~/dc34/title

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DEF CON 34

No Socket, No Privs, No Problem.

Weaponizing OCI registries for SSRF, Credential Theft & Container Escapes

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What even is an OCI Registry?

- HTTP API that stores and serves artifacts, most commonly container images and model files

- Like a web server hosting any other content

- Available Artifacts described by a manifest

The manifest is the menu

TAG

registry.io/model:latest

→

MANIFEST.JSON

```
{
  "config": { "digest": "sha256:9f2a…" },
  "layers": [
    { "digest": "sha256:a3ed…" },
    { "digest": "sha256:71bc…" }
  ]
}
```

→

BLOBS

- config JSON
- layer 128 MB
- layer 42 MB

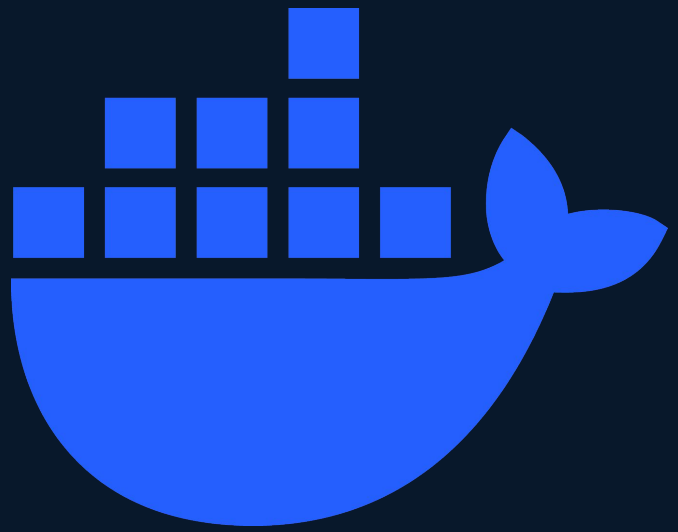
The manifest just lists **digests available on the server**.

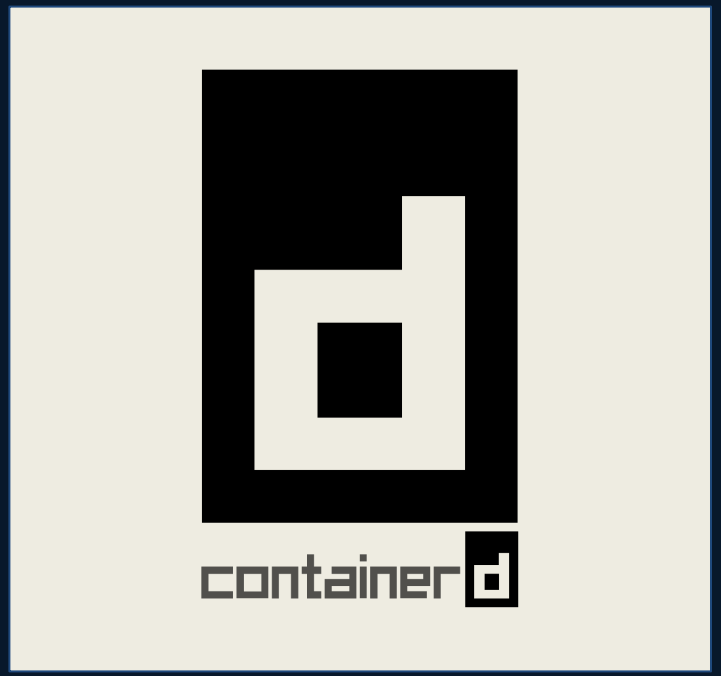
Communicate over the OCI protocol

```
GET    /v2/                                  # is this a registry?
GET    /v2/<name>/manifests/<ref>            # fetch a manifest
PUT    /v2/<name>/manifests/<ref>            # publish a manifest
GET    /v2/<name>/blobs/<digest>             # download a blob
POST   /v2/<name>/blobs/uploads/             # upload a blob
```

Example to download model blob:
curl -sSL https://registry.io/v2/model/blobs/sha256:9f2a3c8d…e41 -o model.gguf

Most software implements their own OCI client





Ollama

- Exposes APIs with zero authentication
- Commonly bound to 0.0.0.0 to facilitate access
- Users can
  - pull models
  - push models
  - request inference

```
POST   /api/generate    # run inference
POST   /api/chat        # chat completions
GET    /api/tags        # list local models
POST   /api/pull        # pull a model from any registry we name
POST   /api/push        # push a model to a registry
DELETE /api/delete      # delete a model
```

NO SOCKET, NO PRIVS, NO PROBLEM // OCI

Docker Model Runner

- Introduced to Docker Desktop in March 2025
- Run models locally and interact with service from containers
- Reachable from any container via model-runner.docker.internal
- Reachable locally on port 12434

```
POST   /engines/v1/chat/completions  # inference
POST   /engines/v1/embeddings  # embeddings
GET    /models  # list models
POST   /models/create  # pull from any registry
GET    /models/{ns}/{name}  # inspect
DELETE /models/{ns}/{name}  # delete
```

DMR - Pulling a Model

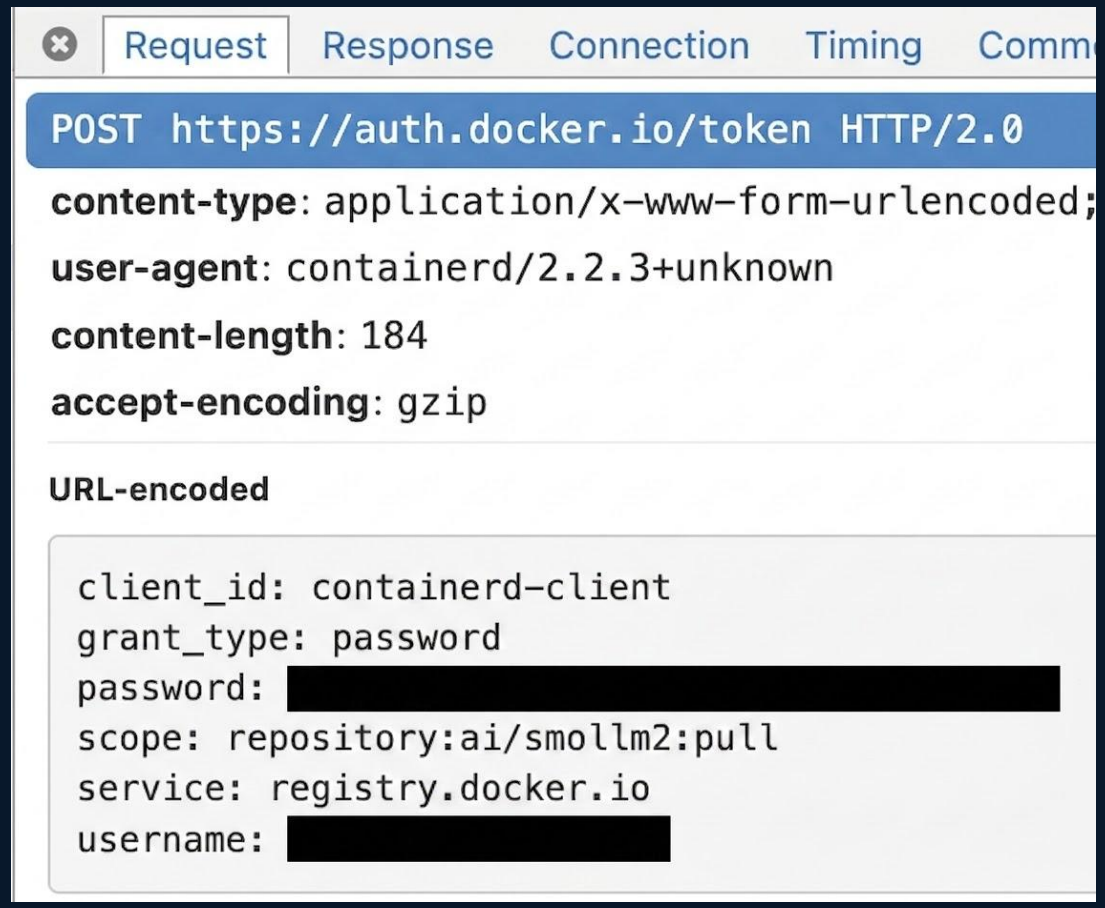
```
~ curl -s -X POST http://localhost:12434/models/create \
-H "Content-Type: application/json" -d '{"from":"ai/smollm2"}'
```

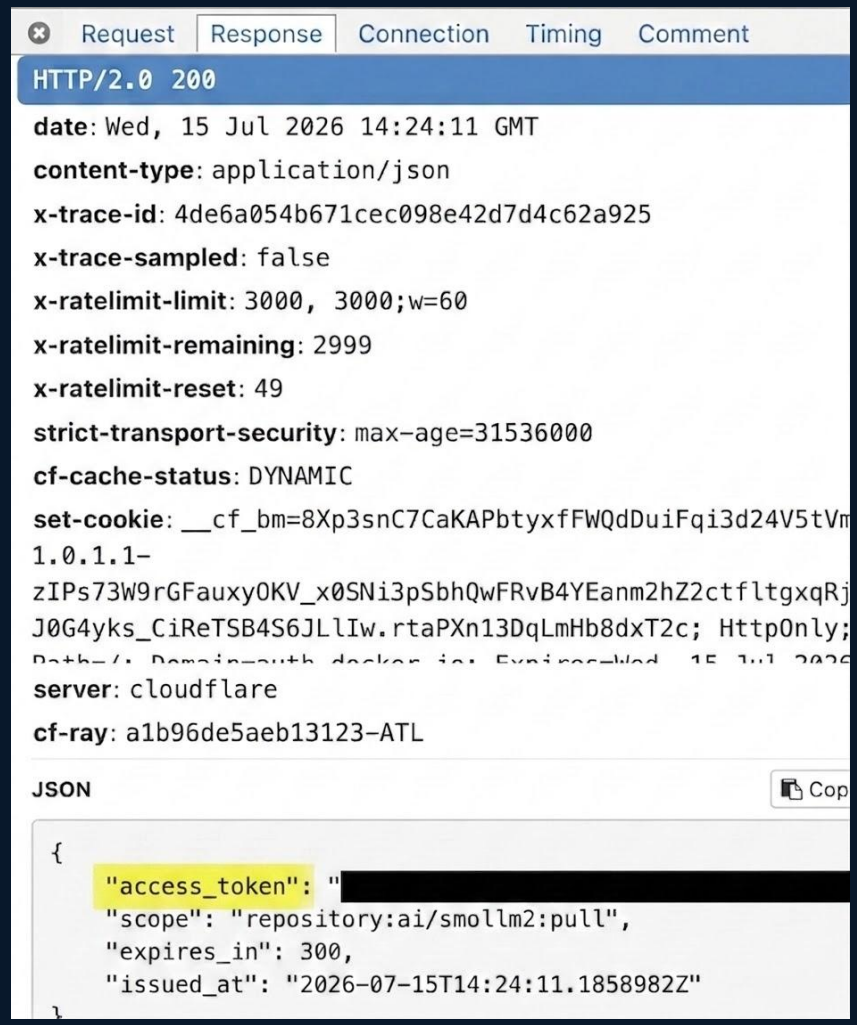
Request | Response | Connection | Timing | Comment

```
HEAD https://registry-1.docker.io/v2/ai/smollm2/manifests/latest HTTP/2.0
accept: application/vnd.docker.distribution.manifest.v2+json,
application/vnd.docker.distribution.manifest.list.v2+json,
application/vnd.oci.image.manifest.v1+json, application/vnd.oci.image.index.v1+json,
*/*
```

```
HTTP/2.0 401
date: Wed, 15 Jul 2026 14:24:10 GMT
content-type: application/json
content-length: 153
docker-distribution-api-version: registry/2.0
www-authenticate: Bearer
realm="https://auth.docker.io/token",service="registry.docker.io",scope="repository:
ai/smollm2:pull"
docker-ratelimit-source: 2600:6c5e:1340:1::
strict-transport-security: max-age=31536000
```

DMR - Pulling a Model cont.





DMR- Pulling a Model cont.

Request | Response | Connection | Timing | Comment

```
GET https://registry-1.docker.io/v2/ai/smollm2/manifests/sha256:354bf30d0aa3af413d2aa5ae4f23c66d78980072d1e07a5b0d776e9606a2f0b9 HTTP/2.0
```

user-agent: Docker-Desktop/4.74.0 (Mac; arm64)

accept: application/vnd.oci.image.manifest.v1+json, */*

accept-encoding: zstd;q=1.0, gzip;q=0.8, deflate;q=0.5

authorization: Bearer
eyJhbGciOiJSUzI1NiIsInR5cCI6IkpXVCIsIng1YyI6WyJNSUlFRmpDQ0F2NmdBd0lCQWdJVU9yTFd5UVpx
MmFuZXd6WnhYN1JLbHQ3bDVUTXdEUVlKS29aSWh2Y05BUUVMQlFBd2dZWXhDekFKQmdOVkJBWVRBbFZUTVJN
d0VRWURWUVFJRXdwRFlXeHBabTl5Ym1saE1SSXdFQVlEVlFRSEV3bFFZV3h2SUVGc2RHOHhGVEFUQmdOVkJB

No content | Edit | Replace | View: auto

Request | Response | Connection | Timing | Comment

```
HTTP/2.0 200
```

date: Wed, 15 Jul 2026 14:24:11 GMT

content-type: application/vnd.oci.image.manifest.v1+json

content-length: 551

docker-content-digest: sha256:354bf30d0aa3af413d2aa5ae4f23c66d78980072d1e07a5b0d776e9606a2f0b9

docker-distribution-api-version: registry/2.0

etag: "sha256:354bf30d0aa3af413d2aa5ae4f23c66d78980072d1e07a5b0d776e9606a2f0b9"

docker-ratelimit-source: davidrochester1

x-ratelimit-limit: 200;w=3600

ratelimit-limit: 200;w=3600

x-ratelimit-remaining: 198;w=3600

ratelimit-remaining: 198;w=3600

strict-transport-security: max-age=31536000

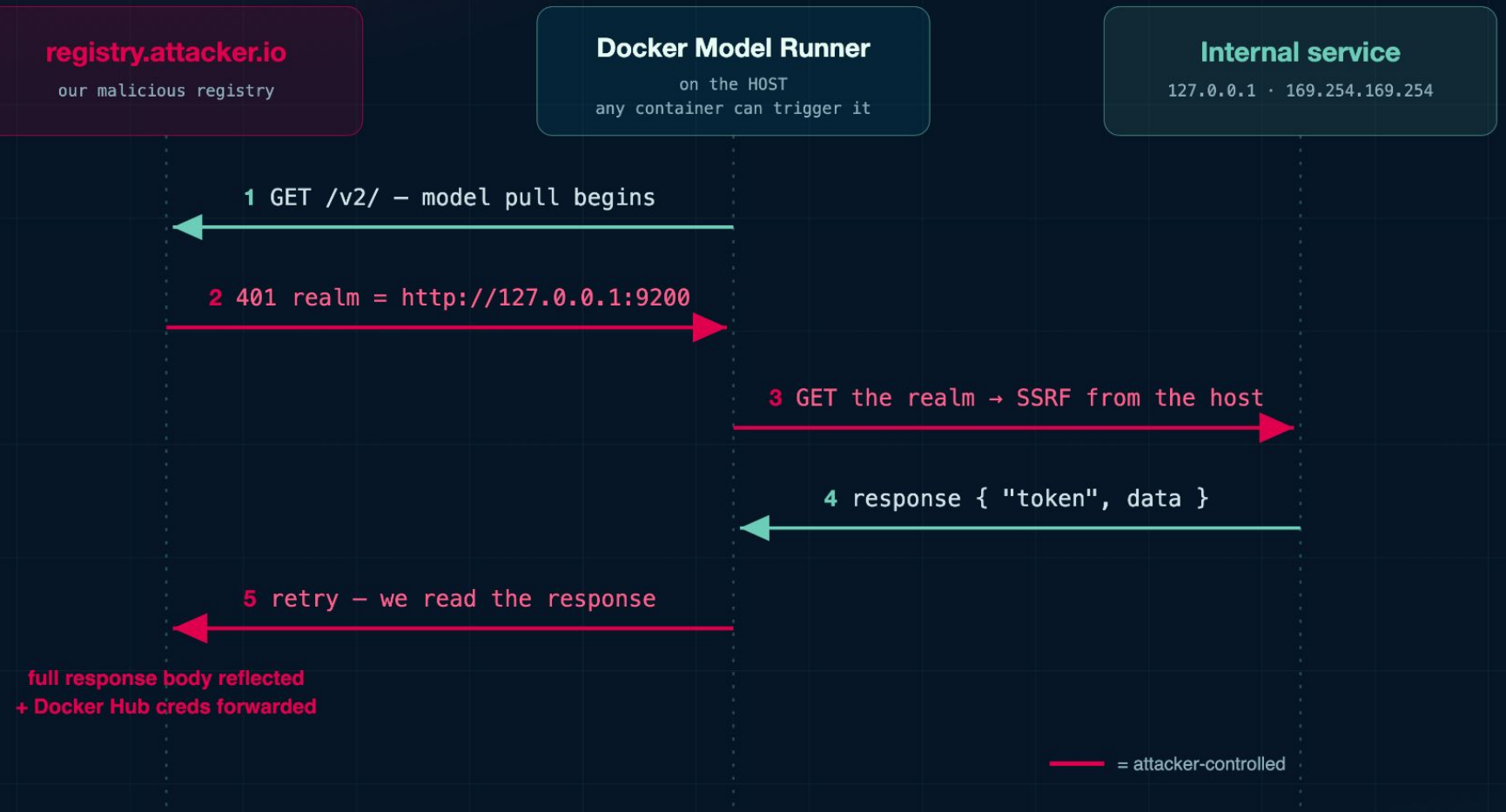
JSON | Copy | Edit | Replace | View: auto


```
{
    "schemaVersion": 2,
    "mediaType": "application/vnd.oci.image.manifest.v1+json",
    "config": {
        "mediaType": "application/vnd.docker.ai.model.config.v0.1+json",
        "size": 375,
        "digest": "sha256:32aaa72e00e9a79d38786abd1e37388e7f01181a0f1bdf23efff6433c12f88
    }
```

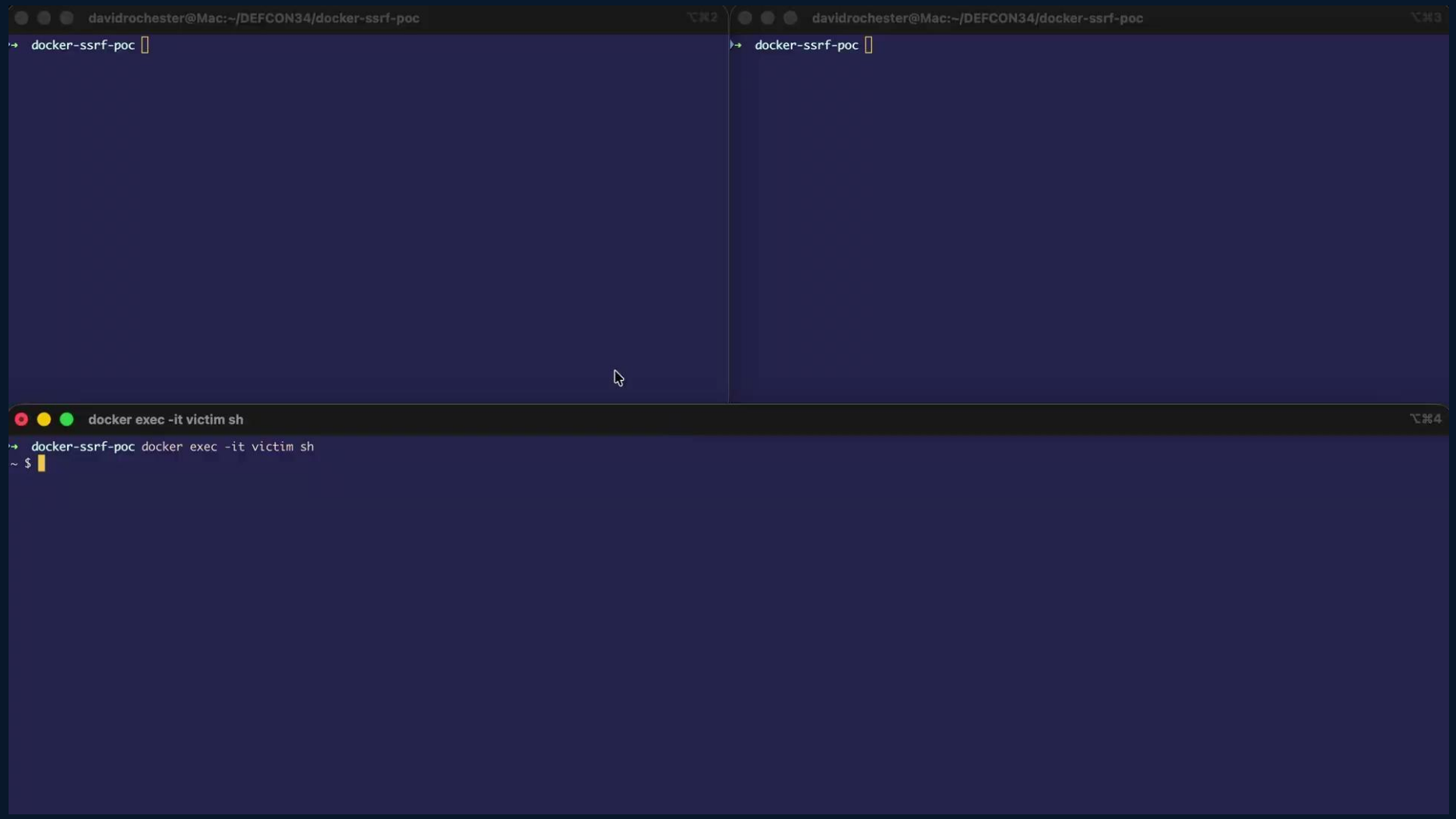
DMR - Pulling a Model cont.

```
HTTP/2.0 401
date: Wed, 15 Jul 2026 14:24:10 GMT
content-type: application/json
content-length: 153
docker-distribution-api-version: registry/2.0
www-authenticate: Bearer
realm="https://auth.docker.io/token",service="registry.docker.io",scope="repository:
ai/smollm2:pull"
docker-ratelimit-source: 2600:6c5e:1340:1::
strict-transport-security: max-age=31536000
```

Abusing the Auth Flow



DMR - SSRF Demo



Hunting SSRF in Ollama

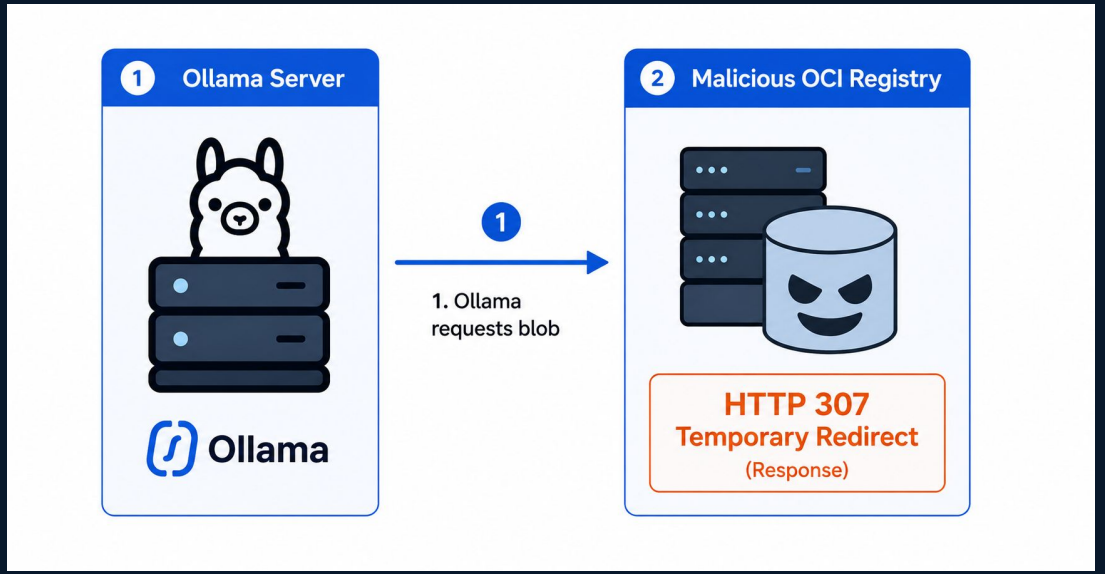
- Ollama validates realm before sending tokens cross-origin

```
// Validate that the realm host matches the original request host to prevent sending tokens cross-origin.
if redirectURL.Host != originalHost {
    return "", fmt.Errorf("realm host %q does not match original host %q", redirectURL.Host, originalHost)
}
```

`server/auth.go`

Hunting SSRF in Ollama

- 307 Redirects




```
if resp.StatusCode != http.StatusTemporaryRedirect && resp.StatusCode != http.StatusOK {
    return nil, fmt.Errorf("unexpected status code %d", resp.StatusCode)
}
return resp.Location()
```

`server/download.go`

HASH VERIFY · THE BYPASS

One digest, twice. Verification skipped.

01

Malicious Manifest

Two layers · same digest

sha256:a1b2...

02

downloadBlob()

307 → SSRF body written

03

digest	skipVerify
a1b2...	~~false~~ → **true**
c9d0...	false

skipVerify Map

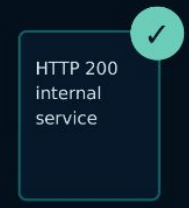
Cache hit overwrites the flag

04

verifyBlob()

Skipped — flag is true

05



Blob on Disk

Internal response persists

```
skipVerify[layer.Digest] = cacheHit
```

LOGIC FLAW A cache hit overwrites verification state — the unverified blob stays on disk.

02

ATTACK CLASS

ATTACK CLASS

Credential Theft

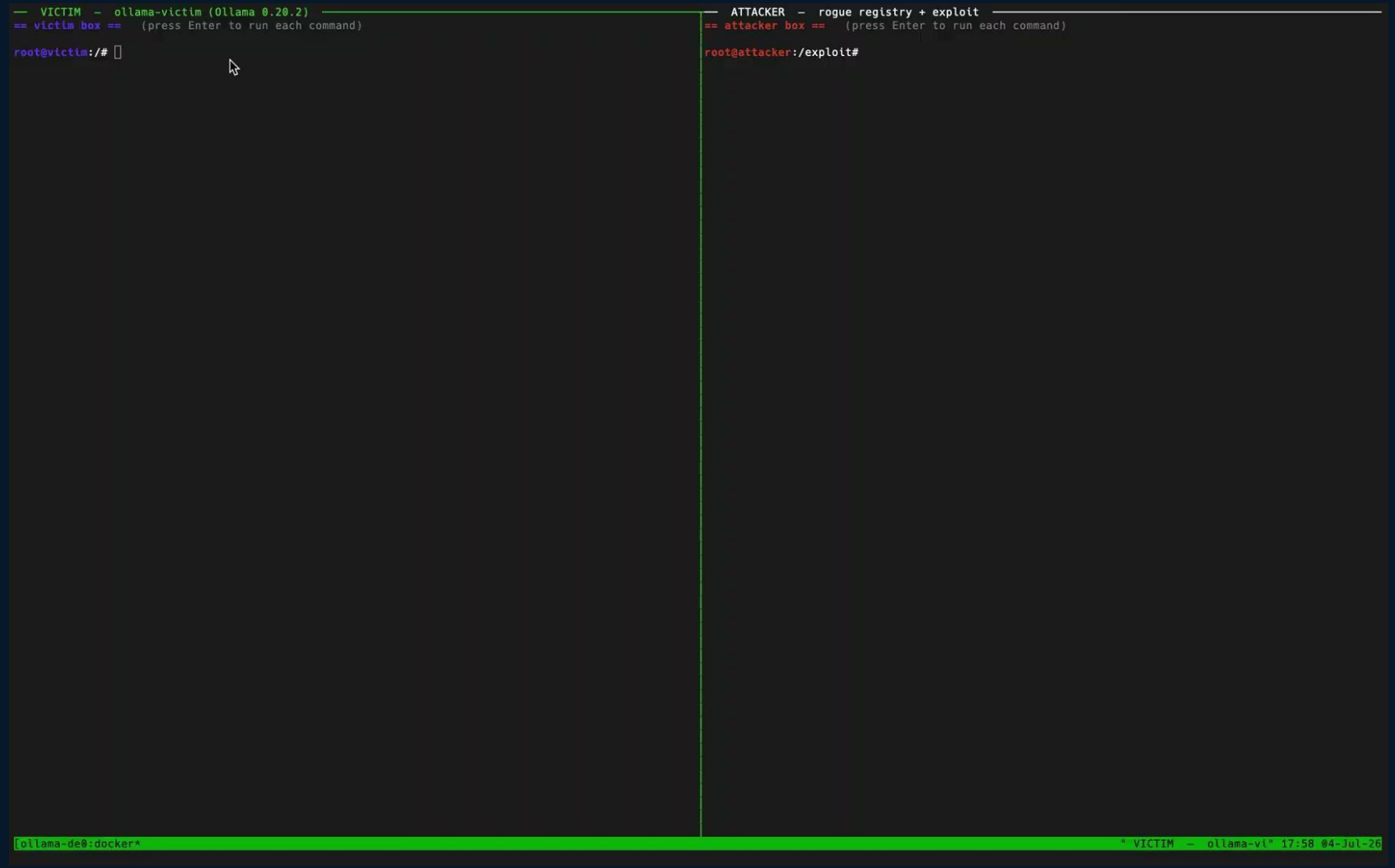
Access Galore

Ex: (O)llama Whisper

Ex: (O)llama Whisper

- Attacker reads any file on the server (e.g. /etc/shadow, SSH keys)
- No login required: Ollama has no auth by default
- Ollama commonly listens on 0.0.0.0
- Bug: a file "digest" isn't checked for ../, so the path escapes its folder
- Trigger: three normal API calls with a booby-trapped digest
- In Docker = runs as root ⟶ reads the whole filesystem
- Unpatched : works on latest release (0.31.1) and main, disclosed to Ollama multiple times

Ex: (O)llama Whisper PoC



Ex: (O)llama Whisper Current State

- Disclosed to Ollama several times (starting April 5 2026)
- received a CVE
- Publicly Exposed Ollama servers:
    - Jan 2026: 175,000 over 130 countries

03

ATTACK CLASS

ATTACK CLASS

Container Escape

Abusing Docker Model Runner’s inference backends

Inference backends

llama.cpp

GGUF · Metal

vLLM

Metal backend

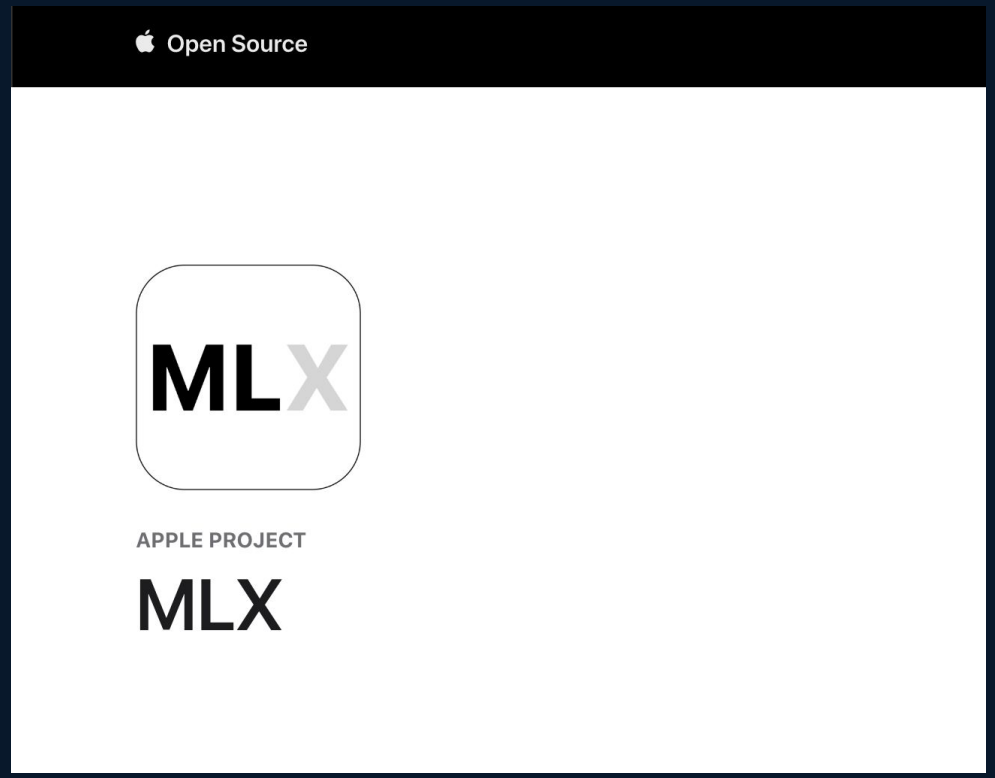
MLX

mlx-lm · Apple Silicon

native, **Metal-accelerated** inference — runs as a host process

MLX-LM

Apple’s open source library for running LLMs on Apple Silicon



`config.json` gets one extra field:

```json
{
  "model_file": "model.py",
  "architectures": ["LlamaForCausalLM"],
  "model_type": "llama",
  ...
}
```

Docker Model Runner Sandbox

```
return backends.RunBackend(ctx, backends.RunnerConfig{
    BackendName:     "MLX",
    Socket:          socket,
    BinaryPath:      m.pythonPath,
    SandboxPath:     "",
    SandboxConfig:   "",
    Args:            args,
    Logger:          m.log,
    ServerLogWriter: logging.NewWriter(m.serverLog),
})
```

`pkg/inference/backends/mlx/mlx.go`

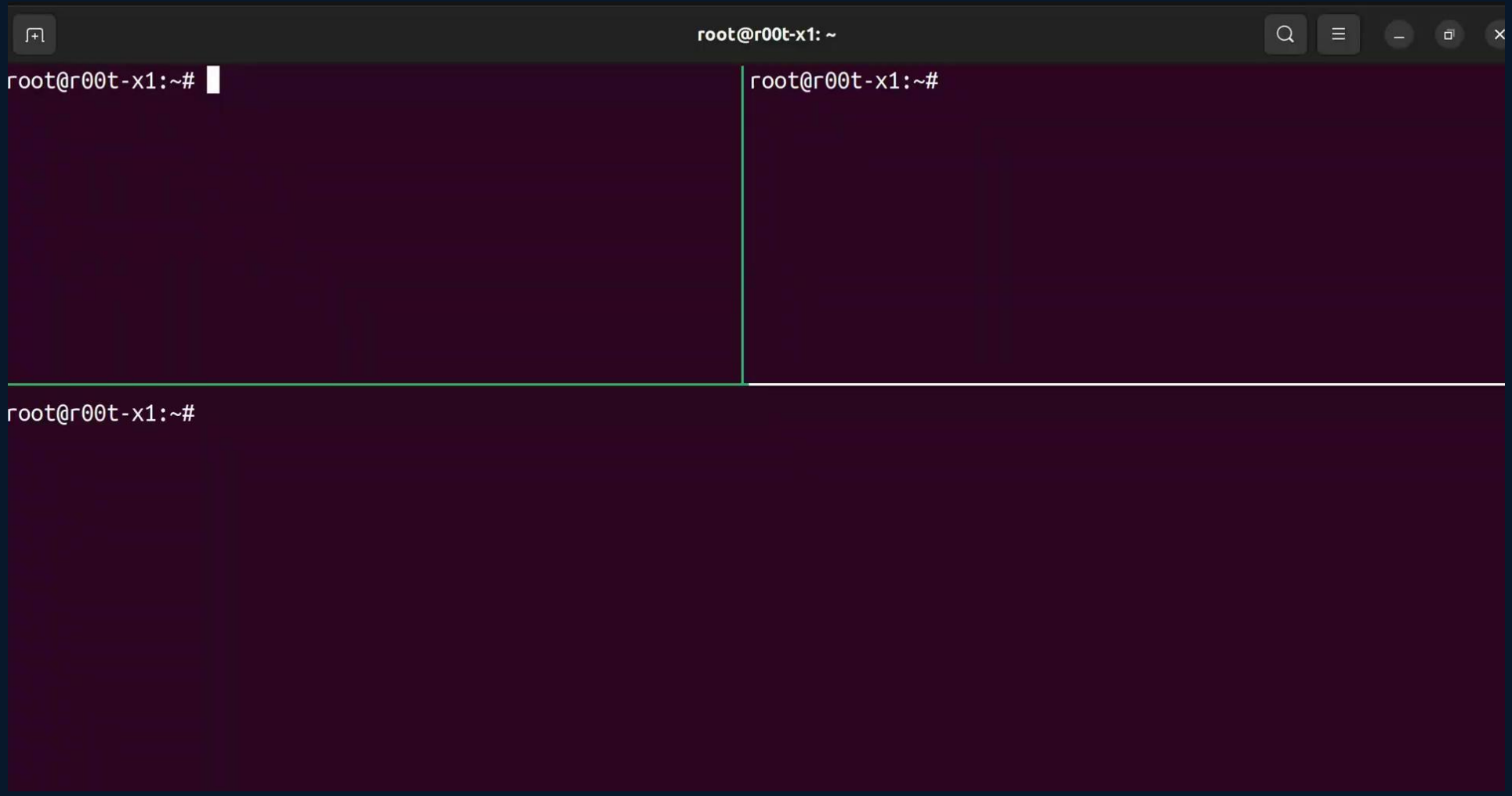
Docker Model Runner Sandbox

```
return backends.RunBackend(ctx, backends.RunnerConfig{
    BackendName:     "MLX",
    Socket:          socket,
    BinaryPath:      m.pythonPath,
    SandboxPath:     "",
    SandboxConfig:   "",
    Args:            args,
    Logger:          m.log,
    ServerLogWriter: logging.NewWriter(m.serverLog),
})
```

Its empty

`pkg/inference/backends/mlx/mlx.go`

Ex: Free Willy...errrr Docker PoC

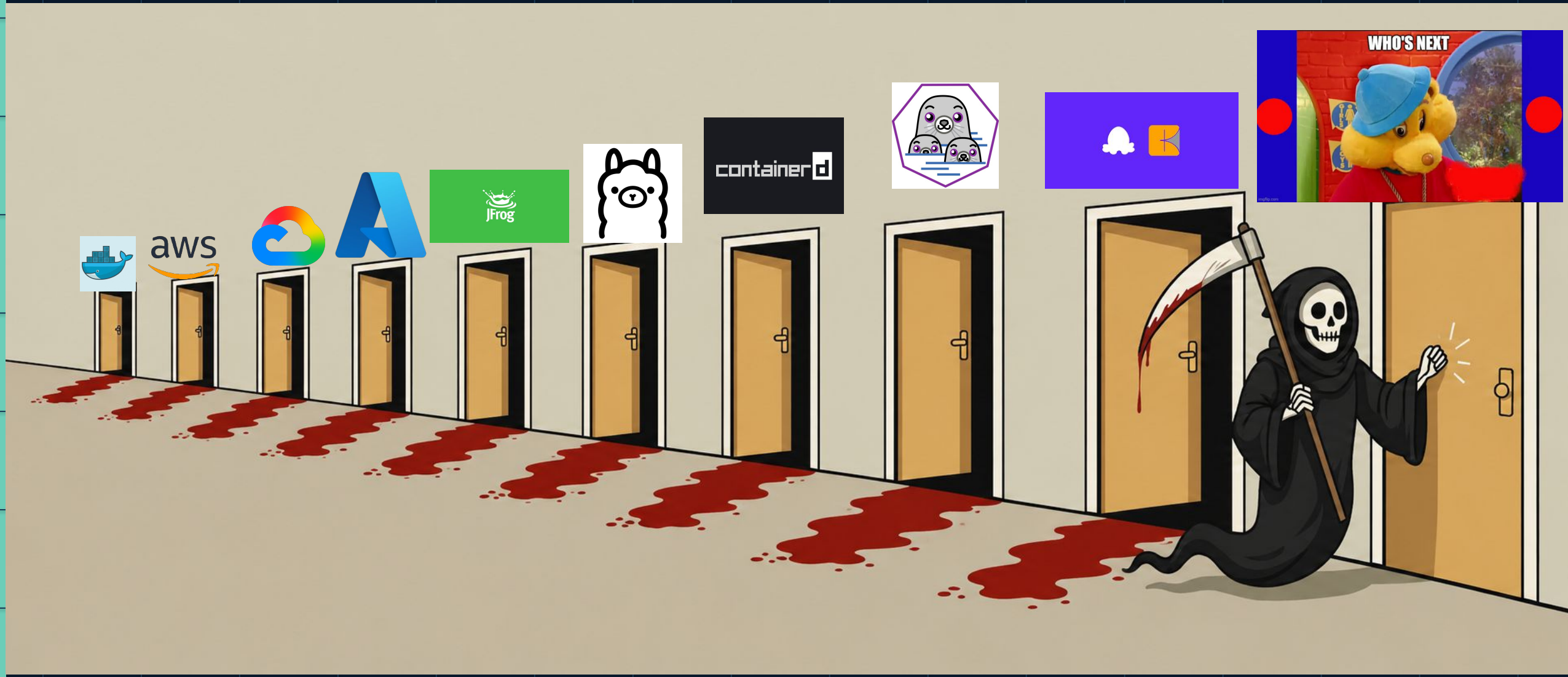


But Wait there's more…

Some of the other OCI primitives we've discovered

- SSRF Family: 3XX redirects, 401 auths, etc
- Producer-controlled metadata XSS Family: stored XSS
- Referrers API / attestation / signature Family: DOS, Injection, bypasses
- Tar layer extraction Family: LFI , RFI, RCE
- Image config / build directive Family: RCE, DOS, RFI, LFI
- Parser / ACL / mediaType / digest differentials Family: injection, data leak, bypasses
- Cross-class compositions: above chained

Turns out, OCI can be used to perpetuate almost any traditional attack type, not just SSRF / RFI. You just need to find a way to embed it into your OCI artifact


WHO'S NEXT
aws
JFrog
containerd

~/dc34/closing

DEF CON 34

No Socket. No Privs.
No Problem.

$ questions?

David Rochester · @davidrxchester · **Nicholas Gould** · @gouldnicholas

References:

- https://www.docker.com/products/docker-desktop/
- https://github.com/docker/model-runner/security
- https://github.com/ml-explore/mlx-lm
- https://github.com/ggml-org/llama.cpp
- https://github.com/vllm-project/vllm-metal
- https://thehackernews.com/2026/01/researchers-find-175000-publicly.html
- https://github.com/ollama
- https://github.com/containerd/containerd
- https://opencontainers.org/