Stream-Based Processing

- Partition data flow oriented process
  - Common interface
  - Partitioning: Spatial and temporal
  - Programming: Application level and device level
- Examples of Stream-Based Processing
Reconfigurable Computing

**Essence:**

Independent (potentially self-steering) streams of programming information and operand data that interact within the architecture to perform the computational problem at hand.
Wormhole RTR Stream Format

Stream Format

Program/Flow Header

Data

Configuration information
- Routing information
- Variable size
- Possibly removed as stream routes

Application data stream
- Possibly chained
- Variable size
Modular Stream-Based Design

- Modular design
  - Interchangeable and simplifies design process
  - Global complexity traded for local complexity
    - Increases size of each module

- All modules contain:
  - State machine
  - Configuration registers
  - Processing pipeline
  - Bypass pipeline
Module Design Process

1. Concept and Algorithms
2. High-level Simulation (Matlab, SPW)
3. Hardware Verification
4. Place & Route (Xilinx)
5. Synthesis (Synopsys)
6. VHDL Description
7. VHDL Simulation (WVOffice)

Test vectors flow through the process from High-level Simulation to VHDL Description, then to Synthesis.
Generic Stream Module

- 10-BIT DATA IN
- DATA
- 10-BIT DATA OUT
- Module State Machine
- Status Pipeline
- Stage 0
- Stage 1
- Stage N
- Output Mux