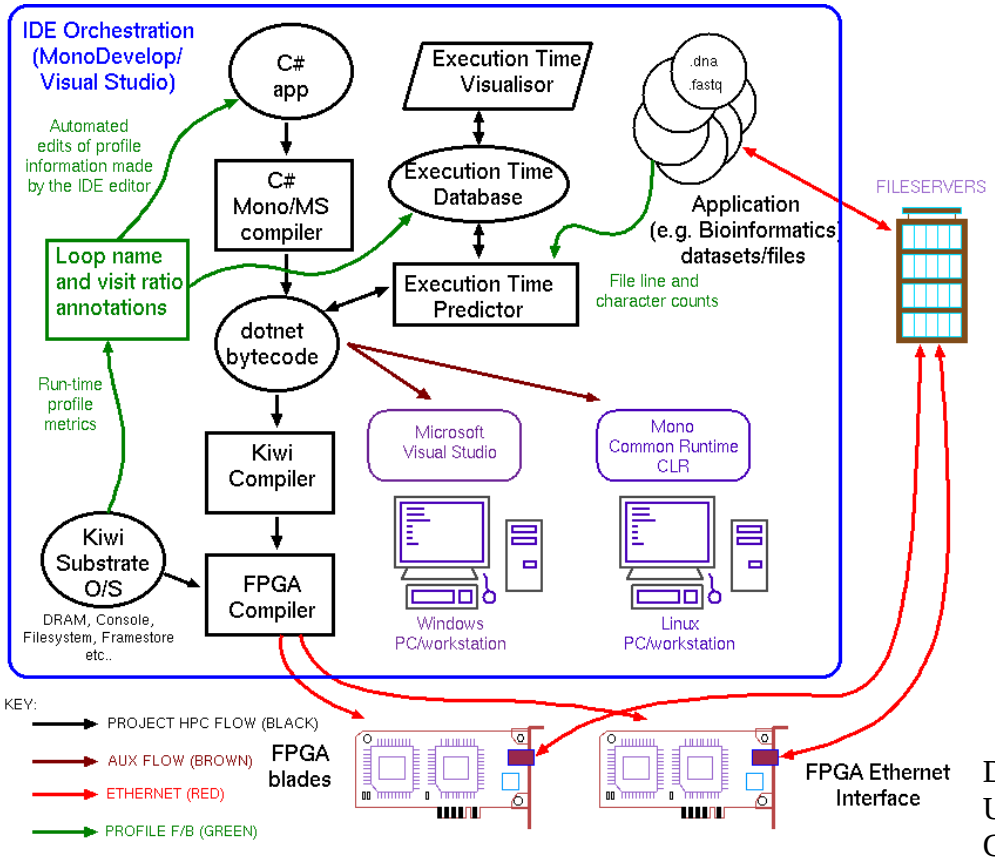
Kiwi HLS and Kiwi Scientific Acceleration using FPGA



It is widely accepted that C# and mono/dotnet provide a significant leg up compared with C++ owing to crystal clear semantics, selectively checked overflows, neat higher-order functions and delegates, amenability to compiler optimisations and automated refactoring, garbage management, versioned assemblies and so on. Many of these benefits are most strongly felt with parallel programs. Also, the LINQ/Dryad extension is a clean route for manual invocations of accelerators.

The Kiwi system has the following USPs compared with most/all other HLS tools:

> Source language is C# (or other CIL PE-generating HLLs),
> The same program runs on mono/dotnet for development as on the FPGA for high-performance execution,
> Concurrent (parallel) programs are supported,
> Dynamic allocation of objects and manipulation of object pointers is supported,
> Automatic mapping of arrays and object heap to appropriate memory subsystems,
> Channel communication between separately-compiled components, instead of manual bit banging of wires to implement a protocol,
> Floating-Point is supported (custom precision F/P in the future),
> Mix hard and soft coding styles where clock cycle mapping is/is not controlled from the C# file (for manual bit-banging of net-level protocols) or fully automatic (for Scientific Acceleration),
> Advanced register colouring taking into account wiring length under 2-D projection and multiplexor fan-in
> Some recursive programs are supported (unlimited recursion again in the future),
> Fully-pipelined accelerator mode generates sequencer-less, high-throughput pipes, eg for AES,
> Compile on linux or Windows with existing substrate templates for Zynq, VC-707 and NetFPGA

Performance predictor: uses extrapolation to rapidly estimate how fast your FPGA will process your dataset without lengthy FPGA place and route experiments. Avaliable next year.

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10 or so alpha users (victims)
10 further users welcome to sign up during FPL'16
Open source release end of 2016.

Also currently being used for network deep-packet inspection.

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Kiwi Scientific Acceleration