



Audit on GENIVI's components in AGL/Phase-1

Version 1.0
September 2015

RENESAS References

P/O No: 4509311437

Ref. No: YPR0325150

Description: AGL Distribution phase1 ML1

Abstract

This document presents the results of an audit of the packages originating from GENIVI consortium that have been pre-selected for inclusion in AGL/Phase-1.

For each package, the following tasks have been performed:

- a gap analysis with Tizen:IVI and/or AGL legacy
- measure impact on distribution
- qualify added value and alternatives
- evaluate maturity and acceptance within Open Source community
- gather legal constraints (licenses, patents ...)

Document revisions

Date	Version	Designation	Author
8 Sept. 2015	0.1	Initial release	M. Bachmann [IoT.bzh]
10 Sept. 2015	0.2	Review	S. Desneux [IoT.bzh]
14 Sept. 2015	1.0	Final version	S. Desneux [IoT.bzh]

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1. Introduction

Early 2014, AGL chose Tizen IVI as the reference distribution for its Automotive Software Stack¹.

In mid-2014, thus during the same time frame, was announced the «Tizen on Yocto» project, which intended to bring the flexibility of Yocto to the Tizen distribution².

GENIVI then distributed its reference software as a Yocto layer, directly hosted at the Yocto project homepage³.

In 2015, visible progress on Tizen IVI slow down. Finally no definitive merge between GENIVI packages and Tizen IVI and Yocto⁴ happened before Intel moved its effort onto IoT-OS. As of today, there are still a significant number of packages remaining out of sync in between Tizen, Yocto and Genivi.

In this document, we present an analysis of AGL/Phase 1 regarding GENIVI components and propose a strategy to integrate GENIVI and other projects smoothly into AGL.

For this study, the following GIT repositories have been considered:

- GENIVI 8.0 - meta-ivi layer
git://git.yoctoproject.org/meta-ivi (branch '8.0')
- GENIVI demo
http://git.projects.genivi.org/meta-genivi-demo.git (branch 'master')
- Tizen IVI 3.0 final
https://git.tizen.org/cgit/scm/bb/tizen-distro.git (tag rev_ivi_2015_02_04)
- Poky 1.7 'Dizzy'
git://git.yoctoproject.org/poky.git (branch 'dizzy')
- OpenEmbedded 1.7 'Dizzy'
git://git.openembedded.org/meta-openembedded (branch 'dizzy')

1 see <https://www.automotivelinux.org/news/announcement/2014/06/automotive-grade-linux-delivers-open-automotive-software-stack-connected>

2 see <https://lists.tizen.org/pipermail/ivi/2014-May/002470.html> and https://wiki.tizen.org/wiki/Tizen_on_Yocto_Project

3 see <http://git.yoctoproject.org/cgit/cgit.cgi/meta-ivi>

4 see <https://lists.tizen.org/pipermail/ivi/2014-October/003585.html>

2. GENIVI Components

2.1. GENIVI/Yocto/Tizen IVI differences

There were discussions in August 2015 about the OS/Common Libs recipes development and how to integrate the GENIVI layers into AGL ⁵.

An analysis has been done to identify packages impacted by the GENIVI layer. The list contains **19 packages** (systemd packages were excluded) :

POKY - GENIVI – TIZEN IVI : PACKAGES DIFFERENCES					
NAME	POKY 1.7	GENIVI 8	TIZEN IVI 3.0	Gap motivation	Description
Bash	4.3.30	3.2.48 [1]	4.3.30	GPLv2 vs. GPLv3	Basic shell interpreter
Coreutils	8.22	6.9 [1]	8.22	GPLv2 vs. GPLv3	Basic shell utilities
Gawk	4.1.1	3.1.5 [1]	4.1.1	GPLv2 vs. GPLv3	Formatting and parsing tool
Gettext	0.18.3.2	0.16.1 [1]	0.18.3	GPLv2 vs. GPLv3	Multilingual support framework
Readline	6.3	5.2 [1]	5.2	GPLv2 vs. GPLv3	Command-line support library
Parted	3.1	3.1	3.1	Depends on (GPLv2) coreutils	Partition edition utility (GPLv3)
Fuse	2.9.3	2.9.3 [2]	2.9.2		Userspace filesystem drivers

⁵ see AGL mailing list discussion, thread "OS/Common Libs Recipe Development":
<http://lists.linuxfoundation.org/pipermail/automotive-discussions/2015-August/000613.html>
<http://lists.linuxfoundation.org/pipermail/automotive-discussions/2015-August/000717.html>
<http://lists.linuxfoundation.org/pipermail/automotive-discussions/2015-August/000727.html>

POKY - GENIVI - TIZEN IVI : PACKAGES DIFFERENCES					
NAME	POKY 1.7	GENIVI 8	TIZEN IVI 3.0	Gap motivation	Description
Procps / Procps-ng	Procps 3.2.8	Procps 3.2.8	Procps-ng 3.3.9	Tizen IVI has procps-ng, GENIVI/Yocto has procps (has not been updated for years and requires distro-specific patches)	/proc virtual filesystem utilities (ps, top...)
Iptables	1.4.21	1.4.21	1.4.21	Tizen IVI provides an additional «iptables-apply» utility	Netfilter firewall configuration utility
Unzip	6.0	6.0	6.0	GENIVI/Yocto provides an additional security patch (CVE 2015- 1315)	ZIP archive extraction utility
Libarchive	3.1.2	3.1.2	3.1.2	GENIVI/Yocto provides an additional security patch (CVE 2013- 0211)	Multi-format archive and compression library
quota	4.0.1	4.0.1	none	Not provided by Tizen	Filesystem quota configuration utilities
tcp- wrappers	7.6	7.6	none	Not provided by Tizen	TCP/IP wrapper utilities (finger, tcpd...)
libcgroup	0.41	0.41	none	Not provided by Tizen	Kernel control groups manipulation library
os-release	-	-	none	Not provided by Tizen (Tizen IVI uses other scripts for this purpose)	Sets «/etc/os- release» info

POKY - GENIVI - TIZEN IVI : PACKAGES DIFFERENCES					
NAME	POKY 1.7	GENIVI 8	TIZEN IVI 3.0	Gap motivation	Description
volatile-binds	-	-	none	Not provided by Tizen	Yocto-specific systemd service for temporary mounts
glib-networking	2.38.0	2.38.0	2.38.0	?	Network subset of glib library requiring additional dependencies

[1] : maintained in Poky, but not the default version

[2] : forked and maintained in GENIVI

Another analysis has been posted on the AGL mailing list ⁶. This last one was used as an alternative source of information. Following is a raw copy of posted document on AGL mailing list:

Recipe	Scope	Detail	Depends
coreutils_6.9.bb	No	coreutils_8.22.bb is included in minimal package.	
gettext_0.16.1.bb	No	gettext_0.18.3.2.bb is included in minimal package.	
glib-networking_2.38.0.bb	Yes		gnutls nettle
readline_5.2.bb	No	readline_6.3.bb is included in minimal package.	
systemd_216.bb	No	Systemd related.	
bash_3.2.48.bb	No	bash_4.3.bb is included in minimal package.	
gawk_3.1.5.bb	No	gawk_4.1.1.bb is included in minimal package.	

6 <http://lists.linuxfoundation.org/pipermail/automotive-discussions/2015-August/000727.html>

iptables_1.4.21.bb	Yes		None
parted_3.1.bb	Yes		None
procps_3.2.8.bb	Yes		None
quota_4.01.bb	Yes		tcp-wrapper
tcp-wrappers_7.6.bb	Yes		None
unzip_6.0.bb	Yes		None
fuse_2.9.3.bb	Yes	Need meta-ivi from GENIVI Need to adopt patch same as GENIVI	None
gettext_0.16.1.bb	No	gettext_0.18.3.2.bb is included in minimal package.	
libcgroup_0.41.bb	Yes		None
os-release.bb	Yes		None
systemd-compat-units.bb	No	Systemd related.	
systemd-serialgetty.bb	No	Systemd related.	
systemd_216.bb	No	Systemd related.	
volatile-binds.bb	No	Systemd related. This package is only for correcting location of "umount" binary on rootfs.	
gawk_3.1.5.bb	No	gawk_4.1.1.bb is included in minimal package. Duplicated of above.	
libarchive_3.1.2.bb	Yes		None

2.2. Explanation of motivations

2.2.1. GPLv2 vs. GPLv3 issue

Recent GNU software tend to use the GPLv3 license, which compared to the former GPLv2, adds some additional constrains onto software distribution. Such restrictions are often considered as an issue for derived proprietary embedded systems. For a detailed description of potential issues, please read:

<http://www.zdnet.com/article/using-gpl-software-in-embedded-applications/>.

Instructions for building the older 6.0.0 GENIVI release contained an explicit mention to prohibit the use of the GPLv3: <http://git.yoctoproject.org/cgit/cgit.cgi/meta-ivi/tree/README.md?h=6.0>

Tizen IVI had no such restriction.

As a result, some packages differ as they are kept at their older GPLv2 revisions. Currently:

- Bash
- Gawk
- Coreutils
- Gettext

Bash, Gawk and Coreutils are merely tools, and can be easily replaced. Gettext, on the other hand, is a widely-used internationalization library with ramifications deep inside the system.

Please also note that these dependencies impact the following package:

- Parted

Side notes

As a side note, recent GENIVI build instructions do not contain anymore the GPLv3 mention: <http://git.yoctoproject.org/cgit/cgit.cgi/meta-ivi/tree/README.md>. Does this means that GENIVI now allows GPLv3 packages? A formal clarification on GPL license policies would be more than welcome.

Suggestions

Whether GENIVI would allow GPLv3, it would then be possible to switch to more recent versions of many packages (except for Gettext).

If it does not, then we have to keep these older versions until a suitable replacement is found.

Potential replacements include :

- **Bash:**
Dash (<http://gondor.apana.org.au/~herbert/dash/>)
ksh (<http://www.kornshell.com>)
- **Gawk:** BWK awk (<http://www.cs.princeton.edu/~bwk/btl.mirror>)
- **Coreutils :** Toybox (<http://www.landley.net/toybox>)
- **Parted:** GPT fdisk (<http://sourceforge.net/projects/gptfdisk/>)

2.2.2. Package misalignment

Tizen Yocto was supposed to align all its packages versions with Yocto 1.7. There is only one package which does not comply :

- Fuse

The Tizen IVI version is a bit older. As there is no technical explanation, this is most likely to be a mistake or an oversight. Updating should be straightforward.

Suggestions

Stick to the Yocto/OpenEmbedded version.

2.2.3. Custom patches

Yocto provides two packages with applied patches, making them differ from Tizen IVI :

- Unzip
- Libarchive

The patches are security fixes, one of which (CVE 2015-1315 for Unzip) was released subsequently to Tizen IVI's latest release (mid-February 2015). Using these Yocto-patched versions is a no-brainer.

Suggestions

Keep the Yocto versions, with custom patches.

2.2.4. Nonexistent packages

There are some packages which simply do not have any correspondence between distributions. This mostly happens for «administrative» packages (i.e. used for compilation or production of the final image) or for strategical reasons.

Packages present in Tizen IVI, but NOT in GENIVI/Yocto

- Procps-ng
 - « Procps » is the traditional package providing /proc-related command-line tools

(ps, top, skill...). However, it has not been updated for years and requires lots of custom patches for today's uses; hence why Tizen IVI prefers to use its « Procps-ng » fork instead.

Yocto 1.7, though, unfortunately does not provide this package.

Suggestions

Keep the Tizen IVI version, store it in the AGL tree, and submit it to the upstream Yocto project meanwhile. This way, future AGL releases may be able to use Procps-ng directly without maintaining the packaging.

Packages present in GENIVI/Yocto, but NOT in Tizen IVI

- Quota
- Libcgroup
- Tcp-wrappers
- Os-release
- Volatile-binds

Out of these 5 packages, 1 is a command-line utility («quota»), 1 an application library («libcgroup») and the last 3 («tcp-wrappers», «os-release», «volatile-binds») are Yocto-specific administrative packages.

- «Quota» permits to put size restrictions on users' profiles. This feature was not implemented in latest Tizen (multi-user had just been implemented in Tizen 3.0, see https://wiki.tizen.org/wiki/Multi-user_Architecture) but can prove itself useful in a near future and should be straightforward to integrate.
- «Libcgroup» permits applications to easily manipulate kernel Control Groups ; it could be useful to control/isolate applications on embedded systems.
- «tcp-wrappers», «os-release» and «volatile-binds» are administrative packages used mostly for OS image preparation and boot. For instance, «os-release» customizes the «/etc/os-release» file used by most tools to identify the distribution; Tizen IVI does it too, but in its «tizen-release» package.

Suggestions

Keep «quota», «libcgroup» and «os-release» from Yocto 1.7. Remove use of «tcp-wrappers» and «volatile-binds» until it proves itself useful. «os-release» could be replaced by a specific package «agl-release».

3. GENIVI Yocto layer ("meta-ivi")

3.1. Dependencies induced by GENIVI layer

GENIVI also maintains a publicly-accessible repository of Yocto recipes, supposed to be used on top of Yocto (as an additional layer):

<http://git.yoctoproject.org/cgit/cgit.cgi/meta-ivi> .

Here is a list of these recipes, and what they contain and relate to.

These recipes do not exist in Yocto:

Name	Motivation	Category
audiomanager_6.2.bb	Required by AGL 1.0 specification	GENIVI System - Audio Manager
audiomanager_git.bb	Required by AGL 1.0 specification	GENIVI System - Audio Manager
common-api-c++_2.1.6-p1.bb		GENIVI Libraries - Misc (IPC)
common-api-c++-dbus_2.1.6-p6.bb		GENIVI Libraries - Misc (IPC)
dlt-daemon_2.11.1.bb	Required by AGL 1.0 specification	GENIVI System - Logging daemon
encryptfs-utils_104.bb	GENIVI configuration - disable NSS dependency	Base - Utilities
fuse_2.9.3.bb		System - Libraries
gstreamer1.0_1.2.3.bb		Library - Multimedia (audio/video)
gstreamer1.0-libav_1.2.3.bb		Library - Multimedia (audio/video)
gstreamer1.0-omx_1.0.0.bb	GENIVI patches	Library - Multimedia (audio/video)

Name	Motivation	Category
gststreamer1.0-plugins-bad_1.2.3.bb	GENIVI configuration - enable bluez5, disable bluez4	Library - Multimedia (audio/video)
gststreamer1.0-plugins-base_1.2.3.bb		Library - Multimedia (audio/video)
gststreamer1.0-plugins-good_1.2.3.bb		Library - Multimedia (audio/video)
gststreamer1.0-plugins-ugly_1.2.3.bb		Library - Multimedia (audio/video)
keyutils_1.5.8.bb	GENIVI patches	Base - Utilities
layer-management_1.1.bb	Required by AGL 1.0 specification	GENIVI System - Layer Manager
layer-management_git.bb	Required by AGL 1.0 specification	GENIVI System - Layer Manager
libitzam_6.0.4.bb	Embedded-oriented	Library - Database
node-health-monitor_1.3.5.bb	Required by AGL 1.0 specification	GENIVI System - System health daemon
node-startup-controller_1.0.2.bb	Required by AGL 1.0 specification	GENIVI System - User context controller daemon
node-startup-controller_git.bb	Required by AGL 1.0 specification	GENIVI System - User context controller daemon
node-state-manager_2.0.0.bb	Required by AGL 1.0 specification	GENIVI System - User context controller daemon
persistence-administrator_1.0.5.bb	Required by AGL 1.0 specification	GENIVI System - Data persistence daemon

Name	Motivation	Category
persistence-client-library_1.0.0.bb	Required by AGL 1.0 specification	GENIVI Libraries - Data persistence
persistence-common-object_1.0.3.bb	Required by AGL 1.0 specification	GENIVI Libraries - Data persistence
wayland-ivi-extension_1.2.0.bb	Required by AGL 1.0 specification	GENIVI System - Graphics
wayland-ivi-extension_1.3.0.bb	Required by AGL 1.0 specification	GENIVI System - Graphics

For reference, we used the following extraction command:

```
# find meta-ivi -name *.bb | egrep -v "(packagegroup|recipes-yocto-ivi)" | xargs -n 1 basename | sort
```

The following packages already exist in Yocto/OpenEmbedded, and are modified by the meta-ivi layer:

Name	Motivation	Category
bluez5_%.bbappend	GENIVI patches	System - Bluetooth
busybox_1.22.1.bbappend	GENIVI configuration - provide additional tools : unzip...	System - Tools
connman_%.bbappend	GENIVI configuration - disable Bluetooth management	System - Network
dbus_%.bbappend	GENIVI patches - AF_BUS support	System - Libraries
gstreamer1.0-plugins-bad_%.bbappend	GENIVI configuration - enable bluez5	Library - Multimedia (audio/video)
libpcap_1.6.1.bbappend	Not present in Yocto	Library - Network
mesa_10.%.bbappend	GENIVI configuration - enable Gallium	System - Graphics
neard_0.14.bbappend	GENIVI configuration - disable	Library - Network

Name	Motivation	Category
	bluez4	(NFC)
ofono_%.bbappend	GENIVI configuration - disable bluez4, enable bluez5	Library - Telephony (GSM/UMTS)
pulseaudio_5.0.bbappend	GENIVI configuration - disable bluez4, enable bluez5	System - Audio
qemu_2.%.bbappend	GENIVI configuration - enable PulseAudio	Application - Virtualization
qt4-embedded_%.bbappend	GENIVI configuration - enable QML	Application Framework (Qt)
shadow-securetty_4.%.bbappend	GENIVI configuration - enable vexpress A9 ports	?
weston_1.5.0.bbappend	GENIVI patches - add IVI-Shell	System - Graphics
xkeyboard-config_%.bbappend	GENIVI configuration - pull Gettext	Data - Misc (keyboard layouts)
xserver-xorg_%.bbappend	GENIVI configuration - add systemd service	System - Graphics

For reference, we used the following extraction command:

```
# find meta-ivi -name *.bbappend | xargs -n 1 basename | sort
```

3.2. Explanation of motivations

3.2.1. AGL 1.0 specification matching (original packages)

Most of the non-Yocto ("original") packages implement parts of the AGL 1.0 specification, which do not have any notable implementation in the upstream field nor in Tizen IVI.

The specific parts of the specification are studied further below (see §5.2 [AGL 1.0 specification matching]), but here is a short summary:

- audiomanager : **Sound Manager** (AGL§4.1.4)
- dlt-daemon : **Diagnostic Services** (AGL§5.2.4)
- layer-management – wayland-ivi-extension : **Window Manager** (AGL§4.1.2)
- node-health-monitor : **Health Monitoring** (AGL§5.1.5)
- node-startup-controller - *-state-controller : **Lifecycle Management** (AGL§5.1.7)
- persistence-administrator – *-client-library – *-common-object : **Persistent Storage** (AGL§5.1.5)

Among the already existing packages, some are also patched to match the AGL specification :

- weston_1.5.0.bbappend : add IVI-Shell = **Window Manager** (AGL§4.1.2)

3.2.2. Bluetooth with bluez5, QML... (existing packages)

Most of the existing Yocto packages reimplemented in the GENIVI layer have patches serving the following purposes :

- gstreamer1.0-plugins-bad - neard – ofono - pulseaudio: **switch from bluez4 to bluez5**
- qt4-embedded: **enable the QML/Qt graphical widget definition language**
- ... and other negligible things

4. Suggestions for AGL integration workflow

As Yocto provides a basis for a working (embedded) operating system, and the most recent versions of Tizen IVI and GENIVI are based on it, there is no need to duplicate its work. In other words: **basic and not-to-be-modified packages such as «glibc», «zlib» ... can be pulled from Yocto directly, without any involvement besides adding contextual patches.**

This will also allow maintainers to concentrate on integration tasks for RENESAS and GENIVI compliance. This mainly consists in:

- RENESAS-specific work (kernel modules for BSP support);
- IVI packages, consisting of packages pulled from either Tizen IVI or GENIVI Legacy (IVI-Shell, Automotive Message Broker ...)

In this respect, the team should actively:

- push new packages for upstream integration (e.g. RENESAS BSP support inside Yocto/OpenEmbedded, procps-ng support inside Poky...) so that their maintenance cost decreases over time;
- for packages out of place on upstream channels (ex : IVI-specific software such as Automotive Message Broker, ICO...), maintain them on a third-party repository providing additional Yocto layers ;

Next sections will detail how this could be done.

4.1. General distribution proposal

Yocto allows to extend existing recipes by using .bbappend files.

The user should be instructed to download a Yocto-Poky 1.7 stable release, and have instructions to download the additional RENESAS Yocto layers as easily as possible.

These layers should not, if possible, alter the underlying Poky distribution. They should fit nicely «on top» of it.

If those layers provide an alternative for a Poky packages (for instance, «procps-ng» instead of «procps»), they should provide a .bbappend and a .conf rule so that the alternative gets picked up instead of the Poky one.

If these layers provide patch for a Poky package, they should provide a .bbappend rule so that the patch gets applied when necessary.

Then, by a single group of commands, the user should be able to compile the software and create a flashable image containing RENESAS and GENIVI components.

Nevertheless, some of these components, such as drivers, are binary-only due to license concerns. In this case, the components should be downloaded in their binary format from a RENENAS or team repository.

The final image should contain all software necessary to boot on the RENESAS R-Car board, with graphics, sound... and comply with the AGL spec.

It is the responsibility of maintainers to write the documentation and do the integration related to this.

4.2. Specific workflow proposals

4.2.1. Tizen IVI / GENIVI gap merge

- 1) Merge former 19 packages depending on conclusions of first analysis (see 2.2. for results);
- 2) Repeat a comparison between full list of current Yocto 1.7 and Tizen IVI packages. Notice the gaps, identify their motivations as in the first analysis, and merge as in 1) (see Annex for results);
- 3) Host the result on an accessible repository.

4.2.2. GENIVI layer integration

- 1) Merge GENIVI packages depending on conclusions of first analysis (see 3.2. for results);
- 2) Repeat a comparison between full list of current Yocto 1.7 and Tizen IVI packages. Notice the gaps, identify their motivations as in the first analysis, and merge as in 1) (see Annex for results);
- 3) Host the result on an accessible repository.

4.2.3. RENESAS BSP integration

- 1) Validate that RENESAS BSP layers can be added on top of Poky 1.7. Modify or create new rules (.bbappend, .conf files) if necessary. Push patches to upstream Poky if necessary ;
- 2) Test on R-Car board(s);
- 3) Host the whole layers on an online repository;
- 4) Write instructions on how to generate the final image using this repository.

5. Advanced study

5.1. Global gap : Tizen IVI / Yocto 1.7

(see annex «Audit on GENIVI's components in AGL_Phase-1-ANNEX »)

Listing all packages present in Tizen IVI, and comparing them with Yocto 1.7, gives the following result :

- Total Tizen packages **305**
- Tizen Common-specific packages: **90**
- Tizen IVI-specific packages: **17**
- Upstream packages, not synchronized Poky <> Tizen: **58**
- Upstream packages, which exist in Tizen but not in Poky: **42**

Hence the following status:

- Tizen has $305 - 90 - 17 = \mathbf{198}$ upstream packages ;
- Among these 198 packages, $198 - 42 = \mathbf{156}$ also exist in Yocto ;
- Among these 156 packages, $156 - 58 = \mathbf{98}$ are synchronized.

We can then propose two strategies depending on the type of package.

5.1.1. Upstream packages not in Yocto

There are 42 upstream packages, having public websites and/or repositories, not present in Yocto. Are they necessary? If they are, they should be pushed to upstream Yocto.

Here are some examples:

- **ibus**: internationalization helper library
Mostly needed by weekeyboard (EFL virtual keyboard) : do we need an alternative Wayland virtual keyboard ? Weston already provides one. If not, no work needed.
- **iniparser**: general-purpose configuration parser library.
Not used by any important software, no work needed.
- **libbullet**: physics engine library
Mostly needed by recent EFL ; should be here when it becomes mandatory. Work needed.
- **libinput**: general-purpose input library (keyboard, mouse, touch...)
Will be needed by Weston ≥ 1.70 , already present in recent Poky, work not needed.
- **libva**: GPU video acceleration support
Appreciably enhances video playback. Will a future version support our GPU? If it will, work needed.

5.1.2. Out-of-sync packages

There are currently 58 packages in Tizen which are not in sync with their counterpart in Yocto 1.7.

Is there any ground for this? If there is, patches and custom recipes should be maintained locally; if not, we should synchronize with Yocto.

Here are some examples:

- **bluez**: hardware bluetooth support
Does our bluetooth hardware require the most recent version ? If it does, maintain locally.
- **EFL**: UI application framework
Do we need the more recent features, such as the pure-Wayland display manager ? If we do, maintain locally.
- **mesa**: graphics stack
Does our GPU requires the most recent version ? If it does, maintain locally.
- **openssl**: cryptographic library
Yocto version has the CVE-2014-3567/3568/3569 security vulnerabilities.
Patch or maintain locally.
- **libv4l**: video4linux, hardware video capture support
Yocto has a more recent version, and supports our hardware. Synchronize with Yocto.

5.2. AGL 1.0 specification matching

(see annex «Audit on GENIVI's components in AGL_Phase-1-ANNEX »)

The final distribution should ideally be fully compliant with the AGL 1.0 specification. This includes features such as: Application framework, Web runtime with HTML5, Miracast compatibility, Policy Manager...

These features are mostly in non-upstream packages, part of Tizen Common or IVI, such as «crosswalk», «automotive message broker», «murphy»...

Hence follow some proposals:

1. Are these features supported in a GENIVI layer (see above) package ? If they are, we should simply use this package, and no further work is needed.
2. If they are not, is there an existing upstream package, included in Yocto, supporting these features? If there are, we should list and compare them, and decide if adaptation work is needed.
3. If not, is there an existing Tizen Common/IVI package supporting these features ? If there are, we should list them, and decide if adaptation work is needed.

5.2.1. Detailed AGL specification 1.0 analysis

This chapter describes how to group the features by package types, then determine existing package names in GENIVI, upstream, and Tizen.

Here follows some of the AGL specification 1.0⁷ points which can materialize as packages (the notation 'AGL§x.y.z' is used to reference an AGL specification 1.0 chapter).

Home Screen (AGL§3.1)

The specification requires a *"customizable GUI layout"*, defined with items such as *"screen resource"*, *"input resource"*, *"transition effect"*. (AGL§3.1.8.1)

Weston's ivi-shell provides a home screen without any specific automotive application, fitting those needs. It is included starting from Weston 1.7, which is present in **latest Yocto**.

However, it also requires *"sound resource"* management, a *"system setting menu"*, a *"mechanism to change date"*, *"change wireless communications"*... (AGL§3.1.8.2).

For this, we need an enhanced home screen. GENIVI nor upstream do not provide one; **Tizen IVI**, though, had 2 optional packages fitting this need : **"Modello-Homescreen"** (HTML5) and **"ico-uxf-homescreen"** (native). Note that these 2 packages are not maintained anymore, so we need to resume it.

Proposal : pull Weston ivi-shell from latest Yocto, pull ICO or Modello homescreen from Tizen IVI, and securize maintenance/development of these.

Window Manager (AGL§4.1.2)

The specification requires a *"software component that is responsible for a layout management of windows"* (this is satisfied by the standard *"weston"* package) but also which satisfies *"IVI's complex requirements, typically requested from Policy Manager"*.

The Use Case (AGL§4.1.2.1) then refers to Policy Manager's (see below) screen resource control section, which specifies :

- allocation of surfaces (position, size....) ;
- visibility control (surfaces visible depending on driving mode e.g.) ;
- layer information (surfaces z-order...).

The GENIVI Yocto layer *"meta-ivi"* contains the *"layer-management"* and *"wayland-ivi-extensions"* packages, which fulfill this requirement.

⁷ AGL Specification 1.0:

https://www.automotivelinux.org/sites/agl/files/pages/files/agl_spec_v1.0_final_0.pdf

Proposal : pull the "layer-management" and "wayland-ivi-extensions" package from GENIVI Yocto.

Policy Manager (AGL§4.1.3)

The specification requires a Policy Manager which will *"collect lots of status, such as user operation and application status, then issue Vehicle Info Control or Resource Control"* (AGL§4.1.3.1.1).

The detailed sections specify that it includes Screen (AGL§4.1.3.1.2.a.), Sound (AGL§4.1.3.1.2.b.), Input (AGL§4.1.3.1.2.c.) Resource, and precisely which resource

A policy manager is specific to the IVI market, there are no well-known implementations upstream, nor does GENIVI provide one. **Tizen IVI**, though, had such a software called **Murphy**. Note that it's not much maintained anymore.

Proposal : pull Murphy from Tizen IVI, and securize maintenance/development of it.

Sound Manager (AGL§4.1.4)

The specification requires a Sound Manager which will *"manage a mediation rule"* when a *"sound output demand in two or more zones from two or more applications is arbitrated"*.

The GENIVI Yocto layer "meta-ivi" contains an **audio-manager** package, which serves precisely this requirement.

Proposal : pull the GENIVI Yocto "audio-manager" package.

Web HMI (AGL§4.2)

The specification requires a web-based interface for the application framework, including a HTML5-based Web API (AGL§4.2.1) which must provide :

- a multimedia content selection API (with URL, predefined list...) ;
- a multimedia content browsing API (play, pause, rewind...) ;
- a volume control API (up, down, mute) ;
- a metadata access API for content (author, year...) ;
- a notification emission API ;
- an AM/FM radio playing API (frequency change, station info...) ;
- a digital radio playing API ;
- a vehicle information access API (fuel level, car model...) ;
- a speech-to-text/text-to-speech control API ;

- a navigation control API ;
- a peer-to-peer communication API for applications ;
- a W3C/HTML5 DOM, Forms and Style API ;
- a W3C/HTML5 Device API (touch event, screen orientation change event...) ;
- a W3C/HTML5 graphics API (canvas, SVG...) ;
- a W3C/HTML5 media API (audio/video tags...) ;
- a W3C/HTML5 communication API (web sockets, server events...) ;
- a W3C/HTML5 storage API (web storage, file storage, web SQL...) ;
- a W3C/HTML5 security API (cross-origin restriction, iframe restriction...) ;
- a W3C/HTML5 desktop UI API (clipboard access, drag-&-drop events...) ;
- a W3C/HTML5 performance API (timing control...) ;
- a W3C/HTML5 geolocation API ;
- a W3C/Widget API ;
- Khronos WebGL API.

In order to support all these APIs, a Web Runtime, which is a web application execution environment, is required (AGL§4.2.2). It provides :

- an access control mechanism ;
- GUI components (text labels, buttons, sliders, input forms...) ;

Neither Yocto, nor GENIVI have a ready-to-use web framework for this purpose. Tizen had **webkit-efl**, then **crosswalk** (based upon Chromium) together with the **tizen-*extensions** package, but they are tightly linked with the Tizen Web API, which is slightly different from the AGL web API specification.

Proposal : find an alternative.

Native HMI (AGL§4.3)

The specification requires a native interface for the application framework, providing :

- GUI components (text labels, buttons, sliders, input forms...) ;

Neither Yocto, nor GENIVI have a ready-to-use native framework for this purpose.

Tizen had the **platform/core/api/*** packages, but they are tightly linked with the Tizen API, which is slightly different from the AGL API specification.

Proposal : find an alternative.

Location Services (AGL§5.1.4)

The specification requires the presence of a GPS system, which will be used for geolocation as well as for time-of-day adjusting (AGL§5.1.4.2).

The OpenEmbedded layer of Yocto provides the **gpsd** daemon. It is a well-known and functional GPS daemon implementation.

Proposal : use gpsd from Yocto/OpenEmbedded.

Health Monitoring (AGL§5.1.5)

The specification requires "*platform monitoring services such as watchdog or active monitoring*".

The **GENIVI Yocto layer ("meta-ivi")** provides a "**node-health-monitor**" package which address the requirement.

Proposal : pull the "node-health-monitor" package from GENIVI Yocto layer.

Persistent Storage (AGL§5.1.9)

The specification requires a "*power-safe persistent storage*" solution.

The **GENIVI Yocto layer ("meta-ivi")** provides a "**persistence-client-library**" package which, together with "**persistence-administrator**" and "**persistence-common-object**", fulfill this requirement.

Proposal : pull the "persistence-client-library" package from GENIVI Yocto layer.

Telephony Services (AGL§5.1.12)

The specification requires the presence of a phone system, which will have Bluetooth pairing (AGL§5.1.12.1.1).

Yocto 1.7 contains the **ofono** telephony daemon, as well as the **bluez** subsystem for Bluetooth hardware recognition and data transfer. Bluez may need enhancements or patches to work well with the board Bluetooth adapter.

Proposal : use the ofono and bluez packages from Yocto, eventually patch and upgrade bluez depending on hardware.

Miracast (AGL§5.1.13.1.2)

The specification requires a display sharing protocol, which is specifically named to be Miracast.

There is no well-known open-source implementation of Miracast, mostly due to royalty fees. A proprietary stack named **WiDi** (http://nttd-mse.com/sites_en/special/mwc/)

is available but was not shipped with Tizen IVI for this reason.
Proposal : find/choose an implementation.

DLNA (AGL§5.1.13.1.3)

The specification requires a digital media sharing protocol, which is specifically named to be DLNA.

There is an open-source implementation of DLNA named **dleyna**, which is included in Yocto (0.4.0 in 1.7 as of writing).

Proposal : use the dleyna package from Yocto.

Camera Services (AGL§5.2.2)

The specification requires support for mounted cameras inside the vehicle.

Yocto includes a version of the **v4l** (Video4Linux) libraries, which enables hardware access to cameras, allowing recording, monitoring...

Proposal : use the v4linux-util package from Yocto.

Multimedia Server (AGL§5.2.5)

The specification requires support for a variety of multimedia formats : CD, DVD, Blu-Ray, MP3...

What's more, it also requires the presence of a Media Player (AGL§5.2.5.1), which is said, without much precision, to match "*major end-user exception*", support "*multiple audio/video sources*"... It further indicates that it should be able to extract data such as "subtitles", support streaming protocols such as "HTTP", "RTSP", (AGL§5.2.5.2.1)...

Further text states support for containers such as "MPEG2-TS/PS", "MP4" ; audio codecs such as "MP3" or "AAC" (AGL§5.2.5.2.2), video codecs such as "MPEG-2", "MPEG-4 Part 2" (AGL§5.2.5.2.3), and image formats such as "JPEG" or "PNG" (AGL§5.2.5.2.4)...

Among Yocto packages, **libav**, which is a fork of the popular FFmpeg, provides such audio/video capabilities. Please note, however, that some codecs such as MP3 may suffer distribution restrictions depending on the publication region, and thus may be disabled for development builds.

Proposal : use libav from Yocto. Provide Yocto configuration options to disable restricted codecs in development builds.

Personal Information Manager (AGL§5.2.7)

The specification requires a service able to centralize personal data : appointments, reminding...

Tizen used the "evolution-data-server" (eds) package together with libfolks for this purpose.

Proposal : use the evolution-data-server package from Tizen.

Smart Device Link (AGL§5.2.8.2)

The specification requires Smart Device Link capabilities, also known as remote control from a smartphone (for capable applications only).

There is no Yocto package implementing this ; **Tizen IVI**, though, contains a "smartdevicelink" package, which responds to the requirements.

Proposal : use **smartdevicelink** from Tizen IVI.

Speech Services (AGL§5.2.9)

The specification requires "voice recognition and synthesis".

There is no dedicated package in Yocto. **Tizen IVI**, however, contains the dedicated "festival" library, the dedicated "sphinx" library, and even a dedicated "speech-recognition" daemon, which may however need some modifications.

Proposal : use the festival/sphinx packages from Tizen IVI. Evaluate the speech-recognition daemon of Tizen IVI.

5.2.2. AGL specification matching in GENIVI / Upstream projects / Tizen

In this chapter: for each package group listed in §5.1[Global gap : Tizen IVI / Yocto 1.7], we try to find a match in GENIVI, Upstream or Tizen IVI.

GUI resource management

The Policy Manager (AGL§4.1.3.1.2) requires the following :

- Weston 1.7, for IVI-Shell : in Yocto 1.8 ;
- Policy manager : Tizen IVI contains Murphy, which responds to the requirement.

Preinstalled applications

Only a HomeScreen is mandatory (AGL§4.1.3.1.2).

Tizen IVI contains 2 packages fulfilling the requirement : ICO and Lemolo,

- ICO is native, whereas Lemolo is HTML5.
- Both are not maintained anymore, though.

Proposal: choose one and resume its maintenance.

Screen Sharing

Miracast (AGL§5.1.13.1.2) requires an implementation.

Tizen IVI has WiDi, which responds to the requirement.

Digital Multimedia Server

DLNA (AGL§5.1.13.1.3) requires the following :

- Yocto 1.7 contains Dleyna 0.4.0, which addresses the requirement.

Login and security

From AGL§4.1.6.7: login/password is mandatory, NFC and biometric identification COULD be supported.

Yocto 1.7 contains Neardal, and Tizen IVI contains nfc-manager-neard. Both are needed in order to respond to the requirement. Adaptation is needed for nfc-manager-neard.

Applications

Online Store is needed (AGL§3.1.8.3), with secure communications.

Local databases and multi-user support are needed for applications.

Sound

A Sound Manager is needed (AGL§4.1.4).

6. CONCLUSION

The gaps between Tizen-IVI and Genivi packages as extracted from Genivi mailing list and Yocto repository originate from 3 main motivations: license dependency on GPLv3, specific requirements addressed by Genivi or simplicity of construction.

For most of the packages, it should be relatively simple to make a pragmatic choice of which version or a given package should be used or not. For some others nevertheless due to complex dependencies, this decision might be more political than technical.

Going further and aiming at AGL-1.0 compliance, it looks obvious that even by collecting every packages from Tizen, Genivi and Yocto some functionality would still miss.

In order to move forward: first basic version conflict of identical packages in between Yocto/Genivi/Tizen should be cleared out. Secondly the AGL architecture group and steering committee should address missing functionality and choose technologies they would like to use to address those requirements.