Benefits of Network on Chip Fabrics
For Late Stage Design Changes, Adaptive QoS and Floorplan Selection

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April 30, 2014
Arteris Snapshot

Founded in 2003; headquarters in Silicon Valley

Awards

Customer Adoption

Timeline of Key Events*

2003 - Arteris is founded by Philippe Boucard, Alain Fanet and Cézar Douady in Paris.
2004 - Charlie Janac joins Arteris as CEO.
2005 - Arteris receives first funding from Crescendo Ventures, Ventech and TVM Capital.
2006 - Arteris secures funding in a round led by Synopsys and moves headquarters from Paris to Silicon Valley.
2007 - Arteris ships its first interconnect IP product called "NoCSolution" and closes US$ 1 million in licenses almost immediately.
2008 - Texas Instruments selects the Arteris NoCSolution IP for OMAP4 Application Processor development. TI works with Arteris to productize NoC technology.
2009 - Arteris ships second-generation NoC: FlexNoC. It closes funding from Qualcomm Ventures (Europe), ARM (UK) and Innotech (Japan) plus existing investors.
2010 - Arteris becomes profitable.
2011 - Leading smartphone models ship using Arteris interconnect technology.
2012 - A majority (~60%) of the world’s mobility system-on-chip projects adopt Arteris FlexNoC Interconnect. Arteris receives Inc. 500 and other awards for rapid growth.
2013 - Qualcomm purchases Arteris IP and engineering team in unique transaction.
2014 - Arteris announces hiring of new engineering leadership team.

*Timeline graphic courtesy of World Economic Forum
Active Customers

+9 Unannounced Customers

[Samsung] [Qualcomm] [Texas Instruments] [Spreadtrum] [HiSilicon] [Altera] [Allwinner Technology] [Applied Micro] [LG] [VIA Telecom] [RDA] [Rockchip] [MegaChips] [Pixelworks] [Toshiba] [Core Logic] [Actions] [CSR] [Renesas] [NTT Electronics] [Mobileye] [Freescale] [NSN] [LeadCore] [Schneider Electric] [Open-Silicon] [Ericsson] [SCK CPO] [mmWavevision] [CEVA] [GCT] [GUC] [Sabolic] [Accense Network Technology] [AXIS Communications] [iC-Logic] [Life, augmented] [ChipEx 2014] [April 30, 2014]
MobilEye and ADAS SoCs

Challenges
- Camera-only collision avoidance systems
- Real-time vision processing: Bandwidth and latency
- Changing floorplan late in schedule; timing closure

Initial Environment
- Crossbar, switched to FlexNoC

Solution
- Arteris FlexNoC Network-on-Chip Interconnect
- Two product lines so far

Results
- Able to manage the complexity
- Fast iterations
- Successful tape out on time
- Meet the performances requirements
SoC design flows are not really linear

FlexNoC Exploration
Structural NoC Synthesis
Automated NoC Verification
FlexVerifier
Observability

Standard TTM is 18-24 Months

Architecture | Interconnect Design | Interconnect Verification | SoC system Verification | Physical Design | T/O
---|---|---|---|---|---
A | D | V | S | P | Platform Debug

IP Design | IP Integration

original

realistic

Floorplan change

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Floorplan changed late in the schedule

- Due to wire and IPs congestion, timing closure was impossible
One tool – All Integrated

- Full automation of design steps
  - Fast and safe changes
- Quick analysis/fast iterations
  - Back annotated design
  - Performance feedback
  - Layout impact estimation
- Faster time to market
  - Early detection of issues
  - Performance validation
  - Full verification of the NoC

Full design flow integrated
Topology and pipelining flexibility save the day!

- Very low cost for Muxes/Demuxes
- Freedom of optional pipeline placement
- Pipelining optional between cascaded muxes
- Separate request and response networks
- Total flexibility in topology to match layout requirements
Different Floorplans = Different topology and Timing Challenges

Symmetric Topology

Asymmetric Topology
QoS resilient to topology changes

- Late changes do not break the QoS!

- Arteris QoS is
  - Initiator based
    - QoS drives arbitration in the network
  - Topology independent
    - QoS waves propagate with and ahead of packets

- Flexible serialization
  - Mitigates the cost of dedicated paths for critical traffic
  - Can be configured for 0 latency!
Adaptive End to end QoS is a must

Symmetric Topology

Asymmetric Topology
Adaptive End to end QoS is a must

Symmetric Topology

Asymmetric Topology

- Low priority
- Medium priority
- High priority

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Conclusions

- Front-end design teams must adapt to late-stage changes
- Flexibility is very valuable:
  - Especially floorplan changes, topology implementation and timing closure options
  - Choice of fabric can be difference between late chip or on-time
- QoS must adapt to any topology and pipelining
- NoC interconnect fabrics have demonstrated this value and flexibility
Thank YOU