- Server: 129.74.246.122
- Login: daspos
- Password: daspos1

Quick start: bertini software

```
mkdir -p /tmp/alex/umbrella_cache
cd /tmp/alex
wget -O bertini.umbrella \
https://curate.nd.edu/downloads/b2773t9694n
umbrella --spec bertini.umbrella \
--localdir umbrella cache/\
--sandbox mode docker \
run
```

Umbrella

- Tracking execution environment
 - Umbrella Specification
- Creating execution environment
 - Umbrella Execution Engine
- Preserving execution environment
 - Umbrella Archiver

Umbrella Specification

Sections:

Hardware

Kernel

OS

Software

Data

Environment variables

CMD

Output

```
"description": "A ray-tracing application which creates video frames.",
"hardware": {
  "arch": "x86 64",
  "cores": "1".
  "memory": "1GB",
  "disk": "3GB"
"kernel": {
  "name": "linux",
  "version": ">=2.6.18"
"os": {
  "name": "redhat".
  "version": "6.5".
  "mountpoint": "/",
  "source": [ "http://ccl.cse.nd.edu/.../redhat-6.5-x86 64.tar.gz" ],
  "format": "tgz".
  "action": "unpack",
  "checksum": "669ab5ef94af84d273f8f92a86b7907a",
  "size": "633848940",
  "uncompressed size": "1743656960",
  "ec2": {
     "ami": "ami-2cf8901c",
     "region": "us-west-2",
     "user": "ec2-user"
"software": {
  "povray-3.6.1-redhat6-x86 64": {
     "mountpoint": "/software/povray-3.6.1-redhat6-x86 64",
     "source": [ "http://ccl.cse.nd.edu/.../povray-3.6.1-redhat6-x86 64.tar.gz" ].
     "format": "tgz",
     "action": "unpack",
     "checksum": "b02ba86dd3081a703b4b01dc463e0499".
     "size": "1471452",
     "uncompressed size": "3010560"
"data": {
  "4_cubes.pov": {
     "mountpoint": "/tmp/4_cubes.pov",
     "source": [ "http://ccl.cse.nd.edu/.../4_cubes.pov" ],
     "format": "plain",
     "action": "none",
     "checksum": "c65266cd2b672854b821ed93028a877a",
     "size": "1757"
"environ": {
  "PWD": "/tmp"
"cmd": "povray +l/tmp/4_cubes.pov +O/tmp/frame000.png +K.0 -H50 -W50",
"output": {
  "files": [ "/tmp/frame000.png" ],
  "dirs": [ "/tmp/output" ]
```

Resource URLs Supported by Umbrella

| Resource | Example URL |
|------------------------------|---------------------------------------|
| Local Filesystem | /home/dthain/data/input |
| HTTP | http://www.data.com/data/file1 |
| HTTPS | https://lab.cse.nd.edu/data/hep/file2 |
| Amazon S3 | s3+https://s3.aws.com//cubes.pov |
| Open Science Framework (OSF) | osf+https://files.osf.io/v1//7559c3a |
| Git Repository | git+https://github.com//cctools.git |
| CernVM File System | cvmfs://cvmfs/cms.cern.ch |

Umbrella spec example

```
"cmd": "/software/bertini",
"comment": "Bertini",
"data": {
  "input": {
    "action": "None",
    "checksum": "5566c8dc820c2a2744f646abf662e34b",
    "format": "plain",
    "id": "5566c8dc820c2a2744f646abf662e34b",
    "mountpoint": "/tmp/input",
    "size": "197",
    "source": [
      "https://curate.nd.edu/downloads/8w32r496z2g"
```

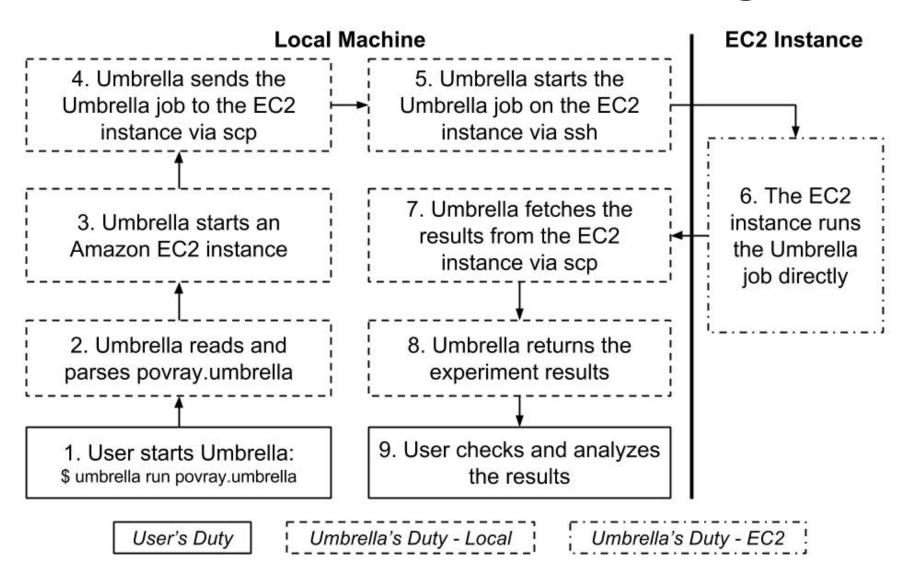
Umbrella Execution Engine

Matching degree between

- -- the execution node
- the execution environment specified via an Umbrella specification

| Hardware | Kernel | OS | Sandbox Techniques |
|----------|--------|-----|--|
| Yes | Yes | Yes | Utilize the current OS directly |
| Yes | Yes | No | OS-level Virtualization Docker, Parrot |
| Yes/No | No | No | Hardware Virtualization Local: VirtualBox, VMWare Remote: Amazon EC2 |

Umbrella EC2 Execution Engine

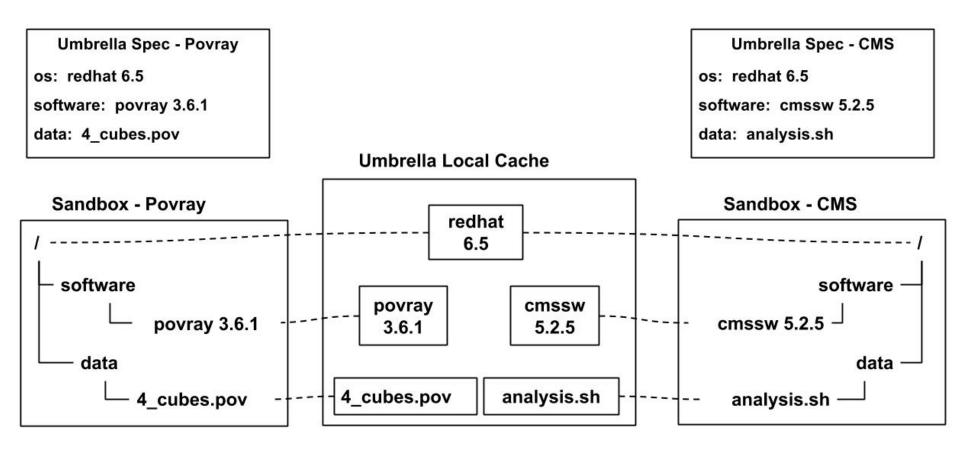


Example: parrot execution engine

```
umbrella --spec bertini.umbrella \
--localdir umbrella_cache_parrot/\
--sandbox_mode parrot \
run
```

Umbrella Local Cache

OS-level virtualization



 [avyushko@stockpile demo1]\$ Is /tmp/umbrella_cache/cache
 5566c8dc820c2a2744f646abf662e34b c2a2b68f8089209fc2454f3bc242b5d2
 902703f016e0f930a870eaf9cb31640b

Build umbrella spec

```
cd ~/update_spec
umbrella \
--localdir /tmp/umbrella_test/ \
build bertini.umbrella bertini.new.umbrella
```

```
"data": {
     "input": {
        "format": "plain",
      "source": [
        "/tmp/spec/input_new"
        ],
        "action": "None",
      }
}
```

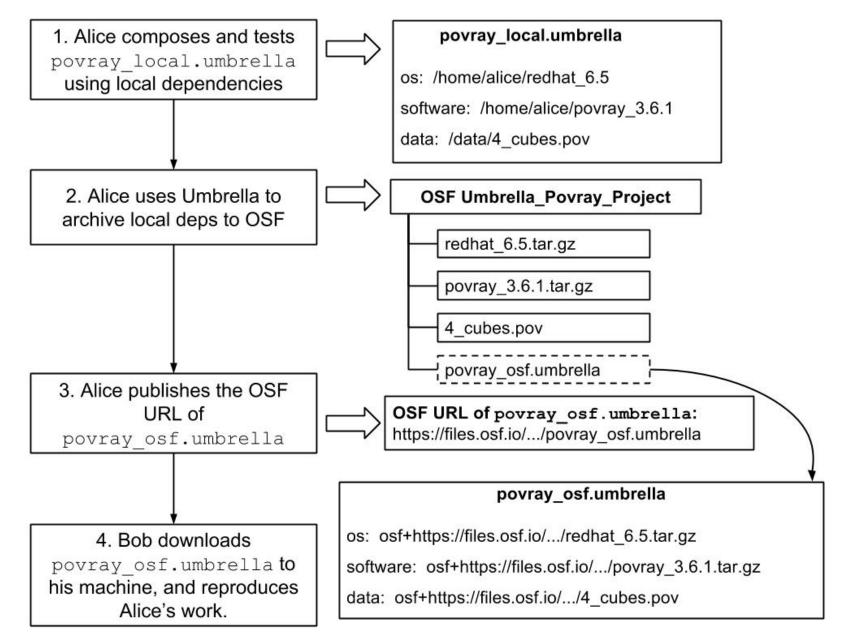
```
"data": {
    "input":{
     "format": "plain",
     "checksum":
"5566c8dc820c2a2744f646abf662e34b"
      "source": [
"/tmp/spec/input new"
       "action": "None",
"5566c8dc820c2a2744f646abf662e34b"
     "size": "197"
```

Umbrella Archiver

Two Categories of Unreliable Dependencies:

- Local dependencies
- Some third-party network dependencies
- Allows the user to mark unreliable deps
- Uploads the unreliable deps to reliable archive
 - Amazon S3
 - OSF storage service
- Allows the user to set the access permission of uploaded resources

Umbrella + OSF



```
umbrella --spec bertini.new.umbrella \
--localdir umbrella_osf/ \
--osf_userid=kh4n3 \
--osf_user=avyushko@nd.edu \
--osf_pass=password upload osf proj_bertini public osf.umbrella
```

```
"os": {
    "name": "CentOS",
    "format": "tgz",
    "checksum": "902703f016e0f930a870eaf9cb31640b",
    "source": [
"osf+https://files.osf.io/v1/resources/6q523/provider
s/osfstorage/573f29bdb83f6901f2768b29<sub>"</sub>
    "version": "6.6",
    "uncompressed_size": "212684800",
    "id": "902703f016e0f930a870eaf9cb31640b",
    "size": "72213624"
  },
```