

Unchain Your Toolchains with CROPS (CROssPlatformS)

Todor Minchev

todor.minchev@linux.intel.com

Intel Open Source Technology Center

Embedded Linux Conference

San Diego, 5 April 2016



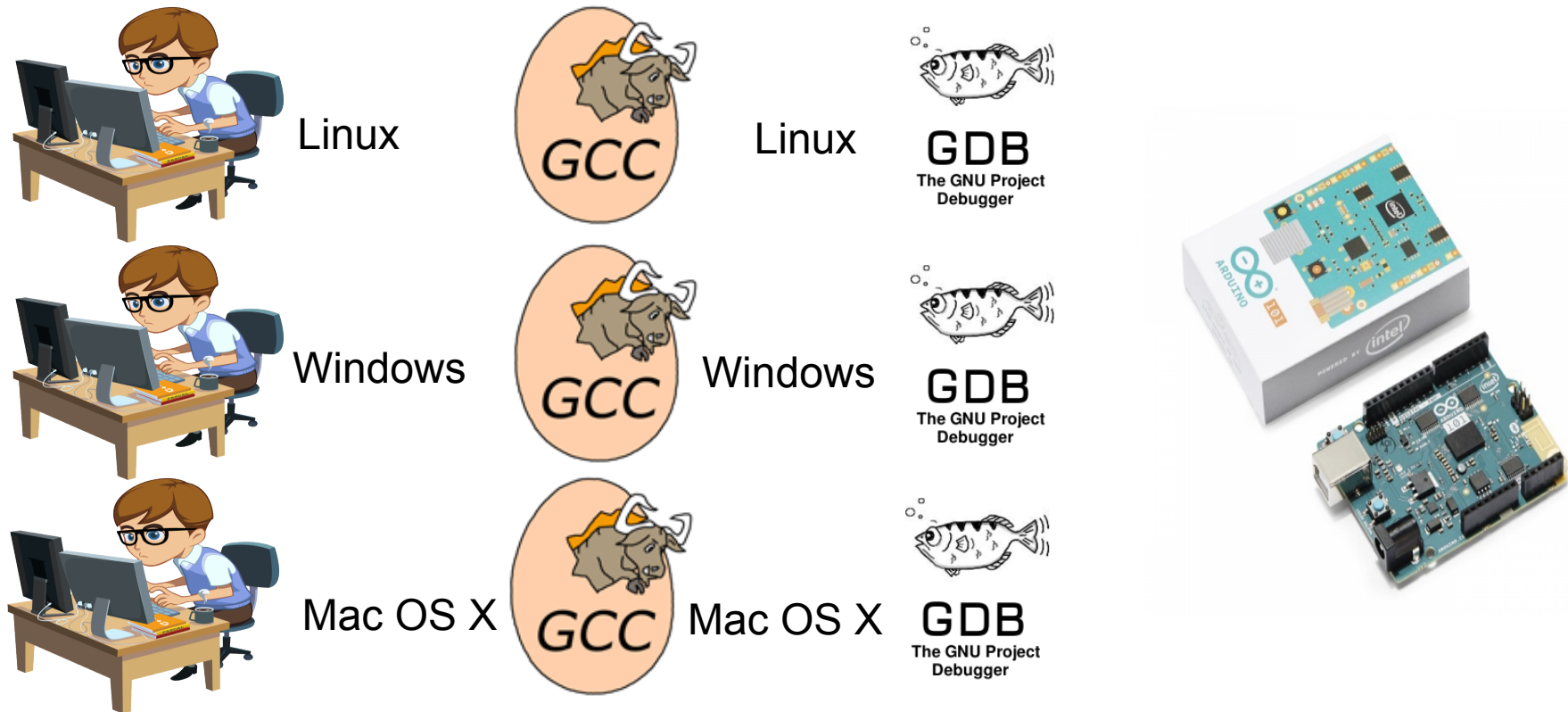
Agenda

- Traditional Cross-Platform Development Workflow
- CROPS Definition & Value
- Native Tools vs CROPS Containers
- Technical Overview
- Current Status
- Future Plans & Challenges
- Demo
- Q & A

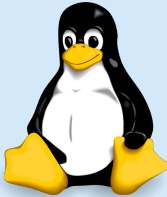
Traditional cross-platform development workflow



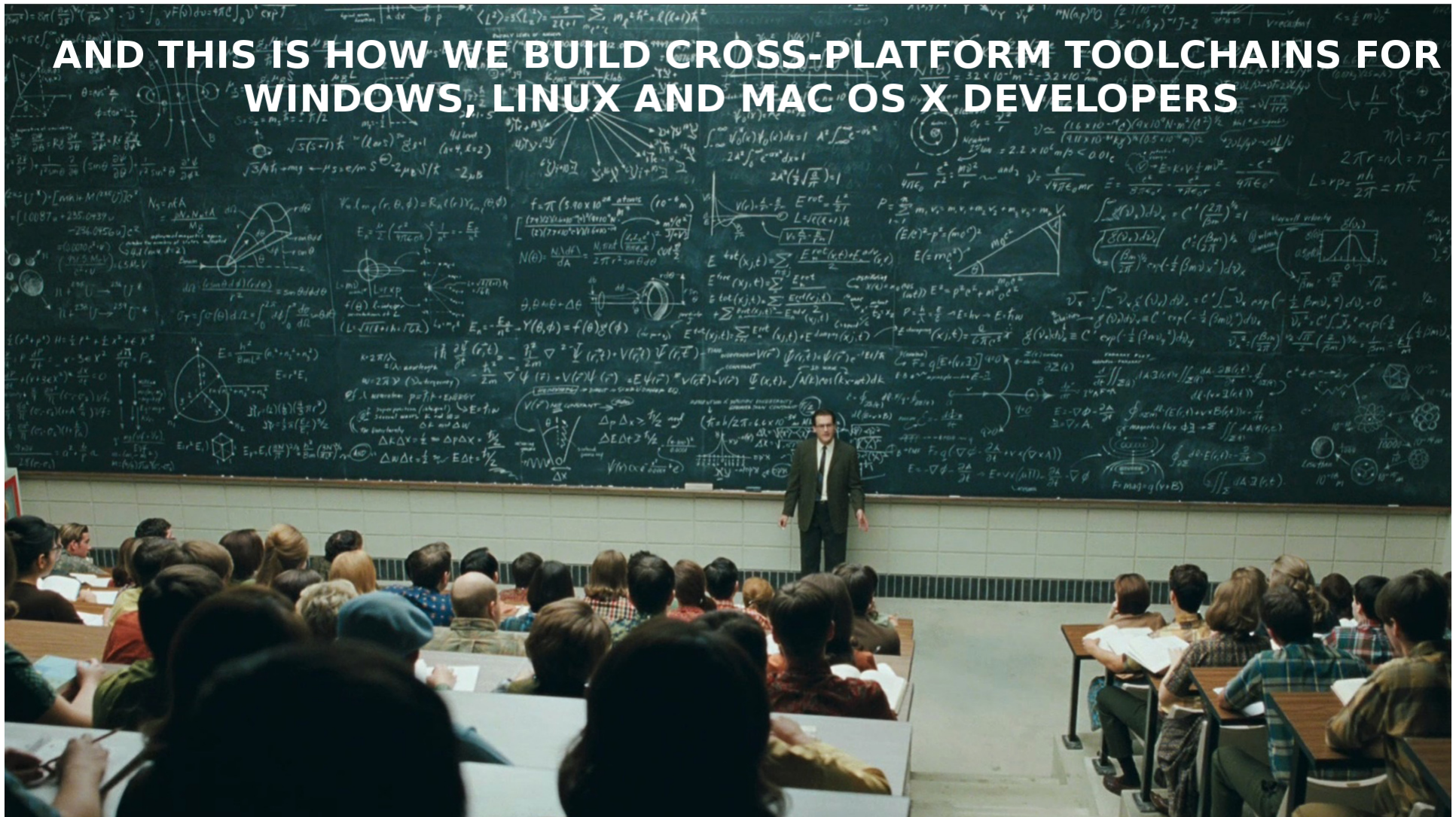
Traditional cross-platform development workflow on multiple host platforms



Scalability of the traditional cross-platform development model

DEVELOPMENT HOST (N)	SDK (N x M)	TARGET PLATFORMS (M)
	X86	X86
	ARM	
	MIPS	
	OTHERS	
Windows	X86	ARM
	ARM	
	MIPS	MIPS
	OTHERS	
Mac OS X	X86	OTHERS
	ARM	
	MIPS	
	OTHERS	

**AND THIS IS HOW WE BUILD CROSS-PLATFORM TOOLCHAINS FOR
WINDOWS, LINUX AND MAC OS X DEVELOPERS**



What is CROPS?

CROPS is an open source, cross-platform development framework that leverages Docker containers to provide an easily managed, extensible environment which allows developers to build binaries for a variety of architectures and use native Linux tools on Windows, Mac OS X and Linux hosts.



What Value does CROPS provide?

CROPS provides the following capabilities:

- a solution to allow cross building for different targets from Windows, Mac, & Linux hosts
- the ability to leverage Linux based tools in addition to the cross compiler e.g. bitbake, image creator, kernel menuconfig, perf, oprofile
- a path to embrace the cloud as part of the solution
- an alternative to a full Linux VM
- easy toolchain distribution and updates
- a clean, reproducible state for development and testing



Native Solution

Port the Linux toolchains for all the desired architectures to each of the desired hosts

PROS	CONS
No added complexity from containers	Need to qualify N toolchains on M hosts
Based on well known technologies	Windows represents several hosts (7,8,8.1,10, future...)
Meets user expectation for a toolchain app	Toolchain updates are likely monolithic, making rollbacks harder
	Easily polluted by host environment
	Remote builds infeasible

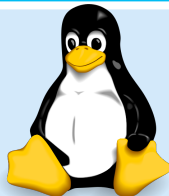
Containers Solution

Leverage containers to solve problem needs while relying on the host for the graphical IDE

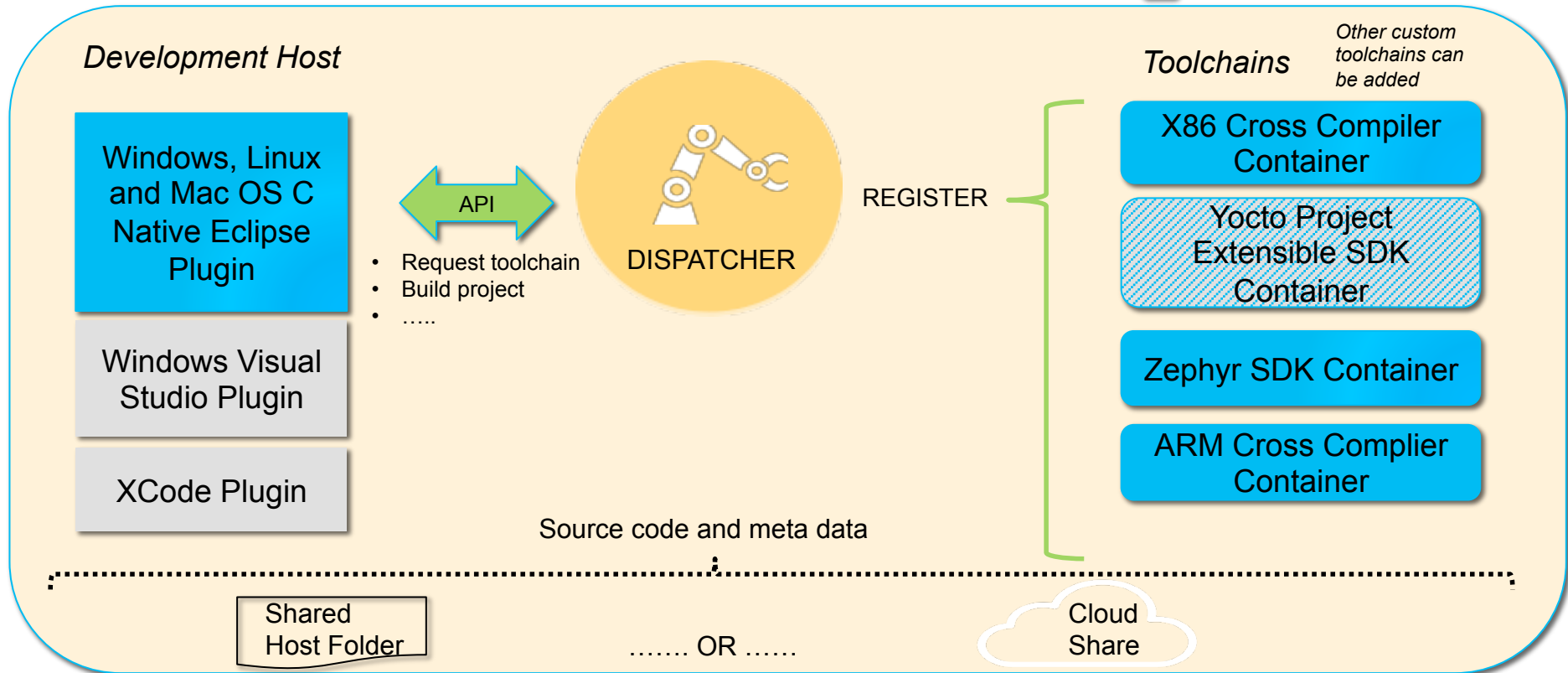
PROS	CONS
Need to qualify N toolchains on only 1 container	Containers add additional level of complexity (largely hidden)
Easy toolchain distribution, updates, and rollbacks	Based on forward-looking, state of the art technologies
Isolated from host environment	
Supports remote builds	
Active community support enabling containers on different hosts	

The primary advantage of containers is that we concentrate on the API and what is inside the container while others manage the issue of making it work on diverse platforms.

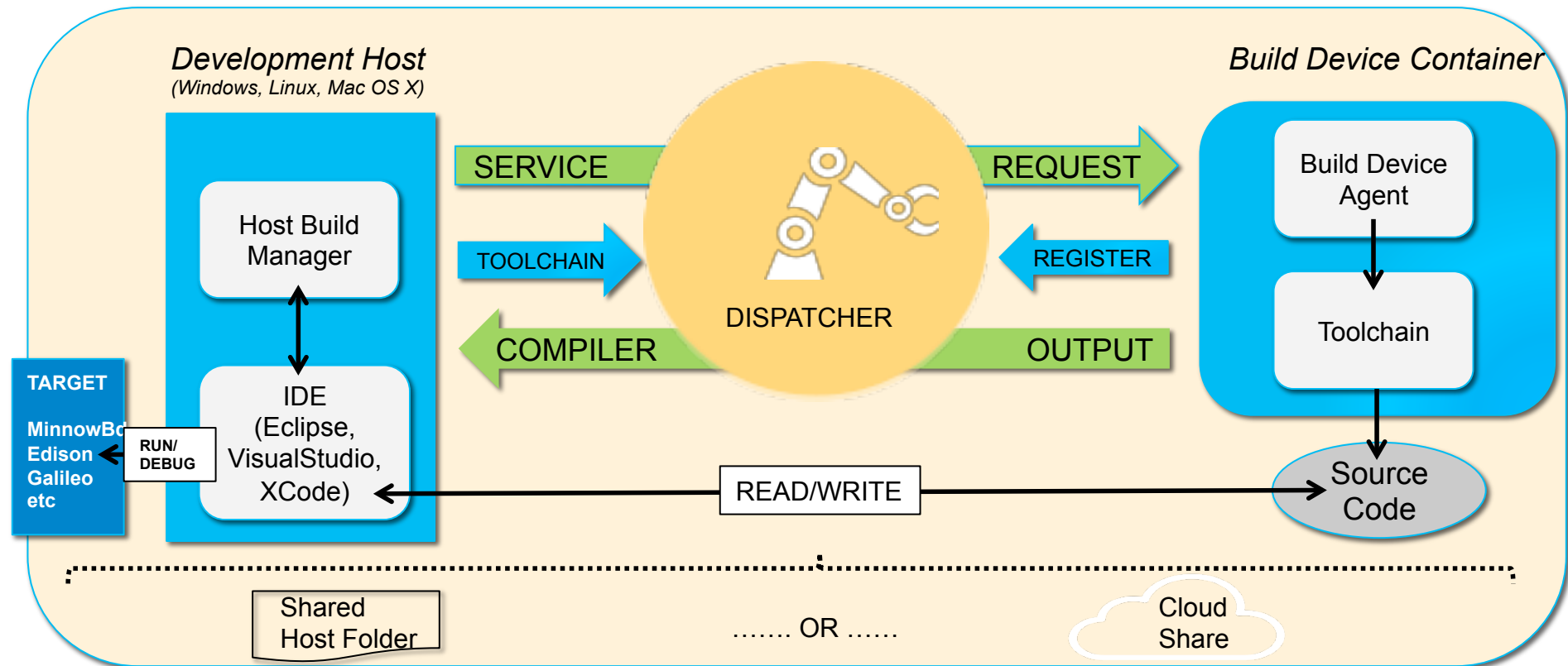
Scalability of the CROPS development model

DEVELOPMENT HOST (N)	CROPS SDK(M)	TARGET PLATFORMS (M)
	X86 ARM MIPS OTHERS	X86
Windows		ARM
Mac OS X		MIPS
		OTHERS

What the framework allows



How CROPS works



Current Status – Project Home (<https://git.yoctoproject.org/cgit/cgit.cgi/crops/>)

crops - CROPS cross

https://git.yoctoproject.org/cgit/cgit.cgi/crops

Apps For quick access, place your bookmarks here on the bookmarks bar. [Import bookmarks now...](#)

yocto

PROJECT

index : crops

CROPS cross-platform development framework for Linux/Windows and Mac OS X hosts

git repository hosting

aboutsummaryrefslogtreecommitdiffstats

log msgsearch

Branch	Commit message	Author	Age
master	installers: add gdb wrapper script to Zephyr installer	Todor Minchev	10 min.

Age	Commit message	Author	Files	Lines
10 min.	installers: add gdb wrapper script to Zephyr installer	Todor Minchev	1	-2/+4
10 min.	scripts: add gdb wrapper script	Todor Minchev	1	-0/+8
10 min.	README: Update README	Todor Minchev	1	-45/+126
10 min.	installer: moved platform check to top of script so we only do it once	brian avery	1	-13/+26
10 min.	installer: added a check for docker installation	brian avery	1	-0/+10
10 min.	installer: install ceed for mac	Todor Minchev	1	-4/+6
10 min.	installer: pass codi ip address to ceed on Windows and Mac	Todor Minchev	1	-2/+9
2016-03-01	installer: add a universal crops installer for Zephyr builds	Todor Minchev	2	-3/+194
2016-02-26	travis: force docker version to be 1.10	brian avery	1	-0/+13
2016-02-26	travis: add docker version so we know what we are running on	brian avery	1	-0/+1
[...]				

Clone

git://git.yoctoproject.org/crops

http://git.yoctoproject.org/git/crops

generated by cgit v0.10.2 at 2016-03-18 16:59:43 (GMT)

intel

Software

Intel

OpenSource

TECHNOLOGY CENTER

14

Current Status - GitHub mirror with wiki (<https://github.com/todorez/crops>)

The screenshot shows a web browser window with the address bar displaying <https://github.com/todorez/crops/wiki>. The page content is titled "1 . Install Docker" and includes a list of instructions for Windows users. A "Setup - Docker Toolbox" window is overlaid on the page, showing the "Select Additional Tasks" section with the following options:

- ☒ Create a desktop shortcut
- ☒ Add docker binaries to PATH
- ☒ Upgrade Boot2Docker VM
- ☒ Install VirtualBox with ND155 driver [default ND156]

Below the Docker Toolbox window, the page continues with instructions for Mac users and a section titled "2 . Run Zephyr Installer".

Current Status – DockerHub (<https://hub.docker.com/r/crops/>)

The screenshot shows the DockerHub profile page for the user 'crops'. The page layout includes a header with navigation links (Dashboard, Explore, Organizations), a search bar, and a user profile section on the left. The main content area displays a list of repositories created by the user. The footer features the Intel Software and Intel OpenSource Technology Center logos.

Profile Information:

- Username: crops
- Joined: December 2015

Repositories:

Repository	Stars	Pulls	Details
crops/toolchain public	0 STARS	4.6 K PULLS	> DETAILS
crops/codi public	0 STARS	90 PULLS	> DETAILS
crops/zephyr public	0 STARS	51 PULLS	> DETAILS
crops/ceed public	0 STARS	27 PULLS	> DETAILS

Footer:

- Intel Software
- Intel OpenSource TECHNOLOGY CENTER
- Page Number: 16

Current Status - CLI

```
MINGW64:/c/Users/tminchev.GER
Deleted: sha256:2e79b498571d320a33d302bcb88cd9fd3a0d8b43d3819b2662fa9b06ab6a712f
Deleted: sha256:4d65cc431093f73be46e1494d3d7c970b1d8a5f427021d68399fafb87ca28dde
Deleted: sha256:d9d81958beda8c39e1f16c2a2dd6cc6ba9c1a2be2293ec019876627a9a3ff701
Deleted: sha256:1e05dd52e2b9abeb32e8c8128165f9e991ca2a2fd95549bcc481c8cb3637958a
Deleted: sha256:3ee183ac4dc340e2c50979ac839c0fdc6a1b7096711f46f8e579f28c99a72db1
Deleted: sha256:1cc1cd984c41fdb75f08fe17231c4c06f9ccd473ee2884ff4e44954a0d93d7f5
Deleted: sha256:c8529bd7bae0fe199b7165a052ae21be46d14978b70e969a8342ee36bc7caac6
Deleted: sha256:2582f3312042a435c96e662c9ff8b6ec9d93942c33a0dddd42f3efb247cadcb2
Done
Window Snip

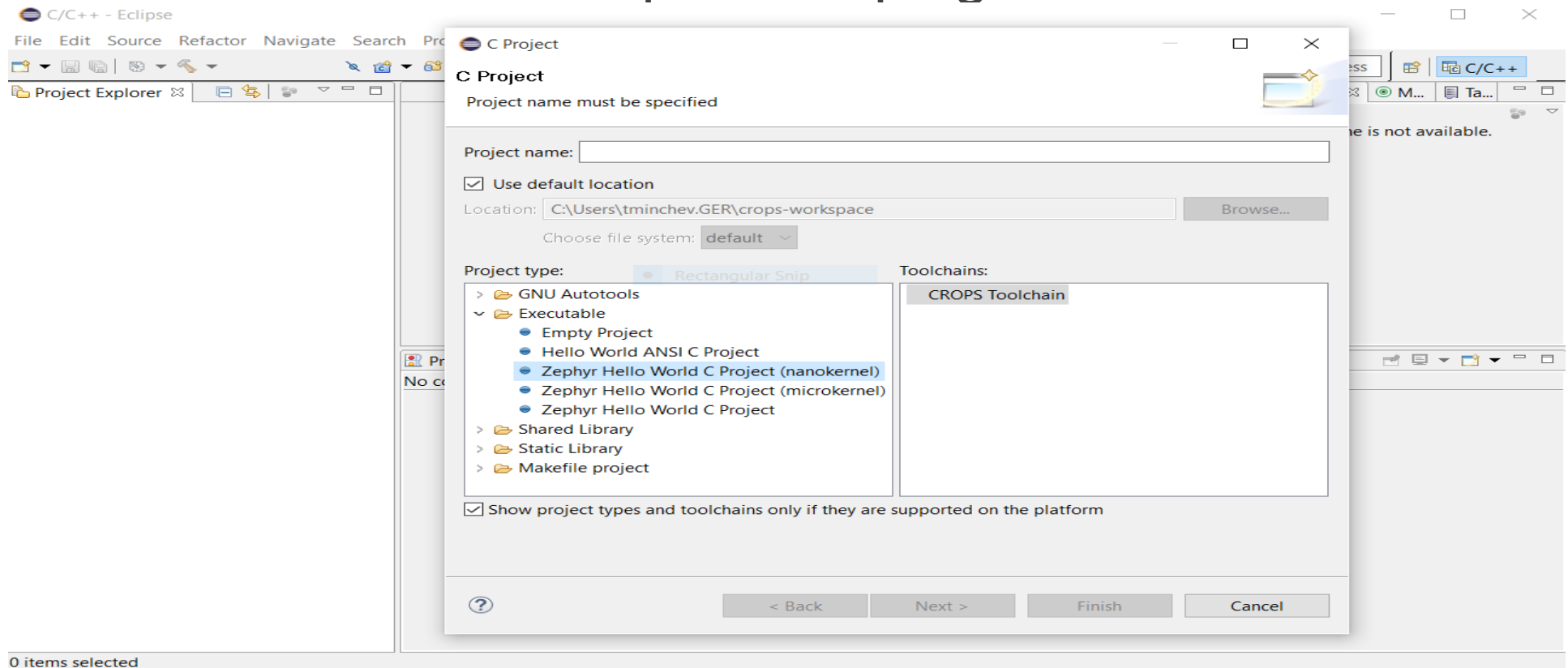
THE CROPS ENVIRONMENT HAS BEEN SET UP

Initialize Zephyr environment for CLI use
Example :
/c/Users/tminchev.GER/.crops/ceed/ceed -i 192.168.99.100 -d crops-zephyr-0-7-2-s
rc -g "git clone --branch v1.0.0 /zephyr-src /crops/zephyr-project/"

You can now build Zephyr applications from the CLI
Example :
/c/Users/tminchev.GER/.crops/make.zephyr BOARD=arduino_101 -C /crops/zephyr-proj
ect/samples/nanokernel/apps/hello_world/

tminchev@tminchev-MOBL6 MINGW64 ~
$
```

Current Status – Eclipse IDE plug-in



Future Plans

- **RESTful API**
 - Current framework uses Internet sockets
 - Firewalls allow only well known ports through (e.g 80, 443)
- **Remote Toolchain/Projects Support**
 - Host toolchain containers remotely
 - Store project workspaces remotely
 - Share toolchains
- **Toolchain descriptors**
 - Describe toolchain capabilities
 - Supported architectures
 - Default compiler flags

Future Plans

- **Dynamic Eclipse IDE UI**
 - Provide different UI perspectives based on toolchain capabilities
 - RTOS builds vs userspace application builds

Challenges

- **Remote Projects Support**
 - File synchronization
 - Depends on Internet connectivity
 - Binary File Diffs
- **Debugging from Eclipse on Windows**
 - Pseudo terminals on Windows

DEMO



Intel
OpenSource
TECHNOLOGY CENTER

Q & A



Intel
OpenSource
TECHNOLOGY CENTER

CROPS Team

Todor Minchev

todor.minchev@linux.intel.com

Brian Avery

brian.avery@intel.com

Tim Orling

timothy.t.orling@intel.com



Legal Disclaimer

INFORMATION IN THIS DOCUMENT IS PROVIDED “AS IS”. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. INTEL ASSUMES NO LIABILITY WHATSOEVER AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO THIS INFORMATION INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

- Other names and brands may be claimed as the property of others.

Copyright © 2016 Intel Corporation.

