

Active Circle :feedback for Paris Virtual Observatory

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Context

Context & Goal

Active Circle

How

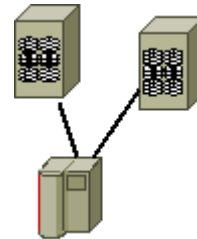
How it works

“A virtual observatory (VO) is a collection of interoperating data archives and software tools which utilize the internet to form a scientific research environment in which astronomical research programs can be conducted” from wikipedia.

So, we provide [some big collections of astronomical data We need:

- a stable storage system, easily scalable in volume
- a backup solution having low cost in manpower
- a multi-site replication
- hardware independent
- be easily integrable in the storage solution of the IT department.

▶ We started with DAS (Direct attached storage)



Then we decided to discuss the perspectives and to find the best compromised in :

Price / security / scalability / globalisation

We checked several major storage manufacturers.

We checked different distribution storage solutions.

We made made a visit to colleague running Active Circle at “Soleil Synchrotron”

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How it works

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EXPLORING MATTER BY THE LIGHT OF SOLEIL SYNCHROTRON

SOLEIL IS DEDICATED TO FUNDAMENTAL AND APPLIED RESEARCH, FOR EXAMPLE IN THE FIELDS OF BIOLOGY, PHARMACY AND MEDICINE, CHEMISTRY AND PETROCHEMICALS, THE ENVIRONMENT, NANOTECHNOLOGY, MICROMECHANICS AND MICROELECTRONICS, THE AUTOMOTIVE INDUSTRY, ETC.

1 LINAC: the electron 'launching ramp'

LINAC, the linear accelerator, is the first link in the chain. It starts with an electron gun operating in a similar way to that of a television set. A heated element produces electrons that an electrical field collects in bunches the size of a hair. The electron bunches will be accelerated whilst travelling on an electromagnetic wave like a surfer on an ocean wave.

2 THE BOOSTER: the frenzied whirling dance of the electrons

Upon leaving the LINAC, the electrons enter the BOOSTER, a synchrotron with a circumference of 157 m. In just a fraction of a second, their energy will be increased from 100 MeV to 2750 MeV (or 2.75 GeV). During this energy rise, the beam characteristics such as bunch size and energy scattering will be fine-tuned.

3 THE STORAGE RING: the 'electron trail'

The electrons are transferred to the storage ring where they circle for several hours very close to the speed of light. The ring is a closed tube roughly 5 cm in diameter with a series of straight and curved segments. In the dipoles and insertion elements, the electrons undergo accelerations and lose energy in the form of electromagnetic radiation, known as 'synchrotron radiation'.

4 BEAMLINES

The light emitted by the electrons is guided towards outlets known as "beamlines". Each line is a laboratory in its own right. In 2010 there will be 25 of these at SOLEIL, with the possibility of 43 in the future.

5 BENDING MAGNETS

Dipoles (or bending magnets) generate the magnetic field to bend the trajectory of the electrons into an arc. They then lose energy in the form of light. The dipoles are both a source of light and an electron beam guidance element. There are 38 of them in the booster and 32 in the ring.

6 MAGNETIC GUIDANCE AND FOCUSING ELEMENTS

From the LINAC to the storage ring and even the booster, there are dozens of magnetic elements to guide the beam of particles: dipoles (or bending magnets) to make them turn, quadrupoles and sextupoles which are magnetic lenses to concentrate the bunches of particles to preserve their qualities.

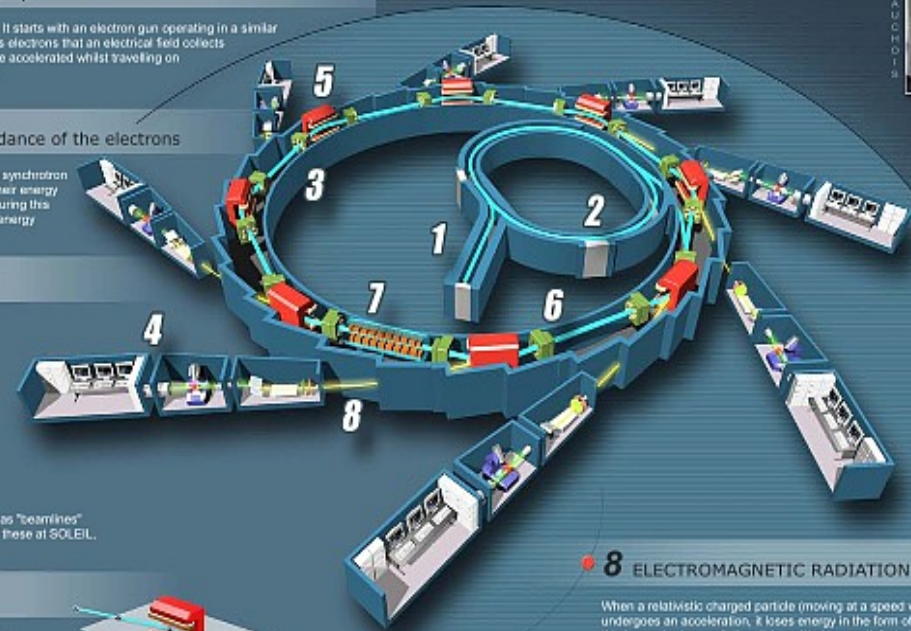
THEY DISCOVERED THE SECRETS OF LIGHT

James Clerk Maxwell (1831-1879): Scottish physicist. His fundamental work changed the nature of electromagnetism and introduced the bases of field theory.

Alfred-Marie Liénard (1869-1958): French professor and research scientist. He was the first to show that a charged particle in motion produces electrical and magnetic fields.

Yvette Cauchois (1900-1999): Pioneer in the field of x-rays and the use of synchrotron radiation by French laboratories.

John Paul Blewett (1910-2000): Canadian physicist. He was the first to calculate electron energy loss by synchrotron radiation.

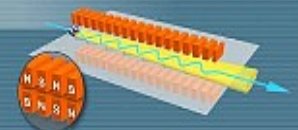


8 ELECTROMAGNETIC RADIATION

When a relativistic charged particle (moving at a speed very close to the speed of light) undergoes an acceleration, it loses energy in the form of electromagnetic radiation; this is synchrotron radiation. It is emitted tangentially to the direction of the particles.

7 MAGNETIC INSERTION ELEMENTS (undulator and wiggler)

These are magnetic devices placed in the straight segments of the ring. They consist of small juxtaposed magnets to make the electrons follow an undulating path, a little bit like a skier skidding. With each wave, the electron undergoes an acceleration and emits light. Thus, the magnetic insertion elements make the beams more intense than those emitted by the dipoles.



Observatoire de Paris – Meudon
6 departments on 2 sites with 1000 people

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Paris



Meudon



← Around 10 km →

**All departments want to be independent; scientific teams want to have their data stored as close as possible (i.e. Inside the department).
Level of reliability are very different; storage elements are very heterogeneous**

Different policy privacy

Mainly linux, but not always

We have decided to deal only with the archive file storage and not with the transactional database. We did not put any constraints on the access time.

We need a scalable solution with multi-site replication and tape storage management.

Active Circle

– Virtualisation solution

(from AC web site)

Features of Active Circle's Active Archive solution:

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- Scalable file system from 1 TB to 4 PB
- Data accessible via CIFS and NFS network file protocols
- Automated Data Lifecycle Management (DLM) over multiple storage tiers
- Data integrity guaranteed by WORM mode
- Reduction in storage TCO by selecting standard hardware (disk or tape)
- Automated management of technology changes and data migration
- Exports in TAR format for data vaulting

Why Active Circle ?

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- to reuse existing storage elements
- “Class Of Service” to define the number of units in disk and/or tapes
- storage synchronisation to be done in background
- self recovery in case of crash
- to be able to manage data lifecycle
- Multi cite replication (100 Mbps at the beginning
- NFS access to data collection, no special client and/or protocol.
- We don't have manpower for tape storage software, we need simple and open format tape storage solution.

Active Circle why ?

- At that time we didn't find any free solution at this level
- The choice was made at the time when the lack of storage was critical.

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◆ After a Public Tender

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- We have buy 3 AC cells and 50 Tb storage

- 2 sun Storage Element X4500 (38 TO raw)



- 1 robotic + dedicated server

How it works

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- **Trouble with Solaris system updates**

- **AC were not dedicated to small files.**

Long instability period in case of high load (NFS not responding) but no data loss

- **We are still in the test period, due to lack of manpower to work on it. AC developers are very responsible and spent a lot of time on debugging.**

- **The tape storage functionality is now our major interest in this solution.**

Contexte &
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entrepot1 - Informations Principales

Informations | Edition des Paramètres | Partitions

entrepot1

Pack storage

Cache

Informations principales

Type	Entrepôt de packs sur disque
Etat	En service
Disponibilité	Normale
Statut	Normal
Nombre de partitions	14
Taille de l'entrepôt	26,86 To
Volume utilisé	78,12 %

Informations sur les conteneurs

Nombre total de conteneurs créés	880128
Taille d'un conteneur	32 Mo
Nombre de conteneurs utilisés	687591
Nombre de conteneurs en cours d'utilisation	0

Domaines

- Circle
 - obspm
 - asimov
 - Archives-amplus
 - Archives-babel
 - Archives-cluster
 - Archives-imcce
 - Archives-kronos
 - Archives-kronos2
 - Archives-vo
 - entrepot1
 - Pack
 - thot-m
 - entrepot1
- Gestionnaire de verrous

Classes de Service

Annuaire

NAS

Médias Amovibles

Cont
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How

- Domaines
- Classes de Service
- Annuaire
- NAS
- Services de Fichiers
 - Partages
 - amplus
 - babel
 - backupcm
 - cluster
 - comm
 - kronos
 - kronos2
 - sifac
 - swaves
 - testdd
 - vo
 - Serveurs
 - obspm
 - HA Cluster Services
- Médias Amovibles

Informations | Edition des Paramètres | Contrôles d'Accès | Cellules | Historisation | Quotas |

VO
Donnees VO

Gestion des Classes de Service

Cellule gérant les COS Cellule de traitement

Etat du partage sur la cellule

Mode

Statut de la Classe de Service des Données

Classe de service des données

Fichiers atteints

Fichiers non atteints

Statut de la

Classe de serv

Fi

Fichier

Quotas

Volume actuel de données

Nombre actuel de fichiers

Seuil maximum en Go

Seuil maximum en nombre de fichiers

Paramètres

Activer l'audit

Activer la planification de réplication

Activer la gestion de verrous distribués

Admin interface

Fichier Fenêtre Administration Supervision Configuration

vo

Informations \ Edition des Paramètres \ Contrôles d'Accès \ Cellules \ Historisation \ Quotas \ Archives \

Dernière mise à jour : 22 mai 2009 11:56:35

Information

Archives Fichiers archivés
 Réussies Volume

Nom	Etat	Phase	Statut	Date de Création ▲	Durée	Volume	Fichiers A...	Fichiers n...	Emplacement
Archive:vo#0	Interrom...	-	Incom...	26 février 2009 17:...	0:02:11:...	39,95 G...	73080	126920	Archives-vo
Archive:vo#6	Réussi	-	Compl...	27 février 2009 13:...	0:02:36:...	109,58 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	27 février 2009 16:...	0:02:39:...	109,06 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	27 février 2009 18:...	0:03:47:...	108,38 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	27 février 2009 22:...	0:02:32:...	110,97 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	28 février 2009 01:...	0:02:33:...	111,58 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	28 février 2009 03:...	0:20:45:...	3,51 To	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	1 mars 2009 00:25:...	0:21:59:...	3,99 To	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	1 mars 2009 22:24:...	0:02:50:...	121,44 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	2 mars 2009 01:15:...	0:03:17:...	123,02 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	2 mars 2009 04:33:...	0:03:48:...	124,49 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	2 mars 2009 08:22:...	0:04:18:...	124,97 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	2 mars 2009 12:40:...	0:03:31:...	123,88 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	2 mars 2009 16:12:...	0:02:47:...	124,05 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	2 mars 2009 19:00:...	0:03:00:...	125,19 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	2 mars 2009 22:01:...	0:02:51:...	124,89 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	3 mars 2009 00:52:...	0:03:03:...	123,23 ...	200000	0	Archives-vo
Archive:vo...	Durée ma...	-	Incom...	3 mars 2009 03:56:...	0:03:33:...	99,88 G...	164853	35147	Archives-vo
Archive:vo...	Réussi	-	Compl...	3 mars 2009 12:45:...	0:02:00:...	119,86 ...	200000	0	Archives-vo
Archive:vo...	Réussi	-	Compl...	3 mars 2009 14:46:...	0:02:02:...	121,01 ...	200000	0	Archives-vo

Services de Fichiers

- Partages
 - amplus
 - babel
 - backupcm
 - cluster
 - comm
 - kronos
 - kronos2
 - sifac
 - testdd
 - vo
- Serveurs
- HA Cluster Services

Médias Amovibles



- Domaines
- Classes de Service
- Annuaire
- NAS
- Médias Amovibles

- Pools de Médias
 - Archives-amplus
 - Archives-babel
 - Archives-cluster
 - Archives-imcce
 - Archives-kronos
 - Archives-kronos2
 - Archives-vo
 - Pack
 - Pool de Médias de Nettoyage
 - Pool de Médias de Type Inconnu
 - Pool de Médias Non Affectés
 - Pool de Médias Vierges

Informations \ Edition des Paramètres \ Médias Amovibles \ Cellules

Information

Nombre de médias : 6 Volume écrit : 1,77 To

Capacité : 4,62 To Volume utilisé : 2,25 To

Retirer Supprimer

Nom	Code Barre	Type d...	Capacité	Volume Ecrit	Volume ...	Clôt...	Pleine	Emplacement
Archives-cluster-10	DLM842L4	LTO-4	776,47 ...	32,95 % - 255,86 Go	308,47 ...	Oui	Non	asimov - Library 0 - Slo...
Archives-cluster-11	DLM841L4	LTO-4	776,47 ...	99,99 % - 776,39 Go	1 To	Oui	Oui	asimov - Library 0 - Slo...
Archives-cluster-12	DLM816L4	LTO-4	776,47 ...	99,99 % - 776,41 Go	963,83 ...	Oui	Oui	asimov - Library 0 - Slo...
Archives-cluster-13	DLM838L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slo...
Archives-cluster-14	DLM840L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slo...
Archives-cluster-15	DLM814L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slo...

Conte
Active
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Information

Nombre de médias 25 Volume écrit 8,86 To
 Capacité 19,26 To Volume utilisé 10,25 To

Retirer Supprimer

Nom ▲	Code Barre	Type de mé...	Capacité	Volume Ecrit	Volume Utilisé	Clôturée	Pleine	Emplacement
Archives-vo-0	DLM812L4	LTO-4	776,47 Go	99,93 % - 775,96 Go	963,34 Go	Oui	Oui	asimov - Library 0 - Slot 1002
Archives-vo-1	DLM804L4	LTO-4	776,47 Go	99,88 % - 775,52 Go	785,79 Go	Oui	Oui	asimov - Library 0 - Slot 1006
Archives-vo-10	DLM810L4	LTO-4	776,47 Go	69,44 % - 539,18 Go	567,6 Go	Oui	Non	asimov - Library 0 - Slot 1014
Archives-vo-11	DLM820L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slot 101C
Archives-vo-12	DLM826L4	LTO-4	776,47 Go	99,81 % - 774,98 Go	982,66 Go	Oui	Oui	asimov - Library 0 - Slot 1021
Archives-vo-13	DLM801L4	LTO-4	776,47 Go	99,89 % - 775,62 Go	969,42 Go	Oui	Oui	asimov - Library 0 - Slot 1003
Archives-vo-14	DLM846L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slot 1041
Archives-vo-15	AFJ836L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Mailbox .
Archives-vo-1 Média amovible	AFJ833L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slot 1004
Archives-vo-17	AFJ833L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slot 1043
Archives-vo-18	DLM824L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slot 1003
Archives-vo-19	AFJ835L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Mailbox .
Archives-vo-2	DLM819L4	LTO-4	776,47 Go	99,82 % - 775,07 Go	785,21 Go	Oui	Oui	asimov - Library 0 - Slot 1005
Archives-vo-20	AFJ834L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Mailbox .
Archives-vo-21	000059L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slot 1044
Archives-vo-22	DLM847L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slot 1005
Archives-vo-23	DLM806L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slot 1002
Archives-vo-24	DLM800L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slot 104C
Archives-vo-3	DLM803L4	LTO-4	776,47 Go	99,91 % - 775,8 Go	1,26 To	Oui	Oui	asimov - Library 0 - Slot 1015
Archives-vo-4	DLM853L4	LTO-4	776,47 Go	99,99 % - 776,37 Go	801,86 Go	Oui	Oui	asimov - Library 0 - Slot 1013
Archives-vo-5	DLM850L4	LTO-4	776,47 Go	99,8 % - 774,93 Go	796,4 Go	Oui	Oui	asimov - Library 0 - Slot 1012
Archives-vo-6	DLM805L4	LTO-4	800 Go	0 % - 0 Octets	0 Octets	Non	Non	asimov - Library 0 - Slot 1039
Archives-vo-7	DLM852L4	LTO-4	776,47 Go	99,99 % - 776,39 Go	817,32 Go	Oui	Oui	asimov - Library 0 - Slot 1009
Archives-vo-8	DLM851L4	LTO-4	776,47 Go	99,95 % - 776,09 Go	949,95 Go	Oui	Oui	asimov - Library 0 - Slot 1018
Archives-vo-9	DLM825L4	LTO-4	776,47 Go	100 % - 776,46 Go	789,53 Go	Oui	Oui	asimov - Library 0 - Slot 102C

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- kronos
- kronos2
- vo
- Médias de Nettoyage
- Médias de Type Inconnu
- Médias Non Affectés
- Médias Vierges