

Xilinx

Digital Signal Processing in Space

October 2018



Xilinx - #1 PLD Provider for Aerospace & Defense



Xilinx Space Product Applications– On-Board Processing

➤ Communication Digital Payloads:

- Channelizer – RX/TX module, DSP Switches
- High frequency down converter, Modulation, De-Modulation
- Beamforming Modems & Crypto Unit, Ethernet Routers/Switches
- Payload frequencies reconfiguration - defeating jamming threats

➤ Imaging (remote sensing, space telescopes):

- ADC data conversion, Imaging data processing & compression

➤ Synthetic Aperture Radar (SAR)

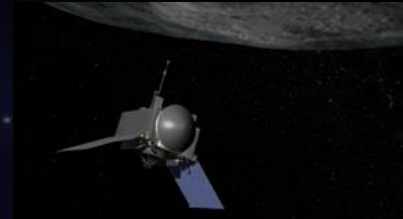
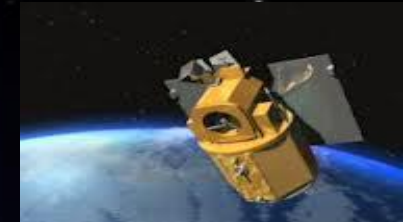
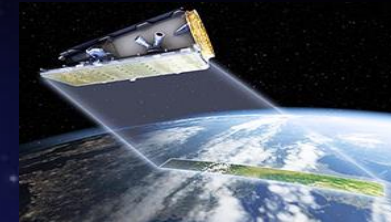
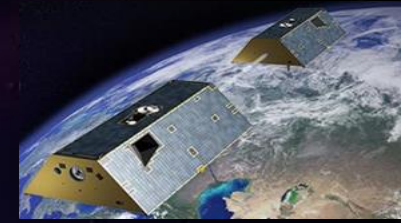
- High Speed Digitizer, Timing Generator Module, Baseband data processing, data compression, mass memory storage

➤ GPS

- Digital Waveform Generators

➤ Manned Crew Capsules

- Video processor and Displays for Crew Capsules
- C&DH (Command and Data Handling)



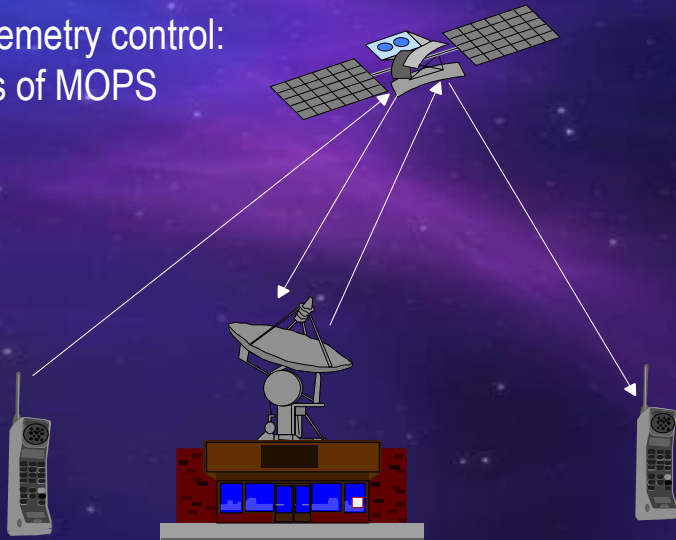
FPGA On-Board DSP for Space Applications

Marco Caceres, senior analyst and director of space studies for Virginia-based Teal Group consulting firm

"We expect that the next 10 years will see an increase of about 25 percent in the number of new spacecraft of 50Kg mass or larger. These new spacecraft will have more sophisticated payload electronics than their predecessors, doing more on-board data processing to maximize data acquisition while dealing with limited downlink bandwidth."

"Bent Pipe"

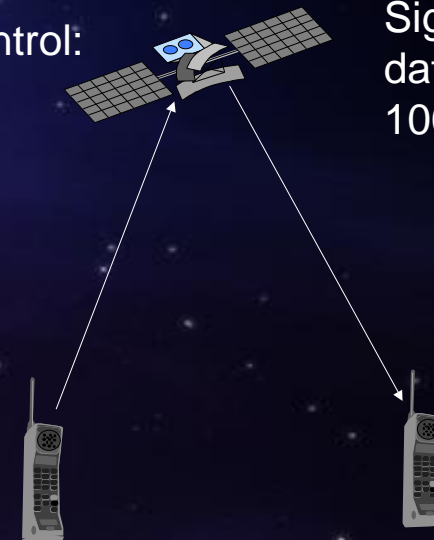
Telemetry control:
10s of MOPS



Signal processing &
data switching:
100s of GOPS

"On-board Processing"

Telemetry control:
10s of MOPS



Signal processing &
data switching:
100s of GOPS

Paradigm shift to Satellite on-board, autonomous processing drives need for very high performance **reconfigurable** electronics in space

Xilinx Re-configurable FPGAs for Space



- **Dynamically re-configurable digital logic FPGA for space processing**
- **XRTC Radiation Reports available in Xilinx Space Lounge**
- **Major flight heritage accumulated since 2014**
- **V5QV mature product in stable production accumulating heritage**
 - >> Life cycle extended to 2030
 - >> Screened devices with 30% lower static power now available
- **XQRKU060 Continues to Support On-Orbit Reconfiguration**
 - >> On-orbit reconfiguration support algorithm updates, bug fixes, machine learning

Adaptable.
Intelligent.

