This is a redacted version of a final draft of the 2003 MySQL investor deck. In this B round the company raised $16m from Benchmark Capital and Index Ventures.

Hope this is useful to startup entrepreneurs all over the world.

MySQL Business

The Opportunity To Disrupt the Database Market

Mårten Mickos, CEO

How To Read This Plan

- We assume the reader has a basic familiarity with MySQL and its present business
- Feel free to pick sections of this presentation in any order you feel comfortable with (see TOC on next page)

Table of Contents

Go
Go
Go
Go
Go
Go
Go
Go
Go
Go
Go

currently not updated

The Business Case

Table of Contents

The Business Case

- Intro
  - Yahoo, Google, Cisco, Nokia, Lucent, Census Bureau, Rhode Island and 4 million trust MySQL with their database needs
- Market
  - Organisations urgently need to cut IT costs, or expand without adding costs
  - ISVs need to reduce dependency on ORCL-MSFT-IBM
  - Linux is validating open source in the enterprise
- Now
  - Open source databases are maturing for enterprise use
  - Open source is a method for
    - producing high-quality software at a low cost
    - selling and distributing software at a low cost
  - MySQL is the world's most popular OS DBMS
  - MySQL owns its software and has a revenue model: dual licensing

The Business Case (2)

- For the customer
  - Amazing cost savings (TCO and capital investment)
  - Better reliability and uptime
  - Faster application deployment
  - Abundance of skilled personnel
  - MySQL supported 24/7 worldwide by a viable commercial vendor - MySQL AB

The Business Case (3)

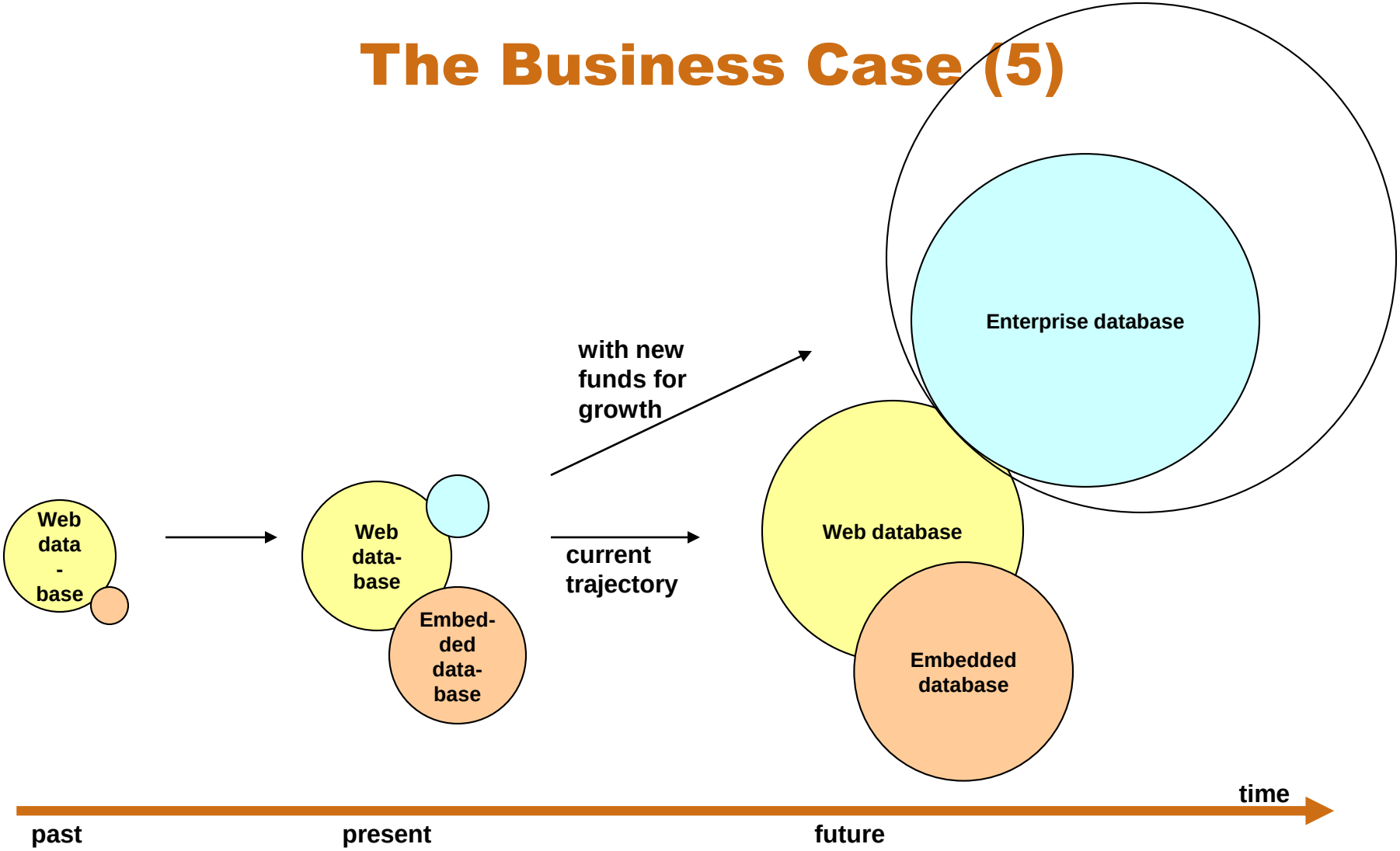
- Therefore
  - We are the only ones who can meet the economic desires of the market while being profitable.
- So let us
  - Sell to ISVs and the enterprise market
  - Forge alliances needed for enterprise business
  - Perfect the offering
  - Build the sales channel

and cause a permanent change to the way software is produced and procured.

The Business Case (4)

- Why us?
  - Proven product leadership
  - Proven user base success
  - Proven open source business model
  - Vast and active community
  - Viable vision by owners and management
  - Proven management
  - Fully functional and clean company
  - New visible output every month
    - web market business is growing rapidly
    - embedded business is growing very rapidly
    - enterprise market is enticed

The Business Case (5)



Market and Opportunity

Table of Contents

Bloomberg.com 17 Aug 02

"Oracle, IBM, Microsoft May Lose Business to Free Database Software MySQL"

ComputerWorld 11 Feb 03

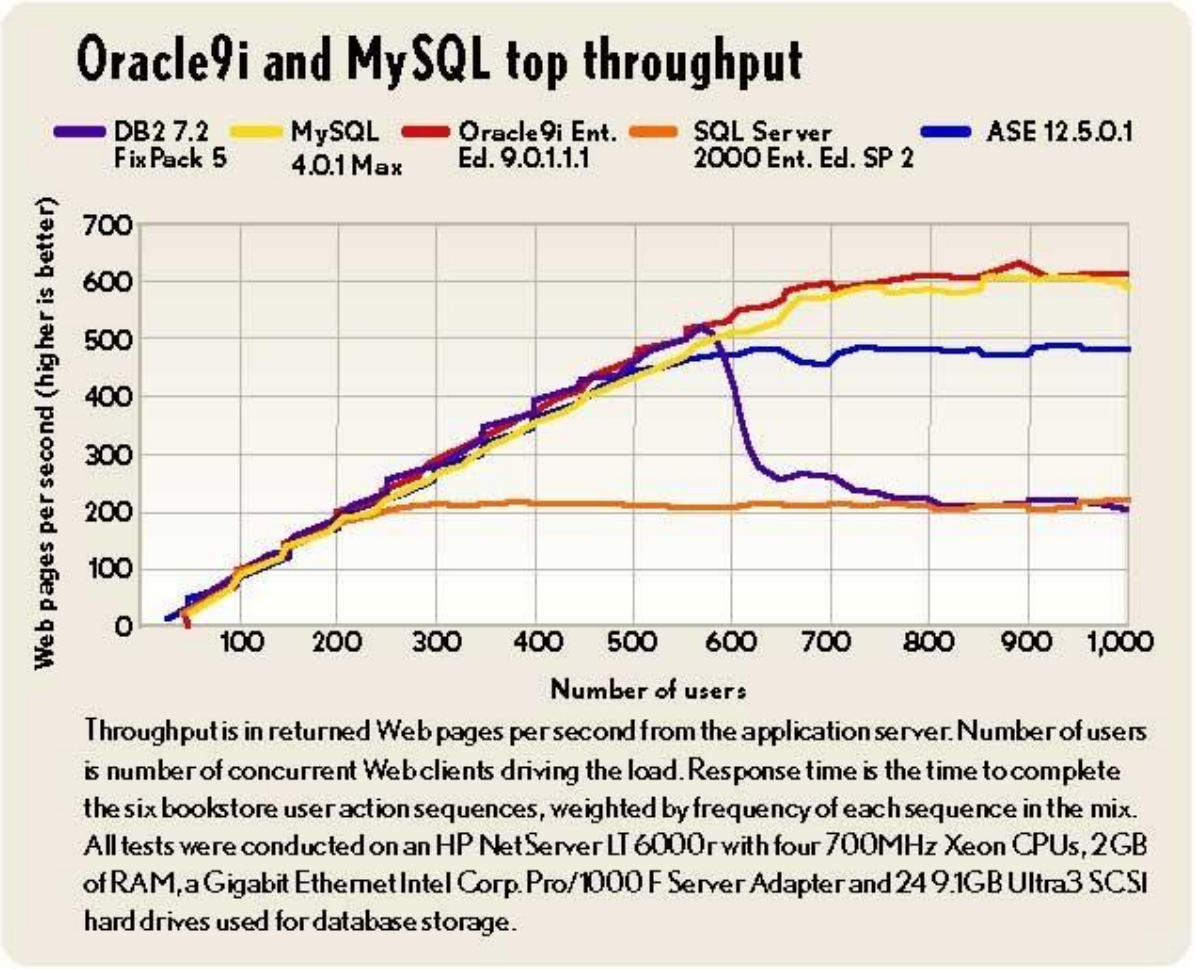
McNealy: ...if you want to save more money, make the default database MySQL.

It's free, it's bundled, you've got the whole open-source community working on making it better. If Yahoo and Google can run their entire operations on MySQL, then certainly there's a huge chunk of your operations you could run on it as well.

San Francisco Chronicle 14 Aug 02

Some major corporations, including 7-Eleven, Deutsche Telekom and Amazon.com, are migrating to Linux servers to take advantage of low- cost, open-source versions of data management software such as MySQL.

eWeek's DBMS Benchmark



Throughput is in returned Web pages per second from the application server. Number of users is number of concurrent Web clients driving the load. Response time is the time to complete the six bookstore user action sequences, weighted by frequency of each sequence in the mix. All tests were conducted on an HP NetServer LT 6000r with four 700MHz Xeon CPUs, 2GB of RAM, a Gigabit Ethernet Intel Corp. Pro/1000 F Server Adapter and 24 9.1GB Ultra3 SCSI hard drives used for database storage.

Disruptive Business Model

- "Open Source/Linux software is a **'disruptive innovation**' that has the potential to seriously erode the traditional software business model by attacking the heart of its model – high margin software licensing fees."

Merrill Lynch 24 Oct 2001

- "… the popularization of the Open Source movement continues to pose a significant challenge to the Company's business model …"

Microsoft 10-Q, February 2003

The Database Market

- is dominated by the Big Three
  - Oracle, IBM and Microsoft command 83% of the market
- MySQL owns 0.02% of the market by revenue
  - so the Big Three say "MySQL is not a threat"
  - and that is fine with us, because
- MySQL commands an estimated 20% by installed base
  - and makes money

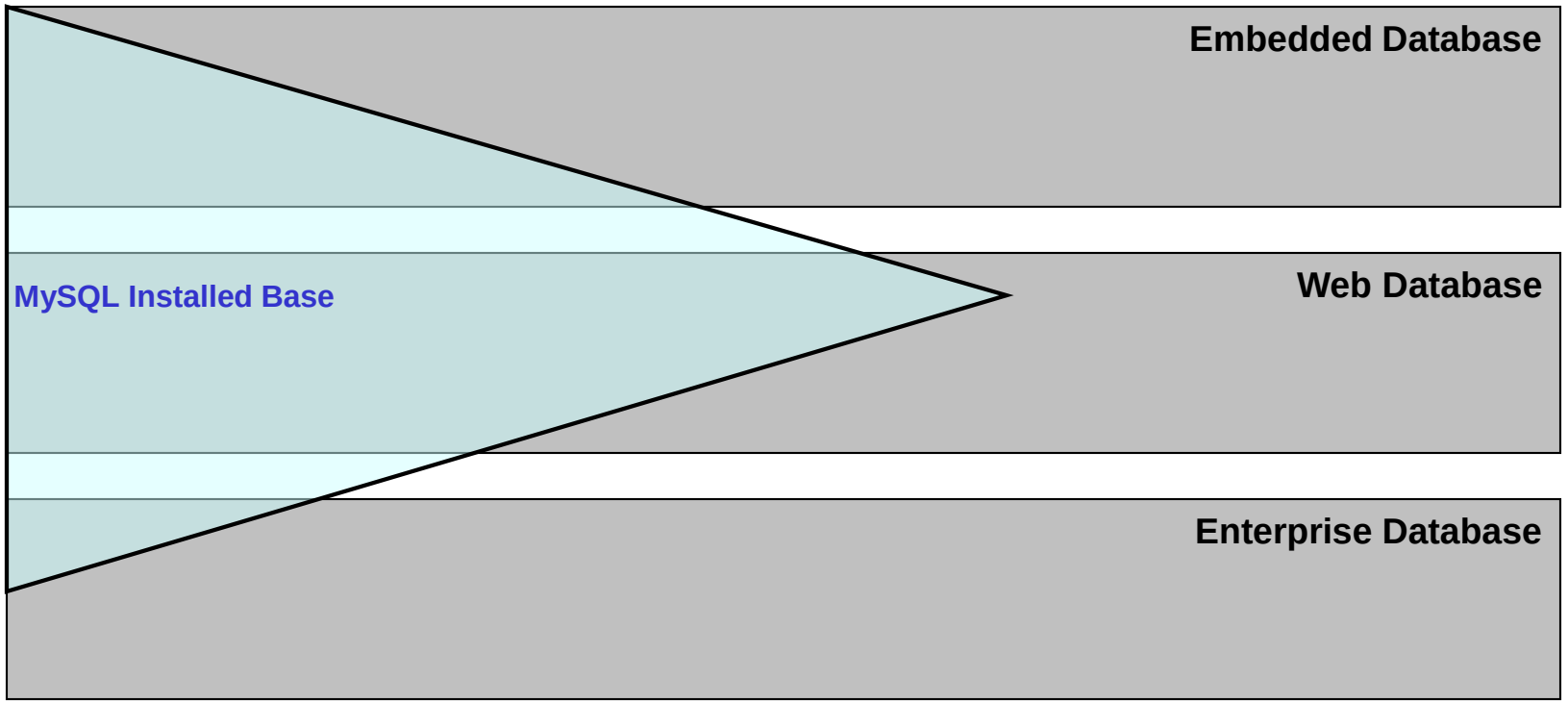
- What's wrong? - Nothing!

Database Market

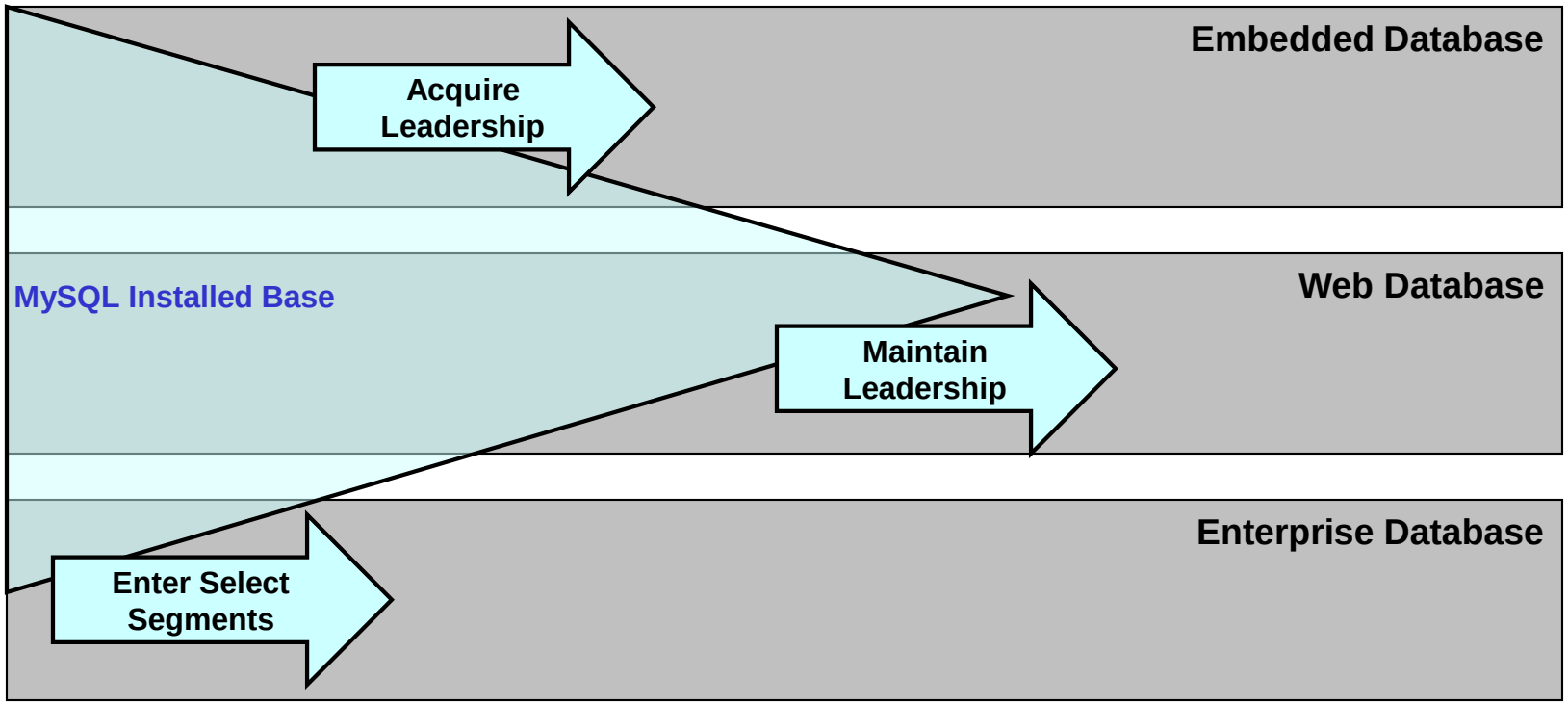
$1B	Embedded in Software Embedded in Hardware	Embedded Database
$2B	Dynamic Content E-Commerce	Web Database
$6B	Utility Database Data Warehousing Database Business Transaction Database	Enterprise Database

N.B. Revenue split above is MySQL estimate.

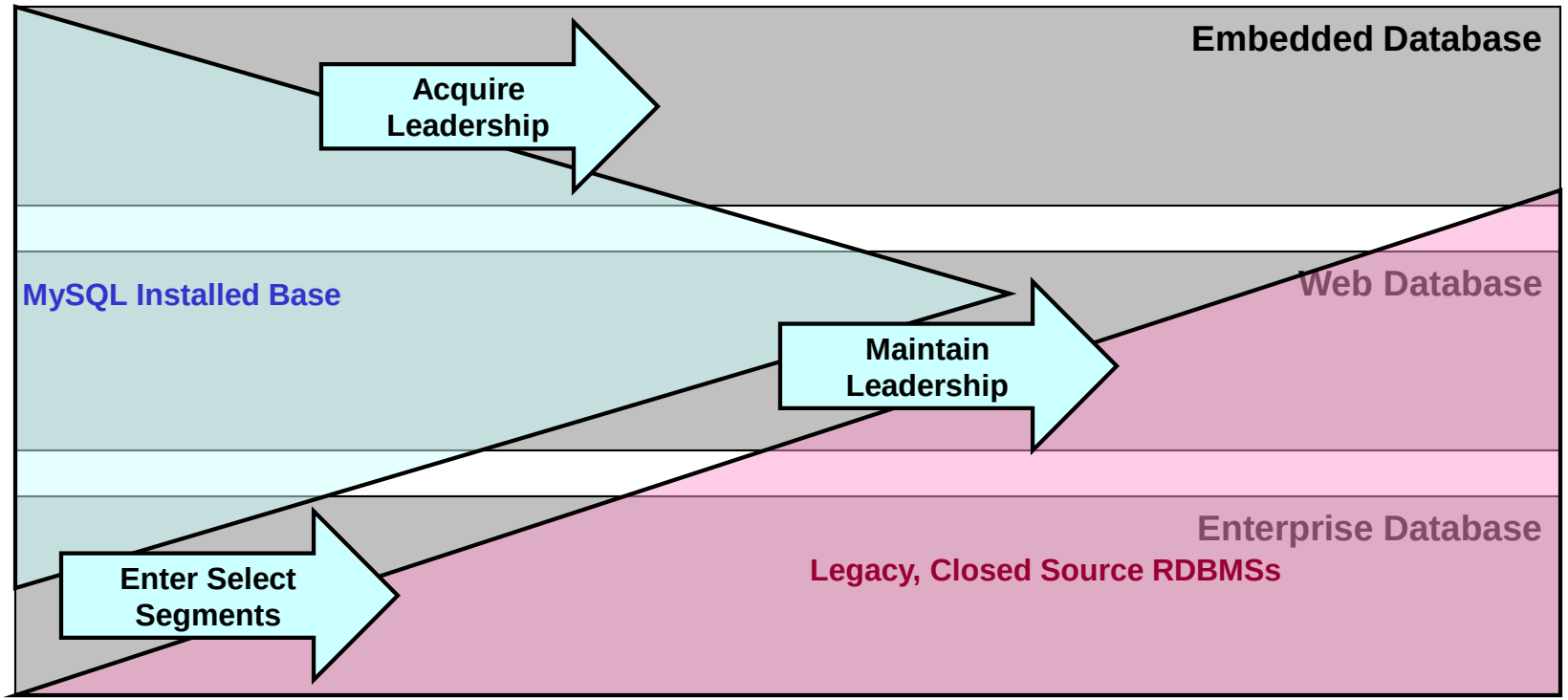
Database Market



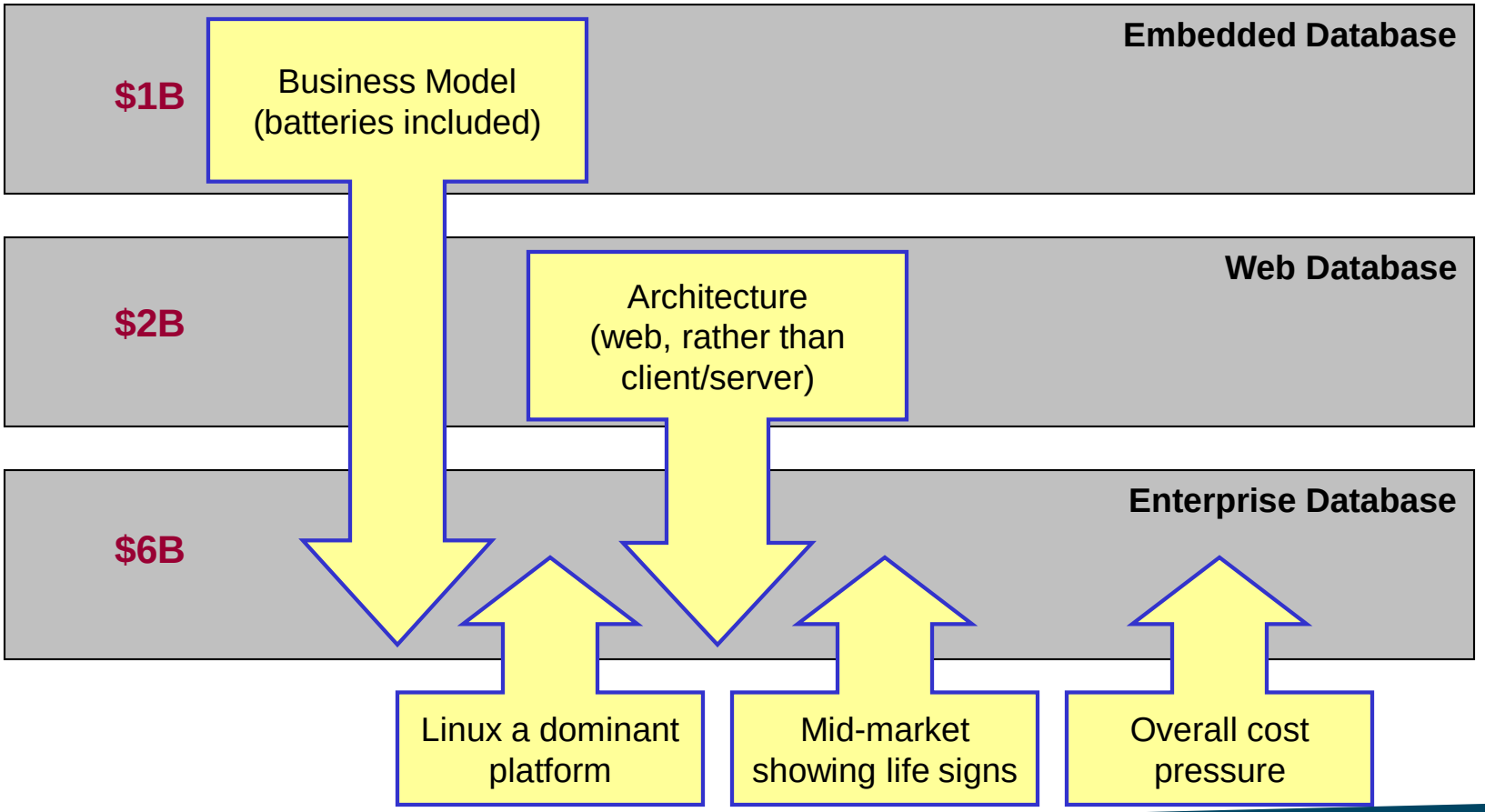
Database Market



Database Market



Database Market Evolution



Estimated MySQL Potential

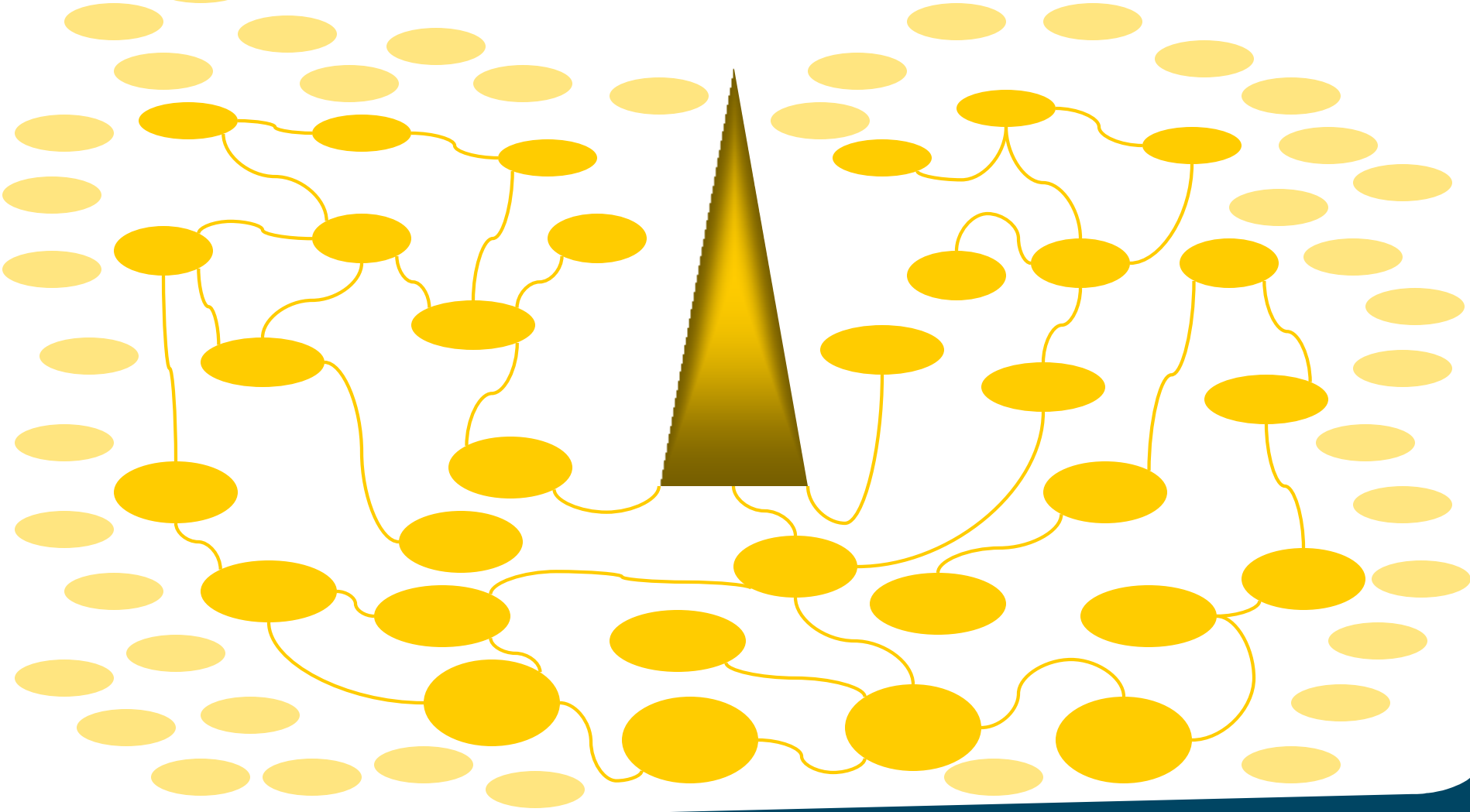
- In the embedded market
  - €100m
- In the web market
  - €300m
- In the enterprise market
  - €600m - €1bn

The above figures represent current best estimates by the management.

Open Source Info

Table of Contents

MySQL - The Cathedral in the Bazaar



Three Modes of Production

- Individuals order their productive activities
  1. as employees in firms, following the directions of managers
  2. as individuals in markets, following price signals
- and now, also
  3. as groups of individuals in the world, following diverse motivational drives and social signals (rather than either market prices or managerial commands), successfully collaborating on largescale projects
- This third form of production has been dubbed

  "**commons-based peer production**"

See research papers by Ronald Coase, Oliver Williamson (for items 1 and 2), and Yochai Benkler (for item 3).

MySQL Has 2 Modes of Production

- Two production modes
  1. The Cathedral: employees of MySQL AB, following the directions of managers.
  2. The Bazaar: individuals all over the world, following diverse motivational drives and social signals.
- Both modes are Quid pro Quo
  - Employees receive salary and other benefits
  - Individuals receive GPL'd software, rapid bug fixing, rapid evolution, i.e. solutions to every-day problems, and, additionally, peer recognition
- Ideally for MySQL, it does not matter to an individual whether he is in the cathedral or in the bazaar, or both.

MySQL Community Goals

1. Grow installed base from present 4m to 40m
2. Continually activate and engage community
3. Outsmart, outposition and outpromote Postgres

1. Grow Installed Base from Present 4m to 40m

A. Make sure product is suitable for vast deployment and usage
B. Encourage the world's most powerful distributors to distribute MySQL
C. Integrate with the world's most popular software tools, platforms and servers
D. Ensure MySQL is used in as many FOSS projects as possible (FOSS = Free / Open Source Software)

2. Keep Community Active

- Actively engage in rich, honest, relevant and frank communication
- Encourage intelligent contributions to advance our source code
- Promote and augment our open source strategy
- Encourage and enable peer recognition

3. Outsmart Postgres

- Have financially viable business and go for goals 1. and 2. with perfection – and that's it

Dual Licensing

- MySQL AB employs dual licensing for its product, the MySQL server.
- This means that MySQL is available under a regular commercial licence for commercial customers, and under the GPL licence for those who live by the Free Software principles.
- The product is technically the same under both licences, but the financials and the legal ramifications are different.
- It is up to the customer to decide what path he wants to follow and what licence to use.

Common Open Source Objections

"Lack of proper support"
- MySQL operates worldwide 24/7 support since 1999

"Lack of vendor accountability"
- MySQL owns its product and takes full responsibility

"Lack of vendor viability"
- MySQL has made money since 1995

"Lack of third-party software integration"
- MySQL is working with Sun, Novell, Veritas and others to ensure interoperability

"Lack of skilled staff"
- There are more than 4 million installations worldwide and hundreds of thousands of skilled developers and administrators. Use the community.

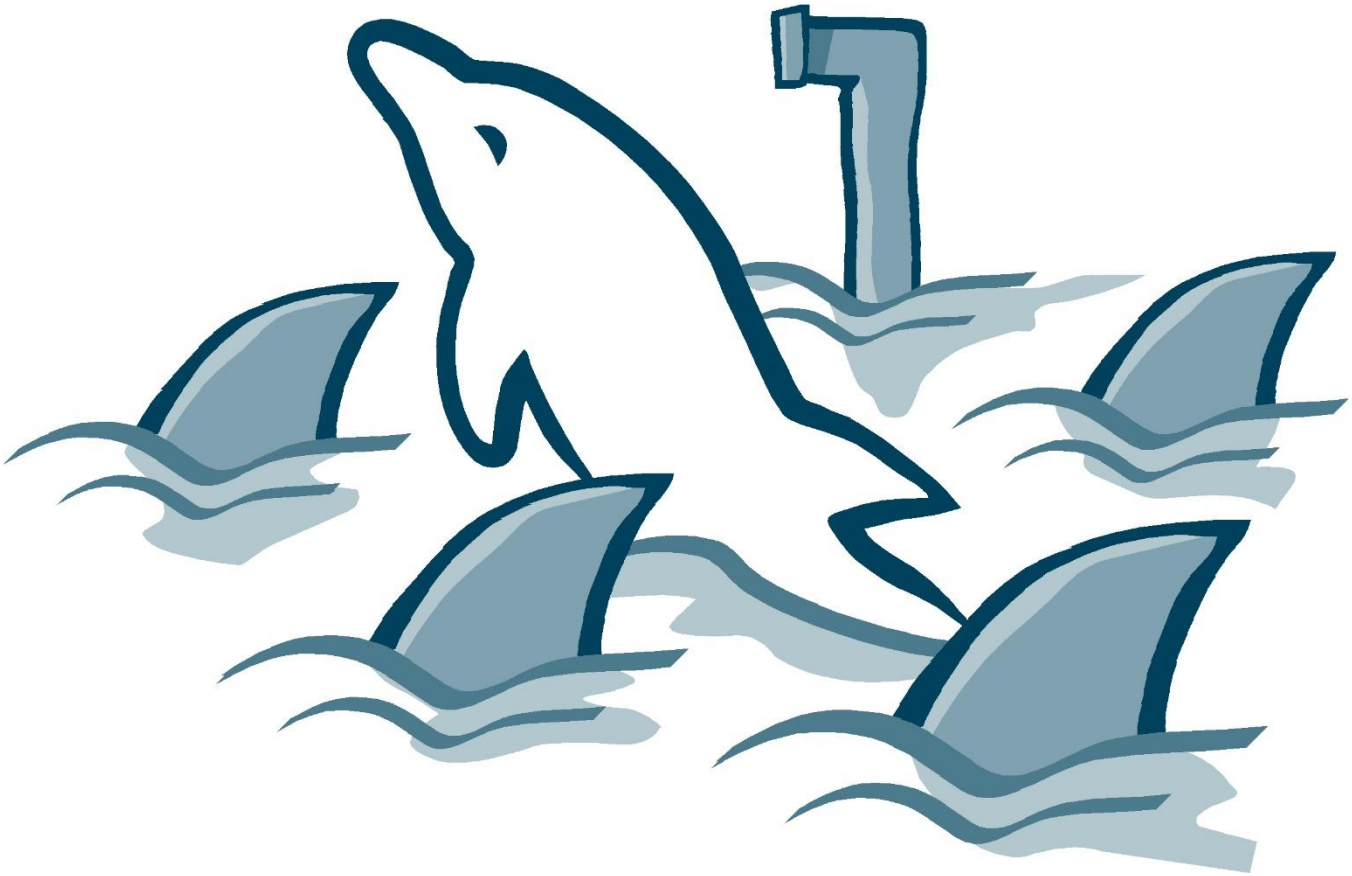
MySQL Info

Table of Contents

MySQL Mission

Make superior
database software
available and affordable to all

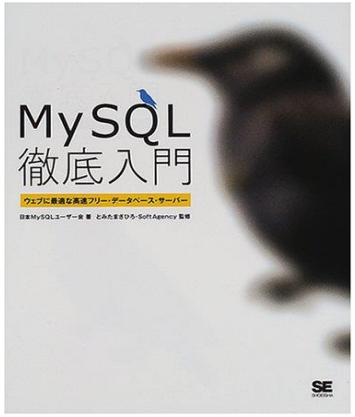
Do Differently

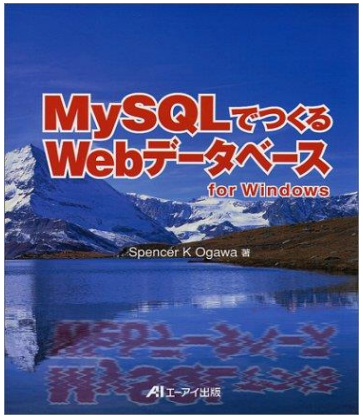


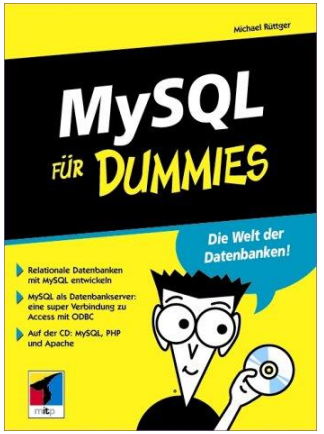
The World's Most Popular Open Source Database

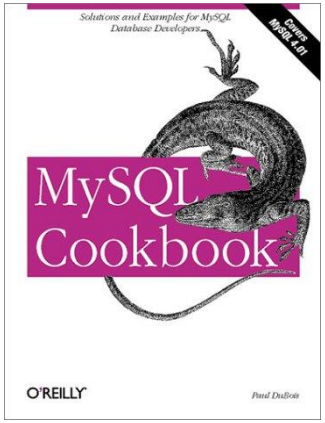
- Numbers
  - An estimated **4 million** installations
  - More than **1.8 million** web visits per month
  - Average of **29,000** downloads PER DAY
  - Google finds some **8 million pages** with "mysql" (on par with "oracle")
- Distribution
  - Every major Linux distribution includes MySQL
  - LAMP = **L**inux + **A**pache + **M**ySQL + **P**HP/Perl/Python
  - Mac OS X servers,Sun LX50 servers, Sun Cobalt Qube 3 appliances, Solaris 9 Companion CD, DELL PowerEdge Web Servers, Packet Design Route Explorer, etc. equipped with MySQL

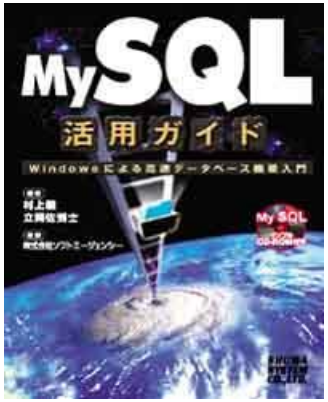
The Entire World

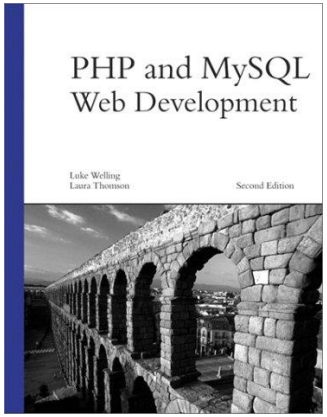


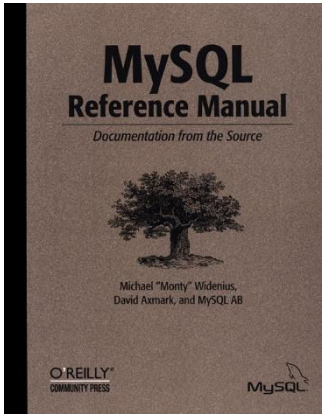












Analogy

MySQL is doing to **databases**
what DELL did to PCs:

In a maturing market, turning the key product into a cost-efficiently produced high-quality high-performance mainstream product with excellent customer service, giving new masses of customers access to the value of the offering at an affordable price.

Sustainable Business Model

What we have

- We own and develop our **software**
- We own and protect our **trademark**
- We apply **dual licensing** to our product
  - GNU General Public Licence (GPL) - free
  - Commercial Licence - for a fee

What we do

- We let the free version of our software find its way into every organisation
- We sell **support** and services to the users of the free software
- We sell commercial **licences** and **support** to commercial customers

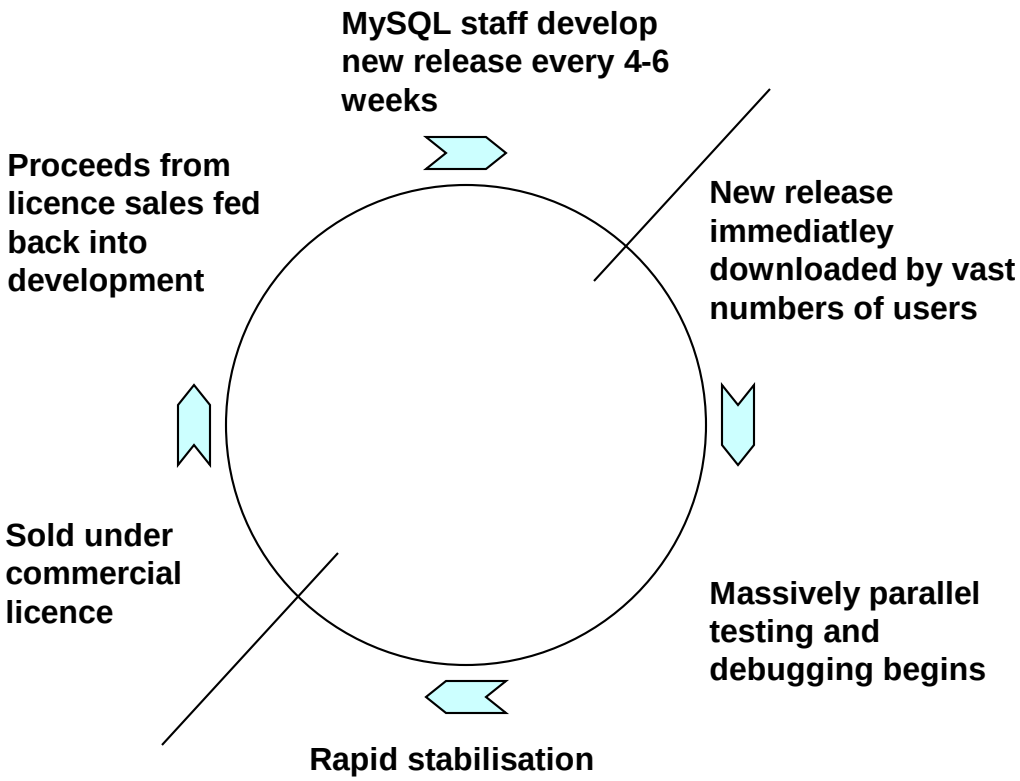
Second Wave of Open Source

- Preserve the benefits of open source
  - battle-tested by millions every day
  - contributions from the community
  - an ecosystem far wider than yourself
- Without compromising business viability
  - ownership of source code means responsibility can be taken
  - ownership of trademark means that customers can trust you

Virtuous Development Cycle

Commercial benefits:

- battle tested product
- rapid development



Community benefits:

- commercial-grade framework free of charge

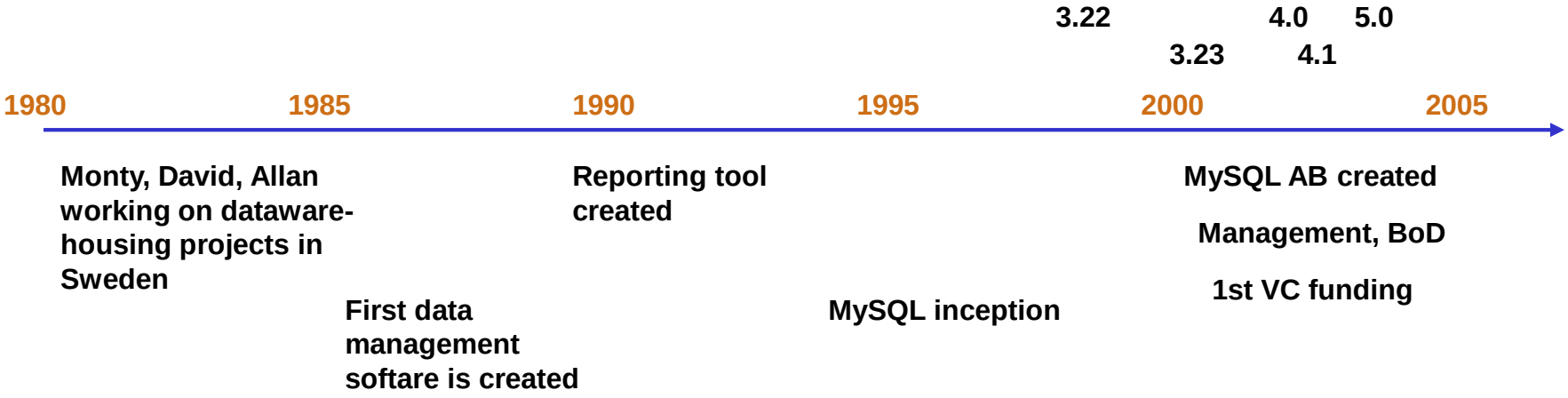
The MySQL Product Formula

1. Speed
2. Reliability & Stability
3. Ease of everything: installation, integration, development, deployment, management
4. Economy

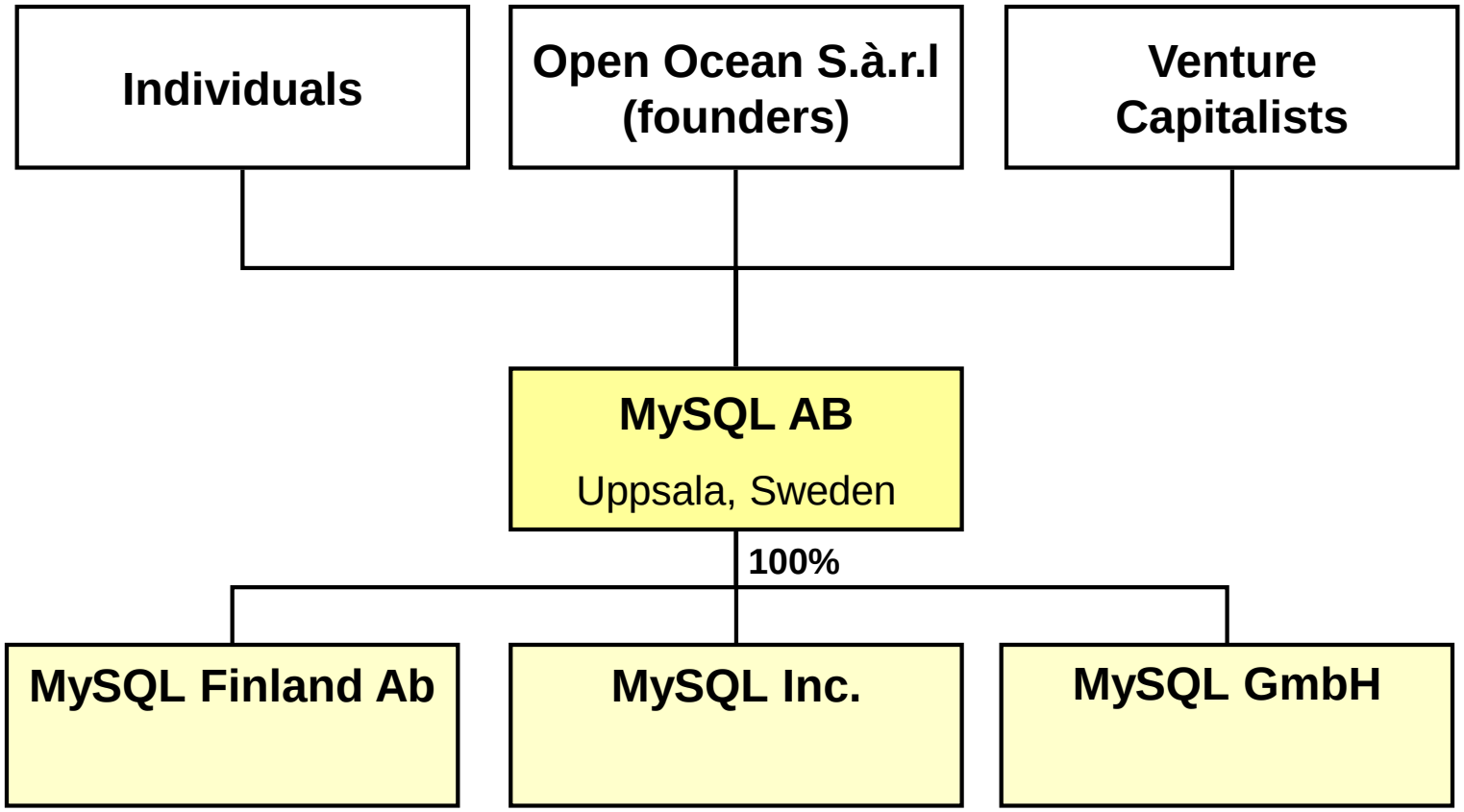
MySQL AB Overview

- MySQL founded in 1995 by open source gurus Michael "Monty" Widenius and David Axmark
- Head office in Uppsala, Sweden
- Some 65 staff in 14 countries
- Privately owned
- Profitable 1996-2000
- MySQL AB owns the intellectual property rights of the MySQL server, the mysql.com domain name and the MySQL trademark
- A total of EUR 4m in external investments so far by:
  - ABN AMRO Alfred Berg Industrifinans, NO
  - Scope Capital, SE
  - Servisen Management, SE
  - Respect Ventures (Holtron), FI

Historic Timeline



Corporate Structure



As of 1 Jun 2002

Balance Sheet Etc.

- No debt, no lines of credit
- No equipment leases
- No R&D costs deferred
- Property & Equipment €364k
- US GAAP compliant revenue recognition
- Outstanding shares and options as of 1 Jan 2003: [REDACTED]

More Information

- Website http://www.mysql.com
- Management team http://www.mysql.com/company/management.html
- Company fact sheet http://www.mysql.com/company/factsheet.html
- Recent press releases and coverage http://www.mysql.com/press
- Product information: http://www.mysql.com/products
- Reference manual that includes company information, benchmark information, product roadmap, and more http://www.mysql.com/doc/en
- Product roadmap: http://www.mysql.com/doc/en/TODO.html
- Recent press mentionings according to Google: http://news.google.com/news?q=mysql&hl=en&lr=&ie=UTF-8&sa=G&scoring=d

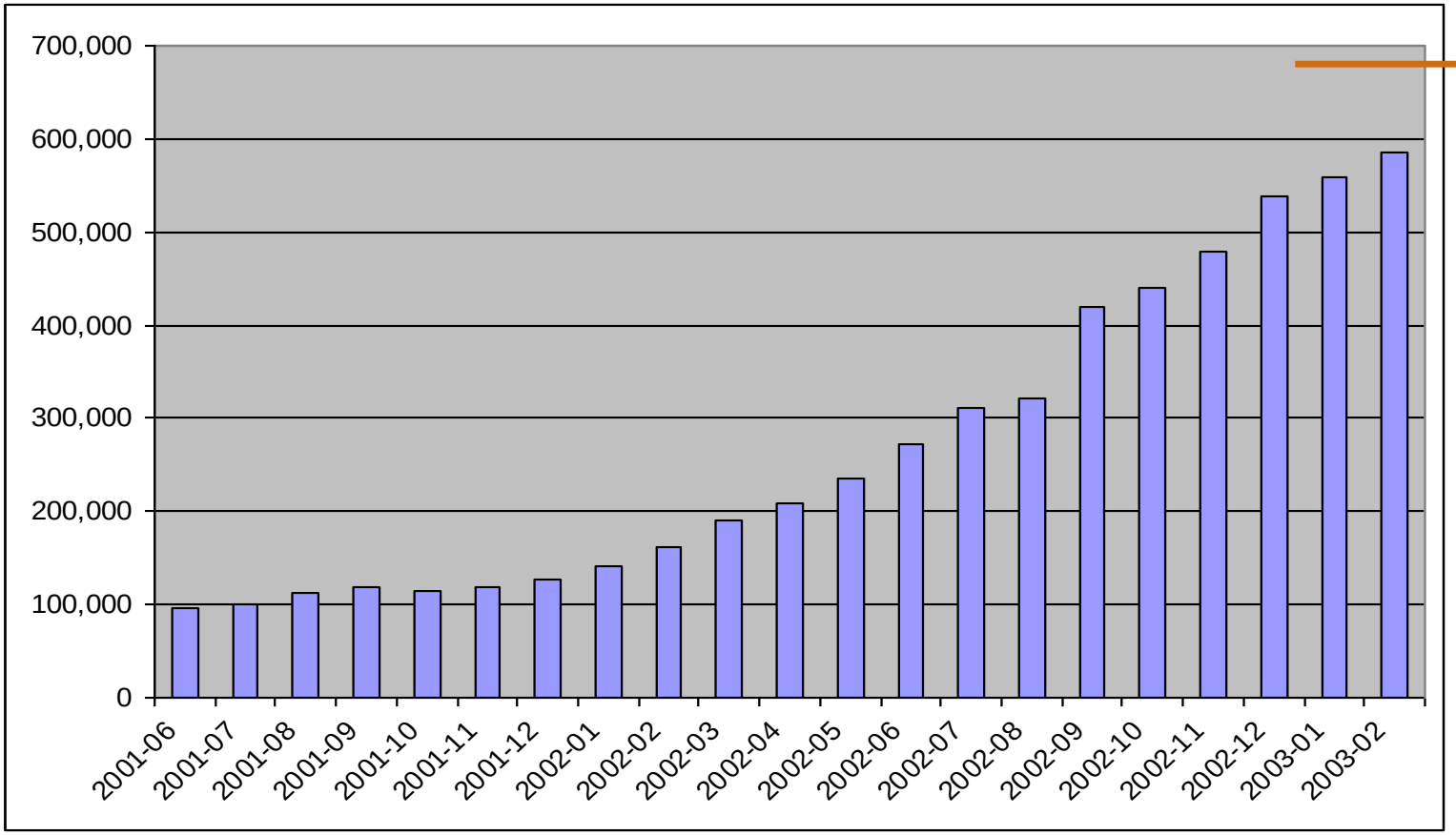
Figures 2002

Table of Contents

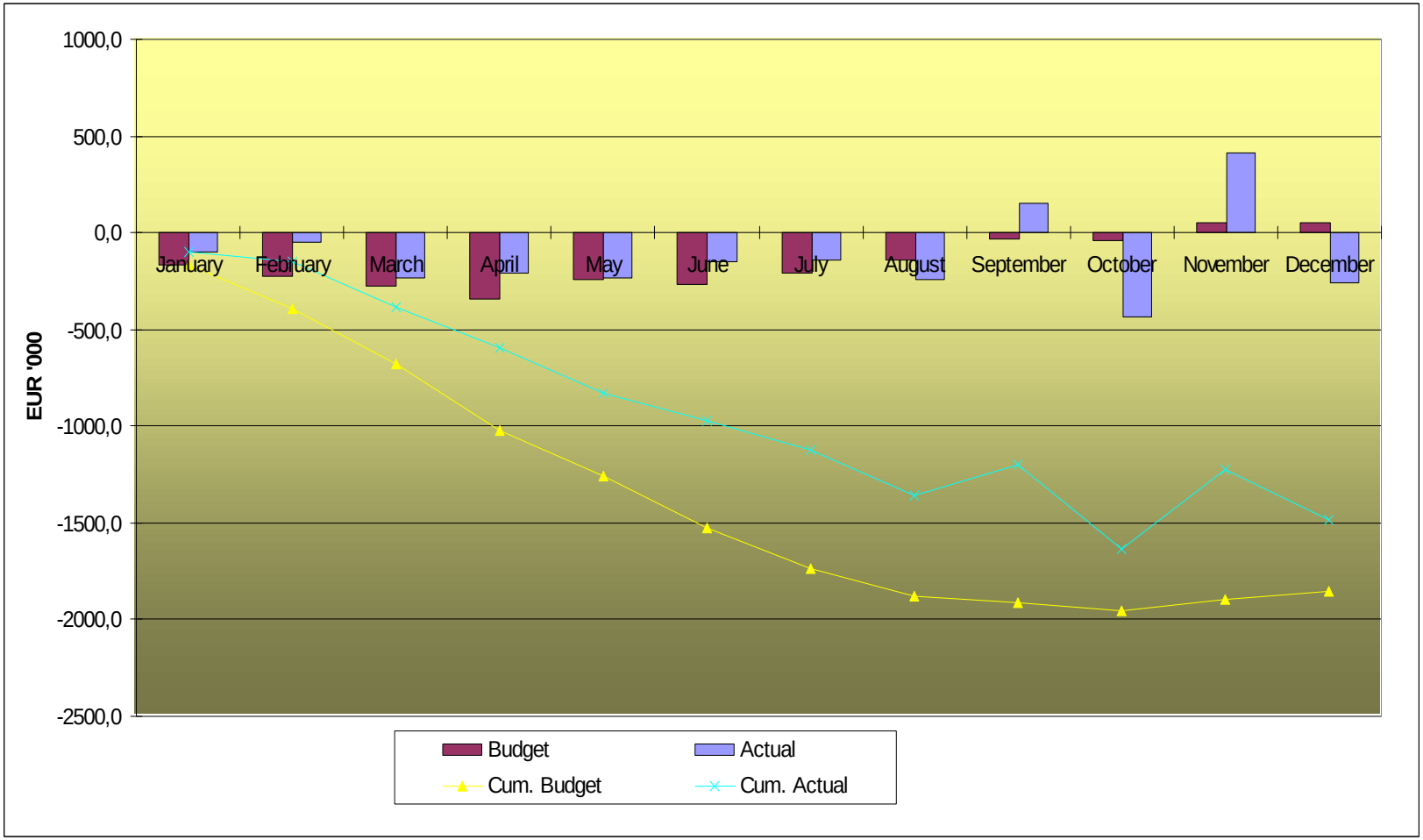
Year 2002 in Figures (Prel.)

• **Revenues**	**€4,701k**
– Cost of revenues	€1,325k (28%)
– OPEX	€5.037k
• DEV	€1,288k (27%)
• S&M	€2,123k
• G&A	€1,626k
• Net income	(€1,486k)
• Avg. no. of employees	49 (55 with subcontractors)
• Product line split	
– Licences	52% - starting $200, $395 per copy
– Support	23% - $1,500 - $48,000 p.a.
– Training	12%
– Other services	6%
– Partner and other fees	7%

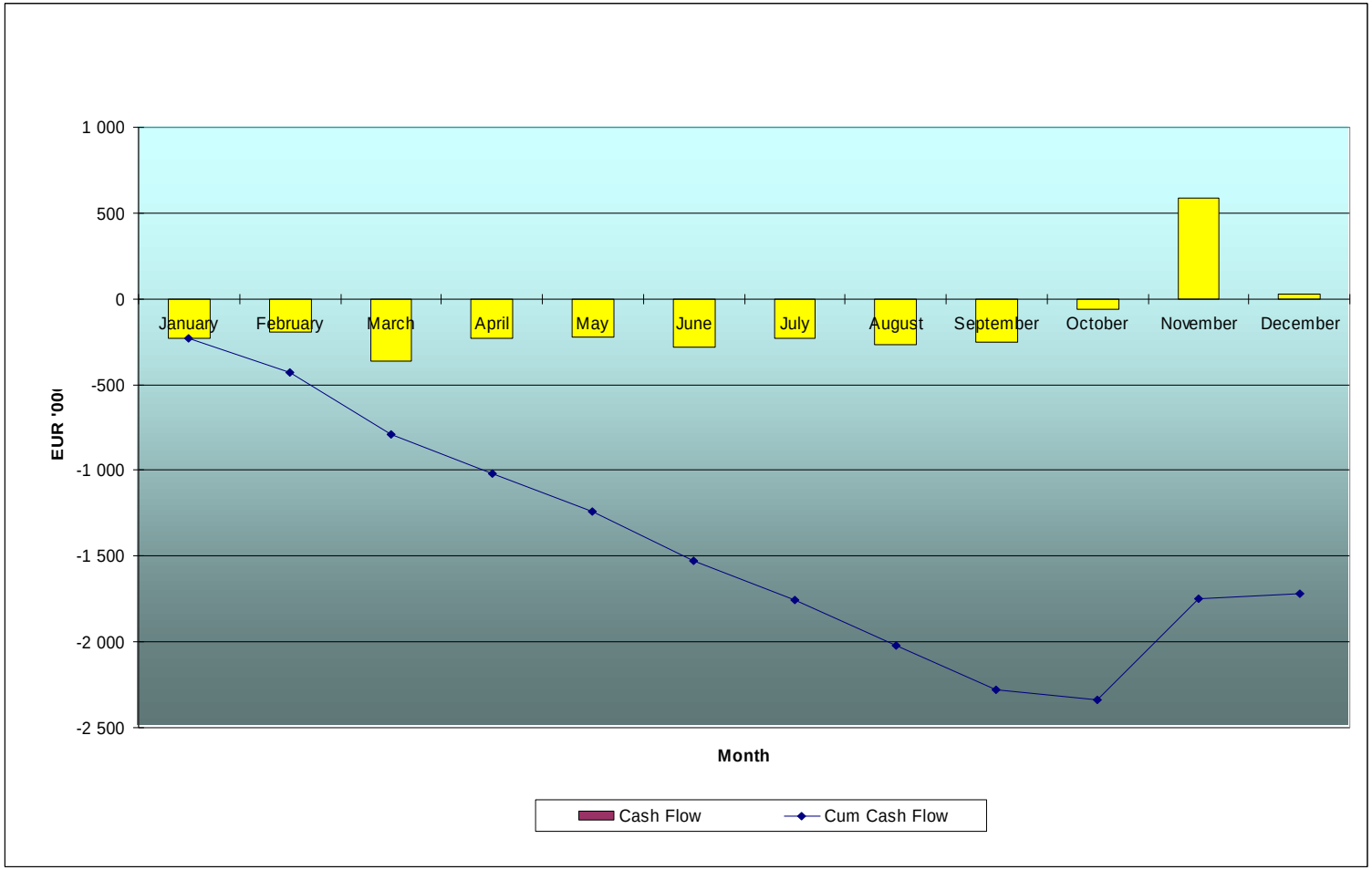
Sales, 6 Month Trailing Average



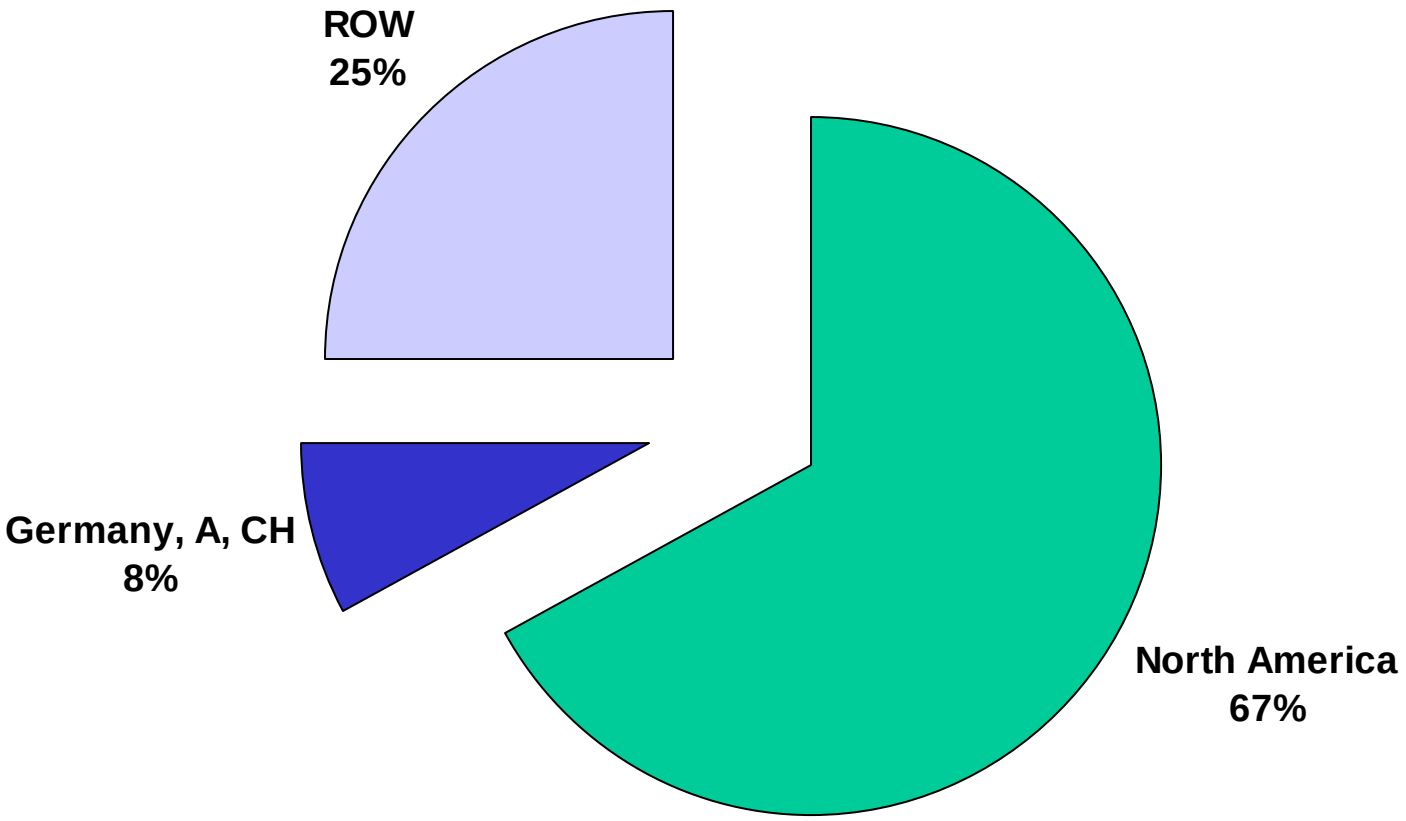
P&L: Actual vs. Budget



Monthly Operating Cash Flow 2002



Sales by Territory 2002

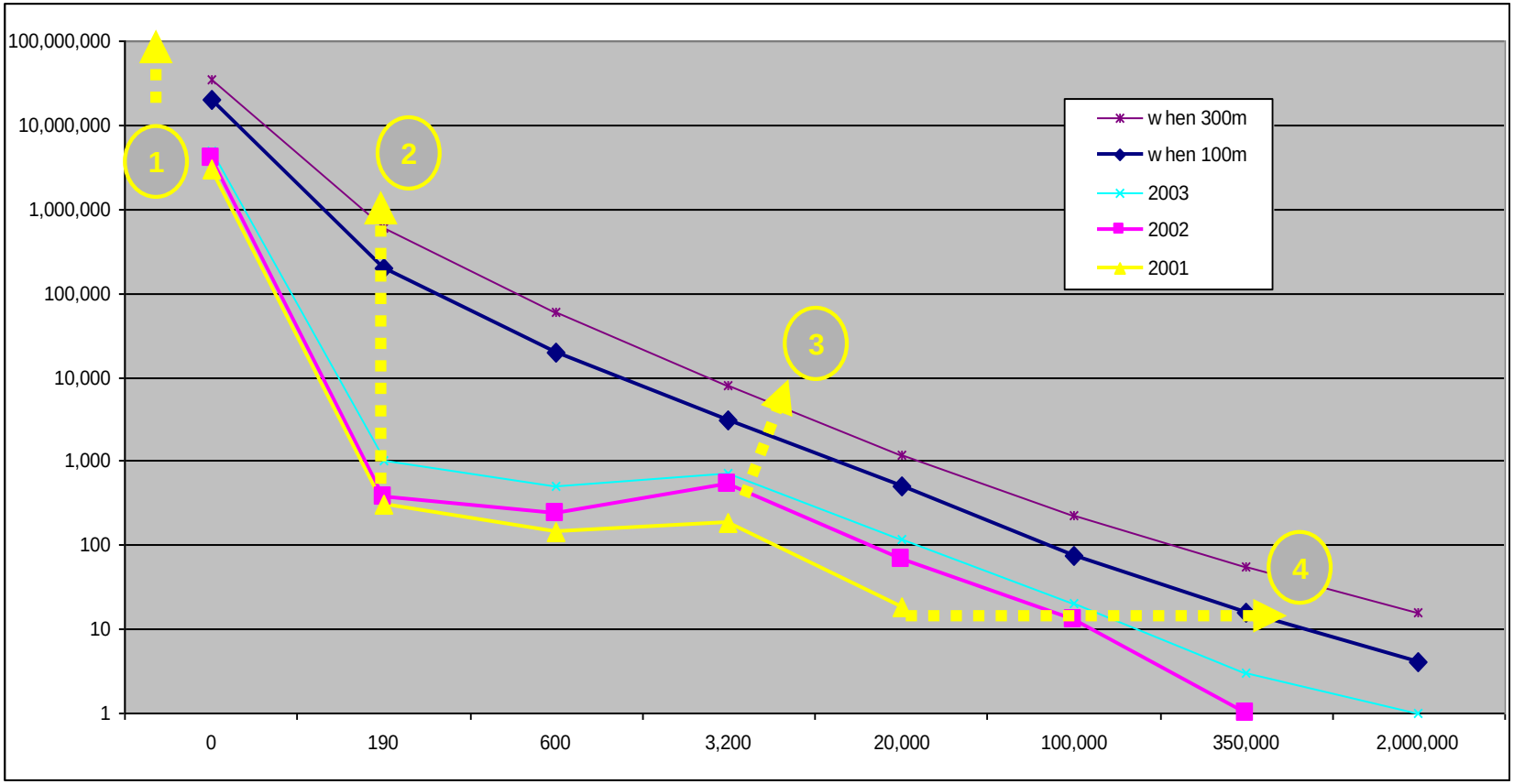


Deal Size Study

Deal size:	< €250	< €1k	< €10k	< €50k	< €250k	< €1m	< €4m
No. of customers	366	236	530	72	13	1	0
% of no.	30.0%	19.4%	43.5%	5.9%	1.1%	0.1%	0.0%
Sales volume	69,235	128,025	1,703,326	1,526,098	1,102,187	326,858	0
% of sales	1%	3%	35%	31%	23%	7%	0%
Avg. deal size	189	542	3,214	21,196	84,784	326,858	-

7% of the deals make 61% of the business

Four Long-Term Initiatives



Largest Customers 2002

Over €100k

- [REDACTED]

€50-100k

- [REDACTED]

€30-50k

- [REDACTED]

A total of 1,177 customers à €4,126

Entering the Enterprise Market

Changing the Business Faster than the Competition Can React

Table of Contents

Sales Team

- Typical setting for field sales
  - $80k fixed annual base salary
  - 4.7-5% commission on sales
  - quota of $1.6m p.a.
  - sales volume per sales mgr used for budgeting: $1m p.a.
    - $1m – 2x ($80k + $50k) = $740k contribution per sales mgr (assuming that fully loaded cost is 2x salary)
  - some sales mgr have higher packages and quotas, some lower
  - this works well with our present size – for the future, a more elaborate model is planned
  - to get $9m in direct sales we need 9 sales mgrs; today we have 10

Earnings Logic - Alternatives

Embedded Database	• Commercial licences • • •
Web Database	• Services • Subscriptions • Hosted services • Add-on tools
Enterprise Database	• Services • Add-on tools • Enterprise extensions • Commercial licences

Earnings Logic - Subscriptions

- A concept dubbed "**Automated Notification Service**" (ANS) is in early development
- Under ANS, customers are to receive automated, customised, relevant notifications of product and service changes directly to their email, with clickable links for activating the suggested operations (such as product updates, database health checks, etc.)
- Pricing to be determined, current assumption is $80-200 per person p.a.
- Value proposition based on convenience; the same information to be freely but not as conveniently available to the open source community
- Market potential estimated to be in the hundreds of thousands of subscribers; subscriptions to be sold one by one or as enterprise subscriptions

Offerings

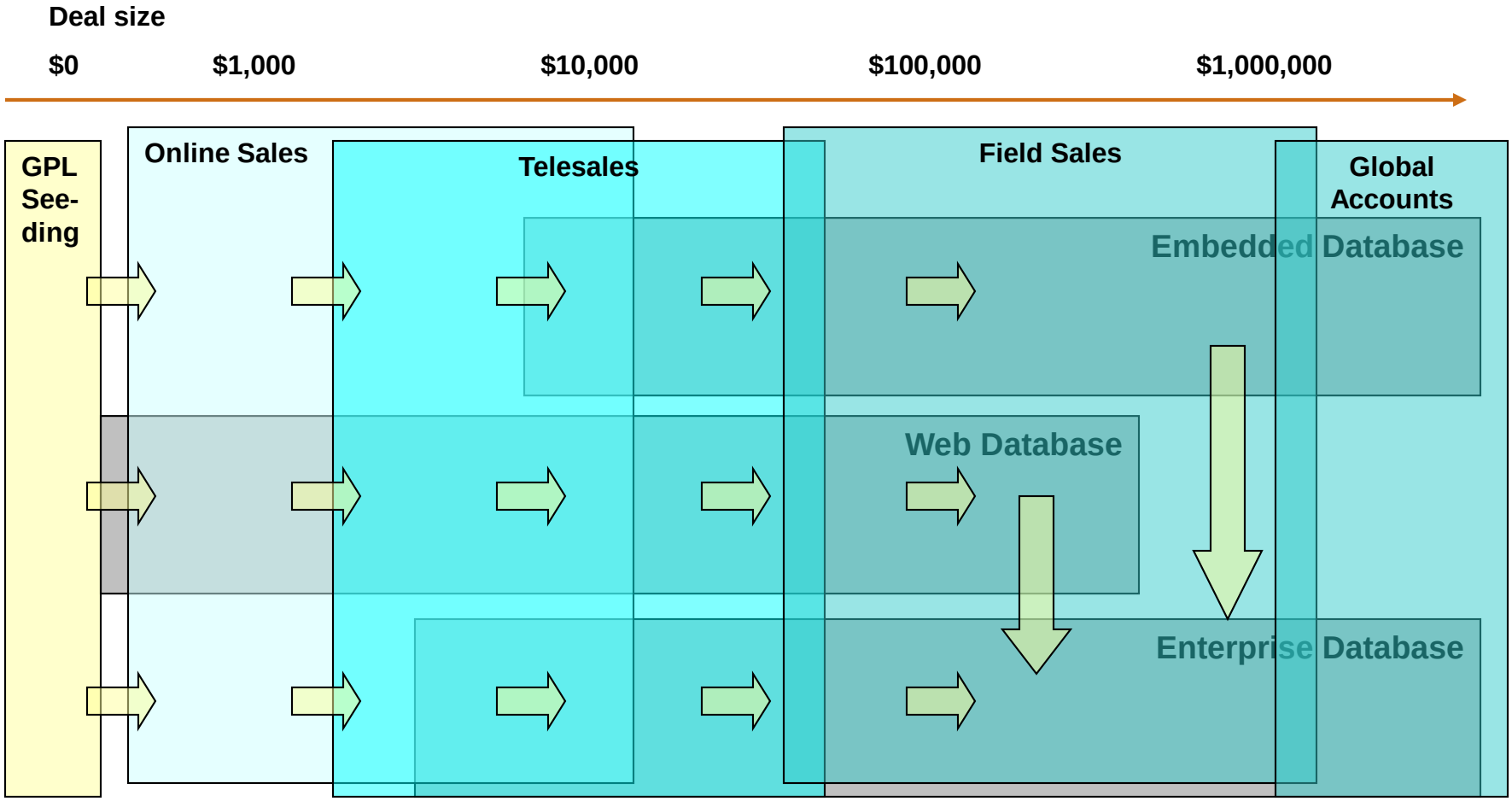
- Software
  - MySQL under GPL - $0
  - MySQL Light - $0
    - (to seed market and provide alternative to JetEngine and MSDE)
  - MySQL Classic - $200
  - MySQL Pro - $495
  - MySQL Enterprise - $2,000 to $30,000
  - MySQL utilities
    - pricing 0 or TBD
  - MySQL tools
    - TBD
- Services
  - Automated Notification Service - $40-$190 p.a.
  - Support - $500-$48,000 p.a.
  - Certification $150-$500
  - Training
  - Consulting
  - Migration services
- Tangible products
  - Reference Manual
  - Product Box

N.B. Prices are tentative.

Innovative Sales Model

- MySQL's sales model is based on the fact that GPL'd MySQL installations are in use in most organisations today, which
  - reduces marketing costs
  - shortens sales cycles
- Our order of priority for sales cases
  1. Enterprise buys off-the-shelf app (and MySQL is the batteries included database)
  2. Enterprise builds new app (in-house or outsourced) where database choice is open
  3. Enterprise rewrites old app
  4. Enterprise migrates old app to new database

Sales Model



Yellow arrows denote self-propagating product promotion. N.B. Box width means deal size span, but box size (area) has no specific meaning

4 Sells To Do (In this Order)

- Sell to the business application ISV
  - Sell MySQL as the ”batteries included” database for their application
- Sell to the enterprise system software ISV
  - Create integration with their software and MySQL
- Sell to the SI
  - Sell the idea of the SI doing LAMP and other MySQL projects for enterprises
- Sell to the enterprise
  - Sell MySQL as the DBMS platform for the next in-house project

CIO Magazine Survey Nov 2002

- 29% are using open source databases today, and for 33% it will be the predominant type of software for databases in five years

- The majority (64%) of companies surveyed are using open source
- CIOs say the greatest benefits from using open source are
  - lower total cost of ownership,
  - lower capital investment and
  - greater reliability and uptime compared to their existing systems.
- IT executives report that open source provides
  - greater flexibility, control and
  - faster, cheaper application development.
- All things equal, the majority of IT executives surveyed said they would choose open source for a new implementation over a proprietary vendor solution.
- More info:
  - http://www2.cio.com/research/surveyreport.cfm?id=51
  - http://www2.cio.com/research/surveyreport.cfm?id=48

Our Enterprise Experience So Far

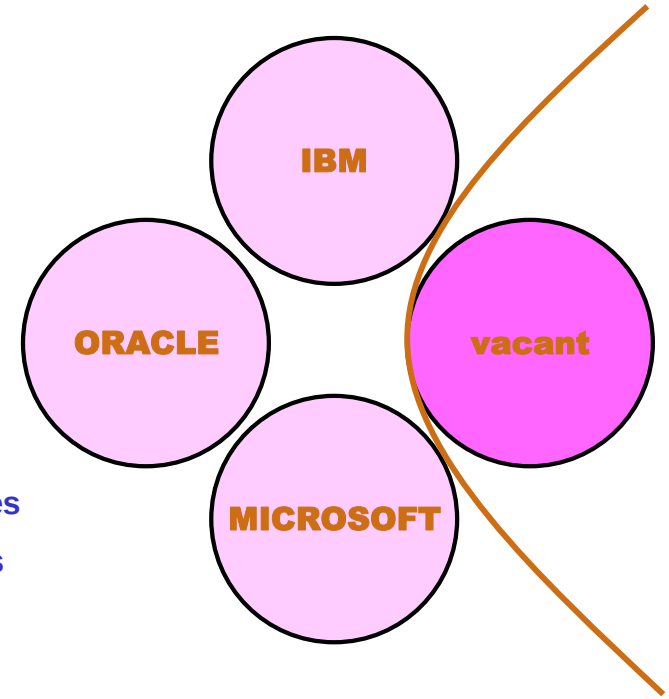
- Enterprises appear to be open to multi-vendor DBMS strategy (which wasn't the case earlier)
- Enterprises appear to be open to open source software
- Enterprises typically see DBMSs in three categories:
  - High-end: Oracle, DB2
  - Middle: Microsoft SQL Server, MySQL
  - Desktop: Microsoft Access
- Many enterprises signed 3-5 year DBMS deals in 1999-2000 (and many overpurchased); those deals now are coming to expiration

The Market Needs an Alternative

PRESENT-DAY SITUATION:

- onerous prices and licensing terms
- vendor lock-in
- products have too many features
- products continue to have bugs
- mandatory DBAs
- performance requires tuning
- little bang for the buck

+ ISV aspect: Big Three DBMS vendors compete with many of their own ISVs in the application space



DESIRABLE SITUATION:

- compelling prices, low up-front investment
- open standards, open software stacks, open source
- products with just the right amount of features
- battle-tested products
- minimal admin overhead
- superior performance
- great bang for the buck

Recipe for Market Entry

- Pick entry segments
- Position MySQL as the 4th player, the alternative solution
- Compelling reason to buy:
  - economy
  - speed, reliability, ease, ubiquity
- Whole product
  - MySQL Enterprise
  - Support and Services
  - Third-party integration and endorsement
- Partners & Allies
  - enemies of the enemies
- Distribution
  - directly to ISVs for batteries included
  - via platform vendors
  - via SI's
  - directly to end customers
- Pricing
  - Choose earnings logic
  - 10x present MySQL, 0.3x competitors
- Competition
  - MSFT, ORCL, IBM

How to Sell to the Enterprise

- CIO thinking
  - a DBMS is just one piece in the puzzle
  - how easy is it to retrain existing staff?
  - here I will use Open Source, here not
  - I don't want another vendor
- xxx
- xxx
- xxx

Cost-Effectiveness is a Must

- To keep prices low and our profitability high, we must
  - Keep the customer acquisition (and retention) cost low
    - see next slide
  - Keep the product development cost low
    - through open source
  - Keep COGS low
    - by focusing on selling high-margin offerings (licences and automatic subscription services)
    - by automating the labour involved in providing services

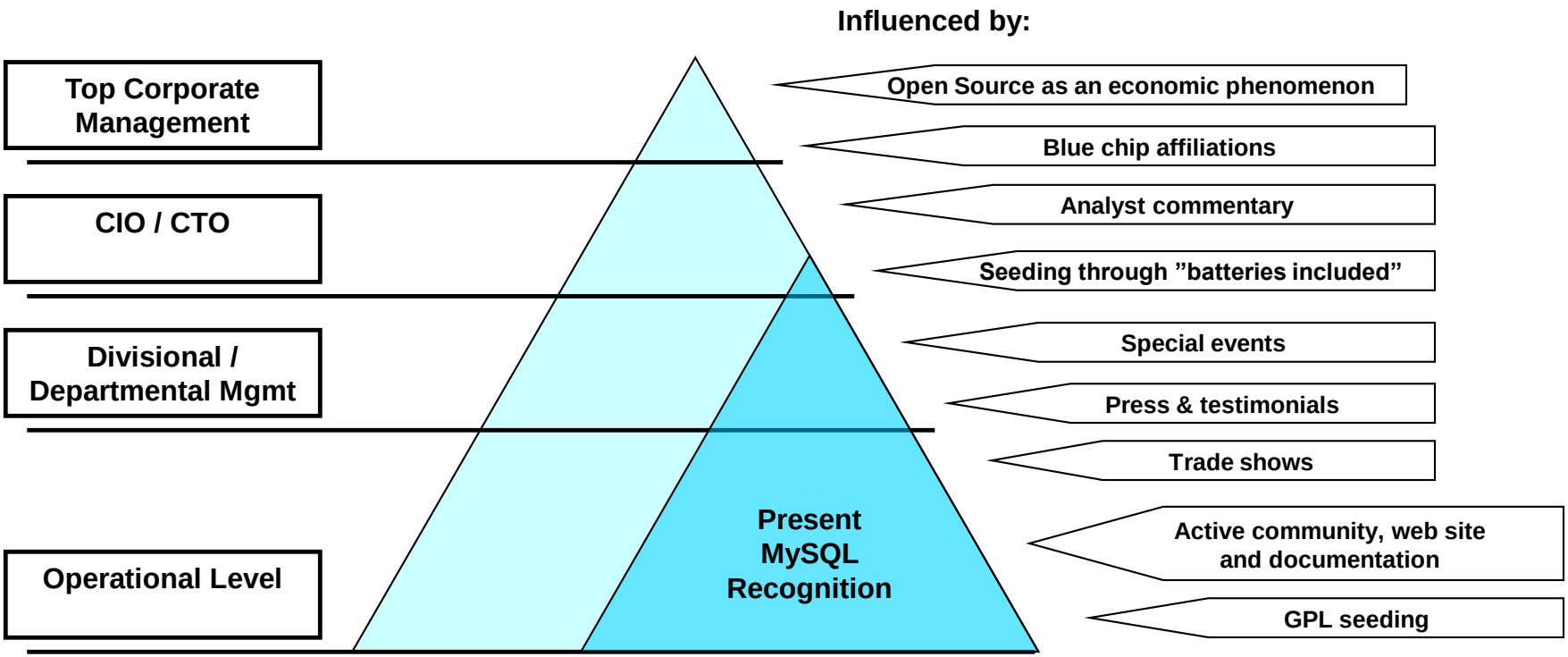
Keep the Customer Acquisition Cost Low

- Seed the market with GPL'd software
  - and reduce need for advertising and promotion
  - and shorten sales cycles
- Build a strong brand
  - and shorten sales cycles
  - and reduce price sensitivity among customers
  - and sell more online
- Sell "batteries included MySQL" to ISVs and platform vendors
  - and get straight into the enterprise in one low-cost blow
- Sell online
  - and reduce the need for an expensive sales force
- Sell direct
  - and avoid spending money on a multi-tiered sales channel
- Make buying easy
  - (by simple pricing, simple configuration, web-enabled processes)
  - and close more deals per account manager

Communicate the Positioning

- Analysts, analysts, analysts
- Landmark partnerships
- PR & speaking engagements
- Benchmarks and certifications
- Build a ”community” of enterprise CIOs and CTOs
- Have regional sales offices

Ways of Achieving Recognition

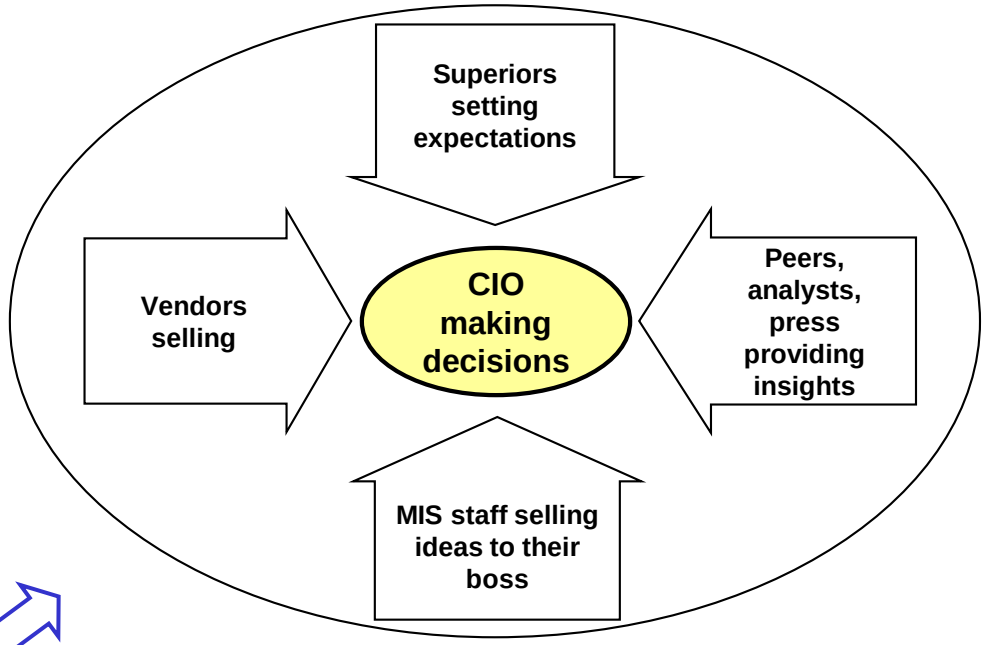


The CIO Making Decisions

MySQL takes the back-door into the forces that influence the CIO in his/her decision-making.

This is done in good time before the MySQL sales team is deployed into the organisation to close commercial deals.

MySQL:
Open source as an economic phenomenon



MySQL: "Batteries included" database in other products

MySQL:
PR work, brand building

MySQL sales team ready to be deployed

MySQL:
GPL seeding

Proposition to CIO

- MySQL offers
  - all essential functionality
  - at a compelling upfront cost
  - and a compelling on-going maintenance cost
- thus enabling organisations to continue to roll out new applications while meeting the cost-cutting targets set
- And, by the way,
  - you already run MySQL in these products: ...
  - this is open source, like Linux
  - there are millions of people with MySQL skills
  - and these are some of our top customers, partners and investors: ....

Potential Entry Segments

- TMT
  - as they already use MySQL
- Financial Services
  - as they are data-intensive and progressive
- Pharmaceuticals
  - as they already use MySQL
  - as they are data-intensive and research-intensive
- Government
  - as they already use MySQL
- Research and Academia
  - as they already use MySQL
- Via ISVs
  - who look to reduce cost and reduce dependency on the Big Three

Sample TMT References

Technology

Veritas Software

Peregrine Systems

Compaq

Sun Microsystems

Apple Computer

DELL Computer

Media

Vivendi Universal

Yahoo!

Google

Spiderman (Sony Pictures)

FIFA Soccer World Cup website

Virage

Telecom

Cisco

Lucent

Nokia

Ericsson

Telia

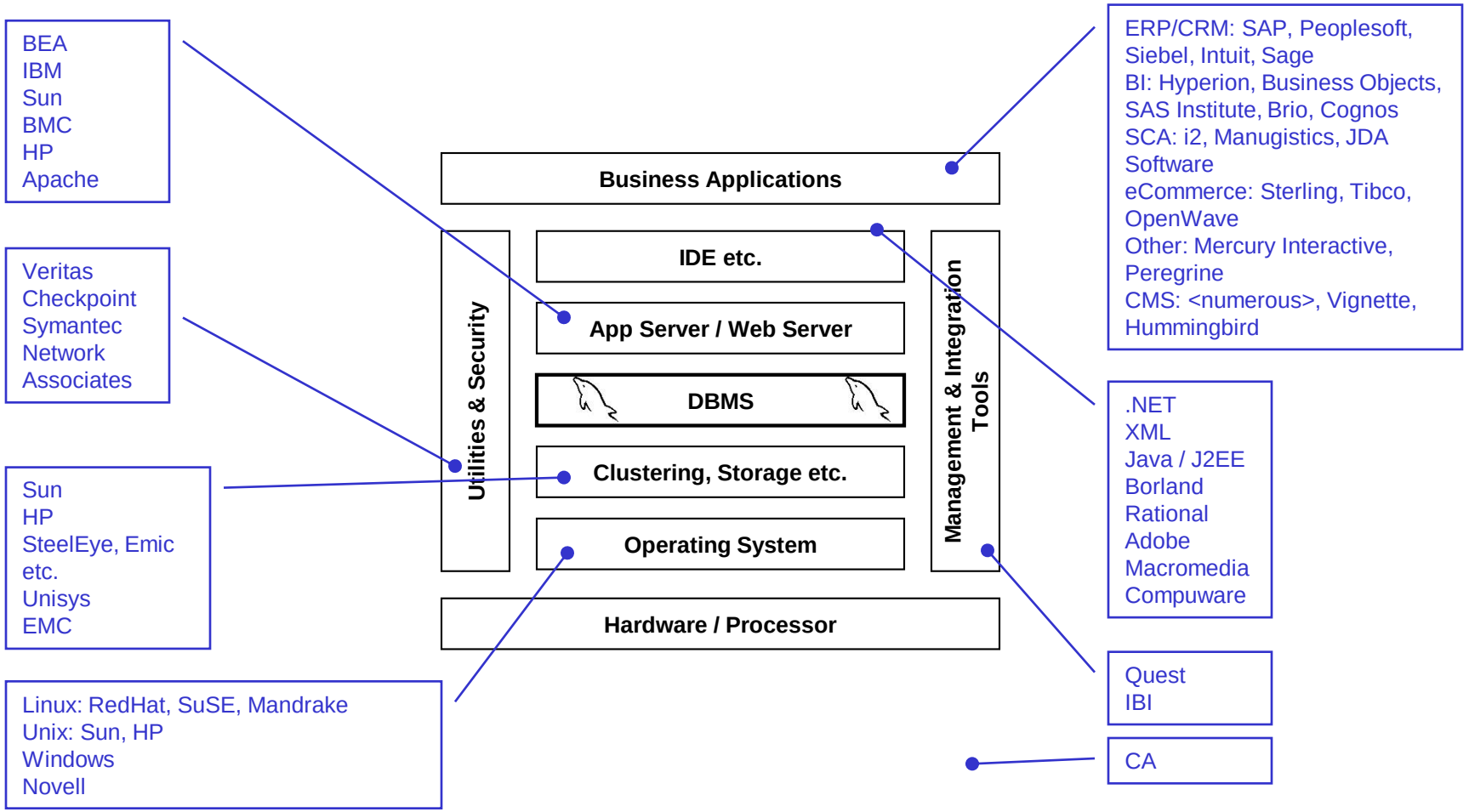
Tahoe Networks

MySQL Enterprise (The Software)

Existing MySQL plus improvements in:

- Syntax (triggers, views, SQL-92 ,etc.)
- Load balancing, clustering
- Fault tolerance, high availability, clustering
- Huge datasets
- Distributed use
- Management of the database
- OLAP, data warehousing, data mining
- Security
- Third-party integration

Software Stack & ISV's



Potential Partners & Allies

- Platform Vendors
  - Apple
  - Dell
  - HP
  - Sun
- ISV's
  - BEA
  - BMC
  - Veritas
  - CA
  - SAP, Peoplesoft, Siebel
  - etc.
- SI's
  - Accenture
  - EDS
  - IBM Global Services
  - CSC
  - Cap Gemini Ernst & Young

Potential Counter-Actions by Big Three

- Microsoft
  - may give away SQL Server free of charge with Windows (but anti-trust considerations may prevent that)
  - may bundle SQL Server with technology stack
  - may port SQL Server to Linux
  - may attack with patents
- Oracle
  - may give away some version free of charge?
  - may block sales channels (ISVs, SIs)
  - may attack with patents
  - may attack in MySQL's home markets (embedded, web)
- IBM
  - may acquire Red Hat and/or SuSE to attempt to block access to Linux
  - may give away DB2 free of charge?
  - may bundle DB2 inside technology stack
  - may attack in MySQL's home markets (embedded, web)

How to Deal with Competition

- Microsoft
  - Let Linux do the fighting
  - Be easily available on Windows
- Oracle
  - Cost savings!
- IBM
  - Cost savings!
  - Customer's desire not to buy all from one vendor

Acceleration

Table of Contents

Use of Proceeds

- Status quo sufficient for:
  - stepwise expansion into France, UK, Far East
  - MySQL 5, MySQL 6, ...
  - 50-80% annual growth in the next few years
  - profitability
  - €100m in revenues in 6-7 years
- Use of new round
  - Enterprise marketing
  - Faster sales ramp-up
  - Services ramp-up
  - Strategic alliances
  - MySQL Enterprise

Recruitment

- Management positions
  - VP Marketing
  - VP Professional Services
  - VP Software Engineering
- Skills and teams to ramp up
  - Technical
    - enterprise computing
    - benchmarks
    - migration & other professional services
  - Sales & Marketing
    - direct sales force
    - alliance management
    - product marketing

Stepwise Approach

Step 0

Demonstrate MySQL viability in web and OEM markets

- Done, and ramp up continues

Step 1

Demonstrate MySQL viability in enterprise market

- Work closely with select Fortune500 companies and existing enterprise customers
- Forge key partnerships with ISVs and platform vendors
- Acquire and develop skill sets needed
- Build MySQL Enterprise (evolutionarily from MySQL Pro)
- Position MySQL in the market
- Enter select market segments
- Test our assumptions
- Test our ambitions

Step 2

Ramp-up

- Perfect the offering
- Expand into other segments
- Expand geographically
- Penetrate

Steps 1 and 2 overlap, and business build-up will be continuous.

We estimate that Step 1 will be concluded within 2-3 years and require funds of up to €10m.

Assumptions & Ambitions of Step 1

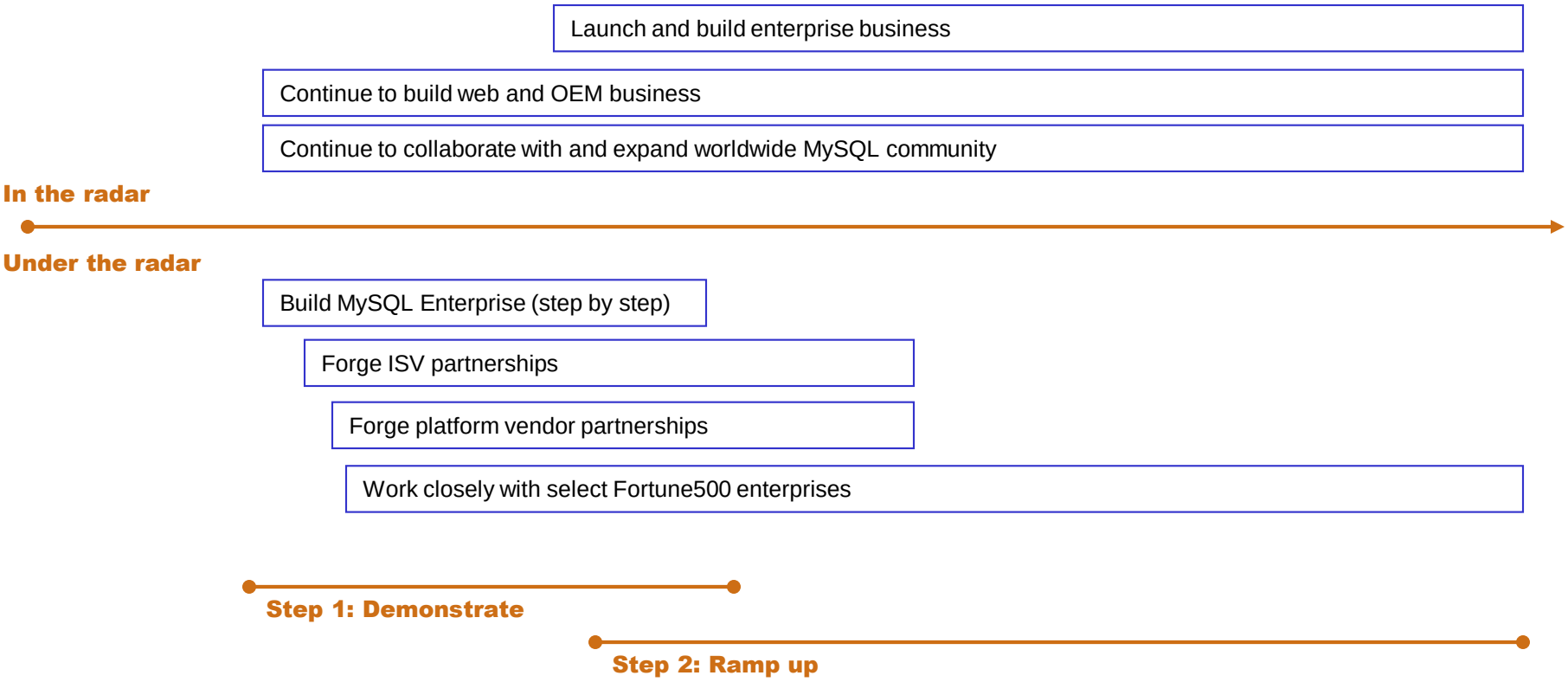
Assumptions

- Open source is enterprise-ready and enterprises are open source-ready
- Most platform vendors are open to a fourth db player
- Key ISVs are open to a fourth db player
- Key SIs are open to a fourth db player
- ”Batteries included” gains ground in the enterprise and single db strategy loses ground in the enterprise
- Enterprise db's increasingly need to be web-enabled
- Mid-market is active (as opposed to top-tier enterprise market)
- The Big Three are unable to successfully defend their perimeters

Ambitions

- Have enterprise db ready in 3-4 years
- Have revenue model that works in enterprise arena
- Build strong brand recognition and credibility among enterprise decision makers
- Keep customer acquisition cost down
- Price at roughly 1/3 of legacy players without compromising own profitability

Timeline



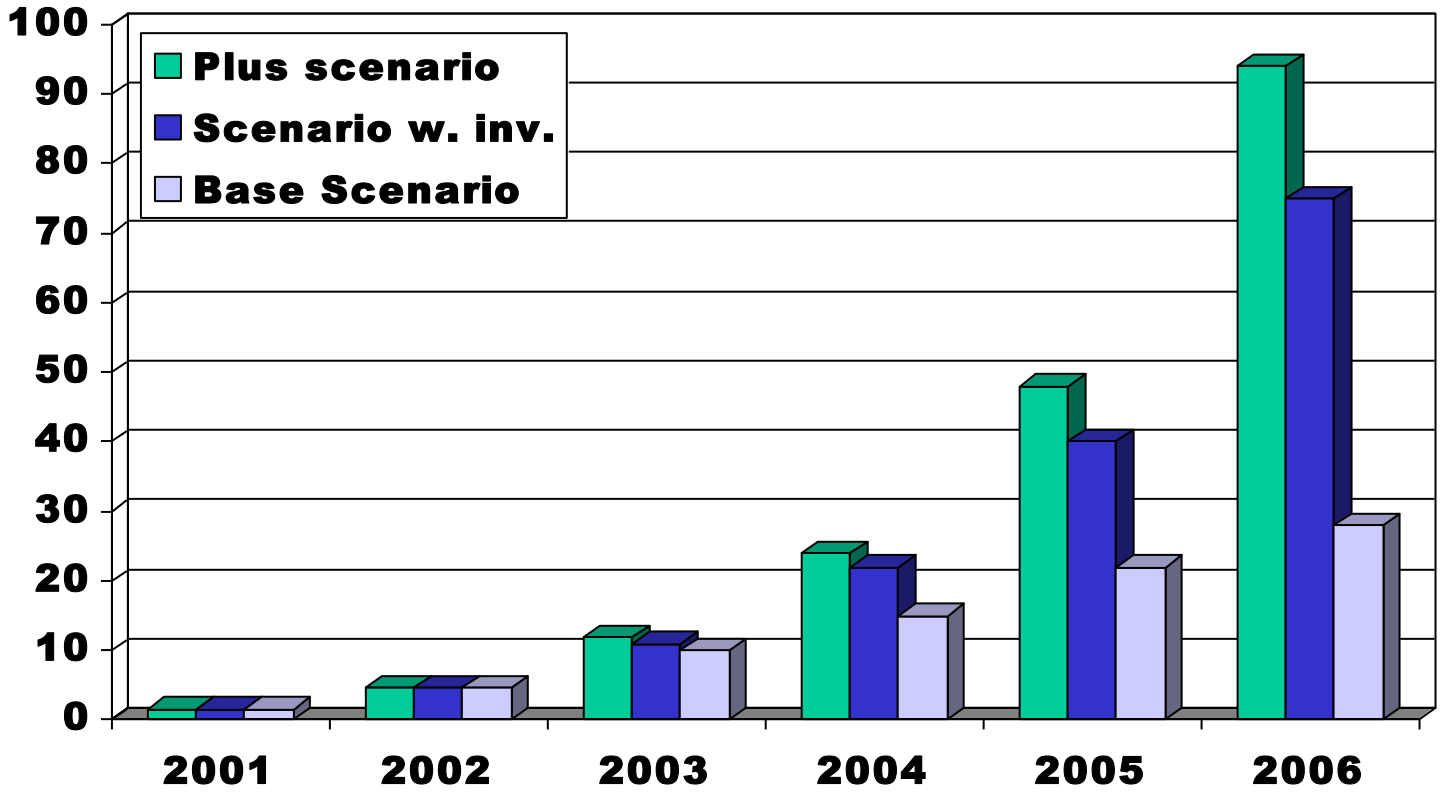
Milestones (*DRAFT*)

Milestone	Ideally	NLT
• Recruit		
– additional VPs	Q4/03	Q2/04
• Landmark ISVs signed up		
– first ISV	Q2/03	Q1/04
– 2 more	Q4/03	Q3/04
• Sales in a quarter		
– €3m (run-rate €12m)	Q1/04	
– €4m (run-rate €16m)	Q3/04	
– €5m (run-rate €20m)	Q1/05	
• Number of Fortune500 companies directly or indirectly generating revenues as customers in excess of €50k p.a.		
– 50 (totalling €2.5m)	Q2/05	
– 100 (totalling €5m)	Q4/06	
– 200 (totalling €10m)	Q4/07	

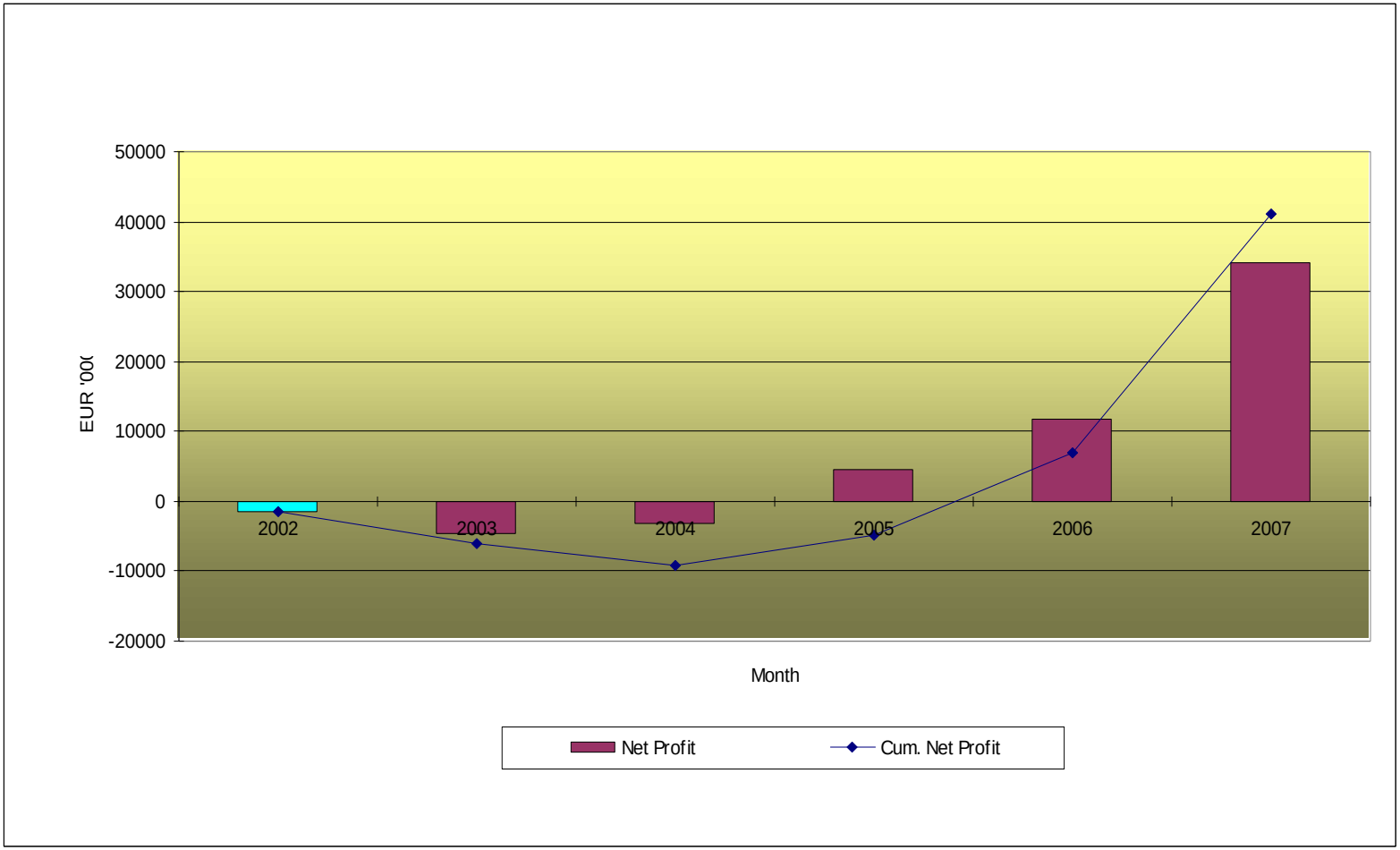
Product Release Timetable (*DRAFT*)

Product version	alpha	production
• MySQL 4	Q4/01	Q1/03
– MySQL 4.1	Q1/03	Q3/03
• MySQL 5	Q4/03	
• MySQL 6	Q2/04	
– MySQL 6.x = **MySQL Enterprise**		Q1/06
• MySQL Control Center	tbd	

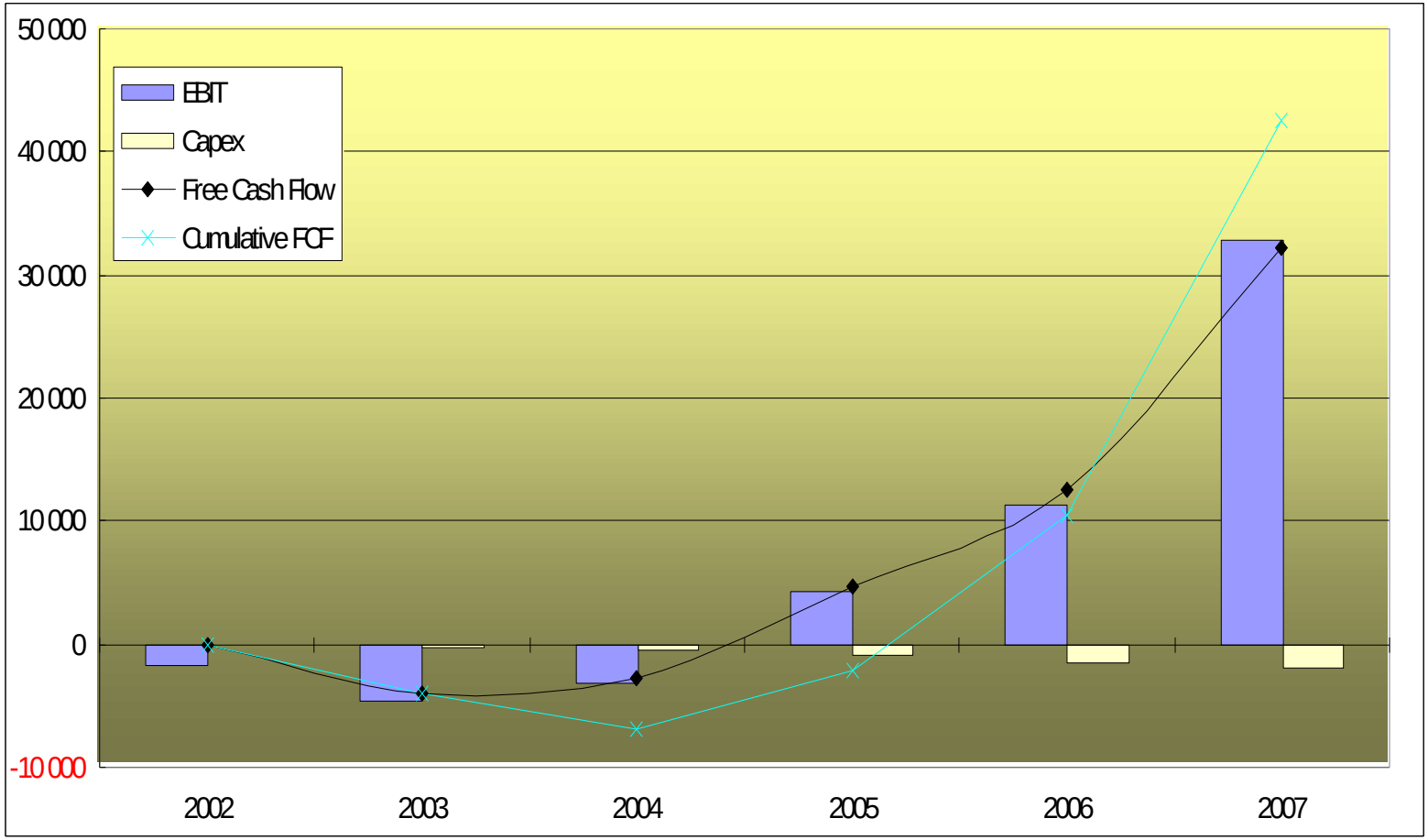
Projections: Revenue



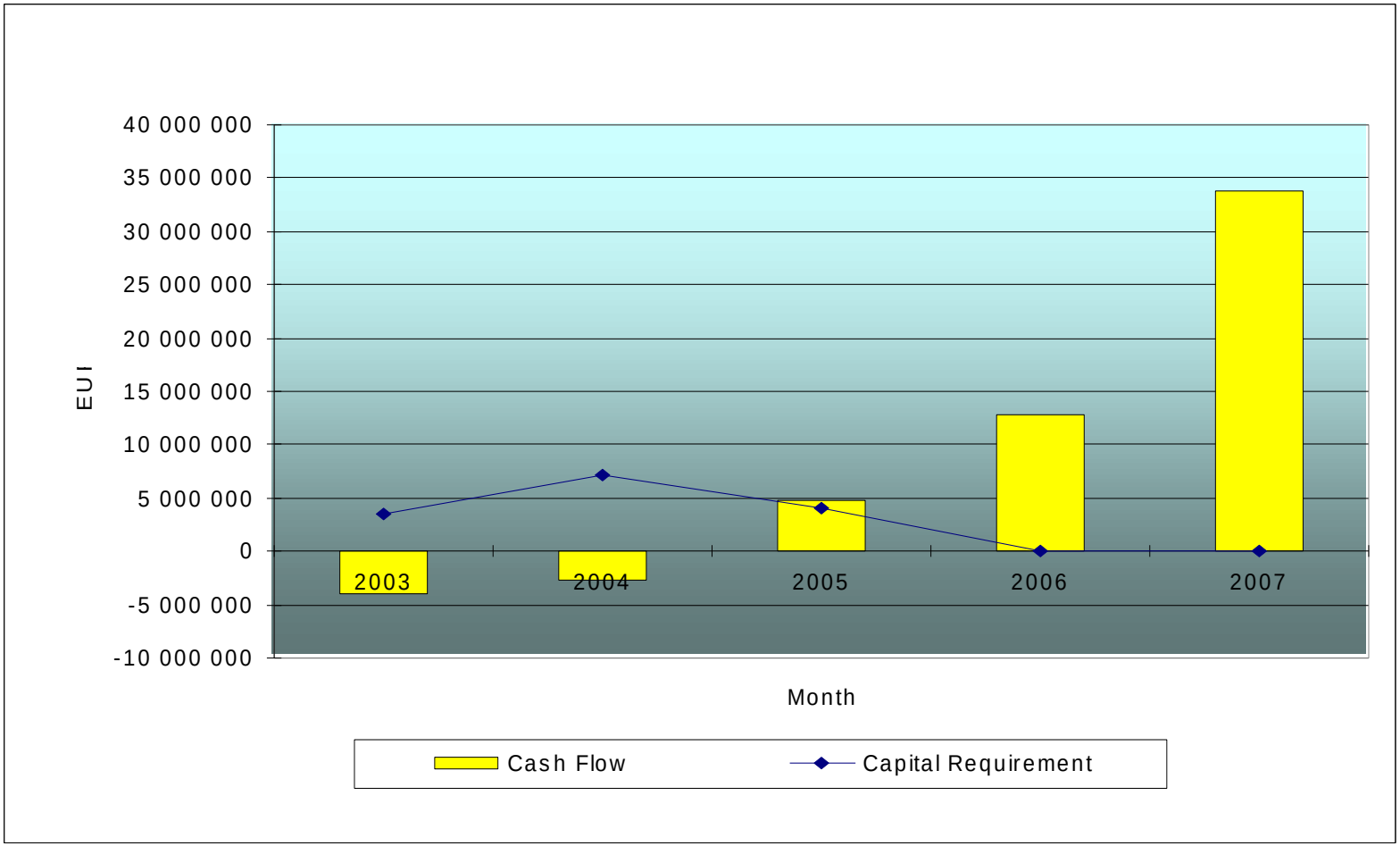
Projected P&L 2003 – 2007



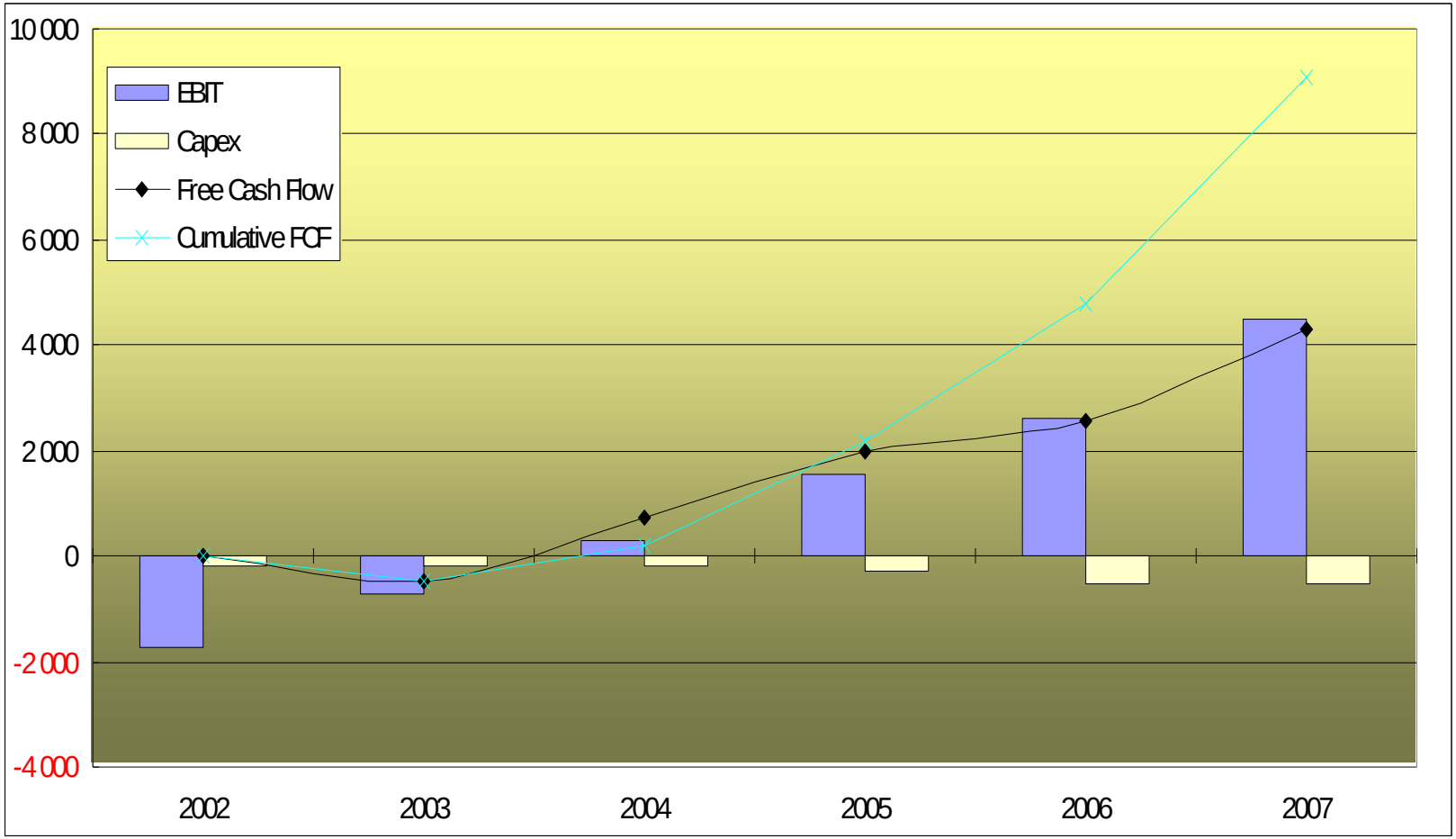
Projections: EBIT, CapEx, FCF



Projections: Funding Requirement



Projections: Without Investment



Pressentation of Management

Table of Contents

John Wattin, Chairman

- Professional board member, serial entrepreneur
- Colleagues say: ”Business man!”
- Lives in Sweden, age 55
- Track record
  - Founded/Reconstructed: Enator AB, Sigma AB, Mandator AB, Astral AB, Scandiaconsult AB, Indevo AB
  - Chairman/Board Member: Akademikliniken AB, Berit AB, Cherry AB, Establish AB, Lemon Planet AB, Netentertainment AB, Qbranch AB, MySQL AB
  - Senior Advisor, Prosper Capital Fund

Mårten Mickos, CEO

- Skilled CEO and entrepreneur
- Colleagues say: ”Motivator!”
- Lives in Finland, age 40
- Track record
  - MatchON Sports Ltd, CEO 1999-2000
  - Intellitel Communications, CEO 1997-1999
  - Solid Information Technology, Channels Marketing Director 1995-1997
- Life outside MySQL
  - wife and 3 children
  - water and snow

MARTEN MICKOS,
CEO of MySQL AB

Hans von Bell, CFO

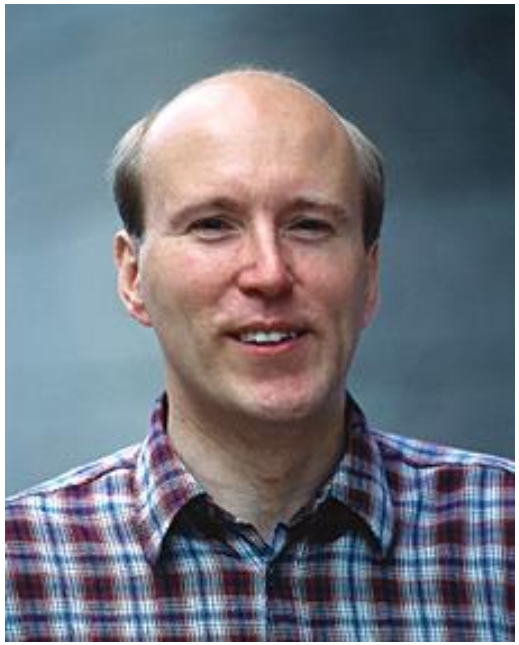
- Experienced builder-up of financial administration
- Colleagues say: ”Pragmatist!”
- Lives in Sweden, age 42
- Track record
  - Incirco AB, CFO 2000-2001
  - MSI AB, CFO 1996-2000,
    Regional Controller EMEA 1998-2000
  - Unisource Mobile, Inv. Fin. Dir. 1994-1996
- Life outside MySQL
  - family with two sons
  - scuba diving, skiing, guitars

Michael Widenius, CTO

- a.k.a. Monty
- Fanatic programmer who hates bugs and loves speed
- Colleagues say: ”Guru!”
- Lives in Finland, age 41
- Track record: MySQL
- Life outside MySQL
  - family with children My and Max
  - visiting exotic places

David Axmark, Co-founder

- Free / Open Source evangelist
- Colleagues say: "Monty's second brainhalf!"
- Lives in Sweden, age 40
- Track record: MySQL
- Life outside MySQL
  - ultimate (the frisbee sport), disc golf
  - hiking
  - traveling



Larry Stefonic, VP Sales

- Knows the database market inside out
- Colleagues say: "Dealmakerl!"
- Lives in Seattle, USA, age 35
- Track record
  - Birdstep
  - Centura / Gupta
  - Raima
- Life outside MySQL
  - wife and son
  - boxing, skiing

Kaj Arnö, VP Training

- Analytical thinker and extensive communicator
- Colleagues say: ”Productive!”
- Lives in Germany, age 39
- Track record: Polycon Ab
- Life outside MySQL
  - wife and 2 children
  - marathon

Management

- Firmly in place
  - CEO
  - CFO
  - CTO
  - VP Sales
  - Co-Founder
- Advancing, filling
  - VP Prof. Serv.
  - Director Alliances
  - Director Online Sales
  - Director Support
  - Director Development
- VPs to be hired
  - VP Marketing
  - VP Software Engineering
  - VP Professional Services
  - VP Alliances (?)
  - Legal Counsel (?)
  - VP Biz Dev. (?)
- Directors to be hired / promoted
  - Internal IT
  - HR
  - Sales Directors

Advisors and Investors

- Board
  - John Wattin, Sweden, Chairman
  - Terje Laugerud, Norway
  - Morten Austestad, ABN Amro, Norway
  - Fredrik Oweson, Scope, Sweden
  - Michael Widenius, MySQL AB
- Non-board investors and advisors
  - Ralf Wahlsten, Finland, Investor
  - Mina Gouran, UK, Investor
  - Natasha Bhatia, UK, Investor
  - Peter Harris, UK, Investor
  - Florian Müller, Germany, Advisor

Competition

Table of Contents

Competition by Size

- Tier 1 - the billion dollar league
  - Oracle (sales $10.5B, database licences $823m)
  - IBM DB2 (sales $85.9B)
  - Microsoft, SQL Server and Access
  - Sybase (sales $950.3M)
- Tier 2 - the 100 million dollar league
  - Sybase SQL Anywhere, Progress
- Tier 3 - the 5-50 million dollar league
  - Berkeley DB, Birdstep/Raima, Ardent, Interbase, Intersystems, Pervasive, Centura/Gupta, TimesTen, Solid, Pointbase, Polyhedra, Empress, Versant

Comparison Chart

	MSFT	ORCL	IBM	MySQL
SQL-compliant RDBMS	✓	✓	✓	✓
Low TCO	-	-	-	✓
Low capital expense	-	-	-	✓
Multi-platform	-	✓	✓	✓
Easy to deploy	✓	-	-	✓
High reliability and uptime	✓	✓	✓	✓
Top performance	-	✓	-	✓
Fast application development	?	?	?	✓
Abundance of skilled staff	✓	✓	✓	✓
Supported by commercial vendor	✓	✓	✓	✓
Easy to administer	✓	-	-	✓

Microsoft vs. MySQL

Microsoft has (and relevance to MySQL is)

- Enterprise Database
  - SQL Server (competitor)
- Web Database
  - SQL Server (competitor)
- Embedded Database
  - SQL Server (competitor)
  - MS Access (too weak to be competitor, but GUI is useful as front-end to MySQL)
- Operating System
  - Windows (important platform for MySQL)
  - Windows CE (potential future platform for MySQL)

Microsoft is against open source and GPL.

Oracle vs. MySQL

Oracle has (and relevance to MySQL is)

- Enterprise Database
  - Oracle (competitor)
- Web Database
  - Oracle (competitor)
- Embedded Database
  - Oracle Lite, Personal Oracle (weak competitor)
- Operating System
  - none

IBM vs. MySQL

IBM has (and relevance to MySQL is)

- Enterprise Database
  - DB2 (competitor)
- Web Database
  - DB2 (competitor)
- Embedded Database
  - DB2 Everywhere (competitor)
- Operating System
  - AIX (good platform for MySQL)

IBM invests heavily in Linux.

Sybase SQL Anywhere vs. MySQL

- SQL Anywhere has
  - Customers
  - Features
  - Speed
- SQL Anywhere lacks
  - Speed to match MySQL
  - Robustness through superior design
  - Platform availability
  - Massive user base support

Can the Competition Produce Something Better?

- By starting from scratch?
  - Hardly. It takes 10 years for any mission-critical software product to mature.
- By opensourcing a closed-source product?
  - Hardly. It takes years (or an eternity) for closed-source software to become clean enough go gain open source acceptance.
- By improving an existing open source product?
  - Perhaps. But note that MySQL is today several times more popular than the next runner-up.
- By forking a new version based on MySQL?
  - Anybody is free to modify and distribute MySQL under GPL, but maintaining the code is extremely difficult for anyone but the core development team of MySQL AB. Also, only MySQL AB can sell commercial licences and use the MySQL name.
- By giving away an existing product free of charge?
  - May happen, but that does not make the product open source or superior.

Risks and Uncertainties

Table of Contents

Risks and Uncertainties

- External
  - Open source business models partly unproven or immature
  - Dependance on success of Linux
  - Dependance on worldwide Internet infrastructure
  - Potential counter-actions by competitors (most notably MSFT-ORCL-IBM)
  - Potential competition from other open source databases such as Postgres, Firebird and SAP DB

Risks and Uncertainties (2)

- Internal
  - Limited operating history
  - Limited financial strength in the immediate future due to expansion
  - Dependence on the success of OEM customers in their markets
  - Dependence on key personnel and recruitment of additional management
  - Dependence on successful and timely delivery of new product versions
  - Intellectual property right risks in relation to our software

Investment Proposal and Exit Potential

<NOTE: This info will be removed from this file and put in a separate one, in order to avoid it spreading to too many people in the VC community.>

Table of Contents

Background Info

- Cap table – see appendix (xls)
- External funding raised so far: EUR 4m
- Use of proceeds – see elsewhere in this document
- Peer analysis – see elsewhere in this document

- Please send or cc all your email communication to Mr

[REDACTED]

This Round

- MySQL AB believes that a fair pre-money value of the company presently is €28m (but please note that this is not a formal offer, and that the valuation may change due to significant events in the company)
- The company now wishes to raise €10m
- In conjunction with the round a new share option pool will be launched, to grow its percentage from existing 6.92% up to 9% of outstanding shares
- The company is looking for one new active investor (or syndicate of 2) from the UK or USA or continental Europe
- The company may in parallel receive investment from strategic partner(s)
- The company presumes that the existing shareholders agreement be extended to cover new investors as well
- ABN Amro and Scope are likely to join pro rata, other present investors not

Capitalisation Table

[REDACTED]

The MySQL Investment Team

- Chief negotiators
  - Mårten Mickos, CEO, assisted by Hans von Bell, CFO
- All owners & present investors represented by
  - John Wattin, Chairman
- Coordinator of timetables, documents, meetings, Q&A
  - Peter Liss
- Additional core management
  - Larry Stefonic, VP Sales
  - Michael "Monty" Widenius, CTO
  - David Axmark, Co-Founder
- Key investor representatives
  - Morten Austestad, ABN Amro Industrifinans
  - Fredrik Oweson, Scope Venture Capital

Timetable

- [REDACTED]
- /C:S
- Conference

Selection Criteria

- MySQL AB reserves the right to accept or decline offer letters at its discretion after the offer letter deadline
- MySQL AB will pay great attention to the following selection criteria:
  - relevant market experience and value-add of the investor
  - personal chemistry between partner(s) in charge and MySQL management and directors
  - valuation
  - adherence to the existing shareholders agreement
  - how well the VC matches ”The Ideal Investor” list which was authored by the MySQL management (see next page)

The Ideal Investor

- The ideal investor in MySQL, in addition to bringing great tangible and intangible value to the company:
  - takes a long-term view on his investment
  - understands and respects the open source philosophy of MySQL AB (as demonstrated by MySQL AB and other open source companies such as Trolltech and Sleepycat)
  - understands and respects the Nordic management culture (as demonstrated by Nokia, VOLVO, MySQL AB and others)
  - understands and respects the MySQL core values as described at: www.mysql.com/company/index.html
  - has ample industry experience and a vast network of relevant contacts
  - is at all times actively engaged in building a long-term viable business for MySQL AB through active participation in board work and otherwise
  - lives up to and demands from others a business conduct of the highest ethical standards
  - in summary, is a value-adding contributor rather than a zero-sum game player.

Offer Letter

- The signed letter from an interested investor shall be presented to the company no later than 18 March 2003, covering the following topics at a minimum:
  - Proposed investment size (and distribution between syndicated partners, if applicable)
  - Proposed pre-money valuation
  - Proposed partners of the VC firm who would be board members and in charge of the investment for the VC, and list of references for such partners
  - Detailed comments on any proposed deviations from the existing shareholders' agreement to be disclosed to parties interested in submitting an offer letter
  - Proposed timetable and execution plan for completing the transaction
  - The investor's comments on the business plan and projections, in order to highlight:
    - where there is agreement
    - where there is disagreement or just doubt
    - where there is an alternative proposal from the investor
    - what may be missing in the investor's view
  - Any other information deemed valuable

Exit Potential

- Without the investment, the company estimates it can reach up to €100m in annual revenues. With the investment now at hand, the management estimates the potential to rise to some €200m and beyond.
- If the company is successful in its undertakings in the next few years and if the market develops as anticipated, the management believes that the company can grow to a size 2-5 times bigger than above depicted, given that appropriate additional growth funding is available.
- The management and owners are committed to building a company with a sustainable business for the long term. It is anticipated that the company will be able to float on an internationally acknowledged stock exchange in the next 3-4 years and continue as an independent entity for the foreseeable future.
- As a result of successful execution of the business plan, it is also likely that opportunities will emerge for a trade sale to a major platform, software, or database player in the market. Such companies presently include but are not limited to: Sun, HP, IBM, CA, Dell, SAP, Intuit, Microsoft, Oracle. No such discussions have been conducted or initialised.
- The founders of MySQL AB have stated their intention to build a great business and their interest to find the best possible future for the company – a future where the MySQL product can fulfill its mission of being available and affordable to all.

Additional Reading

Table of Contents

Additional Reading

- The following documents or compilations will be provided as part of the investment memo package:
  - Financial Figures 2002
  - Financial Projections 2003-2007
  - Financial Potential – Long term
  - Sales statistics 2002 (xls)
  - Sales statistics Jan-Feb 2003 (xls)
  - Sales pipeline as of March 2003 (xls)
  - Compilation of internal business intelligence emails (doc)
  - Compilation of analyst reports, etc. (doc, pdf)
  - Staff list (xls)
  - Recruitment plan 2003 (xls)
  - References – Mårten (text)
  - References – Hans (text)
  - References – Larry (text)
  - Investment timetable and contacts (doc)
  - Reference customers including contact info (doc)
  - Existing shareholders agreement (doc)
  - Cap table (xls)
  - Table of contents of due diligence material (doc)
  - User survey 2001
  - Investment Q&A (living document, updated as we go).

Projections and Statements

i.e. XLS files that will be provided to select potential investors

Year 2002	Years 2003-2005	Ultimate Ambition
P/L	Revenue projections by 3 scenarios including P/L, BS and CF	Revenue Analysis and P/L Projection for Maximum Market Potential in 3 Markets: - Embedded database - Web and personal database - Enterprise database
BS	Current Sales Pipeline	
CF	Current Sales Stats	
Sales Stats	Staff Table with FTE deployment by Cost Centre	

Hans: please scrutinise and make changes!

Product & Service Information

Table of Contents

MySQL™ in a nutshell

- MySQL is an RDBMS, such as Oracle, Microsoft SQL Server, IBM DB2 and others
- MySQL is designed for mission critical applications, where performance and reliability are key
- MySQL runs on most operating systems
- MySQL interfaces with most programming languages
- MySQL aims to have everything necessary, and nothing more: ACID transactions, replication, interfaces
- MySQL is available both under GPL and a commercial licence – dual licensing

MySQL Customer Value: Saving time, in many ways

- Performance / speed
- Reliability
- Ease of use
  - easy installation
  - limited complexity
  - many interfaces
- Low total cost of ownership
  - low licence fees (at times free of charge)
  - low support costs
  - lower hardware costs, longer economic lifetime
  - low training and administration costs (low complexity)

How MySQL Software Develops

- Core development
  - done by salaried employees of MySQL AB worldwide
- Assimilation
  - licensing (InnoDB, Berkeley DB) or acquisiton (JDBC driver) of technology developed in the open source community
- Contributions
  - case-by-case contributions by individuals and companies (where ownership is transferred to MySQL AB)
- Community
  - some add-ons and APIs that remain in community ownership (such as Perl-DBI and PHP-MySQL connection)

Principles of Software Development

- Bugs are bad
- Modular design
- Compact code
- Release early, release often
- Never let new features compromise speed
- Make the product easy to install - easy and practical to use
- Document while coding
- Do it right the first time, every time

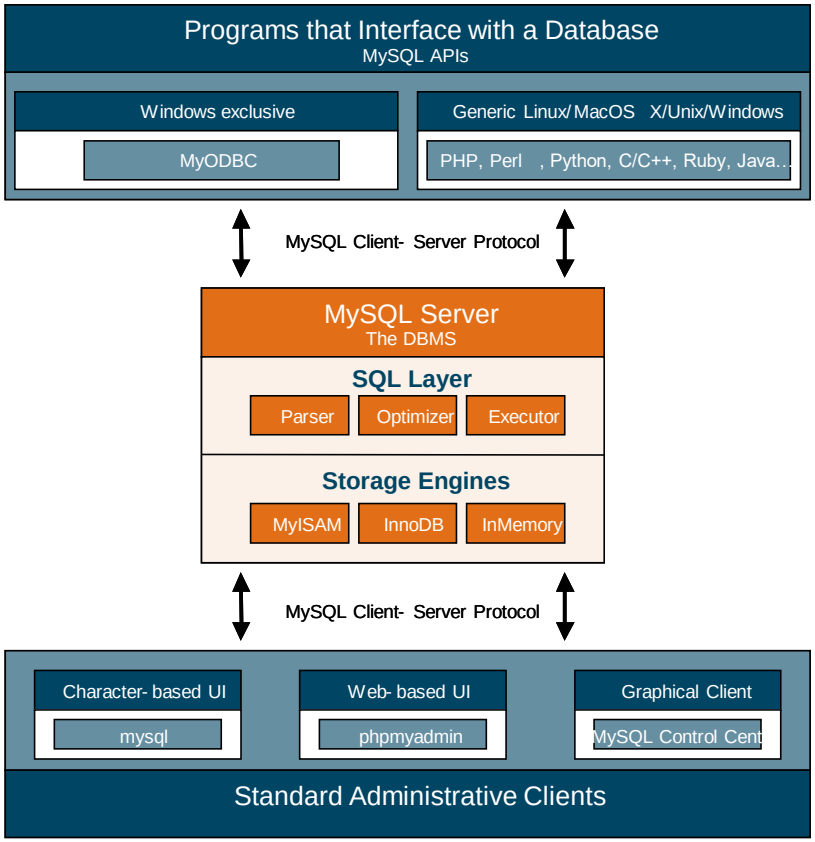
Ultra-Conservative Versioning

- Not one single release leaves the company until all known repeatable fatal bugs have been fixed or properly documented
  - Alpha
    - first public release of a new version
  - Beta
    - feature freeze
    - many old customers put betas in production use
  - Gamma
    - beta turns to gamma when one month has passed without fatal bugs
  - Production
    - gamma turns to production when one month has passed without fatal bugs

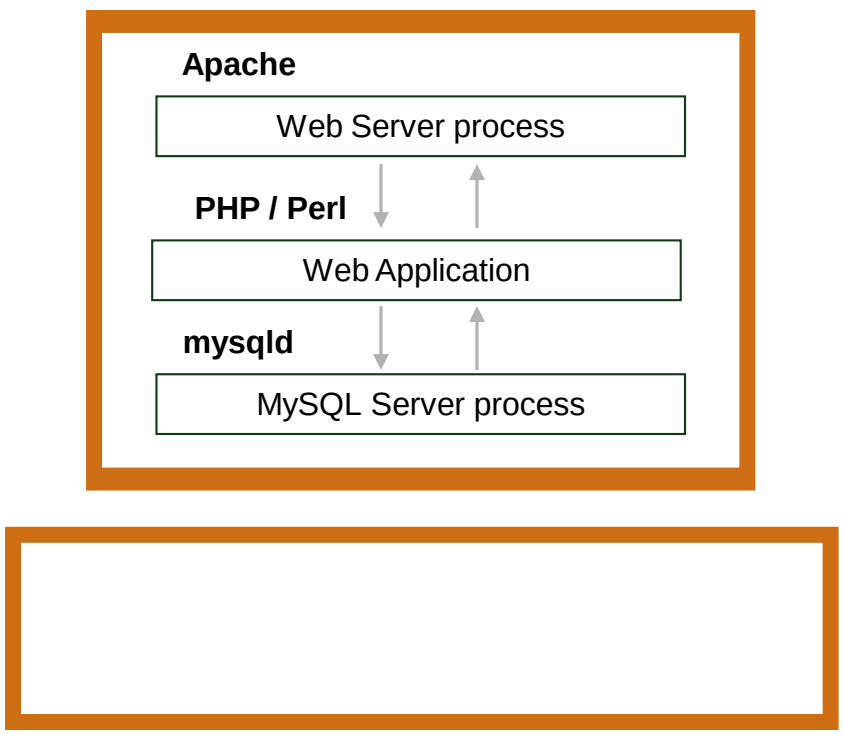
Four Concurrent Source Trees

- Presently (Feb 03)
  - 3.23 - production version
  - 4.0 - in gamma
  - 4.1 - in alpha
  - 5.0 - being worked on
- All versions available for public scrutiny at bitkeeper.com
- Bug and other fixes are merged into all active source trees

Product Architecture



The LAMP model
Linux-Apache-MySQL-PHP/Perl/Python



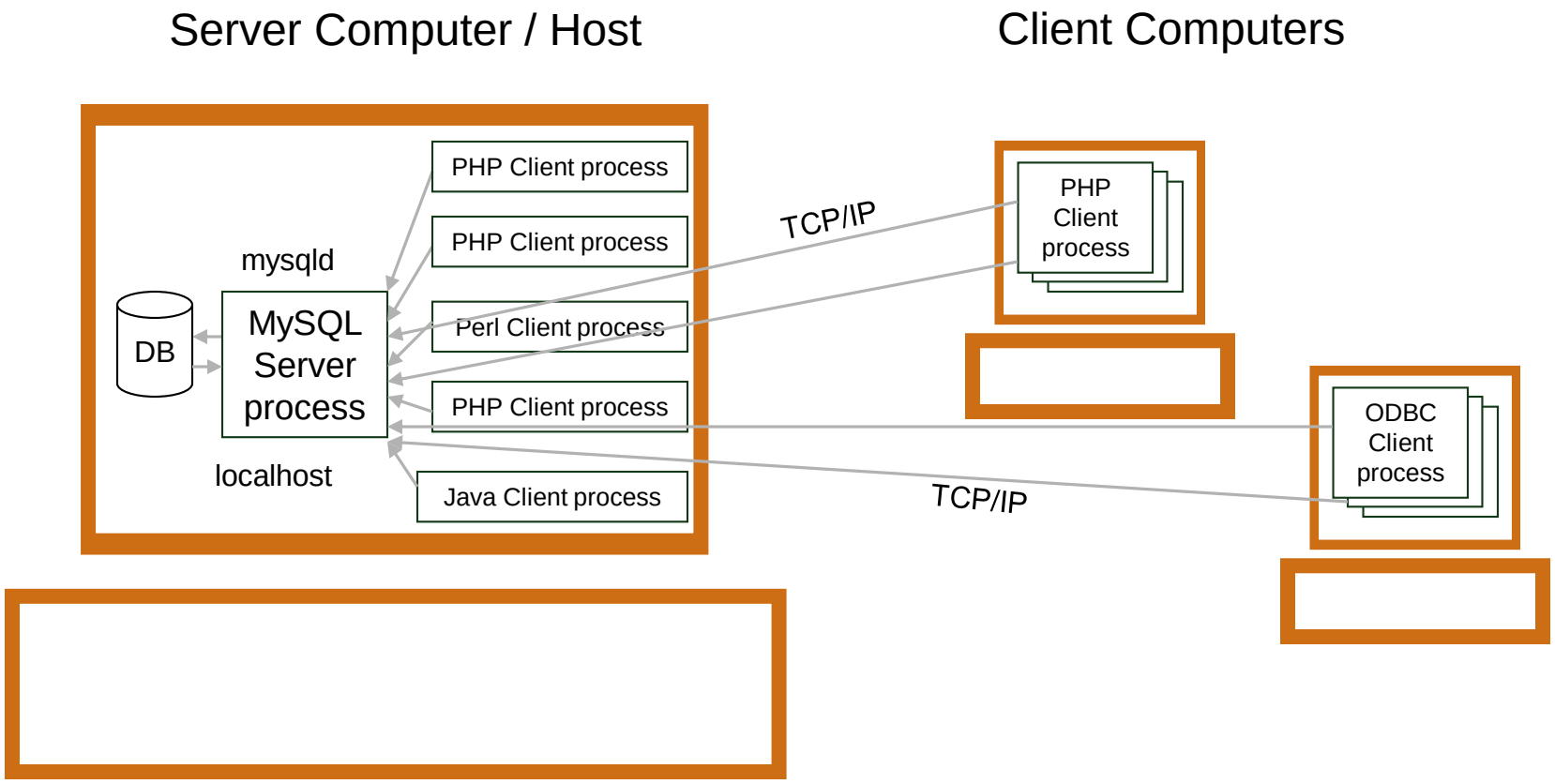
LAMP is

- a complete and integrated technology stack
- for rapid development and deployment
- of heavy-duty web applications.

Many degrees of freedom

- WAMP, NAMP, LAMJ, …
- Move, duplicate, replicate the MySQL Server process

The Client / Server Model



Supported operating systems

www.mysql.com/doc/W/h/Which_OS.html

- AIX 4.x+
- Amiga
- BSDI 2.x (mit-pthreads)
- BSDI 3.0, 3.1, 4.x (native)
- DEC Unix 4.x
- FreeBSD 2.x / 3.x, 4.x
- HP-UX 10.20 / 11.x
- Linux 2.0+
- Mac OS X Server
- NetBSD 1.3/1.4
- Novell Netware 6
- QNX
- OpenBSD <2.5 / >2.5
- OS/2 Warp 3, FixPack 29, Warp 4, FixPack 4
- SGI Irix 6.x
- Solaris 2.5+
- SunOS 4.x
- SCO OpenServer
- SCO UnixWare 7.0.1
- Tru64 Unix
- Win95, Win98, NT, Win2000, XP.

Supported APIs

C API based

- PHP
- Perl
- ODBC
- C
- C++
- Python
- Tcl
- Eiffel
- Ruby
- Delphi

Others

- Java (Connector/J JDBC)

Over ODBC / .NET

- VBA
- VB
- Word
- Excel
- Access
- Delphi
- ASP

Where are the limits of MySQL?

- **Database size:** Hundreds of gigabytes in practice
- **Scalability:** >90 replication slaves at mobile.de, >2,500 queries per second in a single server at mainchat.de
- **Features:** Subselects in 4.1, Stored Procedures, Triggers, referential integrity of foreign keys in 5.0, then Views
  - Limitation unimportant in new applications
  - Porting of existing applications easier to 4.1 and 5.0
- The most important limits of MySQL lie in user perceptions
  - Decision makers may know little about MySQL and Open Source

MySQL 1984-95: The Roots

- 1984-94: Michael "Monty" Widenius develops database routines for his own purposes
  - 10 % further development of ISAM database routines
  - 90 % solution of customer problems in Data Warehousing
- 1986: David Axmark meets Richard Stallman
- 1994: Customer requires SQL interface to web database
  - Monty needs 9 months to build a MySQL parser and optimiser
- 1995- Perl API identical to API of mSQL

MySQL 1995-2000: Growth

- More: Users, development tools (such as PHP), operating systems (such as Windows)
- Commercial support available from the outset
- Profitable from inception
- Open Source all the time
- Licences under GPL since June 2000
- Technology is key; marketing limited to www.mysql.com; hardly any administration
- More and more employees through mailing lists

MySQL 2001-2003: Presence

- New management: CEO, VP Training, CFO, VP Sales
- Monty CTO, David VP Community Relations
- Scandinavian Venture Capitalists invest money
- Focus: USA (largest growth), German second place
- More employees worldwide (14 countries, 65 people)

MySQL Proliferation

- MySQL is part of all Linux distributions
- MySQL is downloaded 29 000+ times a day
  - >800.000 times a month or 10M times a year
- We estimate some 4 million installations
- Installed base on par with Oracle
  - more users according to iX Magazine in Germany 2002: MySQL 46%, Oracle 44%
  - more web pages with "MySQL" than with "Oracle" according to Google
  - 20% of worldwide relational database use, 0.02% of licence revenues

MySQL has grown from the roots

- A significant portion of all large companies use MySQL somewhere
- Only in some of them, the management knows it
- Some of them become customers of MySQL AB
- Companies that publicly acknowledge using MySQL:
  - Ericsson, NASA, Yahoo! Finance, Silicon Graphics, Slashdot.org, Texas Instruments, US Census Bureau, Virage, Silicon Storage Technology, Lucent, Motorola, HP, Xerox, mobile.de, handy.de
  - Search for "Supplied argument is not a valid MySQL" in Google – among the 90,000+ results you will find a few others who use MySQL

MySQL Inc: Services

www.mysql.com/services

Support

www.mysql.com/support

- Support Wizard
- Email responses
- Login Support
- Phone Support
- Fast
- 24/7 availability
- "Insurance"
- From the developers themselves

Training

www.mysql.com/training

- Open courses
- In-house courses
- eTraining
- Certification
- Worldwide
- by MySQL Trainers

Consulting

www.mysql.com/consulting

- Deployment
- Migration
- Specification
- Solutions
- Tuning
- On site / online
- Embedding
- Enhancements
- Porting

Support Pricing

	Standard	Advanced
	EUR	EUR
Monthly agreements:		
Installation support :	N/A	250,-
Login installation:	N/A	1.000,-
Yearly agreements:		
Entry Level	1.500,-	2.500,-
Primary	4.000,-	6.000,-
Enhanced	9.000,-	12.000,-
Premium	N/A	48.000,-

Training

- Five days of "MySQL Training Week"
- Day 1: Overview, structure, basic SELECT
- Day 2: SELECT, UPDATE, INSERT, DELETE, CREATE
- Day 3: Security, User Management, Server Setup
- Day 4: Administration, installation, Storage Engine
- Day 5: Tuning, EXPLAIN, database structures
- Blocks of 2, 3 or 5 days
- MySQL/PHP training from 2002

Certification

- Purpose
  - Enables market to assess quality of MySQL developer pool
  - Enhances MySQL brand recognition outside core Open Source developers
  - Adds to momentum among developers, focuses their attention as directed by MySQL AB
  - Building block for MySQL in creating partnerships
  - Drives training income for MySQL AB
- Delivered by 3,000 Pearson/VUE testing centres worldwide
- Present levels
  - MySQL Core Certification (beta Dec 2002, GA Mar 2003)
  - MySQL Professional Certification (beta Apr 2003, GA Jul 2003)
- Planned future levels
  - MySQL PHP Certification
  - MySQL DBA Certification
- Cost $195 and up
- Supported by MySQL Certification Study Guides under writing

Consulting

- Dimensions: on-site/online
- Grows out of support and training cases
- Grows out of application growth pains
- Prices from 160 to 250 euro/h
- Lower pricing implies at least three weeks of scheduling time and long duration
- Minimum duration of task 2-3 days

MySQL Press

- Purpose
  - To build and widely distribute the most helpful, accurate, and timely documentation for MySQL
  - To draw the potential out of the joint branding of MySQL AB, a leading publisher, and the best MySQL authors
  - To attain the predominant position in retail channels for the target market
  - To build the premiere canon of published works related to MySQL Goals
  - Publish at least four new titles a year by the best available MySQL authors
  - Support MySQL AB goals of product positioning and installed base growth
  - Provide an offering of MySQL AB at a low price point

MySQL Tomorrow

1. MySQL Release Logic
   - source – alpha – beta – gamma – production
   - 4.0 "gamma" Nov/Dec 2002
   - 4.1 Dec 2002
2. MySQL 4.0
3. MySQL 4.1
4. MySQL 5.0
5. MySQL 5.1

Active Versions

- We are now working on 4 different MySQL major versions at the same time
- 3.23 Stable Production Release
- 4.0 Feature Freeze Release (Gamma)
- 4.1 Out in Source code for some months
- 5.0 We will soon open the source code

MySQL 4.0

http://www.mysql.com/mysql40

- Features
  - ACID transactions with versioning and high transaction isolation (RepeatableRead) using InnoDB
    - DB2, MSSQL and PostgreSQL use only ReadCommited
  - embedded server library (libmysqld)
  - query cache: prestored answer sets
  - dynamic server variables
  - boolean FULLTEXT
  - UNION
  - multi-table deletes, updates
  - improved replication

4.0: Handler (Navigation) Interface

- Used when porting old database application with a navigational (direct ISAM) interface
- Also useful when you are doing a userinterface that navigates a lot of data
- This interface gives "Dirty" reads (but no other MySQL commands are affected!)
- HANDLER table_name OPEN;
- HANDLER table_name READ index_name > ("Banana") LIMIT 10;
- HANDLER table_name READ index_name PREVIOUS;

4.0: Multiple table DELETE

- Allows you to delete rows in multiple tables bases of conditions from multiple tables
- Like saying that you want to delete all rows found by a SELECT
- Syntax inspired by MS Access
- DELETE t1,t2 FROM t1,t2,t3 WHERE t1.id=t2.id and t2.id=t3.id

4.0: Dynamic Setting of Variables

- Change options on the fly (per thread and globally)
  - No need to restart server to change cache sizes
  - Possible to set larger buffers for specific commands
- SET GLOBAL SORT_BUFFER=1*1024*1024
  - This will set the sort buffer (used by ORDER BY queries) for all new connections
- SET SESSION SORT_BUFFER=32*1024*1024
  - Will set the same buffer but only for the current connection
- SELECT @@GLOBAL.SORT_BUFFER
  - Returns the default size of the variable

4.0: Query Cache

- Improves the speed of queries on read mostly tables. Most (all?) websites has some query that will run many times a second
- 3x speed improvement for web sites not uncommon
- Does not change semantics at all!
- To enable add a line to my.cnf
  - query_cache_size = 128MB
  - Or set it on a running server
- SET @@GLOBAL.QUERY_CACHE_SIZE=128*1024*1024
  - Turns the Query Cache on with 128 MB memory

4.0: Replication

- Replication uses two threads
  - One to read the all queries and store them on disk in case
  - One to do the updates
  - This makes sure that the slave always catches up to the latest changes even if it was executing a slow update when the server went down
- LOAD DATA INFILE commands are now replicated properly

4.0: Other Features

- SELECT * FROM articles WHERE MATCH (title,body) AGAINST ('+apples -bananas' IN BOOLEAN MODE);
  - Find all records with the word "apples" but not the word "bananas" using a full textindex
- SELECT SQL_CALC_FOUND_ROWS ... LIMIT 10
- SELECT FOUND_ROWS();
  - Make it possible to display the total number of rows even with a limit. For "10 out of 124 items shown" things
- Hash functions: SELECT SHA1("foo")
- GRANT .. MAX_QUERIES_PER_HOUR=# MAX_UPDATES_PER_HOUR=# MAX_CONNECTIONS_PER_HOUR=#
  - Limit a user (Very useful for ISP use)

4.0: Faster ...

- SELECT COUNT(DISTINCT ...) ...
- Bulk loading of data
- Bulk updates of full text indexes
- Removing all the rows in a table
  - TRUNCATE TABLE table_name;
- SELECT * FROM table WHERE blob_col like "%keyword%"
  - Uses a fast turbo BoyerMore stringsearch
- CREATE TABLE foo DATA DIRECTORY="/path/to/dir" INDEX DIRECTORY="/path/to/dir"
  - Support for spreading MyISAM files over many disks
- Multithreaded index rebuilding in myisamchk

MySQL 4.1

- Features
  - Subqueries / nested SELECTs
    - SELECT row1 FROM table1 WHERE a=(SELECT b FROM table2)
  - GIS / Geometric Data
  - Warnings when data is lost
  - Unicode support
  - Memory tables
    - SELECT * FROM table1, (SELECT b from table2) WHERE ...
  - Multiple table update
    - UPDATE t1,t2,t3 SET t1.c1=Val,t2.c2=val2 WHERE t1.id=t2.id and t2.id=t3.id
  - Others: SSL

4.1: Prepared Statement

- Instead of sending a query direct you do
  - Prepare SELECT foo from bar where a=?
  - Do ("1")
  - Do ("2")
- Also works with binary data without quoting
- The client server protocol has been extended for this
- The whole protocol is now fully binary so it runs even faster

4.1: Subqueries

- Scalar Subqueries
  - SELECT Country, Inhabitants, Area FROM World.Country WHERE Area > (SELECT Area FROM World.Country WHERE Country='Finland');
- Correlated Subqueries
  - SELECT * FROM World.City WHERE City.Country = ANY (SELECT Country FROM World.Country WHERE City.Inhabitants > Country.Inhabitants/4);
- WHERE field IN (SELECT ...
  - SELECT * FROM World.Country WHERE Country IN (SELECT Country FROM World.City WHERE City.Inhabitants > 5000000);

4.1: GIS / Geometric Data

- OpenGIS: New data type ”Geometry”
- CREATE TABLE geom (g Geometry, SPATIAL INDEX(g));
- INSERT INTO geom VALUES (GeomFromText(’POINT(1 1)’)), (GeomFromText(’POLYGON(0 0,10 0,10 10, 0 10, 0 0)’));
- New functions, e.g. AsText, IsClosed, Length, Area, Intersection, Intersects, Within
- Red-black index trees: Indexes for Within

4.1: UNICODE Support

- CREATE TABLE t (field_list) [CHARSET=latin1];
- SELECT Last_name FROM Customer ORDER BY Last_name COLLATE latin1_de;
- SELECT MAX(Last_name COLLATE latin1_de);
- SELECT * FROM Customer WHERE (Last_name COLLATE latin1_de)="Müller";
- CONVERT(Last_name USING utf8);
- UCS2 support (two byte Unicode)
- UTF8 support RFC2279, 1..3 bytes

4.1: Other New Features

- SSL connection from client to master
- libmysqld smaller, faster
- Online Help for server functions
- Foreign Keys with CASCADING DELETE
- Improved MEMORY tables (earlier name HEAP) (faster, B-tree indexes)

MySQL 5.0

- Features
  - Stored Procedures as in ANSI SQL
  - Triggers
  - Referential integrity (foreign keys)
  - Online backup of MyISAM tables
  - New column types:
    - BIT
    - True VARCHAR (no space trimming)
    - ARRAY
  - Warning/Info system
    - Notify sysadmin when something may go or goes wrong
    - Give feedback while a slow command is running

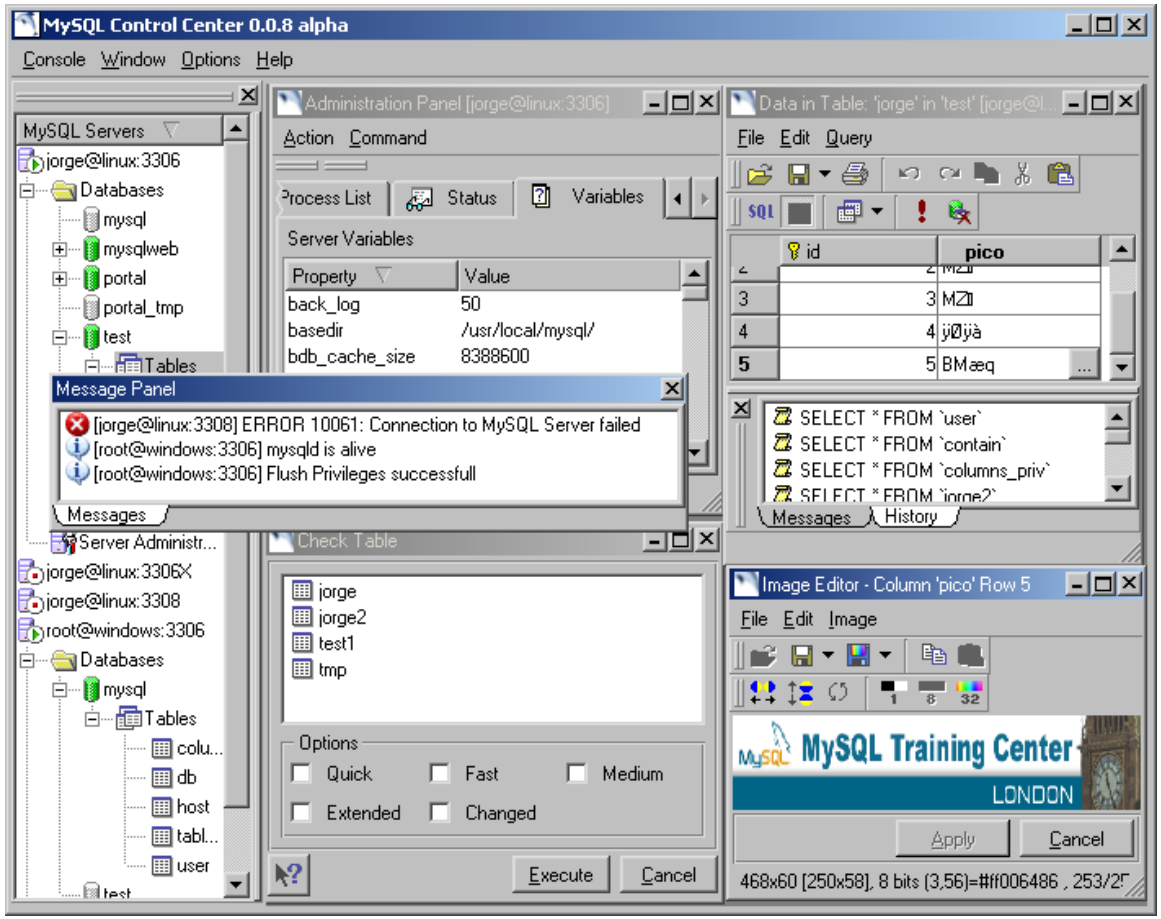
5.0: Stored Procedures

- ANSI SQL99, can be extended to e.g. PHP or PL/SQL
- CREATE PROCEDURE MyProc (IN InputField SMALLINT, OUT OutputField SMALLINT ...
- CALL MyProc(5,@MyVariable);
- Grammar with BEGIN, END, SET, RETURN, CASE, IF, LOOP, WHILE, REPEAT, FOR

MySQL 5.1

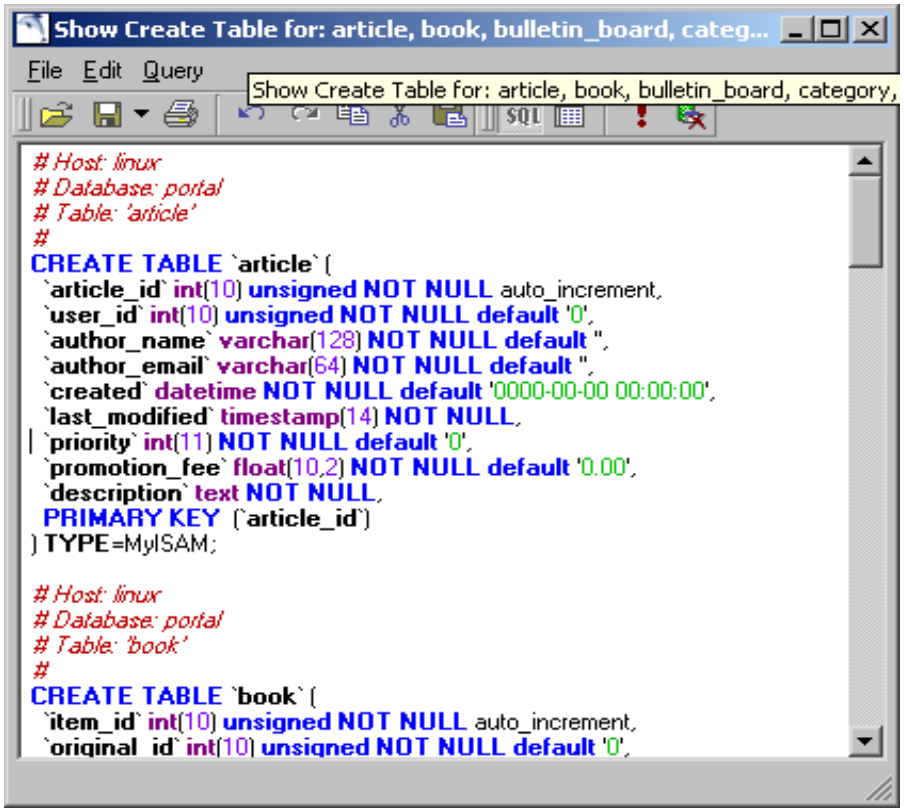
- Views
- More ANSI SQL99 compatibility

MySQL Command Center (mysqlcc)



- Graphical MySQL client
- Written in C++ using the QT toolkit for UNIX & Windows
- Features:
  - Create/drop databases
  - Create/edit/drop tables
  - Write and execute SQL-queries
  - SyntaxHighlighting editor
  - List of servervariables and status
  - View and kill other user-processes
  - And many more...

MySQL Command Center



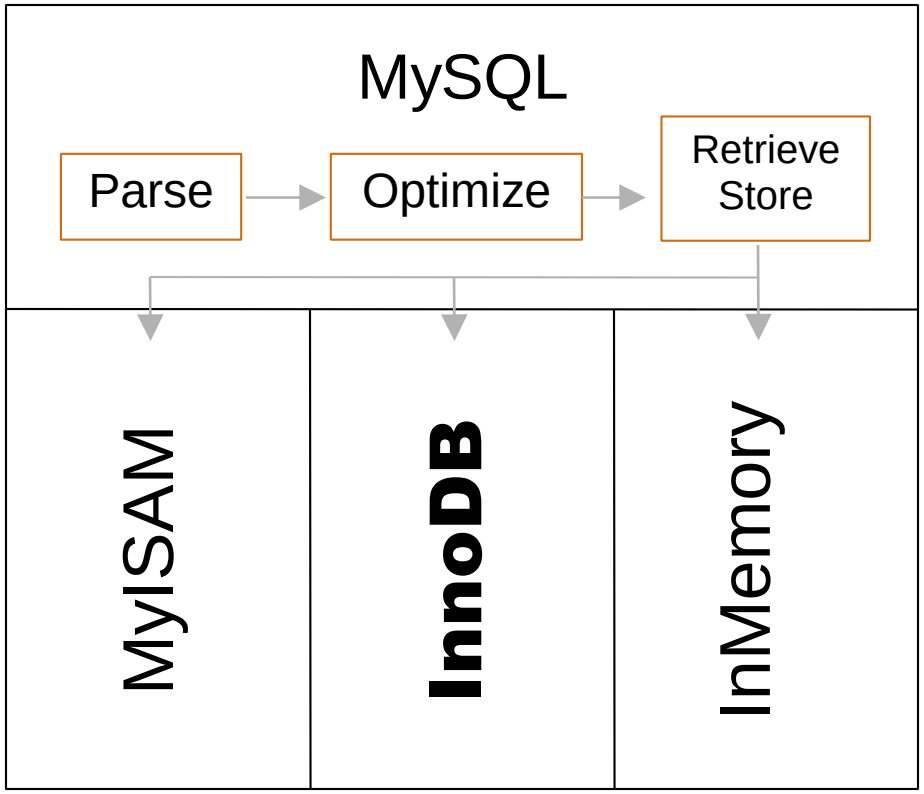
High Availability by Replication

- MySQL supports many sites that need high reliability
  - This is done by "mirroring" the data to many machines
- The single Master logs all SQL commands that update data
- Slaves connect to the master or another slave to read, and rerun the updates
- Examples of users are
  - Yahoo
  - Slashdot.org
  - Mobile.de (used car broker, over 300M page views/month)

Storage Engines

- A storage engine is a low level data storage / retrieval module (disk or memory)
- This allows you to choose locking and speed trade offs per table (instead of when choosing db!)
- MySQL supported multiple storage engines from the very beginning
- CREATE TABLE (key int, value char(10), PRIMARY INDEX key) TYPE=HEAP;
- ALTER TABLE table_name TYPE=InnoDB;

The Storage Engine Concept



MySQL Database Management Level

Table Handler / Storage Engine Level

Storage Engine: MyISAM

- Developed by MySQL AB (replaced original ISAM)
- Static, dynamic and compressed (read-only) row formats but no transactions
- Text and compressed indexes
- Data and indexes in separate files
- Fast read/write performance but low r/w concurrency
- Extremely good concurrency in the select and insert at end case (logs)
- External check and repair program (myisamchk)
- Especially useful for websites & logging

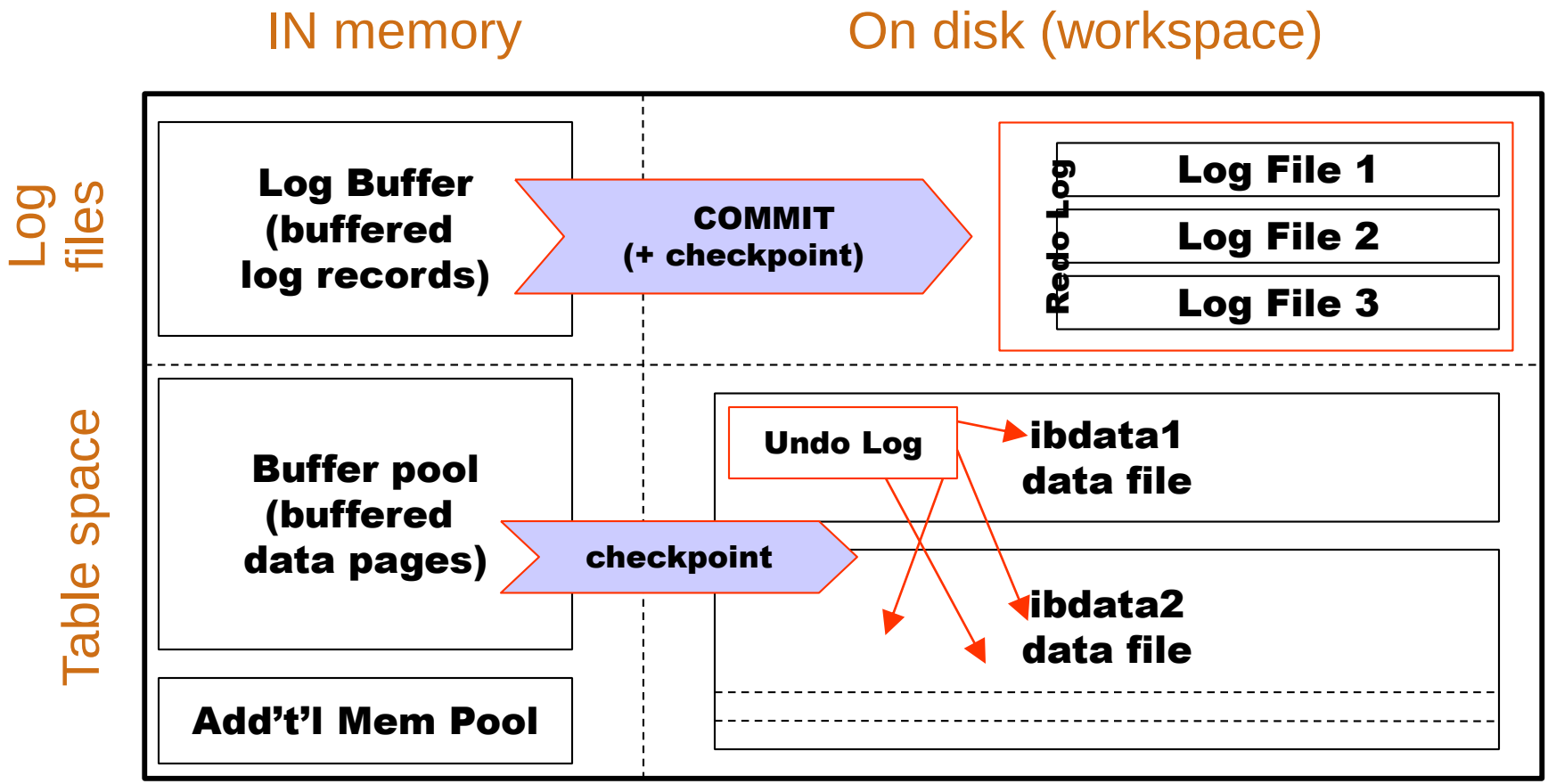
Storage Engine: Hash/InMemory

- Developed by MySQL AB
- Completely in Memory with very fast hash based indexing
- Useful for
  - Temporary tables
  - Lookup tables
- Bad for range queries (Already fixed in MySQL 4.1)

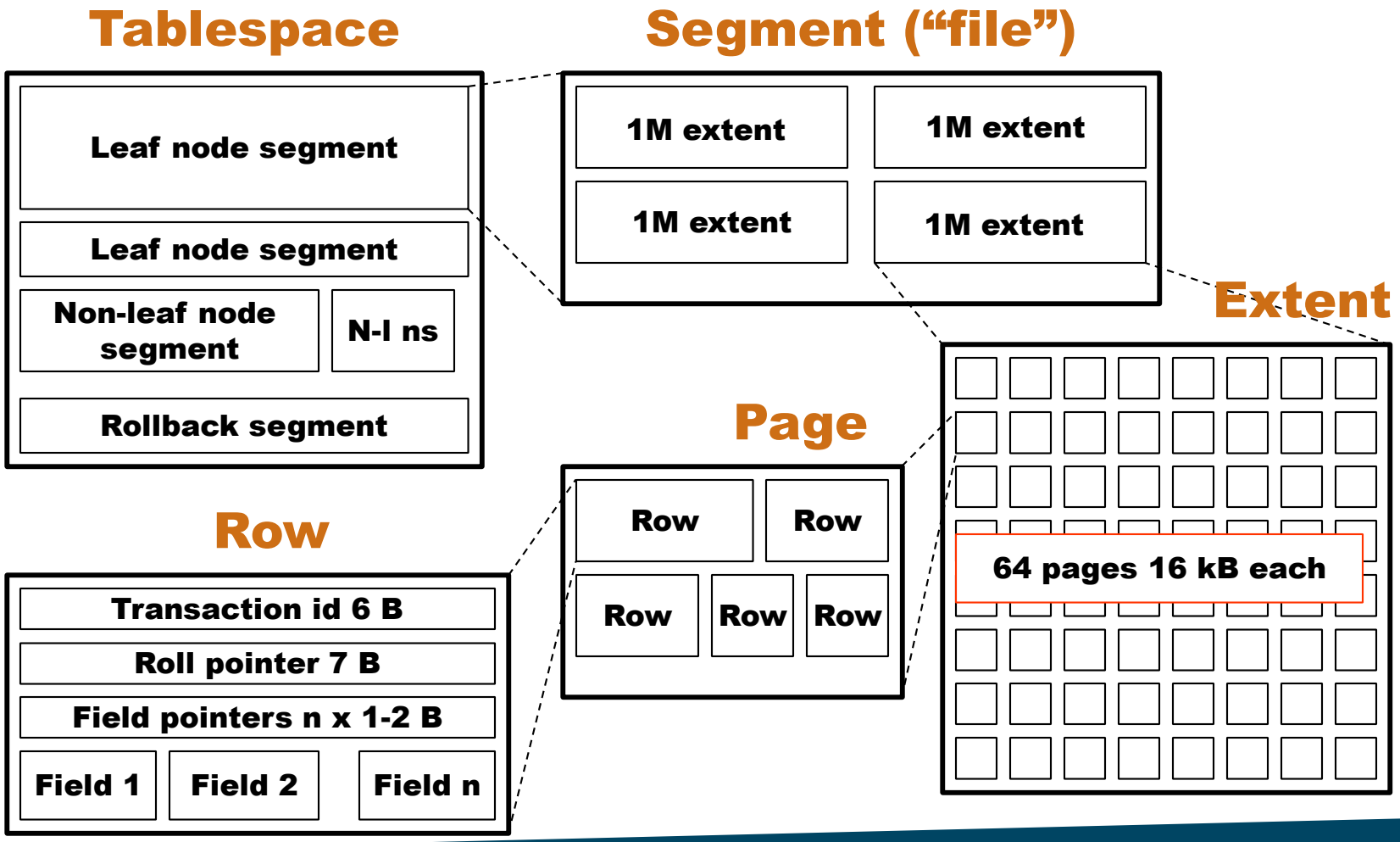
Storage Engine: InnoDB

- Actively developed code from InnoBase Oy & MySQL AB
- Full transactions (ACID) with versioning row level locking with automatic cleanup (no vacuum!)
  - Consistent reads (Oracle style MVCC)
- Better concurrency than MyISAM for read/write on the same table
- Uses table spaces instead of individual files
- MySQL AB provides full support for InnoDB
- Is included in MySQL 4 & the MySQL Max binarys
- Has now been in active use under heavy load. Was for example used for the FIFA world cup site

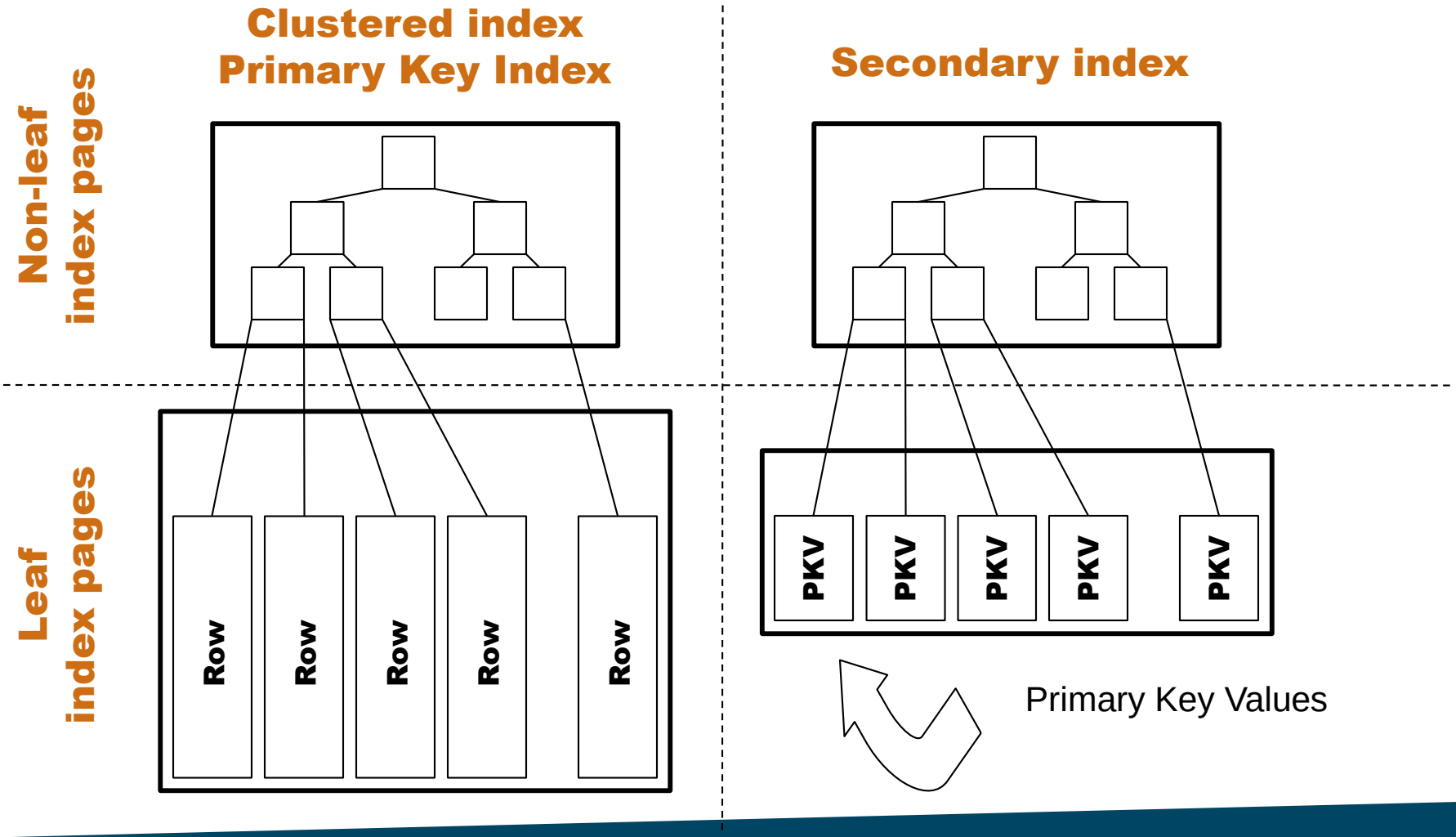
The InnoDB Storage Engine



ibdata Data File Structure



Standard Segment Types



InnoDB Row Structure

- Records with variable (dynamic) size

Record hdr	Trx ID	Roll ptr	Fld ptrs	Field values … Field values

- Record header (6 B, ptr to next record, no of fields)
- Transaction ID (6 B, timestamp)
- Roll pointer (7 B, points to previous version of record)
- Field pointers (1-2 B / field)
  - Start position of field within record
  - 2 bytes if more than 255 fields
- Out-of-page pointers if record size > page size/2 (8 kB)

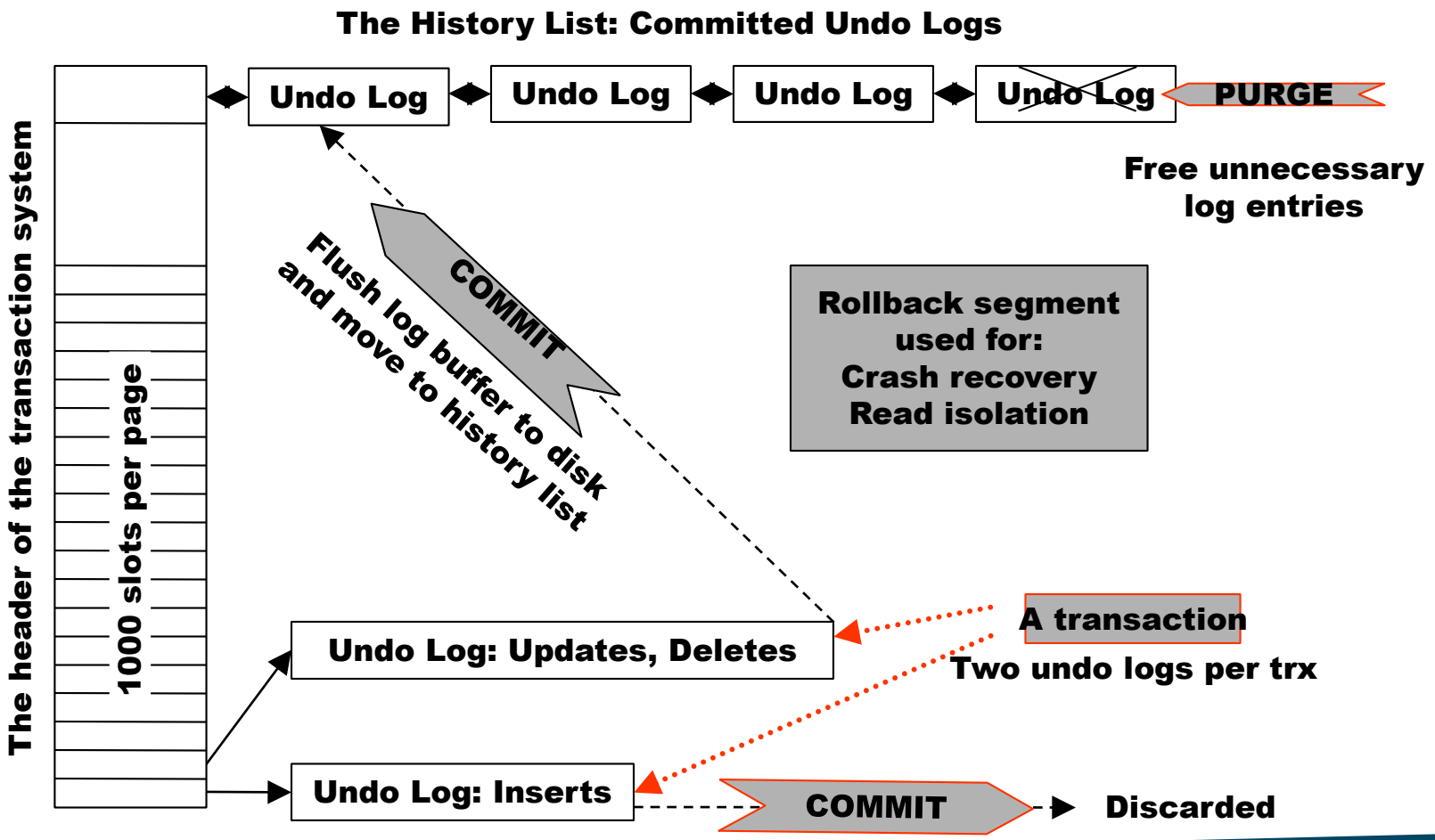
InnoDB Redo Log Structure

- A collection of log records

PageNo	Offset	Record Type	Changes on that page

- Page Number (4 bytes, page within Tablespace)
- Offset of the change within the page (2 bytes)
- Log Record Type (1 byte)
  - Insert, Update, Delete
  - Other types (like "fill space with blanks")
- Changes (only redo values, no old values) except for DELETEs, which need no change notes at all

The InnoDB Rollback Segment



Thank you!

www.mysql.com

Table of Contents