Building best practices

Best practices

Use multi-stage builds

Multi-stage builds let you reduce the size of your final image, by creating a cleaner separation between the building of your image and the final output. Split your Dockerfile instructions into distinct stages to make sure that the resulting output only contains the files that are needed to run the application.

Using multiple stages can also let you build more efficiently by executing build steps in parallel.

See Multi-stage builds for more information.

Create reusable stages

If you have multiple images with a lot in common, consider creating a reusable stage that includes the shared components, and basing your unique stages on that. Docker only needs to build the common stage once. This means that your derivative images use memory on the Docker host more efficiently and load more quickly.

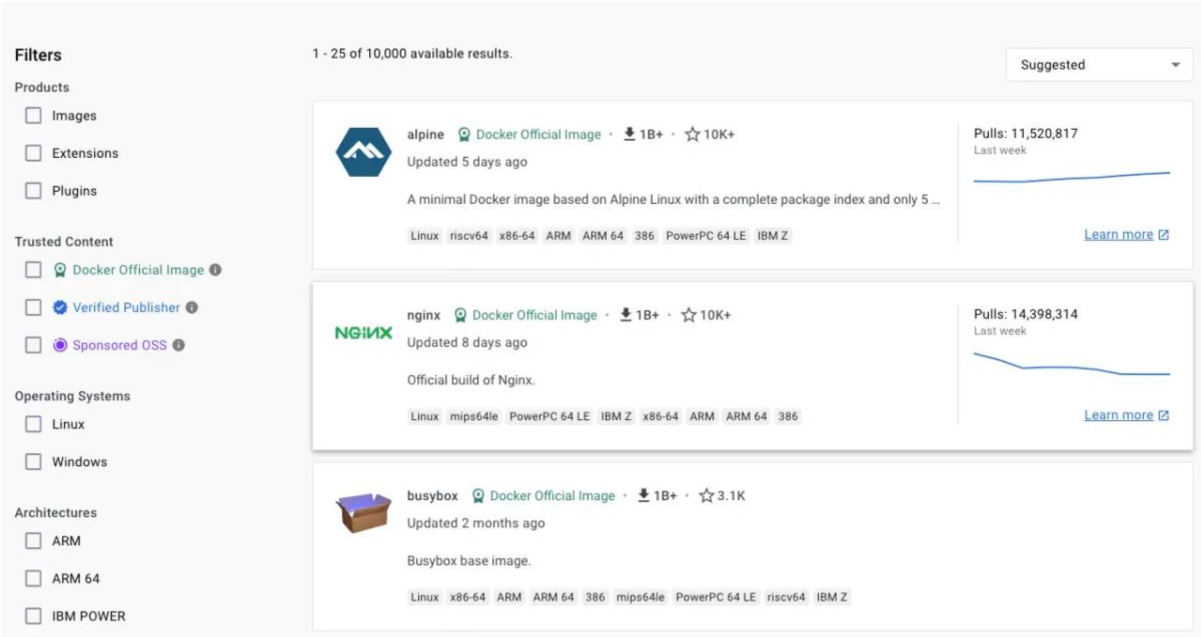
It's also easier to maintain a common base stage ("Don't repeat yourself"), than it is to have multiple different stages doing similar things.

Choose the right base image

The first step towards achieving a secure image is to choose the right base image. When choosing an image, ensure it's built from a trusted source and keep it small.

- Docker Official Images are some of the most secure and dependable images on Docker Hub. Typically, Docker Official images have few or no packages containing CVEs, and are thoroughly reviewed by Docker and project maintainers.
- Verified Publisher images are high-quality images published and maintained by the organizations partnering with Docker, with Docker verifying the authenticity of the content in their repositories.
- Docker-Sponsored Open Source are published and maintained by open source projects sponsored by Docker through an open source program.

When you pick your base image, look out for the badges indicating that the image is part of these programs.



When building your own image from a Dockerfile, ensure you choose a minimal base image that matches your requirements. A smaller base image not only offers portability and fast downloads, but also shrinks the size of your image and minimizes the number of vulnerabilities introduced through the dependencies.

You should also consider using two types of base image: one for building and unit testing, and another (typically slimmer) image for production. In the later stages of development, your image may not require build tools such as compilers, build systems, and debugging tools. A small image with minimal dependencies can considerably lower the attack surface.

Rebuild your images often

Docker images are immutable. Building an image is taking a snapshot of that image at that moment. That includes any base images, libraries, or other software you use in your build. To keep your images up-to-date and secure, make sure to rebuild your image often, with updated dependencies.

To ensure that you're getting the latest versions of dependencies in your build, you can use the `--no-cache` option to avoid cache hits.

```
$ docker build --no-cache -t my-image:my-tag .
```

The following Dockerfile uses the `24.04` tag of the `ubuntu` image. Over time, that tag may resolve to a different underlying version of the `ubuntu` image, as the publisher rebuilds the image with new security patches and updated libraries. Using the `--no-`

`cache`, you can avoid cache hits and ensure a fresh download of base images and dependencies.

```
# syntax=docker/dockerfile:1
FROM ubuntu:24.04
RUN apt-get -y update && apt-get install -y --no-install-recommends
python3
```

Also consider [pinning base image versions].

[Exclude with .dockerignore]

To exclude files not relevant to the build, without restructuring your source repository, use a `.dockerignore` file. This file supports exclusion patterns similar to `.gitignore` files.
For example, to exclude all files with the `.md` extension:

```
*.md
```

For information on creating one, see [Dockerignore file].

[Create ephemeral containers]

The image defined by your Dockerfile should generate containers that are as ephemeral as possible. Ephemeral means that the container can be stopped and destroyed, then rebuilt and replaced with an absolute minimum set up and configuration.

Refer to [Processes] under *The Twelve-factor App* methodology to get a feel for the motivations of running containers in such a stateless fashion.

[Don't install unnecessary packages]

Avoid installing extra or unnecessary packages just because they might be nice to have. For example, you don't need to include a text editor in a database image.

When you avoid installing extra or unnecessary packages, your images have reduced complexity, reduced dependencies, reduced file sizes, and reduced build times.

[Decouple applications]

Each container should have only one concern. Decoupling applications into multiple containers makes it easier to scale horizontally and reuse containers. For instance, a web application stack might consist of three separate containers, each with its own unique image, to manage the web application, database, and an in-memory cache in a decoupled manner.

Limiting each container to one process is a good rule of thumb, but it's not a hard and fast rule. For example, not only can containers be spawned with an init process, some programs might spawn additional processes of their own accord. For instance, Celery can spawn multiple worker processes, and Apache can create one process per request.

Use your best judgment to keep containers as clean and modular as possible. If containers depend on each other, you can use Docker container networks to ensure that these containers can communicate.

Sort multi-line arguments

Whenever possible, sort multi-line arguments alphanumerically to make maintenance easier. This helps to avoid duplication of packages and make the list much easier to update. This also makes PRs a lot easier to read and review. Adding a space before a backslash (`\`) helps as well.

Here’s an example from the buildpack-deps image:

```
RUN apt-get update && apt-get install -y --no-install-recommends \
  bzr \
  cvs \
  git \
  mercurial \
  subversion \
  && rm -rf /var/lib/apt/lists/*
```

Leverage build cache

When building an image, Docker steps through the instructions in your Dockerfile, executing each in the order specified. For each instruction, Docker checks whether it can reuse the instruction from the build cache.

Understanding how the build cache works, and how cache invalidation occurs, is critical for ensuring faster builds. For more information about the Docker build cache and how to optimize your builds, see Docker build cache.

Pin base image versions

Image tags are mutable, meaning a publisher can update a tag to point to a new image. This is useful because it lets publishers update tags to point to newer versions of an image. And as an image consumer, it means you automatically get the new version when you re-build your image.

For example, if you specify `FROM alpine:3.19` in your Dockerfile, `3.19` resolves to the latest patch version for `3.19`.

```
# syntax=docker/dockerfile:1
FROM alpine:3.19
```

At one point in time, the `3.19` tag might point to version 3.19.1 of the image. If you rebuild the image 3 months later, the same tag might point to a different version, such as 3.19.4. This publishing workflow is best practice, and most publishers use this tagging strategy, but it isn't enforced.

The downside with this is that you're not guaranteed to get the same for every build. This could result in breaking changes, and it means you also don't have an audit trail of the exact image versions that you're using.

To fully secure your supply chain integrity, you can pin the image version to a specific digest. By pinning your images to a digest, you're guaranteed to always use the same image version, even if a publisher replaces the tag with a new image. For example, the following Dockerfile pins the Alpine image to the same tag as earlier, `3.19`, but this time with a digest reference as well.

```
# syntax=docker/dockerfile:1
FROM
alpine:3.19@sha256:13b7e62e8df80264dbb747995705a986aa530415763a6c58f84a
3ca8af9a5bcd
```

With this Dockerfile, even if the publisher updates the `3.19` tag, your builds would still use the pinned image version: `13b7e62e8df80264dbb747995705a986aa530415763a6c58f84a3ca8af9a5bcd`.

While this helps you avoid unexpected changes, it's also more tedious to have to look up and include the image digest for base image versions manually each time you want to update it. And you're opting out of automated security fixes, which is likely something you want to get.

Docker Scout's default **Up-to-Date Base Images** policy checks whether the base image version you're using is in fact the latest version. This policy also checks if pinned digests in your Dockerfile correspond to the correct version. If a publisher updates an image that you've pinned, the policy evaluation returns a non-compliant status, indicating that you should update your image.

Docker Scout also supports an automated remediation workflow for keeping your base images up-to-date. When a new image digest is available, Docker Scout can automatically raise a pull request on your repository to update your Dockerfiles to use the latest version. This is better than using a tag that changes the version automatically, because you're in control and you have an audit trail of when and how the change occurred.

For more information about automatically updating your base images with Docker Scout, see [Remediation].

Build and test your images in CI

When you check in a change to source control or create a pull request, use GitHub Actions or another CI/CD pipeline to automatically build and tag a Docker image and test it.

Dockerfile instructions

Follow these recommendations on how to properly use the Dockerfile instructions to create an efficient and maintainable Dockerfile.

FROM

Whenever possible, use current official images as the basis for your images. Docker recommends the Alpine image as it is tightly controlled and small in size (currently under 6 MB), while still being a full Linux distribution.

For more information about the `FROM` instruction, see Dockerfile reference for the FROM instruction.

LABEL

You can add labels to your image to help organize images by project, record licensing information, to aid in automation, or for other reasons. For each label, add a line beginning with `LABEL` with one or more key-value pairs. The following examples show the different acceptable formats. Explanatory comments are included inline.
Strings with spaces must be quoted or the spaces must be escaped. Inner quote characters (`"`), must also be escaped. For example:

```
# Set one or more individual labels
LABEL com.example.version="0.0.1-beta"
LABEL vendor1="ACME Incorporated"
LABEL vendor2=ZENITH\ Incorporated
```

```
LABEL com.example.release-date="2015-02-12"
LABEL com.example.version.is-production=""
```

An image can have more than one label. Prior to Docker 1.10, it was recommended to combine all labels into a single `LABEL` instruction, to prevent extra layers from being created. This is no longer necessary, but combining labels is still supported. For example:

```
# Set multiple labels on one line
LABEL com.example.version="0.0.1-beta" com.example.release-date="2015-02-12"
```

The above example can also be written as:

```
# Set multiple labels at once, using line-continuation characters to break long lines
LABEL vendor=ACME\ Incorporated \
      com.example.is-beta= \
      com.example.is-production="" \
      com.example.version="0.0.1-beta" \
      com.example.release-date="2015-02-12"
```

See Understanding object labels for guidelines about acceptable label keys and values. For information about querying labels, refer to the items related to filtering in Managing labels on objects. See also LABEL in the Dockerfile reference.

RUN

Split long or complex `RUN` statements on multiple lines separated with backslashes to make your Dockerfile more readable, understandable, and maintainable.

For example, you can chain commands with the `&&` operator, and use escape characters to break long commands into multiple lines.

```
RUN apt-get update && apt-get install -y --no-install-recommends \
    package-bar \
    package-baz \
    package-foo
```

By default, backslash escapes a newline character, but you can change it with the escape directive.

You can also use here documents to run multiple commands without chaining them with a pipeline operator:

```
RUN <<EOF
apt-get update
apt-get install -y --no-install-recommends \
    package-bar \
    package-baz \
    package-foo
```

```
EOF
```

For more information about `RUN`, see [Dockerfile reference for the RUN instruction](#).

apt-get

One common use case for `RUN` instructions in Debian-based images is to install software using `apt-get`. Because `apt-get` installs packages, the `RUN apt-get` command has several counter-intuitive behaviors to look out for.

Always combine `RUN apt-get update` with `apt-get install` in the same `RUN` statement. For example:

```
RUN apt-get update && apt-get install -y --no-install-recommends \
    package-bar \
    package-baz \
    package-foo
```

Using `apt-get update` alone in a `RUN` statement causes caching issues and subsequent `apt-get install` instructions to fail. For example, this issue will occur in the following Dockerfile:

```
# syntax=docker/dockerfile:1

FROM ubuntu:22.04
RUN apt-get update
RUN apt-get install -y --no-install-recommends curl
```

After building the image, all layers are in the Docker cache. Suppose you later modify `apt-get install` by adding an extra package as shown in the following Dockerfile:

```
# syntax=docker/dockerfile:1

FROM ubuntu:22.04
RUN apt-get update
RUN apt-get install -y --no-install-recommends curl nginx
```

Docker sees the initial and modified instructions as identical and reuses the cache from previous steps. As a result the `apt-get update` isn't executed because the build uses the cached version. Because the `apt-get update` isn't run, your build can potentially get an outdated version of the `curl` and `nginx` packages.

Using `RUN apt-get update && apt-get install -y --no-install-recommends` ensures your Dockerfile installs the latest package versions with no further coding or manual intervention. This technique is known as cache busting. You can also achieve cache busting by specifying a package version. This is known as version pinning. For example:

```
RUN apt-get update && apt-get install -y --no-install-recommends \
    package-bar \
    package-baz \
    package-foo=1.3.*
```

Version pinning forces the build to retrieve a particular version regardless of what's in the cache. This technique can also reduce failures due to unanticipated changes in required packages.

Below is a well-formed `RUN` instruction that demonstrates all the `apt-get` recommendations.

```
RUN apt-get update && apt-get install -y --no-install-recommends \
    aufs-tools \
    automake \
    build-essential \
    curl \
    dpkg-sig \
    libcap-dev \
    libsqlite3-dev \
    mercurial \
    reprepro \
    ruby1.9.1 \
    ruby1.9.1-dev \
    s3cmd=1.1.* \
    && rm -rf /var/lib/apt/lists/*
```

The `s3cmd` argument specifies a version `1.1.*`. If the image previously used an older version, specifying the new one causes a cache bust of `apt-get update` and ensures the installation of the new version. Listing packages on each line can also prevent mistakes in package duplication.

In addition, when you clean up the apt cache by removing `/var/lib/apt/lists` it reduces the image size, since the apt cache isn't stored in a layer. Since the `RUN` statement starts with `apt-get update`, the package cache is always refreshed prior to `apt-get install`.

Official Debian and Ubuntu images automatically run `apt-get clean`, so explicit invocation is not required.

Using pipes

Some `RUN` commands depend on the ability to pipe the output of one command into another, using the pipe character (`|`), as in the following example:

```
RUN wget -O - https://some.site | wc -l > /number
```

Docker executes these commands using the `/bin/sh -c` interpreter, which only evaluates the exit code of the last operation in the pipe to determine success. In the example above, this build step succeeds and produces a new image so long as the `wc -l` command succeeds, even if the `wget` command fails.

If you want the command to fail due to an error at any stage in the pipe, prepend `set -o pipefail &&` to ensure that an unexpected error prevents the build from inadvertently succeeding. For example:

```
RUN set -o pipefail && wget -O - https://some.site | wc -l > /number
```

Note

Not all shells support the `-o pipefail` option.
In cases such as the `dash` shell on Debian-based images, consider using the *exec* form of `RUN` to explicitly choose a shell that does support the `pipefail` option. For example:

```
RUN ["/bin/bash", "-c", "set -o pipefail && wget -O - https://some.site | wc -l > /number"]
```

CMD

The `CMD` instruction should be used to run the software contained in your image, along with any arguments. `CMD` should almost always be used in the form of `CMD ["executable", "param1", "param2"]`. Thus, if the image is for a service, such as Apache and Rails, you would run something like `CMD ["apache2","-DFOREGROUND"]`. Indeed, this form of the instruction is recommended for any service-based image.
In most other cases, `CMD` should be given an interactive shell, such as bash, python and perl. For example, `CMD ["perl", "-de0"]`, `CMD ["python"]`, or `CMD ["php", "-a"]`. Using this form means that when you execute something like `docker run -it python`, you'll get dropped into a usable shell, ready to go. `CMD` should rarely be used in the manner of `CMD ["param", "param"]` in conjunction with `ENTRYPOINT`, unless you and your expected users are already quite familiar with how `ENTRYPOINT` works.
For more information about `CMD`, see Dockerfile reference for the CMD instruction.

EXPOSE

The `EXPOSE` instruction indicates the ports on which a container listens for connections. Consequently, you should use the common, traditional port for your application. For example, an image containing the Apache web server would use `EXPOSE 80`, while an image containing MongoDB would use `EXPOSE 27017` and so on.
For external access, your users can execute `docker run` with a flag indicating how to map the specified port to the port of their choice. For container linking, Docker provides environment variables for the path from the recipient container back to the source (for example, `MYSQL_PORT_3306_TCP`).
For more information about `EXPOSE`, see Dockerfile reference for the EXPOSE instruction.

ENV

To make new software easier to run, you can use `ENV` to update the `PATH` environment variable for the software your container installs. For

example, `ENV PATH=/usr/local/nginx/bin:$PATH` ensures that `CMD ["nginx"]` just works.
The `ENV` instruction is also useful for providing the required environment variables specific to services you want to containerize, such as Postgres's `PGDATA`.
Lastly, `ENV` can also be used to set commonly used version numbers so that version bumps are easier to maintain, as seen in the following example:

```
ENV PG_MAJOR=9.3
ENV PG_VERSION=9.3.4
RUN curl -SL https://example.com/postgres-$PG_VERSION.tar.xz | tar -xJC /usr/src/postgres && …
ENV PATH=/usr/local/postgres-$PG_MAJOR/bin:$PATH
```

Similar to having constant variables in a program, as opposed to hard-coding values, this approach lets you change a single `ENV` instruction to automatically bump the version of the software in your container.
Each `ENV` line creates a new intermediate layer, just like `RUN` commands. This means that even if you unset the environment variable in a future layer, it still persists in this layer and its value can be dumped. You can test this by creating a Dockerfile like the following, and then building it.

```
# syntax=docker/dockerfile:1
FROM alpine
ENV ADMIN_USER="mark"
RUN echo $ADMIN_USER > ./mark
RUN unset ADMIN_USER
```

```
$ docker run --rm test sh -c 'echo $ADMIN_USER'

mark
```

To prevent this, and really unset the environment variable, use a `RUN` command with shell commands, to set, use, and unset the variable all in a single layer. You can separate your commands with `;` or `&&`. If you use the second method, and one of the commands fails, the `docker build` also fails. This is usually a good idea. Using `\` as a line continuation character for Linux Dockerfiles improves readability. You could also put all of the commands into a shell script and have the `RUN` command just run that shell script.

```
# syntax=docker/dockerfile:1
FROM alpine
RUN export ADMIN_USER="mark" \
    && echo $ADMIN_USER > ./mark \
    && unset ADMIN_USER
CMD sh
```

```
$ docker run --rm test sh -c 'echo $ADMIN_USER'
```

For more information about `ENV`, see [Dockerfile reference for the ENV instruction].

[ADD or COPY]

ADD and COPY are functionally similar. COPY supports basic copying of files into the container, from the build context or from a stage in a multi-stage build. ADD supports features for fetching files from remote HTTPS and Git URLs, and extracting tar files automatically when adding files from the build context.

You'll mostly want to use COPY for copying files from one stage to another in a multi-stage build. If you need to add files from the build context to the container temporarily to execute a RUN instruction, you can often substitute the COPY instruction with a bind mount instead. For example, to temporarily add a requirements.txt file for a RUN pip install instruction:

```
RUN --mount=type=bind,source=requirements.txt,target=/tmp/requirements.txt \
    pip install --requirement /tmp/requirements.txt
```

Bind mounts are more efficient than COPY for including files from the build context in the container. Note that bind-mounted files are only added temporarily for a single RUN instruction, and don't persist in the final image. If you need to include files from the build context in the final image, use COPY.

The ADD instruction is best for when you need to download a remote artifact as part of your build. ADD is better than manually adding files using something like wget and tar, because it ensures a more precise build cache. ADD also has built-in support for checksum validation of the remote resources, and a protocol for parsing branches, tags, and subdirectories from Git URLs.

The following example uses ADD to download a .NET installer. Combined with multi-stage builds, only the .NET runtime remains in the final stage, no intermediate files.

```
# syntax=docker/dockerfile:1

FROM scratch AS src
ARG DOTNET_VERSION=8.0.0-preview.6.23329.7
ADD --checksum=sha256:270d731bd08040c6a3228115de1f74b91cf441c584139ff8f8f6503447cebdbb \
    https://dotnetcli.azureedge.net/dotnet/Runtime/$DOTNET_VERSION/dotnet-runtime-$DOTNET_VERSION-linux-arm64.tar.gz /dotnet.tar.gz

FROM mcr.microsoft.com/dotnet/runtime-deps:8.0.0-preview.6-bookworm-slim-arm64v8 AS installer

# Retrieve .NET Runtime
RUN --mount=from=src,target=/src <<EOF
mkdir -p /dotnet
tar -oxzf /src/dotnet.tar.gz -C /dotnet
EOF

FROM mcr.microsoft.com/dotnet/runtime-deps:8.0.0-preview.6-bookworm-slim-arm64v8
```

```
COPY --from=installer /dotnet /usr/share/dotnet
RUN ln -s /usr/share/dotnet/dotnet /usr/bin/dotnet
```

For more information about `ADD` or `COPY`, see the following:

- Dockerfile reference for the ADD instruction
- Dockerfile reference for the COPY instruction

ENTRYPOINT

The best use for `ENTRYPOINT` is to set the image's main command, allowing that image to be run as though it was that command, and then use `CMD` as the default flags.

The following is an example of an image for the command line tool `s3cmd`:

```
ENTRYPOINT ["s3cmd"]
CMD ["--help"]
```

You can use the following command to run the image and show the command's help:

```
$ docker run s3cmd
```

Or, you can use the right parameters to execute a command, like in the following example:

```
$ docker run s3cmd ls s3://mybucket
```

This is useful because the image name can double as a reference to the binary as shown in the command above.

The `ENTRYPOINT` instruction can also be used in combination with a helper script, allowing it to function in a similar way to the command above, even when starting the tool may require more than one step.

For example, the Postgres Official Image uses the following script as its `ENTRYPOINT`:

```
#!/bin/bash
set -e

if [ "$1" = 'postgres' ]; then
    chown -R postgres "$PGDATA"

    if [ -z "$(ls -A "$PGDATA")" ]; then
        gosu postgres initdb
    fi

    exec gosu postgres "$@"
fi
```

```
exec "$@"
```

This script uses the exec Bash command so that the final running application becomes the container's PID 1. This allows the application to receive any Unix signals sent to the container. For more information, see the `ENTRYPOINT` reference.

In the following example, a helper script is copied into the container and run via `ENTRYPOINT` on container start:

```
COPY ./docker-entrypoint.sh /
ENTRYPOINT ["/docker-entrypoint.sh"]
CMD ["postgres"]
```

This script lets you interact with Postgres in several ways.

It can simply start Postgres:

```
$ docker run postgres
```

Or, you can use it to run Postgres and pass parameters to the server:

```
$ docker run postgres postgres --help
```

Lastly, you can use it to start a totally different tool, such as Bash:

```
$ docker run --rm -it postgres bash
```

For more information about `ENTRYPOINT`, see Dockerfile reference for the ENTRYPOINT instruction.

VOLUME

You should use the `VOLUME` instruction to expose any database storage area, configuration storage, or files and folders created by your Docker container. You are strongly encouraged to use `VOLUME` for any combination of mutable or user-serviceable parts of your image.

For more information about `VOLUME`, see Dockerfile reference for the VOLUME instruction.

USER

If a service can run without privileges, use `USER` to change to a non-root user. Start by creating the user and group in the Dockerfile with something like the following example:

```
RUN groupadd -r postgres && useradd --no-log-init -r -g postgres postgres
```

Note

Consider an explicit UID/GID.

Users and groups in an image are assigned a non-deterministic UID/GID in that the "next" UID/GID is assigned regardless of image rebuilds. So, if it's critical, you should assign an explicit UID/GID.

Note

Due to an [unresolved bug] in the Go archive/tar package's handling of sparse files, attempting to create a user with a significantly large UID inside a Docker container can lead to disk exhaustion because `/var/log/faillog` in the container layer is filled with NULL (\0) characters. A workaround is to pass the `--no-log-init` flag to useradd. The Debian/Ubuntu `adduser` wrapper does not support this flag.

Avoid installing or using `sudo` as it has unpredictable TTY and signal-forwarding behavior that can cause problems. If you absolutely need functionality similar to `sudo`, such as initializing the daemon as `root` but running it as non-`root`, consider using "gosu".

Lastly, to reduce layers and complexity, avoid switching `USER` back and forth frequently.

For more information about `USER`, see Dockerfile reference for the USER instruction.

WORKDIR

For clarity and reliability, you should always use absolute paths for your `WORKDIR`.

Also, you should use `WORKDIR` instead of proliferating instructions like `RUN cd … && do-something`, which are hard to read, troubleshoot, and maintain.

For more information about `WORKDIR`, see Dockerfile reference for the WORKDIR instruction.

ONBUILD

An `ONBUILD` command executes after the current Dockerfile build completes. `ONBUILD` executes in any child image derived `FROM` the current image. Think of the `ONBUILD` command as an instruction that the parent Dockerfile gives to the child Dockerfile.

A Docker build executes `ONBUILD` commands before any command in a child Dockerfile.

`ONBUILD` is useful for images that are going to be built `FROM` a given image. For example, you would use `ONBUILD` for a language stack image that builds arbitrary user software written in that language within the Dockerfile, as you can see in Ruby's `ONBUILD` variants.

Images built with `ONBUILD` should get a separate tag. For example, `ruby:1.9-onbuild` or `ruby:2.0-onbuild`.

Be careful when putting `ADD` or `COPY` in `ONBUILD`. The onbuild image fails catastrophically if the new build's context is missing the resource being added. Adding a separate tag, as recommended above, helps mitigate this by allowing the Dockerfile author to make a choice.

For more information about `ONBUILD`, see Dockerfile reference for the ONBUILD instruction.

WORKDIR

```
WORKDIR /path/to/workdir
```

The `WORKDIR` instruction sets the working directory for any `RUN`, `CMD`, `ENTRYPOINT`, `COPY` and `ADD` instructions that follow it in the Dockerfile. If the `WORKDIR` doesn't exist, it will be created even if it's not used in any subsequent Dockerfile instruction.

The `WORKDIR` instruction can be used multiple times in a Dockerfile. If a relative path is provided, it will be relative to the path of the previous `WORKDIR` instruction. For example:

```
WORKDIR /a
WORKDIR b
WORKDIR c
RUN pwd
```

The output of the final `pwd` command in this Dockerfile would be `/a/b/c`.

The `WORKDIR` instruction can resolve environment variables previously set using `ENV`. You can only use environment variables explicitly set in the Dockerfile. For example:

```
ENV DIRPATH=/path
WORKDIR $DIRPATH/$DIRNAME
RUN pwd
```

The output of the final `pwd` command in this Dockerfile would be `/path/$DIRNAME`

If not specified, the default working directory is `/`. In practice, if you aren't building a Dockerfile from scratch (`FROM scratch`), the `WORKDIR` may likely be set by the base image you're using.

Therefore, to avoid unintended operations in unknown directories, it's best practice to set your `WORKDIR` explicitly.