How Did Automotive Grade Linux Become THE Open Source Community for Cars?

Open Source Summit North America
August 23, 2019

Walt Miner – AGL Community Manager
Twitter: @VStarWalt
wminer@linuxfoundation.org
Who is This Guy?

- Linux Foundation employee (5 years)
- AGL Development and Community Manager
- Previously at MontaVista and Mentor Graphics
- Continental AG
- Motorola Mobile Devices
- Motorola Telematics Communications Group
- Rode my Yamaha Super Tenere from Chicago to be here!
What is AGL?

Collaborating to build the car of the future through rapid innovation

- Open source Linux-based collaborative project
- Hosted at Linux Foundation
- Focused on rapid innovation of vehicle software using the AGL Unified Code Base
<table>
<thead>
<tr>
<th><strong>Autonomous Driving</strong></th>
<th><strong>Advanced Driver Assistance Systems (ADAS)</strong></th>
<th><strong>Heads-up Display (HUD)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Infotainment</td>
<td>Instrument Cluster</td>
<td>Telematics/Connectivity</td>
</tr>
<tr>
<td>Functional Safety</td>
<td></td>
<td>Advanced Driver Assistance Systems (ADAS)</td>
</tr>
</tbody>
</table>

**the only organization addressing all software in the car**
Total of 9 OEMs supporting AGL!

Accounts for approximately 50% of worldwide annual vehicle shipments*

*Sources (42.8M vehicles out of 86.4M):
Total of 9–10 OEMs supporting AGL!

Accounts for approximately 50% of worldwide annual vehicle shipments*

*Sources (42.8M vehicles out of 86.4M):
AGL Members – Almost 150 companies!

Platinum

DENSO
mazda
Panasonic

Gold

HONDA
The Power of Dreams

Silver

AISIN AW CO.LTD.
amazon
Mercedes-Benz

DENSO
TEN
DRIMRES

NTT DATA
NTT DATA MSE Corporation

QUALCOMM
VOLKSWAGEN
Aktiengesellschaft

WIND RIVER

Bronze

arm
Astroille

Calibrites
Cognizant

Cーム
CORNIX

CFO
Enea

EE
ENEA

EPAM
ETRI

Fujitsu
GitHub

Indelco
ICIS

INTELLIGENT

Kawasaki
Kosms

Lazlo

MCHB

Microchip

MOS

NEC

NEC

NEXUS

NXM

NT

NX

NTC

OMRON

Oracle

PCG

Pentagon

Philips

SONY

Spansion

SUBARU

SYMC

SystemX

W-Systems

TELECOM

WUTHER

WIND ENERGY

XAVIER
In the beginning there was...
Pre-Automotive Grade Linux

• Auto makers very good at advancing and standardizing manufacturing processes and hardware features
  • Assembly line
  • A trip to the gas station
  • Turn signals
Pre-Automotive Grade Linux

• Software
  • GM ECUs – Early 1980s - Proprietary
  • CAN, AUTOSAR, J1939 – Some electrical standards. Proprietary software.
  • MOST – Open standard. No open software. Tier Ones forced to re-implement for every OEM
  • GENIVI – “25 players in 25 cabs”
AGL in Aug 2014

- Thirty-five member companies
- Relied on FTE and code contributions from members
- No regularly scheduled meetings
- First All-Member meeting was 6 months in the future
- Using Tizen IVI as a code base with no control over governance
- No tools in place for project management or defect tracking
- No roadmap
35 AGL Member Companies (Aug 2014)
And on the seventh day (ok 5 years)...
AGL Unified Code Base

- Started in 2015 after Tizen IVI mostly abandoned
- Develop a single open source software platform for the entire industry, reducing fragmentation
- Provide at least 70% of the base platform for production projects
- Cultivate an ecosystem of developers, suppliers, and automotive expertise all using a single platform
- Reference hardware and applications available for adaptation
AGL UCB - Thanks for all the fish...

Agile Albacore – Jan 2016
Brilliant Blowfish – July 2016
Charming Chinook – Dec 2016
Daring Dab – July 2017
Electric Eel – Jan 2018
Funky Flounder – Oct 2018
Grumpy Guppy – Feb 2019
Happy Halibut – July 2019
Itchy Icefish – Jan 2020

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## Top 25 Git Committers in 2018

<table>
<thead>
<tr>
<th>Commits</th>
<th>Name</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>942</td>
<td>Romain Forlot</td>
<td>IoT.bzh</td>
</tr>
<tr>
<td>400</td>
<td>Jose Bollo</td>
<td>IoT.bzh</td>
</tr>
<tr>
<td>306</td>
<td>Jonathan Aillet</td>
<td>IoT.bzh</td>
</tr>
<tr>
<td>231</td>
<td>Matt Ranostay</td>
<td>Konsulko</td>
</tr>
<tr>
<td>188</td>
<td>Kazumasa Mitsunari</td>
<td>Witz</td>
</tr>
<tr>
<td>170</td>
<td>Jan-Simon Moeller</td>
<td>Linux Foundation</td>
</tr>
<tr>
<td>115</td>
<td>Ronan Le Martret</td>
<td>IoT.bzh</td>
</tr>
<tr>
<td>108</td>
<td>Thierry Bultel</td>
<td>IoT.bzh</td>
</tr>
<tr>
<td>98</td>
<td>Mark Farrugia</td>
<td>FiberDyne</td>
</tr>
<tr>
<td>87</td>
<td>Khang Nguyen</td>
<td>Renesas</td>
</tr>
<tr>
<td>82</td>
<td>Stephane Desneux</td>
<td>IoT.bzh</td>
</tr>
<tr>
<td>78</td>
<td>Sebastien Douheret</td>
<td>IoT.bzh</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>77</td>
<td>Loic Collignon</td>
<td>IoT.bzh</td>
</tr>
<tr>
<td>73</td>
<td>Changhyeok Bae</td>
<td>LG</td>
</tr>
<tr>
<td>72</td>
<td>Fulup Ar Foll</td>
<td>IoT.bzh</td>
</tr>
<tr>
<td>59</td>
<td>Frederic Marec</td>
<td>IoT.bzh</td>
</tr>
<tr>
<td>58</td>
<td>Zheng Wenlong</td>
<td>Nexty</td>
</tr>
<tr>
<td>57</td>
<td>Tadao Tanikawa</td>
<td>Panasonic</td>
</tr>
<tr>
<td>52</td>
<td>Matt Porter</td>
<td>Konsulko</td>
</tr>
<tr>
<td>41</td>
<td>Kevin Hilman</td>
<td>BayLibre</td>
</tr>
<tr>
<td>41</td>
<td>Tobias Jahnke</td>
<td>Microchip</td>
</tr>
<tr>
<td>41</td>
<td>Wang Zhiqiang</td>
<td>Nexty</td>
</tr>
<tr>
<td>39</td>
<td>Clement Benier</td>
<td>IoT.bzh</td>
</tr>
<tr>
<td>39</td>
<td>Thuy Tran</td>
<td>Renesas</td>
</tr>
<tr>
<td>31</td>
<td>Yuta Doi</td>
<td>Witz</td>
</tr>
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- 3764 Total Commits
- 73 Committers
- 28 Companies
- 01 Jan 2018 – 31 Dec 2018
- Commits to master
## Top 20 Companies in 2018

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<td>IoT.bzh</td>
<td>2301</td>
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<tr>
<td>Konsulko</td>
<td>351</td>
</tr>
<tr>
<td>Witz</td>
<td>219</td>
</tr>
<tr>
<td>Linux Foundation</td>
<td>170</td>
</tr>
<tr>
<td>Renesas</td>
<td>167</td>
</tr>
<tr>
<td>FiberDyne</td>
<td>120</td>
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<tr>
<td>Nexty</td>
<td>99</td>
</tr>
<tr>
<td>LG</td>
<td>73</td>
</tr>
<tr>
<td>BayLibre</td>
<td>61</td>
</tr>
<tr>
<td>Panasonic</td>
<td>57</td>
</tr>
<tr>
<td>Microchip</td>
<td>50</td>
</tr>
<tr>
<td>Collabora</td>
<td>21</td>
</tr>
<tr>
<td>Mitsubishi Electric</td>
<td>12</td>
</tr>
<tr>
<td>Xevo</td>
<td>11</td>
</tr>
<tr>
<td>ADIT</td>
<td>10</td>
</tr>
<tr>
<td>Intel</td>
<td>8</td>
</tr>
<tr>
<td>Qt Company</td>
<td>7</td>
</tr>
<tr>
<td>Individual</td>
<td>6</td>
</tr>
<tr>
<td>AisinAW</td>
<td>5</td>
</tr>
<tr>
<td>Amazon</td>
<td>5</td>
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- 3764 Total Commits
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- 28 Companies
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Other Numbers

- 342 commits to flounder release branch in 2018
- 170 commits to eel release branch in 2018
- 9 commits to dab release branch in 2018
- Grand Total = 4285 commits
- 124 unique individuals and 41 unique companies have contributed to AGL since the start of the project
  - 33 new committers in 2018
  - 5 new companies contributed in 2018
- 11 individuals not affiliated with a member company have contributed
- 701 Jira issues closed during 2018
  - 1675 issues closed since start of project (through 20 Feb 2019)
Collaboration Recommendations or “The Bacon Bits”
Collaboration Practices

• Compare Automotive Grade Linux to some best practices

• Recommendations from Jono Bacon’s presentation “Best of Breed Tools for Building an Open Source Community” on Wednesday at OSS North America
Collaboration Recommendations

• Default to open (branches, pull requests, issues, roadmaps)
• Provide a clear README.md and CONTRIBUTING.md
• Properly LICENSE your repo
• Provide essential documentation (E.g., arch, coding standards, submissions reqs.)
• Have a clear, open, code review process
• Build a culture of regular issue triage
• Integrate discussion/planning into your engineering (E.g., meetings)
• Identify and engage with active contributors
AGL Collaboration Practices

- Default to open (branches, pull requests, issues, roadmaps)
- Have a clear, open, code review process
  - *Everything* AGL does is open and transparent to members and non-members alike
  - Anyone can submit pull requests to gerrit
  - Core team ensures all pull requests are reviewed in a timely fashion
  - Code review process documented on wiki using AGL gerrit
    [http://gerrit.automotivelinux.org/](http://gerrit.automotivelinux.org/)

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AGL Collaboration Practices

✓ Properly LICENSE your repo
  • AGL has over 50 repositories we own
  • Generally have a proper LICENSE.md in each repo (Apache 2.0 default)
  • AGL git

https://git.automotivelinux.org/
AGL Collaboration Practices

- Provide essential documentation (E.g., arch, coding standards, submissions reqs.)
  - AGL documentation site
    - [http://docs.automotivelinux.org/](http://docs.automotivelinux.org/)
  - AGL Wiki
    - [https://wiki.automotivelinux.org/](https://wiki.automotivelinux.org/)
AGL Collaboration Practices

✓ Integrate discussion/planning into your engineering (E.g. meetings)

• AGL Expert Groups meet every two weeks
  • Application Framework and Security
  • Connectivity
  • Continuous Integration and Automated Test
  • Graphics and UI
  • Navigation
  • Virtualization
  • Reference Hardware System Architecture
  • Speech
  • Vehicle to Cloud
  • Instrument Cluster
  • Requirements Specification

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AGL Collaboration Practices

- Regular meetings to discuss architecture, design, and code issues
- Roadmaps per expert group
- Started with four expert groups
- Only create new Expert Groups with critical mass and designated leadership
AGL Collaboration Practices

✓ Identify and engage with active contributors

• Weekly Developer Call on Tuesdays
  https://wiki.automotivelinux.org/dev-call-info

• IRC channel #automotive on freenode.net
  Discussion about open source software for vehicles. No help for mechanical issues should be accepted from anyone on this channel.

• Weekly Newsletter
  https://wiki.automotivelinux.org/newsletter

• Discussions Mail List – note only ONE email list
  https://lists.linuxfoundation.org/mailman/listinfo/automotive-discussions
2019 F2F Workshops

- Mar 5-7 – Tokyo AGL AMM
- May 7-9 – A Coruña, Spain (Igalia)
- July 16 – Tokyo - Day before Automotive Linux Summit
- Sep 24-26 – Berlin (VW/ Carmeq)
- October 21 - 24 – Monte Carlo – AGL Fall AMM
- Nov 12 – 14 – TBD – CES Integration Session #1
- Dec 10 – 12 – San Francisco – CES Integration Session #2
- Jan 7-10 : CES 2020
AGL Collaboration Practices

✓ Build a culture of regular issue triage
• Review new issues and hot issues during weekly developer call
• Assign all new defects out to owners every week.
• All follow up on defects is in AGL Jira

https://jira.automotivelinux.org/
Q & A/ Discussion
THANK YOU