

“GridVideo”: a Grid-Based Multimedia Application

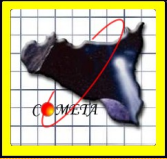
Giuseppe Iellamo*, Giuseppe Minutoli, Dario
Bruneo*, Antonio Puliafito*

Engineering Faculty, University of Messina

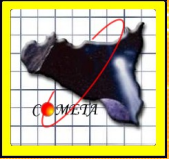
**Consorzio Cometa*

3rd EGEE User Forum

Clermont-Ferrand, 11-14 February 2008

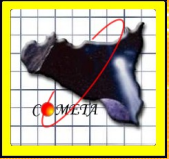


- **What is Grid-Video?**
- **GridVideo Ancestor**
- **GridVideo Activities**
- **Tools**
- **Multimedia Upload**
- **Multimedia Streaming**
- **Performance Evaluation**



What is GridVideo?

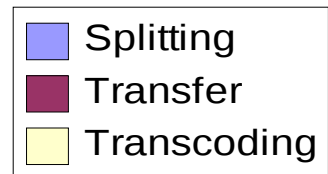
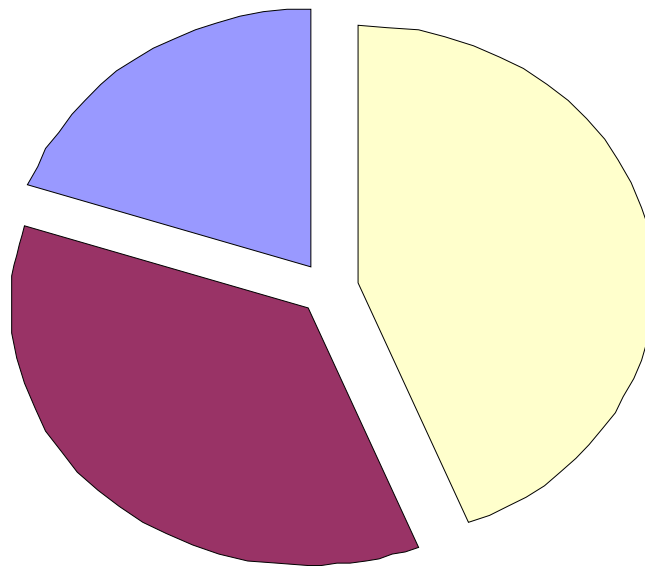
- A multimedia application, based on the Grid Computing paradigm, for the storage, distributed tailoring and streaming of media files.
- **Key idea:**
 - A media file is splitted and then sent to remote nodes that transcode and stream the media towards the user device.

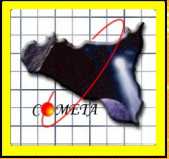


GridVideo ancestor (1/2)

- A first version of GridVideo was developed relying on a “local” Globus v2.4 cluster and directly on GRAM services.

Operation	Percentage
Splitting	20,00%
Transfer	36,00%
Transcoding	44,00%



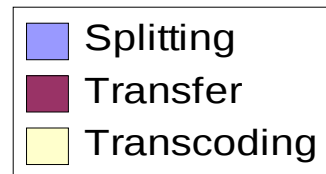
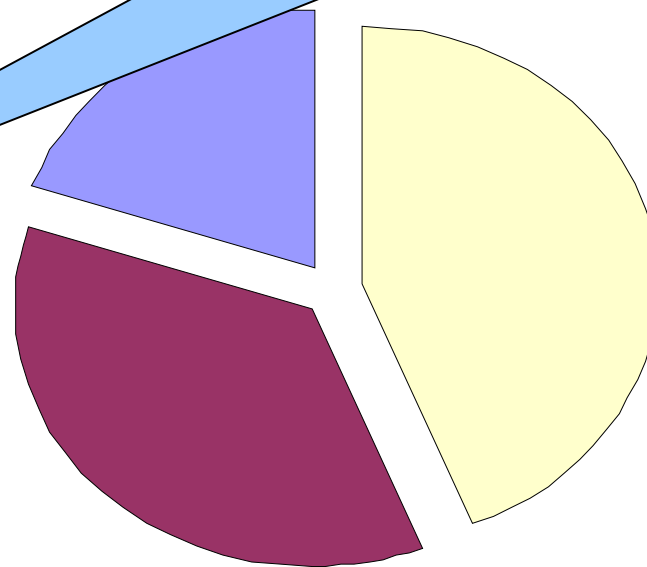


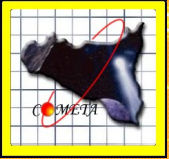
GridVideo ancestor (2/2)

- A first version of GridVideo was developed relying on a “local” Globus v2.4 cluster and directly on GRAM services.

In order to cut down this latency we want to eliminate this splitting time.

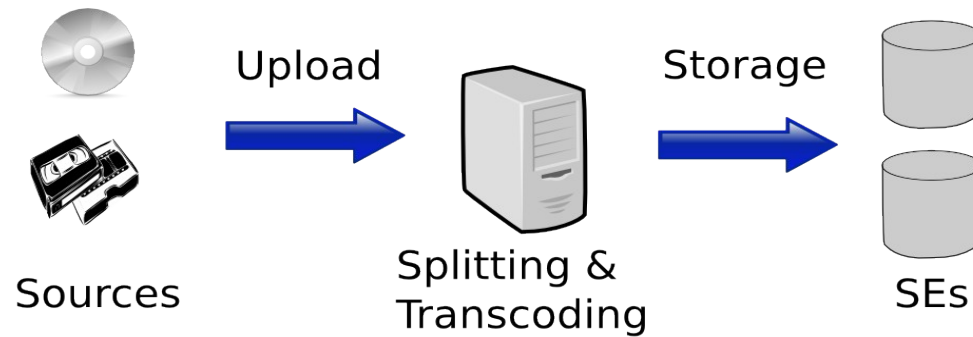
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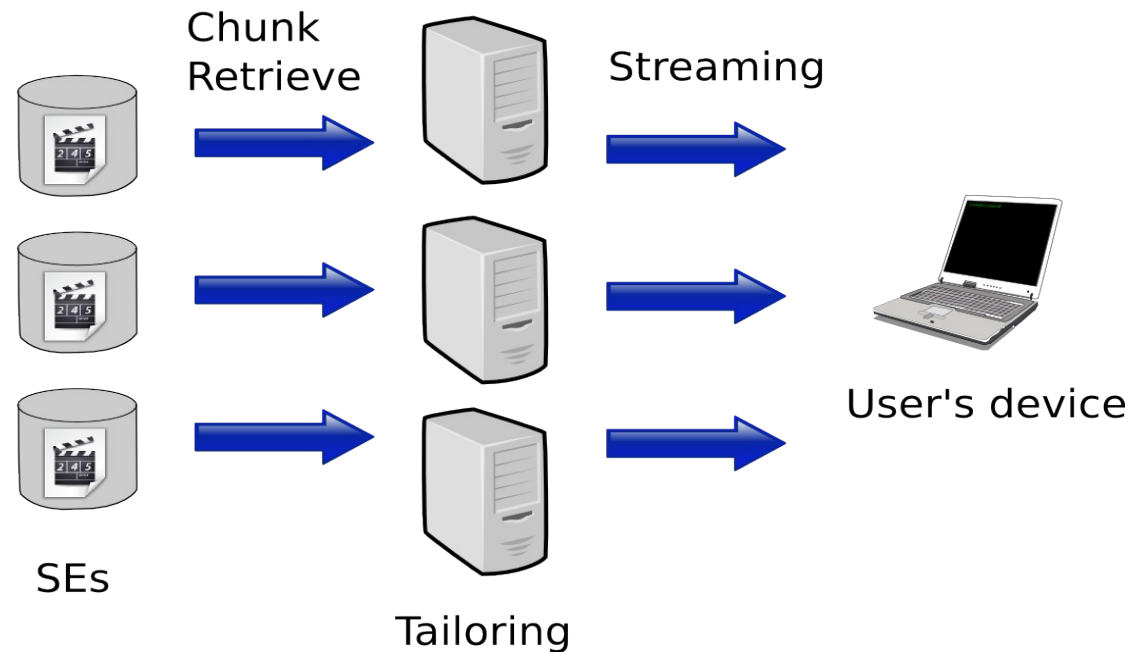


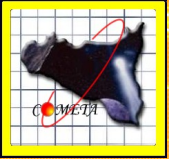
GridVideo: Activities

Multimedia Upload



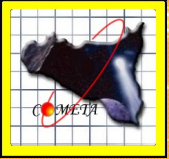
Multimedia Streaming





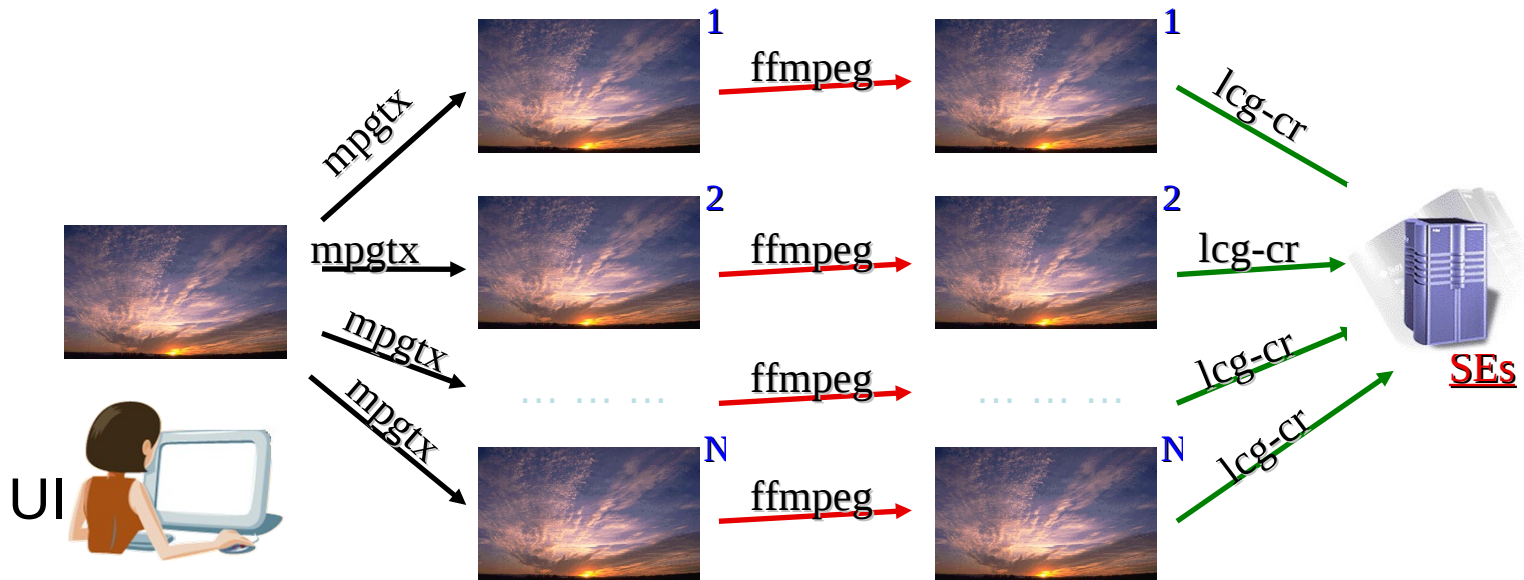
GridVideo: Tools Used

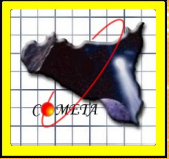
- **GridVideo is developed using a mixture of Bash Shell script and Java software;**
- **Video transcoder: ffmpeg;**
- **Splitting software: mpgtx;**
- **Player Video Lan Client (vlc);**
- **Java Messaging Service (JMS) server: Apache ActiveMq.**



Multimedia Upload

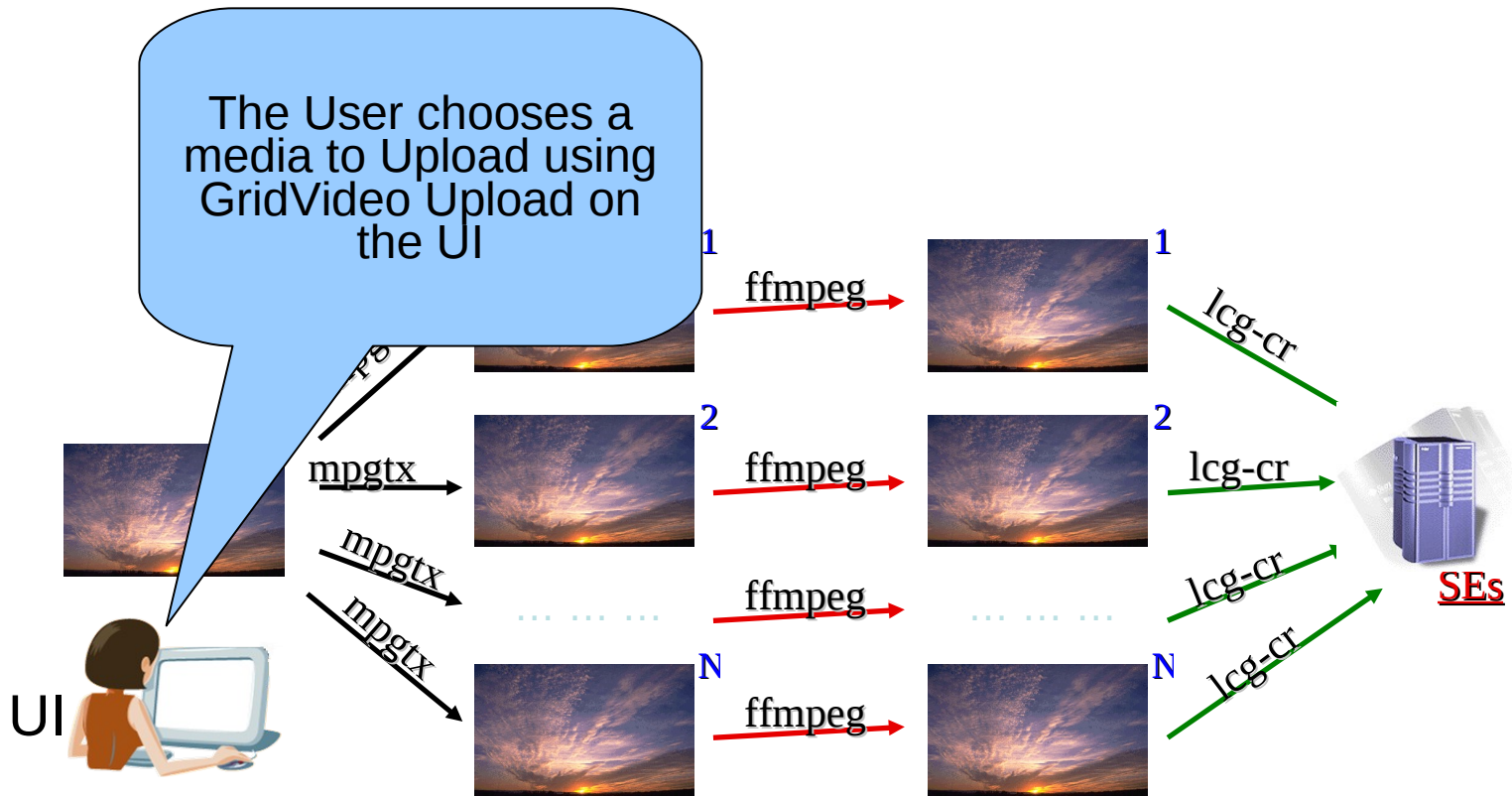
- This activity goal is to store multimedia contents on the Grid;

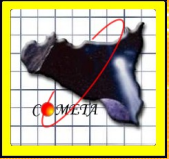




Multimedia Upload

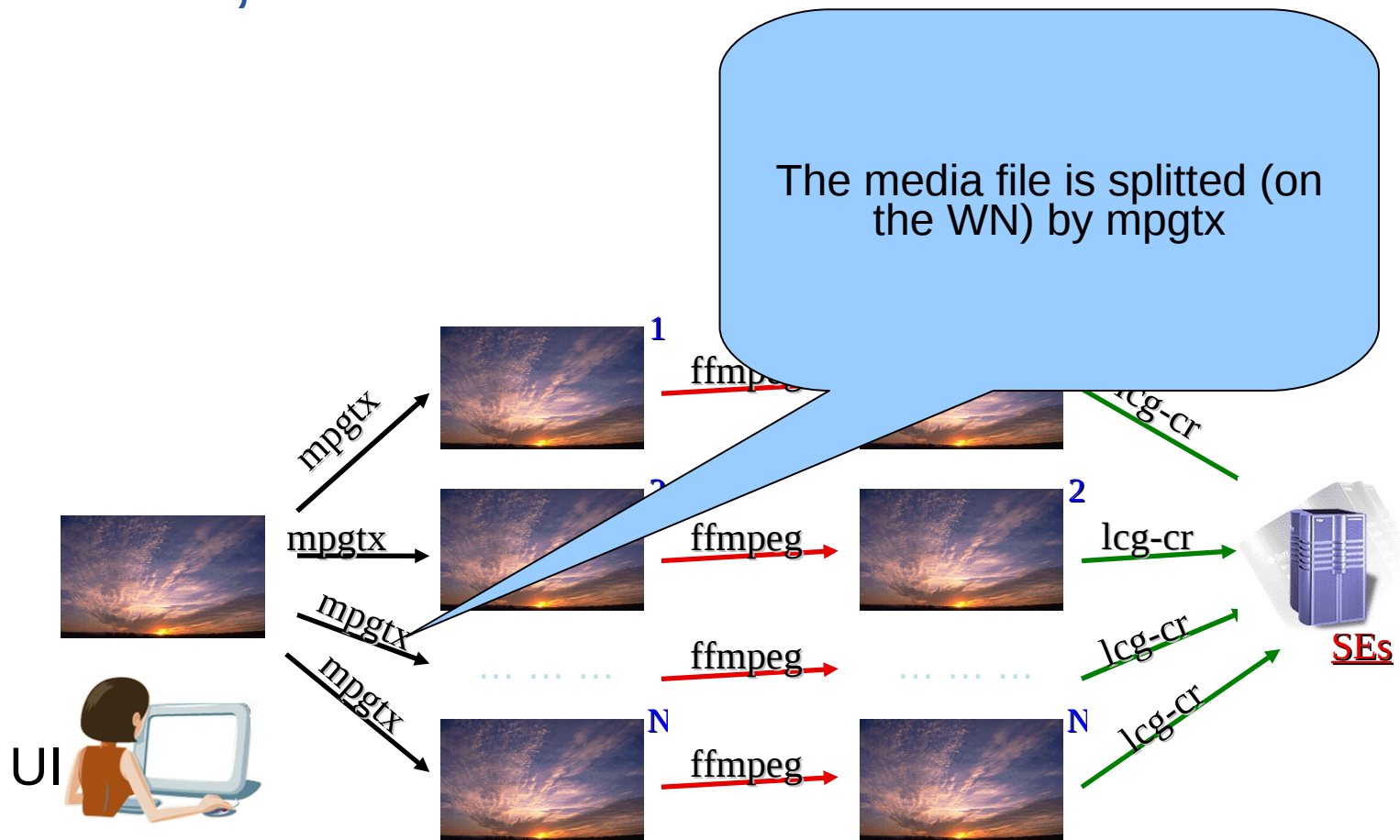
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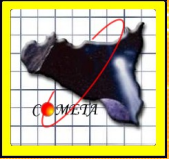




Multimedia Upload

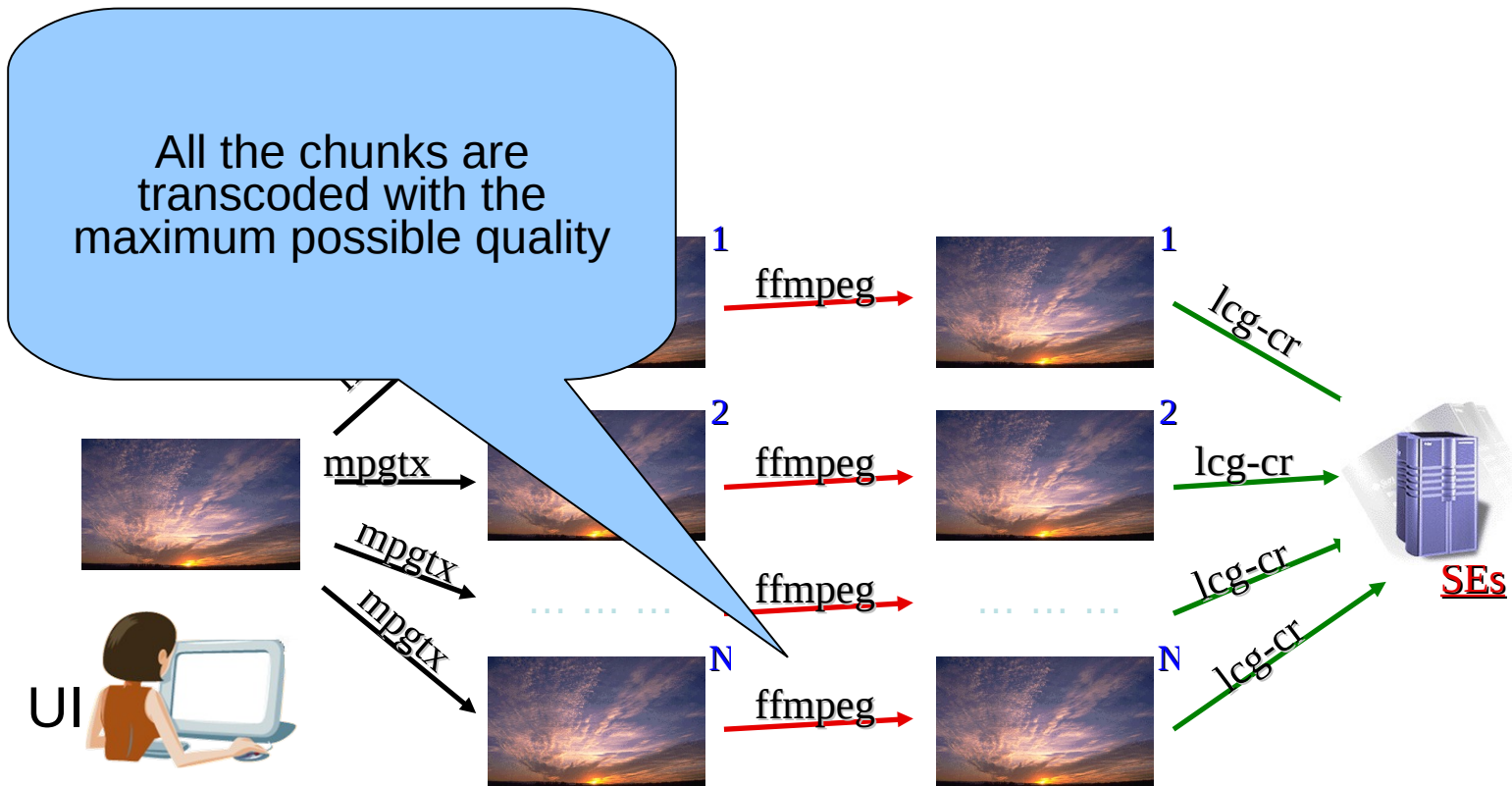
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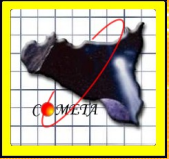




Multimedia Upload

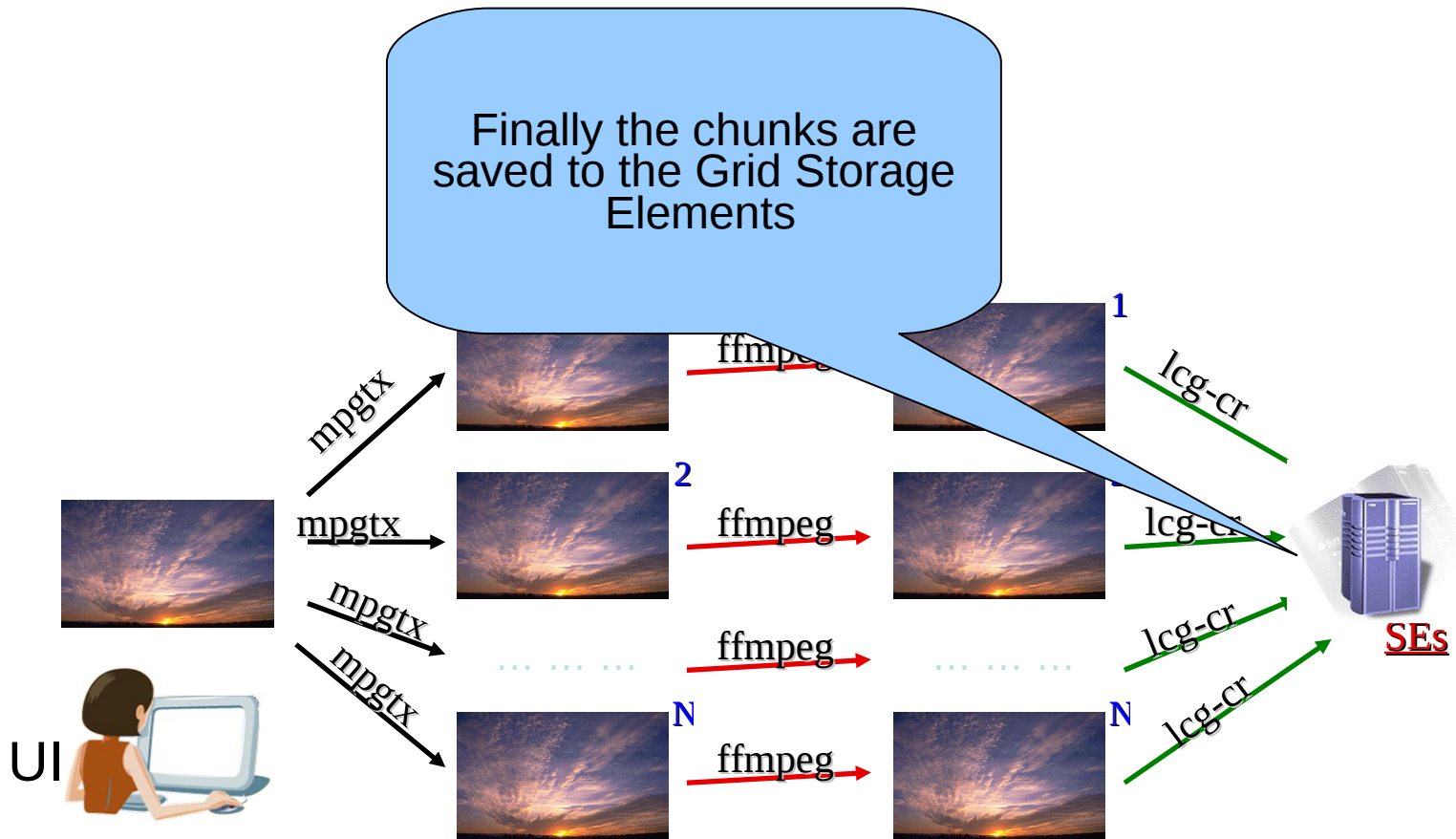
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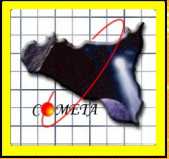




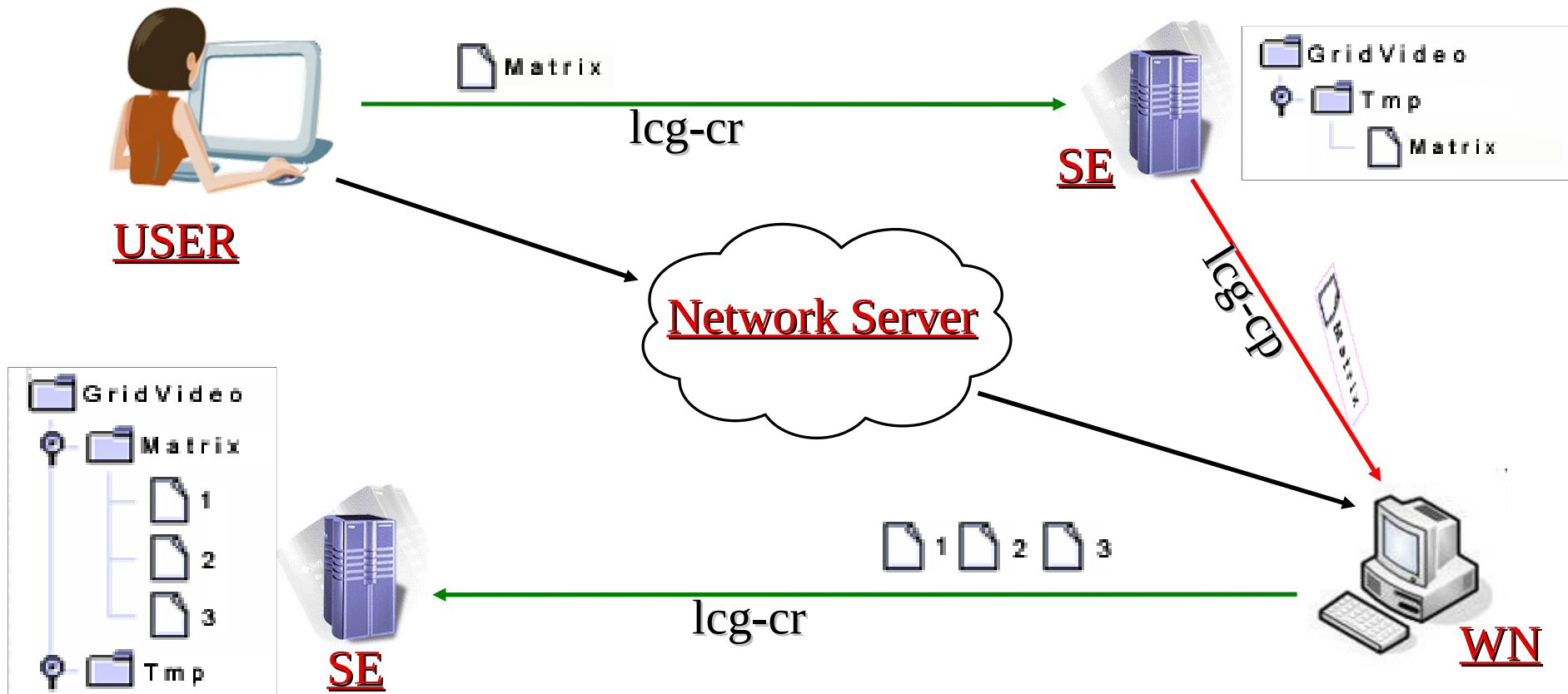
Multimedia Upload

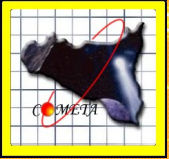
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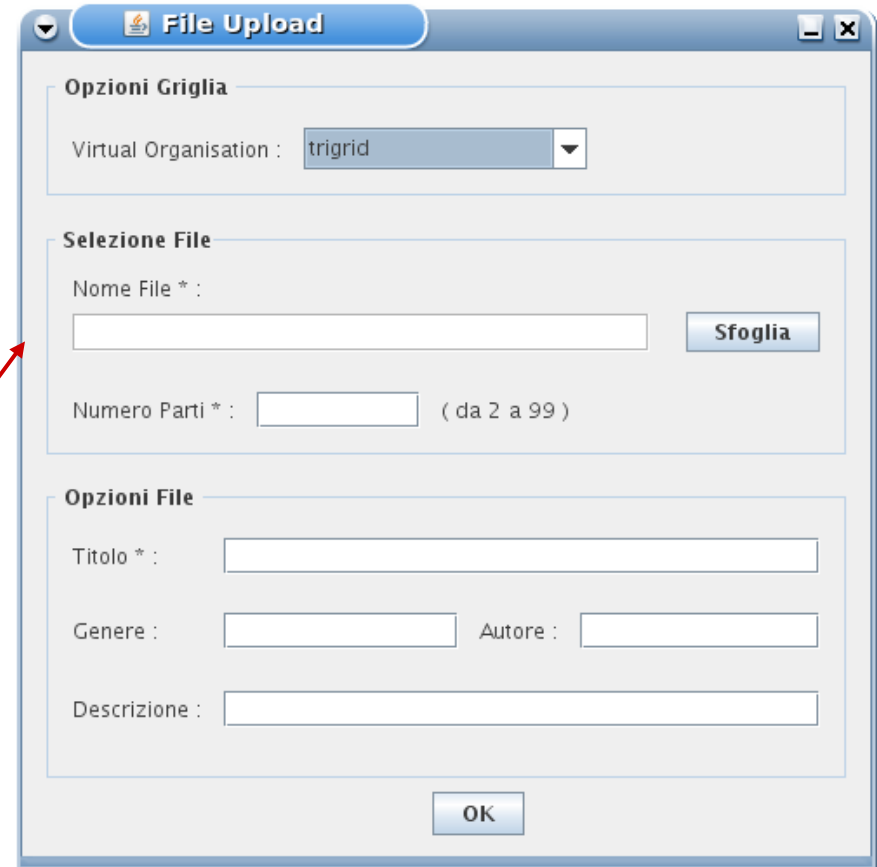


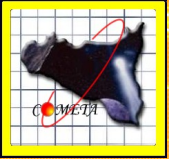
Current Solution



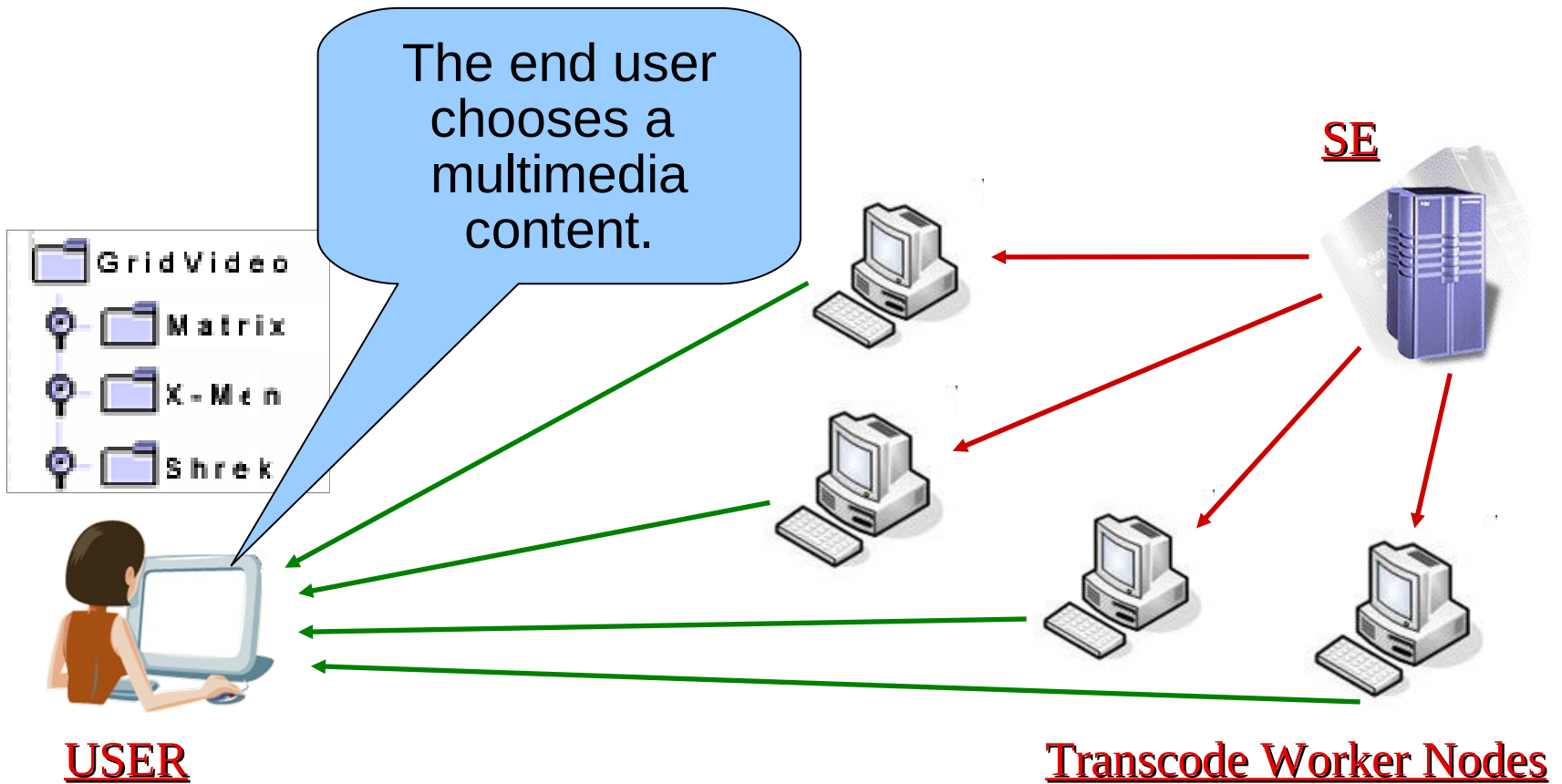


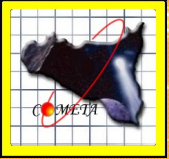
Multimedia Upload Screenshots





Multimedia Streaming

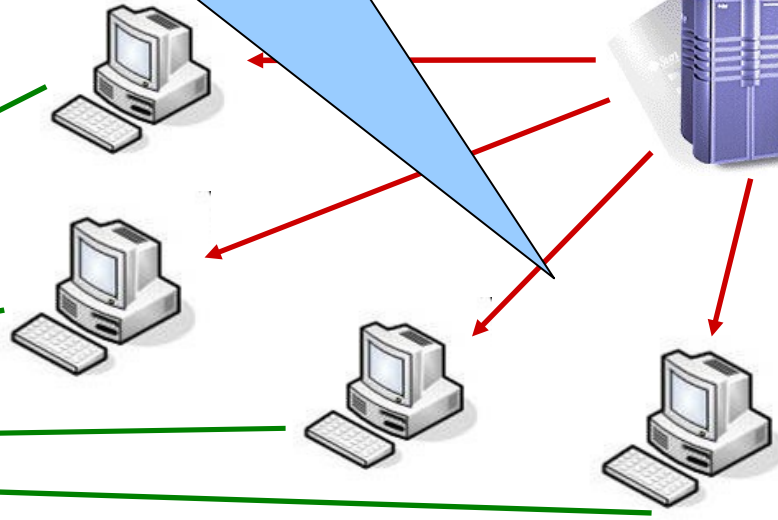




Multimedia Streaming

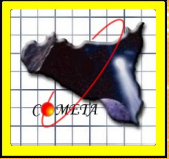
The different chunks are recovered from Storage Elements.

- GridVideo
- Matrix
- X-Men
- Shrek

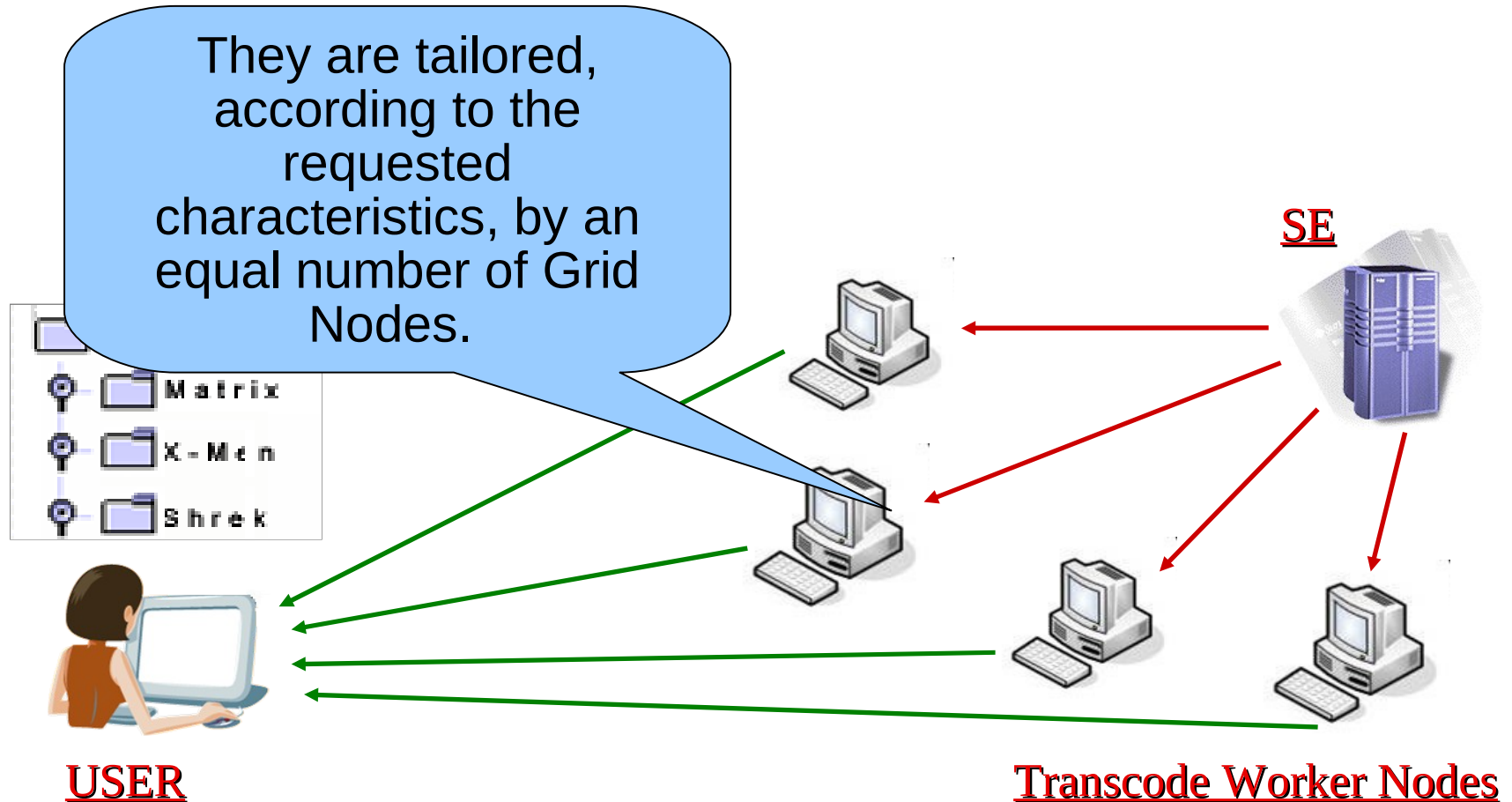


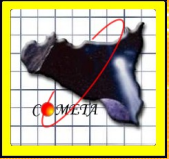
USER

Transcode Worker Nodes



Multimedia Streaming

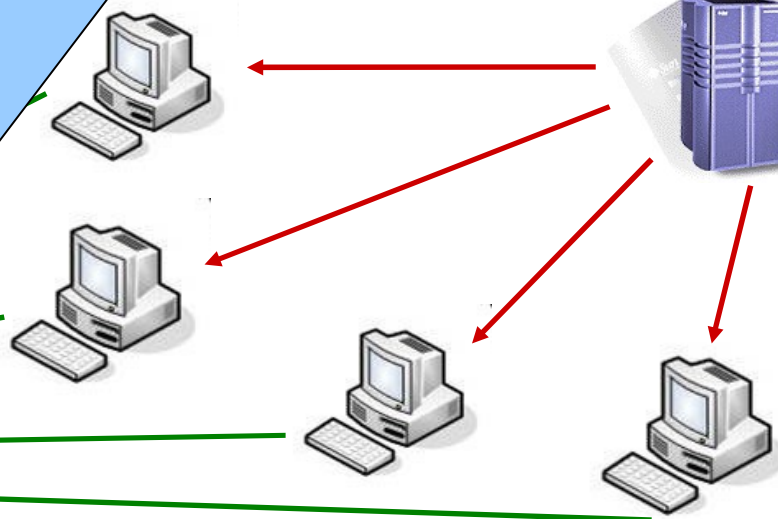




Multimedia Streaming

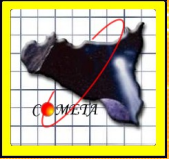
Then the Streaming is started.

- GridVideo
- Matrix
- X-Men
- Shrek

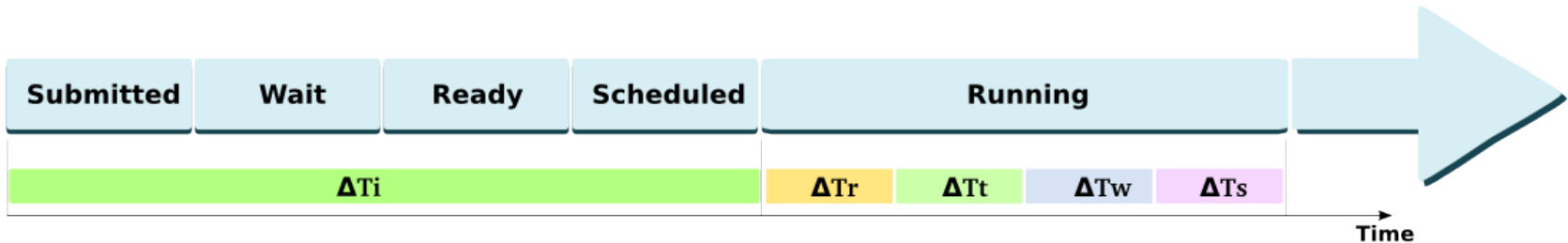


USER

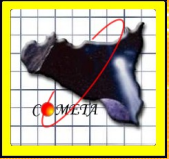
Transcode Worker Nodes



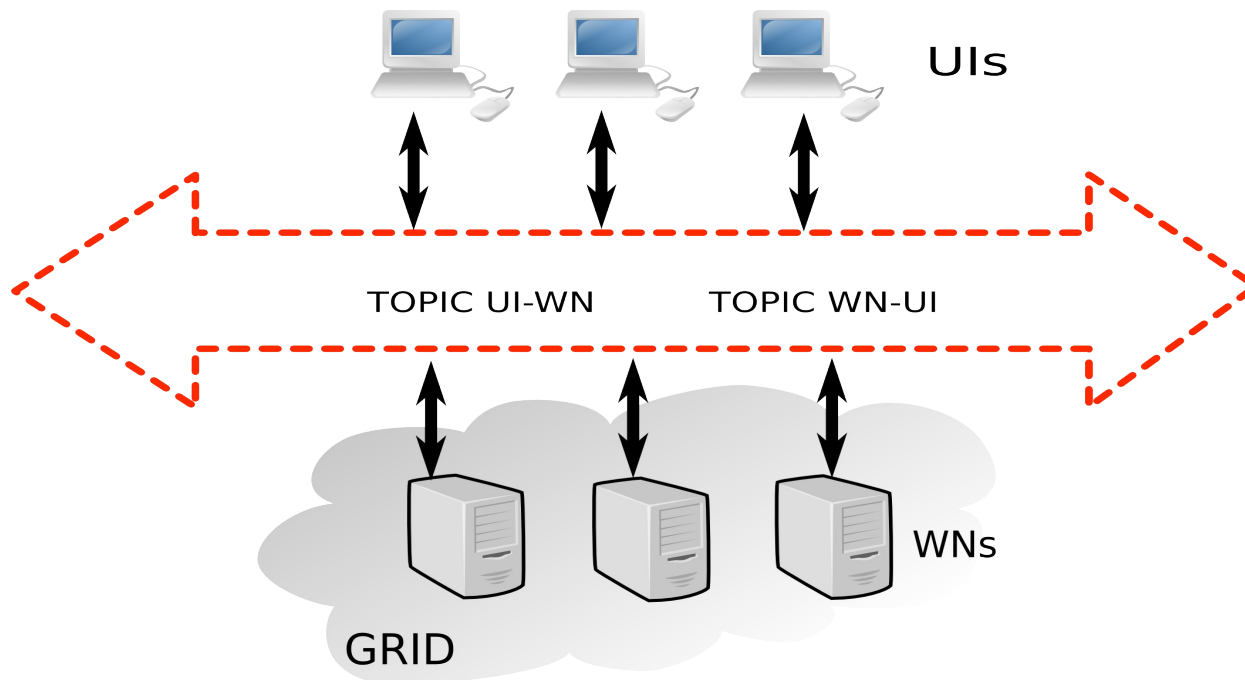
Simple Solution

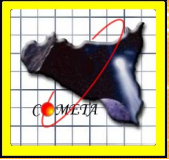


- **If N is the number of chunks of the requested media**
 - Submit N jobs each one recover a media chunk, transcode it and stream it to the user device.
- **It doesn't work:**
 - If I request N jobs to the RB, I have no guarantee on when these job will be scheduled.
 - In order to enable the streaming I have to know the exact address of the WN used this is not usually given by plain jobs.
 - Interactive jobs proved not to be a practical solution.

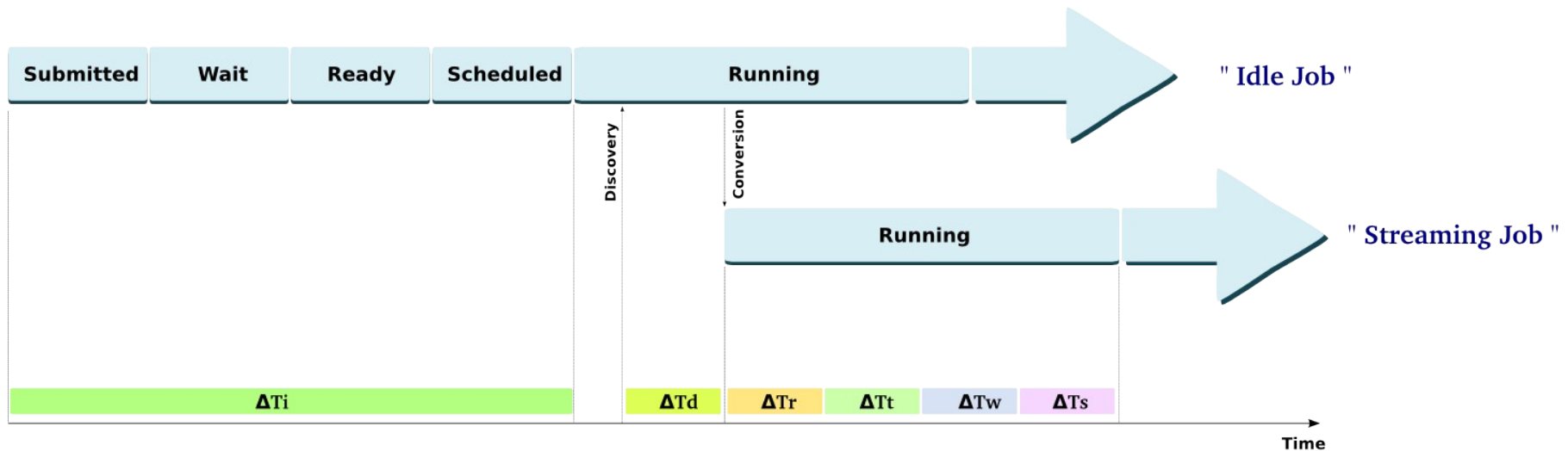


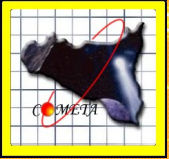
- In order to solve the aforementioned problems a flexible communication service between various jobs is needed, our choice is the Java Message Service (JMS) because of its wide adoption and support.
- In particular we deployed a JMS publish and subscribe topic on a Grid node thus enabling all the jobs and the Uis to communicate.



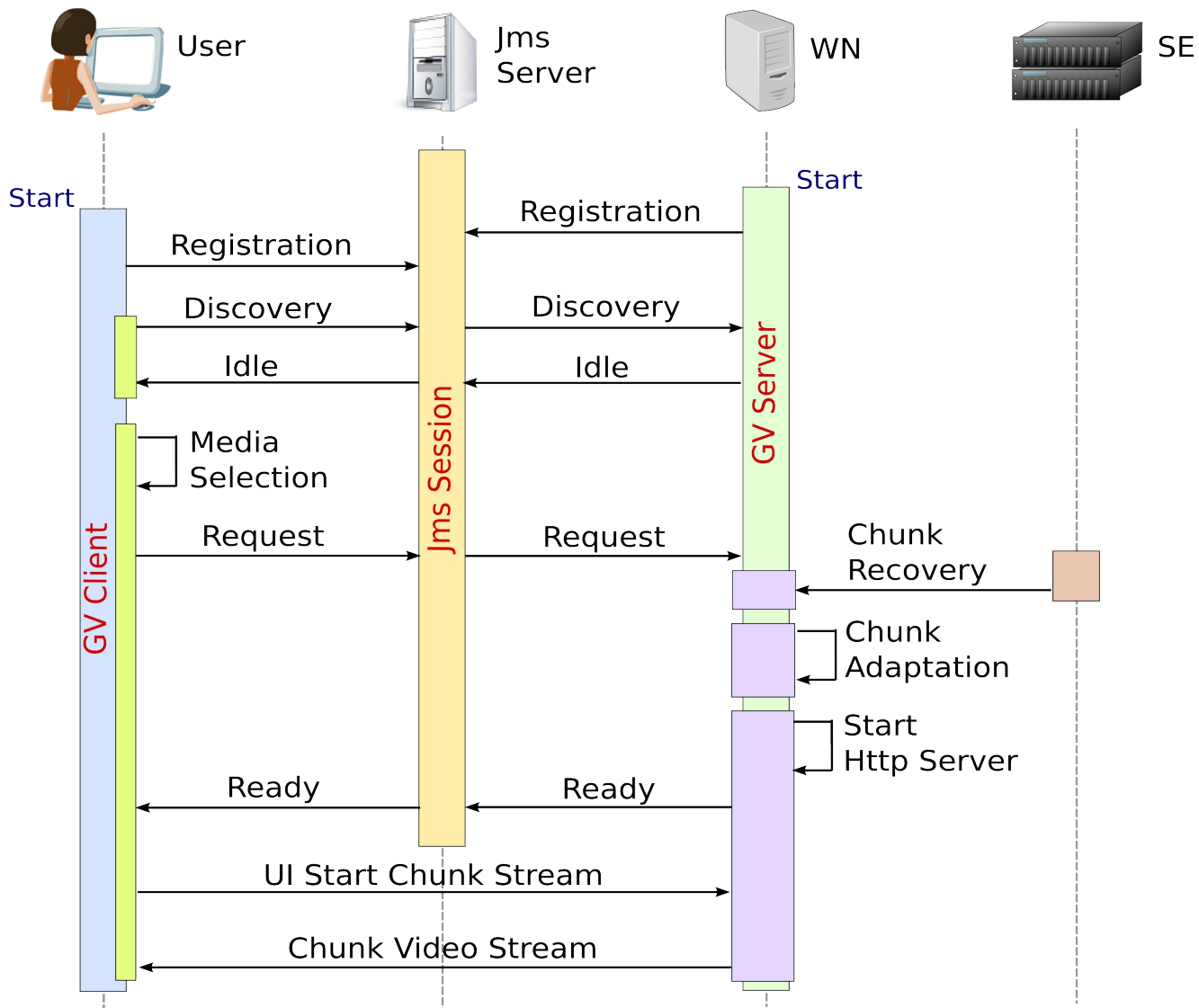


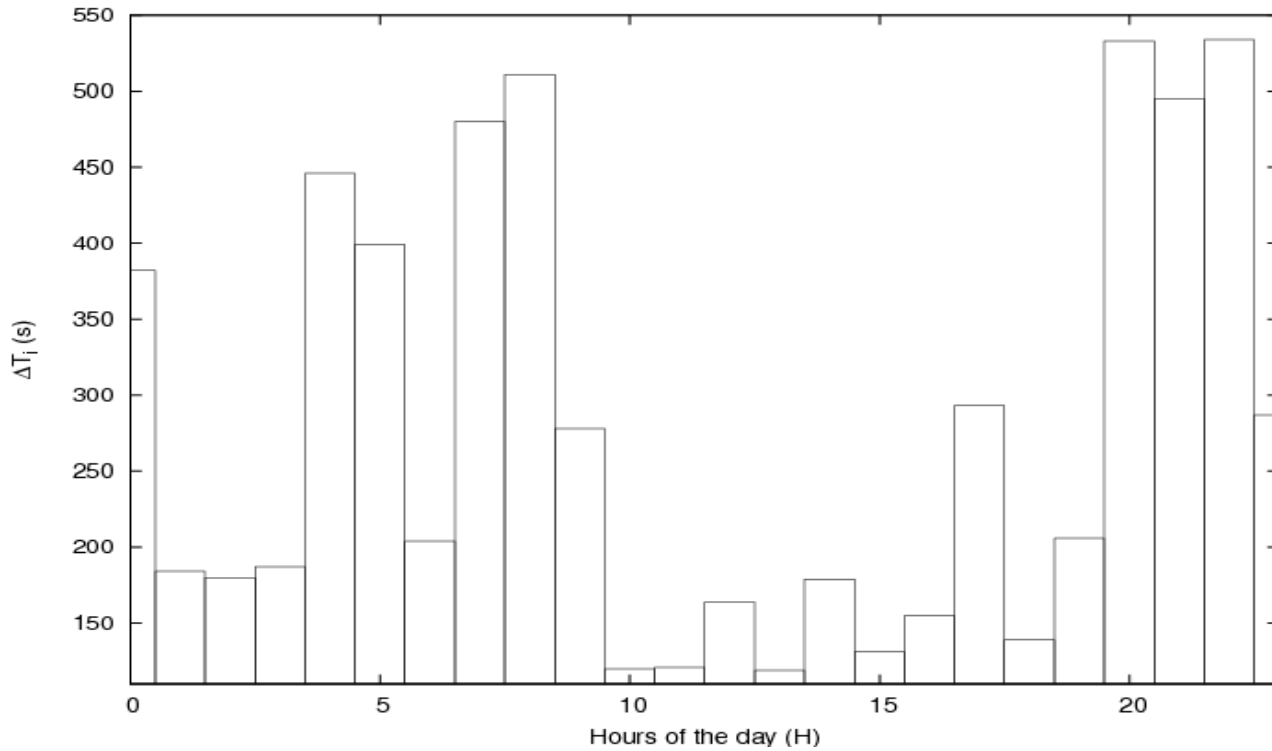
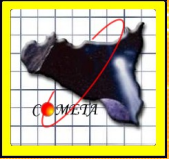
- An `idle_job` is a sort of pre-submitted job that contains all the application logic but does nothing until it receives instruction via messages.
 - File to transcode
 - Transcoding options



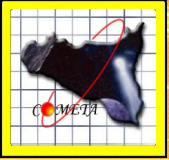


Streaming Session



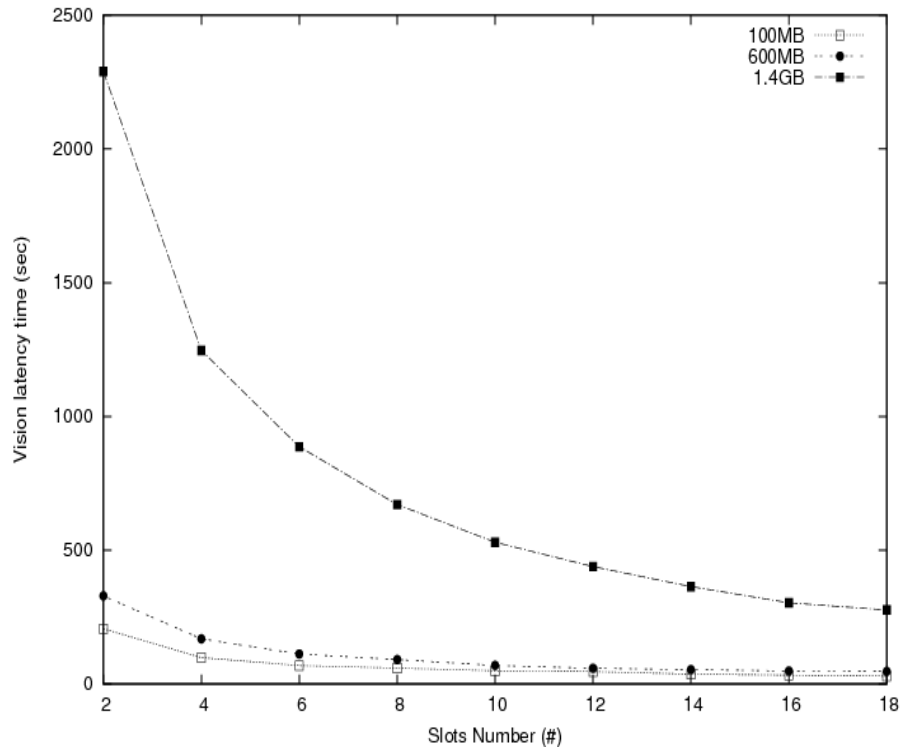


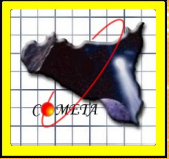
- ΔT_i evolution during an ordinary working day for the Grid.



Uniform Splitting

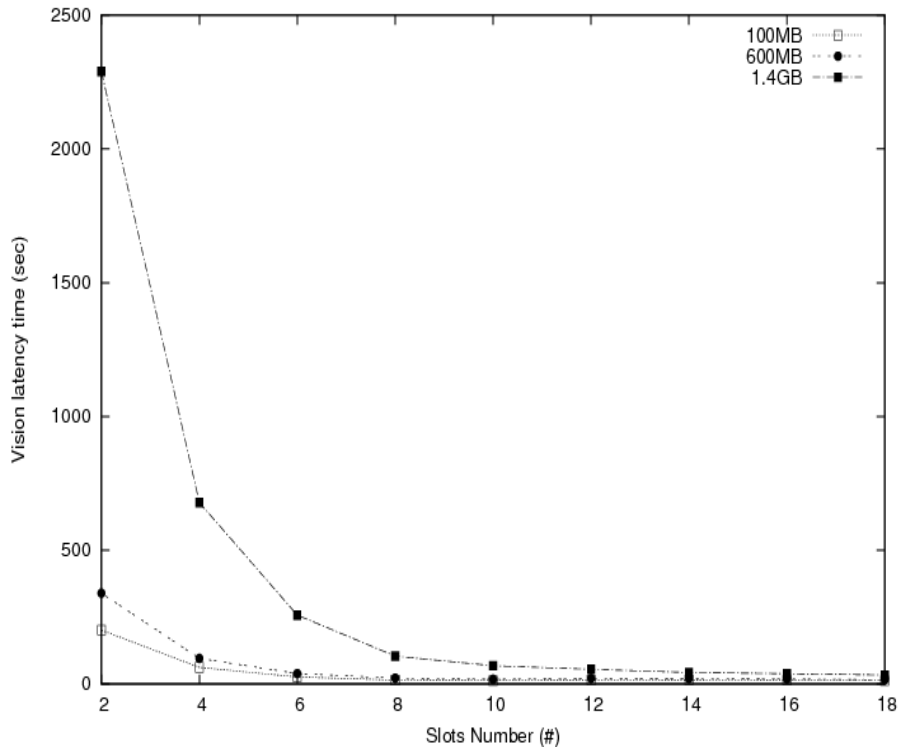
- The diagram in figure shows latency for the three analysed files in the case of an uniform splitting strategy, (where all the chunks have approximately the same size), using a variable number of Grid slots (resulting in an equivalent number of media chunks).



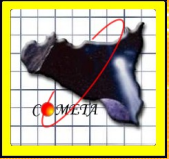


Fibonacci Splitting

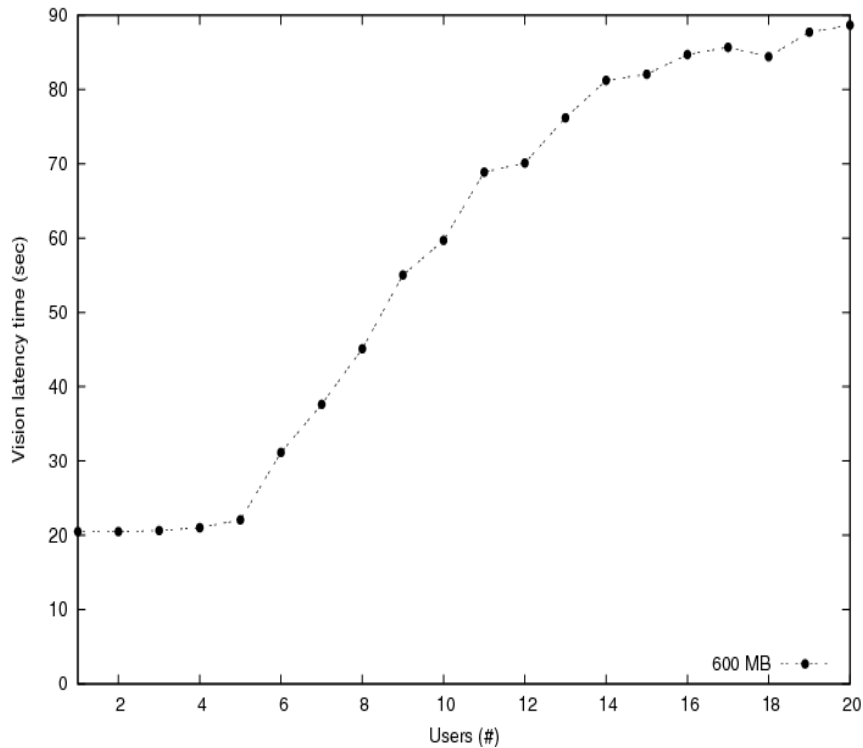
$$\Delta T_{ready}^{i+1} \leq \Delta T_{stop}^i \quad \forall i \in [1, \dots, n-1]$$

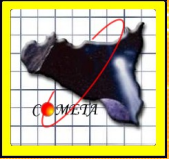


- A reduction in the size of the first chunk lowers the latency, but we must address the shown requirement.



- This figure shows what happens with 40 idle_jobs when the number of user increases.





Screenshots

Accesso alla Griglia

Creazione proxy voms per accesso ai servizi di griglia

Virtual Organisation
trigrid

Validità (Ore)
12

Pass Phrase

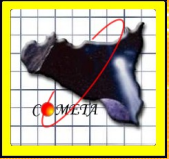
OK

Input

Settare IP o Hostname del Server Jms

trigriden05.unime.it

OK Annulla



Screenshots

- GRID VIDEO STREAM -

Consente di selezionare un contenuto multimediale tra tutti quelli disponibili su la griglia. L'utente può adoperare i seguenti comandi :

- "New Stream" : consente di selezionare contenuto di cui si vuole lo stream.
- "View Stream": consente di avviare stream per un contenuto selezionato.

New Stream

View Stream

Elenco contenuti multimediali disponibili:

- Jeeg_Robot_-300107173245-3
- Slam_Dunk-290107155527-3
- Test-300107173245-1

OK INFO

Informazioni relative al contenuto selezionato:

TITOLO : Slam_Dunk

GENERE : Sigla_Cartone_Animato

AUTORE : Giuseppe

DESCRIZIONE : Sigla_di_Prova

OK

Elenco contenuti multimediali pronti per stream...

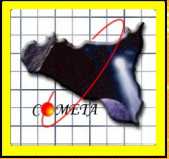
- Test-300107173245-1

OK DELETE

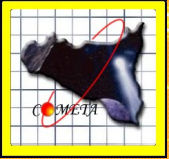
VLC media player

File Visualizza Impostazioni Audio Video Navigazione Ajuto

x1.0C /home/gridvideo/Desktop/FilmatiTest/sigla_slamdunk.mp



- ➔ **Porting application to Grid environments requires an important effort.**
- ➔ **Reliability is a great issue**
 - A Grid is composed by heterogeneous system that changes over time.
- ➔ **Non trivial multi job applications need some standardized way to communicate.**



Any Questions ?

Thank you very much for your kind attention!

