DOCKER 101

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AGENDA

- How to participate
- What is a container
- Docker images
- Working with Docker containers

NOT ON THE AGENDA

- Why should I use Docker
- Content of a container

HOW TO PARTICIPATE

- Install guide on github.com/josefkarasek/docker101
- For Linux, Mac and Windows

Other than that:

- Follow the instructions
- When you have a question, just fire it
- Enjoy yourself

ATOMIC DEVELOPER BUNDLE (ADB)

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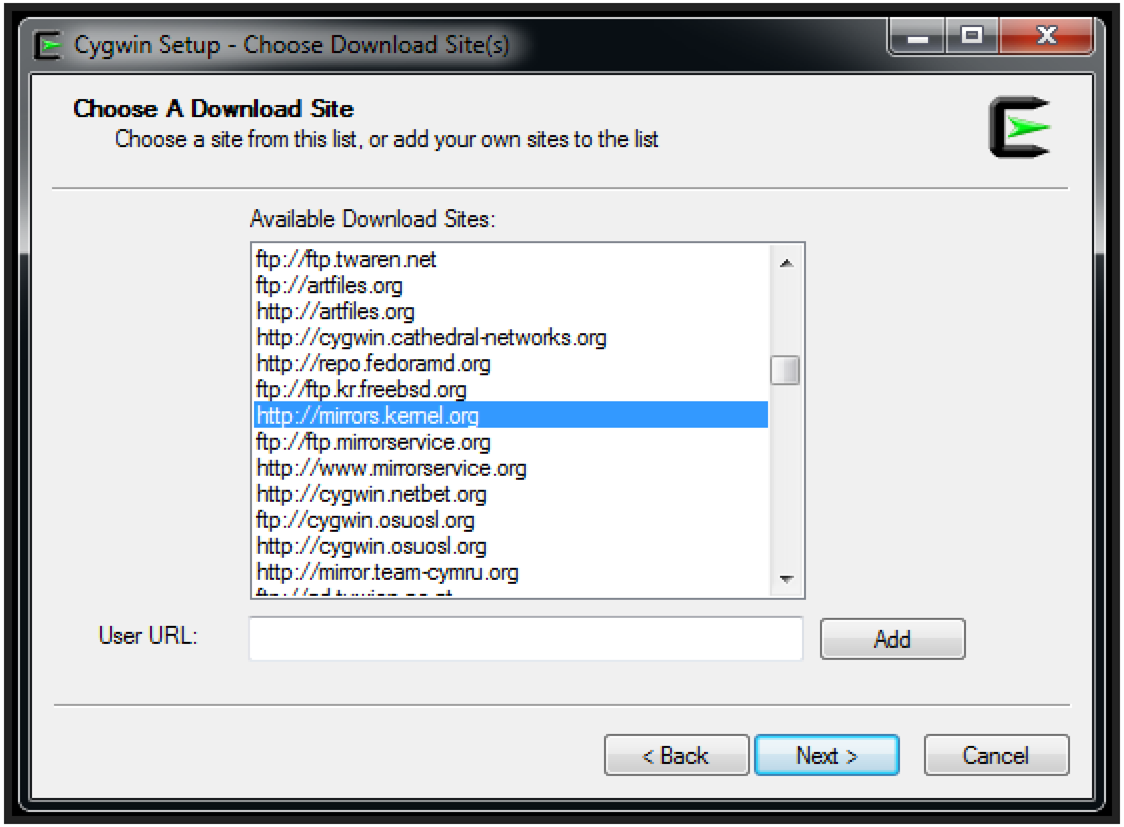
- Prepackaged development environment filled with pre-configured tools that makes container developer's lives easier
- For Linux, Mac and Windows

INSTALL GUIDE FOR WINDOWS

- Install VirtualBox from virtualbox.org
- Install Vagrant 1.7.4 from vagrantup.com
  - Version 1.8.x is buggy on Windows

INSTALL GUIDE FOR WINDOWS II

- Install Cygwin from cygwin.com
  - Select download site - **mirrors.kernel.org**



Cygwin Setup - Choose Download Site(s)

Choose A Download Site

Choose a site from this list, or add your own sites to the list

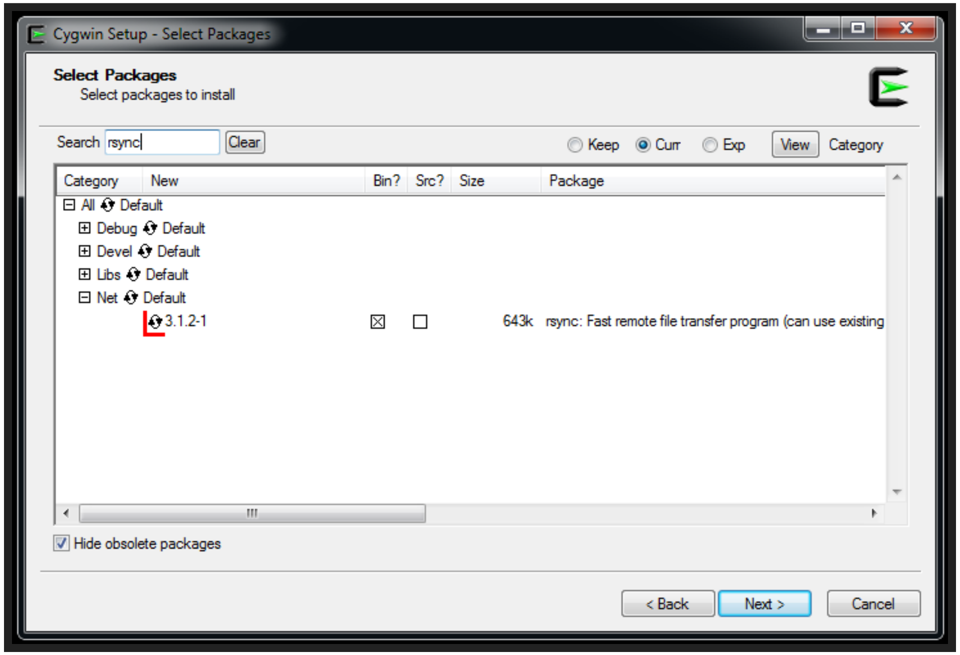
Available Download Sites:

ftp://ftp.twaren.net
ftp://artfiles.org
http://artfiles.org
http://cygwin.cathedral-networks.org
http://repo.fedoramd.org
ftp://ftp.kr.freebsd.org
http://mirrors.kernel.org
ftp://ftp.mirrorservice.org
http://www.mirrorservice.org
http://cygwin.netbet.org
ftp://cygwin.osuosl.org
http://cygwin.osuosl.org
http://mirror.team-cymru.org

User URL:

INSTALL GUIDE FOR WINDOWS III

- Select **rsync** and **openssh** during installation



Cygwin Setup - Select Packages

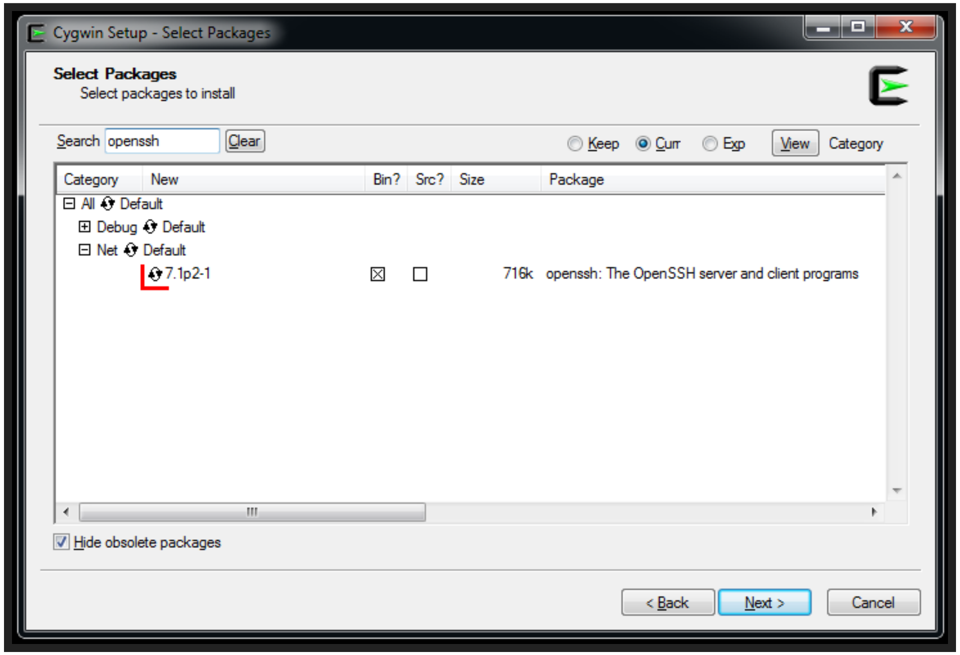
Select Packages
Select packages to install

Search rsync Clear ○ Keep ● Curr ○ Exp View Category

Category	New	Bin?	Src?	Size	Package
⊟ All Default					
⊞ Debug Default					
⊞ Devel Default					
⊞ Libs Default					
⊟ Net Default					
	3.1.2-1	☒	□	643k	rsync: Fast remote file transfer program (can use existing

☑ Hide obsolete packages

< Back Next > Cancel



Cygwin Setup - Select Packages

Select Packages
Select packages to install

Search openssh Clear ○ Keep ● Curr ○ Exp View Category

Category	New	Bin?	Src?	Size	Package
⊟ All Default					
⊞ Debug Default					
⊟ Net Default					
	7.1p2-1	☒	□	716k	openssh: The OpenSSH server and client programs

☑ Hide obsolete packages

< Back Next > Cancel

INSTALL GUIDE FOR WINDOWS IV

- In **CygWin64 Terminal** write:

```
export VAGRANT_DETECTED_OS=cygwin
mkdir vagrant-images
cd vagrant-images
vagrant init projectatomic/adb
vagrant up
vagrant ssh
```

WHAT IS A CONTAINER?

actually, there is no container

but there are constrained applications*

*application = 1 or more running processes

WHEN WE TALK ABOUT CONTAINERS

we talk about multiple Linux kernel features

configured for one or set of processes

DOCKER

a platform for running, shipping (and building containers)

Docker daemon manages containers on the host

DOCKER IMAGE

An archive containing:

- Minimal OS for installing and running applications
- Application with all dependencies

Image is uniquely identified by:

- Image registry
- Author
- Image name
- Image tag (version)

```
registry.access.redhat.com/jboss-eap-6/eap64-openshift:1.2
```

DOCKER PULL

Downloads and updates Docker images

```
$ docker pull docker.io/fedora:latest
```

DOCKER IMAGES

Lists all Docker images on the host

```
$ docker images
REPOSITORY        TAG      IMAGE ID      CREATED      VIRTUAL SIZE
docker.io/fedora  latest   0721f2b3cb16  4 weeks ago  206.3 MB
```

DOCKER RMI

Remove Docker image from the host

```
$ docker rmi fedora
```

DOCKER CREATE

Creates stopped container from the image

```
$ docker create -i -t --name my_fedora fedora bash
3c314776542af5507fce81f3ee0a4318e06e617e58a250e4ddcf9b88736624a5
```

-i

Interactive mode (keeps the STDIN open)

-t

Allocates a pseudo-TTY

--name

Name of the container. Good practice is to set one

fedora

Image to be instantiated

bash

Application to be run inside of the container

DOCKER PS

Display containers

```
$ docker ps
CONTAINER ID  IMAGE  COMMAND  CREATED  STATUS  PORTS  NAMES
```

```
$ docker ps -a
CONTAINER ID  IMAGE   COMMAND  CREATED         STATUS   NAMES
3c314776542a  fedora  "bash"   11 minutes ago  Created  my_fedora
```

-a

Show all containers. Only running are shown by default

DOCKER START

Starts created container

```
$ docker start -a -i my_fedora
[root@3c314776542a /]#
```

-a

Attach to the pseudo-TTY

-i

Interactive mode (keeps the STDIN open)

my_fedora

Name of the container

DOCKER RM

Removes container

```
$ docker rm -f my_fedora
my_fedora
```

-f

Removes container even if it's running

my_fedora

Name of the container

DOCKER RUN

docker create + docker start

```
$ docker run -it --rm --name my_fedora fedora bash
[root@7b222b35a6c7 /]#
```

-it

Interactive mode

--rm

Removes container when it stops

--name

Name of the container. Good practice is to set one

fedora

Image to be instantiated

bash

Application to be run inside of the container

LET'S LOOK AROUND

In the container:

```
# dnf install procps-ng iproute hostname  # Bad practice!
# ps ax
# sleep 10000
# ip a
# hostname
```

On the host:

```
$ ps axjf
$ hostname
```

LET'S LOOK AROUND II

```
$ docker run -it --rm --name my_fedora --memory 256m fedora bash
```

In container:

```
# dnf install stress  # Bad practice!
# stress --vm 2 --vm-bytes 512M
```

On the host:

```
$ systemd-cgtop
```

CONTAINER IN THE BACKGROUND

```
$ docker run -d --name my_nginx nginx
c44b0ce917e877615f4f0b36a7c0310f4fa4aaef9219b2e776af103abe92ac7b
```

-d

Run the container in the background

--name

Name of the container. Good practice is to set one

nginx

Image to be instantiated

```
$ docker ps
CONTAINER ID   IMAGE   COMMAND                  CREATED         STATUS
c44b0ce917e8   nginx   "nginx -g 'daemon off"   6 minutes ago   Up 6 min
```

EXPOSING PORTS

```
$ docker run -d -P --name my_nginx nginx
```

-P

Publish all exposed ports to random ports on the host

```
$ docker port my_nginx
443/tcp -> 0.0.0.0:32768
80/tcp -> 0.0.0.0:32769

$ docker ps
CONTAINER ID   IMAGE   COMMAND   CREATED          STATUS         PORTS
dd0802ce4333   nginx   "ngi.."   6 minutes ago    Up 6 minutes   0.0.0.0:3
```

EXPOSING PORTS II

```
$ docker run -d -p 80:80 --name my_nginx nginx
```

-p

Publish a container's port to the host

```
$ docker port my_nginx
80/tcp -> 0.0.0.0:80

$ docker ps
CONTAINER ID  IMAGE  COMMAND  CREATED         STATUS        PORTS
f7b1be4c1c9c  nginx  "ngi.."  6 minutes ago   Up 6 minutes  0.0.0.0:8
```

VOLUMES

```
$ docker run -d -p 80:80 \
-v /tmp/nginx:/usr/share/nginx/html:ro,Z \
--name my_nginx nginx
```

-V

Bind mount a volume from the host to a container

```
$ docker inspect my_nginx
```

ENVIRONMENT VARIABLES

```
$ docker run -d -e MYSQL_ROOT_PASSWORD=my-secret-pw \
--name my_mariadb mariadb
```

-e

Set environment variable

LINKING CONTAINERS

```
$ docker run -d -p 80:80 --link my_mariadb:mysql \
--name my_wordpress wordpress
```

--link

Add link to another container

DOCKER EXEC

Execute command inside running container

```
$ docker exec -it my_wordpress bash
root@e3b575fc1707:/var/www/html#
```

-it

Interactive mode

my_wordpress

Container name

bash

Command to execute in the container

GCC EXAMPLE

SIMPLE C PROGRAM

```c
#include <stdio.h>

int main()
{
   int a, b, c;

   printf("Enter two numbers to add:\n");
   scanf("%d%d", &a, &b);

   c = a + b;

   printf("Sum of entered numbers = %d\n", c);

   return 0;
}
```

PREPARE DOCKER IMAGE

```
FROM fedora:23
MAINTAINER "Peter Schiffer" <pschiffe@redhat.com>

RUN dnf -y --setopt=tsflags=nodocs install \
        gcc \
    && dnf -y clean all

WORKDIR /gcc
```

CREATE MAKEFILE

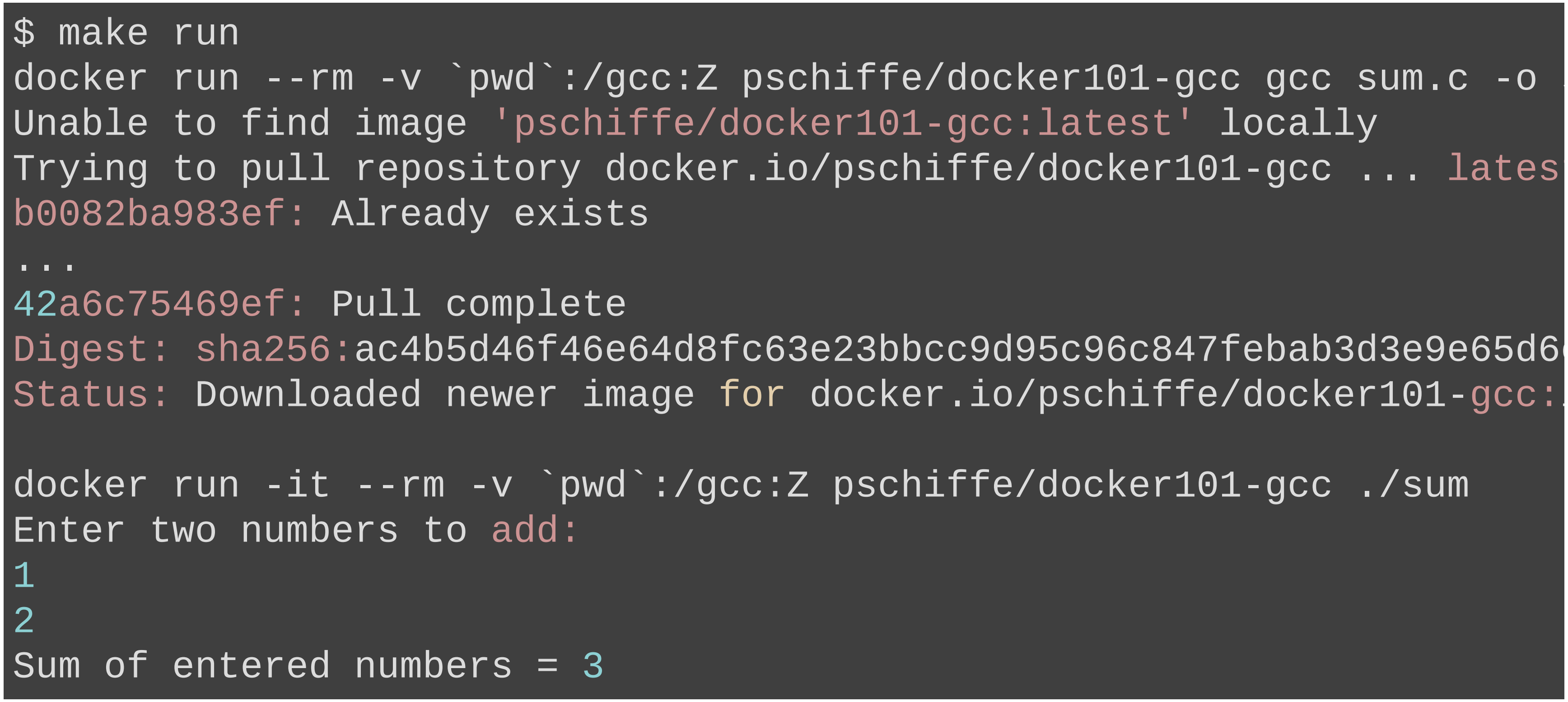
```
CC=gcc
SOURCES=sum.c
EXECUTABLE=sum
DOCKER_IMAGE=pschiffe/docker101-gcc
DOCKER_IMAGE_PATH=/gcc

all: $(EXECUTABLE)

$(EXECUTABLE): $(SOURCES)
        docker run --rm -v `pwd`:$(DOCKER_IMAGE_PATH):Z \
                $(DOCKER_IMAGE) $(CC) $(SOURCES) -o $@

run: $(EXECUTABLE)
        docker run -it --rm -v `pwd`:$(DOCKER_IMAGE_PATH):Z \
                $(DOCKER_IMAGE) ./$(EXECUTABLE)
```

PROFIT $$$



```
$ make run
docker run --rm -v `pwd`:/gcc:Z pschiffe/docker101-gcc gcc sum.c -o
Unable to find image 'pschiffe/docker101-gcc:latest' locally
Trying to pull repository docker.io/pschiffe/docker101-gcc ... lates
b0082ba983ef: Already exists
...
42a6c75469ef: Pull complete
Digest: sha256:ac4b5d46f46e64d8fc63e23bbcc9d95c96c847febab3d3e9e65d6
Status: Downloaded newer image for docker.io/pschiffe/docker101-gcc:

docker run -it --rm -v `pwd`:/gcc:Z pschiffe/docker101-gcc ./sum
Enter two numbers to add:
1
2
Sum of entered numbers = 3
```

LINKS

- github.com/josefkarasek/docker101
- docker.com
- hub.docker.com
- projectatomic.io