MySQL Cluster
Use cases for TELCO/NEP in Europe

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Agenda

- History of MySQL Cluster ”NDB”
- Use cases for NEP/TELCO companies
- Telco/NEP Architectures
- Choosing an Embedded Database
- Summary

History of MySQL Cluster ”NDB”

The Network DataBase NDB

- MySQL Cluster aka Network DataBase NDB
- Designed/Developed at Ericcson in late 90’s
- Original design paper: ”Design and Modeling of a Parallel Data Server for Telecom Applications” from 1997 by Michael Ronström
- Originally written in PLEX (Programming Language for EXchanges) but later converted to C++.
- MySQL AB acquired Alzato (owned by Ericsson) late 2003.

History of MySQL Cluster ”NDB”

The Network DataBase NDB

- Databases services back then:
  - SCP/SDP (Service Control/Data Point) in Intelligent Networks.
  - HLR (Home Location Register) for keeping track of mobile phones/users.
  - Databases for network management especially real-time charging information.

History of MySQL Cluster ”NDB”

The Network DataBase NDB

- NDB was designed to:
  - Reliability, the availability class of the telecom databases should be 6. This means that downtime must be less than 30 seconds per year. This means that no planned down time of the system is allowed.
  - Performance, designed for high throughput, linear scalabillity when adding more servers (data nodes) for simple access patterns (PK lookups).
  - Real-time, data is kept in memory and system is designed for memory operations.

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MySQL Cluster – Users & Applications

Telecoms

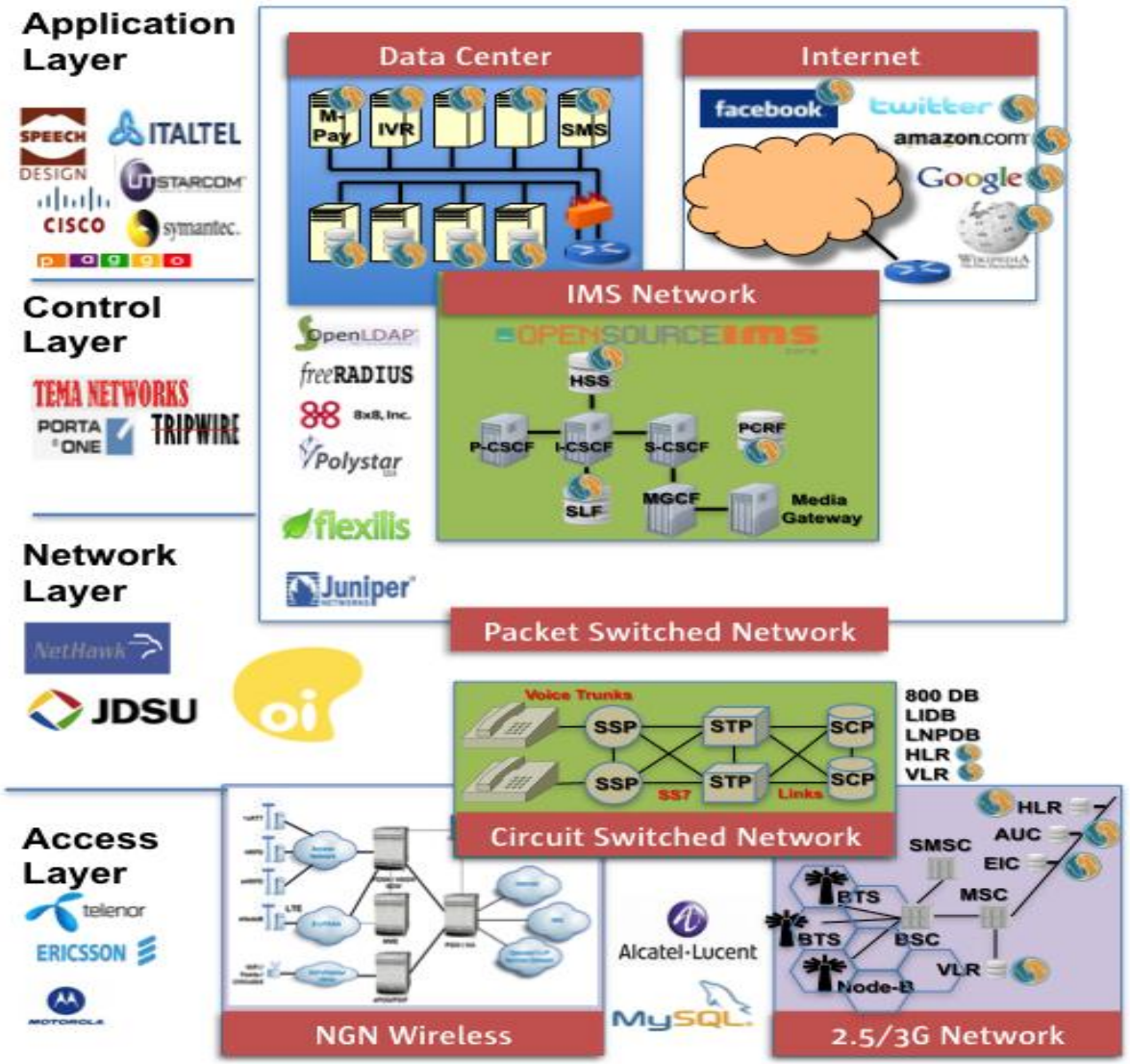
- Subscriber Databases (HLR / HSS)
- Service Delivery Platforms
- VAS: VoIP, IPTV & VoD
- Mobile Content Delivery
- Mobile Payments
- LTE Access

Web & Enterprise

- High volume OLTP
- eCommerce
- User Profile Management
- Session Management & Caching
- Content Management
- On-Line Gaming

http://www.mysql.com/customers/cluster/

Proven in Every Layer of the Network



Subscriber Databases (HLR / HSS / IMS)	Alcatel·Lucent, ERICSSON, MOTOROLA
Billing	TEMA NETWORKS, PORTA ONE
SDP, IPTV, VAS, Portals	STARCOM, SPEECH DESIGN, ITALTEL
Email, Anti-spam Software, Security	flexilis, symantec., TRIPWIRE
VoIP & Online Messaging	CISCO, comsys
Network Monitoring	NetHawk, Polystar
AAA & LDAP	Juniper, freeRADIUS, OpenLDAP

Blending the Agility of the Web with the Trust of the Network

Use Cases of MySQL Cluster in Europe

NEP and TELCO

- Subscriber Data Management HSS/HLR
- IP management (DNS/DHCP and ENUM)
- AAA / RADIUS and Diameter data stores
- Mobile messaging (MMS/SMS Services)
- Service Delivery Platforms
  - VoIP / IPTV / VoD / etc
- Mediation

Requirements of TELCO databases

HSS/HLR, DNS/ENUM, Mediation, QOS

- 5-9’s availability required
- Low latency, real-time access to data
- Language: C/C++ or Java
- Millons of subscribers
- Millions of queries/updates per second
- (Mostly PK/Unique access to data)

MySQL Cluster for TELCO applications

HIGH SCALE, READS + WRITES	• Auto-Sharding, Multi-Master • ACID Compliant, OLTP + Real-Time Analytics
99.999% AVAILABILITY	• Shared nothing, no Single Point of Failure • Self Healing + On-Line Operations
REAL-TIME	• In-Memory Optimization + Disk-Data • Predictable Low-Latency, Bounded Access Time
SQL + NoSQL	• Key/Value + Complex, Relational Queries • SQL + Memcached + JavaScript + Java + HTTP/REST & C++
LOW TCO	• Open Source + Commercial Editions • Commodity hardware + Management, Monitoring Tools

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COMPANY OVERVIEW

- Leading provider of communications platforms, solutions & services
- €15.2bn Revenues (2009), 77k employees across 130 countries

CHALLENGES / OPPORTUNITIES

- Converged services driving migration to next generation HLR / HSS systems
- New IMS platforms for Unified Communications
- Reduce cost per subscriber and accelerate time to value

SOLUTIONS

- MySQL Cluster Carrier Grade Edition
- MySQL Support & Consulting Services

CUSTOMER PERSPECTIVE

"*MySQL Cluster won the performance test hands-down, and it fitted our needs perfectly. We evaluated shared-disk clustered databases, but the cost would have been at least 10x more.*"

-- François Leygues, Systems Manager

RESULTS

- Scale out on standard ATCA hardware to support 60m+ subscribers on a single platform
- Low latency, high throughput with 99.999%+ availability
- Enabled customers to reduce cost per subscriber and improve margins
- Delivered data management solution at 10x less cost than alternatives

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telenor

COMPANY OVERVIEW

- Leading telecoms provider across Europe and Asia. Largest Nordic provider
- 184m subscribers (Q2, 2010)

CHALLENGES / OPPORTUNITIES

- Extend OSS & BSS platforms for new mobile services and evolution to LTE
- OSS: IP Management & AAA
- BSS: Subscriber Data Management & Customer Support

SOLUTIONS

- MySQL Cluster
- MySQL Support Services

CUSTOMER PERSPECTIVE

"Telenor has been using MySQL for fixed IP management since 2003 and are extremely satisfied with its speed, availability and flexibility. Now we also support mobile and LTE IP management with our solution. Telenor has found MySQL Cluster to be the best performing database in the world for our applications."

- Peter Eriksson, Manager, Network Provisioning

RESULTS

- Launch new services with no downtime, due to on-line operations of MySQL Cluster
- Consolidated database supports Subscriber Data Management initiatives
- MySQL Cluster selected due to 99.999% availability, real time performance and linear scalability on commodity hardware

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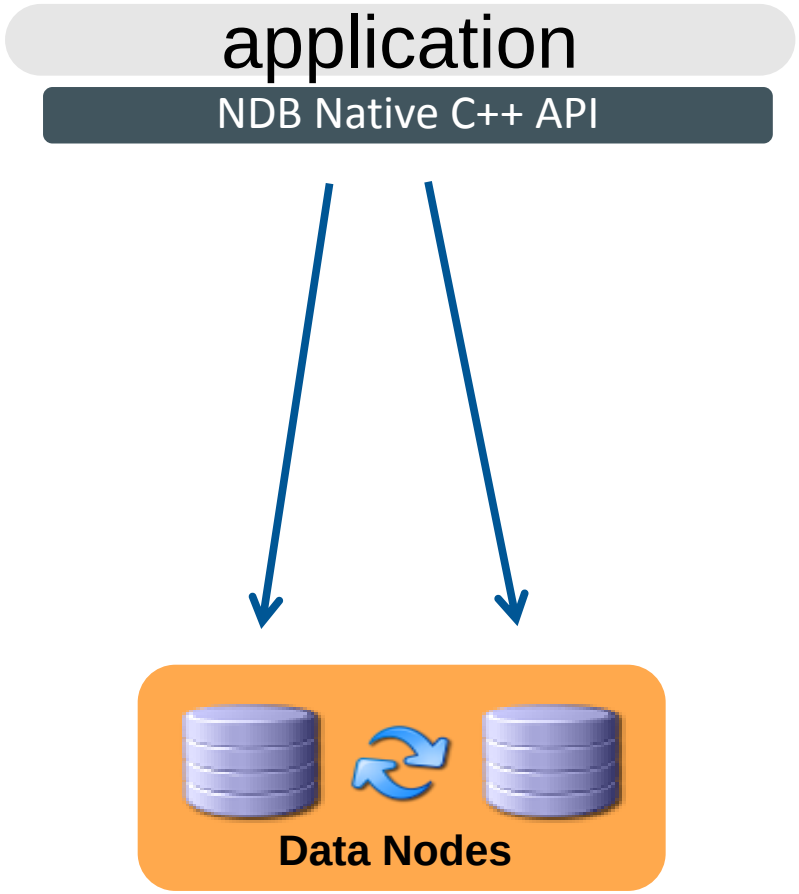
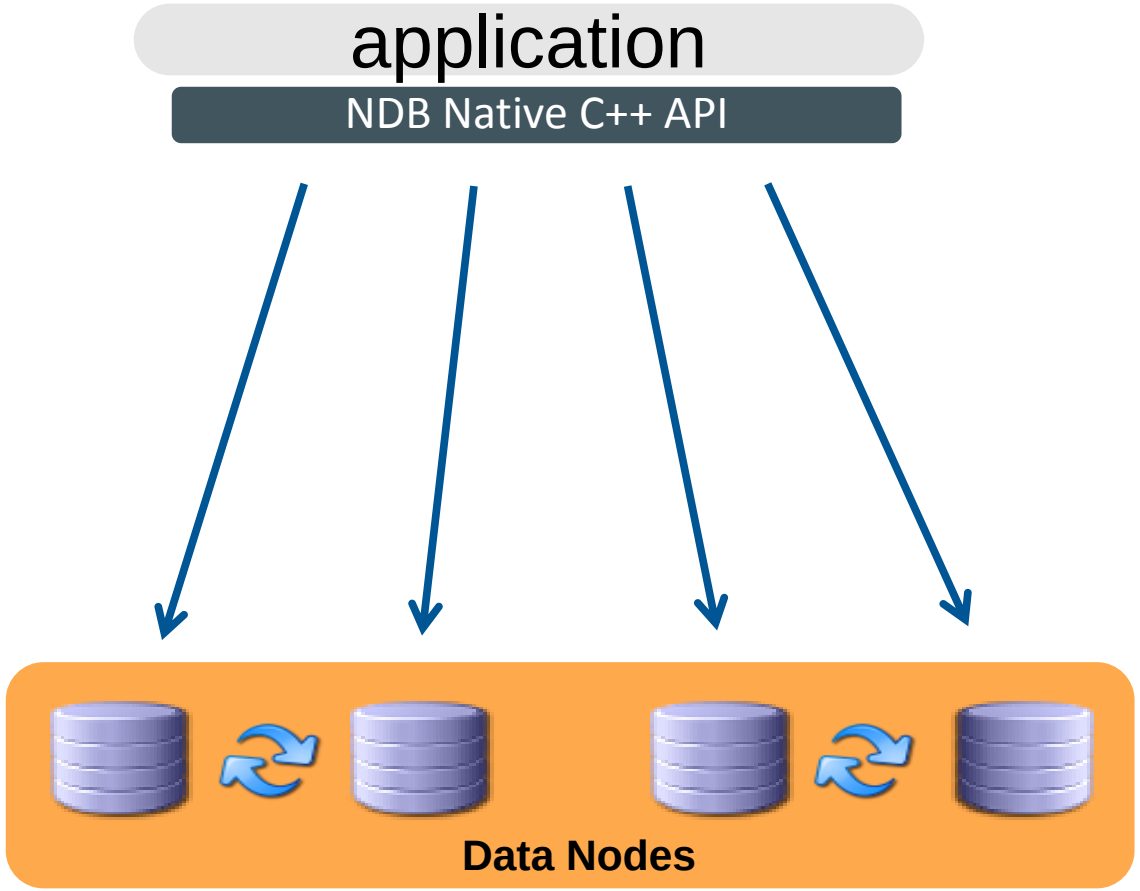
Architectures
Telco apps “small”



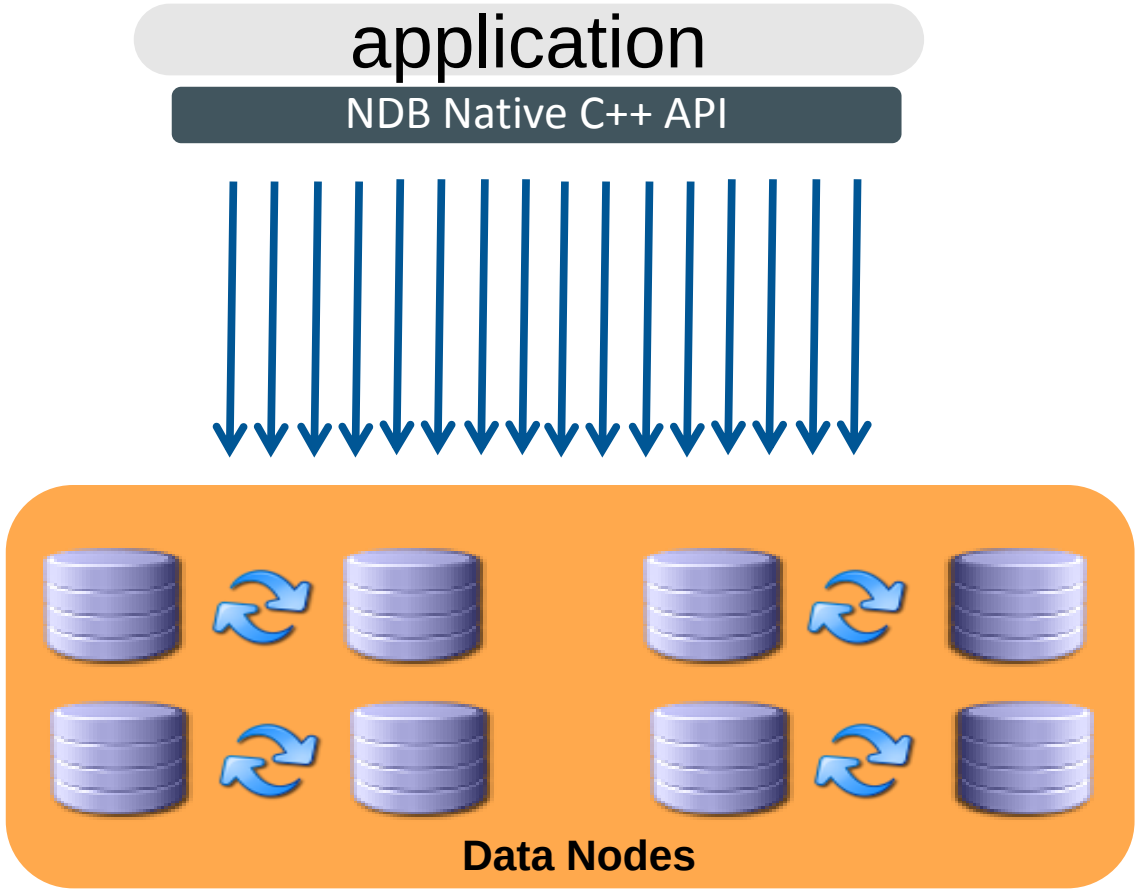
- Start small and grow.
- Smaller operators, DNS/DHCP/EMUM services.
- Minimal installation on 3 (2) physical servers due to arbitration.
- Max 200M QPM and 20M UPM.
- Size of database limited by RAM of smallest server.

Architectures
Telco apps “medium”



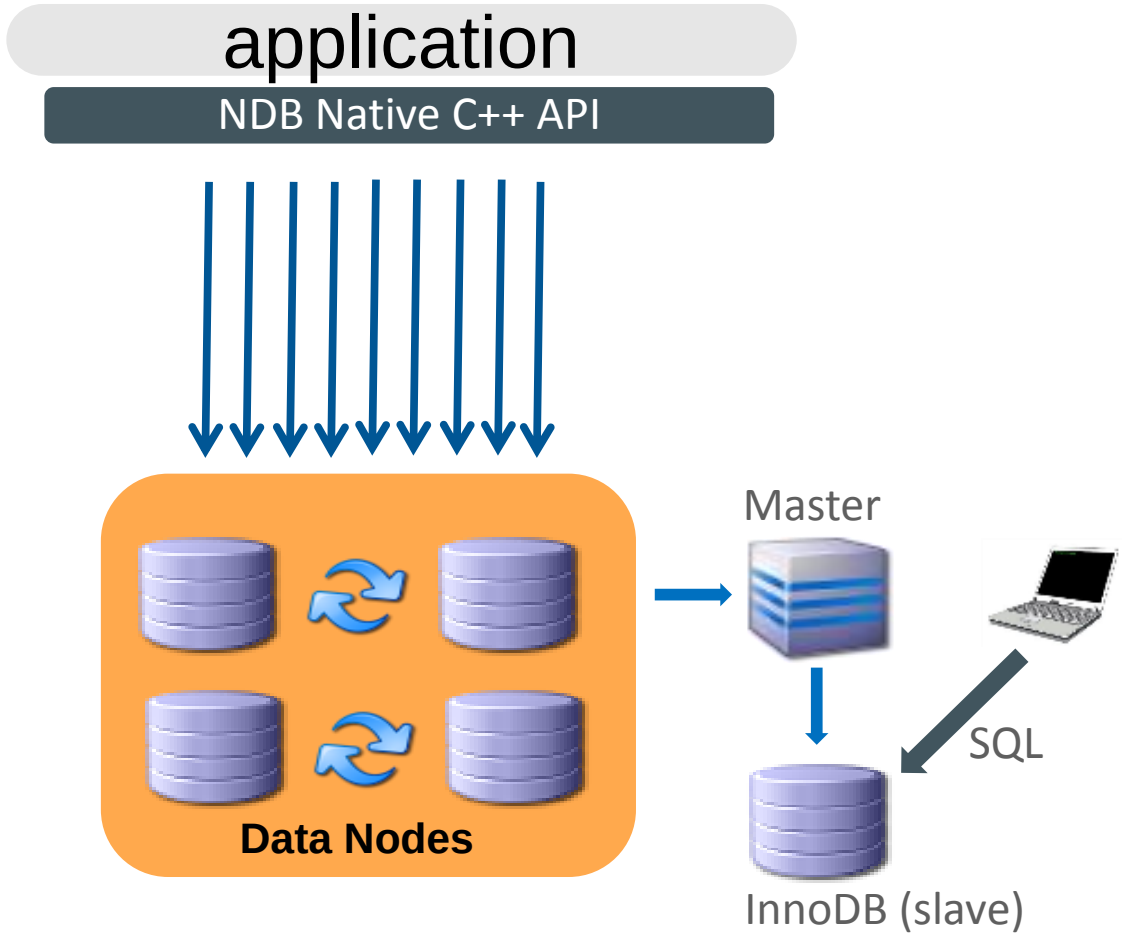
- Most common setup.
- 4 server setup, management nodes can be co-located with data nodes.
- Max 600M QPM and 55M UPM.
- Size of DB limited by 2xRAM (RAM of smallest server).

Architectures
Telco apps “big”



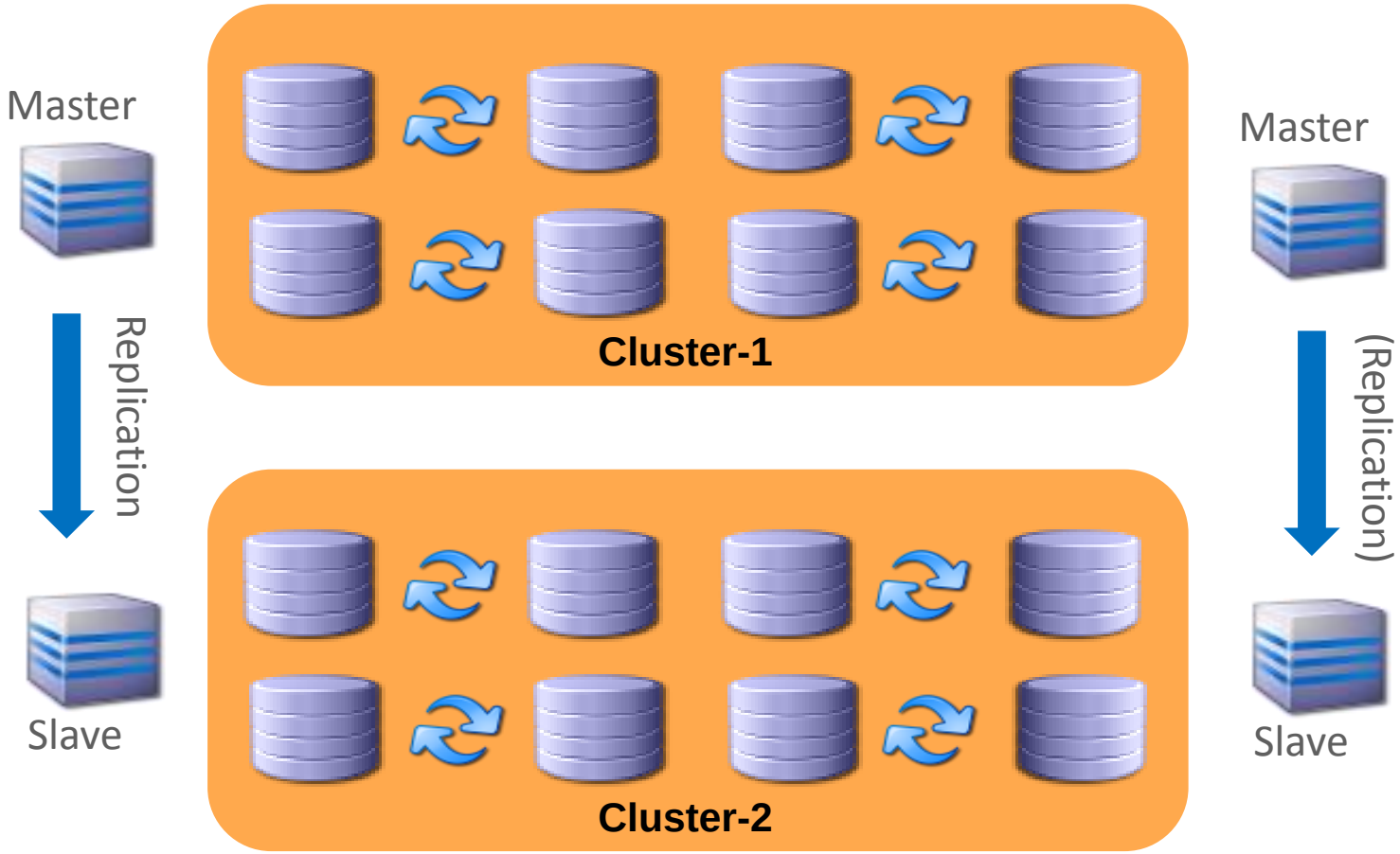
- High performance systems.
- 8 server setup
- Max number of data nodes is 48.
- Max 1100M QPM and 110M UPM.
- Size of DB limited by 4xRAM (RAM of smallest server).

Architectures
Telco apps Hot & Cold data



- Replicate to InnoDB for cold data.
- Full dataset in InnoDB (slave).
- Only “HOT” data in cluster low latency operations.
- Run reports/statistics on disk based database InnoDB.
- Cost effective!

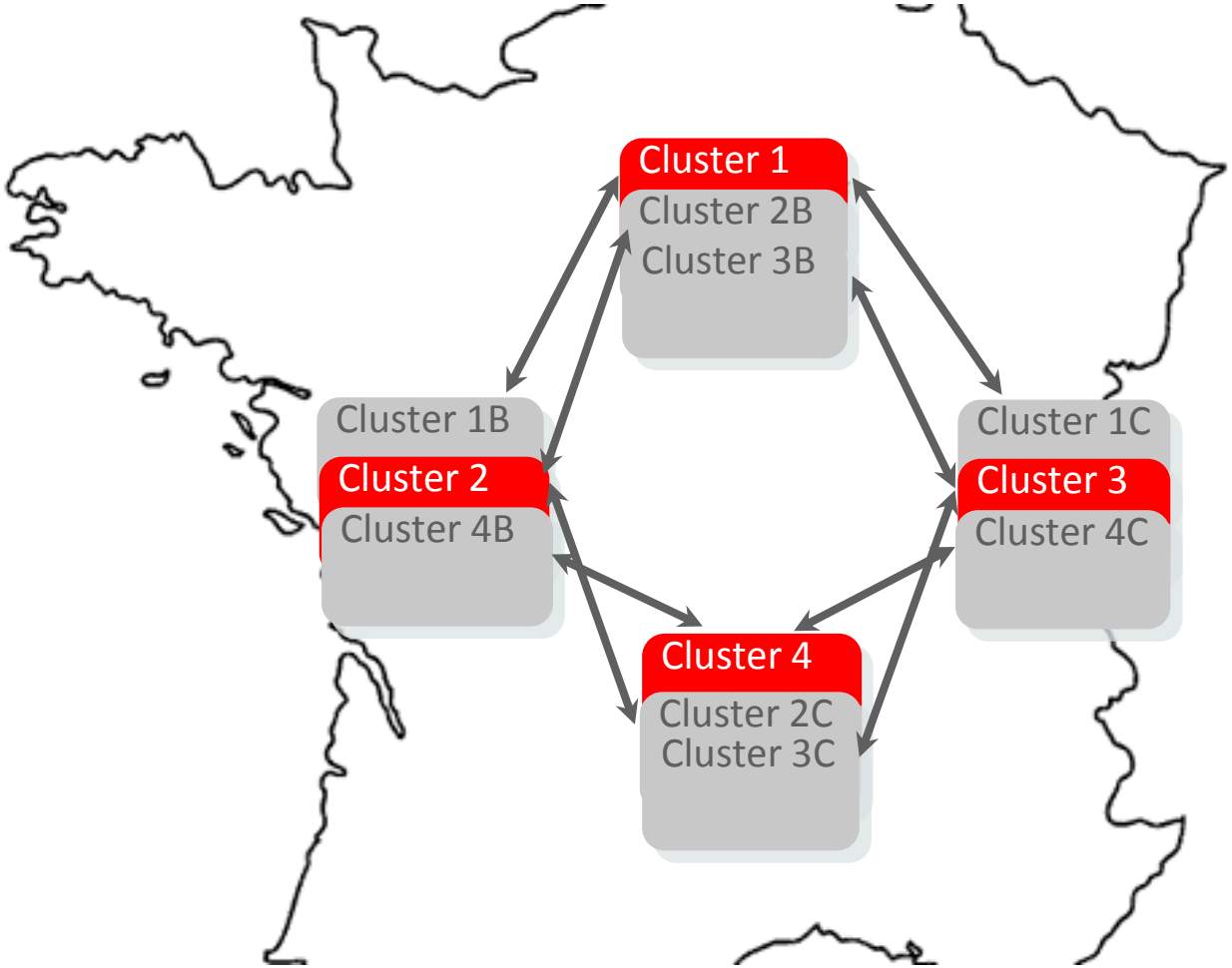
Architectures
Geo redundancy



- Mission critical high performance applications.
- Geographic redundancy between data centers or continents.
- Active/passive or Active/Active

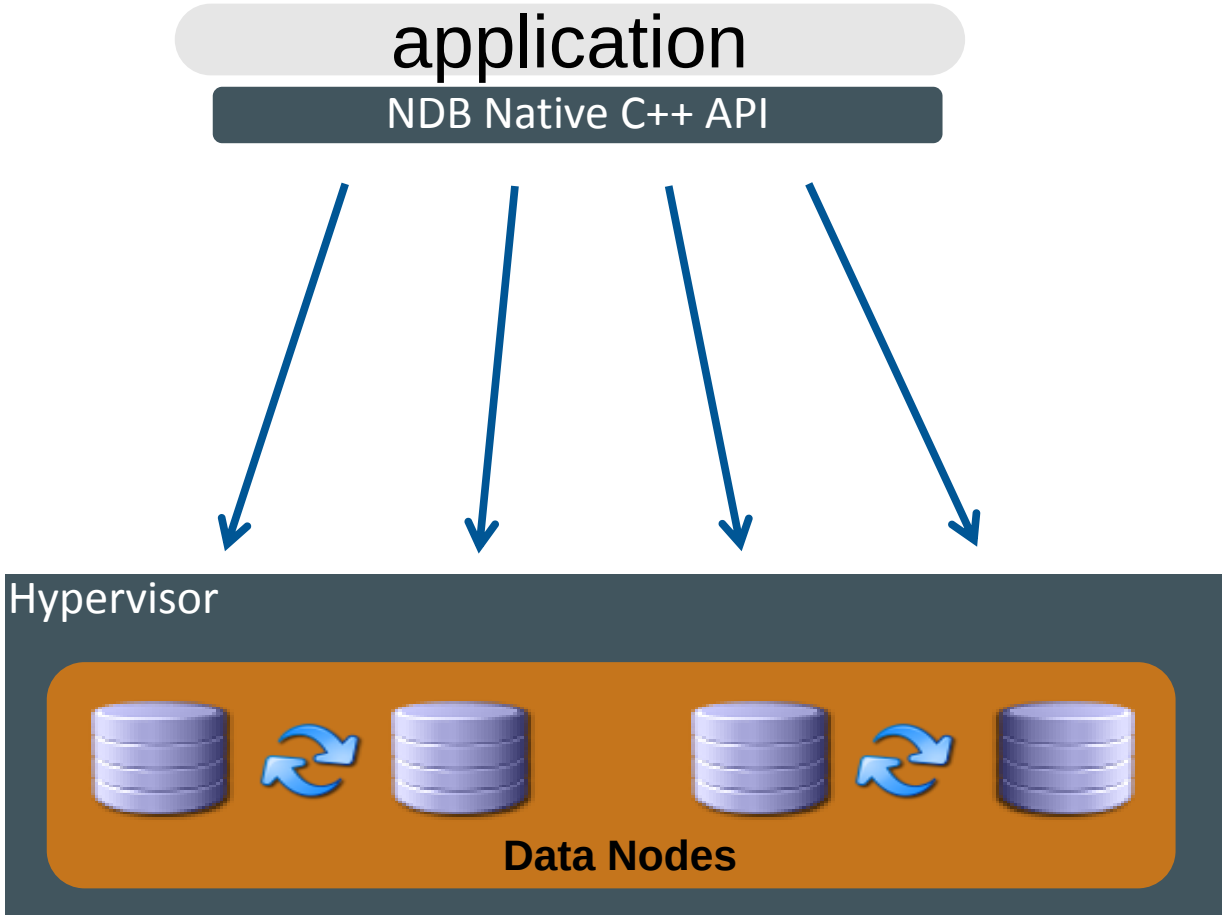
Architectures

Partition your data for low latency



- Partition the subscribers across multiple clusters, distributed by country/region to optimize low latency access.
- Each sub-cluster is replicated for High Availability.
- Active/passive or Active/Active.

Architectures
Virtual environments



- Supported as of MySQL Cluster 7.2
- Use dedicated resources for data nodes in same node groups.
- Be aware of SPOFS.
- Mostly smaller operators using virtual environments today.

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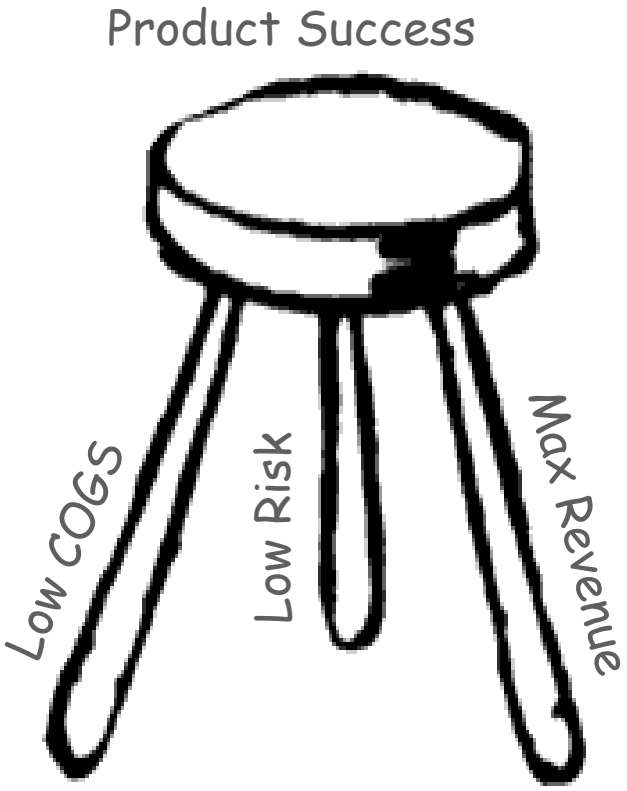
Choosing an Embedded Database

- How will the embedded database impact your products' success?
  - Revenue
    - Can the database meet my customers needs?
      - Current and future?
      - In new products and markets?
  - Cost
    - How will it affect my COGS?
  - Risk
    - Will it raise or lower my risk profile?



Growing Revenue

- Customer satisfaction
  - Proven in most demanding applications --
  - Demonstrated performance and scalability, on commodity hardware
  - 99.999% Availability
  - Real-time, low latency
- Expand to new markets
  - Create “Premium” product editions
  - Supports all leading commodity platforms

"With MySQL Cluster Carrier Grade Edition, we have successfully migrated to an ATCA-based Linux platform.

This has allowed us to standardize our platform to take advantage of an open IT blade solution and at the same time, keep the high levels of scalability and availability required by our customers, including Tier 1"

Hervé Saliou

Business Manager, Subscriber Database Management BU

http://mysql.com/customers/view/?id=566

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MySQL Cluster Helps Lower COGs

- Reduced License Costs
  - 90% less than Microsoft SQL Server
- Reduced Development and Testing costs
  - Simplified Bill of Materials: Integrated HA, caching & sharding
  - API flexibility
- Commodity hardware
  - Industry standard servers
  - No costly shared storage
- Reduced Ongoing Costs
  - Start small, scale on-line
  - Modify schema on-line, upgrade database & platform on-line

"The Pyro Group has selected the MySQL Cluster database to power their InRoam SDP (Service Delivery Platform).

We reduced TCO by being able to scale out on commodity server blades and eliminate costly shared storage."

Phani Naik

CTO

http://www.mysql.com/content/download/id/142/

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MySQL Cluster Helps Reduce Risk

- Reduced Product Risk
  - MySQL: #1 OSDB, Market Leader
- Reduced Vendor Risk
  - Oracle is #1 RDBMS,
  - Oracle is #1 in Embedded RDBMS
  - Proven commitment to MySQL
  - Commercial license and indemnification
  - 24x7 Global Support from the source

"We decided to use MySQL Cluster for our products.

We found that it had wide-spread, proven deployments -- and met our stringent reliability and scalability requirements for the communications industry"

Franco Serio

CTO

http://www.mysql.com/why-mysql/case-studies/mysql_cs_italtel.php

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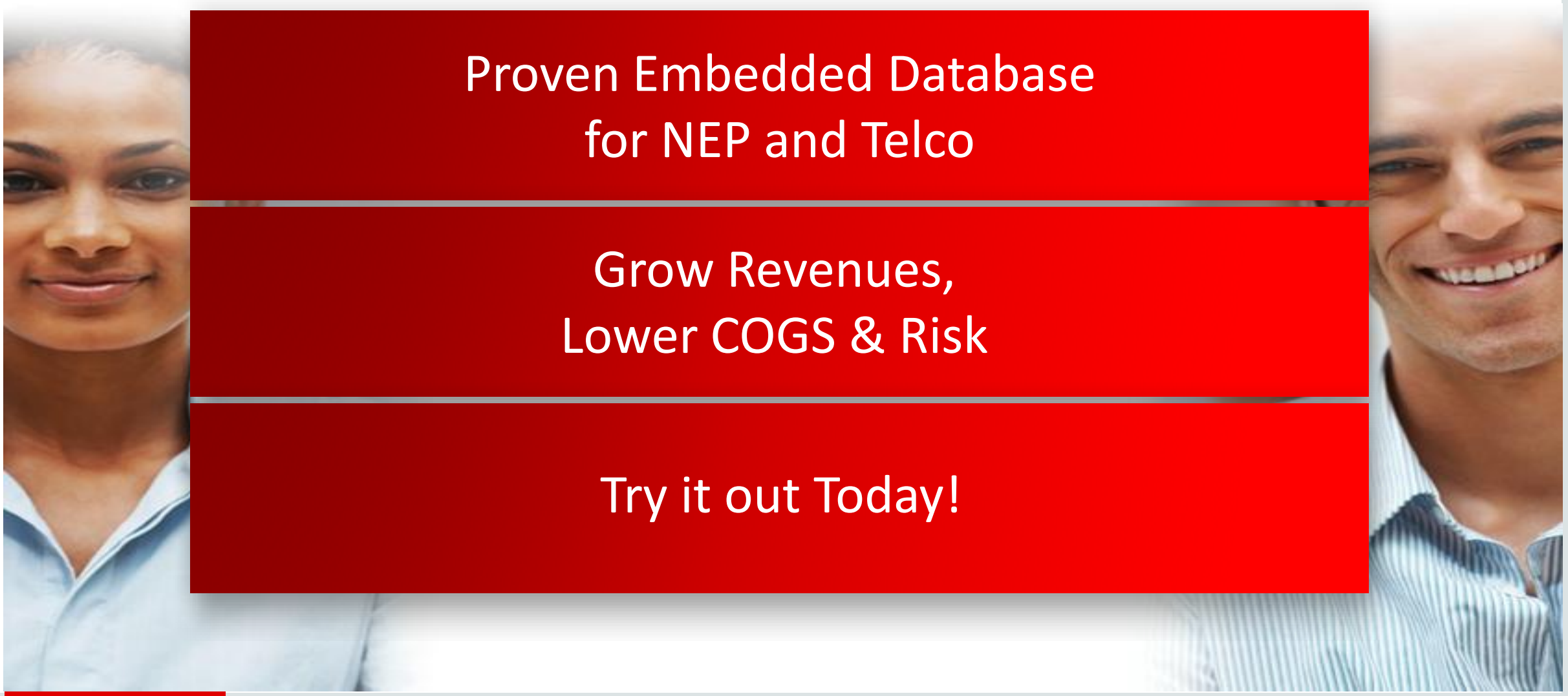

Proven Embedded Database
for NEP and Telco

Grow Revenues,
Lower COGS & Risk

Try it out Today!

Next Steps

Learn More

- www.mysql.com/cluster
- Authentic MySQL Curriculum: http://oracle.com/education/mysql

Try it Out

- dev.mysql.com/downloads/cluster/

Let us know what you think

- bugs.mysql.com
- forums.mysql.com/list.php?25

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