

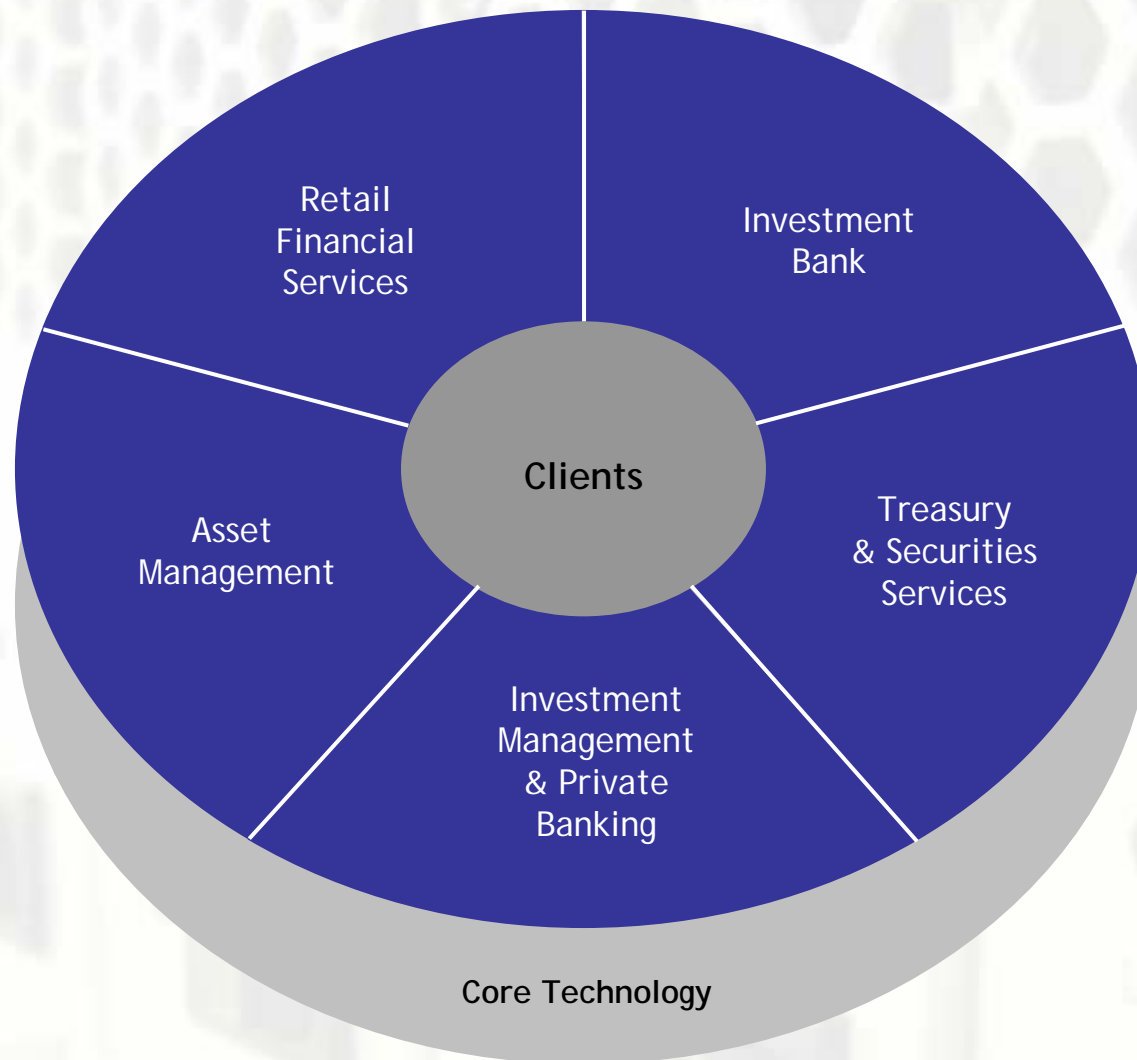
Condor at JPMorganChase

Condor Week, 2006

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JPMorganChase Is One of the Largest Financial Institutions



Over 160,000 employees

We Spend \$7.1B Annually on Technology

The Investment Bank

JP Morgan's Investment Bank is an industry leader offering thousands of clients expert advice and execution in all aspects of capital formation, growth and preservation.

The Investment Bank

Who We Are

- ▶ People: 18,000 in IB; 4,000 in IBTech
- ▶ Locations: Offices in 50 countries
- ▶ Clients: More than 90% of Fortune 1,000
- ▶ Revenues: \$12 billion

Lines of Business

- ▶ Fixed Income
- ▶ Credit & Rates Markets
- ▶ Exotics & Hybrids
- ▶ Institutional Equities, EDG, F&O
- ▶ Global M&A
- ▶ Proprietary Positioning
- ▶ Global Commodities & Currencies
- ▶ Global Credit Risk Management

Leadership Positions

- ▶ Global Syndicated Loans
 - ▶ Interest Rate Derivatives
 - ▶ Asset-Backed Securities
 - ▶ Investment Grade Corporate Debt
 - ▶ Emerging Markets International Bonds
 - ▶ Global Announced M&A
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The Investment Bank – where we fit in

Core IB Technology

- **Architecture**

- Solution Selection governance
- Engineering governance
- Best practices / patterns

- **Foundational Components**

- Identity / Access Management
- Enterprise BPM
- Enterprise Message Bus
- Grid Computing

- ▶ Global M&A
 - ▶ Proprietary Positioning
 - ▶ Global Commodities & Currencies
 - ▶ Global Credit Risk Management
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Why Grid?

Investment banks have computationally intense problems at enormous scale – such as risk management and derivatives pricing – that must be completed in a relatively short period of time

➤ Risk Management

- Investment banking is one of the most highly regulated industries, with formalized risk-based capital requirements for Value at Risk (VaR) and portfolio credit risk.
- These risks are modeled as stochastic processes approximated by binomial trees and monte-carlo simulations, which scale linearly with increased computational resources
- A high degree of accuracy in these risk models can seriously impact the bottom line:
 - Lowers the level of regulatory capital required
 - Increases understanding of sensitivity to market changes or credit events

➤ Derivatives Pricing

- New derivative products are created with increasing frequency
- The ability to accurately price them is critical to future success
- Has to be fast (literally millions / hour)

➤ Portfolio optimization for algorithmic trading

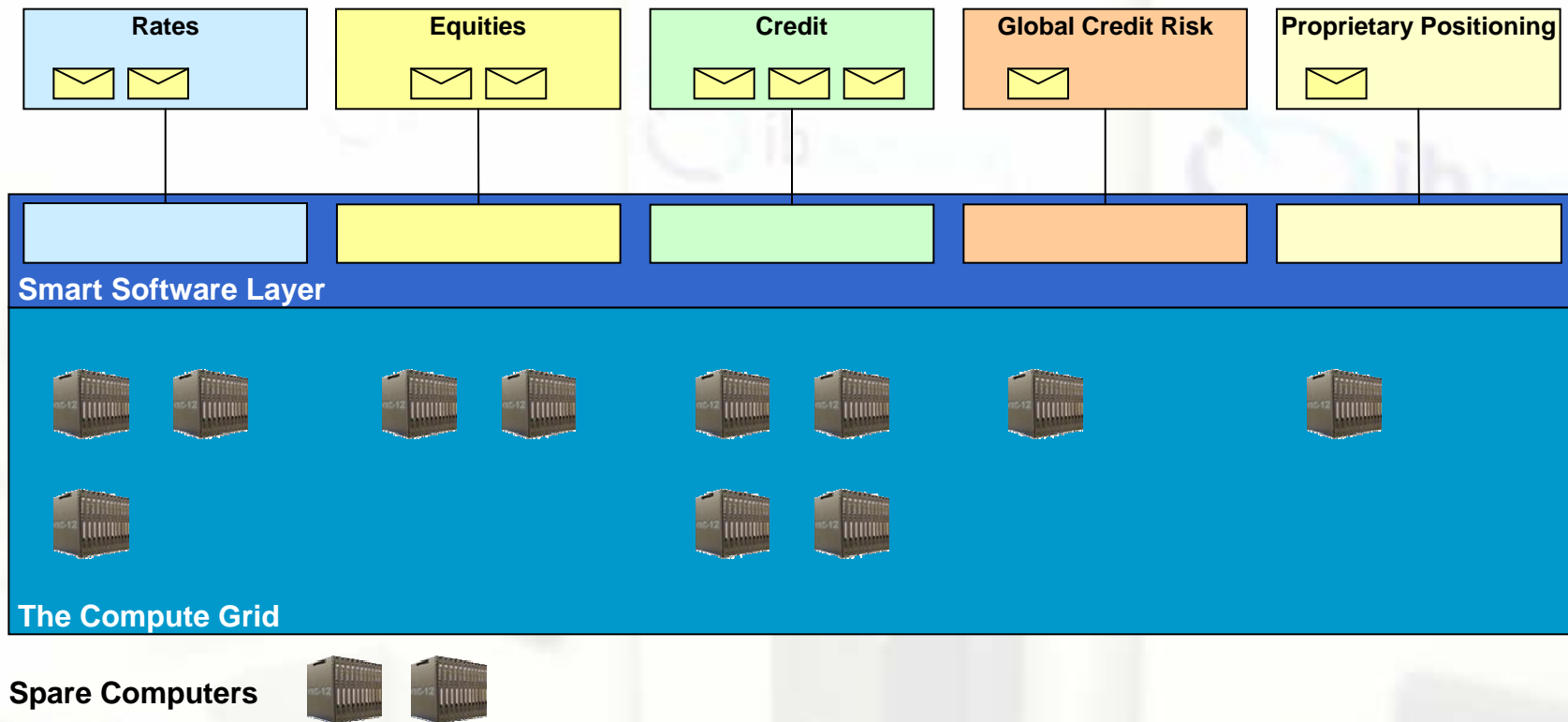
JP Morgan's Answer: the CBB

The JP Morgan grid is known as the “Compute BackBone” (CBB), and consists of the application of over 6,000 shared, networked computers distributed globally.

- The CBB's Infrastructure Investment In 2004 Achieved A 60% To 70+% Utilization Versus The 15% Utilization Typically Observed In Line Of Business Dedicated Computing. (Business Week, October-18-2004).
- The CBB's Reliability Has Been Clearly Demonstrated With Only “Minutes” Of Downtime Since Inception In June/2003. (Over Five 9's.)
- The CBB was named Waters magazine's IT Project of the Year (December / 2003), and Computerworld's Best in Class for 2004.

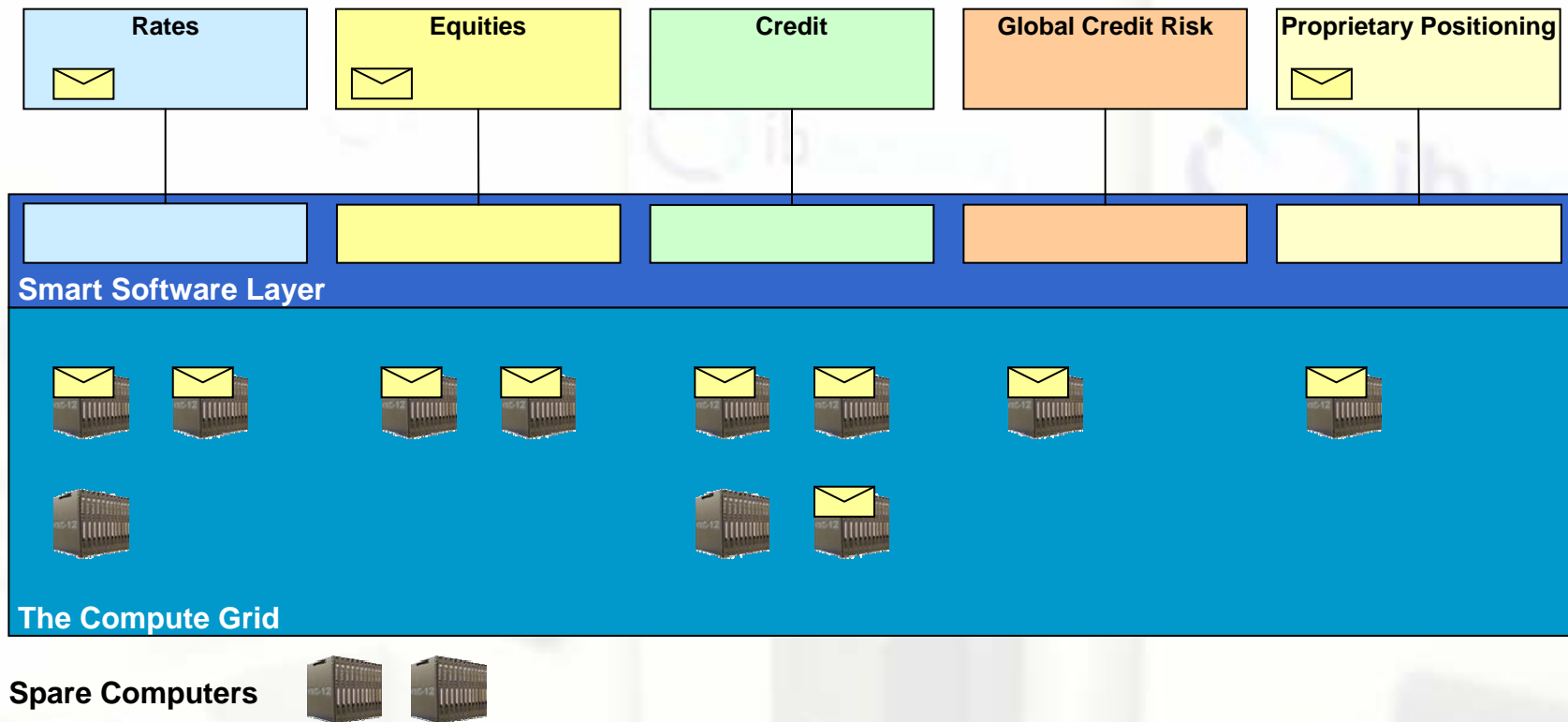
How does it work?

- Computing power is harnessed into a central utility – the grid
- Grid management software coordinates the supply of computing power with demands of the business
- Jobs are submitted by applications, then executed on the grid, with the results returned to the applications



How does it work?

- When one line of business needs more resources than usual, additional power can be drawn from under utilized machines
- Compute Backbone can also add new computing capacity in 24 hours
 - Our target for On Demand initiative is 1 hour



Current CBB Challenges

We're looking for:

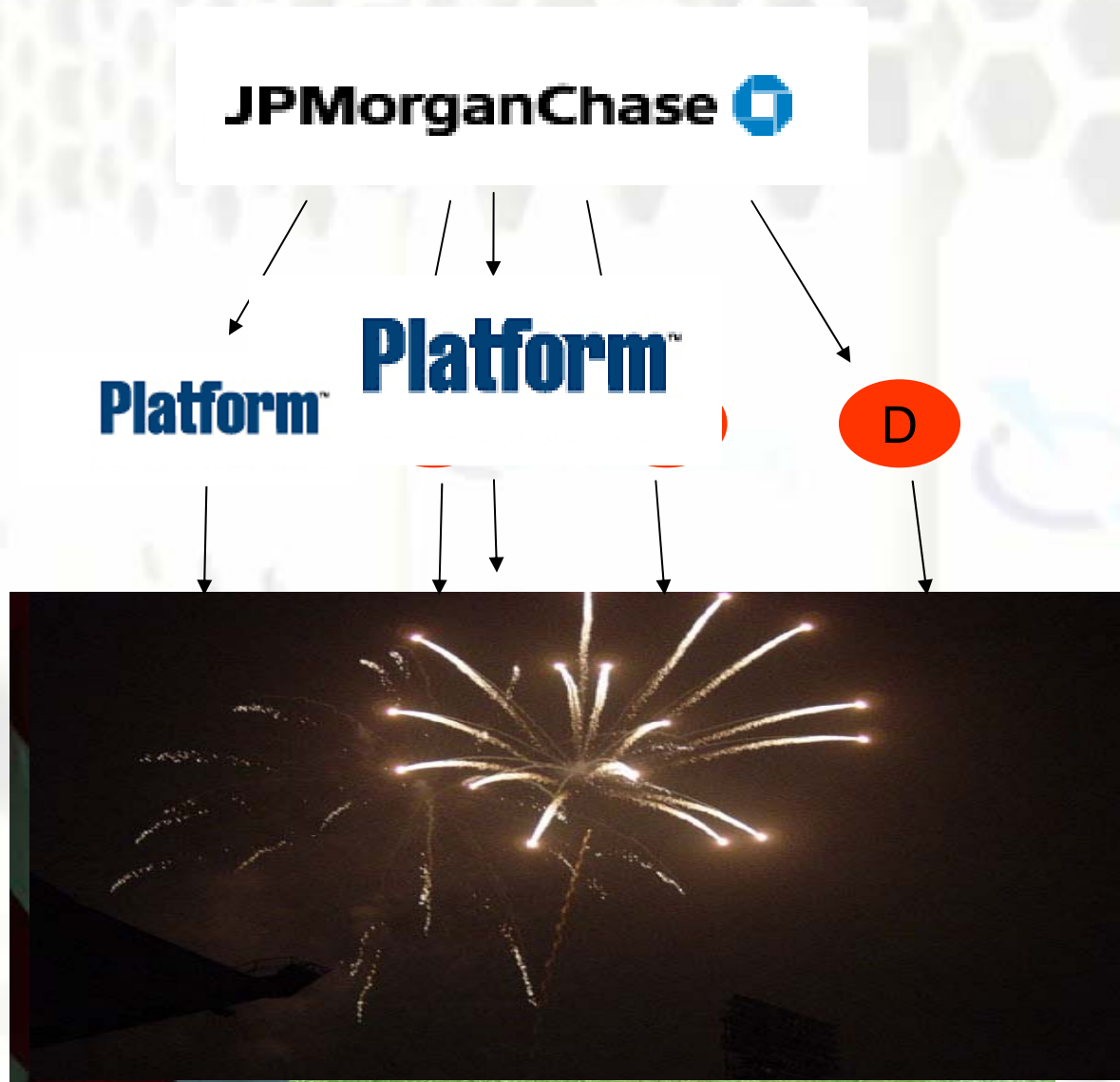
- More flexible resource utilization
- Both deterministic & opportunistic grid scheduling
- On demand grids
- 64 bit support
- Improved data caching functionality
- An orchestration layer (parent – child)
- Coordinated view beyond single datacenter cluster



... our current grid middleware partnership is a **yawn !!!!**

Current CBB Challenges

- Elimination of single vendor dependency



Why Condor?

- No clear leader in vendor space
- Growing commercial interest in Condor
- Seems to meet a lot of our needs
 - Both deterministic & opportunistic scheduling
 - 64 bit support
 - We like the available source model
- They were enthusiastic about enhancing the product for commercial needs

What are we doing with Condor?

- Phase I is Condor on the Desktop
 - Stateless pricing calculator running on several hundred desktop machines for our Exotics & Hybrids business
 - Runs hundreds of thousands of pricing jobs per day
 - Currently in beta, with production in 2Q06

- Using a queuing layer on top of Condor to warm start pricers and eliminate 98% of Condor's scheduling overhead

- We built our own GUI for managing jobs and nodes in the grid

- Phase II is Condor in the Datacenter
 - Currently in R&D

Opportunities for Condor in the Enterprise

Topics	Issues
Operational Support	<ul style="list-style-type: none"> ➤ Must have world class Condor Support ➤ Real time 24 x 7 assistance ➤ Sufficient team depth to cover all contingencies
Management Tools	<ul style="list-style-type: none"> ➤ Quill is a good start ➤ Need standardized set of components in the tool space ➤ Vendor products will never completely meet our needs out of the box
Real Time Functionality	<ul style="list-style-type: none"> ➤ Batch oriented grid scheduling needs to be complemented with real time ➤ MW not ready for prime time – especially on Windows ➤ COD did not really meet our needs
Commercial Community	<ul style="list-style-type: none"> ➤ Applaud the work of Brooklin Gore to organize commercial users group ➤ Need to make sure we're coordinating our message to Condor Team

Thank you!

- Thanks to Miron, Todd, and the entire Condor Team
- We're always looking for bright, talented people
- We're also looking to partner with Condor thought leaders
- Please feel free to talk with any of us:

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