LLVM Linux on x86
state of the union

LLVM microconference
LPC 2015
Overall status

- Patches currently in the queue:
  - 22 for all architectures (down 15)
    - (kbuild, Makefile, lib, drivers)
  - 5 for x86 (down 2)
    - boot-workaround-PR18415.patch
    - export-memcpy-clang-x86_64.patch
    - hweight-x86.patch
    - vlais-xen-mmu.patch
    - workaround_align_jump.patch
Known broken

x86:
- AES-NI (intel, crypto, assembly)
- arch_hweight flags (x86)
  - (flags hardcoded in Kconfig, no switch, not yet upstream)
- -falign-jump=1/-falign-loop=1
  - came up in 4.2-rc, investigating

General
- VLAIS in drivers (whack-a-mole)
AES_NI (crypto)

- `aes_ctrby8_avx-x86_64.c`
  
  arch/x86/crypto/aes_ctrby8_avx-x86_64.S: Assembler messages:
  
  arch/x86/crypto/aes_ctrby8_avx-x86_64.S:552: Error: bad expression
  arch/x86/crypto/aes_ctrby8_avx-x86_64.S:552: Error: junk at end of line, 
  first unrecognized character is `x'

- Tracking bug:
  
  https://llvm.org/bugs/show_bug.cgi?id=24494
New: HOSTCC=clang & kbuild

kernel/bounds.c:18:2: error: unexpected token at start of statement

    DEFINE(NR_PAGEFLAGS, __NR_PAGEFLAGS);

^

include/linux/kbuild.h:5:18: note: expanded from macro 'DEFINE'

asm volatile("\n@->" #sym " %0 " #val : : "i" (val))

^

<inline asm>:2:2: note: instantiated into assembly here

@->NR_PAGEFLAGS $23 __NR_PAGEFLAGS

^
New: HOSTCC=clang & kbuild

- workaround: scripts/Makefile.build (integrated-as is meanwhile default on x86)
  
cmd_cc_s_c = $(CC) $(c_flags) -no-integrated-as $(DISABLE_LTO) -fverbose-asm -S -o $@ $<

- Similar/related to our patch kbuild-asm-defines.patch (which just mitigates the problem for -no-integrated-as)
- As this no „real“ assembly, we cannot expect clang to support it.
- Here we need to add -no-integrated-as depending on which compiler is used. Possibly:
  - check in scripts/Makefile.build (also) for COMPILER and export variable similar to DISABLE_LTO.
- This is pre-Kconfig early in the Make process.
- Patch WIP.
New: ALTERNATIVE (IA on)

clang -Wp,-MD,arch/x86/entry/.entry_64.o.d -nostdinc -isystem [...] -c -o arch/x86/entry/entry_64.o arch/x86/entry/entry_64.S

<instantiation>:4:8: error: expected absolute expression
   .skip -(((144f-143f)-(141b-140b)) > 0) * ((144f-143f)-(141b-140b)),0x90

^ arch/x86/entry/entry_64.S:599:2: note: while in macro instantiation
   ALTERNATIVE "", "byte 0x0f,0x01,0xca", ( 9*32+20)
   ^

<instantiation>:4:8: error: expected absolute expression
   .skip -(((144f-143f)-(141b-140b)) > 0) * ((144f-143f)-(141b-140b)),0x90

^<instantiation>:2:2: note: while in macro instantiation
   ALTERNATIVE "", "byte 0x0f,0x01,0xca", ( 9*32+20)
   ^

arch/x86/entry/entry_64.S:774:1: note: while in macro instantiation
apicinterrupt3 0x20 irq_move_cleanup_interrupt smp_irq_move_cleanup_interrupt
^
New: ALTERNATIVE

Tracked here:
https://llvm.org/bugs/show_bug.cgi?id=24487
Goal allyesconfig

- Not there, yet
- lots of small/large issues to be fixed everywhere (mostly VLAIS, quirks in drivers)
- Definitely broken (and probably wontfix)
  - CONFIG_GCOV_KERNEL
    - (gcda functions not present – has to be coded)
  - CONFIG_MISDN
  - CONFIG_SCSI_QLA_FC / _TCM_QLA2XXX
- http://llvm.linuxfoundation.org/index.php/Broken_kernel_options
  - Xen patch available
  - Down to disabling these:
    - CONFIG_CRYPTO_AES_NI_INTEL
    - BUILD_DOCSRC
    - CONFIG_GCOV_KERNEL
    - CONFIG_RANDOMIZE_BASE
  
  - → defconfig !!
Goal defconfig

- Workable target.
  - gotchas:
    - Needs llvm/clang from git HEAD
    - make CC="clang -no-integrated-as“ \ HOSTCC="clang -no-integrated-as“
Plans/Todo

- x86 defconfig ready (just CC=clang)
- bring defconfig to 0-day builder
- expand driver coverage

- We need you!
  - test, contribute patches,
  - review/submit patches upstream