



DATAALTECH

Dataaltech EDM

The Golden Sources Manager



CONSORTIUM SHARE NETWORKS



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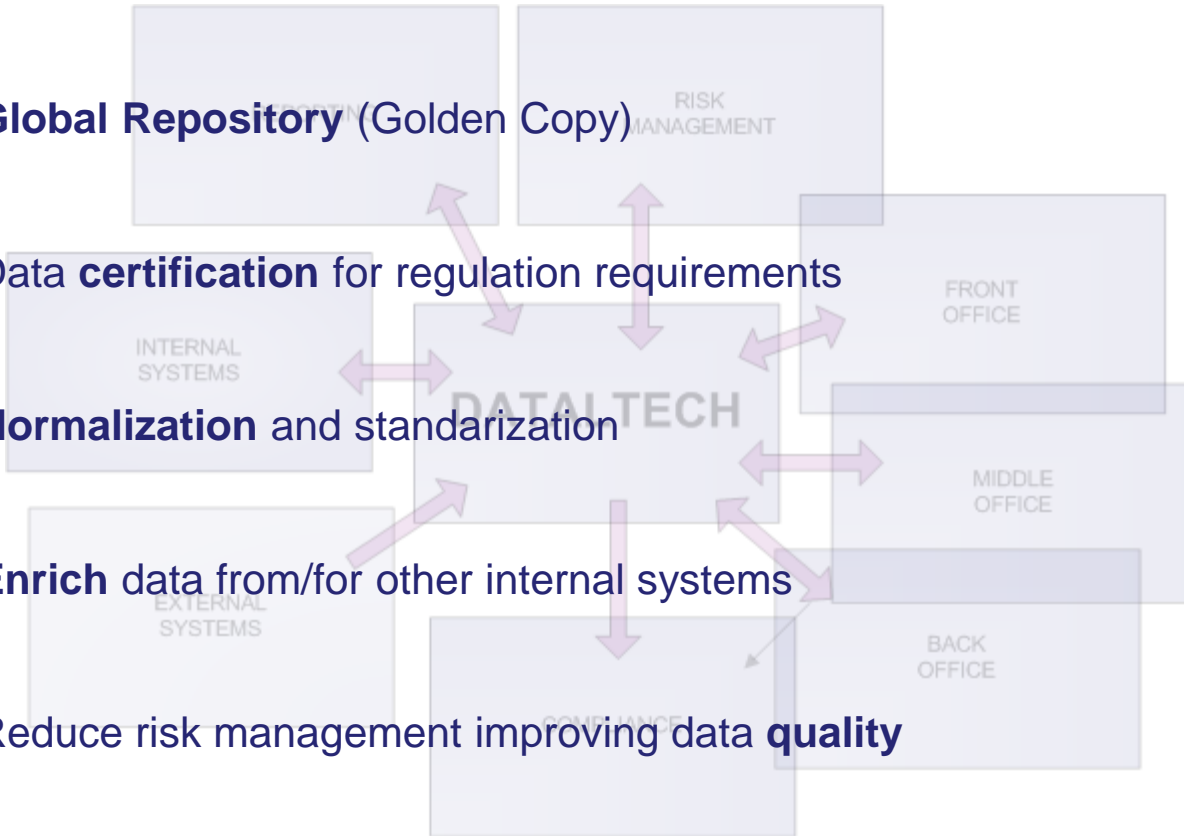
General Features

Process Management
Software Components
Library Management
Services and Grid Control
Annexes

DATALTECH

Why Dataltech?

- **Global Repository (Golden Copy)**
- **Data certification** for regulation requirements
- **Normalization** and standarization
- **Enrich** data from/for other internal systems
- Reduce risk management improving data **quality**





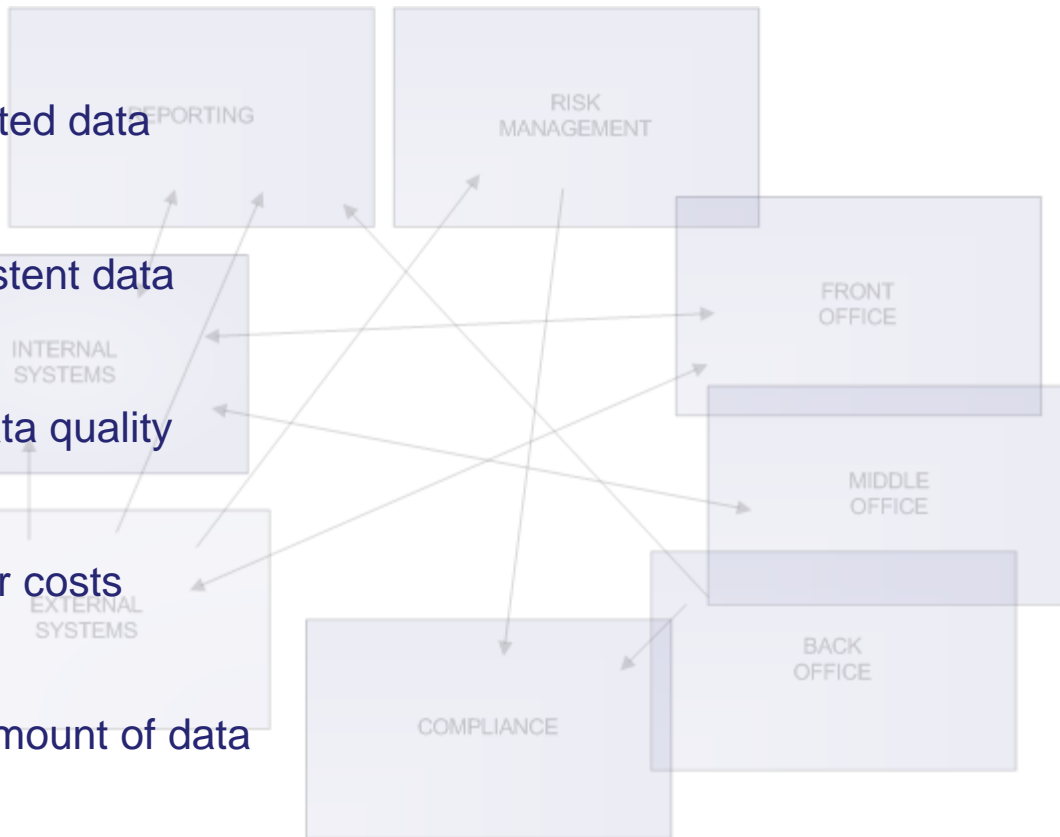
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Common Scene

- Distributed data
- Inconsistent data
- Poor data quality
- Provider costs
- Huge amount of data





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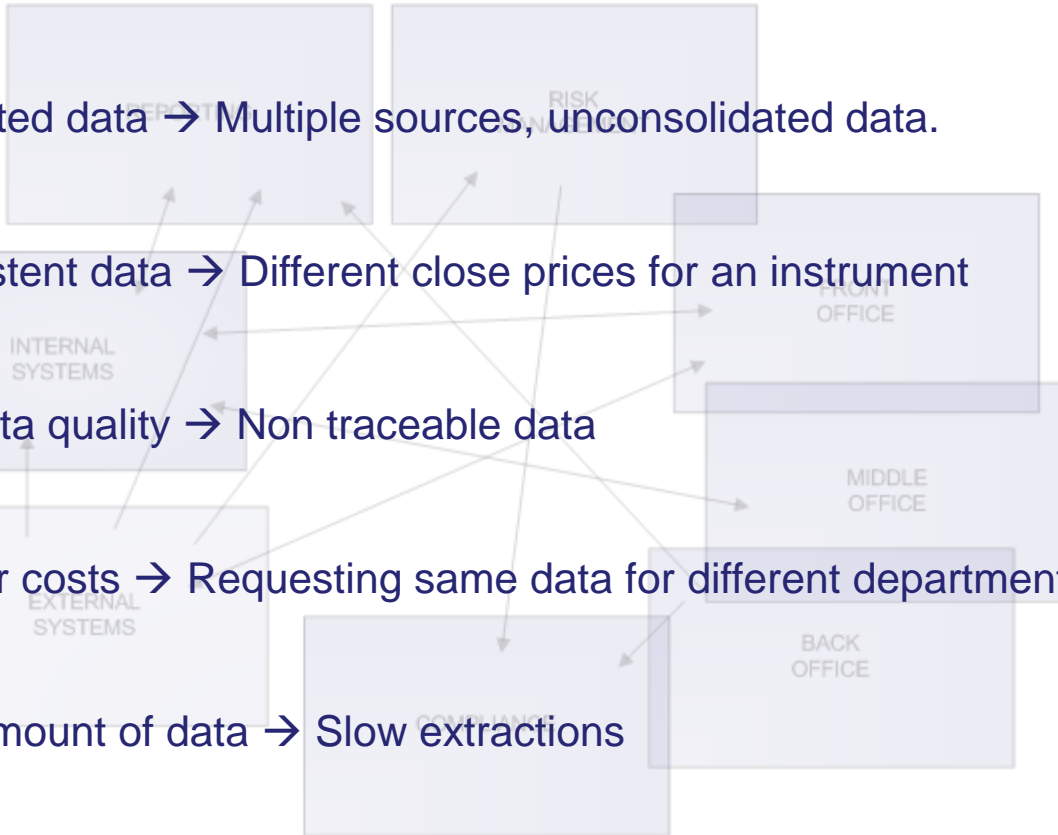
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Common Scene

- Distributed data → Multiple sources, unconsolidated data.
- Inconsistent data → Different close prices for an instrument
- Poor data quality → Non traceable data
- Provider costs → Requesting same data for different departments
- Huge amount of data → Slow extractions





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What makes Dataltech different?

- Huge amount of data management and storage (> 10 years).
- **Snapshot** system.
- Data **tracking**.
- Seamless integration.



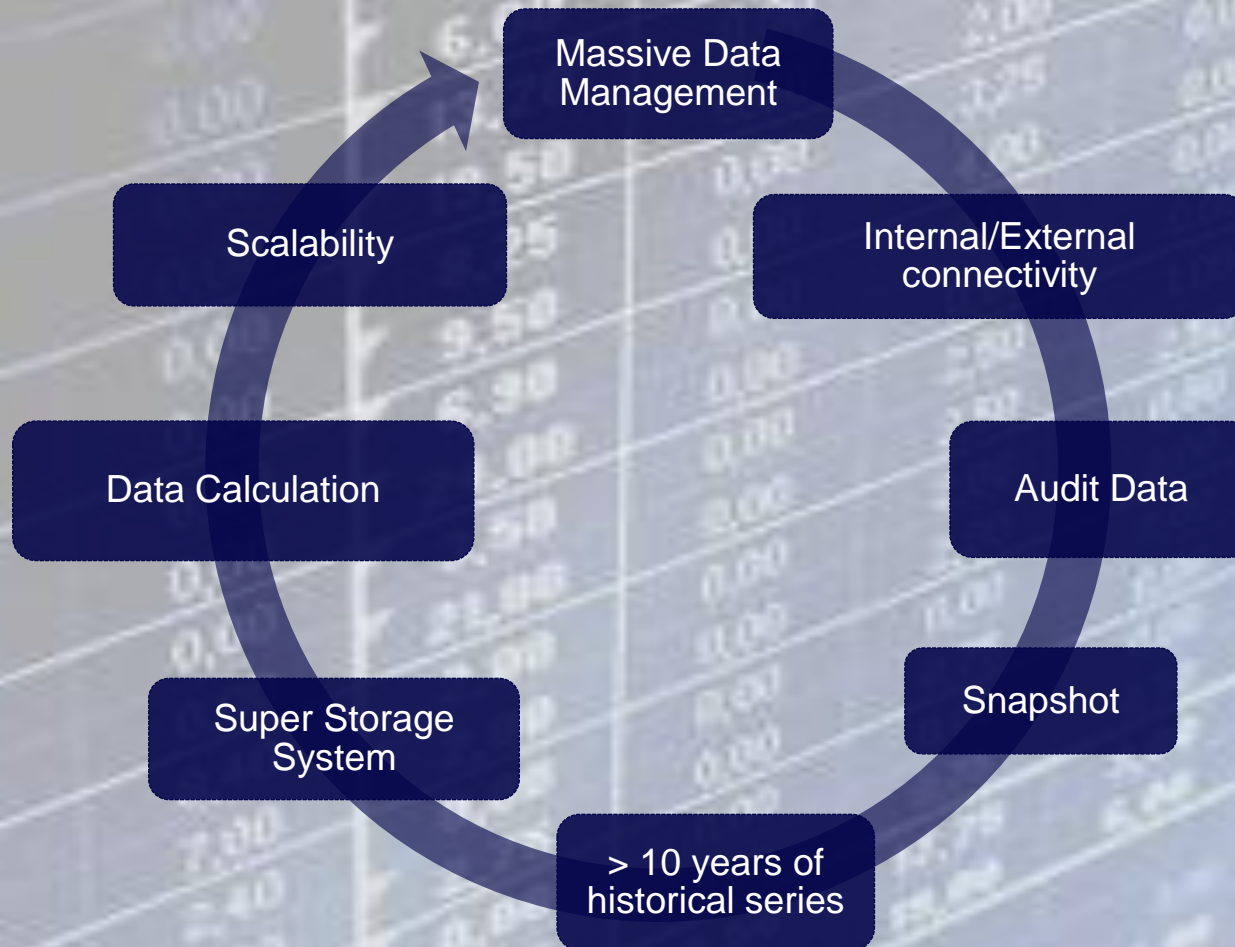


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Massive Data Management

- Single data repository
- Capture and distribution of data.
- Data normalization.
- Data consolidation from multiple data feed.
- Connectivity to external and internal systems.
- Massive storage and management.
- Management of historical series greater than 10 years.
- Support for list with a huge amount of securities.
- Fast ETL workflow.





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Data Distribution

- Translation codes (internal id \leftrightarrow external id):
 - Object identifiers (ie: security id).
 - Attribute identifiers.
- Visual exportation based on plain files (CSV, XML)
- Generation of customized distribution files:
 - Scheduled distributions.
 - Binary-proprietary generation files.
 - Encryption.





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Traceability

- Data:
 - Source data and normalization applied.
 - Business rules applied.
 - User modifications.
 - Annotations.
- Operative:
 - Workflows and processes.
 - Access audit trail.
 - Others.





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Audit System

- Based on snapshot system:
 - Historic re-runs.
 - Data recovery.
 - Modification traceability.
- Present for all the operatives:
 - Data management.
 - Business rules modifications.
 - Libraries uploads.
 - Configurations.





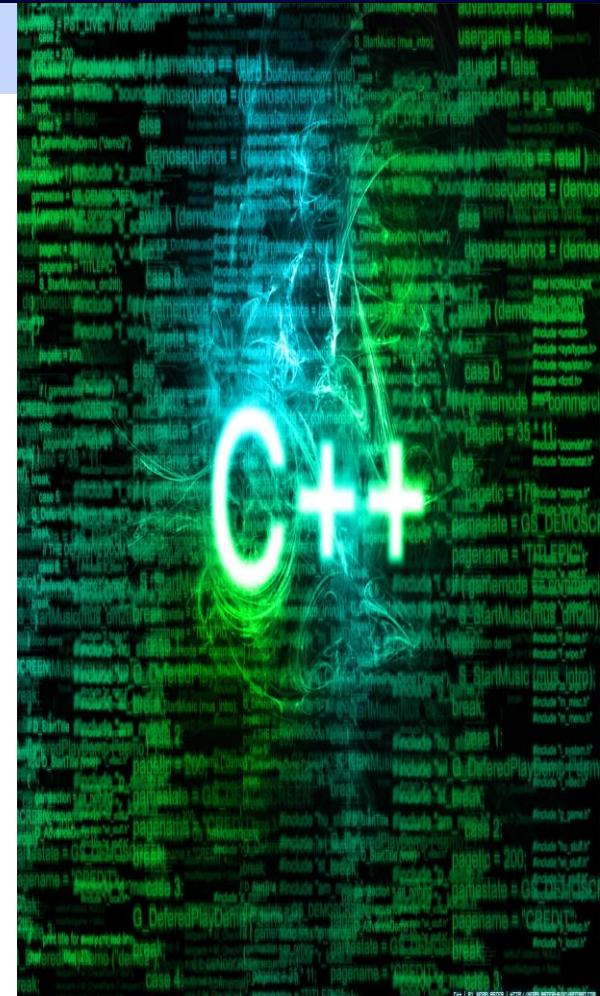
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Library Management

- Allows:
 - Business logic rules customization/integration.
 - Automate tasks.
 - Perform calculations.
- Advantages:
 - Can store native code (fast).
 - Allows scriptable code.
 - Libraries loaded on demand.
 - Library version management.





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Scalability

- Designed to satisfy the requirements of the user requirements growth.
- Optimized for TIER-2 or TIER-3 entities but for TIER-1 as well.
- Grid ready technology.





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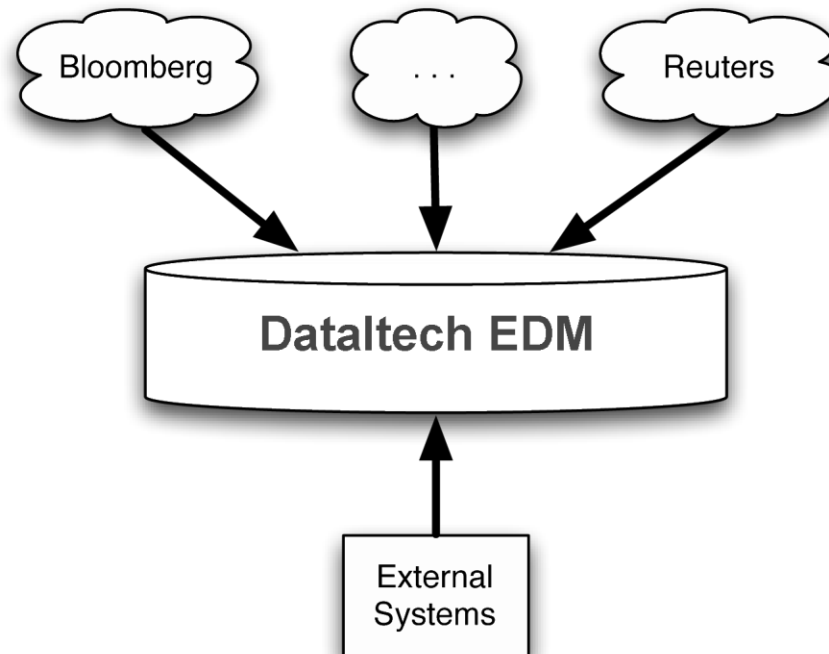
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Datahub

Connectivity integration to external and internal systems, allowing consolidation and validation of certified data.





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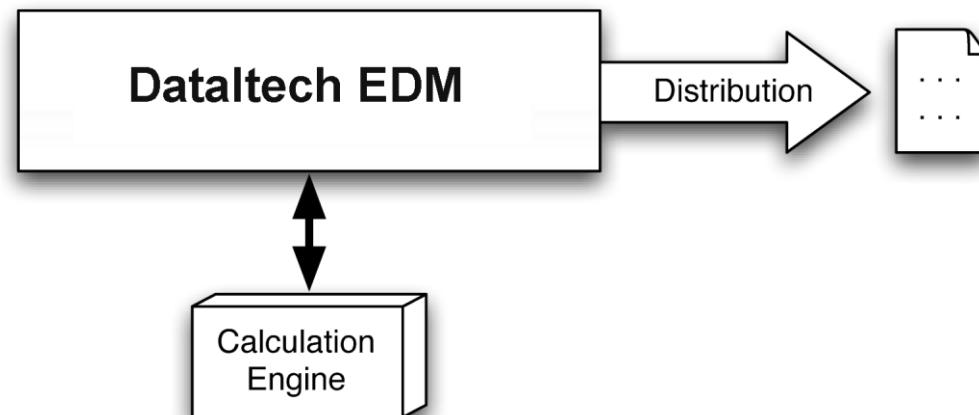
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Calculation Engine

Dataltech allows the enrichment of data using custom calculation within a workflow.





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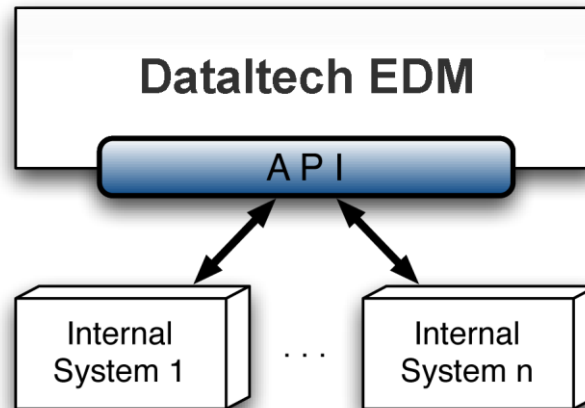
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Development API

Dataltech API allows developers to integrate complex connectors to external/internal systems, calculations, data extraction,...



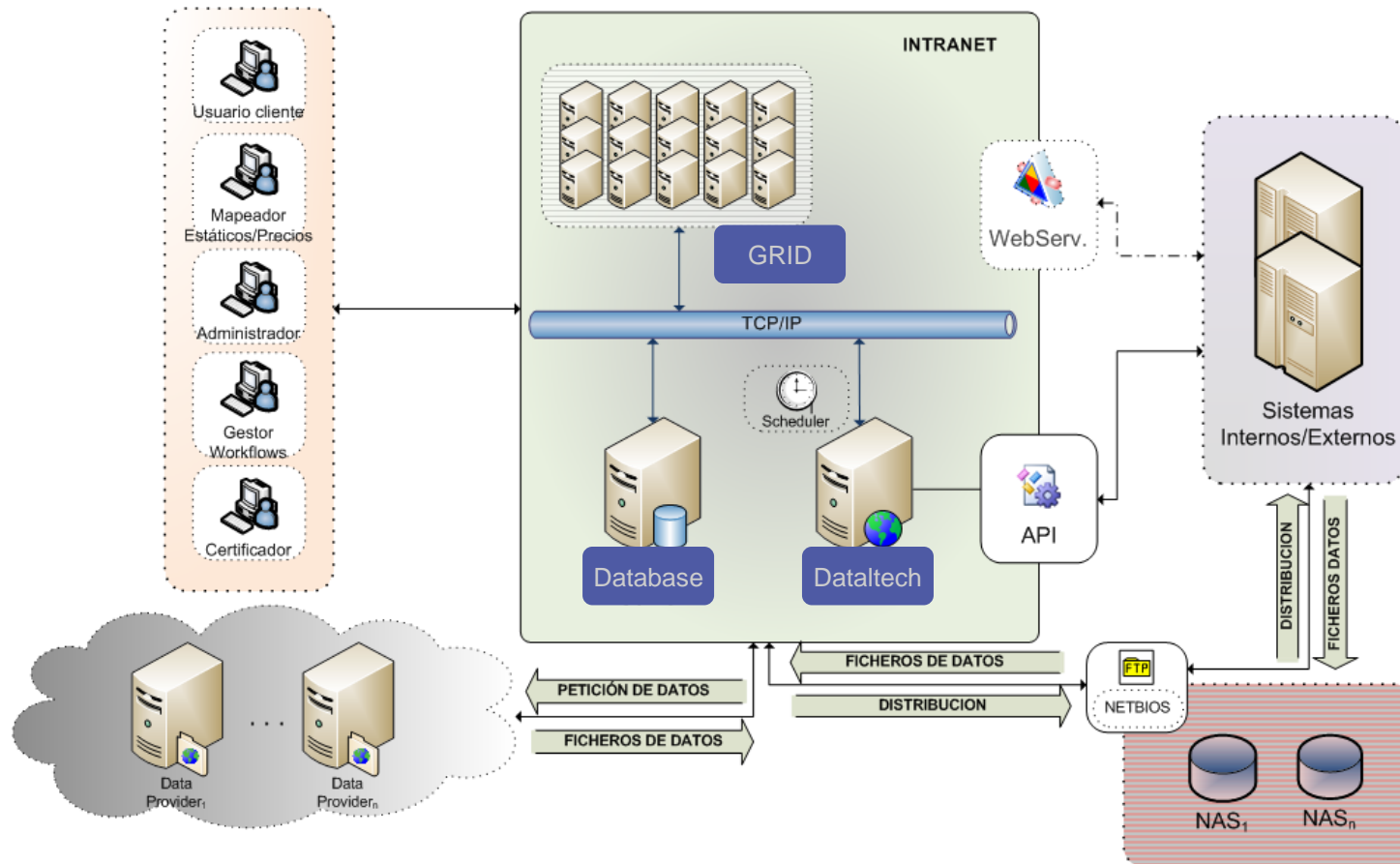


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3 Layers architecture

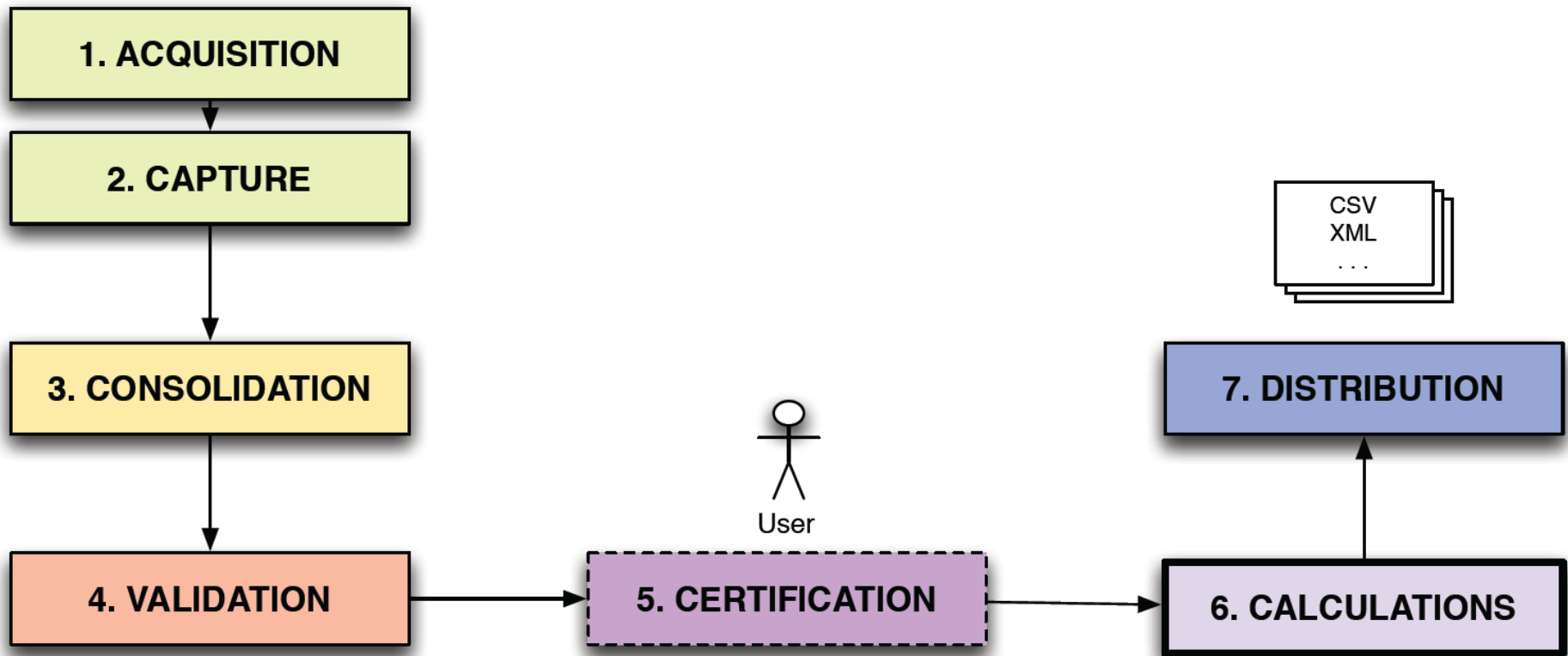




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Workflow



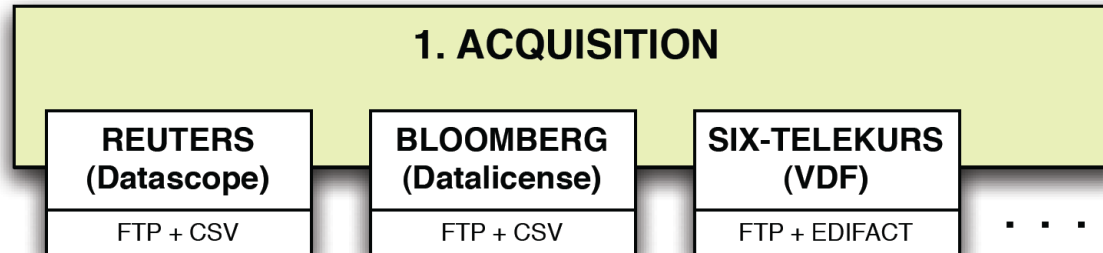


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Workflow: Acquisition

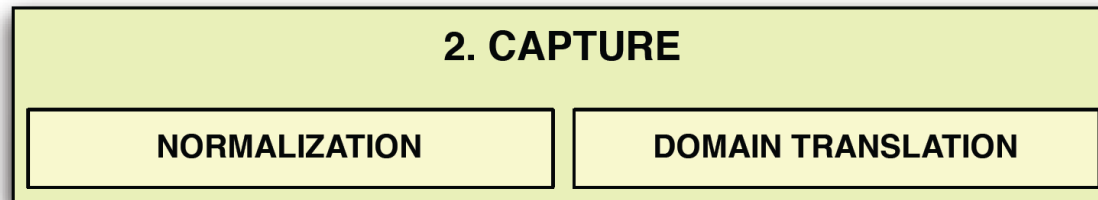
- Retrieve data from internal/external systems.
 - Multiple provider data retrieval.
 - Multiple format natively supported (CSV,...) and protocols supported (FTP, HTTP,...).
 - Possibility to manually import provider files.





Workflow: Capture

- Performs normalization of the data.
- Translation of attribute domain values.
- Capture based on segmented data.

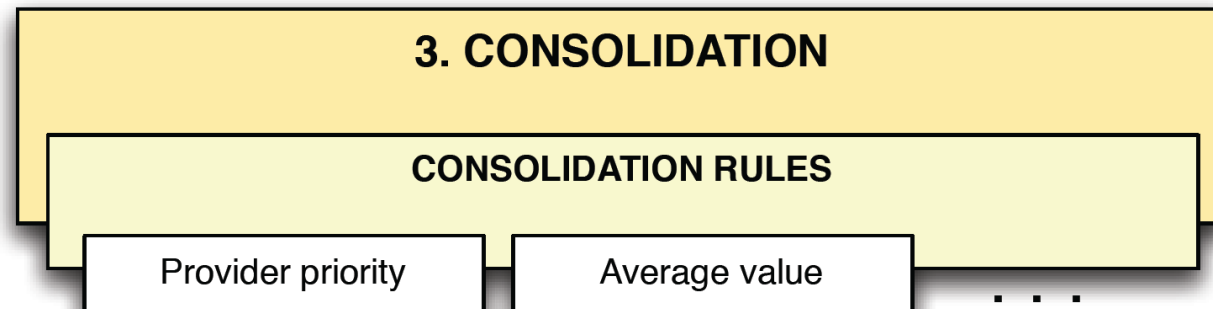




Workflow: Consolidation

Determines the value of an attribute for a multi-feed workflow, based on the users criteria or preferences:

- Performed by consolidation rules.
- One rule can apply for each attribute.
- Traceability is present on the consolidation.





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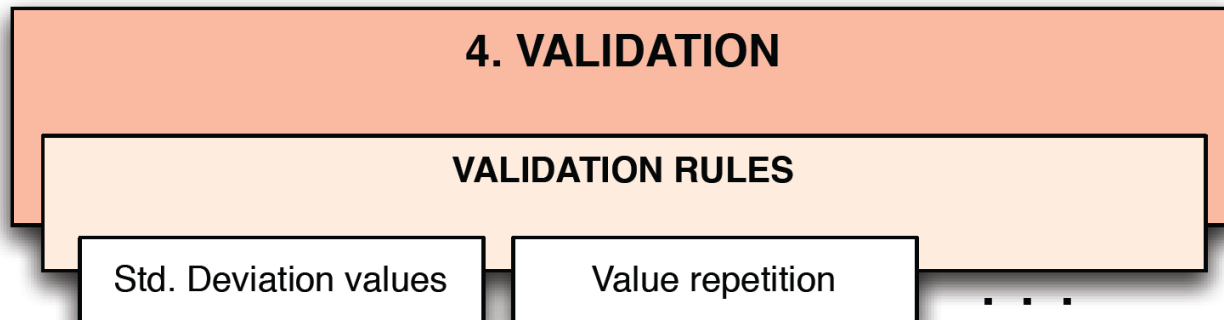
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Workflow: Validation

Provides a set of business rules which will be applied to each attribute to determine suspect erroneous values for a security.

- Performed by validation rules.
- Many rules can match one single attribute.
- Traceability for each rule applied.





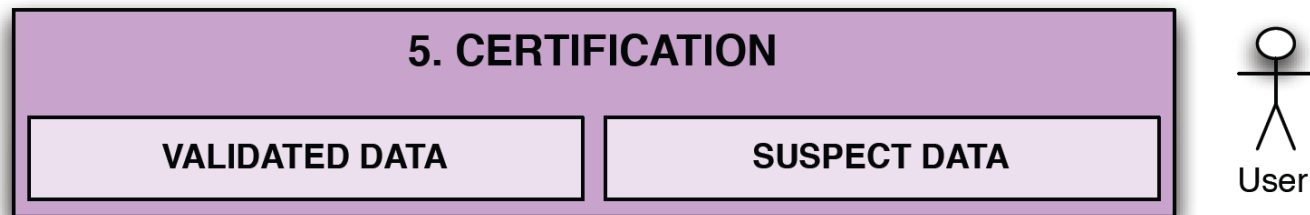
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Workflow Certification

Manual user process, which allows to certify or modify the suspect data detected on the previous stages of the workflow

- Certification alarm system.
- Visual information.
- Classification of the suspect data by type.
- Allows the certifier to modify or add annotations to the data.





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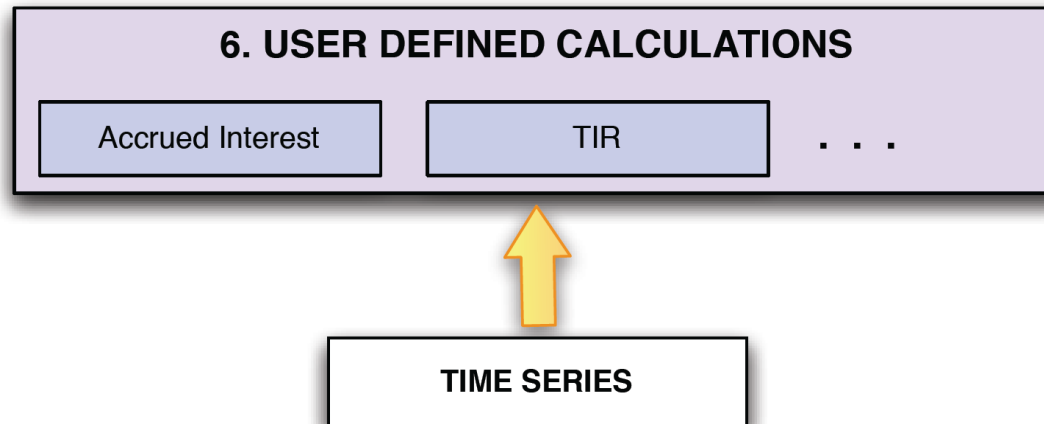
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Workflow: Cálculos, variables no observables.

Workflow: Calculations

Can be selected for securities on a workflow, and can be developed/customized by the user.

- General: historical volatility, spreads,...
- Equities: Beta,...
- Bond: IRR, convexity,...
- Options: Black-Scholes,...

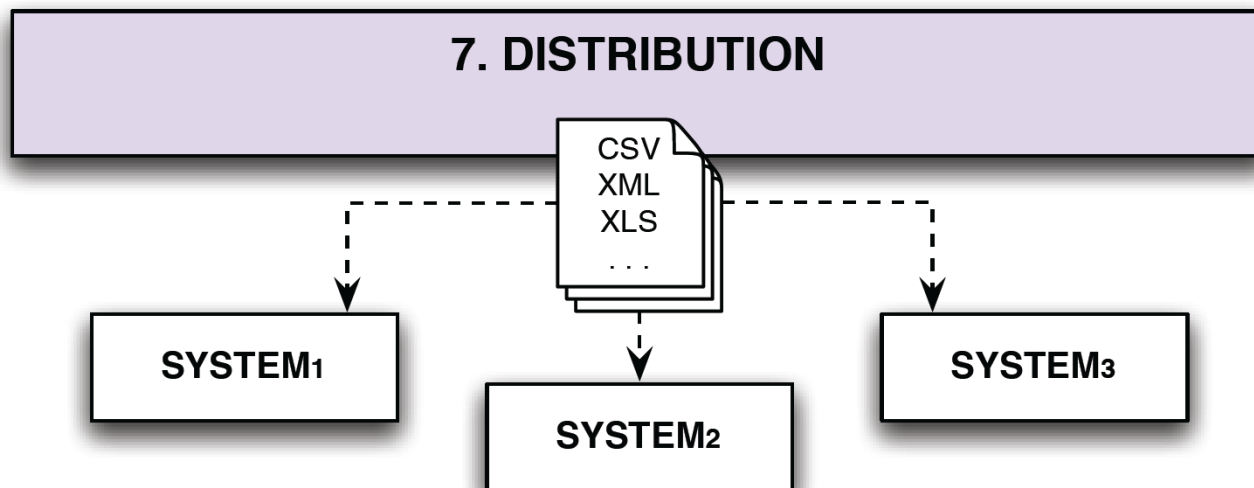




Workflow: Distribution

Allows extraction and send of information to other systems or recipients.

- Customized by distribution rules.
- Translation codes are supported.
- Standard or customized formats are allowed.



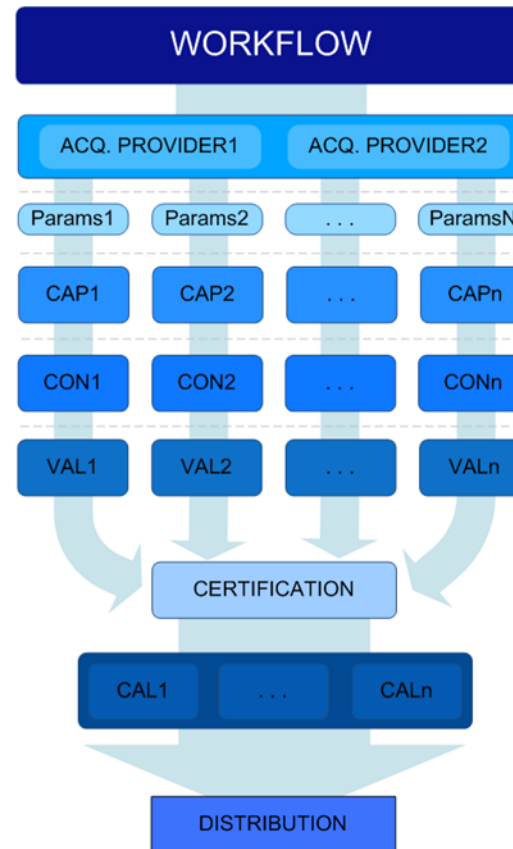
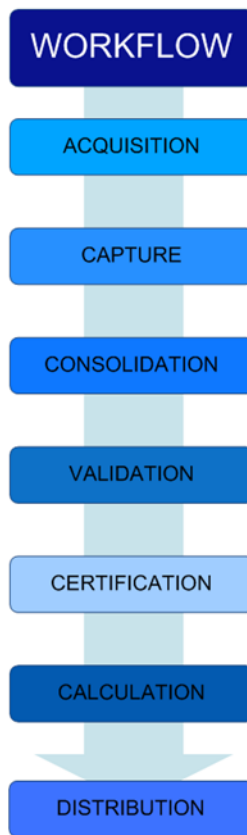


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Workflow Paralellization.





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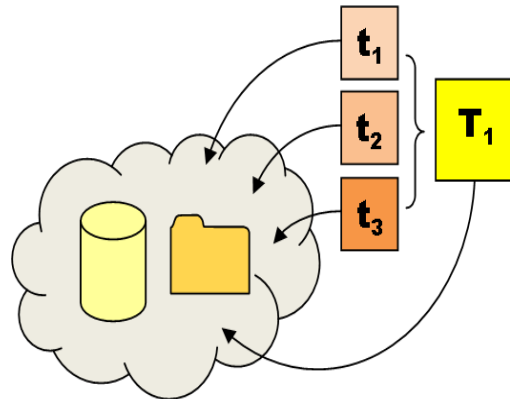
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Workflow: Paralellization, Task Manager

For huge workflow lists, a paralellization plan of the workflow is created, allowing the concurrent execution of:

- Tasks.
- Microtasks.

This paralellization allows the use of clusters.





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Software Components

Dataltech EDM is a composition of services:

- Scheduler: which allows the executions of tasks.
- Runtime: Workflow execution, rule matcher, . . .
- GUI: administration and management of the system.
- OpenAPI: allow the creation of customized applications which interact with Dataltech.





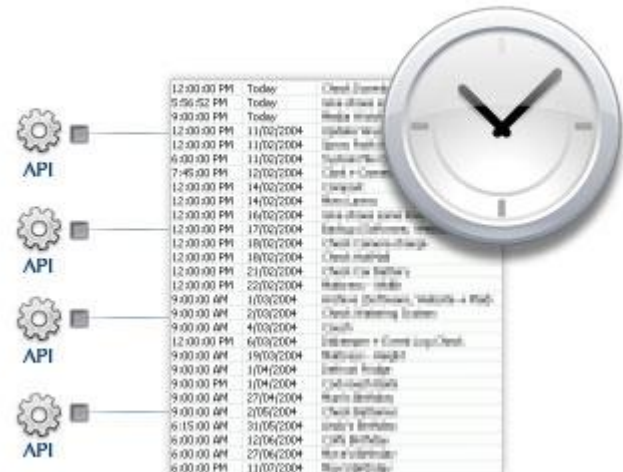
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Scheduler

Executes scheduled tasks:

- Indicated when a workflow should be launched.
- Service oriented, can be replace by other corporative solutions..





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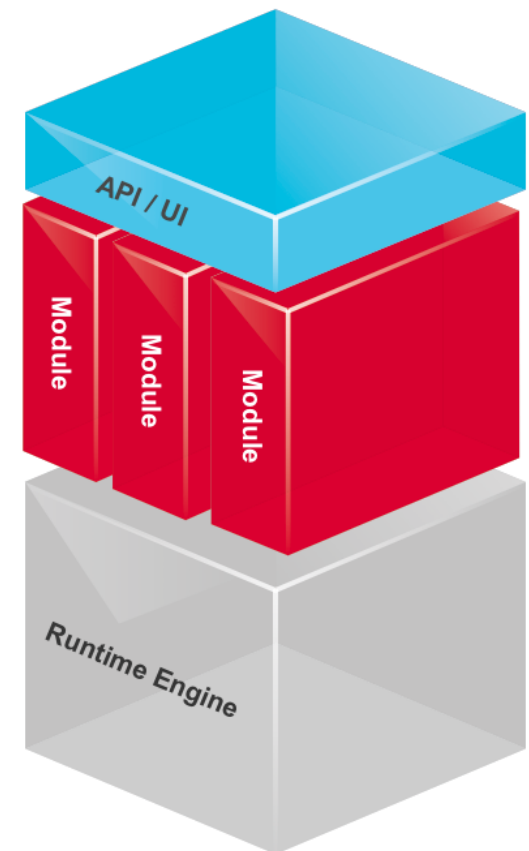
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Runtime Engine

Executes a workflow and the matching of the business rules. Although it can be manually launched, the normal behaviour is the scheduling of a workflow.

- Parallellizes the operative of ordinary workflows (acquisitions, validations...), segmenting the information.
- Allows distributed segments processing.
- Ruled by the snapshot.





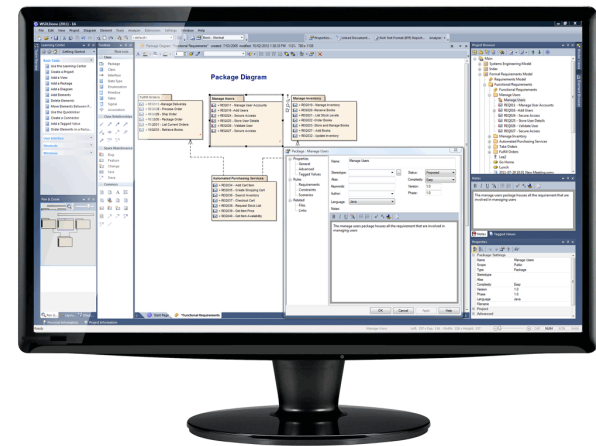
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Graphical User Interface.

The included graphical interface allows the management of the configuration and the operatives, and provides:

- Multi-language support.
- Multiple units, branches and users are supported.
- Transactional interface.
- Customization.





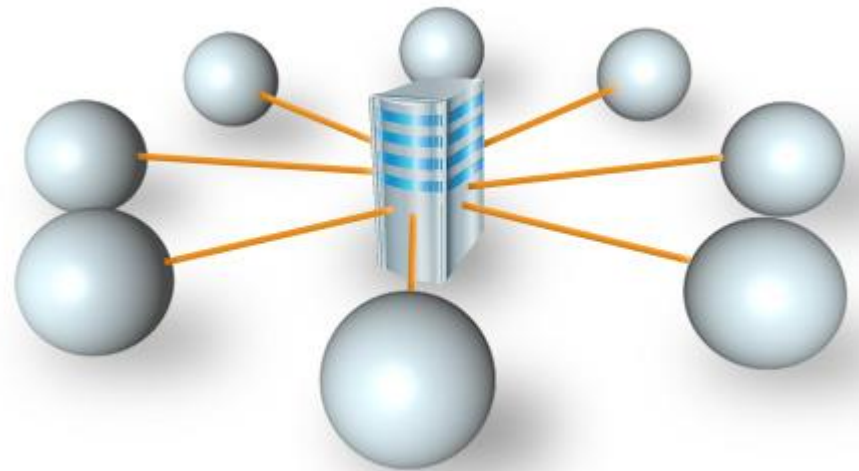
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HUB

Coordination agent among all physic elements with this feature:

- Provides on-demand to each client machine an available resource that has less load at any time.
- Allows several high-availability configurations.





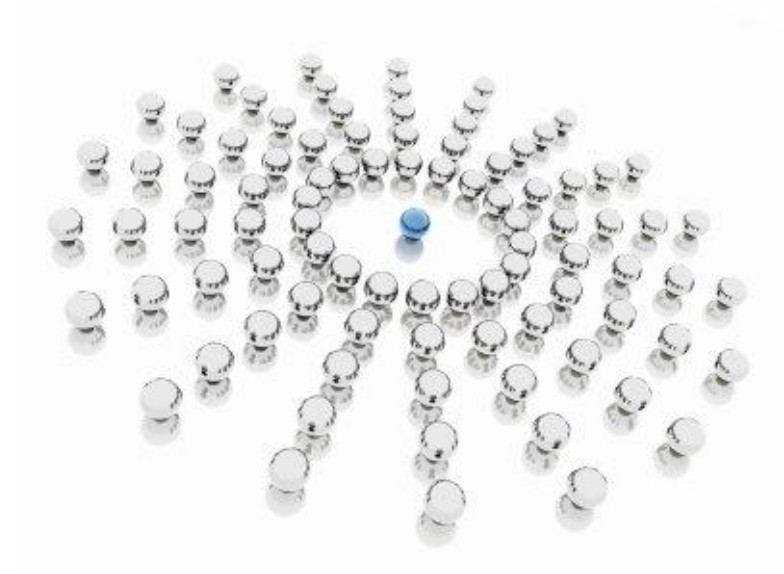
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Broker

Main purpose:

- Ensure the execution of each task.
- Distribution of tasks and microtasks among the available nodes in the Grid.
- It monitors the state of completion of the execution of each microtask on each node.





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Libraries

Allows the storage and management of rules and customized calculations:

- C++ syntax with helpers.
- Possibility to use different libraries per branch.
- Snapshot rules the libraries, allowing to reproduce past situations.
- Several libraries can be used on a single Workflow.

The developer will have an environment designed for helping in the development of new rules and calculations.



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Libraries

Dataltech EDM allows 4 kind of rules:

- Consolidation rules.
- Validation rules.
- Distribution rules.
- Certification rules.

New calculations can also be incorporated to the calculation engine, taking advantage of:

- Hardware: native code.
- Software: allowing the incorporation of third-party libraries.



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Business Rules

- Requires the development of an exportation function on a DLL.
- Can use the alert system to inform about an error or an anomaly.
- Can use the API for distributing the data.
- Allows translation codes.
- Encryption support.
- Accelerated by calculation precache.





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1

Calculation Enrich

- Based on a object oriented framework, using inheritance of other classes.
- Can make use of external libraries (ie: pricers,...).
- Access to both, workflow data and historical series from the repository.
- Acceso total a los datos, tanto de workflow como de histórico.

$$n = \frac{\ln(\sin(\beta_1)) - \ln(\sin(\beta_2))}{\ln(\text{tg}(\beta_1)) - \ln(\text{tg}(\beta_2))}$$

$$c = \frac{\sin(\beta_1)}{n \times \left(\text{tg}\left(\frac{\beta_1}{2}\right) \right)^n}$$

$$p = c \times \left(\text{tg}\left(\frac{\frac{\pi}{2} - \varphi}{2}\right) \right)^n$$

$$x = \frac{p}{\sin(n \times \lambda)}$$

$$y = -\frac{p}{\cos(n \times \lambda)}$$



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2

Calculations

Developers can make use of all the C++ API, and also having some helpers for the access to data.

It is allowed the use of different modes of data access:

- Cached data.
- Direct access.

Different ways of variables encoding are allowed :

- Direct codes.
- References.

$$n = \frac{\ln(\sin(\beta_1)) - \ln(\sin(\beta_2))}{\ln(\operatorname{tg}(\beta_1)) - \ln(\operatorname{tg}(\beta_2))}$$

$$c = \frac{\sin(\beta_1)}{n \times \left(\operatorname{tg}\left(\frac{\beta_1}{2}\right) \right)^n}$$

$$p = c \times \left(\operatorname{tg}\left(\frac{\pi/2 - \varphi}{2}\right) \right)^n$$

$$x = \frac{p}{\sin(n \times \lambda)}$$

$$y = -\frac{p}{\cos(n \times \lambda)}$$



Implementation

```
1  #i n c l u d e "HVCCalcAlgorithms . h"  
2  #i n c l u d e " cCalculation .h"  
3  
4  class HVC CALCALGORITHMS DLL cHistoricalVolatility : public cCalculation  
5  {  
6      public:  
7  
8      cHistoricalVolatility( cParams pParams ) ;  
9      ~cHistoricalVolatility ( void ) ;  
10  
11     virtual BOOL getDependencies ( cCachedDataAPI pDependencies ) ;  
12  
13     protected:  
14  
15     VcTimeSerie history;  
16     double daily volatility , week volatility , monthvolatilit y , yearvolatility ;  
17  
18     bool prerequisites( ) ;  
19     bool requisites( ) ;  
20     bool calculate( ) ;  
21     void storeResults( ) ;  
22 }
```



Implementation

```
1      #i n c l u d e "HVCRules . h"
2      #i n c l u d e "cHistoricalVolatility.h"
3
4      HVC CALCULATIONS createHistVolatility ( cParams pParams )
5      {
6          cHistoricalVolatility hv = new cHistoricalVolatility ( pParams ) ;
7          return hv ;
8      }
9
1     HVC CALCULATIONS deleteHistVolatility ( void calc )
2     {
3         if ( calc )
4         {
5             cHistoricalVolatility hv = ( cHistoricalVolatility ) calc ;
6             delete hv ;
7             calc = 0 ;
8         }
9         return calc ;
10    }
```



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OpenAPI

Application Interconnectivity:

- OpenAPI for Java + JMS, C++, Python, .NET,...

Administration Services:

- Command Line Interface (CLI)

Batch and scripting:

- Scripting Python, Java, C++

Thirdparty integration:

- Excel, Access, in-house applications,...



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OpenAPI : Tipos

OpenAPI Protocol (OAP):

- Provides universal integration with software and languages supporting dynamic libraries.
- Based on simple Request-Reply patterns.
- Common access point for all the communications.
- Messages based on **OAS** (OpenAPI Structures).

OpenAPI wrappers:

- Relies on the OAP
- Provides helps depending on the language (Python => list and dict)
- The user can implement wrappers based on specific operatives.



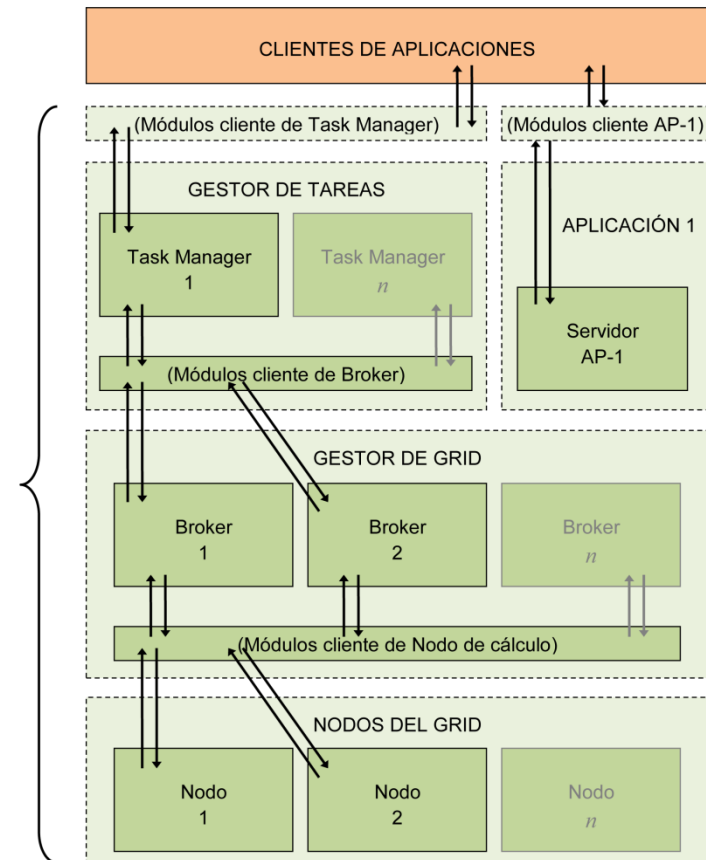
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Services and GRID Control.

Each resource behaves like a client server and at the same time, each server can behave as a client of other resources.





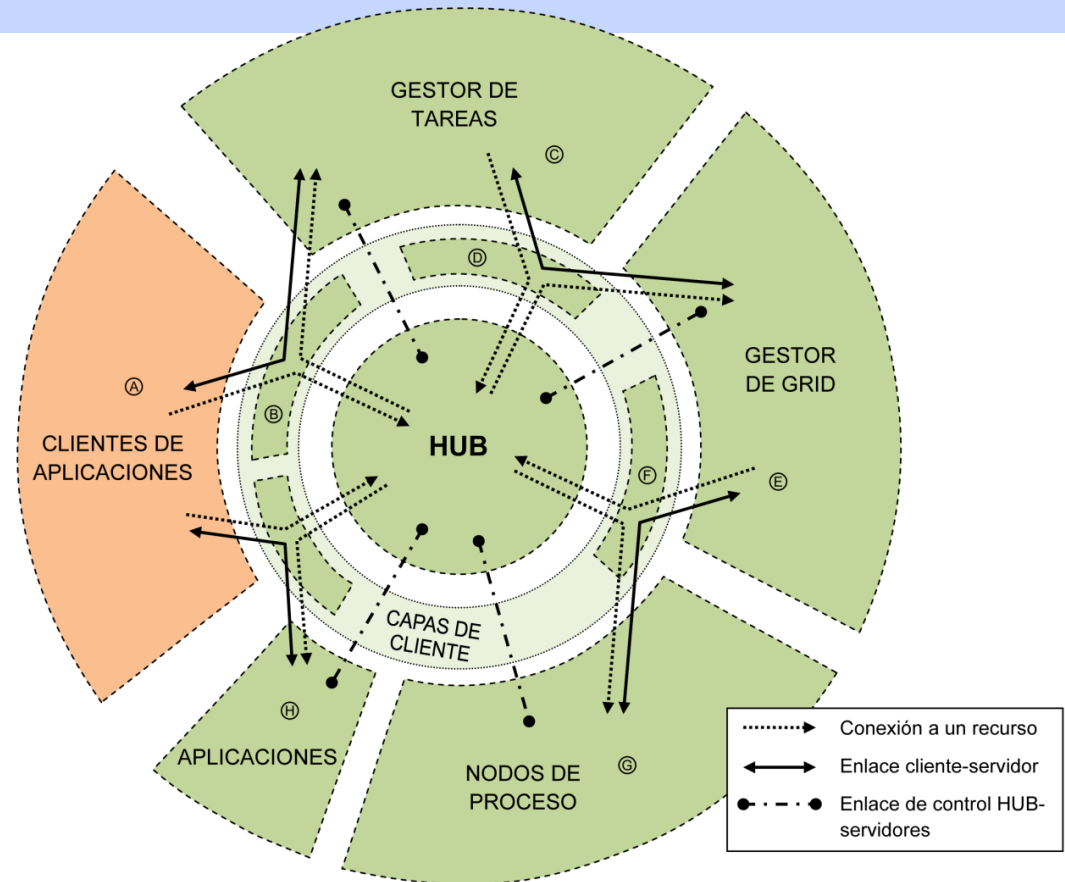
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HUB resources.

- Ⓐ Los programas cliente (de escritorio, *web*, *demonios...*) tienen *tareas* que realizar que van a encomendar a un Gestor de Tareas.
- Ⓑ Un módulo cliente especializado se encarga de solicitar al HUB (que tiene conocimiento del estado de todos los recursos del CSG) un Gestor de Tareas disponible y conecta con éste estableciendo el enlace.
- Ⓒ El Gestor de Tareas fragmenta la tarea encomendada en la cantidad necesaria de *µ*tareas. Para su ejecución requiere de un Gestor de Grid.
- Ⓓ Otro módulo cliente se encarga de solicitar al HUB un Gestor de Grid disponible y conecta con éste estableciendo el enlace entre ambos.
- Ⓔ El Gestor de Tareas encomienda al Gestor de Grid la ejecución de la tarea y éste se encarga de que se ejecuten todas sus *µ*tareas, para lo que necesita Nodos de Proceso y empleará todos los que se le sirvan como disponibles.
- Ⓕ Otro módulo cliente se encarga de solicitar al HUB los Nodos de Proceso que le vaya requiriendo el Gestor de Grid y los pone en contacto.
- Ⓖ Cada Nodo de Proceso ejecuta una *µ*tarea, supervisado por el Gestor de Grid.
- Ⓖ El CSG puede gestionar asimismo otras aplicaciones de idéntica manera.





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Resources control.

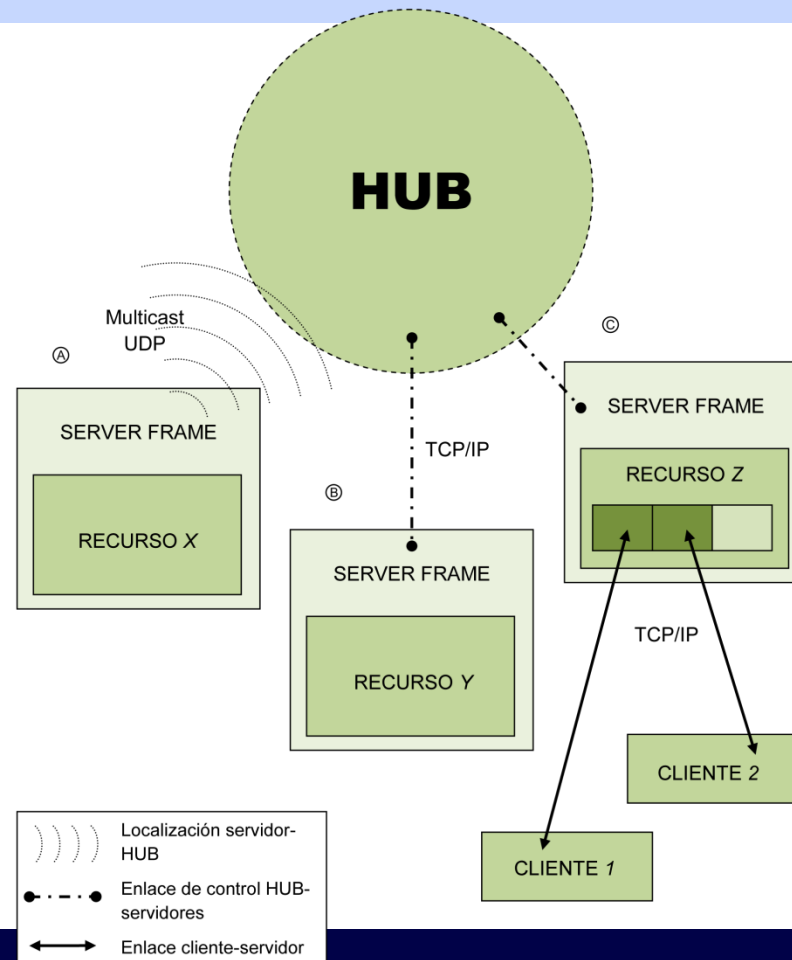
Los recursos del CSG se engloban cada uno en un "marco de servidor" que se encarga de forma transparente de la relación entre el propio recurso y el HUB.

Ⓐ Si un recurso del CSG no está supervisado aún por el HUB, empieza a emitir tramas de llamada por UDP en la red.

Ⓑ Si el HUB recibe una de estas llamadas y puede atender más recursos, se pone en contacto con el recurso que busca al HUB estableciendo con él el enlace de control por TCP/IP, por el cual el HUB tiene conocimiento constantemente del estado de este recurso y de su nivel de ocupación.

Si se pierde este enlace, el HUB deja de supervisar ese recurso y éste empieza de nuevo a intentar localizar al HUB.

Ⓒ Cualquier recurso disponible del CSG y no ocupado al 100% que esté atendido por el HUB puede ser asignado a cualquier módulo cliente que solicite un recurso del tipo dado. Entonces el módulo cliente puede ponerse en contacto con el recurso solicitado por TCP/IP para establecer el enlace cliente-servidor, consumiendo una porción de la disponibilidad total de dicho recurso.





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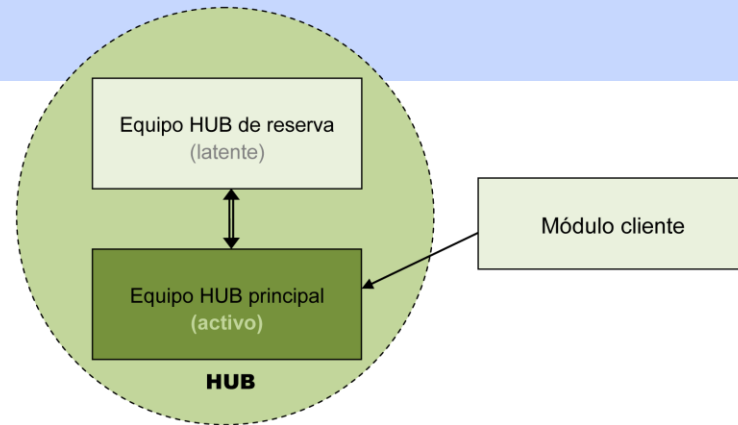
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HUB Active-Pasivo

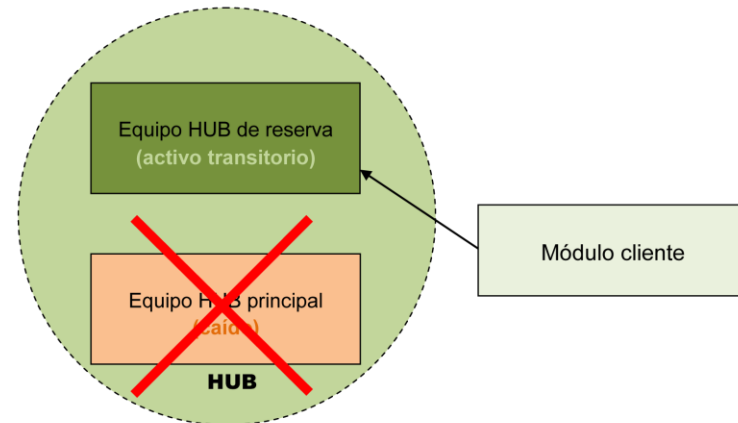
Ⓐ En condiciones normales, los módulos cliente acuden al equipo principal del HUB (“Activo Nominal”) para solicitar un recurso libre que se requiere. El equipo de reserva (“Pasivo”) se encuentra encendido pero en estado latente, y permanentemente sincronizado con el equipo principal. Por tanto, el equipo de reserva puede tomar el relevo del primero en cualquier momento.

Ⓑ En caso de caída del equipo principal, el equipo de reserva pasa del estado latente al de “Activo Transitorio” y toma inmediatamente el relevo. Desde ese momento, los módulos cliente al no poder contactar con el equipo principal acuden al equipo de reserva, de forma totalmente transparente.

Bajo condiciones de fallo saltan las alertas en el monitor del HUB para que la situación sea corregida por el personal de Sistemas lo antes posible.



Ⓐ Condiciones normales



Ⓑ Condiciones de fallo



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DATAALTECH

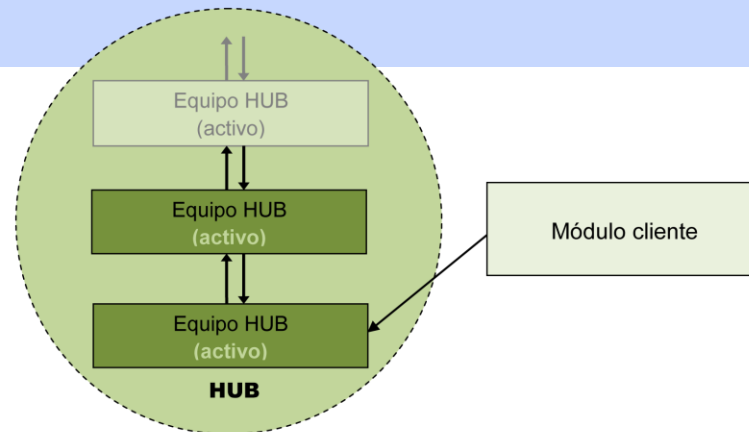
HUB Clúster Activo-Activo

HUB Clúster Activo-Activo.

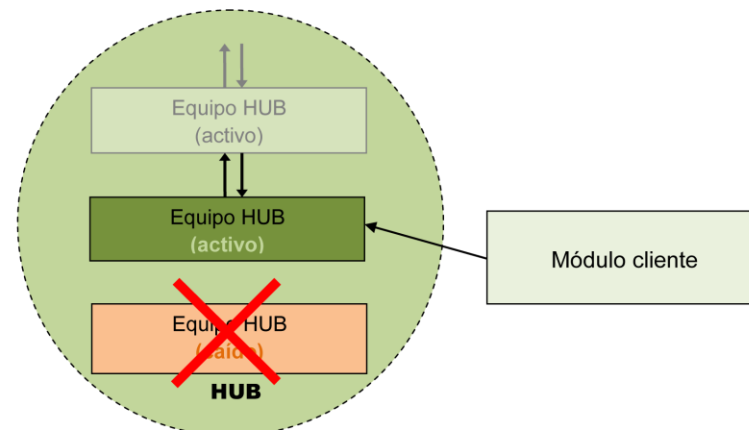
Ⓐ En condiciones normales, todos los equipos HUB del *cluster* se encuentran activos y cada uno supervisa cierta cantidad de recursos. Un módulo cliente usa cualquiera de ellos como proveedor de recursos. Si ese equipo del HUB no tiene disponible un recurso libre del tipo solicitado, consulta al resto de los equipos del HUB para obtener uno y dárselo al módulo cliente que lo solicita.

Ⓑ En caso de caída del equipo HUB al que se conecta un módulo cliente, éste acude a otro equipo HUB en el *cluster* para que le proporcione el recurso que necesita.

Bajo condiciones de fallo saltan las alertas en el monitor del HUB para que la situación sea atendida por el personal de Sistemas, que actuarán en función de la capacidad restante del HUB en su conjunto.



Ⓐ Condiciones normales



Ⓑ Condiciones de fallo



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DATAALTECH

1

Demo: Morningstar.

System:

- 2 Nodes: Intel I3 Hz (4 cores) = 8 Cores
- 8GB RAM each.
- WINDOWS 7 professional 64bits.

Data base:

- Oracle 11g
- Aprox. 140 million price records.
- Más de 3 million reference data records. (statics).



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DATALTECH

2

Demo: Morningstar.

Test data:

- Instruments: 95.000 Funds
- Number of fields: 123 (Prices 73, statics 50)
- Consolidation rules used: 1 ($95.000 \times 73 = 6.935.000$ consolidations)
- Validation rules used: 5 ($95.000 \times 73 \times 5 = 34.675.000$ validations)
- Number of simultaneous process: 8

Timing:

- Params calculations: 525 seg.
- Capturing/Normalisation: 35 seg.
- Consolidation: 66 seg..
- Data persistence: 816 seg.*.
- 15min (t. proc.) + 13min (t. pers.) = <30min



CONSORTIUM SHARE NETWORKS

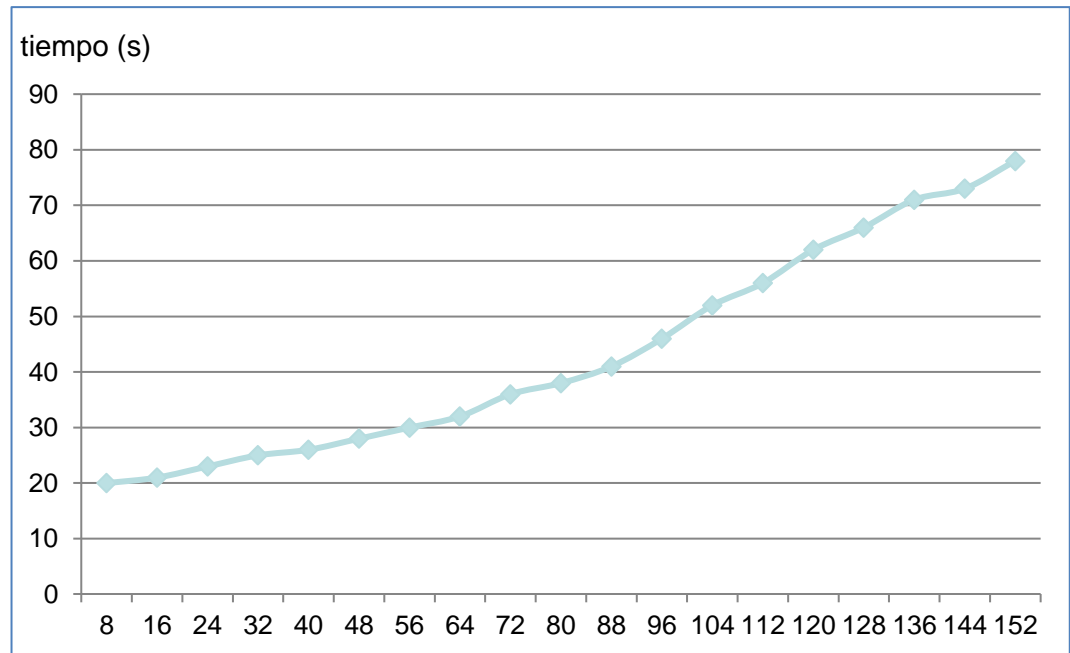
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DATALTECH

3

Data loading times

Records in Database	Average for 200K new records (in seconds)
8.000.000	20
16.000.000	21
24.000.000	23
32.000.000	25
40.000.000	26
48.000.000	28
56.000.000	30
64.000.000	32
72.000.000	36
80.000.000	38
88.000.000	41
96.000.000	46
104.000.000	52
112.000.000	56
120.000.000	62
128.000.000	66
136.000.000	71
144.000.000	73
152.000.000	78





DATAALTECH

Dataaltech EDM

The Golden Sources Manager



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