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Power Aware Framework for Fast & Early Power Estimation on FPGA

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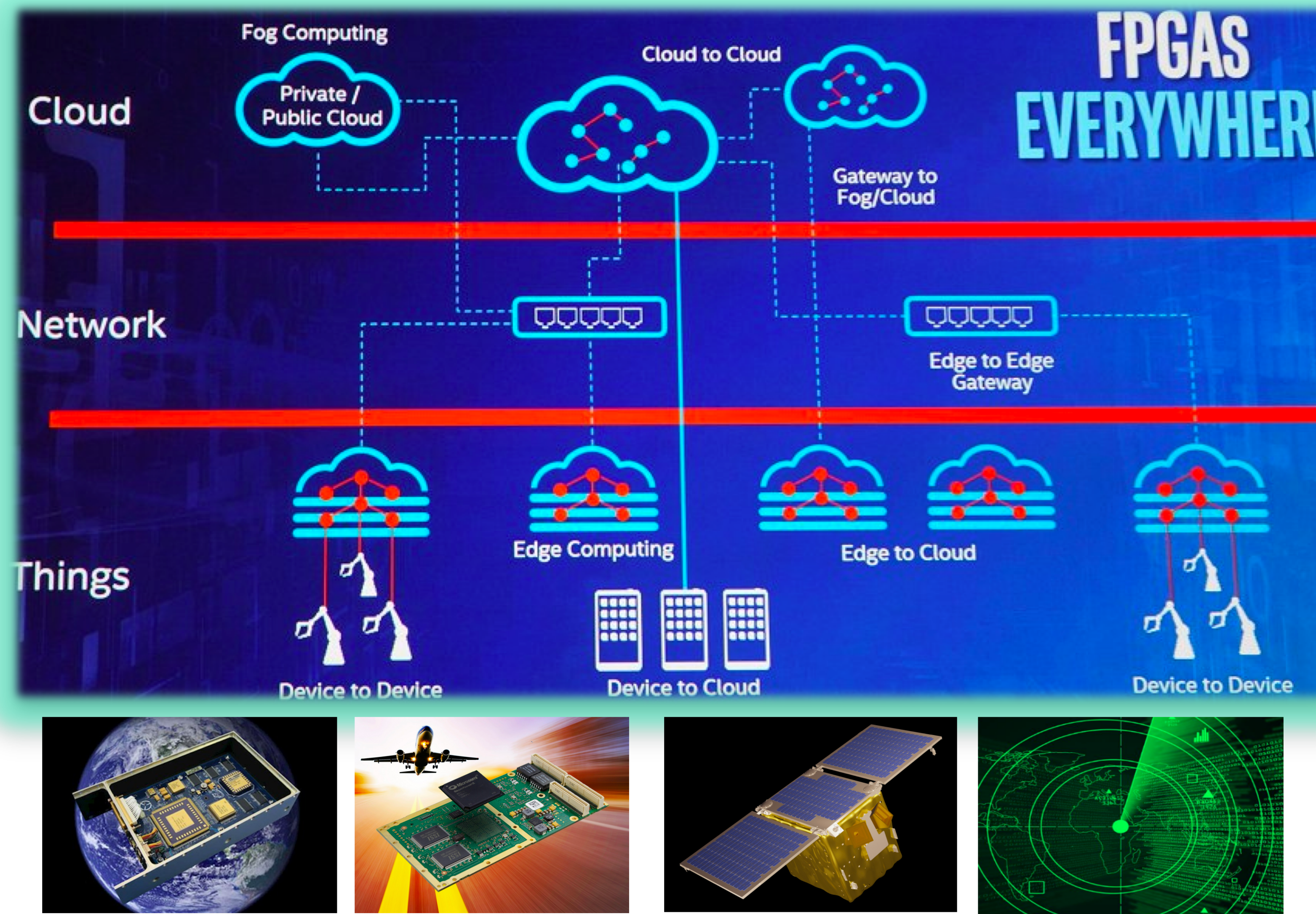
FPGA Advantages

- Faster Time To Market
- Field Reprogrammability
- Simpler Design Cycle
- More Predictable Project Cycle
- Reusability
- High-End Product
- Good processing speed
- No NRE (Non Recurring Expenses)



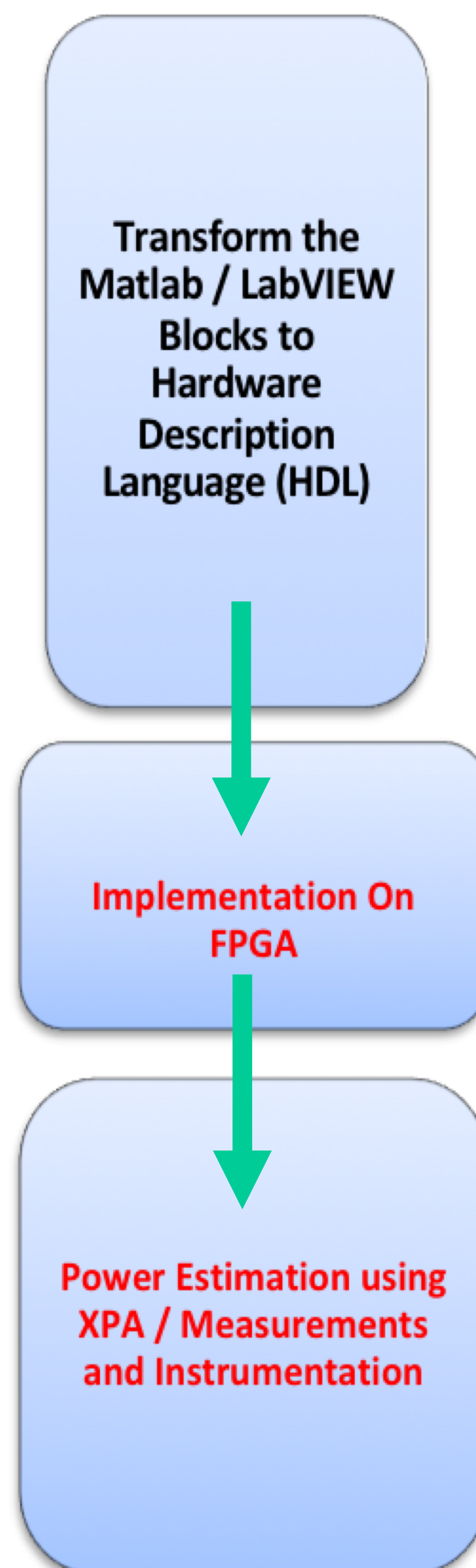
FPGA Disadvantages

- High Power Consumption
- No Control on Power Optimization
- FPGA Limits The Design Size
- As Quantity Increases Cost Increases



Problem Statement

Classical Flow



Signal Processing Researcher



Embedded System Researcher



Q: Does my Algorithm meet the power budget?
A: Not Yet !!!!

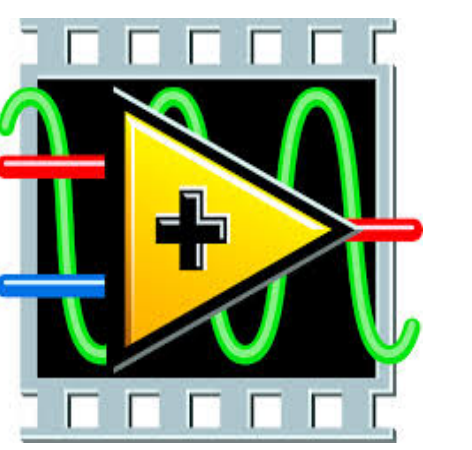
- Problems Regarding Power Estimation
- Today's Tools are Time Consuming
- They Require Implementation for Estimation
- Increase the Time to Market

Can we estimate the power at earlier design stage to facilitate the optimization & avoid hardware implementation?

Our Research Proposal

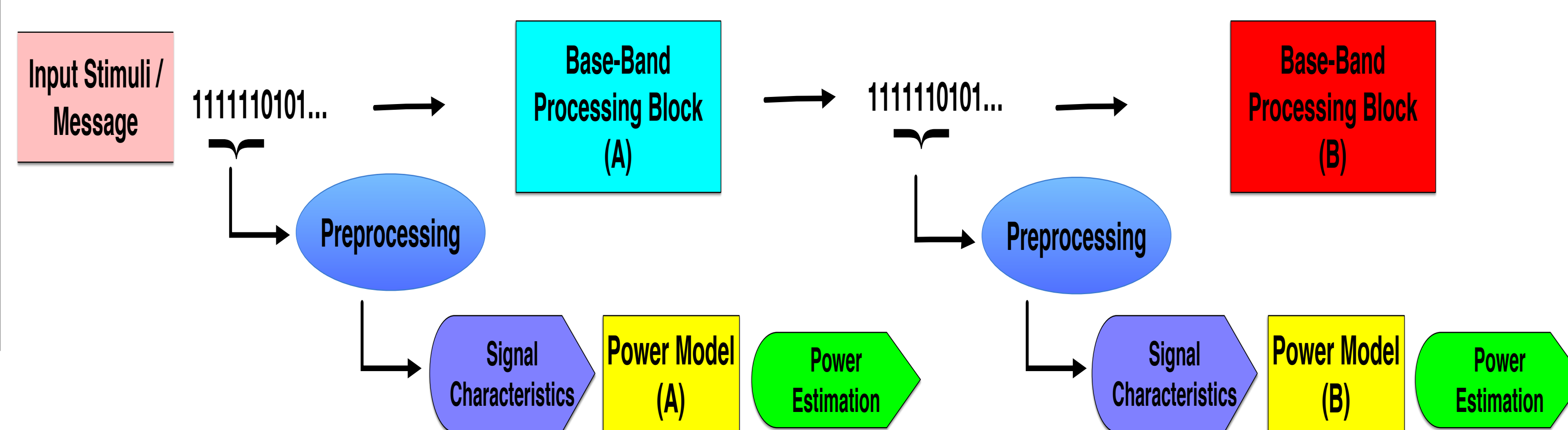
Power Exploration Framework

Integrated In High Level Tools for POWER ESTIMATION



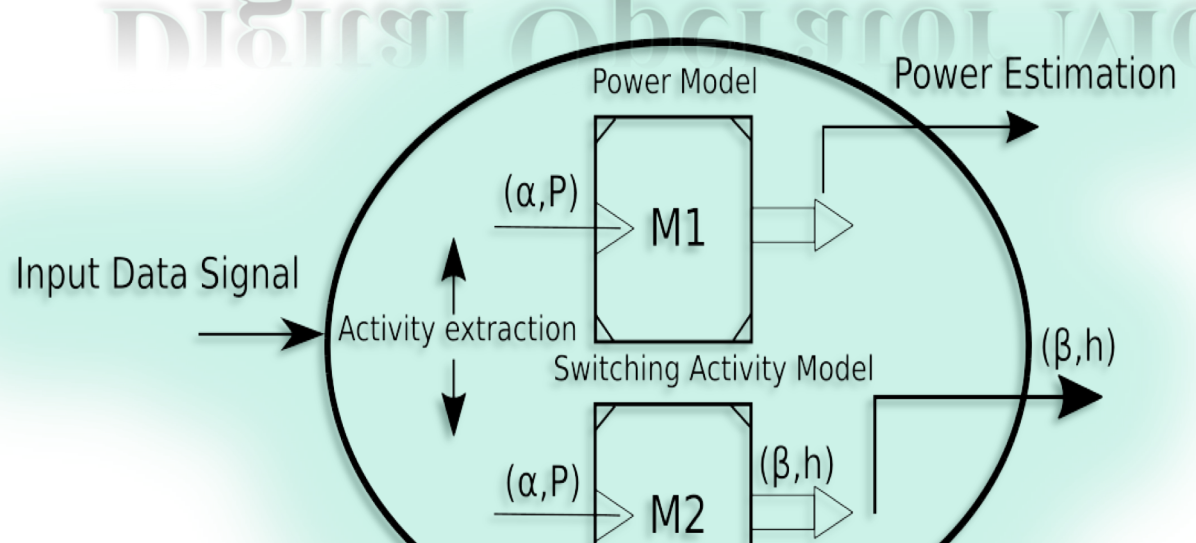
- Bottom up Approach
- Low Level Power Characterization of an Operator on FPGA
- Power Models to be Integrated in a Components Library
- High Level Simulation for Power Estimation
- Power Models Framework to Explore the Design Space

Algorithmic Description (AD)

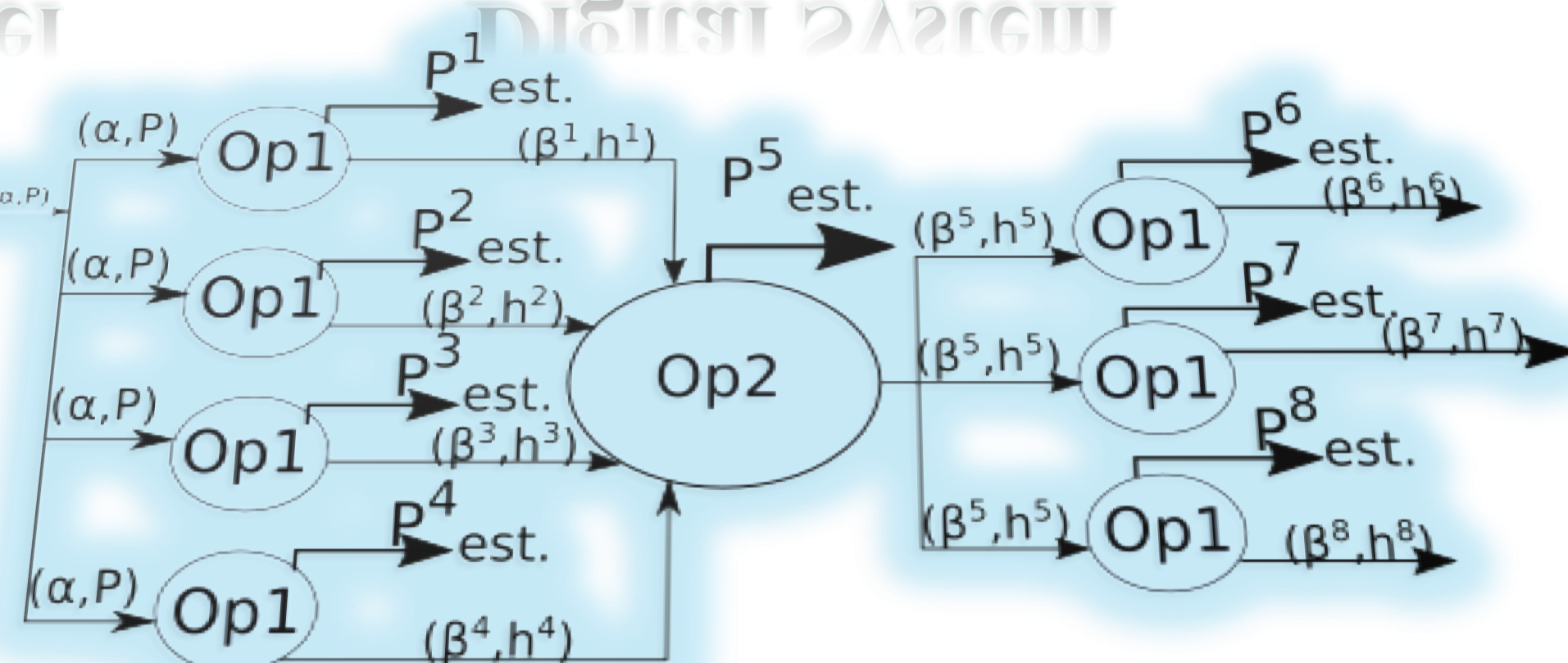


Deep In The approach

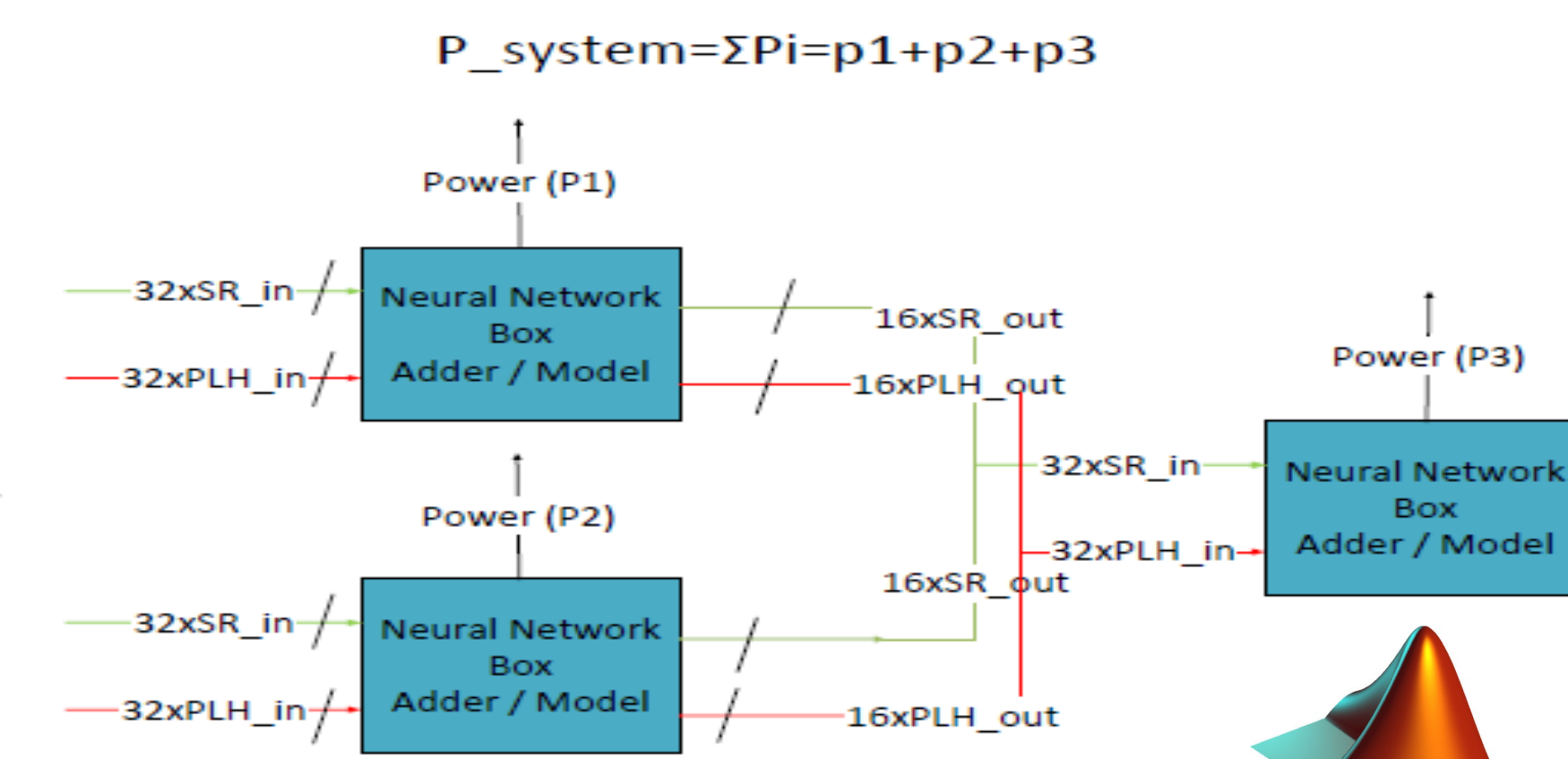
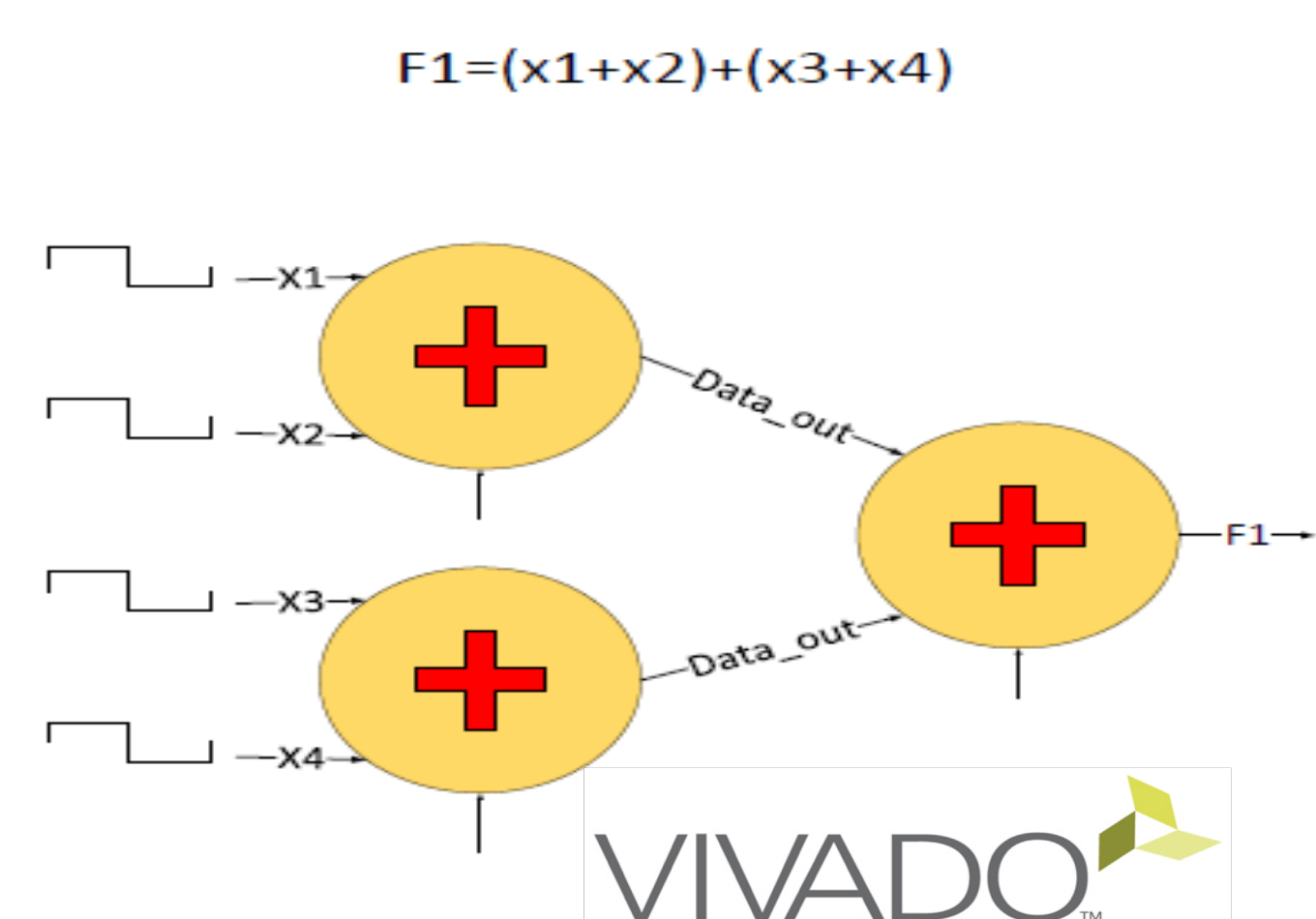
Digital Operator Model



Digital System



Signal Characteristics Propagation



Results and Conclusion

- ❖ Comparing results using Xilinx Tool (XPA) and Power Models :
 - Maximum Mean Absolute Error Less Than 1% per Operator
 - Maximum Mean Absolute Error Less Than 8% per System
- ❖ Advantages:
 - Fast and Early Power Estimation
 - Flexible Power Evaluation of Different Architectural Scenarios
 - Design Space Exploration
- ❖ Disadvantages:
 - Less Accurate Approach
 - Accuracy is Related to the Design Size
 - Significant Characterization and Modeling Time
- ❖ Future Work:
 - Extract Real Power Values from a Real Measurement Bench
 - Improve Different Modeling Techniques