Introducing **Zinc.**

Andy Mroczkowski
MindSnacks Engineering
@amrox

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Zinc helps you manage and distribute assets. It draws inspiration from Git, but is designed with mobile clients in mind.

Or to put it another way…

Zinc gives you NSBundles that update automatically.

For example…

In-App Purchased content

Game levels (art, sounds)

Anything to get under 50mb

Basically…

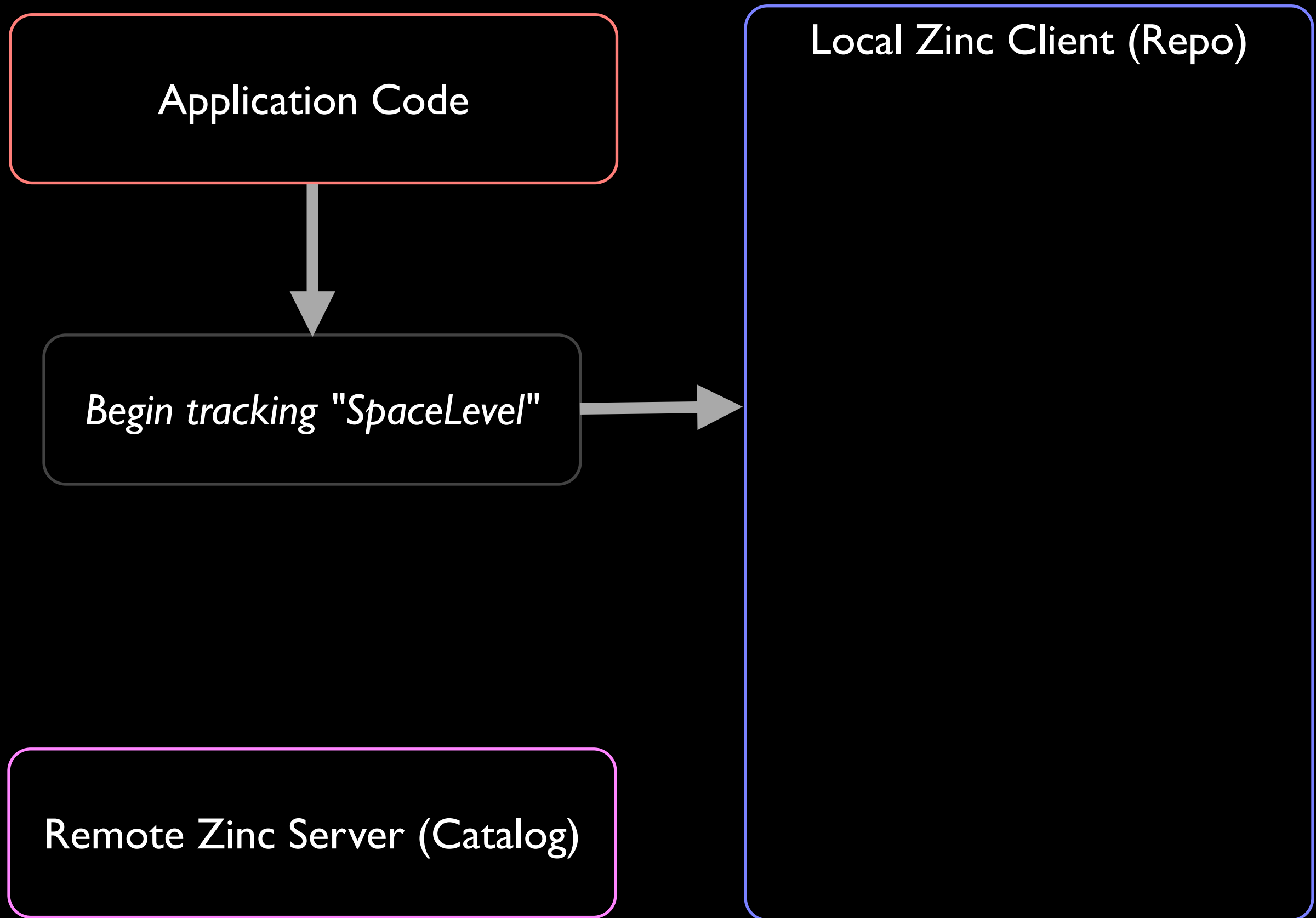**Any group of related files**

The **Basics**
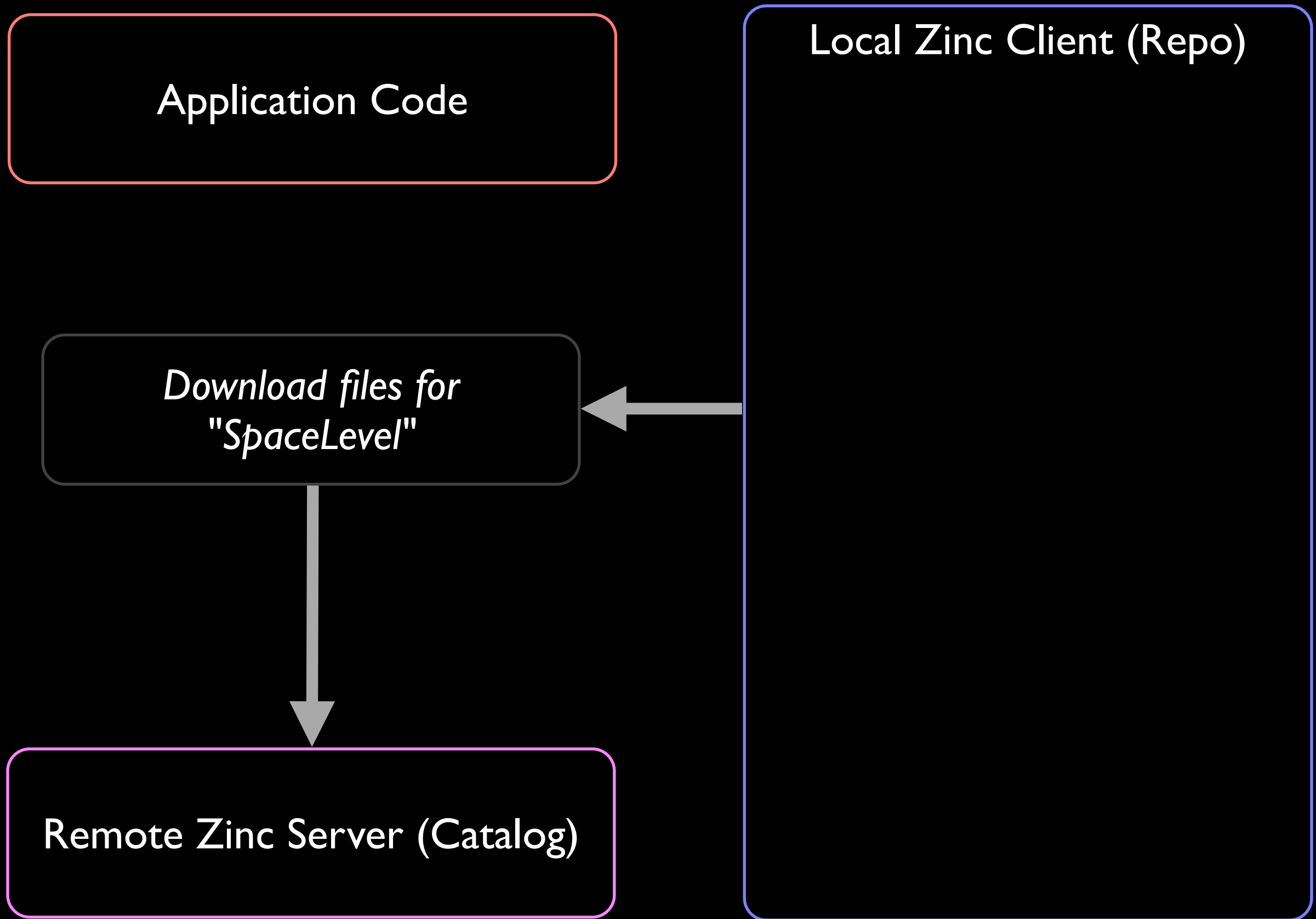
Application Code

Local Zinc Client (Repo)

Remote Zinc Server (Catalog)

Application Code

Begin tracking "SpaceLevel"

Local Zinc Client (Repo)

Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

Download files for "SpaceLevel"

Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

"SpaceLevel" Bundle

Remote Zinc Server (Catalog)

Application Code

Give me the Bundle for "SpaceLevel"

Remote Zinc Server (Catalog)

Local Zinc Client (Repo)
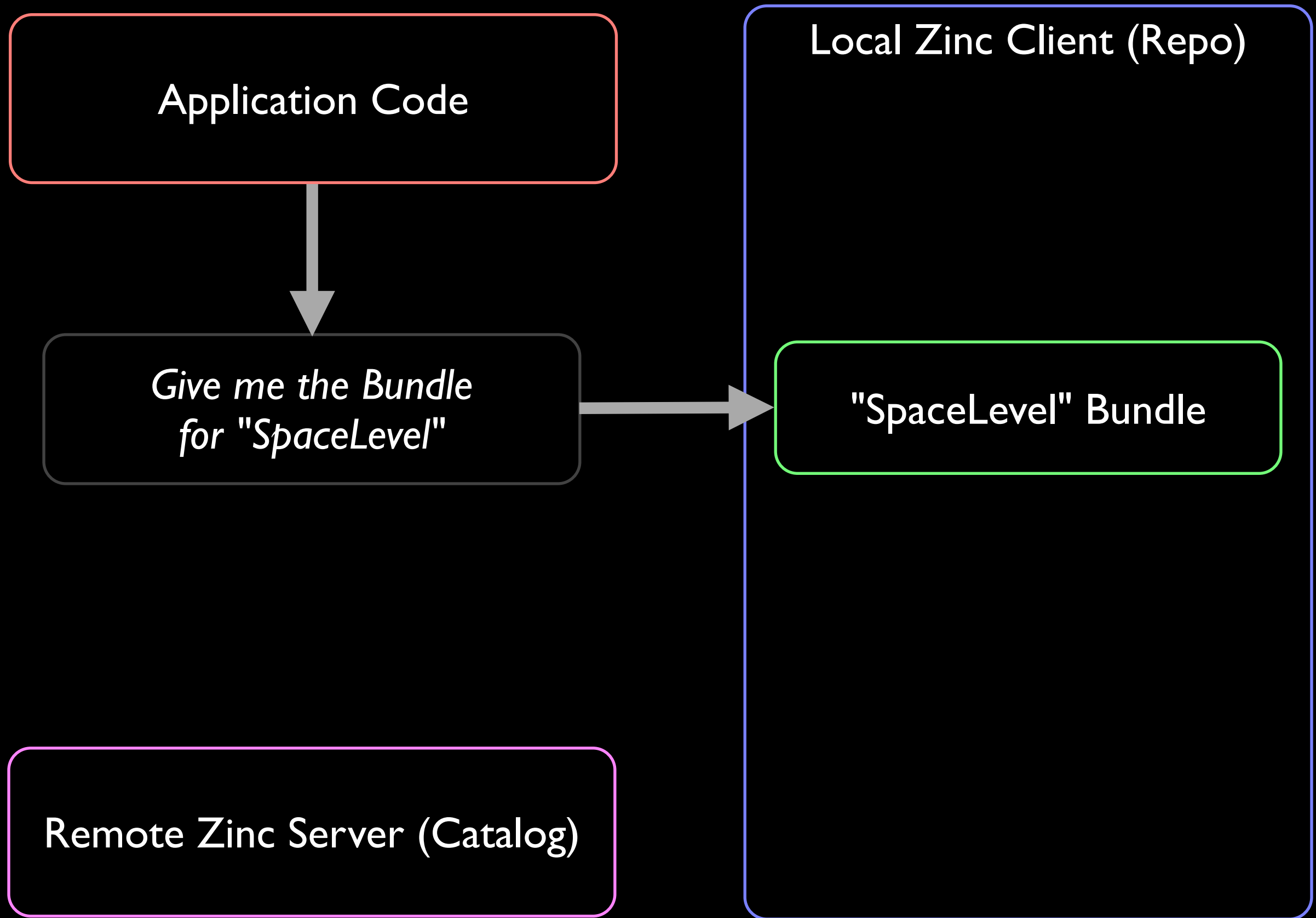
"SpaceLevel" Bundle

Application Code

Local Zinc Client (Repo)

App is now using "SpaceLevel"

"SpaceLevel" Bundle
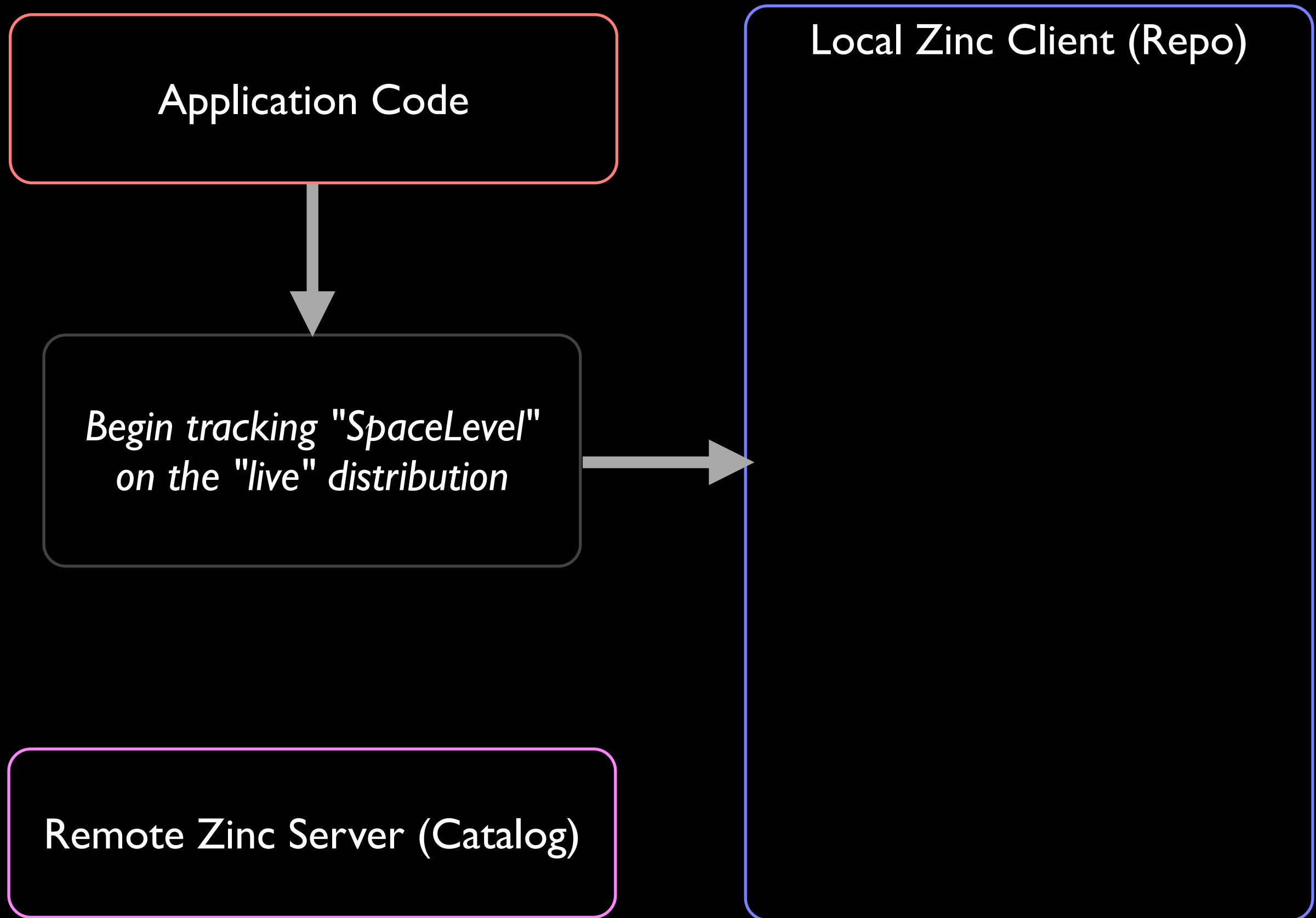
Remote Zinc Server (Catalog)

What about updates?

A **Bundle** is a group of related files (images, sounds, movies).

Every bundle is versioned automatically.

Several versions of a bundle may be available simultaneously.

A **Distribution** is a pointer to a version of a bundle.

A distribution can have any name you want, but some common uses are "live" and "test".

Application Code

Begin tracking "SpaceLevel"
on the "live" distribution

Local Zinc Client (Repo)

Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

What is the current version for "SpaceLevel" on the "live" distribution?

Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

"SpaceLevel" @ *"live"* = *v6*

Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

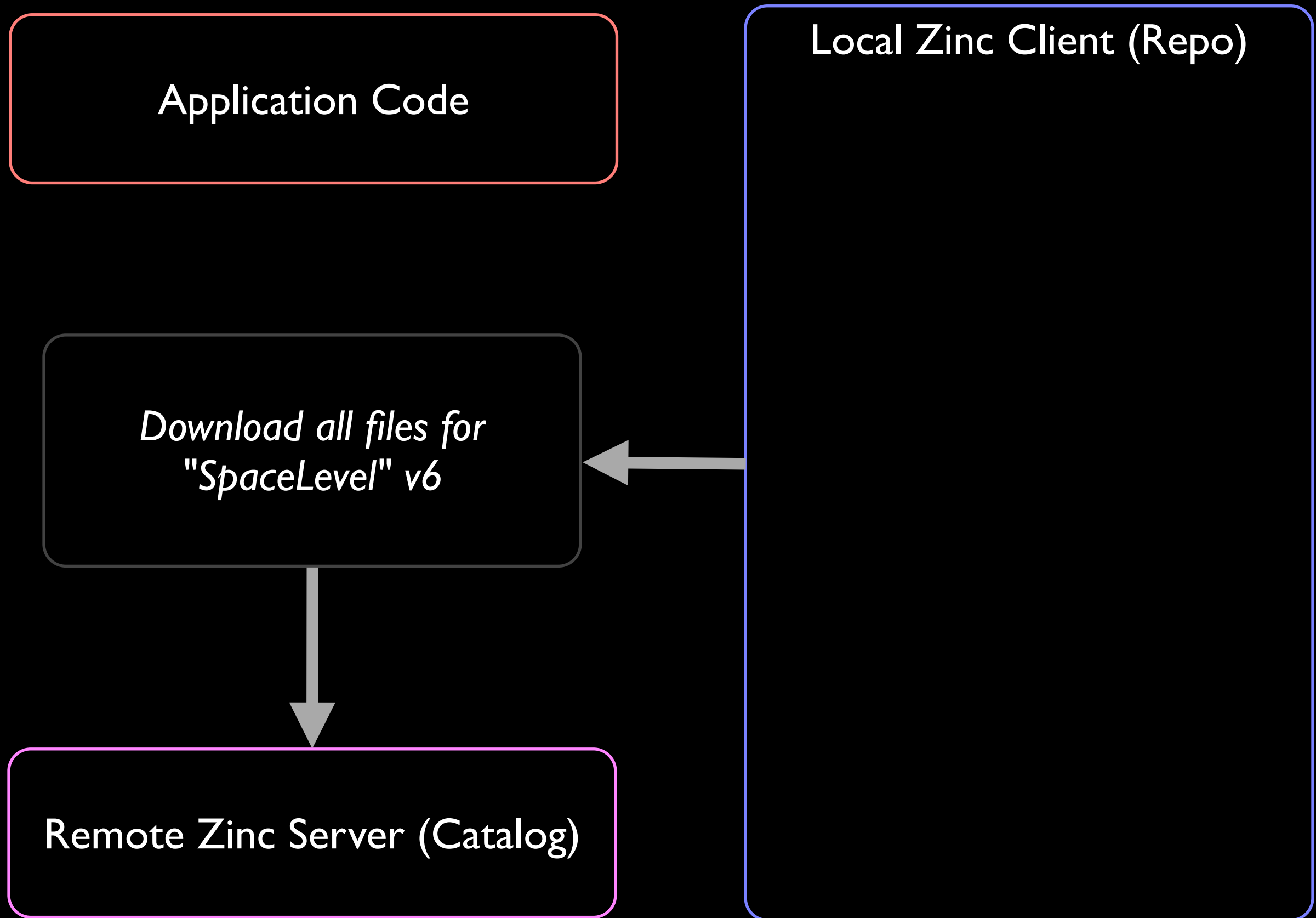*Download all files for "SpaceLevel" v6*

Remote Zinc Server (Catalog)
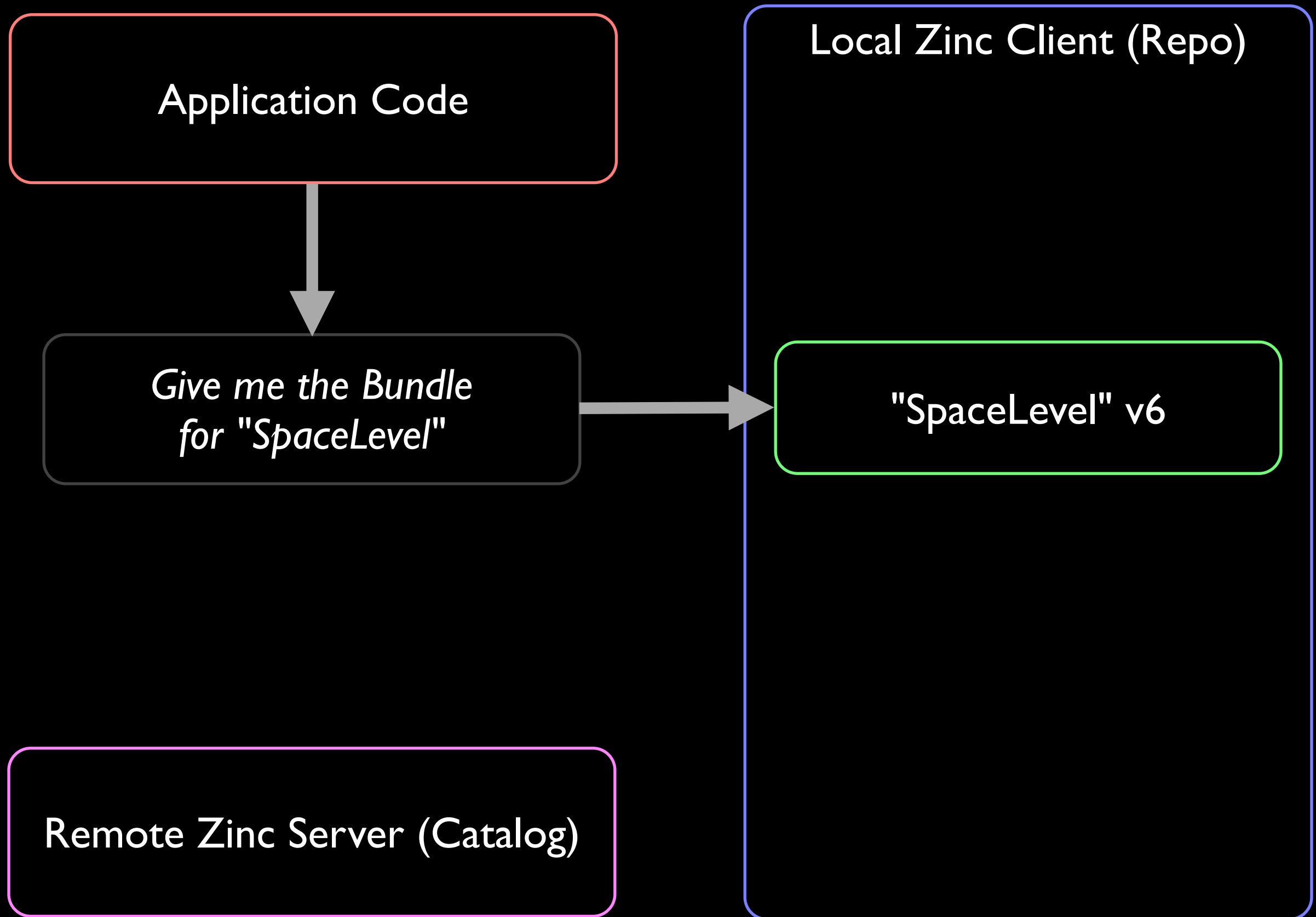
Application Code

Local Zinc Client (Repo)

"SpaceLevel" v6

Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

App is now using "SpaceLevel" v6

"SpaceLevel" v6

Remote Zinc Server (Catalog)

Time passes…

Application Code

Local Zinc Client (Repo)

App is still using "SpaceLevel" v6

"SpaceLevel" v6

Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

"SpaceLevel" v6

What is the current version for "SpaceLevel" on the "live" distribution?

Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

"SpaceLevel" v6

"*SpaceLevel*" @ "*live*" = v7

Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

"SpaceLevel" v6

Download all files for *"SpaceLevel"* v7

Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

"SpaceLevel" v6

"SpaceLevel" v7

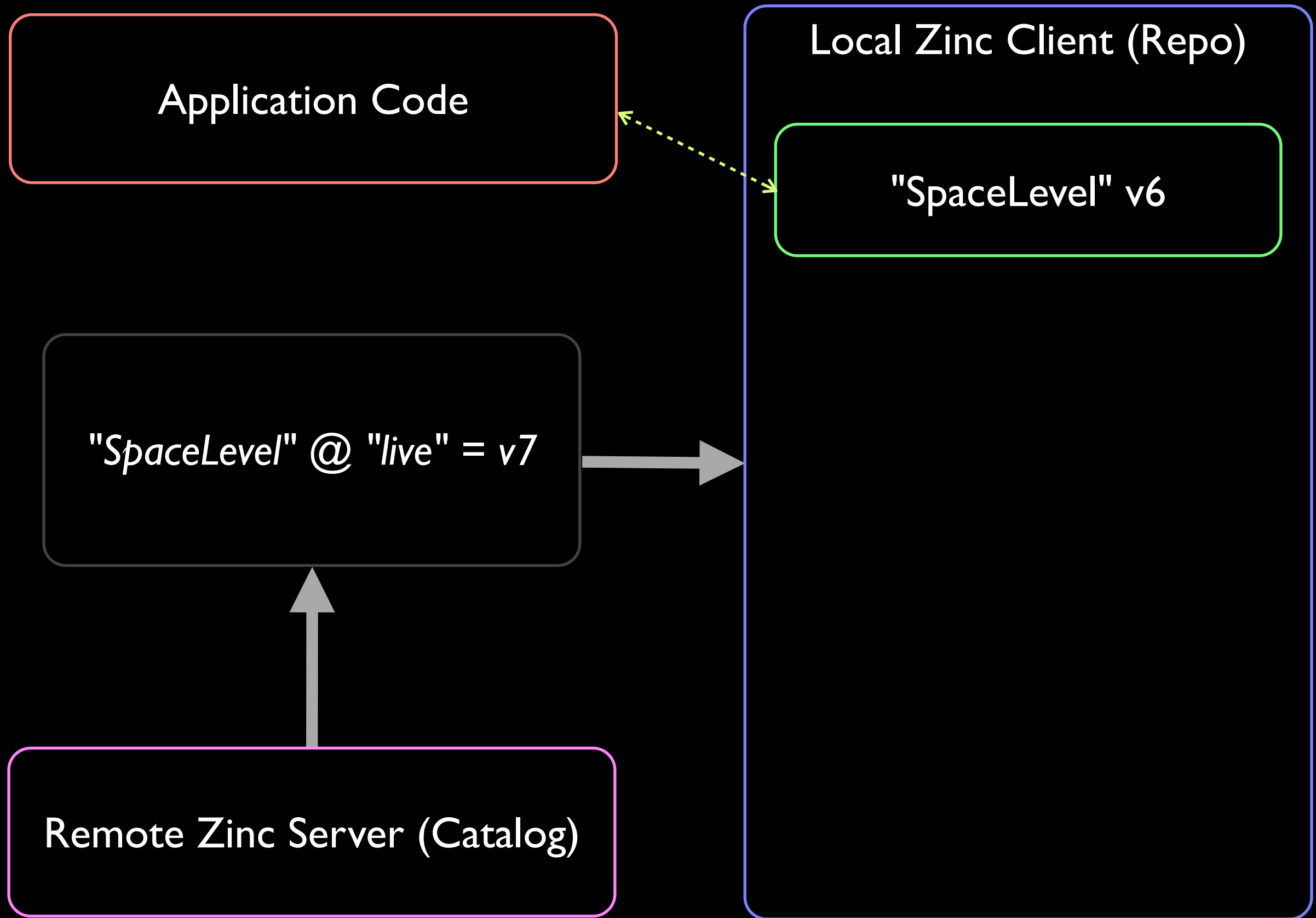Download all files for "SpaceLevel" v7
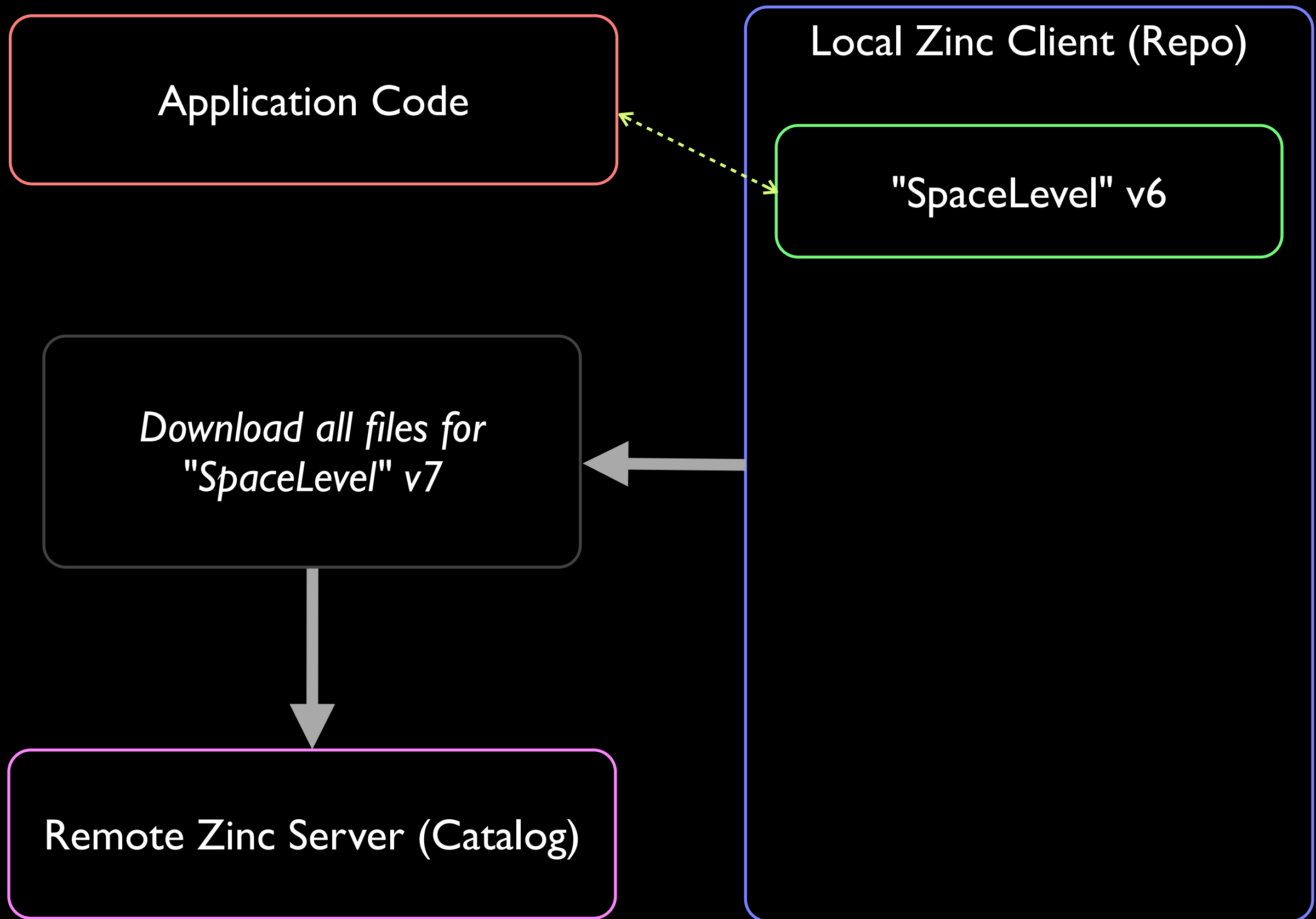
Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

"SpaceLevel" v6

Yes, *"SpaceLevel"* v6 and v7
are both available.

"SpaceLevel" v7

Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

"SpaceLevel" v6

*App **stops** using "SpaceLevel"*

"SpaceLevel" v7

Remote Zinc Server (Catalog)

Application Code

*App **stops** using "SpaceLevel"*

"SpaceLevel" v6 is removed

Remote Zinc Server (Catalog)

Local Zinc Client (Repo)

"SpaceLevel" v6

"SpaceLevel" v7

Application Code

Give me the Bundle for "SpaceLevel"

Local Zinc Client (Repo)

"SpaceLevel" v7
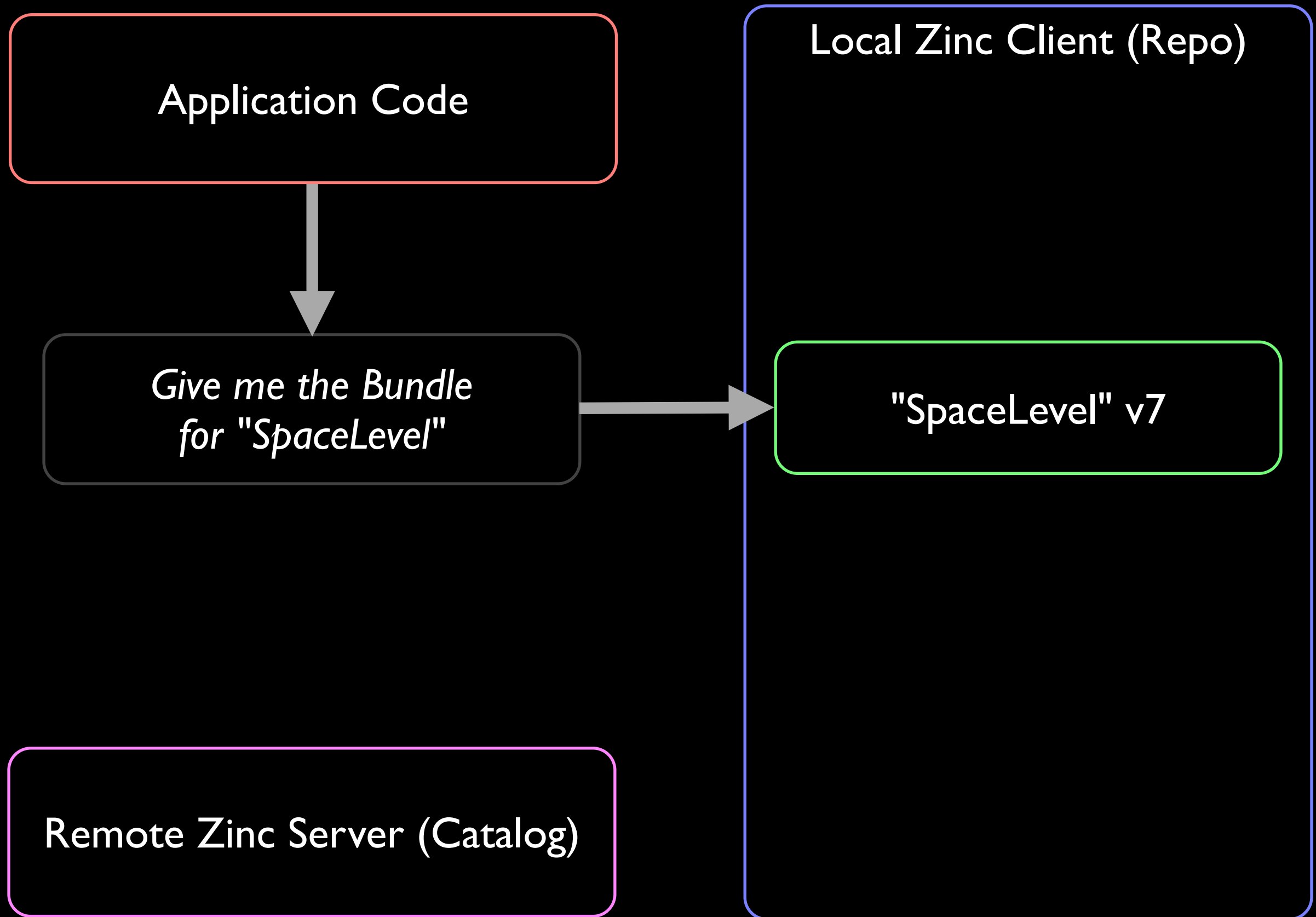
Remote Zinc Server (Catalog)

Application Code

Local Zinc Client (Repo)

App is now using "SpaceLevel" v7

"SpaceLevel" v7

Remote Zinc Server (Catalog)

The **Design**

YUP

- Verifiable content.

- HTTP, CDN friendly.

- Test before pushing to production.

- Simple tools.

- Transparency to client.

NOPE

- File updates in-place

- Duplicate files on the client.

- Unnecessary I/O.

The **Alternatives**

Timestamped Zips

- Previous system based on this

- Problems

  - compress already-compressed files (jpg, mp3, etc

  - zip slow on iOS*, requires libarchive

  - download is all-or-nothing

* I have no data to support this claim

rsync

- classic *nix file sync utility

- Problems

  - requires a machine on server, not S3/CDN compatible

Git

- Essentially a content tracking system
- Problems
  - Requires "checkout", file duplication
  - blobs are not raw
  - More complex than needed

Others?

The **Internals**

- **Bundle** - a versioned group of related assets

- **Manifest** - a file describing the contents of a bundle

- **Distribution** - a named pointer to a bundle version

- **Catalog** - server side collection of bundles

- **Repository** - client side "checkout" of bundles for one or more catalogs

Catalog Highlights

- Files stored by SHA1 of content

- Metadata is JSON

- Automatic compression

- No overwrites except catalog index

Catalog Structure
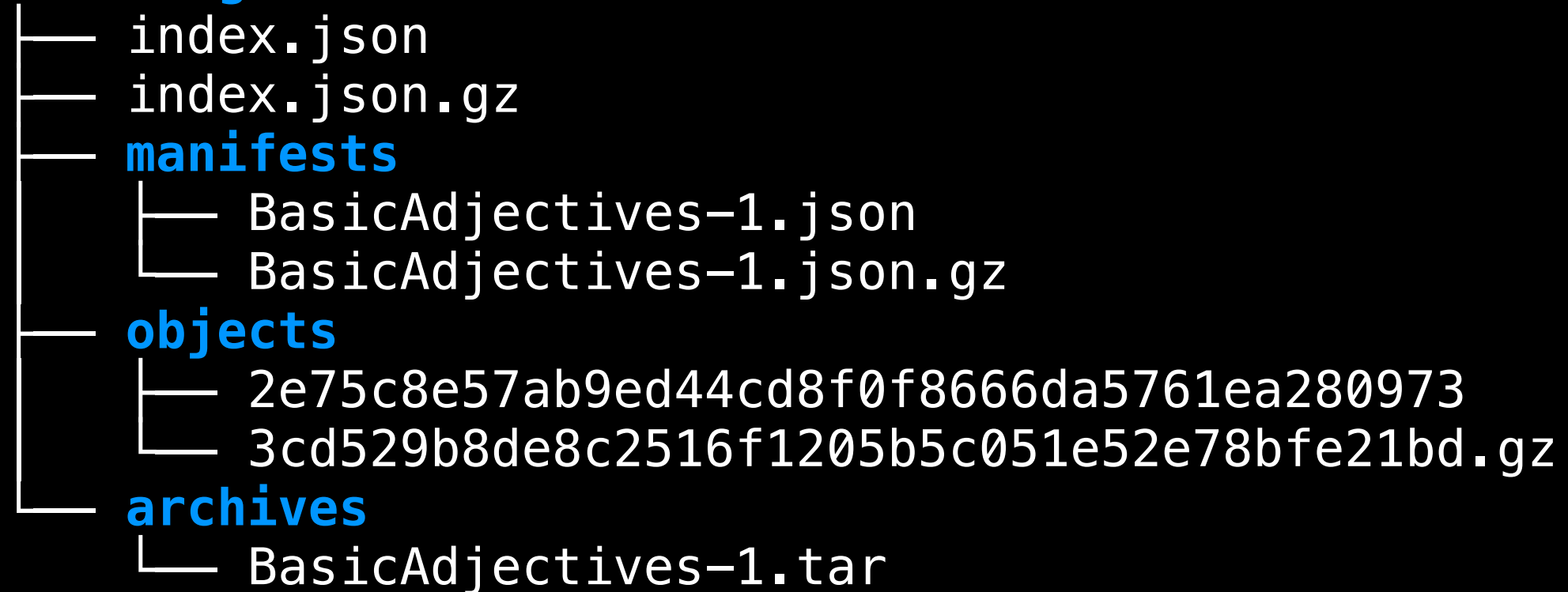
```
<catalog root>
├── index.json
├── index.json.gz
├── manifests
│       ├── BasicAdjectives-1.json
│       └── BasicAdjectives-1.json.gz
├── objects
│       ├── 2e75c8e57ab9ed44cd8f0f8666da5761ea280973
│       └── 3cd529b8de8c2516f1205b5c051e52e78bfe21bd.gz
└── archives
        └── BasicAdjectives-1.tar
```

Catalog Index

```json
{
    "id": "com.mindsnacks.french",
    "format": "1"
    "distributions": {
        "master": {
            "BasicAdjectives": 1
        }
    },
    "bundles": {
        "BasicAdjectives": [1]
    }
}
```

Why Archives?

- Download performance.

- Why .tar? And not .tar.gz?

Repo (client)

- Tracks bundles by **id** and **distro**

- Can download from multiple **Catalogs**

- All metadata stored as JSON

- Files stored by SHA1

- Archives are **not** retained

Repo Structure

```
<repo root>
├── repo.json
├── catalogs
│   └ com.mindsnacks.french.json
├── manifests
│   └── BasicAdjectives-1.json
├── objects
│   ├── 2e75c8e57ab9ed44cd8f0f8666da5761ea280973
│   └── 3cd529b8de8c2516f1205b5c051e52e78bfe21bd
└── bundles
    └── com.mindsnacks.french.BasicAdjectives-1
        ├── photos
        │   └── 85x85
        │       └── kind.jpg
        └── audio
            └── basic-adj-11.caf
```

Repo Structure

```
<repo root>
├── repo.json
├── catalogs
│   └ com.mindsnacks.french.json          ← this is the catalog index
├── manifests
│   └── BasicAdjectives-1.json
├── objects
│   ├── 2e75c8e57ab9ed44cd8f0f8666da5761ea280973
│   └── 3cd529b8de8c2516f1205b5c051e52e78bfe21bd
└── bundles
    └── com.mindsnacks.french.BasicAdjectives-1
        ├── photos
        │   └── 85x85
        │       └── kind.jpg
        └── audio
            └── basic-adj-11.caf
```

Repo Structure

```
<repo root>
├── repo.json
├── catalogs
│   └ com.mindsnacks.french.json          ← this is the catalog index
├── manifests
│   └── BasicAdjectives-1.json
├── objects
│   ├── 2e75c8e57ab9ed44cd8f0f8666da5761ea280973
│   └── 3cd529b8de8c2516f1205b5c051e52e78bfe21bd
└── bundles
    └── com.mindsnacks.french.BasicAdjectives-1
        ├── photos
        │   └── 85x85
        │       └── kind.jpg
        └── audio
            └── basic-adj-11.caf
```

all files are stored
uncompressed (no gz)

Repo Structure

```
<repo root>
├── repo.json
├── catalogs
│   └ com.mindsnacks.french.json
├── manifests
│   └── BasicAdjectives-1.json
├── objects
│   ├── 2e75c8e57ab9ed44cd8f0f8666da5761ea280973
│   └── 3cd529b8de8c2516f1205b5c051e52e78bfe21bd
├── bundles
│   └── com.mindsnacks.french.BasicAdjectives-1
│       ├── photos
│       │   └── 85x85
│       │       └── kind.jpg
│       └── audio
│           └── basic-adj-11.caf
```
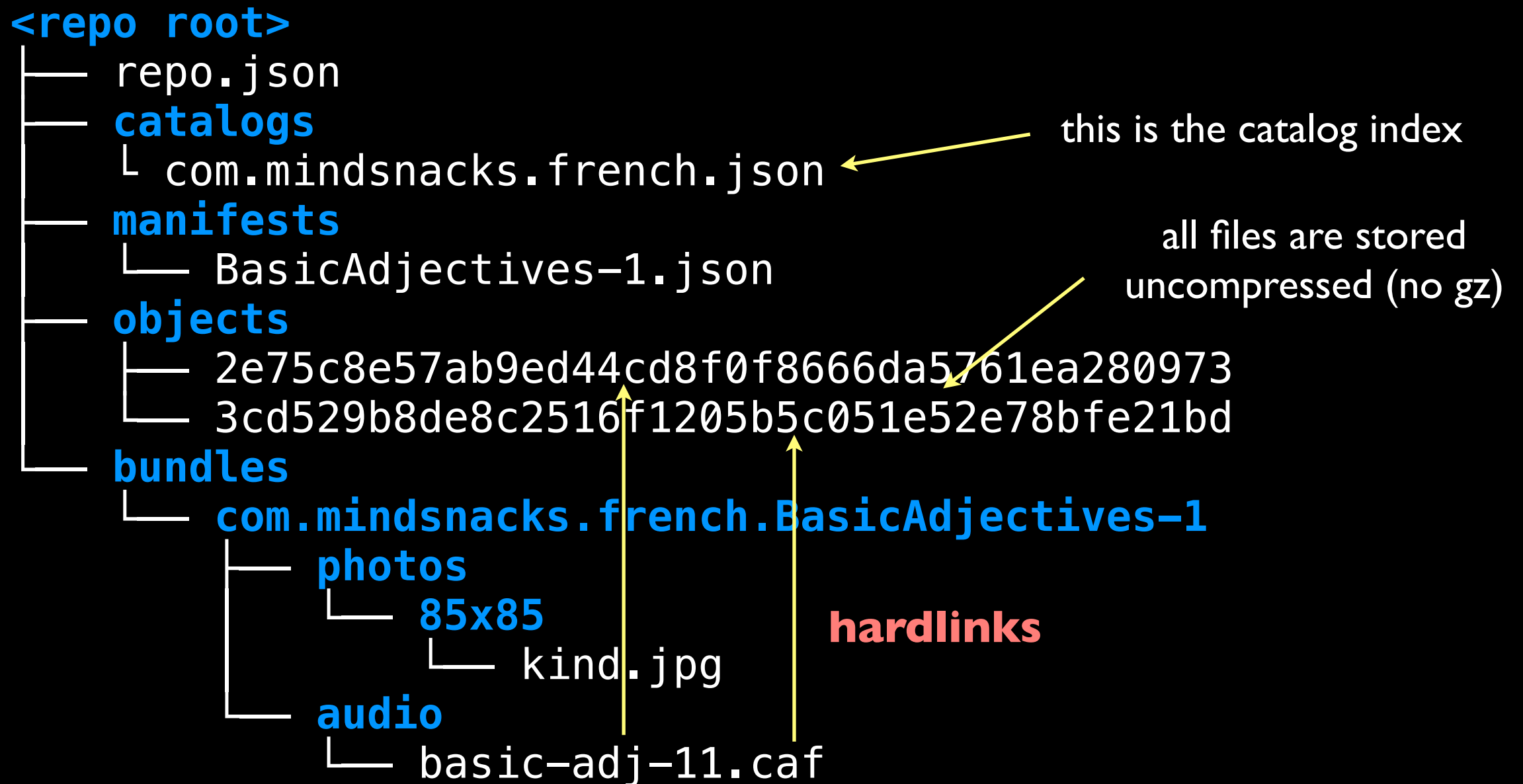
this is the catalog index

all files are stored
uncompressed (no gz)

hardlinks

Why Hardlinks?

- Like a real file, but faster and more space efficient that a copy

- Acts as a simple reference count, useful for deleting unneeded files

Bundle Manifests

```
{
    "bundle_name": "BasicAdjectives",
    "version": 1,
    "files": {
        "photos/85x85/kind.jpg": {
            "sha": "2e75c8e57ab9ed44cd8f0f8666da5761ea280973",
            "formats": {
                "raw": {
                    "size": 8640
                }
            }
        },
        "audio/basic-adj-11.caf": {
            "sha": "3cd529b8de8c2516f1205b5c051e52e78bfe21bd",
            "formats": {
                "gz": {
                    "size": 8366
                }
            }
        }
    }
}
```

The **Implementations**

Zinc tools

- Open source Python package

- Includes simple API and CLI for working with Zinc Catalogs

- Under heavy development

  https://github.com/mindsnacks/Zinc

Zinc-ObjC

- Open source static library for iOS (& Mac?)

- No <u>external</u> dependencies*

- API for working with Zinc Repos and loading files

- Still in development

  https://github.com/mindsnacks/Zinc-ObjC

Zinc-ObjC

- AFNetworking (modified and trimmed)

- Light-Untar-for-iOS

- KSReachability

The **Walkthrough**

Act 1:
Set up Catalog with zinc cli

Create a Catalog

```
$ zinc catalog:create com.mindnsacks.french
```

Create a Bundle

```
$ zinc bundle:update BasicAdjectives
~/French/BasicAdjectives

Created bundle 'BasicAdjectives' version 1
```

Catalog (1)

```
french_catalog
├── index.json
├── index.json.gz
├── manifests
│       ├── BasicAdjectives-1.json
│       └── BasicAdjectives-1.json.gz
├── objects
│       ├── 2e75c8e57ab9ed44cd8f0f8666da5761ea280973
│       └── 3cd529b8de8c2516f1205b5c051e52e78bfe21bd.gz
└── archives
        └── BasicAdjectives-1.tar
```

Catalog Index (1)

```
{
    "id": "com.mindsnacks.french",
    "format": "1"
    "distributions": {
    },
    "bundles": {
        "BasicAdjectives": [1]
    }
}
```

Create a Distribution

```
$ zinc distro:update BasicAdjectives 1 master

 Updated distribution 'master'
 for 'BasicAdjectives-v1'
```

Catalog Index (2)

```json
{
    "id": "com.mindsnacks.french",
    "format": "1"
    "distributions": {
        "master": {
            "BasicAdjectives": 1
        }
    },
    "bundles": {
        "BasicAdjectives": [1]
    }
}
```

Act 2:
Basic iOS client usage

Set up a Repo

```objc
NSURL* repoURL = [NSURL fileURLWithPath:
                        [GetApplicationDocumentsDirectory()
                         stringByAppendingPathComponent:@"zinc"]];


ZincRepo* repo = [ZincRepo repoWithURL:repoURL error:&error];
```

Add a source

```objc
[repo addSourceURL:[NSURL URLWithString:
   @"https://s3.amazonaws.com/zinc-demo/com.mindsnacks.demo1/"]];
```

Track bundles

```objc
[repo beginTrackingBundleWithId:@"com.mindsnacks.demo1.cats"
                   distribution:@"master"
             automaticallyUpdate:YES];
```

Update a bundle manually

```objc
[repo updateBundleWithID:@"com.mindsnacks.demo1.cats"
         completionBlock:^(NSArray *errors) {
            ...
         }];
```

Get a bundle

```objc
ZincBundle* bundle = [repo bundleWithId:bundleId];
NSString* path = [bundle pathForResource:@"cat1.jpg"];
```

Check state for bundle

```objc
ZincBundleState state = [repo stateForBundleWithId:bundleId];
if (state == ZincBundleStateCloning) ...
```

Repo (I)

```
<repo root>
├── repo.json
├── catalogs
│   └ com.mindsnacks.french.json
├── manifests
│   └── BasicAdjectives-1.json
├── objects
│   ├── 2e75c8e57ab9ed44cd8f0f8666da5761ea280973
│   └── 3cd529b8de8c2516f1205b5c051e52e78bfe21bd
└── bundles
    └── com.mindsnacks.french.BasicAdjectives-1
        ├── photos
        │   └── 85x85
        │       └── kind.jpg
        └── audio
            └── basic-adj-11.caf
```

ZincBundle Object

- Acquired from ZincRepo

- Proxy for NSBundle

- Protected from updates while in use

  (i.e., is retained)

Act 3: Update a bundle in the Catalog

Update a Bundle

```
$ (hackety hack in ~/French/BasicAdjectives)

$ zinc bundle:update
    BasicAdjectives ~/French/BasicAdjectives

 Created bundle 'BasicAdjectives' version 2
```

Catalog (2)

```
french_catalog
├── index.json
├── index.json.gz
├── manifests
│       ├── BasicAdjectives-1.json
│       ├── BasicAdjectives-1.json.gz
│       ├── BasicAdjectives-2.json
│       └── BasicAdjectives-2.json.gz
├── objects
│       ├── ae782445abf8bdc9e3fabfff5d34d1843aef79f8
│       ├── 2e75c8e57ab9ed44cd8f0f8666da5761ea280973
│       └── 3cd529b8de8c2516f1205b5c051e52e78bfe21bd.gz
└── archives
        ├── BasicAdjectives-1.tar
        └── BasicAdjectives-2.tar
```

Catalog Index (3)

```json
{
    "id": "com.mindsnacks.french",
    "format": "1"
    "distributions": {
        "master": {
            "BasicAdjectives": 1
        }
    },
    "bundles": {
        "BasicAdjectives": [1,2]
    }
}
```

Create a Test Distro

```
$ zinc distro:update BasicAdjectives 2 test

 Updated distribution 'test' for 'BasicAdjectives-v2'
```

Catalog Index (4)

```
{
    "id": "com.mindsnacks.french",
    "format": "1"
    "distributions": {
        "master": {
            "BasicAdjectives": 1
        },
        "test": {
            "BasicAdjectives": 2
        }
    },
    "bundles": {
        "BasicAdjectives": [1,2]
    }
}
```

Testing happens…

Make it live!

```
$ zinc distro:update BasicAdjectives 2 master

Updated distribution 'master' for 'BasicAdjectives-v2'
```

Catalog Index (5)

```
{
    "id": "com.mindsnacks.french",
    "format": "1"
    "distributions": {
        "master": {
            "BasicAdjectives": 2
        },
        "test": {
            "BasicAdjectives": 2
        }
    },
    "bundles": {
        "BasicAdjectives": [1,2]
    }
}
```

Act 4:
Update a bundle in the client Repo

Client Update

1. Periodically download index.json

2. Compare local and remote distributions versions of tracked bundles

3. If necessary, clone new Bundle

Bundle Clone

1. Download manifest

2. Determine count and total size of changes

3. Download and unpack files/archive*

4. NOT made active if old version of Bundle is still in use

Repo (2)

```
<repo root>
├── repo.json
├── catalogs
│   └── com.mindsnacks.french.json
├── manifests
│   ├── BasicAdjectives-1.json
│   └── BasicAdjectives-2.json
├── objects
│   ├── ae782445abf8bdc9e3fabfff5d34d1843aef79f8
│   ├── 2e75c8e57ab9ed44cd8f0f8666da5761ea280973
│   └── 3cd529b8de8c2516f1205b5c051e52e78bfe21bd
└── bundles
    ├── com.mindsnacks.french.BasicAdjectives-1
    │   └── …
    └── com.mindsnacks.french.BasicAdjectives-2
        └── …
```

If/When old version is released…

Repo (3)

```
<repo root>
├── repo.json
├── catalogs
│   └── com.mindsnacks.french.json
├── manifests
│   └── BasicAdjectives-2.json
├── objects
│   ├── ae782445abf8bdc9e3fabfff5d34d1843aef79f8
│   └── 3cd529b8de8c2516f1205b5c051e52e78bfe21bd
└── bundles
    └── com.mindsnacks.french.BasicAdjectives-2
        ├── photos
        │   └── 85x85
        │       └── kind.jpg
        └── audio
            └── basic-adj-12.caf
```

Advanced Features

- **Bundle Flavors** - filtered files for @2x, ~ipad, etc

- **Bootstrapping** - load files from main app bundle

- **Download Policy** - prioritize bundles, avoid cellular usage

The **Demo**

Thanks.

We're hiring!

http://www.mindsnacks.com/careers/

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