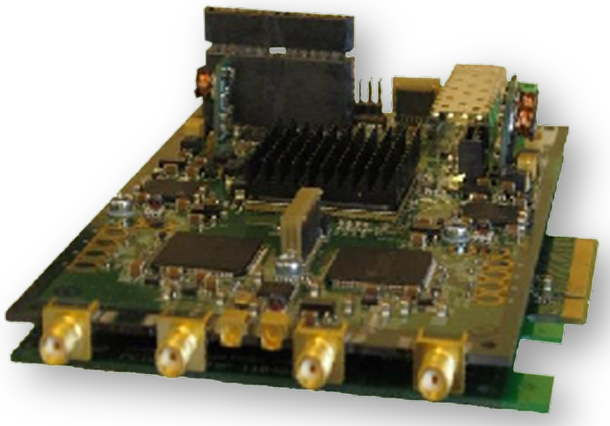
VLBI-In-a-Box

Real Time Analysis

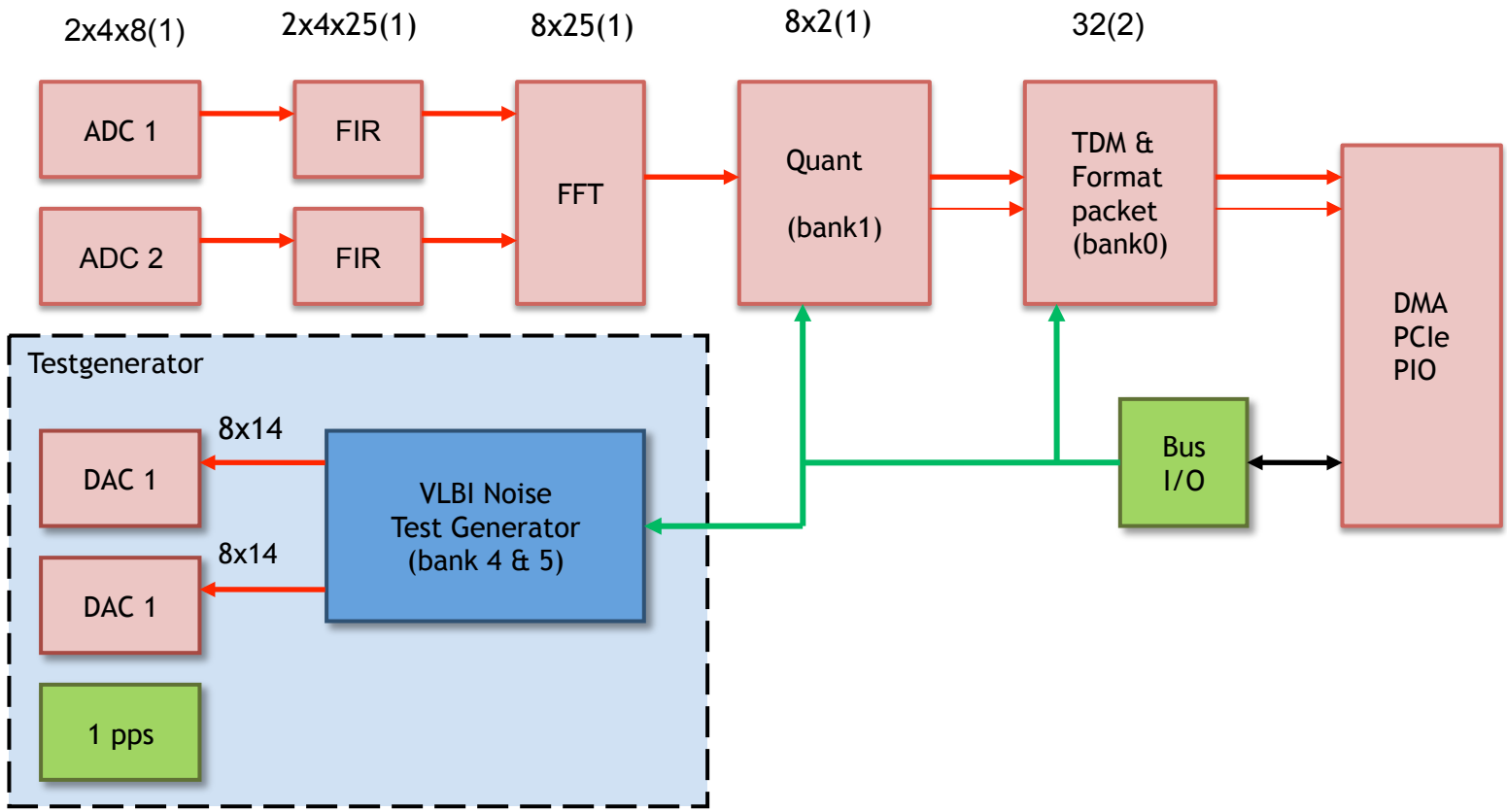


Four Channel PFB Version

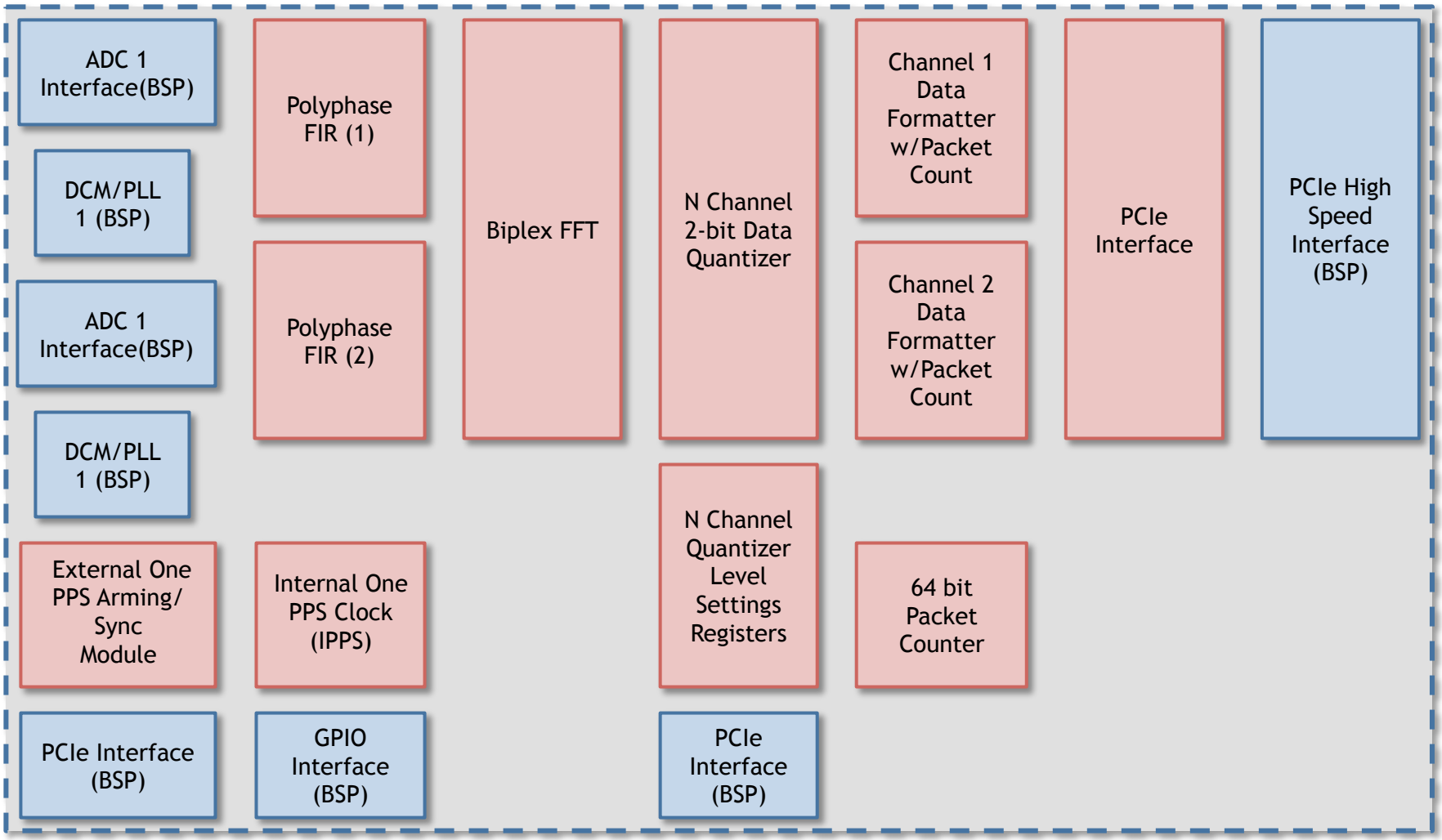
- 4 input channels at 512MHz BW.
- 4, 16 Channel Polyphase Filter Banks.
- FFT 32MHz Channel BW
- Sub-sampling out to 3 nyquist zones (3GHz analog BW)
- 256 Tap prototype Filter, 8 Taps/channel after decimation
- 18 bit filter coefficients, 25 bit precision resultants
- Finial stage processing is re-quantization to 2bits
- Quantization levels are programmable to obtain user requirements
- 5/10MHz Reference clock input.
- Sample clock phase locked to external clock input
- External GPS 1pps input for synchronization
- Internal Noise source for debug and calibration



FPGA Design (2-channel)



FPGA Components



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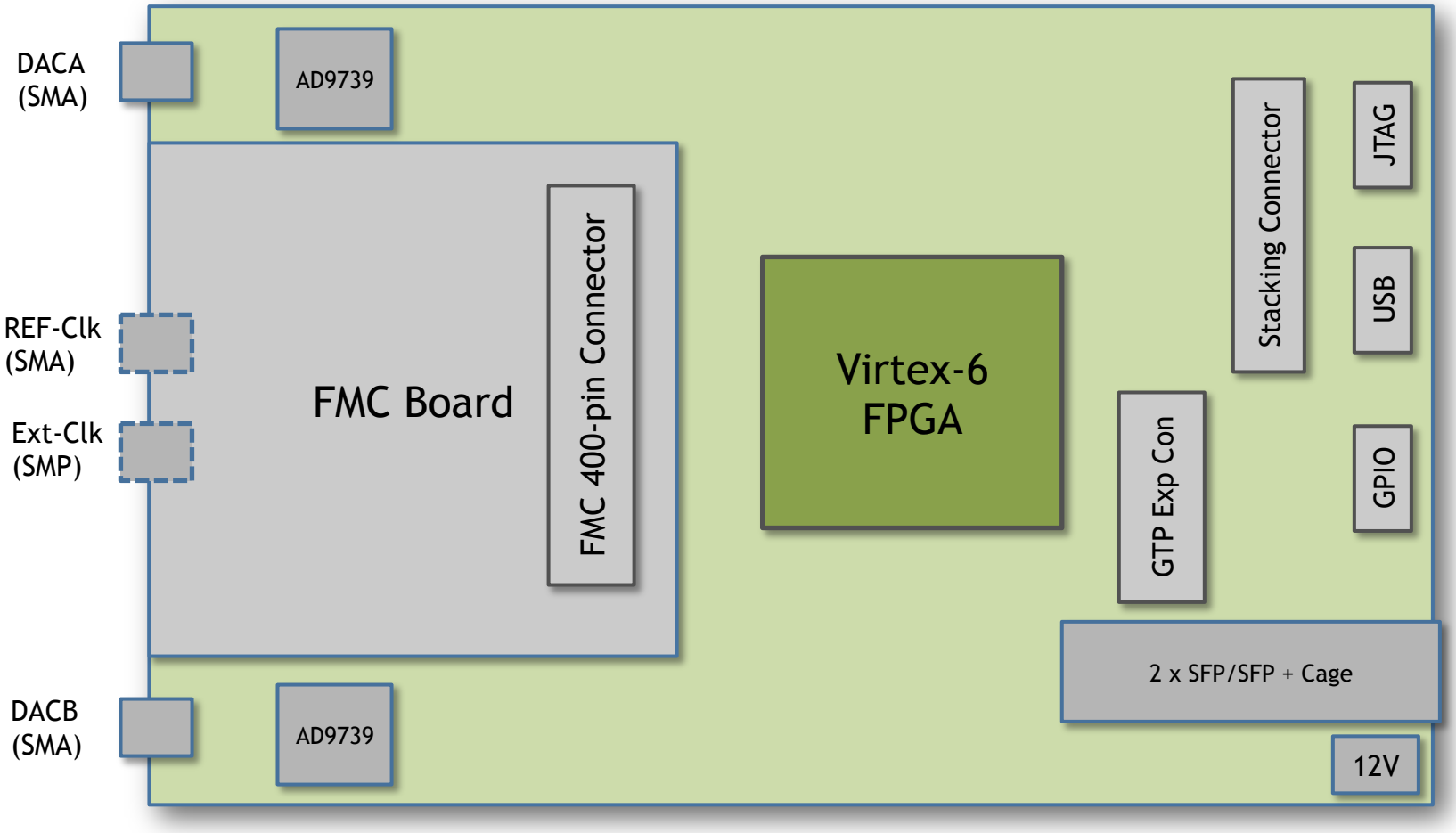
HRFT Block Diagram



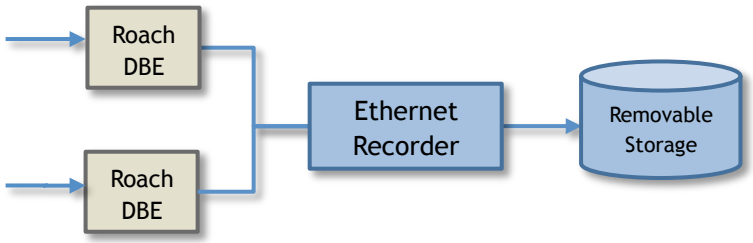
4x Performance Enhancement

Making room for the new 4X performance Enhancement

Scenario #1

Mark-X recorder replacement:

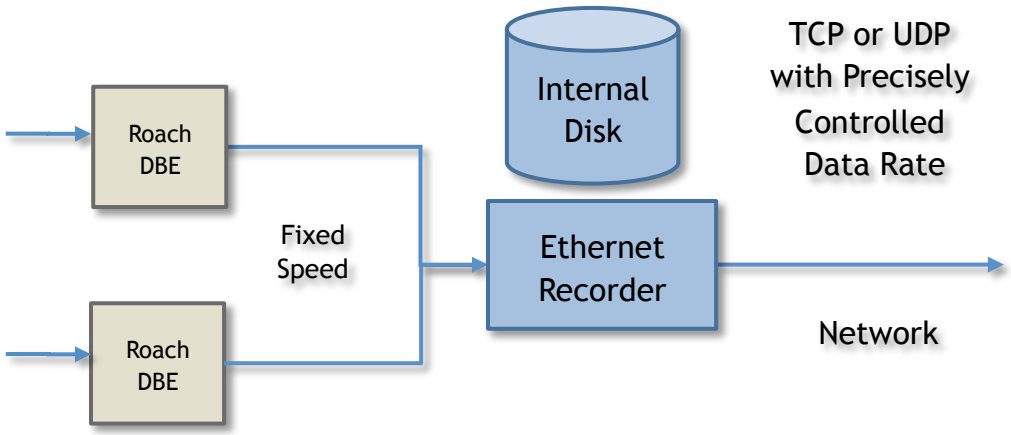
- 16Gbps out of the box recording
- Upgradeable with sampler, FPGA, GPU, and software
- External self-contained disk packs
- Option for internal disk pack
- Capable of eVLBI over network interfaces



Scenario #2

Delayed eVLBI recorder:

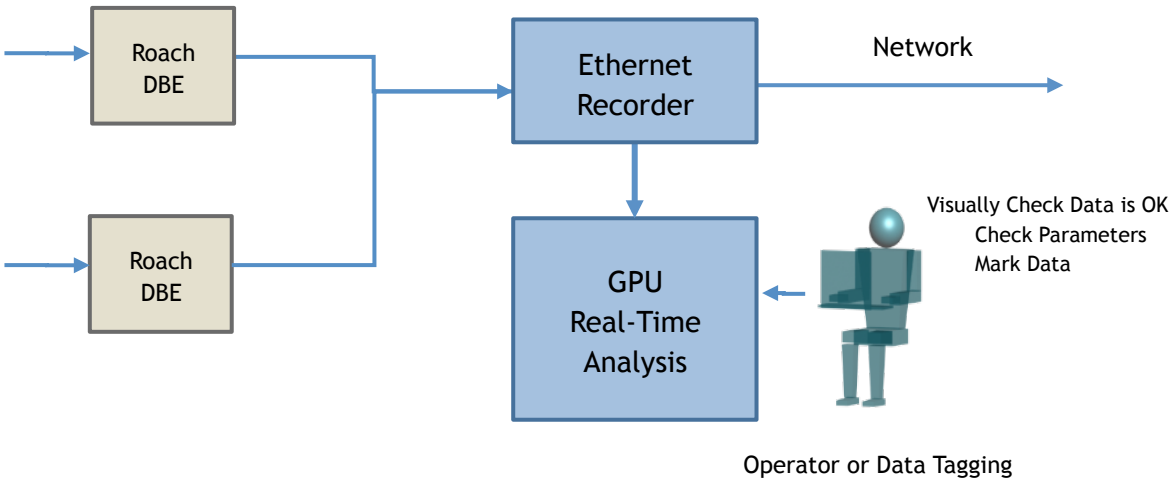
- Internal or External disk pack for local storage
- Trickle data over network interfaces at precisely controlled rate



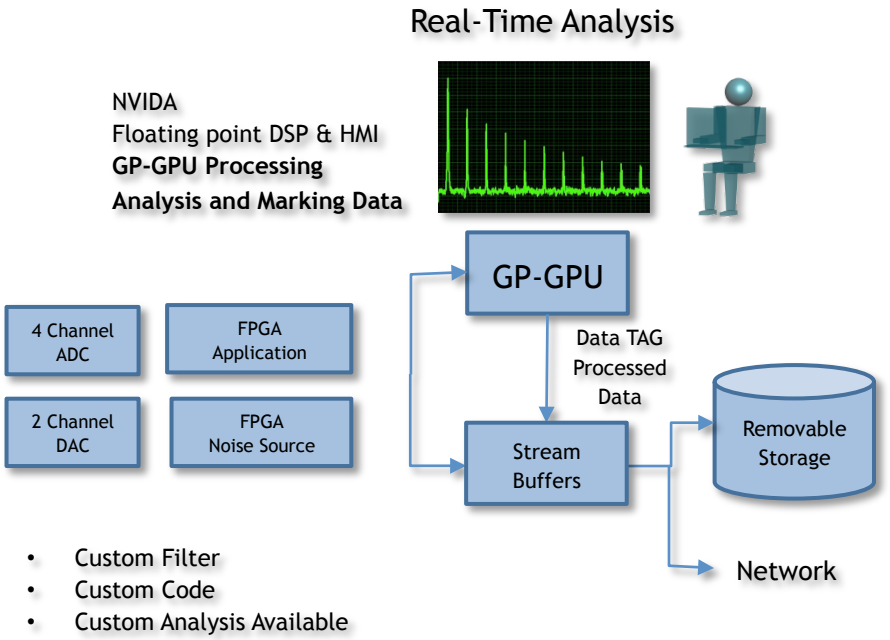
Scenario #3

StreamX Recorder with GPU real-time analysis:

- SDK for NVIDIA GPU integration
- Application software for analysis of data streams



Scenario #4



Complete End to End System:

- Scenario 4 All capabilities of 1,2 and 3
- Full digital backend implementation
- GPU real-time analysis
- FPGA channelization and quantization
- 2 – 4 Channels at 1024Gsps (10 bit planned)
- 2 channels up to 6Gsps, 8-bit
- Analysis of Raw stream, channelized streams or quantized stream

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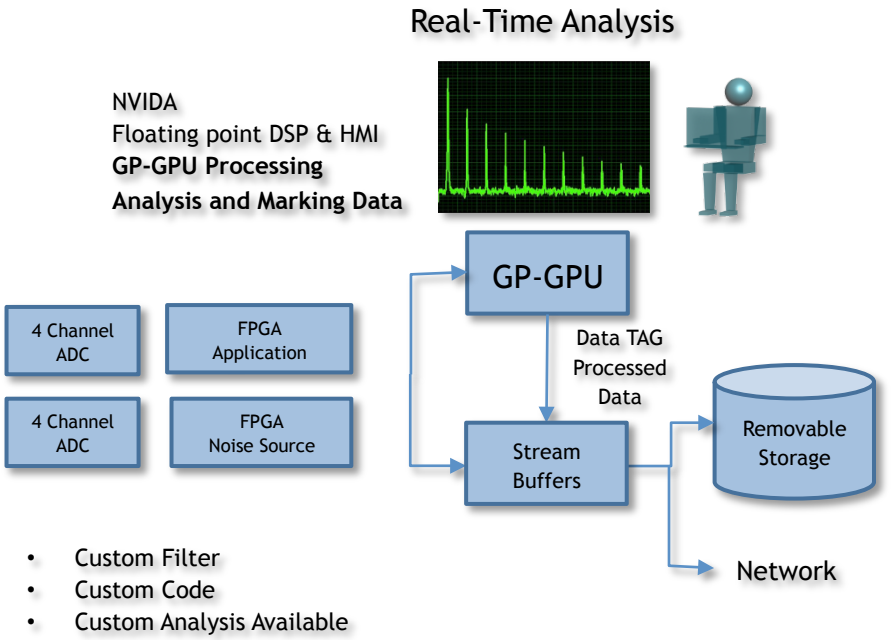
Services



Application services:

- FPGA code can be modified to suit user requirements
- Custom GPU code and analysis software development
- Full application responsibility available

Programming Environment

- StreamX Platform
  - Components exchange slow speed data using XML
  - High speed data with shared memory buffers
  - Direct DMA access
  - Standard Linux operating system and file system
- Tools
  - C++ Environment on host / Java for UI
  - BSP for FPGA Board (Xilinx standard tools)
  - GPU Nvidia standard tools
- SDK Available for custom applications

Our Systems and Solutions

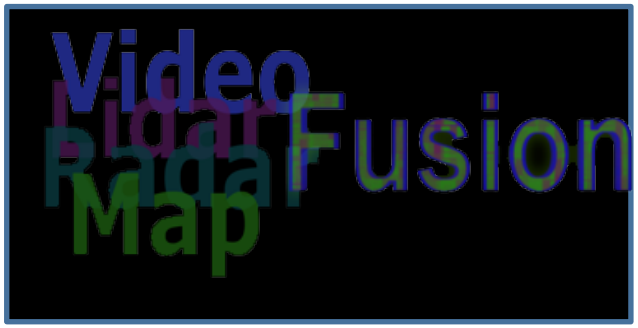
- Distributed storage and simulation solution
- Stream computing technologies
  - FPGA, GPU, GPP stream
- Data acquisition and recording system
- Sensor and information fusion applications

StreamX-Data Management Tools

StreamX-Base

StreamX-Platform and Tool Suite

StreamX-Smart Fusion



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Base System

***StreamX*-Base**

Base Hardware
- Chassis and Computer
- Disk Packs
- Operating System

Base Software
- Interface Manager Software
- File Writers
- Logger Manager

Base UI
- Web-Based UI
- Command Line Interface
- M2M Interface

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Options

High Speed Analog I/O and FPGA processor Option

- HRFT Hardware
- HRFT board support package
- HRFT Interface Manager
- Sample HRFT Application
- Software Development Kit (StreamX-HRFT-SDK)

GPU- Stream Processing Option

- NIVIDIA GPU Hardware
- GPU Manager
- Sample Application
- StreamX-GPU SDK

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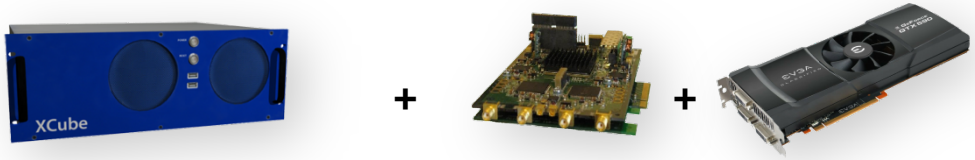
System Applications

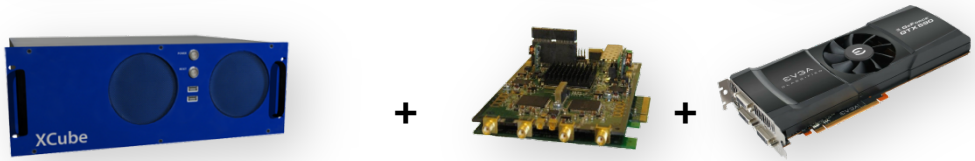
StreamX-VLBI

Radio Telescope Application
StreamX-RT (Real-Time)Configuration
VLBI Application Software



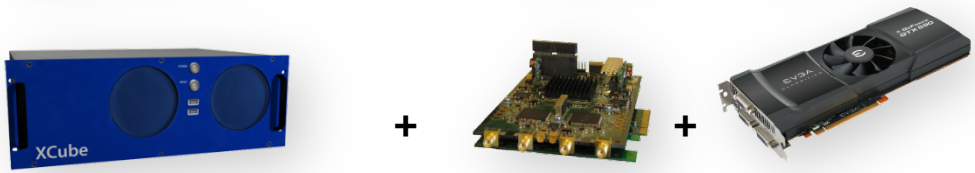
StreamX-DRFM

Radio/Radar Jamming Application
DRFM Application Software



StreamX-Soft Radar

Landing Visualization Application
Soft Radar Application Software



StreamX-Automotive

Data Recorder
Fleet Recorder

Interface Manager: CAN Bus, Fire wire, GigEvision camera, Ethernet, custom sensors

StreamX-Autonomous

Reference and Ground Truth system

Roof Mounted Stand alone system with cameras, sensors, radar, etc..

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Storage Configurations

Internal Disk Pack
16 Terabyte 2.5 drives

External Disk Pack
32 Terabyte 3.5 drives

1U extension box
100 Terabyte 3.5 drives

Rack-able box
144 Terabyte 3.5 drives

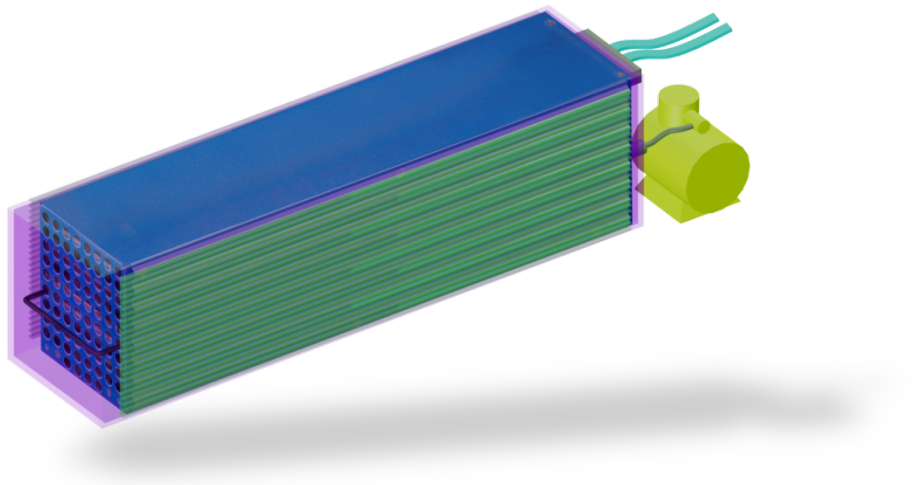
10 units in a Rack
1.5 Petabytes

Global distributed
storage clusters
100s of Petabytes

Storage Options

Near Future Application:

- XCube is developing a cost effective high altitude storage solution.
- The disk packs are placed into self-contained active pressurized containers with monitoring and control.
- Because our disk packs are equipped with power and cooling the pressure box and heat exchanger become highly cost effective.



Air Cooled
Pressurized Containers

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Thank you!

Top View of Logger and Disk Pack

Data Logger(4U Box)

2.5” Disk Pack 16TByte

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Back View of Chassis