Shifting Incentives in Open Source Participation

Craig Northway
Director, Engineering
Qualcomm Technologies, Inc
From 5G to IoT, innovation starts with Qualcomm

$53+ billion cumulative investment in R&D
Open Source Incentives

• Key historic incentives for participation:
  ◦ Hardware Vendors
  ◦ Sell Support and Services
  ◦ Provide Platform as a Service
  ◦ Auxiliary process and Infrastructure
  ◦ Talent Acquisition and Retention

• An example of shifting incentives in database technology.

• Future Shifts:
  ◦ Machine Learning
  ◦ Standards
  ◦ Open Hardware
Hardware Vendors

• Hardware vendors are incentivized to participate in Open Source to support the hardware they sell.
  ◦ Open source software support can be a key enabler to increasing chipset volumes and a differentiator with competitors.

• Examples:
  ◦ Linux Kernel
  ◦ LLVM
Support and Services

• Many companies have made a business out of supporting Open Source software and providing services.
  ◦ Participation gives them the expertise and reputation needed to perform the support and services.

• Examples:
  ◦ Distribution Support:
    • Red Hat
    • Canonical
  ◦ General Services:
    • Bootlin
    • Rogue Wave
    • Codethink
Platform as a Service

• PaaS vendors use Open Source to provide services.

• Incentives to participate include:
  ◦ Improving engineering efficiency
  ◦ Using developer familiarity to drive adoption
  ◦ Enable features in the upstream

• Examples:
  ◦ Elastic.co - Elastic Search
  ◦ AWS - Apache Lucene
Auxiliary Process and Infrastructure

• Companies often participate for parts of their business considered auxiliary.
  ◦ Reduce operating costs by leveraging community and upstream model

• Examples:
  ◦ Google - LLVM
  ◦ Facebook - React
Talent Acquisition and Retention

• Talent acquisition and retention is (or should be an) incentive for all software related businesses.
  ◦ Developers want to be able to participate in Open Source
  ◦ Having an Open Source presence helps to find relevant developers.
Shifting Incentives
Example - Platform as a Service & Database Incentives

• Platform as a Service has made complex infrastructure simple.

• Example of a technology shift that modified incentives to participate in Open Source

• Unless you are an internet scale business or are a PaaS provider:
  ◦ Do you run or control the Operating System anymore?
  ◦ Do you run/control/modify middleware like databases, message buses?
Databases

Proprietary to Open Source Shift

• Proprietary Database
  ◦ Selected by the IT department!
  ◦ Pay a vendor for both the software and the service (support)
  ◦ Long turn around time for bug fixes or features specific to your use case

• Open Source Database
  ◦ Selected by developers
  ◦ May pay a vendor for service (support)
  ◦ Need to fix a bug? Add a feature? Self-service!
Databases

Cloud (PaaS) Shift

• End user abstracted from Database and Operating System implementation
• More economical to buy service than run yourself
• Pay a vendor for the service
• Need to fix a bug? Add a feature?
  ◦ Vendor request
  ◦ Upstream?
Example - Platform as a Service & Databases

Shifting Incentives

• Reduced incentive for **end user** to contribute to middleware like database

• **End user** incentive moved to cloud orchestration, cloud native deployment

• Platform as a Service value chain participates in Open Source database technologies
Shifting Incentives: Database/Middleware

**Historical**
- Use OS middleware to enable agile response to business demands and reduced operating cost.
- Participate to solve your own problems.

**Current**
- Use PaaS to provide middleware to reduce costs.
- Participate to enable efficient orchestration.
Future Shifts in Incentives

• Machine Learning
  ◦ How do we shift incentives to broaden participation further?

• Standards
  ◦ How to we enable participation for varied incentives?

• Open Hardware
  ◦ How do we ensure the right incentives exist?
Machine Learning

• Boom of Open Source Machine Learning software being given away by those using it for their business.

• How do the related businesses make money? How do they differentiate if the software is available to all?
Machine Learning Incentives

• Companies using machine learning to monetize data.
  ◦ Incentives - increase efficiency, attract talent, leverage community support and expertise.

• PaaS companies also have an incentive to participate in machine learning Open Source as can run machine learning as a service
  ◦ Incentives - increase efficiency, attract talent and use developer familiarity to drive adoption.

• Hardware vendors have incentive to participate in ensuring the software runs effectively on their hardware
  ◦ Incentives - sell more hardware.

• How do we continue the innovation in Open Source machine learning?
  ◦ Broaden the incentives to include companies where data is tangential to their business.
Open Data

• Enabling Open Data will continue the innovation boom in machine learning software.
  ◦ Extend the incentive to other businesses.

• How do we open up data for sharing the same way we share software?

• Licenses for data.
  ◦ https://cdla.io
  ◦ https://creativecommons.org
  ◦ https://opendatacommons.org
  ◦ https://project-open-data.cio.gov/open-licenses/

• How much is this used in practice?
Example - Incentives when data is tangential to business

Example - Incentives when data is tangential to business
Shifting Incentives: Machine Learning

Current

- Machine Learning software is an enabler. Value is typically in the data.
- Participate to share development cost, attract developer talent.

Future

- Open data plus machine learning can enable innovative new businesses and increase participation further.
Standards

• Historically limited incentives to directly participate in Open Source.
• Started participating to improve the speed of iteration and quality of standards.
• Standards are wide and varied in their complexity, so incentives may differ.
Standards - Collaboration Models

Commodity Technology  Research Intensive
Standards - Collaboration Models

- Lower energy, higher accuracy
- Lower risk
- Invest in product development
- Roadmap (clarity)

- Higher energy, lower accuracy
- Higher risk
- Invest in R&D
- Science (might fail)
Standards - Collaboration Models
Shifting Incentives - Standards

- Open Source and Standards collaboration is not a one size fits all solution.
Shifting Incentives: Standards

Incentives

Future

- Shared implementation - Aligns with typical Open Source incentives and participation models.
- Validate and improve standard - Use Open Source and Open Source collaboration methods to drive the pace of standardization.
Open Hardware

- Existing commercial architectures:
  - x86
  - PowerPC
  - SPARC
- Driven by vendor or a small set of vendors
- ARM architecture:
  - Many SoC (System on Chip) vendors with different requirements
ARM and Linux Kernel circa 2010/2011

- Fragmentation between ARM SoC vendors and lack of upstream
- ARM Tree size
- ARM Tree changes between releases
- Linus
- Linux Foundation, Linaro and Vendor response.
Open Hardware

• What about an architecture without a main commercial backer?
• RISC-V - Open ISA (Instruction Set Architecture)
• Enables Open Source or Commercial Implementations
Shifting Incentives: Open Hardware

Vendor incentive to ensure support. Software support need to sell hardware/architecture.

Democratized, so less differentiation? Open and collaborative?

Or “leave it to the others”? Tragedy of the commons.
Historical Incentives

• Hardware Vendors
• Sell Support and Services
• Provide Platform as a Service
• Auxiliary process and Infrastructure
• Talent Acquisition and Retention
Shifting Incentives - Future Examples

• Machine Learning:
  ◦ Will we successfully enable open data?
  ◦ Open data may be key to continuing innovation and broadening participation.

• Standards:
  ◦ Standard and Open Source collaboration may not be one-size fits all.
  ◦ We need a variety of models for standards to participate in open source

• Open Hardware:
  ◦ To avoid tragedy of the commons and unnecessary fragmentation we may need to align around open implementations.
Thank you

Follow us on:  

For more information, visit us at:  
www.qualcomm.com & www.qualcomm.com/blog

References in this presentation to “Qualcomm” may mean Qualcomm Incorporated, Qualcomm Technologies, Inc., and/or other subsidiaries or business units within the Qualcomm corporate structure, as applicable. Qualcomm Incorporated includes Qualcomm’s licensing business, QTL, and the vast majority of its patent portfolio. Qualcomm Technologies, Inc., a wholly-owned subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, substantially all of Qualcomm’s engineering, research and development functions, and substantially all of its product and services businesses, including its semiconductor business, QCT.