CAPACITY PLANNING FOR MULTIPLATFORM APPLICATIONS AT FORTIS BANK BELGIUM

Jean-Paul Remory
AGENDA

- Who is Fortis Bank
- ICT @ Fortis Bank
- The PC BANKING application
  - PC Banking : the need for Capacity Planning
- The End2End Capacity Planning Project
- Capacity Planning : a Capacity Management process
- The practical implementation
- Actual Status and Future
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Who is Fortis Bank

- Fortis Bank Belgium is the Belgian Banking Company of Fortis

- Fortis is a leading Benelux-based financial services provider with European aspirations

- Since its inception in 1990, Fortis has grown considerably and has made significant acquisitions

First cross-border merger in Europe

<table>
<thead>
<tr>
<th>Market cap.</th>
<th>Employees</th>
<th>Total assets</th>
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</thead>
<tbody>
<tr>
<td>EUR billion</td>
<td>in capita</td>
<td>EUR billion</td>
</tr>
<tr>
<td>28.6</td>
<td>51,539</td>
<td>694</td>
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</table>
Who is Fortis Bank

Market capitalisation: Fortis #19 in Europe

(31/03/05, in EUR billion)
Who is Fortis Bank

Fortis in Europe

- insurance, commercial banking, merchant banking, asset management, information banking, private & corporate trust
- insurance, retail banking, commercial banking, merchant banking, private banking, asset management
- commercial banking, bancassurance
- insurance, commercial banking, merchant banking, private banking, trust, asset management
- commercial & private banking, trust, asset management

Benelux countries: all businesses

Home market - all businesses
Limited businesses

private & corporate trust
retail banking, commercial banking
commercial banking, asset management, information banking
asset management
commercial banking, merchant banking, asset management, private banking
Who is Fortis Bank

Fortis in the rest of the world

- asset management, merchant banking, information banking, private & corporate trust
- belgolaise activities
- merchant banking
- retail banking, commercial banking
- bancassurance, private banking, asset management
- bancassurance
- asset management
- information banking

Limited businesses
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ICT @ Fortis Bank

STAFF:
- Development Department: 870 persons
- Infrastructure Department: 970 persons

Applications:
- Total number of active applications: 1900
- Some important ones:
  - Branch application
  - Non-Brick applications: self banking (ATM), Phone Banking, PC-Banking (Web-Banking)
  - WEB applications for companies and high end clients
  - Financial Markets
  - Payments
  - Back-end applications: credits, ...
  - ...

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ICT @ Fortis Bank

Infrastructure:
- Mainframe: 10,000 MIPS, backend system for critical applications. Runs 16 million IMS/DB2 transactions per day.
- AIX: 280 Logical systems
- SUN: 460 systems
- Wintel: 1900 servers (branches included)
- Disk storage, user capacity:
  - Mainframe: 36,5 Tbyte
  - Distributed: 130 Tbyte
- Other systems: I-Series, Tandem, Alpha,..
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The PC Banking application.

PC Banking is the Fortis Bank Solution for individual, professionals and small enterprise Banking via the WEB

Offered Services:
- Daily Banking
- Lending
- Invest: Bonds, Shares, Portfolio analysis and simulation
- Financial information
- Mobile reload
- ...

At this moment 850,000 active subscriptions
- Number doubled the last 2 years
- Market share in Belgium: 35%
PC Banking: the need for Capacity Planning

Yearly growth of subscribers with 35-40%


- Total transactions (production data)
- Forecasts 2005 (based on monthly evolution 2003 + 2004)
PC Banking: the need for Capacity Planning

End of 2003 a very sharp increase of load together with a new application release caused a lot of instability of the application:

- Overload on different systems (HW limit)
- Maximum number of session reached (SW limit)
- Communications problems between different application layers
- Saturation on queues
- Server “too busy” messages
- Time-outs for users
- ...

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PC Banking: the need for Capacity Planning

- Taken actions:
  - Correct of some errors
  - Short term upgrades
  - Enforced monitoring
  - Start of a formal End2End capacity planning Project
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The End2End Capacity Planning Project

The experienced service problems demonstrated some weak points in the Capacity Management Process:

- The capacity planning was an activity distributed over the different infrastructure departments
- The capacity planning process was not always formalized
- Basic performance data not always available or put in a Performance DB
- Application drivers not always used or available
- No End2End view on the available/needed capacity for the application
- Planning mostly made based upon simple extrapolation
- Process with very uneven maturity level
The End2End Capacity Planning Project

- A project leader has been appointed
- A theoretical model has been developed
- The platforms in the scope for the capacity planning project were identified
- The technical solution has been setup
- And as usual,... a planning has been proposed
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Main objective of Capacity Management:

“To Manage our actual and future ICT-Configuration as efficient as possible, respecting the SLA”

Capacity Management activity can be seen from different points of view:

- **Functional**: Capacity management is a set of functions concerned with determining and maintaining
  - the proper balance between workloads and resources
  - providing high service levels for the supported application
  - at minimum cost

- **Departmental**: Capacity Management needs a x-platform approach and should be implemented for both mainframe and distributed systems. Every concerned department should be implicated in the process.

- **Organisational**: Capacity Management activity builds, operates and maintains an organisation to meet the capacity management objectives.
In the Capacity Management Model used in Fortis, different activities are related to each other to realise the SLAs, Capacity Planning (Workload Management) is one of them.

SLAs are considered as the “driving force” that enforces these activities.
The SERVICE management objective:

“To ensure that the correct service levels are being provided reliably, and consistently (now and) in the future.”
The WORKLOAD management objective:

“To provide a system to follow up the evolution of defined workloads and to ensure the creation of workload analysis forecasts over the different concerned platforms.”
WORKLOAD MANAGEMENT:
A distributed workload need to be characterised over the different platforms

Key elements:
Workload classification/characterisation (1):

Where
- On which servers runs the application
  - Presentation Servers, WAS Servers, DB servers/ Firewalls...

what?
- which key services/subsystems/servers are used by the application:
  - Batch / Transactions/ Scripts/ SERVLETS

how much?
- resource analysis:
  - define the required basic computer resources per service/workload:
    CPU seconds / IO / memory usage / tape mounts ...

when?
- when are those resources used?
  - Define Time-periods (day, night, weekend...), collect granularity (15’,
    hour, day...), peaks
Capacity Planning : a Capacity Management Process

WORKLOAD MANAGEMENT :

Key elements :

- Workload classification/characterisation (2) :
  - who ?
    - who is using those resources ?
      - End-users/clients
      - Applications
  - wherefrom ?
    - Job names / user ids / account codes / performance groups / Service classes…
  - what for ?
    - Historical data analysis to determine tendencies
    - Make capacity planning correlation models
    - Forecasting from historical data, using forecasting techniques (analytical modelling, regressions, time series, estimators, etc.)

==> Capacity Planning
The RESOURCE management objective:

“To provide a system to ensure adequate resources are available and functional at the required time and that both systems and configurations perform according to the specifications.”

Capacity Planning: a Capacity Management Process
RESOURCE MANAGEMENT:

- Main activities:
  - Performance management:
    - Optimisation of the installed HW and SW (system and application) resources
    - Instrumentation: real time monitors / performance data base…
  - The relation between workload planning and resource management helps to decide for:
    - Resource planning
    - Hardware Planning
THE COST MANAGEMENT OBJECTIVE:

“To provides a system to ensure all costs can be accounted for and attributed to the services provided.”
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- The Future
The practical implementation.

- Project leader within Operations has been appointed
- Inventory of PC Banking Configuration has been made
- Planning for collecting the needed data has been made
- Performance data were identified
- Performance DB has been chosen
- Workload drivers identified and planned
- Workload-CPU load correlation model made
- Specific Capacity Planning reports were defined
- A monthly follow-up meeting is organized
The practical implementation: Configuration
The practical implementation.

An important number of HW components are involved in the PC-Banking configuration:

- Firewalls
- Load balancers
- Switches/routers
- Wintel presentation servers
- Unix WAS servers
- Unix Oracle servers
- Unix MQ servers
- z/OS TP/DB servers
The practical implementation: available data.

<table>
<thead>
<tr>
<th>Machine</th>
<th>Contact</th>
<th>Performance</th>
<th>Network Traffic (1)</th>
<th>Applic</th>
<th>Comments/Steps</th>
<th>Target Date</th>
<th>Workload</th>
<th>Formal Capacity</th>
<th>Prio</th>
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</thead>
<tbody>
<tr>
<td>Raptor</td>
<td>K. Schollaert + B. Permentier</td>
<td>&quot;orcalator&quot;: measures cpu, memory, disk</td>
<td>OK (Concord) / dev. Perf. DB busy</td>
<td>?</td>
<td>Performance: 1) creation and implementation new tender XFB 2) automatisation transfer (Planning) 3) data analysis (F. Kinat + B. Permentier) 4) dev. performance DB application (B. Balcaen)</td>
<td>1) done 743 2) wait input XFB for PROD 3) done 4) done</td>
<td>http requests</td>
<td>to do with security</td>
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<tr>
<td>CSS1</td>
<td>K. Van Den Berghe + J. Fierens</td>
<td>OK (via Concord)</td>
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<td>?</td>
<td>Performance: 1) creation (B. Postiau) and implementation (B. Gaetano) new tender XFB 2) automatisation transfer (Planning) 3) data analysis (F. Kinat + K. Schollaert) 4) dev. performance DB application</td>
<td>done (key figures/day via concord data)</td>
<td>connected users</td>
<td>to do with Telecom</td>
<td>4</td>
</tr>
<tr>
<td>Web Relay</td>
<td>Jean-F. Leblanc + Bertrand Permentier</td>
<td>&quot;VMstat&quot;: measures cpu + memory  &quot;PDW-stat&quot;: measures # connections pers site</td>
<td>OK (Concord) / dev. Perf. DB busy</td>
<td>?</td>
<td>Performance: 1) wait for new version perf. collector with scheduler &quot;contrab&quot; (B. Permentier + Security) by mid-2005 2) automatisation data transfer (H.-Sa ?) 3) data analysis (F. Kinat + J.F. Leblanc) 4) dev. performance DB application (B. Balcaen)</td>
<td>1) OK - tender 743 2) wait input XFB for PROD 3) done 4) to do</td>
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<td>OK (Concord) / dev. Perf. DB busy</td>
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<td>Perf.: 1) creation (B. Balcaen) and implementation (B. Gaetano) new tender XFB 2) automatisation transfer (Planning) 3) data analysis (F. Kinat + K. Schollaert) 4) dev. performance DB application (B. Balcaen)</td>
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<td>connected users</td>
<td>to do with Telecom</td>
<td>4</td>
</tr>
<tr>
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<td>?</td>
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<td>done</td>
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<td>done</td>
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<td>P.S.</td>
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<td>done</td>
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<td>Weblogs</td>
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<td>connected users</td>
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<td>7</td>
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</table>
The practical implementation.

SAS/ITRM is used as Performance, service and application workload DB
The practical implementation.

Workload drivers identified and planned

Relation user contracts vs sessions assumptions:
- PCB contracts grow at the same rate as the PCB contracts in the corresponding months of 2004.
- The ratio “open sessions / actif abonnements” varies by month likewise the corresponding months of 2004.

<table>
<thead>
<tr>
<th></th>
<th>actif abo BE</th>
<th>actif abo NL</th>
<th>Total actif abo</th>
<th>Total open sessions</th>
<th>open sessions/actif abo</th>
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</thead>
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<td>489.737</td>
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<td>8,044.072</td>
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</tbody>
</table>
The practical implementation.

Workload drivers identified and planned

Relation sessions vs simultaneous connections, assumptions:
- the ratio “sessions / active contracts” varies by month likewise corresp. months of 2004
- the ratios “avg. & peak sessions per day / sessions per month” are the average of these ratios in 2004-2005
- the ratio “peak simultaneous sessions / sessions per day” is the average of this ratio from okt/04 till march/05

<table>
<thead>
<tr>
<th>month</th>
<th>actif contracts/ month</th>
<th>sessions / month</th>
<th>average sessions per day for month</th>
<th>sessions on peak day for month</th>
<th>peak simult. sessions on average day</th>
<th>peak simult. sessions on peak day</th>
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</thead>
<tbody>
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<td>jul/03</td>
<td>489.737</td>
<td>2.590.569</td>
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<tr>
<td>feb/04</td>
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<td>mar/04</td>
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</table>
The practical implementation.

Workload drivers identified and planned

+ forecast 2005

actif abo BE
actif abo NL
The practical implementation.

Workload - CPU load correlation model: presentation servers

Presentation Server: Users vs. CPU use

\[ y = 0.0599x + 0.4013 \]

\[ R^2 = 0.9776 \]
The practical implementation.

Workload - CPU load correlation model: Checkpoint firewall

\[ y = 0.0123x + 2.1843 \quad R^2 = 0.9681 \]

\[ y = 0.022x + 4.8931 \quad R^2 = 0.9574 \]

- As from 25/05/2005 a replacement of the Nokia IP 650 with Nokia IP 1200 lead to an increase in capacity of +/- 45%.
- Available capacity OK following load predictions 2005

SAS FORUM 22/6/05 - J.P. Remory
The practical implementation.

Capacity Planning Report Presentation Servers

During March and April 2005 the replacement of the DL580G1 with the DL580G2 lead to an increase in capacity + the migration from NT4 to W2K enhanced performance.

Available capacity = 2x needed capacity (load prediction 2005)
The practical implementation.

Capacity Planning Report WAS Servers

During May 2005 a CPU + memory upgrade led to an increase in capacity.

Available capacity not enough towards September 2005 (following load predictions 2005 at least +30% needed by end 2005)
AGENDA

- Who is Fortis Bank
- ICT @ Fortis Bank
- The PC BANKING application
- PC Banking: the need for Capacity Planning
- The End2End Capacity Planning Project
- Capacity Planning: a Capacity Management process
- The practical implementation
- Actual Status and Future
Actual Status and Future.

ACTUAL STATUS:

- Performance data of most important platforms are collected and reported
- Application workload drivers are identified and collected
- A Capacity management model is developed for those platforms
- Model is tested by specific load tests on those platforms
- A formal capacity plan is delivered to the management
- Based upon this plan configuration and upgrade plans are put in place
- Service and capacity plans are followed up in a monthly meeting
Actual Status and Future

FUTURE:

- Performance data need to be completed
- Extra workload drivers to be collected
- Automate Validation of Capacity Management model
- Automatic generation of monthly capacity planning reports
- Give a consolidated view of the Capacity Planning status of an application
- Take into account new application releases based upon test data
- Extend approach to other applications
CAPACITY PLANNING FOR MULTIPLATFORM APPLICATIONS AT FORTIS BANK BELGIUM

Q&A