



# Real Time PIV System

## Challenges and Approach

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# PIV System Requirements



- **Non-Intrusive**
- **Multiple Sensor Locations**
- **Real Time capable**
- **High Positioning Accuracy for Sensor Placement**
- **Reproducibility**





# PIV Pros and Cons

- **Particle Image Velocimetry**
  - + Many sensor locations
  - + Non-intrusive
  - + Separate velocity components
  - + Easy to calibrate and position
  - + moderately expensive
  - Limited time resolution
  - No real-time system commercially available, only off-line processing





# PIV System Development & Accomplishments -1



In-House System	Original System COTS
On-line operation, real time	Only off-line operation
Advanced trigger capabilities	Limited synchronization options
Interfaces to Matlab, LabVIEW, Tecplot, C	Only ASCII export
Modular, open architecture, easy to modify, hardware independent	"Black Box" closed, fixed system, no customization possible
>3k Vectors/s in direct Correlation	~2k Vectors/s in frequency domain





# PIV System Development & Accomplishments -2

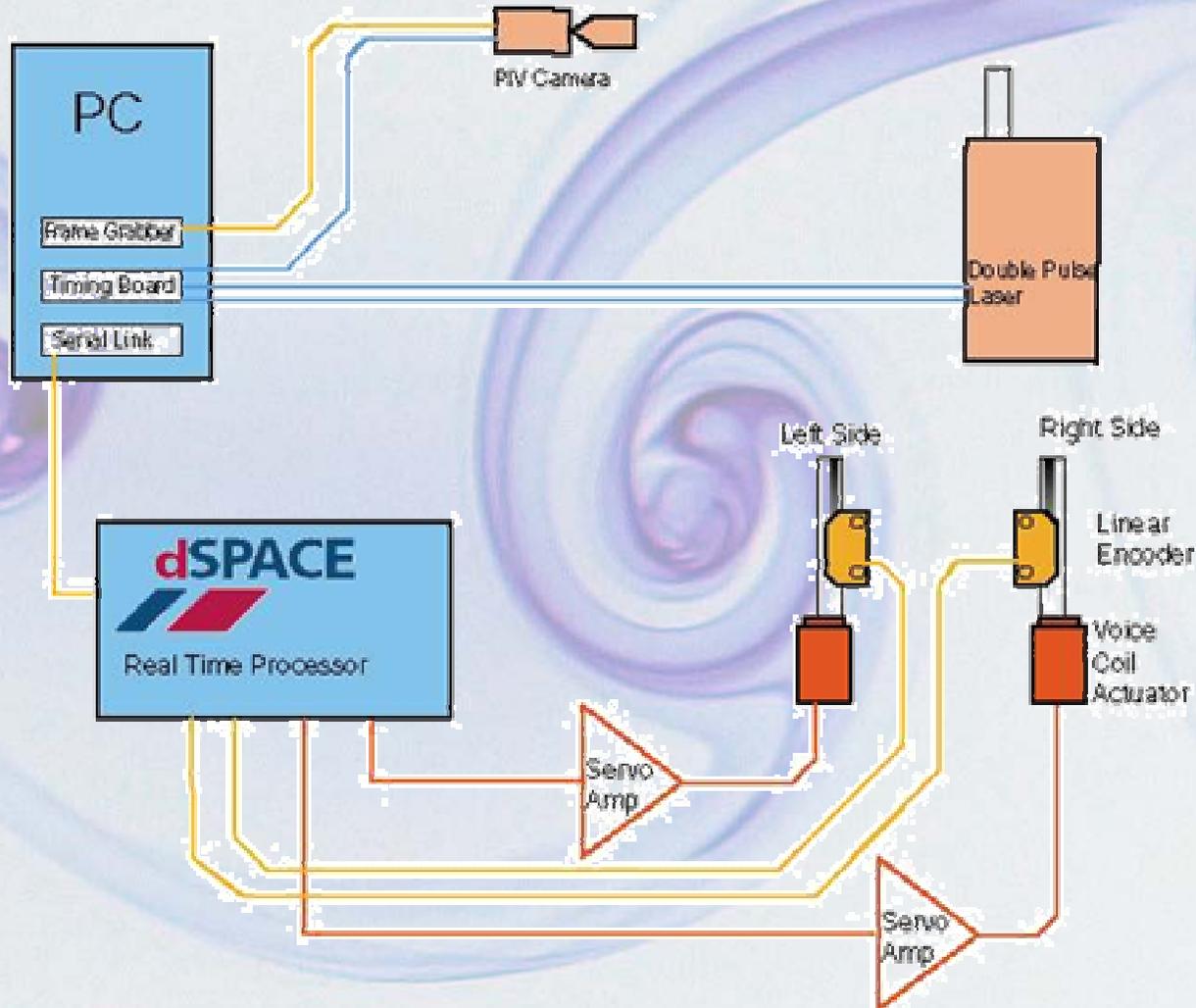


In-House System	Original System COTS
Data available on-line in PC Memory – 1000x faster	Data needs to be uploaded from Processor (slow)
Source code owned by AF, available public domain for non-commercial use	No access to source code, additional license is \$14k
\$3500 for Hardware	\$40,000 for Hardware
Data acquisition process one order of magnitude faster	-
Multi-Sensor Real time capability	-



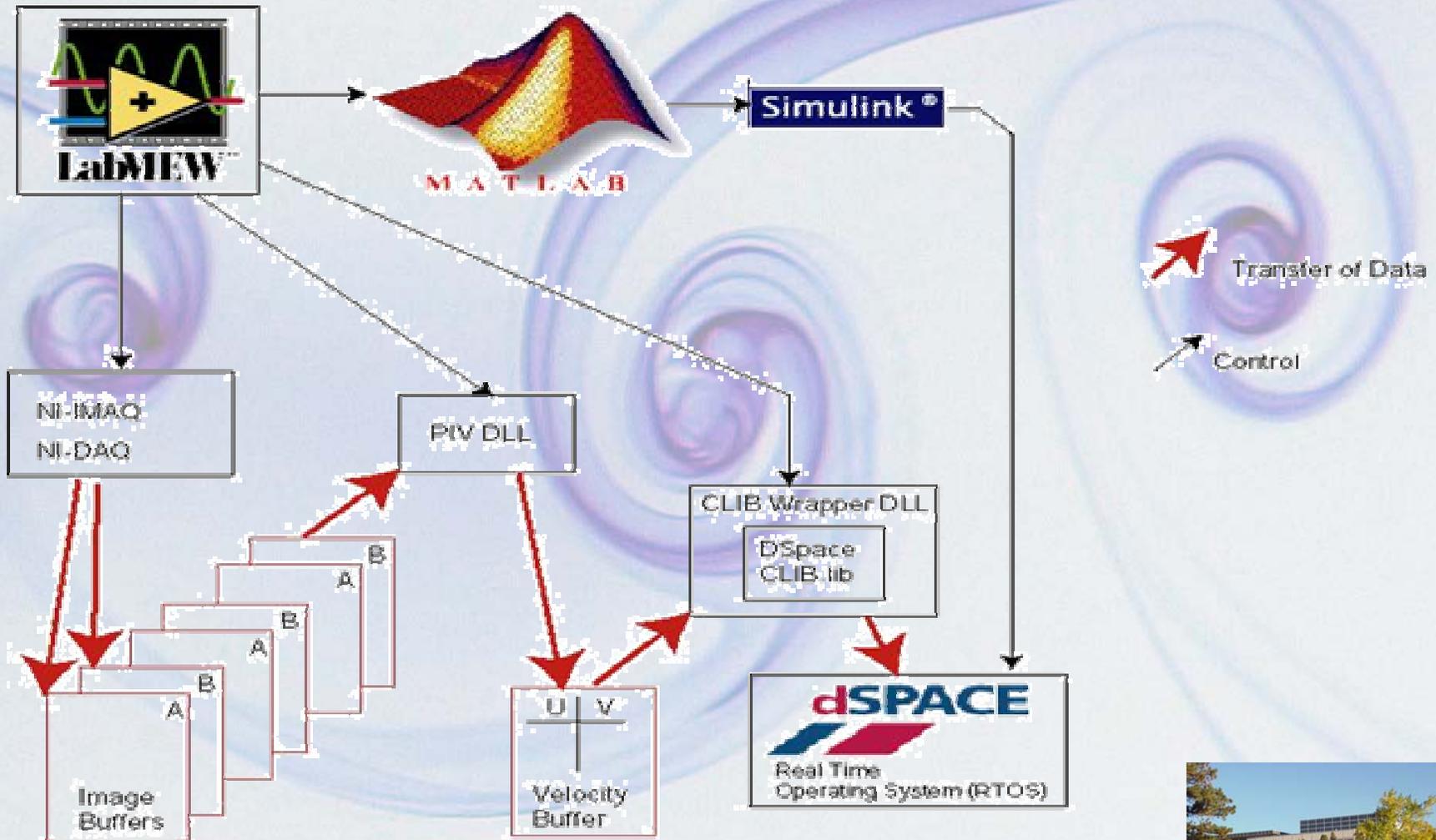


# Hardware Setup





# Software Layout





# Challenges Ahead



- Open loop system response measurements
- Implementation and test of CLIB interface between PC and Real Time Processor
- Overall timing analysis





# Summary

- **Developed and tested a real time PIV system from scratch**
- **System is based on commercially available libraries which make it platform independent**
- **Ready to gather open loop data for POD model and estimator / controller development**

