Porting Nemo Mobile and Mer Project to new Hardware

Marko Saukko
sage@merproject.org
Twitter: @markosaukko

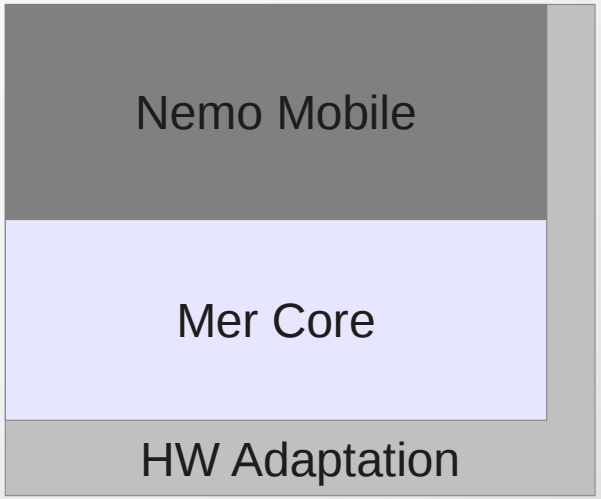
Twitter hashtags: #nemomobile and #merproject

Outline

- Generic notes
- Mer Platform SDK
- Adaptation points
  - Kernel, Graphics, Xorg, Sensors, Audio, usb, etc.
- How to build image for your adaptation
  - Packaging, patterns, kickstarts, image building..

General notes ..

- After this presentation listener should know what are the adaptation points needed and where to start the new adaptation for Mer and Nemo
- As Nemo is build on top of Mer, Mer dependencies/requirements also apply to Nemo
- Mer and Nemo contain as few hw adaptation bits in the main repos as possible
  - Exception, e.g., mesa llvmpipe
  - Report problems to bugzilla
    - https://bugs.merproject.org/
    - https://bugs.nemomobile.org



.. continue

- When building hardware adaptation one should not need to (re)compile any of the components that are located in Mer or Nemo repositories
- Usually normal Nemo image contains around 500 packages from which 5-20 are from the hardware adaptation
- This presentation does not go through all of the details of certain components, but aims to give the general overview of points where adaptation is needed

Mer Platform SDK

- NOTE: Platform SDK, not Application SDK
- All the tools that you need
  - Scractchbox 2, mic, osc, mer-kickstarter, ...
- Works on any typical Linux distribution, with kernel >= 2.6.37
- Very easy to install see tl;dr; guide in wiki
- https://wiki.merproject.org/wiki/Platform_SDK

Mer Hardware Requirements

- There are no real minimum requirements
- Can work on pretty much anything, e.g.,
  - N900, N950, N9
  - Nexus 7
  - Pandaboard
  - Snowball
  - Rasperry Pi
  - ExoPC, Lenovo Ideapad S10-3t, ...

Mer Architectures

Mer port name	Description
i486	Generic i486+ X86 port
i586	SSSE3 enabled X86 port
armv6l	ARMv6 + VFP port
armv7l	ARMv7 VFPv3-D16 port, softfp ABI
armv7hl	ARMv7 VFPv3-D16 port, hardfp ABI
armv7tnhl	ARMv7 VFPv3-D16 port, hardfp ABI, NEON, Thumb2
mipsel	ARMv7 VFPv3-D16 port, hardfp ABI, NEON, Thumb2

https://wiki.merproject.org/wiki/OBS_architecture_naming

Bootloader

- Almost every hw has its own bootloader and the way it is used
  - U-boot most common one
  - Usually needs kernel cmdline modifications, e.g.,
    - New paths for the location of the Mer rootfs
    - Removing initrd loading if not used with Mer

Mer: Kernel

- Minimum kernel version 2.6.32
  - 2.6.32 needs some patches for cgroups
  - 2.6.37 should have everything needed
  - https://wiki.merproject.org/wiki/Adaptation_Guide
- Check the required kernel config options with mer-kernel-checks
  - https://github.com/lbt/mer-kernel-check/
  - mer_verify_kernel_config < .config
    - Checking for the modules that are needed by the different systems that are available in Mer
    - Makes difference between optional and mandatory values
- Example packaging available at https://github.com/lbt/mer-kernel-adaptation

Mer: Graphics Adaptation

- OpenGLES 2.0 recommended (for Nemo Mobile required)
- Needs to provide certain files, such as, libEGL.so.1, libGLES_CM.so.1 and libGLESv2.so.2
- If not provides mesa-llvmpipe packages will be quite easily dragged in instead
- Template packaging available at https://github.com/saukko/mer-graphics-adaptation

Mer: Xorg (1/2)

- Add required configuration to /etc/X11/xorg.conf.d/*.conf or /usr/share/X11/xorg.conf.d/*.conf
  - For example graphics driver and touch usually requires a configuration to be added
- Start with standard fbdev driver, i.e., xorg-x11-drv-fbdev (in Mer Core)
- Multitouch with xorg-x11-drv-mtev (in Mer Core)

Mer: Xorg (2/2)

- Example of mtev config

```
Section "InputClass"
        Identifier              "eGalax Touchscreen"
        MatchVendor             "eGalax"
        MatchDevicePath         "/dev/input/event*"
        Driver                  "mtev"
        Option                  "Ignore"                "off"
EndSection
```

After Xorg – Zephyr

Zephyr is an attempt at creating a stack for use by other projects to be exploring lightweight, high-performance, next-generation UIs based on Mer, Qt5, QML compositor and Wayland.

https://wiki.merproject.org/wiki/Zephyr

Mer: Sensors (1/2)

- Sensorfw – handles rotation with accelerometer, magnetometer etc.
  - Adaptation needs config file and also in some cases new plugin to be written
  - Config files located at /etc/sensorfw/*.conf
- Currently plugins/configs are in Mer core, but those are going away. See: MER#557 and MER#558

- Example code for sysfs adaptor: http://meego.gitorious.org/meego-middleware/sensorfw/blobs/master/examples/adaptorplugin/sampleadaptor.cpp

Mer: Sensors (2/2)

N9: /etc/sensorfw/sensord-rm_696.conf

```
[accelerometer]
dataranges = "-2048=>2048"
intervals =
"0,10,20,25,40,50,100,200,250,500,1000"
transformation_matrix = "-1,0,0,0,-1,0,0,0,-1"

[als]
driver_type = 2
path = /dev/apds990x0
dataranges = "0=>65535"
intervals = 0

[keyboardslider]
input_match = gpio-keys
dataranges = "0=>2"
intervals = 0

[proximity]
driver_type = 2
path = /dev/apds990x0
dataranges = "0=>1"
intervals = 0

[magnetometer]
path = /dev/ak89750
dataranges = "-4096=>4096"
intervals = "25,50,100,200,250,500,1000"
default_interval = 1000
interval_compensation = 16
scale_coefficient = 300
calibration_rate = 100
calibration_timeout = 60000

[tap]
input_match = accelerometer
dataranges = "0=>2"
intervals = 0

[orientation]
threshold_landscape = 25
threshold_portrait = 20
overflow_min = 800
overflow_max = 1250
discard_time = 750000

[context]
orientation_poll_interval = 1000
orientation_offset = 3
stability_timeout = 60
```

Mer: ofono

- Cellular adaptation
  - At times udev rule needed
  - For new modems a plugin for ofono
  - Currently supported modems listed at http://git.kernel.org/?p=network/ofono/ofono.git;a=blob;f=doc/hardware-support.txt
- https://ofono.org/

Mer: Audio

- Good ALSA driver from pulseaudio point of view
- Pulseaudio configuration
  - New port configuration for PulseAudio, which define different routing possibilities; lineout, ihf, etc.
- Phone functionality
  - If call audio is routed through PulseAudio, new PulseAudio module for data transfer with modem
  - If call audio is separate from PulseAudio, volume handling scheme needs to be adapted for new audio route
- Package: **pulseaudio-settings-<NAME>**
- Example: https://github.com/nemomobile/pulseaudio-settings-n950-n9

Nemo: Resource Policy

- Makes routing decisions and after decision pulseaudio changes the audio route
- At minimum new configurations for all enforcement points; PulseAudio, X
  - Map PulseAudio enforcement configuration against ports
  - Create a **resource-policy-<NAME>** package that contains the configs, example
- Write Prolog rules for new/changed use cases
- Binary called ohmd
  - What to do when multiple audio sources are played?
  - What to do when phone rings?
  - What to do when accessories are attached?
- https://github.com/nemomobile/policy-settings-basic

Mer: gstreamer

- Mer/Nemo contains only some very basic things required by other components
- Different hw support different ways of decoding/encoding the media and also most of these codecs/codes are patented/proprietary. Thus codecs are part of the adaptation.
- In Mer
  - gstreamer
  - gst-plugins-base
  - gst-plugins-bad-free
- In Nemo
  - gst-plugins-good

Nemo: MCE

- Responsible for
  - Screen blanking/unblanking with powerkey
  - Turning display backlight off/on to save battery
  - Turn display/touch off when talking on phone (proximity sensor)
  - Display dimming in dark room (ambient light sensor)
  - Suspending the device when possible
- By default should handle most of the things automatically
- Config files can be added when specific conditions needed
  - /etc/mce/*.ini
  - NEMO#616: Some legacy config leftovers in packaging

Nemo: DSME

- Responsible for
  - Watchdog kicking
  - Alarms – wakeup the device when alarm goes off
  - Temperature – shutdown if temperature too high
  - Battery level – shutdown if battery getting too low
  - Shutdown/reboot policy based on various inputs
    - if alarms in near future go to actdead mode instead of shutdown
- **NOTE:** DSME does not have proper configuration handling yet.

Nemo: usb-moded (1/2)

- Not needed, if no usb peripheral port
- Can use following kernel usb gadget modules: g_nokia, g_file_storage, g_mass_storage, g_ether, g_ncm and g_ffs
- Provides:
  - usb networking, also called SDK/developer mode
  - mass-storage mode – has requirements for filesystem partitioning
  - MTP (Media Transfer Protocol)
- Optional settings file at /etc/usb-moded/usb-moded.ini
  - Change default mode (usb networking)
  - Change usb networking ip

Nemo: usb-moded (2/2)

```
[mountpoints]
mount = /dev/mmcblk0p1

[sync]
nofua = 1

[altmount]
mount = /home/user/MyDocs

[usbmode]
mode = developer_mode

[network]
Ip = 192.168.3.15
Gateway = 192.168.3.14
```

Nemo: nemo-user-session

- Responsible of starting up the services for user session, e.g.,
  - Xorg, maliit, pulseaudio, lipstick, ngfd, mcompositor, ...
- Environment values in:
  - /etc/sysconfig/nemo-mobile-ui
  - ~~/etc/sysconfig/nemo-mobile-hw~~
  - /var/lib/environment/nemo/*.conf

Packaging, patterns, kickstarts, image building, ...

Where to put all of these things?

- Create a **<adaptation-x>-configs** package and put config files needed for your adaptation there
  - Pulseaudio and policy configurations usually in separate packages
- Example: nokia-n950-configs, nemo-configs-x86-generic, ...

Patterns

- One thing to mention before building an image is patterns
- Collection of packages or other patterns to be installed easily
- For Nemo the most important to remember is ”Nemo Complete” pattern
  - https://github.com/nemomobile/nemo-patterns/blob/patterns-ux/nemo-complete.yaml
- Makes it easy to update existing images

```
zypper install -f -t pattern nemo-complete
```

Creating a kickstart (.ks) file

- mer-kickstarter
  - Tool to handle multiple different adaptation configurations without need to copy-paste configuration lines
- nemo-kickstarter-configs
  - Nemo configs is a good base to start with

    https://github.com/nemomobile/nemo-kickstarter-configs/

Example .ks file

```
lang en_US.UTF-8
keyboard us
timezone --utc UTC
part / --size 1500 --ondisk sda --fstype=ext3
rootpw nemo

user --name nemo  --groups audio,video --password nemo

repo --name=mer-core --baseurl=http://releases.merproject.org/releases/latest/builds/armv7hl/packages --save --debuginfo
repo --name=ce-mw-shared --baseurl=http://repo.pub.meego.com/CE:/MW:/Shared/Mer_Core_armv7hl/ --save
repo --name=ce-apps --baseurl=http://repo.pub.meego.com/CE:/Apps/CE_MW_Shared_armv7hl/ --save
repo --name=ce-ux-mtf --baseurl=http://repo.pub.meego.com/CE:/UX:/MTF/CE_MW_MTF_armv7hl/ --save
repo --name=your-adaptation-repo --baseurl=http://url.to.your.adaptation.com/ --save

%packages
@Nemo Complete

# Add the adaptation packages
kernel-adaptation-x
graphics-adaptation-x
nemo-configs-x
%end

%post
...
%end

%post --nochroot
...
%end
```

Nemo: oneshot

- When you think about adding script to %post section of .ks file, better thing would be oneshot script
  - .ks file %post section only applies to new image creation not to image updates
- Oneshot scripts that are executed only once on next boot process
- Example of usage https://github.com/nemomobile/nemo-firstsession

Creating the image

- mic
  - Tool to create a image based on the kickstart files (.ks)

```
mic cr raw example.ks --arch=armv7hl --pkgmgr=zypp
```

- Image installation is device specific
  - https://wiki.merproject.org/wiki/Nemo/Installing

Thank you.