

# Applying Grid Technology on Business Support Systems

*A paradigm in the Telecom sector*



- **Established in May 2001**
- **Offices in Address: 98, Vas. Sofias Ave, GR-11528 Athens, Hellas**
- **web site: <http://www.exis.com.gr>**
- **Main areas of competency:**
  - IT & Telecom Consulting (combined business and technical approach)
  - Business & Operation Support Systems
  - E-Business
- **Our business function:**
  - *“Your partner to enable your organization increase and maintain efficiency in today’s business fields, where edge technology combined with best practices becomes a key competitive advantage.”*
- **Expertise in the Telecom Providers’ business,**
- **Active member of the Telemangement Forum**



- **Fast growing market powered by :**
  - Market deregulation
  - Technological evolution
- **The business is challenged by two competing goals:**

**Operational profitability:**

- Efficient use of technical resources (network, service platforms etc.)
- Delivery of services under high automation (cost minimization)
- Provision of added value services (high margin services)

**Market capture:**

- Pricing scheme aggressiveness (complex billing algorithms)
- Time to market of complex product bundles (use of 3rd party services)
- Customer satisfaction through personalization and care

- **Survival rule: engage with edge technology in:**
  - BSS (e.g. CRM, Billing, ERP, BI, etc.)
  - OSS (Mediation, Provisioning, Network Planning / Inventory, etc.)

- **Service distribution over space**
- **Really large data volumes (e.g. EDRs)**
- **Computational intensive business processes (e.g. Billing, Business Intelligence, Mediation), performed:**
  - Real – time or close to real time (e.g. rating and balance management for prepaid services)
  - On a regular basis (e.g. monthly invoicing applying volume discounts)
- **Linear scalability requirements**
- **Spending on infrastructure**
- **Data centre or ASP services bundled into portfolio**
- **Vision: if one day GRID services become a commodity, telecom providers shall both be customers and suppliers in the GRID business**

- **The business of Telecom operators, Service Providers, Banks, Insurance Companies, Investment Companies, Utilities, etc. involve:**
  - Mass personalized document production (e.g. invoices, statements, special offers, letters etc.)
  - Processing in a batch mode (e.g. monthly )
- **Some challenges:**
  - High computational capacity required for limited time period (sizing dilemma)
  - Special software for data processing, personalization and document formatting
  - Costly equipment for printing & filing
  - Customer Support using identical view of sent documents
  - Document archiving for several months
  - Reproduction of selected document upon demand
  - Electronic transmission and / or web presentment

- **In – house**
  - Full control of the business process
  - High CAPEX & OPEX which very rarely be justified
  - Disorientate from main business goals
  - High risk
  - Practically impossible to follow 100%
- **Partial of full Outsource**
  - Lack of flexibility in change requests
  - High dependency on print shop
  - Impossible to optimize, control and fully monitor the end – 2 – end process (in cost, time, quality etc.)
  - Low Risk

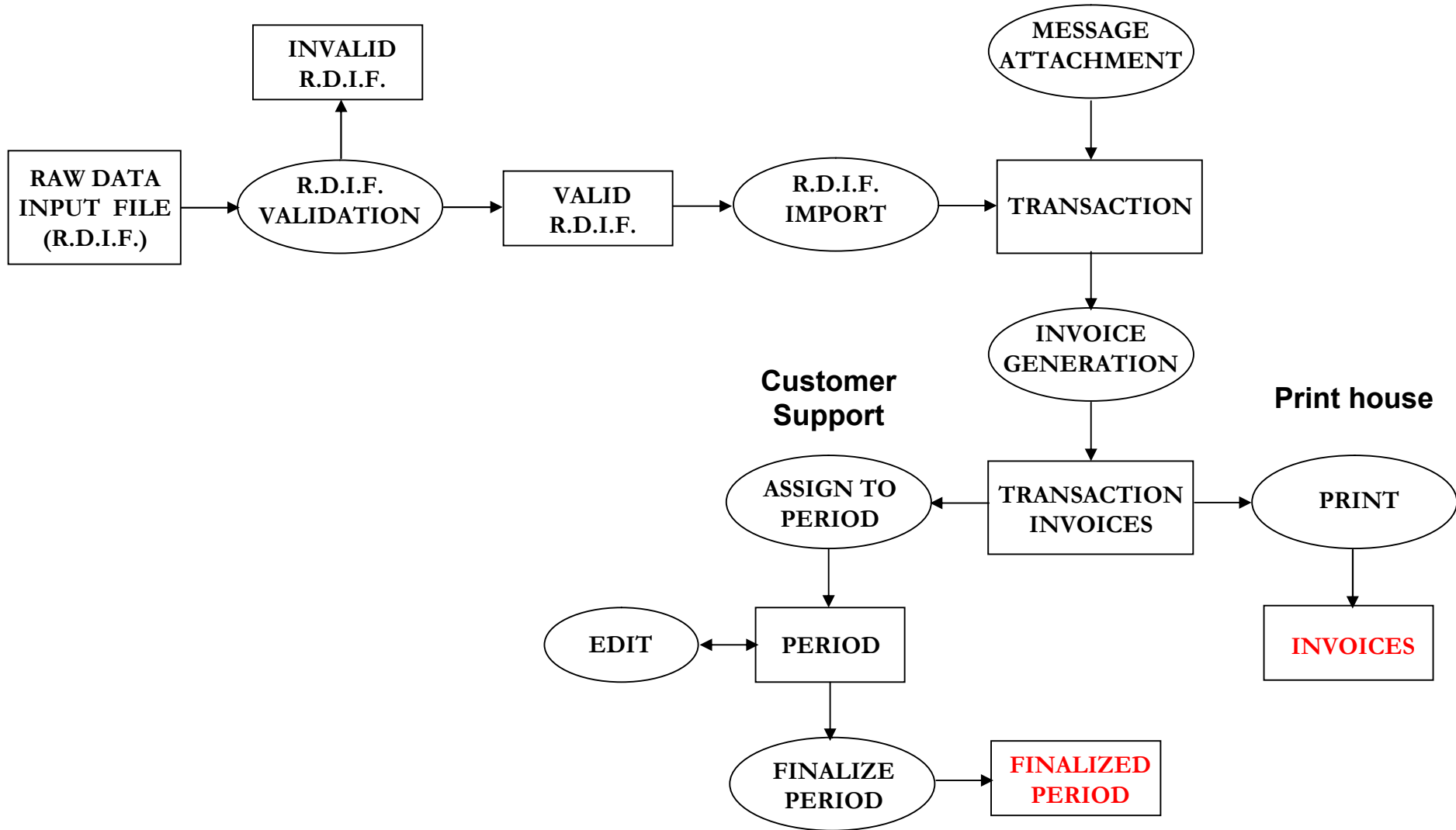
- Supports mass personalized document production in enterprises with periodical written communication with customers (i.e. TelCos, ISPs, Banks, Insurance Companies, Investment Companies etc.)
- The most complex paradigm refers to bills for telecommunication services.
- Receives input data from Billing & ERP systems
- Produces ready-to-print files in various formats (PostScript, PDF)
- Produces documents on various predefined layout(s) by means of reporting tools
- Provides high performance by exploiting spare computation capacity of workstations during non – working hours
- Creates user defined & rule-based messages
- Supports rule-based leaflet incorporation
- Supports various input formats (XML, EDI, etc.)
- Supports preview & editing of invoices

**Bill Printing**

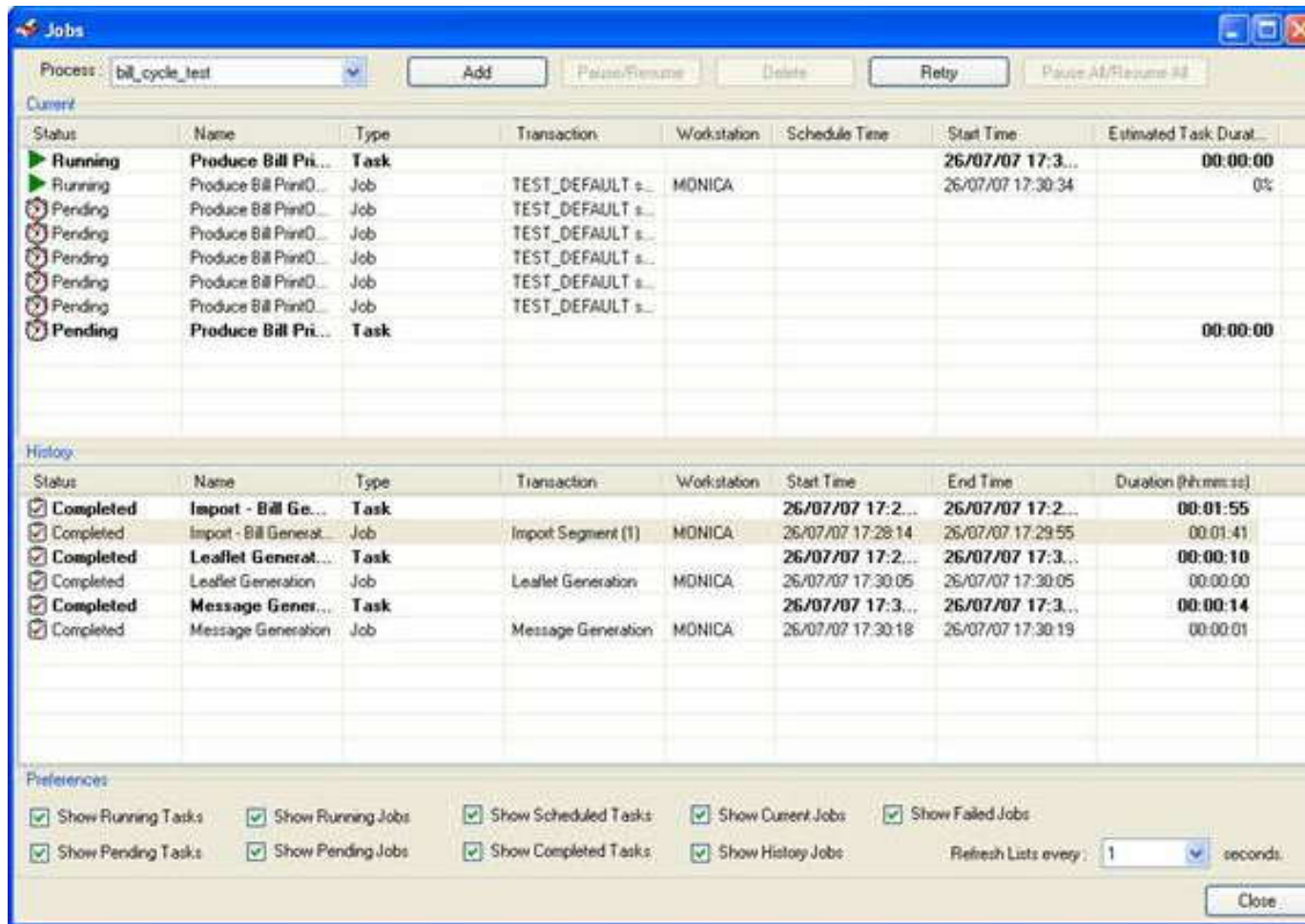
- **Initial design & implementation for first telecom operator**
  - January 2002
  - Client-Server architecture with single client
- **Initial thoughts of applying Grid technology on the system**
  - June 2003
  - Proposed re-design using grid technology
  - Vision: exploit some of the unused desktop PCs during non-working hours.
- **Implementation co-founded though National R&D program**
  - March 2005
  - Resources used by EXIS I.T. & NTUA
  - Project successfully completed on July 2007
- **Contract with another telecom operator for grid - enabled Bill Printing**
  - April 2007
  - Configuration, integration & installation: May 2007 until July 2007
- **Current condition**
  - Migration of other Telecom operators into the new Grid – enabled platform



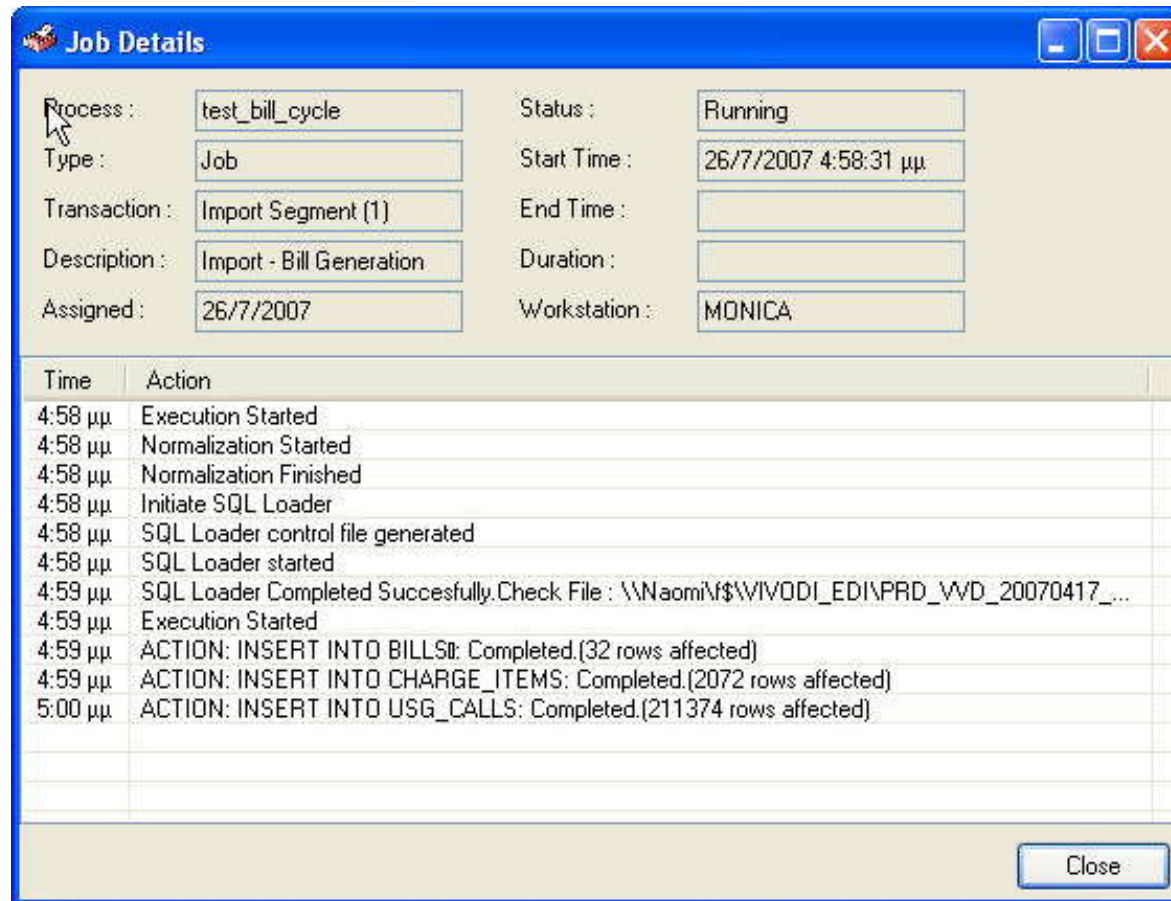
- **Problems identified**
  - Bottleneck on loading of raw data in database
  - Bottleneck on production process
  - Difficulties in identification of errors during raw data loading
  - Significant H/W requirements for performance improvement
  - Difficulty to monitor/control the running tasks
  - Parallelism would require high CPU, I/O and memory
- **Performance information (production environment)**
  - A performance improvement of 50% required 8 – 10 times higher investment on hardware
  - The scalability reserves would saturate quite fast no matter what HW is used



- **Technological information**
  - Grid-enabled architecture
  - Running on multiple clients
  - Developed on C#/.Net
  - Using Oracle 10g RAC
  - Using Crystal Reports 9.0
- **Some of the new features**
  - Workflow-based operations
  - Operations are based on tasks consisting of multiple jobs
  - Monitoring of running tasks/jobs, by means of advanced GUI
  - Ability to merge invoicing information from various billing or ERP systems on a single invoice without affecting creating bottlenecks
  - Scheduling ability of a single task/workflow
  - Prediction of the total time required for running a task, after completion of 5% - 10% of the jobs belonging to the running task
  - High grade of parallelism

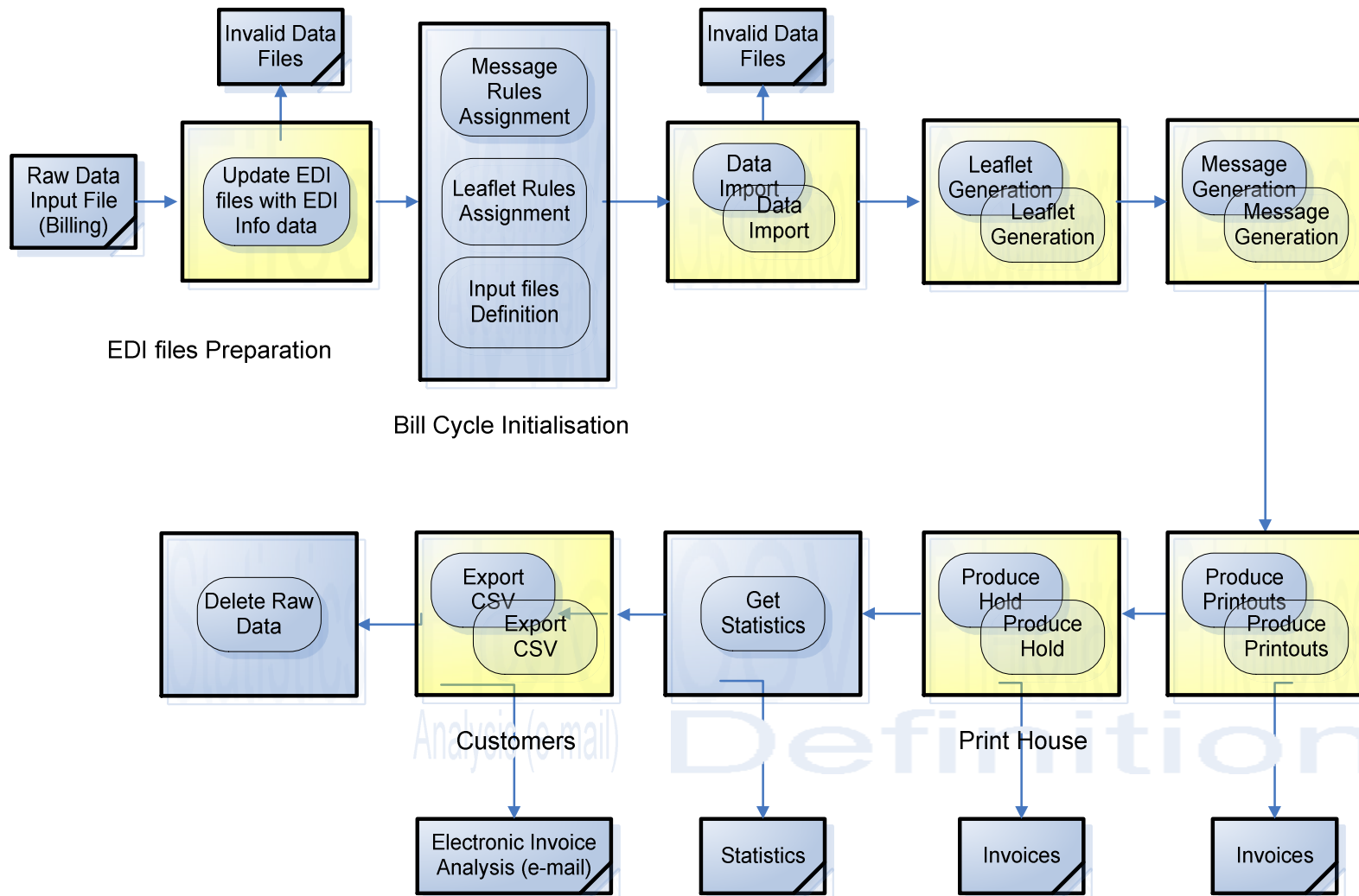


Task monitor GUI



Job details GUI

- **Lower cost H/W required for much higher performance**
  - Faster raw data loading
  - Faster invoice creation
- **Straight forward and costless up - scaling**
- **Ability to use the documents (invoices) as a powerful marketing tool though fine – grained personalization in layout, messages, advertisements, and generally content.**
- **Enhanced cost - control information produced**
  - Number of pages per envelop
  - Number of envelopes

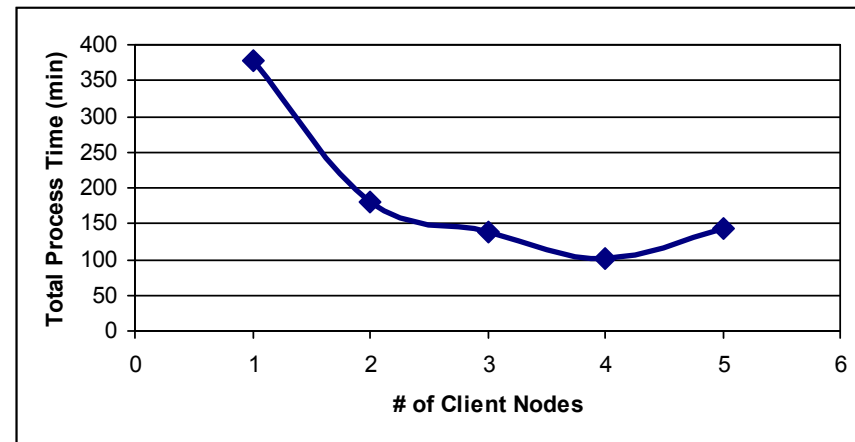


- **Various bill runs required for performance fine tuning, due to various configuration parameters**
  - number of invoices per file produced
  - number of clients used
  - number of raw data files (EDI files)
  - number of invoices per raw data file (EDI file)
  - number of pages per invoice
  - format of document (invoice)
- **Need for printer virtualization; Possible incompatibility of printer settings between clients, could cause defective documents in cases of really strict layout requirements**
- **Integration issues (e.g. Crystal Report libraries with .Net C#)**



- **Performance information (EXIS environment)**
  - Number of produced invoices: 25.000
  - Invoices per task: 2500
  - Environment used:
    - Database: 2-node cluster on Windows 2003 Server, 1 CPU Xeon 3.2 GHz, 2GB RAM
    - Workstations (Windows): 1 to 5 clients, Pentium IV 3.0 GHz, 1 or 2 GB RAM
  - Performance bottleneck is move to the database layer, where scalability is provided by Oracle's RAC technology

Clients	Total time (min)
1	378
2	180
3	138
4	102
5	144



- **Performance information (production environment)**
  - Number of produced invoices: 100.000
  - Invoices per task (output file): 5.000
  - Environment used:
    - Database: Single Unix based server, 2 CPU Xeon 3.2 GHz, 4GB RAM
    - Workstations (Windows XP): 5 clients, Pentium IV 3.0 GHz, 2 GB RAM
  - Total time: ~700 min (10 ½ hours)

- **Telecom Operators provide a great test bed for Grid applications**
- **Proper focus on specific bottlenecks can generate significant business value**
- **The unused computational capacity of Enterprises during non – working hours can be excellently exploited by Grid applications**
- **Even the partial adoption of Grid concepts in business systems, dramatically reduces the costs while providing solution to most of the scalability issues**
- **End users (and stakeholders) do not care about a technology, but can become its faithful fans, if they experience practically measurable improvements in their every – day business operations.**

- **Participation into:**

## Europe-China Grid InterNetworking

*European Sixth Framework STREP FP6-2006-IST-045256*



- **EXIS' Goals:**

- address network bottlenecks
- test platform over wider environments
- enhance knowledge on Grid and capitalize on the experiences gathered
- encourage telecom operators adopt grid concepts
- bring academia closer to everyday business problems

Original Internet technology

Enriched with customised network mechanisms

*Bringing the Grid to its full potential !*

Today's Grid applications

**EC-GIN**

EC-GIN enabled Grid applications

*Driving a racing car on a public road*

*Applications with special network properties and requirements*

Traditional Internet applications (web browser, ftp, ..)

Real-time multimedia applications (VoIP, video conference, ..)



- **STREP in FP6 Call 6, total funding € 2.2 M**
- **Start date: 1 November 2006; duration: 3 years**
- **Consortium: 11 partners**
  - 7 European partners
    - Universität Innsbruck, UIBK, Austria (*coordinator*)
    - University of Zürich, UniZH, Switzerland
    - Institut National de Recherche en Informatique et Automatique, INRIA, France
    - Lancaster University, ULANC, U.K.
    - Justinmind, JIM, Spain
    - EXIS IT, Hellas
    - University of Surrey, UniS, U.K.
  - 4 Chinese partners
    - Beijing University of Posts and Telecommunications, BUPT
    - Institute of Software, Chinese Academy of Sciences, ISCAS
    - China Telecommunication Technology Labs, CCTL
    - China Mobile Group Design Institute Co., Ltd, CMDI
- **GridNets2007 (Lyon, October, 17-19)**
  - Bring the networking and Grid communities together
  - Show that there is more to Grid-Networking than optical signaling
  - Convince others to join EC-GIN in its effort
  - <http://gridnets.org/2007>



**ECGIN**

Europe-China Grid InterNetworking  
 Make Grids work, operate, and communicate better  
 European STREP project, Duration: **Nov 06-Oct 09**

<http://www.ec-gin.eu>

**Partners**

- UNIVERSITÄT INNSBRUCK  
<http://www.uibk.ac.at>
- UNIVERSITY OF ZÜRICH  
<http://www.wtcg.uzh.ch>
- INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET AUTOMATIQUE  
<http://www.inria.fr>
- UNIVERSITY OF LANCASTER  
<http://www.lancs.ac.uk>
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- UNIVERSITY OF SURREY  
<http://www.surrey.ac.uk>
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<http://www.bupt.edu.cn>
- INSTITUTE OF SOFTWARE, CHINESE ACADEMY OF SCIENCES  
<http://www.iscas.ac.cn>
- CHINA TELECOMMUNICATIONS TECHNOLOGY LABS  
<http://www.chinattl.com>
- CHINA MOBILE GROUP DESIGN INSTITUTE CO., LTD.  
<http://www.bcdi.com.cn>

Information Society Technology European Commission

University of Zurich Department of Informatics INRIA LANCASTER JUSTINMIND EXIS IT UniS JUSTINMIND ISCAS CCTL

<http://www.ec-gin.eu>

# Thank you!

**contact information: Serafim Kotrotsos**  
**skotro@exis.com.gr**