

# Handout: Container Networking

Docker containers are isolated by default, but they can communicate through configurable **networks**. Docker's networking options are essential for building multi-container applications (like frontend-backend setups or service stacks).

## 1. Default Networks

Docker creates several built-in networks:

- `bridge` : Default for standalone containers on a single host.
- `host` : Shares the host's network stack (Linux only).
- `none` : No networking (fully isolated).

To see available networks:

```
docker network ls
```

## 2. The Bridge Network (Default)

If you don't specify a network, Docker connects containers to the default `bridge` network.

```
docker run -d --name app nginx
```

This container is isolated but can reach the internet (e.g. for updates) via NAT. **NAT (Network Address Translation)** allows multiple containers to share the host's IP address for outbound traffic — Docker translates internal container IPs to the host's IP when making requests. This enables internet access, but **inbound traffic is blocked** unless you explicitly publish ports. Other containers can't access it by name unless you **create a custom network**.

## 3. Creating a Custom Bridge Network

Custom bridge networks enable automatic DNS-based container discovery. The general command to create a network is:

```
docker network create <network-name>
```

For example, to create a network called `my-net`:

```
docker network create my-net
```

Once the network exists, you can start containers and attach them using the `--network` flag:

```
docker run -d --name <container-name> --network <network-name> <image>
```

Example:

```
docker run -d --name backend --network my-net backend-image
docker run -d --name frontend --network my-net frontend-image
```

Inside the frontend container, you can access `backend` using its container name as a hostname:

```
ping backend
```



Custom networks must be created **before** you can attach containers to them using `--network`. Use them for multi-container setups to enable name-based service discovery and isolate app components.

## 4. Exposing Ports

To make a container accessible from the host machine (e.g. browser or CLI), you must publish a port:

```
docker run -p <host-port>:<container-port> <image>
```

Example:

```
docker run -d -p 8080:80 nginx
```

This maps port `80` in the container to port `8080` on the host.



Port publishing is needed **only for host access**. Containers on the same network can talk via internal ports directly.

## 5. Host Network (Linux Only)

Use the host network to remove isolation and make the container share the host's network stack:

```
docker run --network host <image>
```

This gives the container direct access to host services (e.g. `localhost:5432`), and the container itself is accessible via the host's IP/hostname.



Not available on Docker Desktop for macOS/Windows due to VM-based architecture.

## 6. None Network

To start a completely isolated container:

```
docker run --network none <image>
```

Useful for containers that should not have any external network access.



Use the `none` network when you want complete network isolation, e.g. for security audits, air-gapped containers, or when you manually configure networking.

## 7. Connecting to Networks After Start

You can connect a running container to an existing network using:

```
docker network connect <network-name> <container-name>
```

For example,

```
docker network connect my-net my-container
```

To disconnect:

```
docker network disconnect <network-name> <container-name>
```

For example,

```
docker network disconnect my-net my-container
```



A container can be attached to **multiple networks**, but you should **plan your network layout** to avoid unnecessary complexity.

## 8. Cleaning Up

To remove unused networks:

```
docker network prune
```

To remove a specific network:

```
docker network rm my-net
```



A network cannot be removed while containers are still connected to it.

## 9. Summary: Network Types

Network Type	Own Network Stack	Host Access	Container Discovery
bridge (default)	✓	Needs port mapping	✗
custom bridge	✓	Needs port mapping	✓
host	✗	Direct access	✗
none	✓	✗	✗



Use **custom bridge networks** for most containerized applications to enable DNS-based service discovery. Use **host** for performance-sensitive cases on Linux, and **none** for full network isolation or manual setups.