Issues With LLVM Linker(s) and PX4

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- PX4 is a Dronecode project
- Flight controller
- C and C++
- BSD licensed
- Ported to Linux, and QuRT™
- Single process, multiple threads

- https://github.com/PX4/Firmware
Porting PX4

Linux
- Works with GCC/Clang and binutils (ld.bfd not ld.gold)

Hexagon
- QuRT is Hexagon DSP RTOS
- Hexagon SDK has multiple versions:
  - 6.3 version uses Clang and binutils
  - 7.X version uses Clang and QCLinker (MCLinker based)
- Builds with Clang and binutils (version 6.3)

OS X
- Partial linking not supported by LLD
Codebase Issues

- Make system uses partial linking
  - Code is comprised of modules that are a mixture of C and C++
  - Each module is partially linked (with –Ur) and hidden global variables are given local scope
  - Only ld.bfd supports -Ur
  - Modules are linked together with a linker script that combines all variables with section attribute “_param” into contiguous memory
  - Final link is done with g++ and main.cpp to satisfy C++ dependencies.
Codebase Issues

- **Param**
  - Uses code segment (_param) and partial linker script to place parameters in flash

- **Linker Script is very simple:**

  ```
  SECTIONS
  {
    __param : ALIGN(8) {
      __param_start = .;
      KEEP(*(__param*))
      __param_end = .;
    }
  }
  
  Full linker script not required
  ```
Options?

- Add –Ur support to LLD/MCLinker/QCLinker
  (Unlikely to happen)

- Compile modules as archives
  - Link archives with main.cpp
  (Doesn’t resolve _param issue and linker script)

- Link all object files at once (hundreds) and write full linker script
  (Um… eww)

- ???