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DOF603 - Gérer et Stocker les Images Docker

Contenu du Module

LAB #1 - Re-créer une image officielle docker

1.1 - Utilisation d'un Dockerfile

Bien que la compilation des images soient assuré par Docker Hub, il est tout à fait possible de compiler une image “officielle” à partir d'un Dockerfile :

```
root@debian11:~# mkdir mongodb
root@debian11:~# cd mongodb/
root@debian11:~/mongodb# touch Dockerfile docker-entrypoint.sh
```

Le Docker file contient les instructions nécessaires pour la contruction de l'image :

```
root@debian11:~/mongodb# vi Dockerfile
root@debian11:~/mongodb# cat Dockerfile
FROM ubuntu:bionic

# add our user and group first to make sure their IDs get assigned consistently, regardless of whatever
dependencies get added
RUN groupadd -r mongodb && useradd -r -g mongodb mongodb

RUN set -eux; \
        apt-get update; \
        apt-get install -y --no-install-recommends \
                ca-certificates \
                jq \
                numactl \
        ; \
        if ! command -v ps > /dev/null; then \
                apt-get install -y --no-install-recommends procps; \
        fi; \
        rm -rf /var/lib/apt/lists/*
```

```
# grab gosu for easy step-down from root (https://github.com/tianon/gosu/releases)
ENV GOSU_VERSION 1.11
# grab "js-yaml" for parsing mongod's YAML config files (https://github.com/nodeca/js-yaml/releases)
ENV JSYAML_VERSION 3.13.0

RUN set -ex; \
        \
        apt-get update; \
        apt-get install -y --no-install-recommends \
                wget \
        ; \
        if ! command -v gpg > /dev/null; then \
                apt-get install -y --no-install-recommends gnupg dirmngr; \
        fi; \
        rm -rf /var/lib/apt/lists/*; \
        \
        dpkgArch="$(dpkg --print-architecture | awk -F- '{ print $NF }')"; \
        wget -O /usr/local/bin/gosu
"https://github.com/tianon/gosu/releases/download/$GOSU_VERSION/gosu-$dpkgArch"; \
        wget -O /usr/local/bin/gosu.asc
"https://github.com/tianon/gosu/releases/download/$GOSU_VERSION/gosu-$dpkgArch.asc"; \
        export GNUPGHOME="$(mktemp -d)"; \
        gpg --batch --keyserver pgp.mit.edu --recv-keys B42F6819007F00F88E364FD4036A9C25BF357DD4; \
        # gpg --batch --verify /usr/local/bin/gosu.asc /usr/local/bin/gosu; \
        command -v gpgconf && gpgconf --kill all || :; \
        rm -r "$GNUPGHOME" /usr/local/bin/gosu.asc; \
        chmod +x /usr/local/bin/gosu; \
        gosu --version; \
        gosu nobody true; \
        \
        wget -O /js-yaml.js "https://github.com/nodeca/js-yaml/raw/${JSYAML_VERSION}/dist/js-yaml.js"; \
# TODO some sort of download verification here
        \
        apt-get purge -y --auto-remove wget
```

```
RUN mkdir /docker-entrypoint-initdb.d

ENV GPG_KEYS E162F504A20CDF15827F718D4B7C549A058F8B6B
RUN set -ex; \
        export GNUPGHOME="$(mktemp -d)"; \
        for key in $GPG_KEYS; do \
                gpg --batch --keyserver pgp.mit.edu --recv-keys "$key"; \
        done; \
        gpg --batch --export $GPG_KEYS > /etc/apt/trusted.gpg.d/mongodb.gpg; \
        command -v gpgconf && gpgconf --kill all || :; \
        rm -r "$GNUPGHOME"; \
        apt-key list

# Allow build-time overrides (eg. to build image with MongoDB Enterprise version)
# Options for MONGO_PACKAGE: mongodb-org OR mongodb-enterprise
# Options for MONGO_REPO: repo.mongodb.org OR repo.mongodb.com
# Example: docker build --build-arg MONGO_PACKAGE=mongodb-enterprise --build-arg MONGO_REPO=repo.mongodb.com .
ARG MONGO_PACKAGE=mongodb-org-unstable
ARG MONGO_REPO=repo.mongodb.org
ENV MONGO_PACKAGE=${MONGO_PACKAGE} MONGO_REPO=${MONGO_REPO}

ENV MONGO_MAJOR 4.1
ENV MONGO_VERSION 4.1.9
# bashbrew-architectures:amd64 arm64v8 s390x
RUN echo "deb http://$MONGO_REPO/apt/ubuntu bionic/${MONGO_PACKAGE%-unstable}/$MONGO_MAJOR multiverse" | tee
"/etc/apt/sources.list.d/${MONGO_PACKAGE%-unstable}.list"

RUN set -x \
        && apt-get update \
        && apt-get install -y \
                ${MONGO_PACKAGE}=$MONGO_VERSION \
                ${MONGO_PACKAGE}-server=$MONGO_VERSION \
                ${MONGO_PACKAGE}-shell=$MONGO_VERSION \
                ${MONGO_PACKAGE}-mongos=$MONGO_VERSION \
```

```
                ${MONGO_PACKAGE}-tools=$MONGO_VERSION \
        && rm -rf /var/lib/apt/lists/* \
        && rm -rf /var/lib/mongodb \
        && mv /etc/mongod.conf /etc/mongod.conf.orig

RUN mkdir -p /data/db /data/configdb \
        && chown -R mongodb:mongodb /data/db /data/configdb
VOLUME /data/db /data/configdb

COPY docker-entrypoint.sh /usr/local/bin/
ENTRYPOINT ["docker-entrypoint.sh"]

EXPOSE 27017
CMD ["mongod"]
```

Le fichier docker-entrypoint.sh sert à lancer le serveur mongodb dans le conteneur :

```
root@debian11:~/mongodb# vi docker-entrypoint.sh
root@debian11:~/mongodb# cat docker-entrypoint.sh
#!/bin/bash
set -Eeuo pipefail

if [ "${1:0:1}" = '-' ]; then
        set -- mongod "$@"
fi

originalArgOne="$1"

# allow the container to be started with `--user`
# all mongo* commands should be dropped to the correct user
if [[ "$originalArgOne" == mongo* ]] && [ "$(id -u)" = '0' ]; then
        if [ "$originalArgOne" = 'mongod' ]; then
                find /data/configdb /data/db \! -user mongodb -exec chown mongodb '{}' +
        fi
```

```
        # make sure we can write to stdout and stderr as "mongodb"
        # (for our "initdb" code later; see "--logpath" below)
        chown --dereference mongodb "/proc/$$/fd/1" "/proc/$$/fd/2" || :
        # ignore errors thanks to https://github.com/docker-library/mongo/issues/149

        exec gosu mongodb "$BASH_SOURCE" "$@"
fi

# you should use numactl to start your mongod instances, including the config servers, mongos instances, and any
clients.
# https://docs.mongodb.com/manual/administration/production-notes/#configuring-numa-on-linux
if [[ "$originalArgOne" == mongo* ]]; then
        numa='numactl --interleave=all'
        if $numa true &> /dev/null; then
                set -- $numa "$@"
        fi
fi

# usage: file_env VAR [DEFAULT]
#    ie: file_env 'XYZ_DB_PASSWORD' 'example'
# (will allow for "$XYZ_DB_PASSWORD_FILE" to fill in the value of
#  "$XYZ_DB_PASSWORD" from a file, especially for Docker's secrets feature)
file_env() {
        local var="$1"
        local fileVar="${var}_FILE"
        local def="${2:-}"
        if [ "${!var:-}" ] && [ "${!fileVar:-}" ]; then
                echo >&2 "error: both $var and $fileVar are set (but are exclusive)"
                exit 1
        fi
        local val="$def"
        if [ "${!var:-}" ]; then
                val="${!var}"
        elif [ "${!fileVar:-}" ]; then
```

```
                val="$(< "${!fileVar}")"
        fi
        export "$var"="$val"
        unset "$fileVar"
}

# see https://github.com/docker-library/mongo/issues/147 (mongod is picky about duplicated arguments)
_mongod_hack_have_arg() {
        local checkArg="$1"; shift
        local arg
        for arg; do
                case "$arg" in
                        "$checkArg"|"$checkArg"=*)
                                return 0
                                ;;
                esac
        done
        return 1
}
# _mongod_hack_get_arg_val '--some-arg' "$@"
_mongod_hack_get_arg_val() {
        local checkArg="$1"; shift
        while [ "$#" -gt 0 ]; do
                local arg="$1"; shift
                case "$arg" in
                        "$checkArg")
                                echo "$1"
                                return 0
                                ;;
                        "$checkArg"=*)
                                echo "${arg#$checkArg=}"
                                return 0
                                ;;
                esac
```

```
        done
        return 1
}
declare -a mongodHackedArgs
# _mongod_hack_ensure_arg '--some-arg' "$@"
# set -- "${mongodHackedArgs[@]}"
_mongod_hack_ensure_arg() {
        local ensureArg="$1"; shift
        mongodHackedArgs=( "$@" )
        if ! _mongod_hack_have_arg "$ensureArg" "$@"; then
                mongodHackedArgs+=( "$ensureArg" )
        fi
}
# _mongod_hack_ensure_no_arg '--some-unwanted-arg' "$@"
# set -- "${mongodHackedArgs[@]}"
_mongod_hack_ensure_no_arg() {
        local ensureNoArg="$1"; shift
        mongodHackedArgs=()
        while [ "$#" -gt 0 ]; do
                local arg="$1"; shift
                if [ "$arg" = "$ensureNoArg" ]; then
                        continue
                fi
                mongodHackedArgs+=( "$arg" )
        done
}
# _mongod_hack_ensure_no_arg '--some-unwanted-arg' "$@"
# set -- "${mongodHackedArgs[@]}"
_mongod_hack_ensure_no_arg_val() {
        local ensureNoArg="$1"; shift
        mongodHackedArgs=()
        while [ "$#" -gt 0 ]; do
                local arg="$1"; shift
                case "$arg" in
```

```
                        "$ensureNoArg")
                                shift # also skip the value
                                continue
                                ;;
                        "$ensureNoArg"=*)
                                # value is already included
                                continue
                                ;;
                esac
                mongodHackedArgs+=( "$arg" )
        done
}
# _mongod_hack_ensure_arg_val '--some-arg' 'some-val' "$@"
# set -- "${mongodHackedArgs[@]}"
_mongod_hack_ensure_arg_val() {
        local ensureArg="$1"; shift
        local ensureVal="$1"; shift
        _mongod_hack_ensure_no_arg_val "$ensureArg" "$@"
        mongodHackedArgs+=( "$ensureArg" "$ensureVal" )
}

# _js_escape 'some "string" value'
_js_escape() {
        jq --null-input --arg 'str' "$1" '$str'
}

jsonConfigFile="${TMPDIR:-/tmp}/docker-entrypoint-config.json"
tempConfigFile="${TMPDIR:-/tmp}/docker-entrypoint-temp-config.json"
_parse_config() {
        if [ -s "$tempConfigFile" ]; then
                return 0
        fi

        local configPath
```

```
        if configPath="$(_mongod_hack_get_arg_val --config "$@")"; then
                # if --config is specified, parse it into a JSON file so we can remove a few problematic keys
(especially SSL-related keys)
                # see https://docs.mongodb.com/manual/reference/configuration-options/
                mongo --norc --nodb --quiet --eval "load('/js-yaml.js'); printjson(jsyaml.load(cat($(_js_escape
"$configPath"))))" > "$jsonConfigFile"
                jq 'del(.systemLog, .processManagement, .net, .security)' "$jsonConfigFile" > "$tempConfigFile"
                return 0
        fi

        return 1
}
dbPath=
_dbPath() {
        if [ -n "$dbPath" ]; then
                echo "$dbPath"
                return
        fi

        if ! dbPath="$(_mongod_hack_get_arg_val --dbpath "$@")"; then
                if _parse_config "$@"; then
                        dbPath="$(jq -r '.storage.dbPath // empty' "$jsonConfigFile")"
                fi
        fi

        if [ -z "$dbPath" ]; then
                if _mongod_hack_have_arg --configsvr "$@" || {
                        _parse_config "$@" \
                        && clusterRole="$(jq -r '.sharding.clusterRole // empty' "$jsonConfigFile")" \
                        && [ "$clusterRole" = 'configsvr']
                }; then
                        # if running as config server, then the default dbpath is /data/configdb
                        # https://docs.mongodb.com/manual/reference/program/mongod/#cmdoption-mongod-configsvr
                        dbPath=/data/configdb
```

```
                fi
        fi

        : "${dbPath:=/data/db}"

        echo "$dbPath"
}

if [ "$originalArgOne" = 'mongod' ]; then
        file_env 'MONGO_INITDB_ROOT_USERNAME'
        file_env 'MONGO_INITDB_ROOT_PASSWORD'
        # pre-check a few factors to see if it's even worth bothering with initdb
        shouldPerformInitdb=
        if [ "$MONGO_INITDB_ROOT_USERNAME" ] && [ "$MONGO_INITDB_ROOT_PASSWORD" ]; then
                # if we have a username/password, let's set "--auth"
                _mongod_hack_ensure_arg '--auth' "$@"
                set -- "${mongodHackedArgs[@]}"
                shouldPerformInitdb='true'
        elif [ "$MONGO_INITDB_ROOT_USERNAME" ] || [ "$MONGO_INITDB_ROOT_PASSWORD" ]; then
                cat >&2 <<-'EOF'
                        error: missing 'MONGO_INITDB_ROOT_USERNAME' or 'MONGO_INITDB_ROOT_PASSWORD'
                               both must be specified for a user to be created
                EOF
                exit 1
        fi

        if [ -z "$shouldPerformInitdb" ]; then
                # if we've got any /docker-entrypoint-initdb.d/* files to parse later, we should initdb
                for f in /docker-entrypoint-initdb.d/*; do
                        case "$f" in
                                *.sh|*.js) # this should match the set of files we check for below
                                        shouldPerformInitdb="$f"
                                        break
                                        ;;
```

```
                        esac
                done
        fi

        # check for a few known paths (to determine whether we've already initialized and should thus skip our
initdb scripts)
        if [ -n "$shouldPerformInitdb" ]; then
                dbPath="$(_dbPath "$@")"
                for path in \
                        "$dbPath/WiredTiger" \
                        "$dbPath/journal" \
                        "$dbPath/local.0" \
                        "$dbPath/storage.bson" \
                ; do
                        if [ -e "$path" ]; then
                                shouldPerformInitdb=
                                break
                        fi
                done
        fi

        if [ -n "$shouldPerformInitdb" ]; then
                mongodHackedArgs=( "$@" )
                if _parse_config "$@"; then
                        _mongod_hack_ensure_arg_val --config "$tempConfigFile" "${mongodHackedArgs[@]}"
                fi
                _mongod_hack_ensure_arg_val --bind_ip 127.0.0.1 "${mongodHackedArgs[@]}"
                _mongod_hack_ensure_arg_val --port 27017 "${mongodHackedArgs[@]}"
                _mongod_hack_ensure_no_arg --bind_ip_all "${mongodHackedArgs[@]}"

                # remove "--auth" and "--replSet" for our initial startup (see
https://docs.mongodb.com/manual/tutorial/enable-authentication/#start-mongodb-without-access-control)
                # https://github.com/docker-library/mongo/issues/211
                _mongod_hack_ensure_no_arg --auth "${mongodHackedArgs[@]}"
```

```
                if [ "$MONGO_INITDB_ROOT_USERNAME" ] && [ "$MONGO_INITDB_ROOT_PASSWORD" ]; then
                        _mongod_hack_ensure_no_arg_val --replSet "${mongodHackedArgs[@]}"
                fi

                sslMode="$(_mongod_hack_have_arg '--sslPEMKeyFile' "$@" && echo 'allowSSL' || echo 'disabled')" #
"BadValue: need sslPEMKeyFile when SSL is enabled" vs "BadValue: need to enable SSL via the sslMode flag when
using SSL configuration parameters"
                _mongod_hack_ensure_arg_val --sslMode "$sslMode" "${mongodHackedArgs[@]}"

                if stat "/proc/$$/fd/1" > /dev/null && [ -w "/proc/$$/fd/1" ]; then
                        #
https://github.com/mongodb/mongo/blob/38c0eb538d0fd390c6cb9ce9ae9894153f6e8ef5/src/mongo/db/initialize_server_glo
bal_state.cpp#L237-L251
                        # https://github.com/docker-library/mongo/issues/164#issuecomment-293965668
                        _mongod_hack_ensure_arg_val --logpath "/proc/$$/fd/1" "${mongodHackedArgs[@]}"
                else
                        initdbLogPath="$(_dbPath "$@")/docker-initdb.log"
                        echo >&2 "warning: initdb logs cannot write to '/proc/$$/fd/1', so they are in
'$initdbLogPath' instead"
                        _mongod_hack_ensure_arg_val --logpath "$initdbLogPath" "${mongodHackedArgs[@]}"
                fi
                _mongod_hack_ensure_arg --logappend "${mongodHackedArgs[@]}"

                pidfile="${TMPDIR:-/tmp}/docker-entrypoint-temp-mongod.pid"
                rm -f "$pidfile"
                _mongod_hack_ensure_arg_val --pidfilepath "$pidfile" "${mongodHackedArgs[@]}"

                "${mongodHackedArgs[@]}" --fork

                mongo=( mongo --host 127.0.0.1 --port 27017 --quiet )

                # check to see that our "mongod" actually did start up (catches "--help", "--version", MongoDB
3.2 being silly, slow prealloc, etc)
                # https://jira.mongodb.org/browse/SERVER-16292
```

```
                tries=30
                while true; do
                        if ! { [ -s "$pidfile" ] && ps "$(< "$pidfile")" &> /dev/null; }; then
                                # bail ASAP if "mongod" isn't even running
                                echo >&2
                                echo >&2 "error: $originalArgOne does not appear to have stayed running --
perhaps it had an error?"
                                echo >&2
                                exit 1
                        fi
                        if "${mongo[@]}" 'admin' --eval 'quit(0)' &> /dev/null; then
                                # success!
                                break
                        fi
                        (( tries-- ))
                        if [ "$tries" -le 0 ]; then
                                echo >&2
                                echo >&2 "error: $originalArgOne does not appear to have accepted connections
quickly enough -- perhaps it had an error?"
                                echo >&2
                                exit 1
                        fi
                        sleep 1
                done

                if [ "$MONGO_INITDB_ROOT_USERNAME" ] && [ "$MONGO_INITDB_ROOT_PASSWORD" ]; then
                        rootAuthDatabase='admin'

                        "${mongo[@]}" "$rootAuthDatabase" <<-EOJS
                                db.createUser({
                                        user: $(_js_escape "$MONGO_INITDB_ROOT_USERNAME"),
                                        pwd: $(_js_escape "$MONGO_INITDB_ROOT_PASSWORD"),
                                        roles: [ { role: 'root', db: $(_js_escape "$rootAuthDatabase") } ]
                                })
```

```
                        EOJS
                fi

                export MONGO_INITDB_DATABASE="${MONGO_INITDB_DATABASE:-test}"

                echo
                for f in /docker-entrypoint-initdb.d/*; do
                        case "$f" in
                                *.sh) echo "$0: running $f"; . "$f" ;;
                                *.js) echo "$0: running $f"; "${mongo[@]}" "$MONGO_INITDB_DATABASE" "$f"; echo ;;
                                *)    echo "$0: ignoring $f" ;;
                        esac
                        echo
                done

                "${mongodHackedArgs[@]}" --shutdown
                rm -f "$pidfile"

                echo
                echo 'MongoDB init process complete; ready for start up.'
                echo
        fi

        # MongoDB 3.6+ defaults to localhost-only binding
        if mongod --help 2>&1 | grep -q -- --bind_ip_all; then # TODO remove this conditional when 3.4 is no
longer supported
                haveBindIp=
                if _mongod_hack_have_arg --bind_ip "$@" || _mongod_hack_have_arg --bind_ip_all "$@"; then
                        haveBindIp=1
                elif _parse_config "$@" && jq --exit-status '.net.bindIp // .net.bindIpAll' "$jsonConfigFile" >
/dev/null; then
                        haveBindIp=1
                fi
                if [ -z "$haveBindIp" ]; then
```

```
                        # so if no "--bind_ip" is specified, let's add "--bind_ip_all"
                        set -- "$@" --bind_ip_all
                fi
        fi

        unset "${!MONGO_INITDB_@}"
fi

rm -f "$jsonConfigFile" "$tempConfigFile"

exec "$@"
```

Examinons chaque commande dans le Dockerfile :

1.2 - FROM

```
FROM ubuntu:bionic
```

Cette ligne définit l'image à partir de laquelle sera construite notre image. Quand l'image n'est construite à partir d'une autre image, la valeur de **FROM** est **scratch**.

1.3 - RUN

```
...

RUN groupadd -r mongodb && useradd -r -g mongodb mongodb

RUN set -eux; \
    apt-get update; \
    apt-get install -y --no-install-recommends \
        ca-certificates \
```

```
        jq \
        numactl \
    ; \
    if ! command -v ps > /dev/null; then \
        apt-get install -y --no-install-recommends procps; \
    fi; \
    rm -rf /var/lib/apt/lists/*
...
RUN set -ex; \
    \
    apt-get update; \
    apt-get install -y --no-install-recommends \
        wget \
    ; \
    if ! command -v gpg > /dev/null; then \
        apt-get install -y --no-install-recommends gnupg dirmngr; \
    fi; \
    rm -rf /var/lib/apt/lists/*; \
    \
    dpkgArch="$(dpkg --print-architecture | awk -F- '{ print $NF }')"; \
    wget -O /usr/local/bin/gosu "https://github.com/tianon/gosu/releases/download/$GOSU_VERSION/gosu-$dpkgArch";
\
    wget -O /usr/local/bin/gosu.asc
"https://github.com/tianon/gosu/releases/download/$GOSU_VERSION/gosu-$dpkgArch.asc"; \
    export GNUPGHOME="$(mktemp -d)"; \
    gpg --batch --keyserver pgp.mit.edu --recv-keys B42F6819007F00F88E364FD4036A9C25BF357DD4; \
    gpg --batch --verify /usr/local/bin/gosu.asc /usr/local/bin/gosu; \
    command -v gpgconf && gpgconf --kill all || :; \
    rm -r "$GNUPGHOME" /usr/local/bin/gosu.asc; \
    chmod +x /usr/local/bin/gosu; \
    gosu --version; \
    gosu nobody true; \
    \
    wget -O /js-yaml.js "https://github.com/nodeca/js-yaml/raw/${JSYAML_VERSION}/dist/js-yaml.js"; \
```

```
# TODO some sort of download verification here
    \
    apt-get purge -y --auto-remove wget

RUN mkdir /docker-entrypoint-initdb.d
...

RUN set -ex; \
    export GNUPGHOME="$(mktemp -d)"; \
    for key in $GPG_KEYS; do \
        gpg --batch --keyserver pgp.mit.edu --recv-keys "$key"; \
    done; \
    gpg --batch --export $GPG_KEYS > /etc/apt/trusted.gpg.d/mongodb.gpg; \
    command -v gpgconf && gpgconf --kill all || :; \
    rm -r "$GNUPGHOME"; \
    apt-key list
...
RUN set -x \
    && apt-get update \
    && apt-get install -y \
        ${MONGO_PACKAGE}=$MONGO_VERSION \
        ${MONGO_PACKAGE}-server=$MONGO_VERSION \
        ${MONGO_PACKAGE}-shell=$MONGO_VERSION \
        ${MONGO_PACKAGE}-mongos=$MONGO_VERSION \
        ${MONGO_PACKAGE}-tools=$MONGO_VERSION \
    && rm -rf /var/lib/apt/lists/* \
    && rm -rf /var/lib/mongodb \
    && mv /etc/mongod.conf /etc/mongod.conf.orig

RUN mkdir -p /data/db /data/configdb \
    && chown -R mongodb:mongodb /data/db /data/configdb
...
```

Cette commande lance un processus dans la construction de l'image. Dans les cas ci-dessus, chaque chaîne correspond à la commande passée au shell

/bin/sh.

Il existe un autre syntaxe de la commande RUN appelé le format exec, à savoir :

```
RUN ["/bin/bash", "-c", "commande"]
```

Important : La commande RUN est utilisée pour exécuter une commande passée en argument lors de la compilation de l'image seulement. Cette commande ne doit pas donc être utilisée pour exécuter une commande lors du lancement du conteneur. La commande utilisée pour accomplir ce dernier est ENTRYPOINT.

1.4 - ENV

Cette commande permet de fixer la valeur d'une variable d'environnement disponible dans la suite du Dockerfile :

```
...
ENV GOSU_VERSION 1.11
# grab "js-yaml" for parsing mongod's YAML config files (https://github.com/nodeca/js-yaml/releases)
ENV JSYAML_VERSION 3.13.0
...

ENV GPG_KEYS E162F504A20CDF15827F718D4B7C549A058F8B6B
...

ENV MONGO_PACKAGE=${MONGO_PACKAGE} MONGO_REPO=${MONGO_REPO}

ENV MONGO_MAJOR 4.1
ENV MONGO_VERSION 4.1.95
```

```
...
```

et dans les conteneurs générés à partir de l'image construite.

1.5 - VOLUME

```
...
VOLUME /data/db /data/configdb
...
```

Cette commande expose les répertoires passés en argument afin qu'ils puissent être mappés vers des répertoires sur la machine hôte ou ailleurs, tel que nous avons vu avec l'exemple nginx.

1.6 - COPY

```
...
COPY docker-entrypoint.sh /usr/local/bin/
...
```

Cette commande permet de récupérer les fichiers dans le contexte et de les copier dans l'image.

Attention : tous les fichiers dans le contexte sont inclus dans l'image finale, même ceux qui sont inutiles.

Il est possible d'exclure des fichiers présents dans le contexte en les mettant dans un fichier appelé **.dockerignore** placé dans le contexte.

Important - Il existe une autre commande similaire à COPY : ADD. ADD est une commande qui n'est plus recommendé sauf dans le cas de cas spécifiques. Notez que dans le cas de l'utilisation de la commande ADD, si le fichier source est une archive de type TAR, son contenu sera désarchivé et copier vers la destination tandis que si le fichier source est référencé par

un URL, le contenu sera téléchargé puis déposé dans la destination.

1.7 - ENTRYPOINT

```
...
ENTRYPOINT ["docker-entrypoint.sh"]
...
```

Cette commande stipule la commande qui sera exécutée lors du démarrage du conteneur.

Deux cas de figure se présentent :

- ENTRYPOINT suivi d'une chaîne - un shell est démarré pour exécuter la chaîne,
- ENTRYPOINT suivi d'une table JSON (comme ci-dessus) au format ENTRYPOINT [“commande à exécuter”, “paramètres de la commande”].

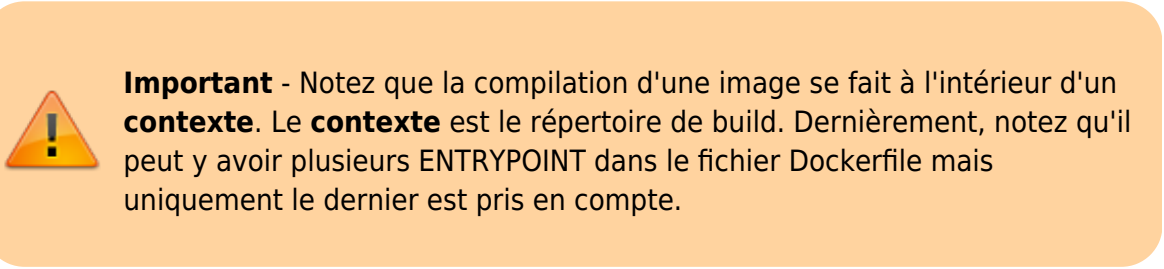
Dans le fichier **docker-entrypoint.sh** :

```
...
originalArgOne="$1"

# allow the container to be started with `--user`
# all mongo* commands should be dropped to the correct user
if [[ "$originalArgOne" == mongo* ]] && [ "$(id -u)" = '0' ]; then
    if [ "$originalArgOne" = 'mongod' ]; then
        find /data/configdb /data/db \! -user mongodb -exec chown mongodb '{}' +
    fi

    # make sure we can write to stdout and stderr as "mongodb"
    # (for our "initdb" code later; see "--logpath" below)
    chown --dereference mongodb "/proc/$$/fd/1" "/proc/$$/fd/2" || :
    # ignore errors thanks to https://github.com/docker-library/mongo/issues/149
```

```
    exec gosu mongodb "$BASH_SOURCE" "$@"
fi

# you should use numactl to start your mongod instances, including the config servers, mongos instances, and any
clients.
# https://docs.mongodb.com/manual/administration/production-notes/#configuring-numa-on-linux
if [[ "$originalArgOne" == mongo* ]]; then
    numa='numactl --interleave=all'
    if $numa true &> /dev/null; then
        set -- $numa "$@"
    fi
fi
...
exec "$@"
```

si la valeur du paramètre passé à entrypoint.sh est **mongod**, le script affecte l'utilisateur mongodb aux répertoires /data/configdb et /data/db puis lance mongo sous l'utilisateur mongodb avec des droits réduits (gosu).

Ce fichier finit par “$@” qui indique que si aucune condition n'ait été remplie, la commande est exécutée avec la valeur passée en argument.



1.8 - EXPOSE

```
...
EXPOSE 27017
```

```
...
```

Cette commande permet d'exposer un port à l'extérieur du conteneur.

1.9 - CMD

```
...
CMD ["mongod"]
...
```

Ceci représente la valeur du paramètre par défaut si aucun paramètre n'est spécifié à la fin de la commande docker run.

1.10 - Autres Commandes

Le Dockerfile peut aussi contenir les commandes suivantes :

- **WORKDIR**,
  - Cette commande fixe le répertoire de travil lors de la compilation d'une image. Elle peut apparaître plusieurs fois dans le Dockerfile permettant ainsi l'évolution du répertoire de travail,
- **LABEL**,
  - Cette commande permet de définir des couples clef/valeur à inclure dans les méta-données décrivant l'image lors de sa distribution, par exemple, la **version**, la **description** ou un **readme**.

Lancez maintenant la compilation de l'image :

```
root@debian11:~/mongodb# docker build .
[+] Building 56.9s (15/15) FINISHED
docker:default
 => [internal] load .dockerignore
0.0s
 => => transferring context: 2B
0.0s
```

```
 => [internal] load build definition from Dockerfile
0.1s
 => => transferring dockerfile: 3.55kB
0.0s
 => [internal] load metadata for docker.io/library/ubuntu:bionic
0.3s
 => [internal] load build context
0.0s
 => => transferring context: 42B
0.0s
 => [ 1/10] FROM
docker.io/library/ubuntu:bionic@sha256:152dc042452c496007f07ca9127571cb9c29697f42acbfad72324b2bb2e43c98
0.0s
 => CACHED [ 2/10] RUN groupadd -r mongodb && useradd -r -g mongodb mongodb
0.0s
 => CACHED [ 3/10] RUN set -eux;  apt-get update;  apt-get install -y --no-install-recommends   ca-certificates
jq   numactl  ;  if ! command -v ps > /dev/null; then   ap  0.0s
 => [ 4/10] RUN set -ex;   apt-get update;  apt-get install -y --no-install-recommends   wget  ;  if ! command -v
gpg > /dev/null; then   apt-get install -y --no-install-r  20.6s
 => [ 5/10] RUN mkdir /docker-entrypoint-initdb.d
0.5s
 => [ 6/10] RUN set -ex;  export GNUPGHOME="$(mktemp -d)";  for key in E162F504A20CDF15827F718D4B7C549A058F8B6B;
do   gpg --batch --keyserver pgp.mit.edu --recv-keys "$key  10.4s
 => [ 7/10] RUN echo "deb http://$MONGO_REPO/apt/ubuntu bionic/${MONGO_PACKAGE%-unstable}/$MONGO_MAJOR
multiverse" | tee "/etc/apt/sources.list.d/${MONGO_PACKAGE%-unstable}  0.5s
 => [ 8/10] RUN set -x  && apt-get update  && apt-get install -y   mongodb-org-unstable=4.1.9   mongodb-org-
unstable-server=4.1.9   mongodb-org-unstable-shell=4.1.9   mong  21.1s
 => [ 9/10] RUN mkdir -p /data/db /data/configdb  && chown -R mongodb:mongodb /data/db /data/configdb
0.5s
 => [10/10] COPY docker-entrypoint.sh /usr/local/bin/
0.1s
 => exporting to image
2.6s
 => => exporting layers
```

```
2.6s
 => => writing image sha256:72fad0b7e0c2206f31a12b7d49f0812c0a594a51e17a8c0e36687f5f626bc735
0.0s
```

Consultez la liste de images :

```
root@debian11:~/mongodb# docker images
REPOSITORY           TAG       IMAGE ID       CREATED              SIZE
<none>               <none>    72fad0b7e0c2   About a minute ago   352MB
ittraining/mongodb   latest    fb3c6d5d186a   7 hours ago          1.11GB
ubuntu               latest    b6548eacb063   9 days ago           77.8MB
nginx                latest    a6bd71f48f68   2 weeks ago          187MB
hello-world          latest    9c7a54a9a43c   7 months ago         13.3kB
centos               latest    5d0da3dc9764   2 years ago          231MB
```

Notez que l'image n'a ni REPOSITORY, ni TAG. Créez donc un TAG :

```
root@debian11:~/mongodb# docker tag 72f i2tch/mongodb1

root@debian11:~/mongodb# docker images
REPOSITORY           TAG       IMAGE ID       CREATED         SIZE
i2tch/mongodb1       latest    72fad0b7e0c2   2 minutes ago   352MB
ittraining/mongodb   latest    fb3c6d5d186a   7 hours ago     1.11GB
ubuntu               latest    b6548eacb063   9 days ago      77.8MB
nginx                latest    a6bd71f48f68   2 weeks ago     187MB
hello-world          latest    9c7a54a9a43c   7 months ago    13.3kB
centos               latest    5d0da3dc9764   2 years ago     231MB
```

Démarrez un conteneur à partir de l'image i2tch/mongodb1 :

```
root@debian11:~/mongodb# docker run -d --name mongo1 i2tch/mongodb1
3c578ea2a0428a07b60dac3b63d806351dffa2bb05224bcf7d12f1189766f38e
docker: Error response from daemon: failed to create task for container: failed to create shim task: OCI runtime
create failed: runc create failed: unable to start container process: exec: "docker-entrypoint.sh": executable
```

```
file not found in $PATH: unknown.

root@debian11:~/mongodb# ls -l
total 16
-rw-r--r-- 1 root root 10971 Dec 10 16:57 docker-entrypoint.sh
-rw-r--r-- 1 root root  3514 Dec 10 17:09 Dockerfile
```

Important - Notez que le fichier docker-entrypoint.sh n'est pas exécutable !

Recompilez donc l'image :

```
root@debian11:~/mongodb# docker rm mongo1
mongo1

root@debian11:~/mongodb# chmod +x docker-entrypoint.sh

root@debian11:~/mongodb# docker build .
[+] Building 0.8s (15/15) FINISHED
docker:default
 => [internal] load build definition from Dockerfile
0.1s
 => => transferring dockerfile: 3.55kB
0.0s
 => [internal] load .dockerignore
0.1s
 => => transferring context: 2B
0.0s
 => [internal] load metadata for docker.io/library/ubuntu:bionic
0.3s
 => [ 1/10] FROM
```

```
docker.io/library/ubuntu:bionic@sha256:152dc042452c496007f07ca9127571cb9c29697f42acbfad72324b2bb2e43c98
0.0s
 => [internal] load build context
0.0s
 => => transferring context: 11.02kB
0.0s
 => CACHED [ 2/10] RUN groupadd -r mongodb && useradd -r -g mongodb mongodb
0.0s
 => CACHED [ 3/10] RUN set -eux;  apt-get update;  apt-get install -y --no-install-recommends   ca-certificates
jq   numactl  ;  if ! command -v ps > /dev/null; then   ap  0.0s
 => CACHED [ 4/10] RUN set -ex;   apt-get update;  apt-get install -y --no-install-recommends   wget  ;  if !
command -v gpg > /dev/null; then   apt-get install -y --no-ins  0.0s
 => CACHED [ 5/10] RUN mkdir /docker-entrypoint-initdb.d
0.0s
 => CACHED [ 6/10] RUN set -ex;  export GNUPGHOME="$(mktemp -d)";  for key in
E162F504A20CDF15827F718D4B7C549A058F8B6B; do   gpg --batch --keyserver pgp.mit.edu --recv-keys  0.0s
 => CACHED [ 7/10] RUN echo "deb http://$MONGO_REPO/apt/ubuntu bionic/${MONGO_PACKAGE%-unstable}/$MONGO_MAJOR
multiverse" | tee "/etc/apt/sources.list.d/${MONGO_PACKAGE%-un  0.0s
 => CACHED [ 8/10] RUN set -x  && apt-get update  && apt-get install -y   mongodb-org-unstable=4.1.9   mongodb-
org-unstable-server=4.1.9   mongodb-org-unstable-shell=4.1.9   0.0s
 => CACHED [ 9/10] RUN mkdir -p /data/db /data/configdb  && chown -R mongodb:mongodb /data/db /data/configdb
0.0s
 => [10/10] COPY docker-entrypoint.sh /usr/local/bin/
0.2s
 => exporting to image
0.1s
 => => exporting layers
0.1s
 => => writing image sha256:56e5b1fb4284e2474392238ee5f91a5d27d9a4a43fa15f655136ae0283d269c2
0.0s
```

Important - Notez ici les lignes **CACHED**. Il est cependant possible de ne pas utiliser le cache en stipulant **–no-cache**. Notez aussi l'utilisation de

conteneurs temporaires par étape nouvelle avec un commit vers une image et une suppression dudit conteneur. Dernièrement, notez que la compilation d'une image se fait à l'intérieur d'un **contexte**. Le **contexte** est le répertoire de build. **Attention** : tous les fichiers dans le contexte sont inclus dans l'image finale, même ceux qui sont inutiles.

Consultez la liste des images de nouveau et renommez votre dernière image :

```
root@debian11:~/mongodb# docker images
REPOSITORY           TAG       IMAGE ID       CREATED              SIZE
<none>               <none>    56e5b1fb4284   About a minute ago   352MB
i2tch/mongodb1       latest    72fad0b7e0c2   5 minutes ago        352MB
ittraining/mongodb   latest    fb3c6d5d186a   7 hours ago          1.11GB
ubuntu               latest    b6548eacb063   9 days ago           77.8MB
nginx                latest    a6bd71f48f68   2 weeks ago          187MB
hello-world          latest    9c7a54a9a43c   7 months ago         13.3kB
centos               latest    5d0da3dc9764   2 years ago          231MB

root@debian11:~/mongodb# docker tag 56e i2tch/mongodb2

root@debian11:~/mongodb# docker images
REPOSITORY           TAG       IMAGE ID       CREATED              SIZE
i2tch/mongodb2       latest    56e5b1fb4284   About a minute ago   352MB
i2tch/mongodb1       latest    72fad0b7e0c2   5 minutes ago        352MB
ittraining/mongodb   latest    fb3c6d5d186a   7 hours ago          1.11GB
ubuntu               latest    b6548eacb063   9 days ago           77.8MB
nginx                latest    a6bd71f48f68   2 weeks ago          187MB
hello-world          latest    9c7a54a9a43c   7 months ago         13.3kB
centos               latest    5d0da3dc9764   2 years ago          231MB
```

Lancez un conteneur à partir de la dernière image :

```
root@debian11:~/mongodb# docker run -d --name mongo2 i2tch/mongodb2
```

```
880733c6bdc33a9a8fa6ae171e977cf745ea9a1b9cfc914992a2d0d3f8cd9d39
```

Utilisez la commande **docker ps** pour visualiser si le processus mongodb est bien démarré :

```
root@debian11:~/mongodb# docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED          STATUS          PORTS
NAMES
880733c6bdc3   i2tch/mongodb2       "docker-entrypoint.s…"   15 seconds ago   Up 13 seconds   27017/tcp
mongo2
885f75b6aa57   ittraining/mongodb   "bash"                   7 hours ago      Up 7 hours
mongo
04d910a3c93d   nginx                "/docker-entrypoint.…"   7 hours ago      Up 7 hours      0.0.0.0:81->80/tcp,
:::81->80/tcp   quirky_moore
```

Connectez-vous à mongodb à partir de votre machine hôte :

```
root@debian11:~/mongodb# docker inspect mongo2 | grep IP
            "LinkLocalIPv6Address": "",
            "LinkLocalIPv6PrefixLen": 0,
            "SecondaryIPAddresses": null,
            "SecondaryIPv6Addresses": null,
            "GlobalIPv6Address": "",
            "GlobalIPv6PrefixLen": 0,
            "IPAddress": "172.17.0.4",
            "IPPrefixLen": 16,
            "IPv6Gateway": "",
                    "IPAMConfig": null,
                    "IPAddress": "172.17.0.4",
                    "IPPrefixLen": 16,
                    "IPv6Gateway": "",
                    "GlobalIPv6Address": "",
                    "GlobalIPv6PrefixLen": 0,

root@debian11:~/mongodb# mongo --host 172.17.0.4
```

```
MongoDB shell version v4.0.28
connecting to: mongodb://172.17.0.4:27017/?gssapiServiceName=mongodb
Implicit session: session { "id" : UUID("057eacfe-5b02-4653-9b20-a2a2044cbe6a") }
MongoDB server version: 4.1.9
WARNING: shell and server versions do not match
Server has startup warnings:
2023-12-10T16:16:13.395+0000 I STORAGE  [initandlisten]
2023-12-10T16:16:13.395+0000 I STORAGE  [initandlisten] ** WARNING: Using the XFS filesystem is strongly
recommended with the WiredTiger storage engine
2023-12-10T16:16:13.395+0000 I STORAGE  [initandlisten] **          See
http://dochub.mongodb.org/core/prodnotes-filesystem
2023-12-10T16:16:14.255+0000 I CONTROL  [initandlisten]
2023-12-10T16:16:14.255+0000 I CONTROL  [initandlisten] ** NOTE: This is a development version (4.1.9) of
MongoDB.
2023-12-10T16:16:14.255+0000 I CONTROL  [initandlisten] **       Not recommended for production.
2023-12-10T16:16:14.255+0000 I CONTROL  [initandlisten]
2023-12-10T16:16:14.255+0000 I CONTROL  [initandlisten] ** WARNING: Access control is not enabled for the
database.
2023-12-10T16:16:14.255+0000 I CONTROL  [initandlisten] **          Read and write access to data and
configuration is unrestricted.
2023-12-10T16:16:14.255+0000 I CONTROL  [initandlisten]
2023-12-10T16:16:14.256+0000 I CONTROL  [initandlisten]
2023-12-10T16:16:14.256+0000 I CONTROL  [initandlisten] ** WARNING: /sys/kernel/mm/transparent_hugepage/enabled
is 'always'.
2023-12-10T16:16:14.256+0000 I CONTROL  [initandlisten] **        We suggest setting it to 'never'
2023-12-10T16:16:14.256+0000 I CONTROL  [initandlisten]
---
Enable MongoDB's free cloud-based monitoring service, which will then receive and display
metrics about your deployment (disk utilization, CPU, operation statistics, etc).

The monitoring data will be available on a MongoDB website with a unique URL accessible to you
and anyone you share the URL with. MongoDB may use this information to make product
improvements and to suggest MongoDB products and deployment options to you.
```

```
To enable free monitoring, run the following command: db.enableFreeMonitoring()
To permanently disable this reminder, run the following command: db.disableFreeMonitoring()
---

> exit
bye
root@debian11:~/mongodb#
```

LAB #2 - Créer un Dockerfile

2.1 - Création et test du script

Créez un répertoire nommé myDocker :

```
root@debian11:~/mongodb# mkdir ~/myDocker
root@debian11:~/mongodb# cd ~/myDocker
root@debian11:~/myDocker#
```

Créez le fichier myEntrypoint.sh :

```
root@debian11:~/myDocker# vi myEntrypoint.sh

root@debian11:~/myDocker# cat myEntrypoint.sh
#!/bin/bash
if [ -z "$myVariable" ]; then
        echo "The variable myVariable must have a value"
        return 1
fi

while true;
do
```

```
        echo $1 \($(date +%H:%M:%S)\);
        sleep "$myVariable";
done
```

Testez ce script :

```
root@debian11:~/myDocker# myVariable=3 . ./myEntrypoint.sh Hello!
Hello! (18:01:54)
Hello! (18:01:57)
Hello! (18:02:00)
Hello! (18:02:03)
Hello! (18:02:06)
^C
root@debian11:~/myDocker#
```

Rendez ce script exécutable :

```
root@debian11:~/myDocker# chmod u+x myEntrypoint.sh
```

Créez maintenant le fichier **Dockerfile** dans le répertoire **~/myDocker** :

```
root@debian11:~/myDocker# vi Dockerfile

root@debian11:~/myDocker# cat Dockerfile
FROM centos:latest
MAINTAINER Team IT Training "infos@ittraining.team"
COPY myEntrypoint.sh /entrypoint.sh
ENV myVariable 3
ENTRYPOINT ["/entrypoint.sh"]
CMD ["mycommand"]
```

Générez maintenant l'image :

```
root@debian11:~/myDocker# docker build -t i2tch/mydocker .
```

```
[+] Building 0.8s (7/7) FINISHED
docker:default
 => [internal] load .dockerignore
0.2s
 => => transferring context: 2B
0.0s
 => [internal] load build definition from Dockerfile
0.1s
 => => transferring dockerfile: 211B
0.0s
 => [internal] load metadata for docker.io/library/centos:latest
0.0s
 => [internal] load build context
0.1s
 => => transferring context: 224B
0.0s
 => [1/2] FROM docker.io/library/centos:latest
0.1s
 => [2/2] COPY myEntrypoint.sh /entrypoint.sh
0.2s
 => exporting to image
0.1s
 => => exporting layers
0.1s
 => => writing image sha256:c5a41438d278439fac2cd65d53d87cabc5c771dd9b99be1913ce049024eba961
0.0s
 => => naming to docker.io/i2tch/mydocker
0.0s
```

Lancez le conteneur :

```
root@debian11:~/myDocker# docker run -it --name myDocker i2tch/mydocker
mycommand (17:05:57)
mycommand (17:06:00)
```

```
mycommand (17:06:03)
^Cmycommand (17:06:06)
mycommand (17:06:09)
mycommand (17:06:12)
^P^Q
root@debian11:~/myDocker#
```

Important - Notez que **^C** n'a aucun effet. Pour se détacher du conteneur il convient d'utiliser **^P^Q**.

Constatez que le conteneur est toujours en cours de fonctionnement :

```
root@debian11:~/myDocker# docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED          STATUS          PORTS
NAMES
97fe360bb1d6   i2tch/mydocker       "/entrypoint.sh myco…"   4 minutes ago    Up 4 minutes
myDocker
880733c6bdc3   i2tch/mongodb2       "docker-entrypoint.s…"   54 minutes ago   Up 54 minutes   27017/tcp
mongo2
885f75b6aa57   ittraining/mongodb   "bash"                   8 hours ago      Up 8 hours
mongo
04d910a3c93d   nginx                "/docker-entrypoint.…"   8 hours ago      Up 8 hours      0.0.0.0:81->80/tcp,
:::81->80/tcp   quirky_moore

root@debian11:~/myDocker# docker logs myDocker | tail
mycommand (17:10:30)
mycommand (17:10:33)
mycommand (17:10:36)
mycommand (17:10:39)
mycommand (17:10:42)
mycommand (17:10:45)
```

```
mycommand (17:10:48)
mycommand (17:10:51)
mycommand (17:10:54)
mycommand (17:10:57)
```

Arrêtez le conteneur :

```
root@debian11:~/myDocker# docker stop -t 1 myDocker
myDocker

root@debian11:~/myDocker# docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED          STATUS          PORTS
NAMES
880733c6bdc3   i2tch/mongodb2       "docker-entrypoint.s…"   55 minutes ago   Up 55 minutes   27017/tcp
mongo2
885f75b6aa57   ittraining/mongodb   "bash"                   8 hours ago      Up 8 hours
mongo
04d910a3c93d   nginx                "/docker-entrypoint.…"   8 hours ago      Up 8 hours      0.0.0.0:81->80/tcp,
:::81->80/tcp   quirky_moore
```

Démarrez le conteneur :

```
root@debian11:~/myDocker# docker start myDocker
myDocker

root@debian11:~/myDocker# docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED          STATUS          PORTS
NAMES
97fe360bb1d6   i2tch/mydocker       "/entrypoint.sh myco…"   6 minutes ago    Up 5 seconds
myDocker
880733c6bdc3   i2tch/mongodb2       "docker-entrypoint.s…"   56 minutes ago   Up 56 minutes   27017/tcp
mongo2
885f75b6aa57   ittraining/mongodb   "bash"                   8 hours ago      Up 8 hours
mongo
```

```
04d910a3c93d   nginx                "/docker-entrypoint.…"   8 hours ago      Up 8 hours      0.0.0.0:81->80/tcp,
:::81->80/tcp   quirky_moore
```

Mettez le conteneur en pause :

```
root@debian11:~/myDocker# docker pause myDocker
myDocker

root@debian11:~/myDocker# docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED          STATUS                     PORTS
NAMES
97fe360bb1d6   i2tch/mydocker       "/entrypoint.sh myco…"   7 minutes ago    Up 55 seconds (Paused)
myDocker
880733c6bdc3   i2tch/mongodb2       "docker-entrypoint.s…"   56 minutes ago   Up 56 minutes              27017/tcp
mongo2
885f75b6aa57   ittraining/mongodb   "bash"                   8 hours ago      Up 8 hours
mongo
04d910a3c93d   nginx                "/docker-entrypoint.…"   8 hours ago      Up 8 hours
0.0.0.0:81->80/tcp, :::81->80/tcp   quirky_moore
```

Supprimez la pause :

```
root@debian11:~/myDocker# docker unpause myDocker
myDocker

root@debian11:~/myDocker# docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED          STATUS              PORTS
NAMES
97fe360bb1d6   i2tch/mydocker       "/entrypoint.sh myco…"   7 minutes ago    Up About a minute
myDocker
880733c6bdc3   i2tch/mongodb2       "docker-entrypoint.s…"   57 minutes ago   Up 57 minutes       27017/tcp
mongo2
885f75b6aa57   ittraining/mongodb   "bash"                   8 hours ago      Up 8 hours
mongo
```

```
04d910a3c93d   nginx                "/docker-entrypoint.…"   8 hours ago      Up 8 hours
0.0.0.0:81->80/tcp, :::81->80/tcp   quirky_moore
```

Lancez maintenant le conteneur avec un paramètre :

```
root@debian11:~/myDocker# docker rm -fv myDocker
myDocker

root@debian11:~/myDocker# docker run -d --name myDocker i2tch/mydocker "Up and Running"
fd5ac836f674fe0bf7b5056e851cd15e4762a5e41b05e00d384bede5234e1f5f

root@debian11:~/myDocker# docker logs myDocker
Up and Running (17:14:23)
Up and Running (17:14:26)
Up and Running (17:14:29)
Up and Running (17:14:32)
Up and Running (17:14:35)
Up and Running (17:14:38)
root@debian11:~/myDocker#
```

Changez la valeur de la variable d'environnement **myVariable** :

```
root@debian11:~/myDocker# docker rm -fv myDocker
myDocker

root@debian11:~/myDocker# docker run -d --name myDocker --env myVariable=1 i2tch/mydocker
a9e02a8bb39df9d5c84fc1d58643bc38c228b0562731792e2356a801b50a9a14

root@debian11:~/myDocker# docker logs myDocker
mycommand (17:15:35)
mycommand (17:15:36)
mycommand (17:15:37)
mycommand (17:15:38)
mycommand (17:15:39)
```

```
mycommand (17:15:40)
mycommand (17:15:41)
root@debian11:~/myDocker#
```

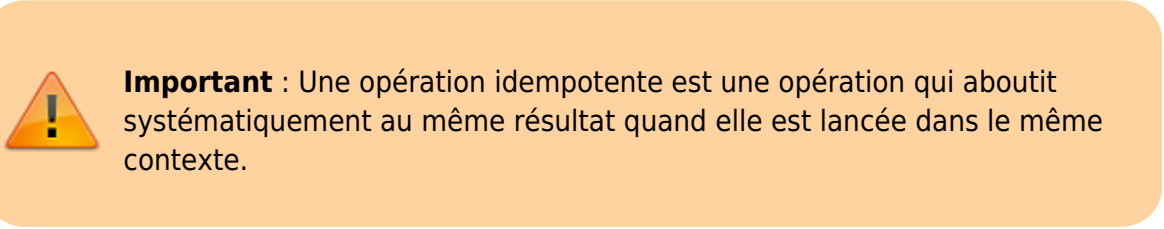
2.2 - Bonnes Pratiques liées au Cache

Opérations Non-Idempotentes

Créez un répertoire **bestp** ainsi que le fichier Dockerfile suivant :

```
root@debian11:~/myDocker# cd ..

root@debian11:~# mkdir bestp

root@debian11:~# cd bestp

root@debian11:~/bestp# vi Dockerfile

root@debian11:~/bestp# cat Dockerfile
FROM ubuntu:latest
RUN date +%N > /tmp/moment
ENTRYPOINT ["more"]
CMD ["/tmp/moment"]
```

Le fichier Dokerfile contient une opération non idempotente.



Compilez l'image :

```
root@debian11:~/bestp# docker build -t testcache .
[+] Building 0.9s (6/6) FINISHED
docker:default
 => [internal] load build definition from Dockerfile
0.2s
 => => transferring dockerfile: 123B
0.0s
 => [internal] load .dockerignore
0.1s
 => => transferring context: 2B
0.0s
 => [internal] load metadata for docker.io/library/ubuntu:latest
0.0s
 => [1/2] FROM docker.io/library/ubuntu:latest
0.1s
 => [2/2] RUN date +%N > /tmp/moment
0.4s
 => exporting to image
0.1s
 => => exporting layers
0.1s
 => => writing image sha256:842ab4a40890a1b5fe7a3af5a41513c6edd5fd2da503b82c375f350671b62707
0.0s
 => => naming to docker.io/library/testcache
0.0s
```

Exécuter maintenant un premier conteneur à partir de l'image compilée :

```
root@debian11:~/bestp# docker run --name test1 -it testcache
771723987
```

Supprimez maintenant le conteneur et relancez la compilation de l'image :

```
root@debian11:~/bestp# docker rm test1
test1

root@debian11:~/bestp# docker build -t testcache .
[+] Building 0.3s (6/6) FINISHED
docker:default
 => [internal] load .dockerignore
0.1s
 => => transferring context: 2B
0.0s
 => [internal] load build definition from Dockerfile
0.1s
 => => transferring dockerfile: 123B
0.0s
 => [internal] load metadata for docker.io/library/ubuntu:latest
0.0s
 => [1/2] FROM docker.io/library/ubuntu:latest
0.0s
 => CACHED [2/2] RUN date +%N > /tmp/moment
0.0s
 => exporting to image
0.0s
 => => exporting layers
0.0s
 => => writing image sha256:842ab4a40890a1b5fe7a3af5a41513c6edd5fd2da503b82c375f350671b62707
0.0s
 => => naming to docker.io/library/testcache
0.0s
```

Lancez un conteneur à partir de l'image re-compilée :

```
root@debian11:~/bestp# docker run --name test1 -it testcache
771723987
```

Important - Notez que les deux sorties des conteneurs sont identiques malgré le fait que la valeur de la commande date aurait du modifier le résultat obtenu lors de l'exécution du deuxième conteneur. La raison que ceci n'est pas le cas est l'utilisation dans la deuxième compilation du cache. Si cette commande avait été quelque chose de plus importante telle apt-get upgrade, le résultat pourrait être génant !

Pour contourner ce problème, il est possible d'utiliser l'option **–no-cache**. Malheureusement ceci produirait une compilation complète à chaque fois, même pour les opérations idempotentes. Il est donc conseillé de combiner les opérations non-idempotentes avec des opérations idempotentes dans la même ligne de commande afin d'invalider le cache pour cette ligne de commande seulement :

```
root@debian11:~/bestp# vi Dockerfile

root@debian11:~/bestp# cat Dockerfile
FROM ubuntu:latest
RUN date +%N > /tmp/moment \
    && echo "V1.1" > /tmp/version
ENTRYPOINT ["more"]
CMD ["/tmp/moment"]
```

Supprimez maintenant le conteneur et relancez la compilation de l'image :

```
root@debian11:~/bestp# docker rm test1
test1

root@debian11:~/bestp# docker build -t testcache .
[+] Building 0.7s (6/6) FINISHED
docker:default
 => [internal] load .dockerignore
0.1s
 => => transferring context: 2B
```

```
0.0s
 => [internal] load build definition from Dockerfile
0.1s
 => => transferring dockerfile: 159B
0.0s
 => [internal] load metadata for docker.io/library/ubuntu:latest
0.0s
 => CACHED [1/2] FROM docker.io/library/ubuntu:latest
0.0s
 => [2/2] RUN date +%N > /tmp/moment     && echo "V1.1" > /tmp/version
0.4s
 => exporting to image
0.1s
 => => exporting layers
0.1s
 => => writing image sha256:5a36b1c7ec76e7bde962c41f5f5dcc11ae0ce3968e4953fbababcc8b7b282dab
0.0s
 => => naming to docker.io/library/testcache
0.0s
```

Lancez un conteneur à partir de l'image re-compilée :

```
root@debian11:~/bestp# docker run --name test1 -it testcache
063819144
```

LAB #3 - Installer un Registre Privé

3.1 - Installer un Registre Local

Pour installer un registre privé, il convient d'utiliser une image publique de docker :

```
root@debian11:~/bestp# cd ..

root@debian11:~# docker run -d --name registry -p 88:5000 registry:latest
Unable to find image 'registry:latest' locally
latest: Pulling from library/registry
c926b61bad3b: Pull complete
5501dced60f8: Pull complete
e875fe5e6b9c: Pull complete
21f4bf2f86f9: Pull complete
98513cca25bb: Pull complete
Digest: sha256:0a182cb82c93939407967d6d71d6caf11dcef0e5689c6afe2d60518e3b34ab86
Status: Downloaded newer image for registry:latest
272df4a849bcbc58a70d6c8e1e74751f24e485fd8ad6817427ef180b9f28b5f8
```

Utilisez maintenant **lynx** à partir d'un terminal de votre machine **hôte Docker** pour vérifier que le registre est actif :

```
root@debian11:~# lynx --dump http://localhost:88/v2
{}root@debian11:~#
```

Important - Notez la réponse du serveur est **{}** soit une liste JSON vide.

Renommez l'image **i2tch/mydocker** afin de pointer vers le nouveau registre :

```
root@debian11:~# docker tag i2tch/mydocker localhost:88/mydocker
```

Envoyez votre image **localhost:88/mydocker** sur ce nouveau registre :

```
root@debian11:~# docker push localhost:88/mydocker
Using default tag: latest
The push refers to repository [localhost:88/mydocker]
f981bd64e799: Pushed
```

```
74ddd0ec08fa: Pushed
latest: digest: sha256:32f7a11d8a8523bb5b4ac0986844d569ca96df4d1875e7e678a885ee3a3c61c3 size: 736
```

Constatez maintenant la présence de l'image dans le registre :

```
root@debian11:~# lynx --dump http://localhost:88/v2/mydocker/tags/list
{"name":"mydocker","tags":["latest"]}
```

3.2 - Créer un Serveur de Registre Dédié

Actuellement, le registre privé créé ci-dessus n'est pas accessible à partir du réseau local car il est référencé par localhost. Il convient donc maintenant de mettre en place un serveur dédié.

Connectez-vous à la VM **CentOS_10.0.3.45_SSH** à partir de votre VM **Debian_10.0.3.46_SSH** :

```
root@debian11:~# ssh -l trainee 10.0.3.45
trainee@10.0.3.45's password: trainee
Activate the web console with: systemctl enable --now cockpit.socket

Last login: Wed Nov 15 05:24:16 2023 from 10.0.3.1
[trainee@centos8 ~]$
```

Devenez root :

```
[trainee@centos8 ~]$ su -
Password: fenestros
[root@centos8 ~]#
```

Modifiez le nom d'hôte de la machine :

```
[root@centos8 ~]# nmcli general hostname myregistry.i2tch.loc
[root@centos8 ~]# hostname
```

```
myregistry.i2tch.loc
```

Editez le fichier **/etc/hosts** et changez l'entrée pour l'adresse IP 10.0.3.61 :

```
[root@centos8 ~]# vi /etc/hosts
[root@centos8 ~]# cat /etc/hosts
127.0.0.1   localhost localhost.localdomain localhost4 localhost4.localdomain4
::1         localhost localhost.localdomain localhost6 localhost6.localdomain6
10.0.3.45       myregistry.i2tch.loc
10.0.3.46       debian11.i2tch.loc
```

Créez maintenant un certificat auto-signé avec **openssl** :

```
[root@centos8 ~]# cd /

[root@centos8 /]# vi myconfig.cnf

[root@centos8 /]# cat myconfig.cnf
[ req ]
distinguished_name = dn
x509_extensions = extensions
prompt = no

[ extensions ]
subjectAltName = DNS:i2tch.loc,DNS:myregistry.i2tch.loc

[ dn ]
0.DC = loc
1.DC = i2tch
commonName = i2tch.loc

[root@centos8 ~]# mkdir certs && openssl req -config myconfig.cnf -newkey rsa:4096 -nodes -sha256 -keyout
certs/domain.key -x509 -days 365 -out certs/domain.crt
Generating a RSA private key
```

```
.....................................................................................................
.....................................................................+++
......+++
writing new private key to 'certs/domain.key'
-----

[root@centos8 /]# ls certs/
domain.crt  domain.key
```

Déconnectez-vous de la VM **CentOS8_10.0.3.45_SSH** :

```
[root@centos8 /]# exit
logout
[trainee@centos8 ~]$ exit
logout
Connection to 10.0.3.45 closed.
root@debian11:~#
```

Re-connectez-vous à la VM **CentOS8_10.0.3.45_SSH** :

```
root@debian11:~# ssh -l trainee 10.0.3.45
trainee@10.0.3.45's password: trainee
Activate the web console with: systemctl enable --now cockpit.socket

Last login: Fri Dec 15 01:07:37 2023 from 10.0.3.46
[trainee@centos8 ~]$
```

Devenez root :

```
[trainee@myregistry ~]$ su -
Password: fenestros
[root@myregistry ~]#
```

Créez un conteneur en mode sécurisé avec TLS à partir de l'image registry :

```
[root@myregistry ~]# docker run -d -p 5000:5000 --name registry -v /certs:/certs -e
REGISTRY_HTTP_TLS_CERTIFICATE=/certs/domain.crt -e REGISTRY_HTTP_TLS_KEY=/certs/domain.key registry:latest
Unable to find image 'registry:latest' locally
latest: Pulling from library/registry
c926b61bad3b: Pull complete
5501dced60f8: Pull complete
e875fe5e6b9c: Pull complete
21f4bf2f86f9: Pull complete
98513cca25bb: Pull complete
Digest: sha256:0a182cb82c93939407967d6d71d6caf11dcef0e5689c6afe2d60518e3b34ab86
Status: Downloaded newer image for registry:latest
bf0d4fe9fcb121f9c2d9e85b8f2bb54b01397602ef0dcefdfc71327acf832fec

[root@myregistry ~]# docker ps -a
CONTAINER ID   IMAGE             COMMAND                  CREATED          STATUS                      PORTS
NAMES
bf0d4fe9fcb1   registry:latest   "/entrypoint.sh /etc…"   47 seconds ago   Up 44 seconds
0.0.0.0:5000->5000/tcp, :::5000->5000/tcp   registry
90267aac9800   hello-world       "/hello"                 15 hours ago     Exited (0) 15 hours ago
eloquent_chatelet
```

Envoyez une copie du fichier **/certs/domain.crt** vers le répertoire /tmp de la machine virtuelle **Debian11_10.0.3.46** en le renommant **ca.crt** :

```
[root@myregistry ~]# scp /certs/domain.crt trainee@10.0.3.46:/tmp/ca.crt
The authenticity of host '10.0.3.46 (10.0.3.46)' can't be established.
ECDSA key fingerprint is SHA256:JFem/0UXFw0aDAOSfOS3vsOGsSDl1wPOza6ybTGO7/8.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.0.3.46' (ECDSA) to the list of known hosts.
trainee@10.0.3.46's password:
domain.crt
100% 2053     2.9MB/s   00:00
```

Configurer le Client

Sortez de la VM **CentOS8_10.0.3.45_SSH** :

```
[root@myregistry ~]# exit
logout
[trainee@myregistry ~]$ exit
logout
Connection to 10.0.3.45 closed.
root@debian11:~#
```

Supprimez le conteneur **registry** :

```
root@debian11:~# docker rm -f registry
registry
```

ainsi que l'image du registry :

```
root@debian11:~# docker rmi registry:latest
Untagged: registry:latest
Untagged: registry@sha256:0a182cb82c93939407967d6d71d6caf11dcef0e5689c6afe2d60518e3b34ab86
Deleted: sha256:909c3ff012b7f9fc4b802b73f250ad45e4ffa385299b71fdd6813f70a6711792
Deleted: sha256:577c3b283118ca6108a6a8c8a0a00eff666dec82c482dd239dfed49f31553df6
Deleted: sha256:2ba6acf6ed95c86cfb2c830693135513bc019a0c0cf8f2c58990bc215995699f
Deleted: sha256:65920463e77382a5cbe8da3e814c4449fc665487c8a9fa4ac27179e809f5ba2e
Deleted: sha256:54501ccbeaec2665849d200fc4a61ab7254ff0f3bd31ab673879fe321fa2ad7f
Deleted: sha256:9fe9a137fd002363ac64f5af66146702432b638a83ee0c5b620c40a9e433e813
```

Renommez l'image **i2tch/mydocker** afin de pointer vers le serveur de registre :

```
root@debian11:~# docker tag i2tch/mydocker myregistry.i2tch.loc:5000/mydocker

root@debian11:~# docker images
```

```
REPOSITORY                              TAG       IMAGE ID       CREATED         SIZE
testcache                               latest    5a36b1c7ec76   4 days ago      77.8MB
<none>                                  <none>    842ab4a40890   4 days ago      77.8MB
i2tch/mydocker                          latest    c5a41438d278   4 days ago      231MB
localhost:88/mydocker                   latest    c5a41438d278   4 days ago      231MB
myregistry.i2tch.loc:5000/mydocker      latest    c5a41438d278   4 days ago      231MB
i2tch/mongodb2                          latest    56e5b1fb4284   4 days ago      352MB
i2tch/mongodb1                          latest    72fad0b7e0c2   4 days ago      352MB
ittraining/mongodb                      latest    fb3c6d5d186a   5 days ago      1.11GB
ubuntu                                  latest    b6548eacb063   2 weeks ago     77.8MB
nginx                                   latest    a6bd71f48f68   3 weeks ago     187MB
hello-world                             latest    9c7a54a9a43c   7 months ago    13.3kB
centos                                  latest    5d0da3dc9764   2 years ago     231MB
```

Editez le fichier **/etc/hosts** afin de pointer le 10.0.3.45 vers le nom **myregistry.i2tch.loc** :

```
root@debian11:~# vi /etc/hosts

root@debian11:~# cat /etc/hosts
127.0.0.1       localhost
10.0.3.46       debian11.i2tch.loc      debian11
10.0.3.45       myregistry.i2tch.loc    myregistry

# The following lines are desirable for IPv6 capable hosts
::1     localhost ip6-localhost ip6-loopback
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
```

Déplacez le fichier **/tmp/ca.crt** vers le répertoire **/etc/docker/certs.d/myregistry:5000/** :

```
root@debian11:~# mkdir -p /etc/docker/certs.d/myregistry:5000

root@debian11:~# mv /tmp/ca.crt /etc/docker/certs.d/myregistry:5000/
```

Créez le fichier **/etc/docker/daemon.json** pour accepter le certificat auto-signé :

```
root@debian11:~# vi /etc/docker/daemon.json

root@debian11:~# cat /etc/docker/daemon.json
{"insecure-registries" : ["myregistry.i2tch.loc:5000"]}
```

Re-démarrez le service docker :

```
root@debian11:~# systemctl restart docker
```

Testez la réponse du registre :

```
root@debian11:~# curl -k https://myregistry:5000/v2/
{}root@debian11:~#
```

Finalement, envoyez l'image au registre :

```
root@debian11:~# docker push myregistry.i2tch.loc:5000/mydocker
Using default tag: latest
The push refers to repository [myregistry.i2tch.loc:5000/mydocker]
f981bd64e799: Pushed
74ddd0ec08fa: Pushed
latest: digest: sha256:32f7a11d8a8523bb5b4ac0986844d569ca96df4d1875e7e678a885ee3a3c61c3 size: 736
```
