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NONSTOP ADVANCED [T.B.C.]

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Interception Technology Enhances Application Functionality

**Jack Di Giacomo
TANDsoft, Inc.**

Interception Technology Enhances Application Functionality



*NonStop Interception
& Availability Solutions*

Jack Di Giacomo
TANDsoft, Inc.

Jack Di Giacomo is a hockey fanatic

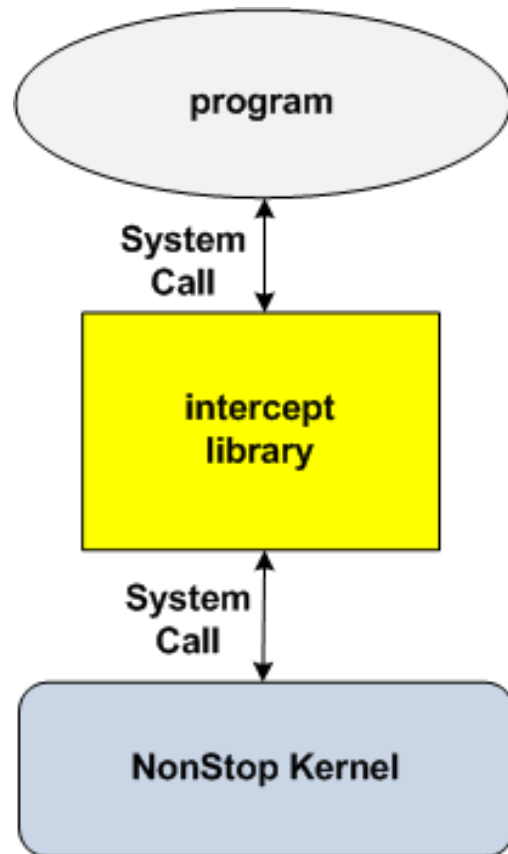


- President, TANDsoft, Inc.
- 30 years of experience in the design, development and support of NonStop software solutions.
- Former Tandem instructor
- Specialist in intercept technology.

Let's Define Interception Technology as it Applies to Computer Programming

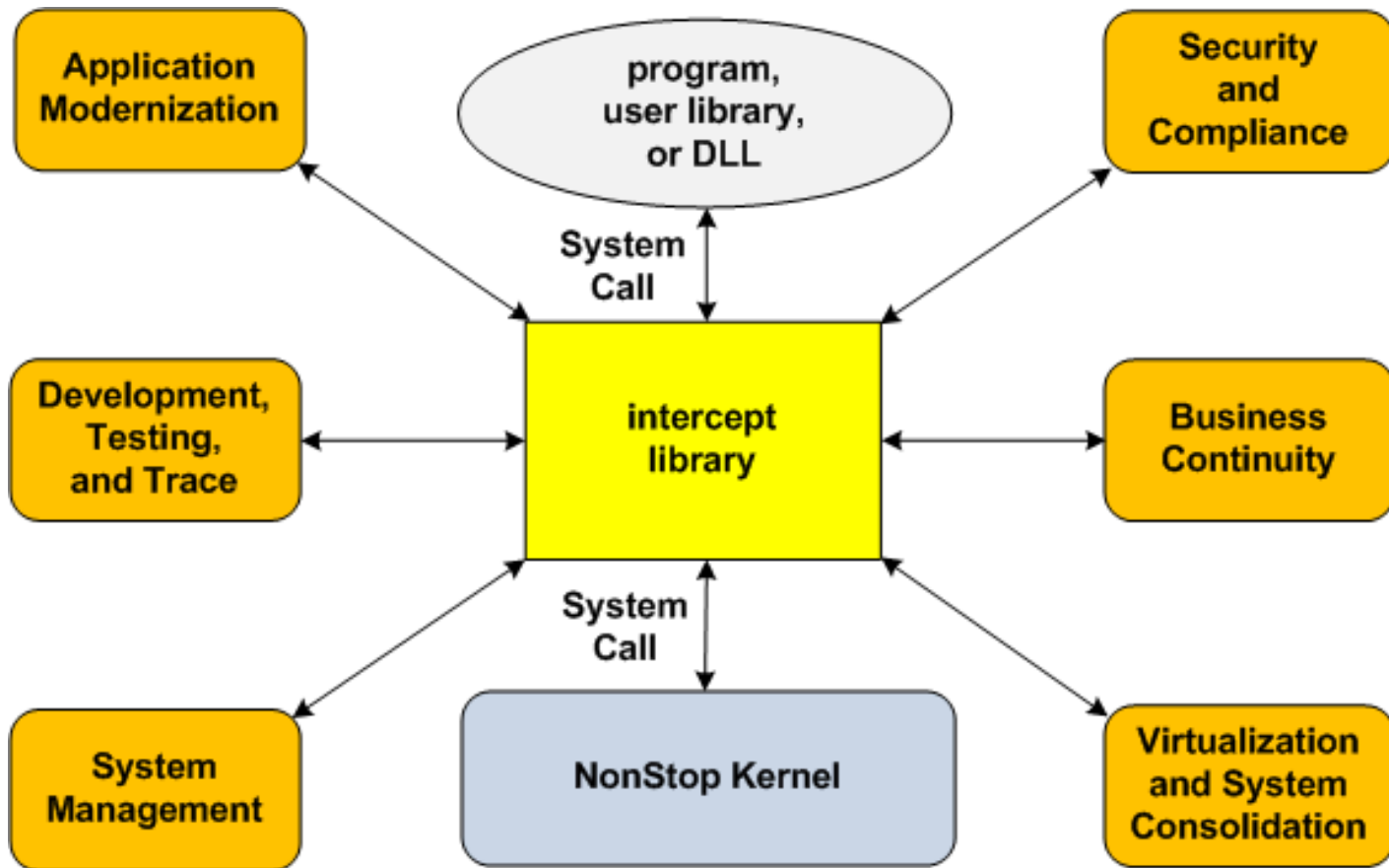
Interception technology covers a range of techniques that can be used to alter or augment the behaviors of applications, operating systems, or other software components by intercepting function calls or system calls.

Let's define Interception Technology as it applies to computer programming



The code that handles intercepted function calls, system calls, events, or messages is called a “hook” or an “intercept” library.

Interception Technology is used to monitor behaviors and to modify application functions



The best thing about interception...

No Source Code Required!

No Need to Recompile Programs!

NonStop interception began with tracing

Tracing is a specialized use of logging to record information about a program's execution.

- **Real-time debugging**
- **Diagnostic purposes**

Early uses of trace in NonStop (Tandem) were only communications-based.

Remember TIL? Tandem-to-IBM Link.

Remember CUP, CMI, Ptrace?

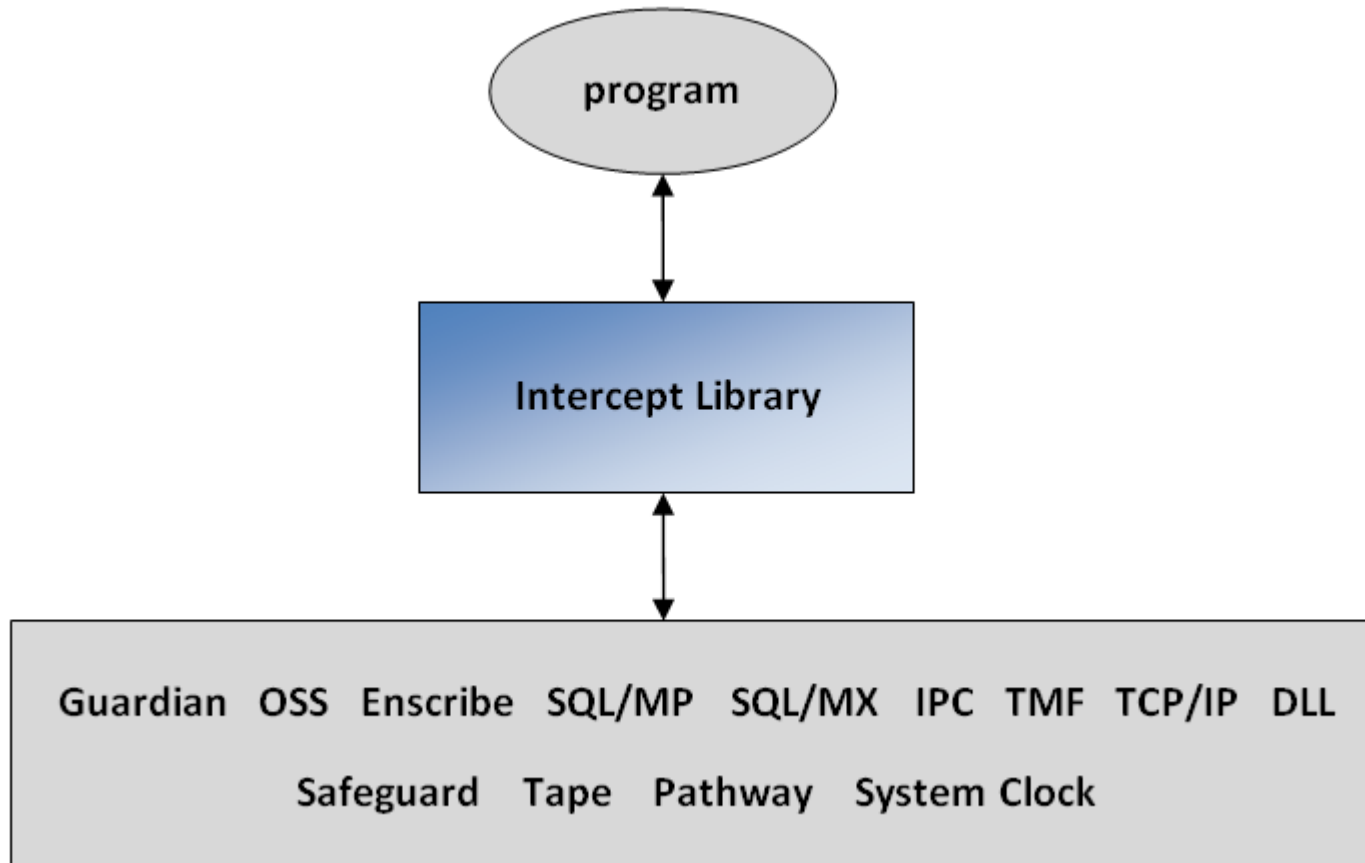
NonStop interception began with tracing

Early tracing utilities did not capture process events other than communication protocol inputs and outputs

Next step in NonStop tracing evolution

- The development of process tracing
- Intercepts and logs system procedure calls
- Can trace program behavior
- Can modify database input-output
- Process-to-process interaction
- Set breakpoints on NonStop system procedures

The architecture of interception



The architecture of interception

An intercept library...

...contains intercept code and is either a user library or a dynamic link library [DLL]

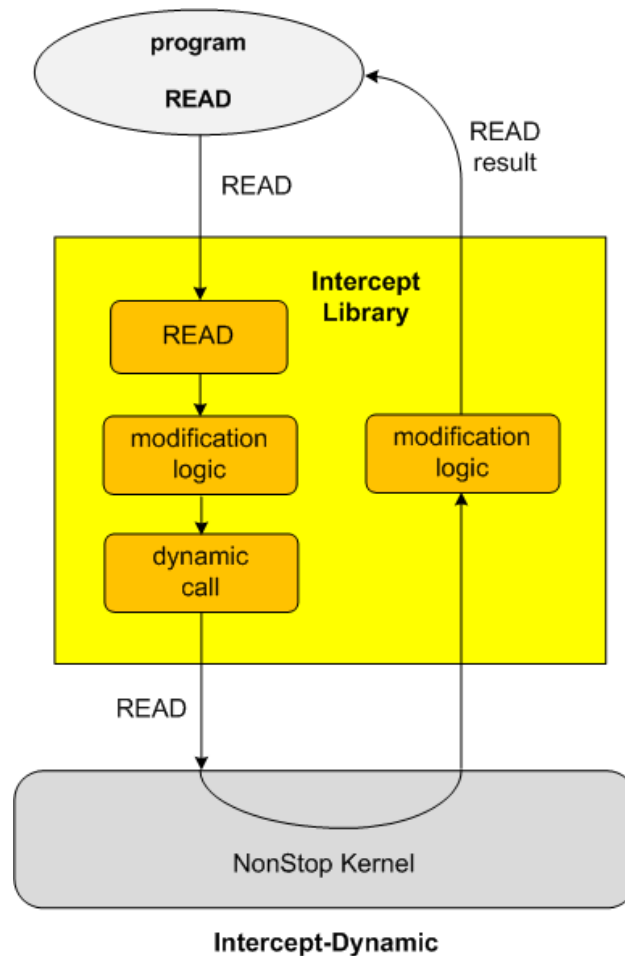
...intercepts Guardian or OSS calls [system and language] from program, user library, or DLLs [private, public (licensed and unlicensed)]

...supports TNS, TNS/R, and TNS/E environments

No source code needed. No program changes required.

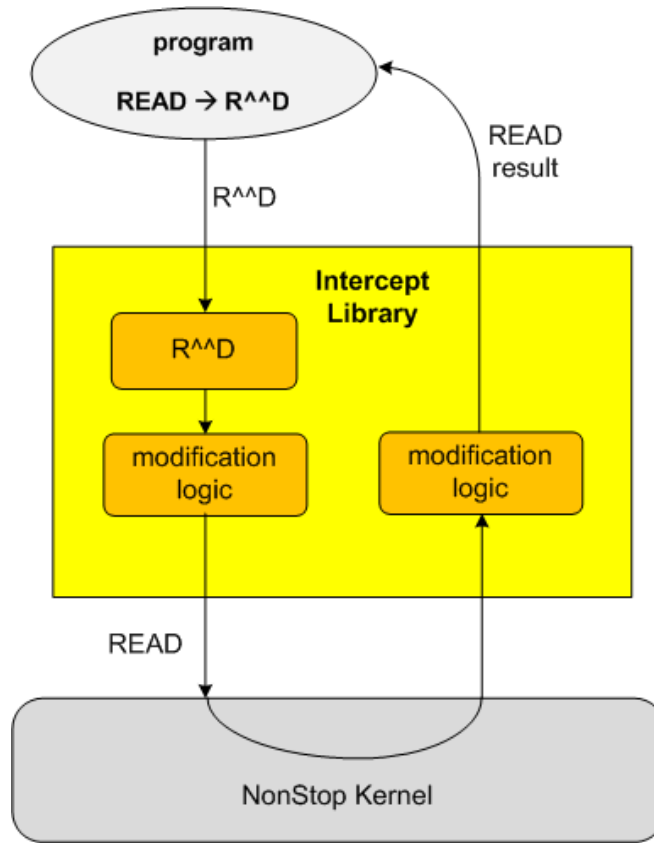
The architecture of interception

Intercept-Dynamic



The architecture of interception

Intercept-Retarget



Intercept-Retarget

Boo! Don't be scared of Interception Technology

- It is not difficult to install
- It is not hard to manage
- There is no massive increase in overhead
- It does not slow everything down

No source code needed. No program changes required.

Boo! Don't be scared of Interception Technology

Utilities exist to simplify the tasks of associating, managing, and removing intercept libraries from programs.

- **Associate intercept library to qualified programs (automatically – whenever programs are recompiled)**
- **Identify programs and processes using intercept library**
- **Remove intercept library from qualified programs**

Boo! Don't be scared of Interception Technology

NB54000 quad-core system running J06.16

TNS (code 100, interpreted code, non-accelerated, non-native)

# of system calls	System calls elapsed time	Intercept calls Retarget	Intercept calls Dynamic
10,000	139783 microsec	152186 (+12403)	163190 (+23407)
1	13.9783 microsec	15.2186 (+1.2403)	16.3190 (+2.3407)

No source code needed. No program changes required.

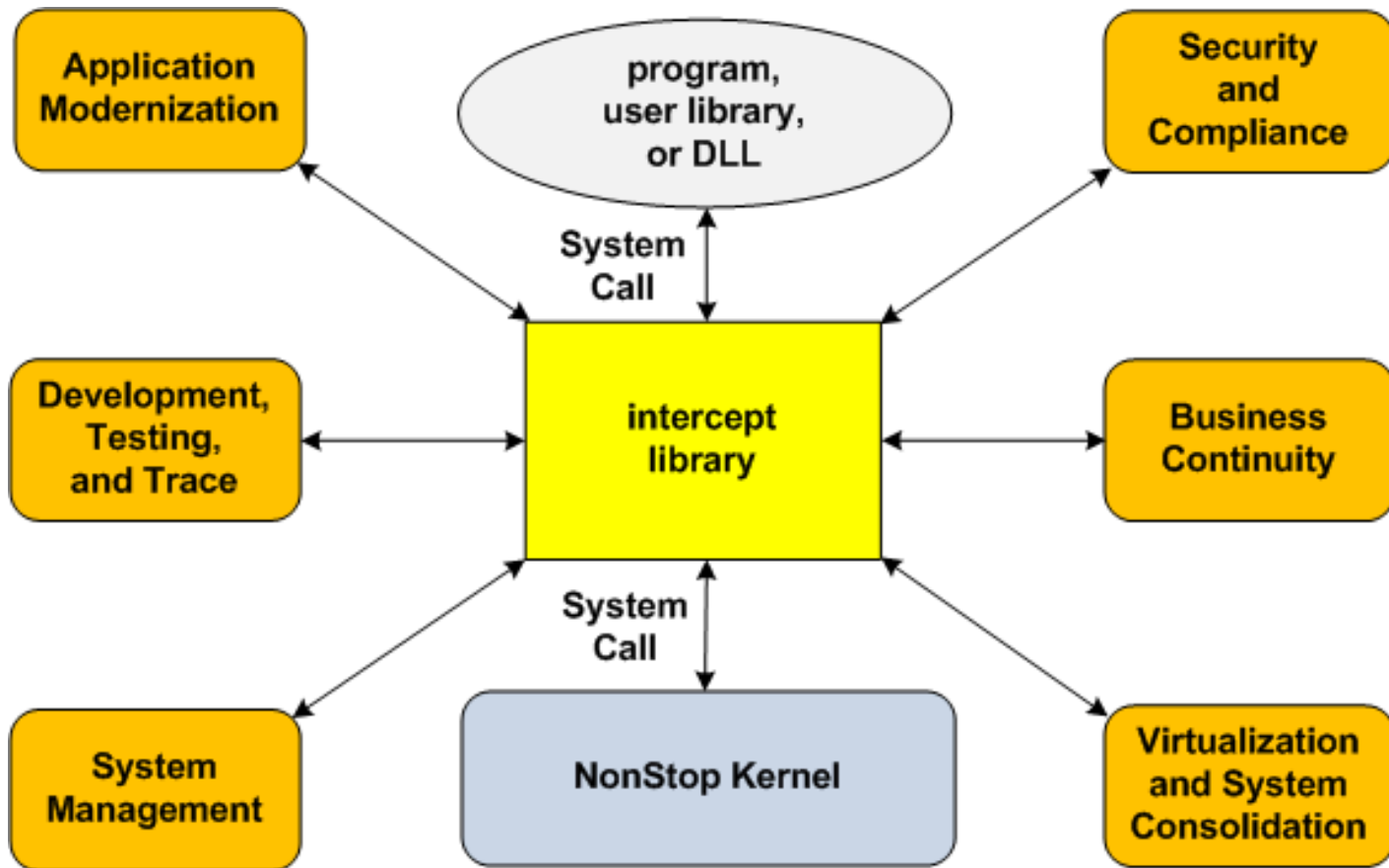
Boo! Don't be scared of Interception Technology

NB54000 quad-core system running J06.16

TNS (code 100, interpreted code, accelerated, non-native)
TNS/E (code 800, native)

# of system calls	System calls elapsed time	Intercept calls Retarget	Intercept calls Dynamic
10,000	100227 microsec	100258 (+31)	100263 (+36)
1	10.0227 microsec	10.0258 (+0.0031)	10.0263 (+0.0036)

Interception Technology is used to monitor behaviors and to modify application functions



NonStop customers use interception to extend application functionality

Application
Modernization

Application Modernization

Application
Modernization

- **Automatic TMF protection of Enscribe files**
 - Insert TMF transactions BEGINTRANSACTION, ENDTRANSACTION
- **Convert Enscribe files to SQL tables**
 - Enscribe OPEN, READ, WRITE converted to EXEC SQL OPEN, FETCH, INSERT

Interception allows NonStop customer to upgrade from non-audited Enscribe to TMF-protected SQL

Application Modernization

A large securities firm used interception technology to upgrade a 3rd party brokerage application from a non-audited Enscribe environment to a TMF-protected NonStop SQL database environment. No program modifications were necessary.

NonStop customers use interception to extend application functionality

Development,
Testing,
and Trace

Development, Testing, and Trace

Development,
Testing,
and Trace

■ Process Trace

- List program system procedure calls made to NonStop Kernel
- Identify deadlocks and program sequencing errors
- Monitor process stack usage to avoid stack overflow
- Learn programming techniques (NonStop, Enscribe, multi-threading, Nowait I/O, IPC, TMF, Startup, DEFINEs, malloc)

■ Add Enscribe file format modifications without reprogramming

NonStop customers use interception to extend application functionality

System
Management

System Management

System
Management

- Files purged or deleted accidentally can be recovered from a recycle bin
- Optimize low-pin resources across all CPUs
- Execute script upon process termination
- Balance workload between CPUs and disks

NonStop customers use interception to extend application functionality

Security
and
Compliance

Security and Compliance

Security
and
Compliance

- **Protect sensitive data at rest (Enscribe, SQL/MP) or in transit**
 - Replace sensitive data, such as Primary Account Number (PAN) or Personally Identifiable Information (PII) with Tokens or Format Preserving Encryption (FPE)
 - Achieve industry compliance (PCI 3.4, SOX, HIPAA)
- **Enforce security policy**
 - Authorization, authentication, and password-change

NonStop Base24 customer uses interception to protect sensitive data at rest

Security and Compliance

A leading payments processor and Base24 user protects its Primary Account Numbers (PANs) by using interception technology to replace the PANs with tokens for use within payment systems and related applications. No changes to the programs are necessary, and the application is fully compliant.

NonStop customers use interception to extend application functionality

Business
Continuity

Business Continuity

Business
Continuity

- **Automatic TMF protection of Enscribe files**
 - Insert TMF transactions BEGINTRANSACTION, ENDTRANSACTION
- **Replicate Enscribe unaudited files or Enscribe file modifications to a backup site**
- **Replicate Enscribe, SQL/MP, and SQL/MX DDL changes to a backup site**

NonStop customers use interception to extend application functionality

Virtualization
and System
Consolidation

Virtualization and System Consolidation

Virtualization
and System
Consolidation

- **Time-Zone simulation**
 - Allows Guardian and OSS applications to operate within any virtual time zone
- **System Clock simulation**
 - Allows Guardian and OSS applications to operate with any virtual system clock or current time value

Large North American bank used interception to consolidate applications requiring multiple time zones into one data center

Virtualization and System Consolidation

The bank decided to consolidate its West-Coast operation into its East-Coast data center as a cost-savings measure. A challenge was determining how to run applications that needed to run in the Pacific Time Zone on a system with a clock set to the Eastern Time Zone.

Using interception technology, the bank created virtual time zones that allow one production system to service two time zones and one disaster recovery system to service two time zones.

The best thing about interception...

No Source Code Required!

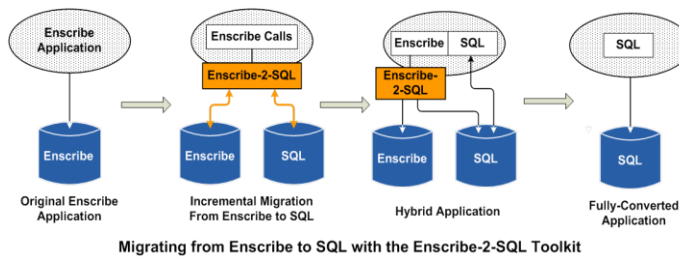
No Need to Recompile Programs!

Thank you for Attending

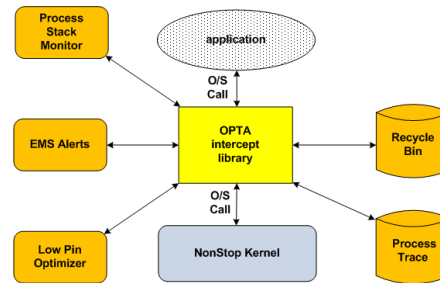
Any Questions?

Ask them now, or contact me later at
jack.digiacomio@tandsoft.com

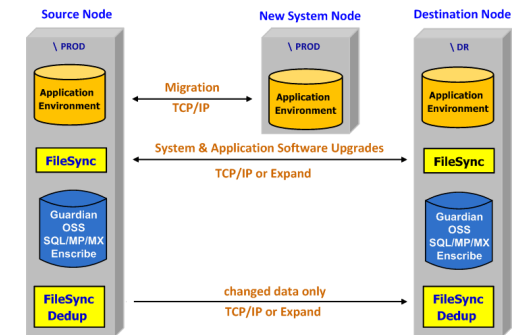
Enscribe-2-SQL Toolkit



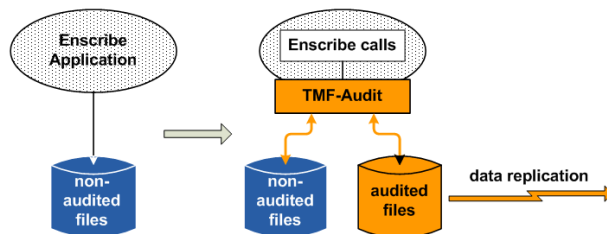
OPTA



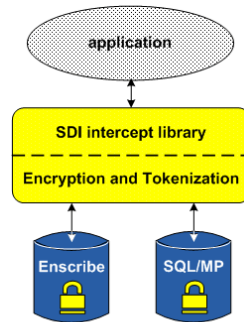
FileSync



TMF-Audit Toolkit

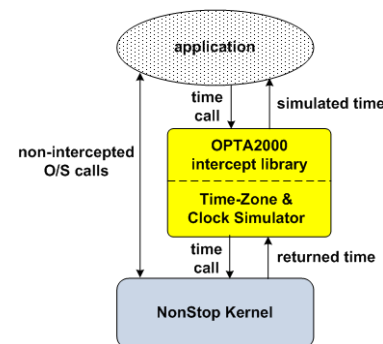


SDI



Protects Sensitive Data at Rest

OPTA2000



Command Stream Replicator

