

Open Collaboration: The Eclipse Way

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Agenda



- Open source, open collaboration
- Collaboration, the Eclipse way
- Research and open collaboration

Software Is Eating the World











Software Matters to Industry











GE CEO Jeff

"Every industrial company will become a software company"

http://www.ge.com/ar2013/pdf/GE_AR13_Letter.pdf





Mike Milinkovich Eclipse Foundation

"Every software company is an open source company."





Open Source Maturity Model



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But What is "Open Source"?



Software Freedoms Freedom 0 to run the program, for any purpose Freédom 1 to study how the program works, and change it to make it do what you wish Freedom 2 to redistribute copies Freedom 3 to distribute copies of your modified versions to others

Transparency



Andrew Magill – flickr.com

Openness





Chris J. Fry – flickr.com

Meritocracy





Why Open Source?

- Better, smarter business
 - -Save costs, faster time to market, improve quality
- Enables collaboration
 - -Consistent sharing of IP
- Rapid adoption of technology
 - -It is free and easy to access
- Scale

Internet/Cloud/IoT Scale





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Enabling Developers

mobile



THE NUMBER OF IOT DEVELOPERS 2014-2020



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The Power of Developer Choice





Distribution of API protocols and styles

Based on directory of 3,200 web APIs listed at ProgrammableWeb, May 2011

A Current Example



Google Trends for "MQTT"



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There Is No Money In Software



The Price of Software

Computer software is now 0.7% of its price in 1980



Computer software price index

Source: U.S. Bureau of Economic Analysis

Bloomberg 🕕

Source: http://www.bloomberg.com/news/articles/2015-02-05/six-things-technology-has-made-insanely-cheap

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Innovation



Open Source enables:

- Permissionless innovation
- Innovation through integration
- Far higher levels of experimentation



The Community is the Capacity





Open Source Questions

- Is Open Source chaotic?
- How does development *really* work?
- What is this "Open Source community"?
- How do you manage community contributions?
- How do you plan in Open Source?
- Isn't open source going to infect our intellectual property?
- Why would we open source our assets?









- Open source, open collaboration
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A Brief History of Eclipse

Launched by IBM in 2001

-Initial release of the Eclipse technology platform (Platform, JDT, PDT)

- -Founding consortium board comprised Borland, IBM, Red Hat.....
- Eclipse Foundation formed in 2004
 - -Independent not-for-profit organization formed in 2004
 - -Definition of bylaws, membership model, initial IP process
- Eclipse Foundation today, 2017
 - Members include IBM, Oracle, SAP, CA, Red Hat, Google, Bosch, Ericsson, etc.
 - 240+ members, (12 strategic members), ~1400 committers
 - 320+ Open Source Projects
 - Industry-focused working groups in Science, LocationTech, IoT and Systems Engineering
 - 27 staff





Predictability

Simultaneous Release Metrics





Governance





- Who and how are decisions made?
- Who controls the intellectual property: copyright, trademark, domain names, etc.?
- Does anyone or company have special status or is it a level playing field for all parties?

Infrastructure



- A forge to host the development and IP
 - -Code repositories
 - -Bug database
 - –IP Management database
 - -Web sites, wikis
 - -Download mirrors
 - Build and release management

IP Management and Licensing



- Consistent and common set of legal agreements that will cover the intellectual property created by the collaboration.
- Software license that allows for downstream commercialization.
- For open source projects, IP Management that ensures license compatibility.
- IP cleanliness to ensure provenance

Projects and Processes



- Development process that enables large-scale distributed development
- Support involvement of many different organizations
- Open source project based on the principles of openness, transparency and meritocracy

Ecosystem Development



- How do ecosystems grow and add value?
- How can all stakeholders participate?
- What are the best practices for creating an ecosystem?



Eclipse Working Groups

 Eclipse is the industry's best model for vendor-neutral open collaboration

• Eclipse Working Groups:

- -Licensing model for sharing co-developed innovation
- -IP management to maximize commercialization opportunities
- -Project model for coordinating investments and activities
- -Governance model to ensure a level playing field for all participants

Eclipse gives you these "out of the box"



Open Source for IoT

IoT needs open source to be successful. Eclipse IoT simplifies IoT development.





Standards

Implementation of IoT standards like

MQTT, CoAP, LWM2M and OneM2M

Getting Started

Step-by-step guide to getting started on IoT development



Services & Frameworks

Building blocks to accelerate IoT development

All projects

projects

Check out all our IoT open source

Technology

Eclipse IoT provides open source implementations of the standards, services and frameworks that enable an Open Internet of Things.

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The 3 IoT Software Stacks

CONSTRAINED DEVICES



IOT CLOUD PLATFORM



GATEWAYS AND SMART DEVICES

The Eclipse Polarsys Initiative



Systems software development for very long lifecycle products



Copyright

The PolarSys Working Group



- Domains such as aerospace, defense and security, energy, health care, telecommunications, transportation must meet several requirements.
- Main projects:
 - Capella, CDT, Papyrus, Titan, Trace Compass



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Steering Committee Member



OLARSYS

Participating Member



The LocationTech Working Group

• LocationTech is a working group developing advanced **location aware technologies**

Steering Committee Member

ORACLE

S redhat

Google

OBoundless



The Science Working Group



- The Science Working Group (SWG) works to solve the problems of making science software inter-operable and interchangeable.
 - Develop reusable open source software for scientific research
 - Enable a collaborative approach to producing technologies used for interdisciplinary analysis of scientific data
 - Group efforts help permeate concepts and capabilities to different research areas which allows serendipitous discoveries to be made.
- Main projects:
 - Apogy, ChemClipse, DAWN, ICE, XACC









Steering



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Issues in Research



- Lack of dissemination / commercialization
- Reinvention vs. experimentation
- Closed collaboration models
- Open source can help these....
 - Direct commercialization, or
 - Throughout the research lifecycle

The Tasktop Story



Mylar Highlights: 2004-2007

- 2004 Mylar invention & innovation
- 2004 1st industrial trial at IBM Toronto
- 2005 1st academic publication
- 2005 EclipseCon/Field Study/Eclipse project
- 2005-06 Company discussions; biz competitions
- 2007 Mik's Ph.D. Friday; incorporate Monday

.

The Tasktop Story

Mylyn/Tasktop Highlights: 2007-2016

- 2007 Mylar becomes Eclipse Mylyn
- 2008 Tasktop Dev
- 2009 Tasktop Dev Enterprise sales
- 2011 Tasktop Sync
- 2014 \$11M Series A funding
- 2015-16 Tasktop Data & Gateway capabilities

Academic (TU Darmstadt)

- Research idea:
 - Developers spent too much time on reading source code. Mostly because the documentation we have is outdated or incomplete.
 - But the knowledge how to properly use an API manifests itself in source code of applications that already use these APIs
 - If we'd apply static analysis and some machine learning on it, we should be able to extract valuable information for code, and thus, help developers to become more productive.
- Ph.D. Thesis:
 - IDE 2.0: Leveraging the Wisdom of the Software Engineering Crowds [link]
- Research started in 2006 at Software Technology Group (Prof. Mira Mezini), Technisc he Univer sität Darms tadt, Germany



Code Recommenders first tool

```
@Override
public void create(JPanel parent) {
```

JButton button = new JButton();

button.



Which method will you call next in this situation?

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What you really want to see...

setText(String string) : void - Text - 73%

setLayoutData(Object layoutData) : void - Control - 71%

addModifyListener(ModifyListener listener) : void - Text - 48%

Press '^Space' to show Chain Proposals (Code Recommenders)

Why we (thought we) moved to Eclipse

- 1. Because we thought we build the <u>most</u> awesome, game-changing tool every developer should know about...
- 2. We wanted to get real users (not just 10 students) for our case studies to better publish our papers
- 3. We wanted to learn whether there is enough interest to build a commercial product around the idea

4. We just wanted to be with the cool kids...

Our benefits being at Eclipse

- Code Recommender s
 - Talks, Talks, Talks!
 50+ talks e.g. at JavaOne, Java User Groups, DemoCamps etc.
 - Eclipse Community Award 2012 attracted investors
 - Being part of the Eclipse Java IDE
 - millions of real users
 - helped to raise research funding (500.000 €)
 - made potential customers aware of Codetrails
- Eclipse Automated Error Reporting
 - Addition to Eclipse IDE and blog posts raised awareness
 - Being part of Eclipse IDE is a door-opener for commercial product



Eclipse as a Research Catalyst







APP4MC



- Eclipse APP4MC is a platform for engineering embedded multi- and many-core software systems.
- The platform enables the creation and management of complex tool chains including simulation and validation.
- As an open platform, proven in the **automotive sector** by **Bosch** and their partners, it supports interoperability and extensibility and unifies data exchange in cross-organizational projects.





AGILE



- AGILE Adaptive Gateways for diverse multiple Environments
- AGILE builds a modular hardware and software gateway for the Internet of Things with support for:
 - protocol interoperability,
 - device and data management,
 - IoT apps execution,
 - and external Cloud communication,
- Featuring diverse pilot activities, Open Calls & **Community building**





AMASS



- Architecture-driven, Multi-concern and Seamless Assurance and Certification of Cyber-Physical Systems
- AMASS will create and consolidate a de-facto European-wide assurance and certification open tool platform, ecosystem and selfsustainable community spanning the largest CPS vertical markets.
- It will start by combining and evolving the OPENCOSS and SafeCer technological solutions towards end-user validated tools, and will enhance and perform further research into new areas not covered by those projects.





BASYS



- The goal of the project is the creation of a platform ('Basissystem') to **manage** future **production plants**.
- To solve variability issues of the **production process** which has been identified as one of the core challenges of the **4th industrial revolution**.
- The concepts of capabilities (of equipment or plants), components of equipment or plants, IT-Services, intelligent devices and functions will be considered to create a holistic data model flexible but standardized runtime platforms real-time instruments for production planning and and conversion (of equipment and plant) flexible production management code

GEFÖRDERT VOM



Bundesministerium für Bildung und Forschung



CROSSMINER



- CROSSMINER will automatically **extract the knowledge** from OSS projects and **inject it into the IDE** of the developers, at the time they need it to make their design decisions.
- This allows them to reduce their effort in knowledge acquisition and to increase the quality of their code. CROSSMINER uniquely combines advanced software project analyses with online monitoring in the IDE.
- The developer will be monitored to infer which information is timely, based on readily available knowledge stored earlier by a set of advanced offline deep analyses of related OSS projects.



European Commission

Horizon 2020 European Union funding for Research & Innovation



RobMoSys



- **RobMoSys** will coordinate the whole community's best and consorted effort to build an open and sustainable, agile and multi-domain **European robotics software ecosystem**.
- **RobMoSys** envisions an integration approach built on-top-of, or rather around, the current **code-centric robotic platforms**, by means of the systematic application of model-driven methods and tools that explicitly focus on system-of-system integration.



European Commission Horizon 2020 European Union funding for Research & Innovation

GEMOC Research Consortium



• Launched in 2017

•Supporting coordinated use of modeling languages leads to what we call the globalization of modeling languages, that is, the use of multiple modeling languages to support coordinated development of diverse aspects of a system.



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Gemac The GEMOC Community



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Current State of Quantum Programming

Treat near-term QPUs as accelerators within a larger HPC environment. How do we program this?

- <u>Current Problems:</u>
 - Many QPLs and many QPUs
 - Massive amount of work to map QPL to QPU
- Near term test beds may have multiple QPUs attached to classical HPC cluster
- Nothing familiar here to current domain computational scientists
- None targets HPC environments





Eclipse XACC Specification

Treat near-term QPUs as accelerators within a larger HPC environment. How do we program this?

We have a solution – the **XACC(*) Specification:**

- Familiar API and Programming model
 - OpenCL-like high-level kernel compilation and execution API
 - LLVM-like language and hardware agnostic through a well designed intermediate representation
- Program quantum code once, in your language, and XACC handles the rest.

(*) eXtreme-scale ACCelerator programming framework





Parting Thoughts...



Our Future is being built on open source

The Community is the Capacity





Get Involved!







Thank you!

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