AGL-based Container Technology Applied to Mass Production of RSE*  
Rear Seat Entertainment

19 July 2019

DrimAES Inc. / Guktae Kim(CEO) & Won Lee(CTO)
# CONTENT

<table>
<thead>
<tr>
<th>I. Overview</th>
<th>II. Technical description</th>
<th>III. Discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaker Introduction</td>
<td>Why LXC container (Docker vs. LXC)</td>
<td>Q&amp;A</td>
</tr>
<tr>
<td>Audience Guide</td>
<td>Major Developments</td>
<td>Open discussion</td>
</tr>
<tr>
<td>Vision Video</td>
<td>Remaining works</td>
<td></td>
</tr>
<tr>
<td>DrimAES Inc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Container Virtualization in RSE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Container Virtualization in IIP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. Overview</td>
<td>II. Technical description</td>
<td>III. Discussion</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------------------------------</td>
<td>---------------------</td>
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Guktae Kim
DrimAES, Inc.
CEO/Co-Founder

Guktae Kim is the co-founder and CEO of DrimAES, Inc., a silver member of AGL since 2017. His brief experience is as follows.

- (Current) Adjunct professor of DGIST (Daegu Gyeongbuk Institute of Science & Technology), Korea University of Science and Technology
- (Current) CEO/Co-founder of DrimLAB, Inc., a technology-based company builder
- (Former) Technology Innovation Consulting Project of Korean Large Enterprise (3 times)
- (Former) 10 international papers published
- (Former) 6 international conference presentations
- (Former) 5 best paper awards

Won Lee
DrimAES, Inc.
CTO

Won Lee is the CTO of DrimAES, Inc. His brief experience is as follows.

- A mentor of BoB (Best of Best), a white hacker training program in Korea
- A security Researcher of GrayHash
- Experience in many development projects

1. Security Analysis and Pen-testing
2. Carplay, Carlife, MirrorLink
3. System emulator based OVP (Open Virtual Platform)
4. Air-BEST (Korea Aero-fighter embedded government project), RTOS kernel, DO-178B Experience
5. DMB, PMP solutions
I. Overview

To facilitate communication we will take advantage of the question-and-answer solution.

https://www.sli.do/

Open any browser and go to www.slido.com

Join with event code #drimaes

Type your question
DRIMAES INC.

Since 2015, we have developed automotive embedded software technologies. Especially, we are specialized in developing and customizing infotainment software platform based on AGL and virtualization technologies. As AGL silver member, we would like to have diverse chance to collaborate with other global infotainment leaders.

2015

03 Acquired an embedded software start-up
05 Launched automotive embedded software training kits (DK-AUTOSAR, DK-W, DK-JWR)
11 Won the 2nd place at Infineon Asian Venture Forum
Founded DrimaES, Inc.

2016

05 Launched automotive embedded software training kits (DK-AUTOSAR, DK-W, DK-JWR)
07 Set up a research lab
Obtained the Korean venture business certification
11 Secured 2 Korean government R&D funding projects

2017

01 Joined AGL as a silver member
07 Registered DAVINCI (Visual Launcher) as AGL 3rd party app in CES 2017
08 Set up partnership with several SoC companies
09 Participated in the ARM Partnership Meeting as an exhibitor

2018

04 Secured Seed funding and premier Korean R&D funding program, TIPS Tech Incubator Program for Startups
09 Filed two patents in the US and Europe

2019

01 Secured Series A funding
02 Made a contract to develop AVN software platform with a Korean Tier 1
05 Enlisted as top 10 fast-growing SW startups by Korean government
07 Participating in the Automotive Linux Summit 2019 (CFP awarded)
CONTAINER IN RSE

I. Overview

Headrest type RSE

SW Architecture

AGL Linux APPs
- Media Player
- Web Browser
- Android Container Monitoring
  - GUI Launcher (2 kinds of UX/UI supported)

AGL Framework
- App Manager
- Window Manager
- Input Manager
- Policy Manager
- User Manager
- Sound Manager

AGL Services
- Network
- Audio
- Graphics
- Resource Manager
- Smartphone Link

AGL Linux Kernel & Device Drivers
- Display
- Audio
- BlueTooth
- Touch Screen
- ALSA
- WiFi

Android Container
- Android APPs
- Android Java API Framework
- Android Runtime
- Linux Native C/C++ Libraries (Optimization)
- AGL Linux Kernel Interface Layer

Android Container Engine
- AGL Linux Container Engine (LXC)

Common kernel & Device Drivers
AGL Framework & Services
Android Container & Services
I. Overview

Beyond RSE → RSE / AVN → Integrated Cockpit System → Integrated Infotainment Platform

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Stage 1: Separate products & Reuse platform

- Simultaneous use of AGL and Linux/Android-based OS on one device

Stage 2: Partial integration & silver box

- Simultaneous IVI control with one silver box

Stage 3: Full integration & silver box

- Control all IVIs with one silver box
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<td></td>
<td></td>
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</tbody>
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WHY LXC (LXC vs. DOCKER)

II. Technical description

Booting Sequence

Android (Embedded System)
- Power up Device
- Internal ROM
- Bootloader 1 (BL1)
- Bootloader (U-Boot)
- Kernel
- init
- Zygote
- Dalvik VM
- Root File System
- User space

AGL
- Power up Device
- Internal ROM
- Bootloader 1 (BL1)
- Bootloader (U-Boot)
- Kernel
- init
- Root File System
- User space

LXC vs. Docker

Linux Containers
- runC
- ranC
- runC
- liblx
- namespaces
- cgroups
- SELinux/AppArmor
- Linux kernel

Docker 1.10 and later
- runC
- runC
- runC
- contained-shim
- contained-shim
- contained-shim
- liblx
- namespaces
- cgroups
- SELinux/AppArmor
- Linux kernel

DOCKER vs. LXC/LXD
- Application virtualization
- Full system virtualization
- Data not saved
- Data can be retrieved
- Single purpose
- Multi-purpose
- Platform independent
- Linux platform
- Security by isolation
- No app isolation
MAJOR DEVELOPMENTS (1)

Android Bridge Service

01 Manage android app list
- Install / Remove android apps (scan)
- Execute android app
- Terminate android app

02 Switch I/O Between AGL and Android
- Display (Frame buffer)
- Touch input

03 Watch dog for abnormal android status
- If no reply from android, switch I/O to AGL and restart android
II. Technical description

Display android app icons

- Scan Android : /data/app Folder
- Parses APK file to get Icon, App name, etc.
II. Technical description

MAJOR DEVELOPMENTS (3)

Execute android apps

- If the user touches the Android App icon in the launcher of AGL, the App is executed through A-Bridge Service
- At this time, pass the display to android
II. Technical description

Install & remove android apps

- Send install/uninstall command with apk path
- Rescan & update App List
II. Technical description

MAJOR DEVELOPMENTS (5)

Where does the display & touch control?
Blocking USB and Network

- Remove USB Functions (MTP, ADB, etc.) from Android System (Preventing collision with AGL)
- Remove WiFi & Network Initializations From Android System (Preventing collision with AGL)
II. Technical description

REMAINING WORKS (1)

- Overlay Android Screen on AGL Screen for AVN

- Use hardware with 2 or more RGB layers
  →Features with hardware dependencies
II. Technical description

REMAINING WORKS (2)

<table>
<thead>
<tr>
<th>Android Streaming</th>
</tr>
</thead>
<tbody>
<tr>
<td>· MJPEG Streaming From Android</td>
</tr>
</tbody>
</table>

AGL UI & Using only one RGB Layer

Screen Capture & Streaming

Why mjpeg?
→ Minimize delay due to video encoding
II. Technical description

REMAINING WORKS (3)

Android Streaming

- Prototyping is complete
II. Technical description

REMAINING WORKS (4)

Audio Mixing (Hardware)
More I/O Switching or Isolations

- USB
- Audio
- WiFi
- Bluetooth
- And Multi Container System

Can be applied differently depending on use case

Issues:
- Multi – Binder (Tested)
- Multi – Display, Audio, Touch …

Currently, sequential boot-up process is required.

ex) Android 0 → Android 1 → …
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- Major Developments
- Remaining works

III. Discussion

- Q&A
- Open discussion
Q&A

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Type your question
III. Discussion
Thank you