# Porting Software To Genode

Alexander Weidinger

July 11, 2017

Technische Universität München

# Overview

- Native port of an application or library
- (Using Genode's Noux runtime)
- (Porting device drivers)

## Steps

1. Look up dependencies
2. Writing a **.port* file
3. Writing a **.mk* file
4. Compilation
5. Testing

# Filesystem Structure Genode-World

- src *(source code or patch files incl. *.mk files)*
    - app
    - lib
    - test
    - ...
- lib *(*.mk files for libs incl. import-mk files)*
    - import
    - mk
- ports *(*.hash and *.port files)*
- run *(*.run files)*

# libmosquitto

# *.port And *.hash Files

## ports/libmosquitto.port

```
VERSION   := 1.4.12
DOWNLOADS := mosquitto.archive
LICENSE   := EPL

URL(mosquitto) := https://mosquitto.org/files/source/mosquitto-$(VERSION).tar.gz
SHA(mosquitto) := 1451547e56bf4d33ea156cbc21f1d12acb58318b
DIR(mosquitto) := src/lib/libmosquitto

PATCHES := src/lib/libmosquitto/net_mosq.patch
```

## ports/libmosquitto.hash

```
c12001a88ffc6f51cc5f8e23e50078eb4e2ce5cc
```

# target.mk file

## lib/mk/libmosquitto.mk

```
LIBMOSQUITTO_DIR := $(call select_from_ports,libmosquitto)/src/lib/libmosquitto

SRC_LIBMOSQUITTO := logging_mosq.c memory_mosq.c messages_mosq.c mosquitto.c \
        net_mosq.c read_handle.c read_handle_client.c read_handle_shared.c \
        send_client_mosq.c send_mosq.c socks_mosq.c srv_mosq.c thread_mosq.c \
        time_mosq.c tls_mosq.c util_mosq.c will_mosq.c

INC_DIR += $(LIBMOSQUITTO_DIR) $(LIBMOSQUITTO_DIR)/lib $(LIBMOSQUITTO_DIR)/lib/cpp/

SRC_CC = $(addprefix $(LIBMOSQUITTO_DIR)/lib/, $(SRC_LIBMOSQUITTO)) \
         $(LIBMOSQUITTO_DIR)/lib/cpp/mosquittopp.cpp

LIBS += libc libc_lwip lwip pthread stdcxx libssl

CC_DEF += -DWITH_TLS -DWITH_TLS_PSK -DWITH_EC -DWITH_SOCKS -DWITH_THREADING

SHARED_LIB = yes

CC_OPT += -O2
```

# import.mk file

## lib/import/import-libmosquitto.mk

```makefile
LIBMOSQUITTO_PORT_DIR := $(call select_from_ports,libmosquitto)
INC_DIR += $(LIBMOSQUITTO_PORT_DIR)/src/lib/libmosquitto/lib/ \
           $(LIBMOSQUITTO_PORT_DIR)/src/lib/libmosquitto/lib/cpp
```

# Testing

- Write an application, which makes use of the library

# Testing

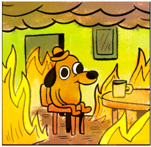
- Write an application, which makes use of the library
- Compile and run it

## Testing

- Write an application, which makes use of the library
- Compile and run it
- Hope for the best

# Testing

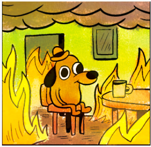
- Write an application, which makes use of the library
- Compile and run it
- Hope for the best

[1]

[1] http://knowyourmeme.com/memes/this-is-fine

# Testing

- Write an application, which makes use of the library
- Compile and run it
- Hope for the best
- Write patches, port additional libraries, ...


[1]

[1] http://knowyourmeme.com/memes/this-is-fine

# Problems With Libmosquitto

## Missing implementations

```
[init -> mpct] int socketpair(int, int, int, int*): socketpair not implemented
```

## Double initializations

```
Plugin::Plugin() {
  Genode::log("using the lwIP libc plugin");
  lwip_tcpip_init();
}
```

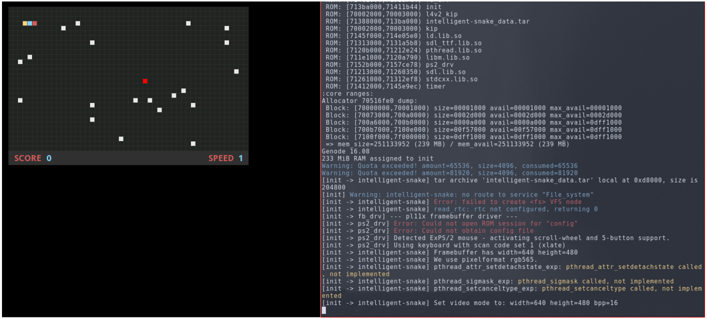
# Patches For Libmosquitto

## src/lib/libmosquitto/net_mosq.patch

```
+++ src/lib/libmosquitto/lib/net_mosq.c
@@ -1172,7 +1172,6 @@ int _mosquitto_socket_nonblock(mosq_sock_t sock)
 #ifndef WITH_BROKER
 int _mosquitto_socketpair(mosq_sock_t *pairR, mosq_sock_t *pairW)
 {
-#ifdef WIN32
         int family[2] = {AF_INET, AF_INET6};
         int i;
         struct sockaddr_storage ss;
@@ -1278,25 +1277,5 @@ int _mosquitto_socketpair(mosq_sock_t *pairR, mosq_sock_t *pairW)
                 return MOSQ_ERR_SUCCESS;
         }
         return MOSQ_ERR_UNKNOWN;
-#else
-        int sv[2];
-
-        if(socketpair(AF_UNIX, SOCK_STREAM, 0, sv) == -1){
-                return MOSQ_ERR_ERRNO;
-        }
@@[...]
-        *pairR = sv[0];
-        *pairW = sv[1];
-        return MOSQ_ERR_SUCCESS;
-#endif
 }
 #endif
```

# References

1. Genode Porting Guide: Overview
2. A simple snake clone in C and SDL 1.2



```
 ROM: [713ba000,71411b44) init
 ROM: [70002000,70003000) l4v2_kip
 ROM: [71388000,713ba000) intelligent-snake_data.tar
 ROM: [70002000,70003000) kip
 ROM: [7145f000,714e05e0) ld.lib.so
 ROM: [71313000,7131a5b8) sdl_ttf.lib.so
 ROM: [7120b000,71212e24) pthread.lib.so
 ROM: [711e1000,7120a790) libm.lib.so
 ROM: [7152b000,7157ce78) ps2_drv
 ROM: [71213000,71260350) sdl.lib.so
 ROM: [71261000,71312ef8) stdcxx.lib.so
 ROM: [71412000,7145e9ec) timer
:core ranges:
Allocator 70516fe0 dump:
 Block: [70000000,70001000) size=00001000 avail=00001000 max_avail=00001000
 Block: [70073000,700a0000) size=0002d000 avail=0002d000 max_avail=0002d000
 Block: [700a6000,700b0000) size=0000a000 avail=0000a000 max_avail=0dff1000
 Block: [700b7000,7100e000) size=00f57000 avail=00f57000 max_avail=0dff1000
 Block: [7100f000,7f000000) size=0dff1000 avail=0dff1000 max_avail=0dff1000
 => mem_size=251133952 (239 MB) / mem_avail=251133952 (239 MB)
Genode 16.08
233 MiB RAM assigned to init
Warning: Quota exceeded! amount=65536, size=4096, consumed=65536
Warning: Quota exceeded! amount=81920, size=4096, consumed=81920
[init -> intelligent-snake] tar archive 'intelligent-snake_data.tar' local at 0xd8000, size is
204800
[init] Warning: intelligent-snake: no route to service "File_system"
[init -> intelligent-snake] Error: failed to create <fs> VFS node
[init -> intelligent-snake] read_rtc: rtc not configured, returning 0
[init -> fb_drv] --- pl11x framebuffer driver ---
[init -> ps2_drv] Error: Could not open ROM session for "config"
[init -> ps2_drv] Error: Could not obtain config file
[init -> ps2_drv] Detected ExPS/2 mouse - activating scroll-wheel and 5-button support.
[init -> ps2_drv] Using keyboard with scan code set 1 (xlate)
[init -> intelligent-snake] Framebuffer has width=640 height=480
[init -> intelligent-snake] We use pixelformat rgb565.
[init -> intelligent-snake] pthread_attr_setdetachstate_exp: pthread_attr_setdetachstate called
, not implemented
[init -> intelligent-snake] pthread_sigmask_exp: pthread_sigmask called, not implemented
[init -> intelligent-snake] pthread_setcanceltype_exp: pthread_setcanceltype called, not implem
ented
[init -> intelligent-snake] Set video mode to: width=640 height=480 bpp=16
```