Avaya Solution & Interoperability Test Lab

Application Notes for the InfoPlus Traffic Study with Avaya Communication Manager - Issue 1.0

Abstract

These Application Notes describe the configuration steps required for InfoPlus Traffic Study by Bristol Capital Inc., to successfully interoperate with Avaya Communication Manager.

InfoPlus Traffic Study is a remote solution that interrogates an Avaya Communication Manager system by collecting data regarding the dynamic aspects of the PBX system. The resulting InfoPlus Traffic Study report is a detailed summary of the PBX dynamic resources, and is a meaningful reporting tool for communication management to address PBX effectiveness.

Serviceability and performance tests were conducted to assess the reliability of the solution.

Information in these Application Notes has been obtained through Developer*Connection* compliance testing and additional technical discussions. Testing was conducted via the Developer*Connection* Program at the Avaya Solution and Interoperability Test Lab.

1 Introduction

InfoPlus Traffic Study by Bristol Capital Inc. is a remote solution that interrogates an Avaya Communication Manager system by collecting data regarding the dynamic aspects of the PBX system. InfoPlus Traffic Study captures all of the data to make a proper analyses as well as a graphical description of the PBX performance periods.

The InfoPlus Traffic Study solution is processed by an InfoPlus Central Database system. The InfoPlus Central Database connects to the Avaya Communication Manager platform using a dialup modem connection. The InfoPlus Central Database is challenged during the login process, presents the Server Availability Management Processor (SAMP) interface with the correct login criteria, and gains access to the Avaya Communication Manager SAT command interface. The InfoPlus Central Database then executes a subset of SAT commands specifically targeted for gathering information about the configuration on the Avaya Communication Manager system (see Appendix A for the complete list of SAT commands).

The InfoPlus Central Database manipulates the captured data into a clear and concise format that is presented to Bristol Capital's customer. From the information obtained by the InfoPlus Traffic Study solution, Avaya Communication Manager performance details are clearly organized and visualized. Business decisions can be justified based on the information detailed in the InfoPlus Traffic Study report.

See Appendix B for the InfoPlus Traffic Study Report.

The illustration below describes the network configuration used to compliance test the InfoPlus Traffic Study solution. The InfoPlus Central Database gains access to the Avaya Communication Manager platform via a modem interface, thus allowing the InfoPlus Traffic Study command-line suite of functions to be executed.

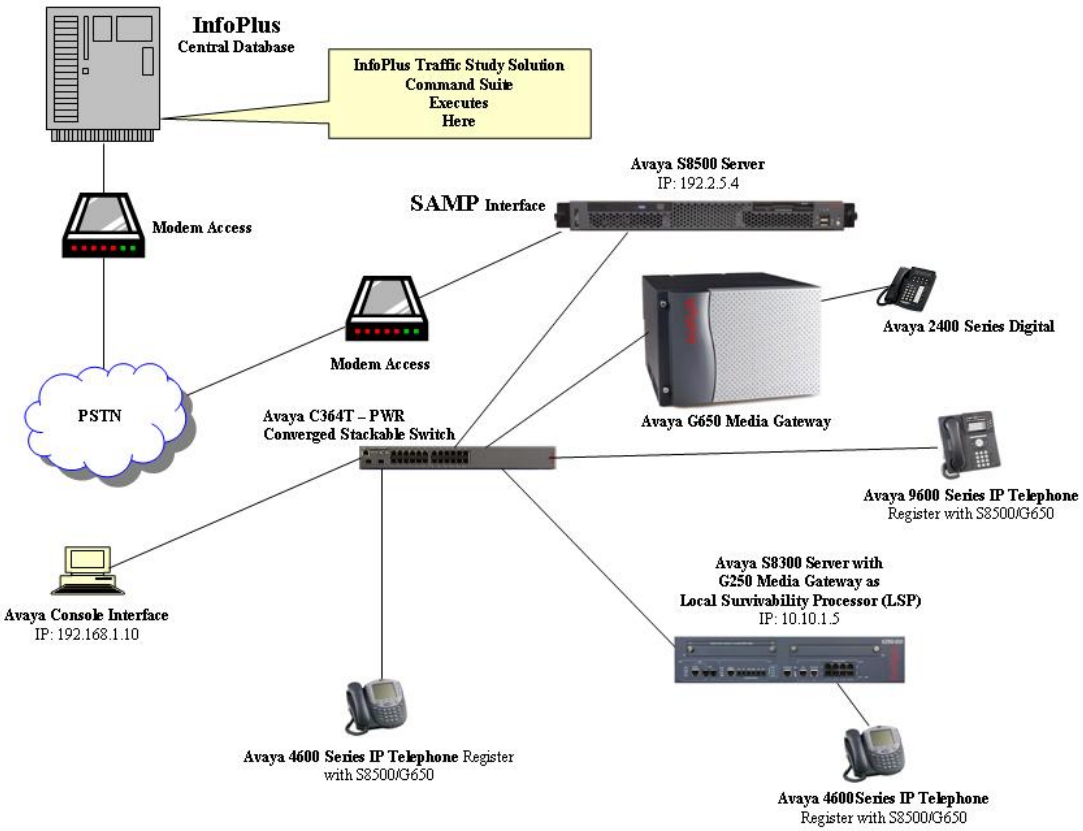


Figure 1 – InfoPlus Test Configuration

2 Equipment and Software Validated

The following table lists the equipment and software versions that were used for compliance testing.

Equipment	Software
Avaya S8500 Server with G650 Media Gateway	4.0.0(R014x.00.0.730.5)
Avaya S8300 Server with G250 Media Gateway	4.0.0(R014x.00.0.730.5)
Avaya 9600 Series IP Telephones	1.20 (H.323)
Avaya 4600 Series IP Telephones	4602: 1.8 (H.323) 4620: 2.8 (H.323)
Avaya 2400 Digital Telephones	
Avaya C363T-PWR Converged Stackable Switch	4.5.14
MultiTech System, Multi*Modem*	
InfoPlus Traffic Study Solution	Not Available [1]

[1] InfoPlus software version is for InfoPlus internal use only.

Table 1 – Hardware and Software Components

3 Avaya Communication Manager Configuration

Administration for proper modem connectivity must be performed.

3.1 Avaya Server Availability Management Processor

The Avaya Communication Manager platforms used for the compliance test were an Avaya S8500 Server with G650 Media Gateway and an Avaya S8300 with G250 Media Gateway as a Local Survivability Processor (LSP). The SAMP interface card installed on the S8500 in slot 1, allows for a modem interface connection. When the appropriate hardware and modem are installed, follow the steps below to ensure proper modem setup.

- Telnet to the S8500 system and log into the Linux interface. At the Linux system prompt, enter **sampdial –v**. A response indicating the SAMP interface is functioning should be displayed as below (SAMP OK):

  craft@S8500C> sampdiag -v
  The SAMP is using the Avaya IP address.
  SAMP HWaddress: 00:0F:29:01:4E:28
  SAMP IPaddress: 192.11.13.2 [2]
  HOST IPaddress: 192.11.13.1
  SSH port: 10022
  SSH OK
  HPI OK
  SAMP OK
  craft@S8500C>

- Setup login access for the modem interface by creating a user and assigning the user a password. At the system prompt, enter **rmbuseradd rasaccess** (rasaccess is used in this case)**.**

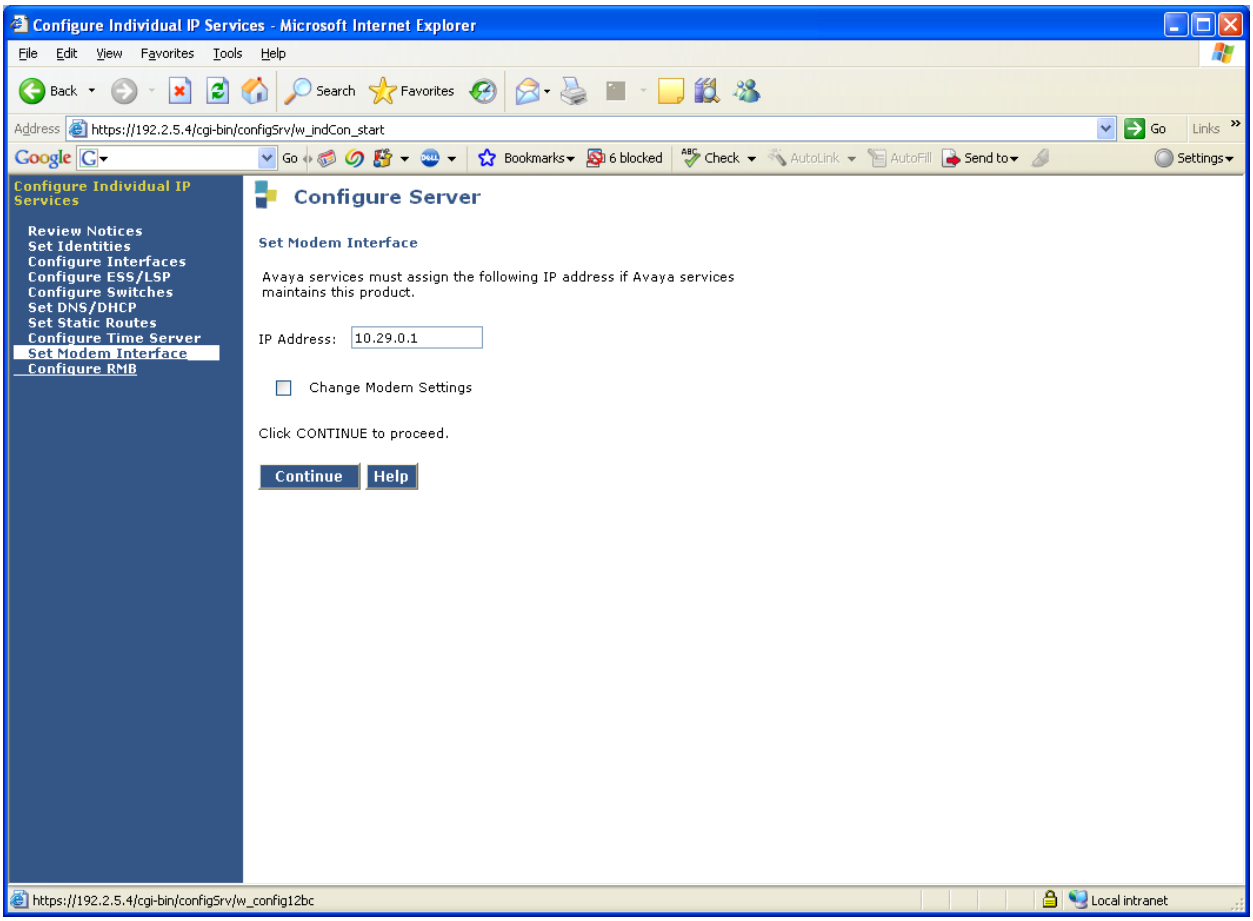
  craft@S8500C>
  craft@S8500C> rmbuseradd rasaccess
  craft@S8500C>

- Again, at the system prompt, enter **rmbpasswd rasaccess.** This will create the first password level challenge encountered by the InfoPlus Central Database processor. The password is not visible when entered.

  craft@S8500C>
  craft@S8500C> rmbpasswd rasaccess
  Enter new password:
  Re-enter new password:
  craft@S8500C>

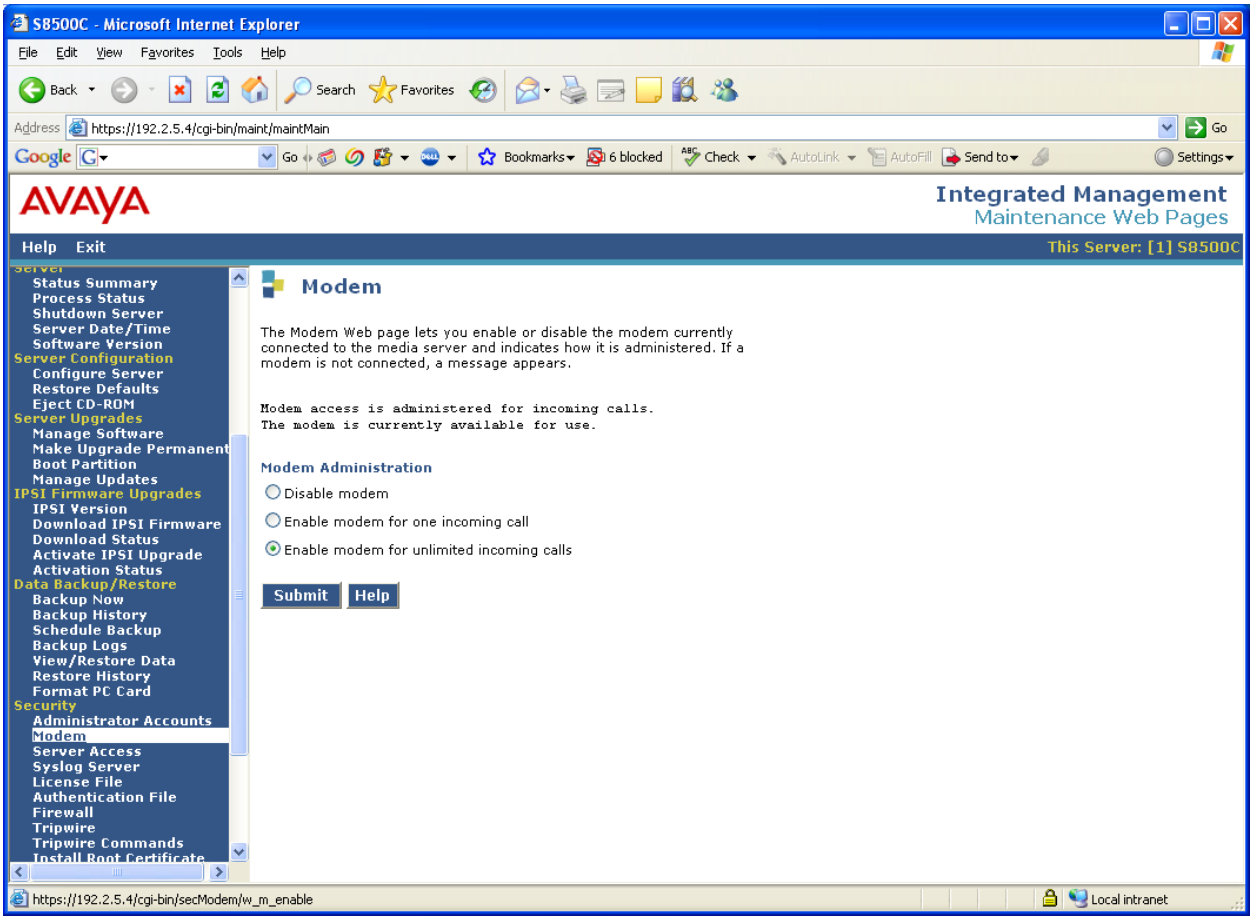
[2] Default IP addresses are listed with the "sampdiag –v" command results.

- Administration of several modem related features must be configured using the Maintenance WEB interface. Launch the Maintenance WEB interface and click on **Configure Server** from the left navigation panel. Continue and under **Configure Individual IP Services,** select **Set Modem Interface** as below. An IP address is assigned for the modem PPP connectivity session. Click **Continue** and ensure the system updated successfully.



- On the left navigation panel, click on **Modem**. Ensure that **Enable modem for unlimited incoming calls** is enabled. Click **Submit** and ensure that the following message, as displayed below, is obtained:

  Modem access is administered for incoming calls.
  The modem is currently available for use.



4 InfoPlus Traffic Study Configuration

The InfoPlus Traffic Study solution is not a software package that is configured or operates at the customer premise; therefore the customer does not require any setup knowledge of the InfoPlus Traffic Study solution. All the system expertise is completely centralized to the InfoPlus Central Database location.

A pre-determined set of passwords and a network IP address must be known by the InfoPlus system administrator to allow modem access to occur. The Avaya system administrator needs to communicate the following information to InfoPlus:

- Telephone number for modem access
- Remote access modem login
- Remote access modem password
- Assign IP address for "telnet" session
- SAT login access
- SAT login password

5 Interoperability Compliance Testing

Interoperability compliance testing included InfoPlus Central Database connectivity, command-line implementation, and serviceability.

Connectivity between systems was pre-arranged by Avaya and Bristol Capital, whereby logins, passwords, and a modem IP address were setup in the InfoPlus Central Database processor. The InfoPlus Central Database processor dialed into the SAMP interface using the modem logon and password, after which a PPP session was created. A telnet to the modem IP address allowed access to the Linux interface. After logging in using the **craft** login and password, the SAT interface was acquired. The InfoPlus Central Database processor runs a command-line suite of functions from this interface.

InfoPlus Traffic Study collected data from Avaya Communication Manager once each hour for a scheduled period of time. Once each hour, for a period of three hours (as scheduled for Compliance test), a call was made by the InfoPlus Central Database processor to Avaya Communication Manager, and gathered data reflecting the Avaya Communication Manager activity for the previous hour. Traffic produced by the Hammer Bulk Call Generator was varied over the three hour interval to product different statistical traffic data. The results of the InfoPlus Traffic Study can be seen in Appendix B Section 2.

The serviceability tests introduced modem connectivity failure scenarios. The failures were performed by pulling out the modem telephone line while the InfoPlus Central Database processor was actually in session. Recovery was accomplished by plugging the telephone line back in and restarting the InfoPlus Central Database processor login session. The last command-line entered at the time of the failure was the point of pickup as the set of command-line functions continued.

5.1 Test Results

All command-line functions geared for the InfoPlus Traffic Study service passed compliance testing. The output captured and formulated in a value-added concise format, passed compliance testing. Serviceability compliance tests passed.

6 Verification Steps

- Compare the output produced by the InfoPlus SourceBook solution with the configuration of the Avaya Communication Manager system.

- Because the Avaya Communication Manager system under test was not a real on-line production system, additional call flow traffic was introduced using the Empirix Hammer Bulk Call Generator, so that meaningful data would be collected and processed by the InfoPlus Traffic Study solution. Therefore:
  - The Hammer was programmed to produce a different rate of calls per hour, for a three hour study period.
  - Once each hour during the study period, the InfoPlus Central database would call Avaya Communication Manager and gather the statistical data.

The number of calls made by the Hammer, verses the number of calls displayed in the InfoPlus Traffic Study report over the three hour period, although a close approximation, is determined to be correct (see graphical data in appendix B section 2).

7 Support

Technical support for Bristol Capital's InfoPlus Traffic Study can be obtained by contacting Bristol Capital Inc. at 201-476-0600 or by sending e-mail to support@infoplusonline.com.

8 Conclusion

This Application Note describes what is required to allow Bristol Capital's InfoPlus Traffic Study solution to interoperate with Avaya Communication Manager. The result of the interoperability testing is presented in Appendix B.

9 References

This section references the Avaya and Bristol Capital documentation that are relevant to these Application Notes. The Avaya product documentation can be found at http://support.avaya.com, and information regarding InfoPlus Traffic Study can be obtained at http://www.infoplusonline.com.

[1] Using the Avaya Server Availability Management Processor (SAMP) - Issue 4), February 2007

10 Appendix A

The categories of the SAT commands run by the InfoPlus Central Database are listed in the following table.

SAT Command Categories by InfoPlus Service
• Extensions • Config All • Stations • Data Modules • Attendants • Announcements • Trunk Groups • Trunk Group Details • Config DS1 • Status System All Cabinets • Cabinets • Capacities • Config Software • Offer • Customer Options • Aliases • Media Gateways • Media Gateway Details

A full set of actual SAT commands for the InfoPlus suite is listed in the following table.

Command Category	Command Syntax
Extension List:	list extension-type
Abbreviated Dialing Groups:	list abbrev group
Abbreviated Dialing Groups Details:	disp abbrev system disp abbrev group X Where X is each group listed by “list abbrev group”
Abbreviated Dialing Personal:	list abbrev personal

Command Category	Command Syntax
Abbreviated Dialing Personal Details:	disp abbrev personal X list Y Where X and Y are all the possible values from "list abbrev personal"
Announcements Detail:	disp announcements
Attendants Detail:	display attendant X Where X is 1 through 28 inclusive
COS Detail:	disp COS
COR Detail:	display COR X Where X can be 0 through 996 inclusive. (For Security Audits, retrieve every COR that exists. For all other services, intelligently determine those that are in use by analyzing Authorization Codes, Extensions, Remote Access and Trunks)
ARS Analysis:	list ars analysis
AAR Analysis:	list aar analysis
Config All:	list config all
Config DS1:	list config ds1
Config Software:	list config software
Coverage Answer:	list coverage answer
Coverage Answer Details:	disp coverage answer X Where X is each value from "list coverage answer"
Coverage Path:	list coverage path
Coverage Path Detail:	disp coverage path X Where X is each value from "list coverage path"
Remote Coverage Path Details:	disp cov rem OR (if switch needs an Identifier) disp cov rem X Where X is each value from 1-10 inclusive
Data Modules:	list data
Hunt Groups:	list hunt-group
Hunt Group Details:	disp hunt-group X Where X is each value from "list hunt-group"
Intercom Groups:	list intercom-group

Command Category	Command Syntax
Intercom Group Details:	disp intercom-group X Where X is each value from "list intercom-group"
Pickup Groups:	list pickup-group
Pickup Group Details:	disp pickup-group X Where X is each value from "list pickup-group"
Route Patterns:	list route-pattern
Route Pattern Detail:	display route-pattern X Where X is each value from "list route-pattern"
Trunk Groups:	list trunk-group
Trunk Group Details:	disp trunk-group X Where X is each value from "list trunk-group"
Paging:	disp paging loudspeaker
Capacities:	disp capacities
Offer:	display system-parameters offer
Partitioned Group:	list partitioned-group
Partition Route Table:	list partition-route-table
Toll:	list toll all
Bridged:	list bridge X Where X = each extension found in the Extension list
Stations:	list station
Logins:	list login
Login Details:	display login X Where X is each value from "list login"
Permissions:	display permission Where X is each value from "list login"
Features:	display system-parameters feature
Maintenance:	display system-parameters maintenance
Security:	display system-parameters security
Dial Plan:	display dialplan analysis
IP Services:	display ip-services
CDR:	display system-parameters cdr
Feature Access Codes:	display feature-access-codes

Command Category	Command Syntax
Aliases:	display alias station
Remote Access:	display remote-access
Time of Day Routing:	display time-of-day X Where X is every value from 1-8 inclusive
Report Schedule:	list report-scheduler
Authorization Codes:	list authorization-code
Agent LoginIDs:	list agent-loginID
Vectors:	list vector
Vector Details:	display vector X Where X is each value from "list vector"
Media Gateways:	list media-gateway
Media Gateway Details:	display media-gateway X Where X is each value from "list media-gateway"
Listed Directory:	disp listed-directory-number
Alternate FRL:	disp alternate-frl
Traffic Measurement:	disp meas-selection trunk-group disp meas-selection route-pattern
Tenants:	display tenant X (Only if Tenant Partitioning is enabled in Customer Options) Where X is each value from 1-100 inclusive
Off PBX Feature Name Extensions:	display off-pbx-telephone feature-name-extensions
Status System Cabinets:	status system all-cab
Cabinet Details:	status cabinet X Where X is each value from "list config-all"
Call Forwarding:	list call-forwarding
ASG History:	list asg-history
VDNs:	list vdn
VDN Details:	display vdn X Where X is each value from "list vdn"
Off PBX Station Mapping:	list off-pbx-telephone station-mapping
ARS Digit Conversion:	list ars digit-conversion

Command Category	Command Syntax
AAR Digit Conversion:	list aar digit-conversion
Traffic Measurements	list measurements attendant group list measurements attendant posit list measurements call-rate **OR (on newer switches)** list measurements call-rate total list measurements block pn last list measurements load-b total last list measurements tone-r summ last list measurements trunk-gr summ last list measurements occup summ list measurements ip dsp-resource summary last-hour (if available)

10.1 Appendix B

The result of compliance testing the InfoPlus Traffic Study solution is attached in this appendix. Note: Blank pages in the report were intentionally omitted.

InfoPlus

Traffic Study

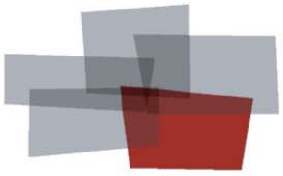
"How well is my PBX performing?"

Produced For

Avaya Compliance Testing

Customer Number:

Reflecting PBX Information from: **6/27/2007 - 7/2/2007**



Inventory
Configuration
Performance
Security
Backup

DISCLAIMER

The information contained in this document is based upon data retrieved remotely from a PBX system. Some of the information presented may be derived, in whole or in part, from this data. Inconsistent and/or incorrect programming of the PBX may cause these derivations to be inaccurate. For the sake of consistency in these reports, there may be cases in which a best–effort attempt is made to derive particular information based upon related data in the PBX. As the reporting facilities of the PBX's hardware and software improve, the enhanced data will lead to more accurate InfoPlus reports. Technical errors encountered during the remote transfer of data from the PBX may cause spurious results in the report. Bristol Capital, Inc. does not guarantee the accuracy of the information presented, although reasonable attempts have been and will continue to be made to ensure InfoPlus reports are as accurate as possible.

This report and the information contained herein is to be used only for the purposes intended. Any disclosure of the information contained herein to parties other than the subscriber of this service, or the organization whose information is represented, is strictly prohibited.

Communications Management with InfoPlus

Regardless of the size or type of organization, there are a few basic concerns of every communications manager. InfoPlus services help address those various concerns through its integrated suite of reports and analyses.

Inventory
Configuration
Performance
Security
Backup

Performance – The InfoPlus Traffic Study consists of analyses and recommendations that address the dynamic aspects of a communications system. Presented as a consultative report (as opposed to a "data dump") the Traffic Study addresses system resources, networks, trunks, processors and even operator consoles. Internal blockages and excessive costly outside facilities are identified and recommendations are made to reduce costs and improve service. Annual Traffic Studies are an important ingredient to consistent high quality and cost effective communications.

While the InfoPlus Traffic Study will improve the cost effectiveness of your communications, you may recognize the need for additional system information, answering questions such as, "Which of my three T-1's really is Trunk Group 3?". The InfoPlus SourceBook defines all the system programming that makes your communications system uniquely yours. Graphics of each set, identification of each software group (Call Pick-up, Intercom, etc.), Trunk Groups, call routing and even service improving Action Items are assembled uniquely for your system.

Other services in the InfoPlus suite include:

Inventory – InfoPlus Site Survey
- Inventory of the major PBX hardware and software components
- "End-of-Life" analysis pinpoints unsupported equipment
- Access to database for enterprise customers

Configuration – InfoPlus SourceBook
- Details a PBX system's programming
- Graphics of each set and each button's feature or line assignment
- Lists of each defined group (Intercom, Call Pick-up, etc.)
- Clearly defines trunking, call routing and even calling privileges
- Service-improving Action Items are uniquely determined for your system

Security – InfoPlus Security Audit
- Detailed, computerized review of the system's programming
- Analyses of 83 separate features with security implications
- Each analysis consists of a feature description, the security concerns and recommended changes in programming
- One hour of personal consultation is included

Backup – InfoPlus Backup Service
- Off-site backup of your PBX's configuration
- Available at any time for restoration through the internet

Please contact your telecommunications vendor for additional information about these services.

Table of Contents

Introduction

We are pleased to provide you with the following Traffic Study to help you identify and address areas of concern involved with the performance of your telecommunications system.

A Traffic Study can be broken down into three general categories. There are several reports on switch performance, measuring among other things the balancing of traffic among available resources, the sufficiency of common resources such as Tone Receivers, and even the processor itself. Generally, these are engineering issues and not directly related to either costs or the quality of service during normal conditions. However, addressing any issues raised will ensure proper service as the business continues to evolve. A second part of the study, the Trunking section, addresses both costs and service. Too few trunks and service to either internal or outside callers suffers, too many trunks and you are paying far more in monthly telephone company charges than is necessary. The last category addresses issues of Operator activity and performance with objective data.

Each section has its own introduction explaining exactly what it is that is being measured and how to interpret the results. Occasionally we found it necessary to use some jargon, however, at the end of the report is a glossary of terms for your reference.

Just as we bring our cars in for periodic servicing, an annual Traffic Study is a prudent step in ensuring cost-effective and reliable communications.

Study Methodology

The Avaya PBX/Media Server comes equipped with registers specifically provided to collect traffic data. This data, if accumulated over a period of time, is the most meaningful information which can be analyzed to help determine the performance of the switch, the sufficiency of the Trunk Groups connected to the switch, and the work load of the attendant consoles. Once each hour during the study period, a call was made to the PBX system to extract traffic data reflecting activity experienced during the previous hour. This data has been accumulated during the study period and processed afterwards to yield the following report.

The data for this Traffic Study was collected over the following period:

Data Collection Dates: 6/27/2007 - 7/2/2007
Number of Days in Study: 5
Beginning Hour: 8AM
Hours Per Day: 12

Collected Data

The following table shows the days and hours of traffic data which were collected for the production of this Traffic Study. Depending on the configuration of the study, there may be no data collected during Saturday and/or Sunday. Due to technical difficulties or inaccessibility to the PBX, some individual hours of information may have been unobtainable. A bullet (•) indicates all data was retrieved successfully from the PBX for that hour, while an upper-case letter indicates missed data. (see the legend below) Up to five attempts are made during the hour to retrieve the traffic data from the PBX, and the last trouble encountered is reported.

Captured Data Legend	
• - All Data Captured	
A - Access Failure	D - Data Incomplete
B - Busy	O - Other Error
C - Communications Failure	- Not Called

Day	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM
Wed 6/27/07	•	-	-	-	-	-	-	-	-	-	-	-
Thu 6/28/07	•	•	•	-	-	-	-	-	-	-	-	-
Fri 6/29/07	-	-	-	-	-	-	-	-	-	-	-	-
Sat 6/30/07	-	-	-	-	-	-	-	-	-	-	-	-
Sun 7/1/07	-	-	-	-	-	-	-	-	-	-	-	-
Mon 7/2/07	-	-	-	-	-	-	-	-	-	-	-	-

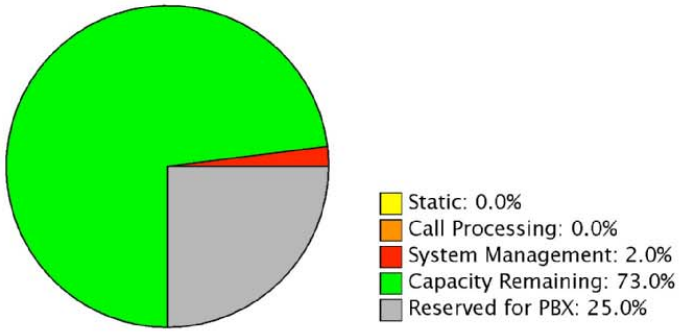
1.1. Processor Occupancy

The information below provides an indication of the busyness of the system, and the system's ability to satisfy all of the demands placed upon it. The processor is the engine which drives your PBX, much like the engine in your car. Just as your car's engine has finite horsepower, the processor in your PBX also has finite processing power.

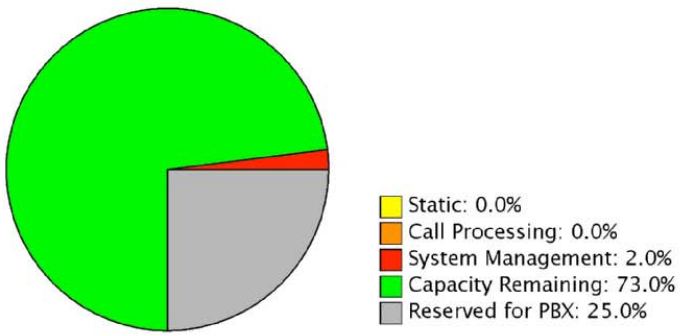
Processor activity may be broken up into three categories - Static, Call Processing and System Management. For both the Maximum Busy Hour and the Average Bouncing Busy Hour, the following graphs depict the percentage of the processor's time spent in each of the three tasks. Static Occupancy consists of high priority background tasks in support of call processing, maintenance and administrative functions. Call Processing Occupancy represents call processing activity. System Management Occupancy represents lower priority tasks such as administrative and maintenance command processing.

It is recommended that the sum of Static and Call Processing Occupancy never exceed 75% of total Processor Occupancy. Thus, in the graphs below, we recommend reserving 25% of the processor's horsepower when planning changes or increased usage.

Maximum Processor Utilization (Thu 6/28/07 8-9AM)



Average Processor Utilization



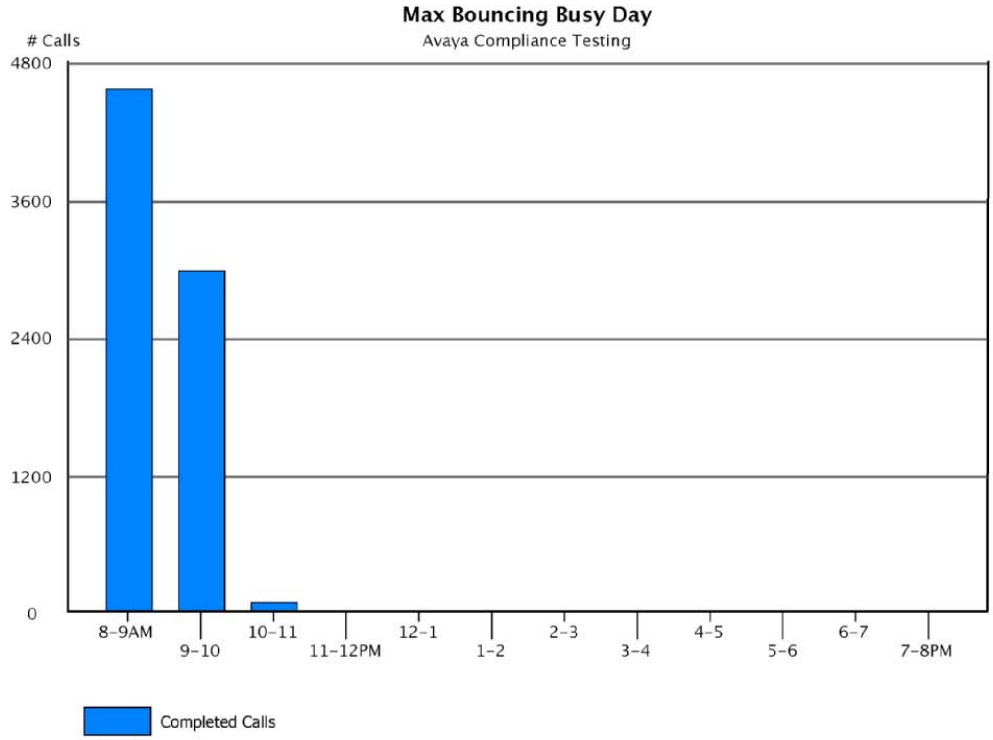
2. Networks

2.1. Bouncing Busy Hour Traffic

After Processor Occupancy, another way to measure overall system activity is by counting the total number of calls, of all types (incoming, outgoing, internal, etc.) handled by the PBX during the study period. In the following graph, each column represents the heaviest volume of calls experienced during the study period for the given hour. The number of calls (indicated on the left hand side of the graph) include all completed calls regardless of type (internal, incoming or outgoing).

The primary purpose of this report is to identify system-level peak calling activity and the hour(s) that the activity occurred. Typically, the busiest hour for peak calling activity will be the same as the peak hour for all Trunk Groups, which is identified in the Trunking Section.

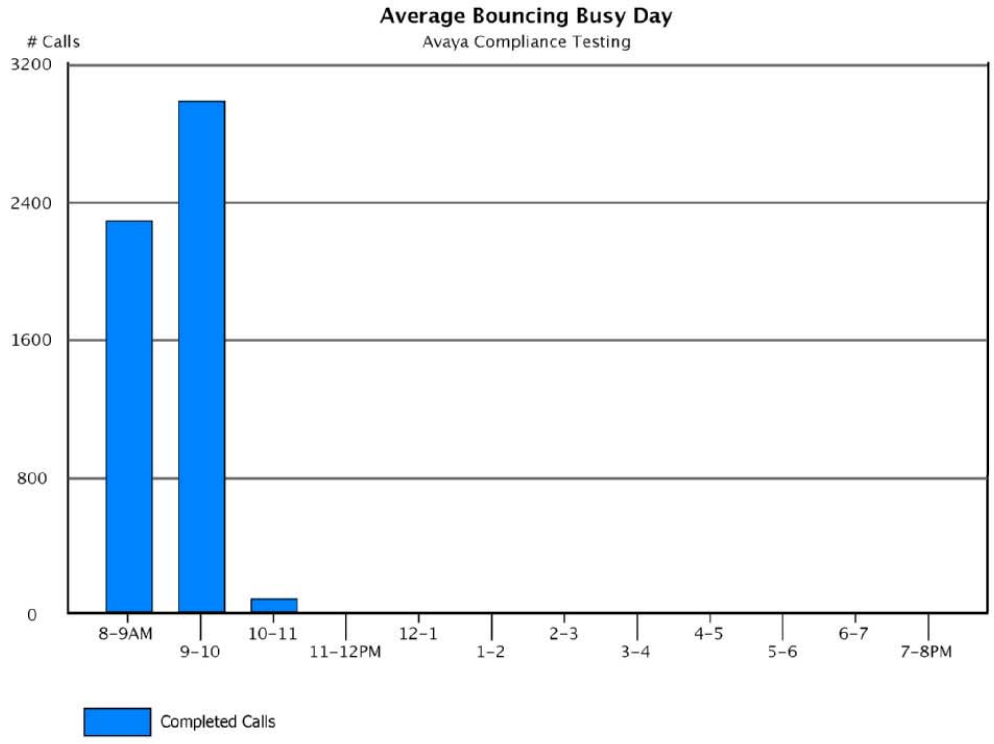
While there is no action to be taken as a result of this information, it is interesting to note the differences between this graph, the maximum Busy Hour Traffic, and the results of the next analysis, on the following page.



2.2. Average Hourly Traffic

If we were to take all of the calls generated over the course of the study and obtain averages for each hour of the day, we would obtain the results below. A comparison between this graph and the preceding one will give an indication of the "peakedness" of the traffic, or the degree of change from the extremes (shown previously) as opposed to the average (shown here).

If there is a wide variation between the previous analysis and this one, it could be that the study included weekends which may have less traffic than the normal workweek. Light traffic weekends would bring the average down, but not effect the Busy Hour data at all.



2.3. Port Network Traffic

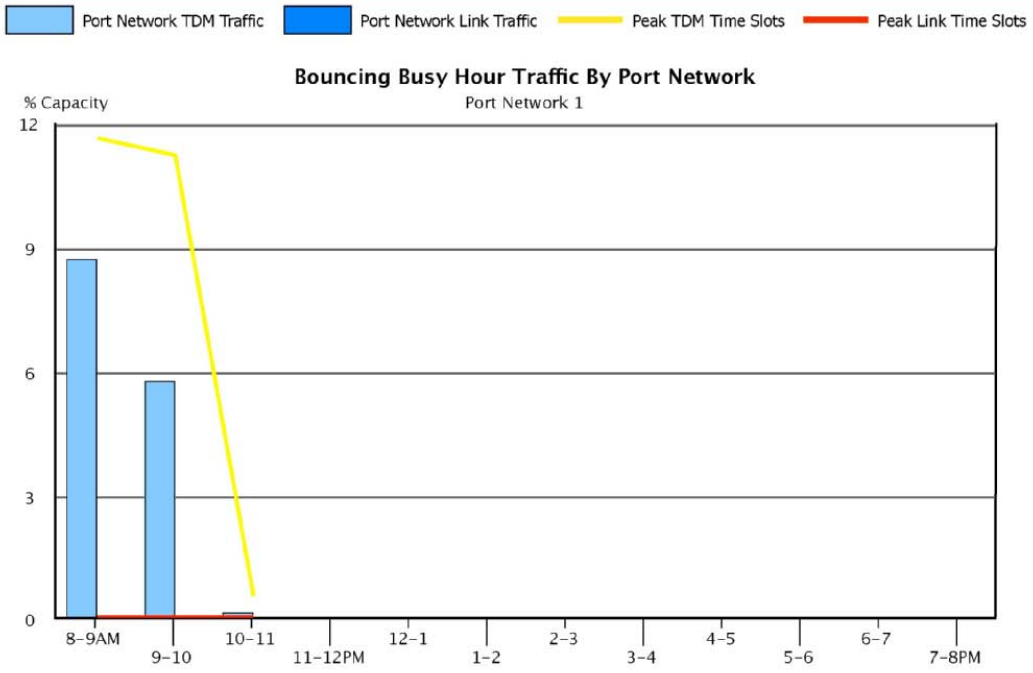
The following graphs can be used to determine the need for additional Port Networks, and to help balance traffic among existing Port Networks in multi-network systems. Planning for growth is also simplified as the graphs will enable one to easily determine those network groups where there are resources available for expansion, and those where any additional growth should be avoided.

Each port in your system is assigned to a card which is associated with a Port Network. Each Port Network can support 512 time slots for TDM traffic, of which 483 are useable as connections (the others serve system functions). This equates to a maximum TDM traffic carrying capacity of 17,388 CCS per Port Network.

For multi-Port Network systems, there is also a finite amount of traffic carrying capacity between the Port Networks, over Port Network Links. This capacity varies based on available time-slots.

In the following graphs (one for each Port Network) the bars represent the greatest volume of traffic experienced for each hour during the course of the study period. For each hour, we display the percentage of capacity used for both TDM traffic and inter-Port Network (Link) traffic. The lines show the same capacities based on number of time-slots instead of usage.

To balance usage across Port Networks, facilities should be moved from Port Networks with a high percentage of capacity used to those with lower percentages of capacity.



3. Service Denials

3.1. Port Network Blocking

Should system demand be so high that the PBX is unable to accommodate additional requests for a time slot, blockage will occur at either the Port Network TDM or Port Network Link level. The following report will present all blockages found during the study period on Port Networks or Port Network Links. For each blockage, we note on which Port Network the blockage occurred, and specify whether the blockage was experienced on the Port Network time slots (TDM), or the Port Network Links.

In either case, the solution to blockages is to move resources (stations and/or Trunks) to another Port Network that is less heavily used.

Blocking

Port Network	Blocks	Block Type	Hour	Day	Peg	CCS
There were no blocks during the study period.						

3.2. Tone Receivers

The data in this section can be used to determine the need for additional Tone Detector or Tone Generator circuit packs. If any tone requests were queued or denied during the study, we note the date and time, the type of Tone Receiver, the greatest number of simultaneous requests, the greatest number of queued requests, and the number of requests denied because a queue was unavailable.

Only DTMF and CC-TTR requests may be queued. Maximum queue sizes are 4 for DTMF requests and 80 for CC-TTR.

If this report indicates any denials, additional Tone Receivers, equal to the number of Peak Denials, should be added to your system. If you wish to ensure that requests are fulfilled immediately and never queued, you need enough Tone Receivers to handle the peak number of requests.

Tone Receivers

Date	Time	TR Type	Peak Requests	Peak Queued	Peak Denied
There were no requests for Tone Receivers that were either Queued or Denied.					

4. DSP Resources

4.1. DSP Resources Traffic

The following pages provide information on DSP Resources allocated to IP Regions.

In this section the graphs represent the average daily traffic experienced by each IP Region for each hour of the day. The tables above the graphs provide further detail by highlighting the busiest hour during the study period and averaging together each daily busy hour for this IP Region. By examining the peg counts, DSP usage and the percentage of blocked call attempts, a determination can be made to add or remove DSP resources for a given region. To ensure that all calls complete, the number of Denied Pegs in each IP Region should be zero.

IP Region: 1

Maximum Busy Hour Traffic - Day Wed 6/27/07 8-9AM

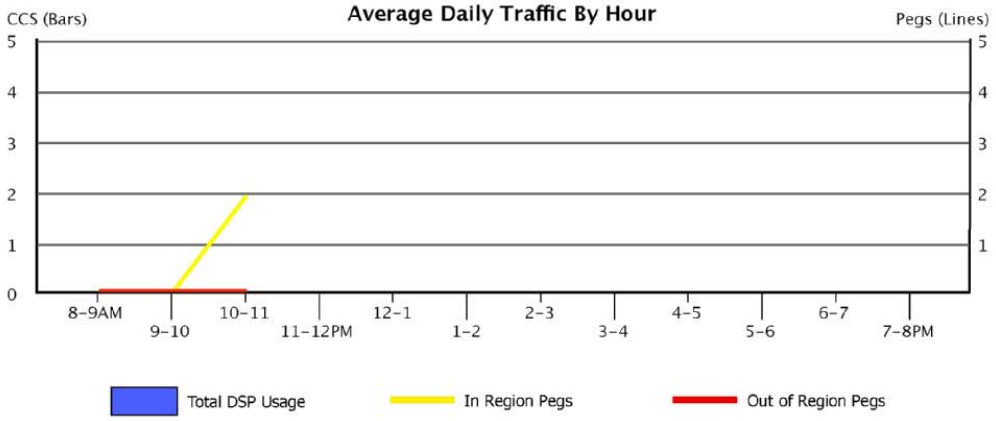
Usage: 0 CCS
Denied Pegs: 0 Pegs
% Blocked Pegs: 0% of Pegs
% Time Out of Service: 0% of time

	Peg Count	Percent
In Region Pegs	0	100
Out of Region Pegs	0	100
Totals	**0**	**100%**

Average Bouncing Busy Hour

Usage: 0 CCS
Denied Pegs: 0 Pegs
% Blocked Pegs: 0% of Pegs
% Time Out of Service: 0% of time

	Peg Count	Percent
In Region Pegs	0	100
Out of Region Pegs	0	100
Totals	**0**	**100%**



IP Region: 2

Maximum Busy Hour Traffic - Day Wed 6/27/07 8-9AM

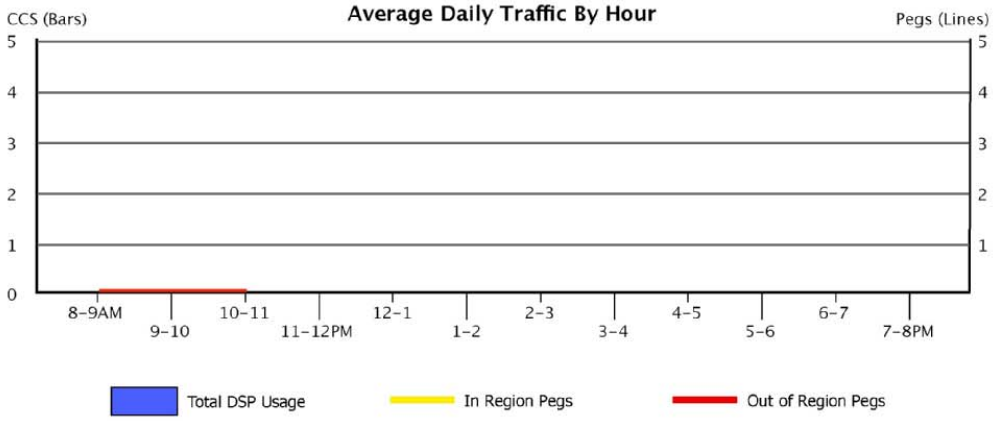
Usage: 0 CCS
Denied Pegs: 0 Pegs
% Blocked Pegs: 0% of Pegs
% Time Out of Service: 0% of time

	Peg Count	Percent
In Region Pegs	0	100
Out of Region Pegs	0	100
Totals	**0**	**100%**

Average Bouncing Busy Hour

Usage: 0 CCS
Denied Pegs: 0 Pegs
% Blocked Pegs: 0% of Pegs
% Time Out of Service: 0% of time

	Peg Count	Percent
In Region Pegs	0	100
Out of Region Pegs	0	100
Totals	**0**	**100%**



5. Trunking

5.1. Trunk Group Traffic

The following pages provide information on the usage of the Trunk Groups in your system. A traffic engineering analysis has been performed for each group to help assess the need to add or remove trunks, based strictly upon the levels of service for each Trunk Group.

On the following pages, the graphs present the average daily traffic experienced by each Trunk Group for each hour of the day. The tables above the graphs provide further detail by 1) highlighting the busiest hour during the study period and 2) averaging together each daily busy hour for this Trunk Group. An aggressive approach to service would use the Maximum Busy Hour data for traffic engineering purposes, while a more conservative approach would use Average Bouncing Busy Hour data. The aggressive approach will yield better service, requiring more trunks (and is probably more expensive). Using similar conventions as in previous graphs, the columns show usage (expressed in CCS), the yellow line displays the number incoming calls, and the red line displays the number of outgoing calls.

We have performed traffic engineering calculations for both the Maximum Busy Hour and Average Bouncing Busy Hour, and provide three different service levels (P.01, P.02 and P.05) for each. The trunking recommendations are displayed in the yellow box of each section.

Did you know?

While this InfoPlus Traffic Study will identify the volume and nature of calls handled by the PBX system, an InfoPlus Security Audit will ensure all traffic was intended and appropriate usage. Also, the 'Trunk Groups' and 'Route Patterns' sections of the InfoPlus SourceBook would add greater meaning and definition to the following pages.

Trunk Group: 7 **Type:** ISDN **Equipped:** 23 **Working:** 23 **Queue Size:** 0

Maximum Busy Hour Traffic - Thu 6/28/2007 8-9AM

	Peg Count	Percent
Incoming Calls	4600	100.0
Outgoing Calls	0	0.0
Overflow Calls	0	0.0
Totals	**4600**	**100.0**

Usage: 755 CCS
Avg. Call Duration: 0.3 min.
All Trunk Busy: 65% of the hour
Blocked/Overflow: 0% of calls

Trunking Recommendations (using Erlang C)

Service Objective	P.01	P.02	P.05
Trunks Needed	34	32	30

Average Bouncing Busy Hour Traffic

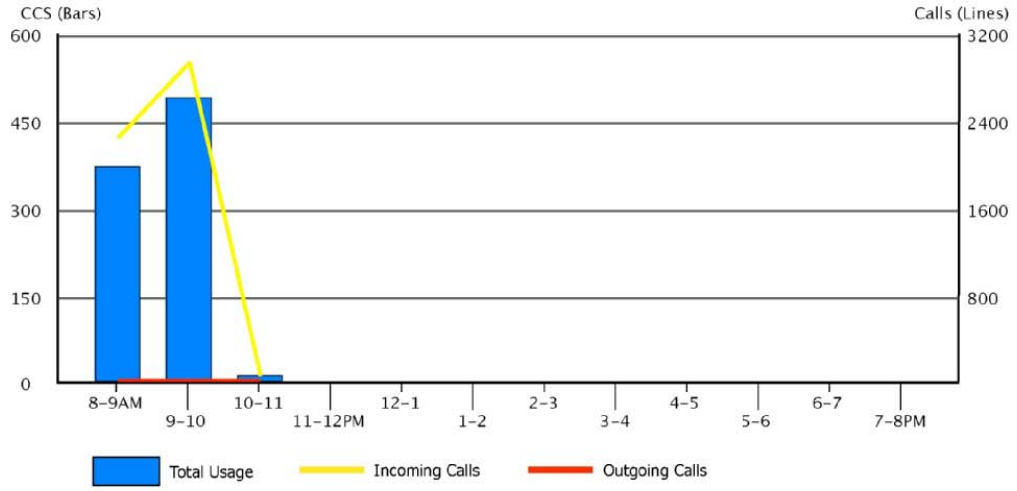
	Peg Count	Percent
Incoming Calls	2300.0	100.0
Outgoing Calls	0.0	0.0
Overflow Calls	0.0	0.0
Totals	**2300.0**	**100.0**

Usage: 377.5 CCS
Avg. Call Duration: 0.3 min.
All Trunk Busy: 32.5% of the hour
Blocked/Overflow: 0.0% of calls

Trunking Recommendations (using Erlang C)

Service Objective	P.01	P.02	P.05
Trunks Needed	20	19	17

Average Daily Traffic by Hour



Note: *There may be additional demand from incoming calls currently receiving busies from the network. Additional trunks are needed to improve service.*

Trunk Group: 8 **Type:** ISDN **Equipped:** 6 **Working:** 6 **Queue Size:** 0

Maximum Busy Hour Traffic - Wed 6/27/2007 8-9AM

	Peg Count	Percent
Incoming Calls	0	0.0
Outgoing Calls	0	0.0
Overflow Calls	0	0.0
Totals	**0**	**100.0**

Usage: 0 CCS
Avg. Call Duration: 0.0 min.
All Trunk Busy: 0% of the hour
Blocked/Overflow: 0% of calls

Trunking Recommendations (using Erlang B)

Service Objective	P.01	P.02	P.05
Trunks Needed	1	1	1

Average Bouncing Busy Hour Traffic

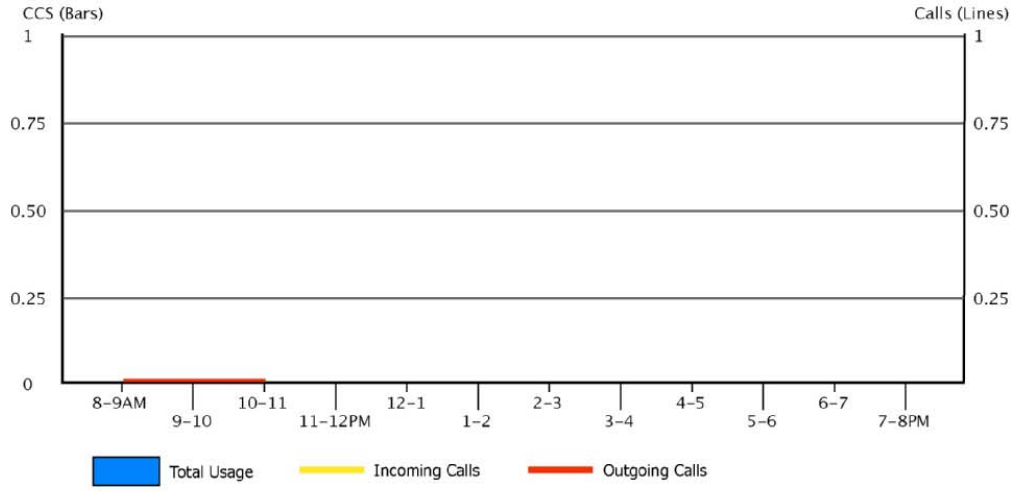
	Peg Count	Percent
Incoming Calls	0.0	0.0
Outgoing Calls	0.0	0.0
Overflow Calls	0.0	0.0
Totals	**0.0**	**100.0**

Usage: 0.0 CCS
Avg. Call Duration: 0.0 min.
All Trunk Busy: 0.0% of the hour
Blocked/Overflow: 0.0% of calls

Trunking Recommendations (using Erlang B)

Service Objective	P.01	P.02	P.05
Trunks Needed	1	1	1

Average Daily Traffic by Hour



5.2. Trunking Worksheet

To make it convenient for you to note changes to trunking that you wish to make, we have provided a summary of the recommendations made for each Trunk Group. Determining the proper number and type of trunks for outgoing calls is usually an economic decision and not one based strictly on Service Objectives. This would be particularly true if the Trunk Group in question is at the beginning of the selection order.

In the worksheet below, the "Dir" column indicates the direction of the usage, whether Incoming, Outgoing or Both-way. Service Objective levels of P.01, P.02 and P.05 have been calculated for both the Maximum Busy Hour and the Average Bouncing Busy Hour. The Service Objective is the statistical probability that calls will be blocked during the hour.

Did you know?

As many of these Trunk Groups may overflow to other Trunk Groups, one should not make decisions to add trunks to any group based solely on the information contained in this summary. For better decision making, the 'Route Patterns' section of the InfoPlus SourceBook should be consulted before initiating significant changes.

Trunking Worksheet

Trk			#	#	Max Busy Hour			Avg Busy Hour			
Grp	Type	Dir	Eqpd	Wrkg	P.01	P.02	P.05	P.01	P.02	P.05	Add/Delete
7	ISDN	In	23	23	34	32	30	20	19	17	
8	ISDN	N/A	6	6	1	1	1	1	1	1	
7	ISDN	In	23	23	34	32	30	20	19	17	
8	ISDN	N/A	6	6	1	1	1	1	1	1	

6. Console Activity

6.1. Console Work Load – Peg Counts of Calls

The graph below shows the average number of calls handled by the console workforce, and the amount of time the consoles were manned and servicing calls for the average day during the study period. The columns display the number of calls handled using the scale on the left side of the graph. The lines show the amount of time the consoles were manned (red line), and the amount of time actually spent servicing calls (yellow line). The 'Min.' scale on the right side of the graph is used to interpret these values.

On the following pages, we display the same information for each console per day, using the same conventions noted above.

There are no consoles defined.

6.2. Console Time Spent in the Processing of Calls

The following graphs display two important pieces of information concerning console management - call duration and hold time.

The graph below shows the call duration and total hold time for all consoles averaged over the course of the study period. The yellow line displays the average duration of all operator calls in seconds, interpreted using the 'Sec/Call' scale on the right of the graph. The bars display the total number of minutes calls were placed on hold, interpreted using the 'Min.' scale on the left of the graph.

On the following pages, we display the same information for each console per day, using the same conventions noted above.

There are no consoles defined.

7. Console Performance

7.1. Overlay Graphs

Generally, there are two overall factors which have a pervasive affect on console performance - the number of calls handled by the attendant force and the number of consoles manned. As the number of calls increase or the number of attendants decrease, we would expect overall console performance to suffer accordingly. Increases in delay time and abandoned calls would be symptomatic of increased activity.

To help assess these dynamics, we have developed the following overlays. The overlays graphically portray both the numbers of calls handled by the entire attendant force and the number of consoles manned for each hour and each day of the study. The number of consoles is actually a summation of the total manned timed for all consoles during a given hour, divided by 60 minutes, yielding the effective net number of consoles for that hour.

When placed upon a graph of 'Abandoned Calls' for example, (matching the date of the overlay graph with the date of the Abandoned Calls graph) we will be able to see the impact call volume and staffing have on the number of calls which abandoned, and their average wait time. A similar analysis can be performed for delayed calls.

There are no consoles defined.

7.2. Delayed Calls (Speed of Answer)

These graphs show the total number of calls placed in queue waiting for an operator to answer, and the average amount of time calls spent waiting for an attendant. Calls which hang-up before being answered are not included here - they are 'abandoned calls' which are analyzed in the next section. The line showing the number of delayed calls is interpreted using the scale on the right of the graph, and the columns showing delay time (in number of rings) is interpreted using the scale on the left side of the graph.

The key to delayed calls is not the number of calls that are delayed, but rather the amount of time they wait before being answered. Short holding times are usually tolerated, but long holding times will result in poor service and a high number of abandoned calls, reflected in the next report. High queue times may indicate the need to either readjust staffing or add additional attendant positions. Consult Appendix A for established norms, and the 'Console Statistics' section to better gauge overall console performance.

There are no consoles defined.

7.3. Abandoned Calls

These graphs show information about calls which 'abandoned', or hung-up before being answered by an attendant. The line shows the number of abandoned calls for each hour, and is interpreted using the scale on the right of the graph. The columns show the average amount of time callers waited before hanging up (in number of rings), and is interpreted using the scale on the left side of the graph.

We would expect to see a direct correlation between abandoned calls and high queue times as shown in the 'Delayed Calls' section. If you are experiencing a high number of abandoned calls, you might want to verify that available positions are being manned during those periods and examine the Servicing Time spent. Having additional operators available or reducing their work load will improve an abandoned call problem. Use the information in the 'Console Statistics' section and Appendix A to better gauge console performance.

There are no consoles defined.

7.4. Console Statistics

The following table presents some of the raw data that we have displayed graphically in the preceding sections. The data shown here is accumulated for all consoles, and summary information is provided at the end of each day in the study period.

Date	Time	Total Calls Offered	# Calls Answered	Avg Speed of Answer (sec.)	# Calls Delayed	% Calls Delayed	# Calls Abnd.	% Calls Abnd.	Avg Wait (sec.)
There are no consoles defined.									

Appendix A. Typical Busy Hour Data for Attendant Consoles

(as published by Nortel Networks)

	Very Efficient Attd In Non DID system	Avg Attendant In Non DID system	Avg Attendant In DID system
Average Speed of Answer (seconds)	8	10–12	12–15
Average Response Times (seconds)	1–2	2–3	3–5
Calls Delayed	25–35%	25–35%	25–35%
Avg Wait time of Calls in Queue & Abandoned Calls (seconds)	8–10	10–12	12–15
Abandoned Calls	1–2%	1–2%	3–5%
# Calls per Attendant	175–200	150–175	125–150
% Time Mannned	95–100%	>85%	>85%
Work Time per Call (seconds)	7–8	10–12	12–16

Appendix B. Viewing your Traffic Study on the Web

Introduction

Every InfoPlus Traffic Study that is run will be automatically archived and uploaded to our web site for secure online viewing. Each account is assigned a unique Web Code, and entering this code on our web site provides a list of all the studies archived for that account, and the dates they were run. We will store every traffic study for at least three years, allowing comparison of current statistics with those from previous InfoPlus studies run for that account. Also, this technology allows any number of your people, across town or across the country, to view the data simultaneously and discuss its implications.

Suggested Software

The Traffic Studies will be stored in PDF format, also known as Adobe Acrobat™ format. You will need the Adobe Reader application (version 5.0 or later) and any web browser to view the PDF files. Adobe Reader is free to download from Adobe's web site (www.adobe.com).

Instructions

Go to the InfoPlus web site located at www.infoplusonline.com. You'll need to enter the Web Code in the form on the home page. If you do not know the Web Code for this PBX, please contact your vendor representative. The code is case–sensitive, and may contain both numbers and letters. Once a correct code is entered, you will be presented with a list of all archived Traffic Studies for that account, and the date each study was started. Select the study you wish to view, and it will either be presented directly in your browser window, or Adobe Reader™ will launch and display your study. Use the navigation bar at the top of the window to flip through the study, or use the index at the left to access a particular report.

Appendix C. Hints for Easier Traffic Management

1. If you suspect you have too many trunks in a Trunk Group (either incoming or outgoing) and want to reduce your costs, don't disconnect the trunks at first, but just busy them out. This way, you can wait to see if you receive any complaints. If you receive complaints (or other indications of busies), it's very simple to reactivate one or more trunks without delay or Telco expense. After you are comfortable with the reduced number of trunks, you can then disconnect them without risk.

2. Use the Trunk Group Busy lamps on the console to monitor your Trunk Groups. They will give your operators realtime indications of busy conditions. Make sure they are labeled so that the operators can associate a lamp with a specific Trunk Group. You might ask the operators to keep a simple stroke count every time they notice a Trunk Group Busy lamp light. This will give you an early warning of busy conditions.

3. Outgoing Trunk Groups having more than 2 trunks could be split up into 2 Trunk Groups. The second group would consist of only one trunk, and the first group would overflow to the second. This way, we have the same total number of trunks but we can get a better picture of your traffic from the traffic reports. Also, if both Trunk Groups have busy lamps, as recommended above, the busy lamp on the first Trunk Group serves as a warning lamp. If you use CDR, make sure you reflect these changes in your CDR system.

Glossary

Abandoned Call
A call which voluntarily hung–up before being answered.

All Trunks Busy
The percent a given hour that all of the Trunks in a Trunk Group were busy. A review of the 'Blocked/Overflow Calls' for that Trunk Group may indicate simultaneous calls in excess of the number of trunks in the group. See Blocked/Overflow Calls.

Blocked/Overflow Calls
The percent of call attempts presented to a Trunk Group which were blocked due to all of the trunks being busy. If the Trunk Group is part of a Route list, these calls would have been presented to the next Trunk Group in that list. If not, a busy would be returned to the caller.

Blocking
Should there be insufficient time slots to complete a call, the PBX will increment a Blocking count. Ideally, there should be no Blocking within a system.

Bouncing Busy Hour
To project the heaviest traffic for a given period, the Bouncing Busy Hour concept seeks out the heaviest traffic within any given hour regardless of the day in which that hour occurred. For example, in attempting to show the heaviest traffic by hour of the day over a 5 day study, the 9 AM hour might be from Wednesday, while the 10 AM hour might be from Monday.

CCS
A unit of time equal to 100 seconds. To convert CCSs to minutes, multiply by 100, then divide by 60.

CC-TTR
Abbreviation for a Touch-Tone Receiver Call Classifier used for call vectoring.

CDR
Call Detail Recording - A log of statistics about the calls handled by a PBX, including call duration, destination number, date and time, etc.

Codec
Short for compressor/decompressor, it is a device that compresses outgoing data or decompresses incoming data.

Delayed Call
A call to an attendant group which was not immediately answered, but rather placed in queue waiting for an available attendant. Also known as a Queued Call.

Digital Signal Processor
A microprocessor which is used for echo cancellation, call progress monitoring, voice processing, and compression of signals (codecs)

DTMF
Acronym for Dual Tone Multi-Frequency, describing the tones generated and detected when using the keypad of a telephone. Also known as touchtone.

Erlang B
A probability formula used for determining trunking requirements for strictly outgoing Trunk Groups, where excess calls are not queued but rather blocked or overflowed.

Erlang C
A probability formula used for determining trunking requirements for incoming or two-way Trunk Groups, where excess calls may be queued.

IP Region
A group of codec-related settings which are assigned to a specific group of IP endpoints.

Manned Minutes
The total number of minutes within an hour that a console is open and capable of receiving calls. Manned Minutes cannot exceed 60 for any console in any one hour.

Overflow Calls
The number of call attempts presented to a Trunk Group which were blocked due to all of the trunks being busy. If the Trunk Group is part of a Route List, these calls would have been presented to the next Trunk Group in that list. If not, a busy would be returned to the caller.

P.0x
An abbreviation for the specification of a service objective. P.01 indicates a .01 service objective. See Service Objective.

PBX
Private Branch eXchange - A private telephone system which provides connectivity and switching functionality for an organization.

Peg
A simple stroke count of events; in most cases those events are calls.

Port Network
Each station and trunk is connected to a Port Network which provides common call processing functions. Systems are expanded by adding additional Port Networks and linking them together.

Port Network Link (PNL)
Port Network Links are the connections between multiple Port Networks enabling any station or trunk to connect to any other station or trunk within the system.

Regrade
The reassignment of terminals from one Port Network to another to balance traffic between all Port Networks within the system.

Service Objective
The statistical probability of receiving a busy signal for a given volume of traffic presented to a given number of trunks. For example, a Service Objective of .02 would indicate a sufficient number of trunks such that no more than 2 busies out of a theoretical 100 call attempts would be incurred during a given hour.

Servicing Minutes
The number of minutes an operator is actually engaged in processing telephone calls. Since all measurements are hourly, the number of Servicing Minutes can not exceed 60 for any operator for any one hour.

SourceBook
A documentation of the assignments and configuration of a PBX, taken directly from the system.

Speed of Answer
Measures how quickly an attendant will respond to (answer) a call once it is presented to the console. Speed of Answer is an average number for all consoles in a given hour.

TDM (Time Division Multiplex)
That portion of a Port Network whose function it is to establish connections for any terminal. A Port Network's TDM can support 512 simultaneous connections, of which 483 are useable for voice connections.

Terminal
Any port within the system, usually meant to refer to a station or trunk.

Time-slot
In a Time Division Multiple Access (TDMA) schema, the portion of the shared medium available to a single user.

Tone Receiver
A general term for the tone detecting and generating hardware in the PBX, which handle touch tones and call progress tones.

Trunk
A voice and/or data channel between two telecommunications facilities. Trunks connect a private PBX to the public telephone network or other private facilities.

Trunk Group
Trunks of similar nature and purpose defined in the system.

Please e-mail any questions or comments pertaining to these Application Notes along with the full title name and filename, located in the lower right corner, directly to the Avaya Developer*Connection* Program at devconnect@avaya.com.