

What's New in TimesTen 18.1

An overview of all new features in TimesTen 18.1 compared to TimesTen 11.2.2

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This document provides an overview of features and enhancements included in TimesTen 18.1. It is intended solely to help you assess the business benefits of upgrading to TimesTen 18.1 and planning for the implementation and upgrade of the product features described.

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Table of Contents

Overview of the TimesTen Releases	6
Version Numbering Scheme	6
Installation and Packaging	6
Packaging JDBC Driver in a WAR file	7
TimesTen Scaleout	7
TimesTen Kubernetes Operator	8
Configuration and Management	8
IPV6 Support	8
Maximum Number of Connections	8
Automatically Use Large/Huge Pages	8
Opening and Closing a Database	8
Forced Disconnect of User Connections	9
Page Touching	9
TimesTen Database Engine and SQL	9
Default Range Index Type	9
Number of Columns in an Index	9
Optimizer Hints	9
SQL Functions	9
Connection Attributes	9
PL/SQL	10
API Support	10
Java 8 / JDBC 4.2 support	10
ODBC 3.51	10
Python and Node.js	10
Driver Manager Library	10
TTCLASSES	10
Diagnostics	10
Critical Events Diagnostics	10
ttStats Enhancements	10
The IncludeInCore Connection Attribute	10
The ttCkptHistory Built-in Procedure	11
The ttDataStoreStatus Built-in Procedure	11
SYS.V\$SESSION View	11
SYS.V\$REPSTATS View	11
Utilities	11
Improvements to ttBulkCp	11
Improvements to ttMigrate	11

Improvements to ttLoadFromOracle	11
Replication	11
Replication with no-commit-ordering	11
Cache	12
Asynchronous Oracle Active Data Guard	12
Continuous Autorefresh	12
Disable Full autorefresh for Incremental Refresh Cache Groups	12
Reduced Lock Contention	12
Monitoring Fragmentation of the Change Log Tables on Oracle	12
Cache Connection Pool	12
Client/Server	12
Generic Automatic Client Failover	12
Row Fetch Size	12
Security	13
Encrypted Network Communication	13
Encrypted Volumes	13
Password Profiles	13
Platforms and Certifications	13
Certifications	13
Supported Platforms	13
Change in Defaults	14
Other	14
Deprecated Features	15
Deprecated Database SQL and Engine Functionality	15
Deprecated Database Built-ins	15
Deprecated Connection Attribute Settings	15
Deprecated Utilities and Utility Options	15
Deprecated Cache and Replication Functionality	15
Other Deprecated Functionality	15
Removed Functionality	15
Appendix A – Changes in TimesTen Instance and Configuration	16
Directories	16
TimesTen Daemon Options File	16
TimesTen daemon Configuration Parameters	16

List of figures and tables

Table 1. Overview of the various TimesTen 18.1 releases	6
Table 2. Changes in version numbering scheme	6
Figure 1. Overview of TimesTen Scaleout architecture	8
Table 3. TimesTen Instance directories and their purpose	16
Table 4. Comparing TimesTen 18.1 and TimesTen 11.2.2 daemon configuration file	16
Table 5. Comparing TimesTen 18.1 and TimesTen 11.2.2 daemon configuration parameters	16

Overview of the TimesTen Releases

This document lists all new features that are available in TimesTen 18.1 when compared to TimesTen 11.2.2. The comparison is based on the latest available patch releases for both TimesTen releases. As shown in Table 1, the latest patch TimesTen 18.1 release is 18.1.4.42.0. For TimesTen 11.2.2, it is TimesTen 11.2.28.63.

Throughout the lifecycle of a TimesTen release, patch sets and patch releases are made available. Both patch set and patch releases contain bug fixes but a patch set release typically also contains several new large product features. If a patch release does contain new features, then these are typically small product enhancements.

Table 1. Overview of the various TimesTen 18.1 releases

Release	Type	Release date	Supported until	Most recent patch (June 2024)
TimesTen 18.1.1	Initial release	May 2018	Feb 2020	18.1.1.8.0
TimesTen 18.1.2	Patch set	Feb 2019	Dec 2020	18.1.2.5.0
TimesTen 18.1.3	Patch set	Dec 2019	Aug 2021	18.1.3.8.0
TimesTen 18.1.4	Patch set	Aug 2020	May 2026	18.1.4.42.0

In addition to the information in this document, the release notes for a patch release always include a list of any new functionality introduced in that patch release. And each book in the TimesTen documentation always contains a chapter called ‘What’s New’, listing any new functionality present at the time the document was published.

Version Numbering Scheme

For TimesTen 18.1, the versioning numbering scheme has changed. Instead of using three sets of digits for the product’s major version (that is, Release family), Oracle now uses only two sets of digits. As a result, the patch set and patch versioning numbering has changed. The changes are shown in Table 2. The fifth set of digits is reserved for future use.

Table 2. Changes in version numbering scheme

Type	Old numbering scheme	New numbering scheme
Release family	11.2.2	18.1
Patch set	11.2.2.8.0	18.1.4.1.0
Patch	11.2.2.8.x	18.1.4.x.0

All TimesTen 18.1 releases (patch sets and patch sets) are binary compatible, meaning a database created with one TimesTen 18.1 release can be used with binaries from another TimesTen 18.1 release

All releases (patch sets and patch sets) are self-contained, i.e. a complete TimesTen release.

Installation and Packaging

The TimesTen 18.1 installation has been split into an *installation* and an *instance*.

- Installation
 - Set of directories and files created when you unzip the TimesTen distribution
 - Owned by the user who unzips it
 - Read-only, must not be changed.
 - Can be shared by one or more TimesTen instances
- Instance
 - Collection of configuration files and a set of TimesTen daemon processes
 - Created from the Installation using `ttInstanceCreate`
 - The instance administrator user is the same as the owner of the installation.
 - Instances are 'linked' to the installation
 - An instance is identified by its location (`TIMESTEN_HOME`) and daemon port (6624)
 - New tools to manage instances: `ttInstanceCreate`, `ttInstanceModify` and `ttInstanceDelete`

Additional changes related to directories, files and configuration parameters of the TimesTen 18.1 instance are described in Appendix A.

Packaging JDBC Driver in a WAR file

A new utility, `ttMkLiteClient`, is available to package the TimesTen JDBC Client in such a way that it can be deployed as part of the WAR file for a web application. This package contains all required TimesTen files, including a single TimesTen shared library containing all necessary code. A single shared library is required to overcome some application server restrictions on loading multiple shared libraries.

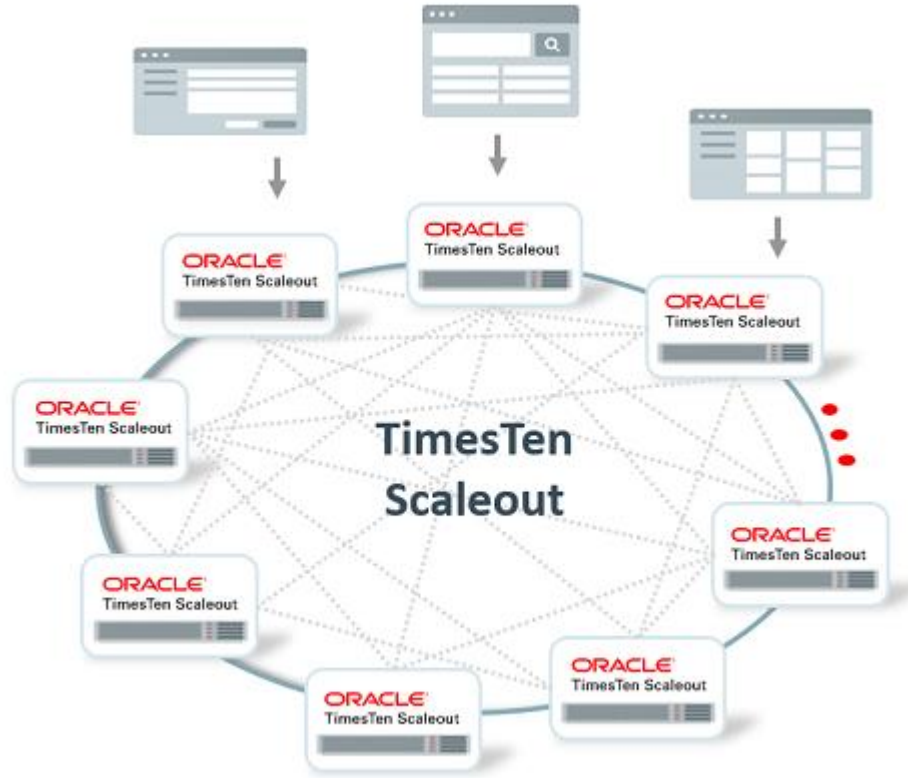
TimesTen Scaleout

A new deployment option called TimesTen Scaleout has been added.

- TimesTen Scaleout is a grid of interconnected hosts running TimesTen Scaleout instances that work together to provide fast access, fault tolerance, and high availability for in-memory data.
- A grid contains one or more databases and each database is distributed across all instances of the grid.
- TimesTen Scaleout delivers these features by distributing the data for each in-memory database in the grid across multiple hosts.

A high-level overview of the TimesTen Scaleout architecture is shown in Figure 1. For more information on TimesTen Scaleout, refer to the [Oracle TimesTen In-Memory Database Scaleout Overview](#) document.

Figure 1. Overview of TimesTen Scaleout architecture



TimesTen Kubernetes Operator

The TimesTen Kubernetes Operator provides the ability for you to deploy both active standby pairs of TimesTen Classic databases as well as TimesTen Scaleout grids and their associated databases in your Kubernetes cluster.

The Operator monitors the TimesTenClassic and TimesTenScaleout objects and properly handles both. It deploys, manages, and monitors active standby pairs of TimesTen Classic database. This same Operator deploys TimesTen Scaleout grids and their associated databases.

Configuration and Management

IPV6 Support

Support for IPV6 is enabled by default.

Maximum Number of Connections

The maximum number of user connections to a database has been increased from 2,000 to 32,000.

Automatically Use Large/Huge Pages

It is no longer required to configure TimesTen to use UNIX large pages or Linux huge pages for large databases. If large/huge pages are available, TimesTen automatically uses them.

Opening and Closing a Database

Instance administrators may open and close a database to direct whether users may connect to that database. For an application to be able to connect to a database, the database needs to be open to accept user connections.

Forced Disconnect of User Connections

Instance administrators may gracefully shut down the database by disconnecting applications in an orderly fashion. The new forced disconnect option asynchronously disconnects all connected applications from the database, including those that are idle or unresponsive.

Page Touching

When a database is first loaded into memory, TimesTen forces all the shared memory pages to be mapped, thus ensuring that at that moment there is sufficient free physical memory to accommodate the memory size allocated for the database. If the database uses `MemoryLock=4`, or is using huge pages, that physical memory is then permanently 'wired' and guaranteed to be available at any time.

TimesTen Database Engine and SQL

Default Range Index Type

By default, range index are now created as B+trees indexes.

Number of Columns in an Index

The maximum number of columns in an index has been increased to 32.

Optimizer Hints

TimesTen now supports connection-level optimizer hints. The following optimizer hint has been added:

`TT_DMLCommitOnSuccess` to enable or disable a commit operation as part of DML processing.

SQL Functions

The following SQL functions have been added:

- **Trigonometric functions:** `ACOS()`, `ASIN()`, `ATAN()`, `ATAN2()`, `COS()`, `COSH()`, `EXP()`, `LN()`, `LOG()`, `SIN()`, `SINH()`, `TAN()`, `TANH()`.
- `VSIZE()`: A scalar function that returns the number of bytes in the internal representation of an expression.
- `TO_TIMESSTAMP()`: A datetime function that converts a `CHAR` or `VARCHAR2` data type to a value of `TIMESTAMP` data type.

The `SYS_CONTEXT()` function now supports the parameters `CURRENT_SCHEMA`, `ACTION`, `CLIENT_INFO`, and `MODULE`.

The `COUNT()` function now returns a `TT_BIGINT` value.

Connection Attributes

The following connection attributes have been added:

- `SQLQueryTimeoutMsec` specifies the time limit in milliseconds within which the database should execute SQL statements.
- `TransactionTimeout` specifies the time limit for user transactions to complete.
- `PLSQL_SESSION_CACHED_CURSORS` specifies the number of session cursors to cache.

PL/SQL

The `PLSQL_SESSION_CACHED_CURSORS` connection attribute specifies the number of session cursors to cache. This setting can also be changed using the `ALTER SESSION` statement.

`PLSQL_OPEN_CURSORS` is a `ttDBConfig` parameter that specifies the maximum number of PL/SQL cursors that can be open in a session at one time.

The `CREATE FUNCTION`, `CREATE PROCEDURE`, and `CREATE PACKAGE` statements now support the `ACCESSIBLE BY` clause.

API Support

Java 8 / JDBC 4.2 support

The TimesTen JDBC driver implements the JDBC 4.2 API (Java 8).

ODBC 3.51

TimesTen now includes support for ODBC 3.51 based applications, in addition to ODBC 2.0 based applications.

Python and Node.js

Support for Python and Node.js based applications is available through the Oracle Database Programming Interface for C (ODPI-C).

Driver Manager Library

A new library, `libttdrvMgr.so`, is included in the release. This library allows an ODBC based application to create both direct-linked and client-server connections to a TimesTen database. Both ODBC 2.0 and ODBC 3.51 are supported.

TTCLASSES

Applications that implement error checking must use `{try/catch}` blocks. The use of `TTStatus&` method parameters is no longer supported.

A new library, `libttclassesTTDM.so`, is included in the release. This library is linked against TimesTen driver manager, and allows both direct-linked and client-server connections from the same TTCLASSES application.

The source code for TTCLASSES is no longer included.

Diagnostics

Critical Events Diagnostics

When critical events (such as invalidations) occur, TimesTen collects the daemon log entries at the moment of the critical event to help when diagnosing critical failures.

ttStats Enhancements

The `ttStats` utility has been enhanced to include many more database statistics.

The IncludeInCore Connection Attribute

The `IncludeInCore` attribute enable the application to control whether TimesTen shared memory should be included in application core dumps, and which portions of that memory should be included.

The ttCkptHistory Built-in Procedure

The `ttCkptHistory()` built-in procedure returns new columns: `reason`, `logsPurged`, `bookmarkName`, and `additional_details`. These columns provide information about the number of actual transaction log files purged by a checkpoint and the reason for a transaction log hold.

The ttDataStoreStatus Built-in Procedure

The `ttDataStoreStatus()` built-in procedure did not separately classify client/server connections. This release includes a flag to indicate whether a connection is direct connect or a client/server connection.

SYS.V\$SESSION View

The `SYS.V$SESSION` view contains data for each current connection in TimesTen Classic.

SYS.V\$REPSTATS View

The `v$repstats` view includes information to track the read position in the transaction log of the transmitter thread for replication.

Utilities

Improvements to ttBulkCp

The `ttbulkCp` utility now supports the `-directLoad` command-line option to perform faster copies from very large ASCII files to a TimesTen table.

Improvements to ttMigrate

The `ttMigrate` utility now supports very large tables with more than 4 billion rows.

Improvements to ttLoadFromOracle

The following new functionality has been added to the `ttLoadFromOracle` utility:

- Improved error handling
 - Error messages now include the column name and value.
 - Users can specify a threshold for the number of errors to tolerate.
 - Users can specify to optionally ignore uniqueness violations.
- Ability to restart load based on Oracle SCN.
- Loading data from an Oracle RDBMS that uses UTF8 character set.

In addition, numerous performance improvements have been made.

Replication

Replication with no-commit-ordering

Certain workloads may benefit from replication with `no-commit-ordering`. This feature allows for parallel replication over multiple threads that automatically enforces transactional dependencies, but does not enforce transactions committed in the same order on the subscriber database as on the active database.

Cache

Asynchronous Oracle Active Data Guard

TimesTen now supports caching tables from an Oracle Active Data Guard with the asynchronous redo transport mode into read-only cache groups.

Continuous Autorefresh

Cache groups can now be auto-refreshed continuously. In this case, the next autorefresh cycle is scheduled immediately after the last autorefresh cycle has ended.

Disable Full autorefresh for Incremental Refresh Cache Groups

Some applications choose incremental autorefresh instead of full autorefresh mode for performance reasons. However, a full autorefresh could still be requested in some situations. If this is undesired, applications can now set the `DisableFullAutorefresh` cache configuration parameter to 1 to disallow any full autorefresh requests for all cache groups defined with incremental autorefresh.

Reduced Lock Contention

To reduce lock contention between autorefresh and dynamic load operations, two new parameters have been introduced.

1. The cache configuration parameter `CacheCommitDurable`.
2. The database configuration parameter `DynamicLoadReduceContention`.

Monitoring Fragmentation of the Change Log Tables on Oracle

When using Oracle TimesTen In-Memory Database Cache, you can now set a time interval for calculating the fragmentation percentage of the change log tables on the Oracle database. Use the `ttCacheConfig` built-in procedure providing the `AutorefreshLogMonitorInterval` as the value parameter.

Cache Connection Pool

Applications can have multiple dynamic load requests to the Oracle database, which could result in too many open connections to the back-end Oracle database. However, for client/server applications with multiple connections per server, you can configure TimesTen to use the cache connection pool for all connections to the Oracle database. The cache connection pool can only be utilized by an application using a client/server connection as the pooled connections are shared across all client/server connections.

Client/Server

Generic Automatic Client Failover

Automatic client failover no longer is limited to databases that are part of an active standby pair nor is it limited to only two databases. The client can automatically fail over from one database to another using generic automatic client failover.

Row Fetch Size

New options to configure the row fetch size for SELECT statements.

Security

Encrypted Network Communication

Network traffic can now be encrypted using Transport Layer Security (TLS). This applies to:

- Network traffic between replication agents.
- Client/server connections.

New utility `ttCreateCerts` was added to create wallets and certificates required to configure the TLS encrypted connections.

The DDL statements `CREATE USER/ALTER USER DDL` and calls to `ttCacheUidPwdSet()` built-in are now allowed over an encrypted C/S connection.

Encrypted Volumes

Support for encrypted volumes in Oracle Automatic storage management Cluster File System (ACFS) 19.6.

Password Profiles

Password management functionality by using PROFILES. The PROFILE functionality is similar to the PROFILE support in the Oracle RDBMS and supports the following features.

- Account locking
- Password aging and expiry
- Password history
- Password complexity verification

Platforms and Certifications

Certifications

- Oracle JDK 8, 9, 10, 11, 12, 13, 14, 17, and 21
- OpenJDK 8, 9, 10, 11, 17, 21
- Clusterware 18.1, 19c
- Oracle Database 19, 21c
- Kubernetes 1.25, 1.26, 1.27, 1.28 and 1.29
- ODP.Net Framework 4.0 certification with Visual Studio 2017
- SQL Developer 20.2+

Supported Platforms

- Linux X64: Oracle Linux 6, 7, 8.2, 9.2, Redhat Enterprise 6, 7, 8.2, 9.2SUSE , Enterprise Server 12 and 15, Ubuntu 22.04
- Solaris 11.3 and 11.4 on Intel and Sparc 64-bit
- IBM AIX 7.1, 7.2, 7.3
- Client-only:

- macOS 12.6 and up, Intel 64-bit
- Oracle Linux 6, 7, and 8.4 or later, 32-bit
- Microsoft Windows 8.1 and up, 64-bit.

Change in Defaults

- Change the default for `-enablePolicyInactive`
- New Default values for connection attributes:
 - `PermSize`: 32 MB
 - `TempSize`: The default size as determined from the `PermSize` value.
 - `LogBufMB`: 1024 MB
 - `LogFileSize`: Value of the `LogBufMB` connection attribute
 - `CommitBufferSizeMax`: 10 MB per connection.
 - `CkptFrequency`: 0
 - `CkptLogVolume` value of the `LogBufMB` connection attribute.
 - `Connections`: Minimum of 2000 or the value of the kernel setting `SEMMNS-15`
 - `Preallocate`: 1
 - `PLSQL`: 1
- DDL is always auto-committed.
- Only Oracle mode is supported for duplicate bind mode.
- New default TCP/IP ports:
 - 6624 for the main TimesTen daemon port
 - 6625 for the TimesTen Server port
 - 3754 for the Clusterware or grid management port

Other

The Oracle Library included with TimesTen has been updated to RDBMS 12.1.0.2 . The new Oracle library is backwards compatible with the previous version. The following areas in TimesTen are impacted by this change:

- PL/SQL engine
- Instant Client
- Pro*C compiler
- Internal Oracle library functions for NLS, Encryption, Oracle databases, etc.

Existing ODBC applications that were compiled with header files and linked with shared libraries included in a previous version of TimesTen must be recompiled and relinked using the files provided with TimesTen 18.1 that were used with previous versions of TimesTen. Some of the API signatures in TimesTen ODBC have changed, and some of the functions have been updated to be 64-bit compliant according to the ODBC 3.51 standard. These and other changes may necessitate application code changes.

Deprecated Features

Deprecated Database SQL and Engine Functionality

- BITMAP indexes
- Asynchronous materialized view
- The `TT_DECIMAL` data type
- The `TIMESTEN8` character set
- The `Optimized For Read` clause in the `CREATE TABLE` statement

Deprecated Database Built-ins

- `ttCompactTS ()` built-in
- `ttSQLCmdCacheInfo2 ()` – additional columns shown by this built-in are now part of `ttSQLCmdCacheInfo ()`

Deprecated Connection Attribute Settings

- `DDLCommitBehavior=1`
- `DuplicateBindMode=1`
- `RangeIndexType=1`
- `PLSQL=0`
- `TypeMode=1`
- `MatchLogOpts`

Deprecated Utilities and Utility Options

- `ttMigrate` utility command-line arguments `-convertTypesToTT` and the `-convertTypesToOra`
- The `-delayFkeys` option to `ttMigrate -r`

Deprecated Cache and Replication Functionality

- Replication `ReceiverThreads` setting
- User-Defined Parallel Replication
- AWT Cache Groups with non-A/S pair replication schemes

Other Deprecated Functionality

- TimesTen daemon configuration parameter `-linuxLargePageAlignment.`

Removed Functionality

The following functionality is no longer available in TimesTen 18.1.

- Cache Grid
- Cache Advisor
- `ttModInstall`

- The Ability for the TimesTen Server to Load Drivers of a Different Release

Appendix A – Changes in TimesTen Instance and Configuration

This appendix explains the changes in TimesTen 18.1 instance in the following areas:

- Directories
- TimesTen daemon options file
- Timesten daemon configuration parameters

Directories

In TimesTen 11.2.2, many files are placed in the directory *install_dir/info*. In TimesTen 18.1, these files are located in one of three different directories, as shown in table 3.

Table 3. TimesTen Instance directories and their purpose

Directory	Purpose
<code>\$TIMESTEN_HOME/conf</code>	Files that instance administrator can configure
<code>\$TIMESTEN_HOME/diag</code>	Files that contain diagnostic output
<code>\$TIMESTEN_HOME/info</code>	Files that the instance administrator should not modify or examine

TimesTen Daemon Options File

Table 4 shows how the name, location and format of the TimesTen daemon options file has changed in TimesTen 18.1 as compared to TimesTen 11.2.2.

Table 4. Comparing TimesTen 18.1 and TimesTen 11.2.2 daemon configuration file

	18.1	11.2.2
Path	<code>\$TIMESTEN_HOME/conf/timesten.conf</code>	<code>install_dir/info/ttendaemon.options</code>
Format	<code>option=value</code>	<code>-option value</code>
Example	<code>tns_admin=/tmp</code>	<code>-tns_admin /tmp</code>

TimesTen daemon Configuration Parameters

Many of the TimesTen daemon configuration parameters have been renamed as shown in table 5 below. A complete list of TimesTen daemon parameters can be found in TimesTen 18.1 product documentation.

Table 5. Comparing TimesTen 18.1 and TimesTen 11.2.2 daemon configuration parameters

18.1	11.2.2	Notes
<code>allow_network_files</code>	<code>allowNetworkFiles</code>	
<code>enableIPv6</code>	<code>enableIPv6</code>	No change

enable_policy_inactive	enablePolicyInactive	
n/a	linuxLargePageAlignment	On by default
listen_addr	listenaddr	
listen_6_addr	listenaddr6	
max_conns_per_server	maxConnsPerServer	
noserverlog	noserverlog	No change
max_support_log_files	maxsupportlogfiles	
max_support_log_size_mb	maxsupportlogsize	Size is in MB instead of bytes.
max_user_log_files	maxuserlogfiles	
max_user_log_size_mb	maxuserlogsize	Size is in MB instead of bytes.
show_date	showdate	
server_port	server	
server_pool	serverpool	
servers_per_dsn	serversPerDSN	
server_stack_size	ServerStackSize	
server_shmipc	serverShmIpc	
server_shmsize	serverShmSize	
shmkey_range	shmkeyrange	



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