Open Source in Every Car with Automotive Grade Linux

Embedded Linux Conference Europe 2016

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Community Manager, AGL , The Linx Foundation

LINUX FOUNDATION

AUTOMOTIVE GRADE LINUX

Who Is This Guy?

- Linux Foundation / AGL Dev Manager since 2014
- Prior 15 years a mix of Tier 1 Automotive Suppliers and Mobile Devices
  - MontaVista / Mentor Embedded
  - Continental BU Infotainment and Connectivity
  - Motorola Mobile Devices
  - Motorola Telematics
- Defense Aerospace

Git Commits BB and CC

Commits	Name	Company
458	Jose Bollo	IoT.BZH
341	NuoHan Qiao	Fujitsu Ten
70	Stephane Desneux	IoT.BZH
64	Ran Cao	Fujitsu Ten
59	Manuel Bachmann	IoT.BZH
58	Jan-Simon Moeller	Linux Foundation
55	Fulip Ar Foll	IoT.BZH
35	Yanhua GU	Fujitsu Ten
34	Christian Gromm	Microchip
27	Yannick Gicquel	IoT.BZH
20	Tadao Tanikawa	Panasonic
15	Leon Anavi	Konsulko
7	Kotaro Hashimoto	Mitsubishi Electric
6	Yuta Doi	Witz
5	Stephen Lawrence	Renesas

Commits	Name	Company
5	Andre Magalhaes	Collabora
4	Phong Tran	Renesas
3	Anton Gerasimov	Advanced Telematics
3	Jens Bockage	Mentor
2	Carlos Alberto Perez	Igalia
2	Tomoki Sekiyama	Hitachi
1	Wataru Natsume	ADIT
1	Philippe Coval	Samsung
1	Tasuku Suzuki	Qt Company
1	Damian Hobson-Garcia	Renesas

* 15 Jan 2016 – 01 Sep 2016

1260 Total Commits
18 Companies

Today's Goals

- Educate you on what AGL is all about
- How to access source code and documentation
- Generate interest in developer community to participate in AGL

Introduction to Automotive Grade Linux

Or "AGL is changing the way automotive manufacturers build and manage software"

LINUX FOUNDATION

AUTOMOTIVE GRADE LINUX

Automotive Grade Linux

Collaborating to build the car of the future through rapid innovation

http://AutomotiveLinux.org

“If Linux is in the car, we want it all to be based on AGL, no matter what the function.”

Dan Cauchy, Linux Foundation,
Automotive Linux Summit 2015

AGL is the only organization that plans to address IVI, instrument cluster, telematics, HUD, control systems, ADAS.

Charter: AGL is “Code First”

- AGL is a Linux Foundation Open Collaborative Project
- Leverage Linux and Open Source technologies
- Build standardized platform(s) and app framework for the entire industry and for all functions in the vehicle
- Develop ~80% of the starting point for a production project
- AGL is a “Code First” organization
- Work with upstream projects
- Educate the industry in open source collaboration and best practices

AGL is changing the future of driving

AGL has 8 major OEM supporters

AGL Members – Over 80 companies!

Platinum Members

DENSO

mazda

Panasonic

RENESAS

TOYOTA

Gold Members

HONDA
The Power of Dreams

NTT DATA
NTT DATA MSE Corporation

Silver Members

AISIN AW CO.,LTD.

CodeThink

Continental

FUJITSU TEN

ir.deta

MITSUBISHI ELECTRIC

NISSAN

Pioneer

QUALCOMM

WIND

Bronze Members

Advanced Driver Information Technology

Advanced Telematic Systems

ALPS

Autoliv

bright box

中国移动 China Mobile

cinemo

COLLABORA

ENEA

ETRI Electronics and Telecommunications Research Institute

Eureka, Inc.

Ford

FORGEROCK

FUJITSU

GlobalLogic Leaders in Software R&D Services

HARMAN

HI CORP.

HITACHI Inspire the Next

HYUNDAI MOBIS

igalia

intel

JAGUAR LAND ROVER

JVC KENWOOD

Konsulko Group

Linaro

mcloudware

MEDIATEK

Mentor Automotive

MICROCHIP

micware

MITSUBISHI MOTORS

KOMПАС

MOVIMENTO

NEC

NVIDIA

NXP

OBIGO

OPENSYNERGY

ORACLE

SUBARU

Suntec

SYMBIO

Texas Instruments

Qt The Qt Company

TOSHIBA

Ubiquitous

UIEVOLUTION

VeriSilicon

Virtual Open Systems

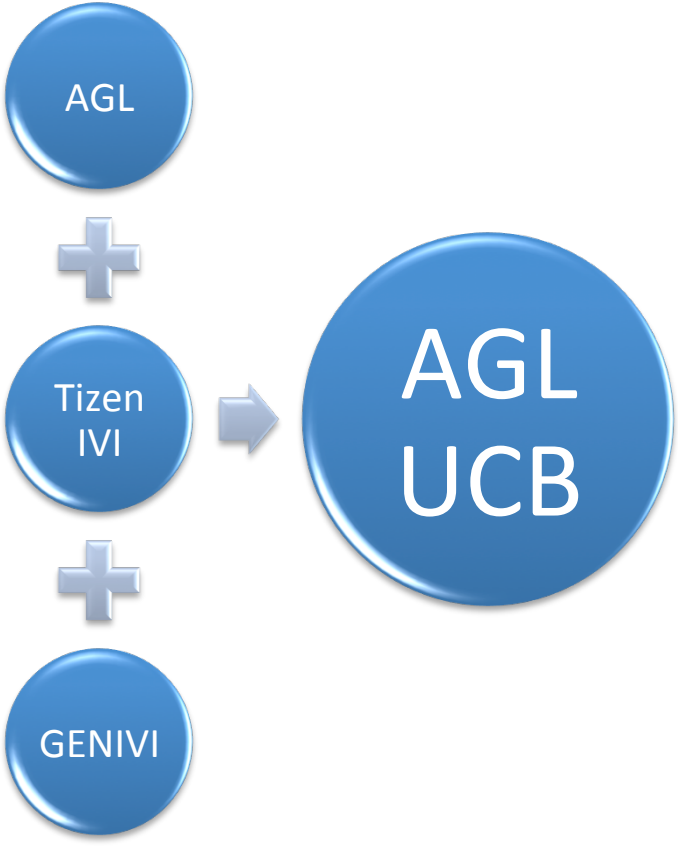
WITZ

AGL is changing the industry

- We are creating a new software development methodology for automotive using open source
- We are changing the way automotive manufacturers build, manage, and treat software
- We are building an AGL ecosystem and supply chain, all using the same code base
- AGL will change:
  - The way consumers interact with the vehicle
  - The way vehicles interact with other vehicles
  - The way vehicles interact with the cloud

AGL Roadmap

AGL Distro “Unified Code Base”



- *First Release announced at CES Las Vegas in January*
- *Unifying the best of AGL, Tizen IVI and GENIVI into a single code base for the entire industry!*
- *Reduce fragmentation, focus on innovation and new features!*
- *Yocto/Poky based with AGL specific layers*

Thanks for all the fish…

- AGL Releases:

  AA – Agile Albacore – Jan 2016

  BB – Brilliant Blowfish – July 2016

  CC – Charming Chinook – Jan 2017

  DD – Daring Dab – July 2017

CES AGL Demo Video

- We posted a video of the CES AGL UCB Demo online:
  - https://www.automotivelinux.org/news/news/2016/01/agl-shows-demo-ces-2016
- ALS Video Coming Soon!

Brilliant Blowfish

- Released July 15, 2016 (Version 2.0.0)
- Version 2.0.2 released October 7
- Upgraded to Yocto 2.0
- Additional BSPs
- IVI Audio Manager
- IVI Layer Manager
- Automated Test Improvements

Brilliant Blowfish

- Reference BSPs – Fully supported by manufacturer, CI, etc.
  - ✓ Renesas R-Car 2 - Porter board – **Full ALS demo**
  - ✓ QEMU – demo code available – not shown at ALS
- Community BSP – Best effort by AGL with minimal support
  - ✧ NXP – i.MX6 – SABRE – **ALS demo available**
  - ✓ NXP - i.MX6x – Wandboard – issues with graphics drivers
  - ✓ Intel - Minnowboard Max - demo code available – not shown at ALS
  - ✓ TI - Jacinto 6 - Vayu board – **ALS demo available**
  - ✧ QCOM – Dragonboard 610-c – no demo available
  - ✧ Raspberry PI – no demo available

Reference or Community BSP?

- Reference board
  - BSP available as part of AGL Core Distribution
  - BSP maintained by board manufacturer
  - Documentation and Kick-start guide available for downloading and building code and running the AGL demo code.
  - SDK Released and maintained
  - Manufacturer provides at least two boards for AGL Continuous Integration and Automated Test (CIAT) infrastructure
  - Continuous Integration
    - Daily snapshot builds available from AGL Jenkins
  - Test and QA
    - Sponsoring company sets up test nodes in Lava
    - Full AGL CIAT test suite is run
    - Test results reported.
    - Expect >90% pass

Reference or Community BSP?

- Community board
  - Hobbyist boards that are not automotive specific
  - Older automotive specific boards that are no longer sponsored / maintained by the manufacturer
  - Best effort by the community
  - AGL will have “featured” community BSP(s) as proposed by the community and designated by the SAT
- See https://wiki.automotivelinux.org/agl-distro#supported_hardware for list of boards

Charming Chinook

- Target December 15, 2016
- SDK for AGL App Developers
- Reference AGL Apps
- AGL Compositor
- AGL Home Screen Reference App in Qt and HTLM5
- Device Profiles for Telematics, IC, ADAS
- IP Network Manager with WiFi and LTE

AGL Documentation

- MD with web publishing for all AGL documentation
- Use git/ gerrit for version control and reviews
- AGL Security Spec
- Move Requirements Spec from DOORS NG

SDK for App Developers

- Available for reference boards with published images that include graphics drivers
- Enables rapid AGL application development (download SDK and write “Hello World” in less than 1 hour)
- Support for Qt and HTML5
- IDE with debugging supported (optional for CC)
- Documentation
- No Yocto knowledge is needed or assumed for SDK users

AGL Compositor

- Currently using Weston and IVI shell as the compositor.
  - Does not meet automotive requirements.
  - Modified from desktop environment
  - No good alternative for automotive is available as open source
- Other option considered was to use Qt compositor, but this is not desirable in the AGL core distribution
- Ideally a member company would donate a solution we can build upon

IP Network Manager with WiFi and LTE

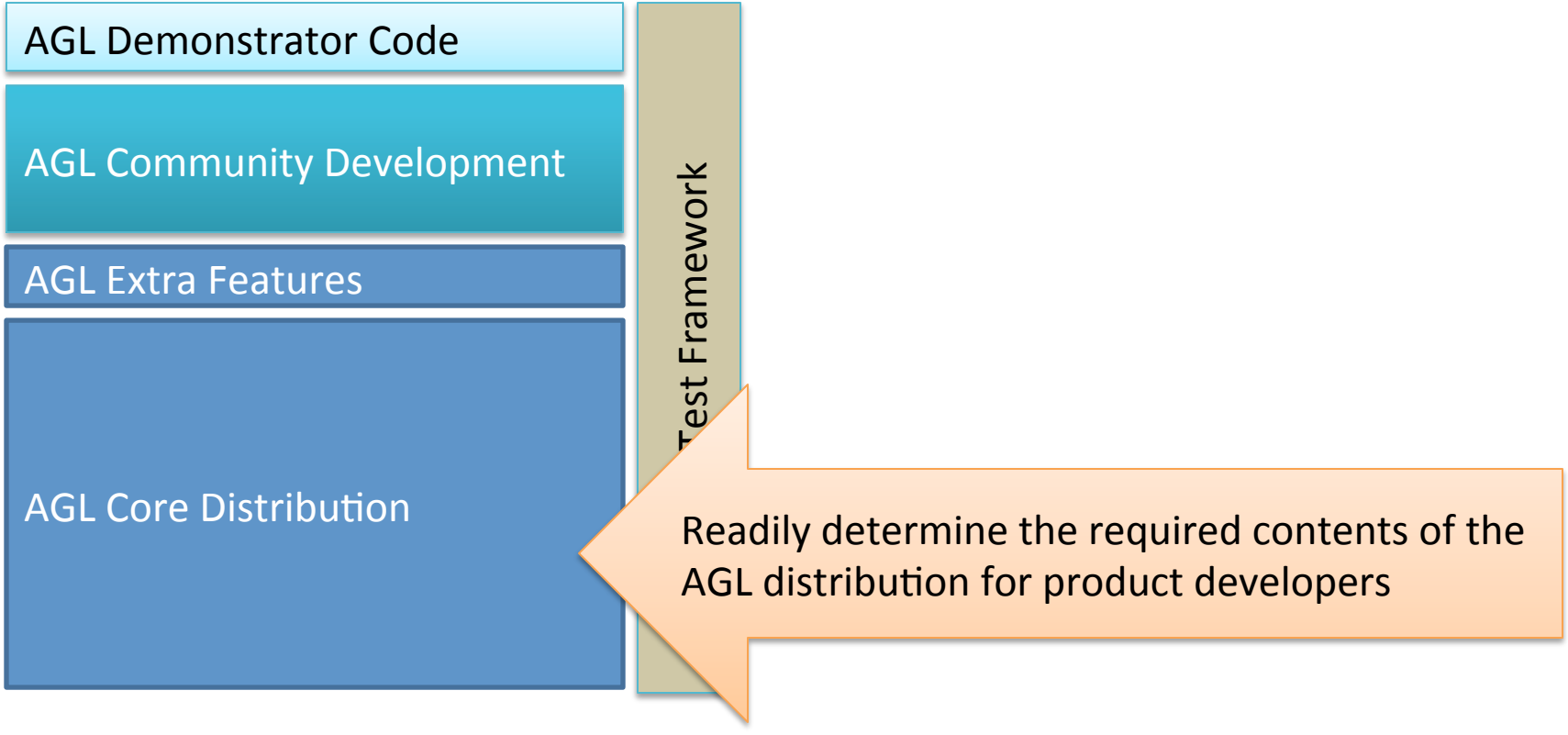
- ConnMan made it into BB
- UI and device management is needed for CC
- Reference Application(s)

Daring Dab

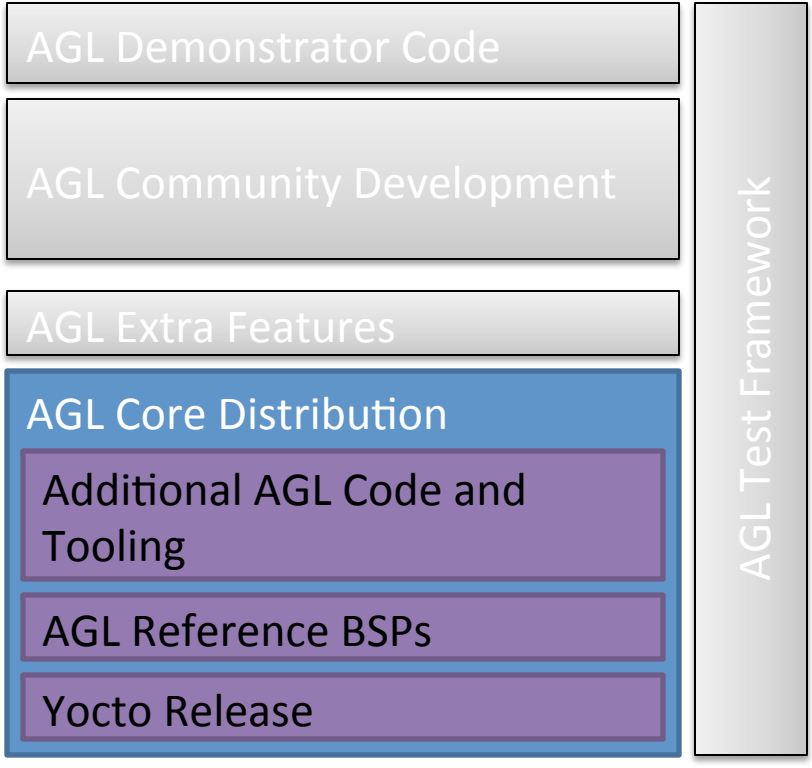
- Smart Device Link
- Navigation API
- Speech Services API
- Browser Engine API

CODE STRUCTURE

Software Configuration Requirements

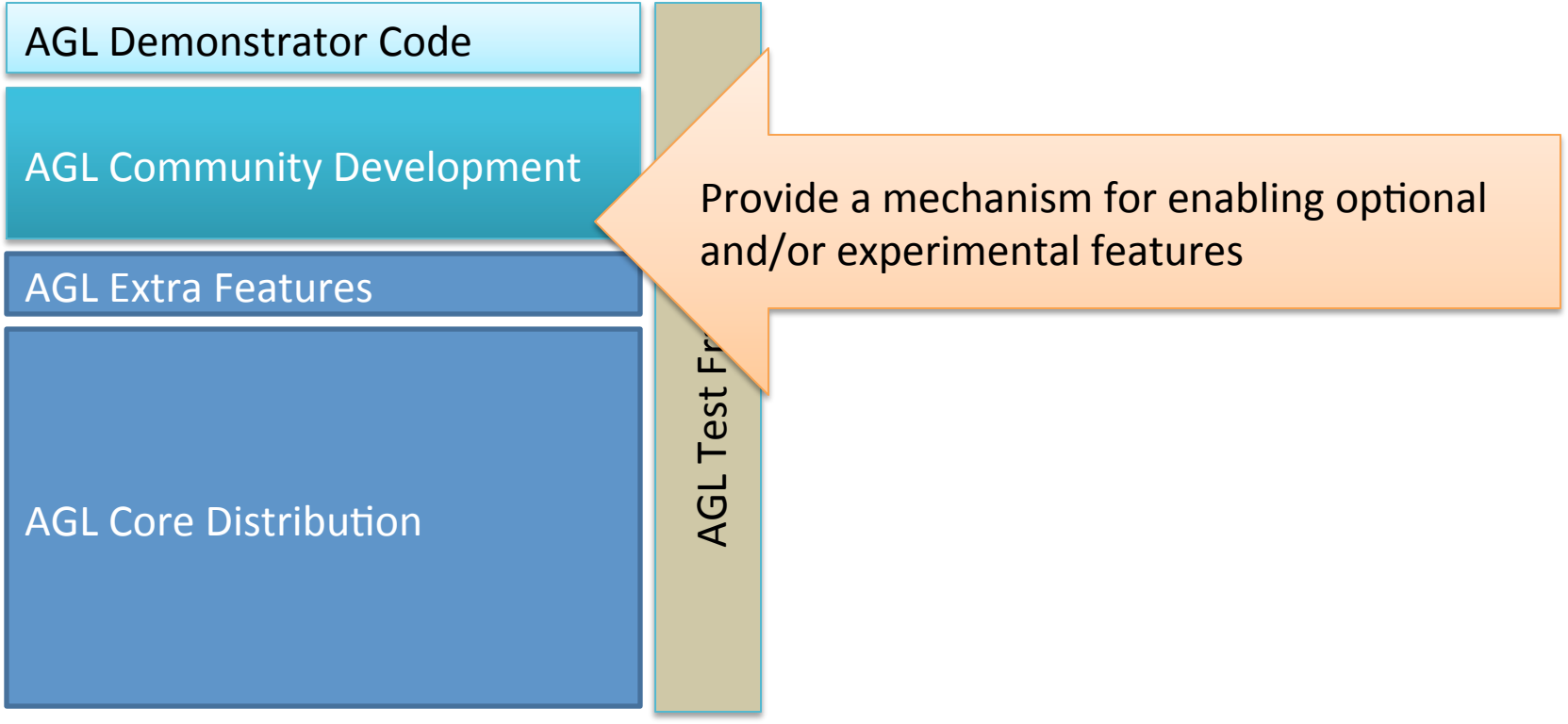


AGL Core Distribution

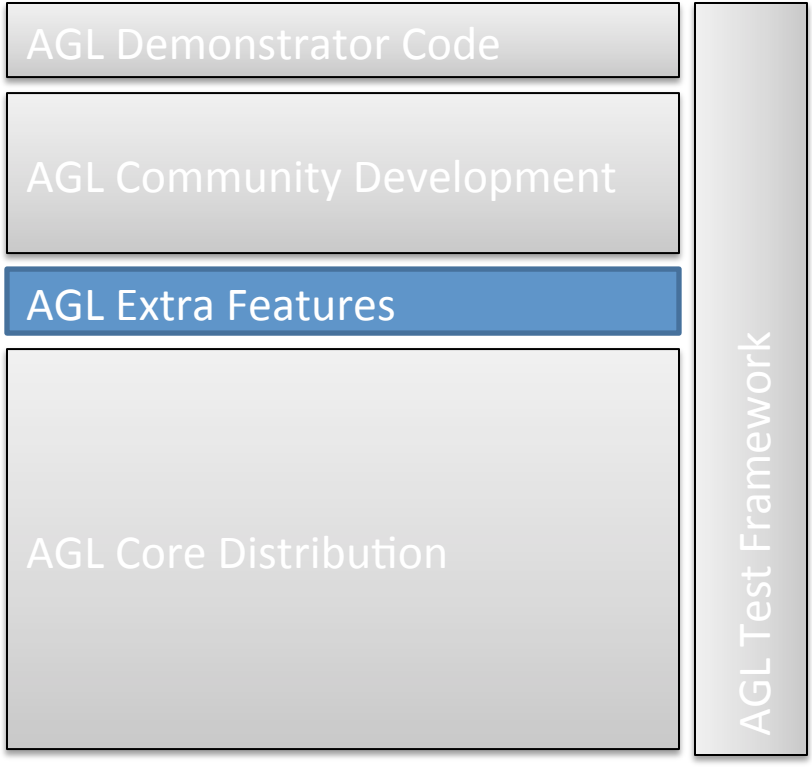


- Stable Yocto release
- Reference BSPs fully supported by the board manufacturer or chip vendor
- Documentation and tooling for building and deploying reference BSPs
- Tooling to allow selection of optional features in the core build
- Test results provided using AGL Test Framework
- Fully supported with updates for at least 6 months
- Defined by Yocto layer – meta-agl

Software Configuration Requirements

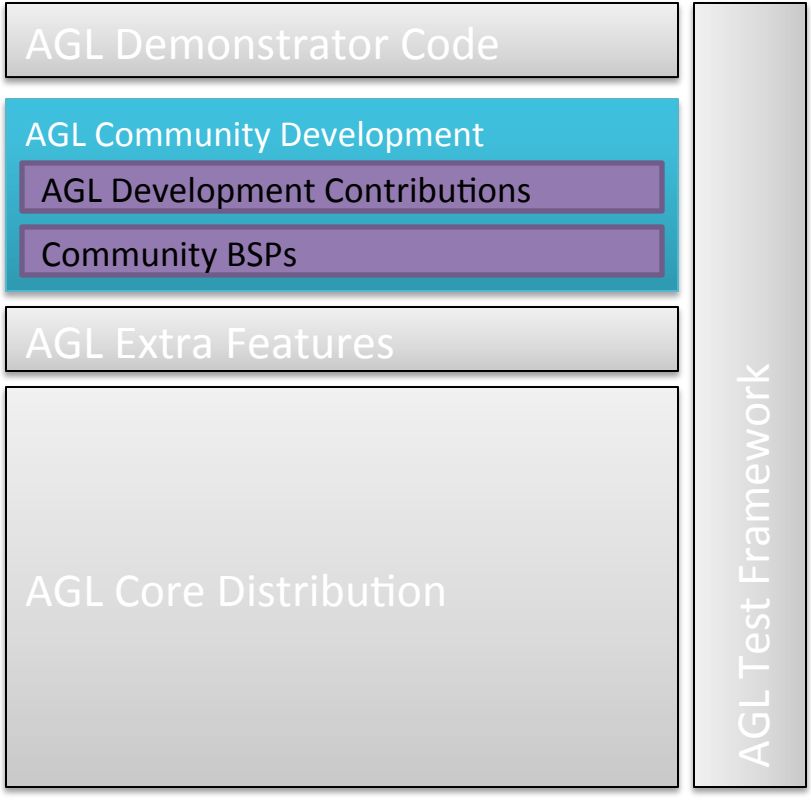


AGL Extra Features



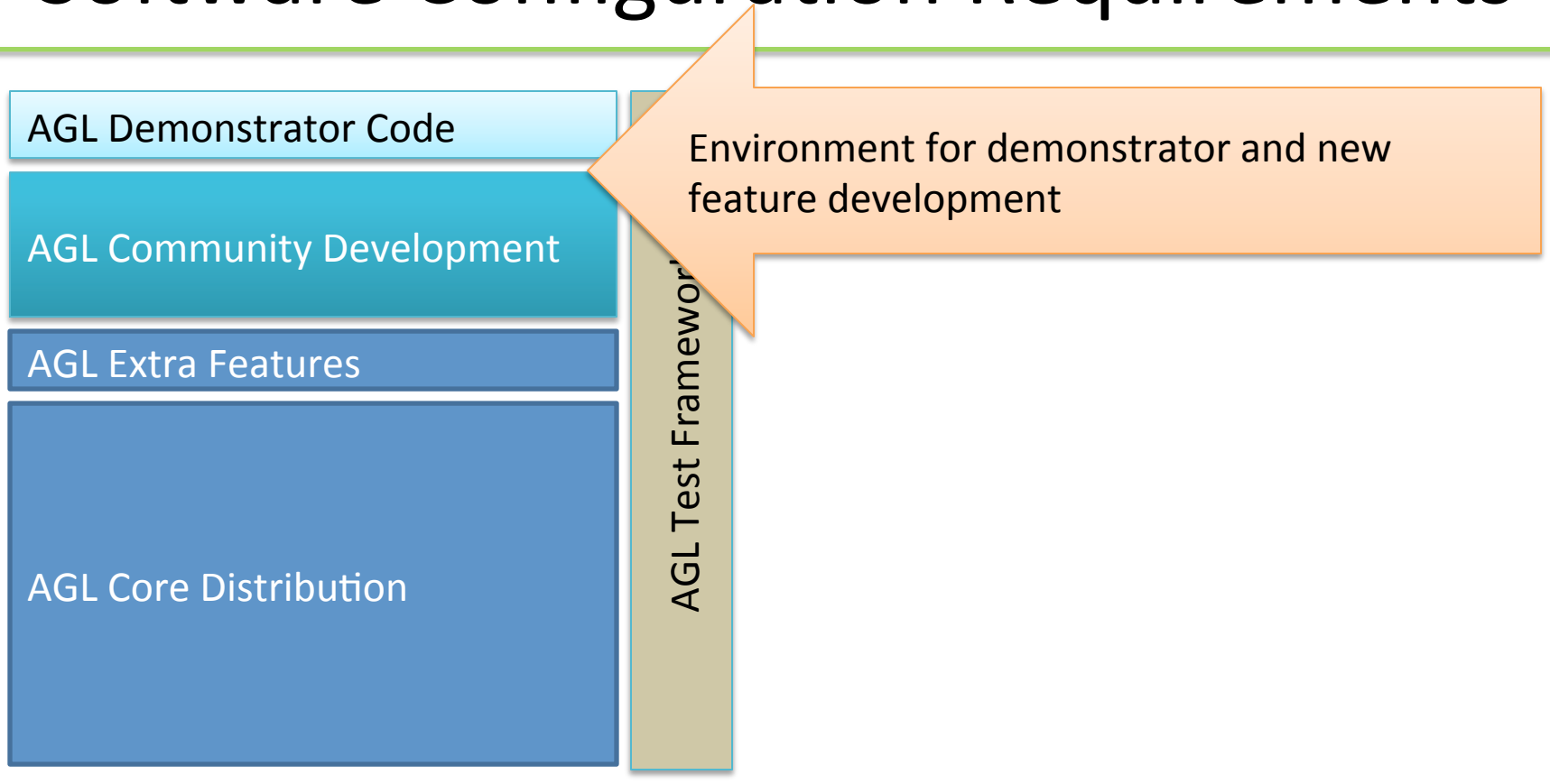
- Builds on AGL Core Distribution
- Features are fully tested and supported as part of AGL release
- AGL environment set up provides extra features that may be enabled by device creators
- Device profiles (e.g., Telematics, ADAS) will be provided in AGL Extra Features
- Yocto layer – meta-agl-extra

AGL Community Development

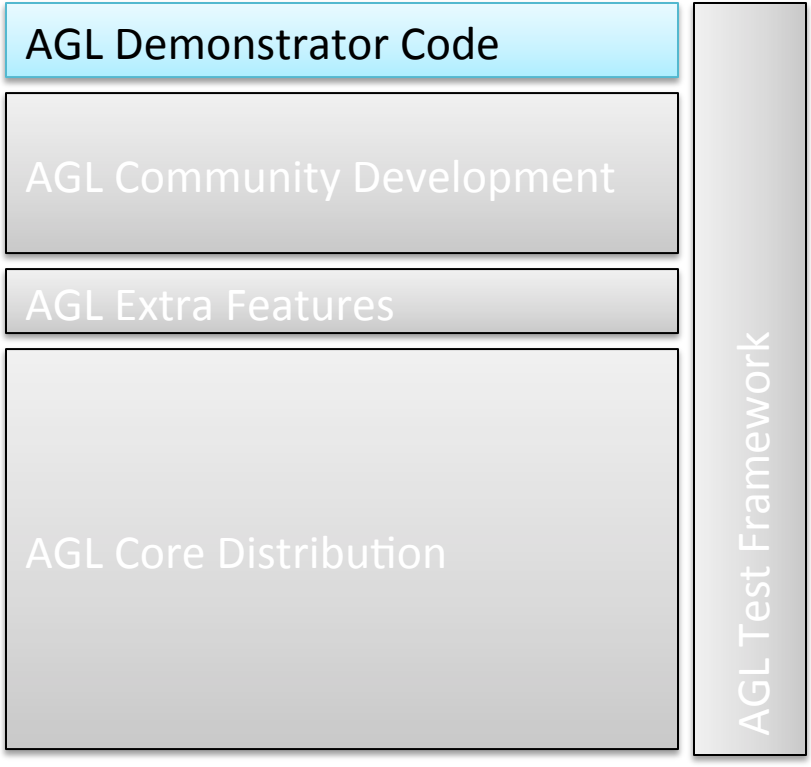


- Place for developing code that may eventually make it into AGL Core or Extra Features
- Snap shot builds for experimental features to facilitate collaboration
- Community BSPs without official support
- Snap shot builds may be provided for Community BSPs
- No formal QA – basically whatever the community can provide
- Defined by Yocto layer – meta-agl-devel

Software Configuration Requirements

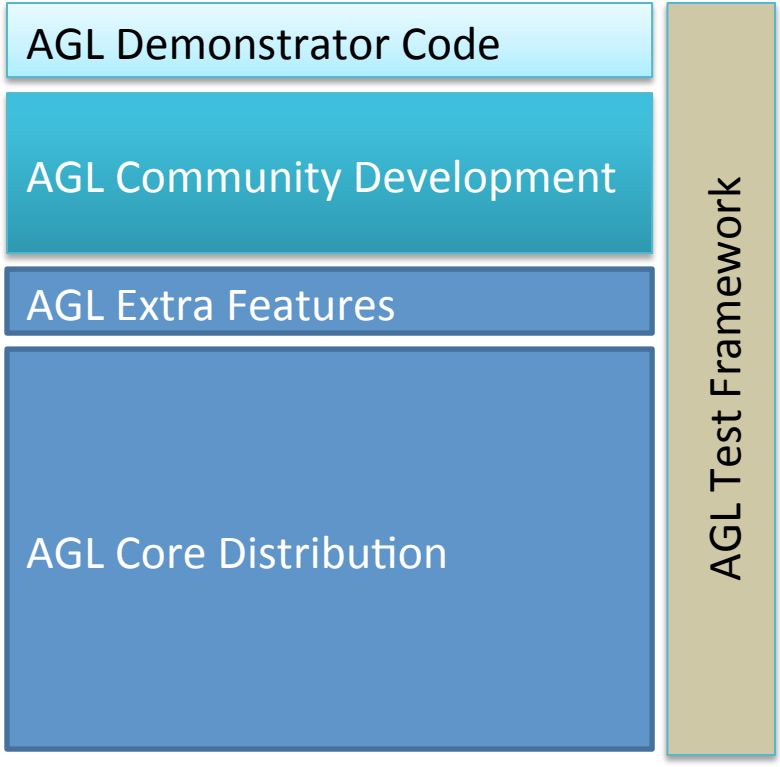


AGL Demonstrator Code



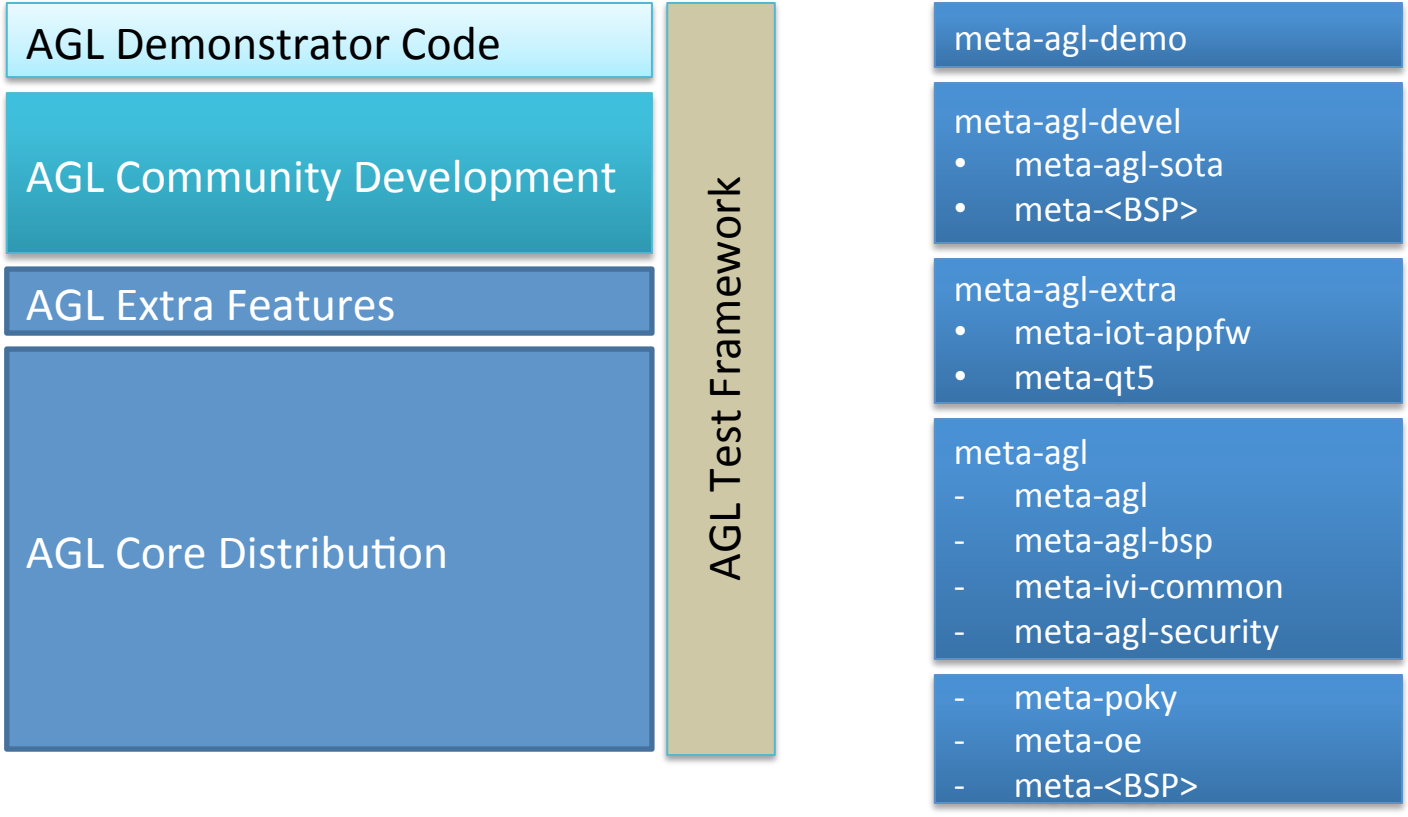
- Code developed to demonstrate specific features and/or releases of AGL
- CES 2016
- Automotive Linux Summit 2016
- Intended for “one shot” development
- Provided “as-is”
- Yocto layer – meta-agl-demo

Release Management



- Twice per year release of AGL Distribution includes
  - AGL Core Distribution and Extra Features
  - All code and tooling with test results
  - Full test results for reference BSPs
  - As-Is demo code, Community Developed features, and BSPs
- Support biannual releases with code fixes for six months
- Long term support (2+ years) for selected releases
- Daily snapshot builds for specific configurations
- Pre-release candidates to allow developer collaboration and coordinated testing

AGL Yocto Layers



Get The Code

- Pre-built binaries and source tar balls available
  - https://www.automotivelinux.org/software/download
- Latest Source Code and Build Instructions
  - https://wiki.automotivelinux.org/agl-distro/source-code

Build Options

- Once you have the repos set up use
  $ source meta-agl/scripts/aglsetup.sh –h
- To determine available boards and build options
- Example – Build QEMU AGL Demo

  $ source meta-agl/scripts/aglsetup.sh -m qemux86-64 agl-demo agl-netboot agl-appfw-smack

  $ bitbake agl-demo-platform

Summary

Source Location	Layer	QA Performed	Release Support	Daily Build and CI Builds
Staging (or remote)	Meta-agl-demo	N	N	Y
Staging (or remote)	Meta-agl-devel	N	N	Y
Src (or remote)	Meta-agl-extra	Y	Y	Y
Src (or remote)	Meta-agl	Y	Y	Y

- Examples
  - ALS and CES Demo apps belong in meta-agl-demo
  - Meta-agl-sota belongs in meta-agl-devel
  - Meta-iot-appfw belongs in meta-agl-extra

Getting Involved with AGL

Reference Apps for AGL App FW

- Show your app in the official AGL demo at CES
- Call for participation for CES 2017

  https://wiki.automotivelinux.org/agl-distro/ces-2017-demo

- Selection by Steering Committee by 15 Oct

Reference HW for CES

- Expanding reference hardware platformas for CES demos.
- Call for participation for CES 2017
- Check mail list this week for qualifications necessary to participate
- Selection by Steering Committee by 15 Oct

Getting Involved

- Most subsystems in need of developers and maintainers particularly user space
- Application developers needed
- Weekly developer calls on Tuesdays at 13:00 UTC
  - Info at https://wiki.automotivelinux.org/dev-call-info
- Check Jira for open issues and tasks that need to be done
  - https://jira.automotivelinux.org/

Contribution Process

- Code development process is documented
  - https://wiki.automotivelinux.org/agl-distro/contributing
- Process continues to evolve as we mature

Git and Gerrit

- AGL uses git for version control and gerrit for code reviews
- Code and patch submissions are via gerrit and use the gerrit review and merge process
- These can be found at
  - https://gerrit.automotivelinux.org
  - https://git.automotivelinux.org

Git and Gerrit

- The AGL gerrit setup is divided into three main repository groups
  - AGL - contains the recipes for building the AGL distribution
  - src - contains source code repositories where AGL is the upstream. This code is officially part of the AGL distribution
  - staging - contains source code repositories where AGL developers can work on new features or components that can eventually be included in the AGL distribution
- Complete descriptions and links to gerrit can be found at https://wiki.automotivelinux.org/agl-distro/contributing

Continuous Integration

- Using Jenkins for Continuous Integration
- Patches
  - All changes submitted to gerrit are built immediately by Jenkins.
  - Successful build gives +1 to new code in Gerrit
  - Build failure -1 in gerrit
- Daily Snapshot builds
  - Available for reference BSPs
  - May add community BSPs later this year
  - https://download.automotivelinux.org/AGL/snapshots/master/

Automated Test

- Fuego (LTSI Jenkins Test Automation) being integrated into process
- More information
  - https://wiki.automotivelinux.org/agl-testframework

AGL Expert Groups

Or "You don't have to be an expert to work in an Expert Group"

Team Overview

- System Architecture Team and Expert Groups working on new feature requirements and architecture
- Component teams own software not specifically assigned to an EG
  - Common Libraries and OS
  - Kernel and Device Drivers
- Each team has a dedicated wiki page
  - Link to roadmap and project backlog from wiki

App Framework and Security EG

- *Application lifecycle (install, run, remove, applications)*
- *SDK and application developer experience both in security and APIs*
- *Security framework (SELinux, SMACK, AppArmor, etc.), policies, and strategy for the distribution*
- Network and vehicle firewalls in conjunction with the Connectivity EG
- Software Update and secure update
- Diagnostic log and trace
- Secure boot

https://wiki.automotivelinux.org/eg-app-fw

UI and Graphics EG

- *AGL Compositor, Layer Manager, and GPU interface*
- *Multimedia video manager (including multi-display and display sharing) and audio manager*, and media manager/player.
- Browser Engine
- Speech Recognition
- Navigation

https://wiki.automotivelinux.org/eg-ui-graphics

Connectivity EG

- *Vehicle Connectivity (CAN, MOST, LIN, AMB)*
- *Network and vehicle firewalls*
- Cloud Connectivity (Iotivity)
- Connected Car
- Bluetooth, Wifi, NFC
- Smart Device Link (SDL)
- Remote Vehicle Interactions (RVI)

https://wiki.automotivelinux.org/eg-connectivity

CI and Automated Test EG

- *Build and smoke test of Gerrit submissions on all hardware*
- *Daily snapshot build and testing*
- *Device tests on real hardware*
- *Test environments such as JTA and Lava*
- Test suites such as LTP
- UI testing (OpenQA)

https://wiki.automotivelinux.org/eg-ciat

Q&A

Tweet questions to @VStarWalt

THANK YOU