



Feedback from the NextGRID Applications Experiments

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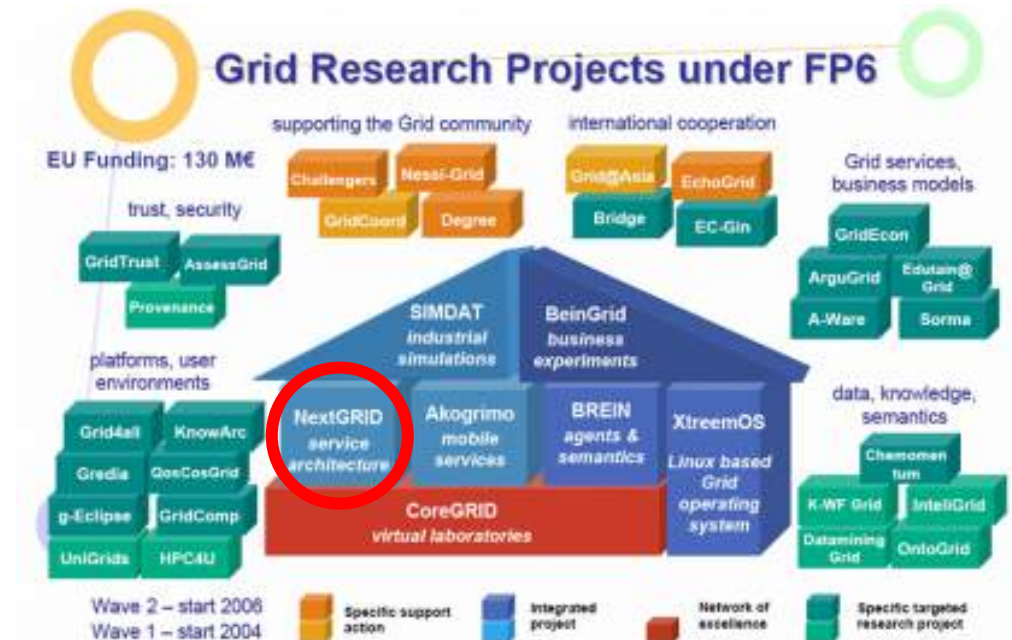
Presentation Overview

- Intro to the NextGRID project & Key Architectural Features
- The NextGRID application experiments – summary of scenarios and feedback/benefits



NextGRID Project Targets

- NextGRID focuses on Grid for business
- Vision is of future Grids :
 - that are economically viable;
 - in which new and existing business models are possible;
 - in which development, deployment and maintenance are easy; and
 - in which the provisions for security and privacy give confidence to businesses, consumers and the general public.



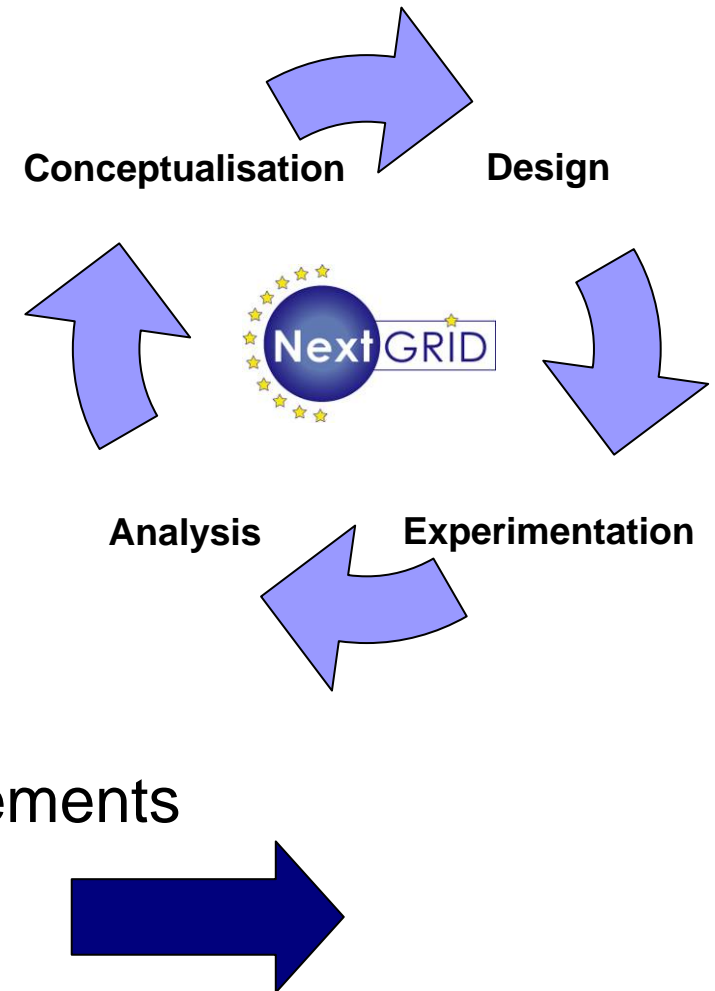
Creating the next generation Grid

■ NextGRID Project Cycles

- ☐ conceptualisation
- ☐ design
- ☐ experimentation
- ☐ Analysis

■ Implementing this cyclical process has been central to developing the NextGRID architecture

Identification of Fundamental Requirements
→ NextGRID architectural principles



Requirements – Architectural Principles

- **Flexible Business Models**
- **Specific Quality of Service Terms**
Open to extension, flexible and able to allow business relationship management
- **Dynamic Security**
Comms & operational security + dynamically changing trust relationships.
- **Dynamic Composition**
late in the service provisioning lifecycle, linked to dynamic security
- **Economic Sustainability**
- **Privacy**
- **Facilitated Management**
semi-automatic and at minimal cost, integration with business infrastructure
- **Interactive Support**
impacting both the service level agreements & basic infrastructure
- **Primary Principles**
 - **SLA-Driven Dynamics**
 - **Dynamic Federation**
 - **Minimal Grid Infrastructure:**
 - Balancing simplicity with sufficient features to support viable business models
- **Secondary Principles**
 - **Dynamic Service Lifetime**
 - **Dynamic Content Support**
 - Service content able to evolve during service lifetime
 - **Manageability**
 - Autonomously, encompassing large-scale Grids
 - **Discovery**
 - **Open Design and Development Process:**
 - Interoperable Grids, subject to some commonalities of design.



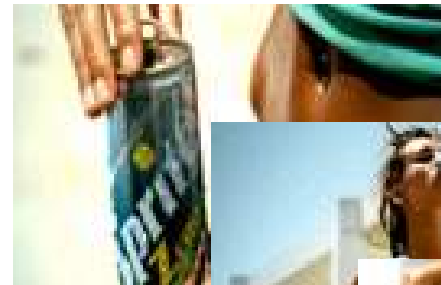
NextGRID Application Areas

Financial Applications:

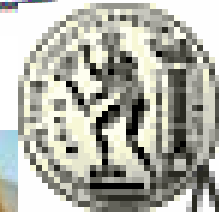
First Derivatives



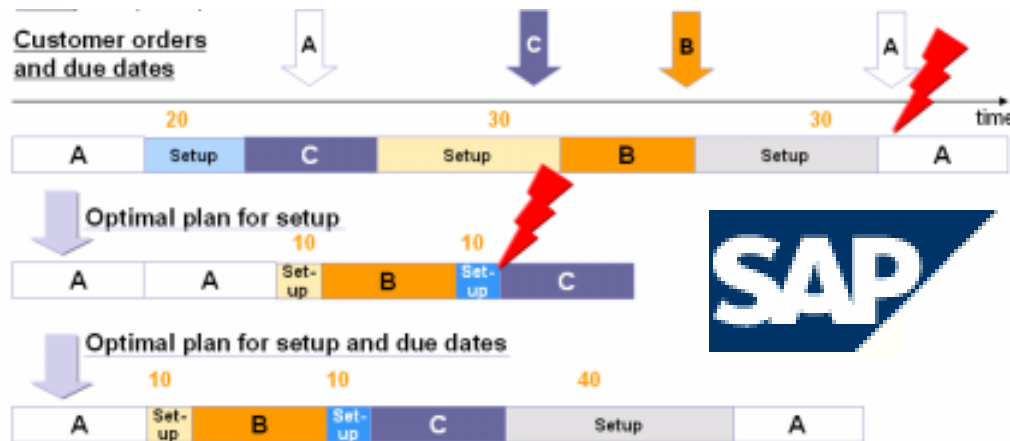
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Digital Media (DM)



Supply Chain Management (SCM)



Electronic Data Record (EDR) Processing



Images provided by Dreamstime.com, SAP, Kino, GridSystems

Financial Applications: **Implied Volatility**

Application Requirements and Targets

- Implied Volatility service requires a set of stock option prices as input, used to derive Volatility which is a mandatory input for the pricing of other Options
- This data could be accessed as a Grid resource
- The data sets required for such calculations are becoming increasingly large → associated problems in transfer to consumer
- A Grid-enabled IV application requires data resources to be treated in a similar manner to compute resources
- Need to be able to Register Data resource attributes such as Description, Time span, Integrity...
- Requirement to Search for and Discover these Data resources.
- Once these Data Resources are available other Grid resources need to be able to interact with them.
- **Benefits are calculations on demand plus the benefits of not having to manage own market data resource**



First Derivatives



Financial Applications: **Implied Volatility**

Experiment Scenario

A Financial Services Grid involving 4 parties:

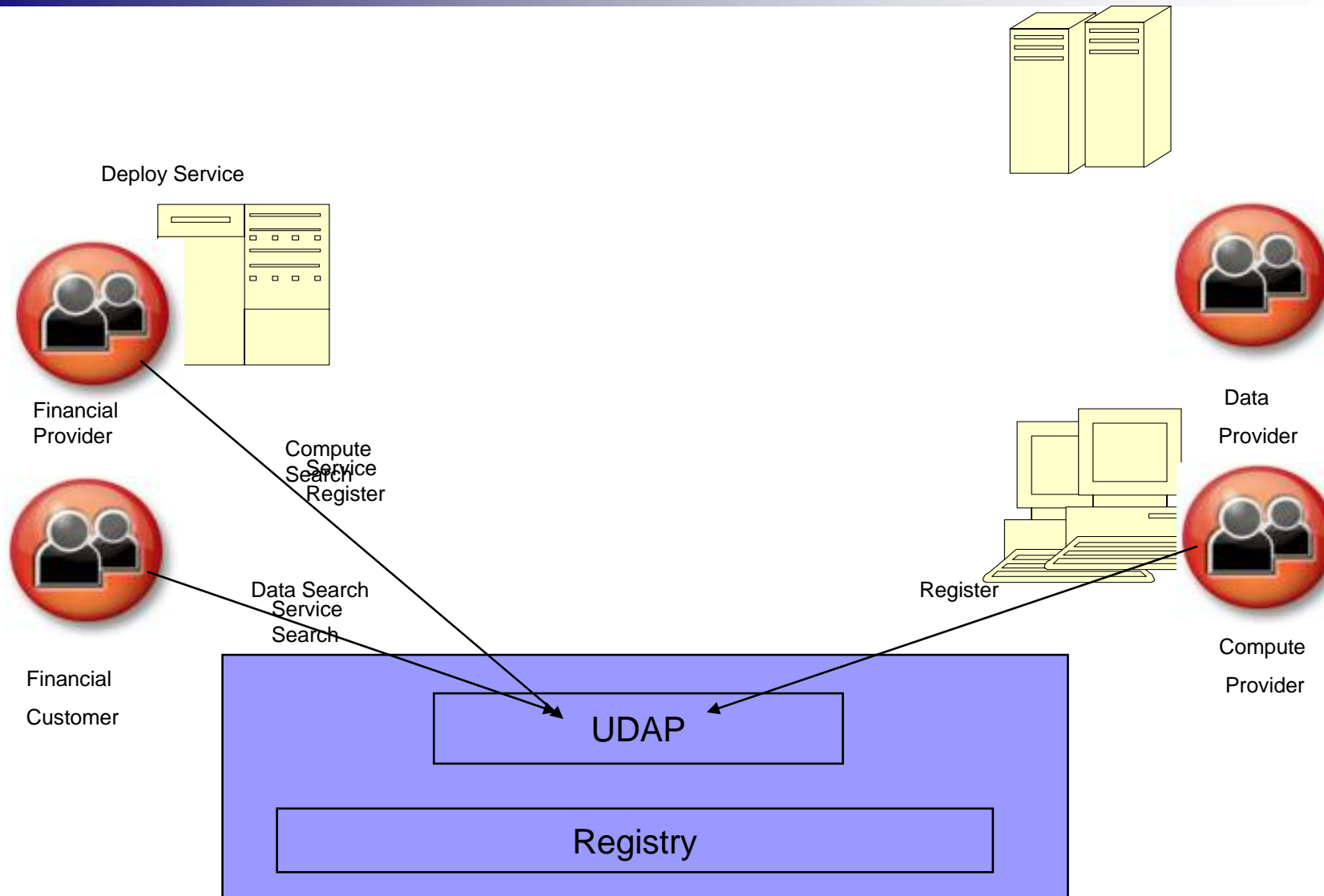
- Compute resource provider
- Financial service provider
- Financial data provider
- Financial service customer

Use NextGRID UDAP & registry components to orchestrate interactions between these parties allowing them to centrally register and discover heterogeneous resources.



First Derivatives 





Financial Applications: **Implied Volatility**

Application Benefits

- Uniform method of describing numerous heterogeneous resources
- Common interface allows parties using different languages, tools, software to interact and simplify the process
- System flexibility allowing new schemas and intermediaries to be added without affecting existing operation



First Derivatives 



Electronic Data Record (EDR) Processing



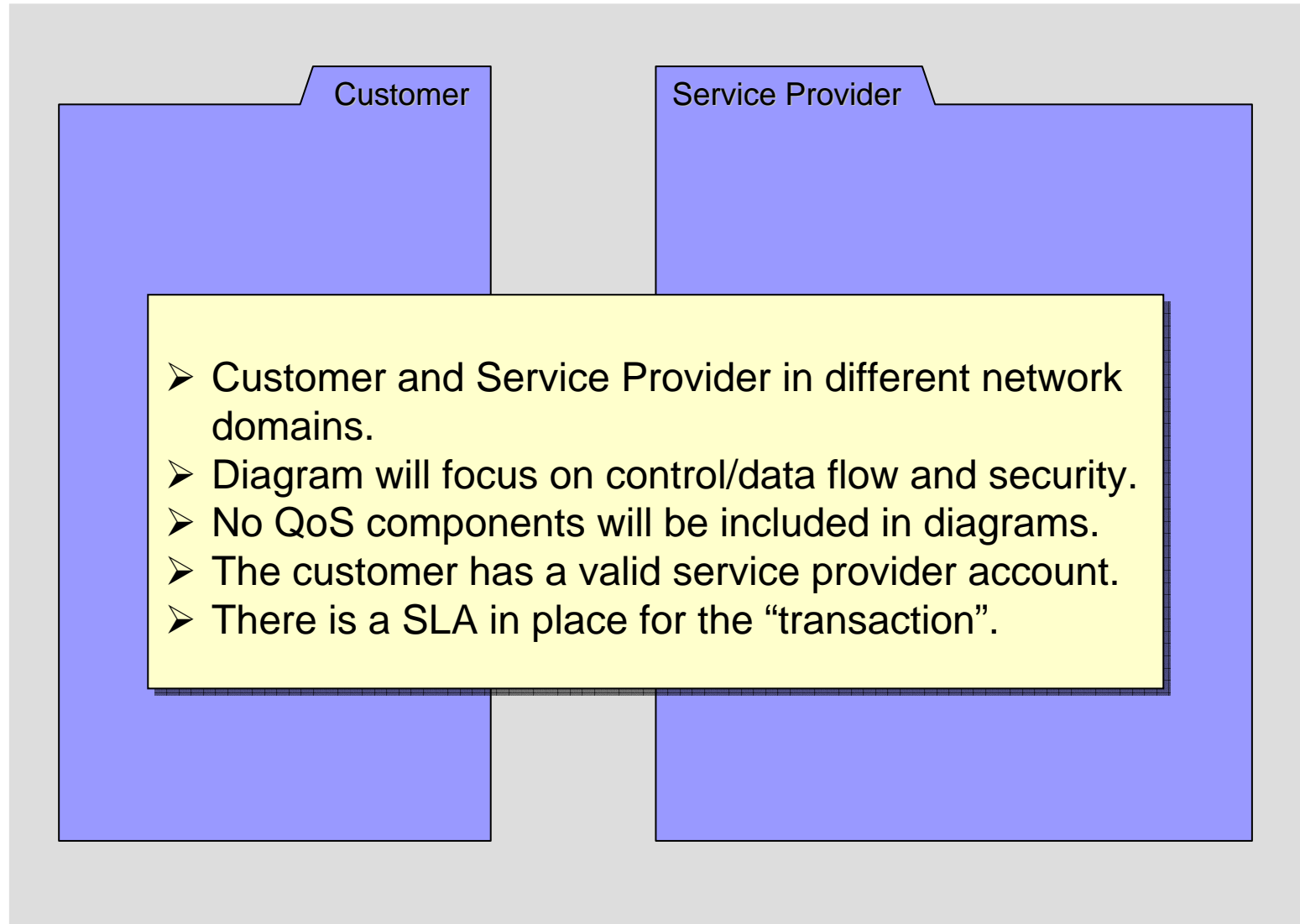
Experiment Scenario Summary



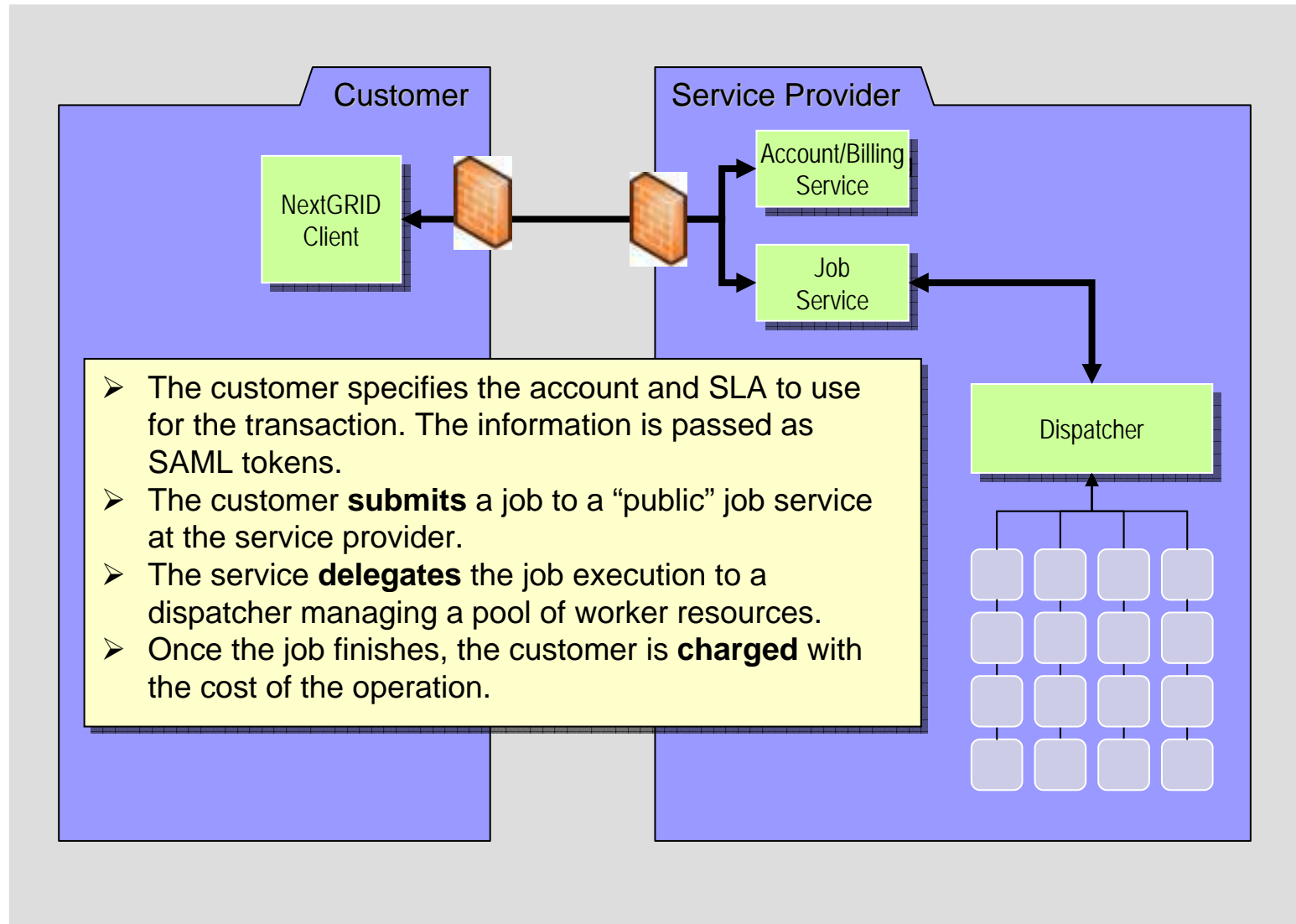
- Customer with huge data sets to be processed under time-constraints (not possible locally)
- Data set published as a NextGRID secure service & service provider (for processing) sought.
- Service provider receives a job submission & URL of the customer data service.
- The service provider distributes jobs across machines, each to receive only subset for processing.



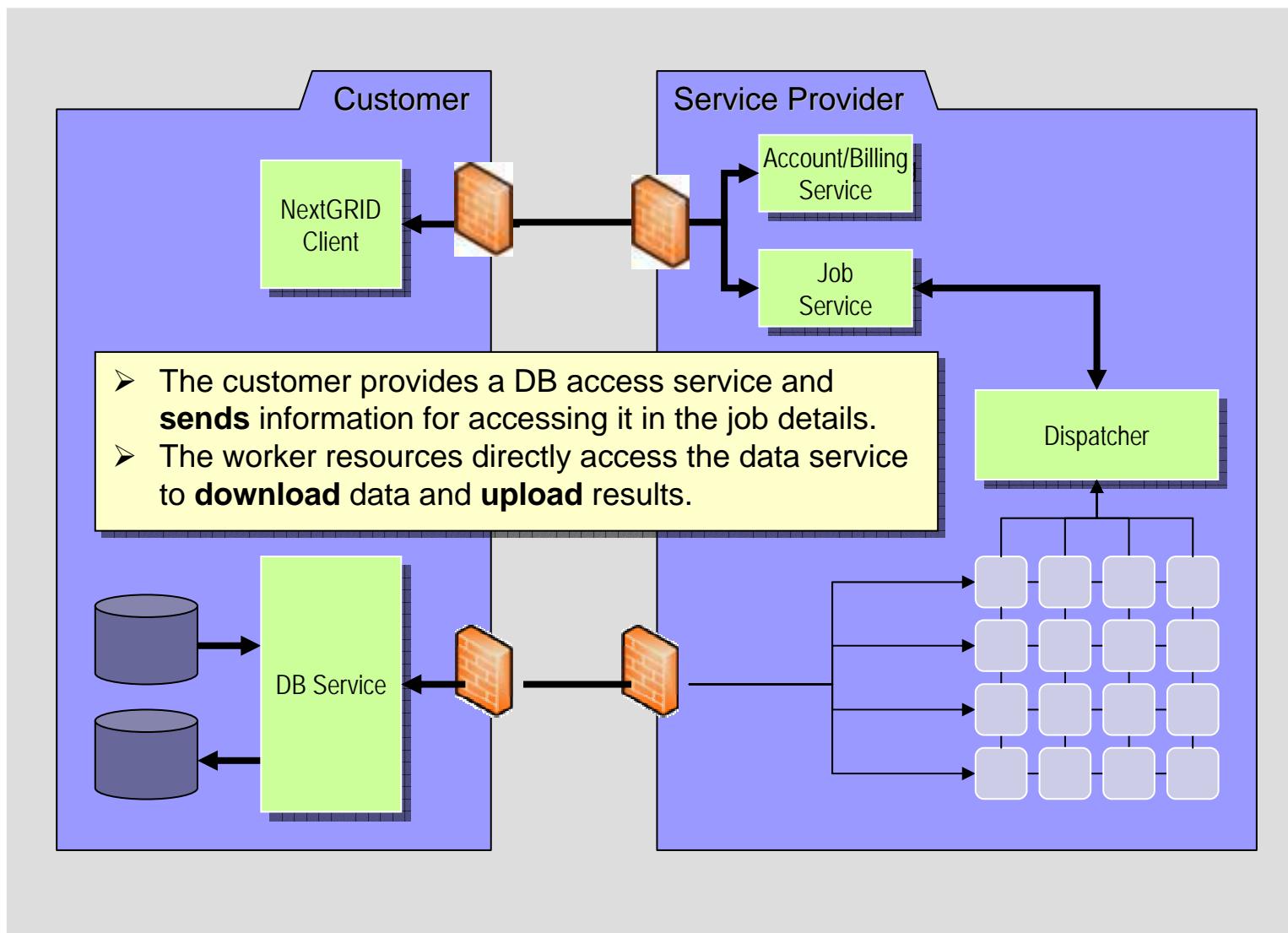
EDR Experiment : App Scenario



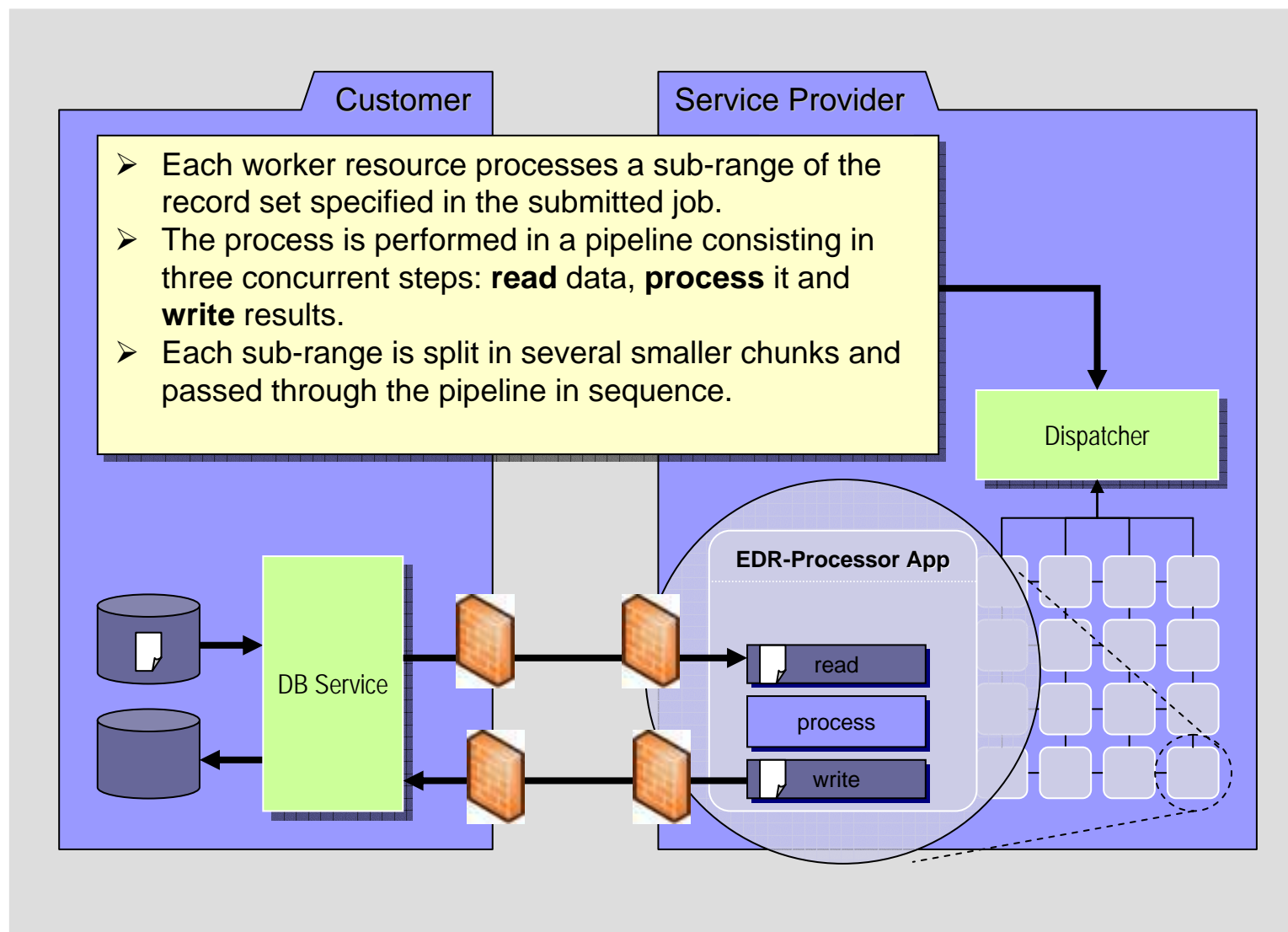
EDR Experiment : App Scenario



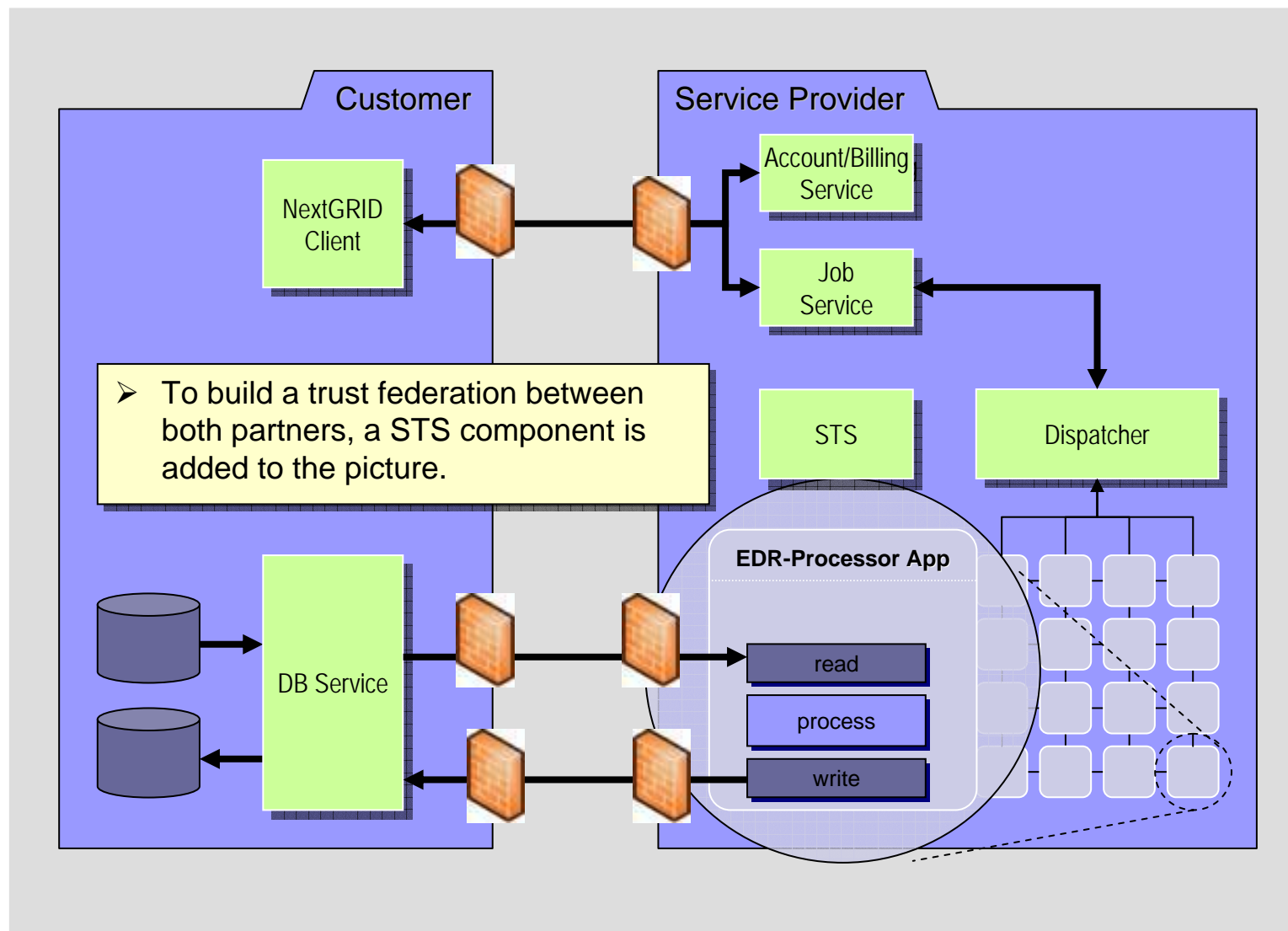
EDR Experiment : App Scenario



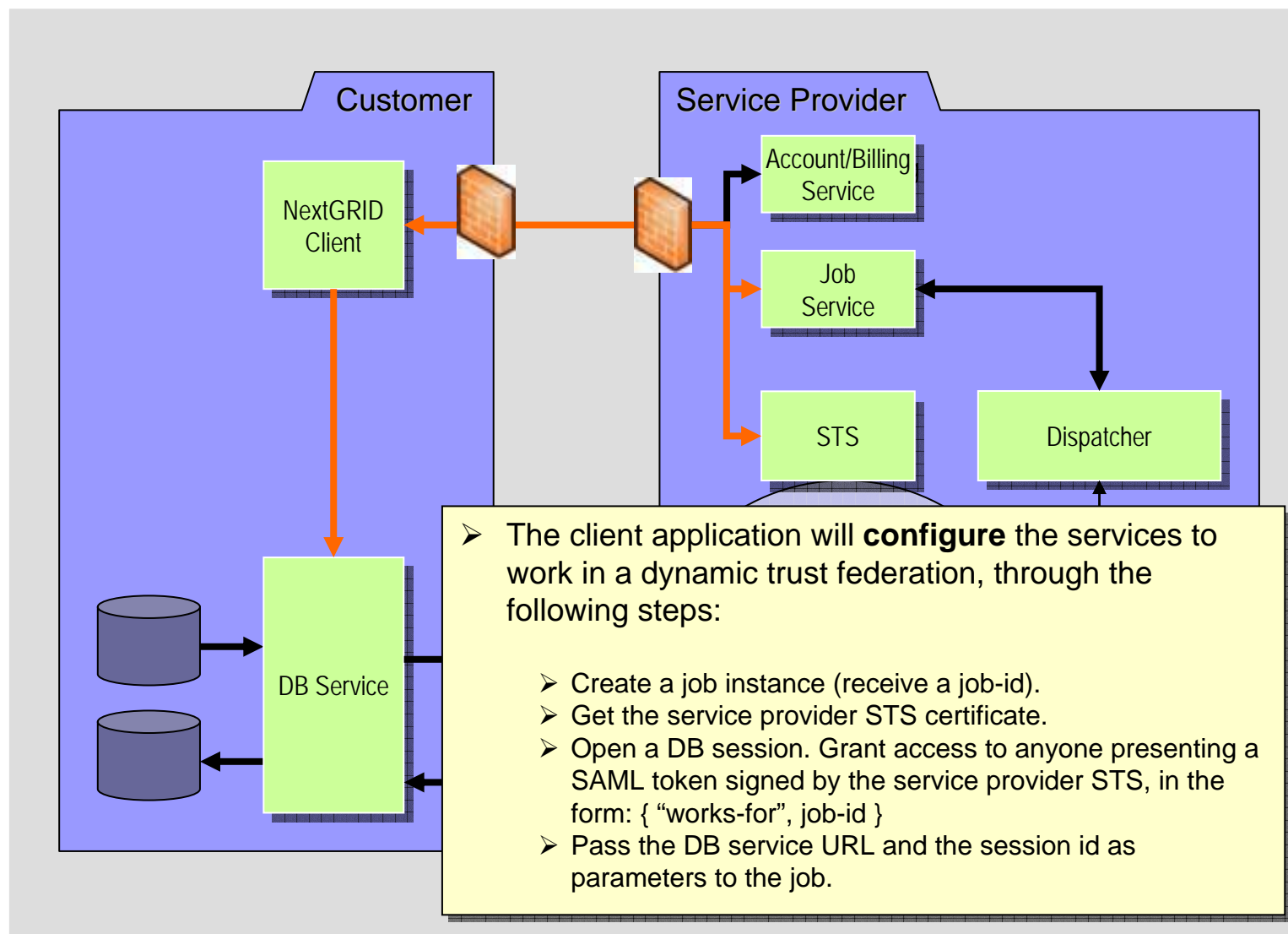
EDR Experiment : App Scenario



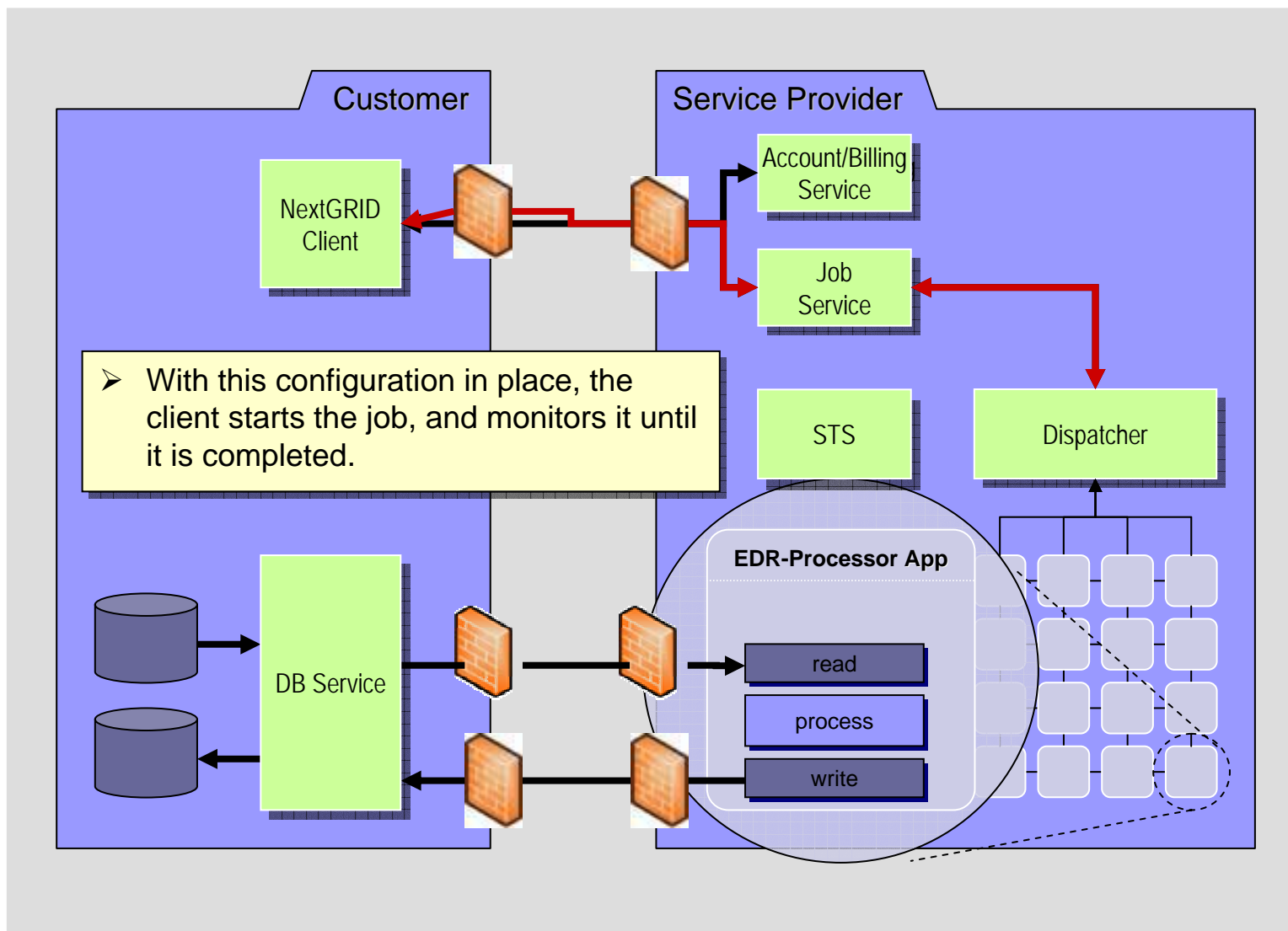
EDR Experiment : Trust Federation



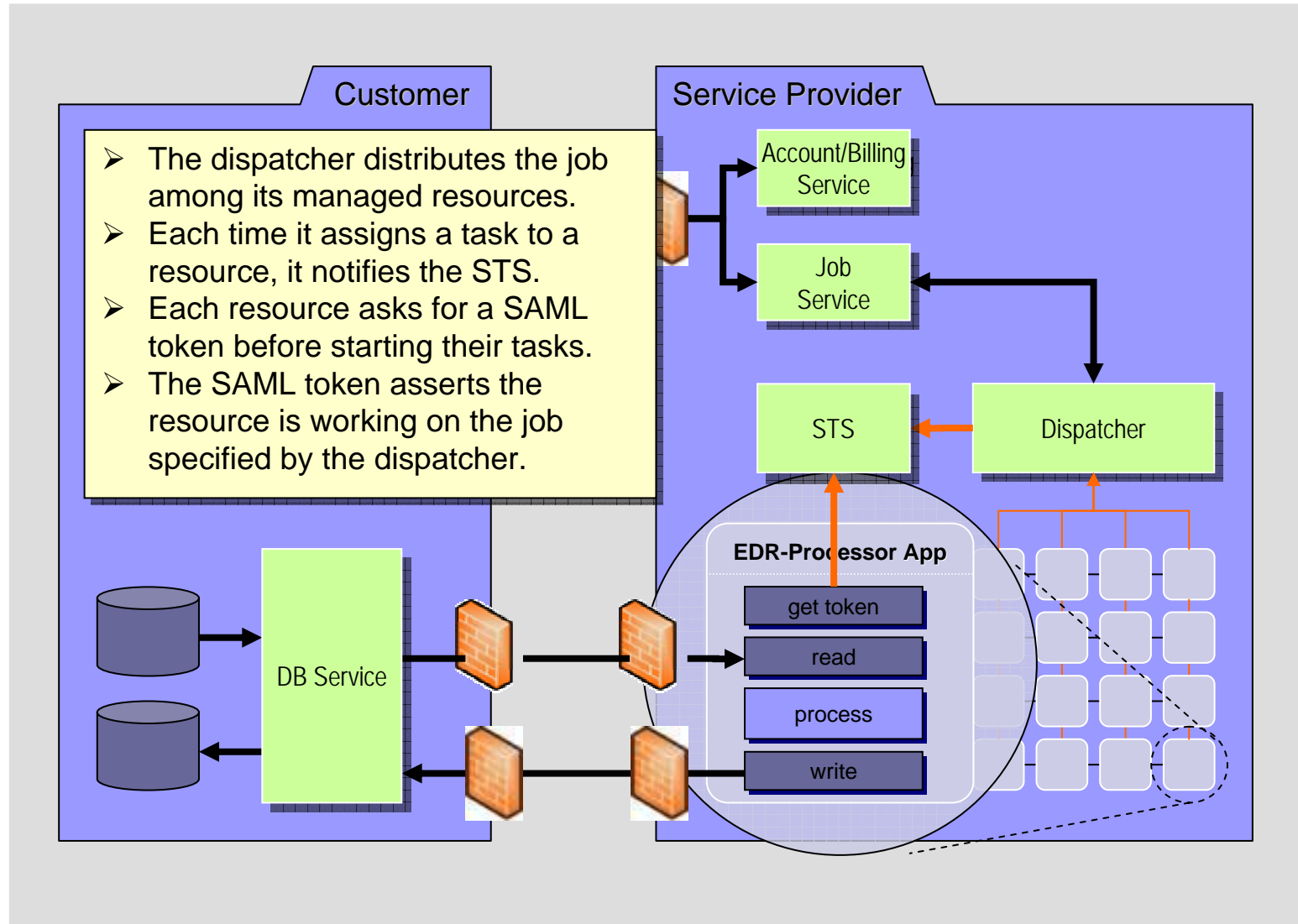
EDR Experiment : Trust Federation



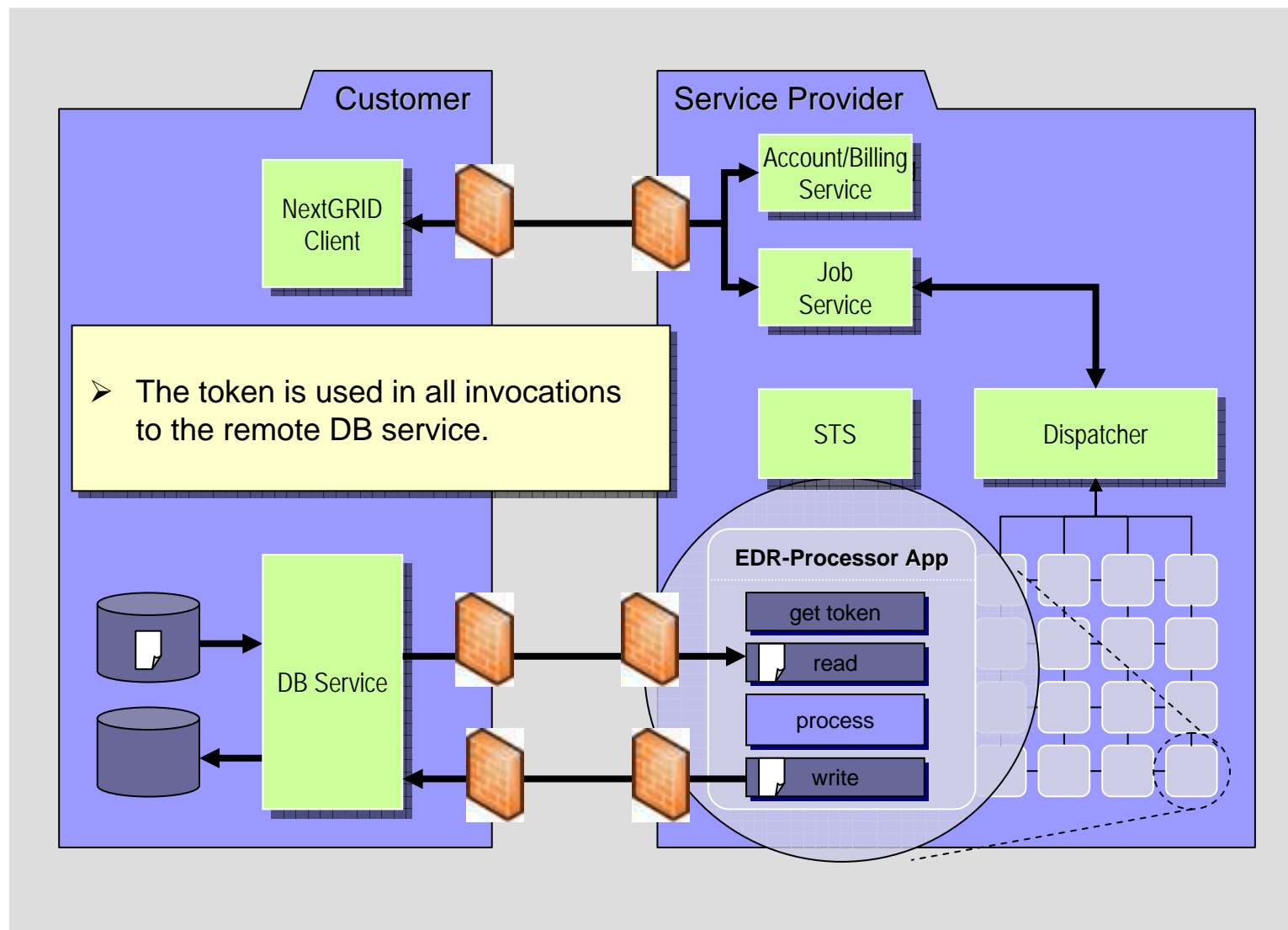
EDR Experiment : Trust Federation



EDR Experiment : Trust Federation



EDR Experiment : Trust Federation



Electronic Data Record (EDR) Processing



Application Benefits



- End to End data transmission highly improves scalability and performance.
- NextGRID provides a coherent set of specifications to manage security, trust, service discovery, SLA negotiation and QoS management (covers the whole “transaction” life-cycle).



Supply Chain Management

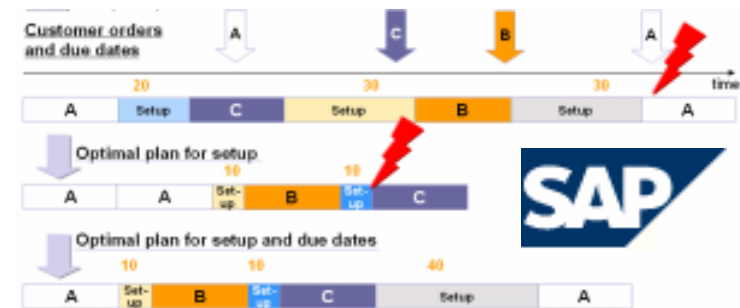
Experiment Scenario

■ Customer:

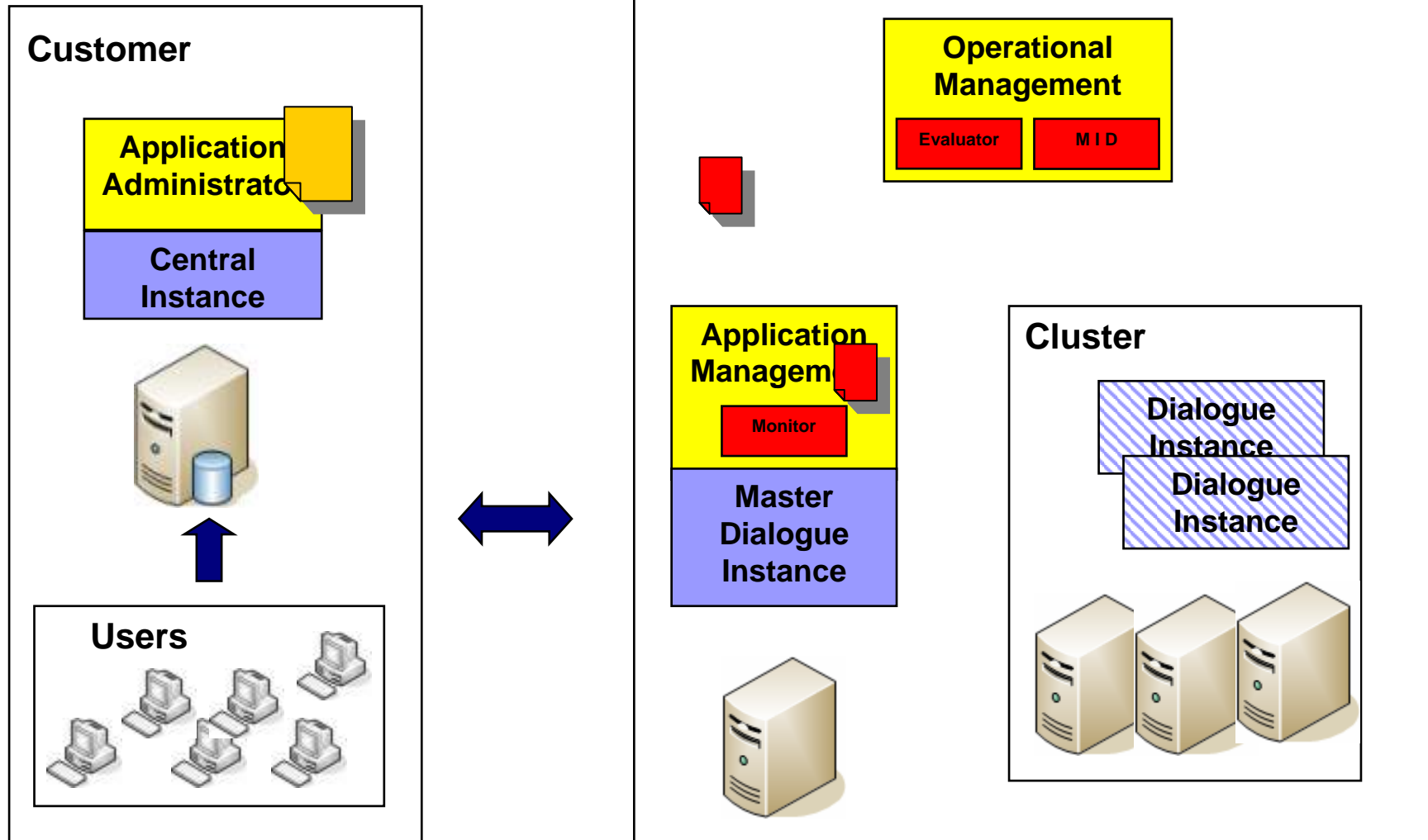
- Runs an SAP SCM solution & seeks to **outsource Dialogue instances** running on SAP WebAS.
- Seeks Provider offering hosting of Dialogue Instances while **the business data remains at the customer site.**
- Given an existing SLA, **initiates the use of the service** by sending application specific configuration data.

■ Provider:

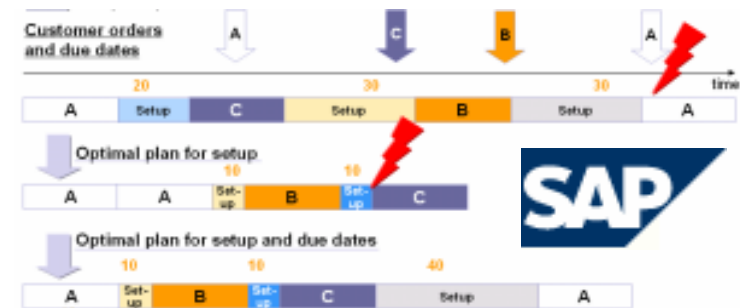
- Offers hosting of Dialogue Instances & utilizes NextGRID Operational Mngmt Framework.
- Installs SAP binaries and the SAP Application Management Framework.
- **SAP Dialogue Instances are deployed dynamically based on NextGRID policies** with a threshold on the mean response time of the system.



SCM Experiment



Supply Chain Management



Application Benefits

- Dynamic management of Dialogue Instance will reduce TCO.
- Policy controlled management introduces high flexibility.
- Event driven operations of business applications
- Security

Architecture Feedback

- Successful operation of a typical business application with the use of NextGRID components
- Emphasized the need for standards in the area of operational management (Service Manufacturer – Service Provider).



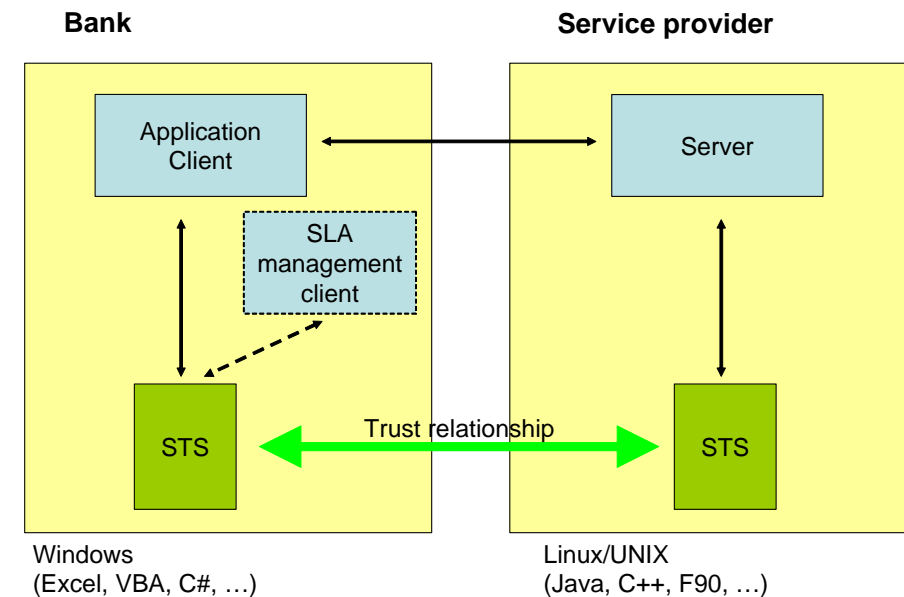
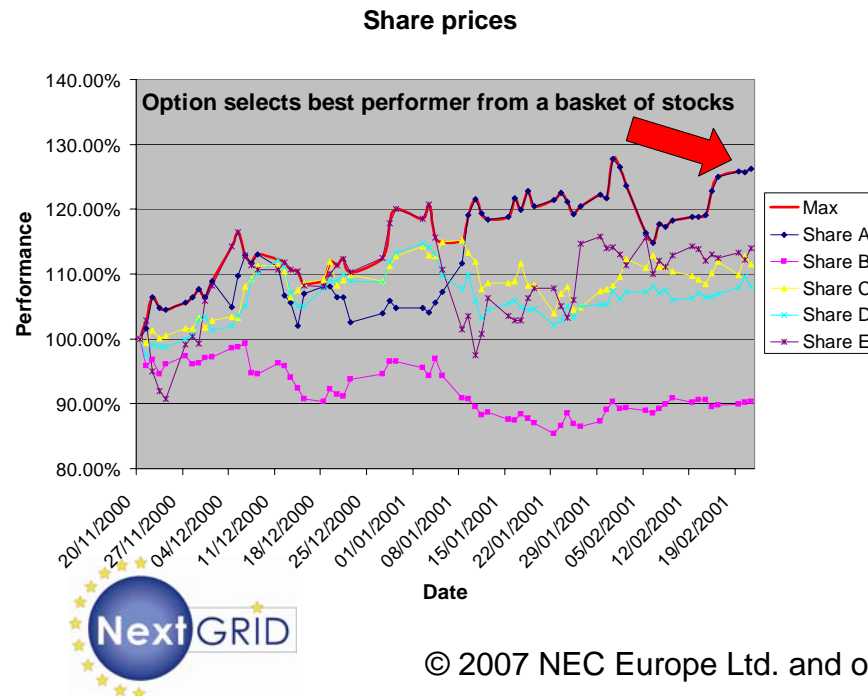
Financial Applications: Derivative Pricing

Experiment Scenario

- Pricing of complex options (example: Bermudan-style basket option)
- Results should be available within seconds or less in order to
 - adapt prices, hedging strategies to market changes
 - allow fast and reliable pricing of products tailored to the needs/demands of potential customers



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Financial Applications: **Derivative Pricing**

Application Benefits & Experiment Feedback

- Viability of NextGRID-relevant security components & interoperability across Windows-Linux/OSS systems
- Secure data transfer: a necessary condition for use of external services
- A bank could dynamically manage and enforce who is able to access the service under which SLA.
- Feedback on handling security (token re-use) for interactivity



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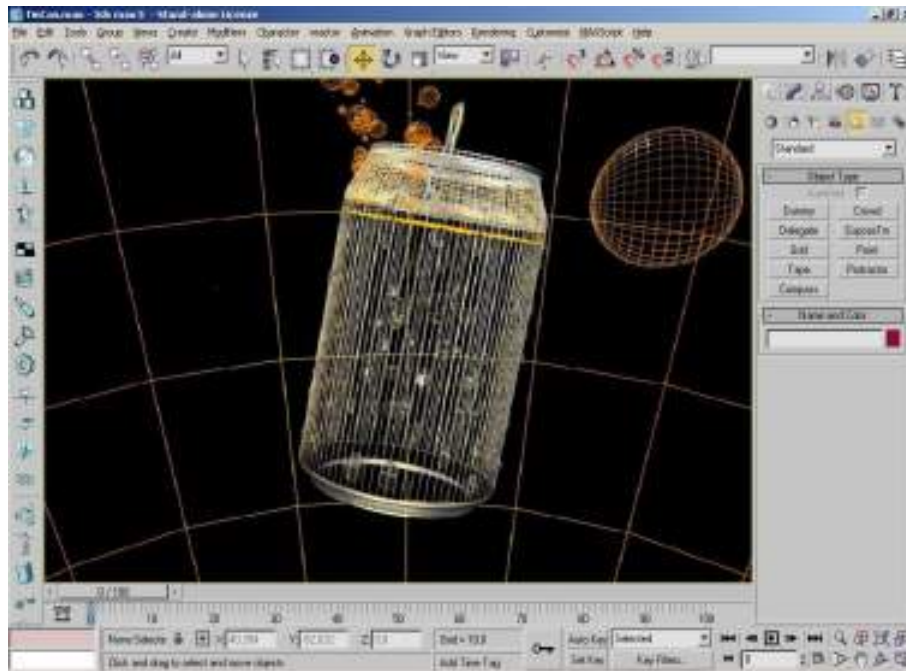
Digital Media Production

Background

- Digital Media Application
 - The main task is 3D rendering
 - A “gridified” application before NextGRID
 - The three important application requirements are:
 - Usability
 - QoS Provision Guarantees
 - Job Submission Automation – Workflows
- The **usability** requirement has been addressed through the creation of a portal.



The 3D Rendering Process



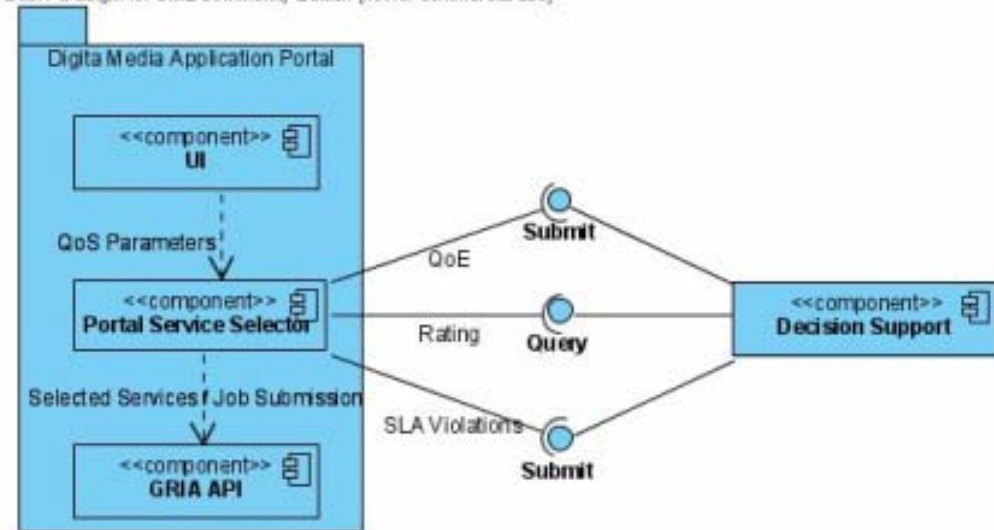
Digital Media Production

Experiment Scenario

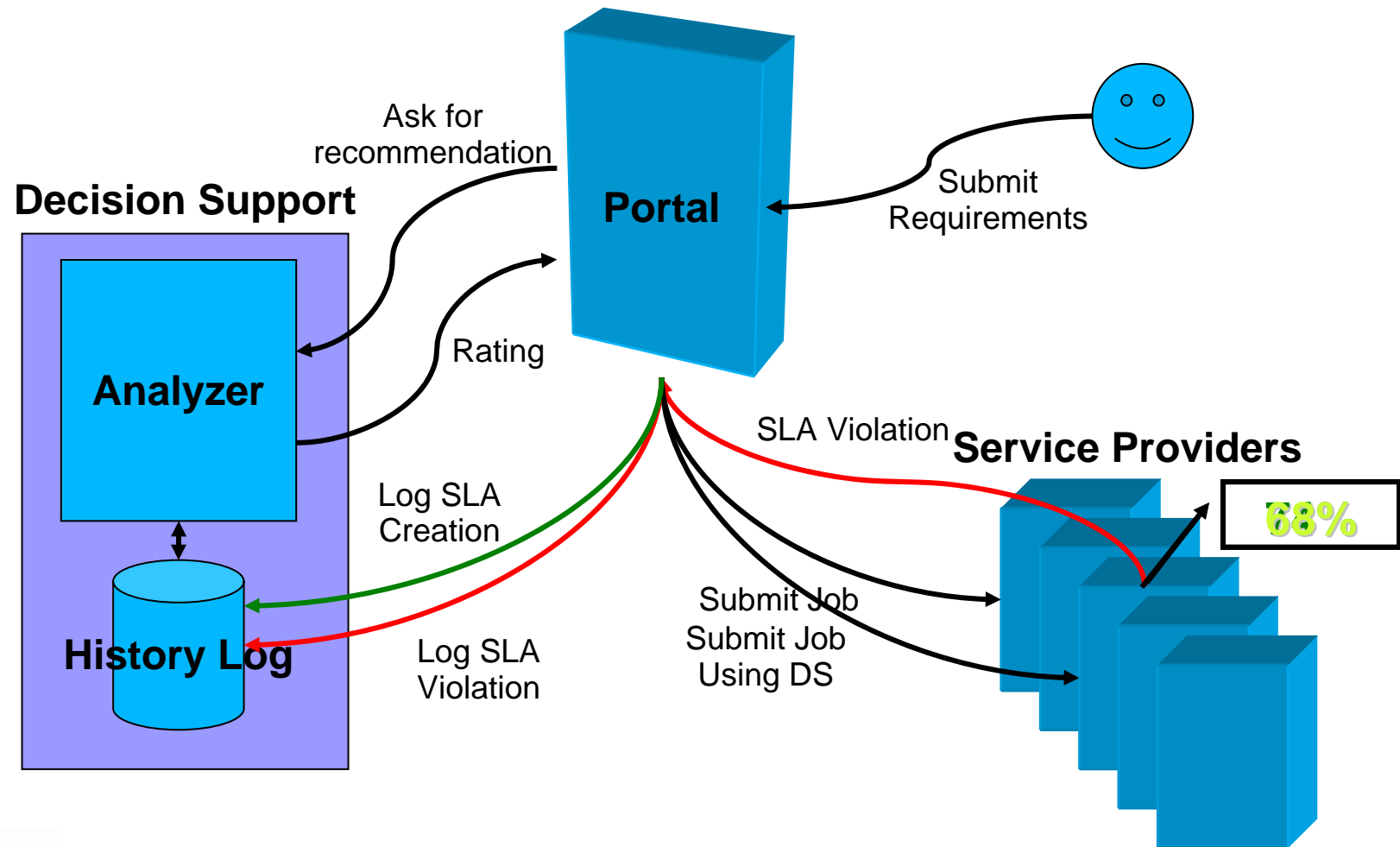
- Selection of service providers for a job submission
- Decision supported by analysis of QoE (Quality of Experience) data from previous job executions
- → Rating of the service providers



Visual Paradigm for UML Community Edition [not for commercial use]



Experiment Summary



Digital Media Production



Application Benefits

- Rating of service providers based on QoE parameters
- Different/customized rating for each job type
- Effective expenditure of consumer's budget (→providers)
- Achieving higher QoS for the consumers

Summing Up...

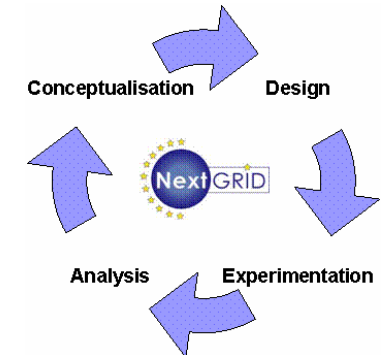
Business-oriented Applications Experiments

→ NextGRID Architecture

and Middleware Experiments

→ Key Architectural features of future

Service-Oriented Knowledge Utilities.



■ NextGRID Contributions

- ☐ Flexible Business Models
- ☐ Dynamic Security
- ☐ Economic Sustainability
- ☐ Facilitated Management
- ☐ Specific QoS Terms
- ☐ Dynamic Composition
- ☐ Privacy
- ☐ Interactivity Support



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- All NextGRID Partners
- For direct contributions to the presentation:
 - Applications teams at First Derivatives, GridSystems, KINO, NEC, NTUA, QUB, SAP

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