



FIDELITY NATIONAL
INFORMATION SERVICES

FIS-PIP™ – A high end database application development platform

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Outline

- What PIP is good for
- PIP DNA
- Architecture
- Limitations
- Future Directions
- Questions
 - *What does PIP stand for? It now stands for PIP Infrastructure Project! (A pip is a seed that can grow into a large, strong tree.)*

What PIP is good for

- Transaction processing database application development and deployment, including
 - ACID (Atomtic, Consistent, Isolated, Durable) properties
 - High performance database
 - Mission critical applications
 - Applications requiring 24x365 availability
- Evolution of legacy “pure MUMPS” applications to relational and/or object technology
 - All technologies co-exist
 - No “big bang” conversion – start small and work up
- Teaching IT
 - Start simple, make it as complex as you want it to be
 - (Reasonably) complete functionality
 - Ability to drill down, learn, change...

Browser IDE – initial screen

The screenshot shows a Mozilla Firefox browser window titled "pip-Profile WebTools - Mozilla Firefox". The address bar displays "http://localhost:8280/ProfileBrowserIDE/pages/ProfileBrowserIDE.htm". The browser's menu bar includes "File", "Edit", "View", "History", "Bookmarks", "Tools", and "Help".

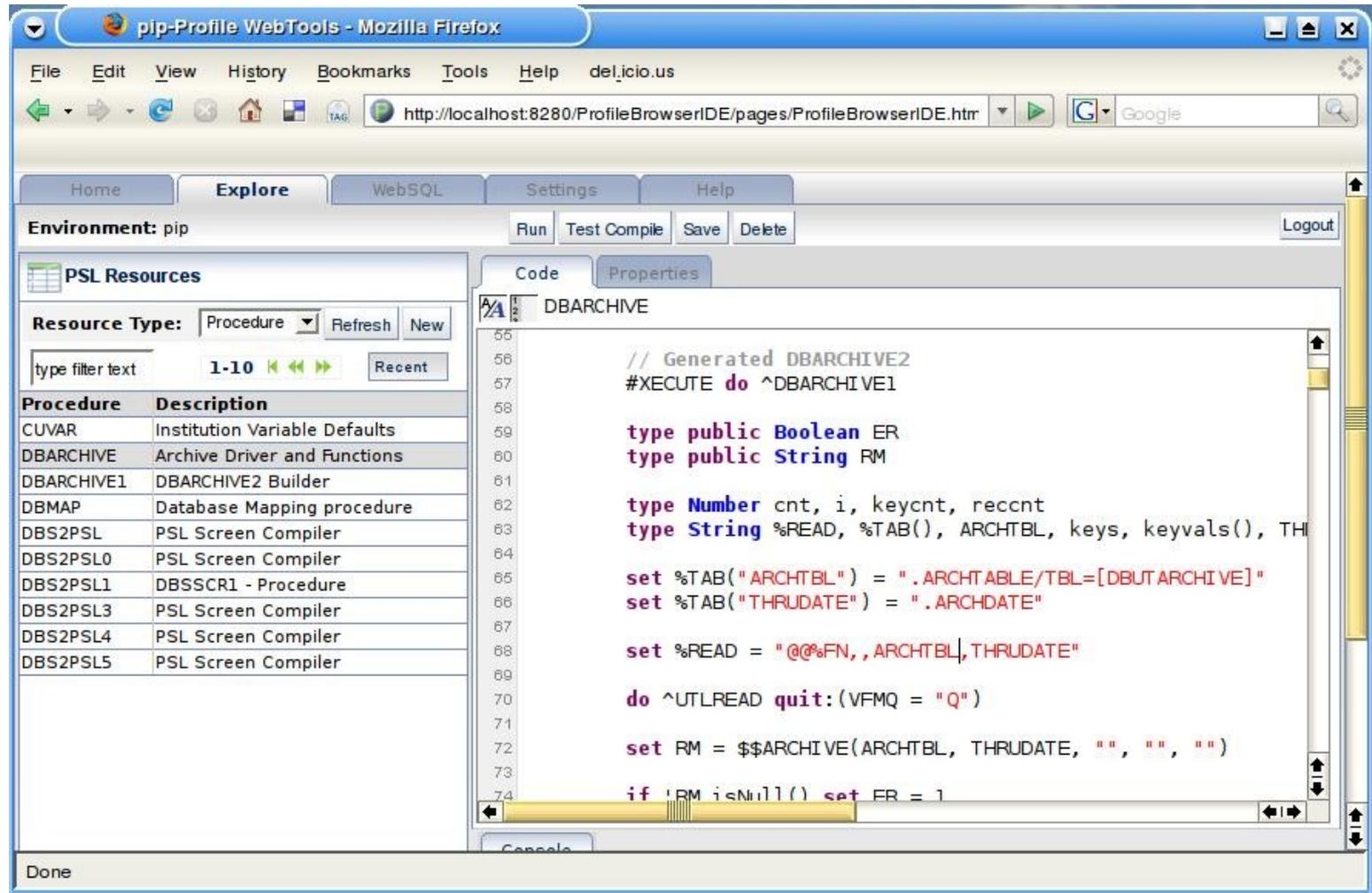
The application interface features a navigation bar with tabs for "Home", "Explore", "WebSQL", "Settings", and "Help". Below this, the "Environment: pip" is indicated, with a "Logout" button in the top right corner.

The main content area is divided into four panels:

- Explore:**
 - Explore PSL resources in Profile
 - Explore PSL classes, methods and properties
 - Edit Procedures, Triggers and Batches
 - Create New Procedures, Triggers and Batches
 - Run PSL Procedures
- WebSQL:**
 - Rapidly run SQL SELECT statements
 - Use the extended SQL syntax to produce rich HTML results
- Settings:**
 - Update your personal settings
 - Change your profile environment connection
 - Set the number of elements you see in the Explore tab
- Help:**
 - Profile WebTools Help
 - PSL Programmer's Guide
 - Profile Programming Standards
 - SQL Help

The status bar at the bottom of the browser window shows "Done".

Browser IDE – Programming



The screenshot displays a web browser window titled "pip-Profile WebTools - Mozilla Firefox". The address bar shows the URL "http://localhost:8280/ProfileBrowserIDE/pages/ProfileBrowserIDE.htm". The browser's menu bar includes "File", "Edit", "View", "History", "Bookmarks", "Tools", and "Help". Below the browser window, the IDE interface is visible, featuring a navigation bar with "Home", "Explore", "WebSQL", "Settings", and "Help". The "Environment" is set to "pip", and there are buttons for "Run", "Test Compile", "Save", "Delete", and "Logout".

The left sidebar contains a "PSL Resources" section with a "Resource Type" dropdown set to "Procedure". Below this is a table listing various procedures and their descriptions:

Procedure	Description
CUVAR	Institution Variable Defaults
DBARCHIVE	Archive Driver and Functions
DBARCHIVE1	DBARCHIVE2 Builder
DBMAP	Database Mapping procedure
DBS2PSL	PSL Screen Compiler
DBS2PSL0	PSL Screen Compiler
DBS2PSL1	DBSSCR1 - Procedure
DBS2PSL3	PSL Screen Compiler
DBS2PSL4	PSL Screen Compiler
DBS2PSL5	PSL Screen Compiler

The main code editor displays the following SQL code for the "DBARCHIVE" procedure:

```
55
56 // Generated DBARCHIVE2
57 #XECUTE do ^DBARCHIVE1
58
59 type public Boolean ER
60 type public String RM
61
62 type Number cnt, i, keycnt, recnt
63 type String %READ, %TAB(), ARCHTBL, keys, keyvals(), TH
64
65 set %TAB(" ARCHTBL") = ".ARCHTABLE/TBL=[DBUTARCHIVE]"
66 set %TAB("THRUDATE") = ".ARCHDATE"
67
68 set %READ = "@@%FN,, ARCHTBL|,THRUDATE"
69
70 do ^UTLREAD quit:(VFMQ = "Q")
71
72 set RM = $$ARCHIVE(ARCHTBL, THRUDATE, "", "", "")
73
74 if !RM isNull() set ER = 1
```

Browser IDE – Interactive SQL 1

pip-Profile WebTools - Mozilla Firefox

File Edit View History Bookmarks Tools Help del.icio.us

http://localhost:8280/ProfileBrowserIDE/pages/ProfileBrowserIDE.htm

Home Explore **WebSQL** Settings Help

Environment: pip Run Copy Results View Results Logout

Editor

```
1 select * from objectmet//rows=100/template=report
2
3
4
5
6
7
8
9
10
11
12
13
14
```

Console

%SQL-Runtime: .106089 Seconds

Profile Framework
Class Methods

Done

Browser IDE – Interactive SQL 2

pip-Profile WebTools - Mozilla Firefox

File Edit View History Bookmarks Tools Help del.icio.us

http://localhost:8280/ProfileBrowserIDE/pages/ProfileBrowserIDE.htm

Console

%SQL-Runtime: .106089 Seconds

Profile Framework Class Methods

Class	Method	Description	Error Code	Formal Parameters
ByteString	ascii	ASCII code of byte at specified pos		local Number position
	extract	Extract a bytestring		local Number start,local Number end
	find	Find the next position of a bytestring		local ByteString string,local Number start
	justify	Justify a bytestring		local Number fieldLength
	length	String length		local ByteString delimiter
	piece	Return bytestring at delimited position		local ByteString delimiter,local Number start,local Number end
	toPSLExpression	translate literal value to PSL expression		
	translate	Byte by byte replace		local ByteString lookFor,local ByteString replaceBy
Cache	getRecord	Get RecordTABLE object from Cache		literal String table,String KeyExpr,literal Boolean classNew
	isDefined	Check if RecordTABLE row exists using Cache		literal String table,String KeyExpr
Class	isAncestor	Is Name1 an ancestor of Name2		String ancestorName,String descendantName
	isClass	Does className exist in OBJECT table		String className
	isDescendant	Is Name1 a descendant of Name2		String descendantName,String ancestorName
	isValid	Does className exist in OBJECT table		Reference instance
	new	Create a new instance of class		literal String Class,Object initObj
Date	day	2 digit day of month		
	dayOfMonth	Numeric day of the month		
	dayOfYear	Day of the year		
	daysInMonth	Number of days in Month		

Done

Browser IDE – Help

The screenshot shows a Mozilla Firefox browser window titled "pip-Profile WebTools - Mozilla Firefox". The address bar displays "http://localhost:8280/ProfileBrowserIDE/pages/ProfileBrowserIDE.htmr". The browser's menu bar includes "File", "Edit", "View", "History", "Bookmarks", "Tools", and "Help". The page content is organized into a navigation bar with tabs for "Home", "Explore", "WebSQL", "Settings", and "Help". Below the navigation bar, the "Environment" is set to "pip", and there is a "Logout" button. The main content area is titled "Profile WebTools Help" and contains four help topics, each with a document icon:

- Profile WebTools Help**: Answers to general help questions using Profile WebTools
- SQL Help**: Learn how to use the extended SQL syntax to enrich your results
- PSL Programmer's Guide**: A complete reference for the PSL Language and the API
- Profile Programming Standards**: Detailed standards for developing in Profile

An "Admin" link is visible in the bottom right corner of the content area. The status bar at the bottom of the browser shows the URL "http://localhost:8280/ProfileBrowserIDE/pages/pages/help/InteractiveSQL.html".

PIP DNA – FIS Profile®

- Real time core processing application for commercial banks
- In production for over 20 years
- System of record for many tens of millions of bank accounts around the world
- Ability to deploy on either Oracle or GT.M
- Proven high end throughput when deployed on GT.M
 - *Runs world's largest live real time core processing system that we are aware of (on Sun SPARC Solaris)*
 - Successful 2007 benchmarks included:
 - 6x largest live system (on IBM pSeries AIX)
 - 1.25x largest live system (on HP DL 580 w. Red Hat EL 5)
- Unique logical multi-site functionality for business continuity when deployed on GT.M



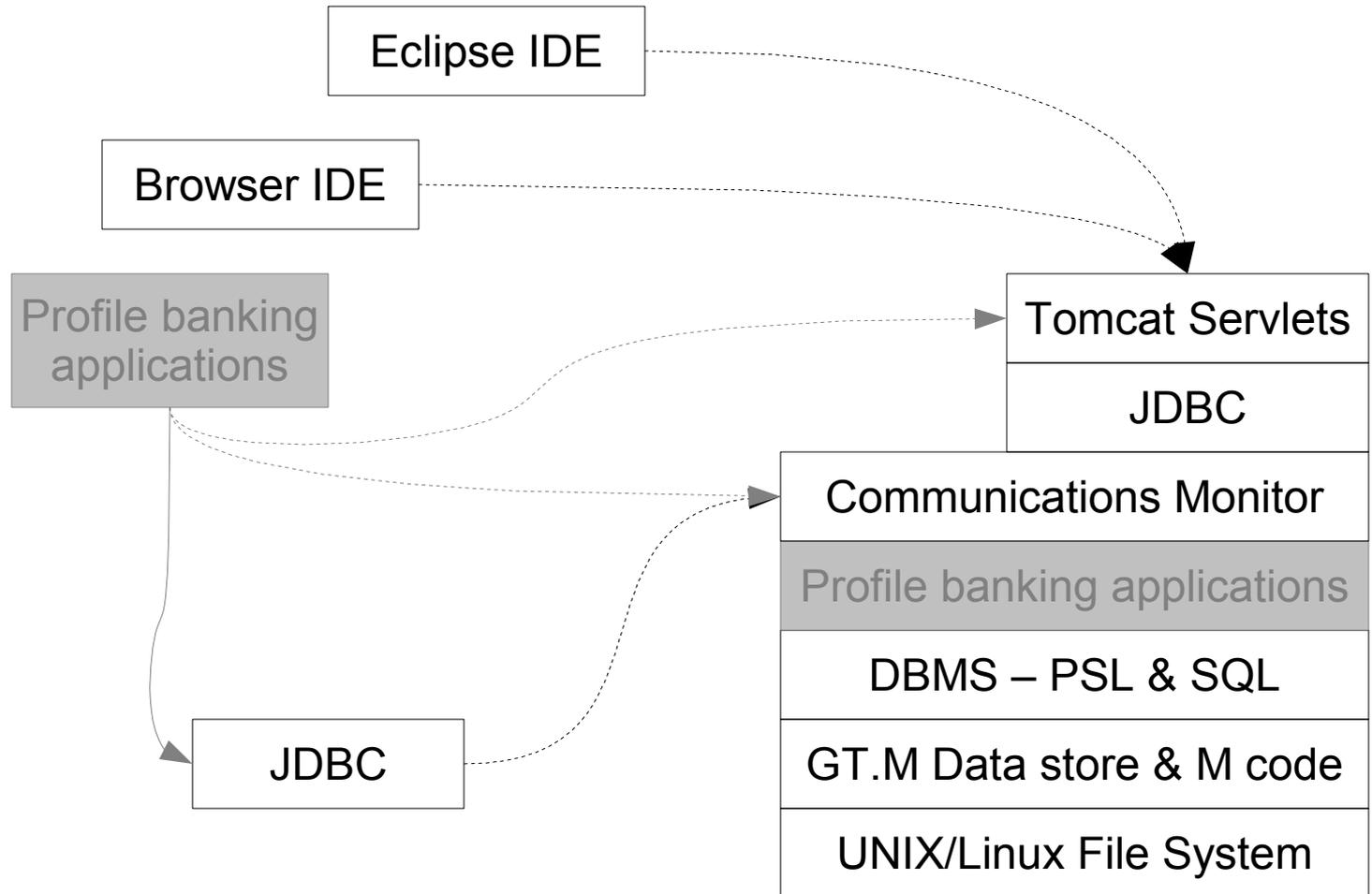
PIP DNA – FIS GT.M™

- Implementation of M
- Robust transactions
- Continuity of business features provide for not only in the face of unplanned events (like system crashes) but also planned events (such as system or application upgrades – even many upgrades involving schema changes)
- Highly scalable – to databases in the TB range
- Choice of GT.M platforms:
 - GPL – x86/x86_64 GNU/Linux, Alpha Tru64 UNIX & OpenVMS
 - Other – Itanium HP-UX & Linux, pSeries AIX, SPARC Solaris

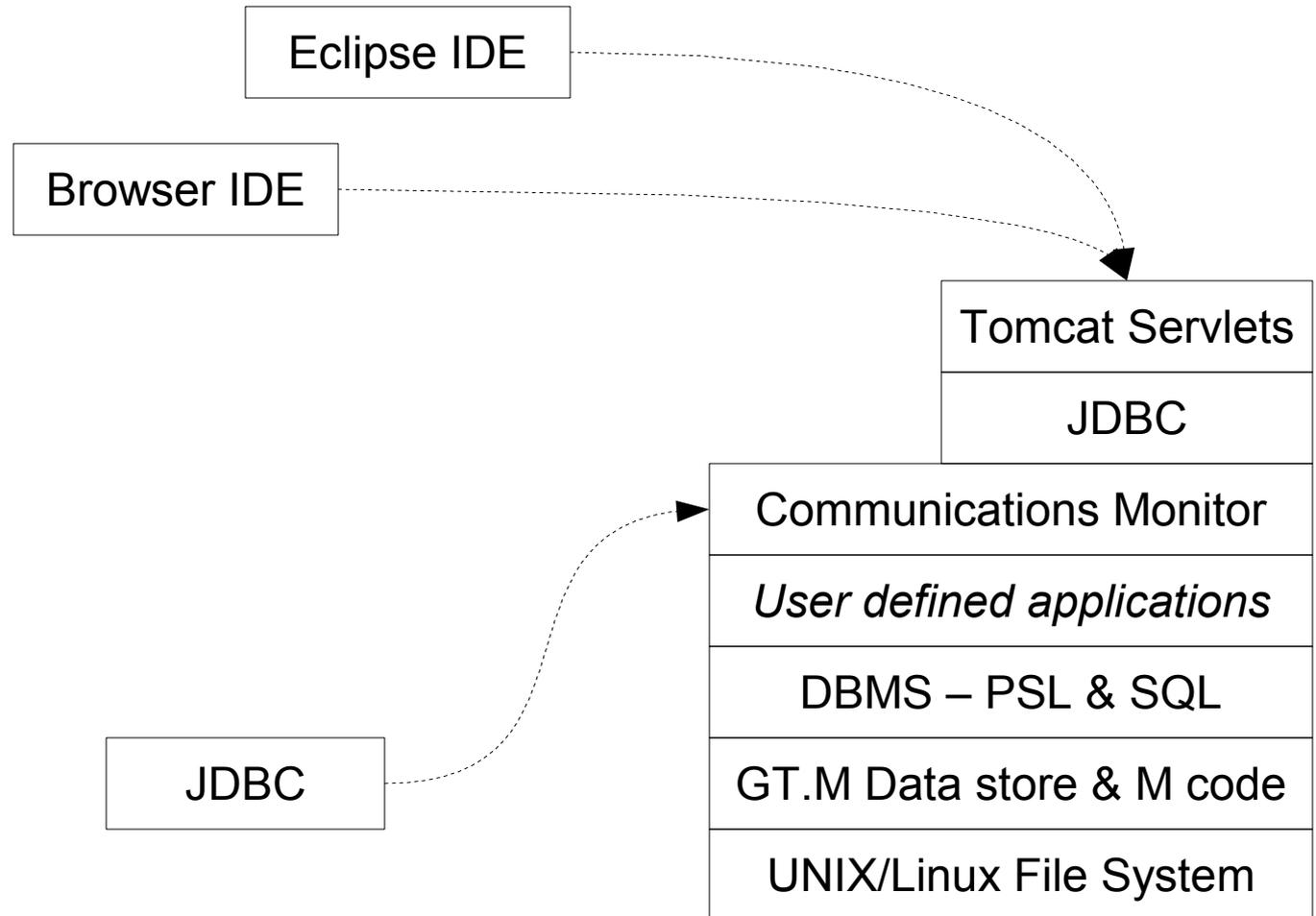
<http://fis-gtm.com>



Profile Architecture



PIP Architecture

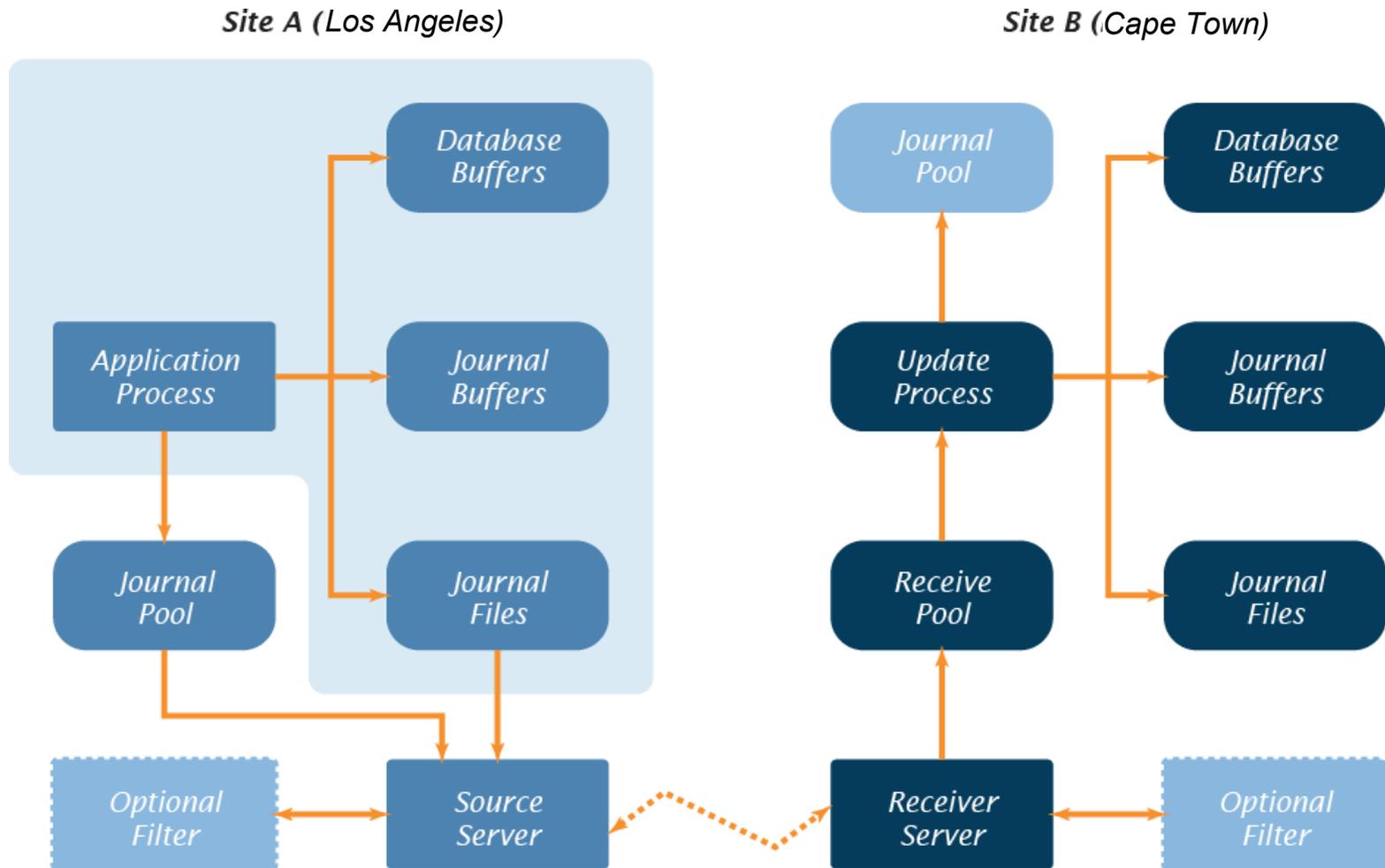


Logical Multi-Site Configurations

- 1 primary instance, replicating to
- 16 secondary instances, replicating to
- 256 tertiary instances, replicating to
- ...
- Any instance can in principle take over as a primary instance
 - (Just because it can doesn't mean that it should)



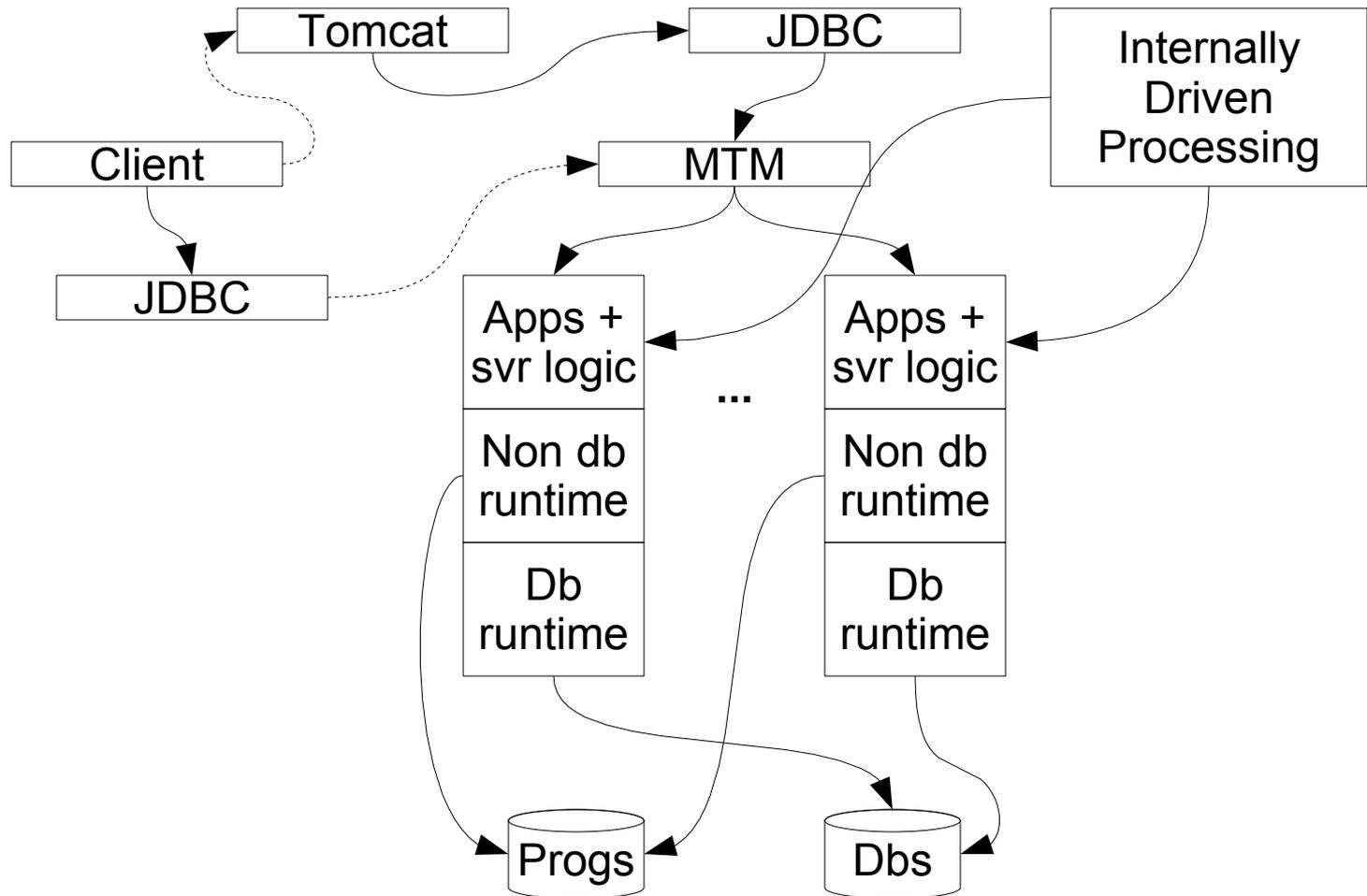
Logical Multi-Site Architecture



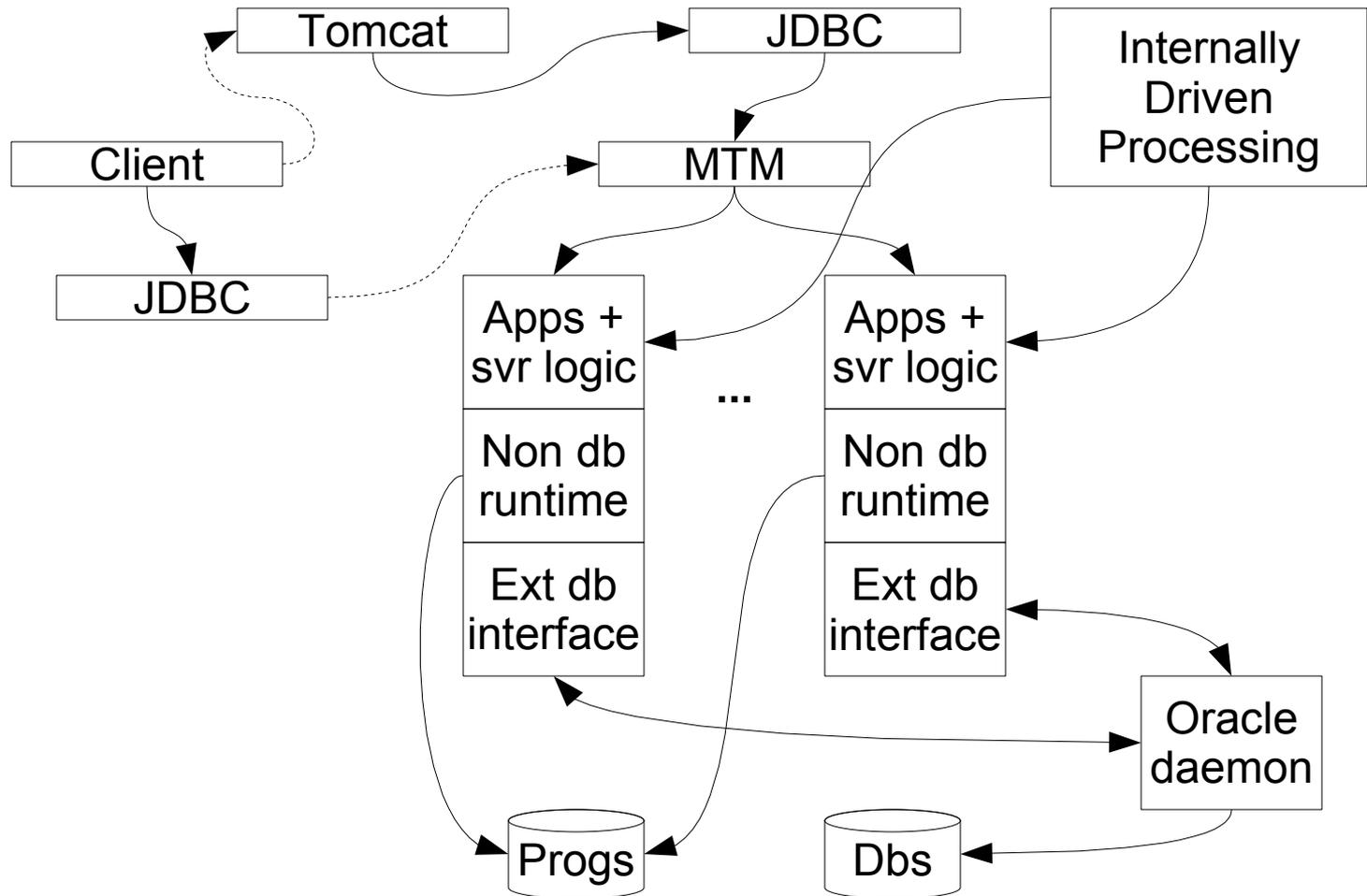
PIP Technology

- Applications developed in:
 - SQL (or on client via JDBC)
 - PSL (Profile Scripting Language - lightweight objects)
- Compiled into M
 - M acts as embedded virtual machine, like JVM for Java
 - Target choices: M database or off the shelf RDBMS
 - Today GT.M is supported M; Oracle is supported RDBMS
 - Architecture allows for future additional M & RDBMS targets
- M is compiled into native machine code by GT.M
- Operational performance and functionality determined by database engine (e.g., logical multi-site supported with GT.M)

PIP/GT.M Runtime environment



PIP/Oracle Runtime environment



PIP Limitations – Today

- Separation from Profile is immature
 - Known references to Profile in computed columns of CUVAR
 - Likely mode code / data that belongs in Profile and vice versa

PIP Limitations – Today

- Separation from Profile is immature
- Separation of PIP from applications for deployment is needed
 - Currently one PIP environment for each application environment
 - Need to repackage PIP to only require one copy per system

PIP Limitations – Today

- Separation from Profile is immature
- Separation of PIP from applications for deployment is needed
- User documentation is inadequate
 - Current documentation is tied to Profile documentation
 - Profile documentation is extensive, but PIP documentation needs to be separated from financial application documentation
 - Volunteers needed!

PIP Limitations – Today

- Separation from Profile is immature
- Separation of PIP from applications for deployment is needed
- User documentation is inadequate
- More standalone testing is warranted
 - GT.M tested with automated regression testing
 - Profile tested with a mix of manual & automated testing
 - PIP tested today only with through Profile financial applications
 - Volunteers needed!

PIP Limitations – Today

- Separation from Profile is immature
- Separation of PIP from applications for deployment is needed
- User documentation is inadequate
- More standalone testing is warranted
- **Security model needs articulation & validation**
 - Profile & GT.M have mature, vetted security models, but not PIP
 - PIP is a development environment – security model for development environment is different from security model of application developed using development environment

PIP Limitations – Today

- Separation from Profile is immature
- Separation of PIP from applications for deployment is needed
- User documentation is inadequate
- More standalone testing is warranted
- Security model needs articulation & validation
- PIP is expert friendly!
 - Or at least, it has a longer learning curve than it should
 - e.g., need to make passwords not expire on demo CDs
Login with userid pip / password PIPRocks and execute:
`cd /opt/pip_v01`
`./dm`
`Set $Piece (^SCAU (1,1) , "|" , 7) = 99999`
`Halt`

PIP – What we plan to work on

- Separation from Profile is immature
- Separation of PIP from applications for deployment is needed
- User documentation is inadequate
- More standalone testing is warranted
- Security model needs articulation & validation
- PIP is expert friendly!

Business model

- GPL v3 license
- Training & support available on a commercial basis



?? Questions?? !! Comments!!

Thank you!

<http://sourceforge.net/projects/pip>

<http://youtube.com/watch?v=P4EzwkR8eNA>

<http://www.fis-pip.com>

<http://www.fis-gtm.com>

<http://www.fis-profile.com>

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