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SVE programming

The Mont-Blanc 2020 approach for SoC codesign

#HiPEAC21

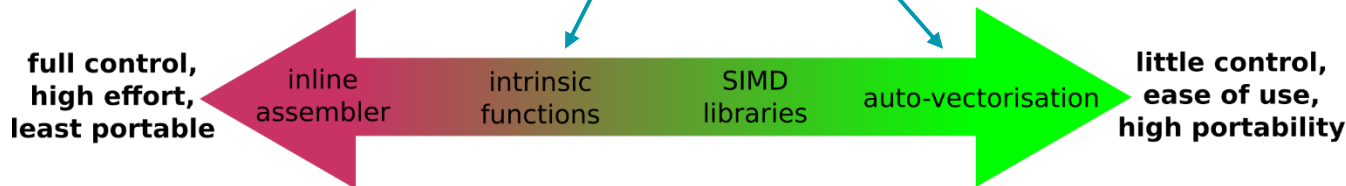


SVE programming

- Many different ways of generating SVE instructions:
 - Auto-vectorisation (GCC, ACfL, Clang, FCC)
 - Libraries supporting SVE (ArmPL, NSIMD, SLEEF, ...)
 - Intrinsic functions
 - Inline assembler
- Our example: SAXPY (BLAS level 1 routine)


$$\vec{y} = a \vec{x} + \vec{y}$$

- \vec{y} and \vec{x} are vectors of size n , a is scalar
- Single precision floating-point numbers



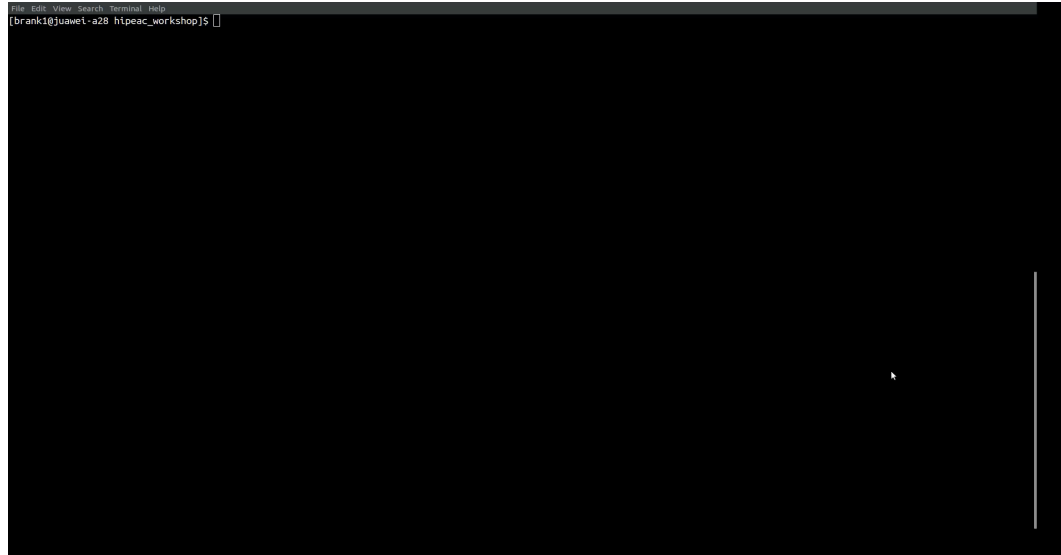
→ Auto-vectorisation:

- Supported in all major compilers
- SIMD vectorisation automatically included with `-O2` or higher
- Targeting Neon or SVE with flag: `-march=armv8-a+[simd|nosimd]+[sve|nosve]`



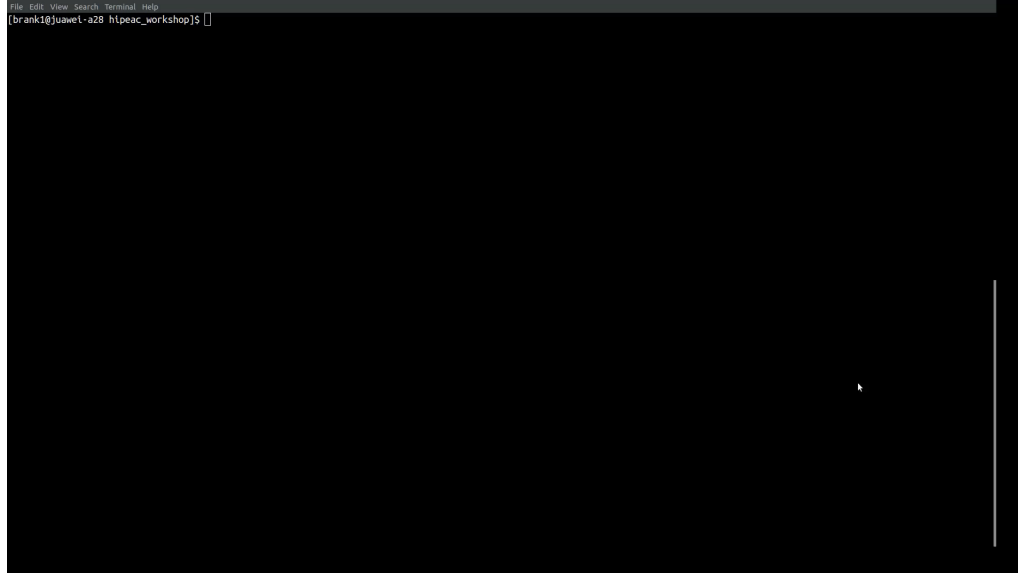
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[brank1@juawel-a28 hipecac_workshop]$
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- Intrinsic functions (Arm C Language Extensions for SVE):
 - Set of types and accessors for SVE vectors and predicates
 - Function interface for relevant SVE instructions
 - All types and functions have a prefix 'sv'
 - Sizeless types



ArmIE – Arm Instruction Emulator

- Running SVE binaries on Arm platforms that do not support SVE
- Easier than Gem5, but no timing information
- Different instrumentation clients available
- Example:
 - `armie -msve-vector-bits=512 -i libinscount_emulated.so -- ./saxpy_sve.x`

A terminal window with a black background and white text. The title bar at the top reads "file Edit View Search Terminal Help". The terminal content shows the prompt "[brank10]@uawel-a28 h[peac_workshop]\$ " followed by a blank line, indicating the command from the list above has been entered but not yet executed.

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file Edit View Search Terminal Help
[brank10]@uawel-a28 h[peac_workshop]$
```

Conclusion

- Many options for generating SVE code
- Easy to test SVE binaries with ArmIE
- Further resources:
 - Arm Compiler for Linux
 - <https://developer.arm.com/documentation/101458/2030/Get-started/Get-started-with-Arm-C-C---Compiler>
 - ACLE for SVE
 - <https://documentation-service.arm.com/static/5f905515f86e16515cdc1a88>
 - ArmIE
 - <https://developer.arm.com/documentation/101726/0200/Arm-Instruction-Emulator/Introduction-to-Arm-instruction-Emulator--armie->
 - Arm Performance Libraries
 - <https://www.arm.com/products/development-tools/server-and-hpc/allinea-studio/performance-libraries>