

# Bypass Secondary Storage

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The logo for Shape Blue, featuring the word "Shape" in white text inside a blue cloud-like shape.

Shape

Blue

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# About Me

- **Based on Montevideo, Uruguay**
- **Senior Software Engineer @ ShapeBlue**
- **Background:**
  - 6+ years Java development experience
  - Involved with CloudStack and Virtualization since 2015
  - Committer since 2016
- **Hobbies: tennis and football (soccer)**



- **Register templates/ISOs uses secondary storage cache.**
- **Bandwidth for copying from secondary to primary storage.**
- **Motivation: improvements on performance, reduce bandwidth and space used**



# Agenda

- **Template/ISO Registration**
- **Bypass Secondary Storage: Template/ISO Registration**
- **Bypass Secondary Storage: VM deployments**
- **Bypass Secondary Storage: KVM agent**
- **Metalink support**



# Template/ISO Registration



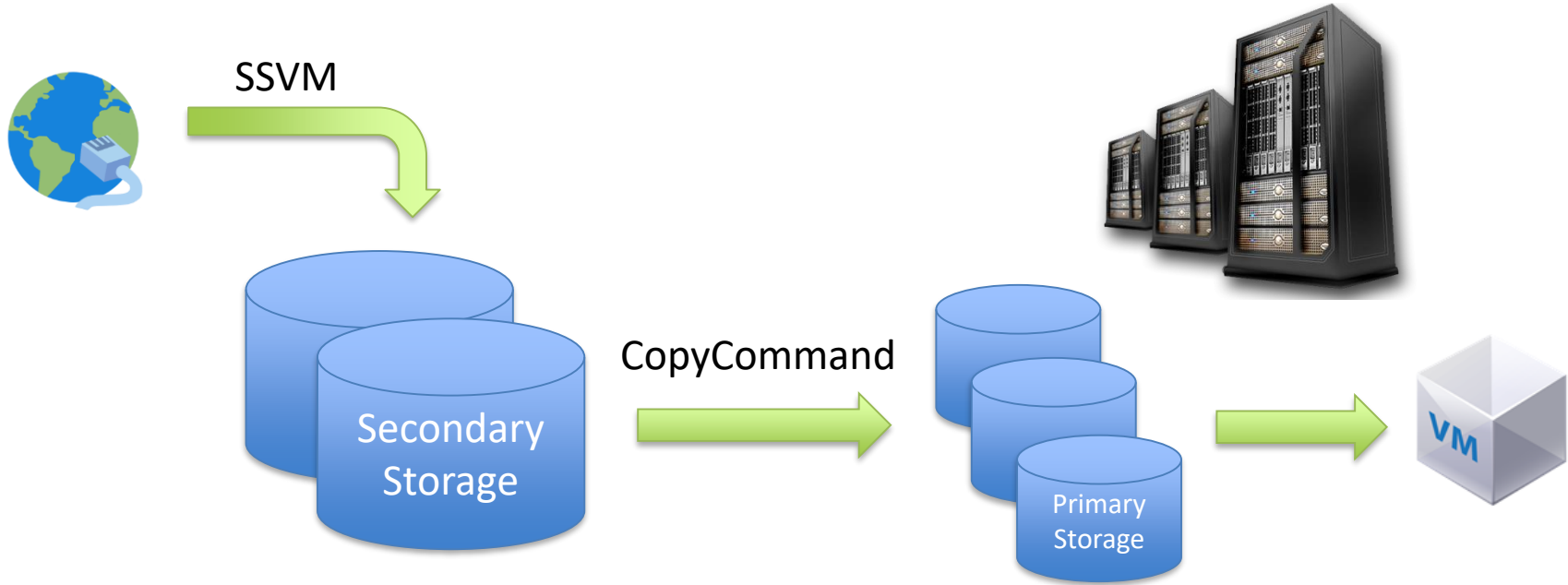
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- **User provides a URL**
- **Secondary Storage VM downloads template/ISO from URL into Secondary Storage**
- **Once downloaded into Secondary Storage, it is ready to use**

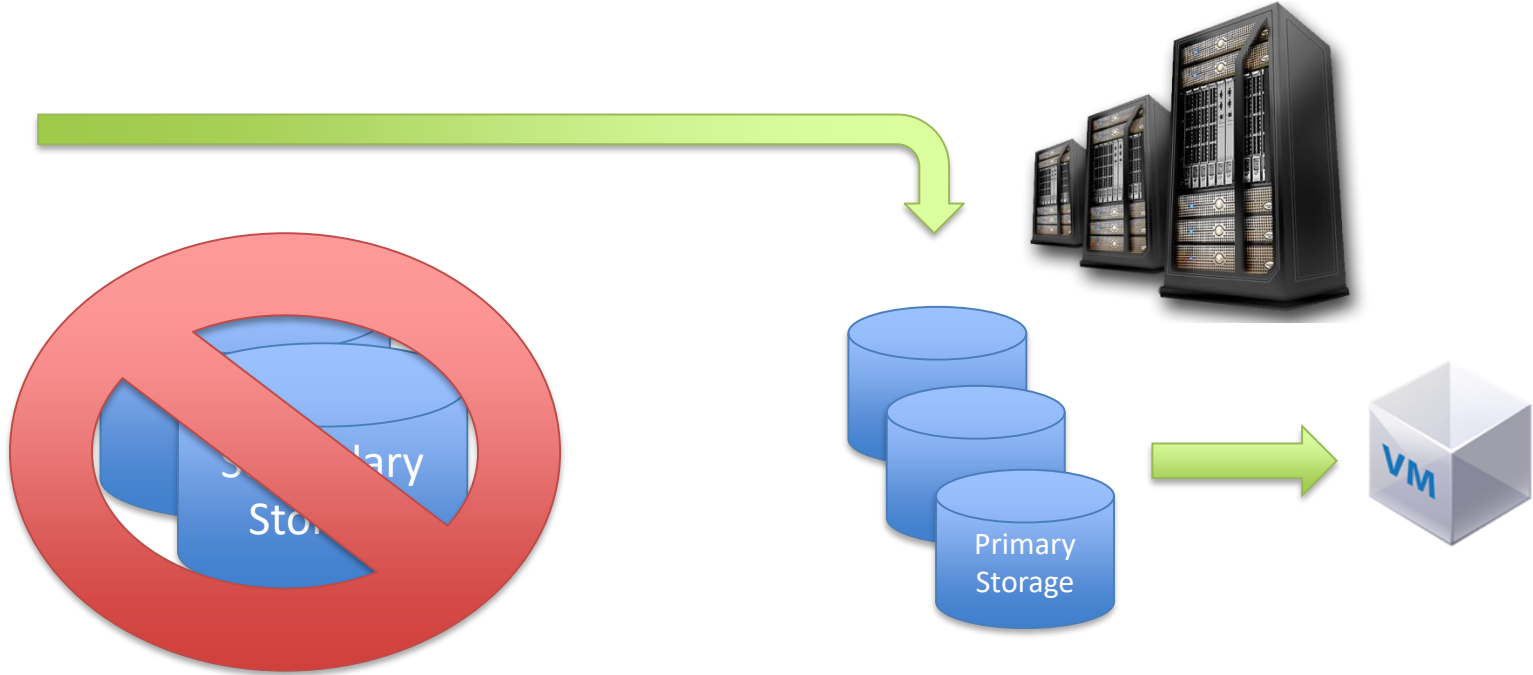


# Usual approach – Template/ISO Registration



$$t_{DEPLOY} = t_{DOWNLOAD} + t_{IDLE} + \max\{t_{COPY-SS-PS}, 0\} + t_{VM}$$

# Avoid Secondary Storage – Template/ISO Registration



$$t_{DEPLOY} = t_{IDLE} + \max\{t_{DOWNLOAD}, 0\} + t_{VM}$$



- **Template/ISO downloaded into Primary Storage when necessary**
- **Template/ISO usable immediately**
- **KVM hypervisor only**
- **CloudStack 4.11.1 or greater**



# Bypass Secondary Storage: Template/ISO Registration

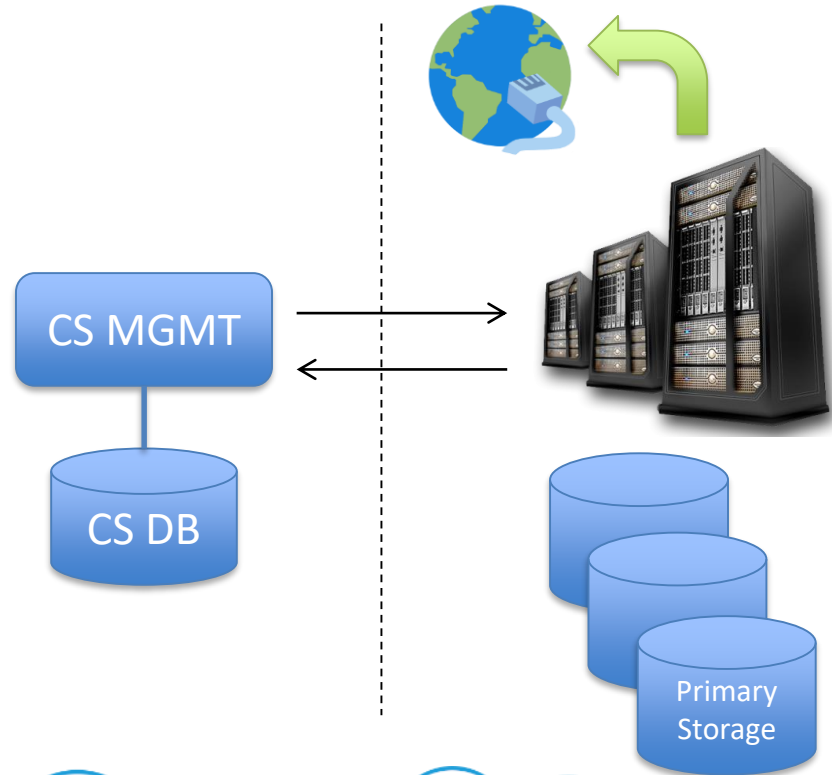


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# Template/ISOs Registration

- Check template/ISO URL on host
- Template registered immediately



- **registerTemplate / registerIso APIs extended:**
  - New Boolean parameter: 'directdownload'
- **Optional: Checksum**
  - Format: {ALG}CHECKSUM
  - ALG in: [MD5, SHA-512, SHA-256]

## + Register Template from URL

\* URL:

\* Name:

\* Description:

Zone:

Hypervisor:

Direct Download:

checksum:

- **A KVM host is randomly selected**
  - Try 3 times
  - If can't reach template/ISO URL -> Registration fails
- **Add `template_store_ref` entry**
  - `Download_state = 'BYPASSED'`
  - `State = 'Ready'`



# Bypass Secondary Storage: VM deployments



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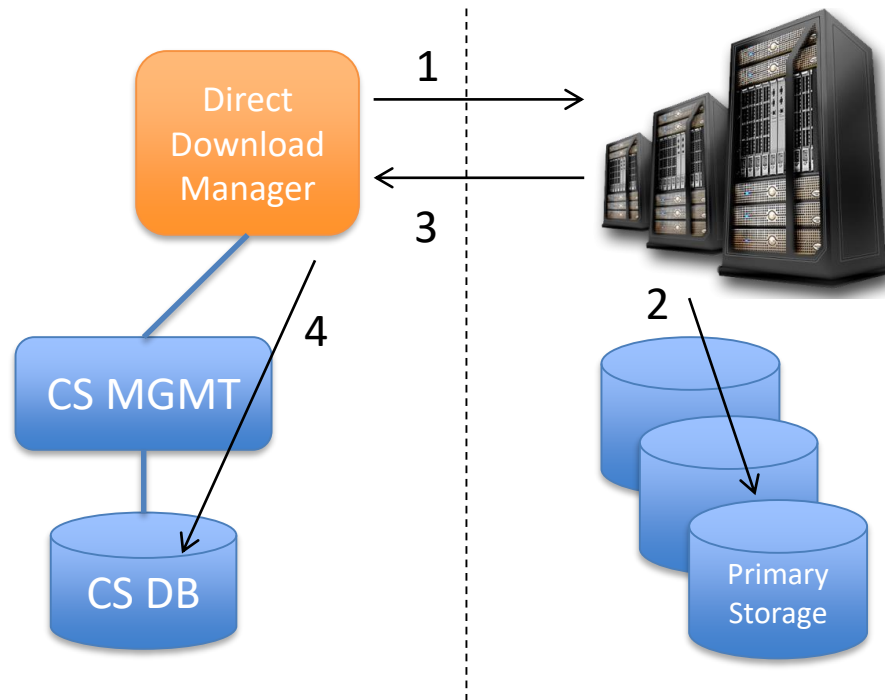


# Bypass Secondary Storage

- **If there is no entry for template/ISO on storage pool (template\_spool\_ref):**

1. Send DirectDownloadCommand to host
2. Host downloads template/ISO
3. DirectDownloadAnswer
4. Insert on template\_spool\_ref

- **Then usual deployment process continues**



- **Pluggable solution: DirectDownloadManager**
  - Used: volumes preparation, ISO preparation
  - Download template/ISO in a storage pool via KVM host (DirectDownloadCommand)
  - Upload certificate to KVM hosts (SetupDirectDownloadCertificateCommand)
  - Supports protocols: NFS, HTTP(S), METALINK



- **Pluggable solution: DirectDownloadManager**
  - Allows passing HTTP headers for direct downloads, via `vm_template_details`:
    - Key: `HTTP_HEADER:HEADER` (`HTTP_HEADER:Content-Type`)
    - Value: Desired value for **HEADER** (`application/x-www-form-urlencoded`)



- **New API method to upload certificates for direct download: 'uploadDirectDownloadCertificate'**
  - Send SetupDirectDownloadCommand to KVM hosts
  - Hosts add certificate to their 'cloud.jks' keystore (CA framework)
  - Used for HTTPS direct downloads



# Bypass Secondary Storage: KVM agent



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- **DirectDownloadCommand extends StorageSubSystemCommand:**
  - HttpDirectDownloadCommand
  - HttpsDirectDownloadCommand
  - NfsDirectDownloadCommand
  - MetalinkDirectDownloadCommand
- **Downloaders added to the KVM agent**
  - Each downloader implements DirectTemplateDownloader



- **DirectTemplateDownloader methods:**
  - downloadTemplate()
  - extractAndInstallDownloadedTemplate()
  - getTemplateInformation()
  - validateChecksum()
- **Java based (initially metalinks handled by aria2:**  
**<https://aria2.github.io/>**



# Metalink support



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- **Metalinks supported on KVM:**
  - Direct download
  - SSVM downloads
- **Template/ISO URL accept .metalink files**

- **Example of metalink:**

```
<?xml version="1.0"?>
<metalink xmlns="urn:ietf:params:xml:ns:metalink">
  <file name="templ.qcow2">
    <size>26268</size>
    <url location="pr" priority="1">https://192.168.1.2/templ.qcow2</url>
    <url location="ma" priority="2">https://192.168.10.10/templ.qcow2</url>
    <hash type="sha-
256">f63c9432b919a87e511b99164fd0c15097ce02fe2da2facc5fb3363aeac5a9bf</h
ash>
  </file>
</metalink>
```



- **Feature Specification:**  
<https://cwiki.apache.org/confluence/display/CLOUDSTACK/Bypass+Secondary+Storage+%28Direct+Download%29+on+KVM>
- **Pull requests:**
  - <https://github.com/apache/cloudstack/pull/2379> (Initial PR)
  - <https://github.com/apache/cloudstack/pull/2424> (HTTPS fixes)
  - <https://github.com/apache/cloudstack/pull/2408> (Several fixes)



# Demo



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# Questions?



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**Thank you**



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