Oracle Tuxedo

Lower Total Cost of Ownership for Mission-
Critical Applications

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Oracle Tuxedo

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Introduction: Changing Needs for Mission Critical Applications

In today's challenging economy, companies are eager to minimize the cost of running business-critical applications. At the same time, these organizations need a robust platform to comply with business SLAs (service level agreements) and support future growth. In many industries such as telecommunications, public sector, travel, web commerce, and financial services there is a growing demand for low cost, scalable platforms for mission-critical applications that require guaranteed high-speed high-throughput processing, low latency, and extreme reliability.

Oracle Tuxedo is empowering companies around the world to transform their businesses and modernize their infrastructures. It's the world's number one open, distributed software platform for transaction processing on standards-based software and commodity hardware.

In almost every industry, IT budgets are shrinking yet expectations are growing, forcing CIOs to consider cost-effective, modern alternatives for mission critical applications. The financial services industry needs applications that can handle high volume credit card and debit card processing, and low latency transactions like stock trading. Telecommunications firms need high-throughput messaging applications to support mounting billing and call data traffic. For logistics service providers, tracking an ever-growing volume of packages and shipping details has become a tall order. For web applications, escalating and unpredictable traffic —in conjunction with rising customer expectations—are putting more pressure on existing infrastructure.

To meet these needs, market leaders are adopting low-cost, commodity hardware, standards-based software, and flexible service-oriented architectures (SOA), leveraging heterogeneous, distributed IT assets, as a foundation for mission critical applications. Oracle Tuxedo, a key offering within Oracle Fusion Middleware, and reliably supporting billions of transactions each day for myriads of mission critical applications, is the platform of choice for these industry leaders,

Yesterday's Answer

The traditional alternatives for developing high-end, mission critical applications are quickly becoming obsolete. Mainframe-based options are powerful but expensive and the resources you need to develop and administer these systems are becoming harder to find. As astute CIOs look to the future, they are motivated to standardize, reuse, go green, and cut costs. Meanwhile companies must be agile, remain competitive, and comply with business SLAs. In the face of these new requirements, proprietary mainframe solutions have become a burden.

Mainframes require users to purchase a large amount of capacity up-front and then pay for usage on a cost-per-MIPS basis—a surcharge on success. And while these systems adequately support a wide variety of languages and databases, over time these legacy applications often become difficult to modify and costly to maintain, especially given the scarcity of experts in older mainframe languages and development and administration tools.

According to *CIO Magazine,* 60 to 70 percent of IT budgets are spent on operations and maintenance. Too often, IT budgets are consumed by high maintenance costs simply to nurture hardware and software systems that don't meet current business needs. This maintenance spending can starve new development initiatives, making it difficult to compete with more nimble companies.

This archaic way of doing business necessitates a vicious cycle of spending. Many CIOs are insisting on more open and efficient infrastructures with mainframe-like performance and reliability. To stay competitive, these companies need systems that can easily accommodate changes in application requirements. For example, the application and underlying infrastructure should be able to grow as the business grows—and no sooner. Nobody wants to pay for excess capacity while waiting for growth to happen.

Today's Solution: Oracle Tuxedo

Oracle Tuxedo is today's solution of choice for mission critical applications on open, standards based software and low-cost hardware. Tuxedo has an established history as an industry-leading distributed transaction processing platform for mission critical applications and an application server for COBOL, C, and C++ applications. Tuxedo has proven to be a solid choice for re-hosting mainframe applications. With its SOA-enablement capabilities, Oracle Tuxedo extends the life of existing IT by making these assets fist-class citizens of modern SOA.

- Tuxedo provides mainframe-class performance, scalability, reliability and availability on an open, standards-based architecture and hence Tuxedo is the premier platform for re-hosting mainframe applications on low-cost commodity hardware.

- As a SOA-ready platform, Tuxedo applications and services become first-class citizens in modern SOA implementations.

- Using Tuxedo, applications running on homegrown and legacy infrastructures can be modernized.

- Tuxedo offers management tools that have state-of-the art monitoring, diagnosis, and administration capabilities for efficient IT operations.

Tuxedo customers don't have to sacrifice performance or reliability as they adopt open systems. When properly configured, a Tuxedo application delivers the same or higher level of throughput as a mainframe system, for a fraction of the cost. For example, Caisse Nationale Assurance Maladie des Travailleurs Salaries (CNAM-TS), which handles the national health service for 50 million members as part of France's Social Security system, reduced its IT costs from $65 million per year to $10 million per year, an 85 percent cost savings, after re-hosting its mainframe applications on Oracle Tuxedo.

Tuxedo's Rich Heritage

Oracle Tuxedo is a mature, well-developed solution that has evolved with the industry. In 1983, Tuxedo began as a project within the Bell Laboratories division of AT&T. The target applications for Tuxedo were UNIX-based operations support systems. In 1989, Tuxedo was transferred to the UNIX System Laboratories (USL) division of AT&T, and its client/server framework was offered as a commercial product. In 1993, Tuxedo was transferred to Novell, Inc., when Novell acquired USL. In 1996, BEA Systems, Inc., entered into an exclusive agreement with Novell to distribute and continue development of Tuxedo on a variety of computer platforms, including Windows and most UNIX systems. In 2008, Oracle Corporation acquired BEA Systems and positioned Tuxedo as a strategic offering within the Oracle Fusion Middleware portfolio.

With each transition, Tuxedo has become more robust and pervasive. Today Oracle Tuxedo runs thousands of mission critical applications worldwide – nearly everyone engages in day-to-day transactions that involve Tuxedo. Pick up the telephone, use a credit card or ATM, go to the bank to wire funds, ship a package, order airline tickets, purchase retail goods – chances are, Tuxedo is involved. It supports some of the largest applications in the world for all of these processes. In fact, Tuxedo has the highest market share – over seventy percent – of the open distributed transaction processing platforms.

Customer Usage Patterns and Supporting Tuxedo Capabilities

Although there are myriad examples of mission critical applications such as electronic funds transfer systems, airline reservation systems, trading exchanges, and telecom network systems that run on Oracle Tuxedo, three predominant usage patterns have emerged.

1. **Extreme transaction processing**

2. **Mainframe re-hosting and re-hosting of C/C++/Cobol applications developed on homegrown or legacy infrastructure**

3. **SOA-enabling IT assets from mainframe or legacy infrastructure**

Customer Usage Pattern #1: Extreme Transaction Processing

Extreme transaction processing (XTP) is an application style aimed at supporting design, development, deployment, management and maintenance of distributed transaction-processing applications that are characterized by exceptionally demanding performance, scalability, availability, security, manageability and dependability requirements.

Extreme High Performance

Tuxedo is well known for its ultra high performance for mission-critical applications. Its many strengths include the ability to process multiple transactions simultaneously on distributed nodes, optimize transactions across multiple databases, load-balance transaction execution, and process or defer transactions to allow distributed applications to work together asynchronously.

Five Nines Availability, Absolute Reliability

The world's leading companies trust mission-critical applications to Tuxedo because of its legendary reliability. Tuxedo ensures data integrity, even when accessed across several domains or databases. It supports XA two-phase commit protocol, ensuring that transaction commit and rollback are properly handled at each resource.

To ensure high availability, Oracle Tuxedo provides built-in clustering capabilities. Services and applications can run on top of a set of clustered Tuxedo nodes transparently. This environment has no single point of failure. Administrators can add or remove nodes without impacting the availability of end user services. Tuxedo can be combined with Oracle RAC and several third-party clustering solutions to further increase application availability.

For example, one of the top global inter-bank payments networks delivers billions of messages over its Tuxedo-based gateways, interconnecting 8,000 global banks and trillions of dollars in daily payment volume over a Tuxedo routing domain. This inter-bank payment network chose Tuxedo as a key part of its inter-bank payments infrastructure because it met their criteria for scalability, availability and throughput.

Extreme, Linear Scalability

Many Tuxedo customers have benefited from Tuxedo's linear scalability, supporting an invest-as-you-grow model. For example, one major UK bank anticipated that their payment processing application would need to scale to more than one million transactions per hour. They scaled the infrastructure in steps from a single Tuxedo node to five Tuxedo nodes, devising a TP infrastructure that could handle more than seven million transactions per hour—much more than the requirement. These results not only significantly exceeded the company's goals, but also demonstrated 96 percent scalability: a five node Tuxedo cluster delivered 4.8 times the performance of a single node.

Many CIOs are insisting on more scalable and efficient infrastructures. To stay competitive, these executives demand systems that can accommodate business changes without major changes to the architecture. In other words, the system should be able to grow as the business grows—and no sooner. Nobody wants to pay for excess capacity while waiting for growth to happen.

Oracle Tuxedo supports one of the world's largest logistics services company's package-tracking application and reliably handles information about more than five million packages per day in 211 countries. The logistics planning application tracks packages as they are scanned at multiple locations, from the point of origin to the final destination. Tuxedo processes more than 150 million transactions per day, equaling 20 billion dollars in annual revenue. Customers can track packages on the web from pickup to destination through this self-service, multi-channel application. Tuxedo delivers extreme high throughput, with high scalability, reliability and availability.

"Our technology has to be absolutely reliable. Tuxedo provides a solid foundation for the many applications that allow us to deliver on our promises to our customers." **-- Chief Technology Officer, major logistics company**

Tuxedo Strengths in Extreme Transaction Processing

- **The leader in open, distributed transaction processing with throughput performance in excess of 100,000 transactions per second and response performance in sub-milliseconds**

- **Provides "five nines" availability proven by many customer implementations**

- **Absolute reliability: Transactional Integrity with two-phase commit; Inherently reliable due to distributed architecture**

- **Built to scale from the ground up with linear horizontal and vertical scalability**

- **Mainframe-class management and end-to-end monitoring in distributed, heterogeneous environments**

- **Broad support for traditional (ATMI, CORBA, MQ) and SOA (WS, ESB) communications channels**

- **Can be deployed on open standards-based software and commodity hardware**

As the only credit and debt card clearing financial institution in China, China Union Pay uses Oracle Tuxedo to process about 50 billion credit card and debit card transactions per year. This financial service provider requires less than 1 second response time for all transactions.

China Union Pay was chartered by the People's Bank of China (the central bank of China) to unify inter-banking processes and establish regulations for Chinese bankcard transactions. That meant integrating businesses with different technologies and system platforms, and deploying a new high performance IT infrastructure.

Decision-makers at China Union Pay had to decide whether to deploy an open system or a mainframe structure for its new payments architecture. Some advisors claimed that only mainframes would be able to satisfy the high volume of transactions and operational reliability that the service provider required. However, the senior-level technical management team believed that an open system would help China Union Pay realize its business development goals. After conducting a proof of concept, they found that Tuxedo was exactly what they were looking for.

China Union Pay chose Tuxedo for the following reasons:

- High performance transaction processing and guaranteed quality of service

- Extreme linear scalability and reliability – Tuxedo enables the most pressing mission-critical applications to be scaled and expanded with no risk of downtime or throughput errors

- Rich management capabilities – Tuxedo's graphical, web-based administrative console makes it easy to diagnose and resolve issues

After going live, Tuxedo reliably processed more than 13,000 transactions per second without a single failure. It achieved the required transaction processing time of less than one second for 100% of the transactions, all of which were correctly processed.

"Tuxedo met our requirements and surpassed all of our expectations, with a peak transaction processing volume of 13,000 TPS. Tuxedo's ease of manageability also shined: we loaded more than 100 software patches while the system was online, without experiencing any down time."

– IT Architect, China Union Pay

Customer Usage Pattern #2: Application Modernization

The exorbitant costs and inherent rigidity of mainframe systems have prompted many companies to migrate applications to more flexible, low-cost open systems environments. Many of these companies depend on millions of lines of legacy code. With seventy percent of the world's data residing on mainframes, modernization and re-hosting technologies are tremendously important. Oracle Tuxedo is the key to unlocking this data. Its integration with Oracle Fusion Middleware and broad support for industry standards provides a platform for moving legacy systems into low cost, open-systems environments age.

Tuxedo is not only a natural platform for re-hosting applications that have been running on mainframes in CICS/IMS environments, but also for hosting C/C++/Cobol applications running on homegrown legacy infrastructures. These applications can be migrated to Tuxedo with minimal changes to the code, considerably reducing the risk associated with these projects. Developers don't have to re-architect applications or recode business logic. Compatibility with CICS and IMS transaction monitors simplifies migration projects and enables automated conversion, improving time to market and predictability while lowering risk. Applications can run virtually unchanged on open systems, dramatically reducing maintenance costs.

Oracle has developed mature capabilities and methodologies to re-host mainframe applications to Tuxedo. For example a 3270 screen can be transformed into a JSP/HTML-based web page hosted on an application server like WebLogic server. Data in VSAM, DB2, or IMS/DB is migrated to Oracle Application transaction services in CICS are migrated to Tuxedo application services. Oracle has tools for each phase of the migration, which helps with automation. More than 150 organizations have taken advantage of this approach and have migrated thousands of applications to Tuxedo.

Application re-hosting is not an 'all or nothing' proposal. Most organizations begin by re-hosting a few applications on Tuxedo. Tuxedo's mainframe adapters help these re-hosted applications to talk to remaining applications on mainframes. Mainframe adapters provide bi-directional connectivity and simplify application rehosting.

With SOA enablement, once these applications are hosted on SOA-ready Tuxedo, it becomes very easy to access them from other applications, such as from Java application servers. These IT assets can be accessed with native web services connectivity or through a service bus. In this way, Tuxedo protects long-term investments by "future-proofing" applications.

Astute organizations are migrating their legacy applications to Tuxedo for the following reasons:

- **Tuxedo provides mission critical performance, reliability, availability, and scalability (comparable to high-end mainframe systems).**

- **Tuxedo preserves customer investments in the business logic contained in legacy COBOL and C/C++ code by re-hosting these assets.**

- **Tuxedo includes tools and methodologies to automate the re-hosting process, reducing risk, lowering costs and significantly improving time to market**

- **As part of Oracle Fusion Middleware, Tuxedo brings legacy applications into an open, extensible, and SOA-ready application platform.**

- **Tuxedo has been proven in more than 150 application re-hosting projects**

Caisse Nationale d'Assurance Maladie

Consider Caisse Nationale Assurance Maladie des Travailleurs Salaries (CNAM-TS), which handles the National Health Service for 50 million members as part of France's Social Security system. This agency wanted to reduce costs of mainframe applications that consumed 12,000 MIPS (million instructions per second) and improve the organization's responsiveness to frequent changes in government regulations.

Building on a Tuxedo foundation, CNAM-TS migrated thousands of COBOL programs from BULL and IBM mainframe environments to Oracle Tuxedo. The migration to Tuxedo in turn enabled them to develop new services using WebLogic Server and Oracle SOA Suite products—

a job that was simplified by the strong integration among products within the Oracle Fusion Middleware family.

These applications now support 80,000 end users, store 270 terabytes of data and 1.1 billion claims per year totaling about €110 billion. They also coordinate the activity of thousands of online and batch programs.

This modernization project, based on Oracle Database and Tuxedo, was completed without missing a single claim reimbursement. According to the CIO at CNAM-TS, the transaction processing costs are 85 percent less for the Tuxedo platform than they were for the mainframe platform. Equally valuable was the ability to immediately start extending the applications using a component-based development methodology and Java-based tools without having to re-write their existing COBOL components to Java.

"The Oracle Tuxedo architecture is CNAM's first concrete step in component-based development. Functions are now re-usable. The development and maintenance workload is reduced. Improved responsiveness and IT performance resulted in faster implementation of new features.

— **Mme. Maryvonne Cronier, CIO of CNAM-TS**

Customer Usage Pattern #3: SOA Enablement

In most organizations, applications run within monolithic stacks of software products. Individual applications handle specific functionality known as services. One set of services may be built on Tuxedo, while another set is built using another Oracle product or a 3rd party product. So how do these sets of services communicate with each other? That's where SOA enablement comes into play.

SOA allows applications to exchange data as they participate in business processes. SOA separates functions into distinct services that are accessible over a network so developers can combine and reuse them as they produce business applications. These services communicate with each other by passing data from one service to another, or by coordinating an activity between two or more services. As the SOA-enablement product option for Oracle Tuxedo, Oracle SALT provides a standards-based, bi-directional web-services gateway. Oracle SALT's configuration-driven approach makes it easy to expose Tuxedo services as Web services or to call an external Web service from within a Tuxedo application. Oracle SALT also includes, a service component architecture (SCA) container, which simplifies new application development using a standards-based programming model and assembles service components into composite applications. Utilizing these standards-based programming models and tools reduces time to market. Developers can focus on business logic rather than worrying about network protocols and

communication among components. Using a component assembly model to create composite applications accelerates the development process.

Another key requirement for the SOA platform is to provide application access through multiple channels. Today's organizations must be able to interact with customers and trading partners via a growing number of delivery channels and end-user devices. For example, users might wish to interface with a trading application via web browsers, hand-held devices, and other methods. Tuxedo fulfills this need by supporting a broad range communication channels. It provides mainframe adapters that connect IBM and Unisys mainframes as well as adapters for incorporating messaging products such as OracleMessageQ. In addition, Tuxedo applications can be accessed from Java, .NET and CORBA/IIOP environments via Tuxedo client APIs as well as via Web services and SOAP/http protocols. Many Tuxedo applications use Oracle Service Bus (OSB) – a core component in the Oracle SOA Suite – as their primary backbone for SOA messaging. With its tight, out-of-the-box integration with Tuxedo, OSB is able to route messages to Tuxedo as well as receive messages from Tuxedo, all within a global transaction context.

Kadaster

For example, when the Dutch land registry office needed to reduce the cost and increase the flexibility of applications that register, record and convey property titles, they envisioned a mission-critical SOA platform based on a few core requirements:

- The SOA platform should provide services-driven application development

- The applications should be highly available and scalable, with no single point of failure

- They should make it easy to reuse services from other environments

IT pros at the land registry office decided to use Oracle Tuxedo because it is built on SOA principles. Everything in Tuxedo is a service. The Tuxedo infrastructure itself is a collection of services. For example, Tuxedo provides transaction management services, event pub/sub services, security services, queuing and messaging services, management services and more. Each application can utilize the services that are applicable to the situation.

Developers at the land registry office can now write service components using their programming model of choice in C, C++, or COBOL. Whether they choose the ATMI, CORBA or SCA programming model, the business logic is contained in a service. This intrinsic service-oriented architecture is well suited to creating composite applications for SOA environments, which has enabled them to leverage and reuse thousands of existing services across ten domains in a SAP-driven workflow. Their first Tuxedo Web services were published in just two hours. Now about 1,000 legacy assets are available as Tuxedo services across 10 Tuxedo domains.

"We were up and running very quickly; all in all it took us less than two hours to get SOAP services going using SALT"

- Mariska Hoogenboom, Software Engineer, Kadaster (Dutch Land Registry Office)

Tuxedo's SOA strengths include the following:

- **Inherent services-based application style**

- **Native Web services gateway (Oracle SALT)**

- **SCA programming model for new service development**

- **SCA assembly model for creating composite applications in heterogeneous environments**

- **Integration and interoperability with Oracle SOA Suite products such as Oracle Service Bus and Oracle BPEL/PM**

Tuxedo Management Capabilities

Oracle Tuxedo System and Applications Monitor (TSAM) provides end-to-end transaction and services monitoring. It allows users to set and monitor response time service-level agreements (SLAs), investigate the performance and behavior of live application services, and improve capacity planning through utilization metrics for all components within the Oracle Tuxedo infrastructure. TSAM monitors the major performance-sensitive areas of an Oracle Tuxedo enterprise computing environment. It can be used to monitor real-time performance bottlenecks and business data fluctuations, determine service models, and provide notification when predefined thresholds are violated.

The Tuxedo management tools enable application administrators to define the hardware, software, and networking resources that make up each Tuxedo application. For example, application designers can specify where servers and services should run, as well as where they should be migrated in the event of a failure. They can also assign various characteristics to the application's servers such as scheduling information, process recovery criteria, and time-out periods.

In addition to Oracle TSAM, Tuxedo offers a comprehensive command-line interface, a programmatic interface, and an SNMP agent for integrating Oracle Tuxedo as a managed application within a larger administrative environment.

Benefits of Oracle TSAM

- Improves performance of Oracle Tuxedo applications and application environments

- Rapidly identifies and resolves bottlenecks and system issues to minimize downtime
- Increases SLA compliance
- Integrates with existing system management applications to lower total cost of ownership
- Tracks progress through real time and historical analysis to optimize IT investments

Mainframe-caliber system monitoring with Oracle TSAM:

- *Detailed, end-to-end monitoring*—Set and monitor response-time service level agreements (SLAs) and investigate the performance and behavior of live application services

- *Improved capacity planning*—Monitor comprehensive utilization metrics for all components of the Oracle Tuxedo infrastructure

  Optimized resources—Use comprehensive metrics to maximize IT hardware in complex, mission-critical application environments

Most system administrators find the TSAM tools to be comparable to the tools used to monitor mainframe applications. However, these administrators have choices with Tuxedo. If they are accustomed to a particular set of systems management and monitoring tools, such as BMC or HP OpenView, they can use those tools to monitor and manage Tuxedo applications. In a mainframe modernization project, users could leverage their current monitoring tools as a transition strategy. If a company has these tools in house, they can continue to use them to monitor and manage Tuxedo applications, or make a gradual transition to TSAM.

Oracle Tuxedo – The Classic Platform for Application Grid

Application grid is Oracle's vision for foundation middleware – a brand new architectural approach. The primary principles of application grid are based on the notion of grid computing – pooling and dynamic provisioning of hardware and computing resources for business applications. The application grid approach results in extreme and guaranteed performance, while driving down operational costs with improved manageability, hardware usage efficiency, the ability to leverage commodity hardware, as well as the ability to scale up and down as needed. An application grid helps customers lower operational costs and outperform competitors through superior quality of service.

Oracle Tuxedo is the classic application grid platform offering. With extreme high performance, reliability, scalability, and state-of-the-art management—all on an open, standards-based platform that runs on distributed, commodity hardware, Tuxedo is the default application grid platform for C/C++/Cobol applications. Tuxedo is also certified with Oracle Clusterware, which improves the availability of Oracle Tuxedo and RAC applications. Oracle RAC supports the deployment of a single database across a cluster of servers, providing superior fault tolerance, performance and scalability.

Oracle Tuxedo leverages Oracle Application Grid to address modern transaction processing needs:

- **Efficiency – a low-cost alternative to mainframe transaction processing systems**

- **Performance – delivering more than 100,000 transactions per second**

- **Scalability – to meet the escalating needs of growing organizations Responsiveness – less than one-second response time even where massive workloads are involved**

- **High availability – based on the stability of grid computing architecture**

- **Manageability – mainframe-class, end-to-end transaction and services monitoring**

- **. . . All on standards-based software and commodity hardware**

Conclusion

Oracle Tuxedo is the industry's #1 distributed transaction processing platform. It provides mainframe-class reliability, performance, and scalability, all on open, distributed systems for applications written in C, C++, and COBOL. Tuxedo is the premier platform for building mission-critical applications and re-hosting mainframe applications on open systems and commodity-based grid infrastructure. Oracle Tuxedo is cost-effective, reliable, and extremely scalable (up to hundreds of thousands of transactions per second). Finally, Tuxedo protects mainframe investments through reuse of existing IT assets in modern service-oriented architecture while significantly reducing operational costs.

As a member of the hot-pluggable Oracle Middleware family, Tuxedo embraces open standards for maximum flexibility and interoperability while delivering unmatched performance and scalability. As companies seek to lower their total cost of ownership, adopt more standards-oriented platforms, and leverage existing IT assets while not compromising on the mission critical nature of their business applications, Oracle Tuxedo emerges as the platform of choice.

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