Appendix 3 – Transaction and Volume Profiling

Terminal Application

Transactions Emanating from Terminal Application

The following transactions are acquired on the Terminal Application node. All transactions, whether successful or not, are included. It is clear that the primary transaction is "Goods and Services".

This test will therefore only make use of the "Goods and Services" transaction.

Table 1: Transactions Emanating from Terminal Application

Transaction	Volume	% of Total
Goods and Services	7,828,456	98.82
Cash Withdrawal	7,279	0.09
Cheque Verification	3,973	0.05
Goods and Services with Cash Back	2,968	0.04
Refund	18,056	0.23
Deposit	7,767	0.10
Balance Enquiry	53,599	0.68
Total	***7,922,098***	***100.00***

On-line/Off-line ratio

Terminal Application terminals do not always connect to Postillion to authorize transactions. In many cases, the terminal authorizes transactions off-line, using an upper limit known as the floor limit. This limit differs from terminal to terminal.

The ratio of on-line to off-line "Goods and Services" transactions must be applied for this test.

Table 2: Off-line vs. On-line Transactions (Terminal Application)

Transaction	Online	Batched	Off-line	% On-line	% Off-line
Goods and Services	3,274,198	4,535,772	1,261,574	72.19	27.81

Terminal Banking Frequency

On average during July 2006, terminals connected to the Postillion for banking more than twice a day (2.27).

Where applicable, this test will assume that each terminal connects at least twice a day.

Terminal Banking Density

This category defines the number of terminals connected for banking purposes concurrently.

Two views were taken for this test – viz. the maximum and average number of connections per hour and per minute. It is important to note that this reflects the number of devices that transferred a batch file – it does not reflect devices that only connected for parameter updates (card file, hot card list etc).

Figure 1: Terminal Banking Density (hourly)

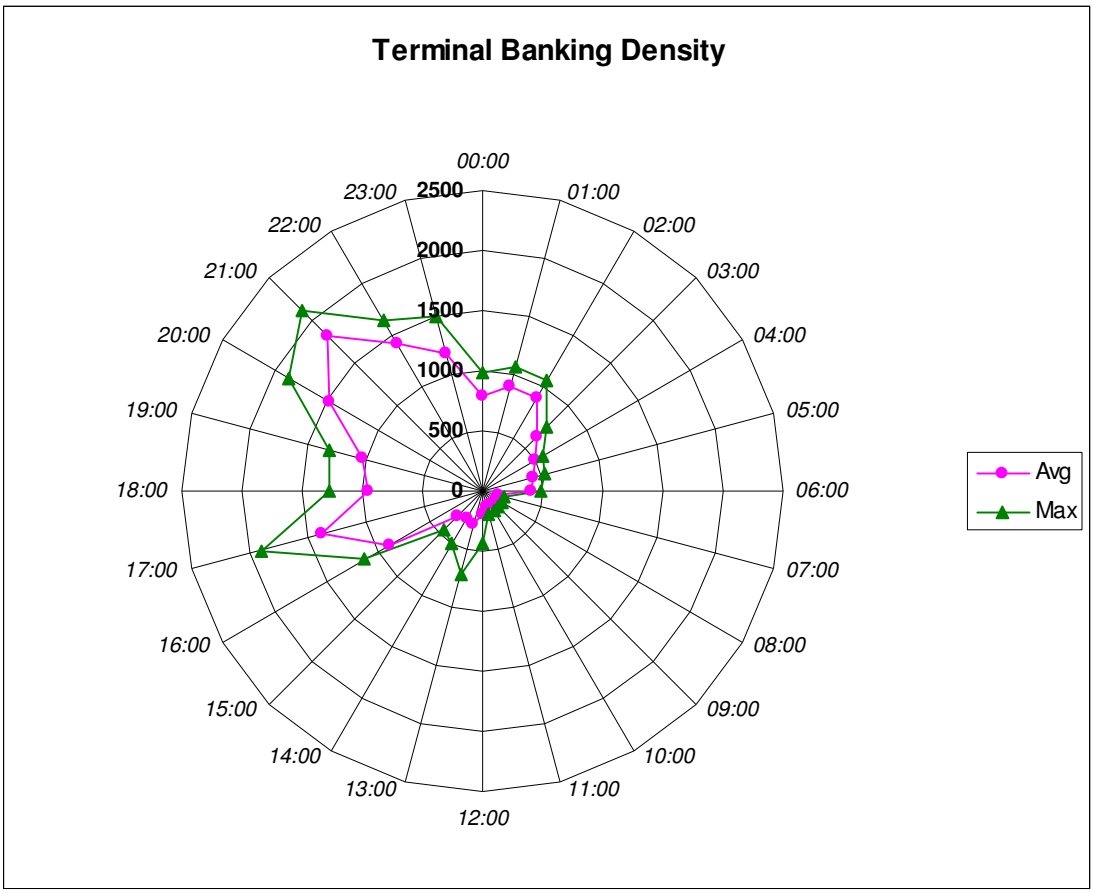


Figure 1 (using data from July 2006) shows that the peak period is between 21:00 and 22:00 with a maximum volume of 2118 sessions during the hour.

The highest number of banking sessions taking place during one minute was at 02:40 on 29 July 2006 with 125.

Terminal On-line Transaction Density

Defines the number of terminals transaction (on-line authorizations, not batches) concurrently.

Figure 2: Terminal On-line Transaction Density (hourly)

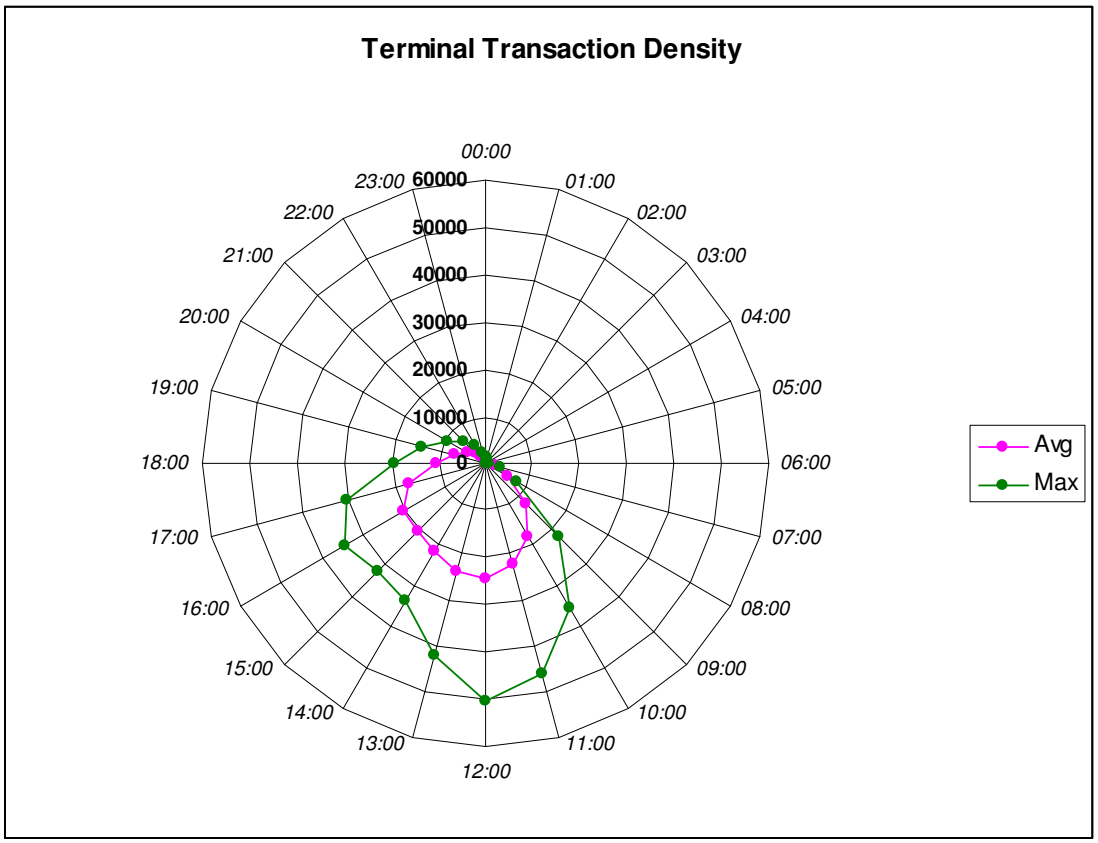


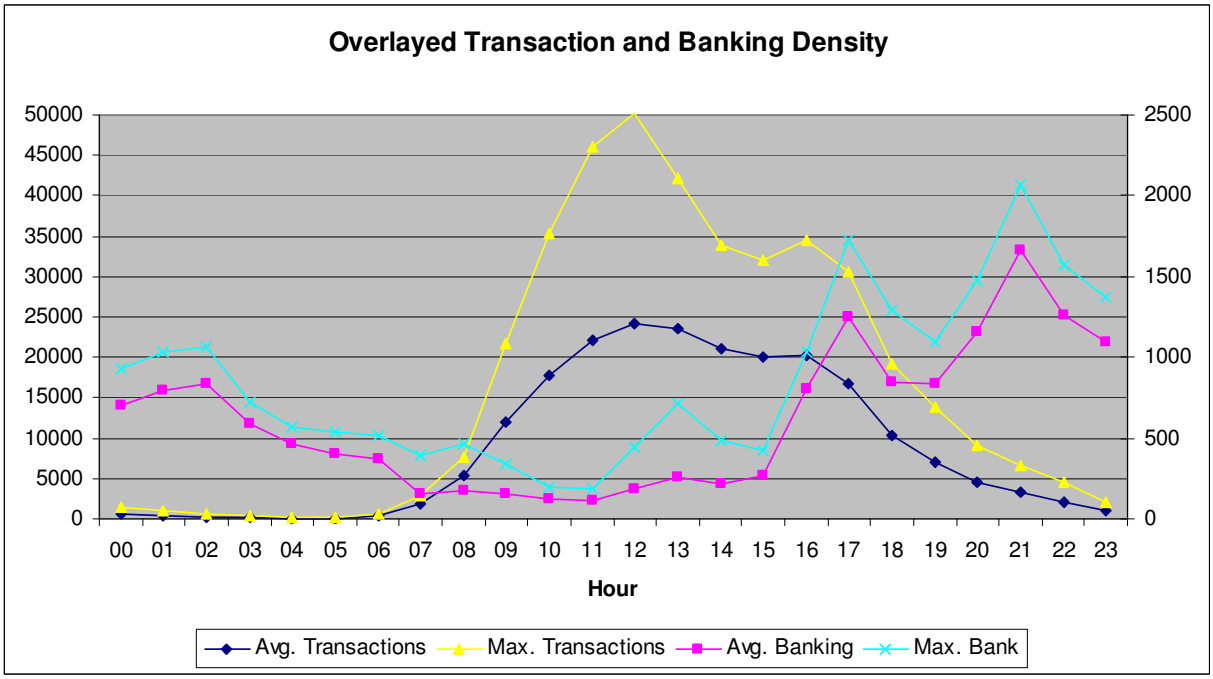
Figure 2 shows that the peak period is between 12:00 and 13:00 with a maximum volume of 50272 on-line authorizations during the hour.

The highest number of on-line transactions taking place during one minute was at 12:34 on 27 May 2006 with 925 for an average of 15.4 transactions per second.

Combined Banking and Transaction Density

This section illustrates the overlap between banking and on-line transactions for the terminal population.

Figure 3: Overlapped Banking and Transaction Density



From *Figure 3* (where banking sessions are plotted against the secondary axis at right) it is clear that the peaks for banking and on-line transactions are wildly divergent – where banking sessions are at the peak, transactions are nearing their lowest volume (and vice-versa). *This test will not attempt to correlate the two – i.e., none of the tests will presume a standard working peak regarding. transactions and banking sessions at the same moment in time. Where relevant, two scenarios (or sub-scenarios) will be constructed, each reflecting one of the two aspects.*

Batch Size

This defines the average number of transactions in a terminal batch. This is the number of transactions transferred to Terminal Application during the terminal's banking session and includes off-line transactions and completions for on-line transactions.

1. *Average number of transactions per terminal overall –8*
2. *Average of the highest number of transactions per terminal – 20*

On-line Transactions per Batch

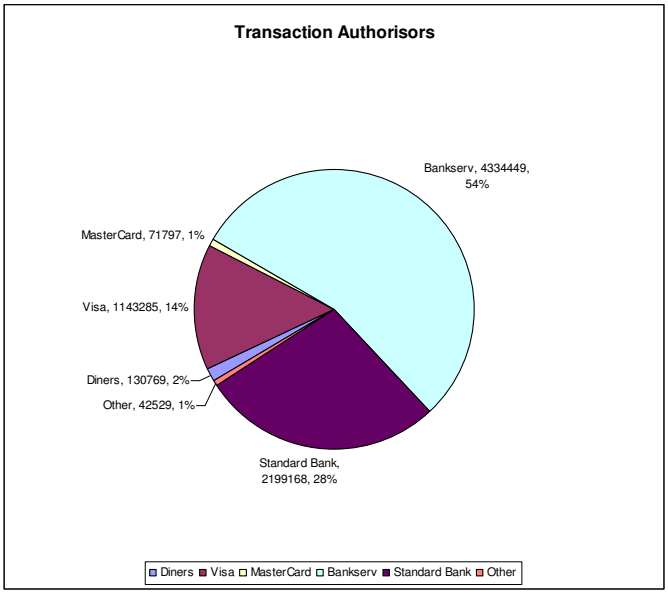
This defines the average number of on-line transaction each terminal performed before banking. Only on-line transactions are measured.

1. *Average number of on-line transactions per terminal per batch overall – 6*
2. *Average of the highest number of on-line transactions per terminal per batch - 17*

On-us vs. Not-on-us

This defines the ratio of on-us transaction to not-on-us transactions and the various transaction destinations for transactions acquired on Terminal Application devices.

Figure 4: On-us vs. Not-on-us



From *figure 4* above, the following is apparent:

1. Local not-on-us (Bankserv) accounts for 54% of all transactions
2. On-us (Standard Bank) accounts for 28% of all transactions
3. International not-on-us accounts for 16% with Visa taking the lion's share at 15%
4. Diners Club accounts for 2% of all transactions
5. A mix of other authorizers (MTN Bank, Unexcor, RCS etc) make up the final 1%

Debit, Credit and PIN

The mix of debit and credit card transactions is relevant because debit card transactions require a PIN. If the number of debit card and PIN bearing transactions is significant, the cryptographic overhead associated with DUKPT processing and PIN block translation must be included in the tests.

Figure 5: Debit & PIN Volumes

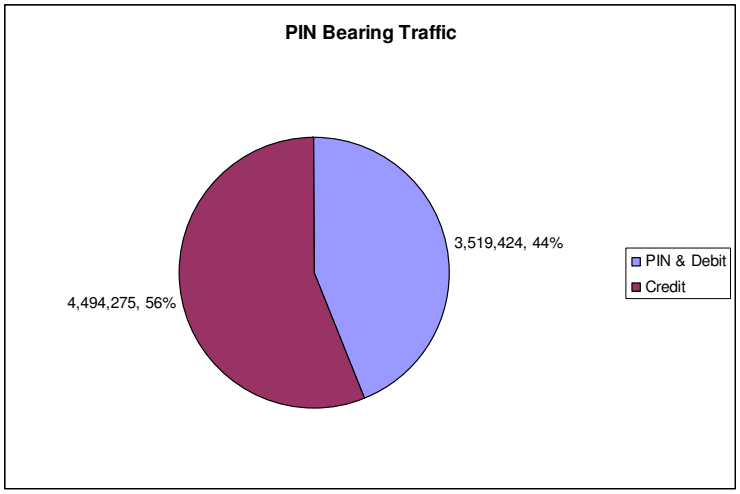


Figure 5 above reflects the split between non-PIN credit and PIN bearing debit and credit. It is clear that debit card (PIN bearing) transactions are highly relevant and must be included in the test.

File Updates

This section details the frequency and magnitude of hot card list and card file updates. The current live system configuration at 28 July 2006 was used to determine these figures.

Hot Card Updates

The hot card list is updated on a daily basis. There are 3 hot card files. Production sizes at the time of writing were:

1. Retail – 6096 entries
2. Forecourt – 3014 entries
3. Spares & Repairs – 9110 entries

Although Spares & Repairs terminals download the largest data set, there are considerably more Retail devices in the population (31320 retail devices vs. 2370 spares & repairs devices).
Tests should therefore always be executed using terminals defined as using the retail hot card list.

The hot card file may be downloaded as an update set (consisting of the change in cards by means of additions and deletions) or as a full download (replacing all cards). The number of updates to the file varies dramatically – additions have ranged between 11 and 416 per day whilst between 42 and 331 deletions have been recorded per day.
Testing will take place using the live retail hot card data that has been adjusted to ensure that the size of the file is approximately 9000 records.

Card File Updates

The card file is infrequently updated – any change to the file requires all terminals to download the full set. *Because this is a fairly static data set, and it is easy to force a file number change without actually changing the data, testing will assume no changes unless the scenario specifically calls for a card file download.*

Other Source Nodes

Transactions Emanating from Other Source Nodes

The following transactions are acquired from the non-Terminal Application source nodes. All transactions, whether successful or not, are included. As with Terminal Application the overwhelming majority of transactions executed are “Goods and Services”
This test will therefore only make use of the “Goods and Services” transaction.

Table 3: Transactions Emanating from Non-Terminal Application Source Nodes

Node	Transaction	Volume	Total	% of Total
ASTSrc	Goods and Services	1,018,586	1,038,460	98.086
ASTSrc	Refund	19,874		1.914
Total		**1,038,460**		**100.000**
BservCrSrc	Goods and Services	9,728,046	9,728,157	99.999
BservCrSrc	Cash Withdrawal	111		0.001
Total		**1,038,460**		**100.000**
CPCTandemSrc	Goods and Services	2,650,842	2,665,155	99.463
CPCTandemSrc	Goods and Services with Cash Back	1,175		0.044
CPCTandemSrc	Balance Enquiry	13,138		0.493
Total		**2,665,155**		**100.000**
GenSrc	Goods and Services	1,042,623	1,043,097	99.955
GenSrc	Refund	474		0.045
Total		**1,043,097**		**100.000**
MCardCrSrc	Goods and Services	560,755	563,388	99.533
MCardCrSrc	Cash Withdrawal	2,633		0.467
Total		563,388		100.000
StratusSrc	Cash Withdrawal	336,797	356,208	94.551
StratusSrc	Available funds inquiry	19,411		5.449
Total		**356,208**		**100.000**

On-line/Off-line ratio

As with Terminal Application, the other source nodes acquire transactions from sources that may apply floor-limit (offline) transactions. Because the flow of advice transactions (e.g. 0220) differs from request transactions (e.g. 0100) the test should reflect the correct ratio off these types.

Table 4: On-line/Off-line Transactions for non-Terminal Application Source Nodes

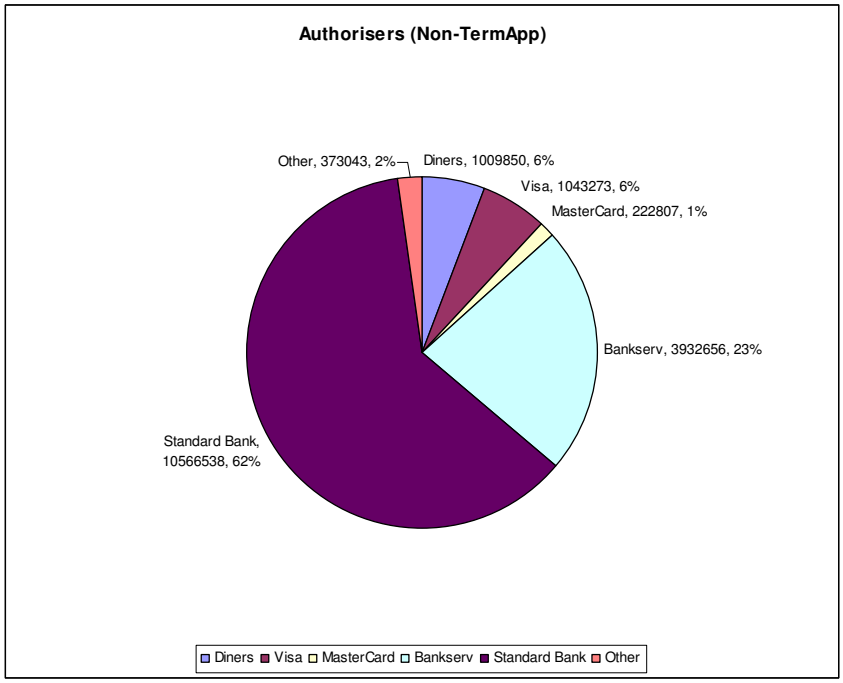
Source Node	Transaction	On-line	Off-line	% On-line	% Off-line
ASTSrc	Goods and Services	695,232	314,860	68.83	31.17
BservCrSrc	Goods and Services	6,553,871	3,120,679	67.74	32.26
CPCTandemSrc	Goods and Services	2,228,636	414,277	84.32	15.68
GenSrc	Goods and Services	265,618	770,174	25.64	74.36
MCardCrSrc	Goods and Services	550,834	5,177	99.07	0.93
			Average	*69.12*	*30.88*

Table 4 reflects a similar ratio to Terminal Application transactions for off-line and on-line transactions – approximately 70% of all transactions executed are on-line.

On-us vs. Not-on-us

This defines the ratio of on-us transactions to not-on-us transactions, and the various destinations for transactions acquired by the non-Terminal Application source nodes.

Figure 6: On-us vs. Not-on-us (Non Terminal Application)



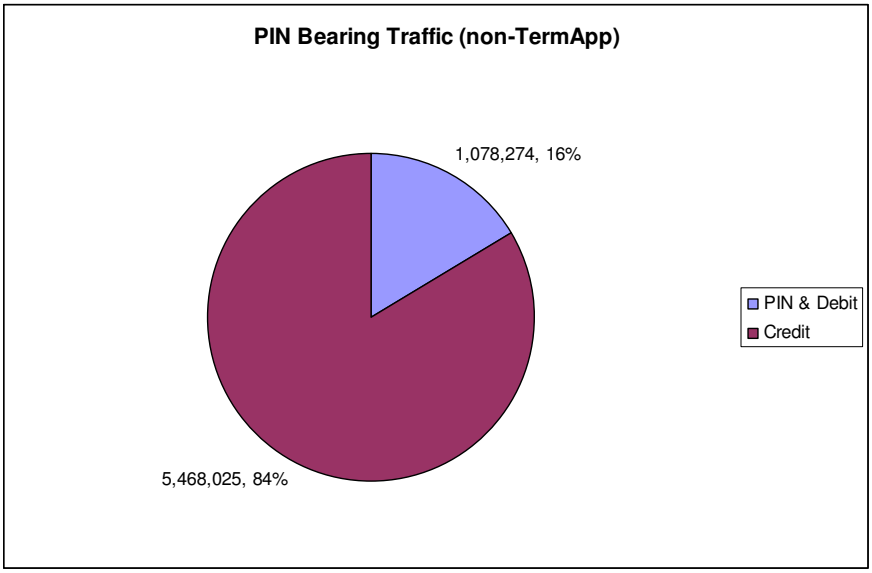
From *figure 6* above:

1. On-us (Standard Bank) accounts for 62% of all transactions
2. Local not-on-us (Bankserv) accounts for 23% of all transactions
3. International not-on-us accounts for 7% (Visa contributing 6%, MasterCard 1%)
4. Diners Club accounts for 6% of all transactions
5. A mix of other authorizers (MTN Bank, African countries via Visa, RCS etc) make up the final 2%

Debit, Credit and PIN

The mix of debit and credit card transactions is relevant because debit card transactions require a PIN. If the number of debit card and PIN bearing transactions is significant, the cryptographic overhead associated with PIN block translation must be included in the tests.

Figure 7: Debit & PIN Volumes - non Terminal Application



The figure above reflects the split between non-PIN credit and PIN bearing debit and credit transactions. *Although substantially less than that reflected for Terminal Application, the proportion of transactions bearing a PIN is still significant and must be included in the test.*

Transaction Density

This section defines the concurrent volume of transactions for non-Terminal Application source nodes

Figure 8: Non-Terminal Application Transaction Density

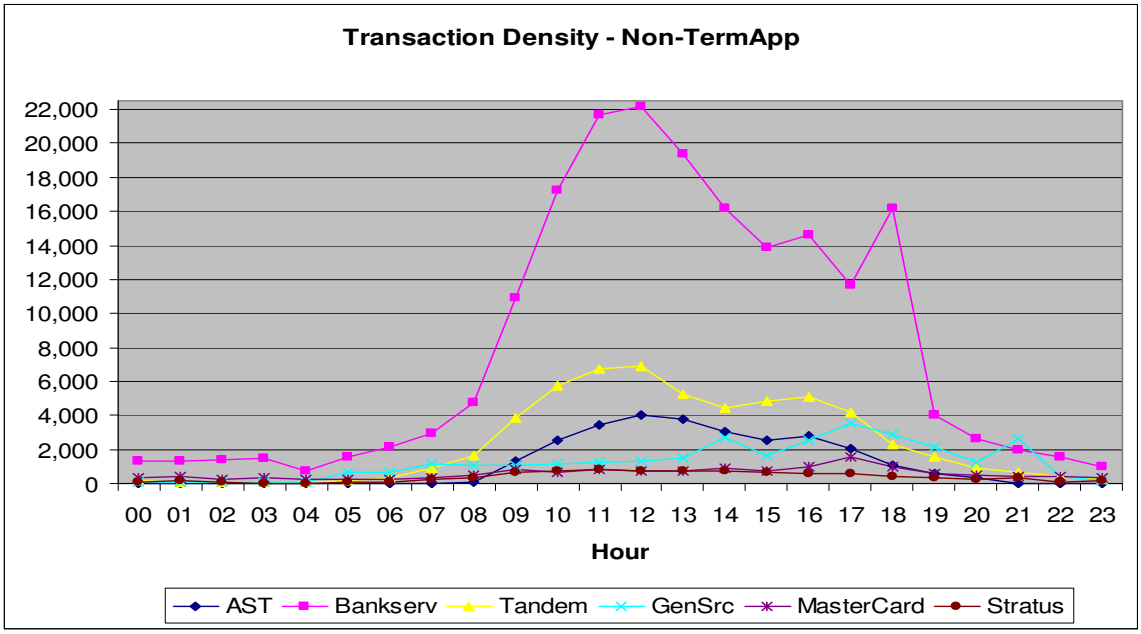


Figure 8 presents the relative transaction volumes throughout the day for non-Terminal Application source nodes. The highest volume period on any given day is between 12:00 and 13:00, with the highest volume experienced from these source nodes being 35,878 transactions for a transaction rate of 598 per minute (just less than 10 per second). The respective node peaks for this period are:

Table 5: Non-Terminal Application Peak Transaction Volumes

Node	Peak Trans/ hour	Avg. Trans/ min.	Avg. Trans/ sec.
AST	4,002	67	1.11
Bankserv	22,147	369	6.15
Tandem	6,924	115	1.92
GenSrc	1,299	22	0.36
MasterCard	728	12	0.20
Stratus	778	13	0.22

The table above reflects the peak transaction volume per hour per node along with an average per minute and per second. *Tests should use these average values for peak processing volumes*