A SCALABLE SEARCH ENGINE AGGREGATOR

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Agenda

- Yioop
- About Project
- Preliminary Work Summary
- News Updater
- Web Interface for Manage Machines
- Video Updater
- Mail Distribution
- Experiments
- Conclusion
- Demo

Yioop

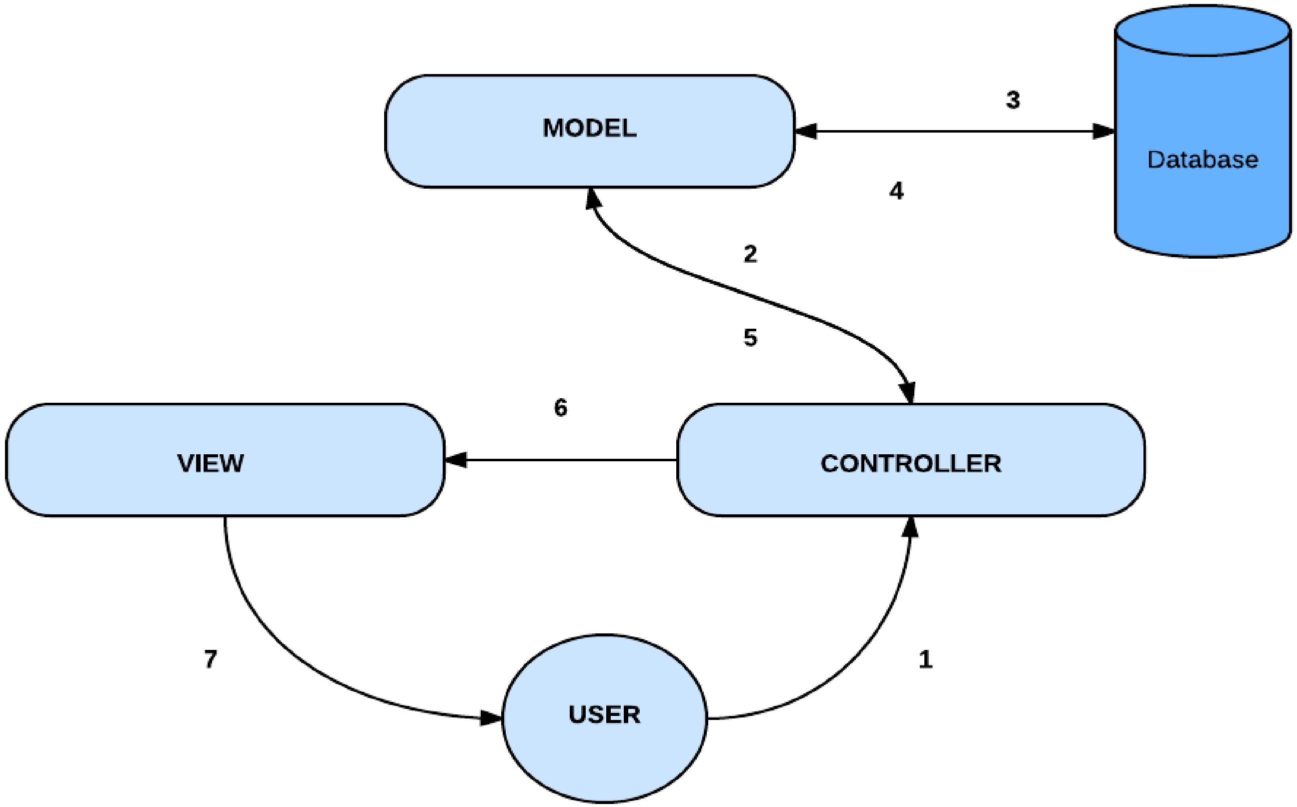
- Yioop, an open source PHP search engine based on GPLv3 license, is designed and developed by Dr. Chris Pollett

- It allows user to index a website or a collection of websites

- It is designed to work on PC, smartphone and tablet

Yioop MVC

Yioop is a web application designed using it’s own Model View Controller framework



About Project

Goal of the project is to primarily enhance some of the media updater features and enhance some of them. It includes –

- News Aggregation
  - Web Interface to Include Media Updater
- Video Updater Feature
- Mail Distribution

Comparison of News Feed Feature

	Based on Categories	Customized for user	Basis for generating customized news feed
Google news	YES	YES	Google search queries and articles visited
Yahoo news	YES	NO	Trending stories
Facebook news	YES	YES	Connections and likes, post views etc.

Facebook – influenced by connections

Google/Yahoo – Follow their own algorithms

News Updater Scalability

- Many web sites allow users to create a personalized feed
- Associate feeds with consumers and event streams with producers
- Selectively materializing each consumer’s feed : events
- Minimize global cost by making local decisions
- Hybrid strategy results in the lowest system load (and hence improves scalability) under a variety of workloads

News Updater in Yioop

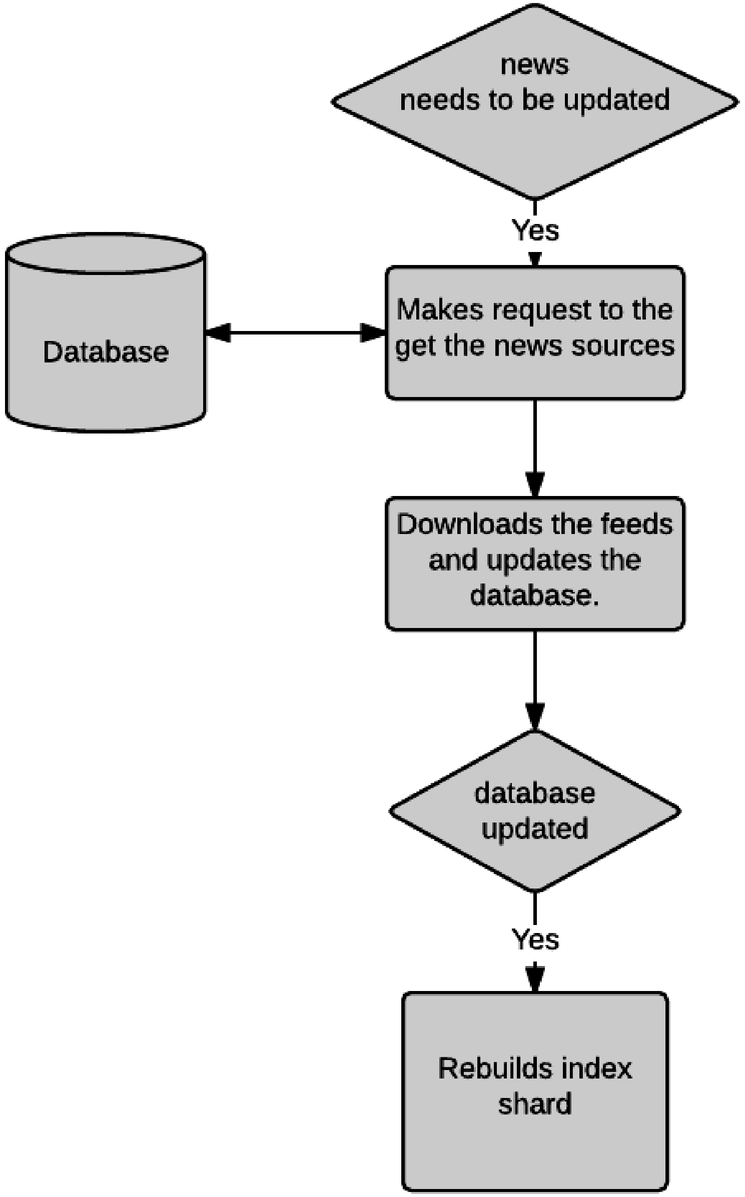
News updater process that can be used to automatically update news feeds from various news sources.

News feeds can either be RSS feeds, or can be scraped from an HTML page using XPath queries and re-indexed.

Improve the quality of the search results.

Existing News Updater Feature

The single machine/name server periodically (once an hour as per current settings in Yioop) fetches the news feeds from the news sources added into the database, then will update the database and rebuild the index shard.



news needs to be updated

Yes

Makes request to the get the news sources

Database

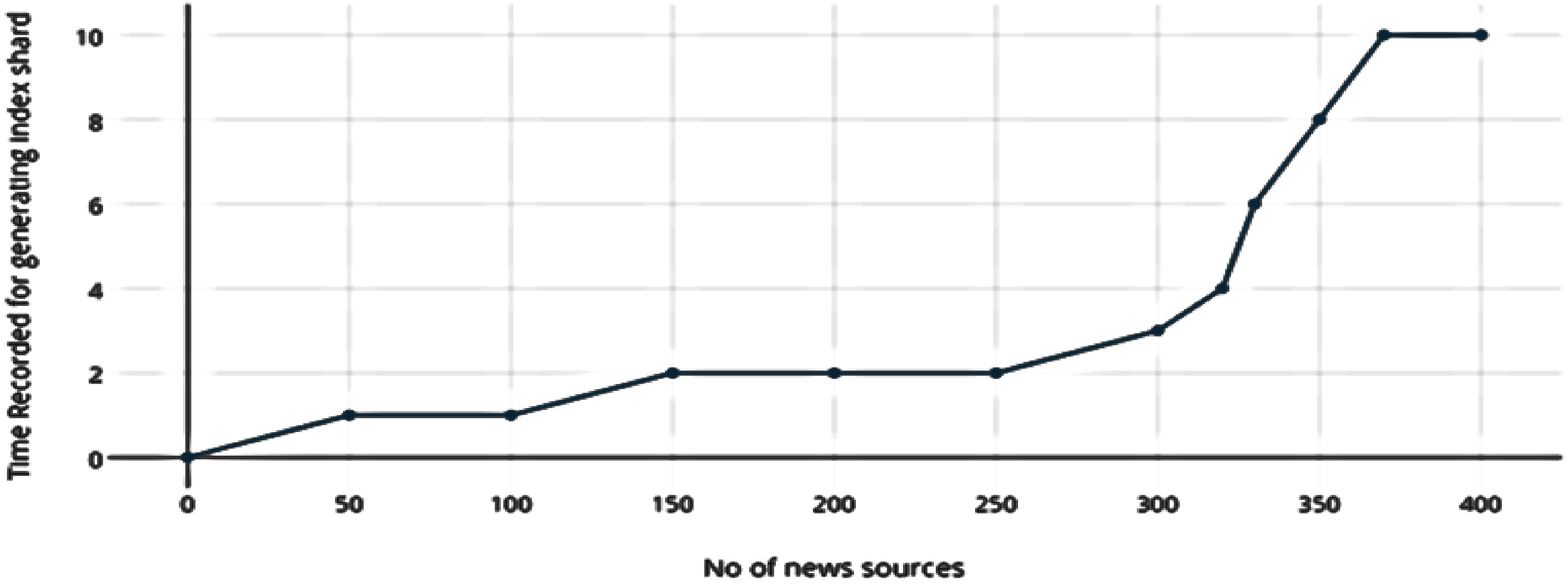
Downloads the feeds and updates the database.

database updated

Yes

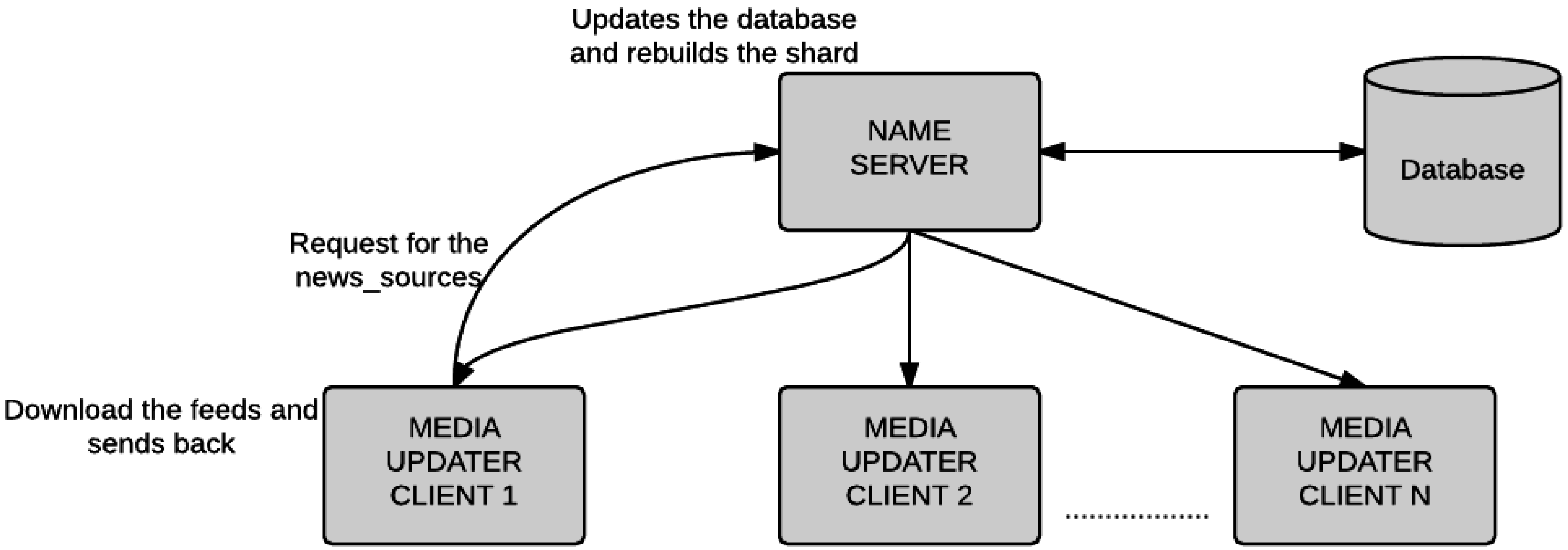
Rebuilds index shard

Initial Experimentation Results



Configuration used for testing –
Intel core i5 with CPU @1.60 GHz , 6GB RAM and windows platform.

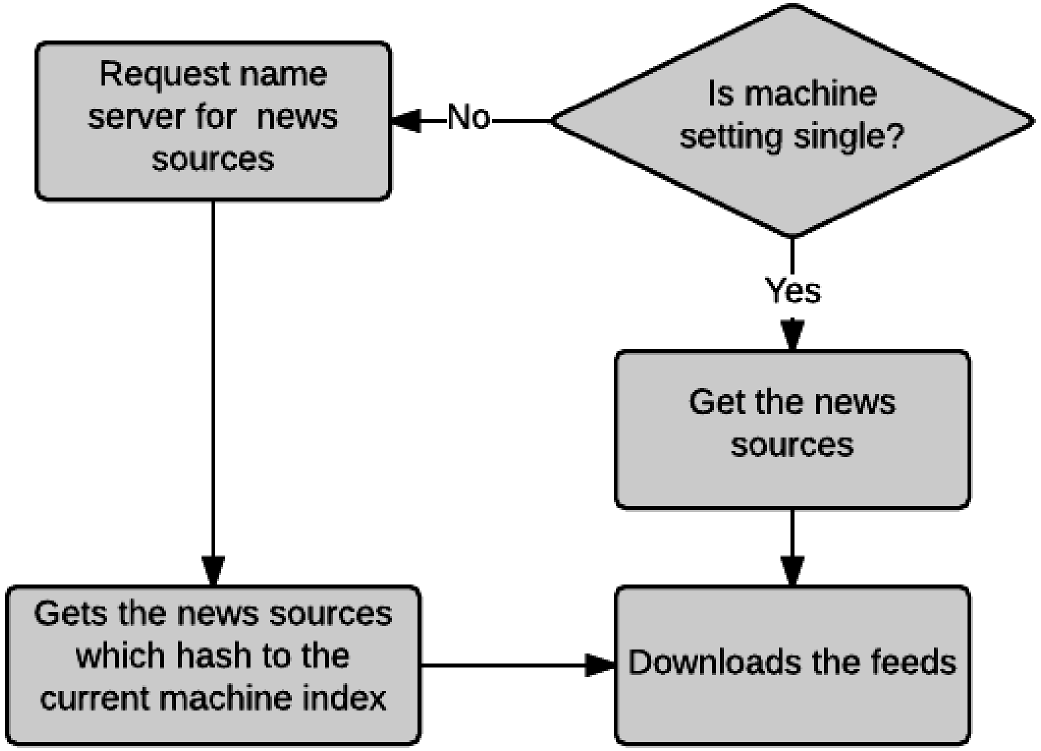
Proposed Distributed News Updater Feature



Distribution of news sources - Hashing mechanism

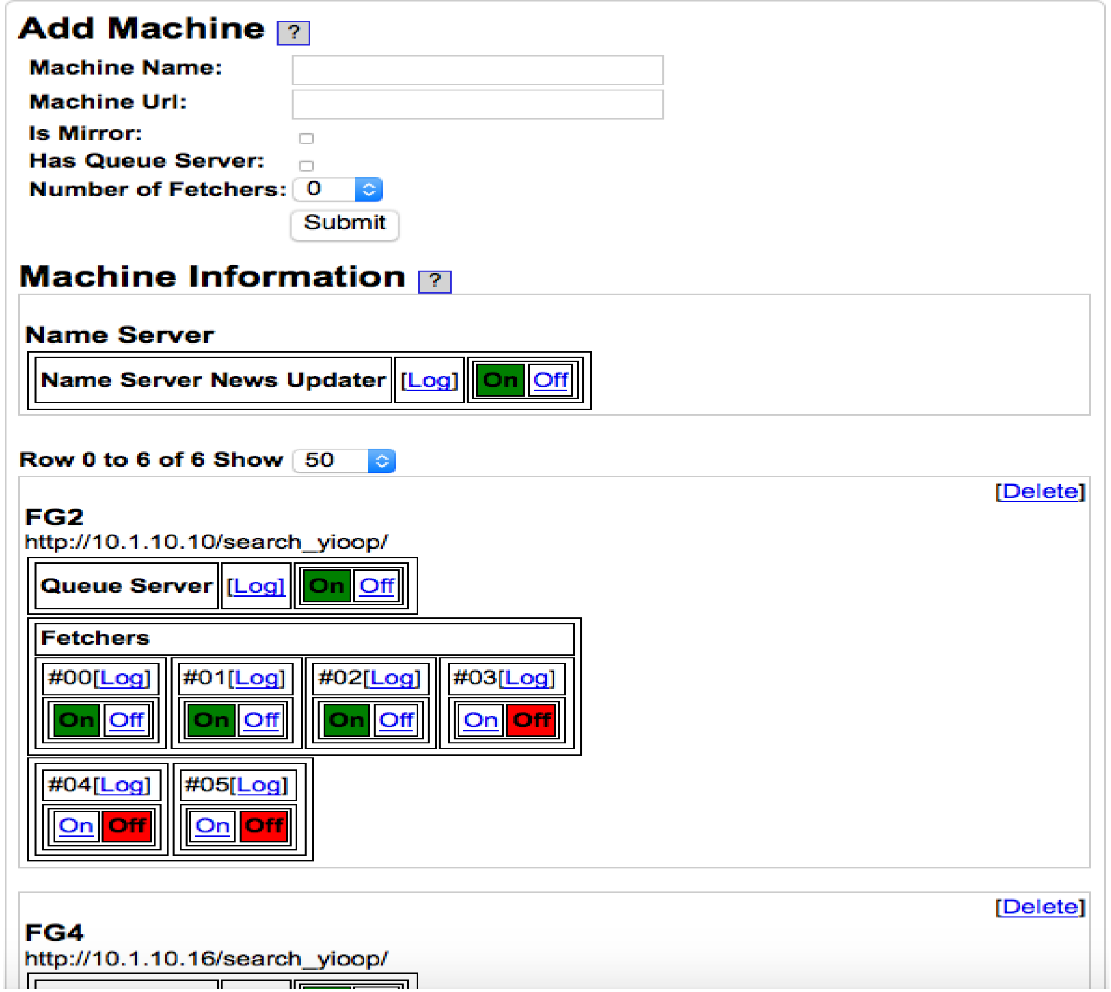
News Updater in Distributed Setup

Now , based on the type of Yioop instance a request is made to name server to get news sources and news feeds from respective sources are fetched.


Request name server for news sources
No
Is machine setting single?
Yes
Get the news sources
Gets the news sources which hash to the current machine index
Downloads the feeds

Manage Machines Activity in Yioop

Initially name server was by default running only on name server.



Add Machine ?

Machine Name:

Machine Url:

Is Mirror: □

Has Queue Server: □

Number of Fetchers: 0

Machine Information ?

Name Server

Name Server News Updater [Log] On Off

Row 0 to 6 of 6 Show 50

FG2
http://10.1.10.10/search_yioop/

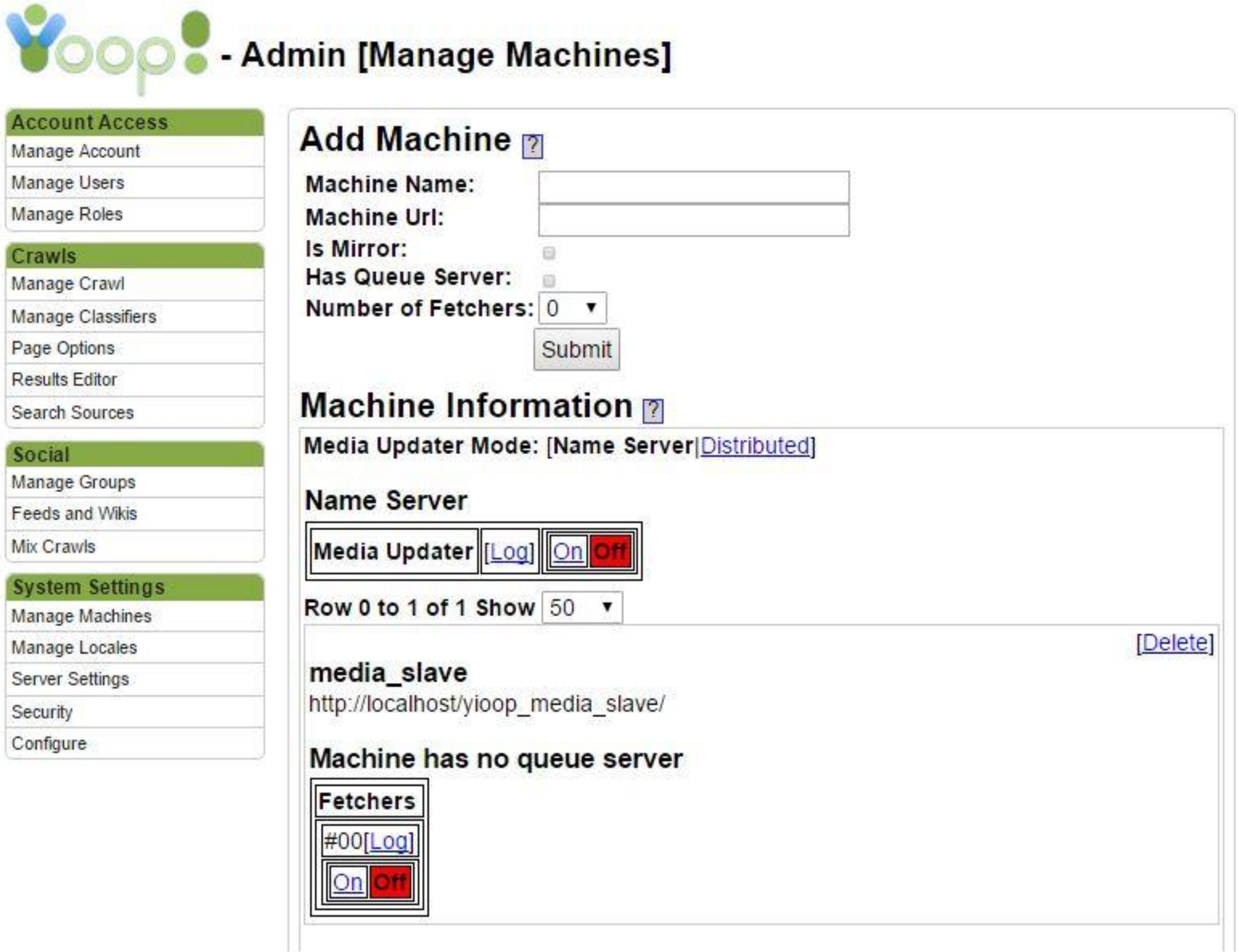
Queue Server [Log] On Off

Fetchers

#00[Log]	#01[Log]	#02[Log]	#03[Log]
On Off	On Off	On Off	On Off
#04[Log]	#05[Log]		
On Off	On Off		

FG4
http://10.1.10.16/search_yioop/

Manage Machines Activity Now..



- Admin [Manage Machines]

Add Machine ?

Machine Name:

Machine Url:

Is Mirror: □

Has Queue Server: □

Number of Fetchers: 0 ▾

Submit

Machine Information ?

Media Updater Mode: [Name Server|Distributed]

Name Server

Media Updater	[Log]	On Off

Row 0 to 1 of 1 Show 50 ▾

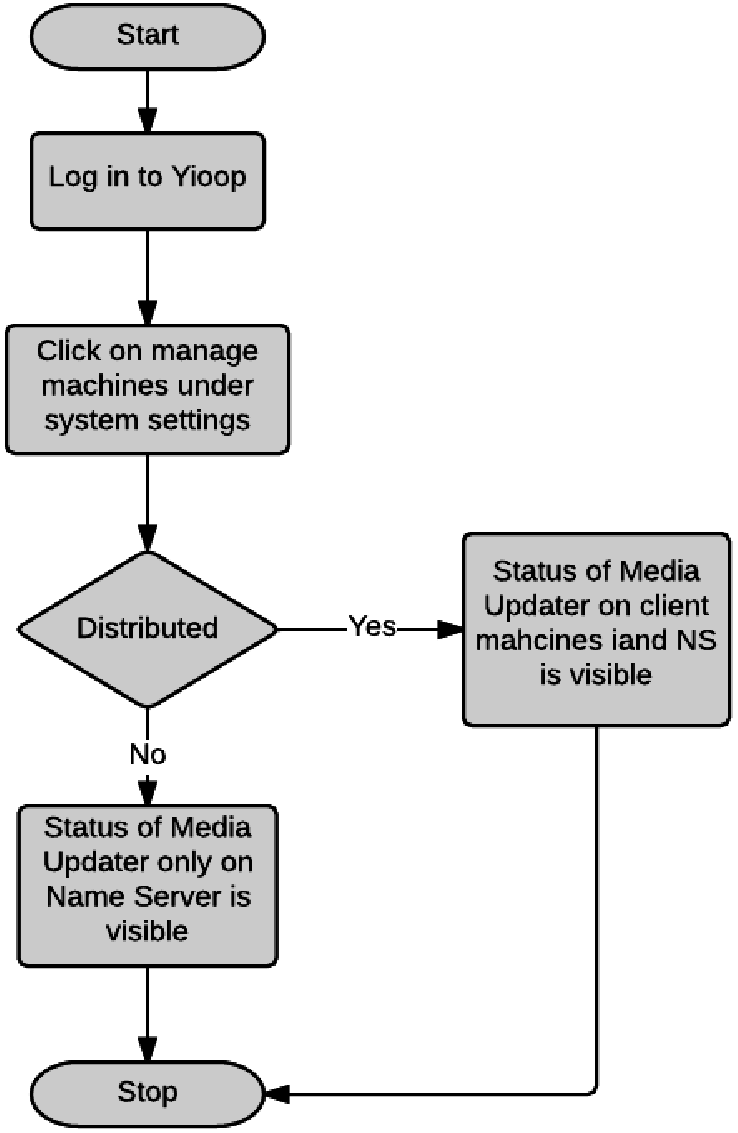
[Delete]

media_slave

http://localhost/yioop_media_slave/

Machine has no queue server

Fetchers
#00[Log]
On Off


Start
Log in to Yioop
Click on manage machines under system settings
Distributed
Yes
Status of Media Updater on client mahcines iand NS is visible
No
Status of Media Updater only on Name Server is visible
Stop

Background Work for Video Updater

- Purpose
- Video Formats Supported by Popular Browsers

Browsers	webm	Mp4	mov	avi
Chrome	✓	✓	✓	✓
Safari	✓	✓	✓	✓
Firefox	✓	✓	✓	
Internet explorer	✓	✓		

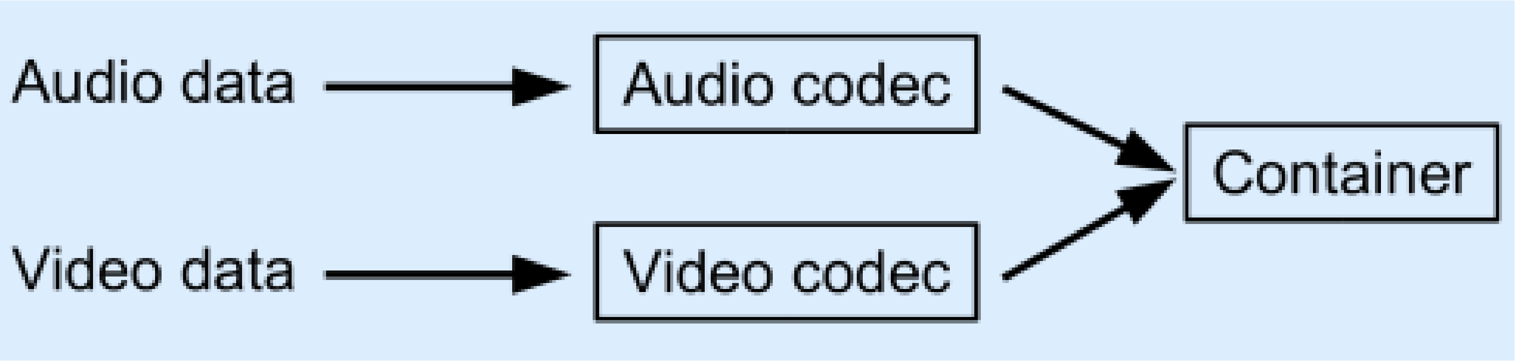
Some of the very popular browsers all support both webm and mp4 formats.

Basics of Audio/Video

- Huge amounts of storage space required
- Traditional, lossless compression algorithms
- Need of elaboration of new algorithms with lossy compression
- Lossy compression
  - Compression that is far more efficient but with a trade-off in that the picture and sound quality
- Codecs - Algorithms that allow us to encode the data in order to transport it and to decode the data the other end

Container

- Encapsulated encoded audio and video files into a single file. packaged, transported, and presented. (AVI , WAV files)
- Informs the media player about the audio and video codecs used

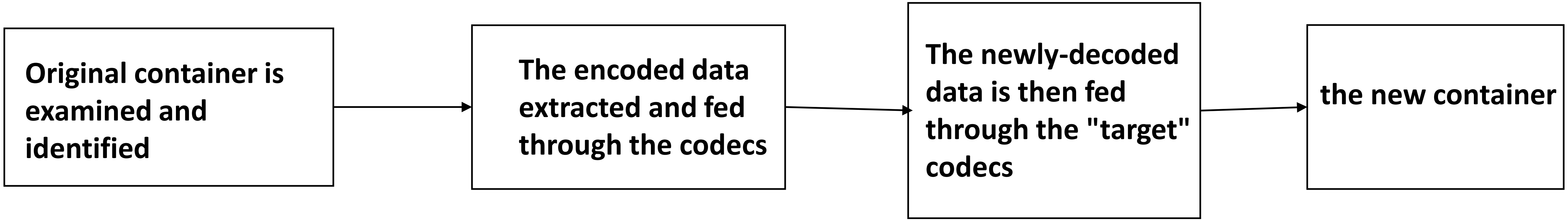


- Playback of a Multimedia File

What is FFmpeg ?

- A free software project that produces libraries and programs for handling multimedia data.
- An application that allows Linux users to convert video files easily
- Implements a decoder and then an encoder enabling the user to convert files from one container/codec combination to another

How conversion takes place?

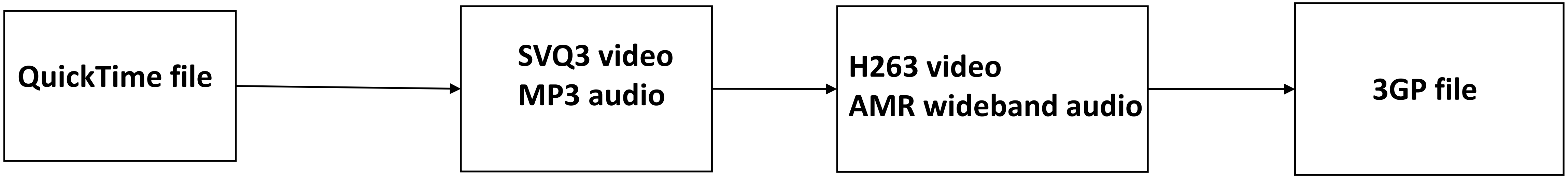


Original container is examined and identified

The encoded data extracted and fed through the codecs

The newly-decoded data is then fed through the "target" codecs

the new container



QuickTime file

SVQ3 video
MP3 audio

H263 video
AMR wideband audio

3GP file

FFmpeg Commands

```
ffmpeg [global_options] {[input_file_options] -i input_file} ... {[output_file_options] output_file} ...
```

- FFmpeg Convert

```
ffmpeg -i sample.mov -vcodec h264 -acodec aac -preset veryfast -crf 28  -strict -2 sample.mp4
```

Mainly used for manipulating videos – split , merge etc.

Server converting video as a whole

Pros

- Easy to implement.
- Less bookkeeping
- No loss of data

Cons

- Will take longer in terms of time.
- Name server’s other functions will also be interrupted and delayed during the media conversion.

Distributed setup converting split video as a whole

Pros

- Easy to implement
- Less bookkeeping
- Greater ease of downloading and uploading the video files for conversion.

Cons

- Videos are assigned in the order that they are assigned for conversion.
- Longer video files assigned to a media updater will take longer even if they were assigned first.

Distributed setup converting split video

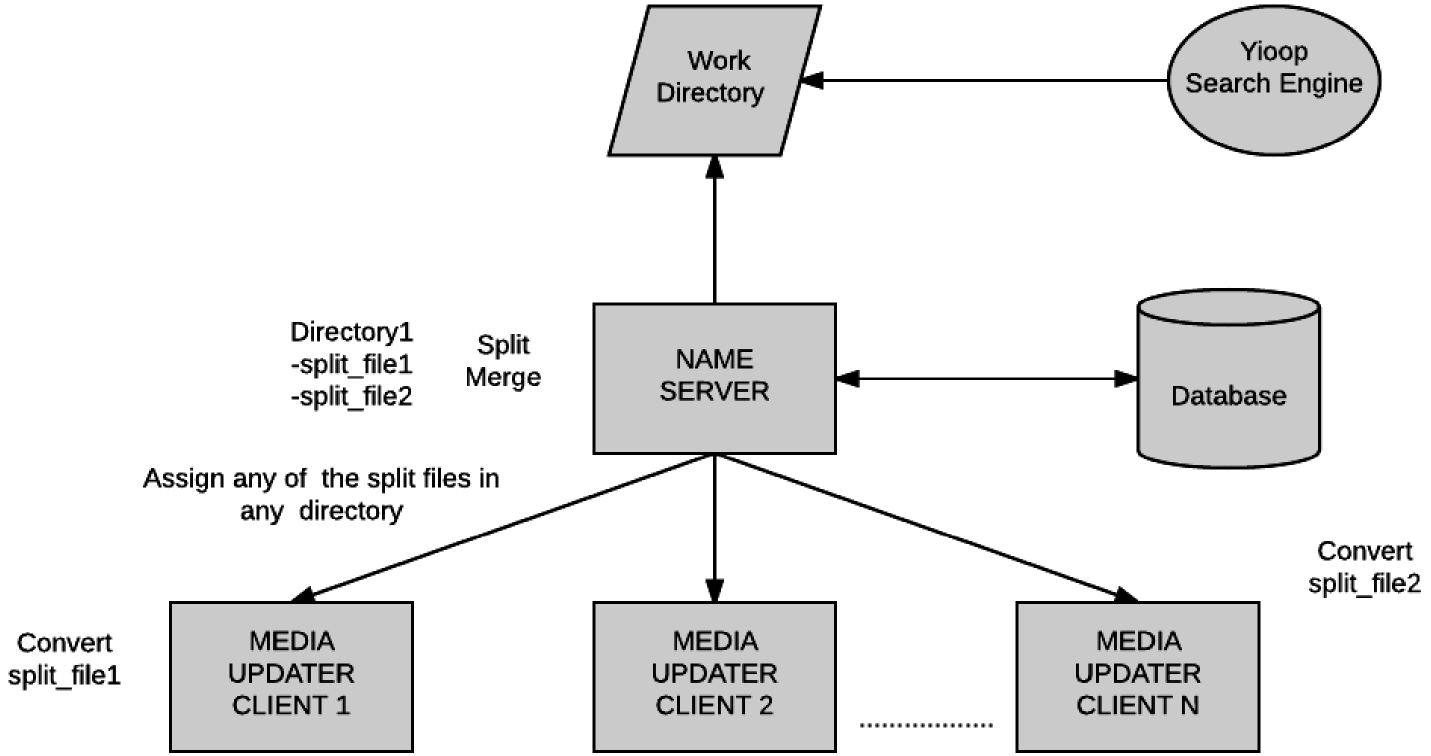
Pros

- Time reduction for the video conversion.
- Easy to upload and download split video files to and from name server.

Cons

- Difficult to implement
- Lots of bookkeeping on the server side.

Choosing an Approach



We chose the Distributed setup converting split video approach.

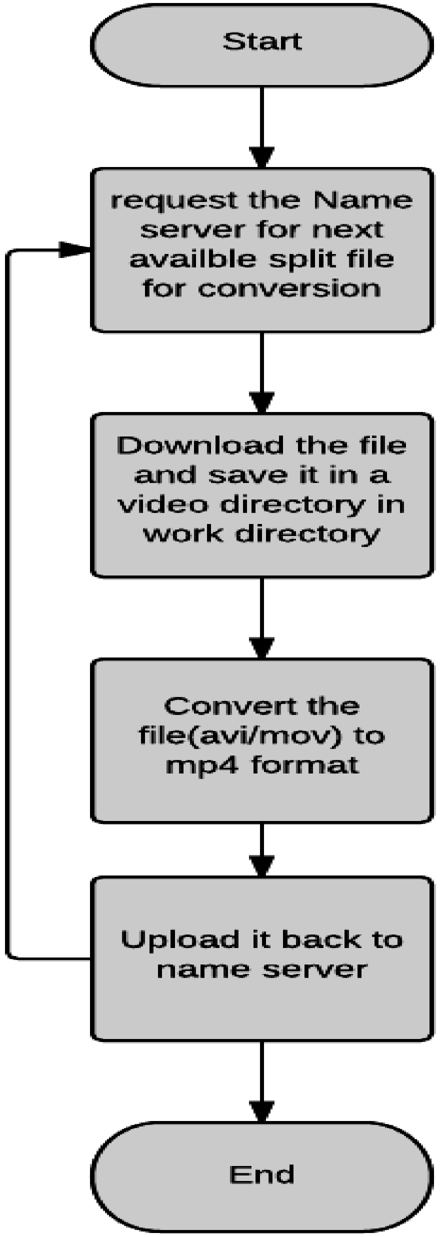
Name Server Media Updater Process

- Handles the requests made by slave Yioop instances
- Performs book-keeping

Function task	Look for	Generate	Delete
Media split	Split.txt		Split.txt
Move folders to converted	Count.txt		
Generate ready to assemble file	Concatenated.txt Ready to assemble.txt	Ready to assemble.txt	
Media merge	Concatenated.txt	Concatenated.txt	All text files

Media Updater Slave Process

- Media updater slave performs only the task of converting videos from one form(mov/avi) to another(mp4).


Start
request the Name server for next availble split file for conversion
Download the file and save it in a video directory in work directory
Convert the file(avi/mov) to mp4 format
Upload it back to name server
End

Mail Distribution

- In Yioop , when a user starts a new thread or comments to an existing thread, several people will be notified.

- Can cause congestion if too many emails are to be sent.

- Currently, emails are sent using two ways –
  - Using PHP mail() function
  - SMTP server configuration

- These emails can be aggregated over a period of time and sent periodically.

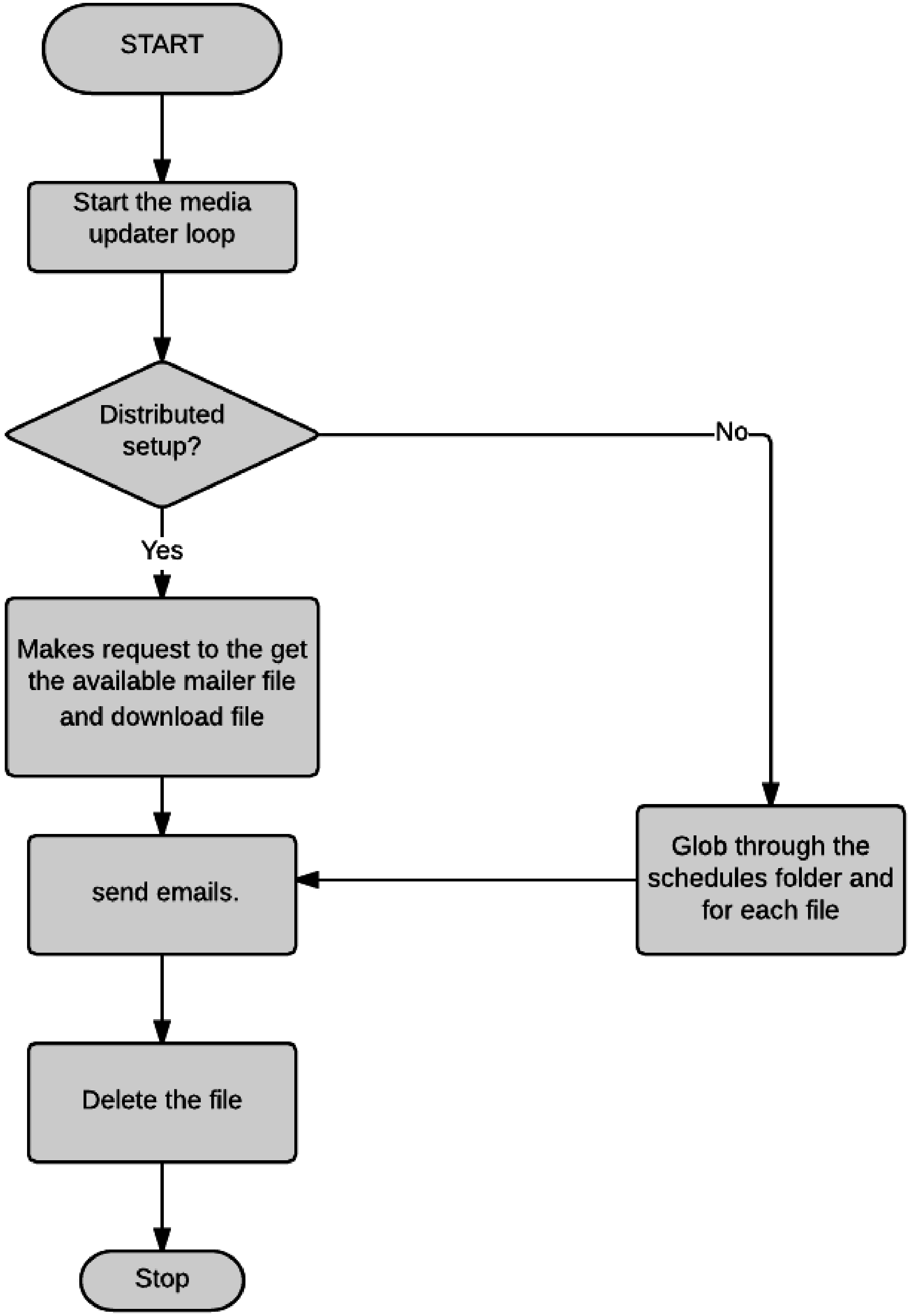
Mail Distribution (2)

- Emails to be sent are aggregated in a text file every 5 minutes

- Locking mechanism

- Media updater process looks for mailer text files and sends out emails

- Email task offloaded from mail server(Yioop Webapp) to media updater process


START
Start the media updater loop
Distributed setup?
No
Yes
Makes request to the get the available mailer file and download file
Glob through the schedules folder and for each file
send emails.
Delete the file
Stop

Experiments

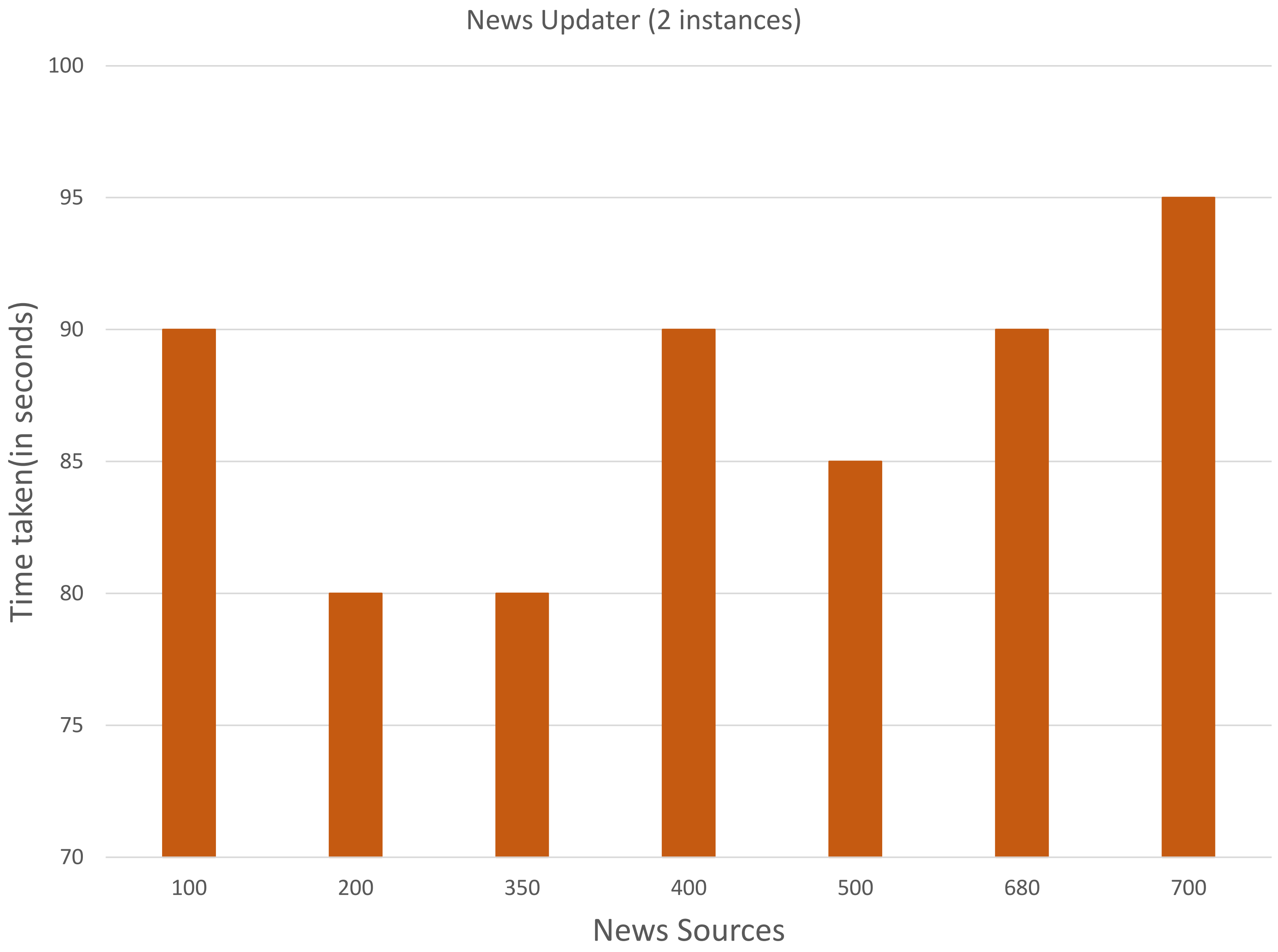
- Unit Testing

- Created a cluster on AWS of a few machines.

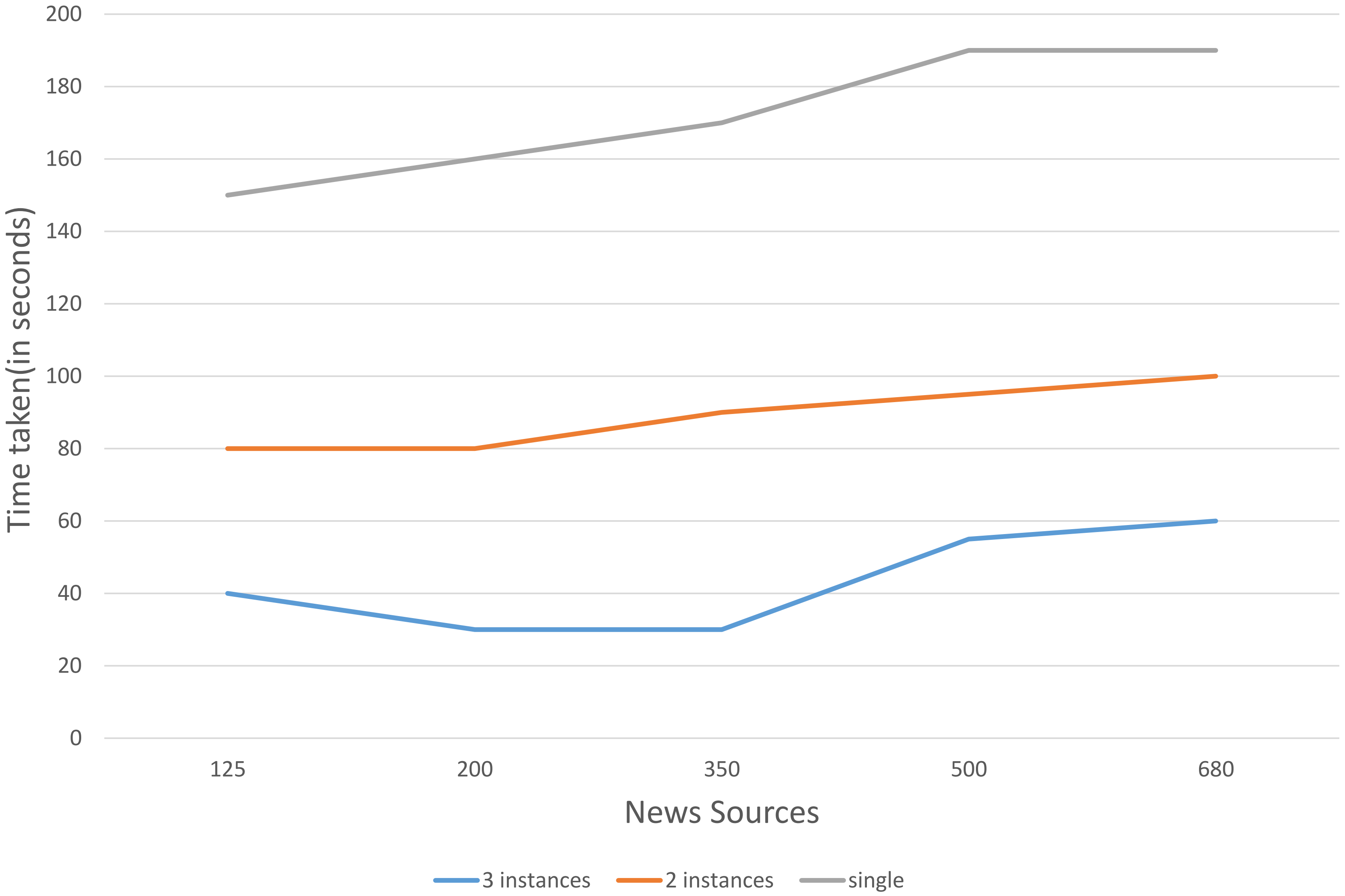
- The configuration for machines -
  - 1 vCPUs, 2.5 GHz, Intel Xeon Family, 1 GiB memory
  - Platform : Ubuntu

- Set up Yioop on one such instance and then created clones of this instance using the AMI option

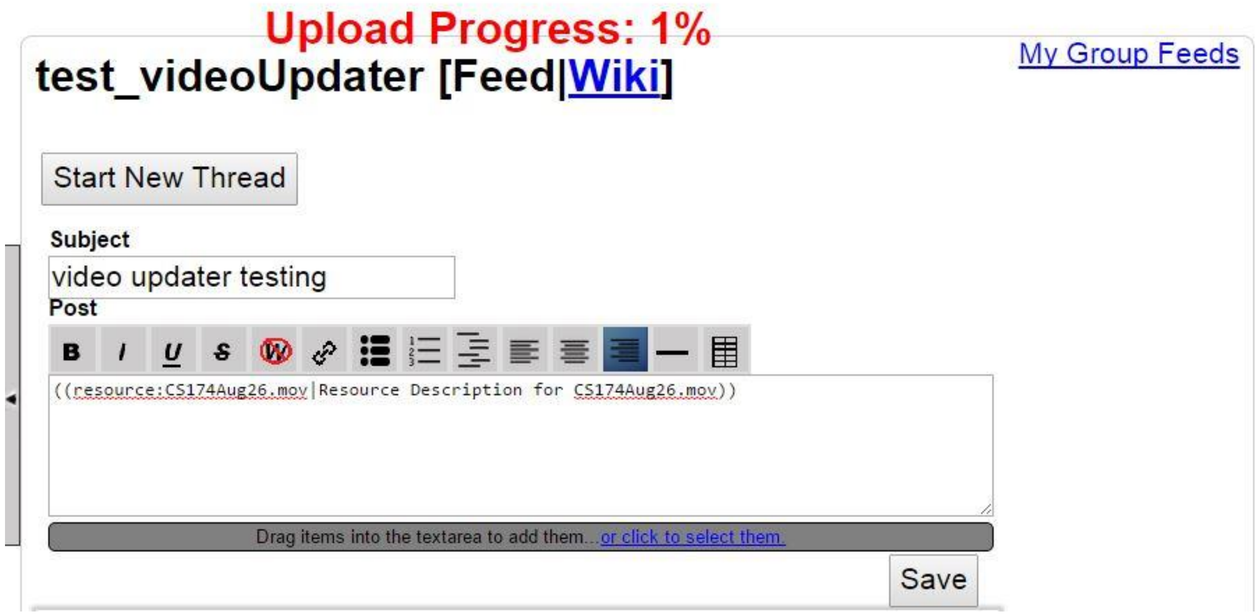
News Updater Performance Testing



News Updater Performance Testing(2)



Video Updater Testing



Upload Progress: 1%

test_videoUpdater [Feed|Wiki]

My Group Feeds
Start New Thread

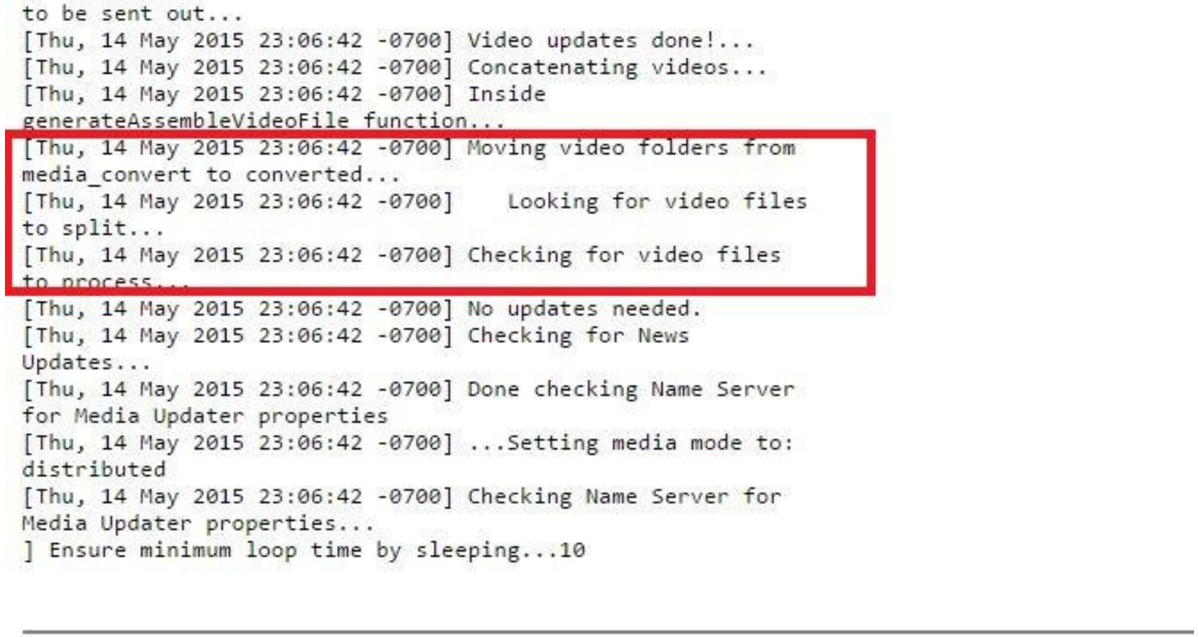
Subject

video updater testing

Post

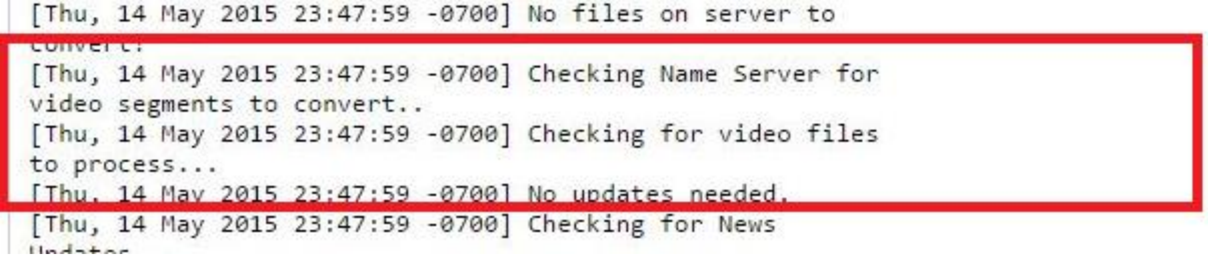
```
((resource:CS174Aug26.mov|Resource Description for CS174Aug26.mov))
```

Drag items into the textarea to add them...or click to select them.
Save

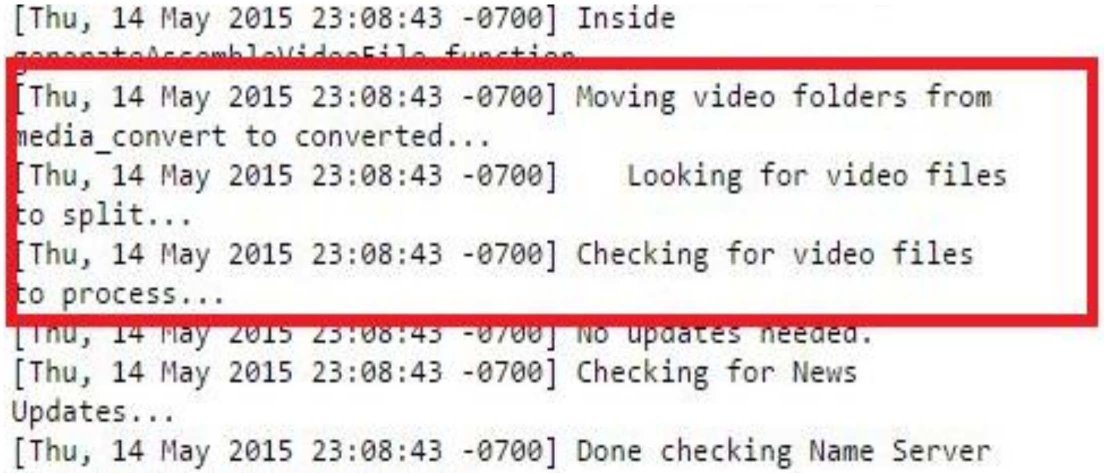


```
to be sent out...
[Thu, 14 May 2015 23:06:42 -0700] Video updates done!...
[Thu, 14 May 2015 23:06:42 -0700] Concatenating videos...
[Thu, 14 May 2015 23:06:42 -0700] Inside
generateAssembleVideoFile function...
[Thu, 14 May 2015 23:06:42 -0700] Moving video folders from
media_convert to converted...
[Thu, 14 May 2015 23:06:42 -0700]    Looking for video files
to split...
[Thu, 14 May 2015 23:06:42 -0700] Checking for video files
to process...
[Thu, 14 May 2015 23:06:42 -0700] No updates needed.
[Thu, 14 May 2015 23:06:42 -0700] Checking for News
Updates...
[Thu, 14 May 2015 23:06:42 -0700] Done checking Name Server
for Media Updater properties
[Thu, 14 May 2015 23:06:42 -0700] ...Setting media mode to:
distributed
[Thu, 14 May 2015 23:06:42 -0700] Checking Name Server for
Media Updater properties...
] Ensure minimum loop time by sleeping...10
```

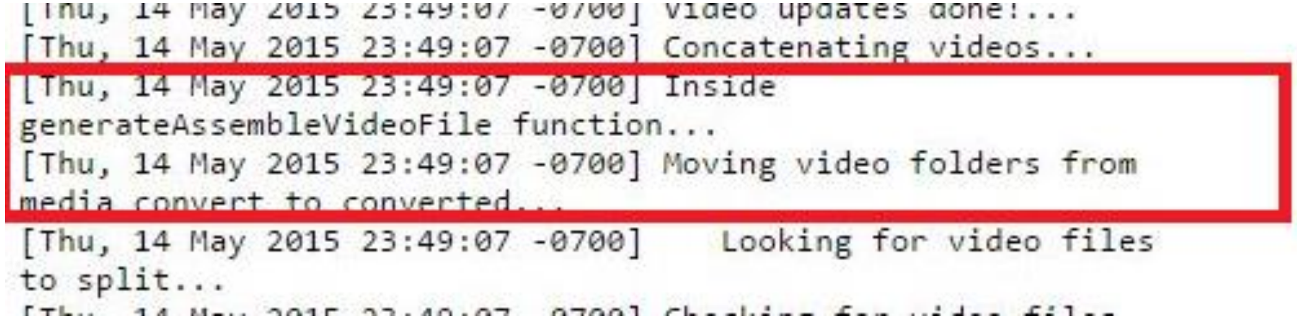
Video Updater Testing(2)



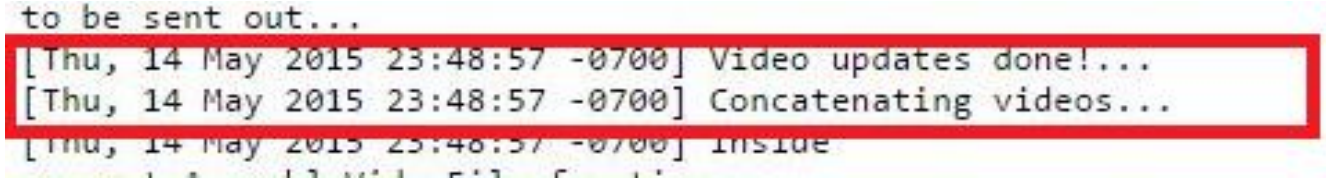
```
[Thu, 14 May 2015 23:47:59 -0700] No files on server to
convert.
[Thu, 14 May 2015 23:47:59 -0700] Checking Name Server for
video segments to convert..
[Thu, 14 May 2015 23:47:59 -0700] Checking for video files
to process...
[Thu, 14 May 2015 23:47:59 -0700] No updates needed.
[Thu, 14 May 2015 23:47:59 -0700] Checking for News
Updates
```



```
[Thu, 14 May 2015 23:08:43 -0700] Inside
generateAssembleVideoFile function
[Thu, 14 May 2015 23:08:43 -0700] Moving video folders from
media_convert to converted...
[Thu, 14 May 2015 23:08:43 -0700]    Looking for video files
to split...
[Thu, 14 May 2015 23:08:43 -0700] Checking for video files
to process...
[Thu, 14 May 2015 23:08:43 -0700] No updates needed.
[Thu, 14 May 2015 23:08:43 -0700] Checking for News
Updates...
[Thu, 14 May 2015 23:08:43 -0700] Done checking Name Server
```



```
[Thu, 14 May 2015 23:49:07 -0700] Video updates done!...
[Thu, 14 May 2015 23:49:07 -0700] Concatenating videos...
[Thu, 14 May 2015 23:49:07 -0700] Inside
generateAssembleVideoFile function...
[Thu, 14 May 2015 23:49:07 -0700] Moving video folders from
media_convert to converted...
[Thu, 14 May 2015 23:49:07 -0700]    Looking for video files
to split...
[Thu, 14 May 2015 23:49:07 -0700] Checking for video files
```



```
to be sent out...
[Thu, 14 May 2015 23:48:57 -0700] Video updates done!...
[Thu, 14 May 2015 23:48:57 -0700] Concatenating videos...
[Thu, 14 May 2015 23:48:57 -0700] Inside
generateAssembleVideoFile function
```

Video Updater Performance Testing

Length of videos	No of machines	Time (in seconds)
1 min	1	5
7-8 mins	1	15
14-15 mins	1	35
	2	15-20
24 mins	1	90
	2	25
	3	20
50 mins(500 Mb)	1	300
	2	180

Conclusion

Feature /Modification	What we have done	How is it impacting Yioop
News updater	• Design for distributed setup • Code for distributing the pre-existing news updater feature	• Scaled the news updater feature • Improved performance to fetch news feeds
Manage machines web interface	• Mockup for UI to add media updaters to existing web interface • Code for adding media updater to Yioop instances	• Switch between name server and distributed setup • Control the media updater independently for each machine
Video updater feature	• Design solution • Code for incorporating video updater in Yioop	• Convert videos and upload back for viewing purposes.(web-friendly) • Distributed setup giving improved performance
Mail Distribution	• Design for mail aggregation • Code for mail distribution(first patch)	• Media updater will send out emails • Prevention of denial of Service attack

Future Scope

- More video formats can be added in video updater feature to cover most of the used video formats

- Building a framework for such aggregation jobs

- Crash recovery

Questions ?

Thank You!