A Erlang GPU Computing Cluster

Jan Henry Nyström
henry.nystrom@erlang-consulting.com
Kimmo Gläborg
kimmo@streamfile.com
The world's first GPU enabled FAWN
(A Fast Array of Wimpy Nodes)

- This has been done before
  - but not with GPU computing on small nodes
- Inspired by the low power usage
  - and the attractive flops/dollar ratio
- Cheap hardware (500USD per node)
- Both GPU and CPU under 100Watts!
- GPU performance has doubled every 6 months since 1990s
- CPU performance doubles every 18 months (Moore’s law)
Key Parts

- Open Source project technology
  - Erlang
  - OpenCL
- Apple Mac mini’s with Snow Leopard 10.6
Erlang

- **Declarative**
  - Functional programming language, high abstraction level, pattern matching and concise readable programs

- **Concurrency**
  - Either transparent or explicit concurrency, light-weight processes and highly scalable

- **Soft real-time**
  - Response times in the order of milliseconds per-process

- **Robustness**
  - Simple and consistent error recovery, supervision hierarchies and "Program for the correct case"

- **Distribution**
  - Explicit or transparent distribution
  - Network-aware runtime system

- **Hot code loading**
  - Easily change code in a running system. Enables non-stop operation
  - Simplifies testing

- **External interfaces**
  - "Ports" to the outside world behave as Erlang processes

- **Portability**
  - Erlang runs on any UNIX, Windows, VxWorks, ...Supports heterogeneous networks

- **SMP Support**
  - Symmetric multiprocessing support. Takes full advantage of multiple CPU architectures.
OpenCL

- The open standard for parallel programming of heterogeneous systems
- Great GPU hardware support for leading vendors
- External C program for computing
Layered Architecture

1.) coordination
   - add/remove nodes
   - cpu or gpu related task?

2.) Transport
   - local disk
   - NFS
   - infiniband

3.) Computing
   - segmentation
   - start/stop
Platform

- Apple Mac mini & Snow Leopard
- Less than 100Watts of power
- Fast CPU: 2Ghz Intel Core 2 Duo
- Fast GPU: NVIDIA 9400M
- Bundled support for OpenCL
- Suggestions for other hardware platforms?
- **Project will be given Mac mini hardware or similar**
• Think hundreds, thousands could be stacked together
Erlang Training & Consulting

The one stop shop for all your Erlang needs

• Founded in 1999
• Offices in the UK, Sweden and Poland
• Clients on Six continents
• System development experience in
  ▪ telecom, banking, e-commerce, track and trace, voice over IP, etc
• Research in collaboration with leading Universities
• We do:
  ▪ in-house system development
  ▪ on site consultancy
  ▪ contracting
  ▪ Erlang based Recruitment
  ▪ professional training at all levels
Streamfile

Tomorrows digital courier systems today

- The Streamfile platform
  - Northern Europe’s largest uploader portal
  - Scalability - written in Erlang
  - Encryption - your files are disk encrypted by our system
  - Sender owns all keys
  - Supported FTP - use your old FTP workflows
  - Integratable within your domain name
  - iPhone support