ISAAC Demo Plan

ISAAC Newton

Charles Le, Yutao He, Jason Zheng, Kayla Nguyen, Will Zheng

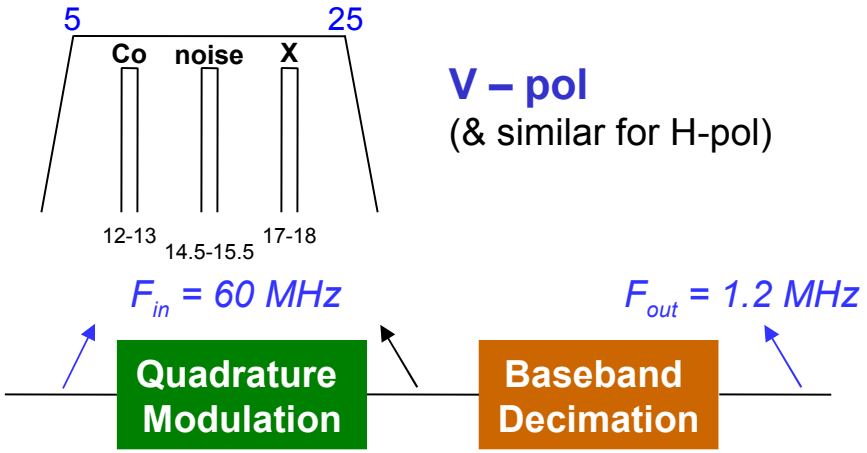
July 24, 2008

Demo Overview

Target Mission and Its Main Characteristics

- SMAP, L-band scatterometer.
- Onboard real-time digital filtering for data rate reduction.

Instrument Digital Electronics Requirement



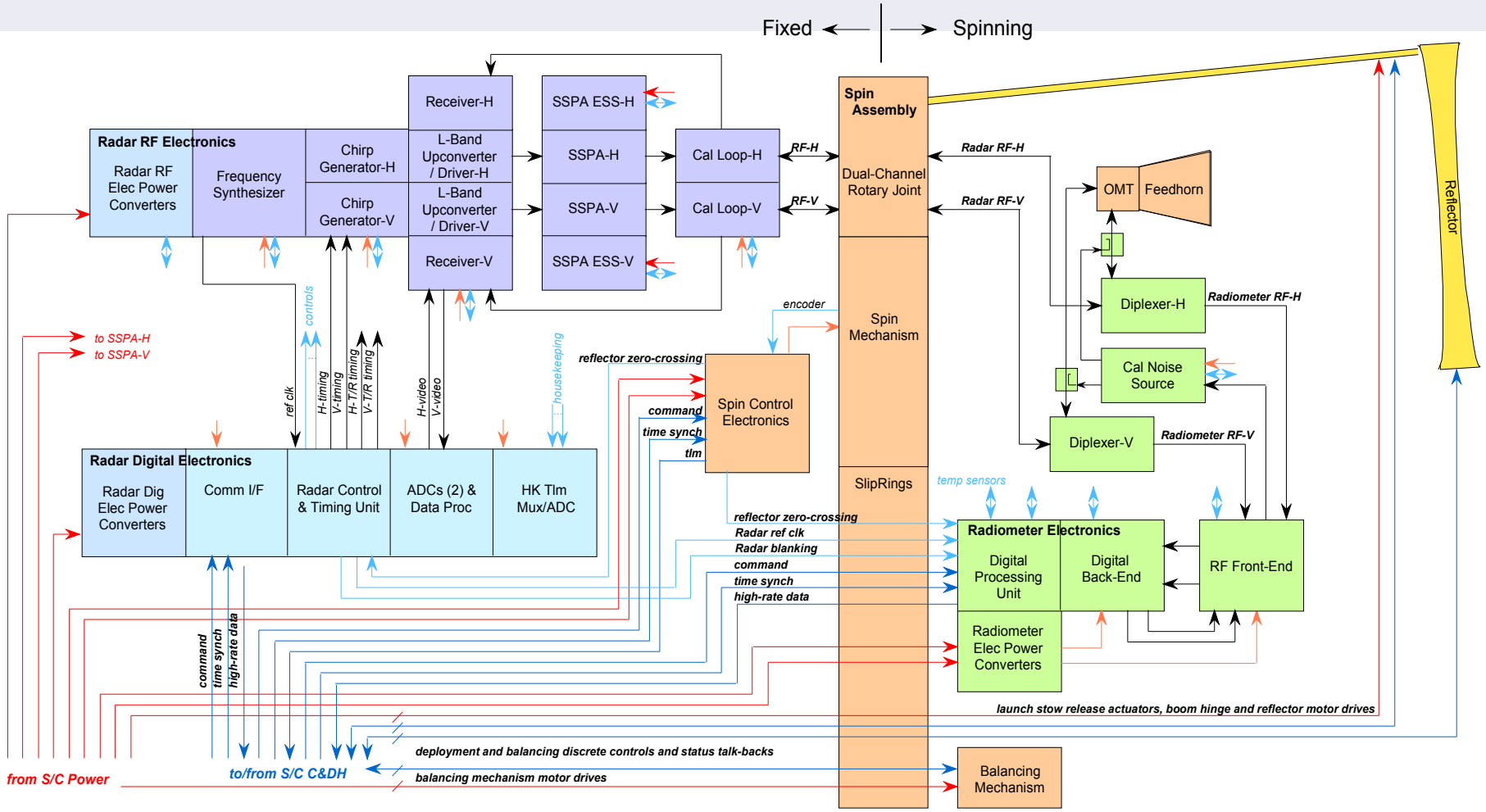
System Context Diagram showing iBoard and the rest of Instrument

- See next page, SMAP's instrument electronics

Demo System Capabilities

- Matlab floating point golden model.
- Realistic mission-specific test data
- FPGA implementation on the ML410 performed at required speed with enough margin
- Integrated tools for functional (speed & utilization) and performance (radar parameters) verification
- Verification and validation tool to demonstrate design readiness to onboard processing requirement of specific mission

SMAP Instrument Electronics

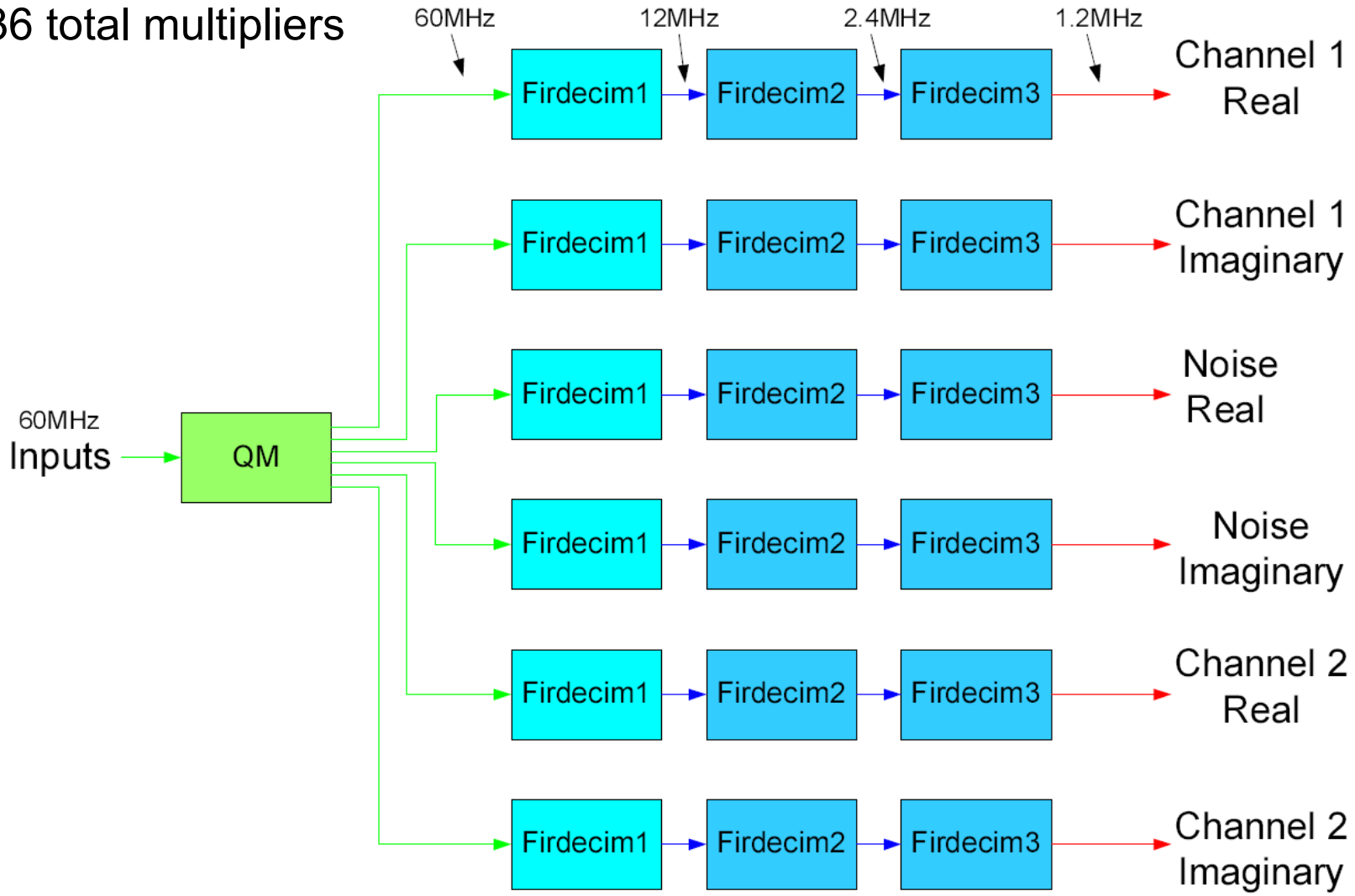


L. Veilleux, 07/2008

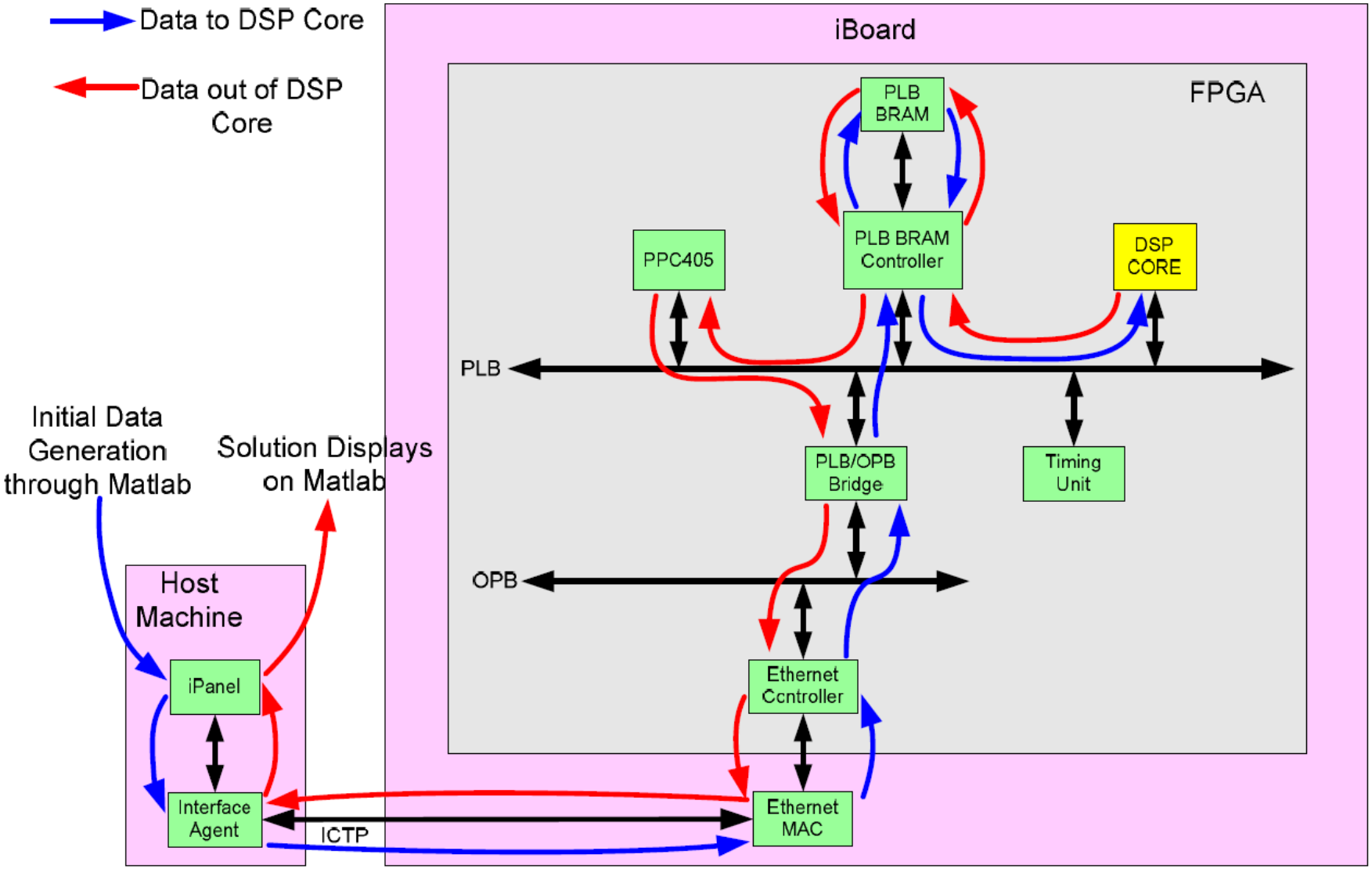
SMAP Instrument Electronics Block Diagram
Single-String Option

Quadrature Modulation and Polyphase Decimation Filters

- 36 total multipliers



Demo System Top-Level Block Diagram



Operational Scenarios to be Demo-ed

- Data stream
  - 16-bit binary offset video sampling @ 60MHz
  - Simulated data stored and read from high-speed memory
- Demo operations
  - Show Matlab floating point golden model.
  - Run FPGA implementation on the ML410.
  - Plot and compare Matlab & FPGA results.
- Validation approach
  - Measure device speed and utilization
  - Compare FPGA outputs with golden Matlab floating-point model
  - Measure radar performance parameters
- Key Parameters specific to the instrument demonstrated
  - Onboard processing capability
  - Design run at required speed
  - Radar performance parameters satisfied
  - Relevant interface
  - Realistic test data

Future Work and Plan

- Year-end final reports (description documents)
  - Algorithm Development & Data Simulation.
  - FPGA Design & Implementation.
  - Demo System Design & Implementation.
- Conference papers
  - ISAAC-Newton overview (Yutao et. al., RadCon09).
  - SMAP's algorithm development (Charles et. al., RadCon09).
  - FPGA design and implementation (Jason et. Al., ISCAS or ICASSP).
- Talk to S314 to explore other radar applications
  - Radar testbed (customer: Kevin Wheeler): integrated data simulation and signal processing.
  - DesdynI (customer: Jim Hoffman): wideband digital filtering.
  - Glistin (customer: Delwyn Moller): wideband digital beamforming
  - ADOP (customer: Yunling Lou): real-time interferometric SAR processing