eInfochips CUDA & Application Porting Capabilities

September 2014
Contents.

- eInfochips’ Introduction
- GPU application migration expertise
- CUDA expertise
- Case Studies
- Contact Information
Product Engineering Services

Software | System | Silicon

Expert
- 20 Years
- 500+ Products
- CMMI L3 | ISO9001

Reliable
- Cash Positive
- Debt Free
- Profitable

Agile
- 1400 Professionals
- 12 Sales Offices
- 10 Design Centers
Our Work.

Application
- Cockpit Displays
- Video Software
- Endoscopy Unit
- Tablet Software

System
- 16nm Silicon
- Custom Camera
- eCommerce SW
- 3D Conferencing

Hardware
- Retail IoT
- Portable HD
- Home Control
- Biometric Access

Mechanical
- Electronic / PCB
- FPGA
- ASIC and SoC
- IP Integration

Enclosures
- CAD Modelling
- Ergonomics
- Industrial

BI and Big Data
Cloud
Mobility
e-Commerce

Firmware
Operating System
BSP and Drivers
On-Chip Features
Concept – to – Sustenance Services

Development
- Hardware Design
- Software Dev.
- Industrial Design
- Production

QA and Testing
- Independent QA
- Test Automation
- Test Management
- Certifications

Re-Engineering
- Customization
- Enhancement
- Platform Migration
- BoM Reduction

Sustenance
- Defect Mgmt.
- Product Support
- Variant Mgmt.
- Release Mgmt.
Industry Focus

World Leader in **Commercial Aerospace**
World Leader in **Video Analytics**
World Leader in **Grocery Supermarkets**
World Leader in **Networking Equipment**
World Leader in **Semiconductor Sales**
World Leader in **Nutritional Supplements**
World Leader in **Display Panels**
World Leader in **Biometric Access Devices**
World Leader in **IP Surveillance Camera**
World Leader in **ATM Machines**
World Leader in **DSP Platforms**
World Leader in **EDA Tools**
World Leader in **Automated Test Equipment**
World Leader in **Microprocessor Products**

Clientele
### Analysts Opinions.

<table>
<thead>
<tr>
<th>Award</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Asia Fast500 Award</td>
<td>Engineering and Design Services, Rockwell Collins, 2014</td>
</tr>
<tr>
<td>Global Supplier of the Year</td>
<td>Outstanding contribution to VLSI &amp; Embedded Design, Silicon India, 2013-14</td>
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<tr>
<td>Company of the Year</td>
<td>Semiconductor and Product Design, Frost &amp; Sullivan, 2013-14</td>
</tr>
<tr>
<td>Corporate Leadership Award</td>
<td>Global Service Providers Ratings, Zinnov Management Consulting, 2013-14</td>
</tr>
<tr>
<td>Leadership and Execution Zone</td>
<td>World #1 in Semiconductor Services</td>
</tr>
<tr>
<td>World #1 in Semiconductor Services</td>
<td>Rated on revenue-per-design index, Gartner, 2010</td>
</tr>
</tbody>
</table>

eInfochips has been recognized time and again, by globally reputed organizations for excellence and innovation in the solutions we deliver.
Client Endorsements and Results

"The team shows incredible amount of initiative and commitment to customers."

"To bring this product to market quickly, we found a partner in eInfochips."

"Have rarely seen such commitment from a consulting organization."

"The skillset is second to none, allowing them to deliver high quality products."

Client Awards

- The Best of Infocomm
- Engineer’s Choice Award
- NeoCon Gold Award
- TV Technology Award
- Apex Crystal Cabin Award
- EH Product of the Year
- ISC West Best in Biometrics
Expertise on algorithm migration for NVIDIA GPUs

- Well defined methodology for parallel code creation
  - Optimized GPU Performance
  - Efficient Coding Practices

- Experienced CUDA Professionals
  - Domain and Technical Experts
  - Process SMEs timely execution
  - Trained CUDA Engineers

- Extensive expertise on various NVIDIA Platforms and Tools
Methodology

eInfochips methodology has evolved from multiple algorithm migration projects for GPUs

Phase I - Feasibility

1. Serial Algorithm
2. Analyse feasibility for parallelism.
3. Feasible?
   - Yes: Cost-benefit analysis of performance improvement
   - No: Develop new algorithm for functionality needed

Phase II - Porting

1. Identify and Create multi-threads
2. Convert to GPU level Parallelism
3. Correct Synchronization and Atomicity?
   - Yes: Optimize GPU code by modifying the algorithm for GPU transperancy
   - No: Modify the algorithm

Phase III - Optimization

This phase leverages eInfochips expertise on GPU execution and NVIDIA tools to enhance algorithm performance on the GPU.
Core Team on CUDA Programming

<table>
<thead>
<tr>
<th>Shashank Khare</th>
<th>Lalit Chandivade</th>
<th>Prerit Kapadia</th>
</tr>
</thead>
</table>
| • Chief Technology Officer  
  • Spearheads all technology initiatives at eInfochips  
  • Hands-on experience on several processors and technologies  
  • 25 years of experience to address technology challenges | • Senior Manager - Engineering  
  • Manages eInfochips CUDA Programming team for NVIDIA Tegra and Tesla  
  • Expertise on Linux API and Device Driver Development  
  • 15 years experience on system software projects | • Technology Leader  
  • Experience on memory footprint optimization projects  
  • Expertise on Multimedia Technologies  
  • Execution with multi-site Agile and Scrum Methodology |
CUDA Trainings for our engineers

• Engineers trained and certified by NVIDIA
  – TESLA technical training by NVIDIA
  – UDACITY course on parallel programming
  – NVIDIA Developer training on CUDA

• eInfochips Training and Research Academy
  – In-house training engine for new hires and experienced professionals
  – Certified CUDA Training Partner with NVIDIA
<table>
<thead>
<tr>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
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<tbody>
<tr>
<td>Parallel Programming Computation</td>
<td>The age of HPC and its applications</td>
<td>Introduction to NVIDIA GPU and CUDA</td>
<td>Introduction to OpenCL</td>
<td>CUDA Tools</td>
</tr>
<tr>
<td>Parallel Computing Tools</td>
<td>Shared and Distributed Memory Programming</td>
<td>Floating point and performance consideration</td>
<td>CUDA programming using OpenCL</td>
<td>CUDA Applications</td>
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<tr>
<td>Steps to Parallelize an algorithm</td>
<td>Development – Coprocessors, MPI, OpenMP</td>
<td></td>
<td>CUDA threads and memories</td>
<td>CUDA example programs</td>
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<td>Task and data decomposition</td>
<td>Hands on Training with examples</td>
<td>Performance and algorithm Optimization</td>
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GPU Software Porting

CASE STUDIES
Quality Assessment Algorithm Optimization on NVidia GeForce 8800

Features

• Hundreds of independent floating point processors that work in parallel
• 500 to 800 Giga floating point ops/sec
• Global 1GB onboard DDR shared by all processor cores
• PCI express x16 interface for external communication
• Interface maximum data throughput of 4 GB/sec

eInfochips Role

• Ported a video quality measurement algorithm on GPU
• Achieved 300x performance improvement as compared to PC
• Reduced processing time from 90s to 250ms
• Optimized memory management for global memory to on chip shared memory to overlap data transfer and processing
• Achieved zero wait time for data while video processing
**Platform Demo Projects**

### eInfochips Role

- Android Firmware and Application on Android Gingerbread, ICS, Jelly bean
- Interfaced with NVIDIA Tegra, Qualcomm Snapdragon and TI OMAP
- Transfer Jet – NFC Wireless Protocol
- Camera Sensors – 8 to 13 MP
- Audio Codec – Noise & Echo cancellation
- Bridge chips – H2C, Slim bus, D2LLP, D2DP, D4DP
- Demonstrated applications in international conferences – CES, MWC, EWC

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**Android Application Software**

GUI to access chip functionality and load configurations

**Android Framework API**

Interface between Application software and Android Kernel

**Android Kernel**

- Linux sub-system compatible chip driver
- I2C/SPI Driver for Register control

**Host Evaluation Board**

(Tegra / Snapdragon / OMAP)

**EVM for the chip to be demonstrated**

**Hardware**

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**eInfochips**

The Solutions People
Thank You

For further details please write to :

nvidia.marketing@einfochips.com