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Distributed Deployment Guide

This document outlines the procedure to deploy the Local Food AI stack across a mixed topology of Windows 11 subsystems and hypervisors on the same local network.

Supported Hypervisor Topologies

You can distribute the services across any combination of:

- Windows Subsystem for Linux (WSL 2): Ideal for the frontend and LLM nodes.
- Hyper-V: Ideal for the Database node.
- VirtualBox: Ideal for isolated Monitoring nodes.

Port Conflict Matrix

When deploying nodes on the same IP subnet or host machine, ensure the following ports are open on your host firewall (e.g., Windows Defender Firewall) and not conflicting with existing services:

| Service Name | Default Port | Protocol | Purpose |
|--------------|--------------|----------|------------------------------------|
| Nginx (App) | 80 | HTTP | Main Application User Interface |
| Streamlit | 8502 | HTTP | Direct Application Interface |
| SearXNG API | 8080 | HTTP | AI web searching endpoint |
| MySQL DB | 3307 | TCP | Relational database port |
| Zabbix Web | 8081 | HTTP | Zabbix monitoring dashboard |
| Zabbix HTTPS | 8444 | HTTPS | Zabbix monitoring dashboard secure |
| Zabbix Agent | 10050 | TCP | Node metric scraping |
| Zabbix Trap | 10051 | TCP | Active monitoring trap receiver |

Distributed Setup Procedure

1. Network Bridging

If you are using VirtualBox or Hyper-V, you must configure the VM network adapter to use a Bridged Adapter or External Virtual Switch. This ensures that the VMs receive an IP address on the same physical subnet as your host machine (e.g., 192.168.x.x).

For WSL 2, use `wsl --set-version <Distro> 2` and ensure `localhost` forwarding is enabled, or use a tool like `wsl-vpnkit` if you need a dedicated IP.

2. Configure the Node via Python

On each designated node, clone the repository and execute the interactive setup script.

```
python scripts/setup_deploy.py
```

The script will ask you for:

1. Node Role: Choose whether this node is the Database, the Application Frontend, or the Monitoring hub.
2. Network IPs: If you are setting up the Application node, it will ask you for the IP address of the Database node (e.g., the Hyper-V VM IP).
3. Credentials: It will securely generate a local `.env` file containing your passwords so they are not committed to Git.

3. Deploy Docker

Once the script generates the role-specific `docker-compose.yml`, run:

```
docker compose up -d
```

Moving Docker Images Offline

If your Hyper-V or VirtualBox nodes do not have internet access, you can transfer the Docker images directly from a machine that does.

On the Internet-connected machine (Export):

```
docker save -o local_food_app.tar local_food_ai-app:latest nginx:latest
docker save -o local_food_db.tar mysql:8.0
docker save -o local_food_monitoring.tar zabbix/zabbix-server-mysql:ubu
```

On the Offline Node (Import): Copy the `.tar` files via USB or SCP, then run:

```
docker load -i local_food_app.tar
```